



Transport
for NSW

Sydney Light Rail Public Private Partnership

Schedules Part E (Volume 1 of 4)

December 2014



**The new state
of business**



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

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PART A - GENERAL

1. Introduction

1.1. The Sydney Light Rail

- (a) The SLR PPP includes:
- i. the operation and maintenance of the existing IWLR;
 - ii. the design, construction, manufacture, testing and commissioning of:
 - A. the CSELR, which will be a new light rail system to service the Sydney CBD and south east Sydney running from Circular Quay to Central Station via George Street, and on to Kingsford and Randwick via Surry Hills and Moore Park. The CSELR must include LRVs, CSELR Stops, terminus facilities, interchanges and facilities for the maintenance and stabling of LRVs;
 - B. public domain works, including a pedestrian zone in George Street from Hunter Street to Bathurst Street; and
 - C. adjustments to existing public roads, existing Utility Services and private properties that are affected by the construction of the CSELR;
 - iii. the testing and commissioning of the CSELR,
 - iv. the operation of the CSELR and IWLR (jointly the Sydney Light Rail (SLR);
 - v. the maintenance of the SLR; and
 - vi. the hand back of the SLR to TfNSW.
- (b) Work to be carried out by others includes Early Works and the ETS ticketing system.
- (c) The SLR Works and OpCo's Activities must comply with the scope and requirements documented in this SPR including those documented in the SPR Appendices.
- (d) SPR Appendix 38 (*Minimum Service requirements*) details the Contract Service Level Requirements being the minimum service requirements for the SLR.
- (e) SPR Appendix 39 (*Operations and customer service requirements*) details the operations and customer service requirements being the minimum operational requirements for the SLR.

1.2. Purpose and requirements in this SPR

- (a) The purpose of this SPR is to set out the scope and performance requirements for the SLR Works and OpCo's Activities. This SPR document, including each appendix, forms part of the deed.
- (b) The requirements in this SPR are minimum requirements, including technical, operational and performance requirements, for the SLR Works and OpCo's Activities, which OpCo must satisfy to fulfil its obligations under the deed.
- (c) If more than one requirement applies in respect of any part of the SLR Works and OpCo's Activities then all requirements must be satisfied. If there are requirements which are mutually exclusive, then the requirement which either delivers the greatest level of service, or is of the highest standard, will apply.

- (d) Reference to any work includes any additional activities necessary for the satisfactory completion and performance of that work and full compliance with the requirements of this SPR.
- (e) OpCo bears the risk that compliance with this SPR will not fulfil OpCo's obligations under the deed. In particular, OpCo will be required to carry out any work, tasks and activities additional to that contemplated by this SPR to ensure that OpCo satisfies its obligations under the deed. For the avoidance of doubt, no requirement in this SPR limits any of OpCo's obligations under any other part of the deed including the Environmental Requirements.

1.3. Meanings and Interpretations

- (a) Unless otherwise defined in this SPR, terms which have a defined meaning in the deed have the same meaning where used in this SPR.
- (b) Where used in Appendix 7 (*Sustainability*), the term "Construction" has the meaning as defined in the Planning Approvals.
- (c) Appendix 1 (*Definitions and acronyms*) contains definitions and acronyms used in the SPR that are not set out in clause 1.1 of the Operative Provisions.
- (d) Unless the context otherwise requires, a reference to "Appendix" (or "appendix") and "Appendices" (or "appendices") in this SPR (including the Appendices) is a reference to an Appendix and the Appendices attached to this SPR, and a reference to this SPR includes all Appendices to it.
- (e) Unless the context otherwise requires, a reference to "section" in this SPR is a reference to a section of this SPR.
- (f) Unless the context otherwise requires, a reference to "Schedule" in this SPR is a reference to a Schedule to the deed.
- (g) Unless stated otherwise, all survey coordinates specified in this SPR are to the Map Grid Australia (MGA-GDA-94).

2. The Customer experience

2.1. TfNSW Customer Service Principles

- (a) The SLR is to provide an integral part of the Customer focused integrated Sydney metropolitan public transport services.
- (b) OpCo is required to incorporate the TfNSW Customer service principles into all of OpCo's Activities. These are:
 - i. **Balanced:** functional performance is balanced with Customer service to achieve high levels of Customer satisfaction;
 - ii. **Efficient assisted self service:** a self-service system that is designed for easy intuitive use. Where assistance may be required, support is available and easy to get;
 - iii. **Universally accessible:** meets the needs of all members of the community with service features that accommodate the distinct needs of key Customer segments;
 - iv. **Flexible:** able to adapt to a range of typical usage patterns and service whilst delivering a consistent level of service outcomes;
 - v. **Legible and consistent:** reflects a service style and tone that is easily understood and consistent with the experience of an integrated transport network; and
 - vi. **Responsive:** a service system open to feedback from Customers that adjusts over time as Customer needs and preferences change, and continuously improves.

2.2. TfNSW Customer satisfaction

- (a) TfNSW requires that Customer satisfaction is a critical outcome of the Customer experience on Sydney metropolitan public transport services. The drivers of Customer satisfaction which have been identified by TfNSW and which must be addressed in the performance of OpCo's Activities are:
 - i. **timeliness;**
 - ii. **personal safety and security;**
 - iii. **ticketing;**
 - iv. **convenience;**
 - v. **accessibility;**
 - vi. **comfort;**
 - vii. **cleanliness;**
 - viii. **information; and**
 - ix. **customer service.**

- (b) *Timeliness* relates to the convenience of access to the service, the service frequency and reliability, and total transit time (A to B time). OpCo must deliver the following *Timeliness* outcomes:
- i. Customers will be offered a frequency of service that enables them to turn up and go at most times of the day;
 - ii. journey time will be consistent, and transit to the Customer's destination will help them to make the most efficient use of their time;
 - iii. Customers will have confidence of service availability through international best practice for reliability; and
 - iv. overall travel times will be minimised, including the time taken to transfer between the SLR and buses, trains, ferries, taxis, and bicycle facilities.
- (c) *Personal safety and security* relates to the level of perceived *personal safety and security* arising from physical design features, asset condition, service operation and other people present. OpCo must deliver the following *personal safety and security* outcomes:
- i. CSELR Stops and LRVs will incorporate crime prevention through environmental design (CPTED) principles and service features that give customers a high degree of confidence about *personal safety and security*;
 - ii. effective lighting and active CSELR Stops will enhance passive surveillance and facilitate a safe Customer environment; and
 - iii. Customers will feel safe on LRVs and at Stops. OpCo will have clear and effective responses to manage any incidents and restore confidence.
- (d) *Ticketing* relates to the ease and convenience of getting and using a ticket. OpCo must deliver the following *ticketing* outcomes:
- i. Customers will experience a consistent *ticketing* system and service across all transport modes through the implementation of the ETS; and
 - ii. connections will be seamless across public transport modes, facilitating multi-modal journeys.
- (e) *Convenience* relates to the ease and convenience of interchange and connection between this and other public transport modes. OpCo must deliver the following *Convenience* outcome:
- i. facilities will provide easy connection between Light Rail and other public transport modes, in particular buses, as part of an integrated transport network.
- (f) *Accessibility* relates to the arrangement of physical facilities to make access to the mode easy, with clear information and signage that makes navigating simple. OpCo must deliver the following *accessibility* outcomes:
- i. CSELR Stop design will ensure integration with pathways, cycle paths, kiss and ride areas and other transport facilities;
 - ii. the SLR will provide the benchmark for compliance with requirements for disability access in public transport;
 - iii. SLR will be compliant with the federal Disability Discrimination Act 1992, and will meet the requirements of the TfNSW Disability Action Plan except where a

- DDA related Existing Asset Defect exists on the IWLR in accordance with Appendix 3 (Assets) ; and
- iv. Customers' special needs will be accommodated by the system design and operation, whether cognitive, physical or sensory and when travelling with children or handling luggage except for IWLR system or operational limitations of a DDA related Existing Asset Defect as detailed in Appendix 3 (Assets)..
- (g) *Comfort* relates to a clean, pleasant environment that is temperature-controlled, well-lit and with sufficient personal space, and other amenities where needed. OpCo must deliver the following *comfort* outcomes:
- i. LRVs will have features that provide general ambient comfort and seats that are designed to be comfortable;
 - ii. comfort features and facilities will be provided in CSELR Stops including shelter and seating;
 - iii. the internal environment of LRVs will be comfortable for Customers; and
 - iv. on board noise will be minimised where possible.
- (h) *Cleanliness* relates to a clean, well-maintained environment, with particular attention to clean seats and an absence of Graffiti and litter. OpCo must deliver the following *cleanliness* outcomes:
- i. all LRVs, Stops, materials, fixtures and fittings will be kept clean and maintain a high quality appearance; and
 - ii. management measures will ensure effective cleaning and maintenance, contributing to the Customer's feeling of comfort and safety, as well as their satisfaction with the standard of cleanliness.
- (i) *Information* relates to clear, effective communication of service and timetable information (in real time) plus clear, easy to understand announcements. OpCo must deliver the following *information* outcomes:
- i. wayfinding and signage will help Customers to navigate the SLR easily and intuitively, and will be consistent with other TfNSW public transport modes;
 - ii. Customers will get accurate and reliable real-time information as they need it to help them use the SLR and be properly informed;
 - iii. measures will be in place to keep Customers informed and help them work out how to get to their destination if service is disrupted; and
 - iv. information about how the services the SLR provides will be fully integrated into Customer information channels.
- (j) *Customer service* relates to polite, knowledgeable, helpful Customer Service Officers who attend promptly and respond effectively to service requests, issues and feedback. OpCo must deliver the following *customer service* outcomes:
- i. facilities, systems and staff, where required, will assist customers with special needs, respond to questions about the transport system and ETS, and provide advice on connecting services and locality information.;
 - ii. Customers will be given accurate, prompt and responsive service, particularly when delays occur and during Special Events;

- iii. measures will be in place to ensure that all Customers understand the accepted norms for social behaviour on the SLR, and there will be processes to address any issues of non-conformance; and
- iv. Staff will be empowered and trusted to deliver outstanding service, capture feedback and drive continuous improvement.

3. SLR PPP scope

3.1. OpCo's Activities

3.1.1. General

- (a) OpCo must undertake OpCo's Activities in accordance with the requirements of the deed, including this SPR, and the Environmental Requirements.
- (b) OpCo must implement a totally integrated approach to the management of OpCo's Activities which continuously and effectively addresses all requirements. In particular, OpCo must:
 - i. deliver the SLR Works and the Temporary Works and maintain and operate the SLR in a manner that ensures the safety of the Customers and personnel at all times;
 - ii. satisfy the technical and procedural requirements of TfNSW with respect to:
 - A. the investigation, design, construction, manufacture, installation, testing and commissioning of the SLR Works and the Temporary Works;
 - B. the operation, maintenance and handback of the SLR; and
 - C. the performance of OpCo's Activities;
 - iii. demonstrate appropriate application of whole of life considerations in:
 - A. the design and construction of the SLR Works; and
 - B. the operation and maintenance of the SLR;
 - iv. develop, implement and maintain workplace initiatives during the performance of OpCo's Activities including industrial relations and training;
 - v. establish and maintain a positive relationship with TfNSW, Customers, stakeholders and the community;
 - vi. establish and maintain a positive relationship with interfacing transport operators;
 - vii. ensure that its planning and programming is comprehensive and provides for the concurrent delivery of the performance and environmental requirements of the deed;
 - viii. ensure that risks are managed throughout the performance of OpCo's Activities;
 - ix. act at all times in a way which supports and enhances the SLR;
 - x. proactively liaise with and comply with the requirements of all relevant Authorities;

- xi. proactively coordinate OpCo's Activities with the activities being carried out by the Managing Contractor and by Other Contractors;
- xii. diligently address safety, function, durability, maintainability, reliability and aesthetics in all aspects of OpCo's Activities including the carrying out of the SLR Works and the Temporary Works;
- xiii. develop, implement and maintain an appropriate Integrated Management System and must ensure that the Integrated Management System satisfies the requirements of the deed including those relating to rail safety, workplace health and safety, quality, environment, sustainability and community;
- xiv. undertake all requirements to obtain and retain Accreditation as necessary to design, build, test, commission, introduce into revenue service, operate, maintain and handback the SLR;
- xv. develop, implement and maintain the Project Plans in accordance with clause 8 of the Operative Provisions and this SPR;
- xvi. preserve and protect existing infrastructure including structures, public transport facilities, cycleways, footpaths, shared paths, Utility Services, roads, railways and buildings, except for existing infrastructure that is required to be demolished where required as part of OpCo's Activities;
- xvii. ensure the SLR Works accommodate maintenance while maintaining user convenience;
- xviii. integrate the SLR operationally and physically with Sydney metropolitan public transport, facilities and services;
- xix. incorporate urban, architectural and landscape design excellence in all relevant aspects of the SLR Works;
- xx. diligently minimise disruption and inconvenience to the public and to other affected parties;
- xxi. implement a proactive stakeholder and community involvement strategy which enables OpCo to respond to and accommodate reasonable stakeholder and community expectations; and
- xxii. ensure a high standard of environmental, sustainability, community, safety and quality performance in the delivery of OpCo's Activities by developing and implementing effective management plans and providing effective leadership to develop and maintain the culture and values that are consistent with this performance objective.

3.1.2. Delivery Activities

- (a) The Delivery Activities include undertaking all tasks and things necessary to:
 - i. investigate, design, construct, manufacture, install, inspect, test and commission the SLR Works and the Temporary Works;
 - ii. maintain any parts of the Early Works located within SLR Site;
 - iii. comply with the Environmental Requirements and all Approvals;
 - iv. prepare the Design Documentation;

- v. prepare, update, submit and report on the Delivery Program;
 - vi. cooperate, coordinate and communicate with TfNSW, the Managing Contractor, the Early Works Contractors, the ETS Contractor and Other Contractors;
 - vii. secure, maintain, repair, reinstate and hand over, in the specified condition, Temporary Areas and any other areas occupied by or affected by the Temporary Works;
 - viii. investigate, relocate, upgrade, install, test, commission and protect Utility Services as necessary as a consequence of performing the Delivery Activities;
 - ix. adjust properties, public space and access as necessary as a consequence of performing the Delivery Activities;
 - x. enable the Independent Certifier to perform its functions (including those identified in the Independent Certifier Deed) and to independently certify the SLR Works and the Temporary Works;
 - xi. provide and apply a quality assurance system for the SLR Works and the Temporary Works;
 - xii. minimise environmental impacts during performance of the Delivery Activities;
 - xiii. maintain the SLR Works, including the Local Area Works, Property Works and Utility Service Works;
 - xiv. repair all Defects in the Local Area Works, Property Works and Utility Service Works;
 - xv. implement all necessary traffic and transport management methods and procedures to effectively and safely manage all road, public transport and public space users affected by the SLR Works, the Temporary Works and the Delivery Activities during construction;
 - xvi. re-open roads affected by the Local Area Works to traffic in accordance with the deed;
 - xvii. facilitate the installation of the ETS by TfNSW in accordance with Schedule B1 (*Electronic Ticketing System and interface*);
 - xviii. hand over the Local Area Works, Property Works and Utility Service Works and the Temporary Areas to TfNSW or other relevant owners or Authorities in accordance with the deed;
 - xix. prepare all documentation required, and undertake all activities necessary, for testing and commissioning of the SLR to achieve Completion;
 - xx. prepare all documentation required for the operation and maintenance of the SLR; and
 - xxi. any other activities which are necessary to achieve Completion and Final Completion.
- (b) OpCo must develop and implement systems integration within the SLR, to achieve the primary objective of carrying passengers between Stops safely and reliably. OpCo must manage SLR systems interfaces, including setting overall protocols, processes and procedures to ensure and assure systems integration.

3.1.3. Operations Activities

- (a) The Operations Activities include undertaking all tasks and doing all things necessary to:
- i. operate and maintain the SLR, including cleaning, repairs, refurbishments, upgrades and replacements as required;
 - ii. provide and manage Customer services;
 - iii. manage incidents affecting the SLR;
 - iv. cooperate, co-ordinate and liaise with TfNSW's Representative and Other Contractors;
 - v. implement, review, update and improve all documentation for the operation and maintenance of the SLR;
 - vi. provide quality assurance of the Operations Activities;
 - vii. maintain, upgrade, protect and provide Utility Services necessary for the Operations Activities;
 - viii. operate and maintain the ETS in accordance with Appendix 39 (*Operations and Customer Service Requirements*);
 - ix. supply all information required for, and review compliance of, all Other Contractors' work and cooperate with Other Contractors;
 - x. coordinate and cooperate with other public transport operators;
 - xi. maintain and comply with the environmental management requirements;
 - xii. maintain an appropriate Integrated Management System that ensures that the Integrated Management System complies with the requirements of the deed including those relating to rail safety, work health and safety, quality, environment, sustainability and community;
 - xiii. undertake all requirements to maintain Accreditation as necessary to operate, maintain, modify and augment the SLR;
 - xiv. address Customer enquiries, complaints and concerns;
 - xv. minimise environmental impacts;
 - xvi. collect data using consistent and accurate methods and systems and report performance of the Operations Activities; and
 - xvii. ensure that the SLR and the ETS Equipment are handed back to TfNSW in the condition required by the deed.

3.2. SLR Works

3.2.1. Categories

- (a) The SLR Works and the Temporary Works include the following categories of works:
- i. the CSELR works, which include:
 - A. trackwork;

- B. rail systems;
 - C. the CSELRVs;
 - D. rail structures;
 - E. the CSELR Stops;
 - F. interchange facilities;
 - G. terminus facilities; and
 - H. the Light Rail Maintenance and Stabling Facilities;
- each of which is further described in paragraphs (i) to (xv) in section 3.2.2(b);
- ii. OpCo ETS Works;
 - iii. Third Party Works, which include:
 - A. Local Area Works;
 - B. Property Works; and
 - C. Utility Service Works; and
 - iv. Temporary Works.
- (b) SLR Works do not include the Early Works which are identified in Appendix 22 (*Early Works*) and which will be undertaken by TfNSW.
- (c) The SLR Works must include necessary provisions to enable the future extensions and network expansions detailed in SPR Appendix 36 (*Future Network*).

3.2.2. Principal Items of infrastructure to be constructed or manufactured

- (a) The SLR Works include all permanent new infrastructure (fixed and moveable) and modifications to existing infrastructure (fixed and moveable) which must be constructed or manufactured to enable OpCo to satisfy the requirements of the deed.
- (b) The permanent infrastructure and modifications to existing infrastructure to be constructed or manufactured include:
 - i. trackwork, including:
 - A. approximately 12 kilometres of twin Light Rail tracks from Circular Quay to Central Station and Kingsford and Randwick via Surry Hills and Moore Park, including rails, track structures, fittings, turnouts and switches;
 - B. a junction between the CSELR and the IWLR; and
 - C. associated civil works, including earthworks, drainage and retaining walls;
 - ii. rail systems, including:
 - A. main control systems (for integrated control and monitoring of all SLR systems);
 - B. signalling and Light Rail control systems (both wayside and LRV borne systems);
 - C. control systems to integrate with traffic signals at road intersections;

- D. communication systems (wayside, Operations Control Centre (OCC) and LRV borne systems);
 - E. power control systems;
 - F. tunnel fire and control systems;
 - G. lighting;
 - H. bulk electrical supply and high voltage reticulation;
 - I. traction power systems and electrification systems;
 - J. wire free electrification systems;
 - K. traction return and electrical earthing, bonding and isolation, and EMC; and
 - L. security systems;
- iii. a fleet of electric-powered CSELRVs, each featuring air-conditioning and accessible low-floor design; and
 - iv. rail structures, including:
 - A. a tunnel under Moore Park and Anzac Parade (also referred to as "Moore Park Tunnel"); and
 - B. a bridge over the Eastern Distributor Motorway (also referred to as "Eastern Distributor Bridge");
 - v. CSELR Stops, including:
 - A. platforms;
 - B. communication systems, including Passenger Information Display Systems, Help Points, signage and wayfinding; and
 - C. lighting;
 - vi. interchange facilities at:
 - A. the Circular Quay Stop;
 - B. the Wynyard Stop;
 - C. the Town Hall Stop;
 - D. the Central Station Stop;
 - E. the Queen Victoria Building Stop;
 - F. the Rawson Place Stop;
 - G. the Randwick Stop;
 - H. the Kingsford Stop;
 - vii. terminus facilities at:
 - A. the Circular Quay Stop;
 - B. the Randwick Stop;
 - C. the Kingsford Stop;
 - viii. the Light Rail Maintenance and Stabling Facilities, including:
 - A. trackwork including stabling areas and associated civil works;

- B. administration building;
 - C. an Operations Control Centre (OCC);
 - D. signalling and LRV control systems;
 - E. control systems (maintenance facilities related);
 - F. maintenance facilities and associated equipment for the SLR;
 - G. LRV wash;
 - H. office facilities and staff amenities;
 - I. surveillance and security systems;
 - J. facilities for receipt, storage and protection of Spares;
 - K. noise mitigation measures;
 - L. drainage works;
 - M. landscaping, bicycle and car parking;
- ix. OpCo ETS Works, including:
- A. ETS supporting data infrastructure;
 - B. ETS supporting power infrastructure; and
 - C. associated civil works;
- x. adjustments to existing public domain and public roads that are affected by the SLR Works, the Temporary Works, the Property Works, the Utility Service Works and OpCo's Activities. The adjustments include:
- A. pedestrian zones and shared zones;
 - B. public domain modifications, including paving, street trees, lighting and furniture;
 - C. modifications to:
 - 1. deceleration lanes and turning bays;
 - 2. pedestrian crossings and footpath construction;
 - 3. traffic control signals;
 - 4. control systems and integration of signalling and LRV detection;
 - 5. all associated pavements, drainage, traffic barriers, signposting, linemarking, lighting and fencing;
 - D. those works which are identified in Appendix 16 (*Road Works*);
 - E. all modifications to any existing Local Areas, footpath, shared path, cycleway, park or other publicly accessible area or street which are required by the Environmental Requirements, except as identified in Schedules B2 (*Environmental Requirements and Planning Approvals*) and B3 (*Requirements of Third Parties*);
 - F. a new pedestrian bridge over Anzac Parade;

- G. all provisions to allow pedestrians, pedal cyclists and disabled persons to use the surrounding transport networks, including footpath, shared path, cycleway, bus and road networks, affected by the SLR Works and the SLR;
 - H. all permanent arrangements to allow people and vehicles access to property affected by the SLR;
 - I. adjustments to pavement markings, signs, sign support systems, traffic control signals and street lighting;
 - J. items of street furniture to improve safety (particularly safety barriers) and all fencing and other security measures;
 - K. measures to minimise and mitigate noise and vibration during the performance of the Local Area Works;
 - L. adjustments to roads, footpaths, shared paths and cycleways;
 - M. all environmental safeguards necessary to mitigate environmental impacts which might arise as a consequence of the use of the Local Areas, including those identified in the Environmental Requirements;
 - N. removal of the existing footbridge across the Eastern Distributor opposite Parkham Street, Surry Hills and the associated traffic control signals and pedestrian crossings on the eastern and western carriageways of South Dowling Street; and
 - O. removal of the existing at-grade pedestrian crossing Anzac Parade Parade outside Sydney Girls High School opposite the southern end of the special event busway;
- xi. adjustments to private properties which are necessary as a consequence of the CSELR works, the Temporary Works, the Local Area Works, the Utility Service Works and OpCo's Activities including private properties owned or under the control of parties identified in Schedule B3 (*Requirements of Third Parties*). The adjustments include:
- A. all changes in access arrangements outside the Construction Site and road reserves;
 - B. demolition and modification of built features;
 - C. modifications to existing buildings;
 - D. modifications to property drainage; and
 - E. all other property adjustment works necessary as a consequence of performing the Delivery Activities including those identified in the Environmental Documents.
- xii. new Utility Services, including:
- A. substations; and
 - B. Utility Services identified in Schedule B4 (*Requirements of Utility Provider Agreements*); and
- xiii. adjustments and modifications to existing Utility Services that are affected by the construction of the SLR Works, Local Area Works and Property Works. The adjustments and modifications include:
- A. the protection, repair, adjustment or enhancement of infrastructure related to Utility Services which are affected by the Delivery Activities;

- B. all environmental safeguards and measures necessary to mitigate environmental effects which may arise during the design and construction of the Utility Service Works;
- C. the preservation of Utility Services throughout the construction of the SLR Works and the Temporary Works; and
- D. the provision of all Utility Services connections required to provide the SLR Works and perform the Operations Activities.

3.3. Temporary Works

- (a) Temporary Works include:
 - i. temporary measures necessary to meet the needs of all road, public area and pathway users during the Delivery Activities, including the requirements for any temporary footpaths, shared paths and public transport facilities if applicable;
 - ii. temporary arrangements to divert and control traffic and to provide public amenity, security and safety during the Delivery Activities;
 - iii. temporary arrangements for people and vehicles to access all property affected by the Delivery Activities;
 - iv. all environmental safeguards and measures necessary to mitigate environmental effects during construction of the SLR Works;
 - v. sustainability initiatives to minimise resource use during construction of the Temporary Works;
 - vi. cleaning, maintenance, repair, replacement and reinstatement, as required, of all areas occupied by OpCo during construction of the SLR Works;
 - vii. the maintenance of Local Areas during construction of the SLR Works;
 - viii. temporary site facilities required for construction of the SLR Works; and
 - ix. temporary infrastructure installed or erected to undertake construction of the SLR Works.

3.4. Early Works

- (a) OpCo's Activities include any modifications necessary to the Early Works to accommodate the SLR Works, to otherwise accommodate OpCo's Activities or to otherwise comply with the deed including this SPR.

3.5. Future proofing

- (a) OpCo must design the SLR Works to enable:
 - i. the construction, commissioning and testing of the future network extensions and future network expansions as contemplated in section 3.6;
 - ii. the future upgrading of, and adjustments to, Assets, including trackwork, CSELRVs, CSELR Stops, Public Domain and the Light Rail Maintenance and Stabling Facilities, as contemplated by this SPR, including Appendix 13 (*Stops*), Appendix 14 (*Public Domain*), Appendix 17 (*Trackwork*), Appendix 19 (*Light Rail Maintenance and Stabling Facilities*) and Appendix 37 (*Rolling Stock*); and

- iii. modification to all systems, Project Plans and operating protocols and obtaining all Approvals required for (i) and (ii) above,

with minimal effect on the operation of the SLR or the provision of the Required Services, so far as is reasonably practicable.

3.6. Provisions for future network

- (a) The SLR must be designed, constructed and maintained to enable the future network extensions and future network expansions detailed in Appendix 36 (*Future Network*).
- (b) OpCo must ensure that the SLR Works and OpCo's Activities are sufficiently flexible to enable the future network extensions and future network expansions to occur as detailed in Appendix 36 (*Future Network*).
- (c) OpCo must provide evidence during its design development of the provision for the future network extensions and future network expansions in accordance with the requirements of Appendix 36 (*Future Network*).

4. General requirements

4.1. General

- (a) All investigation, design, approvals, construction, manufacture, installation, testing, commissioning, operation, management and maintenance are to be entirely integrated and compatible and together they must mutually satisfy all the requirements of the deed including this SPR.
- (b) The SLR Works and the Temporary Works must be designed and constructed to the standards and to deliver the performance requirements of the deed, including this SPR.
- (c) The required performance of the SLR Works and the Temporary Works must be taken into account during all stages of OpCo's Activities, including:
 - i. safety in design (with input from the end users);
 - ii. safety during construction and installation;
 - iii. safety during testing and commissioning;
 - iv. safety in operation;
 - v. safety during cleaning and maintenance;
 - vi. safety for renewal, refurbishment and disposal;
 - vii. safety during Augmentation; and
 - viii. safety during decommissioning.
- (d) The IWLR must be operated and maintained during the IWLR Operations Phase in accordance with the IWLR operational performance requirements of the deed, including this SPR.
- (e) The SLR must be operated and maintained during the Operations Phase in accordance with the operational performance requirements of the deed, including this SPR.

- (f) OpCo must develop, implement, ensure and assure SLR systems integration, including:
- i. set system objectives, functions and operational rules, procedures outcomes and goals;
 - ii. assign systems protocols, develop system definitions and systems hierarchy to sub-systems, assemblies, components and parts;
 - iii. develop system and human interfaces and controls;
 - iv. develop standards and guidelines for design, construction, testing, commissioning and operation;
 - v. set maintenance and preventative maintenance practices to achieve operational outcomes and goals; and
 - vi. implement training in relation to design, construction, operation and maintenance of SLR systems.

4.2. Standards and General Specifications

4.2.1. TfNSW's General Specifications

- (a) OpCo's Activities must, as a minimum, comply with TfNSW's General Specifications provided in Appendix 11 (*TfNSW's General Specifications*).
- (b) Any references in TfNSW's General Specifications to "Drawings" (or "drawings") must be read as a reference to Design Documentation prepared by OpCo that has been certified by the Independent Certifier and otherwise prepared and submitted in accordance with clause 13 of the Operative Provisions.
- (c) Any reference in TfNSW's General Specifications to submissions to TfNSW or otherwise, must be read to also be a submission to the Independent Certifier.

4.2.2. Standards and Guidelines

- (a) OpCo's Activities must, as a minimum, comply with the Standards and Guidelines.
- (b) OpCo must comply with the version of a code or standard in accordance with clause 1.14 of the Operative Provisions.

4.3. Effects of OpCo's Activities

- (a) OpCo's Activities must have no adverse impacts on any existing ground conditions or on the performance of any infrastructure (including roads, railways, Utility Services, pedestrian access and buildings) including any impact, other than the impacts that are acknowledged in the Environmental Requirements, relating to:
- i. amenity;
 - ii. aesthetics;
 - iii. durability;
 - iv. function and performance;
 - v. user benefits;
 - vi. safety during construction and operation; and

- vii. sustainability and environmental performance.
- (b) OpCo must undertake a detailed and rigorous engineering analysis (including numerical modelling) to predict the effects (the Predicted Effects) of OpCo's Activities on existing ground conditions and infrastructure (including roads and the road network, roadway lighting, roadway signalling and other below ground infrastructure, railways, Utility Services and buildings).
 - (c) In determining the Predicted Effects, the detailed rigorous engineering analyses must, as a minimum, consider the effects of vertical and horizontal displacements, rotations, strain, shear, structural loads, vibration, noise, seepage and groundwater movement as well as potential variations or changes to the existing ground and infrastructure conditions.
 - (d) The Predicted Effects must include the limits of accuracy of the prediction and the expected statistical spread of measured results.
 - (e) OpCo must also determine the extent to which the existing ground conditions and infrastructure may be acceptably affected (the Acceptable Effects), consistent with satisfying the requirements in section 4.3(a) above and the Environmental Requirements.
 - (f) Throughout OpCo's Activities, OpCo must monitor the actual effects of OpCo's Activities and compare the actual effects to both the Predicted Effects and the Acceptable Effects.
 - (g) Monitoring of the actual effects of OpCo's Activities on existing ground and infrastructure must be undertaken by qualified and experienced geologists, geotechnical engineers, structural engineers, noise and vibration specialists and environmental specialists.
 - (h) In the event that the actual effects of OpCo's Activities exceed the Predicted Effects, OpCo must review and, if necessary, re-evaluate the Predicted Effects and make any adjustment subsequently necessary to any aspects of the manner in which OpCo's Activities is undertaken to ensure that the Acceptable Effects are not exceeded and to ensure full compliance with section 4.3(a) above and the Environmental Requirements.
 - (i) During the Operations Phase, OpCo must continue to monitor the actual effects of OpCo's Activities until it is demonstrated that the effects have fully materialised and that OpCo has complied with section 4.3(a) above.
 - (j) Notwithstanding the Predicted Effects contemplated in section 4.3(b), OpCo must, where necessary, repair and reinstate infrastructure at the earliest opportunity so that OpCo satisfies the requirements of section 4.3(a) above in respect of each item of infrastructure and the ground conditions.
 - (k) OpCo must promptly and progressively provide TfNSW and the Independent Certifier with:
 - i. analysis and determinations, including any revisions, and re-evaluations of the Predicted Effects and the Acceptable Effects;
 - ii. results of monitoring the actual effects of OpCo's Activities, in a form which is directly comparable to the Acceptable Effects and Predicted Effects;
 - iii. details of any adjustments to the manner in which OpCo's Activities are carried out which are necessary as a consequence of any re-evaluation of Predicted Effects; and

- iv. details of designs and materials for the repair and reinstatement of infrastructure required by section 4.3(j) above.
- (l) OpCo must submit, prior to the Date of Completion, a final updated report detailing the Predicted Effects, Acceptable Effects and actual effects of OpCo's Activities on the existing ground conditions and infrastructure.

4.4. Safety

- (a) Safety requirements must be taken into account in all aspects of OpCo's Activities with input from involved and affected parties.
- (b) Without limiting the requirements in the WHS Legislation, the Rail Safety National Law and the Rail Safety Regulations, OpCo must consider and address all safety issues, hazards and risks and requirements relating to safety during design, investigation, construction, commissioning, operation, maintenance, augmentation, handback and decommissioning of the SLR Works and the Temporary Works and in the development and production of the Design Documentation, including:
 - i. all safety issues, hazards and risks arising out of or in connection with OpCo's Activities, including public and community safety during the Delivery Activities;
 - ii. safety goals and objectives and generic hazards associated with OpCo's Activities;
 - iii. safety issues, including generic issues, and hazards and risks associated with OpCo's Activities;
 - iv. all applicable safety standards and codes of practice to be applied to the design input for each design package, hazards and risks which cannot be eliminated, managed or mitigated by the design and the measures to be adopted in the construction, operation, maintenance, handback and decommissioning phases to manage and mitigate these hazards and risks;
 - v. hazards and risks that require the development of specific procedures in the construction, operation, maintenance and decommissioning phases to eliminate the risks to safety and, where elimination of a risk to safety is not reasonably practicable, reduce those risks so far as is reasonably practicable;
 - vi. hazards and risks associated with working in a light rail corridor;
 - vii. safety issues related to the on-going repair, maintenance, upgrading and decommissioning;
 - viii. issues relating to working adjacent to or with live Utility Services, including high voltages or pressures, overhead clearances, dangerous excavations, contaminated ground or groundwater and asbestos materials;
 - ix. hazards and risks identified as part of the risk management process and resultant changes and management measures in the Design Documentation and OpCo's Activities;
 - x. safety implications of OpCo's Activities including the:
 - A. competencies and condition of personnel;
 - B. positioning of site access and egress points;
 - C. location of site facilities and accommodation;

- D. location of traffic / pedestrian routes;
 - E. working on or adjacent to the road network;
 - F. safe work at height requirements;
 - G. proximity to traffic and railway lines during the performance of OpCo's Activities; and
- xi. hazards and risks which arise from the materials proposed for the SLR Works and the Temporary Works and which require precautions either because of the nature of the materials or the manner of their intended use. The materials must be specified in sufficient detail to allow the safe use of the materials, based on precautionary information provided by the suppliers of those materials.
- (c) Safety in design principles and processes must be included in the design development and other key stages throughout OpCo's Activities, incorporating the requirements of all relevant codes and standards, including Safe Work Australia Code of Practice, "Safe Design of structures". The outcomes of OpCo's risk assessment activities must be considered as part of the safety in design process.
- (d) TfNSW must be provided an opportunity to participate in the various safety in design processes.

4.5. Site Investigation, Survey and Condition Monitoring

- (a) OpCo must undertake all site investigations, property and land surveys and ground and infrastructure condition surveys required for the OpCo's Activities in accordance with Appendix 46 (*Site Investigation, Survey and Condition Monitoring*).
- (b) OpCo must promptly provide TfNSW and the Independent Certifier with two copies of all site investigation reports, property and land surveys and ground and infrastructure condition surveys, including progressive copies of such documents as each is developed, promptly, and in any event within 5 Business Days of OpCo receiving such reports.

4.6. Local Area Works

- (a) OpCo must carry out all Local Area Works necessary as a consequence of the SLR Works, the Temporary Works, the Property Works, the Utility Service Works and OpCo's Activities.
- (b) OpCo must carry out all Local Area Works which are:
- i. necessary to satisfy TfNSW's obligations arising from the Environmental Requirements;
 - ii. required to allow all road users and the affected public to safely use any Local Area affected by the SLR Works or OpCo's Activities;
 - iii. necessary to prevent either unlawful or accidental access; or
 - iv. required as a consequence of requirements arising from the stakeholder and community liaison process.
- (c) In addition to the standards and requirements specified in this SPR, Local Area Works must be in accordance with the requirements of all relevant Authorities.
- (d) Evidence of Approvals from Authorities must be provided to the Independent Certifier in accordance with the deed.

- (e) OpCo must carry out the Local Area Works in such a way as to minimise delay and disruption to all road users (including pedestrians, cyclists, public transport passengers and operators).
- (f) OpCo must use appropriate traffic and transport management methods and procedures to effectively and safely manage all road users throughout the Delivery Phase.
- (g) OpCo must maintain access to and minimise disruption to affected businesses, properties and land throughout the Delivery Phase.
- (h) OpCo must communicate its planned processes, solutions and program to the tenants, occupiers and owners of properties that have the potential to be affected by the construction of Local Area Works. OpCo must respond to and address issues that are raised during this consultation.

4.7. Property Works

- (a) OpCo must carry out all Property Works necessary as a consequence of OpCo's Activities including work which is necessary to satisfy TfNSW's obligations arising from the Environmental Documents and required as a consequence of requirements arising from land acquisition and the stakeholder and community liaison process.
- (b) OpCo must carry out all Property Works required to provide people and vehicles access to and egress from existing buildings, infrastructure and properties which are affected by OpCo's Activities or the SLR Works.
- (c) OpCo must carry out all Property Works necessary to ensure the amenity or the functionality of any property (including any building or structure) which is affected by OpCo's Activities or the SLR Works is maintained to at least the standard prior to OpCo's Activities.
- (d) Not used.
- (e) In respect of all Property Works, the consent of the owner and any occupier of each property affected by the Property Works must be obtained prior to any work commencing as required by the deed. The Property Works must be designed and implemented to the standards specified in the deed, including this SPR, or in the absence of any such specification, to reasonable engineering standards and must be fit for their intended purpose.
- (f) Access to properties affected by the Property Works must be provided by OpCo to TfNSW's Representative at all times while OpCo has access to the relevant property.
- (g) Where OpCo's Activities require work within or directly adjacent to properties, OpCo must consult with the owner of the property and gain their consent, as far as is reasonably possible, to the planned protection methodology.

4.8. Utility Service Works

- (a) OpCo must carry out all Utility Service Works necessary as a consequence of OpCo's Activities.
- (b) OpCo must carry out all Utility Service Works necessary to satisfy TfNSW's obligations arising from the Environmental Requirements.
- (c) OpCo must carry out all Utility Service Works which are:
 - i. necessary to preserve and protect Utility Services throughout the design and construction of the OpCo Works and Temporary Works; and

- ii. required for the provision of all Utility Services and Utility Services connections for undertaking OpCo's Activities.
- (d) OpCo must identify all the Utility Services (including overland flow paths) potentially affected by OpCo's Activities to determine requirements for adjustment, protection and support. This must be undertaken in consultation with the relevant Utility Service owner or Authority.
- (e) OpCo must identify all Utility Services required for OpCo's Activities and must do all things necessary to provide and maintain connections to such Utility Services to the SLR Works and the Temporary Works.
- (f) Except as expressly set out in this deed, OpCo must investigate, adjust, protect, support, relocate, enhance or provide for all Utility Services that are affected by OpCo's Activities or required for OpCo's Activities whether or not the existence or extent of the existing Utility Services were known prior to the execution of the deed.
- (g) OpCo must ensure that there are no unplanned disruptions to Utility Services resulting from OpCo's Activities and that planned disruptions are minimised. OpCo must advise all affected parties including local residents, businesses, and TfNSW prior to any disruption of any Utility Service.
- (h) OpCo must arrange, and where necessary design, and coordinate the relocation of all Utility Services and must ensure that the requirements of each Utility Service owner and Authority are met. OpCo must obtain the written approval and acceptance of all works to and around any Utility Service from the relevant Utility Service owner or Authority in accordance with the deed.
- (i) OpCo must inform TfNSW of the status of the Utility Service owner or Authority arrangements and must provide sufficient notice to allow TfNSW's Representative and the Independent Certifier to attend Utility Service owner or Authority meetings as may be required from time to time.
- (j) Permanent location markers must be provided as required by the relevant owner or Authority. As constructed details of the locations of Utility Services must be provided to TfNSW and the Independent Certifier on progressive completion of the SLR Works.
- (k) All Utility Services exposed to view as a consequence of OpCo's Activities must be protected and concealed in accordance with the requirements of the relevant Utility Service owner or Authority.
- (l) With the approval of the relevant Authorities and Utility Service owners, OpCo may abandon Utility Services, in which case any works to make safe the Utility Services must be to the satisfaction of the relevant Authorities and Utility Service owners.

4.9. Traffic and transport management

- (a) Traffic and transport management associated with the Delivery Activities and maintenance activities must be planned to avoid delays and detours that will inconvenience the affected public or road users or interfere with traffic during periods of heavy traffic flows.
- (b) All traffic and transport management associated with the Delivery Activities and maintenance activities must comply with the Environmental Requirements and the following:
 - i. Appendix 11 (*TfNSW's General Specification*) – (*G10, Traffic and Transport Management*));

- ii. Appendix 12 (*Construction Traffic and Transport Management Constraints*); and
 - iii. the Traffic and Transport Management Plan.
- (c) OpCo must obtain approval from the relevant Authorities prior to implementing any changes to traffic flow, vehicle, pedestrian, public transport and bicycle movements or adjustments to arrangements for control of traffic on roads, footpaths and shared paths.
 - (d) Unplanned traffic management activities, including emergency work due to incidents, that involves unplanned closure of a lane, shoulder, footpath or shared path or a restriction in the flow of pedestrians, cyclists, public transport services or traffic occurs, OpCo must immediately advise the relevant Authorities and TfNSW's Representative of the nature of the closure or restriction and of the schedule for reopening of the lanes, shoulders, footpaths or shared paths. OpCo must take all necessary measures to open the lanes, shoulders, footpaths and shared paths as quickly as possible.
 - (e) Copies of any traffic control plans approved by relevant Authorities that set out specific traffic and transport management arrangements to be implemented at specific locations during the construction of the SLR Works and Temporary Works must be issued to TfNSW and the Independent Certifier.
 - (f) Where traffic control devices include safety barriers, the safety barriers must comply with the requirements of all relevant Authorities.
 - (g) Temporary traffic lanes on roads must comply with the requirements of all relevant Authorities.
 - (h) Vehicles involved in the Delivery Activities must only enter, operate within or exit from a work site in a manner which does not endanger the public and under suitably designed and appropriate traffic control measures.
 - (i) OpCo must provide suitable intersections or points of access for vehicles entering or leaving the Construction Site and at locations where the traffic volumes are increased as a result of the Delivery Activities. The intersection and access treatments must comply with the requirements of all relevant Authorities.
 - (j) Advertising must be undertaken by OpCo to advise the affected public and road users of the proposed changes to traffic flow, vehicle, pedestrian and bicycle movements and arrangements for control of traffic on roads in accordance with the requirements in TfNSW's General Specifications G10 (*Traffic and Transport Management*).
 - (k) OpCo must acknowledge and make provision for Special Events, Class 1 Events and Class 2 Events, including New Year's Eve from 12am on 30 December to 12am on 2 January, and maximise the areas available for the safe passage of pedestrians.
 - (l) OpCo must comply with any traffic direction or instruction given by the NSW Police Force, a relevant Authority or TfNSW's Representative in respect of traffic and transport management.
 - (m) The NSW Police Service, a relevant Authority or TfNSW's Representative may, at any time, instruct OpCo to re-open a lane, shoulder, footpath or shared path without delay, whether or not that lane, shoulder, footpath or shared path was closed by prior agreement. OpCo must immediately comply with such instructions.
 - (n) OpCo must plan and execute OpCo's Activities to comply with the requirements of relevant Authorities to ensure safe cycling and pedestrian conditions, including

temporary or modified provisions, are maintained at all times during OpCo's Activities.

4.10. Accidents and incidents

- (a) In the event of an accident or Incident occurring at a Construction Site or any other location affected by OpCo's Activities, OpCo must:
- i. gather all relevant available information about the accident or Incident, including but not limited to witness statements and details, photographs, and locations of all safety devices, people, vehicles and equipment and anything else whose location may have a bearing on the event;
 - ii. record all information gathered and its knowledge of the facts as soon as practicable and possible after the accident or Incident;
 - iii. provide notification to TfNSW's Representative and all relevant Authorities of the accident or incident as soon as possible but not later than 2 hours after the event; and
 - iv. provide a detailed report with all available information to TfNSW's Representative within 2 days of the accident or Incident.

PART B - DELIVERY

5. Design

5.1. General

- (a) The design of the SLR must provide innovation and flexibility to enable future upgrades, improvements and Augmentation to be implemented without materially adversely impacting on the management, use, operation and maintenance of the SLR.
- (b) The Design Documentation must not depart from the Concept Design included in Appendix 45 (*Concept Design*) in a manner that will:
 - i. increase user costs, whole of life costs or travel time; or
 - ii. reduce the performance of any part of the SLR including:
 - A. quality of the Customer experience and amenity;
 - B. safety;
 - C. durability;
 - D. aesthetics, cleanliness, condition and visible features;
 - E. design life;
 - F. maintainability;
 - G. whole of life performance;
 - H. environmental performance;
 - I. sustainability performance;
 - J. user benefits;
 - K. functional performance; or
 - L. security.
- (c) All visible elements of the SLR Works and the Temporary Works must have an attractive appearance. The SLR Works must be of no lesser standard than the architectural and urban design for the SLR Works as described in Appendices 13 (*Stops*), 14 (*Public Domain*) and 45 (*Concept Design*).
- (d) CSELR Stops and Public Domain areas must be designed to accommodate the future-proofing requirements identified in Appendix 13 (*Stops*) and Appendix 14 (*Public Domain*).
- (e) The design and selection of equipment for the SLR Works must incorporate:
 - i. a modular approach to enable effective exchange of components;
 - ii. consistency of design, system and equipment types and manufacture;
 - iii. crime prevention through environmental design principles, including consideration of the processes and principles described in 'Crime prevention and the assessment of development applications – Guidelines under section 79C of the Environmental Planning and Assessment Act 1979'.;
 - iv. sustainability;
 - v. equipment and components that will be secured or mounted so as not to impede the Rolling Stock gauge swept path or dynamic envelopes; and

- vi. equipment with demonstrable prior performance in an equivalent light rail environment.
- (f) The design and selection of equipment for the SLR must incorporate an assessment of OpCo's Activities in accordance with the process and requirements of the NSW Police assessment tools 'Safer By Design Evaluation' and the 'Companion to the Safer By Design Evaluation'. The assessment must be carried out by a suitably qualified individual who has completed the safer by design training course provided by the NSW Police and an assessment statement must be prepared.
- (g) OpCo must provide a fully integrated design solution, integrated across the various systems through the design.
- (h) All equipment of the same function and rating must be of the same manufacture, model and (where applicable) build.
- (i) Where not specified in the deed or within Standards and Guidelines, OpCo must ensure that all Assets are rated and able to perform their normal duties or cycles, within the design environmental ranges provided in Table 1 below, excepting that electrical power equipment need only be suitable for the design environmental ranges set out in TfNSW standard EP 00 00 00 13 SP - Electrical Power Equipment - Design Ranges of Ambient Conditions where this standard nominates a less onerous condition than that shown in Table 1.

Table 1 Design environment ranges

Control/environment	Range/comment
Ambient air temperature	-10°C to 45°C dry bulb (+ Operation in lower performance for temperature peak up to 50°C in exceptional circumstances)
Relative humidity	10% to 95% non-condensing
Rainfall rate	up to 40mm/hour
Solar radiation	up to 1000W/m ²
Wind speed	up to 120kph
Dust and particulates	To accommodate actual circumstances and location of affected Asset
Vibration	Not in excess of an acceleration rate of 0.1 G continuously, or 0.25G intermittently in the frequency range of 5 to 25 Hz
Ambient lighting	10 to 100,000 lux

- (j) The design and selection of equipment for the SLR must be resistant to attack by wildlife present along the route. Wildlife to be considered must include (but is not limited to) birds (that might attack OHW insulators), possums, flying foxes, insects and rodents.

5.2. Design Life

- (a) The Design Life is the period within which an element of the SLR Works must continue to meet the technical requirements as described in this SPR and its intended function, without replacement or work that requires the operation of the SLR to be disrupted.
- (b) The Assets comprising the SLR Works must have the following minimum Design Life:

Table 2 Minimum Design Life – SLR Works

No.	Asset	Design Life
General		
1.	Civil and structural elements including foundations, retaining structures, culverts, tunnel structures and portals, tunnel elements, bridge structures and other structural load bearing elements unless specifically noted otherwise below	100 years
2.	CSELR Stop structural elements including pre cast and cast in place concrete and load bearing masonry and structural steel canopy structures	50 years
3.	Retaining structures, rock bolts, rock anchors and sprayed concrete	100 years
4.	Trackform structure between Circular Quay Stop and George Street / Rawson Place intersection (inclusive)	100 years
5.	Trackform structure at all locations other than that specified in item 4 above	75 years
6.	OHW mast foundations, OHW masts and portals	50 years
7.	Permanent and inaccessible elements of fire protection, mechanical and electrical control systems	50 years
8.	Drainage structures, tanks and inaccessible pipe systems	50 years
9.	Earthing, bonding and electrolysis protection systems (inaccessible)	The same life as the structure in which it is buried
10.	Earthing, bonding and electrolysis protection systems (accessible)	30 years
11.	Non-load bearing masonry building elements	50 years
12.	Fire systems – fixed parts including: suppression, hydrant and hose reel systems	30 years
13.	Foundation structures and any permanent connections for all artwork, signage and way finding systems, flood and scour protection	25 years
14.	Fixed elements of water treatment plant and systems	30 years
15.	Noise barriers, noise attenuation devices and acoustic panels and support systems	30 years
16.	Artwork, signage and way finding - primary support systems (excluding foundation systems or panel faces/fascia panels)	15 years
17.	Pumps, tanks and valves, pump control systems and accessible pipe systems	20 years
18.	General lighting & electrical (not part of 19 and 21), ventilation, fire and other fire life safety services	25 years
19.	Low voltage switchboards, lighting fixtures and electrical systems	30 years

No.	Asset	Design Life
20.	External building roof finishes, glazing and external cladding	25 years
21.	Building services – main switchboards, central systems and plant and reticulation	30 years
22.	Cabling, conduits and cable support systems	30 years
23.	Public telephone operator communication, public information systems and security systems	20 years
24.	External furniture and fittings, fences and security/fire gates or doors	20 years
25.	Internal non-structural elements – fit out, fixtures and finishes	20 years
26.	Flexible (asphalt) road pavements, car park surfaces, external paving, footpaths, shared paths and hard landscaping features	20 years
27.	Artwork, signage and way finding - panel faces and fascia panels (internal and external)	15 years
28.	Multi-user-screens, ICT equipment and general whitegoods	5 years
29.	UPS batteries, HV/LV switch/control batteries and battery chargers	15 years
CSELR Stops		
30.	Ticketing system - structures, gantries, and other equipment structures not supplied by TfNSW	40 years
31.	Glazing, frames, fixtures and fittings	30 years
Light Rail Maintenance and Stabling Facilities		
32.	Building structural elements	50 years
33.	Train wash – slab, structure, drainage systems, tanks and sumps	50 years
34.	Facility plant and equipment	30 years
35.	OCC server and rack support frames, computer flooring, cable support structures and seismic frame supports	30 years
36.	Train wash – wash unit, controls and water treatment systems	15 years
37.	OCC servers, racks, routers, controls and subsystems	10 years
38.	OCC local HMI computers, screens, wall screens, printers and general OCC IT support equipment	5 years
Rolling Stock		
39.	LRVs and primary support systems	30 years
40.	Non-Revenue Vehicles	20 years
41.	Specialist emergency equipment, re-railing and recovery equipment	20 years
Road corridor		
42.	Road pavement which incorporate a cement base or subbase	40 years
43.	Road pavements other than those described in item 42 above	20 years
44.	Pavement modifications consisting of corrector courses and / or pavement wearing course overlays only	10 years
45.	Shared use path pavements	20 years
46.	Road sign support structures and other roadside furniture	15 years

No.	Asset	Design Life
47.	Road side barriers, (excluding maintenance for road crash repairs)	40 years
Rail systems		
48.	Rails on plain line track	40 years
	Rails where horizontal radii is <100m (measured on track centreline)	15 years
49.	Rail joints (welds, Insulated, movement)	40 years
50.	Rail pads, rail base plates and fixings	20 years
51.	Track turnouts and crossings	40 years
52.	Sleepers	40 years
53.	Ballast	25 years
54.	Sub ballast mats and specialist formation treatments	50 years
55.	Electrical supply and traction power supply systems, transformer, main distribution boards, switches and control systems	30 years
56.	OHW, contact and catenary, insulators and switches	30 years
57.	Rail telecommunications systems – fibre and copper back bones	30 years
58.	Signalling and LRV location systems, wayside equipment	20 years
59.	All other rail telecommunications systems	15 years
60.	Passenger information systems, PA, help points	15 years
61.	Access control and security systems including CCTV	15 years
Other		
62.	All other Assets and sub Assets not described above	Typical industry values for similar assets of a high standard and quality

5.3. Durability in design

- (a) Durability must be incorporated in all Assets. Durability must be considered and addressed throughout the design and construction of all Assets.
- (b) OpCo must make its own assessment of the events and circumstances which affect the whole of life performance of each Asset including:
 - i. the micro-environment, including local air and ground conditions, groundwater conditions, contamination and exposure conditions including temperature, humidity and CO₂ level;
 - ii. operational conditions including drying and wetting, flooding, vibration, heat and stray current effects;
 - iii. potential deteriorating mechanisms in the micro-environment including penetration of aggressive substances into structural elements through cracks, joints, by wick action or other areas of deterioration;
 - iv. rate of deterioration;

- v. the likely material life;
 - vi. risk and variability of the constructed product;
 - vii. the feasibility and cost of in-situ monitoring, maintenance and/or repair and replacement;
 - viii. the necessity of providing additional protection including coatings; and
 - ix. the significance of failure.
- (c) OpCo must incorporate all controls necessary to ensure the durability of all Assets and to ensure that the specified Design Life for each Asset is met. These controls must be identified in the Design Documentation and the Project Plans.
- (d) The durability portions of the Design Documentation and the Project Plans must demonstrate the specified Design Life for each Asset and how the selected design, materials, construction and maintenance methods will achieve the durability requirements for each Asset.
- (e) Where the durability for an Asset has been defined by OpCo as a high or extreme risk to normal operations, the Design Documentation must detail OpCo's intended approach to maintaining durability during the life of that Asset.

5.4. Maintainability in design

- (a) The SLR Works must be designed and constructed so that they can be maintained effectively, safely and with minimum whole of life cycle costs.
- (b) The design must provide adequate maintenance access to allow for ease of maintenance.
- (c) All equipment must have sufficient clear space on all sides to allow maintenance and replacement to take place.
- (d) Where possible, Assets should be located so that they are safely accessible for maintenance, including during operations.
- (e) The design must allow for the Replacement and Refurbishment of Assets.
- (f) All substations, equipment rooms, cabinets, etc. must use an integrated, hierarchical key and lock system that allows access to be managed, but reduces the number of keys to be carried by an individual to a minimum. OpCo must obtain the key and lock system and must assign ownership of the key and lock system to TfNSW.
- (g) The design must incorporate features which deter Graffiti attacks.

5.5. Fire engineering

- (a) The fire engineering design for the CSELR tunnels and covered structures must be based on fire engineered solutions (performance assessments).
- (b) OpCo must develop and document performance assessment solutions in accordance with International Fire Engineering Guidelines (IFEG), Australian Building Codes Board (2005 or later edition).
- (c) With the exception of section (d) below, the fire engineering design for all other building elements of the SLR must be compliant with the 'deemed to satisfy' provisions of the Building Code of Australia (BCA).

- (d) Where the 'deemed to satisfy' provisions of the BCA are not or cannot be met by OpCo, OpCo must develop an 'alternative solution' which must be based on the following minimum requirements:
- i. BCA – 'alternative solution' process; and
 - ii. International fire engineering guidelines (IFEG), Australian Building Codes Board (2005 or later edition) – Process of developing and presenting solutions to be followed.
- (e) OpCo must develop the SLR fire engineering design in accordance with the requirements of Appendix 25 (*Fire Engineering*).

5.6. Electromagnetic compatibility management

- (a) All items of equipment, systems and integrated systems forming part of the SLR must be electromagnetically compatible with:
- i. each other; and
 - ii. all electrical and mechanical systems within and external to the SLR.
- (b) OpCo must ensure that the SLR Works are designed in accordance with Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*).

5.7. Flood and stormwater immunity

- (a) The SLR must be designed and constructed, and the SLR must be operated and maintained, so as to prevent flooding from the design storm events identified in Appendix 18 (*Civil and Structural Works*).
- (b) SLR Works must be designed, maintained and operated such that the potential for flooding of any other property is not increased by the SLR Works or the performance of OpCo's Activities.

5.8. Design management requirements

- (a) OpCo must:
- i. provide a qualified and experienced design team which works collaboratively with TfNSW and the Independent Certifier and relevant Authorities throughout the design of the SLR Works and Temporary Works;
 - ii. undertake all studies, investigations, design, documentation and reporting required to design the SLR Works and the Temporary Works;
 - iii. produce fully integrated Design Documentation with all design component interfaces managed and co-ordinated;
 - iv. produce Design Documentation that incorporates and complies with all functional, durability, economic, whole of life, social, aesthetic, environmental and sustainability requirements of the deed, including this SPR;
 - v. provide high quality design services and high quality Design Documentation;
 - vi. ensure that Design Documentation complies with all of the requirements of the deed, including this SPR;

- vii. verify and validate all Design Documentation to ensure that it meets the requirements of the deed, including this SPR, using recognised engineering principles; and
 - viii. manage the design development and review process in accordance with the Design Management Plan.
- (b) OpCo must comply with the design documentation requirements in Appendix 47 (*Design Documentation requirements*).
- (c) The design report in Stage 1 of the Design Documentation must comply with the design commitments in Appendix 48 (*Design Commitments*).

6. Construction and Manufacture

6.1. General

- (a) OpCo must construct and manufacture the SLR Works and the Temporary Works in a manner and to standards which meet the requirements of the deed, including this SPR.
- (b) OpCo must provide sufficient design resources during the Delivery Phase to ensure effective monitoring of the Delivery Activities including testing and commissioning, verification and validation of the integration of the design components, clarification of design issues, review of design changes, witnessing of acceptance tests and release of Hold Points.
- (c) OpCo must provide on the Construction Site from the commencement of construction until the Date of Completion sufficient suitably qualified and experienced representatives including in the fields of civil, mechanical, structural, geotechnical and electrical design.

6.2. Possession of the Construction Site

- (a) From the commencement of the Delivery Phase, OpCo must progressively take possession of Sections in accordance with Schedule B6 (*Section Access Schedule*).
- (b) Each Section may include relevant Early Works as described in Appendix 22 (*Early Works*).
- (c) At the time of taking possession of Sections, OpCo must assume all obligations and responsibilities for:
 - i. care and maintenance of the Early Works, existing features including roads, footpaths, infrastructure and landscaping, any Temporary Works and any SLR Works;
 - ii. obtaining and complying with all local Authority licences relating to occupation of the Sections;
 - iii. consumption of and payment for all Utility Services;
 - iv. collection, treatment and approval of all groundwater discharge;
 - v. management arrangements for road and public space users;
 - vi. all site security, including monitoring and management of entry into the Construction Site; and
 - vii. all site personnel protection requirements.

6.3. Design changes and non-conformances during construction

- (a) OpCo must submit details of all proposed design changes and actions to address construction non-conformances to TfNSW and the Independent Certifier no less than 7 days prior to inclusion within the SLR Works.
- (b) OpCo must not propose any design change or action to address non-conformances that would result in a lower standard or service level in respect of the SLR.

6.4. Work methods and training

- (a) The work methods used by OpCo in carrying out OpCo's Activities must result in the use and application of materials and workmanship which, as a minimum, must comply with TfNSW's General Specifications and with the Standards and Guidelines.
- (b) OpCo must provide all personnel involved in OpCo's Activities with appropriate training in the construction techniques and work methods to be applied during the Delivery Phase.
- (c) The methods of excavation, working at heights, protection from falling objects and other construction activities must conform to the requirements of relevant Legislation.

6.5. Quality of materials and workmanship

- (a) All workmanship and materials employed by OpCo in carrying out the Delivery Activities must comply with the SPR including:
 - i. the Appendices;
 - ii. TfNSW's General Specifications; and
 - iii. Standards and Guidelines.
- (b) Equipment, pipes and cables must be protected from damage that could be caused by animals or acts of vandalism.
- (c) The design and installation of Assets must ensure that they are protected from corrosion.
- (d) Assets must be fitted in a manner to meet WHS, human factor standards and maintainability requirements.
- (e) For building works, OpCo must comply with the BCA requirements.
- (f) For electrical installation works, OpCo must:
 - i. properly segregate cables;
 - ii. use appropriate cable trays, conduits, and cable hangers;
 - iii. provide good protection for wires and cables around corners;
 - iv. correctly terminate and label all cables and wires;
 - v. remove any redundant cables or wires unless they are specifically identified as Spares;
 - vi. not infringe the minimum allowable cable bending radius when installing cables;
 - vii. not exceed the maximum allowable cable pulling tension when installing cables; and
 - viii. ensure that the contact (trolley) wire is not kinked or unnecessarily spliced during installation.
- (g) For pipe installations, OpCo must:
 - i. use the correct fittings for the intended purpose of the pipe and its installation;

- ii. route all pipes neatly and such that they do not affect the safe operation of the SLR;
 - iii. apply correct labels and notices; and
 - iv. remove all burrs and swarf from pipes and conduits.
- (h) For mechanical fabrications and installations, OpCo must:
 - i. utilise competent fitters and welders appropriate for the application;
 - ii. dress all welds so they do not affect the outward appearance nor the functionality of the Asset;
 - iii. remove all rough edges, burrs and sharp corners; and
 - iv. protect from corrosion.

6.6. Demolition

- (a) Where permanent demolition of infrastructure is required, OpCo must:
 - i. provide a levelled site, free of depressions and undulations;
 - ii. disconnect all Utility Services at the property boundaries in accordance with the requirements of the relevant Utility Service owners and Authorities;
 - iii. cap all conduits and pipes at the disconnection points to prevent ingress of surface runoff and groundwater;
 - iv. remove all structures, facilities and debris above ground level;
 - v. remove all ground slabs, foundations, strip footings, pile caps, tanks and other structures below ground level excluding piles below pile cap level;
 - vi. remove all demolished materials and debris from the Construction Site;
 - vii. backfill all excavations with fill free of deleterious materials and compact to a density consistent with the surrounding ground;
 - viii. recycle, to the maximum extent possible, all demolished materials to be removed from the Construction Site; and
 - ix. develop and implement a demolition method that minimises noise, vibration and air quality impacts.

6.7. Stockpiling of materials for construction

- (a) OpCo must make its own arrangements for temporary or permanent stockpiles of materials arising from the Delivery Activities.
- (b) Materials which are not suitable for incorporation in the SLR Works must be removed from the Construction Site and disposed of at a construction waste recycling facility, or alternatively re-used, to the maximum extent possible.
- (c) Stockpiles located on land outside the Construction Site are subject to the land owner's and occupier's written consent, compliance with the law, consent of relevant Authorities and compliance with the Environmental Requirements.
- (d) Stockpiles must not be placed in drainage lines, channels or paths.

6.8. Explosives and blasting

- (a) Blasting must not be undertaken.

6.9. As-built Design Documentation

- (a) OpCo must update the approved for construction Design Documentation, and any other drawings as necessary to fully describe the SLR Works, to produce the as-built Design Documentation, which must be submitted to TfNSW and the Independent Certifier.
- (b) OpCo must submit sample as-built Design Documentation for all Assets for review and acceptance by the Independent Certifier prior to production of any final work-as-executed Design Documentation.
- (c) OpCo must show on as-built Design Documentation details of the locations of existing infrastructure within the Construction Site and the location and extent of the SLR Works.
- (d) As-built Design Documentation for any building component of the SLR Works must include all drawings produced for the building component, including but not limited to design drawings, shop drawings and drawings produced by specialist trades (for example, combined services layouts, structural electrical and mechanical drawings, and equipment installation drawings).
- (e) OpCo must ensure the content, accuracy and level of detail of as-built Design Documentation is equivalent to those in the for construction Design Documentation and are sufficient to describe, enable and facilitate the efficient operation and maintenance of the assets comprising the SLR Works.
- (f) OpCo must include in as-built Design Documentation, the final survey drawings undertaken and signed by a licensed surveyor, in accordance with the Surveying and Spatial Information Regulation 2012 (NSW), certifying the positioning of the SLR Works relative to the primary survey grid and the cadastral boundaries.
- (g) OpCo must include in the as-built Design Documentation the locations and extremities of all ground and infrastructure support including rock bolts.
- (h) OpCo must certify, via a statutory declaration, that each item of as-built Design Documentation is accurate, complete and correct, and that the SLR Works (other than the Third Party Works) as completed are wholly contained within the Project Site.
- (i) OpCo must ensure the as-built Design Documentation complies with AS 1100, the ASA CAD Manual and the requirements of relevant Utility Service Authorities and owners, unless otherwise instructed by TfNSW's Representative.
- (j) OpCo must, where necessary to describe the SLR Works, or where directed by TfNSW's Representative, include digital photographs of specific aspects of the SLR Works in as-built Design Documentation.
- (k) OpCo must identify and cross reference all Assets on as-built Design Documentation with the information in the Asset Information System.

6.10. SLR Works Model

- (a) Not used.

6.11. Temporary site facilities

- (a) Site sheds must be as-new and must be maintained in excellent condition.

- (b) Site sheds must be established at locations and positions that minimise the impact on adjoining properties, residents and users.
- (c) All facilities utilised for the purpose of OpCo's Activities must be sited, constructed and maintained to meet the requirements of TfNSW and relevant Authorities.
- (d) For the duration of the Delivery Phase, OpCo must provide site facilities for use by TfNSW and the Independent Certifier in accordance with Appendix 4 (*TfNSW and IC Site Facilities*).
- (e) Temporary site facilities must satisfy the sustainability requirements of Appendix 7 (*Sustainability*).
- (f) All temporary site facilities, including site sheds, must be maintained free of Graffiti and any advertising material not authorised by TfNSW's Representative.
- (g) OpCo must carry out daily inspections of all temporary site facilities including site sheds.

6.12. Hoardings, fencing and walls

- (a) OpCo must install and maintain temporary hoardings, fencing and walls on and around the Construction Site as necessary to provide safety and security in the performance of OpCo's Activities. The temporary hoardings, fencing and walls must be erected prior to commencing OpCo's Activities in the affected areas.
- (b) Hoardings and fencing installed by OpCo must be made from as-new materials and must at all times be maintained in a neat and tidy condition and be sympathetic with the surroundings.
- (c) Any hoardings, fencing or walls on or around the Construction Site must be maintained free of Graffiti and any advertising material not authorised by TfNSW's Representative until the Date of Completion.

6.13. Hoarding and fence banners and signage

- (a) OpCo must comply with the relevant signage and branding requirements specified in SPR Appendix 8 (*Stakeholder and Community Engagement*).
- (b) OpCo must not place any signage, advertising or branding (other than safety signage or other signage required to comply with the law or signage produced in accordance with designs provided by TfNSW as required by section 6.13(c)) on the external face of any hoarding or fence without the prior written approval of TfNSW's Representative.
- (c) OpCo must prepare and install wayfinding signage to direct pedestrians, commuters and vehicles around the Construction Site.
- (d) OpCo must provide, install and maintain hoarding banners for the external faces (visible to the public) of hoardings and fences that are constructed by OpCo as well as signage that provides the community with details of the SLR information line and out of hours contact details for OpCo. The hoarding and fencing banners must be in full colour and produced in accordance with designs provided by TfNSW.
- (e) Hoarding and fencing banners must be made from either vinyl or from shade cloth.
- (f) OpCo must carry out daily inspections for Graffiti and unauthorised advertising on hoardings, hoarding and fencing banners and hoarding and fencing signage. Graffiti and unauthorised advertising must be removed or covered within the following timeframes:

- i. offensive Graffiti must be cleaned or covered within 24 hours;
 - ii. highly visible yet non-offensive Graffiti must be cleaned or covered within 1 week;
 - iii. Graffiti that is neither offensive nor highly visible must be cleaned or covered during normal operations within one month; and
 - iv. any unauthorised advertising material must be removed or covered within 24 hours.
- (g) If the hoarding and fencing banners or hoarding and fencing signage are irreparably damaged, OpCo must install replacement fencing banners or fencing signage within 24 hours of this damage occurring.
- (h) OpCo must, every 12 months, replace the existing banners for the external faces of fences and hoardings with new banners. TfNSW's Representative will provide new artwork every 12 months for the replacement hoarding and fencing banners.

6.14. Site restoration

- (a) OpCo must comply with the requirements in the Environmental Requirements and ensure that significant trees (based on species, age or size) which may be affected by OpCo's Activities are identified and appropriate protection management measures implemented including fencing and pruning.
- (b) OpCo must reinstate the Construction Site and complete the architectural and landscaping work forming part of the SLR Works progressively as each part of the SLR Works is completed.
- (c) All Temporary Areas and other land occupied or used by OpCo for the purpose of the SLR Works, including storage and site facilities, must be reinstated to a condition at least equivalent to that existing prior to the occupation or use by OpCo.
- (d) Site reinstatement must be undertaken in accordance with the Environmental Requirements.

6.15. Discharge water quality

- (a) Without limiting the requirements of the deed, all water including groundwater seepage captured within the Construction Site must be treated and disposed of in accordance with the Environmental Requirements and the requirements of relevant Authorities.
- (b) OpCo must monitor and record the quality of water discharged from the Construction Site.

6.16. Maintenance during the Delivery Phase

- (a) OpCo must maintain and repair:
 - i. the Construction Site for the duration of the Construction Site Licence; and
 - ii. the Local Areas from the commencement of any construction activities within each Local Area until the handover of that Local Area to the relevant Authority.
- (b) OpCo must ensure that all infrastructure, facilities and amenities in the areas being maintained are at all times fit for purpose, clean and tidy, free from Graffiti and in a condition which satisfies the requirements of the deed.

- (c) The extended storage of rubbish or loose items on the Construction Site, Local Areas or elsewhere is not permitted.
- (d) OpCo must monitor and remove Graffiti with the following timeframes:
 - i. offensive Graffiti must be removed or covered within 1 hour;
 - ii. other Graffiti on hoarding, fencing banners or fencing signage must be removed or covered within 2 hours; and
 - iii. all other Graffiti must be removed or covered within 24 hours of OpCo becoming aware of the Graffiti.

6.17. Road conditions

- (a) OpCo must ensure that any road, footpath, shared path or cycleway which is open to the public is at all times kept free of mud, dirt, dust, deleterious material, debris, obstructions and trip hazards arising from OpCo's Activities in accordance with the Environmental Requirements.
- (b) OpCo must ensure that no dirt, mud or other material is deposited on any road which is open to the public, and cover all construction vehicles to prevent any loss of fuels, lubricants, load or other substances, whether in the form of dust, liquids, solids or otherwise.
- (c) Any spillage or build-up of such material or debris must be cleaned up promptly and any damage caused by such an occurrence must be immediately repaired.
- (d) OpCo must apply appropriate treatments to roads, footpaths, shared paths or cycleways that protect the roads, footpaths, shared paths or cycleways from damage arising from OpCo's Activities and allow for repair if damage occurs.
- (e) OpCo must repair immediately any damage caused by OpCo's Activities, to any road, footpath, shared path or cycleway which is open to the public, and restore the road, footpath, shared path or cycleway to a condition at least equivalent to the condition it was immediately prior to the occurrence of the damage.

6.18. Fire precautions

- (a) OpCo must, during the construction of the SLR Works and Temporary Works, do all things necessary to minimise the risk of fire within the Construction Site and minimise the risk of fire adjacent to the Construction Site due to the performance of OpCo's Activities.
- (b) For work outdoors, OpCo must routinely confirm the status of total fire bans. Hot work must not be carried out during total fire bans, except where OpCo has obtained approval for the hot work from NSW Rural Fire Service. OpCo must provide TfNSW's Representative copies of approvals from NSW Rural Fire Service to carry out hot work during total fire bans. For the purpose of this section 6.18(b), hot work includes all work associated with welding, thermal or oxygen cutting, heating and other fire or spark producing operations.

6.19. Construction noise and vibration

- (a) OpCo must, during the performance of the Delivery Activities, comply with the noise and vibration requirements in the Environmental Requirements and the TfNSW Construction Noise and Vibration Strategy.

- (b) OpCo must install and maintain acoustic walls and other noise attenuation devices in accordance with the requirements of the Environmental Requirements to provide noise mitigation during the performance of the Delivery Activities.
- (c) Delivery Activities that require the installation of acoustic walls or other noise attenuation devices must not commence until the acoustic walls or other noise attenuation devices are erected.
- (d) Acoustic walls and other noise attenuation devices installed by OpCo must be made from as-new materials and must at all times be maintained in a neat and tidy condition and be sympathetic with the surroundings.

6.20. Testing and commissioning

- (a) OpCo must complete all testing and commissioning in accordance with the requirements of Appendix 33 (*Testing and Commissioning*) and the Testing and Commissioning Plan.

6.21. Property access and Utility Services

- (a) OpCo must carry out the Property Works and do all things necessary to satisfy the reasonable requirements of individual owners, occupiers of and visitors to properties, businesses and community facilities affected by the Delivery Activities in respect of timing, duration and the carrying out of the relevant Delivery Activities.
- (b) OpCo must ensure that suitable access is maintained at all times to all properties and between severed portions of properties. Appropriate detours must be arranged and provided.
- (c) OpCo must make all arrangements with all affected persons in relation to the impacts and consequences of the interruption of any Utility Services.

6.22. Completion requirements

- (a) It is a condition precedent to Completion that OpCo:
 - i. has fulfilled its obligations under section 4.5 of the SPR in respect of pre-construction and post-construction survey reports;
 - ii. has provided TfNSW's Representative with the fire engineering certification required by sections 4(e) and 4(f) of Appendix 25 (*Fire Engineering*); and
 - iii. has populated the Asset Information System with data for all Assets in accordance with Appendix 40 (*Asset Information Management Systems*).

PART C - OPERATIONAL

7. SLR Operational Readiness

- (a) OpCo must include in the Operational Readiness Plan details of how OpCo will plan for and achieve the milestones associated with operational readiness of the SLR, in accordance with Appendix 43 (*Project Plan Requirements*).
- (b) OpCo must update the following Project Plans at least 6 months prior to the planned commencement of Trial Running of the CSELR:
 - i. Safety and Systems Assurance Management Plan;
 - ii. Accreditation Management Plan;
 - iii. Safety Management Plan;
 - iv. Risk Management Plan;
 - v. Training Management and Competency Plan;
 - vi. Operations Phase Environmental & Sustainability Plan;
 - vii. Operations Management Plan;
 - viii. Operational Readiness Plan;
 - ix. Customer Service Plan;
 - x. Revenue Protection Plan;
 - xi. Security Management Plan; and
 - xii. Incident Management Plan.

8. Operations Requirements

8.1. General

- (a) OpCo must:
- i. prepare, implement and update the Minimum Operating Standards and the Light Rail Operating Manual for the SLR;
 - ii. meet or exceed the Minimum Operating Standards;
 - iii. meet or exceed the operations commitments in Appendix 49 (*Operation Commitments*);
 - iv. manage, operate and maintain the SLR and Assets to deliver the minimum service requirements in Appendix 38 (*Minimum Service Requirements*) and the operations and Customer service requirements in Appendix 39 (*Operations and Customer Service Requirements*);
 - v. prepare, implement and update an Operations Management Plan in accordance with Appendix 43 (*Project Plan Requirements*) which enables OpCo to fulfil the requirements set out in the deed;
 - vi. obtain and maintain Accreditation;
 - vii. obtain and comply with all Approvals required to carry out the Operations Activities;
 - viii. ensure that the presentation of LRVs, Stops and remaining Assets complies with the Minimum Operating Standards;
 - ix. remove and repair all Graffiti, Vandalism in accordance with the Minimum Operating Standards;
 - x. provide security for Customers through provision of secure monitored locations;
 - xi. provide Customer Service Officers to satisfy the requirements of this SPR, including Appendix 39 (*Operation and Customer Service Requirements*);
 - xii. in real time, monitor and control the Operations Activities;
 - xiii. provide ticketing operations functions in accordance with Appendix 39 (*Operations and Customer Service Requirements*), including provision of ticketing and fare information, operations of ETS equipment and servicing of ticketing equipment;
 - xiv. establish a revenue protection strategy and develop, implement and maintain a Revenue Protection Plan in accordance with Appendix 43 (*Project Plan Requirements*), to enforce and reduce fare evasion;
 - xv. manage, identify, respond to and record Incidents including emergencies in accordance with Appendix 10 (*Reporting requirements*);
 - xvi. restore Required Services following an Incident or disruption such that Customer inconvenience is minimised;
 - xvii. monitor and control noise emissions to ensure noise levels specified in the Environmental Requirements and Appendix 42 (*Additional Environmental Requirements*) are not exceeded;

- xviii. ensure complaints and compliments are recorded and acted upon in accordance with Appendix 8 (*Stakeholder and Community Engagement*); and
 - xix. cooperate with Authorities including NSW Police and other emergency services in preparing for and responding to Incidents and security or safety exercises.
- (b) OpCo must deploy operational strategies which deter Graffiti attacks and capture evidence of offences in areas identified by OpCo as likely to be vulnerable to Graffiti attacks.

8.2. IWLR

- (a) At the time of commencement of Revenue Service on the IWLR, OpCo must assume all obligations and responsibilities for the IWLR, including responsibility for:
- i. all local Authority licences relating to occupation of the Site;
 - ii. the operation and maintenance of the IWLR, including vehicles, infrastructure, equipment and facilities;
 - iii. ensuring that the IWLR operates in compliance with the deed, including this SPR;
 - iv. obtain and/or maintain all necessary Accreditation;
 - v. complying with the DDA, except to the extent a DDA related Existing Asset Defect exists in accordance with Appendix 3 (*Assets*);
 - vi. collection, treatment and Approval of all groundwater discharge;
 - vii. management arrangements for road and public space users;
 - viii. all site security, including monitoring and management of entry into IWLR assets; and
 - ix. all site personnel protection requirements.
- (b) From the commencement of Revenue Service on the IWLR the IWLR must be maintained in accordance with the deed.

8.3. Minimum Operating Standards

- (a) OpCo must:
- i. develop, implement, update and improve Minimum Operating Standards that ensure that all the requirements of the deed are met at all times including the requirement to obtain Accreditation;
 - ii. not use lesser Minimum Operating Standards than those developed without the prior written approval of TfNSW's Representative; and
 - iii. ensure that the Minimum Operating Standards it uses complies with the deed and that compliance with them enables it to comply with its obligations under the deed.
- (b) The Minimum Operating Standards are the minimum condition, cleanliness and presentation standards for Assets and comprise:
- i. the minimum standards for LRVs that if not met will prohibit a LRV from entering passenger service or trigger a withdrawal of a LRV from passenger service;

- ii. the minimum standards for Stops that if not met will prohibit a Stop or any part thereof from being available for use or trigger a withdrawal of a Stop or any part thereof from use; and
 - iii. the maximum time to rectification standards for Asset cleanliness, Graffiti and Vandalism.
- (c) OpCo must incorporate the processes and procedures to monitor and report any non-compliance with the Minimum Operating Standards in railway manuals.

8.4. Customer information

- (a) OpCo must provide static, scheduled and real-time Customer journey information in accordance with the requirements of Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (b) OpCo must provide real time information to Customers on board all LRVs and at all Stops including updates during Incidents, accidents, crises or emergencies that cause delays or disruption to Customer Services.
- (c) Opco must provide real time LRV location data to TfNSW and TMC in accordance with the requirements of Appendix 23 (*Communication Systems and Passenger Information*).

8.5. Presentation

- (a) OpCo must ensure Assets and the ETS Equipment are clean and presentable in accordance with the:
 - i. Minimum Operating Standards; and
 - ii. the requirements of clause 2 of Schedule B3 (*Requirements of Third Parties*).
- (b) OpCo must promptly report instances of cleanliness or presentation that fail or have the potential to fail to meet the Minimum Operating Standards and arrange for rectification in accordance with the Minimum Operating Standards.
- (c) OpCo must include in the Manuals processes and procedures to prevent, monitor, report and rectify instances of cleanliness and presentation that fail or have the potential to fail to meet the Minimum Operating Standards.
- (d) As part of the Operations Management Plan and the Asset Management Plan, OpCo must develop suitable processes and procedures to actively manage, monitor and report Graffiti and Vandalism and the prevention, removal and repair of Graffiti and Vandalism.
- (e) OpCo must proactively work with the NSW Police and TfNSW towards the prosecution of Graffiti and Vandalism offenders.

8.6. Not used

8.7. Management of unplanned events

8.7.1. Incidents

- (a) OpCo must develop, implement and maintain an Incident Management Plan in accordance with the requirements of Appendix 43 (*Project Plan Requirements*).
- (b) OpCo must develop, implement and maintain Incident response policies, procedures, rules and instructions detailing the tactics and scenarios for response

- to, recovery from and investigations of Incidents and emergencies including those caused by external circumstances beyond the control and responsibility of OpCo.
- (c) OpCo must assist with the development of, and agree to reasonable requests for amendments and modifications to, the emergency response policies, procedures, rules and instructions.
 - (d) OpCo must comply with any reasonable requirement notified by emergency services in relation to the Incident and emergency response policies, procedures, rules and instructions.
 - (e) OpCo must respond to the site of any Incident or emergency with sufficient qualified personnel to determine and undertake the initial response activities within 15 minutes of the time of the first report of such Incident or emergency to the Operations Control Centre.
 - (f) OpCo must, within 10 minutes and after the notification of initial responders, notify the following agencies of any unplanned Incident or emergency which prevents OpCo from operating Required Services or results in a response from NSW Police or emergency services:
 - iii. Transport Management Centre; and
 - iv. operational interfacing organisations.
 - (g) OpCo must:
 - i. cooperate with any special enquiries or investigations carried out by TfNSW or other regulatory Authorities as a result of accidents, Incidents or changes in legislation;
 - ii. promptly provide all information, resources and facilities within its control which are reasonably required for such enquiries or investigations; and
 - iii. review the findings of and implement any outstanding actions required by any such special enquiry or investigation.

8.7.2. Unplanned service disruptions

- (a) OpCo must, following any event of an Incident which disrupts or degrades the operation of the SLR:
 - i. attempt to resolve the issue as soon as reasonably practicable and minimise the impact on Customers;
 - ii. resume normal operations in accordance with the Contract Service Level Requirement within a time frame equivalent to one round trip when it has been demonstrated that the SLR is safe to resume normal operations;
 - iii. prepare, update and submit to TfNSW an Indicative Timetable in accordance with section 8.10 of the SPR;
 - iv. where all or part of the SLR is expected to be unavailable for Customer services for a period in excess of 1 hour, notify the Transport Management Centre that replacement bus services are required on the affected sections of SLR;
 - v. comply with the directions given by the Transport Management Centre in relation to the replacement bus service operations and associated Customer management;

- vi. provide Customer services on the sections of the SLR which are not affected by the Incident in the event of a partial shutdown of the SLR in accordance with the following principles:
 - A. the transportation of Customers to destination where transfer to an alternative mode of transport can be easily achieved;
 - B. a logical and reliable service pattern can be provided avoiding the complicated operational scenarios and limiting confusion to Customers; and
- vii. assist Transport Management Centre with the coordination of the replacement bus services with whatever Customer services may be operating at the relevant time.

8.8. Security

- (a) OpCo must implement a security strategy such that Customers will regularly see SLR staff or security personnel at Stops and on board LRVs.
- (b) OpCo must ensure that access control systems, CCTV and Help Points are monitored 24 hours a day 7 days a week.
- (c) OpCo must verbally respond to any Help Point initiated emergency call within 10 seconds of activation.
- (d) OpCo must ensure that Customers are appropriately informed when personal images or audio are being recorded and retained in accordance with the TfNSW signage requirements in Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (e) OpCo must make access control system, CCTV and Help Point data recordings available to TfNSW and emergency services as required, and in accordance with any operating protocols and agreements.

8.9. Lighting

- (a) OpCo must operate and maintain all lighting associated with Stops and ancillary facilities.
- (b) OpCo must ensure Customers are provided with efficient lighting on the SLR.
- (c) Lighting must be available 24 hours a day, 7 days a week.

8.10. Indicative Timetable

- (a) OpCo must prepare and update the Indicative Timetable as necessary in the Operations Management Plan so that at all times it:
 - i. complies with the Contract Service Level Requirements;
 - ii. provides the Required Services and daily operating kilometres:
 - A. Monday to Thursdays;
 - B. Fridays;
 - C. Saturdays, Sundays and Public Holidays; and
 - D. Special Events. and
 - iii. provides:
 - A. the Operating Hours; and

B. opening and closing time for each Stop.

8.11. Special Events

- (a) OpCo must make provision for Special Event Services in accordance with Appendix 38 (*Minimum Service Requirements*).

9. Asset management

9.1. Asset management obligations

- (a) OpCo must:
- i. carry out the Asset Management Activities to ensure the performance of Assets enable OpCo to satisfy all requirements of the deed and to ensure that Assets are maintained in a way that enables them to achieve their Design Life;
 - ii. ensure that only trained and suitably experienced personnel are engaged in respect of the Asset Management Activities;
 - iii. coordinate all Asset Management Activities with TfNSW;
 - iv. keep the Assets in a clean and tidy condition and remove all waste, spillage, Graffiti, litter and debris, including incident debris, and repair all damage;
 - v. schedule the Asset Management Activities to comply with the requirements of the deed;
 - vi. maintain records of all Asset Management Activities carried out;
 - vii. conduct Asset Management Activities in accordance with the Asset Maintenance Standards, Operations and Maintenance Manuals and the Asset Management Plan and the other Project Plans
 - viii. inspect, weed, trim, mow, water, dewater, fertilise, repair, replace, plant all landscaped areas and non-structure areas of the Assets;
 - ix. have available appropriate plant, tools and equipment to carry out the Asset Management Activities; and
 - x. retain appropriate replacement parts, Rotable Spares and consumables.

9.2. Asset Management System

- (a) OpCo must develop, implement and maintain an Asset Management System that meets the principles of ISO 55000 Standards for Asset Management.
- (b) The Asset Management System must include:
- i. Asset Management Plan;
 - ii. Operations and Maintenance Manuals; and
 - iii. Asset Maintenance Standards.
- (c) The Asset Management System must be supported by:
- i. the Asset Information System; and
 - ii. review and reporting processes.

9.3. Not Used

9.4. Not Used

9.5. Asset Management Plan

- (a) OpCo must develop, implement, review and update the Asset Management Plan in accordance with Appendix 43 (*Project Plan Requirements*).
- (b) The Asset Management Plan must describe the Asset Management Activities which must be carried out during the Term to ensure that the SLR performs in accordance with the requirements of the deed and that Assets achieve their Design Life.
- (c) The Asset Management Activities contained in the Asset Management Plan must include:
 - i. the proposed Asset inspection and condition monitoring activities in accordance with sections 9.8.1 and 9.8.5 respectively;
 - ii. proposed scheduled Asset Management Activities;
 - iii. approach to service failures or reduced performance between scheduled Asset Management Activities; and
 - iv. the Replacement and Refurbishment program in accordance with sections 9.8.2.

9.6. Asset Maintenance Standards

- (a) OpCo must develop and implement Asset Maintenance Standards.
- (b) The Asset Maintenance Standards must include manufacturer's requirements in technical specifications and performance standards or such higher standards as may be required to meet the obligations of the deed.
- (c) The Asset Maintenance Standards must cover each Asset type and include;
 - i. the specific performance characteristics which must be maintained;
 - ii. potential faults or hazards which could affect each performance characteristic;
 - iii. clearly defined severity ratings for each potential fault or hazard;
 - iv. the severity ratings at which the fault must be rectified or the hazard removed (intervention level);
 - v. the time period / response time within which any faults must be rectified or hazard removed; and
 - vi. condition indicators and condition ratings for each specific performance characteristic that will be used to record an objective assessment of the condition of the Asset and Asset type.
- (d) OpCo must review and improve the Asset Maintenance Standards on an ongoing basis throughout the Term to ensure that the Asset Maintenance Standards enable OpCo to comply with its obligations under the deed.
- (e) OpCo must submit the Asset Maintenance Standards to TfNSW;
 - i. before commencement of the IWLR Operations Phase;

- ii. before commencement of the Full Operations Phase;
- iii. at quarterly intervals for the IWLR Operations Phase and for the first year of the Full Operations Phase;
- iv. thereafter, at yearly intervals for the duration of the Full Operations Phase; and
- v. if OpCo materially amends the Asset Maintenance Standards.

9.7. Operations and Maintenance Manuals

- (a) OpCo must develop, implement, maintain and update the Operations and Maintenance Manuals in accordance with Appendix 41 (*Manuals*).

9.8. Specific asset management obligations

9.8.1. Asset inspection and maintenance

- (a) Assets must be inspected and maintained in a manner and at a frequency that ensures that the requirements of the deed are complied with.
- (b) Inspections must be carried out and maintenance undertaken in accordance with the Asset Maintenance Standards and Operations and Maintenance Manuals.
- (c) Personnel undertaking the inspections and maintenance activities must be suitably experienced and trained to identify and respond to issues which have the potential to:
 - i. adversely impact the safe operations of the SLR;
 - ii. adversely affect property, including damaging the Assets;
 - iii. adversely affect the reliability and availability of the SLR;
 - iv. result in a failure to comply with Approvals or law;
 - v. adversely affect the safety of personnel undertaking OpCo's Activities;
 - vi. increase the likelihood of an Incident; or
- vii. otherwise result in the SLR or any Asset not being in compliance with the deed including the Asset Maintenance Standards.
- (d) Personnel undertaking inspection and maintenance activities must be equipped to carry out their activities in accordance with Operations and Maintenance Manuals and Light Rail Operating Manuals and be able to:
 - i. communicate with the Operations Control Centre;
 - ii. immediately respond to protect people or property and to minimise disruption to Customers; and
 - iii. prepare reports at the time inspection or maintenance activities are undertaken.
- (e) The inspections must identify non-compliances and potential non-compliances in the performance of OpCo's Activities and the condition of the Assets.
- (f) The outcomes of inspections must be recorded in the Asset Information System in accordance with Appendix 40 (*Asset Information Management Systems*) on the day of the inspections, together with OpCo's action plan to rectify any non-compliance.

- (g) The outcomes of Asset Maintenance Activities must be recorded on the day they are undertaken.

9.8.2. Replacement and Refurbishment

- (a) Replacement and Refurbishment of an Asset must be undertaken by OpCo where replacement or restoration of components of an Asset is necessary for the Asset to meet the requirements of the deed and achieve its Design Life.
- (b) Replacement and Refurbishment of an Asset must meet the following requirements:
 - i. where refurbishment of an Asset is undertaken, the functionality and performance of the refurbished Asset must be equivalent to the functionality and performance of the Asset when new; and
 - ii. where replacement is undertaken with a new Asset, the functionality, performance and Design Life of the new Asset must be equivalent to or exceed the functionality, performance and Design Life of the replaced Asset.

9.8.3. Special Tools and Equipment

- (a) All Special Tools and Equipment must be maintained in good and safe condition and in working order (including inspection, testing and calibration as required), and repaired or replaced as necessary.
- (b) Records of the Special Tools and Equipment must be kept and updated continuously within the Asset Information System during the Term.

9.8.4. Inventory

- (a) OpCo must provide all aspects of inventory control, and all activities, required to maintain an adequate supply of materials, supplies, and equipment to carry out the Operations Activities.

9.8.5. Condition monitoring

- (a) OpCo must undertake condition monitoring in order to:
 - i. identify and prevent as far as practicable, future Asset failures;
 - ii. identify Assets that require maintenance, replacement or refurbishment;
 - iii. provide objective analysis of the condition of the Asset which can be used to determine remaining serviceable life; and
 - iv. enable analysis of trends in performance and reliability of Assets referable to location and system
- (b) Condition monitoring must include (as applicable for each Asset):
 - i. sampling and analysis;
 - ii. in-situ testing;
 - iii. dimensional checks; and
 - iv. measurement of actual performance.
- (c) The method and frequency of condition monitoring and the minimum performance at which intervention is required must be:
 - i. as defined in the Asset Maintenance Standards;

- ii. as nominated by the manufacturer; and
 - iii. otherwise sufficient to ensure OpCo's compliance with the requirements of the deed.
- (d) OpCo must document the method, frequency and intervention condition indicators for condition monitoring in the Asset Management Plan and the Operations and Maintenance Manuals.
- (e) The outcomes of condition monitoring must be recorded at the time it is carried out and entered in the Asset Information System.

9.8.6. Electrical network performance and load monitoring

- (a) OpCo must obtain manufacturers' thermal analysis reports as required for maintenance purposes for major electrical equipment and incorporate the models analysis reports as needed within the Asset Information System.
- (b) OpCo must undertake electrical performance monitoring of the network and major electrical equipment, and incorporate the results in the Asset Information System.

9.9. Asset Condition assessment

- (a) OpCo must undertake Asset condition assessments of all Assets such that each Asset is assessed with a frequency of at least that stated in the Asset Maintenance Standards.
- (b) OpCo must report the results of all Asset condition assessments in accordance with Appendix 40 (*Asset Information Management Systems*).
- (c) Asset condition assessments must:
- i. verify whether or not the condition of each Asset type meets the Asset Maintenance Standards;
 - ii. identify any major or latent defects in the Assets;
 - iii. verify that Asset Management Activities are consistent with meeting performance requirements of each Asset;
 - iv. verify the residual life for all Asset types against the Design Life;
 - v. verify that there is no accumulating backlog of Asset Management Activities; and
 - vi. identify requirements for upgrading or replacement of life expired or obsolete Assets.

9.10. Excluded Assets

- (a) OpCo is not required to maintain the Excluded Assets.
- (b) OpCo must provide safe access and, if possible, power supply for maintenance of the Excluded Assets that are owned by TfNSW and other parties for a reasonable amount of time.

10. Handback Conditions

10.1. Asset Handover Standards

- (a) At the Expiry Date (or the end of the Term if deed is terminated), OpCo must ensure that:
- i. the Assets are in such condition to ensure a safe and reliable operation of the system;
 - ii. any deficiencies in any Asset that mean the Design Life, or the residual life, of the Asset will not be achieved are rectified (unless such deficiencies were forecast to be rectified after expiry of the Term in the 30 year renewal and replacement program as at the date of the deed); and
 - iii. all Rotable Spares are in as new condition or refurbished in accordance with the Operations and Maintenance Manuals and Asset Maintenance Standards.

PART D - MANAGEMENT

11. Management requirements

11.1. Project management

- (a) OpCo must implement and maintain processes, procedures, protocols, methodology and responsibilities which will ensure that OpCo efficiently and effectively delivers its obligations under the deed.
- (b) OpCo must, at all times, ensure that the personnel employed in the undertaking of OpCo's Activities are appropriately capable, experienced, trained, committed and authorised to ensure that OpCo efficiently and effectively delivers its obligations under the deed.

11.2. Integrated Management System

- (a) OpCo must implement and maintain an effective Integrated Management System which address all OpCo's obligations under the deed.
- (b) The Integrated Management System must seamlessly integrate all of OpCo's systems and processes, including those related to rail safety and rail accreditation quality, environmental, sustainability, health and safety.
- (c) The Integrated Management System must include all management processes, procedures, standards and protocols which are to be implemented by OpCo for governance and control of OpCo's Activities as well as to ensure and record compliance with the deed, including this SPR and law.
- (d) The Integrated Management System must accommodate, coordinate and give effect to the Project Plans.
- (e) The Integrated Management System must comply with all relevant law, including law relating to railway design, construction, Accreditation and operation.
- (f) OpCo must comply with the Integrated Management System.

11.3. Project Plans

- (a) OpCo must prepare and update Project Plans in accordance with the requirements of clause 8 (*Project Plans*) of the Operative Provisions and Appendix 43 (*Project Plan requirements*).
- (b) OpCo acknowledges that the requirements in Appendix 43 (*Project Plan requirements*) do not necessarily meet all of the requirements of the deed.
- (c) OpCo must ensure that the Project Plans it develops and uses comply with the deed.
- (d) Initial versions of some Project Plans and some Project Plan commitments are included in Part F of the schedules. OpCo acknowledges that these initial Project Plans and Project Plan commitments do not necessarily meet the requirements of Appendix 43 (*Project Plan requirements*) or of the deed but provide:
 - i. the minimum basis for content of the relevant Project Plan; and
 - ii. minimum OpCo commitments in relation to the relevant Project Plan.
- (e) All Project Plans must incorporate the requirements and recommendations of the Independent Certifier as required.
- (f) Each Project Plan must be a quality assurance document prepared in accordance with AS/NZS/ISO9001.

- (g) All Project Plans must recognise and adhere to the requirements of the Quality Management Plan.

11.4. Particular rail safety management requirements

- (a) OpCo must:
- i. comply with the Rail Safety National Law (NSW);
 - ii. eliminate risks to safety associated with OpCo's Activities, so far as is reasonably practicable;
 - iii. ensure that the SLR Works and the Temporary Works are safe and fit for their intended use;
 - iv. carry out verification and validation, including testing and examination, to demonstrate that the SLR Works and the Temporary Works are safe and fit for their intended use;
 - v. ensure that the Design Documentation and inspection and test plans are fit for their intended use;
 - vi. ensure that verifiers have a suitable level of independence from the personnel involved in preparing Design Documentation and that any inspection and test plans verify and validate the Design Documentation and inspection and test plans for the various components of the SLR Works and the Temporary Works;
 - vii. provide TfNSW with all relevant information in relation to the use of the SLR Works and the Temporary Works, including:
 - A. the results of Testing and examination; and
 - B. any conditions for safe use of SLR Works and the Temporary Works;
 - viii. ensure that a Safety Management Plan is developed, implemented, maintained and updated as required throughout the performance of OpCo's Activities;
 - ix. ensure that a Safety and Systems Assurance Plan is developed, implemented, maintained and updated as required throughout the performance of OpCo's Activities;
 - x. ensure that a Security Management Plan is developed, implemented, maintained and updated as required throughout the performance of OpCo's Activities;
 - xi. ensure that an Incident Management Plan is developed, implemented, maintained and updated as required throughout the performance of OpCo's Activities;
 - xii. ensure that the processes and procedures in the Incident Management Plan are tested at least annually and that TfNSW's Representative is invited and permitted to attend and participate in the test;
 - xiii. provide a copy of the Security Management Plan and the Incident Management Plan to all relevant Authorities, including emergency services, all relevant OpCo's personnel and OpCo Contractors' personnel as well as any other person or organisation that may be required to assist in the implementation of the Security Management Plan or the Incident Management Plan or are affected by the Security Management Plan or the Incident Management Plan;

- xiv. assess, identify and acquire the competencies to ensure that all rail safety workers have the competence to carry out the relevant rail safety work that they are undertaking as part of OpCo's Activities, including any prescribed provisions of the Rail Safety Regulations applicable to OpCo's Activities;
 - xv. ensure that training is provided to enable OpCo's Activities to be carried out safely;
 - xvi. ensure that records of competence and training are maintained for all rail safety workers and that copies of such records are provided to TfNSW upon request; and
 - xvii. identify, assess and manage the hazards and risks associated with OpCo's Activities where they interface with any relevant road Authority.
- (b) OpCo must comply with the requirements in AS4292.1 and AS4292.2 and must:
- i. identify and address the hazards and risks which may affect the integrity of the SLR Works, the Temporary Works or OpCo's Activities;
 - ii. communicate with TfNSW's Representative in respect of any matter which could affect the safe and continuous operation of the SLR;
 - iii. establish and implement standards and procedures to ensure that any interfaces between OpCo's Activities and any activity that involves other parties are safely managed;
 - iv. establish and implement standards and procedures to ensure that the design, construction and commissioning of the SLR Works will enable the SLR Works to remain fit for the safe and continuous operation of the SLR; and
 - v. establish and implement standards and procedures for the verification and validation of all stages of the design, construction, commissioning of the SLR Works and the Temporary Works.
- (c) OpCo must:
- i. ensure that rail safety workers do not carry out rail safety work, or are on duty, while under the influence of a drug or of alcohol as prescribed in the Rail Safety Regulations;
 - ii. ensure that the personnel undertaking OpCo's Activities are not affected by fatigue related impairment;
 - iii. ensure that rail safety workers comply with OpCo's fatigue management programs;
 - iv. ensure that the personnel undertaking OpCo's Activities (including all rail safety workers) are of sufficiently good health and fitness to carry out those OpCo's Activities (including all rail safety work);
 - v. ensure that human factors are taken into account and addressed in all aspects of OpCo's Activities;
 - vi. ensure that any public venues used by OpCo are safe and accessible; and
 - vii. provide the monthly safety performance data.

- (d) OpCo must develop effective risk management standards and procedures to identify hazards and risks, assess hazards and risks and plan work processes to control and communicate those hazards and risks.

11.5. Quality requirements

11.5.1. Quality management requirements

- (a) OpCo must provide a dedicated responsible Quality Manager who:
 - i. is directly responsible to OpCo's senior management;
 - ii. must act independently of the other personnel undertaking OpCo's Activities; and
 - iii. has responsibility for ensuring that the requirements of the Quality Plan are implemented and maintained throughout OpCo's Activities.
- (b) The Integrated Management System must incorporate and comply with TfNSW's General Specifications and AS/NZS/ISO9001.
- (c) All management systems records and all records relating to the quality of the SLR Works must be freely accessible to TfNSW and the Independent Certifier until all the Delivery Activities have been completed and must be held at the Construction Site up to the Date of Completion.
- (d) All management systems records and all records relating to the quality of OpCo's Activities must be freely accessible to TfNSW.
- (e) OpCo must supply to TfNSW all applicable identified records, as identified and required by TfNSW's General Specifications as a precondition to Completion.
- (f) OpCo must:
 - i. develop all aspects of its Quality Plan which impact upon the Operations Activities; and
 - ii. incorporate these aspects of the Quality Plan into the Operation and Maintenance Manuals in accordance with Appendix 41 (*Manuals*).

11.5.2. Quality Management Plan requirements

- (a) OpCo must develop a Quality Management Plan in accordance with the requirements of Appendix 43 (*Project Plan requirements*).
- (b) The Quality Management Plan must:
 - i. nominate the Quality Manager who has the defined authority and responsibility for ensuring that the requirements in the Quality Plan are implemented and maintained;
 - ii. define the responsibilities and authority and reporting function of personnel primarily responsible for upholding the quality assurance provisions of the deed;
 - iii. identify how independent inspection, witnessing, monitoring, auditing and reporting will be carried out;
 - iv. identify the interfaces between corporate support and on-site personnel in relation to paragraphs (i) and (ii) of this section 11.5.2(b);

- v. identify the qualifications, experience and required competencies of personnel who must undertake the duties required in each of paragraphs (i), (ii) and (iii) of this section 11.5.2(b);
 - vi. contain systems, processes and procedures which give effect to and co-ordinate the implementation of each Project Plan;
 - vii. address the durability of the SLR Works in every aspect of OpCo's Activities; and
 - viii. address safety in every aspect of OpCo's Activities.
- (c) OpCo must undertake surveillance, audit and review of its Quality Management Plan and report on all non-conformances in accordance with the requirements of TfNSW's General Specifications.
- (d) The Quality Management Plan must be updated and developed in accordance with clause 8 of the Operative Provisions.

11.5.3. Hold Points and Witness Points

- (a) The Quality Plan must include a schedule of Hold Points and Witness Points.
- (b) The Independent Certifier may at any stage during the performance of OpCo's Activities nominate Hold Points and Witness Points for inclusion in the Project Plans.
- (c) The schedule of Hold Points and Witness Points must include, as a minimum, all Hold Point and Witness Points nominated in TfNSW's General Specifications, or nominated by the Independent Certifier as contemplated by clause 5.4(h)(iii) of the Operative Provisions. The schedule must include any Witness Points required by TfNSW. The schedule must contain sufficient additional Hold Points as are necessary to ensure that OpCo's Activities and related activities are undertaken in a manner consistent with the Integrated Management System.
- (d) TfNSW and the Independent Certifier may nominate persons to attend or witness the release of any Hold Point or to attend any Witness Point.
- (e) TfNSW must be given a minimum of 3 Business Days' notice of all Hold Points and Witness Points that relate to construction, testing or commissioning activities.

11.5.4. Release of Hold Points

- (a) Each Hold Point must be assigned a designated authority by OpCo that is acceptable to TfNSW and the Independent Certifier to release the Hold Point, except where a designated authority is already specified in this SPR.
- (b) The Quality Manager must be satisfied that all activities in the Hold Point process (including methods of work, sequences of activities, inspections and tests preceding any Hold Point specified in the Quality Plan) comply fully with the requirements of the deed and, once satisfied, must:
- i. release that Hold Point, where the Quality Manager is the designated authority, in order that work may proceed on that part of OpCo's Activities; or
 - ii. obtain release from the designated authority that work may proceed on that part of OpCo's Activities.
- (c) OpCo must not proceed beyond any Hold Point referred to in the Quality Plan without release by the designated authority.

- (d) The release of a Hold Point by the designated authority, allowing the work to proceed beyond that Hold Point, will not relieve OpCo of any responsibility for carrying out all or any part of OpCo's Activities in accordance with the requirements of the deed.
- (e) Without limiting section 11.5.3(e), TfNSW and the Independent Certifier must be given reasonable notice of the release of any Hold Point and must be given reasonable opportunity to witness any inspections and tests preceding the release of any Hold Points, and the release of any Hold Points.

11.5.5. Non-conformances and continuous improvement

- (a) OpCo must regularly update and develop the Quality Plan and the other Project Plans in order to minimise the recurrence of any non-conformances.
- (b) TfNSW and the Independent Certifier may advise OpCo of apparent non-conformances. In this event OpCo must treat the matter as a non-conformance to be addressed within OpCo's Integrated Management System.
- (c) OpCo must review and analyse the cause of all non-conformances and develop a plan of corrective action to minimise the likelihood of recurrence. OpCo must provide details of such corrective actions to TfNSW and the Independent Certifier.
- (d) OpCo must examine relevant changes in technology and work methods for opportunities to improve its processes, particularly processes which interact with TfNSW and the Independent Certifier.
- (e) The Quality Plan must include structured and verifiable processes for monitoring and ensuring compliance of OpCo's Activities with the requirements of the deed as well as include structured and verifiable processes for the rectification of any non-conformances.
- (f) The Quality Plan must make specific provision for reporting of all non-conformances that may reduce the future durability or performance of any part of the SLR Works and the rectification of any such non-conformances.
- (g) All non-conformances must be promptly reported to TfNSW and the Independent Certifier.
- (h) Proposals for rectification work of non-conformances must be reviewed by the relevant Designer and the Independent Certifier and must take all durability objectives, safety objectives and performance requirements into account.
- (i) OpCo must provide details of all proposals for rectification work for non-conformances to TfNSW and the Independent Certifier.

11.5.6. Audits and monitoring

OpCo must, at the request of TfNSW:

- (a) have its compliance with the Quality Plan and the other Project Plans audited by an independent auditor;
- (b) permit representatives of TfNSW and the Independent Certifier to be present during such audits; and
- (c) deliver copies of each audit report to TfNSW and the Independent Certifier within 5 Business Days of completion of each report.

11.5.7. Records

- (a) OpCo must satisfy the record management requirements:

- i. set out in Appendix 11 (*TfNSW's General Specifications - Q6 Quality Management System*);
- ii. of the State Records Act 1998 (NSW); and
- iii. of other relevant Legislation.

11.6. Not used

11.7. Environmental management requirements

- (a) OpCo must ensure that environmental management is addressed throughout the performance of OpCo's Activities in accordance with the requirements of the Environmental Requirements, Appendix 42 (*Additional Environmental Requirements*) and Appendix 11 (*TfNSW's General Specifications*).
- (b) OpCo must ensure that the Integrated Management System for the Term:
 - i. complies with the requirements of Appendix 43 (*Project Plan Requirements*);
 - ii. complies with the Environmental Requirements;
 - iii. is compatible with and respond to the TfNSW's NSW Sustainability Guidelines and TfNSW's NSW Sustainability Targets, as identified in Appendix 34 (*Standards and Guidelines*);
 - iv. complies with AS/NZS/ISO14001;
 - v. complies with the NSW Government Environmental Management Systems Guidelines Edition 3 (August 2013); and
 - vi. during the Delivery Phase, be accredited by a NSW Government construction agency.
- (c) OpCo must develop, implement and maintain a Construction Environmental Management Plan and an Operations Phase Environmental and Sustainability Plan.
- (d) Environmental and sustainability requirements as required under this deed must be taken into account in all aspects of OpCo's Activities.

11.8. Sustainability management requirements

- (a) OpCo must ensure that sustainability is addressed throughout the performance of OpCo's Activities in accordance with the requirements of Appendix 7 (*Sustainability*).
- (b) OpCo's management systems for the Term must:
 - i. comply with the Environmental Requirements;
 - ii. be in accordance with AS/NZS/ISO14001, and apply procedures to social and economic issues in addition to environmental issues where appropriate;
 - iii. comply with the requirements and intent of Social Accountability International SA8000;
 - iv. comply with the requirements and intent of RG Sustainability Reporting Guidelines (Global Reporting Initiative, Version 3); and
 - v. be documented in the Delivery Phase Sustainability Plan or the Operations Phase Environmental and Sustainability Plan (as applicable) that complies with

the Environmental Requirements and the requirements of Appendix 7 (*Sustainability*) and Appendix 43 (*Project Plan requirements*).

- (c) The SLR Works must comply with the sustainability requirements set out in Appendix 7 (*Sustainability*).

11.9. Safety requirements

- (a) In addition to the requirements of clause 9.5 (*Safety Management Plan*) of the Operative Provisions, OpCo must:
- i. take account of, and incorporate all applicable, relevant or necessary requirements in relation to WHS in all aspects of OpCo's Activities;
 - ii. ensure that its Integrated Management System complies with and is accredited to the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (5th Edition) (September 2013) and any subsequent updates and is maintained for the duration of OpCo's Activities;
 - iii. develop, implement and maintain a Safety Management Plan for OpCo's Activities as required in Appendix 43 (*Project Plan Requirements*);
 - iv. develop, implement and maintain safe work method processes and statements for all aspects of OpCo's Activities as part of the Safety Management Plan that ensure the safety of all of OpCo's Staff and others within and adjacent to the SLR;
 - v. demonstrate how the Integrated Management System is integrated with the wider safety policy in the Accreditation Management Plan and the Safety Management Plan prepared in accordance with Appendix 43 (*Project Plan Requirements*);
 - vi. comply with the requirements of Appendix 11 (*TfNSW's General Specifications G22 – Safety Management*);
 - vii. provide a suitably qualified site safety representative with the authority and responsibility for issues relating to work health and safety for all OpCo's Activities;
 - viii. up until Completion, engage a site safety representative in the Delivery Activities exclusively for WHS management and WHS issues;
 - ix. during the Full Operations Phase, form and maintain a management committee to maintain continuous improvement and integration with the emergency services; and
 - x. as part of the development of the Safety Management Plan, prepare a comprehensive risk register that identifies all project risks and complies with the WHS legislation and Rail Safety National Law (NSW). The risk register must be provided to TfNSW's Representative upon request.
- (b) OpCo must undertake a quantitative risk assessment in relation to its operational protocols for the CSELR to ensure the safe operation of LRVs.

11.10. Risk management requirements

- (a) OpCo must undertake risk management as an integrated part of OpCo's Activities as follows:

- i. OpCo must implement risk management techniques to identify and assess risks which could affect the SLR and develop and implement strategies to treat and manage these risks;
- ii. OpCo must undertake risk management in accordance with the requirements of AS/NZS/ISO31000, the requirements of ISO/IEC31010, and in a manner consistent with the requirements of TfNSW;
- iii. OpCo must manage adverse effects and realise potential opportunities relating to the SLR and the performance of OpCo's Activities;
- iv. OpCo must develop, implement and continuously update the Risk Management Plan, as detailed in Appendix 43 (*Project Plan Requirements*), and conduct risk management activities in accordance with the Risk Management Plan;
- v. OpCo must produce a consolidated risk register that includes all reasonably foreseeable risks associated with OpCo's Activities, including risks which could affect the SLR, safety hazards and risks identified in the workshops required by sections 4.4(c) and 11.9(c);
- vi. OpCo must implement and maintain a risk management database for the management of risks and opportunities;
- vii. OpCo's risk register must record the relevant details related to each risk, as a minimum the details specified in the Risk Management Plan, as detailed in Appendix 43 (*Project Plan Requirements*);
- viii. OpCo must report any newly identified risks classified as key risks to TfNSW within 48 hours; and
- ix. OpCo must report on risks and risk management in accordance with the reporting requirements in the Risk Management Plan and Appendix 10 (*Reporting Requirements*).

11.11. Training management requirements

- (a) OpCo must, in addition to its commitments in the Workplace Relations Management Plan, Human Resources Plan and Operational Readiness Plan as required in Appendix 43 (*Project Plan Requirements*):
 - i. comply with the NSW Government Training Management Guidelines;
 - ii. achieve the project training management targets identified in the NSW Government Training Management Guidelines for civil construction projects;
 - iii. meet all statutory obligations relating to WHS training;
 - iv. provide induction on WHS, quality, environmental and sustainability objectives, systems and procedures and stakeholder and community relations for all employees and persons engaged on OpCo's Activities, including persons nominated by TfNSW's Representative;
 - v. provide structured training programs to address the requirements of the deed including WHS, quality, environmental sustainability, stakeholder and community relations and project specific requirements;
 - vi. ensure that all personnel engaged in OpCo's Activities are suitably trained, competent, licensed and certified;

- vii. ensure that suitable facilities for the training of personnel are available;
- viii. provide a structured training program, including rail safety, power safety, environmental and project specific requirements; and
- ix. provide TfNSW with access to all training material and all training management records, to enable TfNSW to undertake the implementation reviews identified in the NSW Government Training Management Guidelines.

11.12. Information and documentation management requirements

- (a) OpCo must give TfNSW and the Independent Certifier copies of notices, reports and submissions it gives to Authorities at the time it submits such notices, reports and submissions as well as any responses from, and details of any consultations with, Authorities.
- (b) Copies of Approvals obtained by OpCo must be immediately issued to TfNSW and the Independent Certifier.
- (c) OpCo must prepare and submit to TfNSW and the Independent Certifier, progress reports, updates of the Delivery Program, durability assessment reports, Design Documentation, as constructed documentation, construction completion reports, site investigation reports, property and land surveys, ground and infrastructure condition surveys, geotechnical mapping records and inferred ground condition reports and other documents in accordance with the requirements of the deed, including this SPR and Appendix 10 (*Reporting Requirements*).
- (d) OpCo must provide, implement and operate an issues management database of issues arising during the performance of OpCo's Activities. The issues management database must provide information and data on:
 - i. all issues, including design, construction, operation and maintenance;
 - ii. the identities of personnel with responsibility for resolution of the issues;
 - iii. all actions to address each identified issue, including responsibility, due date and status;
 - iv. all comments by TfNSW, the Independent Certifier and OpCo;
 - v. OpCo's response to all comments and any required action(s); and
 - vi. the overall status of each issue.
- (e) OpCo must upload and make available on the project data and collaboration system (PDCS) all submissions, information, data and records relating to OpCo's Activities including the following:
 - i. copies of notices given in accordance with the deed;
 - ii. each Delivery Phase Progress Report;
 - iii. each update of the Delivery Program;
 - iv. durability assessment reports;
 - v. Design Documentation;
 - vi. as constructed documentation and construction completion report;

- vii. site investigation reports;
 - viii. property and land surveys and ground and infrastructure conditions surveys;
 - ix. geotechnical mapping records and inferred ground condition reports;
 - x. progress and other reports, minutes of meetings, photographs, programs, information requests, correspondence register, site personnel and Subcontract registers;
 - xi. each version of each Project Plan;
 - xii. all Integrated Management Systems records and all records relating to the governance and control of OpCo's Activities;
 - xiii. all Integrated Management System records and all records relating to the quality of OpCo's Activities, including quality registers, lot registers, audit reports, non-conformance reports, corrective action requests, checklists, conformance reports and test results;
 - xiv. environment inspection reports, sustainability reports, Incident reports, action notes, improvement notices, reports and any other documents required by the Environmental Requirements, environmental monitoring data and other environmental data;
 - xv. monitoring reports including monitoring data;
 - xvi. WHS induction registers, dangerous goods information, hazardous substances register, material safety data sheets, Incident-accident registers and reports, work method statements, safe work procedures, inspections, site safety meetings and toolbox sessions;
 - xvii. risk information, identification, assessment, actions and reports;
 - xviii. performance, operational and maintenance activity data, records and reports including passenger related data and statistics;
 - xix. Asset management schedules, plans, procedures, Manuals and reports;
 - xx. security information, images and statistics;
 - xxi. benchmarking reports and other information and studies that OpCo produces or has access to;
 - xxii. stakeholder and community complaints, comments, newsletters and notices, registers, fact sheets and meetings;
 - xxiii. engineering assurance documentation and reports;
 - xxiv. safety assurance documentation and reports; and
 - xxv. training materials and registers.
- (f) OpCo must control user access of the PDCS for:
- i. OpCo's Staff, agents and representatives; and
 - ii. any other users approved by TfNSW's Representative.

- (g) OpCo must manage the PDCS user categories including user requests to change or alter the functionality of the user categories.
- (h) All information and data uploaded onto the PDCS must be in both electronic format (such as pdf, .nwd, .nwf, .dwf, .dwfx and .kmz) and native (such as doc, .docx, .xls, .xlsx, .dgn, .dwg, .fbx, .fbx, .ifc, .sat and .adsk) format.
- (i) OpCo must ensure that OpCo's users of the PDCS receive adequate training in relation to the PDCS. OpCo's users of the PDCS must attend the general user training session relating to the use of the PDCS which OpCo must arrange with TfNSW's Representative.
- (j) OpCo must provide an adequate number of personnel to manage the PDCS setup and administration activities, including the addition and setup of OpCo's users, the removal of OpCo's users and management and administration of OpCo's files and records.
- (k) OpCo must ensure that these personnel receive adequate training in relation to the PDCS and attend specific training sessions relating to the use and administration of the PDCS. OpCo must arrange these training sessions with TfNSW's Representative.
- (l) Submission of, access to and any use of information and data on and via the PDCS must comply with the requirements of the:
 - i. Sydney Light Rail File Naming Convention; and
 - ii. Sydney Light Rail CAD Manual identified in Appendix 34 (*Standards and Guidelines*).
- (m) OpCo must maintain and store in a secure location that is approved by TfNSW's Representative one hard copy version of all Design Documentation. In the event of any inconsistency, ambiguity or discrepancy in the Design Documentation uploaded onto the PDCS and stored in the secure location, the Design Documentation uploaded to the PDCS will take precedence.
- (n) Notwithstanding and in addition to the information and documentation management requirements of the deed, including sections 11.12(a) to (m) above, and the modelling, Design Documentation and Asset Information System requirements of the deed (including the SPR and Appendix 40 (*Asset Information Management Systems*)), OpCo must create, manage and produce:
 - i. not used;
 - ii. Design Documentation drawings for the SLR Works derived from the electronic 3D model required by section 11.12(n)(i); and
 - iii. Asset information for the SLR Works.

11.13. Stakeholder and community involvement requirements

- (a) OpCo must undertake the requirements for stakeholder and community involvement set out in Appendix 8 (*Stakeholder and Community Engagement*).

11.14. Traffic and transport management requirements

- (a) OpCo must manage the impacts of OpCo's Activities on the capacity and performance of the surrounding pedestrian, road traffic and public transport network.

- (b) OpCo must develop, implement, maintain and update a Traffic and Transport Management Plan, including any relevant traffic management plans and traffic control plans in accordance with the deed and the requirements of all relevant Authorities.
- (c) OpCo must provide a traffic and transport representative who has authority and responsibility for issues relating to traffic and transport management, including liaison with relevant Authorities, the Transport Management Centre, and the Traffic and Transport Liaison Group.
- (d) The traffic and transport representative must be given the responsibility for and authority to develop and implement the Traffic and Transport Management Plan.
- (e) The traffic and transport representative must have recognised and appropriate traffic management and/or traffic planning qualifications and at least fifteen years relevant traffic and transport management experience on projects similar to OpCo's Activities.
- (f) The traffic and transport representative must be engaged full time on or around the Construction Site during the Delivery Phase with responsibilities limited to traffic and transport management of the Delivery Activities.
- (g) OpCo must provide appropriate OpCo's personnel and technical experts to attend the Traffic and Transport Liaison Group meetings, as required and requested by TfNSW's Representative.

11.15. Aboriginal participation requirements

- (a) Further to the requirement in clause 9.22 (*Aboriginal participation in construction*) of the Operative Provisions, for the purposes of the New South Wales Government Aboriginal Participation in Construction Guidelines, the SLR is a category 3 project.

11.16. Safety and systems assurance management

- (a) As part of its safety and systems assurance activities, OpCo must undertake a comprehensive assurance program to demonstrate that the safety and systems requirements have been met for all OpCo's Activities in accordance with the requirements of the SPR and Appendix 9 (*Safety and Systems Assurance*).
- (b) The program must cover design, implementation, operations, maintenance, upgrade and decommissioning activities as necessary to provide whole of life assurance.
- (c) The safety and systems assurance must integrate with and accurately represent all elements of the SLR at all times.
- (d) OpCo must:
 - i. provide a safety and systems assurance manager who has authority and responsibility for issues relating to safety and systems assurance including those required by Appendix 9 (*Safety and Systems Assurance*);
 - ii. assign a safety and systems assurance manager with recognised and appropriate engineering qualifications and at least fifteen years relevant safety and systems assurance management experience on similar projects;
 - iii. engage the safety and systems assurance manager full-time during the execution of OpCo's Activities.
- (e) The safety and systems assurance manager must be responsible for the development of the Safety Management Plan and the Accreditation Plan and Safety

and Systems Assurance Management plan in accordance with Appendix 43 (*Project Plan requirements*).

- (f) OpCo must identify and manage any interdependence between discrete design and construction elements of OpCo's Activities.
- (g) OpCo must demonstrate compliance with the requirements of the deed, including the SPR, using the SLR requirements and traceability register as required in Appendix 9 (*Safety and Systems Assurance*).

11.17. Configuration management requirements

- (a) OpCo must produce a configuration management system to manage the configuration of the SLR.
- (b) OpCo must produce a Configuration Management Plan in accordance with Appendix 43 (*Project Plan Requirements*).
- (c) OpCo must apply configuration management to all new and altered Assets under its scope of control.
- (d) The configuration management system must consist of plans, procedures, tools and other elements necessary to satisfactorily fulfil OpCo's responsibilities of maintaining configuration change or maintaining the configuration of Assets and associated configuration information.
- (e) OpCo must have a system of configuration audits at key stages relevant to OpCo's activities and SLR.
- (f) OpCo must control the configuration change in relation to the systems and organisations that the SLR interfaces with.
- (g) OpCo must demonstrate that it has the capability to meet the requirements of TfNSW's configuration management committee acceptance panel for safety.

11.18. Security requirements

- (a) OpCo must develop, implement, maintain and update a Security Management Plan in accordance with the deed and Appendix 43 (*Project Plan Requirements*).
- (b) OpCo must manage in accordance with the Security Management Plan the security of:
 - i. the Construction Site during the Delivery Phase;
 - ii. the SLR during Testing;
 - iii. the IWLR during the IWLR Operations Phase; and
 - iv. the SLR during the Full Operations Phase.
- (c) OpCo must use Crime Prevention Through Environmental Design (CPTED) principles throughout the SLR in accordance with 'Crime prevention and assessment of development applications – Guidelines under section 79C of the Environmental Planning and Assessment Act 1979'.
- (d) OpCo must develop security and safety mechanisms through consultation with, and to satisfy the requirements of, the authorities listed in the Security Management Plan requirements contained in Appendix 43 (*Project Plan Requirements*).
- (e) OpCo must use a risk-based approach when developing security and safety mechanisms for the SLR.

- (f) Security measures for vulnerable areas such as the tunnel, bridges and OCC must be specifically highlighted within the risk assessment and Security Management Plan.
- (g) OpCo must develop, implement, maintain and update an Incident Management Plan in accordance with the deed and Appendix 43 (*Project Plan Requirements*).

11.19. Interface management requirements

- (a) OpCo must manage all interface requirements in connection with OpCo's Activities, including design, construction, manufacture, testing, commissioning, operation and maintenance of the SLR, with all relevant stakeholders.
- (b) OpCo must implement interface management and coordination procedures in accordance with the Interface Management Plan.

11.20. Authorities and emergency services

- (a) OpCo must carry out OpCo's Activities in accordance with, and to satisfy, the requirements of all relevant Authorities including emergency services, and must consult with such Authorities as required by the deed, including this SPR.

11.21. Delivery Program

- (a) OpCo must prepare and maintain the Delivery Program in Primavera P6 Professional Release 8.1, or later release, which demonstrates how OpCo will plan, design, obtain Approvals, construct and commission the SLR Works by the Date for Completion.
- (b) Each update of the Delivery Program must identify the Date for Completion and demonstrate how OpCo will achieve Completion by the Date for Completion. The Delivery Program must also identify the SLR Works remaining to be performed to achieve Final Completion and demonstrate how these works will be completed by the date for Final Completion.
- (c) The structure and implementation of the Delivery Program must facilitate sorting and reporting of the Delivery Program by:
 - i. work phase;
 - ii. trade;
 - iii. subcontractor geographical area; and
 - iv. any other categories required by TfNSW.
- (d) The Delivery Program must:
 - i. facilitate all of the requirements of Appendix 10 (*Reporting Requirements*);
 - ii. be prepared using critical path method network technique and minimise the use of constrained dates;
 - iii. minimise the use of positive or negative lags between activities and replace any lags with activities;
 - iv. identify all activities associated with the Delivery Activities, including traffic management, mobilisation, management plans, Approvals, site establishment activities, ETS program, Testing and commissioning, training and trial operations;

- v. identify all activities that interface with the roads and road related infrastructure, including traffic management proposals, in order to minimise disruption to the road network;
- vi. include contingency allowances consistent with assessed inherent and contingent risks.;
- vii. identify the production of each part of the Design Documentation including the time for supply of documentation and information to TfNSW and the Independent Certifier;
- viii. identify all activities associated with the Delivery Activities, the current status and actual progress of each activity and the scheduled planned progress of each activity;
- ix. show the dates when OpCo will require information, documents, materials or instructions from TfNSW or the Independent Certifier under the deed and the dates when OpCo will provide and request information or documents to or from TfNSW or the Independent Certifier, taking account of the processes contemplated by the deed. These dates must be no earlier than TfNSW could reasonably have anticipated at the date of the deed that the information, documents, materials and instructions would be required and provided;
- x. be a resource loaded program that identifies key equipment, materials, plant, labour and management roles with sufficient level of detail to demonstrate adequate allocation of resources to complete the works or services on resource charts linked to the program;
- xi. identify the award of all Significant Contracts;
- xii. identify comprehensively all pre-construction activities and all Approvals required to be obtained from Authorities, including preparation, consultation, submissions and Authority reviews of Approval submissions;
- xiii. identify all certifications required to be obtained by OpCo to comply with its obligations under the deed;
- xiv. identify off site and on-site activities associated with the procurement, testing and commissioning of all major plant, equipment or materials, including order dates, supply lead times and site delivery dates;
- xv. identify all activities that have a significant bearing on time required to complete the SLR Works;
- xvi. identify all staging of the SLR Works and all external interfaces that impact on the SLR Works;
- xvii. break down all activities into periods of no greater than four weeks with sufficient details to allow accurate monitoring of the progress of the SLR Works;
- xviii. utilise activity descriptions that are precise and clearly traceable to work elements;
- xix. identify key dates, milestones, stages and sections of works (key dates and milestones must be an integral part of the Delivery Program);
- xx. identify the sequencing, logical interdependencies and interrelationship required to achieve each Completion; and

- xxi. identify all activities associated with the procurement of long lead equipment and materials including Approvals, design, order, manufacture, prefabrication, testing, delivery and on-site activities.
- (e) Each update of the Delivery Program must be accompanied by a program narrative that clearly demonstrates how the program has been developed and includes the following:
- i. program strategy;
 - ii. fundamental assumptions;
 - iii. calendars used in the Delivery Program;
 - iv. details of the derivation of activity durations from work method design and construction methodology, resources availability and allocation, activity sequencing and/or cycle times and any other inputs affecting activity durations;
 - v. production rates and cycle times for all major work elements including:
 - a. tunnel construction;
 - b. track slab;
 - c. track installation;
 - d. CSELR Stop construction;
 - e. road junctions;
 - f. George Street pedestrian zone;
 - g. Light Rail Maintenance and Stabling Facilities;
 - h. electrical and mechanical installation;
 - i. light rail systems installation including overhead wire and wire free areas, cable support, signalling equipment, ventilation;
 - j. manufacture of LRVs;
 - k. road and footpath works;
 - l. Utility Services Works;
 - vi. construction staging and major work front configuration;
 - vii. resource allocation and profile (resource histogram); and
 - viii. program risks and contingencies.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 1 – Definitions and Acronyms

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1. Definitions and acronyms

1.1. General

- (a) Definitions and acronyms which have a defined meaning in clause 1.1 of the Operative Provisions have the same meaning where used in this SPR.
- (b) For the purpose of this SPR the following definitions and acronyms have the related meanings set out opposite them unless the context requires otherwise.

1.2. Definitions

100% Low Floor	means the step-free central gangways and vestibule areas.
AEO Authorisation Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Accreditation Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Acceptable Effects	has the meaning given in section 4.3 of the SPR.
Ambassador Program	means a structured program of in school curriculum support activities delivered by appropriate project and operational delivery staff, linking project activity to national curriculum activities in related subject areas (for example, science, technology, engineering and mathematics).
Ambient Design Condition	means the external condition relevant to the geographic location or area in which the respective ECS operates.
Apprentices	<p>means an employee undertaking a recognised Australian apprenticeship program and related qualification holding a formal training contract with their employer. Apprentices must be employed on a SLR worksite for a minimum continuous period of 26 weeks.</p> <p>Employment conditions must meet or exceed the obligations and expectations of the Australian Apprenticeships National Code of Good Practice, including pay rates reflecting individual awards or the national minimum wage for apprentices where no award or agreement exists.</p>
Asset Category	means a group of the Assets broken down by system type.
Asset Handover Standards	means the standards of that name, as updated from time to time in accordance with section 10.1 of the SPR.
Asset Standards Authority	means the group within TfNSW being the design authority responsible for assuring that the NSW transport network remains fit for purpose and fulfils its safety and operational requirements.
Australian Qualifications Framework (AQF)	means the national policy for regulated qualifications in Australian education and training. AQF qualifications ensure national recognition and consistency as well as common understanding across Australia of what defines each qualification.
AW0 Load Condition	means the passenger load condition defined in Table 2 of Appendix 37.
AW1 Load Condition	means the passenger load condition defined in Table 2 of Appendix 37.

AW2 Load Condition	means the passenger load condition defined in Table 2 of Appendix 37.
AW3 Load Condition	means the passenger load condition defined in Table 2 of Appendix 37.
AW4 Load Condition	means the passenger load condition defined in Table 2 of Appendix 37.
Back-up Time	means the time required by an alternative power source to support a Load in the event of electrical supply failure.
Bulk Power Supply	means the bulk supply feeder and associated equipment from the electricity supply authority including HV substations converting the bulk supply feeder to a voltage suitable for the HV Reticulation System. The Bulk Power Supply includes the feeders connected to the HV Reticulation System.
Business Continuity Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Business Management Plan	means the plan of that name, as defined in the Planning Approvals.
Capacity Performance Test	means the Tests that are required to demonstrate that the SLR meets the specified performance requirements over the full length of the SLR.
Carbon and Energy Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
CCS Connected System	means a system that is monitored or controlled by the Central Control System.
Central Control System (CCS)	means the central control system defined in Appendix 20 (<i>Operations Control Centre</i>).
Class 1 Event	means an organised event that impacts normal major traffic and transport systems and causes significant disruption to the non-event community. An example is an event that affects a principal transport route in Sydney, or one that reduces the capacity of the main arterial roads.
Class 2 Event	means an organised event that impacts normal local traffic and transport systems and causes low-scale disruption to the non-event community. An example is an event that blocks off a main street or road but does not impact a principal transport route.
Configuration Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Construction Materials Sustainable Procurement Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Construction Noise and Vibration Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Contamination Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).

Contestable Works	has the meaning given in the <i>Code of Practice, Contestable works, April 2007</i> by the Department of Water and Energy, NSW Government.
Contingency	means, in the context of operations, the Services that run when there is a fault in the system.
Critical Equipment Room	means Enclosed Space, wholly or in part, containing temperature sensitive equipment, systems and services that are critical to maintaining the normal operation of the SLR or responding to an emergency situation.
Customer Service Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Delivery Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Delivery Phase Carbon and Energy Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Delivery Phase Progress Report	means the report of that name, as required by Appendix 10 (<i>Reporting Requirements</i>).
DOORS®	means the software program nominated for requirements management developed by IBM®. Also known as IBM® Rational® DOORS®.
Drained	means the underground structural permanent works are designed such that any groundwater pressure acting on the underground structure is relieved, and the ingress of any groundwater into the underground structure's drainage system is provided for throughout the Design Life.
Dust and Air Quality Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Dwell Time	means the time during which the LRV is stopped in the Stop, as defined in Appendix 38 (<i>Minimum Service Requirements</i>).
Earth Electrode	means an uninsulated conductor installed in contact with the general mass of earth intended for the conduction and dissipation of current.
Earth Grid	means interconnected Earth Electrodes installed in contact with the general mass of the earth, intended for the conduction and dissipation of current and or for the provision of a uniform voltage reference.
Earth Potential Rise	means the maximum potential rise of an Earthing and Bonding System, with respect to the general mass of earth.
Earthing and Bonding System	means the arrangement of earth conductors and bonding conductors, typically including an Earth Grid, Earth Electrodes, overhead earth wires, cable sheaths, equipotential bonding cables, earth continuity conductors and parallel earthing conductors.

ECS Comfort Applications	<p>means the application of the ECS for the purpose of providing comfort to occupants not essential to maintain the equipment operation.</p> <p>Comfort Applications can be:</p> <ol style="list-style-type: none"> a. non-transient: normally occupied areas, typically enclosed, where any one occupant will remain for more than 30 minutes duration. b. transient: pertaining specifically to the public platform space, where the ECS is provided to improve the Thermal Comfort sensation for the short term occupant.
ECS Critical Applications	<p>means the application of the ECS for the direct purpose of maintaining the operation of critical equipment, systems and services, or preventing the development of potentially Hazardous Areas. Critical equipment, systems and services are those absolutely necessary to the normal uninterrupted operation of the railway or for responding to an Emergency Event.</p>
ECS Peak	<p>means time at which the greatest ECS capacity is required, considering all loads and demands.</p>
Electrical Rooms	<p>means an Enclosed Space wholly or in part, containing equipment that is part of or supporting the electrical supply system, that are not temperature sensitive but are water sensitive.</p>
Electrification System	<p>means a power delivery system containing electro-mechanical components consisting of a suspended catenary(s) and contact(s) wire arrangement (overhead wiring) used to transfer power from the Traction Power Supply system to the pantograph of electric Rolling Stock. The Electrification System also includes the positive feeder connections from the isolation switches within the Traction Power Supply system to the overhead wiring.</p>
Electrolysis	<p>means corrosion caused by Stray Current, or bimetallic dissimilar metals, producing an electrochemical reaction of a metal with its environment, resulting in the metal's progressive degradation or destruction.</p>
Electromagnetic Compatibility (EMC)	<p>means the ability of a piece of equipment or system to function satisfactorily in its electromagnetic environment without introducing electromagnetic disturbances to anything in that environment.</p>
Electromagnetic Compatibility Plan	<p>means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).</p>
Emergency Event	<p>means a situation in which there is an unacceptable risk, to the health and wellbeing of occupants, Staff or the general public, which needs intervention by Staff or emergency services to control, limit escalation, suppress or address the risk and return to normal operations.</p>
Enclosed Space	<p>means a room, space or area typically but not necessarily, bounded by walls and a roof, in which without mechanical systems, heat, contaminants, stale air or smoke could accumulate.</p>

Environmental Management System	means the environmental management system to be developed, implemented and maintained by OpCo in accordance with the requirements of the SPR.
Environmental Requirements	means the Planning Approvals and SPR Appendix 42 (<i>Additional Environmental Requirements</i>)
Equipment Room	means an Enclosed Space, wholly or in part, containing temperature sensitive equipment.
Equipment Spares	means spare equipment (including Rotable Spares) to support the operation of the LRVs.
Factory Acceptance Test (FAT)	means a comprehensive Test or series of Tests undertaken on prototype equipment, and initial deliveries from sub suppliers to ensure all design and manufacturing problems for both hardware and software are resolved before full manufacturing begins.
Factory Integration Tests	has the meaning given in Appendix 33 (<i>Testing and Commissioning</i>).
Final Performance Test	means the Tests that are required to demonstrate that the integrated Assets of the SLR meet the performance requirements of the deed over the full length of the SLR with Customers.
Fire Control Room	means an Enclosed Space containing the fire indication panel (FIP) and associated sound system and intercom system for emergency purposes, and fan control panel where applicable, and serving as a coordination point for Fire and Rescue NSW, and other emergency services personnel when responding to an Emergency Event at a respective Stop or facility.
First Article Inspection Test (FAIT)	means the comprehensive inspection of the first component, or completed assembly of components that undergoes a full quality control check for all aspects of the design.
Fixed Location Reader	means the electronic ticketing system card reader machine installed at a Stop.
Garbage Area	means an Enclosed Space, wholly or in part, which is intended to hold refuse, litter, rubbish or other such wastes, which could potentially be wet or contain organic matter, and in which odours or noxious gases, vapours, or contaminants could accumulate.
Global Reporting Initiative (GRI)	means the global non-profit organisation which produces a comprehensive sustainability reporting framework which includes the reporting guidelines, sector guidelines and other resources enabling greater organisational transparency about economic, environmental, social and governance performance.
Graduate Program	means a structured, paid program providing a diverse work experience with training and mentoring for university graduates to develop potential and capabilities that align with strategic workforce needs.
Greenhouse Gas Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).

Hazardous Areas	means areas that may develop or contain gases and vapours that could be harmful to human health, be depleted of oxygen or develop an explosive environment.
Headway	means the interval of time between LRVs moving in the same direction on the same route.
Help Point	means an interface where a Customer may request information or assistance from the OCC.
Heritage Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
HV Reticulation Systems	means the the power supply system from the Ausgrid network to the Traction Power Supply.
IC Office Complex	has the meaning given in Appendix 4 (<i>TfNSW and IC Site Facilities</i>).
ICT & Software Systems Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
IK Rating	means the level of protection that electrical appliances provide against mechanic impacts from outside as defined by EN62262.
Indicative Timetable	means the indicative timetable as defined in section 8.10 of the SPR.
Industry and skills partnerships	means collaborations between industry and skills organisations to support the development and delivery of workforce skills programs, meeting CSELR construction and SLR operational requirements.
Infrastructure Sustainability Rating Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Infrastructure Sustainability (IS) Rating Scheme	means the sustainability rating scheme prescribed by the ISCA.
Infrastructure Sustainability (IS) Rating Tool	means the sustainability rating process regulated by the ISCA.
Ingress Protection (IP) rating	means the rating as specified in AS60529.
Integrated Management System	means the management system developed, implemented and maintained by OpCo in accordance with section 11.2 of the SPR.
Integrated Water Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Interchange Stops	means the CSELR Stops where Customers change between CSELR and other public transport modes including bus, rail, IWLR and ferry.
Initial Performance Test	means the Tests that are required to demonstrate that the integrated Assets of the SLR meet the specified performance requirements.

Integrated Factory Acceptance Tests (IFAT)	means a comprehensive series of Tests carried out before delivery to the SLR Site to certify the performance requirements are met for a combination of Assets.
Integrated Management System	means the management system to be developed, implemented and maintained by OpCo in accordance with section 11.2 of the SPR.
IS Rating Scheme	means the IS rating scheme for infrastructure as developed and administered by the Infrastructure Sustainability Council of Australia (ISCA). It is comprised of the IS Technical Manual, IS Rating Tool Scorecard, IS Materials Calculator.
Level of Service (LoS)	means the level of service as set out in "Pedestrian planning and design" by John J. Fruin.
Light Rail Operating Manual	means the manual of that name, as updated from time to time in accordance with Appendix 41 (<i>Manuals</i>).
Loads	means the SLR electrical power consuming devices or points which are connected to a final sub-circuit of the LV Distribution System.
Local Business Engagement Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Local Community	means the residents of each of the six local government areas administered by City of Botany Bay, Council of the City of Sydney, Leichhardt Council, Waverley Council, Woollahra Council and Marrickville Council.
Local Employment Policy	means a policy giving employment preference to local residents where more than one person is equally suitable for an advertised position.
LV Distribution System	means the SLR low voltage electrical power distribution equipment from the power transformer secondary side terminals to Loads.
Manuals	means the Operations and Maintenance Manuals and Light Rail Operating Manual.
Manufacturing and Procurement Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Maximum Operational Speed	means the maximum speed that any Rolling Stock may travel at.
Minimum Operating Standards	means the standards of that name, as updated from time to time in accordance with in section 8.3 of the SPR.
Modal Hierarchy	means the hierarchy of movement modes that places relative importance to each transport mode as defined in Appendix 13 (<i>Stops</i>).
Nationally Recognised Accredited Training	means an AQF recognized qualification comprising a complete program of learning that leads to formal certification that a graduate has achieved learning outcomes as described in the AQF.
Noise and Vibration Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).

Normal	means, in the context of operations, the Services that run when there is no fault in the system and in the absence of Special Events.
Normal Load	means those Loads not defined as either Safety Service Loads or Operations Critical Loads.
NSW Electrolysis Technical Committee (NSWETC)	Means a voluntary body consisting of owners or representatives of owners of underground utility structures in NSW. The NSWETC meets monthly and can be contacted through Industry and Investment NSW.
OCC Operator	means a person operating the CCS.
Operational Readiness Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Operations Critical Load	means those Loads that are required to be kept operational to facilitate normal operations and are not classified as Safety Service Loads.
Operations Model	Means the OpCo modelling of the LRV operations for the SLR
Operations Vegetation Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Operations Waste and Recycling Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Wire-free	Means the section of the line where the LRV operates without continuous overhead power supply.
Passenger Information Display	means the electronic devices used to convey visual information to Customers.
Performance Tests	has the meaning given in Appendix 33 (<i>Testing and Commissioning</i>).
Predicted Effects	has the meaning given in section 4.3 of the SPR.
Plant Room	means an Enclosed Space, wholly or in part, containing equipment, systems or services which are not temperature or water sensitive.
Power Control System (PCS)	means the system of that name as defined in Appendix 29 (<i>Traction Power, Electrification Systems and Control</i>).
Property Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Public Domain	means the general publicly accessible areas not within Stops.

Quality Benchmark	<p>means an agreed minimum acceptable standard for the finished appearance of a product, material, applied finish, component, fixture, fitting, assembly or installation by reference to an existing location or installation where a similar product, material, applied finish, component, fixture, fitting, assembly or installation is used.</p> <p>This benchmark relates to the minimum acceptable visual quality of the product, material, applied finish, component, fixture, fitting, assembly or installation in the finished state at time of its completion, and does not represent an endorsement of its fitness for purpose, overall workmanship, actual product or supplier, colour (unless otherwise stated), or its conformance any other specified performance or technical requirement.</p>
Quality Manager	has the meaning given in section 11.5.1(a) of the SPR.
Redundancy	<p>Redundancy for a system is defined as 'N-x', where:</p> <p>(a) "N" is the number of items, components or sub-systems required to be operational to ensure all Operations Activities can be undertaken; and</p> <p>(b) "x" is the number of items, components or sub-systems that may 'fail' or be removed from service without affecting or reducing the Operations Activities.</p> <p>The term 'fail' above includes:</p> <p>(c) electrical faults;</p> <p>(d) mechanical damage; and</p> <p>(e) fire damage.</p>
Replacement and Refurbishment	means an asset maintenance activity that may be undertaken to enable the Asset to continue to meet its performance requirements by refurbishing or replacing life expired or obsolete Assets.
Re-skilling and Up-skilling	means training that supports the employee to meet or exceed SLR construction and operational requirements and identified longer-term career progression.
Revenue Protection Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Riparian and Restoration Areas	means the existing water courses, drainage areas and associated lands affected by the Works.
Rolling Stock	means the LRVs and the Non-Revenue Vehicles.
Rotable Spares	means a component which, when worn out or faulty, can be repaired or reconditioned and re-used.
Routine Test	means a Test to which a vehicle is subjected during or after manufacture to ascertain whether it complies with the specified criteria.
Safety and Systems Assurance Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).

Safety Integrity Level (SIL)	means the relative level of risk-reduction provided by a safety function, or to specify a target level of risk reduction based on the EN50126.
Safety Service Load	means those Loads as defined by AS/NZS 3000 – Australian/New Zealand Wiring Rules.
Satellite Offices	has the meaning given in Appendix 4 (<i>TfNSW and IC Site Facilities</i>).
Seepage Water	means water that seeps into underground tunnels and other underground structures.
Senior Leadership and Management	means a Tier 1 – 4 of organisational structure.
Service and System Performance Requirements	means the service and system performance requirements specified in Appendix 38 (<i>Minimum Service Requirements</i>) of the SPR.
Site Acceptance Tests (SAT)	means a Test or series of Tests of both hardware and software that are undertaken at the SLR Site on an Asset to confirm that the Asset meets the requirements of the SPR.
Site Administration Complex	has the meaning given in Appendix 4 (<i>TfNSW and IC Site Facilities</i>).
Site Tests	has the meaning given in Appendix 33 (<i>Testing and Commissioning</i>).
Skills and Employment Delivery Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Skills and Employment Plan for Sub-contractors	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Skills and Employment Targets Delivery Profile	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
SLR CBD Area 11kV Ring	means the 11kV cables from Belmore Park Zone Substation to CBD area TPSs and the 11kV cables between CBD area TPSs and their associated switchgear to be provided in accordance with Appendices 27 (<i>Ausgrid High Voltage Supply and Reticulation</i>) and 29 (<i>Traction Power, Electrification Systems and Control</i>).
Smartpoles®	means a multi-function track based system that allows mounted multiple accessories to be accommodated on a single pole. The Smartpole® system is used within the CoS LGA.
SOBEK	means the computer modelling suite used for flood modelling, flood forecasting, optimisation of drainage systems and surface water quality.
Soil and Water Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Spares	means all types of spares including Rotable Spares and consumables.

Spot Cooled Zone	means a discrete area in which a discernible cooling sensation can be perceived by consensus when it is compared with the boarder area in which the spot cooled zone sits.
Standards and Guidelines	means the standards and guidelines referred to in Appendix 34 (<i>Standards and Guidelines</i>).
Station Computer	means the machine used as a data staging computer for the transmission of data from equipment to the ETS core system
Stop Access Point	means an areas where Customers can access Stop platforms from surrounding areas.
Stopping Sight Distance	means the clear line of sight distance that is required for the driver of a Light Rail Vehicle to identify a hazard/obstruction/signal, apply the service brake and bring the Light Rail Vehicle to a complete stop in a safe manner.
Stray Current	means the current produced by a DC Traction Power System that follows paths other than the Traction Return circuit.
Stray Current Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Supply Chain	means a network of contracted suppliers, participating in the delivery and operation of the SLR.
Sustainable Design Implementation Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Sustainable Job	means new employees who have not worked for the employer during the six months prior to their start date. Direct employment for a minimum of 26 weeks and 15 hours per week. All employment subject to the conditions of the National Employment Standards.
Sustainable Procurement Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
System Integration Tests (or SIT)	means a series of Tests undertaken to confirm that a group of integrated Assets perform in a manner that meets the requirements of the SPR.
Systems Integration Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Talent Program	means a structured program offering work experience, training and mentoring, defined through individual development plans to high performing young people (under 30).
TfNSW Complex	has the meaning given in Appendix 4 (<i>TfNSW and IC Site Facilities</i>).
TfNSW Customer Service Principles	means the Customer Service Principles described in section 2 of the SPR.
TfNSW's General Specifications	means the specifications and documents contained in Appendix 11 (<i>TfNSW's General Specifications</i>).

Thermal Comfort	means a measure of the physical and mental condition that expresses satisfaction with the thermal environment.
Time to Restore	means the time required to restore a low voltage supply in the event of electrical supply or equipment failure.
Traction Power Substation Areas	means substations containing rectification equipment as well as sectioning huts, where the requirements and specifications are relevant to sectioning huts to be provided in accordance with Appendix 27 (<i>Ausgrid High Voltage Supply and Reticulation</i>) and Appendix 29 (<i>Traction Power, Electrification Systems and Control</i>).
Traction Power Supply	means a power supply system containing substations with rectification equipment to convert high voltage AC power to DC including all protection, control and isolation equipment. The Traction Power Supply provides power to the Electrification system.
Traction Power System	means the overall Traction Power System including the Traction Power Supply, Electrification System and Traction Return.
Traction Return	means a circuit forming the return leg of traction current from Rolling Stock to the Traction Power Supply. The circuit includes the main traction return bar at a traction substation and the cable connection to the running rails.
Traffic and Transport Liaison Group	means the group of that name as defined in the Environmental Documents.
Trainees	<p>means an employee, registered as a trainee, holding a formal training contract with their employer. Trainees must be employed on a SLR worksite for a minimum continuous period of 26 weeks.</p> <p>Employment conditions must meet or exceed the obligations and expectations of the Australian Apprenticeships National Code of Good Practice, including pay rates reflecting individual awards or the national minimum wage for trainees where no award or agreement exists.</p> <p><i>(Apprenticeships are also known as traineeships in some states. These terms are interchangeable. The definition of a trainee within all SLR contracts replicates an apprentice).</i></p>
Trial Running	means the Tests of that name as defined in Appendix 33 (<i>Testing and Commissioning</i>).
Tuflow	means a software suite for simulating free-surface water flow for urban waterways, rivers, floodplains, estuaries and coastlines.
Type Tests	means a series of Tests carried out to certify the fundamental design of material and equipment meets the requirements, and must include accelerated life Tests where appropriate over the specified range of operating conditions.
Universal Workstation	means a single control workstation with multiple visual display units that may be used in any control room allowing a user any configuration of monitoring and control functions dependant on the user's authorisation.

Utility Service Treatment Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Vegetation Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Volatile Organic Compound	means the organic chemicals that have a high vapour pressure at ordinary, room-temperature conditions. Their high vapour pressure results from a low boiling point, which causes large numbers of molecules to evaporate or sublime from the liquid or solid form of the compound and enter the surrounding air.
Waste and Recycling Management Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Wheel Rail Interface	means the interface between the wheel and the rail. Compatible profiles will ensure the safe passage of LRVs for each stage of the project and reduce maintenance activities.
Wheel Rail Interface Study	means the strategy on how the wheel profile interacts with the rail head and its effect and impact on wheel wear, maintenance, speed, safety, hunting, journey comfort, vehicle loadings, wheel and rail head profiles, etc.
WorkCover NSW	mean the agency under the Safety, Return to Work and Support Board Act 2012.
Workforce	means the total number of workers employed by the appointed contractor and Supply Chain within the SLR Project, inclusive of management and professional, technical and trade.
Workforce Diversity	means equal Employment Opportunity (EEO) groups underrepresented in the workforce. These groups include: Aboriginal and/or Torres Strait Islander people; people with a disability; members of racial, ethnic and ethno-religious minority groups; young people under 25; and women in senior leadership roles.
Workforce Profile and Gap Plan	means the plan of that name, as updated from time to time in accordance with Appendix 43 (<i>Project Plan Requirements</i>).
Workshop	means an Enclosed Space wholly or in part, in which manufacturing, assembly, or maintenance and repair work of an industrial nature is done.

1.3. Acronyms

Acronym	Definition
3D	Three Dimensional
AC	Alternating Current
AHD	Australian Height Datum
ANZECC	Australia New Zealand Environment Conservation Council
ARI	Average Recurrence Interval
ASA	Asset Standards Authority
AVLS	Automatic Vehicle Locating System
BCA	Building Code of Australia
BOM	Bureau of Meteorology
BRS	Business Requirements Specification
CAF	Construcciones y Auxiliar de Ferrocarriles
CBD	Central Business District
CBI	Computer Based Interlocking
CBTC	Communications Based Train Control
CCS	Central Control System
CCTV	Closed Circuit Television
CEMP	Construction Environmental Management Plan
CLD(CLD3)	Cashless Load Device
CNVMP	Construction noise and vibration management plan
CPTED	Crime Prevention Through Environmental Design
CSA	Customer Service Attendant
CSR	Combined Services Route
DC	Direct Current
DCCB	Direct Current Circuit Breakers
DDA	Disability Discrimination Act
DECC	Department of Energy and Climate Change
DKE	Dynamic Kinetic Envelope
DSAPT	Disability Standards for Accessible Public Transport
DVM	Disposable Vending Machine
ECS	Environmental Control Systems
EDR	Emergency Door Release
EFT	Electronic Funds Transfer

Acronym	Definition
EMC	Electromagnetic Compatibility
EPA	Environment Protection Agency
ESDAT	Environmental Data Management Software
FAIT	First Article Inspection Tests
FAT	Factory Acceptance Testing
FIP	Fire Indicator Panel
FLR	Fixed Location Reader
FLS	Fire and Life Safety
FMEA	Failure Modes and Effects Analysis
FMECA	Failure Modes, Effects and Critical Analysis
FRACAS	Failure Reporting Analysis and Corrective Action System
GIS	Geographical Information System
GoA	Grade of Automation
GPS	Global Positioning System
HD uPVC	Heavy Duty Unplasticised Poly Vinyl Chloride
HMI	Human Machine Interface
HR	Human Resources
HV	High Voltage
HVAC	Heating Ventilation and Air Conditioning
ICT	Information and Communications Technology
IFAT	Integrated Factory Acceptance Test
I / O	Input / Output
IOC	Installation and operation tests
IP	Ingress Protection
ISCA	Infrastructure Sustainability Council of Australia
KPI	Key Performance Indicator
LAN	Local Area Network
LED	Light Emitting Diode
LGA	Local Government Area
LoS	Level of Service
LRT	Light Rail Transit
LV	Low Voltage
MGA	Map Grid Australia

Acronym	Definition
MIS	Management Information System
NABERS	National Australian Built Environment Rating System
NCC	National Code of Construction
NRV	Non Revenue Vehicle
OCC	Operations Control Centre
OHW	Overhead wiring
ONVR	Operational Noise And Vibration Review
PA	Public Address
PAZ	Precinct Activation Zone
PEA	Passenger Emergency Alarm
PHA	Preliminary Hazard Analysis
PLC	Programmable Logic Controller
PVC	Polyvinyl chloride
PID	Passenger Information Display
PMF	Probable Maximum Flood
RAMS	Reliability, Availability, Maintainability and Safety
RTA	Roads and Traffic Authority
RTU	Remote Terminal Unit
SAT	Site Acceptance Test
SCADA	Supervisory Control and Data Acquisition
SEMP	Systems Engineering Management Plan
SETDP	Skills and Employment Target Delivery Profile
SHA	System Hazard Analysis
SIL	Safety Integrity Level
SIT	System Integration Tests
SRS	System Requirements Specification
TGSI	Tactile Ground Surface Indicator (s)
TPS	Traction Power Substation
UPS	Uninterruptible Power Supply
uPVC	Unplasticised polyvinyl chloride
VLD	Voltage Limiting Device
WHS	Work Health and Safety
WRI	Wheel Rail Interface

Acronym	Definition
WSUD	Water Sensitive Urban Design



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 2 – Construction Site

Document Number: 3126366_14
Execution Version

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1. Overview and references

1.1. General

- (a) This Appendix identifies the Project Site and the Temporary Areas for the SLR PPP.

1.2. Drawings

- (a) This Appendix contains the drawings identified in Table 1.

Table 1 Drawings

Drawing Number	Revision	Drawing Title	Electronic File Reference
116621500 (Sheets 1 to 47 inclusive)	08, 11-12-14	Construction Site Drawings	Refer to separate electronic disc titled "Sydney Light Rail – Schedules Electronic Documents" dated the date of this deed, electronic folder named "Schedules Part E – SPR Appendix 2 (Construction Site)", electronic file named "SPR Appendix 2 – Construction Site Drawings"

- (b) The drawings include a label for each Section, shown in a box with 2 tiers. In the Section labels references to "PS" must be read as "PS-" and references to "TA" must be read as "TA-".

1.3. References

In this Appendix, a reference to:

- (a) "Construction Site Drawings" is a reference to the drawings identified in Table 1 of this Appendix; and
- (b) a lot number and DP number is a reference to the area contained in the lot so numbered in a deposited plan so numbered and registered with Land and Property Information, New South Wales under the Real Property Act 1900 (NSW).

1.4. Boundaries

- (a) Subject to paragraph 1.4(b), each Section in the Construction Site Drawings contains the land enclosed by the area represented for that Section in the Construction Site Drawings.
- (b) Sections in the Construction Site Drawings are unrestricted in height and depth above and below the plan area represented in the Construction Site Drawings, unless a limit is specified in the Construction Site Drawings.
- (c) Where boundaries of a Section are identified as curved in the Construction Site Drawings, the boundary is defined by the schedule of curved boundaries.
- (d) As identified in the third column of Table 1 of Schedule B6 (*Section Access Schedule*) some Sections are a part or parts of public road reserves. For each of those Sections, the Section boundaries comprise:

- (i) where the Construction Site Drawings show a continuous straight line between two coordinated boundary points, the boundary is that line defined by those coordinated boundary points; and
 - (ii) for all boundaries other than those described in section 1.4(d)(i) above, the property boundaries of the relevant parts of the public road reserves.
- (e) In relation to each of Sections PS-SE46-A1, PS-SE46-A2 and PS-SE46-A3:
 - (i) the parties acknowledge the Section is for the purpose of a catenary support pole which, at the date of this deed, is anticipated to be at location of the Section;
 - (ii) the parties acknowledge that the Temporary Area Section adjoining the Section is for the purpose of Temporary Works during construction of the catenary support pole; and
 - (iii) OpCo may, subject to agreement with TfNSW (which shall not be unreasonably withheld), amend the boundaries of the Section and the adjoining Temporary Area Section to suit the final catenary support pole location determined in the development of the design for the pole.

2. Project Site and Temporary Areas

- (a) The Project Site is all of the land described in Table 2 below.

Table 2 Project Site

Description
Section PS-CB01 in the Construction Site Drawings
Section PS-CB01-A1 in the Construction Site Drawings
Section PS-CB01-A2 in the Construction Site Drawings
Section PS-CB29 in the Construction Site Drawings
Section PS-CB28 in the Construction Site Drawings
Section PS-CB30 in the Construction Site Drawings
Section PS-CB30-A1 in the Construction Site Drawings
Section PS-CB31 in the Construction Site Drawings
Section PS-CB02 in the Construction Site Drawings
Section PS-CB02-A1 in the Construction Site Drawings
Section PS-CB02-A2 in the Construction Site Drawings
Section PS-CB03 in the Construction Site Drawings
Section PS-CB04 in the Construction Site Drawings
Section PS-CB04-A1 in the Construction Site Drawings
Section PS-CB05 in the Construction Site Drawings
Section PS-CB25 in the Construction Site Drawings
Section PS-CB25-A1 in the Construction Site Drawings
Section PS-CB25-A2 in the Construction Site Drawings
Section PS-CB06 in the Construction Site Drawings

Description
Section PS-CB06-A1 in the Construction Site Drawings
Section PS-CB07 in the Construction Site Drawings
Section PS-CB08 in the Construction Site Drawings
Section PS-CB09 in the Construction Site Drawings
Section PS-CB10 in the Construction Site Drawings
Section PS-CB10-A1 in the Construction Site Drawings
Section PS-CB11 in the Construction Site Drawings
Section PS-CB12 in the Construction Site Drawings
Section PS-CB13 in the Construction Site Drawings
Section PS-CB13-A1 in the Construction Site Drawings
Section PS-CB14 in the Construction Site Drawings
Section PS-CB15 in the Construction Site Drawings
Section PS-CB16 in the Construction Site Drawings
Section PS-CB17 in the Construction Site Drawings
Section PS-CB17-A1 in the Construction Site Drawings
Section PS-CB18 in the Construction Site Drawings
Section PS-CB33 in the Construction Site Drawings
Section PS-CB33-A1 in the Construction Site Drawings
Section PS-CB18-A1 in the Construction Site Drawings
Section PS-CB19 in the Construction Site Drawings
Section PS-CB19-A1 in the Construction Site Drawings
Section PS-CB19-A2 in the Construction Site Drawings

Description
Section PS-CB20 in the Construction Site Drawings
Section PS-CB21 in the Construction Site Drawings
Section PS-CB22 in the Construction Site Drawings
Section PS-CB32 in the Construction Site Drawings
Section PS-CB23 in the Construction Site Drawings
Section PS-CB23-A1 in the Construction Site Drawings
Section PS-CB27 in the Construction Site Drawings
Section PS-CB24 in the Construction Site Drawings
Section PS-CB26 in the Construction Site Drawings
Section PS-SE39 in the Construction Site Drawings
Section PS-SE39A in the Construction Site Drawings
Section PS-SE39A-A1 in the Construction Site Drawings
Section PS-SE01 in the Construction Site Drawings
Section PS-SE01-A2 in the Construction Site Drawings
Section PS-SE59 in the Construction Site Drawings
Section PS-SE02 in the Construction Site Drawings
Section PS-SE02-A1 in the Construction Site Drawings
Section PS-SE03 in the Construction Site Drawings
Section PS-SE04 in the Construction Site Drawings
Section PS-SE41 in the Construction Site Drawings
Section PS-SE42 in the Construction Site Drawings
Section PS-SE05 in the Construction Site Drawings

Description
Section PS-SE05-A1 in the Construction Site Drawings
Section PS-SE06 in the Construction Site Drawings
Section PS-SE07 in the Construction Site Drawings
Section PS-SE07-A1 in the Construction Site Drawings
Section PS-SE43 in the Construction Site Drawings
Section PS-SE44 in the Construction Site Drawings
Section PS-SE45 in the Construction Site Drawings
Section PS-SE08 in the Construction Site Drawings
Section PS-SE09 in the Construction Site Drawings
Section PS-SE09aA in the Construction Site Drawings
Section PS-SE09-A1 in the Construction Site Drawings
Section PS-SE60 in the Construction Site Drawings
Section PS-SE10 in the Construction Site Drawings
Section PS-SE10-A1 in the Construction Site Drawings
Section PS-SE27 in the Construction Site Drawings
Section PS-SE57 in the Construction Site Drawings
Section PS-SE40 in the Construction Site Drawings
Section PS-SE40-A1 in the Construction Site Drawings
Section PS-SE58 in the Construction Site Drawings
Section PS-SE46 in the Construction Site Drawings
Section PS-SE46-A1 in the Construction Site Drawings
Section PS-SE46-A2 in the Construction Site Drawings

Description
Section PS-SE46-A3 in the Construction Site Drawings
Section PS-SE11 in the Construction Site Drawings
Section PS-SE11-A1 in the Construction Site Drawings
Section PS-SE11-A2 in the Construction Site Drawings
Section PS-SE11-A3 in the Construction Site Drawings
Section PS-SE12 in the Construction Site Drawings
Section PS-SE12A in the Construction Site Drawings
Section PS-SE12-A1 in the Construction Site Drawings
Section PS-SE12-A2 in the Construction Site Drawings
Section PS-SE13 in the Construction Site Drawings
Section PS-SE13-A1 in the Construction Site Drawings
Section PS-SE14 in the Construction Site Drawings
Section PS-SE61 in the Construction Site Drawings
Section PS-SE15 in the Construction Site Drawings
Section PS-SE61-A1 in the Construction Site Drawings
Section PS-SE16 in the Construction Site Drawings
Section PS-SE47 in the Construction Site Drawings
Section PS-SE48 in the Construction Site Drawings
Section PS-SE62 in the Construction Site Drawings
Section PS-SE17 in the Construction Site Drawings
Section PS-SE18 in the Construction Site Drawings
Section PS-SE54 in the Construction Site Drawings

Description
Section PS-SE55 in the Construction Site Drawings
Section PS-SE56 in the Construction Site Drawings
Section PS-SE63 in the Construction Site Drawings
Section PS-SE19 in the Construction Site Drawings
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Section PS-SE77A in the Construction Site Drawings
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Section PS-SE52 in the Construction Site Drawings
Section PS-SE74 in the Construction Site Drawings
Section PS-SE53 in the Construction Site Drawings
Section PS-SE21 in the Construction Site Drawings
Section PS-SE22 in the Construction Site Drawings
Section PS-SE22-A1 in the Construction Site Drawings
Section PS-SE23 in the Construction Site Drawings
Section PS-SE23-A1 in the Construction Site Drawings
Section PS-SE14-A1 in the Construction Site Drawings

Description
Section PS-SE14-A1 in the Construction Site Drawings
Section PS-SE25 in the Construction Site Drawings
Section PS-SE26A in the Construction Site Drawings
Section PS-SE26B in the Construction Site Drawings
Section PS-SE26C in the Construction Site Drawings
Section PS-SE26-A1 in the Construction Site Drawings
Section PS-SE24 in the Construction Site Drawings
Section PS-SE28-A1 in the Construction Site Drawings
Section PS-SE14-A4 in the Construction Site Drawings
Section PS-SE14-A5 in the Construction Site Drawings
Section PS-SE14-A6 in the Construction Site Drawings
Section PS-SE29 in the Construction Site Drawings
Section PS-SE29-A1 in the Construction Site Drawings
Section PS-SE65 in the Construction Site Drawings
Section PS-SE66 in the Construction Site Drawings
Section PS-SE30 in the Construction Site Drawings
Section PS-SE67 in the Construction Site Drawings
Section PS-SE68 in the Construction Site Drawings
Section PS-SE31 in the Construction Site Drawings
Section PS-SE32 in the Construction Site Drawings
Section PS-SE33 in the Construction Site Drawings
Section PS-SE34 in the Construction Site Drawings

Description
Section PS-SE35 in the Construction Site Drawings
Section PS-SE34-A1 in the Construction Site Drawings
Section PS-SE69 in the Construction Site Drawings
Section PS-SE69-A2 in the Construction Site Drawings
Section PS-SE36 in the Construction Site Drawings
Section PS-SE36A in the Construction Site Drawings
Section PS-SE70 in the Construction Site Drawings
Section PS-SE71 in the Construction Site Drawings
Section PS-SE72 in the Construction Site Drawings
Section PS-SE73 in the Construction Site Drawings
Section PS-SE37 in the Construction Site Drawings
Section PS-SE38 in the Construction Site Drawings
Section PS-SE38A in the Construction Site Drawings
Section PS-SE38B in the Construction Site Drawings
Section PS-IW01 in the Construction Site Drawings
Section PS-IW02 in the Construction Site Drawings
Section PS-IW01-A1 in the Construction Site Drawings
Section PS-IW01-A2 in the Construction Site Drawings
Section PS-IW02-A1 in the Construction Site Drawings
Section PS-IW02-A2 in the Construction Site Drawings

(b) The Temporary Areas is all of the land described in Table 3 below.

Table 3 Temporary Areas

Description
Section TA-CB01 in the Construction Site Drawings
Section TA-CB03 in the Construction Site Drawings
Section TA-CB03-A1 in the Construction Site Drawings
Section TA-CB33-A2 in the Construction Site Drawings
Section TA-CB02 in the Construction Site Drawings
Section TA-SE15-A1 in the Construction Site Drawings
Section TA-SE15-A2 in the Construction Site Drawings
Section TA-SE15-A3 in the Construction Site Drawings
Section TA-SE01 in the Construction Site Drawings
Section TA-SE15 in the Construction Site Drawings
Section TA-SE02-A1 in the Construction Site Drawings
Section TA-SE02 in the Construction Site Drawings
Section TA-SE13-A1 in the Construction Site Drawings
Section TA-SE03 in the Construction Site Drawings
Section TA-SE04 in the Construction Site Drawings
Section TA-SE04A in the Construction Site Drawings
Section TA-SE05 in the Construction Site Drawings
Section TA-SE 05A in the Construction Site Drawings
Section TA-SE 05B in the Construction Site Drawings
Section TA-SE16 in the Construction Site Drawings
Section TA-SE13 in the Construction Site Drawings

Description
Section TA-SE13-A2 in the Construction Site Drawings
Section TA-SE13-A3 in the Construction Site Drawings
Section TA-SE13-A4 in the Construction Site Drawings
Section TA-SE06 in the Construction Site Drawings
Section TA-SE14 in the Construction Site Drawings
Section TA-SE11-A1 in the Construction Site Drawings
Section TA-SE07 in the Construction Site Drawings
Section TA-SE08 in the Construction Site Drawings
Section TA-SE10 in the Construction Site Drawings
Section TA-SE22-A1 in the Construction Site Drawings
Section TA-SE19 in the Construction Site Drawings
Section TA-SE17 in the Construction Site Drawings
Section TA-SE21 in the Construction Site Drawings
Section TA-SE20 in the Construction Site Drawings

- (c) The conditions of some of the Sections will be affected by certain Early Works activities occurring prior to making the relevant Sections available to OpCo. Those early works are generally described in the drawings and schedules included in SPR Appendix 22 (*Early Works*).



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Schedule E1 Scope and Performance Requirements

Appendix 3 – Assets

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1. Overview

- (a) This Appendix describes the Assets which form part of the SLR and must be maintained by OpCo in accordance with its asset management obligations set out in the SPR.

1.1. Principles

- (a) The Assets can generally be described as:
- i. everything OpCo is required to construct, manufacture and supply under this deed;
 - ii. all assets located within the Permanent Light Rail Corridor; and
 - iii. all IWLR assets located outside the Permanent Light Rail Corridor;
- excluding the Excluded Assets.

1.2. Asset Management System

- (a) This Appendix sets out an indicative list only and OpCo must define all Assets within the Asset Management System.

2. Assets

2.1. Corridor Assets and Non-Corridor Assets (fixed)

Component of the System	OpCo Responsibility	Description
Bridge and Viaduct Structures	Yes	All structural components including: <ul style="list-style-type: none"> • decks; • piers; • piles; • sub-structure; • abutments; • retaining walls; • parapets; • drainage; and • all other elements to give support to the trackwork.
Tunnels	Yes	All structural components including: <ul style="list-style-type: none"> • retaining walls; • piers; • piles; • sub-structure; • tunnel roof; • abutments; • drainage; • parapets; • signalling; • ground anchors; • tunnel systems; and • all other elements to give support to the trackwork. Security: <ul style="list-style-type: none"> • CCTV; • Security systems to prevent unauthorised access.
Light Rail Maintenance and Stabling Facilities	Yes	All associated infrastructure / components fence to fence to the maximum depth of piles including: <ul style="list-style-type: none"> • foundations;

Component of the System	OpCo Responsibility	Description
		<ul style="list-style-type: none"> • piles/piers; • building structure, doors and roof; • building systems and utilities; • drainage and services; • roads, carpark and footpaths; • storage areas; • fencing and gates; • CCTV and security systems; • noise barrier; • wash bay; • sanding facility; • wheel lathe; • overhead cranes; • all associated equipment and maintenance vehicles; • overhead gantry platforms; • track and track components; • switches and crossovers; • overhead line infrastructure; and • emergency access routes.
Embankments	Yes	Embankment to toe or top of batter, including: <ul style="list-style-type: none"> • earth embankments; • stabilisation structures; • gabions; • "shot crete"; • rock pitching; • boundary walls and fencing; • retaining walls; and • rock bolts / ground anchors.
Interchanges	Yes	All components for Randwick and Kingsford interchanges including: <ul style="list-style-type: none"> • the platforms; • access ramps/stairs; • retaining walls;

Component of the System	OpCo Responsibility	Description
		<ul style="list-style-type: none"> • fencing and barriers; • pedestrian areas; • roads and footpaths; • drainage to lawful point of discharge; • passenger information systems; • CCTV; • help points; • bus stops; • buildings and toilets; • ETS ticketing infrastructure; • equipment cabinets; • shelters and canopies; • bicycle facilities; and • any other facilities essential for the functioning of the system.
Retaining Walls	Yes	All structural components including: <ul style="list-style-type: none"> • walls; • associated subsoil drainage; • footings; • anchors; • piles; and • all other elements to give support to the trackwork, whether or not contiguous to the trackform.
System separation / protection structures	Yes	All structural components including: <ul style="list-style-type: none"> • fences and gates; • guardrail; • concrete barriers; and • kerbs.
SLR Stops	Yes	All components within the Stop footprint including: <ul style="list-style-type: none"> • the platforms; • shelters and canopies; • access ramps/stairs; • footpaths and walkways;

Component of the System	OpCo Responsibility	Description
		<ul style="list-style-type: none"> • pedestrian crossings; • retaining walls; • fencing and barriers; • lifts and escalators; • drainage to lawful point of discharge; • passenger information systems; • CCTV; • help points; • ETS ticketing infrastructure; • equipment cabinets; • associated cables, conduits and pits; • bicycle facilities; • any other facilities essential for the functioning of the system; and • LTS Equipment, in the case of IWLR Stops.
Overhead Line Infrastructure	Yes	<p>All OHL infrastructure and components including:</p> <ul style="list-style-type: none"> • crash protection devices; • poles, wire, insulators, fixings and associated support infrastructure; • feed and return current cables, conduits and pits; • isolation equipment; • stray current monitoring equipment if applicable; • earthing and bonding cables; and • all other elements that constitute the OHL system.
Communication Systems	Yes	<p>All communication infrastructure and components including:</p> <ul style="list-style-type: none"> • radio masts; • communication cabinets; • CCTV; • public announcement system and equipment; • passenger communication systems; • Passenger Information Displays; • Operations Control Centre and all associated equipment; and

Component of the System	OpCo Responsibility	Description
		<ul style="list-style-type: none"> Radio frequency spectrum licences.
Traction Power Sub Stations	Yes	All infrastructure including: <ul style="list-style-type: none"> buildings and services; cabinets; power supply cables from the external substation; fencing and gates; signage; pedestrian and vehicular access; parking areas; associated cartilage; and earthing systems.
Rail System Conduits	Yes	Conduits, pits and covers for control system data, communications and power supplies and cables.
Power Supplies and Interfaces – non traction power	Yes	Low voltage power for SLR Stops and other equipment from point of supply including: <ul style="list-style-type: none"> signalling; lighting; lifts and escalators; passenger information displays; help points; shelters; ETS ticketing infrastructure; stabling and maintenance depot(s); signage; LRV control systems; and track switches and crossings.
Track Form	Yes	All infrastructure and components including: <ul style="list-style-type: none"> rails and joints; track slab; sleepers and ballast; foundation structure; track transponders; pavers;

Component of the System	OpCo Responsibility	Description
		<ul style="list-style-type: none"> • LRV line markings; • track surface; • crossovers; • points; • switches; and • rail boots/encapsulation.
Batters - cuttings	Yes	Cuttings to toe or top of batter, including: <ul style="list-style-type: none"> • earth structures; • stabilisation structures; • gabions; • "shot-crete"; • rock-pitching; • boundary walls and fencing; and • retaining walls.
Track Drainage	Yes	All infrastructure that collects and conveys storm and surface water from the system until legal point of discharge including: <ul style="list-style-type: none"> • pipes; • drains; • kerb and channel; • kerbs; • sub-soil drains; • pits; • joints; • covers and gratings; and • chambers.
Lighting	Yes	Lighting including: <ul style="list-style-type: none"> • bridges and viaducts; • tunnels; • SLR Stops; • interchanges; • stabling and maintenance depot(s); • substations; and

Component of the System	OpCo Responsibility	Description
		<ul style="list-style-type: none"> shared use road lighting.
Road Traffic / Tram signals	Yes	LRV signal boxes and associated conduits, cables and pits. Points Indicators. All other signal systems and infrastructure excluded.
Signalling	Yes	Including: <ul style="list-style-type: none"> LRV detection equipment; signal systems at termini, turnbacks, turnouts and junctions; and all conduits, pits, control systems and power supplies.
Signage	Yes	Including signage to the following: <ul style="list-style-type: none"> SLR Stops; interchanges; stabling and maintenance facilities on roads related to SLR operations; electrical safety signage; and infrastructure signage.
Way finding	Yes	All wayfinding signage that carries the TfNSW SLR branding.
Vegetation	Yes	Including: <ul style="list-style-type: none"> embankments and cuttings; and trees and vegetation within 700mm of the DKE.
Delineation	Yes	<ul style="list-style-type: none"> road pavement marking to delineate the Permanent Light Rail Corridor fencing required to prevent unauthorised access into the Permanent Light Rail Corridor

- (a) Without limiting the principles set out at section 1.1 (Principles) and the list of assets at section 2.1 (Corridor Assets and Non-Corridor Assets (fixed)) above, the IWLR Assets include the following:

Asset Description / Name	Asset Type	Location	Existing Asset Defect regime applies
Central Station Stop	Stop furniture (PIDs, Help point; ticket booth, billboard)	Sydney Central Station colonnade concourse	No
Colonnades and concourse structure	Signage (no walking sign)	Sydney Central Station colonnade concourse	No
Ramp embankment and road pavement	Embankment – road pavement between the tracks	Along Belmore Park east of Haymarket	Yes
Ramp embankment and road pavement	Embankment – road pavement between the tracks	Along Belmore Park west of Haymarket	Yes
Overline bridge (brick arch type) structures	Overline bridge	Harris St (adjacent to John St sq building, Pyrmont)	Yes
Overline bridge (steel girder type) structures & pedestrian walkway (RMS Road No.523; Bridge No. 156)	Overline bridge	Pyrmont Bridge Rd, Pyrmont West (also known as Gipps Street)	Yes
Overline bridge (steel girder type) structures & pedestrian walkway (RMS state road No#523; Bridge No.8355)	Overline bridge	Pyrmont Bridge Rd, Pyrmont West	Yes
Cuttings (sandstone) and support piers/columns (steel) structures and rock bolts (NSW Heritage listed No. 4801122)	Cutting & columns	Pyrmont Tunnel	Yes
Tunnel (brick lined) underneath Pyrmont (NSW Heritage listed No. 4801122)	Tunnel	Pyrmont (adjacent to John St Square building)	Yes
Tunnel (brick lined) extending approximately 800 metres underneath Glebe (NSW Heritage listed No. 4803228)	Tunnel	Glebe	Yes

Asset Description / Name	Asset Type	Location	Existing Asset Defect regime applies
(including fire, life safety systems)			
Passenger lifts and accessible facilities (including ramps)	Lift and ramps	Permanent Light Rail Corridor	No
Structures constructed and operated for IWLR purpose: Track and associated infrastructure	Track and associated infrastructure	Permanent Light Rail Corridor	No
Structures constructed and operated for IWLR purpose: walkways and pathways	Walkways and pathways, excluding walkways and pathways with non compliant DDA grades	Permanent Light Rail Corridor (including stairs at John St Square and Lilyfield, and walkway at Jones St)	No
Structures constructed and operated for IWLR purpose: walkways and pathways	Walkways and pathways with non compliant DDA grades	Permanent Light Rail Corridor	Yes
Structures constructed and operated for IWLR purpose: Electrical traction system (from ring main units and downstream including earthing and bonding)	Ring main units; substations, stanchions, overhead wiring, catenaries, support poles	Permanent Light Rail Corridor	No
Structures constructed and operated for light rail purpose: IWLR stops (including 415V electrical infrastructure from and including the distribution board and earthing and bonding)	IWLR stops	Permanent Light Rail Corridor	No
Structures constructed and operated for light rail purpose: maintenance and stabling facilities	Maintenance facilities (maintenance building, staff facilities and offices, operations control centre, rail tracks, stabling roads, vehicular roads, fencing etc)	190 Pyrmont Road, Pyrmont and Lilyfield	No
Drains	Drains	Permanent Light Rail	No

Asset Description / Name	Asset Type	Location	Existing Asset Defect regime applies
		Corridor	
Underline bridge (brick arch type)	Underline bridge	White Creek Canal, Lilyfield	Yes
Underline bridge (steel truss type) (NSW Heritage listing no. 4803231)	Underline bridge	Railway Parade, Rozelle Bay	Yes
Underline bridge (steel truss type) (RMS state road no. 655 Johnson St; state road no. 666 The Crescent; Bridge no. 204; NSW Heritage listing no. 4803229)	Underline bridge	Johnston Street and The Crescent, Rozelle Bay	Yes
Viaduct (brick arch type) (NSW Heritage listing no. 4801104)	Viaduct	Jubilee Park, Glebe	Yes
Underline bridge (steel girder type) (RMS state road no. 523)	Underline bridge	Pyrmont Bridge Road, Glebe	Yes
Underline bridge (steel girder type)	Underline bridge	Darling St, Glebe	Yes
Darghan St Subway(concrete)	Underline bridge	Darghan St Subway, Glebe	Yes
Underline bridge (reinforced concrete type) (NSW Heritage listing no. 4801828)	Underline bridge	Bellevue St, Glebe	Yes
Underline bridge (steel truss type) (NSW Heritage listing no. 4805732)	Underline bridge	Wentworth Park Rd, Glebe	Yes
Wentworth Park Viaduct (brick arch type) (NSW Heritage listing no. 4801104)	Viaduct	Wentworth Park, Ultimo	Yes
Underline bridge (steel girder type) (RMS state road no. 594; Bridge no. 6430)	Underline bridge	Wattle St, Wentworth Park	Yes

Asset Description / Name	Asset Type	Location	Existing Asset Defect regime applies
Cuttings and Embankments (including works identified by geotechnical inspections)	Cuttings and Embankments	Permanent Light Rail Corridor	Yes
Fencing, gates and signage	Fencing, gates and signage	Permanent Light Rail Corridor	No
Elevated and overline former monorail maintenance depot structure including OpCo' offices	Structure	220 Pymont Road, Pymont	No
Access level crossing Edward Street (not used for pedestrian or traffic)	Level crossing gates and road pavement	Edward Street (between The Star and Pymont Bay)	No
Hay St section where Light Rail runs	Road pavement (white line to white line)	Between Darling Drive and Castlereagh Street	No
Wash plant and washing equipment	Building and equipment	Between 190 and 220 Pymont Road, Pymont	No
Offices - 220 Pymont St, Pymont	Offices and staff facilities	220 Pymont St, Pymont	No
All IT assets, fibre backbone, systems and software licences used in the operations of the IWLR	IT systems, cabling	Permanent Light Rail Corridor	No
All IT assets, systems and software licences used in OpCo offices	IT	OpCo offices	No
CCTV and Help Points	Security	IWLR stops	No
Passenger Information Displays	Information	IWLR stops	No
ETS Devices	Ticketing	IWLR stops	No
Overline bridge	Overline bridge	Hercules St, Dulwich Hill	Yes

Asset Description / Name	Asset Type	Location	Existing Asset Defect regime applies
		(8.544kms)	
Overline bridge	Overline bridge	New Canterbury Rd, Dulwich Hill (8.632kms)	Yes
Overline bridge	Overline bridge	Constitution Rd, Dulwich Hill (8.886kms)	Yes
Overline bridge	Overline bridge	Davis St, Dulwich Hill (9.31kms)	Yes
Overline bridge	Overline bridge	Old Canterbury Rd, Lewisham (9.842kms)	Yes
Overline bridge	Overline bridge	Longport St/Railway Tce, Lewisham (10.165kms)	Yes
Underline bridge	Underline bridge	Longport St, Lewisham (10.24kms)	Yes
Underline bridge	Underline bridge	Dobroyd Branch Sewer, Lewisham (10.26kms)	Yes
Underline bridge	Underline bridge	Great Western H'way, Leichhardt (10.489kms)	Yes
Underline bridge	Underline bridge	Lord's Road, Leichhardt (10.898kms)	Yes
Underline bridge	Underline bridge	Marion St, Leichhardt (11.127kms)	Yes
Underline bridge	Underline bridge	Charles St, Leichhardt (12.405kms)	Yes
Overline bridge	Overline bridge	Balmain Road, Leichhardt (13.193kms)	Yes
Overline bridge	Overline bridge	Catherine St, Lilyfield (13.548kms)	Yes
Culverts	Culvert	Permanent Light Rail Corridor	Yes
Subway	Subway	Darley Road	Yes
Retaining Walls	Retaining Walls	Permanent Light Rail Corridor	Yes

Asset Description / Name	Asset Type	Location	Existing Asset Defect regime applies
All other assets relating to the IWLR, including: - fire and life safety equipment City West link Tunnel; - lighting; - road accessways from boundary line; and - public art.	Various	Various	No

2.2. Moveable Assets and Existing Moveable Assets

- (a) OpCo must maintain the Moveable Assets and the Existing Moveable Assets.

3. Excluded Assets

3.1. CSELR Excluded Assets

- (a) The following assets are excluded and do not form part of the Assets to be maintained by OpCo for the CSELR after Completion.

Component of the System	OpCo Responsibility	Description
Bus Stops	No	Not applicable
Roads	No	Infrastructure, including: <ul style="list-style-type: none"> • street lighting • road surface at intersections; • road markings at intersections; • road signage at intersections; • signalling at intersections; and • traffic controllers at intersections.
Traffic Monitoring and Street Security CCTV	No	Pre-existing CCTV not provided as part of the SLR Works
Pedestrian Area	No	The pedestrian area along George Street, excluding assets within the Permanent Light Rail Corridor.
Underground and overground services and utilities	No	With the exception of those services that are required or have been provided as part of the SLR Works, including associated pits, chambers and tunnels.
Underground Structures	No	Including: <ul style="list-style-type: none"> • Eastern Suburbs Railway station box, under Chalmers Street; • Town Hall station box, under George Street; • Arcades/subways under George Street at Park Street/Druitt Street and at Market Street; • Wynyard pedestrian tunnel, north of Wynyard stop; and • Railcorp deep level railway tunnels and station infrastructure.
Sydney Trains / Railcorp	No	Fibre telecommunications networks
ETS Equipment	No	Except as required under Appendix 39 (<i>Operations and</i>

Component of the System	OpCo Responsibility	Description
		<i>Customer Service Requirements</i>

3.2. IWLR Excluded Assets

- (a) The following assets are excluded and do not form part of the Assets to be maintained by OpCo for the IWLR.

Asset Description / Name	Asset Type	Location	Ownership
Level Crossings x 5, traffic signals and signage of Sydney Light Rail running	Road	Hay St with Castlereagh St, Pitt St, George St, Sussex St and Dixon St	RMS
Level Crossing traffic signals and signage	Road	Darling Drive and Sydney Light Rail at Haymarket	RMS
Overline bridge (pre-stressed concrete plank type) (RMS Br No.8534) for widened. Pymont Bridge Rd (RMS State Rd 523) E/B structures and road pavement	Overline bridge	Adjacent to and between Gipps St Bridge and Pymont Bridge Rd at Pymont West	RMS
Overline bridges x 4 (pre-stressed concrete trough girder type) (RMS Br No. 7806)	Overline bridges	Western Distributor (aka Glebe Island Arterial) (RMS State Rd 165) E/B, W/B, E/B off-ramp to Allen St and W/B off-ramp to Pymont Bridge Rd, structures and road pavements at Pymont west.	RMS
Overline bridge (pre-stressed concrete plank type) (RMS Br No. 8095) on City West link (RMS State Rd 650) structures and road pavement at Lilyfield.	Overline bridge	City West Link	RMS
Road pavement of Pymont Bridge Road (RMS State Rd 523) W/B on RailCorp's overline bridge (RMS Br No.8355) at Pymont west.	Overline bridge	Pymont Bridge Road, Pymont West	RMS
Road pavement of Pymont Bridge Road (RMS State	Overline bridge	Pymont Bridge Road, Pymont	RMS

Asset Description / Name	Asset Type	Location	Ownership
Rd 523) E/B on RailCorp's overline bridge (aka Gipps Street) (RMS Br No. 156) at Pyrmont west.		West (aka Gipps street).	
Road pavement of Wattle Street (RMS State Rd 594) below RailCorp's underline bridge (RMS Br No 6430) at Pyrmont.	Underline bridge	Wattle Street, Pyrmont.	RMS
Road pavement of Bridge Road (RMS State Rd 523) below RailCorp's underline bridge (RMS Br No. 155) at Glebe	Underline bridge	Bridge Road, Glebe	RMS
Road pavements of Johnston Street (RMS State Rd 655) and The Crescent (RMS State Rd 666) below RailCorp's underline bridge (RMS Br No. 204) at Annandale.	Underline bridge	Johnston Street and The Crescent, Annandale.	RMS
Overline bridge (concrete type) structures and road pavement of Pier Street at Darling Harbour.	Overline bridge	Pier Street at Darling Harbour	RMS
Overline bridges (concrete) x6 of Western Distributor (RMS State Rd 165) E/B, W/B, E/B on-ramp from Pyrmont St, E/B on-ramp from Fig St, E/B off-ramp to Bathurst Street and W/B off-ramp to Harris Street structures and road pavements at Darling Harbour.	Overline bridge x 6	Western Distributor; on-ramp from Pyrmont St, on-ramp from Fig St, off-ramp to Bathurst St and off-ramp to Harris St; s at Darling Harbour	RMS
Road pavement of Level Crossing of Darling Drive and Sydney Light Rail at Haymarket	Level Crossing	Darling Drive and Sydney Light Rail at Haymarket	SHFA
Overline bridge structures of pedestrian walkway to Harbourside at Darling Harbour	Overline bridge	Darling Harbour	SHFA
Overline bridge (concrete type) of Pyrmont Bridge	Overline bridge	Pyrmont Bridge Road (aka Darling Drive, Murray Street and	SHFA

Asset Description / Name	Asset Type	Location	Ownership
Road (aka Darling Drive, Murray Street and Union Street) structures and road pavements at Pymont east.		Union Street), Pymont east.	
Road pavements of Level Crossings x5 of Sydney Light Rail running on Hay Street with Castlereagh St, Pitt St, George St, Sussex St and Dixon St	Road	Hay Street with Castlereagh St, Pitt St, George St, Sussex St and Dixon St	COS
Overline bridge structures and road pavement of Jones Bay Rd at Pymont	Overline bridge	Jones Bay Rd, Pymont	COS
Overline bridge structures of pedestrian walkway between Pymont cliffs and Saunders Street at Pymont	Overline bridge	Pymont cliffs and Saunders Street, Pymont	COS
Overline bridge structures (concrete type) and road pavement of Pymont Street (aka Pont Street) at Pymont	Overline bridge	Pymont Street (aka Pont Street), Pymont	COS
Overline bridge (steel girder type) structures and road pavement of Miller Street at Pymont west	Overline bridge	Miller Street, Pymont West	COS
Overline John Street Square buildings structures and piers near Harvey St and Pymont.	Overline bridge	Harvey St, Pymont	COS
Road pavement of Harris Street on RailCorp's overline bridge (adjacent to John Street Square buildings) at Pymont	Overline bridge	Harris Street (adjacent to John Street Square buildings), Pymont	COS
Road pavement of Eddy Avenue below RailCorp's underline bridge, middle at Haymarket	Road	Eddy Avenue, Haymarket	COS
Road pavement of Eddy Avenue below RailCorp's underline bridge, west at	Road	Eddy Avenue, Haymarket	COS

Asset Description / Name	Asset Type	Location	Ownership
Haymarket			
Road pavement of Wentworth Park Road below RailCorp's underline bridge at Glebe	Road	Wentworth Park Road, Glebe	COS
Road pavement of Bellevue Street below RailCorp's underline bridge at Glebe	Road	Bellevue Street, Glebe	COS
Road pavement of Darling Drive below RailCorp's underline bridge at Glebe	Road	Darling Drive, Glebe	COS
Road pavements of Hay street for joint tram and RMVs at Haymarket	Road	Hay Street, Haymarket	COS
Pedestrian walkway below RailCorp's underline bridge off Darghan Street at Glebe	Pedestrian walkway	Darghan Street, Glebe	COS
Passenger lift and stairs of the Fishmarket Station east at Pyrmont	Passenger lift and stairs	Fishmarket Station, Pyrmont	COS
Arches of viaduct over Wentworth Park wherever lessee and vegetation beneath at Ultimo	Viaduct	Wentworth Park, Ultimo	RailCorp
Arches of viaduct over Jubilee Park wherever lessee or burdened by easement and vegetation beneath at Glebe.	Viaduct	Jubilee Park, Glebe	RailCorp
Road traffic signals	Traffic signals	On road section of IWLR	RMS
33 KVa and 11 KVa transmission lines, including cabling, poles and cable troughs	Electrical	Above and underground in the Permanent Light Rail Corridor	RailCorp
Electrical Sub-Station	Electrical Sub-Station	Lewisham	RailCorp
Footbridge – Hawthorne	Footbridge	Hawthorn Canal, Leichhardt	RailCorp

Asset Description / Name	Asset Type	Location	Ownership
Canal		(11.43 kms)	
Footbridge across canal	Footbridge	Marion, Leichhardt (11.43 kms)	RailCorp
Passenger Lifts x 4	Lifts	Pymont Bay Station and Johns St Square Station	SHFA
Central Station	IWLR stops	Central	RailCorp
The Star	IWLR stops	The Star Casino	Casino Owner
Underline bridge	Underline bridge	Ness Avenue, Dulwich Hill (7.944 kms)	RailCorp
Rozelle Yard	Various	Rozelle	RailCorp
Dulwich Hill West Fork	Various	Dulwich Hill	ARTC
Unused sidings	Various	Various including Mungo Scott	RailCorp
Advertising billboards / posters (excluding located on Stops)	Billboards / posters	Various	RailCorp



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Schedule E1 Scope and Performance Requirements

Appendix 4 – TfNSW and IC Site Facilities

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1. Overview and scope

1.1. General

- a) This Appendix describes the scope and performance requirements for TfNSW's and the Independent Certifier's site facilities for SLR.

2. Site facilities

2.1. General

- (a) OpCo must establish, provide, maintain, operate and service the site facilities for use by TfNSW's Representative, TfNSW's personnel, TfNSW's technical advisers, the Independent Certifier and the Independent Certifiers' personnel, as identified in this Appendix.
- (b) The site facilities must include a primary site office complex for the TfNSW Representative, TfNSW's personnel, TfNSW's technical advisers, the Independent Certifier and personnel (**Site Administration Complex**).
- (c) The Site Administration Complex must be located adjacent to OpCo's main Project administration and office facilities.
- (d) OpCo must also provide separate satellite offices for TfNSW and the Independent Certifier adjacent to each of OpCo's site offices within the Construction Site (**Satellite Offices**).
- (e) The site facilities must be available for use and be fully operational four weeks prior to the commencement of substantial construction of the SLR Works and Temporary Works until two weeks prior to the Date of Final Completion. The site facilities must be removed as a condition of Final Completion.
- (f) The site facilities must be available and accessible to the TfNSW Representative, TfNSW's personnel, TfNSW's technical advisers, the Independent Certifier and the Independent Certifier's personnel 24 hours per day for seven days per week throughout the period described in section (e) of this Appendix.
- (g) Where OpCo's main Project administration and office facilities are located in an office building, OpCo must, in consultation with TfNSW and the Independent Certifier, provide accommodation which, while being separate office space, may include some common or shared facilities such as bathroom and kitchen facilities.

2.2. Site Administration Complex and Satellite Offices

2.2.1. General

- (a) The Site Administration Complex must include:
 - i an office complex, or in the event that office accommodation is provided, separate office accommodation, for the sole use of the TfNSW Representative, TfNSW's personnel and TfNSW's technical advisers (TfNSW Office Complex);
 - ii an office complex, or in the event that office accommodation is provided, separate office accommodation, for the sole use of the Independent Certifier and the Independent Certifier's personnel (Independent Certifier Office Complex), which must be separate, but adjacent to the TfNSW Office Complex;
 - iii an all weather car parking area with a minimum capacity of eight cars. The car parking area must:
 - A. be lit; and
 - B. include covered walkways to the main and rear entrance doors to the TfNSW Office Complex and the Independent Certifier Office Complex;

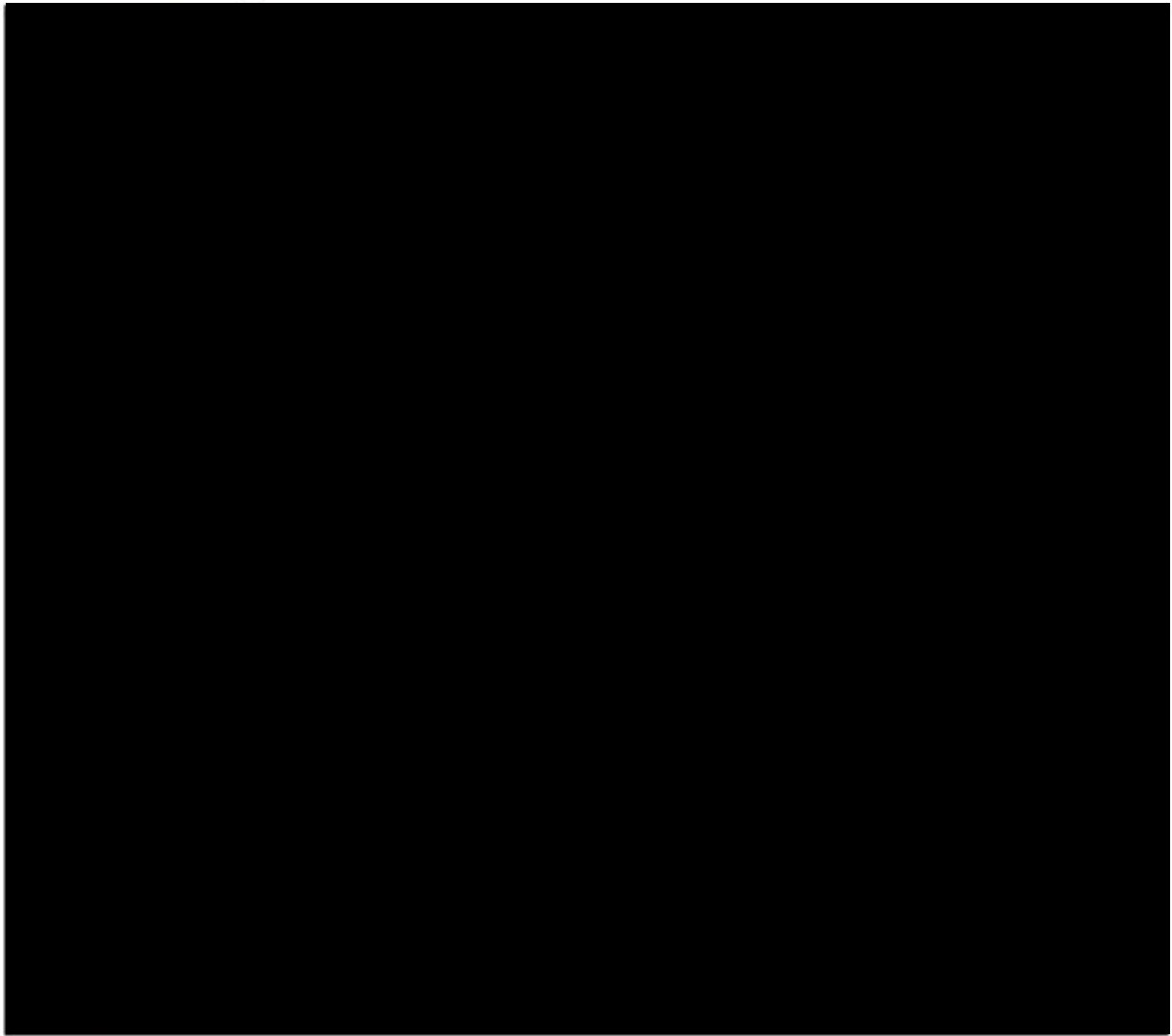
- iv furniture, fixtures and equipment for the TfNSW Office Complex and the Independent Certifier Office Complex, as detailed in sections 2.2.4 and 2.2.5 to this Appendix;
 - v ICT infrastructure in the TfNSW Office Complex and the Independent Certifier Office Complex as identified in section 2.2.4 to this Appendix;
 - vi all Utility Services necessary for operation of the Site Administration Complex; and
 - vii signage "TfNSW Site Office" displayed on the outside of the main exterior door.
- (b) The Satellite Offices must:
- i include an office complex for the sole use of the TfNSW Representative, TfNSW's personnel and TfNSW's technical advisers;
 - ii include an office complex for the sole use of the Independent Certifier and the Independent Certifier's personnel, which must be separate, but adjacent to the TfNSW Office;
 - iii include an all weather car parking area with a minimum capacity of 6 cars. The car parking area must:
 - A. be lit; and
 - B. include covered walkways to the main and rear entrance doors to the TfNSW Office and the Independent Certifier Office;
 - iv include furniture, fixtures and equipment as detailed in sections 2.2.4 and 2.2.5 in this Appendix;
 - v include ICT infrastructure as identified in section 2.2.3 in this Appendix; and
 - vi include all Utility Services necessary for operation of the Satellite Offices.
- (c) The TfNSW Site Administration Complex and Satellite Offices must:
- i be maintained in a serviceable condition and provide a suitable professional office environment for the TfNSW Representative, TfNSW's personnel, TfNSW's technical advisers, the Independent Certifier and the Independent Certifier's personnel;
 - ii comply with all relevant building codes and safety requirements;
 - iii be connected to power, communications, water and sewer Utility Services; and
 - iv be insulated to provide noise and temperature levels inside the complexes that are suitable and appropriate for an office working environment at the Construction Site.

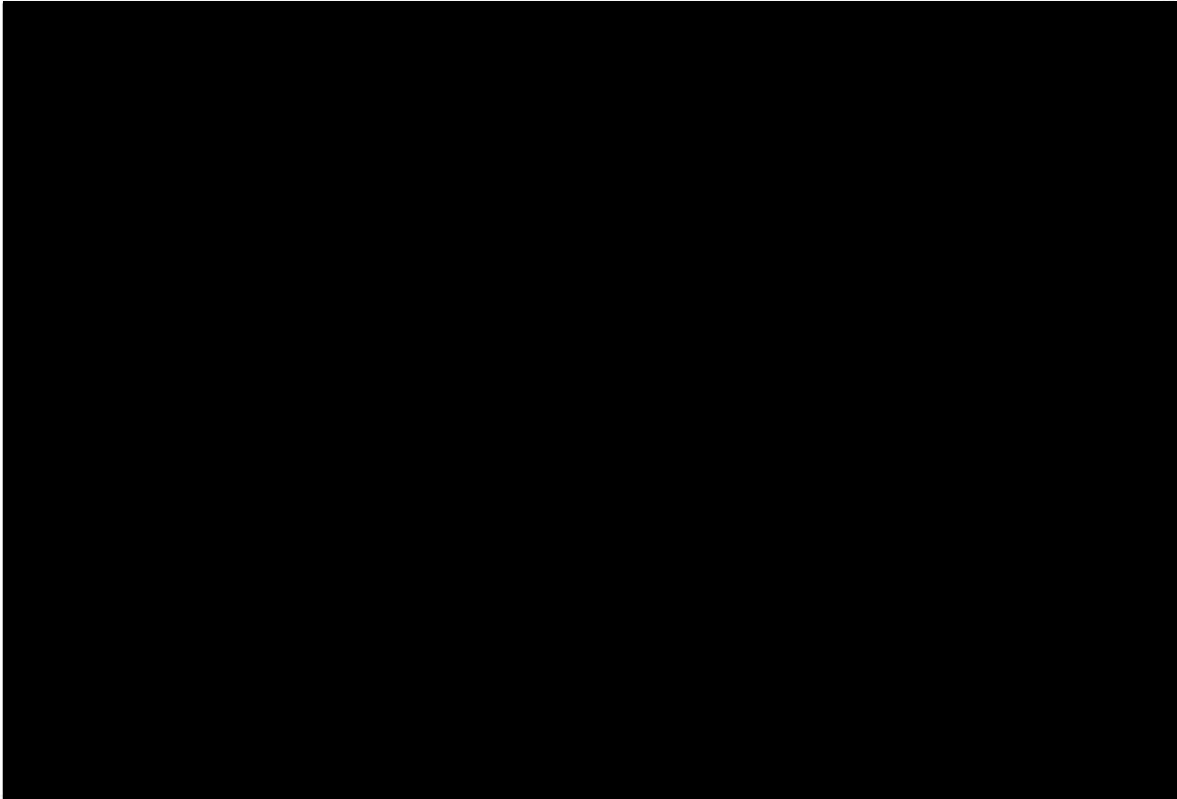
2.2.2. Toilet and washroom facilities

- (a) The Site Administration Complex must include:
- i a separate male and female toilet and washroom facilities, which must:
 - A. be conveniently located for use by the TfNSW's Representative, the TfNSW's personnel the TfNSW's technical advisers, the Independent Certifier and the Independent Certifier's personnel; and

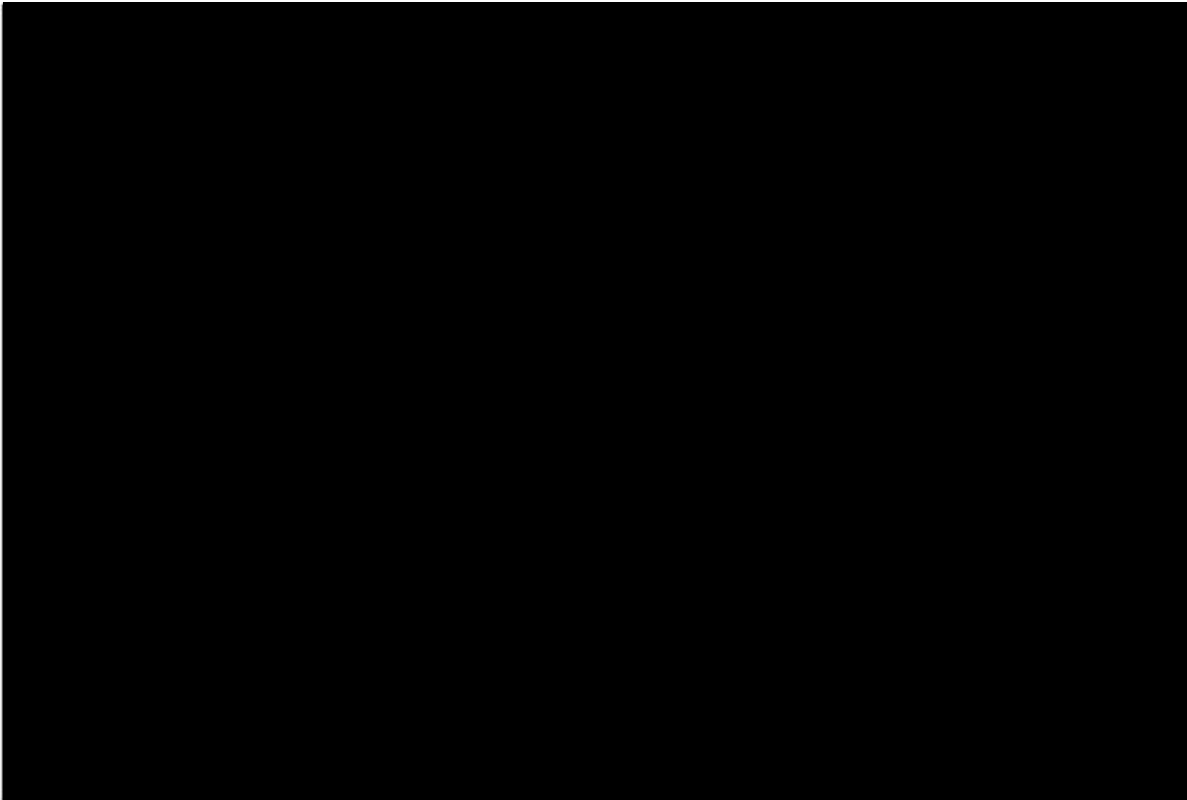
- B. have a minimum of three male cubicles, four urinals, two female cubicles and one unisex disabled access cubicle.
- (b) The washroom facilities must include:
 - i a suitable number of hand basins;
 - ii separate shower facilities, two male and one female; and
 - iii eight full height clothes lockers (six for the men's facilities and two for the women's facilities).
- (c) The showers and hand basins must be serviced with hot and cold water.
- (d) The Satellite Offices will utilise OpCo's toilets and washroom facilities at the area or zone sites.
- (e) Where office accommodation is provided by OpCo in a suitable existing building, these facilities may be considered on a shared use basis with other inhabitants of the building.

2.2.3. Security





2.2.4. Information technology and communications



- (b) The TfNSW Office Complex must include provision for an exclusive TfNSW internet network and associated infrastructure, which includes network rack space, network patching provisioning, main distribution frame access for network providers, access for ongoing support of the network, and network connectivity access into the TfNSW Office Complex.
- (c) Access to the site (at times agreed with OpCo) for TfNSW staff, or its contracted entities, is to be provided to support this network.
- (d) The Independent Certifier Office Complex must include a dedicated secure network environment with 10 Mb internet bandwidth, for the purpose of connecting the Independent Certifier and the Independent Certifier's personnel to the Independent Certifier's general computer network and the environmental control system.
- (e) The Independent Certifier Office Complex internet connection must be capable of being scaled up if required.
- (f) Where office accommodation is provided by OpCo in a suitable existing building, these services may be part of a shared telecommunications connection to the building. In this event, equivalent capacity and security must be provided.

2.2.5. TfNSW Office Complex requirements

- (a) As a minimum, the TfNSW Office Complex within the Site Administration Complex must include:
 - i one general meeting room. The general meeting room must:
 - A. have a minimum floor area of 25m²;
 - B. be equipped with a meeting table and chairs to seat 8 people and one whiteboard; and
 - C. include a conference call telephone;
 - ii an open plan work area. The work area must include:
 - A. eight workstations (hot desks), each containing:
 - i. an office chair;
 - ii. a desk area of at least 3m²;
 - iii. partitions incorporating ducted cable and outlet panels with dimensions for the main spine of 1500mm and returns of 1280mm high;
 - iv. one lockable mobile pedestal including two stationery drawers and one filing drawer with pen and pencil tray insert; and
 - v. one book shelf; and
 - B. five visitors' chairs;
 - iii a central filing system. The central filing system must be comprised of:
 - A. ten, three-drawer filing cabinets (or equivalent system); and
 - B. two drawing racks including drawing hanger sets;

- iv a library or plan room. The library or plan room must:
 - A. be lockable;
 - B. include:
 - i. one desk with one office chair;
 - ii. a minimum of 4m of full height lockable storage with adjustable shelving;
 - iii. two drawing racks including drawing hanger sets; and
 - iv. two adjacent plan tables with a minimum area of 2m² per table including underneath open shelving and storage area;
- v a kitchen or lunch room. The kitchen or lunch room must be equipped with:
 - A. one refrigerator and freezer of minimum capacity of 400L;
 - B. hot and cold running water;
 - C. dishwasher;
 - D. microwave;
 - E. hot water boiler (Zippo Style);
 - F. instant cold, filtered water system;
 - G. cupboards; and
 - H. staff table with 18 chairs and work surfaces;
- vi a stationery and utility area. The stationery and utility area must:
 - A. have a minimum floor area of 15m²;
 - B. include:
 - i. a minimum of six lineal metres of dual level lockable storage and bench top or work area;
 - ii. space, power and data outlets for a plotter and two photocopiers and fax machines;
 - iii. space and a power outlet for a shredder; and
 - iv. 6 power outlets for other general office equipment located at the bench top or work area;
- vii a rear entrance door and area. The rear entrance area must include facilities for hanging protective and wet weather clothing for eight people;
- viii security grills and mini venetian blinds to all windows;
- ix reverse cycle air conditioning to service the entire interior of the TfNSW office complex, except for the toilet and washroom facilities. The air conditioning must be suitable to handle the peak loads for the minimum and maximum temperatures that occur at the Construction Site;
- x a communications or server room. The communications or server room must have a minimum floor area of 10m² and have a separate air conditioning zone for temperature and humidity control for the room;
- xi a central PABX/voicemail system connected to an ISDN service capable of supporting a minimum of 25 extensions and two fax lines. Each meeting room, office, hot desk and workstation must include a telephone outlet point and a

- separate data outlet point. The stationery and utility area must include three data outlet points;
- xii general purpose power outlets throughout the office complex, including a minimum of four double power points within:
 - A. the main meeting room/display room;
 - B. the library/plan room;
 - C. the kitchen/lunch room; and
 - D. the communications/server room;
 - xiii a minimum of two double power points to:
 - A. each workstation;
 - B. each general meeting room; and
 - xiv a minimum of six double power points to the stationery and utility area;
 - xv a paved courtyard area. The paved courtyard area must include outdoor tables and seating for twenty people and cover providing shade over the outdoor tables and seating;
 - xvi full height fixed wall partitions and doors must be provided to the offices, the main meeting room or display room, the general meeting rooms, the library or plan room, the kitchen or lunch room and the communications or server room; and
 - xvii a minimum of one double window must be provided to each room, office, open plan work areas, the reception area and stationery and utility area within the TfNSW Office Complex.

2.2.6. Independent Certifier Office Complex requirements

- (a) As a minimum, the Independent Certifier Office Complex within the Site Administration Complex, must include:
 - i two general meeting rooms. Each meeting room must:
 - ii have a minimum floor area of 25m²; and
 - iii be equipped with a meeting table with chairs to seat ten people and one whiteboard;
 - iv an open plan work area. The open plan work area must include:
 - A. ten workstations, each containing:
 - i. an office chair;
 - ii. a desk area of at least 4m² and must include:
 - iii. partitions incorporating ducted cable and outlet panels with dimensions for the main spine of 1500mm and returns of 1280mm high;
 - iv. one lockable mobile pedestal including two stationery drawers and one filing drawer with pen and pencil tray insert;
 - v. one book shelf;
 - B. five visitors' chairs; and
 - C. two hot desks with office chairs;

- v a reception area. The reception area must:
 - A. include a reception counter and desk; and
 - B. be situated so that all visitors and Independent Certifier's personnel must pass the reception counter before entering the main office facilities;
- vi a central filing system. The central filing system must comprise of:
 - A. ten three-drawer filing cabinets (or equivalent system); and
 - B. two drawing racks including drawing hanger sets;
- vii a library or plan room. The library or plan room must:
 - A. be lockable;
 - B. include:
 - i. one desk and office chair;
 - ii. a minimum of 4m of full height lockable storage with adjustable shelving;
 - iii. two drawing racks including drawing hanger sets;
 - iv. two adjacent plan tables with a minimum area of 2m² per table including underneath open shelving and storage area;
- viii a kitchen or lunch room. The kitchen or lunch room must be equipped with:
 - A. one refrigerator and freezer of minimum capacity of 400L;
 - B. hot and cold running water;
 - C. dishwasher;
 - D. microwave;
 - E. Hot water boiler (Zippo style);
 - F. instant cold, filtered water system;
 - G. cupboards; and
 - H. staff tables with twelve chairs and work surfaces;
- ix a stationery and utility area. The stationery and utility area must:
 - A. have a minimum floor area of 20m²;
 - B. include a minimum of six lineal metres of dual level lockable storage and bench top or work area;
 - C. include space, power and data outlets for a plotter and two photocopiers and fax machines;
 - D. provide space and a power outlet for a shredder; and
 - E. provide six power outlets for other general office equipment located at the bench top or work area;
- x a rear entrance door area. The rear entrance area must include facilities for hanging protective and/or wet weather clothing and be for ten people, with direct access to the clothes lockers in the toilet and washroom facilities;
- xi carpet to the whole of the interior of the Independent Certifier Office complex, except for the toilet and washroom facilities, the rear entrance area and the kitchen or lunch room, which must be curable vinyl flooring;

- xii security grills and mini venetian blinds to all windows;
- xiii reverse-cycle air-conditioning to the whole of the office complex, except for the toilet and washroom facilities. The air conditioning must be suitable to handle the peak loads for the minimum and maximum temperatures that occur at the Construction Site;
- xiv a communications or server room. The communications or server room must have a minimum floor area of 10m² and have a separate air conditioning zone for temperature and humidity control for the room;
- xv a central PABX/voicemail system connected to an ISDN service capable of supporting a minimum of 20 extensions and two fax lines. Each meeting room, office, hot desk and workstation must include a telephone outlet point and a separate data outlet point. The stationery and utility area must include three data outlet points; and
- xvi general purpose power outlets throughout the office complex, including:
 - A. a minimum of four double power points within:
 - i. each office;
 - ii. the library or plan room;
 - iii. the kitchen or lunch room; and
 - iv. the secure communications or server room;
 - B. a minimum of two double power points to:
 - i. each workstation;
 - ii. each meeting room;
 - C. a minimum of six double power points to the stationery and utility area;
- xvii full height fixed wall partitions and doors must be provided to the offices, the general meeting rooms, the library or plan room, the kitchen or lunch room and the communications or server room; and
- xviii a minimum of 1 double window must be provided to each room, office, open plan work areas, the reception area and stationery and utility area within the Independent Certifier Office Complex.

2.2.7. Satellite Office Requirements

- (b) As a minimum the Satellite Offices for TfNSW and the Independent Certifier must include:
 - i four hot desks with office chairs (each desk to include 4 power outlets);
 - ii four lockable three-drawer filing cabinets (or equivalent);
 - iii two drawing racks including drawing hanger sets;
 - iv a kitchenette including one refrigerator;
 - v hot and cold running water;
 - vi dishwasher;
 - vii microwave;
 - viii hot water boiler (Zippo style);
 - ix instant cold, filtered water system;

- x cupboards;
- xi power outlets;
- xii space, power and data outlets for photocopier;
- xiii telephone; and
- xiv Wi-Fi Connection to internet.

2.2.8. Utility Services, security, cleaning and maintenance

- (a) OpCo must:
 - i clean and remove all rubbish from the Site Administration Complex and the Satellite Offices on a daily basis;
 - ii provide all bathroom consumables for the Site Administration Complex and the Satellite Offices;
 - iii undertake maintenance and rectification and repair of defects in the Site Administration Complex and the Satellite Offices within two days of OpCo becoming aware of or being advised by the TfNSW's Representative of the maintenance work or defect; and
 - iv maintain and clean the parking areas, including clearing and weeding of vegetated areas.
- (b) The Site Administration Complex and the Satellite Offices must be provided with all Utility Services, including power, water, sewer, telephone, internet, data, electronic security system and site security patrol including responses to alarm events and security related issues and be fully serviced and maintained by OpCo.
- (c) OpCo must pay for the provision of all services, servicing and maintenance, including all connection, service, hire and other utility, maintenance and service costs, except for the cost of telephone calls and data transmission services.

2.2.9. Removal of site facilities

- (a) OpCo must provide TfNSW's Representative with a minimum of two weeks notification, in writing, of the planned date for disassembling and removal of the site facilities.
- (b) As part of the disassembling and removal of the site facilities, OpCo must disconnect all services and rehabilitate and reinstate the areas occupied by the facilities to a condition at least equivalent to that existing prior to the establishment of the site facilities.

3. Off site facilities

- (a) OpCo must provide facilities for TfNSW and Independent Certifier representatives at OpCo's manufacturing and production sites (including OpCo's Contractors' sites) as required during inspections, Testing and other site visits, including:
- i two desks with chairs;
 - ii power for computers and similar equipment;
 - iii access to a landline telephone; and
 - iv access to printing facilities.



**Transport
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Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 5 – Not Used

Document Number: 3126369_10
Execution Version



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 6 – Permanent Light Rail Corridor

Document Number: 3124942_13
Execution Version

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1. Permanent Light Rail Corridor

1.1. Introduction

- (a) This Appendix identifies the Permanent Light Rail Corridor (PLRC), which will consist of the CSELR Permanent Light Rail Corridor and the IWLR Permanent Light Rail Corridor.

1.2. CSELR Permanent Light Rail Corridor

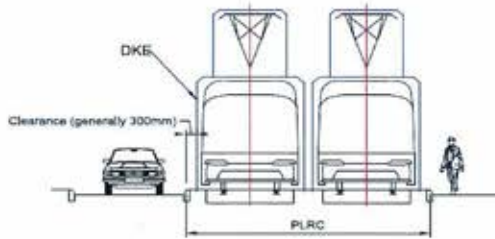
- (a) The CSELR PLRC will be set out in OpCo's Design Documentation and is to be generally in accordance with the following principles:
- i. within the road reserve: Dynamic Kinematic Envelope (DKE) + specified clearance (nominally 300mm) on each side;
 - ii. intersections: DKE + 300mm on each side;
 - iii. outside of the road reserve: fence to fence or building to building (as applicable);
 - iv. within Moore Park Tunnel: external face of structure + 300mm on all sides;
 - v. Eastern Distributor Bridge: external face of structure;
 - vi. at Stops: to include the Stop, steps, ramps and paving;
 - vii. at Light Rail Maintenance and Stabling Facilities: fence boundary;
 - viii. depth: the deeper of 1.2m below rail, the underside of the Light Rail utility conduits or as required by Third Party Agreements; and
 - ix. height: 7m or the underside of any over bridge.
- (b) These principles are demonstrated in the diagrams contained in Attachment 1 to this Appendix.
- (c) Within the road reserve the PLRC must be designated by way of visible markers as contemplated by S155A of the Road Rules 2008 (NSW).

1.3. IWLR Permanent Light Rail Corridor

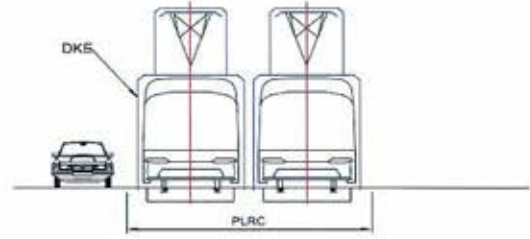
- (a) The IWLR PLRC is described in Attachment 2 to this Appendix.

ATTACHMENT 1

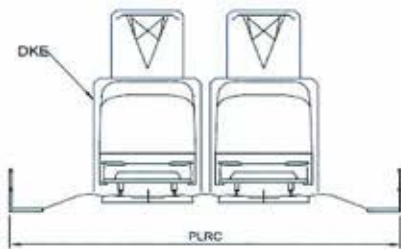
This Attachment 1 illustrates the Permanent Light Rail Corridor principles for various circumstances envisaged on the alignment.



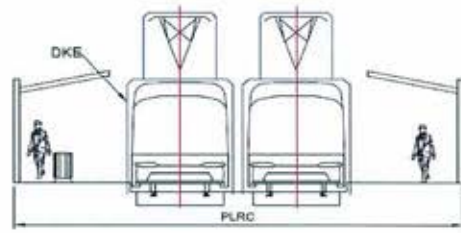
Light Rail segregated corridor in a road
 The edge of the PLRC is at the nearest edge of the carriageway or footway



Light Rail across a road intersection
 The edge of the PLRC is at the DKE + 300mm



Light Rail in former railway or other segregated corridor
 The PLRC extends between the boundary fences



Light Rail at Stops
 The PLRC encompasses the platforms and everything on them

ATTACHMENT 2

This Attachment 2 contains:

- (i) a listing in Table 1 of drawings and easement-related documents describing the IWLR PLRC; and
- (ii) unregistered plans referred to in Table 1 (under the titles 'Unregistered Plan A', 'Unregistered Plan B', 'Unregistered Plan C' and 'Unregistered Plan D').

Table 1 IWLR Permanent Light Rail Corridor

Section of route		Title and other references	
Central to Wattle Street, Ultimo			
Land	Lot(s)	Deposited Plan	
Darling Harbour	33, 34, 35 , 36	DP870306	
Gateway Site	4	DP868728	
Edward Street	2, 5	DP868787	
Casino Development	211	DP870336	
Jones Bay Road Tunnel	12	DP867852	
Site N and M	2	DP870305	
Harris Street	10	DP868832	
John Street	55, 58	DP868356	
John Street Tunnel	93, 95, 96	DP868828	
Saunders Street	94	DP858635	
Miller Street City West Lots	1012	DP870307	
Gipps Street Bridge	14, 15, 16	DP870308	
Miller Street Bridge	22	DP868830	
Wattle Street	1, 2	DP868833	
Wattle Street Overpass	9	DP870309	
Easements			
Easement for road operation		Memorandum 3096268 and shown on DP868663	
Easement for catenary attachment		Memorandum 3096267 and shown on	

Section of route	Title and other references
	DP868663
Easement for catenary attachment	Transfer 3291493 and shown on DP868663
Easement for road operation	Transfer 3291494 and shown on DP868663
Colonnade easement	Transfer 3291490 and shown on DP267881, DP868831, DP868834, DP868829 and DP267889
Easement for catenary attachment	Memorandum 3161674 and shown on DP868830
Various easements - DP870306	Easements burdening and benefiting Lots 33, 34, 35 and 36 in DP870306 – Section 88B Instrument 870306
Easement for access	Dealing T738285
Proposed easement for stormwater	DP1031734 and any associated instrument
Various easements - DP773353 and DP836419	Easements benefiting Lots 35 and 36 in DP870306 – Section 88B Instruments DP773353 and DP836419
Right of way	Dealing Z743915
Easement for access	Easement burdening Lot 35 in DP870306 – Section 88B Instrument DP265257
Easements for access and services	Easements burdening and benefiting Lot 36 in DP870306 and Lot 4 in DP868728 – Section 88B Instrument DP868787
Various easements - DP868728	Easements burdening and benefiting Lot 4 in DP868728 – Section 88B Instrument 868728
Various easements - DP1001757	Easements burdening and benefiting Lot 4 in DP 868728 – Section 88B Instrument DP1001757
Easement for maintenance of floating track slab	Easement burdening Lot 2 in DP868787 and Lot 12 in DP867852 – Section 88B Instrument DP870336
Easement for access and services	Easement burdening Lot 5 in DP868787 – Section 88B Instrument DP868787
Easements for access and services and positive covenant	Easements and positive covenant burdening Lot 211 in DP870336 – Section 88B Instrument DP867855

Section of route	Title and other references
Various easements - DP870336	Easements burdening and benefiting Lot 211 in DP870336 – Section 88B Instrument DP870336
Various easements - DP867852	Easements and restriction on use burdening and benefiting Lot 12 in DP867852 – Section 88B Instrument DP867852
Easement for support	Dealing Y349861
Various easements and restriction on use – DP868355	Easements and restriction on use burdening Lot 2 in DP870305 – Section 88B Instrument DP868355
Various easements – DP870305	Easements burdening Lot 2 in DP870305 – Section 88B Instrument DP870305
Various easements – DP868356	Easements burdening and benefiting Lots 55 and 58 in DP868356 – Section 88B Instrument DP868356
Various easements – DP1000215	Easements benefiting Lots 55 and 58 in DP868356 – Section 88B Instrument DP1000215
Various easements – DP1000217	Easements benefiting Lots 55 and 58 in DP 868356 – Section 88B Instrument DP1000217
Easement for access	Easement burdening Lot 94 in DP858635 – Transfer 2147820
Various easements – DP870307	Easements burdening and benefiting Lot 1012 in DP870307 – Section 88B Instrument DP870307
Various easements and restriction on use – DP267912	Easements benefiting and restriction on use Lot 1012 in DP870307 – Section 88B Instrument DP267912
Various easements – DP870308	Easements benefiting and burdening Lots 14, 15 and 16 in DP870308 – Section 88B Instrument DP870308
Various easements and restriction on use – DP870309	Easements benefiting and burdening and restriction on use Lot 1 in DP868833 and Lot 9 in DP870309 – Section 88B Instrument DP870309

Section of route	Title and other references
Wattle Street, Ultimo to Catherine Street, Lilyfield	
Land	
Corridor	<ul style="list-style-type: none"> Lot 2 in "Unregistered Plan A" attached. Lot 50 in "Unregistered Plan B" attached. Lot 30 in "Unregistered Plan C" attached. Lot 40 in "Unregistered Plan D" attached.
Other land	<ul style="list-style-type: none"> Lot 1 in "Unregistered Plan A" attached. Lot 51 in "Unregistered Plan B" attached. Lot 31 in "Unregistered Plan C" attached. Lot 41 "Unregistered Plan D" attached. Any additional areas of land identified in the plans labelled "Additional Land Plan" attached.
Unregistered licence	Granted in favour of Leichhardt Municipal Council as licensee in respect of part Lot 30 in DP1055559 – Government Gazette 2/11/2001, Folio 9041
Unregistered contract	Granted in favour of Australian Posters in respect of part Lot 30 in DP1055559 – Government Gazette dated 2/11/2001, Folio 9041
Easements	
Easement for support	Benefits part Lots 3 and 5 in Deposited Plan 1001928
Easement granting right to use lift shaft	Benefits part Lots 3 and 5 in Deposited Plan 1001928.
Easement for attachment	Benefits part Lots 8 and 9 in Deposited Plan 1033151.
Easement to drain water	Benefits part Lots 8 and 9 in Deposited Plan 1033151.
Easement for support	Benefits part Lots 8 and 9 in Deposited Plan 1033151.
Easement for attachment	Benefits part Lots 1 and 4 in Deposited Plan 1033147 and Lot 30 in Deposited Plan 1055559.
Easement to drain water	Benefits part Lots 1 and 4 in Deposited Plan 1033147 and Lot 30 in Deposited Plan 1055559.
Easement for	Benefits part Lots 1 and 4 in Deposited Plan 1033147 and Lot 30 in

Section of route	Title and other references
support	Deposited Plan 1055559.
Easement for attachment	Benefits part Lot 12 in Deposited Plan 1033149.
Easement to drain water	Benefits part Lot 12 in Deposited Plan 1033149.
Easement for support	Benefits part Lot 12 in Deposited Plan 1033149.
Easement for right of accessway	Easement benefits Lot 1 in DP868833 – Section 88B Instrument 870309
Easements for noise, vibration and electrolysis	Easement benefits Lot 8 in DP 1033151 – AA317039
Various easements	Easements benefiting and burdening Lot 30 in DP1055559 – AC461626

Lilyfield to Dulwich Hill

Land	Lot(s)	Section	Deposited Plan
	1	3	DP356
	2	3	DP356
	3	3	DP356
	8	3	DP356
	9	3	DP356
	10	3	DP356
	11	3	DP356
	12	3	DP356
	17	4	DP356
	5	5	DP813
	6	5	DP813
	6	1	DP1162
	7	1	DP1162
	14	3	DP1162
	15	3	DP1162
	64	3	DP1162
	65	3	DP1162
	66	3	DP1162
	20	4	DP1401
	1	2	DP1576
	2	2	DP1576
	3	2	DP1576

Land	Lot(s)	Section	Deposited Plan
	4	2	DP1576
	5	2	DP1576
	6	2	DP1576
	14A	2	DP1576
	15A	2	DP1576
	16A	2	DP1576
	17A	2	DP1576
	18A	2	DP1576
	19A	2	DP1576
	20A	2	DP1576
	45	13	DP2279
	46	13	DP2279
	76	12	DP2279
	18		DP2336
	19		DP2336
	20		DP2336
	28		DP2336
	29		DP2336
	25	3	DP2626
	95	2	DP2626
	96	2	DP2626
	97	2	DP2626
	15		DP3841
	16		DP3841
	17		DP3841
	18		DP3841
	1		DP4452
	19		DP4452
	1		DP58521
	1		DP110346
	6		DP114919
	1		DP119106
	3		DP184476
	4		DP184476
	1		DP219741
	1		DP221451
	2		DP221451
	1		DP224939
	2		DP224939
	1		DP230474
	2		DP230474
	3		DP230474

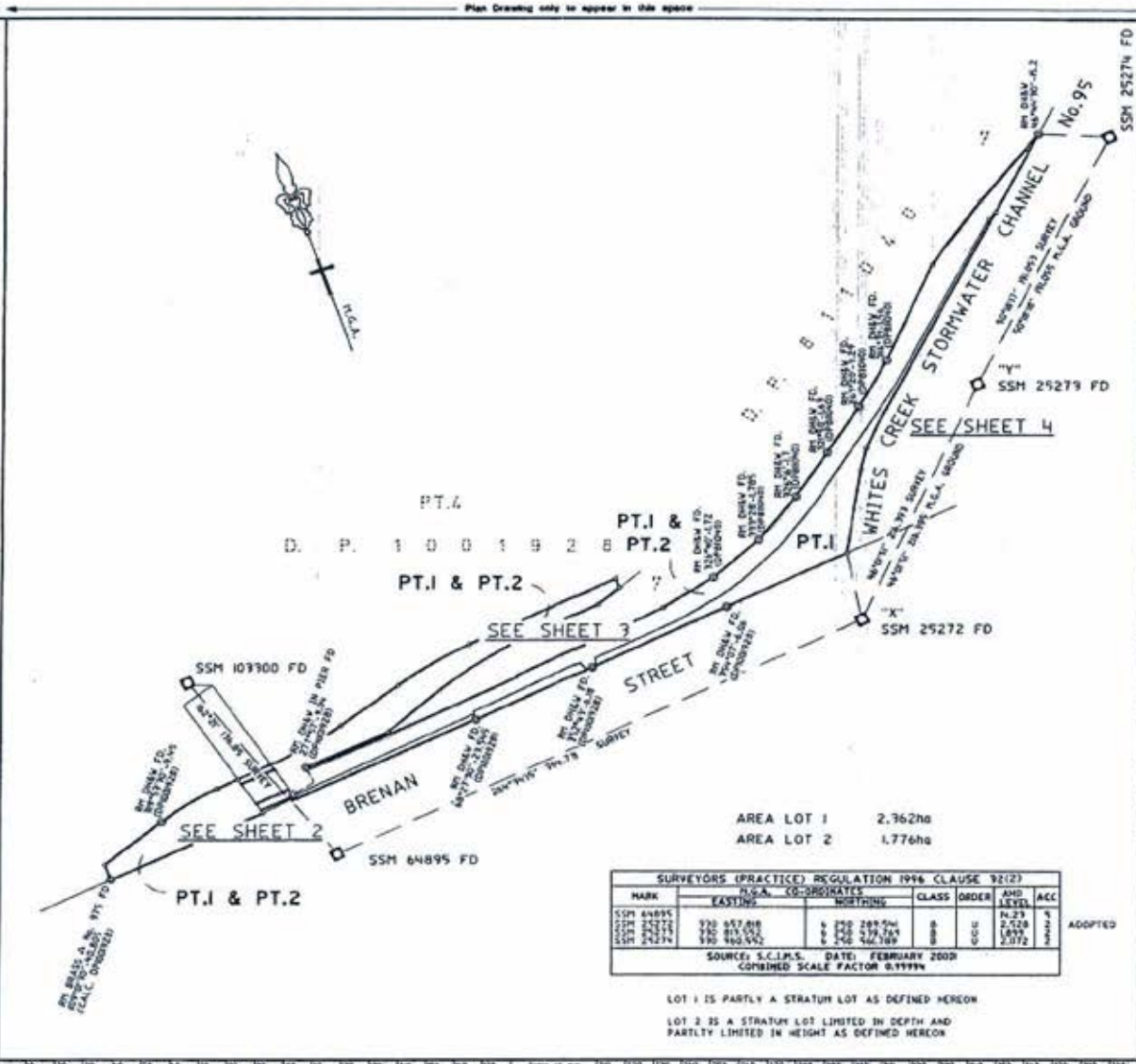
Land	Lot(s)	Section	Deposited Plan
	1		DP435233
	1		DP455529
	1		DP455641
	21		DP455754
	22		DP455754
	23		DP455754
	24		DP455754
	3		DP455764
	4		DP455764
	1		DP505808
	1		DP506338
	1		DP506339
	1		DP506341
	1		DP506342
	1		DP506480
	1		DP508429
	1		DP508430
	1		DP509240
	2		DP509240
	3		DP509240
	1		DP509242
	1		DP520931
	2		DP520931
	1		DP552754
	4		DP588876
	16		DP662897
	38		DP665160
	3		DP666475
	18		DP666555
	20		DP666556
	25		DP666557
	7		DP667150
	38		DP667879
	24		DP668202
	2		DP790040
	1		DP791838
	17		DP791838
	2		DP804112
	1		DP804811
	10		DP811040
	1		DP814226
	1		DP814867

Land	Lot(s)	Section	Deposited Plan
	1		DP826960
	1		DP829225
	2		DP829225
	3		DP829225
	1		DP940924
	2		DP946225
	2		DP949658
	1		DP949672
	1		DP952379
	2		DP956400
	A		DP966496
	1		DP970874
	77		DP970944
	1		DP972855
	B		DP973687
	1		DP1001928
	2		DP1001928
	4		DP1001928
	5		DP1001928
	6		DP1001928
	Part 1		DP1003675
	11		DP1014318
	1		DP1032024
	1		DP1032806
	673		DP1039466
	Part 1		DP1065311
	1		DP1090936
	1		DP1093960
	1		DP1096040
	1		DP1115700
	2		DP1116111
	1		DP1116116
	1		DP1119383
	2		DP1119383
	3		DP1119383
	4		DP1119383
	5		DP1119383
	6		DP1119383
	7		DP1119383
	8		DP1119383
	9		DP1119383
	10		DP1119383

Land	Lot(s)	Section	Deposited Plan
	11		DP1119383
	12		DP1119383
	13		DP1119383
	14		DP1119383
	15		DP1119383
	16		DP1119383
	1		DP1120867
	2		DP1120867
	1		DP1123965
	1		DP1125639
	2		DP1125639
	1		DP1126069
	1		DP1156281
	2		DP1156281
	1		DP1172726
	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14		DP1184308
	7, 8, 9, 10		DP1014318
	24,13,14,15	4	DP1162
	18, 19, 72,73	5	DP1162
	33,34,35,36,37	7	DP1162
	36		DP1133250
	37,38,39,40	9	DP2279
	1		DP1187117
	1		DP1186785
	21		DP1186791
	3, 4		DP1186809
	1		DP1187171
	1		DP1185474
	1		DP1187084
	4,5		DP1184103
	11,12		DP1186975
	Z2		CP4389SY

PLAN FORM 2

SIGNATURES AND SEALS ONLY.



Green Land Office Approval

PLAN APPROVED: Authorised Officer

Local District: PARRAMATTA
Field Book: 2004

SUBDIVISION CERTIFICATE

I hereby certify that the production of a NSW of the Environmental Planning and Assessment Act 1979 has been satisfied in relation to the proposed:

1. Create "Subdivision" or "New road" All not needed

* Authorised Person/General Manager/Accountant/Clerk

Consent Authority:

Date of Endorsement:

Authorised Officer:

Subdivision Certificate No.:

File No.:

Notes:

What the plan is to be lodged electronically in the Land State Office, it should include a signature in an electronic or digital format approved by the Registrar-General.

* Date withdrawn is blank area

SURVEYORS (PRACTICE) REGULATION 1996 CLAUSE 92(2)

MARK	EASTING		NORTHING		CLASS	ORDER	AND LEVEL	ACC
	1	2	1	2				
SSM 64895	720 457.06	720 457.06	720 289.24	720 289.24	IMP	CGC	N.23	2.728
SSM 25272	720 813.528	720 813.528	720 432.74	720 432.74	IMP	CGC	N.23	1.875
SSM 25274	720 462.542	720 462.542	720 442.789	720 442.789	IMP	CGC	N.23	1.072

SOURCE: S.C.I.P.S. DATE: FEBRUARY 2000
CONTAINED SCALE FACTOR 0.99994

ADOPTED

Registered:

C.A.:

Title System:

Purpose: LEASE

Ref. Map:

Lost Plan:

PLAN OF SUBDIVISION OF LOTS 3 & 5 D.P.1001928.

Lengths are in metres. Reducible Ratio 1:2000

L.G.A. LEIGHHARDT
Locality ROZELLE
Parish PETERSHAM
County CUMBERLAND

This is sheet 1 of my plan in 4 sheets (Range of Instruments)

Surveyors (Practice) Regulation 1996

4. ROBERT LACHLAN ANDREW
SCOTTED SIGN AND PARTIALS
17/09-23 BRIDGE STREET PARRAMATTA

I, a surveyor registered under the Surveyors Act 1992, hereby certify that the survey represented by this plan is accurate. All measurements were taken in accordance with the Surveyors (Practice) Regulation 1996 and are completed on 04/02/00.

No survey marks on: SITE 1 & 2.

Drawn by: [Signature]

Checked by: [Signature]

Done: [Signature]

Done: [Signature]

Plan used in preparation of survey/compilation D.P.1001928, D.P.61010

PLANED FOR USE ONLY for statements of intention to dedicate public roads or to create public reserves, drainage reserves, easements, restrictions on the use of land or positive covenants.

PURSUANT TO SEC 88B OF THE CONVEYANCING ACT 1919 IT IS INTENDED TO CREATE:-

- EASEMENT FOR SUPPORT.
- RIGHT TO USE LIFT SHAFT.

SURVEYOR'S REFERENCE: 280510PA /3 CHECKLIST

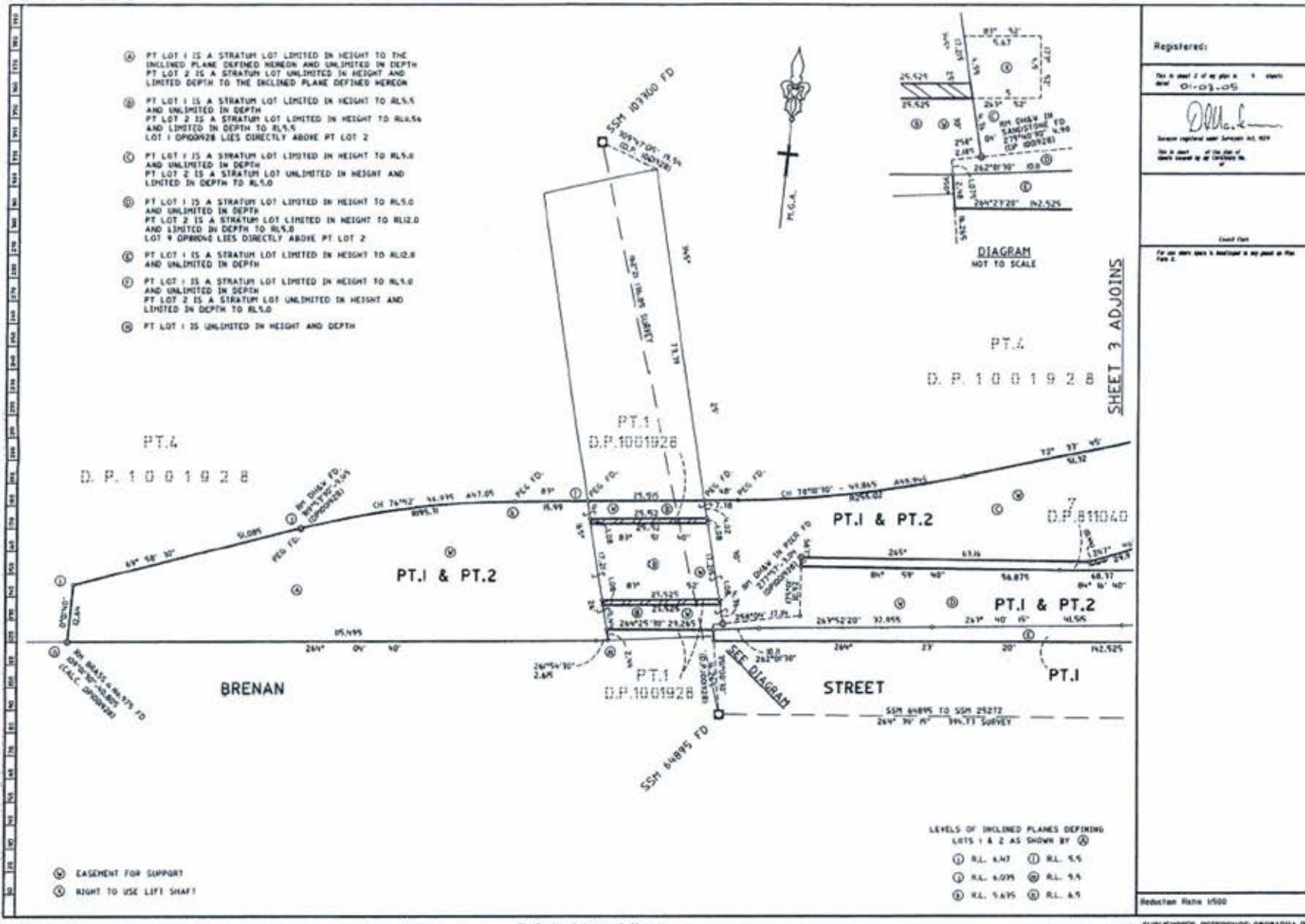
WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

ISSUE A

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

OFFICE USE ONLY

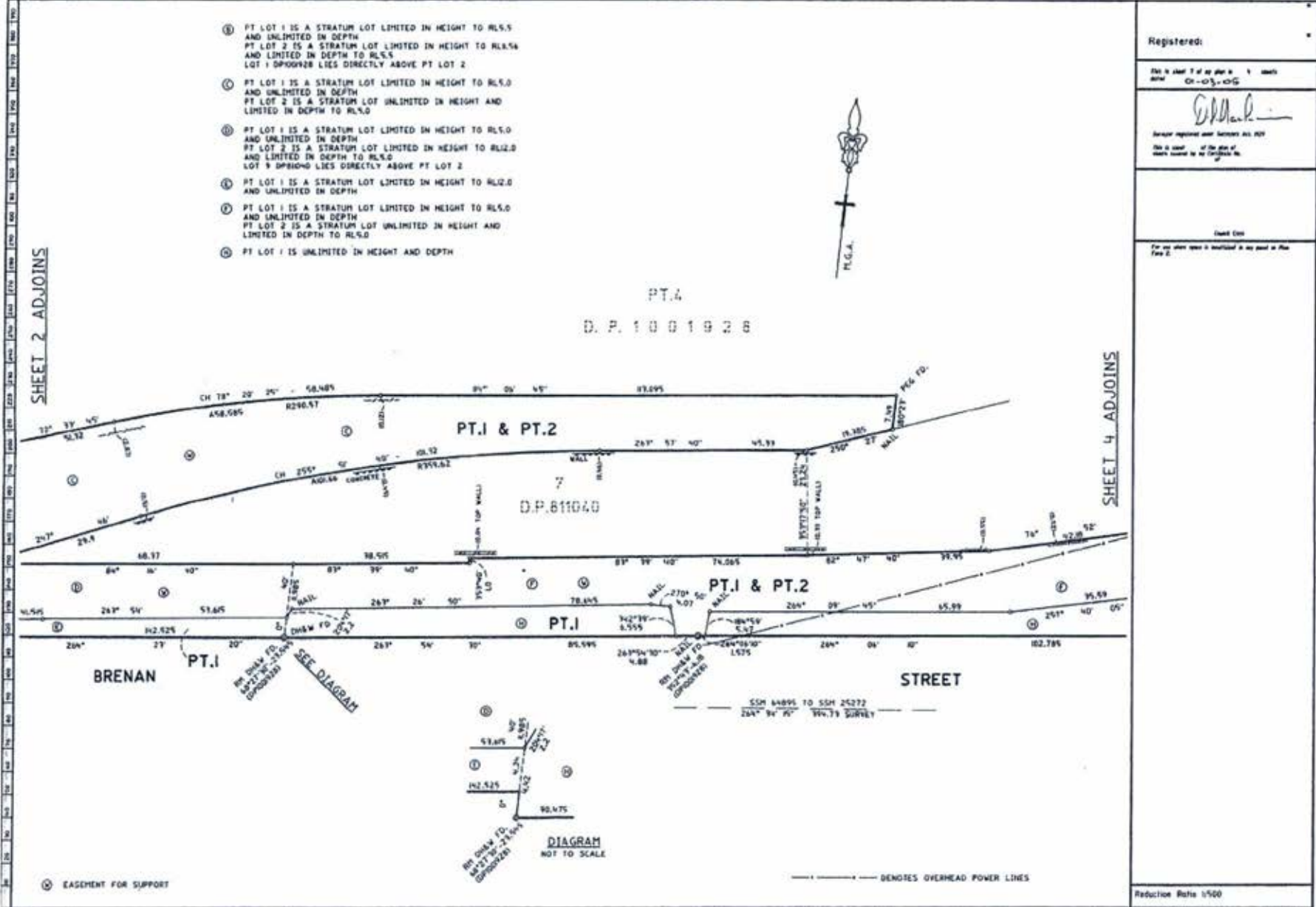


Unregistered Plan A

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

OFFICE USE ONLY

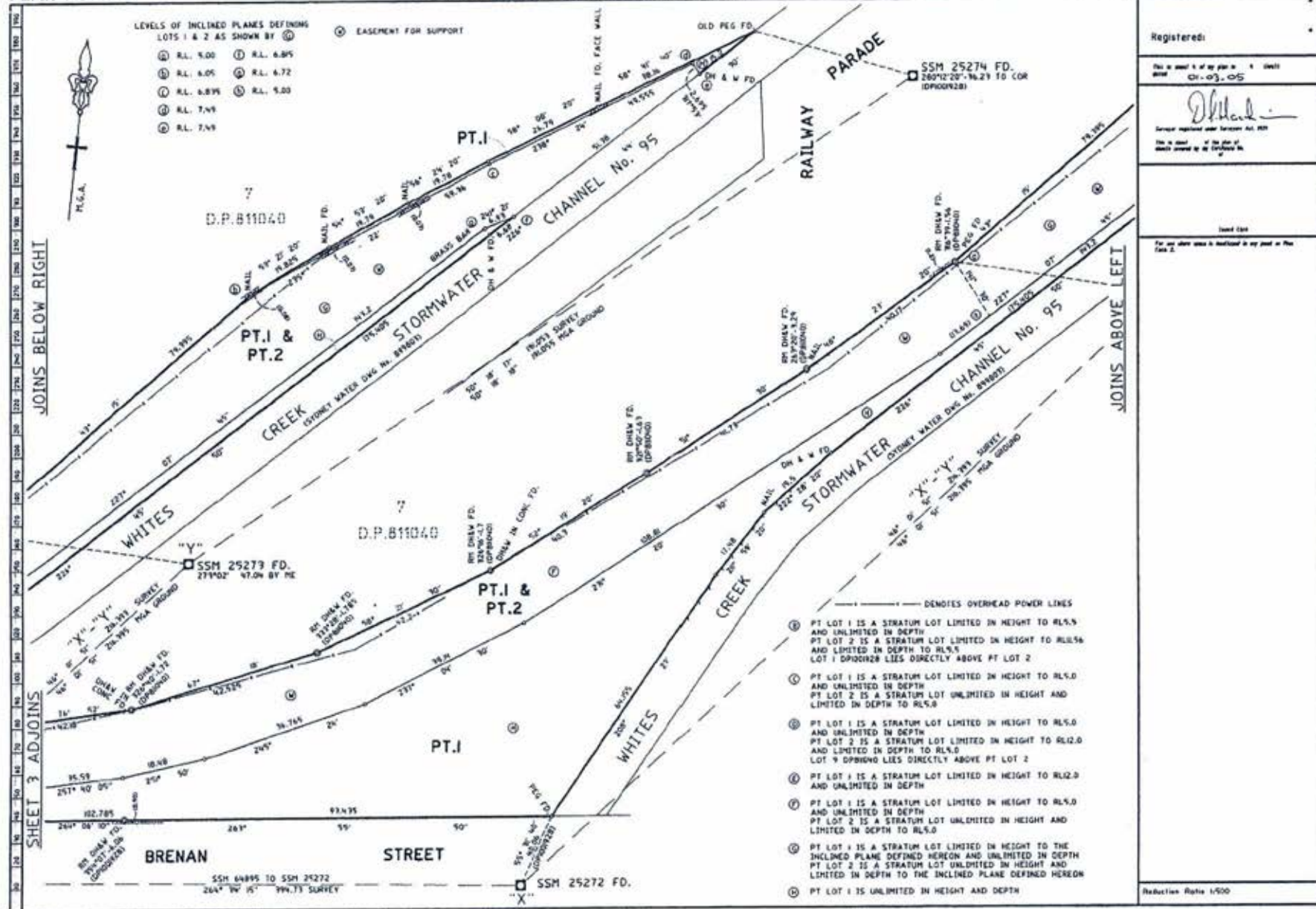


Unregistered Plan A

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

*OFFICE USE ONLY



Registered:

This is sheet 1 of 10 pages in 1 sheet
dated 01-03-05

D. H. H. H.
Survey registered under Section 141, 1917
This is sheet 1 of the plan of
which is filed in the office of the Registrar.

Sheet 1 of 10

For any other sheet in this plan see the
Index

Reduction Ratio 1/500

Unregistered Plan B

PLAN FORM 2

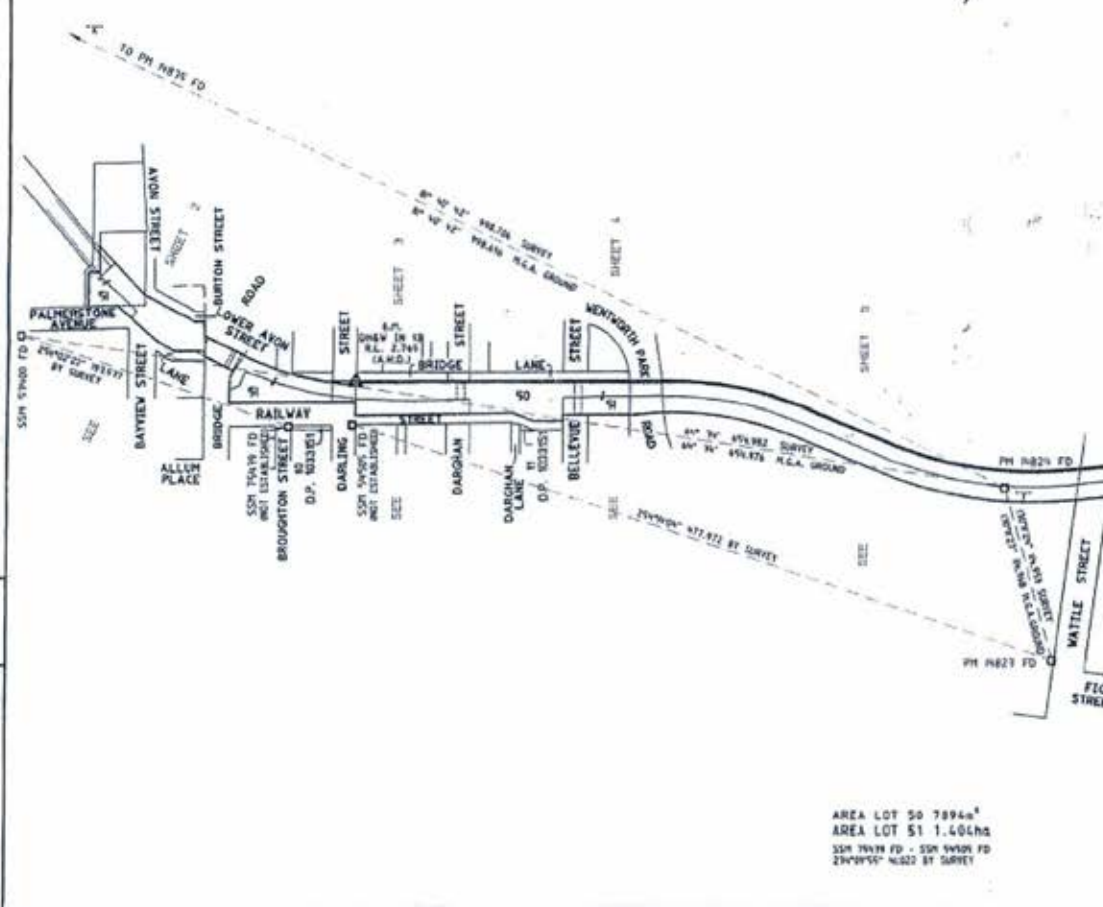
Plan Drawing only to appear in this space

OFFICE USE ONLY

SIGNATURES AND SEALS ONLY.

SURVEYORS (PRACTICE) REGULATION 1996 CLAUSE 12(2)							
MARK	N.G.A. CO-ORDINATES		ZONE	CLASS	ORDER	A.H.D.	ACCURACY
	EASTING	NORTHING					
P.M. 14824	102 442.224	8 250 797.019	5a	B	U	2.5M	2
P.M. 14825	10 811.004	8 250 067.447	5a	B	U		
P.M. 14827	102 945.841	8 250 022.830	5a	B	U		
S.S.M. 57400	102 270.581	8 249 95.753	5a	B	U	15-811	2

SOURCE : LAND & PROPERTY INFORMATION DATE: JANUARY 2008
COMBINED SCALE FACTOR 0.99994



Registered:
C.A.
Title System:
Purpose: LEASE
Ref. Map:
Last Plan:
PLAN OF SUBDIVISION OF LOT 8 & 9 IN D.P. 1033151
Lengths are in metres. Resection facts 1:1000.
L.G.A. LEICHHARDT
Locality GLEBE
Parish PETERSHAM
County CUMBERLAND
This is sheet 1 of no. plan in 7 sheets (Scale of map/plan)
Surveyors (Practice) Regulation 1996
1. DONALD LADHAM MAGUIRE
of DONALD LADHAM MAGUIRE
15/18-22 BRIDGE STREET, SYDNEY
a surveyor registered under the Surveyors Act 1992, hereby certifies that the survey represented in this plan is correct and has been made in accordance with the Surveyors (Practice) Regulation 1996 and was completed on 20/01/2008 (Date of completion) in accordance with SORS 20.8.21.
This plan is the final result of a survey conducted in accordance with the Surveyors Act 1992 and the Surveyors (Practice) Regulation 1996.
(Signature) *Donald Ladham Maguire*
Don Ladham/Maguire
Surveyor registered under the Surveyors Act 1992
Plan used in preparation of survey/consolidation
D.P. 1033151

Green Lands Office Approved
Authorised Officer
Land District
Paper No.
Field Book
SUBDIVISION CERTIFICATE
I hereby certify that the provisions of s.126A of the Environment Planning and Assessment Act 1979 have been satisfied in relation to the proposed
"Street" "road" or "foot road"
"Authorized Person/ward manager/authorized officer"
Consent Authority
Date of Endorsement
Amendment No.
Subdivision Certificate No.
File No.
Note: This plan is to be lodged electronically in the Land Title Office. It shall include a signature in an electronic or digital format approved by the Registrar-General.
A note attached to registration
SURVEYOR'S REFERENCE: 26051UP24 /4 CHECKLIST

AREA LOT 50 7894m²
AREA LOT 51 1.604ha
SSM 79438 FD - SSM 59409 FD
29°49'55" N 52°31' BY SURVEY

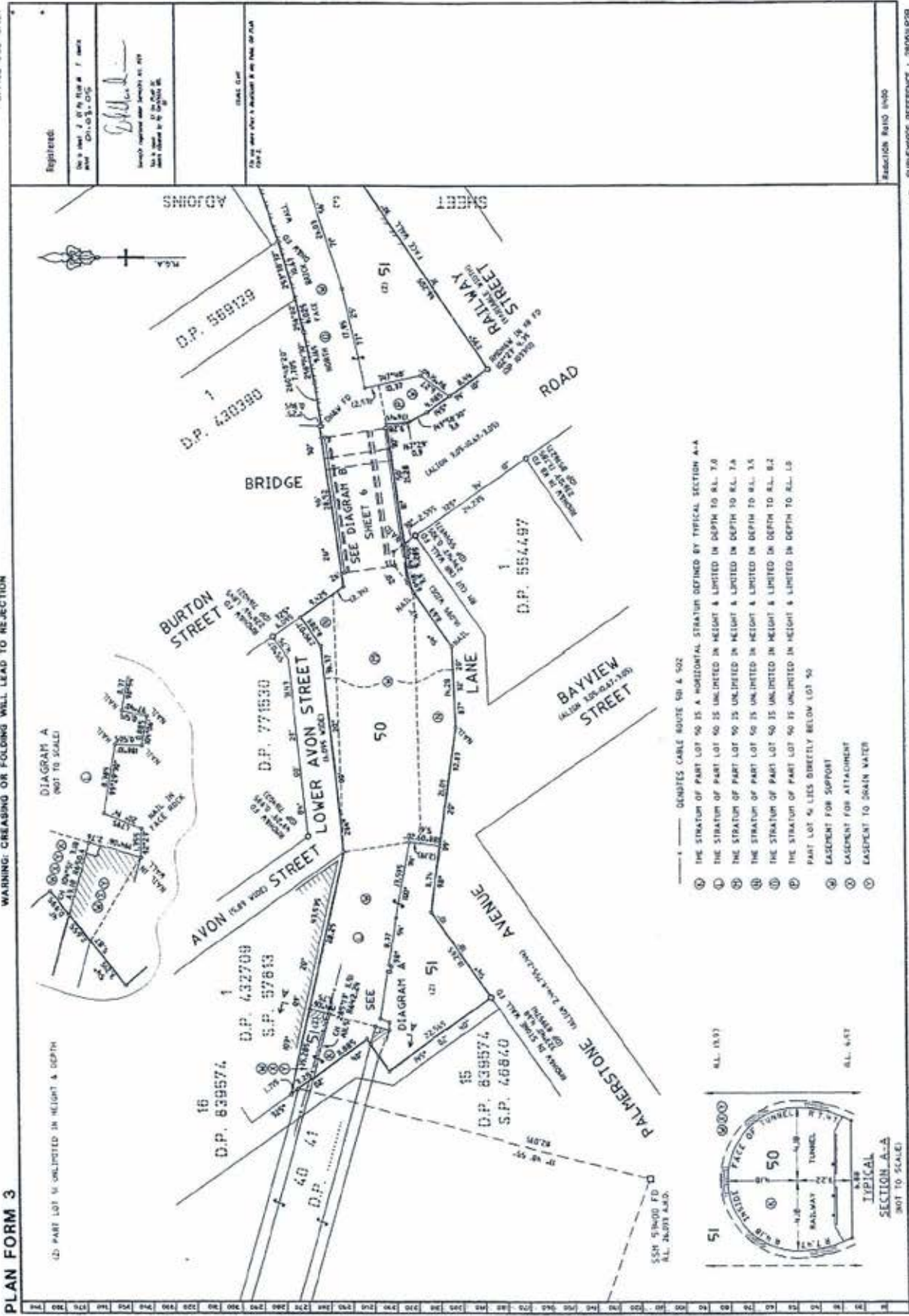
PURSUANT TO SECTION 6 OF THE CONVEYANCING ACT 1999, IT IS INTENDED TO CREATE:
1) EASEMENT FOR ATTACHMENT
2) EASEMENT TO DRAIN WATER
3) EASEMENT FOR SUPPORT

WARNING: CREATING OR FOLDING WILL LEAD TO REJECTION

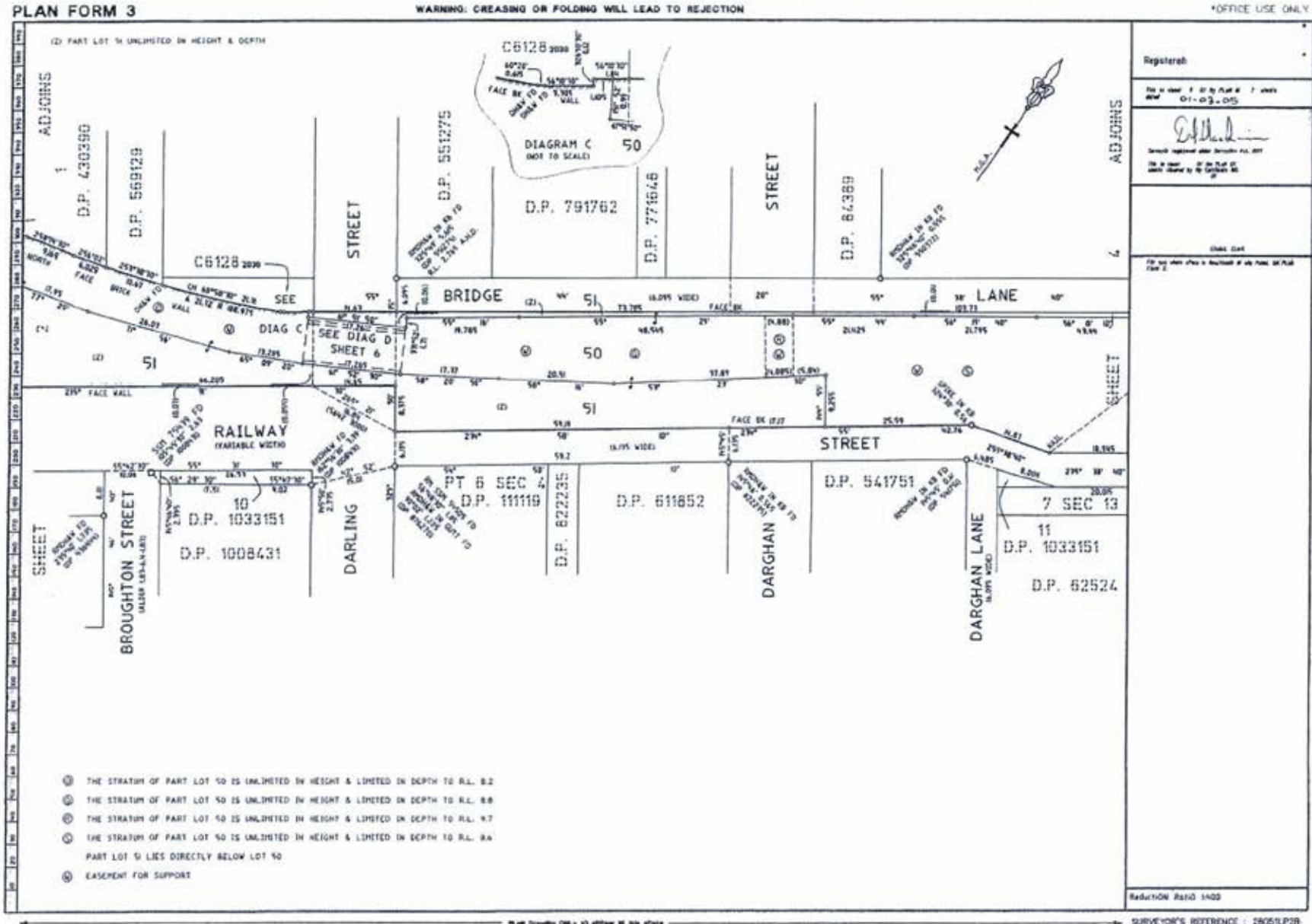
ISSUE A

Unregistered Plan B

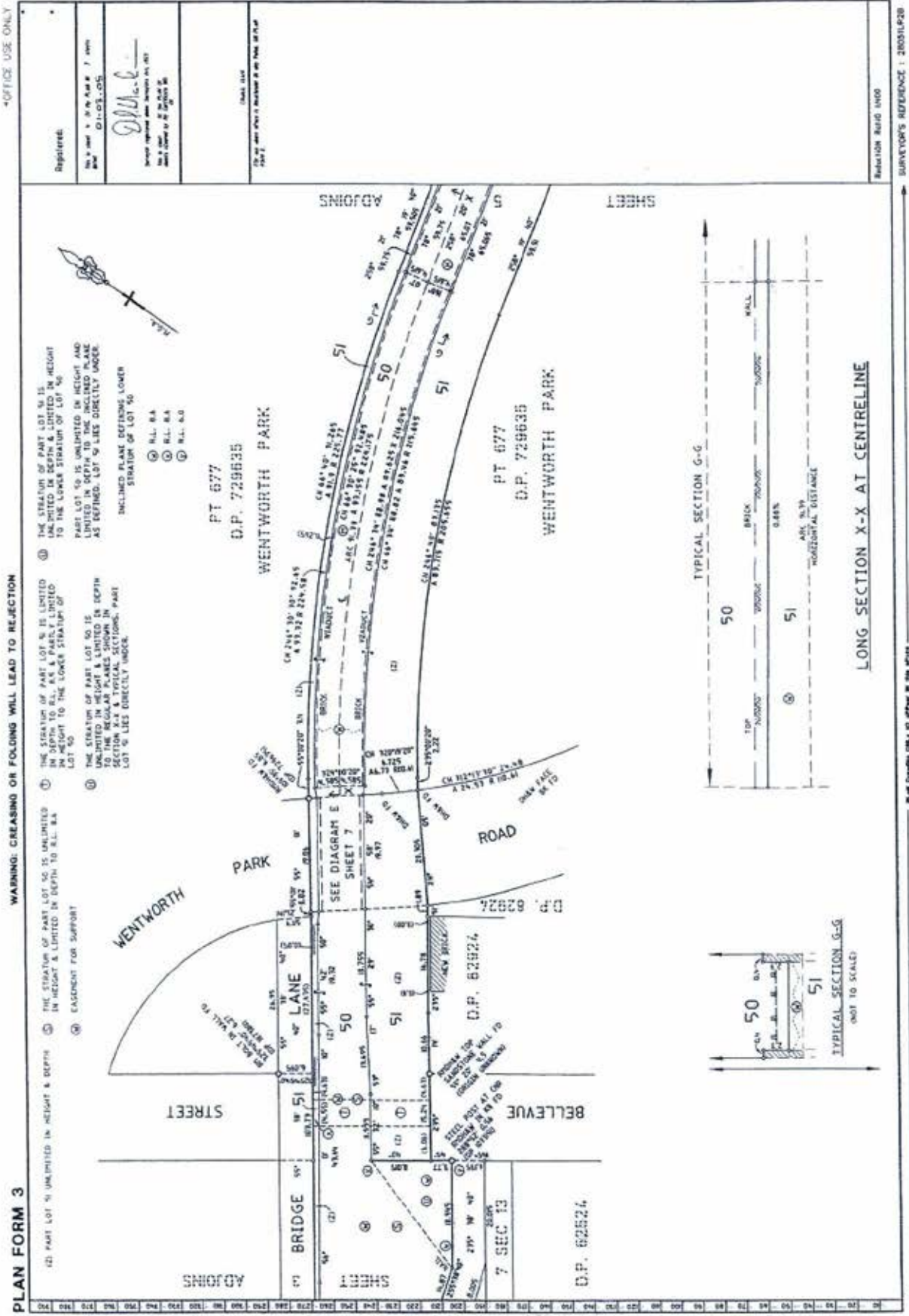
Appendix 6 – Permanent Light Rail Corridor
Attachment 2: IWL Permanent Light Rail Corridor



Unregistered Plan B



Unregistered Plan B

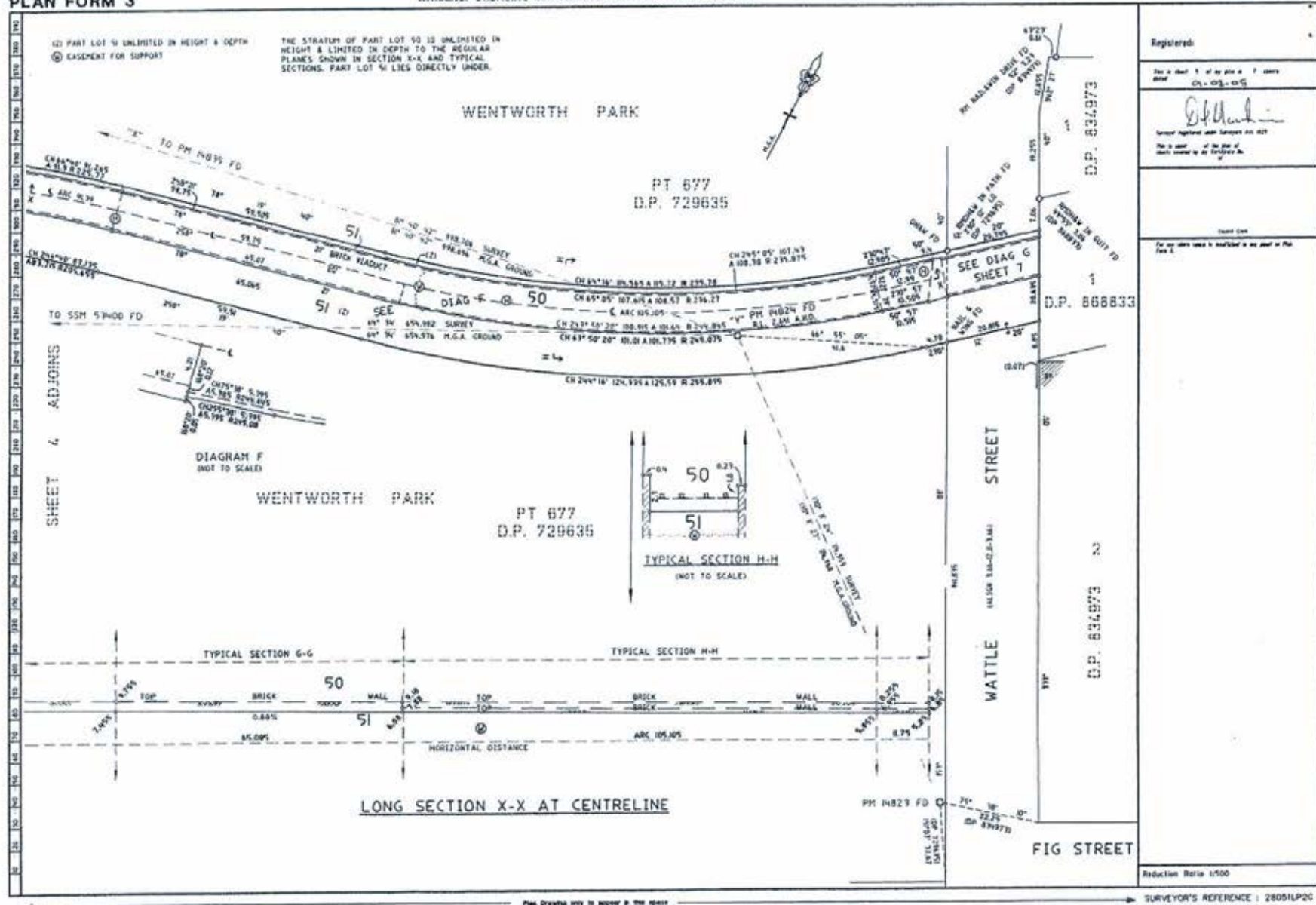


Unregistered Plan B

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

SCALE: USE ONLY



Unregistered Plan B

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

OFFICE USE ONLY

- ① THE STRATUM OF PART LOT 51 IS LIMITED IN DEPTH TO R.L. 9.6 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 50.
- ② THE STRATUM OF PART LOT 51 IS LIMITED IN DEPTH TO R.L. 9.4 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 50. PART LOT 50 IS UNLIMITED IN HEIGHT & LIMITED IN DEPTH TO THE INCLINED PLANES AS DEFINED. PART LOT 51 LIES DIRECTLY UNDER.



TYPICAL SECTION B-B
BRIDGE ROAD

INCLINED PLANE DEFINING LOWER STRATUM OF LOT 50

- | | |
|--------------|--------------|
| ① R.L. 9.665 | ⑩ R.L. 8.855 |
| ② R.L. 9.995 | ⑪ R.L. 8.895 |
| ③ R.L. 9.999 | ⑫ R.L. 9.925 |
| ④ R.L. 9.665 | ⑬ R.L. 9.685 |
| ⑤ R.L. 9.665 | ⑭ R.L. 9.685 |
| ⑥ R.L. 9.995 | ⑮ R.L. 9.925 |
| ⑦ R.L. 8.885 | ⑯ R.L. 9.005 |
| ⑧ R.L. 8.885 | ⑰ R.L. 9.005 |
| ⑨ R.L. 8.655 | ⑱ R.L. 9.19 |
| | ⑲ R.L. 9.95 |



- ① THE STRATUM OF PART LOT 51 IS LIMITED IN DEPTH TO R.L. 8.55 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 50. PART LOT 50 IS UNLIMITED IN HEIGHT & LIMITED IN DEPTH TO THE INCLINED PLANES AS DEFINED. PART LOT 51 LIES DIRECTLY UNDER.



TYPICAL SECTION C-C
DARLING STREET

INCLINED PLANE DEFINING LOWER STRATUM OF LOT 50

- | | |
|--------------|--------------|
| ① R.L. 8.54 | ⑩ R.L. 9.31 |
| ② R.L. 10.59 | ⑪ R.L. 9.49 |
| ③ R.L. 10.59 | ⑫ R.L. 9.49 |
| ④ R.L. 10.4 | ⑬ R.L. 9.31 |
| ⑤ R.L. 10.4 | ⑭ R.L. 9.31 |
| ⑥ R.L. 10.59 | ⑮ R.L. 9.49 |
| ⑦ R.L. 9.4 | ⑯ R.L. 10.59 |
| ⑧ R.L. 9.31 | ⑰ R.L. 10.4 |

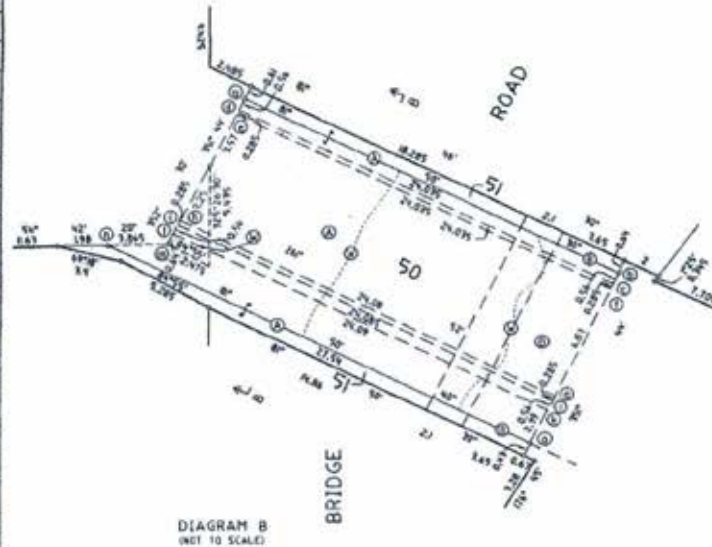


DIAGRAM B
(NOT TO SCALE)

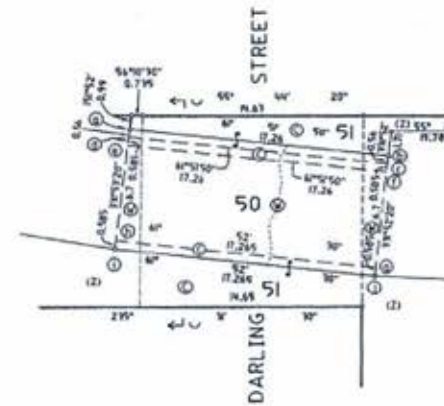


DIAGRAM D
(NOT TO SCALE)

- ① PART LOT 51 UNLIMITED IN HEIGHT & DEPTH
- ② EASEMENT FOR SUPPORT

Registered:

This is sheet 1 of 1 of Plan of 1 sheets
MPL 01-03-05

D. Mack
Surveyor registered under Statute No. 100
This is sheet 1 of 1 of Plan of 1 sheets
shown on the M.L. Certificate No. 01

Drawn by:

This is sheet 1 of 1 of Plan of 1 sheets
shown on the M.L. Certificate No. 01

Reduction Ratio

SURVEYOR'S REFERENCE : 28001LP28

Unregistered Plan B

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

REF FILE: LDR: LDR.T

Ⓐ THE STRATUM OF PART LOT 50 IS LIMITED IN DEPTH TO R.L. 8.26 & UNLIMITED IN HEIGHT.

Ⓑ THE STRATUM OF PART LOT 51 IS LIMITED IN DEPTH TO R.L. 8.1 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 50.

PART LOT 50 IS UNLIMITED IN HEIGHT & LIMITED IN DEPTH TO THE INCLINED PLANES AS DEFINED. PART LOT 51 LIES DIRECTLY UNDER.

TYPICAL SECTION E-E
WENTWORTH PARK ROAD

INCLINED PLANE DEFINING LOWER STRATUM OF LOT 50

Ⓐ R.L. 10.645 Ⓒ R.L. 9.515

Ⓑ R.L. 10.455 Ⓓ R.L. 9.325

Ⓔ R.L. 9.325 Ⓕ R.L. 10.445

Ⓖ R.L. 9.515 Ⓗ R.L. 10.645

Ⓙ R.L. 9.545

Ⓚ R.L. 9.325

Ⓛ R.L. 9.325

Ⓜ R.L. 9.545

Ⓐ THE STRATUM OF PART LOT 50 IS LIMITED IN DEPTH TO R.L. 8.88 & UNLIMITED IN HEIGHT.

Ⓑ THE STRATUM OF PART LOT 51 IS LIMITED IN DEPTH TO R.L. 6.5 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 50.

PART LOT 50 IS UNLIMITED IN HEIGHT & LIMITED IN DEPTH TO THE INCLINED PLANES AS DEFINED. PART LOT 51 LIES DIRECTLY UNDER.

TYPICAL SECTION F-F
WATTLE STREET

INCLINED PLANE DEFINING LOWER STRATUM OF LOT 50

Ⓐ R.L. 8.75 Ⓒ R.L. 7.54

Ⓑ R.L. 8.47 Ⓓ R.L. 7.7

Ⓔ R.L. 7.26 Ⓕ R.L. 8.51

Ⓖ R.L. 7.53 Ⓗ R.L. 8.74

Ⓙ R.L. 7.53

Ⓚ R.L. 7.26

Ⓛ R.L. 7.7

Ⓜ R.L. 7.54

DIAGRAM E
(NOT TO SCALE)

DIAGRAM G
(NOT TO SCALE)

Ⓐ PART LOT 51 UNLIMITED IN HEIGHT & DEPTH

Ⓑ EASEMENT FOR SUPPORT

Registered: *

This is sheet 7 of the Plan of 7 sheets
1:1 - 0.5 - 0.5

[Signature]

Surveyor registered under Statute No. 100

This is sheet 7 of the Plan of 7 sheets
1:1 - 0.5 - 0.5

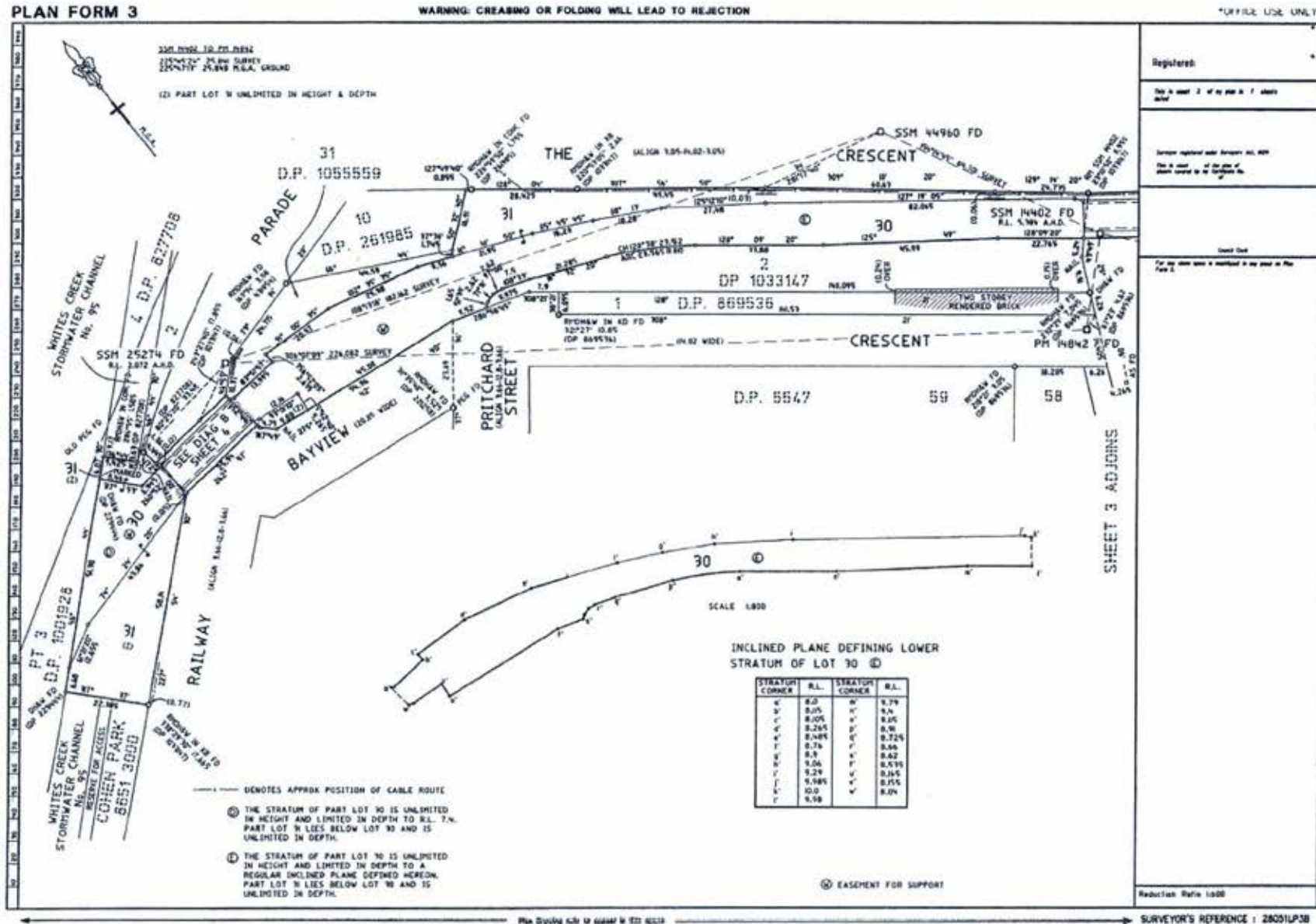
DATE: 10/11/11

1:1 or more often as directed in any Part of Plan

Sheet 7

D.P. 568873

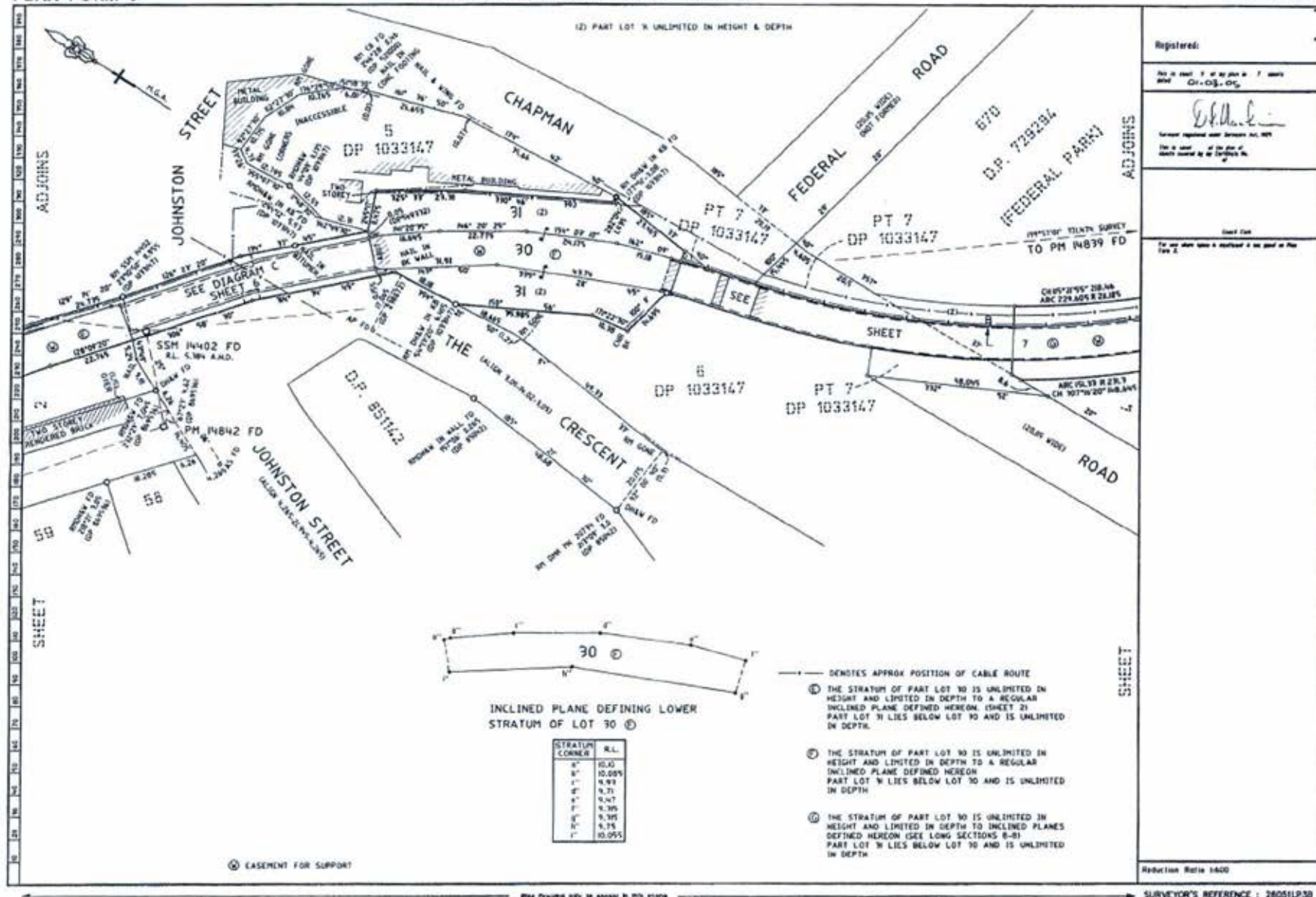
Unregistered Plan C



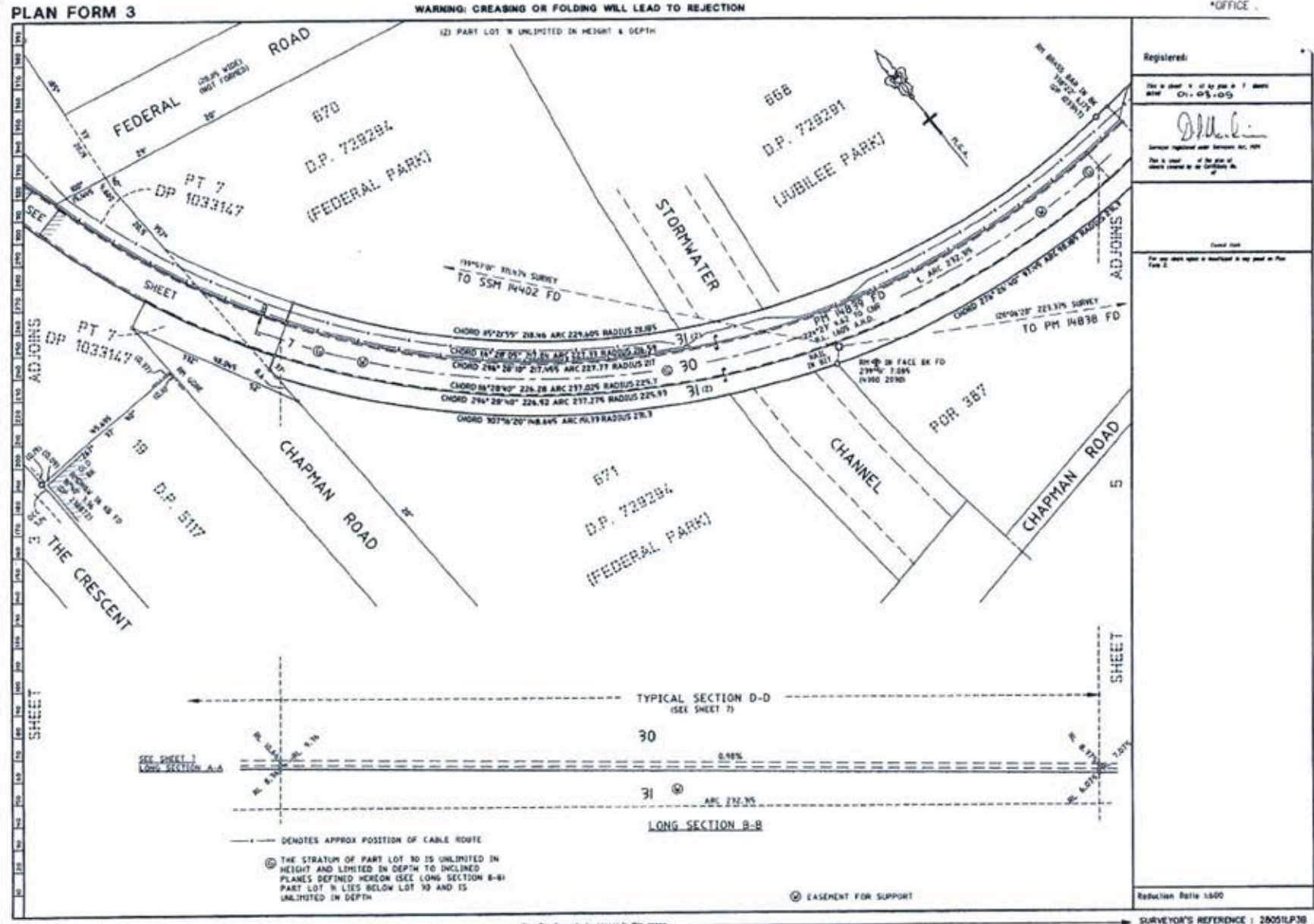
PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

*OFFICE USE ONLY

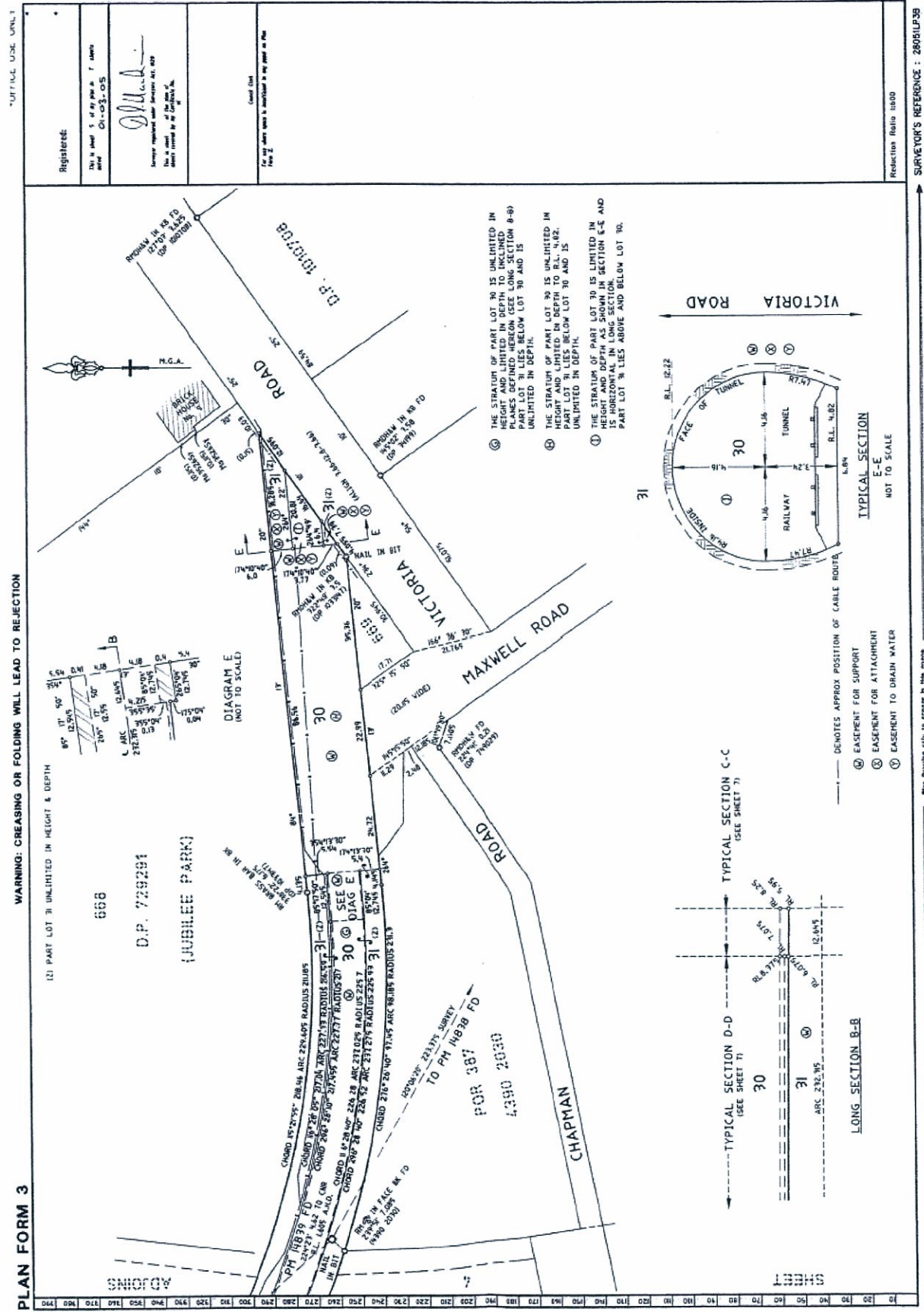


Unregistered Plan C



Unregistered Plan C

Appendix 6 – Permanent Light Rail Corridor
 Attachment 2: IWLR Permanent Light Rail Corridor



PLAN FORM 3
 WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

121 PART LOT 71 UNLIMITED IN HEIGHT & DEPTH

668
 D.P. 729291
 (JUBILEE PARK)

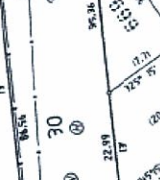
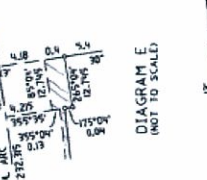
REGISTERED:
 This is a plan 5 of a plan 7 under
 order O.L. 03-05

[Signature]
 Surveyor Registered under Section 121, 122
 This is a plan 5 of a plan 7
 under order O.L. 03-05

Consult Clerk
 For any other queries to be referred to the parties to this plan

Reduction Ratio: 1:1000

SURVEYOR'S REFERENCE: 2805LUP39



- ① THE STRATHGROVE OF PART LOT 30 IS UNLIMITED IN HEIGHT AND LIMITED IN DEPTH TO INCLINED PLANS DEFINED HEREON (SEE LONG SECTION 8-8) PART LOT 30 LIES BELOW LOT 70 AND IS UNLIMITED IN DEPTH.
- ② THE STRATHGROVE OF PART LOT 31 IS UNLIMITED IN HEIGHT AND LIMITED IN DEPTH TO INCLINED PLANS DEFINED HEREON (SEE LONG SECTION 8-8) PART LOT 31 LIES BELOW LOT 70 AND IS UNLIMITED IN DEPTH.
- ③ THE STRATHGROVE OF PART LOT 32 IS UNLIMITED IN HEIGHT AND LIMITED IN DEPTH TO INCLINED PLANS DEFINED HEREON (SEE LONG SECTION 8-8) PART LOT 32 LIES BELOW LOT 70 AND IS UNLIMITED IN DEPTH.
- ④ THE STRATHGROVE OF PART LOT 33 IS UNLIMITED IN HEIGHT AND LIMITED IN DEPTH TO INCLINED PLANS DEFINED HEREON (SEE LONG SECTION 8-8) PART LOT 33 LIES ABOVE AND BELOW LOT 70.

--- DENOTES APPROX POSITION OF CABLE ROUTE
 (A) EASEMENT FOR SUPPORT
 (B) EASEMENT FOR ATTACHMENT
 (C) EASEMENT TO DRAIN WATER

R15a Drawing etc; to appear in this return

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

FULL USE ONLY

(2) PART LOT 11 UNLIMITED IN HEIGHT & DEPTH

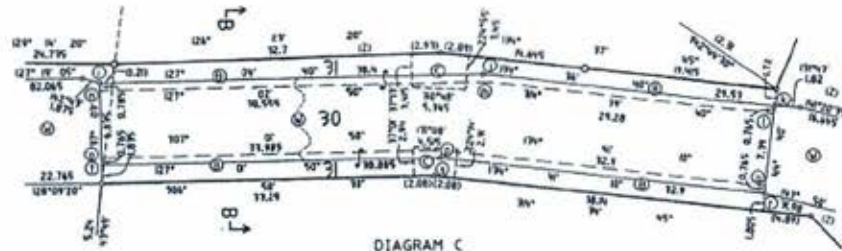
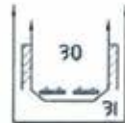


DIAGRAM C
(NOT TO SCALE)
JOHNSTON STREET

(1) THE STRATUM OF PART LOT 11 IS LIMITED IN DEPTH TO R.L. 9.42 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 10.

(2) THE STRATUM OF PART LOT 11 IS UNLIMITED IN DEPTH & PARTLY LIMITED IN HEIGHT TO LOWER STRATUM OF LOT 10.

PART LOT 10 IS UNLIMITED IN HEIGHT & LIMITED IN DEPTH TO THE INCLINED PLANES AS DEFINED. LOT 11 LIES DIRECTLY UNDER.



TYPICAL SECTION B-B
JOHNSTON STREET

HORIZONTAL & INCLINED PLANES DEFINING LOWER STRATUM OF PART LOT 10

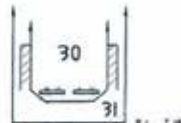
- | | | |
|---------------|---------------|----------------|
| 1 R.L. 12.195 | 11 R.L. 10.74 | 21 R.L. 10.74 |
| 2 R.L. 12.195 | 12 R.L. 10.74 | 22 R.L. 10.74 |
| 3 R.L. 12.195 | 13 R.L. 10.74 | 23 R.L. 10.74 |
| 4 R.L. 10.74 | 14 R.L. 10.74 | 24 R.L. 12.195 |
| 5 R.L. 10.74 | 15 R.L. 10.74 | 25 R.L. 12.195 |
| 6 R.L. 10.74 | 16 R.L. 10.74 | 26 R.L. 12.195 |

(3) THE STRATUM OF PART LOT 11 IS LIMITED IN DEPTH TO R.L. 7.18 & PARTLY LIMITED IN HEIGHT TO THE LOWER STRATUM OF LOT 10.

PART LOT 10 IS UNLIMITED IN HEIGHT & LIMITED IN DEPTH TO THE INCLINED PLANES AS DEFINED. LOT 11 LIES DIRECTLY UNDER.

INCLINED PLANES DEFINING LOWER STRATUM OF LOT 10

- | | | |
|--------------|---------------|---------------|
| 1 R.L. 9.819 | 11 R.L. 8.479 | 21 R.L. 8.479 |
| 2 R.L. 9.598 | 12 R.L. 8.287 | 22 R.L. 8.287 |
| 3 R.L. 8.287 | 13 R.L. 8.287 | 23 R.L. 9.598 |
| 4 R.L. 8.479 | 14 R.L. 8.479 | 24 R.L. 9.819 |



TYPICAL SECTION A-A
RAILWAY PARADE



DIAGRAM B
(NOT TO SCALE)
RAILWAY PARADE

⊗ CASHEMENT FOR SUPPORT

Reduction Ratio

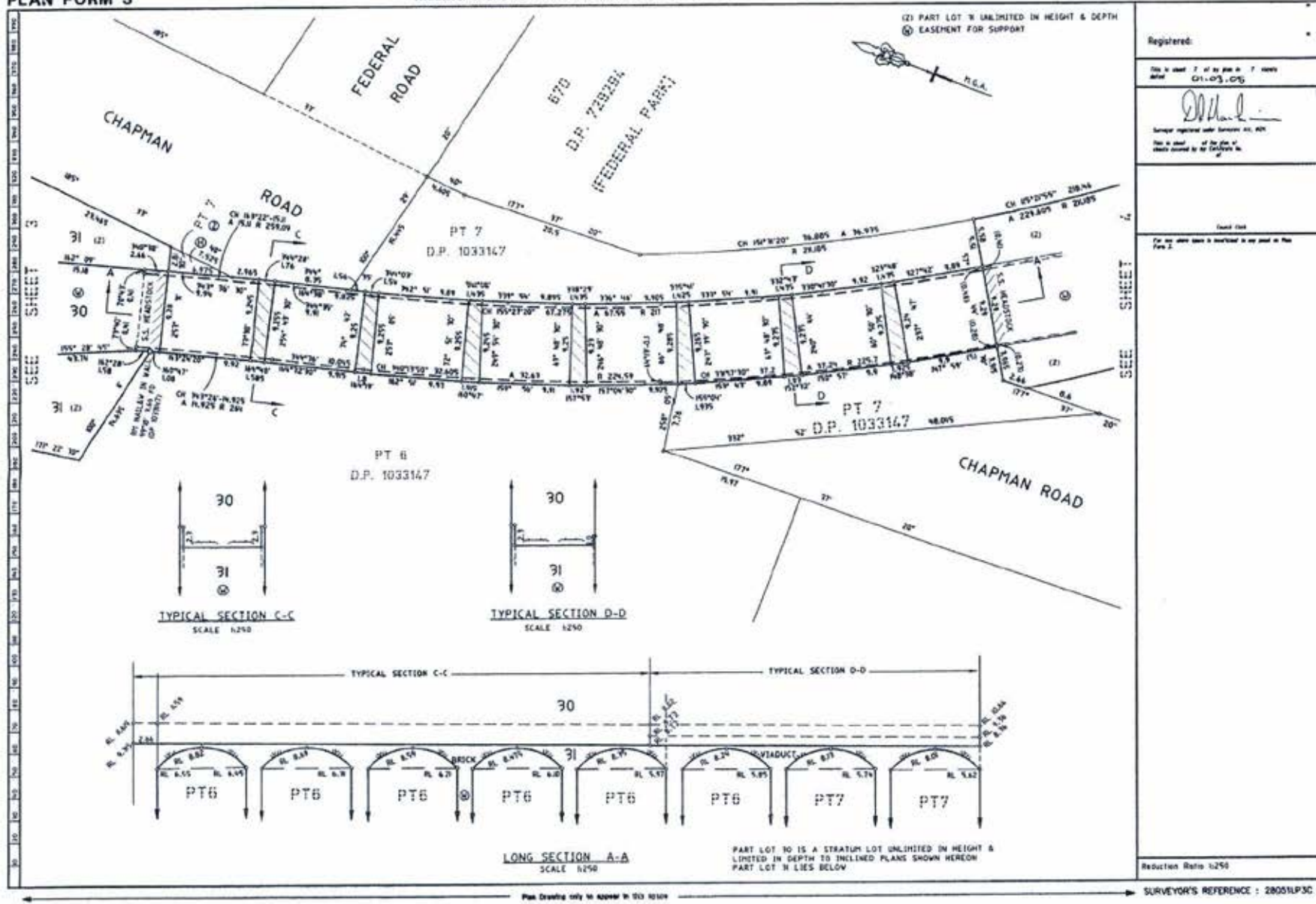
SURVEYOR'S REFERENCE : 28051UP38

Unregistered Plan C

PLAN FORM 3

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Unregistered Plan D

PLAN FORM 2

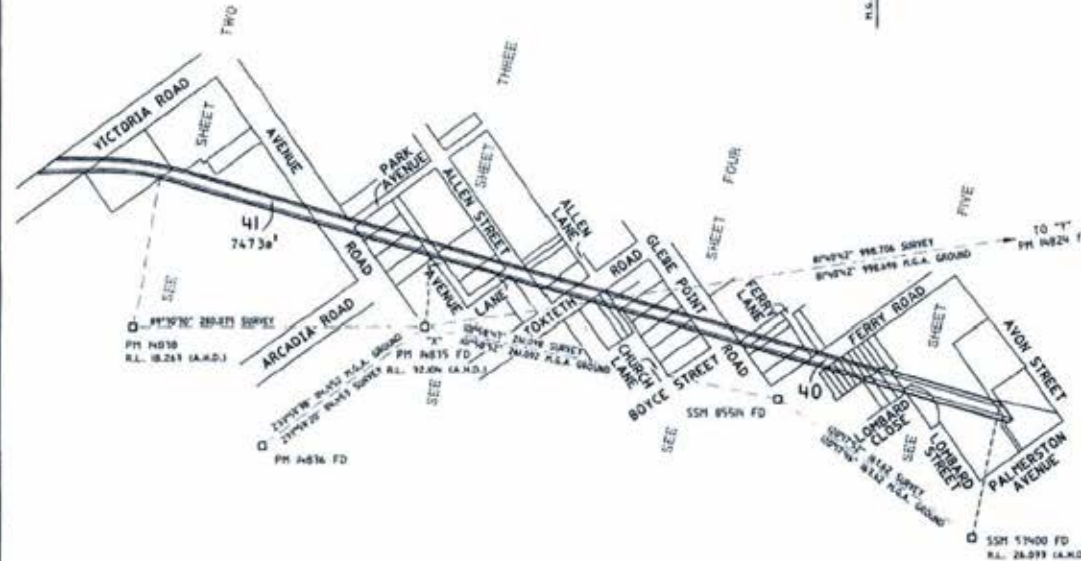
Plan Drawing only to appear in this space

VERTICAL USE ONLY

SIGNATURES AND SEALS ONLY.

SURVEYORS (PRACTICE) REGULATION 1996 CLAUSE 12(2)						
NAME	P.L.A. CO-ORDINATES		CLASS	ORDER	A.M.D.	ACCURACY
	EASTING	NORTHING				
P.L. N838	131 813.504	6 250 052.481	B	U	12.00	2 ADP(1)
P.L. N839	131 781.323	6 249 995.200	B	U		
P.L. N836	132 047.026	6 250 071.09	B	U		
S.S.H. 8958	132 129.293	6 249 998.290	C	U		
S.S.H. 51100	132 276.560	6 249 995.553	B	U		

SOURCE : LAND & PROPERTY INFORMATION DATE: JANUARY 2008
COMBINED SCALE FACTOR 0.9999



Drawn Lands Office Approval

Plan approved: _____
Authorised Officer: _____

Land Officer: _____
Project No: _____
Field Book: _____

SUBDIVISION CERTIFICATE

I hereby certify that the provisions of a 100% of the Subdivision Planning and Assessment Act 1978 have been satisfied in relation to the proposed _____

✓ (Insert "Subdivision" or "New road")

* Authorised Person/Agency manager/Authorised Officer

Consent authority: _____
Date of Endorsement: _____
Accreditation No: _____
Subdivision Certificate No: _____
File No: _____

Note:
When this plan is to be lodged electronically in the Land State Office, it should include a signature in an electronic or digital format approved by the Registrar-General.
* Date of return to Registrar-General

Registered
C.A.:
Title System:
Purpose: LEASE
Ref. Map:
Local Plan:

PLAN OF SUBDIVISION OF LOT 12 IN D.P. 103949

Lengths are in metres. Reduction Ratio 1:2000

L.G.A. LEICHHARDT
Locally GLEBE
Parish PETERSHAM
County CUMBERLAND

This is sheet 1 of my plan in 0 sheets (delete if inapplicable)

Surveyors (Practice) Regulation 1996
I, DONALD CADGAN ARCHER
REGISTERED SURVEYOR AND PRACTICER
11/18-23 BRIDGE STREET, SYDNEY
a surveyor registered under the Surveyors and Land Agents Act 1978, hereby certify that the survey information in this plan is accurate, was done in accordance with the Surveyors (Practice) Regulation 1996 and was completed on 08/01/2011.
The survey relates to LOTS 10 & 11

I hereby certify that the land parcels depicted in this plan are the same as the parcels shown in the plan that is the subject of the survey shown on "1" - "1"

(Signature) _____
Donal Cadgan Archer
Authorised Person/Agency manager/Authorised Officer

Plans used in preparation of survey/contamination

D.P. 103949

PANEL FOR USE ONLY for statements of intention to dedicate public roads or to create public easements, drainage easements, restrictions on the use of land or positive covenants.

PURSUANT TO SECTION 88B OF THE CONVEYANCING ACT 1999, IT IS INTENDED TO CREATE:

0 EASEMENT FOR ATTACHMENT
2 EASEMENT TO DRAIN WATER
8 EASEMENT FOR SUPPORT

NOTE: EASEMENT FOR ATTACHMENT, EASEMENT TO DRAIN WATER AND EASEMENT FOR SUPPORT AFFECTS ALL OF LOT 11
AREA LOT 40 6031m²
AREA LOT 41 7473m²

SURVEYOR'S REFERENCE: 2805N/PIA /4 CHECKLIST

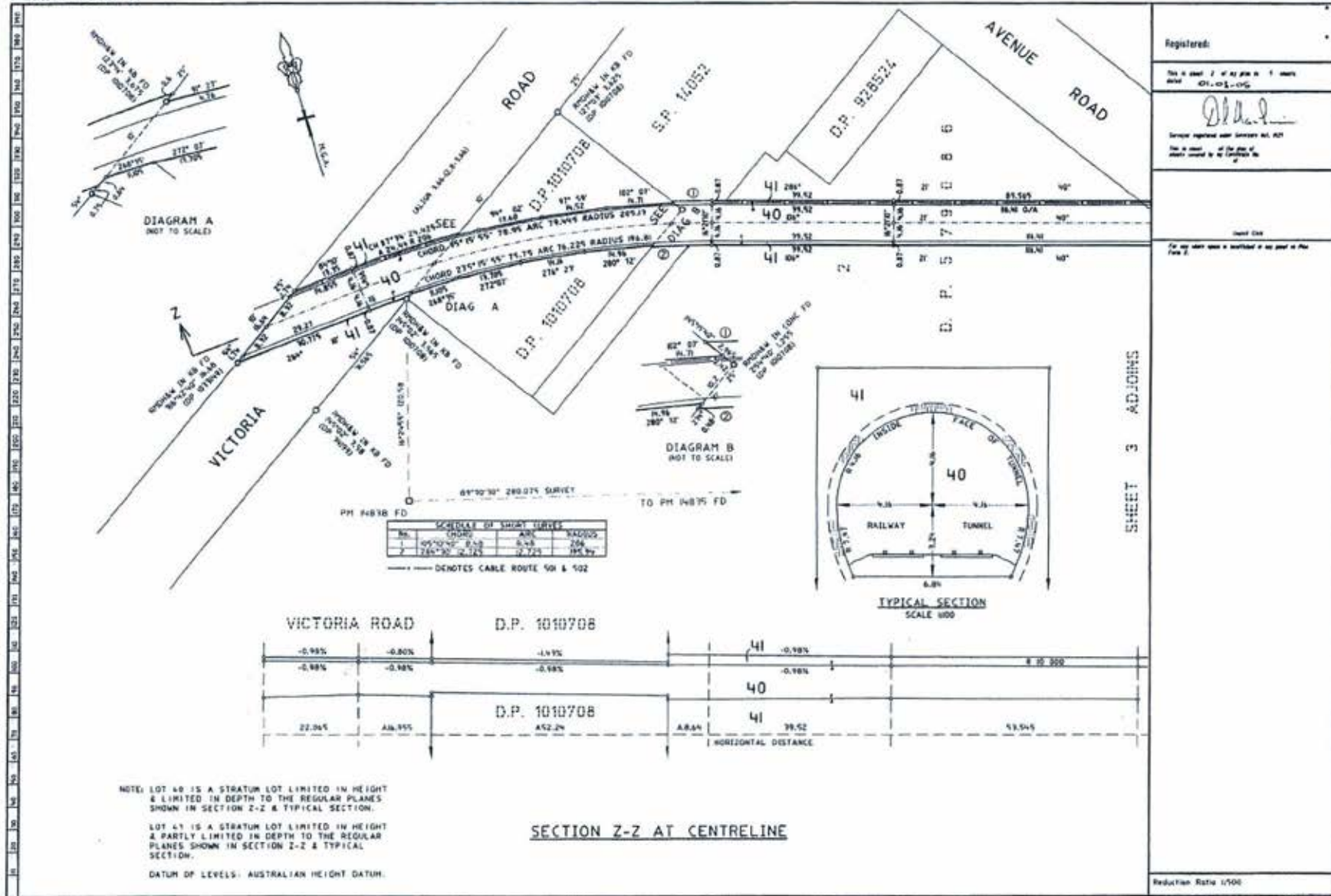
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ISSUE A

PLAN FORM 3

WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

1:1000



Registered:
This is sheet 1 of 12 plan of 1 sheet.
Date: 01.01.05

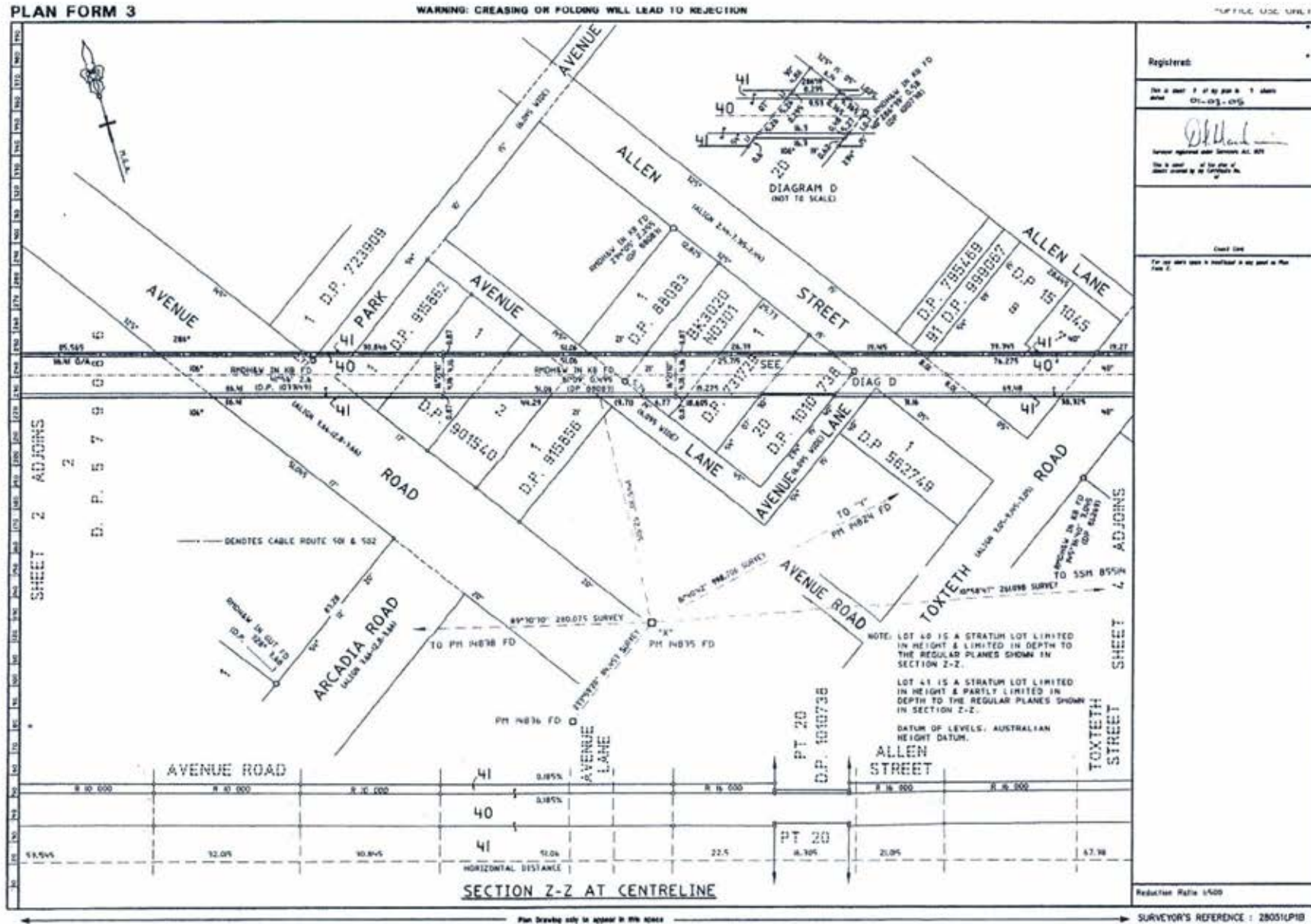
[Signature]
Surveyor registered with Registrar of Land, NSW
This is sheet 1 of 12 plan of 1 sheet.
Date: 01.01.05

Sheet Date:
For any other uses a modification is required to this plan.

SHEET 3 ADJOINS

Reduction Ratio 1/500

SURVEYOR'S REFERENCE : 28051UP10

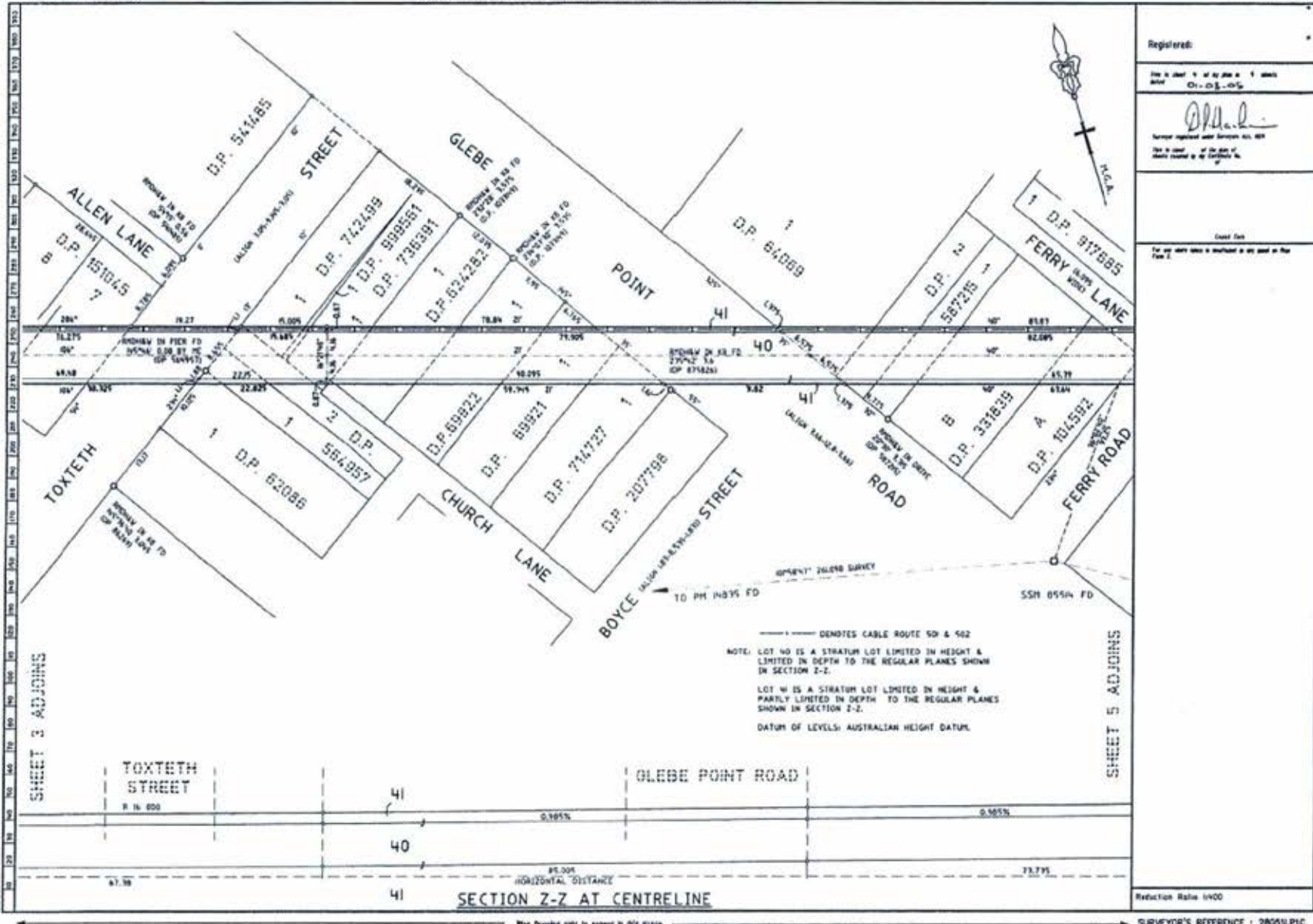


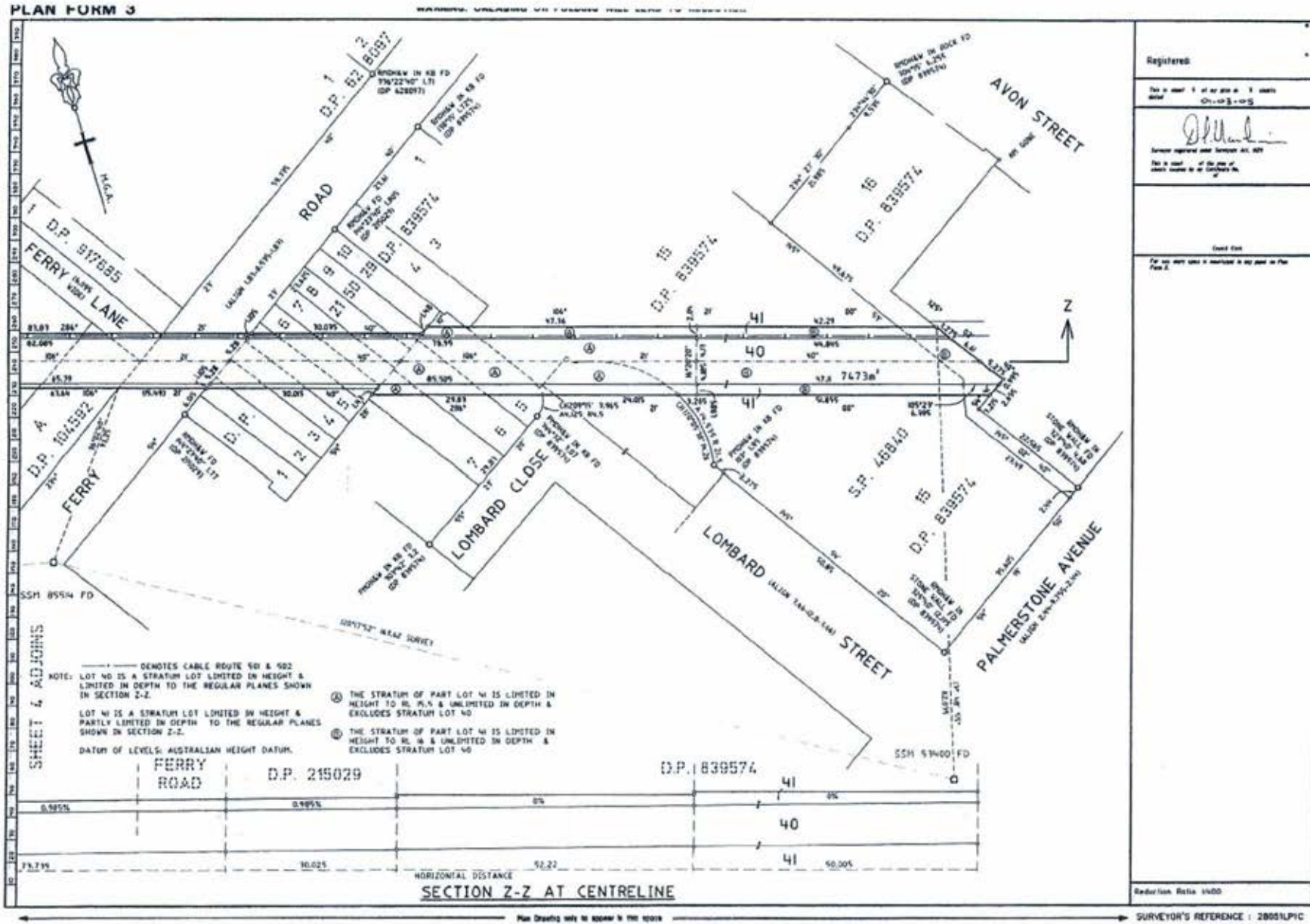
Unregistered Plan D

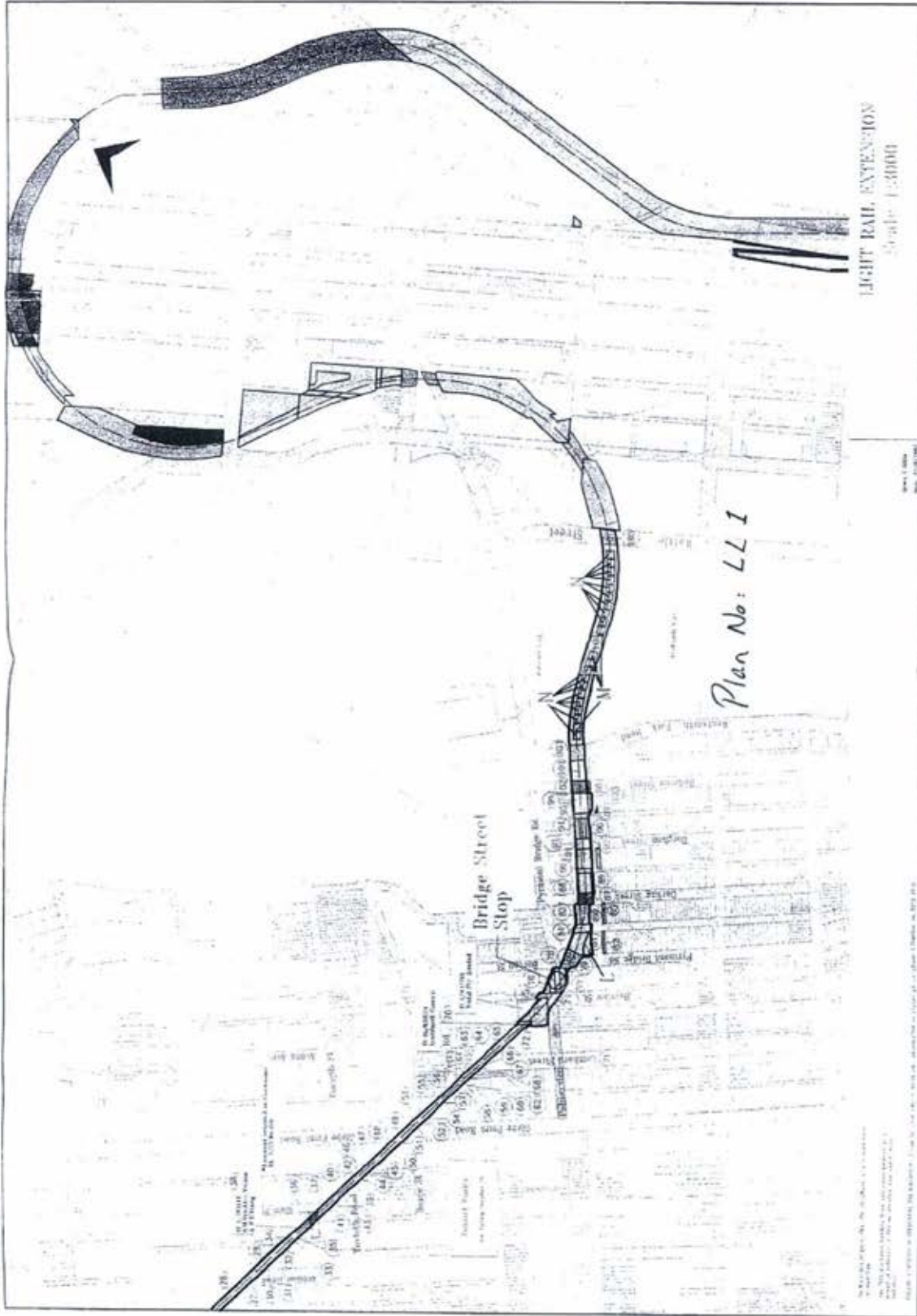
PLAN FORM 3

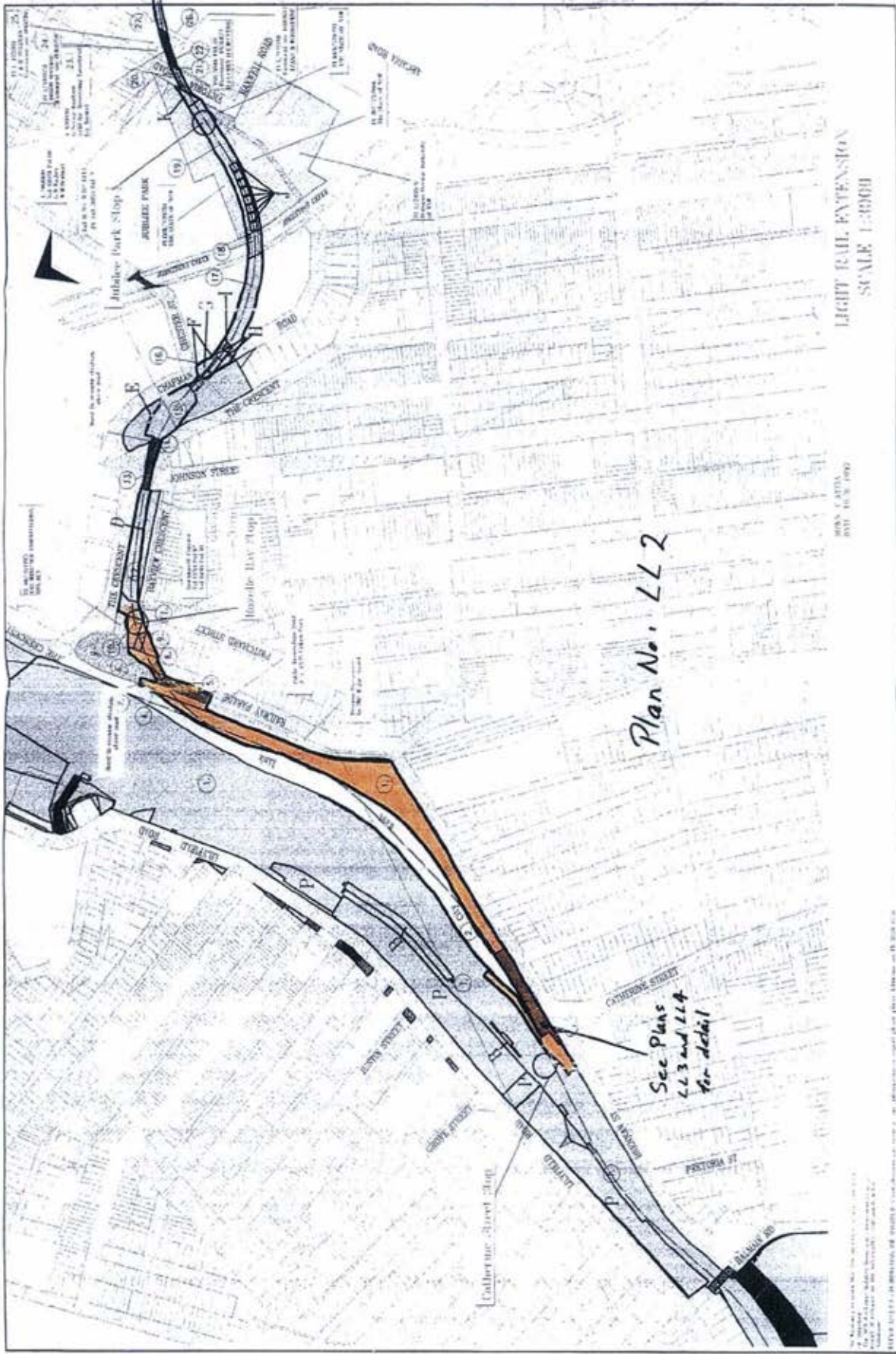
WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION

OFFICIAL USE ONLY









Plan No: LL3

PROPOSED INFIELD STOP

TUNNEL B/C
CITY WEST VP

VIRTUAL TRANSITION
50 MPH
50 MPH

VIRTUAL TRANSITION
55 MPH
55 MPH

VIRTUAL TRANSITION
350 8.15 TANGENTIAL TURNOUT
SPEED ONE TO CENTER ENTRY ANGLE
TO BE DETERMINED

CITY-WEST LINK RD

FUTURE HEAVY RAIL

FUTURE COMPASS TO AIRPORT DEVELOPMENT

CATHERINE ST

GROVE ST

LITFIELD RD

PRELIMINARY

DEPARTMENT OF TRANSPORT
STONEY LITTLE RAIL - SECTION ELECTION

PROPOSED ALIGNMENT DETAILS
SHEET 7 OF 8

A.I. No. 9018007

AT&T

Transmark
1400 West 10th Street, Suite 100
Edmonton, Alberta T6A 1K6
Tel: 780-443-1111
Fax: 780-443-1112

In Accordance with the provisions of the Transportation Act, R.S.A. 1980, c. T-7, s. 10(1), the Department of Transportation is pleased to announce that it has approved, with conditions, the proposed alignment details for the Stoney Little Rail project.

DATE: 10/15/07

BY: [Signature]



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 7 - Sustainability

Document Number: 3126370_15
Execution Version

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1. Overview and Scope

1.1. General

- (a) This Appendix describes the scope and performance requirements relating to sustainability for the delivery of the CSELR and activities associated with operating and maintaining the Sydney Light Rail network.

1.2. Scope

- (a) OpCo must:
- i. address its environment and social responsibilities outlined in the Environmental Requirements as applicable to OpCo's Activities;
 - ii. deliver on the sustainability requirements outlined in this Appendix;
 - iii. achieve sustainability targets during OpCo's, refer section 2.6; and
 - iv. adopt industry rating tools including the Infrastructure Sustainability Council of Australia's (ISCA) Infrastructure Sustainability (IS) Rating Tool and TfNSW's – NSW Sustainable Design Guidelines Version 3.0 and achieve the minimum ratings specified in this Appendix.

2. Performance and Technical Requirements

2.1. Management and governance

2.1.1. Management systems

- (a) OpCo must:
- i. ensure that sustainability is addressed throughout the performance of all OpCo's Activities;
 - ii. ensure that sustainability is embedded into the design and delivery of the CSELR, and the operation and maintenance of the SLR;
 - iii. comply with the TfNSW Sustainable Design Guidelines Version 3.0 to meet a minimum "gold" design rating as applicable to OpCo's Activities;
 - iv. submit to TfNSW's Representative a completed checklist provided in electronic format (standard template supplied by TfNSW) confirming compliance with the requirements of the TfNSW Sustainable Design Guidelines Version 3.0 every 3 months during the Delivery Phase;
 - v. within forty (40) days of the date of the deed, register with the ISCA Infrastructure Sustainability Rating Scheme to use the IS Rating Tool;
 - vi. use the IS Rating Tool to calculate the "design" and "as built" rating scores for OpCo's Activities;
 - vii. achieve an IS Rating Tool "design" rating score of at least 65 for the design of OpCo's Activities;
 - viii. achieve an IS Rating Tool "as built" rating score of at least 65 for OpCo's Activities;
 - ix. consult with the TfNSW's Representative and ISCA to achieve an operations rating under the IS Rating Scheme;
 - x. develop, implement and maintain governance structures, processes and systems that ensure integration of all sustainability considerations, initiatives and reporting during OpCo's Activities;
 - xī. allow for and address sustainability requirements for the CSELR in:
 - A. design briefings for all personnel involved in the preparation of Design Documentation;
 - B. processes for the development of Design Documentation;
 - C. site inductions for all personnel engaged in OpCo's Activities;
 - D. project plans for the design, delivery, operation, maintenance and management of the SLR; and
 - xii. report annually using the Global Reporting Initiative sustainability reporting framework for the Operations Activities.

2.1.2. Procurement & purchasing

- (a) OpCo must
- i. identify and implement sustainable procurement initiatives that provide environmental and social improvement;

- ii. develop, implement and maintain a robust system for informing subcontractors regarding sustainable procurement requirements for purchase of materials, goods and services;
- iii. develop, implement and maintain procurement processes that comply with the requirements of BS 8903 and use the IS Rating Tool in the selection of subcontractors and suppliers;
- iv. include environmental and social criteria in the selection process for subcontractors;
- v. maximise opportunities for Australian and New Zealand (ANZ) small and medium enterprises (SME) participation;
- vi. ensure that all materials, products and services are sourced and produced in accordance with the requirements of BS 8903;
- vii. identify ANZ SMEs for potential participation in the Supply Chain for the SLR Works, and alert these ANZ SMEs of potential tenders and supply opportunities; and
- viii. describe the process for identifying and procuring suitable products with low life cycle environmental and social impacts.

2.1.3. Climate change adaptation;

(a) OpCo must:

- i. prepare a climate change impact assessment report with the detailed design for the CSELR. This report must address as a minimum:
 - A. identification of project-specific and project-relevant climate change risks (utilising climate modelling data);
 - B. identify planned risk mitigation measures to reduce the identified climate risks; and
 - C. outline how risk mitigation measures will be addressed through the design process to reduce "extreme", "high" and "medium" risks to "low" where practicable;
- ii. identify and implement climate change initiatives that ensure OpCo's Activities are resilient to the effects of climate change known at the time of detailed design;
- iii. undertake climate change risk assessments in respect to OpCo's Activities in accordance with the guidance and requirements included in the *Australian Green Infrastructure Council Guideline for Climate Change Adaptation* (AGIC Revision 2.1: October 2011), the *Infrastructure Sustainability Council of Australia's IS Rating Tool Technical Manual – Climate Change Adaptation chapter*, the Department of the Environment and Heritage *Australian Greenhouse Office Climate Change Impacts and Risk Management (A Guide for Business and Government 2006)*, and AS5334-2013 *Climate Change Adaptation for Settlements and Infrastructure – A Risk Based Approach*;
- iv. identify and implement all necessary adaptation measures that comprehensively address risks during the design life which are rated as "extreme" and "high" using AS 5334-2013 *Climate Change Adaptation for Settlements and Infrastructure – A Risk Based Approach*;
- v. ensure that residual risks resulting from OpCo's climate risk assessment are mitigated so far as is reasonably practicable; and

- vi. ensure that the climate change projections and guidance which underpin OpCo's climate change risk assessment are the most recent available and are consistent with industry best practice.

2.1.4. Energy and greenhouse gases

- (a) OpCo must:
 - i. minimise carbon emissions associated with OpCo's Activities;
 - ii. develop and implement an energy and greenhouse gas emissions strategy that identifies process and methods to:
 - A. avoid or reduce energy use;
 - B. improve energy efficiency;
 - C. source low carbon energy (onsite); and
 - D. source low carbon energy (offsite);
 - iii. undertake carbon footprint assessments in accordance with the requirements in ISO 14064-1, ISO 14064-2, ISO 14064-3 that incorporate direct and indirect emissions associated with electricity and fuel consumption, on-site process emissions and embodied emissions for all concrete and steel used in OpCo's Activities;
 - iv. undertake energy modelling that incorporates electrical energy consumption and fuel consumption as well as any on-site renewable energy generation and renewable energy sourced from the main electricity grid;
 - v. use the energy modelling (as referred to in section 2.1.4 iv) to establish a reliable estimate against which the benefits of efficiency initiatives can be measured;
 - vi. ensure that the life cycle assessments must be used to assist selection of the most appropriate low-impact materials;
 - vii. ensure that refrigerants and fire suppression systems within temporary site facilities and permanent infrastructure have zero ozone depletion potential and low or zero global warming potential; and
 - viii. ensure that fire suppression devices do not use halons.

2.1.5. Operational energy

- (a) OpCo must:
 - i. to the maximum extent possible, limit energy demand for the Operations Activities;
 - ii. ensure that all systems are designed to support the most energy efficient operation by utilising only those functions or elements of the systems necessary to support the site operation at any given time and for the conditions prevailing at that time;
 - iii. identify and implement opportunities for using onsite sources of renewable or low carbon energy, where practicable;
 - iv. ensure that the energy efficiency initiatives and systems installed must continue to operate with an equivalent or better level of efficiency throughout the term;
 - v. maximise the use of regenerative braking energy to the extent practicable;
 - vi. maximise the energy efficiency of lighting; and

- vii. use a minimum 5% bio diesel mix for all diesel powered plant and equipment and a minimum 10% blended ethanol mix for all petrol powered plant and equipment where practicable.

2.1.6. Construction energy

- (a) OpCo must:
 - i. must ensure that, as a minimum, 25% of the total electrical needs of the Delivery Activities is offset through either one or a combination of the following:
 - A. purchase of Australian carbon offsets credits (including Large-scale Generation Certificates – LGCs); and / or
 - B. purchase of renewable energy from an Australian Government accredited renewable energy supplier; and
 - ii. prepare a greenhouse gas (GHG) inventory report for the Delivery Phase.
- (b) The GHG inventory report must:
 - i. include estimates of the total carbon footprint (Scope 1, 2 & 3 emissions) for all construction activity associated with the works;
 - ii. identify processes and methodologies for greenhouse gas tracking and reporting Scope 1, 2 & 3 emissions generated in accordance with AS 14064.1-2006 and the greenhouse gas protocol tracking of the construction GHG footprint during design and construction activities;
 - iii. nominate all initiatives that will be implemented to reduce the Project's overall carbon footprint (examples include the selection of construction materials and the creation of suitable offsets including renewable energy initiatives);
 - iv. identify and allocate responsibility for greenhouse gas tracking and reporting Scope 1, 2, and 3 emissions in accordance with AS14064.1-2006 and the greenhouse gas protocol;
 - v. review and revise the GHG inventory report as a minimum every 6 months during the Delivery Phase; and
 - vi. submit the GHG inventory reports to the TfNSW Representative.

2.1.7. Water

- (a) OpCo must:
 - i. identify and implement water savings initiatives for the existing IWLR;
 - ii. develop an integrated water management plan for SLR that identifies water sources and usage requirements during construction, operation and maintenance activities for the SLR;
 - iii. identify and implement an integrated water management approach employing a water-hierarchy decision-making framework that includes:
 - A. avoid or reduce water use;
 - B. improve water efficiency;
 - C. reuse water; and
 - D. collect rainwater or stormwater;

- iv. identify and implement water management approaches that incorporate appropriate treatment and disposal of waste water and stormwater management, including use of water sensitive urban design approaches;
- v. identify and implement good practice water management initiatives that include:
 - A. use of water efficient fixtures and appliances;
 - B. rainwater harvesting for reuse at the fixed facilities (depot, maintenance and stabling);
 - C. water efficient vehicle wash facilities; and
 - D. water metering and monitoring;
- vi. meter all water supply sources including potable, rainwater and the Sydney Water recycled water network;
- vii. ensure that a minimum of 85 per cent of the water used in the vehicle wash is collected, recycled and reused;
- viii. at the completion of the Delivery Activities, develop an Integrated Water Management Plan for the SLR network that incorporates the requirements of sections 2.1.7(iii) – (vii);
- ix. identify and implement water savings opportunities for the operation of the SLR with the objective of replacing potable water sources with non-potable water, and minimising discharge to sewer;
- x. as part of the annual sustainability report (refer section 2.1.1 xii) report on the integrated water management for the SLR.

2.1.8. Materials

- (a) OpCo must:
 - i. identify and implement material selection strategies to minimise the embodied carbon and lifecycle impacts of materials associated with OpCo's Activities;
 - ii. reduce materials use through materials avoidance and reduction strategies and minimise construction materials volumes through design refinement, construction planning and construction methods;
 - iii. minimise embodied carbon and lifecycle impacts by using, where practicable:
 - A. blended cement that contains waste industrial products such as fly ash and ground granulated blast furnace slag;
 - B. low carbon concrete;
 - C. recycled steel, including in concrete reinforcing; and
 - D. spoil generated on-site;
 - iv. achieve a minimum of one point under the Green Star Mat-4 concrete credit criteria for Portland cement;
 - v. achieve one point under the Green Star Mat-4 Concrete credit criteria for aggregate and water;
 - vi. use reinforcing steel which is produced using energy-reducing processes in its manufacture where practicable;

- vii. endeavour to source fabricated structural steelwork from a steel fabricator / steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute;
- viii. not use materials in the manufacture of the LRVs that contain and / or have been produced using asbestos, lead, cadmium, cyanide, mercury, halons, chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), polychlorinated biphenyls (PCBs), chlorinated solvents or other environmentally degrading substances;
- ix. endeavour to source:
 - A. concrete used in the construction of the SLR Works and the Temporary Works from members of the Cement Concrete & Aggregates Australia (CCAA) or a similar international association or organisation;
 - B. steel used in the construction of the SLR Works and the Temporary Work from suppliers that are certified under the Australian Certification Authority for Reinforcing Steels (ACRS) or a similar international association or organisation; and
 - C. PVC used in the construction of the SLR Works and the Temporary Works from suppliers that are signatories to the "Vinyl Council of Australia Product Stewardship Program" or a similar international program;
- x. source 100 per cent of all timber products used in OpCo's Activities from either re-used timber, post-consumer recycled timber or from Forest Stewardship Council (FSC) certified timber suppliers where practicable;
- xi. use recycled and recyclable materials where possible, without compromise to the structural integrity, durability and visual quality of materials and structures;
- xii. use post-consumer, post-industrial recycled material or waste materials, including crushed glass, recycled aggregate, tyre derived aggregate, and recycled materials for any noise attenuation devices where practicable; and
- xiii. use reusable formwork where practicable.

2.2. Emissions pollution & waste

2.2.1. Discharge to air, land and water

- (a) OpCo must:
 - i. identify and implement pollution control initiatives and target zero major pollution incidents;
 - ii. identify and implement initiatives to maintain and enhance the quality of the existing receiving environment as a result of undertaking its activities; and
 - iii. identify and implement initiatives to minimise emissions that degrade the receiving environment.

2.2.2. Land

- (a) OpCo identify and implement initiatives to reduce the footprint of the Delivery Activities.

2.2.3. Waste

- (a) OpCo must:

- i. minimise the generation of waste and demonstrate through design refinement, construction planning and construction methods, waste minimisation, recycling and resource recovery;
- ii. ensure that at least 95 per cent of inert and non-hazardous construction waste, excluding spoil, and at least 80 per cent of office and kitchen waste (by weight) is recycled or alternatively beneficially reused, where reasonable and practicable;
- iii. implement the following waste management measures:
 - A. provide comingled recycling bins adjacent to all general waste bins within all areas accessible by customers and in back of house areas;
 - B. provide separate bins for storage of specialist waste streams, including oil, electrical and electronic waste, and equipment waste;
 - C. wherever practical specialist wastes must be recycled;
 - D. provide sufficient on-site storage space for the safe storage of recyclable waste and general waste prior to collection for treatment and disposal;
- iv. ensure that 80 per cent, where reasonable and feasible, of office and kitchen waste (by weight) is recycled or alternatively beneficially reused during Operations Phase;
- v. negotiate and implement packaging take-back arrangements, where practicable with suppliers;
- vi. select compostable or reusable temporary erosion control devices;
- vii. avoid the production of hazardous waste; and
- viii. mulch all appropriate cleared vegetation (excluding weeds) and either store onsite for future reuse or ensure it is sent to an off-site compost facility.

2.3. Ecology

- (a) OpCo must:
 - i. minimise clearance of vegetation, particularly native vegetation; and
 - ii. undertake any landscaping and revegetation works as soon as practicable.

2.4. People & place

2.4.1. Community health, wellbeing and safety

- (a) OpCo must identify, implement and document initiatives that enhance community health, well being and safety.

2.4.2. Heritage

- (a) OpCo must identify, implement and document initiatives that enhance heritage values and minimise heritage impacts.

2.4.3. Urban and landscape design

- (a) OpCo must identify and implement Urban Design strategies that facilitate the inherent sustainability of Light Rail through consideration of passenger access to/from active transport modes (walking and cycling).

2.5. Temporary site facilities

- (a) OpCo must:
- i. ensure that, where reasonable and feasible, any temporary site facilities provided by OpCo incorporate:
 - A. energy efficient lighting schemes and light fittings;
 - B. plug-in electrical equipment which complies with the requirements of the Equipment Energy Efficiency Program (E3) "Minimum Energy Performance Standards" and has at least a five star Energy Rating Label;
 - C. high performance thermal insulation in all walls, ceilings and floors that optimise thermal performance;
 - D. natural daylighting;
 - E. natural ventilation;
 - F. rainwater harvesting;
 - G. water efficient fixtures, fittings and controls;
 - H. air conditioning refrigerants with low or zero global warming potential;
 - I. bicycle storage facilities, showers and changing room facilities; and
 - J. Crime prevention through environmental design principles;
 - ii. install any security and warning lighting so that light is not directed at neighbouring properties or in such a way that light reflects onto structures or neighbouring properties;
 - iii. ensure that Temporary Works that are visible to or accessible to the public are Graffiti resistant, vandal resistant and aesthetically pleasing; and
 - iv. consult with Stakeholders and the community in the design and construction of the Temporary Works.

2.6. Sustainability targets

- (a) OpCo must include, as a minimum, for the CSELR each of the sustainability targets set out in Table 1 below in the Delivery Phase Sustainability Plan and the Operations Phase Environment and Sustainability Plan. There are no targets for IWLR.
- (b) OpCo must include in the Construction Environmental Management Plan and the Delivery Phase Sustainability Plan appropriate baseline studies that support specific credit categories, to assist in achieving the minimum ISCA IS rating. These credits include Energy and Carbon (Ene-1), Water (Wat-1 and Wat-3) and Materials (Mat-1).
- (c) OpCo must, as a minimum, achieve the sustainability targets identified in the Delivery Phase Sustainability Plan and the Operations Phase Environment and Sustainability Plan.

Table 1 Sustainability targets

Delivery Activities (Design and Construction)		Target
1	IS Rating Tool 'design' score.	65

Delivery Activities (Design and Construction)		Target
2	IS Rating Tool 'as built' score.	65
3	TfNSW's – NSW Sustainable Design Guidelines Version 3.0 score.	Gold (80% Discretionary)
4	Number of secure cycle parking spaces to be provided.	In accordance with any cycle parking requirements of the Pedestrian and Cyclist Network and Facilities Strategy to be prepared in accordance with Planning Approval Condition B33 as detailed in Schedule B2.
5	Area of new landscape / public open space created.	2.12 Ha
6	Estimated temporary and permanent project footprint (Ha).	9.3 Ha
7	Percentage reduction of the temporary and permanent project footprint from the Concept Design through the detailed design to Final Design Documentation.	1%
8	Percentage of construction waste to be beneficially reused or recycled.	95%
9	Total water demand (kL) for construction, with potable and non-potable water demand expressed as a percentage of total water demand.	Total water demand for construction will be estimated through development of the ISCA approved reference footprint. During construction, it is intended that 40% of construction water demand will be from non potable sources and 60% from potable sources.
10	Percentage non-potable water demand which is sourced from non-potable sources during construction.	40% (where practicable)
11	Percentage of non-potable water demand which is sourced from non-potable sources during operation.	85%
12	Quantity of water harvested for reuse (kL) during construction.	The major opportunity for water harvesting during construction will be from dewatering during tunnel construction. OpCo will consider recycling of this water during delivery and will advise TfNSW of its plan to harvest and recycle water.
13	Quantity of water harvested for reuse (kL) during operation.	OpCo will install a 150m ³ underground tank at Randwick depot and a 20m ³ tank at the existing IWLR facilities.
14	Quantity of wastewater recycled or reclaimed (kL) during construction.	The major opportunity for water recycling/reclamation during construction will be from dewatering during tunnel construction. OpCo will consider recycling this water during delivery and will advise TfNSW of its plan to harvest and recycle

Delivery Activities (Design and Construction)		Target
		water.
15	Quantity of wastewater recycled or reclaimed (kL) during operation.	2520 kL/annum
16	Percentage of LRV wash water recycling which will be achieved at the Light Rail Maintenance and Stabling Facilities.	80%
17	Percentage replacement of Portland cement content in concrete using supplementary cementitious materials, measured by mass, across all concrete used in the project compared to a reference case (no replacement of Portland cement).	30%
18	Embodied energy of concrete and steel during construction based on ISO 14040 Environment Management – life cycle assessment – requirements and guidance (tCO ₂ e).	Total embodied energy of concrete and steel during construction will be estimated and nominated through development of the ISCA approved reference footprint. 34,764 tCO ₂ e
19	Percentage of structural steel which is sourced from a steel fabricator / contractor accredited by the Environmental Sustainability Charter of the Australian Steel Institute.	Processes will be put in place to include this in the supplier selection process but currently no target is nominated
20	Percentage of reinforcing bar and mesh that is produced through energy reduction processes.	60%

Skills and Employment Framework targets		Target
1	Jobs	
	(a) Overall Workforce number	606
	(b) Number of total project Workforce that are new Sustainable Jobs	122
	(c) Percentage of the total project Workforce that are new Sustainable Jobs	20%
	(d) Number of the total project Workforce that are new Sustainable Jobs sourced from the Local Community	122
	(e) Percentage of the Workforce that are new Sustainable Jobs sourced from the Local Community	20%
	(f) Workforce Diversity group targets	Processes will be implemented, on a best endeavours basis, to meet targets outlined by TfNSW for workforce diversity - in the document "SLR Skills and Employment Framework Targets".
		Processes will be implemented, on a best

Skills and Employment Framework targets		Target
	(g) Workforce disadvantage group targets	endeavours basis, to meet targets outlined by TfNSW for disadvantaged workforce - in the document "SLR Skills and Employment Framework Targets".
2	Apprentices and Trainees	
	(a) Number of total project Workforce that are Apprentices or Trainees	60
	(b) Percentage of total project Workforce that are Apprentices or Trainees	10% (where applicable)
	(c) Number of Apprentices and Trainees participating in a TfNSW apprenticeship/traineeship support program	20
	(d) Workforce Diversity group targets	Processes will be implemented, on a best endeavours basis, to meet targets outlined by TfNSW for workforce diversity - in the document "SLR Skills and Employment Framework Targets".
	(e) Workforce disadvantage group targets	Processes will be implemented, on a best endeavours basis, to meet targets outlined by TfNSW for disadvantaged workforce - in the document "SLR Skills and Employment Framework Targets".
3	Scholarships, Cadetships and Graduates	
	(a) Number of total project Workforce that are scholars, cadets or graduates	30
	(b) Percentage of total project Workforce that are scholars, cadets or graduates Number of scholars, cadets or graduates participating in a TfNSW graduate support program	5%
	(c) Workforce Diversity group targets	Processes will be implemented, on a best endeavours basis, to meet targets outlined by TfNSW for workforce diversity - in the document "SLR Skills and Employment Framework Targets".
	(d) Workforce disadvantage group targets	Processes will be implemented, on a best endeavours basis, to meet targets outlined by TfNSW for disadvantaged workforce - in the document "SLR Skills and Employment Framework Targets".
4	Skills Training	
	(a) Number of total project Workforce participating in Nationally Recognised Accredited Training	121

Skills and Employment Framework targets		Target
	(b) Percentage of total project Workforce participating in Nationally Recognised Accredited Training	20%
5	Work placements (16+) (a) Number of work placements delivered	5 per annum (delivery and operation)
6	Education Program (a) Number of Ambassador sessions delivered (b) Number of work experience placements delivered (c) Number of rail safety sessions delivered (d) Curriculum support materials provided	8 per annum (delivery) 10 per annum (operations) 6 per annum (delivery and operation) 4 per annum Yes
7	Talent Program (a) Number of youth Workforce (under 30) participating in Talent Program (b) Percentage of youth Workforce (under 30) participating in Talent Program	15 5%
8	Supplier diversity (a) Local sourcing assessed or accessed	Materials and services will be sourced locally where reasonable and practicable.
9	Leadership & Management (a) Number of Senior Leadership and Management roles filled by women (b) Percentage of Senior Leadership and Management roles filled by women	4 20%
Operation Activities – Annual targets		Target
1	Percentage of low voltage operational energy consumed at the Light Rail Maintenance and Stabling Facilities which is sourced from on site low carbon or renewable sources.	OpCo will install 100kW of photovoltaics and 20kW of solar hot water systems across the Light Rail Maintenance and Stabling Facilities. The percentage may vary depending on seasonal fluctuations
2	Quantity of waste recycled or beneficially reused (%).	80%
3	Total water demand (kL), with potable and non-potable water demand expressed as a percentage of total water demand.	3465 kL/annum (15% potable and 85% non potable) to be confirmed through the ISCA reference footprint.
4	Percentage of non-potable water demand which is sourced from non-potable sources.	85%
5	Percentage of train wash water recycling achieved	80%

Skills and Employment Framework targets		Target
	at Light Rail Maintenance and Stabling Facilities.	
6	Number of ANZ SMEs (including the contractor and/or sub-contractors and/or dealers, distributors) that will participate in the Supply Chain for the Operation Activities.	44

3. Design Documentation Requirements

- (a) Sustainability must be addressed by OpCo within all relevant design packages at each Design Stage for the Project.
- (b) In preparing the design OpCo must incorporate the sustainability initiatives necessary to meet the sustainability targets and requirements identified in this Appendix.
- (c) OpCo submit to TfNSW's Representative a sustainability benchmarking report within 40 business days of the date of the deed, which demonstrates lessons learnt from previous project experience and best practice initiatives to be applied to OpCo's Activities.
- (d) OpCo's sustainability benchmarking report must include benchmarking on carbon and energy intensity from relevant international light rail projects.
- (e) OpCo must produce a climate change risk assessment and adaptation strategy.
- (f) OpCo must submit a quarterly sustainability design report to the TfNSW's Representative which includes:
 - i. a compliance table which shows the status of the compliance with sustainability requirements from this Appendix which are addressed in design;
 - ii. evidence to demonstrate how the sustainable design initiatives achieve the targets in this Appendix;
 - iii. a graphical representation of the achievement of targets in this Appendix;
 - iv. evidence to demonstrate where climate change mitigation and adaptation measures or changes have been implemented in design;
 - v. scoring achieved using the TfNSW's Sustainable Design Guidelines and the IS Rating Tool 'design' rating including supporting completed checklists and scorecards;
 - vi. concrete life cycle assessment and evidence of how this has informed the design and materials selection;
 - vii. other life cycle assessments, including steel, and details of where the lifecycle assessments have informed design, selection of materials and materials sourcing;
 - viii. carbon foot printing assessments including details of where low carbon initiatives have been implemented in the design and construction of the SLR Works and Temporary Works; and
 - ix. a demonstration and description of innovative sustainable design initiatives.

4. Skills and Employment Development

- (a) For all phases of the CSELR OpCo must:
- i. identify and implement skills and employment initiatives in accordance with the SLR Skills and Employment Framework and SLR Skills and Employment Targets;
 - ii. assess current and future Workforce skill needs and must provide as a minimum:
 - A. skills and employment delivery plan;
 - B. skills and employment targets delivery profile;
 - C. Workforce Profile and Gap Plan;
 - D. skills and employment delivery plan and method statement for sub-contractors; and
 - E. Workforce quarterly report;
 - iii. ensure that at least 20% of the overall Workforce, excluding Apprentices and Trainees are Sustainable Jobs sourced from the Sydney Metropolitan Area;
 - iv. provide a minimum of 5 work placements per annum during the Delivery Phase and 5 work placements per annum during the Operations Phase for job-seekers aged 16+ years;
 - v. ensure that at least 10% of the wages and direct labour Workforce are Apprentices and Trainees. OpCo must enable all Apprentices / Trainees to access and participate in TfNSW apprenticeship support program where practicable;
 - vi. ensure that at least 5% of the applicable Workforce are graduates, scholars or cadets on formal programs with a minimum of 20% being scholars or cadets streaming into the graduate pool:
 - A. OpCo and all of their core contractors must enable graduates, scholars and cadets to access and participate in TfNSW graduate support program where practicable; and
 - B. OpCo and all of their core contractors must establish a Talent Program, identifying 5% high performing youth Workforce to provide development opportunities and fast track career opportunities;
 - vii. ensure that at least 10% of Senior Leadership and Management roles are held by women;
 - viii. ensure that workforce initiatives are implemented in accordance with the Workforce Diversity and disadvantage targets associated with the above requirements [detailed in SLR Skills and Employment Targets appended to CBD and South East Light Rail Sustainability Strategy];
 - ix. identify and implement Workforce development initiatives that provide for the acquisition and utilisation of new workplace skills and contribute to sectoral, state and national targets;
 - x. ensure that a minimum of 20% of the overall Workforce per annum are participating in work related, nationally recognised accredited training in addition to business as usual mandatory or legislative requirements, where practicable;
 - xi. as a minimum:

- A. provide relevant Nationally Recognised Accredited Training to assist in Re-skilling and Up-skilling the Workforce;
- B. identify and engage with recognised educational and training facilities that can provide the training, assessment and qualifications required for Workforce participation and development;
- C. identify and deliver formal Australian Qualifications Framework (AQF) recognised accredited programs that provide relevant training and qualifications for the Workforce;
- D. provide nationally recognised apprenticeship programs to capacity build and up-skill the Workforce;
- E. provide scholarship, cadetship and Graduate Programs to capacity build the Workforce;
- F. establish Industry and Skills Partnerships for Workforce skills acquisition and utilisation; and
- G. make use of existing relevant government training and employment programs to support Workforce participation and development;
- xii. develop and implement strategies to obtain Workforce participation and development funding, subsidies and grants;
- xiii. develop and implement programs for engagement with local universities including scholarships, cadetships and graduate;
- xiv. identify and implement programs offering community benefits;
- xv. provide a minimum of 6 work experience placements per annum during the delivery phase and 6 work placements per annum during the operations phase for young people aged 14+ years in statutory, tertiary or higher education;
- xvi. provide an education program to local schools and colleges, including but not limited to:
 - A. Ambassador Program offering a minimum of eight sessions per annum during delivery phase and ten sessions per annum during operations phase;
 - B. curriculum support materials (year 7, 8 and 9);
 - C. rail safety sessions (year 5 and 6);
- xvii. as a minimum:
 - A. give preference to local residents where more than one person is equally suitable for an advertised position; and
 - B. work with Local Community groups, training providers and employment support organizations to maximise employment opportunities;
- xviii. support local entrepreneurship and supplier diversity through local sourcing, where practicable;
- xix. develop strategies to support local small to medium enterprises and social enterprises;
- xx. assess the capacity of local small to medium enterprises and social enterprises to deliver works, services or supplies that are required for OpCo 's activities where practicable;
- xxi. not used;

- xxii. comply with and implement planning, reporting and monitoring processes to include the Supply Chain; and
- xxiii. monitor performance against the Skills and Employment Delivery Plan on a quarterly basis. Any under-performance will result in outstanding targets being rolled forward into the following quarter's delivery requirements.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E.1 Scope and Performance Requirements

**Appendix 8 – Stakeholder and Community
Engagement**

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Execution Version

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for stakeholder and community engagement for the Sydney Light Rail (SLR).

1.2. Precincts

- (a) Precincts referred to in this Appendix are as defined in the Environmental Impact Statement and are:
- i. Sydney CBD;
 - ii. Surry Hills;
 - iii. Moore Park;
 - iv. Randwick; and
 - v. Kensington / Kingsford.

2. Delivery Phase

2.1. General community liaison obligations

- (a) OpCo must comply with the requirements of TfNSW's guidelines and policies and the following documents in relation to its stakeholder and community engagement obligations:
- i. Sydney Light Rail Stakeholder and Community Engagement Strategy;
 - ii. TfNSW Editorial Style Guidelines; and
 - iii. TfNSW Transport Projects Style Guide for Contractors and Consultants.
- (b) OpCo must:
- i. support TfNSW's overall management and coordination of stakeholder and community engagement management, consultation and notification in relation to the SLR and to OpCo's Activities;
 - ii. work with TfNSW to provide a coordinated approach to stakeholder and community engagement management that is consistent across the stakeholders and communities affected by OpCo's Activities and works being carried out by Other Contractors;
 - iii. ensure that TfNSW, stakeholders and the community are provided with adequate notification of planned construction activities and milestones;
 - iv. ensure that stakeholders and the community are fully aware of and understand OpCo's Activities, their objectives, benefits, potential impacts and expected outcomes;
 - v. ensure that TfNSW is informed as soon as practicable of all issues raised by Authorities in relation to OpCo's Activities and is invited to all meetings, presentations and site visits attended by Authorities;
 - vi. ensure that TfNSW is regularly informed of all issues raised by stakeholders and the community;
 - vii. ensure that TfNSW is informed as soon as practicable in relation to planned or unplanned community protests that may arise during the performance of OpCo's Activities;
 - viii. appoint a senior Stakeholder and Community Engagement Manager, as defined in 2.1 (c), reporting directly to OpCo's leadership who is responsible for delivering stakeholder and community engagement requirements of the deed;
 - ix. appoint a dedicated community engagement team, to meet the requirements of the deed. This must include as a minimum those roles defined in 2.1 (d), including appointing at least 3 dedicated place managers and 2 dedicated assistant place managers to conduct day to day community engagement across the 5 precincts along the route, as defined in clause 1.2, as well as the locality of the proposed maintenance and stabling facility in Rozelle, and one community information centre;
 - x. include reasonable allowances of time for stakeholder and community notification, engagement and consultation in the Delivery Program;
 - xi. ensure that Staff comply with the Sydney Light Rail Stakeholder and Community Engagement Strategy and meet the database record keeping requirements;

- xii. provide relevant OpCo managers, including technical experts to attend meetings with stakeholders and the community, as required and requested by TfNSW; and
 - xiii. consult TfNSW prior to taking any action that may impact on stakeholders and the community.
- (c) The Stakeholder and Community Engagement Manager must:
- i. be a senior appointment, reporting directly in to the OpCo leadership or executive team;
 - ii. have minimum 10 years experience in similar roles carrying out community engagement activities;
 - iii. have demonstrated achievement leading and delivering community engagement on complex, high profile projects;
 - iv. demonstrated project management, negotiation and mediation skills; and
 - v. possess tertiary qualification in media, communications, public relations or other relevant discipline, or equivalent experience.
- (d) The community engagement team must be appropriately resourced to meet the requirements of the deed and comprise at least 3 place managers and 2 assistant place managers, who must:
- i. be dedicated full-time to communications, community engagement and stakeholder relations activities;
 - ii. be specialist community engagement practitioners;
 - iii. have demonstrated experience delivering community engagement activities on construction projects; and
 - iv. possess tertiary education and or equivalent experience in public relations, communications or community engagement discipline.
- (e) The community engagement team must include at least one community information centre attendant who must:
- i. be a specialist community engagement practitioner; and
 - ii. possess tertiary education and or equivalent experience in public relations, communications or community engagement discipline.

2.2. Database

- (a) OpCo must use a database software package approved by TfNSW for the collection and recording of details of all contact and correspondence with stakeholders and the community. OpCo must ensure all relevant personnel are formally trained in the use of the database at all times.
- (b) OpCo must update and maintain the database with accurate contact details.
- (c) OpCo must record all contacts with stakeholders and the community and the actions resulting from these contacts in the database within 24 hours.
- (d) All entries made in the database must be in accordance with the requirements in the Sydney Light Rail Stakeholder and Community Engagement Strategy.

2.3. Communications management control group

- (a) TfNSW and OpCo will establish a communications management control group to:
 - i. provide a forum to exchange information and coordinate communication and consultation activities between OpCo, Other Contractors and TfNSW to ensure that a consistent approach to stakeholders and the community and others is delivered; and
 - ii. provide TfNSW with an update on current and upcoming milestones of the Delivery Phase and any associated stakeholder and community issues.
- (b) The communications management control group will be chaired by TfNSW's Representative (or delegate). Membership will comprise such other representatives of TfNSW as may be needed to fulfil its role. OpCo's Stakeholder and Community Engagement Manager and a nominated senior OpCo design and construction representative must attend all meetings of the group. Representatives from key partners and Other Contractors will also be invited to attend by TfNSW.
- (c) The communications management control group will meet on a schedule to be determined by TfNSW, but no less than monthly.
- (d) OpCo must prepare an up-to-date report for each meeting of the group, in a format approved by TfNSW, that sets out all relevant information regarding OpCo's Activities and any actual or potential impact they may have on stakeholders.
- (e) OpCo must provide the following information at each communications management control group meeting:
 - i. a detailed schedule of current and upcoming OpCo's Activities, likely impacts, and proposed communication strategies to address these impacts;
 - ii. an update on any current or emerging issues and/or any promotional opportunities;
 - iii. an update on complaints received and action taken to resolve them; and
 - iv. other information as required and requested by TfNSW.

2.4. Meetings with stakeholders and the community

- (a) OpCo must work collaboratively with TfNSW to coordinate consultation activities with stakeholders and the community.
- (b) OpCo must organise meetings with stakeholders and the community, or attend with TfNSW (as requested) where such meetings are organised by TfNSW, to discuss OpCo's Activities including work in progress, work upcoming, or any issues in connection with OpCo's Activities.
- (c) OpCo must invite TfNSW and advise of the timing, purpose and attendees for all meetings with stakeholders and the community, 7 days prior to them taking place.
- (d) OpCo must advise TfNSW of the purpose for any consultation activities prior to organising. TfNSW will decide its level of involvement.
- (e) OpCo must produce relevant materials for presentation and/or distribution at stakeholder and community meetings.
- (f) OpCo must provide appropriate OpCo personnel to attend and participate in stakeholder and community meetings (including after-hours) as required and requested by TfNSW.

- (g) OpCo's personnel must be informed and suitably qualified to participate and chair the meeting in order to update stakeholders and community on the progress of OpCo's Activities.
- (h) OpCo must provide appropriate personnel to attend and participate in any meetings of working groups established by TfNSW for the SLR as requested by TfNSW.
- (i) OpCo must ensure that the details of all meetings held with stakeholders and the community are recorded in the database within 24 hours of the meeting taking place.

2.5. Public communication material

2.5.1. General requirements

- (a) OpCo must provide information as reasonably required for the production of public communication material that will be produced and distributed by TfNSW, as directed by TfNSW.
- (b) All public communication material produced by OpCo must;
 - i. be consistent with and comply with the TfNSW Transport Projects Style Guide for Contractors and Consultants, the TfNSW Editorial Style Guidelines and the Sydney Light Rail Stakeholder and Community Engagement Strategy; and
 - ii. where applicable, the policies of TfNSW and the Department of Premier and Cabinet in relation to adherence to the government advertising guidelines;
- (c) Any communication material produced by OpCo must be submitted at least 5 Business Days prior to its planned release for TfNSW review and approval. OpCo must amend the content as may be reasonably required by TfNSW and must not release any public communication until it has been approved by TfNSW
- (d) For urgent communications where it is not feasible to provide material to TfNSW 5 Business Days before release, such as notice related to emergency or remedial works, OpCo must provide the material with as much notice as possible along with written advice from the Stakeholder and Community Engagement Manager setting out the reasons why the required notice cannot be provided and the deadline by which approval is requested.
- (e) OpCo must provide a .pdf version of all final communication materials produced and distributed by OpCo to TfNSW before they are delivered to the public.
- (f) Where OpCo's Activities are adjacent to other works being undertaken for other public projects, public communication activities must be coordinated (via the communications management control group) and shared as required before distribution to the public.

2.5.2. Community notifications

- (a) OpCo must notify stakeholders, and the community of current and upcoming OpCo's Activities with the potential to impact on stakeholders and the community.
- (b) OpCo must produce and distribute all community notifications relating to OpCo's Activities. Notifications must be in English and languages widely spoken in the communities where the notifications are distributed. Alternatively, OpCo may provide a translation service to ensure that notifications are easily understood by the community.

- (c) Written notifications must be distributed to all affected commercial and residential properties within a minimum of 500m radius of the works. Local councils must be included in the distribution list for all written notifications distributed within the relevant council's local government area.
- (d) OpCo must issue written notifications to stakeholders and the community at least 7 days before commencing any activity with the potential to impact on any stakeholders or member of the community being undertaken including but not limited to:
 - i. construction commencement;
 - ii. significant milestones;
 - iii. changes to the scope of work;
 - iv. night works;
 - v. changes to traffic conditions;
 - vi. modifications to pedestrian routes, cycleways and bus stops;
 - vii. out of hours work;
 - viii. disruption of residential or business access;
 - ix. disruption of access to cultural, sporting or entertainment events;
 - x. changing or disrupting of Utility Services; and
 - xi. investigation activities.
- (e) OpCo must ensure that the notifications contain all required details, including the following:
 - i. scope of work;
 - ii. location of work;
 - iii. hours of work;
 - iv. duration of activity;
 - v. type of equipment used;
 - vi. likely impacts including noise, vibration, traffic, access and dust; and
 - vii. the SLR 24 hour telephone number, website address, postal address and email address.
- (f) OpCo must provide and erect signage that identifies changes to traffic and access arrangements at least 7 days before:
 - i. making changes to pedestrian routes;
 - ii. impacting on cycle ways;
 - iii. changing traffic conditions; and
 - iv. disrupting access to public transport modes.
- (g) OpCo must, whenever possible, provide written and verbal notification to properties immediately adjacent to or impacted by any emergency works at least two hours prior to commencing any emergency works.

- (h) OpCo must issue traffic alerts at least 7 days before changes to traffic and access arrangements are made by email to all key traffic and transport stakeholders including:
 - i. relevant Authorities;
 - ii. transport operators, including bus, coach and taxi operators; and
 - iii. couriers.
- (i) OpCo must provide written notification to relevant Utility Service Authorities at least at least 7 days before commencing any Utility Service Works.
- (j) Except in the case of emergency works, all notifications to the community and stakeholders must be submitted to TfNSW for approval in accordance with 2.5.1(c).
- (k) OpCo must issue the final versions of all notifications issued to the community and stakeholders in electronic format for uploading onto TfNSW's website.
- (l) OpCo must record all details relating to notifications to the community and stakeholders in the database. For complex or potentially contentious issues or works (for example, major road closures or disruptions to major events), or where directed by TfNSW, an issues-specific communications strategy must be developed to adequately consider, address and manage the communications process. Communications strategies must be submitted to TfNSW for approval at least 5 Business Days prior to the commencement of implementation of the strategy.

2.5.3. Advertisements

- (a) OpCo must plan in advance and develop appropriate advertisements as required to update the community of current and upcoming OpCo's Activities.
- (b) OpCo must prepare and publish advertisements relating to the performance of OpCo's Activities that are required to comply with the law and Approvals.
- (c) OpCo must, as a minimum, advertise in newspapers that cover the geographical areas of OpCo's Activities. For those major stages of the Delivery Phase of the Project that are of city-wide interest, this will include notices in the Daily Telegraph and the Sydney Morning Herald. The advertisements must detail significant traffic management changes, detours, traffic or event disruptions and work outside any working hours contained in the Environmental Requirements at least 7 days before any detour, disruption or change occurs.
- (d) Advertising must comply with the policies of TfNSW and Department of Premier and Cabinet in relation to procurement of advertising services by an external vendor and must adhere to the Government Advertising Guidelines.
- (e) OpCo must submit a draft of all advertisements to TfNSW for approval in accordance with section 2.5.1(c).

2.5.4. Construction update newsletters

- (a) OpCo must include all construction update information requested by TfNSW in its quarterly newsletters to update the community on the status of current and upcoming OpCo's Activities.
- (b) OpCo must develop, produce and distribute a site-specific quarterly construction update newsletter, for each of the precincts defined in section 1.2.
- (c) The quarterly construction update newsletters must:

- i. be site specific, and inform the community of the progress of the SLR and key milestones or activities taking place during the following three months;
- ii. be of high quality, and include relevant photos, maps, graphics and illustrations;
- iii. be at least two A4 double sided sheets in full colour;
- iv. be submitted in draft form to TfNSW for approval in accordance with section 2.5.1(c); and
- v. be distributed to all affected commercial and residential properties within a minimum of 500m radius of the site; and provide the final versions of all newsletters issued to the community and stakeholders to TfNSW in a format that is suitable for uploading onto TfNSW's website on the day they are delivered to the public. Local councils must be included in the distribution list for all newsletters distributed within the relevant council's local government area.

2.5.5. Community emails

- (a) OpCo must provide all construction update information requested by TfNSW that will be used for inclusion in TfNSW's overarching project emails on the status of the SLR.
- (b) OpCo must develop, produce and distribute site-specific monthly community update emails for each precinct.
- (c) The monthly community update emails must:
 - i. be site specific, and inform the community of the progress of the SLR and key milestones or activities taking place during the following month;
 - ii. be submitted in draft form to TfNSW for approval in accordance with 2.5.1(c);
 - iii. for each site, be distributed to registered stakeholders; and
 - iv. be recorded in the database referred to in section 2.2.

2.6. Information to TfNSW

- (a) OpCo must provide accurate information and detailed explanations to TfNSW regarding current and upcoming OpCo's Activities and all associated community impacts.
- (b) OpCo must develop, implement and maintain a stakeholder and community engagement program that includes the key dates for the commencement and conclusion of construction activities, the associated impacts on stakeholders and the community as well as OpCo's strategy for minimising impacts on stakeholders and the community and informing stakeholders and the community.
- (c) The Stakeholder and Community Engagement Manager must meet with TfNSW as required and provide details of OpCo's community engagement activities including the provision of any updated stakeholder and community engagement programs.
- (d) OpCo must provide a person that is available for contact by TfNSW at all times that any OpCo's Activities are being performed, to answer any questions, concerns, complaints or enquires in relation to OpCo's Activities.

2.7. Marketing and promotional opportunities

- (a) OpCo must not commit to marketing or promotional opportunities or develop marketing or promotional materials that relate to the SLR or OpCo's Activities,

without the prior approval of TfNSW in accordance with section 2.5.1(c). This includes:

- i. signage;
 - ii. media articles;
 - iii. advertisements;
 - iv. presentations at conferences;
 - v. photographs;
 - vi. sponsorships;
 - vii. website text and graphics;
 - viii. social media activities;
 - ix. award entries
 - x. case studies; and
 - xi. other corporate materials.
- (b) OpCo must recognise and identify TfNSW's role in any promotional material or award submissions that it develops in relation to OpCo's Activities. Promotional material or award submissions must be submitted in draft form to TfNSW for approval in accordance with section 2.5.1(c).
- (c) OpCo must not participate in any public local events and open days without prior approval from TfNSW.

2.8. Enquiries and complaints management

- (a) TfNSW has established a 24 hour telephone number, postal address and email address to which enquires and complaints can be made. Enquires and complaints determined by TfNSW as relating to OpCo's Activities will be directed to OpCo.
- (b) OpCo must respond to enquiries and manage complaints directed to OpCo by TfNSW as well as any enquires and complaints received directly by OpCo relating to OpCo's Activities.
- (c) OpCo must provide suitably qualified and experienced personnel to respond to enquiries and complaints directed to or received directly by OpCo.
- (d) When responding to enquiries OpCo must:
- i. provide at least a verbal response to telephone enquiries within 2 hours from the time of the enquiry being received unless the enquirer agrees otherwise;
 - ii. provide a written response to letters and email within 24 hours;
 - iii. record the enquiries received in the database within 24 hours; and
 - iv. report monthly on any enquiries received, and response given, to TfNSW in writing.
- (e) OpCo must develop and implement procedures for managing and resolving all stakeholder and community complaints relating to OpCo's Activities that comply with the requirements in "Customer Satisfaction – Guidelines for complaints handling in organisations", ISO 10002:2004, MOD (formerly AS 4269: Complaints Handling) and the requirements in the SLR Stakeholder and Community Engagement Strategy.

- (f) When responding to complaints OpCo must:
- i. record details of every complaint received and how it was managed and closed out in the database referred to in section 2.2 within 24 hours of the complaint being received;
 - ii. investigate and determine the source of the complaint immediately and make an initial call to the complainant where the complaint was received by telephone and/or where a phone number was provided;
 - iii. notify TfNSW if it is considered that the complaint does not relate to OpCo's Activities;
 - iv. appropriately escalate complaints in accordance with the complaints escalation procedures set out in the Sydney Light Rail Stakeholder and Community Engagement Strategy;
 - v. take all actions and implement all measures to prevent the reoccurrence of stakeholder and community complaints;
 - vi. provide a verbal response to the complainant within 2 hours where a phone number was provided or is available in the database referred to in section 2.2;
 - vii. provide a written response to complaints received by email within 4 hours;
 - viii. provide a written response to letters or emails within 24 hours or a verbal response if a contact number is provided; and
 - ix. forward information on any complaints received, including response times and details of any actions undertaken or proposed or investigations occurring, to TfNSW in writing within 1 business day.
- (g) OpCo must comply with all directions from TfNSW in relation to the resolution of any escalated complaints.

2.9. Community information sessions

- (a) OpCo must provide appropriate personnel, including the Stakeholder and Community Engagement Manager and OpCo's technical experts, to attend any community information sessions as required and requested by TfNSW.
- (b) OpCo must provide materials to support the community information sessions as directed by TfNSW.

2.10. Community and business forums

- (a) TfNSW will establish business forums and community forums for each precinct described in section 1.2.
- (b) OpCo must, during the Delivery Phase, develop content for and administer six business forums per year in each precinct and six community forums each year in each precinct.
- (c) The community forums and business forums must:
 - i. focus on key environmental management issues relating to OpCo's Activities;
 - ii. ensure that the requirements of the Planning Approval regarding these community-based and business-based forums are met;
 - iii. be promoted through appropriate channels and ensure impacted community and business stakeholders are invited;

- iv. have relevant photos, maps and illustrations provided in the forums;
 - v. have appropriate mechanisms in place to capture feedback; and
 - vi. include reporting back to forum members on how and why their feedback was or was not used.
- (d) All invitations, notifications and materials for distribution in the forums must be submitted in draft form to TfNSW for approval in accordance with section 2.5.1(c).

2.11. Branding and logos

- (a) All branding and logos must be consistent with and comply with the TfNSW Transport Projects Style Guide for Contractors and Consultants.
- (b) SLR branding must be used on:
 - i. hoardings and construction site signage;
 - ii. vehicles;
 - iii. public materials approved for distribution by TfNSW;
 - iv. reports; and
 - v. clothing, including personal protective equipment.

2.12. Media and Government relations

- (a) OpCo must:
 - i. advise TfNSW of any enquiry / contact by the media or elected government representative as soon as reasonably practicable, but within no more than 2 hours;
 - ii. not provide any statement (verbal or written) or any photographs or illustrations to the media or elected government representatives regarding OpCo's Activities without the prior written approval of TfNSW;
 - iii. not permit any media or elected government representative on any part of the Construction Site without the prior written approval of TfNSW;
 - iv. provide a suitably qualified and experienced media and government relations spokesperson that has comprehensive knowledge of OpCo's Activities to assist TfNSW in the management of media and government relations as required and requested by TfNSW;
 - v. ensure relevant senior staff are available to provide TfNSW with approved relevant information required to respond to media and government enquiries within one hour of receipt of a request from TfNSW for such support;
 - vi. record all contact with the media, other third parties and elected government representatives, and project related articles (paper and web based) and online discussions (blogging) into the database and send copies of articles or web links to TfNSW; and
 - vii. provide a minimum of 20 business days notice to TfNSW of any significant milestones to enable TfNSW to organise official media events.

2.13. Incident communications

- (a) OpCo must prepare an Incident Management Plan that complies with the Sydney Light Rail Stakeholder and Community Engagement Strategy and TfNSW and NSW Government policies and protocols.
- (b) If TfNSW and / or the NSW Government enacts crisis protocols, OpCo must take all necessary measures to comply with the protocols.

2.14. Construction Site inspections

- (a) OpCo must not organise any Construction Site visits by stakeholders or community members without approval from TfNSW. OpCo must provide TfNSW with at least 48 hours prior written notice of all proposed visits.
- (b) TfNSW will also arrange visits to the Construction Site in cooperation with OpCo. OpCo must give access to TfNSW's visitors at all reasonable times.
- (c) OpCo must provide support to facilitate the visits to the Construction Site arranged by TfNSW including the provision of safety equipment, site inductions and site transport.
- (d) OpCo must accommodate regular, periodic visits to the Construction Site by TfNSW for the purpose of photography or videography for promotional purposes. Any photographs or film footage taken by OpCo or TfNSW becomes the property of TfNSW who may, without OpCo's approval, use the photographs and/or film footage for whatever purpose TfNSW deems necessary or appropriate.
- (e) OpCo must take and provide TfNSW with time lapse photography of at least one Construction Site in each precinct, that is suitable for uploading to TfNSW's website, images and drawings of the status of OpCo's Activities.
- (f) The photographs must be a minimum of 300 dpi and be provided on a monthly basis to TfNSW.
- (g) OpCo must submit signed release forms for all people captured in photographs or videos submitted to TfNSW.

2.15. Electronic information

2.15.1. Sydney Light Rail website

- (a) OpCo must, as a minimum, provide the following information in electronic format to be uploaded onto TfNSW's Sydney Light Rail website at www.sydneylightrail.com.au:
 - i. copies of advertisements, traffic alerts, notification letters, and other public material related to OpCo's Activities, that has been published or publicly distributed by OpCo;
 - ii. the Stakeholder and Community Engagement Plan; and
 - iii. photos and videos of completed and current construction, community, environmental and sustainability management activities associated with OpCo's Activities.
- (b) OpCo must not establish any website in relation to Sydney Light Rail.
- (c) OpCo will be required to work with TfNSW to maintain a page on the Sydney Light Rail web site that publishes:

- i. information required to be published to comply with the Planning Approvals; and
- ii. executive summaries of publicly available reports relating to OpCo's Activities.

2.16. Social Media

- (a) TfNSW may set up social media pages required for each of OpCo's Construction Sites and maintain administrator rights. If a social media presence is established for this Project, OpCo may be asked to manage social media pages and provide content for precincts and will do so in accordance with the Sydney Light Rail Stakeholder and Community Engagement Strategy and TfNSW Use of Social Media Policy, which is available at <http://www.transport.nsw.gov.au/sites/default/files/b2b/access-info/use-of-social-media-policy.pdf>
- (b) OpCo must provide responses to any social media platform enquiries or complaints in accordance with section 2.8.
- (c) Where OpCo's Activities are adjacent to Other Contractor's activities, social media updates should be coordinated (via the communications management control group) and shared as required.

2.17. School education program

- (a) OpCo must provide information and photographs for inclusion in TfNSW's school education programs as directed by TfNSW.
- (b) Supporting TfNSW's school education program should be part of the general duties of OpCo place managers, as directed by TfNSW.
- (c) OpCo must ensure that place managers and any other staff that interact with children during TfNSW's school education program undergo the 'Working With Children Check' as required by the NSW Commission for Children and Young People.

2.18. Site inductions and training

- (a) OpCo must ensure Staff are adequately inducted and trained on the stakeholder and community liaison requirements of the deed, including this Appendix, with a particular focus on incident management, incident reporting procedures, community enquiries or complaints, and media enquiries prior to commencing any OpCo's Activities.
- (b) Site inductions and training must be regularly updated to address any actions taken in response to stakeholder and community complaints and any changes to the Stakeholder and Community Engagement Plan.
- (c) OpCo must periodically carry out further inductions and training of persons previously inducted and trained to ensure TfNSW's procedures and protocols remain clear.
- (d) All induction materials must be submitted in draft form to TfNSW for approval in accordance with section 2.5.1(c).

2.19. Community information centre

- (a) OpCo must provide one suitably qualified and experienced community relations team member from 30 days after Financial Close through until the Date of Completion to staff TfNSW's community information centre Monday to Friday 9am to

5pm and provide information and assistance to community information centre visitors including community and school groups.

- (b) OpCo must develop and produce appropriate interactive displays for the community information centre relating to OpCo's Activities as directed by TfNSW within 6 months of the date of the deed.
- (c) The interactive displays must include graphical information, simulations of construction activities and operation, simulations photographs and videos, details of environmental protection work and sustainability initiatives and be updated, as a minimum, on a 3 monthly basis.

2.20 Public safety campaigns

- (a) OpCo is responsible for all matters, including suitable communications, related directly to ensuring the safety of its own operations and passengers. Consistent with its responsibilities OpCo must produce and, on approval of TfNSW, undertake its own communications program at Stops, on-board vehicles and via other channels of communications it manages or controls.
- (b) OpCo must ensure an appropriate level of general public awareness in relation to public safety around the SLR, including the development and implementation of appropriate public safety communications campaigns.
- (c) OpCo must develop all communications to comply with the requirements of section 2.5.1(b) and submit it to TfNSW for approval in accordance with section 2.5.1(c). OpCo must make all changes to form, style, content and tone that may be reasonably required by TfNSW.
- (d) Each year, OpCo must develop a proposed annual program of communications activities that fulfils its obligations as set out in this clause. This annual program will:
 - i. identify the objectives and requirements for public safety communications;
 - ii. set out the proposed program of campaigns and activities it proposed to undertake to fulfil these objectives requirements;
 - iii. for each campaign or initiative, set out the details of the target audiences and the key messages, creative approach and proposed channels, including but not limited to signage, print, electronic and on-systems communications, media, on-line, publicity and other activities, and the rationale for its proposals; and
 - iv. include a program for the detailed development, implementation and delivery of each identified activity.
- (e) OpCo must submit its initial annual program for its first year of operation to TfNSW within 3 months of Financial Close, and thereafter annually three months in advance of the commencement of proposed activities. TfNSW (acting reasonably) will notify OpCo of any changes required to ensure the program complies with the requirements of section 2.20(d), within 5 days of receipt. OpCo must make all changes as may be reasonably required as soon as reasonably practicable and resubmit it to TfNSW for comment.
- (f) Within 5 days of receipt of the revised program, TfNSW will either:
 - i. notify OpCo it has no further comment; or
 - ii. provide further comments, in which case OpCo must resubmit the program and this section 2.20(f) will reapply.

- (e) Notwithstanding anything else in this clause, OpCo must cooperate with TfNSW in the installation of all materials and the transmission of all information and communications at Stops, on-board vehicles and via other channels of communications it manages or controls as reasonably required by TfNSW that is produced by TfNSW for the purpose of assuring public safety and security.

2.21 Community Reference Group and Business Reference Group

- (a) The information OpCo provides to support TfNSW in carrying out the consultation with the Community Reference Group and the Business Reference Group (as required by Schedule B2 (*Action in complying with Planning Approvals*)) must include information on the developing design as reasonably requested by TfNSW's Representative.
- (b) OpCo must document responses to issues raised by the Community Reference Group and the Business Reference Group in relation to the design as reasonably requested by TfNSW's Representative (as required by Schedule B2 (*Action in complying with Planning Approvals*)).

3. Operations Phase

3.1. Nominated representatives

- (a) OpCo must appoint a senior, suitably qualified and experienced Stakeholder and Community Engagement Manager, who reports directly to OpCo leadership to fulfil the requirements of the deed.
- (b) OpCo must also provide a person or persons who have a comprehensive knowledge of OpCo's Activities to support TfNSW and provide the following functions:
 - i. media spokesperson;
 - ii. government relations; and
 - iii. stakeholder relations.

3.2. Compliments, complaints and feedback management

- (a) TfNSW is responsible for establishing the policy framework and supporting service standards for the management of complaints and feedback from customers, the community and other stakeholders.
- (b) OpCo must:
 - i. establish and maintain its own internal systems and processes for managing customer complaints and feedback in accordance with the standards that TfNSW has set, including as a minimum:
 - A. clearly displaying contact information at appropriate locations in the Permanent Light Rail Corridor;
 - B. providing sufficient information on Assets to enable easy identification for feedback purposes;
 - C. classifying complaints and feedback in a way that supports meaningful analysis;
 - ii. respond directly to complaints and feedback it receives directly from Customers;
 - iii. establish and maintain procedures with TfNSW for capturing and handling complaints received via TfNSW feedback channels including www.transportnsw.info and 131 500;
 - iv. provide TfNSW with reports and analysis of Customer feedback in a format approved by TfNSW on a quarterly basis, or as otherwise required; and
 - v. in the event of a Customer complaint being escalated to TfNSW management:
 - A. cooperate in the investigation of the complaint;
 - B. provide any information requested; and
 - C. implement agreed follow up actions, as soon as reasonably practicable.
- (c) TfNSW will specify a common software platform or system for the management of Customer complaints. OpCo will implement and operate the common software platform, in accordance with the process.

3.3. Stakeholder consultation and community engagement

- (a) TfNSW is responsible for leading the development of a transport-wide strategy, policies, principles and standards for stakeholder consultation and community engagement.
- (b) OpCo must:
 - i. act in accordance with these policies and standards, as notified by TfNSW, in its stakeholder consultation and community engagement activities;
 - ii. inform TfNSW of any proposed activities and initiatives; and if requested provide an associated plan and documentation;
 - iii. modify its plans and programs to incorporate such guidance or direction that may be provided by TfNSW from time to time; and
 - iv. inform TfNSW as to the outcomes of any approved activities, including lessons learned and key insights.
- (c) OpCo must, as a minimum, comply with the requirements of TfNSW guidelines and policies and the following documents in relation to its stakeholder and community engagement obligations:
 - i. Sydney Light Rail Stakeholder and Community Engagement Strategy; and
 - ii. any style guidelines developed by TfNSW and directed for use, including the TfNSW Editorial Style Guidelines.
- (d) OpCo must record all contacts with stakeholders and the community and the actions resulting from these contacts in the TfNSW's specified stakeholder database.
- (e) OpCo must develop and implement a Stakeholder and Community Engagement Plan as required in Appendix 43 (*Project Plan Requirements*).

3.3.1. Asset Management Activities

- (a) OpCo must notify stakeholders and the community of current and upcoming Asset Management Activities including any activities with the potential to impact on stakeholders and the community.
- (b) OpCo must issue notifications to stakeholders and the community within a minimum of 500 metres of the activity, 7 days before commencing.
- (c) All notifications must be submitted in draft form to TfNSW for approval in accordance with section 2.5.1(c).

3.4. Media and social media communications management

- (a) TfNSW is responsible for the strategic coordination of media activities across the transport portfolio, including:
 - i. developing the overall communications strategy in relation to media and social media management;
 - ii. developing and maintaining protocols which govern the management of media and social media communications including;
 - iii. general communications protocols;
 - iv. approval and governance protocols; and

- v. media and social media protocols.
- (b) TfNSW will provide adequate advice and guidance to OpCo as to content and timing of media communications.
- (c) OpCo must:
 - i. assist TfNSW in the development of the overall communications strategy and its components and protocols;
 - ii. comply with any protocols developed by TfNSW;
 - iii. provide TfNSW with lists of updated story and media opportunities with as much advance notice as is reasonably practicable, to a schedule that is mutually agreed; and
 - iv. comply with TfNSW guidance as to content and timing.

3.5. Information to TfNSW

- (a) OpCo must provide as required the following:
 - i. timely, accurate and consistent information in relation to all matters pertaining to OpCo as required for Ministerial correspondence, briefings, house folder notes, questions on notice and all other information required by the Minister's office to assist with the functions of government;
 - ii. timely, accurate and consistent information in relation to all matters pertaining to OpCo as required by TfNSW to assist with the management and reporting functions of TfNSW;
 - iii. media management, stakeholder consultation and community engagement activities to assist TfNSW in maintaining and building reputational and brand equity; and
 - iv. accurate communications information and detailed explanations to TfNSW regarding current and upcoming OpCo's Activities and all associated community impacts.
- (b) OpCo must provide information contributing to the production of public communication material that will be distributed by TfNSW as required and requested by TfNSW.
- (c) In delivering the required activities detailed above, OpCo must:
 - i. comply with relevant policies and procedural direction from TfNSW;
 - ii. respond within agreed timeframes;
 - iii. provide suitably qualified resources to prepare materials and liaise with TfNSW; and
 - iv. ensure resource availability, where in-person attendance is required.

3.6. Marketing campaigns and initiatives

- (a) TfNSW, in consultation with OpCo will:
 - i. develop the overall marketing strategy including plans, protocols, and a calendar of activities informed by TfNSW strategic marketing programs and to support OpCo business requirements;
 - ii. develop and maintain:

- A. an annual marketing plan; and
 - B. for each campaign, a channel plan that sets out the marketing activities that will be undertaken, including the activities on the Assets that require OpCo support.
- (b) OpCo must do all things reasonably required to install TfNSW marketing campaign materials on its Assets; to maintain the materials in good condition, replacing them where necessary and removing them when required to do so by TfNSW:
- (c) OpCo must:
- i. consult with TfNSW in the development of the above documents;
 - ii. provide TfNSW with an annual business initiative program which identifies OpCo's business initiatives which require marketing and communications services; and
 - iii. provide updates to this program on a quarterly basis or as needed.

3.7. Parliamentary services and ministerial correspondence

- (a) TfNSW is responsible for:
- i. managing the preparation of responses to all ministerial correspondence, based on advice provided by OpCo; and
 - ii. coordinating all house folder and estimates hearing notes, questions on notice, cabinet submissions and advice, ministerial requested briefings and other similar communications.
- (b) OpCo must:
- i. provide TfNSW with accurate and timely draft advices for all house folder and estimates hearing notes, questions on notice, cabinet submissions and advice, ministerial requested briefings and other similar communications;
 - ii. ensure senior staff are available to liaise with TfNSW (as required) in relation to all ministerial correspondence and government relations functions;
 - iii. ensure that senior staff are on call during all parliamentary sitting days and budget days, with access to key internal stakeholders to meet ministerial deadlines and urgent requests;
 - iv. provide accurate information and prompt turnaround as required by the deadline advised by TfNSW to enable response to ministerial correspondence, parliamentary services and all other requests for information received from the minister's office;
 - v. adhere to the procedures and processes required by TfNSW for the preparation of advice on ministerial correspondence and all other parliamentary services documentation; and
 - vi. provide updates on progress of actions arising from ministerial correspondence and all other parliamentary services documentation as required by TfNSW.

3.8. Crisis communications

- (a) TfNSW is responsible for leading the development of an integrated plan for crisis communications across the transport cluster.
- (b) OpCo must:

- i. develop, maintain, periodically review and update its own crisis communications plans, procedures and practices;
- ii. ensure these plans, procedures and practices comply and integrate with TfNSW and Government policies and protocols; and
- iii. comply with the requirements and protocols set out in the TfNSW crisis communications plans.

3.9. Electronic information

- (a) OpCo must publish and maintain up to date electronic information relating to OpCo's Activities.
- (b) OpCo must provide, as a minimum:
 - i. electronic information required to be published to comply with the Planning Approval; and
 - ii. copies of environmental, sustainability, transport, traffic, and noise and vibration reports relating to OpCo's Activities, that are publically available and the executive summaries of these reports.
- (c) OpCo must obtain permission from TfNSW for all online content in addition to that required as a minimum in section 3.9 (b), above.
- (d) OpCo must comply with all relevant TfNSW policies and guidelines in relation to the publication of information.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 9 – Safety and Systems Assurance

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1. Overview and scope

1.1. General

- (a) This Appendix describes the systems and safety assurance requirements.
- (b) OpCo must progressively provide evidence of the reliability, availability, maintainability and safety of the SLR in accordance with ASA Requirements and Sydney Light Rail will meet the EN 50126:1999, EN 50128:2001, EN 50129:2003, European Common safety method 352/2009, and ASA Standard TS 20001 "System Safety Standard for New or Altered Assets".
- (c) OpCo must have a system, framework and engineering assurance process for assuring OpCo's Activities which meets the Asset Standards Authority requirements for an Authorised Engineering Organisation for the planning, delivery and operation of the infrastructure and services of Sydney Light Rail.

2. Systems Engineering Management

- (a) OpCo must apply its systems engineering framework to all elements of OpCo's Activities and specifically address identification and management of safety and operational risks, systems performance and reliability-critical elements of the SLR.
- (b) OpCo must implement a systems engineering framework which meets the Asset Standards Authority requirements for an Authorised Engineering Organisation for the planning, delivery and operation of the infrastructure and services of Sydney Light Rail.
- (c) OpCo must document its approach to systems engineering management in the AEO Authorisation Management Plan. The TfNSW AEO Guide to Engineering Management may be used for guidance to provide good engineering practice for RAMs and systems engineering.

2.1. Requirements management

- (a) OpCo must develop a SLR requirements analysis, allocation and traceability management (RAATM) register to capture, record, analyse and prioritise requirements, and manage changes to requirements, and maintain traceability to Design Documentation, verification and validation results, and any modifications made during OpCo's Activities.
- (b) The SLR RAATM register must be prepared in IBM® Rational® DOORS® (DOORS®).
- (c) OpCo must:
 - i. prepare and maintain a System Requirements Specification (SRS) which incorporates the requirements of the Business Requirement Specification (BRS) and the SPR, and addresses the SLR system architecture. The BRS shall be issued by TfNSW to OpCo after the date of the deed and the BRS shall be consistent with the deed, including the SPR;
 - ii. develop and maintain a system architecture for the Term;
 - iii. allocate requirements to subsystem elements as identified in the system architecture;
 - iv. prepare and maintain an interface requirements specification identifying interface requirements for all major subsystems and external interfaces;
 - v. maintain traceability between the BRS, the SRS, works brief, subsystem elements, safety requirements, design outputs, verification and validation activities, integration Tests and operational readiness activities and outcomes, and functional responsibilities;
 - vi. maintain traceability between subsystem elements and work packages allocated to subcontractors; and
 - vii. provide reporting on requirements performance in an interchangeable format.
- (d) The SLR RAATM register must include the requirements derived from section 2.1(c).
- (e) OpCo must produce, as a subset of the SLR requirements and traceability register, an SLR engineering assurance register.

- (f) The SLR engineering assurance register must include:
- i. unique identifiers for each system and interface requirement;
 - ii. system requirements, including those requirements originating from safety controls identified by OpCo in the SLR project safety hazard log;
 - iii. a reference to the source of the requirement including deed clause;
 - iv. other references as appropriate including project safety hazard log references;
 - v. an attribute identifying the type of requirement including:
 - A. safety requirements;
 - B. interface requirements including human factors and systems;
 - C. RAMS requirements;
 - D. systems assumptions, dependencies and constraints (ADCs) for integration;
 - E. obsolescence as a requirement for software and equipment; and
 - F. safety critical systems by FMECA;
 - vi. references to the justification of safety requirements, where these have been allocated;
 - vii. subsystem elements that satisfy a particular system requirement, with a link to subsystem requirements or specification document reference, as appropriate;
 - viii. a description of how each requirement will be verified;
 - ix. work package reference;
 - x. Design Documentation reference;
 - xi. independent professional review;
 - xii. the Independent Certifier's comments on Design Documentation;
 - xiii. OpCo's response to Independent Certifier's comments on Design Documentation;
 - xiv. inspection and test plan references; and
 - xv. reference to verification and validation status including the assurance documentation management plan.
- (g) OpCo must maintain traceability between safety requirements in the SLR requirements and traceability register and the SLR project safety hazard log.
- (h) OpCo must demonstrate that system and interface requirements are known and implemented by all design and other groups on the SLR Project including subcontractors.
- (i) OpCo must integrate the engineering assurance registers produced by the Managing Contractor into the SLR requirements and traceability register to demonstrate the systems and safety assurance of the SLR Works.

3. Safety management

3.1. Safety assurance

- (a) OpCo must adopt a safety by design approach and develop, implement and document a safety assurance process for OpCo's Activities which meets the Asset Standards Authority requirements for an Authorised Engineering Organisation for the planning, delivery and operation of the infrastructure and services of Sydney Light Rail and which meets the requirements of EN 50126:1999, EN 50128:2001, EN 50129:2003, European Common safety method 352/2009, and ASA TS 20001 "System Safety Standard for New or Altered Assets".
- (b) OpCo's safety assurance processes must be defined and detailed in the Safety and Systems Assurance Management Plan, which must include a representation of the safety argument using goal structuring notation.
- (c) OpCo's safety assurance activities must be delivered in accordance with the requirements of EN50126.
- (d) OpCo must implement ASA Standard TS 20001: - System Safety Standard for New and Altered Asset on the basis that the project results in "safety significant changes".

3.2. Hazard management and derived safety requirements

- (a) OpCo must put in place a through lifecycle approach to ensure all reasonably foreseeable hazards and safety risks are identified and appropriately managed. All identified hazards must be recorded and managed in a project hazard log.
- (b) OpCo must incorporate all known hazards into the SLR safety hazard log.
- (c) OpCo must document in the Safety and Systems Assurance Management Plan the hierarchy it will follow with regards to hazard controls and eliminate risks so far as is reasonably practical(SFAIRP).
- (d) All elements of the SLR that comprise software, electrical / electronic systems and which have an associated safety function must have a safety integrity level (SIL) determined and documented in accordance with the requirements of EN50126.
- (e) Safety requirements derived from hazard controls identified within the SLR project safety hazard log must be recorded in the SLR RAATM register while maintaining traceability to the SLR project safety hazard log.
- (f) The SLR project safety hazard log must have considered preliminary hazards assessment (PHA), interface hazards assessment, human factors hazards assessment, systems and subsystems hazards assessments (SHA and SSHA) and residual risk for operational handover.
- (g) Verification and validation references for the derived safety requirements, which will be required as part of the safety case, must be recorded within the SLR RAATM register.

3.3. Safety case

- (a) OpCo must develop and maintain a safety case for OpCo's Activities.
- (b) OpCo must provide within the safety case the safety argument for design, construction, commissioning, operation and maintenance of SLR and describe the safety argument using goal structuring notation (GSN).
- (c) All solutions identified by OpCo in order to satisfy goals identified in the GSN model must be supported by robust and traceable evidence that is referenced against the associated requirement in the SLR RAATM register.
- (d) The safety case must specifically address the interface with the pedestrian and motor vehicle environment to demonstrate risk reduction SFAIRP principles are incorporated in the assets and the operational arrangements.

3.4. Progressive safety assurance

- (a) For OpCo's Activities, safety assurance statements and safety assurance reports must be developed, submitted and updated progressively in accordance with the requirements of the ASA in order to demonstrate progressive safety assurance.
- (b) OpCo must prepare a framework to demonstrate how the requirements of the ASA will be assured.
- (c) OpCo must demonstrate the level of progressive assurance for compliance with ASA AEO requirements performed by an independent professional review.

3.5. Safety and Systems Assurance Management Plan

- (a) OpCo must provide within its Safety and Systems Assurance Management Plan details of how it will progressively provide assurance that safety requirements will be met. As a minimum this must be demonstrated by safety cases submitted progressively as follows:
 - i. prior to commencement of OpCo operation on IWLR;
 - ii. at the completion of the preliminary design stage;
 - iii. at the completion of the detailed design stage;
 - iv. prior to energisation of the system;
 - v. prior to staged handover;
 - vi. prior to dynamic testing;
 - vii. prior to integration;
 - viii. prior to passenger service;
 - ix. prior to material changes being implemented on the operational system; and
 - x. prior to handback.
- (b) OpCo must briefly describe within its Safety and Systems Assurance Management Plan the safety reporting system to be used during operations to demonstrate that the safety targets are met during operations.

4. Human Factors

- (a) OpCo must identify all human factors risks associated with OpCo's Activities.
- (b) OpCo must establish and maintain a Human Factors Issue Register (HFIR).
- (c) OpCo must record all identified human factors issues in the HFIR.
- (d) OpCo must develop and implement processes for human factors risk management for OpCo's Activities.
- (e) Human factors principles and processes adopted by OpCo must be documented in the human factors integration plan which must meet the Asset Standards Authority requirements for an Authorised Engineering Organisation for the planning, delivery and operation of the infrastructure and services of Sydney Light Rail.
- (f) OpCo must progressively demonstrate that the SLR is designed to take account of the capabilities and limitations, and the task requirements of the human operators and personnel accessing the systems for maintenance.

5. Reliability, availability, maintainability and safety

5.1. General reliability, availability, maintainability and safety requirements (RAMS)

- (a) OpCo must establish a reliability, availability, maintainability and safety (RAMS) analysis framework which meets the Asset Standards Authority requirements for Authorised Engineering Organisation for the planning, delivery and operation of the infrastructure and services of Sydney Light Rail.
- (b) The process applied in the RAMS performance analysis must be based on EN50126.
- (c) The RAMS analysis process must include functional analysis and failure modes, effects and criticality analysis for all systems, equipment and components that could contribute to OpCo's ability to meet the Service and System Performance Requirements.
- (d) The RAMS analysis conducted by OpCo must take into account all potential factors that might affect the Services, including those which may be beyond the control of OpCo.
- (e) OpCo must conduct analyses at both equipment and Spares level to demonstrate that the performance targets, defined in Service and System Performance Requirements can be achieved.

5.2. RAMS assurance process

- (a) OpCo must develop a RAMS assurance process encompassing the whole SLR lifecycle.
- (b) OpCo must apportion RAMS performance targets to individual rail systems during the design stage and must define them in a RAMS analysis report.
- (c) The sources of all data used by OpCo in RAMS analyses must be identified and justified as being applicable to SLR.
- (d) For OpCo's Activities, RAMS assurance statements and RAMS assurance reports must be developed, submitted and updated on a progressive basis in order to demonstrate progressive RAMS assurance.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 10 – Reporting Requirements

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1. Overview and scope

1.1. General

- (a) This Appendix describes the reporting requirements during the Delivery Phase and the Operations Phase for the SLR.
- (b) OpCo must comply with the reporting requirements of the Operative Provisions and the SPR.

1.2. Scope

- (a) During the Delivery Phase, OpCo must provide the monthly Delivery Phase Progress Report and quarterly and annual environment and sustainability reports.
- (b) During the Operations Phase, OpCo must provide:
 - i. Monthly Operations Performance Reports;
 - ii. Monthly Service Payment Reports;
 - iii. quarterly performance reports;
 - iv. annual performance reports;
 - v. Incident reports; and
 - vi. Special Event reports.
- (c) Each report must address:
 - i. the reporting requirements as set out in this deed, including in the relevant sections of this Appendix;
 - ii. the relevant reporting requirements under the Project Plans; and
 - iii. any other information that TfNSW may reasonably request.
- (d) Each report must be provided in a format agreed with TfNSW, and include a concise executive summary.
- (e) Each report must be provided in the form of two hard copy sets and one electronic copy to TfNSW and during the Delivery Phase, one hard copy and one electronic copy to the Independent Certifier.
- (f) The reports must be prepared and submitted as follows:

Report	Submission frequency and date
Delivery Phase	
Delivery Phase Progress Report	Monthly, within five Business Days after the end of the relevant calendar month.
Environment and sustainability reports	Quarterly, within seven Business Days after the relevant Quarter End
Environment and sustainability reports	Annually, within ten Business Days after the end of the relevant calendar year.
Operations Phase	

Report	Submission frequency and date
Monthly Operations Performance Reports	Monthly, within ten Business Days after the end of the relevant calendar month.
Monthly Service Payment Reports	At times required by clause 25.12 of the Operative Provisions.
Quarterly performance reports	Quarterly, within ten Business Days after the relevant Quarter End.
Annual performance reports	Annually, within ten Business Days after the end of the relevant calendar year.
Special Event reports	Within ten Business Days after each Special Event.
Safety reports	Monthly, or within five business days of a request from TfNSW.
Incident reports	Within 24 hours of any Incident.

2. Delivery Phase Progress Report requirements

2.1. General Delivery Phase Progress Report content

- (a) The Delivery Phase Progress Report must include:
- i. photographic records, using date marked photography, showing manufacture and construction progress for the period;
 - ii. video records of construction progress for the period (nominal duration of 15 minutes per report);
 - iii. separate sections or sub-reports reporting on:
 - A. the Delivery Program;
 - B. safety statistics;
 - C. risk management;
 - D. stakeholder and community engagement;
 - E. environmental management;
 - F. sustainability;
 - G. systems engineering and safety assurance;
 - H. quality; and
 - I. traffic and transport management.
 - iv. progress in achieving RAMS targets;
 - v. the status of any proposed Modifications or approved Modifications;
 - vi. a copy of each certificate issued by the Independent Certifier pursuant to clause 5.4(b) of the Operative Provisions;
 - vii. the status of all Project Plans, including their preparation, implementation, review and modification, and details on any non-conformances identified under any Project Plan;
 - viii. a list of all reports and submissions sent to Authorities, in accordance with section 5.8 of the SPR;
 - ix. interfaces with Other Contractors and Stakeholders, including progress of discussions with relevant Utility Service owners, local Authorities, road Authorities, public transport Authorities and emergency services Authorities;
 - x. the status of all insurances that clause 39 of the Operative Provisions requires OpCo to effect and maintain;
 - xi. rail safety matters, including ONRSR accreditation notifiable occurrences;
 - xii. training of Staff, including current and planned numbers of Apprentices;
 - xiii. evidence that all Staff are aware of and abide by the requirements for the release of information detailed in Appendix 8 (*Stakeholder and Community Engagement*);
 - xiv. status of industrial relations management and any issues;

- xv. geotechnical issues;
- xvi. noise and vibration issues;
- xvii. traffic and transport management reporting requirements detailed in Appendix 11 (*TfNSW's General Specification – G10 Traffic and Transport Management*);
- xviii. progress in achieving Completion as against the Conversion Period and the Conversion Date;
- xix. any information reasonably required by TfNSW to assess whether or not OpCo will, or is likely to, achieve Completion before, within or after the Conversion Period;
- xx. progress in achieving Civils and Systems Completion as against the dates set out in clause 19.16(a) of the Operative Provisions; and
- xxi. any information reasonably required by TfNSW to assess whether or not OpCo will, or is likely to, achieve Civils and Systems Completion before, within or after the dates set out in clause 19.16(a) of the Operative Provisions.

2.2. Delivery Program

- (a) OpCo must update the Delivery Program each month by inputting the actual start and finish dates of all activities during the month and by inputting the percentage progress achieved and the forecast remaining duration on all activities.
- (b) The updated Delivery Program must show the following:
 - i. the critical path to Completion and the second and third critical paths, including with reference to the Conversion Period;
 - ii. a summary program of no more than two pages;
 - iii. all activities planned for the next two months;
 - iv. design status, including the status of the design for each major system, including:
 - A. track line and level, services relocations, road junctions, Rolling Stock, Stops and precincts, the pedestrianised area, the OCC, signalling and communications systems, electrical infrastructure and power supply and Light Rail Maintenance and Stabling Facilities;
 - B. design review; and
 - C. the status of safety in design;
 - v. procurement status, including the status of procurement for each major system, including track, services relocations, Rolling Stock, Stops and precincts, the OCC, signalling and communications systems, electrical infrastructure and power supply and Light Rail Maintenance and Stabling Facilities;
 - vi. construction status, including the status of construction of each major system, including track line and level, services relocations, road junctions, Rolling Stock, Stops and precincts, the pedestrianised area, the OCC, signalling and communications systems, electrical infrastructure and power supply and Light Rail Maintenance and Stabling Facilities;

- vii. commissioning status, including the status of commissioning of each major system, including relocated services, Rolling Stock, the OCC, signalling and communications systems, electrical infrastructure and power supply and Light Rail Maintenance and Stabling Facilities; and
 - viii. the status and activities in relation to OpCo's obligations in respect of Accreditation including ongoing actions for maintaining Accreditation.
- (c) Each Delivery Program activity must include the following:
- i. activity ID;
 - ii. activity description;
 - iii. original duration;
 - iv. early start;
 - v. early finish;
 - vi. total float;
 - vii. percent complete; and
 - viii. remaining duration.
- (d) OpCo must provide a written description of the items listed in section 2.2(b) above, and of the following:
- i. how OpCo will achieve Completion by the Date for Completion and Final Completion by the Date of Final Completion;
 - ii. program strategy;
 - iii. details of the contingency allowed in the updated Delivery Program to Completion, including with reference to the Conversion Period;
 - iv. dependency schedules;
 - v. delivery schedules;
 - vi. details of any activities which have been delayed since the previous update and highlighting activities that could impact the critical path;
 - vii. details of any delays or anticipated delays which may detract from OpCo's capacity to undertake the design, construction, commissioning or to achieve Completion by the Date for Completion, including with reference to the Conversion Period;
 - viii. details of the actions which OpCo is taking to recover any such delays and to ensure that it will achieve Completion by the Date for Completion, including with reference to the Conversion Period;
 - ix. rail safety matters, including Accreditation progress;
 - x. notifiable occurrences;
 - xi. a schedule of all TfNSW obligations and required inputs for the next six months, including a schedule of any / all Hold Points and Witness Points;
 - xii. current and planned resources and staffing levels;

- xiii. current and planned plant and equipment levels;
- xiv. an updated copy of the time chainage diagram showing progress to date and planned future works; and
- xv. any significant changes to the critical path.

2.3. Safety statistics

- (a) The safety statistics section of the Delivery Phase Progress Report must, as a minimum, address and detail:
 - i. the amount of lost time due to injuries / diseases, number of first aid treatments, WorkCover notices/fines and injuries to the public and other WHS lead performance indicators and lag performance indicators;
 - ii. a summary of any traffic or other accidents, Incidents and notifiable events recorded at the Construction Site, or any other locations affected by OpCo's Activities, in accordance with section 4.10 of the SPR;
 - iii. details of any Incident and accident investigation, including the lessons learnt, recommendations made, actions taken and any changes to procedures, working practises and/or the Safety Management System;
 - iv. details of safety audits, including the type, outcomes and non-conformances, status (raised/closed) of issues, the preventative actions, accidents, occurrences, and hazards;
 - v. results of drug and alcohol tests;
 - vi. number of employees on site and hours worked;
 - vii. proactive safety indicators for OpCo's Activities;
 - viii. list of proactive activities undertaken; and
 - ix. list of inspections, audits and number of corrective actions open and closed.

2.4. Risk management

- (a) The risk management section of the Delivery Phase Progress Report must, as a minimum, address and detail:
 - i. OpCo's performance against the requirements of the Risk Management Plan and status of risk management implementation;
 - ii. a summary of key risks and opportunities, as defined in agreement with TfNSW, and corresponding risk treatments or opportunity implementations, either underway or planned;
 - iii. the status and progress of OpCo's Activities and details of key risks likely to affect the updated Delivery Program or the achievement of project objectives including those associated with key stakeholders including the community, key interfaces, WHS, environment and cultural heritage;
 - iv. changes in OpCo's risk profile / risk register since the previous Delivery Phase Progress Report and trend reporting, including:
 - A. new or emerging risks that have been identified;

- B. risks that have increased or decreased in risk exposure / rating;
- C. risks that have occurred and how the impact is being managed; and
- D. risks that have been closed or eliminated; and
- v. the current version of OpCo's risk register.

2.5. Stakeholder and community engagement

- (a) The stakeholder and community engagement section of the Delivery Phase Progress Report must, as a minimum, address and detail:
 - i. OpCo's performance against the stakeholder and community involvement requirements of the Stakeholder and Community Engagement Plan;
 - ii. stakeholder and community enquiries during the month including:
 - A. number and types of enquiries received;
 - B. number and types of complaints received;
 - C. location of enquirer or complainant;
 - D. issues raised;
 - E. response times;
 - F. status;
 - G. how lessons learnt are being applied across the project to avoid issues recurring;
 - iii. media or government enquiries;
 - iv. crisis communications;
 - v. meetings and presentations including audience, issues and outcomes, and in particular a summary of actions taken to resolve issues and actions agreed at the Traffic and Transport Liaison Group meetings;
 - vi. a summary of the feedback from public displays and community forums and business forums detailed in Appendix 8 (*Stakeholder and Community Engagement*);
 - vii. notifications details, including number of notifications sent, notifications topics, notification recipients and notification period achieved (including doorknocks, signage, traffic alerts and advertising); and
 - viii. future events, including upcoming site visits, upcoming milestones, updated stakeholder and community engagement program, night works, potential impacts and proposed communications strategy and opportunities for media or government promotion.

2.6. Environmental management

- (a) The environmental management section of the Delivery Phase Progress Report must, as a minimum, include address and detail:
 - i. OpCo's performance against the environmental management requirements of the Construction Environmental Management Plan;

- ii. the status of the Construction Environmental Management Plan including all sub-plans and environmental construction method statements;
- iii. management strategies for environmental compliance;
- iv. management strategies to identify the need for, and to undertake, consistency reviews under the EP&A Act;
- v. the status of environmental obligations including those identified in OpCo's compliance tracking program;
- vi. the status of and performance against environmental licences held for the SLR Works and Temporary Works;
- vii. OpCo's performance against environmental key performance indicators;
- viii. graphical representation of the monthly frequency of environmental issues and incidents each month for the previous 12 months, including an analysis of trends and what actions are being taken to improve performance;
- ix. details of environmental Incidents or emergencies;
- x. materials tracking, reporting material volumes against baseline, in accordance with the Construction Materials Sustainable Procurement Plan;
- xi. data and performance in accordance with the Construction Environmental Management Plan with reference to:
 - A. Construction Noise and Vibration Management Plan;
 - B. Dust and Air Quality Management Plan;
 - C. Greenhouse Gas Management Plan;
 - D. Soil and Water Management Plan;
 - E. Contamination Land Management Plan;
 - F. Waste Management and Recycling Plan;
 - G. Vegetation Management Plan; and
 - H. Construction Materials Sustainable Procurement Plan;
- xii. environmental inspection reports;
- xiii. the results, findings and any environmentally relevant actions of any internal or external audits carried out; and
- xiv. environmental training and the type of training they received.

2.7. Sustainability

- (a) The sustainability section of the Delivery Phase Progress Report must, as a minimum, address and detail:
 - i. the performance of OpCo against all sustainability targets relating to the Delivery Activities specified in the Construction Environmental Management Plan and the Delivery Phase Sustainability Management Plan;

- ii. data to support reporting on targets, and an analysis of trends including actions to be undertaken to improve performance, for the following:
 - A. electrical energy consumption and generation, including any on-site renewable energy generation and any renewable energy sourced for the Delivery Activities and performance against energy consumption reduction targets;
 - B. the current level of carbon emissions and performance against the carbon emission reduction targets;
 - C. the current level of energy use and performance against the energy reduction target identified in the Delivery Phase Carbon and Energy Management Plan;
 - D. fuel consumption and performance against fuel consumption reduction targets;
 - E. volume of potable and non-potable water consumed including details of the sources of potable and non-potable water consumed and harvested and performance against water consumption reduction and water consumption and harvesting targets;
 - F. quantities of waste recycled, beneficially re-used or disposed of and performance against waste targets;
 - G. the actual volume of spoil reused within the Construction Site, beneficially reused off-site or disposed of off-site against the spoil targets identified in the Spoil Management Plan;
- iii. "Design" and "As Built" performance against the Infrastructure Sustainability Council of Australia rating tool;
- iv. performance against the "compulsory initiatives" and the "discretionary initiatives" required by the Transport for NSW - NSW Sustainable Design Guidelines for Rail Version 2.0 for civil infrastructure corrective actions taken where non-conformances in the design of construction of PPP Works and the Temporary Works were identified;
- v. current workforce status and performance against workforce participation targets for the delivery activities outlined in SPR Appendix 7 (*Sustainability*), including current levels of:
 - A. new recruitments;
 - B. Apprentices;
 - C. Trainees;
 - D. proportion of workforce participating in structured training;
 - E. Workforce Diversity;
 - F. Workforce disadvantaged groups;
 - G. work experience placements; and
- vi. corrective actions taken where non-conformances in the design of construction of the SLR Works and the Temporary Works were identified.

2.8. Systems engineering and safety assurance

- (a) The systems engineering and safety assurance section of the Delivery Phase Progress Report must, as a minimum, address and detail:
- i. record of engagements with ONRSR and ASA;
 - ii. risk review, identifying impediments to Accreditation and mitigation strategies;
 - iii. ongoing actions for maintaining Accreditation; and
 - iv. any audit results, including non-conformities, from ASA or ONRSR audits completed that month;
 - v. statistical data from DOORS®, and graphical representation, to indicate the state of progress of system and subsystem requirements being realised throughout significant stages of the Delivery Activities, including:
 - A. status of existing and newly identified (within that month) requirements;
 - B. where requirements have been traced to;
 - C. proportion of requirements blocked by issues outstanding;
 - D. project safety hazard log statistics including:
 - i. number of new hazards, underlying causes and controls identified during the month;
 - ii. total number of safety requirements within the project safety hazard log;
 - iii. number of uncontrolled hazards within the project safety hazard log;
 - vi. human factor issues current at the time of reporting, including statistics on:
 - A. number of new issues identified during the month; and
 - B. number of outstanding issues.

2.9. Quality

- (a) The quality section of the Delivery Phase Progress Report must, as a minimum, address and detail:
- i. a report on OpCo's performance against the requirements of the Quality Management Plan;
 - ii. a copy of the updated index of quality records including all significant non-conformances identified under the Quality Management Plan together with the dispositions, authorisations and corrective actions undertaken; and
 - iii. a schedule of all audits planned under the Quality Management Plan and the results of any audits carried out under the Quality Management Plan.

2.10. Traffic and transport management

- (a) The traffic and transport management section of the Delivery Phase Progress Report must address and detail the requirements of Appendix 11 (*TfNSW's General Specification – G10 Traffic and Transport Management*).

3. Quarterly Environment and Sustainability Reports

- (a) During the Delivery Phase, OpCo must provide quarterly environment and sustainability reports, which must include as a minimum:
- i. the reporting requirements as per sections 2.6 and 2.7 of this Appendix;
 - ii. reporting against the Delivery Phase Sustainable Design Implementation Plan;
 - iii. reporting against the Carbon and Energy Management Plan; and
 - iv. reporting against the Sustainable Procurement Plan.

4. Annual Environment and Sustainability Reports

- (a) During the Delivery Phase, OpCo must provide annual environment and sustainability reports, which must include as a minimum:
- i. the quarterly reporting requirements as per section 3 of this Appendix;
 - ii. reporting against the Delivery Phase Sustainability Plan;
 - iii. reporting against the Skills and Employment Delivery Plan; and
 - iv. compliance reporting against the Construction Environmental Management Plan.

5. Operations Phase reporting requirements

5.1. Monthly Operations Performance Reports

- (a) OpCo must provide Monthly Operations Performance Reports that address and detail the status and progress of OpCo's operations Activities in the previous month, and provide a forecast of operations activities for the forthcoming month.
- (b) The Monthly Operations Performance Report must include separate sections or sub-reports reporting on:
 - i. the Operations Activities ;
 - ii. patronage;
 - iii. fare evasion;
 - iv. safety performance;
 - v. Asset management;
 - vi. Accreditation; and
 - vii. stakeholder and community engagement.

5.1.1. Operations Activities

- (a) The Operations Activities section of the Monthly Operations Performance Report must include as a minimum:
 - i. performance of OpCo against all operations requirements with reference to the Operations Management Plan;
 - ii. operating statistics, utilising where possible graphs, tables, trend lines and dashboards for:
 - A. events and trends that in the opinion of OpCo are impacting or have the potential to impact on patronage and travel behaviour;
 - B. the number of Services provided for each day, and for each period of the day, in the reporting period compared to the number of Required Services;
 - C. the on time performance achieved for each day in relation to headway and journey time variances greater than 60 seconds;
 - iii. information relating to the overall performance of the SLR:
 - A. details for each day how service perturbations and other incidents were dealt with, the cause and effect on the delivery of Services and the time taken to resume normal operation;
 - B. details for each day the number of non compliances with Minimum Operating Standards, how they were dealt with, the cause and effect on the delivery of Required Services and the time to rectification; and
 - C. the number of planned service disruptions and additional planned service disruptions together with a report on any issues relating to the delivery of temporary service levels or replacement services;
 - iv. the number of:

- A. Vandalism and Graffiti reports and the remedial actions taken;
- B. crime Incidents on the SLR and the action taken; and
- C. Incident reports required by any other legislation and the action taken.

5.1.2. Patronage

- (a) The patronage section of the Monthly Operations Performance Report must include as a minimum:
 - i. passengers carried for each hour of each day on the LRVs by route;
 - ii. passenger Stop loadings for each hour of each day for each Stop; and
 - iii. total passengers carried against forecast'which in the case of IWLR is subject to capacity of the IWLR assets to produce the relevant data.

5.1.3. Fare evasion

- (a) The fare evasion section of the Monthly Operations Performance Report must include as a minimum:
 - i. analysis and reporting against the objectives and targets derived from the Revenue Protection Plan;
 - ii. patronage data and validations by service, route, day and time;
 - iii. resources deployed by route, day and time;
 - iv. fare evaders by type, service, route, day and time;
 - v. number of passengers checked;
 - vi. market intelligence on fare evasion;
 - vii. estimated fare evasion rate; and
 - viii. commentary and key initiatives to reduce fare evasion.

5.1.4. Safety performance

- (a) The safety performance section of the Monthly Operations Performance Report must include as a minimum:
 - i. proactive management, including:
 - A. percentage of planned leadership visits completed (the total number of planned visits completed as compared to the total number planned for the month);
 - B. percentage of planned safety actions closed out(within timeframe);
 - C. hazards reported per month;
 - D. percentage of planned safety audits completed;

- E. safety audits, including the type, outcomes and non-conformances, status (raised/closed) of issues, the preventative actions, accidents, occurrences, and hazards; and
- ii. operations and staff, including:
 - A. lost time injury frequency rate (injury and illness). Based on the following formula:
$$\text{Lost time injury frequency rate} = \frac{\text{Number of lost time injuries/illnesses in the month}}{\text{Total hours worked in the month}} \times 1,000,000.$$

A lost-time injury is as defined in the Australian Standard: Workplace Injury and Disease Recording Standard (Australian Standard 1885.1 – 1990). Work related (compensable) injuries and illnesses are to be included;
 - B. the amount of Staff lost time due to injuries / diseases, number of Staff first aid treatments, WorkCover notices / fines and other WHS lead performance indicators and lag performance indicators;
 - C. notifiable incidents (safety and environmental) with a description;
 - D. driver human error incidents per vehicle operating kilometre;
 - E. the number of drug and alcohol tests undertaken and the total number of negative and positive results;
 - F. number of employees and total hours paid;
 - G. proactive safety indicators for OpCo's Activities;
 - H. list of proactive activities undertaken; and
 - I. list of any inspections, audits and number of corrective actions open and closed;
- iii. Customer impact, including:
 - A. number of customer injuries per 100,000 customer journeys (directly attributable to the operations);
 - B. number of customer injuries from slips, trips and falls per 100,000 customer journeys (subset of above); and
 - C. fatalities (on and off board), (all fatalities with a subset of those related to self harm);
- iv. any accidents or injuries to members of the public;
- v. the disruption to Services arising from any accident; and
- vi. a summary of any traffic or other accidents and notifiable events recorded on the SLR, or any other locations affected by OpCo's Activities, in accordance with section 4.10 of the SPR;
- vii. any Incident and accident investigation, including the lessons learnt, recommendations made, actions taken and any changes to procedures, working practices and/or the Safety Management System.

5.1.5. Asset management

- (a) The Asset management section of the Monthly Operations Performance Report must include as a minimum:
- i. a summary of failures for each Asset category;
 - ii. details and explanation of specific Asset failures and remediation undertaken;
 - iii. details and explanation of how Asset performance has impacted on service delivery for each Asset category;
 - iv. report on actual Asset performance against agreed targets including trend analysis;
 - v. report on the actual maintenance inspection and renewal activities undertaken versus planned maintenance inspection and renewal activities;
 - vi. details and explanation of any engineering allowance (track possession) over-runs and their impacts; and
 - vii. performance against, and variances to the Maintenance Works Program, including the introduction of any new Assets.

5.1.6. Accreditation

- (a) The Accreditation section of the Monthly Operations Performance Report must include as a minimum:
- i. record of engagements with ONRSR and ASA;
 - ii. risk review, identifying impediments to Accreditation and mitigation strategies;
 - iii. record of ONRSR notifiable occurrences and associated corrective actions; and
 - iv. ongoing actions for maintaining Accreditation.

5.1.7. Stakeholder and community engagement

- (a) The Stakeholder and community engagement section of the Monthly Operations Performance Report must include as a minimum:
- i. OpCo's performance against the stakeholder and community engagement requirements of the Stakeholder and Community Engagement Plan;
 - ii. media or government enquiries;
 - iii. crisis communications;
 - iv. complaints received and action taken;
 - v. meetings, presentations and site visits including audience, issues and outcomes;
 - vi. notifications including number of notifications sent, notification topics, notification recipients and notification period achieved; and
 - vii. look ahead including updated stakeholder and community engagement program, potential impacts and proposed communications strategy and opportunities for media or government promotion.

5.2. Monthly Service Payment Reports

- (a) OpCo must prepare and submit a Monthly Service Payment Report at the times required by clause 25.12 of the Operative Provisions which must include, as a minimum:
- i. a completed invoice in the form as per Annexure 3 of Schedule D1 (*Service Payment Regime*);
 - ii. all supporting information required to support the invoice, including:
 - A. approvals and notices relevant to the invoice; and
 - B. any data not already provided in the Monthly Operations Performance Reports that is relevant to the invoice; and
 - C. the Occupation Cessation Date, any revised Occupation Cessation Date, for each Fee Zone, the Occupation Commencement Date, and calculated Daily Fee payable to TfNSW;

5.3. Quarterly performance reports

- (a) During the Operations Phase, OpCo must provide quarterly performance reports that address and detail the status and progress of OpCo's Activities in the previous quarter.
- (b) The quarterly performance reports must include separate sections or sub-reports on:
- i. Operations Activities;
 - ii. Asset performance;
 - iii. risk management;
 - iv. Customer compliments, complaints and feedback; and
 - v. financial performance.

5.3.1. Operations Activities

- (a) The Operations Activities section of the quarterly performance report must include as a minimum:
- i. the monthly reporting requirements, as per section 5.1 of this Appendix;
 - ii. a forward look ahead for the next period, including key planned activities;
 - iii. an analysis of Customer satisfaction survey statistics, utilising where possible, graphs, tables, trend lines, dashboards and narrative on problem areas and actions taken in response to Customer feedback in the categories set out in Schedule D1 (*Service Payment Regime*);
 - iv. the number of Operations Activities Reviews undertaken and action taken on any issues raised in the Operations Activities Reviews;
 - v. significant changes in OpCo's Supply Chain and subcontracting arrangements;
 - vi. summary statement of legally required Incident reports;
 - vii. summary statement of incidents and fault and Incident resolution times;

- viii. summary of Special Event reports;
- ix. a human resources report, including as a minimum:
 - A. a staffing report, showing any changes of key Staff in the quarter together with a summary of actual versus planned staffing numbers by function;
 - B. lost injury time through accidents;
 - C. Staff turnover rates;
 - D. training and development activities undertaken;
- x. details of newly identified hazards and risks by OpCo and actions taken; and
- xi. a status report on planned service disruptions against the Operations Plan and the Asset Management Plan.

5.3.2. Asset performance

- (a) The Asset performance section of the quarterly performance report must include as a minimum:
 - i. the monthly reporting requirements, as outlined in section 5.1 of this Appendix;
 - ii. details of Asset Condition Assessments that have been carried out during the period including details and explanation of all key issues identified and proposed rectifications;
 - iii. progress on any outstanding engineering safety issues;
 - iv. Assets that will be subject to Replacement and Refurbishment in the next quarter;
 - v. Assets that have been subject to Replacement and Refurbishment in the previous quarter;
 - vi. Assets which were identified as failed, defective or otherwise not in a satisfactory operational condition and the reason why Asset Management Activities have not addressed such condition; and
 - vii. an estimate of the remaining serviceable life of any Asset assessed in the relevant quarter and the basis of the estimate.

5.3.3. Risk management

- (a) The risk management section of the quarterly performance report must include as a minimum:
 - i. a summary of key risks, threats and opportunities and corresponding risk treatments either planned or underway;
 - ii. OpCo's performance measured against the requirements of the Risk Management Plan and status of risk management implementation;
 - iii. the status and progress of OpCo's Activities and details of key risks likely to affect operational performance or the achievement of business objectives including those associated with key stakeholders including the community, key interfaces, WHS, environment and sustainability;

- iv. changes in OpCo's risk profile / risk register since the previous quarterly performance report and trend reporting, including:
 - A. new or emerging risks that have been identified;
 - B. risks that have increased or decreased in risk exposure/rating;
 - C. risks that have occurred and how the impact is being managed; and
 - D. risks that have been closed or eliminated; and
- v. the current version of the project risk register.

5.3.4. Customer compliments, complaints and feedback

- (a) The Customer compliments, complaints and feedback section of the quarterly performance report must include as a minimum:
 - i. a register(s) of Customer compliments, complaints and feedback;
 - ii. quantitative analysis of complaints and feedback by type, location, status, initial response time, and total resolution time;
 - iii. trend analysis of compliments, complaints and feedback;
 - iv. qualitative commentary of trends, anomalies and other items of note;
 - v. details of issues requiring attention from TfNSW; and
 - vi. details of improvement initiatives and actions arising from the analysis.

5.3.5. Financial performance

- (a) The financial performance section of the quarterly performance report must include, as a minimum, a statement of income and expenditure, by relevant revenue and cost categories, comparing actual results to budget for the quarter and year to date with a description provided of significant variances for OpCo and the Core Contractors.
- (b) At year end a reconciliation of income and expenditure provided pursuant to (a) above and to audited financial statements required by clause 46.2(a)(ii) and (iii) of the Operative Provisions.

5.4. Annual performance reports

- (a) During the Operations Phase, OpCo must provide annual performance reports that address and detail the status and progress of OpCo's Activities in the previous year.
- (b) The annual performance reports will align with TfNSW reporting periods as notified by TfNSW and must include separate sections or sub-reports on:
 - i. Operations Activities;
 - ii. Asset performance;
 - iii. environment and sustainability; and
 - iv. stakeholder and community engagement.

5.4.1. Operations Activities

- (a) The Operations Activities section of the annual performance report must include as a minimum:
- i. report on how the Operations Management Plan has been applied throughout the period, including in particular:
 - A. a summary of SLR operations throughout the year for normal, degraded and incident operations, in accordance with the minimum operating standards;
 - B. a summary of Special Event operations throughout the year, including a summary of services, patronage, Incidents, feedback and lessons learnt;
 - C. an analysis of safety performance throughout the year, against WHS performance indicators;
 - D. a summary of Incidents occurring throughout the year, including lessons learnt, recommendations made and changes to procedures or working practises; and
 - E. a summary of planned service disruptions against the Operations Plan;
 - ii. a summary report and analysis of patronage carried on a month by month basis;
 - iii. an analysis and report against the objectives and targets derived from the Revenue Protection Plan;
 - iv. any changes or proposed changes to the Operations Plan;
 - v. any changes or proposed changes to the governance of the SLR; and
 - vi. provide a forecast of activities for the forthcoming year.

5.4.2. Asset performance

- (a) The Asset performance section of the annual performance report must include as a minimum:
- i. report on how the Asset Management Plan has been applied throughout the period, noting in particular:
 - A. any changes in Assets;
 - B. any changes in operational performance requirements;
 - C. any changes in the expected condition or life of the Assets;
 - ii. describe and report on how OpCo has discharged its Asset management obligations during the previous year;
 - iii. include for each Asset Category:
 - A. availability performance (actual and trend);
 - B. reliability performance (actual and trend);
 - C. performance against targets;

- D. an Asset Condition Assessment summary which describes the results of the quarterly Asset Condition Assessments undertaken in accordance with section 9.9 of the SPR;
- E. a list of technical risks and how they are being contained and mitigated;
- iv. describe in sufficient detail how the Maintenance Works Program has been delivered. In particular the report must provide:
 - A. details of all Asset inspections and maintenance activities that were planned and subsequently undertaken on each Asset category over the course of the previous year;
 - B. details of all Asset Replacement and Refurbishment activities and modifications undertaken;
 - C. information on all variances from the Maintenance Works Program and must include appropriate mitigation actions;
- v. contain a review of OpCo's Asset Condition Assessments carried out under section 9.9 of the SPR during the previous 12 months and include details and explanation of all key issues identified and proposed rectifications;
- vi. contain a summary and explanation of the results of the Asset Information System data quality audit;
- vii. contain details and explanation of any changes to the Asset Maintenance Standards or Operations and Maintenance Manuals; and
- viii. any proposed changes to the Asset Management Plan and Asset Maintenance Standards with the reason or reasons for the recommendation of the change, which is to include a business case setting out:
 - A. quality and time implications and any other effect on the Asset of undertaking the proposed changes;
 - B. impact the changes will have on OpCo's Activities; and
 - C. how compliance with the deed will be achieved.

5.4.3. Environment and Sustainability

- (a) The environment and sustainability section of the annual performance report must include, as a minimum, details of OpCo's performance against the environmental management requirements of the Operations Phase Environmental and Sustainability Management Plan, and must as a minimum:
 - i. be easy to understand and suitable for publication on TfNSW's SLR project website, and in the format specified by the TfNSW;
 - ii. detail the overall performance against all sustainability targets relating to the Operation Activities set out in Appendix 7 (*Sustainability*);
 - iii. demonstrate continuous improvement of environment and sustainability performance;
 - iv. detail the performance against environmental compliance key performance indicators;

- v. provide Global Reporting Initiatives reporting against the latest Global Reporting Initiatives frameworks available, and evidence that the principles of AA1000 have been applied to sustainability reporting;
- vi. provide any outcomes from independent assurance reports undertaken by OpCo;
- vii. include environmental annual compliance reporting including in relation to, but not limited to:
 - A. Integrated Water Management Plan;
 - B. Carbon and Energy Management Plan;
 - C. Noise and Vibration Management Plan;
 - D. National Greenhouse Gas and Energy Reporting;
 - E. Energy Efficiency Opportunities Act;
 - F. any Environment Protection Licence requirements; and
 - G. requirements of the Planning Approvals;
- viii. specify the energy intensity per passenger kilometre (kWh per passenger km, and kJ per passenger km);
- ix. include graphical representation of the frequency of environmental issues and Incidents each month for the previous 12 months, including an analysis of trends, and what actions are being taken to improve performance;
- x. specify details of environmental incidents or emergencies;
- xi. include a summary of environmental inspection reports;
- xii. incorporate the results, findings and any environmentally relevant actions of any internal or external audits carried out;
- xiii. provide reports that include the number of staff that have received environmental training and what type of training they received;
- xiv. data and an analysis of trends including actions to be undertaken to improve performance, for the following:
 - A. electrical energy consumption and generation, including any on-site renewable energy generation and any renewable energy sourced for the Operations Activities;
 - B. carbon emissions;
 - C. energy use;
 - D. fuel consumption;
 - E. volume of potable and non-potable water consumed including details of the sources of potable and non-potable water consumed and harvested and performance against water consumption reduction and water consumption and harvesting targets;

- F. quantities of waste recycled, beneficially re-used or disposed of and performance against waste targets;
- xv. provide current Workforce status and performance against workforce participation targets, for the Operations Activities outlined in SPR Appendix 7 (*Sustainability*) including current levels of:
 - A. new recruitments;
 - B. Apprentices;
 - C. Trainees;
 - D. proportion of Workforce participating in structured training;
 - E. Workforce Diversity;
 - F. Workforce disadvantaged groups;
 - G. work experience placements; and
- xvi. record corrective actions taken where non-conformances in the Operations Activities were identified.

5.4.4. Stakeholder and community engagement

- (a) The Stakeholder and community section of the annual performance report must include as a minimum:
 - i. a register of stakeholder and community complaints for the year including:
 - ii. number and types of complaints received;
 - iii. location of enquirer or complainant;
 - iv. issues raised;
 - v. response times; and
 - vi. a summary overview of OpCo's performance against Stakeholder and community involvement key performance indicators.

5.5. Incident report

- (a) OpCo must communicate and notify any Incident, other than occurrences requiring only first aid assistance, to TfNSW by telephone within the hour.
- (b) OpCo must prepare and submit an initial Incident report to TfNSW within 24 hours after each Incident other than occurrences requiring only first aid assistance, which must include as a minimum:
 - i. exact details of the Incident, including time and location;
 - ii. confirmation of the notification and communications made in relation to the Incident, including timing and authorities notified;
 - iii. details of the effect of the Incident, including the disruption to services;
 - iv. details of the Incident response and authorities and organisations involved; and
 - v. time and measures taken to recover operations.
- (c) Following on from the initial Incident report, OpCo must produce a final Incident report, within the month following the Incident, which provides details of any Incident

investigation, including the lessons learnt, recommendations made, actions taken and any changes to procedures, working practises, the Incident Management Plan and/or the Safety Management System.

5.6. Special Event report

- (a) OpCo must prepare and submit a Special Event debrief report to TfNSW which must include as a minimum:
- i. details of the Special Event, including name, venue, Stops affected and Indicative Timetable;
 - ii. details of the patronage carried, including LRV and Stop loadings for the duration of the Special Event and for each of the Services;
 - iii. the number and times of any extra Services provided in addition to the Required Services in the Indicative Timetable;
 - iv. the duration of the Special Event and any perturbations to Services as a result of the event;
 - v. any Incidents associated with the Special Event;
 - vi. any lessons learnt from the Special Event; and
 - vii. any Customer or public feedback arising from the Special Event.

5.7. Traffic and transport management reports

- (a) OpCo must prepare and submit traffic and transport management reports for Operations Activities outlined in SPR Appendix 11 (*TfNSW's General Specifications G10 – Traffic and Transport Management*).



Transport
for NSW

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 11 – TfNSW’s General Specifications

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1. TfNSW's General Specifications for SLR

This Appendix contains the TfNSW's General Specifications for SLR identified in Table 1 below.

Table 1 TfNSW's General Specifications for SLR

Specification	Title
Q6	Quality Management System
G10	Traffic and Transport Management
G22	Safety Management (Work Health and Safety and Rail Safety)
G71	Construction Survey



**Transport
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Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 11 – TfNSW’s General Specification Q6 – Quality Management

Document Number: 3126323_11
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1. General

1.1. Introduction

This general specification contains the Quality Management System requirements that are to be met by OpCo during the performance of OpCo's Activities.

Without limiting the requirements of the deed, OpCo must:

- (a) develop, implement and maintain a Quality Management System that complies with ISO 9001;
- (b) develop and implement a Quality Management Plan to cover OpCo's Activities;
- (c) throughout the duration of OpCo's Activities, review, amend and update the Quality Management Plan and associated Quality Management System procedures; and
- (d) keep Quality Records in accordance with clause 2.7 of this general specification.

1.2. Interpretation and definitions

For definitions not specified in this document refer to the deed and SPR Appendix 1 (*Definitions and Acronyms*).

The definitions used in clause 3 of ISO 9000, clause 3 of ISO 9001 and in ISO 15489.1 apply in the interpretation of the words and expressions appearing in this general specification unless stated otherwise.

A reference to an "Annexure" is a reference to an Annexure attached to this general specification unless stated otherwise.

A reference to a "clause" is a reference to a clause of this general specification unless stated otherwise.

In this general specification, the following terms have the following meanings:

- (a) **"Corrective Action Request"** means a form containing a request to rectify any non-conformity or condition adverse to quality;
- (b) **"Identified Record"** means those project records identified in Schedule B2 of Annexure Q6/B;
- (c) **"Inspection and Test Plan"** means the inspection and test plans described in clause 6.1.1;
- (d) **"ITP Form"** means the form that accompanies the Inspection and Test Plans and that are used for recording inspection and test results (including verification checklists). If the Inspection and Test Plan contains the facility to record inspection and test results, the Inspection and Test Plan is also regarded as an ITP Form;
- (e) **"NATA"** means the National Association of Testing Authorities;
- (f) **"Nominated Authority"** means the person or entity that is identified by TfNSW as having the authority to release a Hold Point;
- (g) **"Non-conforming Product Notification"** means a form that identifies a non-conforming product;

- (h) **"Project Record"** means any record generated to document the execution of the project but does not include records which are commercial in confidence or relate to Staff confidential matters;
- (i) **"Project Testing"** means all testing, including sampling, of materials and products carried out on the SLR Site, at concrete and asphalt batch plants or at off-site locations;
- (j) **"Quality Management System"** means a corporate system that details the organisational structure, policies, procedures, practices, recourses and responsibilities for quality management;
- (k) **"Quality Manager"** means the person appointed to the position of Quality Manager by OpCo;
- (l) **"Quality Manual"** means a document setting out the scope of and procedures established for the Quality Management System;
- (m) **"Quality Record"** means a record used to demonstrate conformity to specified requirements and effective operation under the AS/NZS ISO 9000 series or required by this general specification;
- (n) **"Records Management Plan"** means the records management plan described in clause 2.7;
- (o) **"Survey Procedures"** means agreed quality assured measures to control parameters that affect the accuracy of survey techniques;

1.3. Standards and Guidelines

OpCo must comply with all applicable Standards and Guidelines (listed in Appendix 34 (*Standards and Guidelines*)).

1.4. Hold Points and Identified Records

- (a) The Hold Points listed in Schedule B1 in Annexure Q/B must be observed by OpCo.
- (b) Identified Records are nominated in Schedule B2 in Annexure Q/B and are to be created by OpCo.

2. Quality Management System

2.1. General requirements

- (a) OpCo must develop, implement and maintain a Quality Management System that complies with all the requirements of ISO 9001 and this general specification.
- (b) OpCo must apply the following quality assurance practices during the performance of OpCo's Activities:
 - (i) ensure that purchased items conform to the Design Documentation before incorporating them in the SLR Works or the Temporary Works
 - (ii) plan and control work processes;
 - (iii) plan and carry out inspection and testing (including identification and traceability) to verify that the work processes are effective and that all finished work complies with the deed;
 - (iv) carefully select OpCo Contractors and confirm that their work complies with the deed;
 - (v) where the Design Documentation requires plans, procedures, methods and forms to be documented, use these documents in implementing the Quality Management System;
 - (vi) acknowledge and rectify any non-conforming work and improve work processes to prevent recurrence of non-conformities;
 - (vii) keep orderly records to demonstrate that the SLR Works, the Temporary Works and OpCo's Activities comply with the deed; and
 - (viii) improve procedures and work practices when opportunities are identified, to minimise errors, waste and product non-conformities.
- (c) The requirements in this general specification that are additional to the requirements of ISO 9001 may be addressed within the Quality Management System or in the Quality Management Plan. Where documentation of procedures is necessary, it is acceptable to document the procedures either individually or combined with other procedures depending on how OpCo chooses to structure the Quality Management System and the Quality Management Plan.

2.2. Quality Management System procedures

OpCo must document, maintain and implement procedures in accordance with ISO 9001 and the requirements of this general specification as part of the Quality Management System to:

- (a) control project documents (refer clause 2.6);
- (b) manage Quality Records (refer clause 2.7);
- (c) ensure Staff are competent and appropriately trained / qualified (refer clause 4.2.2);
- (d) plan product realisation and preparation of the Quality Management Plan (refer clause 5.1);
- (e) review Customer requirements (refer clause 5.2);

- (f) plan, resource and manage design and development (refer clause 5.3);
- (g) control purchasing and subcontracted work to ensure conformity to specification requirements (refer clause 5.4);
- (h) plan and implement process controls and monitor their effectiveness (refer clause 5.5.1);
- (i) identify and trace products and work (refer clause 5.5.3);
- (j) control inspection and testing activities (refer clauses 6.1.1, 6.2.4);
- (k) plan and implement internal auditing (refer clause 6.2.2);
- (l) identify, record, notify and control non-conforming products or services (refer clause 6.3);
- (m) analyse non-conformities and implement corrective action (refer clause 6.5.2); and
- (n) implement preventive action (refer clause 6.5.3).

2.3. Quality Manual

OpCo must establish and maintain a Quality Manual in accordance with clause 4.2.2 of ISO 9001 using HB90.3 clause 4.2.2 for guidance.

2.4. Quality Management Plan

OpCo must prepare the Quality Management Plan to inform and direct Staff about the specific quality practices, resources, sequence of activities, controls and checks that they have to implement during the performance of OpCo's Activities. OpCo must include or reference in the Quality Management Plan the planning documents listed in Annexure Q/C.

Associated technical documents that OpCo must also provide with the Quality Management Plan include:

- (a) process control plans and work process that OpCo must use to plan and implement controlled conditions for the performance of OpCo's Activities;
- (b) Inspection and Test Plans and ITP Forms that OpCo must use to verify that the SLR Works, the Temporary Works and OpCo's Activities comply with the deed; and
- (c) a schedule of Hold Points and Witness Points and the Nominated Authority for the release of Hold Points.

2.5. Changes to the Quality Management Plan and associated documents

- (a) OpCo must immediately implement changes, where applicable, to the Quality Management Plan and Quality Management System if the Quality Management Plan and associated Quality Management System documents:
 - (i) do not adequately address the requirements of this general specification;
 - (ii) are causing non-conformity;
 - (iii) have to be revised as a result of an audit; or
 - (iv) no longer represent OpCo's current or appropriate practice.

- (b) OpCo must notify TfNSW's Representative promptly of any change to the Quality Management Plan or the Quality Management System and submit to TfNSW's Representative and the Independent Certifier amended documentation detailing the changes, within 5 Business Days of such notification.

2.6. Control of documents

In addition to the requirements of clause 4.2.3 of ISO 9001 and without limiting the deed, OpCo must:

- (a) describe in the Quality Management Plan the processes and approval regime for the modification and updating of the Quality Management Plan;
- (b) describe in the Quality Management Plan how revisions to other documents and data relevant to OpCo's Activities are to be identified; and
- (c) ensure that copies of ISO 9001 and HB90.3 are accessible for reference by OpCo at the Construction Site.

2.7. Control of Project Records

In addition to the requirements of clause 4.2.4 of ISO 9001 and without limiting the deed, OpCo must:

- (a) include in the Quality Records the items set out in Schedule B2 in Annexure Q/B;
- (b) deliver to TfNSW the Identified Records set out in Schedule B2 in Annexure Q/B and the Identified Records set out in each of the other TfNSW's Specifications in accordance with the requirements of clause E2 in Annexure Q/E;
- (c) implement a records management system in accordance with clauses E1 and E2 in Annexure Q/E. OpCo must use ISO 15489.1 and ISO 15489.2 for guidance in developing and implementing the records management system;
- (d) include in the Quality Management Plan a separate sub-plan Records Management Plan for OpCo's Activities in accordance with clauses E1 and E2 in Annexure Q/E. The Records Management Plan must cover the record keeping practices, resources and sequence of activities required to meet all the requirements of this document. The Records Management Plan must be consistent with the Quality Management Plan and include appropriate cross-referencing to the Quality Management System and the Quality Management Plan;
- (e) describe in the Quality Management Plan where the Quality Records are located and how they are stored and maintained in accordance with the procedures in the Quality Management System. OpCo must make the Quality Records available to TfNSW's Representative at all reasonable times. Where requested by TfNSW's Representative, OpCo must permit TfNSW's Representative to copy Quality Records; and
- (f) provide TfNSW's Representative with copies of any Quality Records within 10 Business Days of a request by TfNSW's Representative.

2.8. Submission of documents to TfNSW's Representative

Documents are to be submitted to TfNSW's Representative in accordance with the requirements of the deed.

OpCo must demonstrate how OpCo's Quality Management Plan addresses the requirements of ISO 9001. A compliance matrix is included in Annexure Q/J – Alignment of Quality Management Plan with ISO 9001.

In addition and when requested by TfNSW's Representative, OpCo must provide controlled copies of the Quality Management Plan and any associated Quality Management System documents and records reasonably requested by TfNSW's Representative.

3. Management Responsibility

3.1. Planning

3.1.1 Quality objectives

OpCo must establish project quality objectives as part of the Quality Management Plan. The project quality objectives must be relevant to OpCo's Activities. OpCo must ensure that the project quality objectives are included in the inductions to site management personnel, including relevant personnel of OpCo Contractors.

3.1.2 Quality Management System planning

OpCo must plan the Quality Management System using clause 5.4.2 of HB90.3 for guidance.

3.2. Responsibility, authority and communication

3.2.1 Responsibility and Authority

The Quality Management Plan must:

- (a) include a description of the quality management team structure including the main responsibilities and authorities of key personnel primarily responsible for upholding the quality system obligations under the deed, including responsibilities for:
 - (i) receiving, in-process and final (or acceptance) inspection and testing;
 - (ii) identifying and recording quality problems;
 - (iii) initiating and recommending solutions through designated channels;
 - (iv) ensuring corrective action is implemented and effective;
 - (v) communicating quality management requirements including solutions to problems;
 - (vi) controlling further processing, delivery and installation of non-conforming product until deficiencies or unsatisfactory conditions have been corrected; and
 - (vii) controlling monitoring and measurement devices;
- (b) identify the personnel responsible for the main construction activities including construction trials; and
- (c) identify the personnel with the responsibility and authority for planning and implementing training and induction for the project, including establishing necessary competencies.

3.2.2 Management representative

- (a) Without limiting the deed, OpCo must:
 - (i) nominate in the Quality Management Plan OpCo's designated management representative that has the corporate responsibility and authority for enacting clause 5.5.2 of ISO 9001;

- (ii) nominate in the Quality Management Plan the Quality Manager directly responsible to OpCo's senior management for ensuring the requirements of the Quality Management Plan are implemented and maintained;
- (iii) include in the Quality Management Plan the minimum skills, experience and qualifications required and include the actual qualifications of the Quality Manager in the training records;
- (iv) where the Quality Manager is not OpCo's designated management representative indicate the relationship between them; and
- (v) establish the Quality Manager on the Construction Site if specified in Annexure Q/A. If not required to be on the Construction Site, the Quality Manager must be available for contact by telephone at all times work is being carried out and be available to attend meetings on the Construction Site within 24 hours of written or verbal notice by TfNSW's Representative.

3.2.3 Internal communication

OpCo must implement internal communications processes to comply with the requirements of clause 5.5.3 of ISO 9001, using clause 5.5.3 of HB90.3 for guidance.

3.3. Management review

OpCo must apply clause 5.6 of ISO 9001 for review of the Quality Management System by senior management, using clause 5.6 of HB90.3 for guidance.

The senior management review must include a review of the Quality Management Plan to confirm its continuing suitability and effectiveness for the OpCo's Activities.

4. Resource Management

4.1. Competence, awareness and training

Without limiting the deed, OpCo must:

- (a) include in the Quality Management Plan a site-specific induction and training plan and induction and training procedures to describe competencies required, who is to be trained, when and how; and
- (b) ensure that all Staff have undergone an appropriate induction program that explains how the Quality Management System and Quality Management Plan are to be implemented. At the request of TfNSW's Representative, OpCo must make the induction program available to TfNSW's personnel.

5. Product Realisation

5.1. Planning of product realisation

OpCo must document a product realisation procedure that addresses the requirements of clause 7.1 of ISO 9001. OpCo must describe the method for preparing the Quality Management Plan and include guidelines about how to determine project-specific requirements applicable to OpCo's Activities.

5.2. Customer-related process

OpCo must document a Customer-related procedure that addresses the requirements of clauses 7.2.1, 7.2.2 and 7.2.3(c) of ISO 9001.

5.3. Design development

Without limiting the deed, OpCo must:

- (a) document a design development procedure that addresses the requirements of clause 7.3 of ISO 9001 using clause 7.3 of HB90.3 for guidance; and
- (b) include design plans in the Quality Management Plan for all design activities, including OpCo Contractors engaged for design work. Where an OpCo Contractor undertaking design does not have a Quality Management System conforming to the deed requirements OpCo must include the method of control and verification of the OpCo Contractor's activities as part of the Quality Management Plan.

5.4. Purchasing

5.4.1 Purchasing process

- (a) OpCo must document a purchasing procedure that addresses the requirements of clause 7.4 of ISO 9001. OpCo must include a method to systematically plan and implement surveillance and inspection of OpCo Contractors' work.
- (b) OpCo must document procedures in the Quality Management Plan for including the subcontract requirements identified in Annexure Q/F for Significant Contracts.
- (c) Where an OpCo Contractor is to carry out work or provide services that require process validation, OpCo must evaluate the OpCo Contractor on their capability to perform process validation. OpCo must document the method and results of this evaluation in the Quality Management Plan.

5.4.2 Purchasing information

- (a) OpCo must apply the Quality Management System requirements detailed in clause 5 to all subcontracted products and services procured as part of OpCo's Activities. This includes work process control documents and inspection and testing documents required under clauses 5.5.1 and 6.1.1.
- (b) In obtaining TfNSW's consent for a Significant Contract, OpCo must include associated reference data (except price) and the applicable subcontract requirements listed in Annexure Q/F. When requested by TfNSW's Representative, OpCo must also submit the evaluation of the OpCo Contractor's ability to meet subcontract requirements.

5.4.3 Verification of purchased product

- (a) OpCo must comply with clause 6.1(a) when receiving products from suppliers.
- (b) OpCo must include in the Quality Management Plan, OpCo Contractors' quality plans, or process control documentation used to control processes and to verify purchased product.
- (c) OpCo must plan the extent of surveillance to be exercised for each OpCo Contractor including management of information and records generated by each OpCo Contractor. When planning this surveillance, OpCo must review the documents submitted by each OpCo Contractor to ensure that all process control and inspection and testing requirements from this document are adequately addressed. The surveillance process must include how Hold Points will be released and other activities to verify that the OpCo Contractor's output complies with quality requirements.
- (d) In the Quality Management Plan, OpCo must include the methods of surveillance for the subcontracted work, in accordance with clause 7.4.3 of ISO 9001.

5.4.4 Use of purchased products

OpCo must ensure that purchased products are compatible with the other products and works and are handled, stored, combined with other products, installed and used in accordance with the manufacturer's recommendations.

5.5. Production and service provision

5.5.1 Control of production and service provision

- (a) OpCo must document a product and service provision procedure that addresses the requirements of clause 7.5.1 of ISO 9001 using clause 7.5.1 of HB90.3 for guidance. OpCo must apply the procedures to plan, document, implement and monitor the controlled conditions for each work process. OpCo must address the following (as appropriate) when planning work process controls:
 - (i) sequence of operations;
 - (ii) types of equipment required, capability, maintenance, calibration;
 - (iii) any special working environment aspects;
 - (iv) competency and skills of Staff;
 - (v) work methods and materials to be used;
 - (vi) product characteristics, tolerances and workmanship standards to be met;
 - (vii) use of process control charts, when specified;
 - (viii) inspection, test and control points;
 - (ix) monitoring of the process to ensure its continuing suitability;
 - (x) records to be kept as evidence that the work process controls remain effective;

- (xi) defining responsibility for implementing and monitoring work process controls and rectifying any deficiencies; and
 - (xii) include the work process control documents in the Quality Management Plan.
- (b) OpCo must document all Survey Procedures that address the survey processes and controls used by OpCo as a separate application of work process control in accordance with the requirements of TfNSW's General Specification G71.

5.5.2 Validation of processes for production and service provision

OpCo must identify in the Quality Management Plan any work processes (including subcontracted work) where the resulting output cannot be verified by subsequent monitoring and measurement. In such cases, control of the work processes must be documented and implemented in accordance with the requirements of clause 7.5.2 of ISO 9001.

5.5.3 Identification and traceability

OpCo must:

- (a) document in the Quality Management Plan procedures addressing identification and traceability in accordance with the requirements of clause 7.5.3 of ISO 9001;
- (b) subdivide OpCo's Activities into lots or discrete work areas and control work in accordance with Annexure Q/H;
- (c) document in the Quality Management Plan the methods for subdividing the work into lots or discrete work areas and for allocating lot numbers to uniquely identify each lot;
- (d) reject any lot that is visually non-homogeneous or non-representative;
- (e) identify all samples and test results with the field locations and lot number, as applicable, to which they relate;
- (f) maintain a register that identifies every work lot established for OpCo's Activities; and
- (g) describe in the Quality Management Plan the procedures for maintaining traceability of the materials specified in Annexure Q/G.

5.5.4 TfNSW property

OpCo must include procedures in the Quality Management Plan for implementing the requirements of clause 7.5.4 of ISO 9001 in relation to any property supplied by TfNSW in relation to OpCo's Activities.

5.5.5 Preservation of product

OpCo must include procedures in the Quality Management Plan for implementing the requirements of clause 7.5.5 of ISO 9001 in relation to transport, handling, storage and protection on-site to prevent damage, deterioration and inappropriate use of materials used for OpCo's Activities.

5.6. Control of monitoring and measuring devices

- (a) OpCo must include procedures in the Quality Management Plan for implementing the requirements of clause 7.6 of ISO 9001 in relation to monitoring and measuring

devices used to set out, construct or check the SLR Works and the Temporary Works and to monitor the work environment (as appropriate), including selection of devices capable of the necessary accuracy and precision for the intended applications.

- (b) Monitoring and measuring devices must include measuring equipment for production purposes (such as a concrete batching plant).
- (c) For laboratory testing equipment, NATA certification is accepted as satisfying the requirements of clause 7.6 of ISO 9001.
- (d) OpCo must verify through the audit process, the control of laboratory equipment supplied and operated by OpCo Contractors. OpCo must identify all inspection, measuring and test equipment (other than laboratory equipment) maintained and calibrated by OpCo Contractors, which is used or proposed to be used for OpCo's Activities. For all on-site activities where inspection, measuring and test equipment is maintained and calibrated by an OpCo Contractor, OpCo must ensure that the OpCo Contractor holds, at the locations where the subcontracted work is being carried out, a valid calibration certificate or a copy of the OpCo Contractor's equipment register showing the calibration status of the equipment.

6. Measurement, Analysis and Improvement

6.1. General

In demonstrating conformity of the product to specified requirements, OpCo must carry out inspection and testing:

- (a) before supplied product is used in OpCo's Activities (receiving inspection and testing);
- (b) progressively during construction of the SLR Works and the Temporary Works (in-process inspection and testing); and
- (c) as a final check that all inspection and testing necessary to demonstrate conformity of OpCo's Activities with specified requirements has been carried out (final or acceptance inspection and testing).

6.1.1 Inspection and Test Plans

- (a) OpCo must document Inspection and Test Plan procedures that address the requirements of clause 8.1 of ISO 9001.
- (b) OpCo must prepare Inspection and Test Plans and ITP Forms for all inspection and testing required by the deed. These Inspection and Test Plans and ITP Forms are to be included in the Quality Management Plan.
- (c) OpCo must document procedures for preparation of a schedule of Inspection and Test Plans. In this schedule, OpCo must list all Inspection and Test Plans proposed to be issued with the proposed date for issue. This schedule must be maintained up to date.
- (d) The Inspection and Test Plans and ITP Forms must indicate:
 - (i) who performs the receiving, in-process and final inspections or testing and at what stage of OpCo's Activities;
 - (ii) how the inspection or test is to be carried out and recorded (e.g. as a documented testing procedure or by reference to a standard test method);
 - (iii) the acceptance criteria and frequency of inspection and testing. The detail for the acceptance criteria and frequency of inspection and testing and must replicate the nominated requirements as may be specified. Reference to a clause in a specification alone is unacceptable;
 - (iv) who reviews inspection and test results, evaluates whether OpCo's Activities conform, determines what to do next if OpCo's Activities do not pass a required inspection or test and closes out work lots;
 - (v) when statistical analysis of test results is required;
 - (vi) when non-conformity control is addressed including closing out work lots;
 - (vii) who performs final review of all inspection and test results to confirm that all inspections and tests have been carried out to completely verify conformity for each lot;

- (viii) the time limits for testing, time constraints for submission, and Hold Points and Witness Points in accordance with the schedule of Witness Points and Hold Points; and
 - (ix) the requirements of clause 5.5.3 for identification and traceability.
- (e) OpCo must document procedures for preparation of a schedule of Witness Points and Hold Points. This schedule must list all proposed Witness Points and Hold Points and must be maintained up to date.

6.1.2 Frequency of Testing

- (a) The frequency of testing must be appropriate to verify conformity and must not be less than that stated in relevant standards. OpCo must nominate appropriate frequencies even where no minimum frequency of inspection or testing is stated in relevant standards.
- (b) OpCo must include in the management review of the Quality Management Plan, a review of the appropriateness of the frequency of testing nominated in the Inspection and Test Plans. OpCo must take into account the frequency of non-conformity detected, including non-conformities remedied by simple reworking.

6.1.3 Inspection and Test Status

- (a) OpCo must describe in the Quality Management Plan, the method to be used for identifying and controlling the inspection and test status of all product and OpCo's Activities, including product and work which is incorporated in the SLR Works and the Temporary Works prior to being verified as conforming.
- (b) If inspection and test records (such as a lot register) do not clearly show the inspection and test status of each lot or work area, lots must be physically marked in the field to show whether they conform.

6.2. Monitoring and Measurement

6.2.1 Customer satisfaction

OpCo must describe in the Quality Management Plan, if specified in Annexure Q/A, the methods to be used to assess Customer satisfaction during the project, in accordance with clause 8.2.1 of ISO 9001.

6.2.2 Internal audit

OpCo must document an internal audit procedure that addresses the requirements of clause 8.2.2 of ISO 9001. Furthermore, OpCo should liaise with TfNSW's compliance and assurance personnel to clarify how the management of the internal audit will occur, particularly as it is planned and implemented as per 6.2.2.1 and 6.2.2.2 below.

6.2.2.1 Audit schedule

- (a) OpCo must incorporate in the Quality Management Plan an audit schedule for the project that identifies the following types of audit:
 - (i) audits of the operation of the Quality Management System, to evaluate the effectiveness of the Quality Management System as applied to the project;

- (ii) product or service audits, to assess the conformity of the product or service with the specified technical requirements; and
 - (iii) audits of work process control, to evaluate how effectively work process controls are implemented in practice.
- (b) OpCo must include in audits the activities of OpCo Contractors.

6.2.2.2 Adjustment to audit schedule

OpCo must adjust the audit schedule:

- (a) when the results of previous audits indicate the need for a higher audit frequency;
- (b) when significant changes are made to functional areas of the Quality Management System, including reorganisations and revisions to procedures;
- (c) when safety, performance or reliability of the product is in jeopardy, or suspected to be in jeopardy, due to non-conformity in the Quality Management System;
- (d) when necessary to verify that the required corrective or preventive action has been taken; or
- (e) when required due to changes in OpCo's Delivery Program.

6.2.3 Monitoring and measurement of processes

- (a) OpCo must include procedures in the Quality Management Plan to implement clause 8.2.3 of ISO 9001 to monitor the effectiveness of the work processes used for OpCo's Activities.
- (b) OpCo must review each work process control and the associated documents and inspections and tests while that work process is in progress to monitor whether the planned controls are effective in achieving product conformity.

6.2.4 Monitoring and measurement of product

- (a) OpCo must implement the Inspection and Test Plans for the project, as required by clause 6.1.1.
- (b) OpCo must document and maintain a method to confirm and demonstrate that all products or work lots requiring inspection and testing are so inspected and tested) at the required testing frequency. OpCo must include this method in the Quality Management Plan or Inspection and Test Plan documentation.
- (c) OpCo must arrange sampling and testing to be performed in accordance with Annexure Q/H.

6.2.4.1 Hold Points

- (a) OpCo must describe in the Quality Management Plan the method of arranging for the release of Hold Points.
- (b) OpCo must not proceed beyond a Hold Point until the Nominated Authority has released the Hold Point.

6.2.4.2 Inspection and Test Records

- (a) The inspection, test and verification records for each lot or work area must:

- (i) clearly show or reference the actual results obtained for any inspection and / or test and demonstrate conformity with the specified requirements;
 - (ii) be progressively maintained as results are achieved; and
 - (iii) indicate that control of non-conformity is addressed.
- (b) OpCo must make inspection, test and verification records available for evaluation by the Independent Certifier and TfNSW's Representative. Inspection and test records which are held on the Construction Site must be stored in a room reasonably accessible to the Independent Certifier and TfNSW's Representative with facilities for the inspection of the records. Access must not be limited by OpCo's other management activities.

6.2.4.3 Close-out of work lots and release of products

- (a) Work lots must not be closed out nor product released, dispatched, used or installed until OpCo has fully verified their conformity and incorporated the required inspection, test results and reports, including the documentation referred to in clause 6.2.4.2, into OpCo's records.
- (b) Work lots and products must not be covered up until their conformity has been fully verified, except as permitted below in this clause 6.2.4.3.
- (c) TfNSW recognises that some specified compliance testing may take over 48 hours to complete. In such circumstances, work lots or products may be covered up before lot close-out, subject to the following conditions:
 - (i) OpCo documents an effective traceability or closure method in the Quality Management Plan that nominates the person or position responsible and describes how work or product that may need to be covered up will be identified, traced, recorded and promptly verified and what action will be taken if full conformity is not achieved;
 - (ii) OpCo applies the traceability method on each occasion that a work lot or product is covered up under such circumstances;
 - (iii) any specified verification survey has demonstrated conformity before covering up the work;
 - (iv) OpCo demonstrates on the basis of past work that it is highly unlikely that the work will fail to pass the specified compliance testing;
 - (v) OpCo applies the closure method and only close out the work lot after verifying that the work or product has passed the specified compliance testing; and
 - (vi) where product or work fails to pass any inspection and / or test, the work lot must not be closed out until the non-conformity has been rectified and closed out.

6.3. Control of non-conforming product

- (a) OpCo must document a control of non-conforming product procedure that addresses the requirements of clause 8.3 of ISO 9001 using clause 8.3 of HB 90.3 for guidance. OpCo must prepare a standard form for use as a non-conformity report.

- (b) OpCo must include procedures in the Quality Plan to address the implementation of the additional requirements of this clause 6.3.
- (c) OpCo must identify and control all products or services that fail to pass any inspection or test in accordance with the defined acceptance criteria. Where conformity may be achieved by simple reworking or repair (that is, without reference to the Independent Certifier), OpCo must record the required action in a format to suit OpCo’s continual improvement procedures.
- (d) Where conformity cannot be achieved by simply reworking with the original process, notify the Independent Certifier of the non-conformity and record it on an appropriate register.
- (e) OpCo must submit a non-conformity report within 2 Business Days of detection of the non-conformity indicating the proposed rectification method and when the rectification is to be undertaken.
- (f) If surveillance or an audit by the Independent Certifier or TfNSW’s Representative indicates a non-conforming product that has not been addressed by a non-conformity report, the Independent Certifier or TfNSW’s Representative may issue a "Non-conforming Product Notification". This non-conforming product must be dealt with in the same manner as if OpCo had identified it.
- (g) A non-conforming product must not be covered up nor be further built in unless the non-conformity has been rectified.

<p>HOLD POINT Process Held. Submission Details. Release of Hold Point.</p>	<p>Implementation of rectification work Proposed rectification method for nonconforming product, and any additional supporting documentation where required by either the Independent Certifier or TfNSW’s Representative. The Independent Certifier will consider the submitted documents and may inspect the nonconforming work prior to authorising the release of the Hold Point.</p>
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6.4. Analysis of data

OpCo is required to comply with the requirements of clause 8.4 of ISO 9001.

6.5. Improvement

6.5.1 Continual improvement

OpCo is required to comply with the requirements of clause 8.5 of ISO 9001.

6.5.2 Corrective action

- (a) OpCo must document a corrective action procedure that addresses the requirements of clause 8.5.2 of ISO 9001.
- (b) OpCo must establish and maintain a corrective action register to record a summary of corrective actions or list those records that demonstrate corrective actions.
- (c) If surveillance or an audit by the Independent Certifier or TfNSW’s Representative indicates that OpCo’s Quality Management System does not comply with the provisions of the deed or that a condition adverse to quality exists, the Independent Certifier or TfNSW’s Representative may issue a Corrective Action Request.

- (d) OpCo must rectify any non-conformity or condition adverse to quality notified by the Independent Certifier or TfNSW's Representative. OpCo must take corrective and preventive action to prevent recurrence of the non-conformity or remove the condition adverse to quality and return the completed Corrective Action Request, all within 5 Business Days after the Corrective Action Request is given to OpCo.
- (e) OpCo must address the Corrective Action Request in accordance with OpCo's arrangements for handling Customer complaints as required by clause 7.2.3(c) of ISO 9001.

HOLD POINT	(Where required by the Independent Certifier or TfNSW's Representative)
Process Held.	The process referred to in the Corrective Action Request issued by the Independent Certifier or TfNSW's Representative.
Submission Details.	Details of the corrective action.
Release of Hold Point.	The Independent Certifier or TfNSW's Representative will consider the submitted documents prior to authorising the release any Hold Point.

OpCo must enter details of the developed corrective action onto the non-conformity report or corrective action records, as appropriate.

6.5.3 Preventive action

- (a) OpCo must document a preventative action procedure that addresses the requirements of clause 8.5.3 of ISO 9001. OpCo must include identification and communication of opportunities for improvement to the Quality Management Systems of OpCo Contractors and the Independent Certifier or TfNSW's Representative.
- (b) OpCo must establish and maintain a preventive action register to record a summary of preventive actions or list those records that demonstrate preventive actions.
- (c) OpCo may nominate to TfNSW's Representative those preventive actions records, or parts thereof, which are commercially sensitive and restrict access to them, as agreed with TfNSW's Representative.

7. TfNSW’s Representative and Independent Certifier Surveillance and Audits

7.1. Quality Management System, process quality and product quality audits and surveillance

- (a) Without limiting the requirements of the deed, Quality Management System audits by the Independent Certifier and/or TfNSW’s Representative may be conducted on a scheduled basis on all aspects of OpCo’s Quality Management System and will be performed in accordance with recognised audit procedures.
- (b) The Independent Certifier and TfNSW’s Representative will give OpCo at least 5 Business Days notice that a Quality Management System audit is to be conducted.
- (c) Surveillance, process quality audits and product quality audits by the Independent Certifier or TfNSW’s Representative may be conducted at any time.
- (d) If surveillance or an audit indicates a significant non-conformity of a product or service, the Independent Certifier or TfNSW’s Representative is entitled to conduct a Quality Management System audit at 24 hours notice to OpCo.
- (e) OpCo must make suitable facilities available at the Construction Site to accommodate an audit team of up to 3 persons. The cost of providing such facilities must be borne by OpCo.

7.2. Validation of design

- (a) Without limiting the requirements of the deed, OpCo must provide records, access to the SLR Works and the Temporary Works and assistance for surveillance and audits conducted by the Independent Certifier or TfNSW’s Representative to allow validation of designs.
- (b) The Independent Certifier or TfNSW’s Representative will give OpCo at least 5 Business Days notice in writing of when an audit by the Independent Certifier or TfNSW’s Representative for design validation is to be carried out. The notice will nominate the design to be validated, the names of persons authorised to conduct the audit for design validation and the inspections and tests to be carried out by the auditors.

ANNEXURE Q/A – DETAILS OF WORK

A1 PROJECT-SPECIFIC REQUIREMENTS

Clause	Description	Requirement
3.5.2	Establish the Quality Manager on the Construction Site.	Yes
6.2.1	Describe in the Quality Management Plan the methods to assess Customer satisfaction.	Yes

ANNEXURE Q/B - SCHEDULES OF HOLD POINTS AND IDENTIFIED RECORDS

Schedule B1 SCHEDULE OF HOLD POINTS

Clause	Description
6.3	Implementation of rectification work
6.5.2	The process referred to in the Corrective Action Request issued by the Independent Certifier or TfNSW's Representative#

Note # The imposition of a Hold Point is at the direction of the Independent Certifier or TfNSW's Representative.

Schedule B2 SCHEDULE OF QUALITY RECORDS AND IDENTIFIED RECORDS

The Quality Records and Identified Records must include those records listed in the table below.

ISO 9001 Clause	Quality System Requirement	Quality Record	Identified Record
4.2.2	Quality management system documents	Quality Manual and Quality Management Plan	Yes
4.2.3	Control of documents	List of who holds issued documents Register of current document issue/revisions	No No
4.2.4	Control of records	Index of all Quality Records	Yes
5.6	Management review	Records of management reviews for the project	No
6.2.2	Competence, awareness and training	Personnel qualifications/skills records Induction and training records	No No
6.4	Work environment	Records of work environment controls, where applicable	No
7.2.2	Review of requirements	Minutes of tender/contract reviews	No
7.3	Design control	Design plan, inputs/outputs, changes, verification/review/ validation records	Yes
7.4	Purchasing	Evaluation of OpCo Contractors and suppliers Surveillance, audit of OpCo Contractors OpCo Contractor supplied documentation Certificate of testing by suppliers	No No No No

ISO 9001 Clause	Quality System Requirement	Quality Record	Identified Record
7.5.1	Control of production and service provision	Procedures describing how to control work processes Records demonstrating effectiveness of work process controls. Survey records Records of process validation when applicable	Yes No No No
7.5.3	Identification and traceability	Product batch/traceability records Lot Identification Register	No No
7.5.4	Customer property	OpCo's verification records/reports	No
7.5.5	Preservation of product	Delivery dockets Product preservation control/inspection records	No No
7.6	Control of monitoring and measuring devices	Register of equipment Calibration frequency and certificates	No No
8.1.1	Inspection and test planning	Inspection and test plans	Yes
8.2.1	Customer satisfaction	Customer satisfaction records and actions taken to improve Customer satisfaction	Yes
8.2.2	Internal audit	Audit reports	Yes
8.2.4	Inspection and test records	Records/checklists of inspection and testing Conformity reports for each completed lot	No No
8.3	Control of non-conforming product	Non-conformity reports TfNSW's Representative's or Independent Certifiers Non-conforming Product Notifications Non-conformity Register	Yes Yes Yes
8.4	Analysis of data	Records of analysis of data generated during the deed	No
8.5.2	Corrective action	Corrective action reports and Register TfNSW's Representative's or Independent Certifier's Corrective Action Requests	Yes Yes

ISO 9001 Clause	Quality System Requirement	Quality Record	Identified Record
8.5.3	Preventive action	Preventive action reports and Register	Yes

ANNEXURE Q/C – PLANNING DOCUMENTS

Table C1 - Planning Documents

Q6 Clause	Planning Document
2.2	TfNSW-specific procedures when they are not incorporated into the corporate system procedures
2.2	Description of applicable Quality Management System procedures.
2.6	Description of how changes to documents and data relevant to OpCo's Activities are to be identified
2.7	Description of how Quality Records will be stored and maintained
3.4.1	Project quality objectives established
3.5.1	List of main responsibilities and authorities of personnel primarily responsible for quality assurance activities on this deed
3.5.2	Nominate Management Representative and Quality Manager. Describe reporting relationship, if these positions are held by different people
3.5.2	Minimum qualifications, skills and experience required of the Quality Manager
4.2.2	Site-specific induction and training plan and procedures
5.3	Design plans for all design activities, including OpCo Contractor's engaged for design work
5.4.1	Describe how Annexure Q/F requirements will be included in Subcontracts (when applicable)
5.4.1	Document method and results of OpCo Contractor's evaluation for work processes that require process validation (when applicable)
5.4.1	Purchase planning details (refer Table C2 in Annexure Q/C)
5.4.2	OpCo Contractor's Quality Management Plan or process control documentation for each Subcontract
5.4.3	Method of surveillance for subcontracted work
5.5.1	Work process control documents
5.5.1	Survey procedures, processes and controls

Q6 Clause	Planning Document
5.5.2	Identification of work processes where the resulting output cannot be verified by subsequent monitoring and measurement
5.5.3	Method of maintaining traceability for materials listed on Annexure Q/G
5.5.3	Methods for subdividing the work into lots and allocating lot numbers
5.5.4	Description of how TfNSW supplied property will be dealt with
5.5.5	Method of preserving products
5.6	Method of control of monitoring and measuring devices
6.1.1	Inspection and Test Plans, ITP Record Forms for all inspection and testing required by the specifications
6.1.3	Method for identifying and controlling inspection and test status
6.2.1	Methods to assess Customer satisfaction
6.2.2.1	Audit schedule
6.2.3	Method of monitoring the effectiveness of work processes
6.2.4	Method for verifying that all inspection and / or testing is carried out at the required testing frequency
6.2.4.1	Method for release of Hold Points
6.2.4.3	Traceability / closure method for close-out of work lots
6.3	Control of non-conforming product
6.5.3	Preventive action procedures

Table C2 - Purchase Planning Details

Planning Document	
(a)	Types of product or service subcontracted
(b)	Purchasing schedule which states the timing of procurement of the product or service to be subcontracted and includes provision for the approval process
(c)	OpCo's method of assessment of OpCo Contractor's ability to meet the Subcontract requirements including the Quality Management System requirements specified
(d)	OpCo's plan for inspection and surveillance of OpCo Contractor's to verify the operation of the Quality Management System and product conformity requirements
(e)	All specified inspection and testing shown in OpCo Contractor's Inspection and Test Plans

ANNEXURE Q/D – NOT USED**ANNEXURE Q/E – RECORD KEEPING AND IDENTIFIED RECORDS****E1 RECORD KEEPING****E1.1 General**

The record keeping work to be undertaken by OpCo must as a minimum consist of:

- (a) development and implementation of a Records Management Plan;
- (b) operation, maintenance and review of the Records Management Plan until the Expiry Date and thereafter as required by this document; and
- (c) secure storage of Project Records and delivery of Identified Records.

E1.2 Contractor's Records Management Plan**E1.2.1 Scope of Records Management Plan**

- (a) Without limiting the deed, OpCo must include procedures for the following in the Records Management Plan:
 - (i) the systematic control of the creation, registration, indexing, filing, maintenance, storage, movement, retrieval and disposal of Project Records related to the deed;
 - (ii) providing to TfNSW's Representative the information required under the deed;
 - (iii) submission and delivery of Identified Records as specified;
 - (iv) disaster management (recovery plan) in accordance with clause E1.2.5; and
 - (v) providing a list of Identified Records relevant to the deed which must be progressively handed over to TfNSW.
- (b) OpCo must include an index of Project Records in the Records Management Plan that is consistent with the records management system. OpCo must keep the index up-to-date until the Expiry Date and provide the index to TfNSW's Representative whenever the index is revised.
- (c) OpCo must include a list of Identified Records relevant to the deed in the Records Management Plan.
- (d) OpCo must revise the Records Management Plan and implement more appropriate record keeping practices if the original record keeping practices prove not to be fully effective. OpCo must apply clause 2.6 of this document whenever the Records Management Plan is revised.

E1.2.2 Record Keeping Policy

OpCo must establish a record keeping policy as part of the Records Management Plan. The record keeping policy must define the record keeping objectives of the Project and be

relevant to OpCo's Activities required by the deed. OpCo must introduce the policy to all appropriate Staff as part of the induction process.

E1.2.3 Project Management

- (a) OpCo must nominate in the Records Management Plan a full-time member of OpCo's site management team to be the authorised contact person for communications with TfNSW's Representative on record keeping matters.
- (b) OpCo must detail the responsibilities of the person nominated in accordance with clause E1.2.3(a) above in the Records Management Plan including filing, indexing, storage, movement, retrieval and disposal of records. This person must be fully conversant with the Records Management Plan, OpCo's record keeping system and progress with handover of Identified Records and must promptly provide access to or copies of records to TfNSW's Representative as required.

E1.2.4 Monitoring and Compliance

- (a) The Records Management Plan must state the requirements for review of the Records Management Plan which must be carried out by a senior officer of OpCo's management. OpCo must confirm the continuing suitability and effectiveness of the Records Management Plan for OpCo's Activities.
- (b) OpCo must undertake compliance audits of the Records Management Plan at intervals of not more than 6 months, preferably in conjunction with Quality Management System audits.

E1.2.5 Disaster Management Plan

- (a) OpCo must develop a disaster management plan that provides a set of clear, comprehensive, written, step-by-step instructions to ensure the minimum of loss and disruption of records in the event of an emergency or disaster.
- (b) The disaster management plan must cover all procedures from the time of discovery to the preparation of a final report to TfNSW's Representative and all the information necessary for their implementation.
- (c) OpCo must include the following in the disaster management plan, as appropriate:
 - (i) a list of vital records, particularly significant or vulnerable holding, and location and control documentation;
 - (ii) a list of equipment and materials available for use in disaster salvage and recovery;
 - (iii) the responsibilities of the salvage and recovery team and their contact information;
 - (iv) procedures for identification and declaration of a disaster situation and initiation of the disaster response plan;
 - (v) provisions for the training and current awareness of the team;
 - (vi) a list of sources of back-up resources, which may include expert personnel, materials equipment, vehicles and accommodation;

- (vii) procedures for updating and testing the plan; and
- (viii) simple technical information on the handling of damaged material, directed towards establishing priorities for early action.

E1.3 Project Records: Basic Record Keeping Requirements

E1.3.1 General

- (a) Project Records include the following:
 - (i) submissions, information, data and records relating to OpCo's Activities;
 - (ii) Quality Records as shown in Schedule B2 in Annexure Q/B of this document;
 - (iii) Identified Records as shown in Schedule B2 in Annexure Q/B of this document;
 - (iv) Identified Records relating to WHS activities as shown in SPR Appendix 11 (*TfNSW's General Specification G22 – Safety Management*);
 - (v) Identified Records relating to surveying activities as shown in SPR Appendix 11 (*TfNSW's General Specification G71 – Construction Surveys*);
 - (vi) As-built documentation; and
 - (vii) Delivery Programs as specified in the deed.
- (b) The Project Records must be:
 - (i) sufficiently comprehensive to demonstrate compliance with deed requirements. This includes OpCo Contractor and supplier records, where relevant;
 - (ii) accurate, legible and fully completed;
 - (iii) kept in order, particularly in the case of multi-page records;
 - (iv) filed in such a way that individual records can be readily retrieved;
 - (v) filed promptly after they are generated or received;
 - (vi) securely maintained to prevent unauthorised access, alteration, removal, deterioration, damage or loss;
 - (vii) kept track of where authorised removal or transfer of records within the company is permitted; and
 - (viii) entered on a register which shows what records are handed over to TfNSW's Representative or sent to other parties including the date and method of hand-over / dispatch.
- (c) OpCo must make all Project Records available to TfNSW's Representative at all reasonable times. When requested by TfNSW's Representative, OpCo must permit TfNSW's Representative to copy such records.

- (d) OpCo must provide up-to-date index of all Project Records to TfNSW's Representative. Following the provision of that index, OpCo must provide copies of any Project Records within 10 Business Days of a request by TfNSW's Representative.

E1.3.2 Form of Records

- (a) OpCo must keep records as paper files and in electronic form in accordance with clause 9 of ISO 15489.1 and clause 4 of ISO 15489.2 unless otherwise provided in the deed or agreed with TfNSW's Representative.
- (b) OpCo must store records on media that ensure their useability, reliability, authenticity and preservation in accordance with the deed. The media and formats used for making records must be in accordance with clause 9 of ISO 15489.1.

E1.3.3 Storage

OpCo must store and maintain Project Records or copies thereof such that they are readily retrievable by TfNSW, in facilities that provide a suitable environment to minimise deterioration or damage, and to prevent loss.

- (a) OpCo must store Project Records:
- (i) prior to the Expiry Date at the location or locations specified in the deed or, failing such specified location at the place where the respective records are used; and
 - (ii) after the Expiry Date, at a secure and accessible location within Sydney Metropolitan area. OpCo must inform TfNSW's Representative of the street address of the location. The location must not be changed without notifying TfNSW's Representative.

E1.3.4 Retention Period

OpCo must keep all Project Records for a minimum of ten years after the Expiry Date. This requirement continues to apply even though the records or copies of the records may have been given to TfNSW's Representative or if TfNSW's Representative may have taken copies of the Project Records.

E1.3.5 Disposal of Records

OpCo must pulp, shred or burn records in industrial facilities when disposing of Project Records after the expiration of the retention period. OpCo must not dump Project Records.

E2 IDENTIFIED RECORDS

E2.1 General

- (a) OpCo must deliver Identified Records to TfNSW's Representative in accordance with clauses E1 and E2 of this Annexure Q/E.
- (b) OpCo must compile a comprehensive list of all Identified Records from all sources, including the deed and all TfNSW's Specifications. The list is to be included in the Records Management Plan.
- (c) The TfNSW's Representative may direct that records be added or deleted from the list of Identified Records.

E2.2 Form of Identified Records

- (a) Unless otherwise provided in the deed or agreed with TfNSW's Representative, all Identified Records must be delivered to TfNSW's Representative in hard copy on paper size A3 or A4 in good quality file housing and covering except that as-built drawings must be on paper size A2. The paper must be premium bond paper of minimum weight 80 grams per square metre. The colour must be white unless the record is normally maintained in some other colour for ease of identification when that colour may be supplied.
- (b) The use of thermal paper is not acceptable.

E2.3 Filing and Indexing

OpCo must file and index Identified Records in accordance with the Records Management Plan.

E2.4 Delivery

- (a) OpCo must deliver Identified Records to TfNSW's Representative progressively during the course of the deed at the times specified in the deed or if not so specified at the such times or within such periods as reasonably determined by TfNSW's Representative.
- (b) Prior to the Expiry Date, OpCo must make arrangements with TfNSW's Representative for the delivery of any outstanding Identified Records.

E2.5 Records to be Kept by OpCo

Notwithstanding that Identified Records have been delivered to TfNSW's Representative or TfNSW's Representative has copies of Identified Records, OpCo must retain the originals of those records or where originals are not held by OpCo, good quality copies of records for the period specified in clause E1.3.4 of this Annexure Q/E.

ANNEXURE Q/F – SIGNIFICANT CONTRACTS REQUIREMENTS

Significant Contracts must include the information in the following table:

Significant Contracts Requirements

- (a) Quality Management System requirements which must be addressed by the OpCo Contractor’s Quality Management System;
- (b) method to be used for identifying purchased products;
- (c) verification requirements to be carried out by the OpCo Contractor;
- (d) points in the OpCo Contractor’s Inspection and Test Plans where OpCo must verify conformity to deed requirements;
- (e) Hold Points and Witness Points to be observed by the OpCo Contractor;
- (f) requirements for the submission, retention and disposal of documentation, Quality Records and Identified Records;
- (g) identification and traceability requirements for work lots and product ;
- (h) any specific requirements with regard to process control activities;
- (i) requirements for the submission of Inspection and Test Plans, procedures and record forms;
- (j) requirements for calibration of OpCo Contractor’s measuring and test equipment;
- (k) for subcontract surveying services, requirements to comply with Appendix 11 (*TfNSW’s General Specification G71 Construction Survey*);
- (l) for subcontract sampling / testing services, requirements to comply with Annexure Q/H;
- (m) right of TfNSW’s Representative to monitor, audit, inspect, test and sample OpCo Contractor’s management systems and plans, products, designs and activities and to inspect and copy records and reports on the OpCo Contractor’s performance;
and
- (n) requirements for warranties in the name of TfNSW.

ANNEXURE Q/G - PRODUCT TRACEABILITY

OpCo must, as a minimum, apply traceability to the following products:

Product	Requirement
Concrete and Grout	The trace must start at the batch plant and finish at the location where the material is incorporated in the SLR Works or the Temporary Works. Records must be kept of the batch quantities and time, testing details and location of placement.
Sand Fill	The trace must start at the location where sand is obtained and finish at the location where the material is incorporated in the SLR Works or the Temporary Works. Records must be kept of the quantities and locations of placement that relate to tests undertaken. Details of testing and location of placement must be recorded.
Stabilised material used in pavements.	The trace must start at the location where material is obtained and finish at the location where the material is incorporated in the SLR Works or the Temporary Works. Records must be kept of the quantities and locations of placement that relate to tests undertaken. Details of testing and location of placement must be recorded.

<p>Asphalt used in wearing courses, intermediate courses and drainage layers.</p>	<p>The trace must start at the batch plant and finish at the location where the material is incorporated in the SLR Works or the Temporary Works. Records must be kept of the batch quantities and time, testing details and location of placement.</p>
<p>Steel (Structural and Reinforcement)</p>	<p>The trace must start at the steelworks and finish at the location where the material is incorporated in the SLR Works or the Temporary Works. Records must be kept of the steel heat number, testing details and location where the material is incorporated in the SLR Works or the Temporary Works.</p>
<p>Precast Concrete Products</p>	<p>The trace must start at the manufacturing plant and finish at the location where the precast concrete product is incorporated in the SLR Works or the Temporary Works. Records must be kept of the batch quantities and time, testing details and location of placement.</p>

ANNEXURE Q/H – SAMPLING AND TESTING PROCEDURES

H1 IDENTIFICATION OF WORK LOTS

- (a) OpCo's Activities must be subdivided into lots or discrete work areas. A lot must consist of a continuous portion of homogeneous and/or representative material or end product produced under essentially constant conditions. Discrete portions of a lot that are visually non-homogeneous and / or non-representative must be excluded from the lot and must be either treated as separate lots or reworked to achieve conformity.
- (b) The size of a lot must not exceed one day's output except where full conformity cannot be achieved in one day. Lot sizes that exceed one day's output must be approved by the Independent Certifier.
- (c) OpCo must describe in the Quality Management Plan how the lot is to be identified in the field.
- (d) OpCo must determine the bounds of each lot before sampling and set the bounds of each lot so that each lot is represented by a single tested sample, except where statistical methods (which require several tested samples to represent a lot) are used. Each acceptance criterion may have different lot boundaries. OpCo must demonstrate the relationship of the boundaries of all adjacent lots to confirm that the lots represent the total work.
- (e) Each lot must be given a unique lot number. This lot number must be used as an identifier on all Quality Records. The lot numbering system must be compatible with any activity numbering system used for OpCo's Delivery Program. OpCo must record the lot number on an appropriate register that indicates the three-dimensional location of the lot. OpCo must include in the Quality Management Plan details of the lot numbering system and the place where the lot register is kept. OpCo must record chainages of start and finish, lateral location and layer location, as relevant. When the lot number does not indicate the location of the lot the method for identification of the lot must be agreed with the Independent Certifier.

H2 TESTING SERVICES

H2.1 General

H2.1.1 NATA Accreditation

- (a) OpCo must apply the requirements of clause H2 to all Project Testing laboratories verifying conformity of materials and work used for the deed. OpCo must ensure all OpCo Contractors required to use or supply tested materials or work are informed of and implement the requirements of clause H2 and testing requirements in any relevant specifications.
- (b) If NATA has not accredited a laboratory for a test, the test must be carried out by a laboratory accredited for the test by an organisation recognised by NATA. The test must be carried out and results endorsed in accordance with accreditation conditions or by a laboratory approved by NATA.

H2.1.2 Laboratory Independence

- (a) OpCo and laboratories must ensure objectivity and impartiality in sampling, testing and reporting of results. The laboratories must act independently of OpCo, any of OpCo's Subcontractors and TfNSW's Representative in conducting the sampling and testing.
- (b) Independence, for the purposes of this clause, means "management and personnel are free from any undue internal and external commercial, financial and other pressures and influences that may adversely affect quality of their work".

H2.1.3 Sampling Personnel

Sampling, including selection of locations, must be conducted by personnel either accredited by NATA for that sampling procedure or who are from a NATA accredited laboratory and who have been assessed as proficient for that sampling procedure and must be supervised by an officer having NATA signatory approval for that process.

H2.1.4 Test Certificates

Test results for each lot must be reported in NATA endorsed documentation.

H2.2 Project Testing

H2.2.1 Project Testing Laboratories

- (a) OpCo must engage one or more project laboratories that hold NATA accreditation to undertake the Project Testing.
- (b) OpCo must provide TfNSW's Representative, on request, copies of NATA audits, relevant to the type of tests carried out for the deed.
- (c) TfNSW's Representative may forward to NATA, copies of test records, certificates, reports of surveillance, performance and audits of any laboratory used for sampling and testing the conformity of materials and work.

- (d) OpCo must ensure that the same Project Testing laboratory responsible for testing the sample undertakes the sampling.
- (e) Should OpCo propose sampling and testing by personnel other than from a Project Testing laboratory, OpCo must ensure that the sampler has NATA accreditation for the specified sampling methods (where applicable) and understands the requirements for independent random and unbiased sampling. If NATA accreditation does not apply for any sampling or testing method, OpCo must ensure that the sampler and tester are suitably trained and competent.

H2.2.2 Inspection and Test Plans

- (a) OpCo must provide Project Testing laboratories with all information, including relevant parts of the deed and OpCo's Inspection and Test Plans and ensure that the Project Testing laboratory performs sampling and testing in accordance with the deed.
- (b) Project Testing laboratories that provide testing services must independently review OpCo's Inspection and Test Plans (and OpCo's Contractors) to confirm that:
 - (i) all conformity tests are identified; and
 - (ii) sampling and test methods, acceptance criteria and frequency of testing conform to specified requirements.
- (c) Any discrepancies must be resolved between OpCo and the Project Testing laboratory and amended Inspection and Test Plans issued where appropriate. The Project Testing laboratory, for each submission of Inspection and Test Plans must supply to TfNSW's Representative, prior to commencement of any sampling and testing, a written report describing the outcome of this review.

H2.2.3 Selection of Sampling Locations

OpCo must define lots and Project Testing laboratories must select appropriate sampling locations. Sampling must not be restricted to locations dimensioned or otherwise defined for setting out the SLR Site, but must be undertaken in a random or unbiased manner at any location within the SLR Site.

H2.2.4 Test Certificates and Declarations

The test certificates for each lot must include the following details:

- (a) identification of work and materials with the relevant lot number;
- (b) where sampling is performed by personnel other than from the Project Testing laboratory undertaking the testing:
 - (i) declaration from the sampler that the sampling was carried out in accordance with Annexure Q/H and the specified sampling methods. Detail all samples taken as part of the lot; and
 - (ii) declaration by an officer having NATA signatory approval for the testing performed, that the test results, and statistical analysis where applicable and conform to the specified criteria. This declaration must reference OpCo's Inspection and Test Plan and the sampler's declaration;

- (c) where sampling is performed by personnel from the Project Testing laboratory undertaking the testing a declaration by an officer having NATA signatory approval for the sampling and testing performed that the sampling was carried out in accordance with Annexure Q/H and the specified sampling methods, test results, and statistical analysis (where applicable) conform with the Inspection and Test Plan. This declaration must reference and indicate the issue number or date of Inspection and Test Plan; and
- (d) declaration that no samples have been abandoned or untested or details of any samples that have been abandoned or untested for any reason.

H.2.2.5 Availability of Sampling and Testing Records

- (a) OpCo must make sampling and testing records available for evaluation by the Independent Certifier and TfNSW's Representative. Sampling and testing records which are held on the SLR Site must be stored in a room readily accessible to the Independent Certifier and TfNSW's Representative with facilities for inspection of the records. Access must not be limited by the Project Testing laboratories other management activities.
- (b) The Project Testing laboratories, on request, must independently provide to TfNSW's Representative concurrently with submission to OpCo, test certificates, including preliminary test results.
- (c) TfNSW's Representative must be given physical access to sites where sampling and testing is performed and to sampling and testing personnel in conjunction with or through OpCo. OpCo must nominate a member from the Project Testing laboratories to be the authorised contact person for communications with TfNSW's Representative in sampling and testing matters. This person must be fully conversant with the relevant specifications, specified test methods, the test carried out and testing records and must promptly provide, when requested, information on testing and access to, or copies of, testing records including worksheets to TfNSW's Representative.

H2.3 Protection of Sampled Work

Samples removed from the SLR Site must be replaced, unless otherwise specified, with similar material placed and finished in accordance with the relevant specification requirements, within 5 Business Days of sampling and prior to the use, deterioration, contamination or covering up of the sampled work.

ANNEXURE Q/I - SURVEY PROCEDURES

Carry out survey in accordance with the TfNSW's General Specification G71 (*Construction Survey*).

ANNEXURE Q/J – ALIGNMENT OF QUALITY PLAN WITH ISO 9001:2008

OpCo must demonstrate how OpCo's Quality Management Plan addresses the requirements of ISO 9001:2008.

The compliance matrix below has two columns:

- (a) Column 1 contains ISO 9001:2008 Elements, sections and sub-sections
- (b) Column 2 – OpCo is to identify where and how the Quality Management Plan addresses the requirements of ISO 9001:2008

AS/NZS ISO 9001:2008		ALIGNMENT TO CONTRACTOR QUALITY PLAN	
Clause	Quality Management System Element	Clause	Comments
4	QUALITY MANAGEMENT SYSTEM (QMS)		
4.1	General Requirements		
4.2	Documentation requirements		
4.2.1	General		
4.2.2	Quality Manual		
4.2.3	Control of documents		
4.2.4	Control of records		
5	MANAGEMENT RESPONSIBILITY		
5.1	Management commitment		
5.2	Customer focus		
5.3	Quality policy		
5.4	Planning		
5.4.1	Quality objectives		
5.4.2	Quality management system planning		
5.5	Responsibility, authority and communication		
5.5.1	Responsibility and authority		
5.5.2	Management representative		
5.5.3	Internal communication		
5.6	Management review		
5.6.1	General		
5.6.2	Review input		
5.6.3	Review output		

AS/NZS ISO 9001:2008		ALIGNMENT TO CONTRACTOR QUALITY PLAN	
6	RESOURCE MANAGEMENT		
6.1	Provision of resources		
6.2	Human resources		
6.2.1	General		
6.2.2	Competence, training and awareness		
6.3	Infrastructure		
6.4	Work environment		
7	PRODUCT REALISATION		
7.1	Planning and product realisation		
7.2	Customer-related process		
7.2.1	Determination of requirements to the product		
7.2.2	Review of requirements related to the product		
7.2.3	Customer communication		
7.3	Design and development		
7.3.1	Design and development planning		
7.3.2	Design and development inputs		
7.3.3	Design and development outputs		
7.3.4	Design and development review		
7.3.5	Design and development verification		
7.3.6	Design and development validation		
7.3.7	Control of design and development changes		
7.4	Purchasing		
7.4.1	Purchasing process		
7.4.2	Purchasing information		

AS/NZS ISO 9001:2008		ALIGNMENT TO CONTRACTOR QUALITY PLAN	
7.4.3	Verification of purchased product		
7.5	Production and service provision		
7.5.1	Control of production and service provision		
7.5.2	Validation of processes of production and service provision		
7.5.3	Identification and traceability		
7.5.4	Customer property		
7.5.5	Preservation of product		
7.6	Control of monitoring and measuring equipment		
8	MEASUREMENT, ANALYSIS AND IMPROVEMENT		
8.1	General		
8.2	Monitoring and measurement		
8.2.1	Customer satisfaction		
8.2.2	Internal audit		
8.2.3	Monitoring and measurement of process		
8.2.4	Monitoring and measurement of product		
8.3	Control of non-conforming product		
8.4	Analysis of data		
8.5	Improvement		
8.5.1	Continual improvement		
8.5.2	Corrective action		
8.5.3	Preventative action		



Transport
for NSW

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 11 – TfNSW’s General Specification G10 –

Traffic and Transport Management

Document Number: 3126375_12
Execution Version

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1. General

1.1. Scope

This document sets out the requirements for the management of traffic past, through and / or around a work site. It includes the provision for the safe movement of traffic, the protection of workers from passing traffic and the provision for access to properties adjoining the work site.

The scope includes the design, construction, maintenance, upgrading and removal of any necessary temporary roadways and detours, the provision of Traffic Controllers to direct and control traffic, and the installation of temporary signs, road markings, lighting and safety barriers.

All temporary traffic arrangements required by OpCo's Activities must comply with this specification unless stated otherwise.

1.2. Standards and Guidelines

OpCo must comply with all relevant Standards and Guidelines (listed in Appendix 34 (*Standards and Guidelines*))

1.3. Interpretation, acronyms and definitions

For definitions and acronyms not specified in this document refer to the deed and SPR Appendix 1 (*Definitions and Acronyms*).

A reference to a "clause" is to a clause of this document, unless stated otherwise.

In this document, the following terms have the following meanings:

Road Occupancy	An activity that is likely to impact on the traffic flow of the road network, and may involve the closure of traffic lane(s).
Road Occupancy Licence (ROL)	A licence for Road Occupancy issued by TMC that allows the holder to use or occupy a specified road space at approved times, provided that certain conditions are met.
Traffic Management Plan (TMP)	A works-specific plan showing how traffic is to be managed when construction or maintenance work is being carried out. A TMP describes the work activities, the impact on the roadway and on road users, and how these impacts are addressed.
Traffic Staging Plans (TCP)	Road design drawings showing lane configurations to be provided for traffic passing through or around the Construction Site during the various construction stages, including details of road alignment and geometry, intersection layouts, provision for buses and cyclists, working areas and pedestrian areas, drainage, signs and pavement markings, etc.
Traffic Control Plan (TCP)	A diagram showing signs and devices arranged to warn traffic and to guide it around, past or if necessary through a work site or temporary hazard.

Traffic Controllers	A trained person whose duty is to control traffic at a work site. This control is normally exercised by the use of STOP/SLOW bats, but may be by manual control or traffic signals or other devices.
Vehicle Movement Plan (VMP)	A diagram showing the preferred travel paths for vehicles associated with a work site entering, leaving or crossing the through traffic stream.
Rigid safety barrier	A physical barrier, separating traffic from work areas, which has little or no deflection when impacted by a vehicle. Examples of rigid barrier systems are given in RMS Road Design Guide Table 6.2. Concrete barriers such as Type F units are only considered to be a rigid barrier system if the series of barriers are fixed to the pavement.
Non-rigid safety barrier	Barriers, including approved water filled units, wire rope barriers and metal guard rail which have lateral deflections of varying amounts when impacted by an out-of-control vehicle.
Long-term temporary work	Work requiring traffic control for duration longer than one work shift and where some form of traffic control must be maintained when the site is left unattended and may need to operate both day and night.
Short-term temporary work	Work requiring traffic control for duration not longer than one work shift and where traffic control is not required when the work is completed and road conditions are returned to normal at the end of the shift.

In this document, the following additional acronyms have been used;

RASS	Radar-activated Speed Sign
TCWS	RMS Traffic Control at Work Sites Manual
TTLG	Traffic and Transport Liaison Group
VMS	Variable Message Sign

1.4. Traffic control at work sites

OpCo must develop and implement traffic management strategies to minimise and mitigate traffic impacts, including road safety impacts, caused by OpCo’s Activities.

In consultation with Transport Management Centre (TMC), OpCo must develop, formalise and implement, traffic management, control and operational protocols, procedures, processes, systems and communications between OpCo and TMC for all traffic and transport management and control matters affecting the road network and traffic systems during OpCo’s Activities, including road network monitoring, day-to-day traffic management and administration, incident management, information distribution and operation and control of CCTV systems and variable message signs.

OpCo must obtain TMC's agreement to all proposals for traffic management, control and operational protocols, procedures, processes, systems and communications between OpCo and TMC prior to the commencement of OpCo's Activities that affects the operation of the road network and traffic systems.

All relevant Authorities and the tollroad leaseholders and operators must be integrated into the traffic management and operational protocols, procedures, processes and methods of communication affected by OpCo's Activities.

Where the RMS Traffic Control at Work Sites Manual (TCWS) or a relevant standard states a role and its corresponding responsibilities, OpCo must nominate a person for that role and ensure that the specified duties and responsibilities of such persons are carried out.

Where the TCWS or a relevant standard provides options, advice or recommendations, OpCo must consider such options, advice or recommendations when planning and implementing traffic control and adopt them, as necessary, for the safe movement of traffic and protection of people and property.

1.5. Traffic control personnel

1.5.1. Authority to direct traffic

Under section 6 of the Roads Regulation 2008 (NSW), OpCo or one of OpCo's Contractors undertaking the traffic control on behalf of OpCo, is authorised to appoint Traffic Controllers solely for the purposes of the deed to provide for the safe movement of traffic around, past or through the work site. Any such appointment must cease upon the completion of traffic control work under the deed, or the termination of the deed, whichever is the earlier.

1.5.2. Registration of traffic control organisations

OpCo, or one of OpCo's Contractors undertaking the traffic control on behalf of OpCo, must be registered under RMS Registration Scheme Category G "Traffic Control".

1.5.3. Qualifications of traffic control personnel

Personnel in traffic control roles must have attended and be qualified in the RMS traffic control training courses relevant to their roles.

Traffic Controllers must carry their relevant qualifications on their person at all times when controlling traffic.

1.5.4. Safety Vests and Logo

Traffic Controllers must use high visibility fluorescent safety vests complying with AS/NZS 4602 and the RMS standard, clearly bearing the words "Authorised Traffic Controller". Traffic Controllers must wear the vest as an outer garment only when controlling traffic, and not at other times.

1.5.5. Traffic Control Site Manager

Each Traffic Management Plan (TMP) must nominate a full-time member of OpCo's site management team as the Traffic Control Site Manager (TCSM) for the work covered by the TMP.

The TCSM must be qualified, as a minimum, in the RMS "Select / Modify Traffic Control Plans" course (i.e. hold a current Red Card) and have recent experience in traffic management on road construction or maintenance sites of equivalent complexity to the work covered by the TMP.

OpCo must detail in the TMP the role and responsibilities of the TCSM, which must include:

- (a) ensuring that the approved traffic control measures are established, implemented and maintained in accordance with the TMP;
- (b) carrying out regular inspections and auditing of the traffic control measures to ensure that they are effective and are being followed;
- (c) amending and updating the TMP, as required, to ensure that it remains current as the work progresses;
- (d) identifying locations and times where traffic congestion or unsafe conditions for vehicles, cyclists, pedestrians and workers are occurring, and providing recommendations for improvement;
- (e) maintaining current copies of the Traffic Management Plan, Traffic Staging Plans, Traffic Control Plans, Vehicle Movement Plans, Road Occupancy Licences and speed zone authorisations, and their controlled distribution;
- (f) liaising with the relevant Authority such as TMC, TfNSW's Representative, the Independent Certifier, NSW Police Force and local councils on traffic management matters for the work covered by the TMP;
- (g) facilitating traffic awareness and giving traffic awareness toolbox talks to site personnel;
- (h) ensuring that a traffic control personnel register is maintained and is up to date;
- (i) assist TfNSW's Representative and the Independent Certifier in any audit of OpCo's traffic management requirements; and
- (j) carrying out regular inspections of Traffic Controllers to ensure the appropriate traffic control card is being carried.
- (k) the authority to stop work on any activity if it is considered to be necessary to prevent traffic accidents, or to comply with the directions of TfNSW's Representative, TMC or NSW Police Force.

2. Planning

2.1. General

OpCo must obtain all necessary approvals from the relevant Authorities for the temporary traffic arrangements as necessary.

OpCo must liaise with the relevant Authorities and when planning and implementing traffic management proposals, ensure there is no conflict in temporary traffic arrangements, including oversize, B-Double and over mass load movements, for OpCo's Activities and other third parties.

OpCo must develop an appropriate level of modelling and / or traffic analysis when required to advise and demonstrate to TMC and RMS that the proposed works will not be detrimental to the local road network. Proposed works that may require modelling / analysis could include:

- (a) Short-term temporary road closures;
- (b) short or long-term temporary lane closures;
- (c) long-term temporary amendments to the road or lane geometry (ie lane width reductions);
- (d) long-term temporary amendments to the traffic flow conditions (ie contraflow, one-way systems, detours); and
- (e) any others works that may have a detrimental impact on the local road network.

2.2. Project-specific restrictions and additional requirements

Any restrictions and / or additional requirements on traffic management specific to OpCo's Activities are stated in SPR Appendix 12 (*Construction Traffic and Transport Management Constraints*), SPR Appendix 16 (*Road Works*) and Schedule B6.

2.3. Temporary speed zoning

Temporary speed zoning for the duration of the Works are stated in SPR Appendix 12 (*Construction Traffic and Transport Management Constraints*).

2.4. Road Occupancy Licence

When OpCo's Activities require a Road Occupancy, OpCo must obtain a Road Occupancy Licence (ROL). The licence applies to the occupation of the road only and does not grant permission for or approval to carry out work on the SLR Site.

Information on how to apply for a ROL is contained in the RMS Road Occupancy Manual, available from the RMS website at:

http://www.rta.nsw.gov.au/trafficinformation/downloads/road_occupancy_manual.pdf.

OpCo's application for each ROL is to be submitted to the relevant Authority and TfNSW's Representative to allow sufficient time for detailed review, but not less than ten (10) working days prior to the planned commencement of the activities requiring the Road Occupancy. The activity must not commence until the ROL is obtained.

OpCo's work activities must comply at all times with the conditions contained in the ROLs. The occupancy hours granted in a ROL may be less than, and will override, the working hours stated in the deed or the Planning Approval.

OpCo must keep a copy of the ROL on site at all times.

Notwithstanding any ROLs granted for any Road Occupancy, OpCo must co-operate with the relevant road Authority, TMC and other Authorities, such as the NSW Police Force or State Emergency Services, to facilitate required traffic flows. In this regard, OpCo must comply with any authorised direction issued to OpCo to temporarily cease any work and re-open any closed lane or shoulder.

2.5. Police notification

In addition in obtaining an ROL, OpCo must submit a completed NSW Police Force "NOTIFICATION of TEMPORARY LANE / ROAD CLOSURE" and a copy of the relevant TCP at least 3 business days prior to the intended commencement of work covered by the TMP.

This documentation is to be faxed to (02) 8220 6329 or emailed to sydcitytraffic@police.nsw.gov.au.

2.6. Site-specific Traffic Management Plan

At least four (4) weeks before undertaking work which affects traffic conditions, OpCo must submit a site-specific Traffic Management Plan (TMP) to the relevant Authority for approval with a copy provided to TfNSW's Representative for information.

The TMP must include, as a minimum and where appropriate, the following elements:

- (a) details of any traffic staging arrangements associated with each proposed construction stage, including Traffic Staging Plans (refer Clause 2.7), and the time periods during which each stage will be in operation;
- (b) identification of, and when available copies of, any ROLs (refer Clause 2.4) and approvals from other relevant Authorities;
- (c) Traffic Control Plans (refer Clause 2.9), including the specific traffic control arrangements associated with obtaining a ROL;
- (d) Vehicle Movement Plan(s) showing the preferred travel paths for vehicles to enter, leave or cross the through traffic stream;
- (e) provision for access to adjoining properties affected by the work covered by the TMP;
- (f) provision for the safe passage of cyclists and pedestrians;
- (g) design drawings for any temporary roadways and detours, including alignment and surface levels, pavement widths, pavement cross-sections and stormwater drainage (refer Clause 2.8); and
- (h) names and contact details of nominated personnel (including the TCSM) responsible for maintenance of traffic control devices and temporary roadways outside normal working hours.

The TMP and associated documentation must be prepared by person(s) suitably experienced in the design and implementation of TMPs of equivalent complexity to the work covered by the TMP and holding relevant qualifications including as a minimum, a qualification in the RMS "Design & Inspect Traffic Control Plans" (Orange Card) course.

The TMP and associated documents, including Traffic Control Plans, may be submitted in stages in accordance with the requirements of SPR Appendix 11 (*TfNSW's General Specification Q6 – Quality Management System*).

Acceptance of the TMP by the relevant Authority will not relieve OpCo of its responsibility to implement an effective traffic management scheme, particularly in cases where a risk has not been previously identified or adequately mitigated in OpCo's TMP.

OpCo must regularly review the effectiveness of the TMP. OpCo must then amend the TMP to incorporate more appropriate procedures if the original traffic management practices prove not to be fully effective.

2.7. Traffic Staging Plans

OpCo must prepare Traffic Staging Plans to show how traffic will pass safely through or around the Construction Site during the various construction stages. Traffic Staging Plans may be integrated with any construction staging plans prepared by OpCo.

The Traffic Staging Plans must show, for each stage, the following:

- (a) lane configurations on existing and new (temporary and permanent) pavements, indicating any departures from existing traffic lanes;
- (b) intersection layouts and temporary traffic signals arrangements;
- (c) working areas and pedestrian and cyclist paths;
- (d) access to residential properties, local businesses and community facilities;
- (e) pavement markings;
- (f) drainage system, both temporary and permanent, including any pollution control measures; and
- (g) Utility Services and their impact on the Project Works, Temporary Works and OpCo's Activities.
- (h) if removal of pavement markings is required, details of the proposed methods for removal, the estimated durations to carry out the removal, and if necessary any proposed measures to restore the road surface.

2.8. Temporary roadways design and drawings

2.8.1. General

If temporary roadways and detours, or adjustments to existing lane configurations and geometry, are required as part of OpCo's traffic staging, they must be designed in accordance with the relevant design standards. These design standards also apply where existing or unused roadways, including road shoulders, are proposed as temporary roadways.

OpCo must obtain a certification by the road designer that the traffic staging road design drawings comply with the relevant standards.

2.8.2. Road design

Unless otherwise agreed with RMS, OpCo must comply with the RMS Road Design Guide for design of the road geometry and configuration.

The minimum design travel speed and traffic lane width are stated in SPR Appendix 16 (*Road Works*).

If no minimum design travel speed is stated in SPR Appendix 16 (*Road Works*), the minimum design travel speed will be the speed limit of the existing road, unless otherwise approved by the relevant Authority.

The temporary road design drawings must show, as a minimum, the following details:

- (a) alignment and grading at a horizontal scale of 1:500 extending to 100 m beyond the limits of the temporary roadway or detour and full width cross-sections, showing levels, at 20 m intervals;
- (b) a sight distance diagram if opposing traffic is to use a single carriageway;
- (c) sufficient cross-sections to indicate the feasibility of making connections between various parts of the work;
- (d) intersections, and any other locations where traffic may be required to make turning, merging or diverging movements, at a scale of 1:500;
- (e) pavement type, including wearing surface, base and subbase details;
- (f) stormwater drainage details;
- (g) pavement marking and signposting, safety barrier and traffic control device details, at a scale of 1:500;
- (h) roadside furniture; and
- (i) street lighting details, if appropriate.

2.8.3. Stormwater drainage design

OpCo must provide an effective drainage system for the temporary roadways to prevent runoff water flowing over the road surface in any storm of intensity less than a 1 in 5 year occurrence.

OpCo must ensure that the drainage system does not result in water ponding at any point.

2.8.4. Pavement design

OpCo must design the wearing surface of temporary roadways and detours to be firm, even and skid resistant under all weather conditions and remain structurally sound during use. This includes any widening of through-carriageways for construction staging purposes. The wearing surface must be carried onto any connecting roadway so as to finish flush with the existing road surface.

OpCo must design the pavement in accordance with the Austroads publication AGPT02/08 "Guide to Pavement Technology - Part 2: Pavement Structural Design" and the RMS Supplement to the Austroads Guide to the Structural Design of Pavements.

Where the existing pavements, and road shoulders areas which will be used as part of the temporary roadways and detours, are not designed to carry the new traffic loadings which will be imposed or are unlikely to be able to support the new traffic loadings, OpCo must design and upgrade the infrastructure for the new traffic conditions.

2.8.5. Safety barriers

OpCo must select safety barrier types and end treatments in accordance with Section 6 of the RMS Road Design Guide, giving due consideration to design traffic speed, angle of departure from the road, separation between work areas, pedestrians and through traffic plus dynamic clearance requirements.

The safety barrier products selected must be from the list of safety barrier products accepted by RMS. This list can be viewed at the RMS website at:

http://www.rta.nsw.gov.au/doingbusinesswithus/designdocuments/safety_barriers.html

OpCo must prepare and include in the relevant TMP a statement of the basis for the selection and locations of safety barrier systems and their end treatments.

OpCo must provide safety barrier systems on temporary embankments, including part-width construction of permanent embankments.

2.9. Traffic Control Plan

2.9.1. Standard Traffic Control Plans

OpCo may use standard TCPs contained in the TCWS, with minor modifications if necessary to suit a specific work location, if they are appropriate. OpCo must follow the procedures set out in the TCWS for the selection, approval and implementation of the standard TCP and keep records of the steps performed.

The selection and minor modification of a standard TCP to suit a specific work location must only be carried out by a person who is qualified in the RMS "Select / Modify Traffic Control Plans" course (i.e. holds a current Red Card).

2.9.2. Project-specific Traffic Control Plans

Where standard TCPs (including TCPs with minor modifications) are not appropriate for the work being planned, OpCo must draw up TCPs specifically for the work being planned. Drawing up TCPs must only be carried out by a person qualified in the RMS "Design & Inspect Traffic Control Plans" course (i.e. holds a current Orange Card).

These Project-specific TCPs must be designed using computer aided drafting software and not be hand-drawn, unless approved otherwise by the relevant Authority. All text, dimensions and symbols must be clearly presented, legible to the naked eye and be unambiguous. The chainages in the TCPs must match those shown and used in the Design Documentation.

Property accesses, side roads and any special features affecting the positioning of signs and other traffic control devices must be shown in the TCP.

Each TCP must include a statement describing the situation for which the TCP is applicable.

If traffic staging is applicable, OpCo must produce individual TCPs for each traffic stage.

Project-specific TCPs must show the following:

- (a) types and locations of permanent regulatory and advisory signs;
- (b) types, locations and times of operation of temporary signs, including advance warning signs, Variable Message Signs (VMS) and speed zone signs;
- (c) pavement marking details, including types of delineation required, turning arrows, stop / holding lines and other road markings, types and positions of raised pavement markers and other delineation devices;
- (d) locations and times of operation of permanent and temporary traffic signals;
- (e) locations and lengths of tapers and buffer zones;
- (f) locations and times of operation of any required Traffic Controllers;
- (g) locations of entry and exit gates to the working areas, individually numbered and signposted;
- (h) pedestrians and cyclists paths;
- (i) details of side roads and access for adjoining properties and parking;
- (j) locations of any safety barriers, barrier systems and end terminals;
- (k) locations of temporary lighting;
- (l) special event details and management responses;
- (m) over dimensioned and over mass vehicle particulars;
- (n) bus route and bus stop changes and associated arrangements; and
- (o) construction vehicle site access arrangements.

2.9.3. Vehicle Movement Plans

Vehicle Movement Plans (VMPs) must provide for traffic associated with the works, such as trucks delivering materials and equipment and work supervisors' vehicles, to safely manoeuvre into and out of traffic streams, and turn at work areas, depots, stockpile sites, etc and turn around.

The VMP must show the vehicle entry and exit points to the worksite and indicate clearly that these are the only points where interface with the road traffic is permitted.

A VMP may be combined with or superimposed on a TCP.

2.10. Traffic management risk assessment workshops

OpCo must undertake a traffic management risk assessment workshop prior to the commencement of any traffic management works, to identify and address the risks associated with road safety, traffic management and road network issues specific to the site.

The workshop is to be used to raise awareness of good traffic management practices and for network planning provisions to be made known to site management personnel.

The content of the workshop will be specific for each project. However, it must include at least the following:

- (a) training and knowledge requirements;
- (b) planning for traffic switches;
- (c) TCP;
- (d) Project deed requirements relating to traffic management;
- (e) safety barriers systems;
- (f) delineation, signage and guidance to motorists; and
- (g) road safety auditing requirements.

Participants must include relevant OpCo's site management staff, OpCo's road designer (refer Clause 2.8.1), personnel responsible for preparing TCPs (refer Clause 2.9), Any personnel involved in reviewing / road safety auditing of TCPs, and NSW Police Force and local council representatives, as appropriate. TfNSW's Representative and the Independent Certifier are to be invited but their attendance is not mandatory. OpCo must advise TfNSW's Representative of the workshop 14 days in advance.

OpCo must record the identified risk issues and close them out when finalising its TMP and Traffic Staging Plans.

OpCo must undertake additional workshops as appropriate to train site personnel regarding implementation of the TMP and TCPs and when traffic management issues need to be reinforced or reviewed.

2.11. Road safety audit of TCPs

Road safety audits must be undertaken as required by the NSW Centre for Road Safety.

3. Temporary Roadways and Detours

3.1. Construction of temporary roadways and detours

OpCo must construct the temporary roadways and detours in accordance with the approved traffic staging road design drawings. This construction work must include modification and strengthening of existing pavement and road shoulders, where they are unlikely to be able to support the new traffic loadings.

Construction of temporary roadways must comply with the relevant RMS Specifications or relevant Authority specification, as listed in SPR Appendix 34 (*Standards and Guidelines*), for the particular road works element.

3.2. Access to side roads and properties

At all times OpCo must provide a safe and convenient passage for vehicles and pedestrians to and from side roads and property connecting to the roadway under construction.

OpCo must not undertake any work which affects the use of side roads and access to properties without providing an adequate alternative access.

3.3. Opening temporary roadways and detours to traffic

OpCo must complete all pavement markings, retro-reflective raised pavement markers, signposting and safety barriers and installation of portable or temporary traffic signals, before opening the temporary roadways to traffic.

OpCo must arrange for an inspection by a person qualified in the RMS "Design and Inspect Traffic Control Plans" course to verify that regulatory signs, warning signs and traffic control devices have been suitably located to be visible and effective under the site conditions and expected traffic speeds before opening the temporary roadways to traffic.

If either OpCo's inspection or inspection by a relevant Authority or the Independent Certifier identifies a need for adjustments to any signs or traffic control devices or the provision of additional signs or traffic control devices, OpCo must amend the applicable TCPs as needed, to show the final traffic control arrangement in place.

Unless otherwise approved by the relevant Authority, traffic may only be switched to a temporary roadway or detour where OpCo's usual workforce will be performing work on the Construction Site for a minimum of two successive days thereafter.

Unless otherwise approved by the relevant Authority, OpCo must not disturb sections of existing roadway being replaced for at least two days after opening a temporary roadway or detour to traffic. This is to provide for the event where failure of the temporary roadway or detour occurs and there is a need to redirect traffic back onto the existing roadway.

3.4. Road safety audit of temporary roadways or detours

OpCo must undertake road safety audits for temporary roadways and detours in accordance with the requirements of the NSW Centre for Road Safety.

3.5. Removal of temporary roadways and detours

Upon completion of the relevant works, OpCo must remove the temporary roadways and / or detour arrangements and restore the area to a condition equivalent to that which existed prior to the commencement of the work.

4. Traffic Control Devices

4.1. Safety barriers

Where identified in any TCP or TMP for the work, OpCo must provide safety barriers to protect the work areas and pedestrian areas from the traffic. The safety barriers must be from the list of safety barrier products accepted by the RMS, in accordance with clause 2.8.5.

OpCo must erect the safety barriers in accordance with Specification RMS D&C R132 and the acceptance conditions for that safety barrier product.

OpCo must establish an exclusion zone behind barriers as required and not permit construction work or pedestrian movement within the deflection or impact zone of safety barriers.

OpCo must not use safety barriers or safety barrier systems for delineation in place of linemarking.

4.2. Pavement markings and signs

OpCo must install all pavement markings, retroreflective raised pavement markers and signposting proposed for use in the temporary works in accordance with the requirements of Specifications RMS D&C R141, RMS D&C R142 and RMS D&C R143 respectively, to the same standard as for permanent work.

Unless otherwise specified, OpCo must use waterborne paint for pavement markings for temporary works.

The method of removal of redundant pavement markings from wearing surfaces, other than final wearing surfaces, must comply with the requirements of the TCWS. Removal of redundant linemarking within traffic lanes by covering with paint is not acceptable.

OpCo must supply and erect temporary speed zoning signs at the locations indicated in its TCP. OpCo must keep the signs covered when the speed zone is not in use and remove the signs when the temporary speed zoning is no longer in force.

4.3. Portable Variable Message Signs

Where specified in OpCo's TCP, VMSs are to be placed at prominent locations on each end of the work site as agreed with the relevant Authority, to keep road users informed of changes to road conditions and of possible delays as a result of construction work.

The VMSs must be portable, Type C size, and solar powered, complying with AS 4852.2.

OpCo must ensure that the messages displayed on the VMSs remain current over the duration of OpCo's work and must move the locations of the VMSs, as needed, during the progress of OpCo's work. The locations of the signs and the messages displayed must be approved by the relevant Authority.

OpCo must use the VMSs to publicise any pending changes in traffic arrangements for seven days prior to those changes, and for changed traffic arrangements, for seven days after making those changes.

OpCo must fully maintain and make secure the VMSs. Maintenance shall include cleaning the VMS perspex faces and solar panels and checking the battery distilled water levels at least once each month.

4.4. Radar-Activated Speed Signs

Where specified in OpCo's TCP, trailer mounted Radar-activated Speed Signs (RASS) must be provided for use during the construction period.

OpCo must locate the RASS in positions suitable for influencing the speed of motorists entering the reduced speed zone. The locations of the RASS and the message displayed must be as agreed with the relevant Authority.

OpCo must obtain calibration details from the RASS supplier(s) to confirm that each RASS is accurately calibrated within the manufacturer's specified tolerances. OpCo must periodically check each RASS for accuracy and carry out recalibration to within the manufacturer's specified tolerances promptly as needed.

OpCo must monitor the effectiveness of the speed limit reductions and furnish a detailed log of the speeds each week to the relevant Authority.

4.5. Temporary traffic signals

Where specified in its TCP, OpCo must install portable traffic signals complying with the TCWS or temporary fixed traffic signals complying with RMS Traffic Signals Equipment Specification No SI/TCS/8 and associated drawings.

5. Monitoring of Traffic Control Measures

As a minimum, OpCo must check at the commencement and conclusion of each day's work that all required traffic control measures and signs are in place as detailed on the TCP for each stage.

OpCo must record the details of this inspection daily.

The person conducting this check must be qualified in the RMS "Apply Traffic Control Plans" course.

6. Road Construction Work Adjacent to Traffic

6.1. General

Where a temporary roadway or a detour is not provided or available, then subject to the approval of the relevant Authority, construction under or adjacent to traffic may be permitted provided that at least one 3.5m wide lane remains open to traffic on a two lane roadway and at least one 3.5m wide lane remains open in each direction on divided multi-lane roads.

Alternatively, subject to the approval of the relevant Authority, the lanes may be linemarked to a reduced width.

Prior to cessation of work each day, OpCo must restore the carriageway(s) to a safe and trafficable state for through traffic, unless otherwise stated in the approved TCP.

6.2. Approved clothing for workers working adjacent to traffic

All personnel working in close proximity to traffic must wear high visibility fluorescent safety clothing complying with AS/NZS 4602, which is suitable for daytime, night time and / or wet weather conditions, as applicable.

6.3. Plant and equipment used for work adjacent to traffic

OpCo must equip all vehicles used in traffic control operations with the appropriate vehicle mounted warning devices in accordance with the TCWS.

During daytime, plant and equipment working in a position adjacent to traffic and having a projection beyond the normal width of the item, for example, a grader blade, must have a fluorescent red flag attached to the outer end of the projection.

During poor light conditions or at night, an additional Traffic Controller with an illuminated red wand must direct traffic around such plant and equipment.

During night time, where traffic is permitted to use the whole or portion of the existing road, OpCo must remove all plant items and similar obstructions from the normal path of vehicles, to provide a lateral clearance of at least 6m where practicable, with a minimum clearance of 1.2m.

OpCo must illuminate any plant and equipment which is within 6m of the normal path of vehicles with not less than two yellow steady lamps suspended vertically from the point of the obstruction nearest to a traffic lane, and one yellow steady lamp at each end of the obstruction on the side furthest away from the traffic lane.

7. Maintenance of Roadways

7.1. Existing roadways

OpCo must carry out routine maintenance of the pavement and drainage on existing roads (including shoulders and kerb and gutter) within the limits of the SLR Site. OpCo's obligations under this clause will start when OpCo commences any work on site other than site establishment.

This maintenance work includes repairing potholes, cleaning kerbs and gutters, clearing drainage blockages, removal of debris from roadway, straightening and cleaning roadside furnishings, grass mowing and trimming of vegetation, as needed.

Maintenance of existing roads outside the SLR Site will be undertaken by others. OpCo must co-operate with RMS, local councils or their agents in carrying out their maintenance responsibilities.

7.2. Cyclist and pedestrian facilities

OpCo must maintain all existing cyclist and pedestrian facilities and movements that are within the limits of the SLR Site.

OpCo must provide appropriate pedestrian and cyclist facilities within and adjacent to the SLR Site.

OpCo must identify all pedestrian and cycle routes that exist prior to the commencement of any construction activities on the SLR Site and provide suitable alternative access and routes for those routes affected by OpCo's Activities. Any alternative access and routes must be provided to the satisfaction of TfNSW's Representative and the relevant Authority.

OpCo must provide appropriate advisory and directional signage at all new and adjusted cyclist and pedestrian facilities.

7.3. Facilities for road-based public transport

OpCo must maintain all existing public transport infrastructure including bus stops, priority bus movements and bus lanes that are within the limits of the SLR Site.

Where OpCo's Activities result in changes to existing public transport infrastructure, OpCo must implement measures that include:

- (a) localised changes to traffic management infrastructure, including minor civil works, linemarking and signposting changes, changes to kerb lines and blisters and other on-road treatments;
- (b) changes to existing infrastructure to accommodate changes to existing bus routes and bus stops, including regulatory signposting, bus shelters and bus stops;
- (c) the provision of new infrastructure and changes to existing infrastructure to accommodate the introduction of new bus routes and bus stops, including regulatory signposting, bus shelters and bus stops;
- (d) the provision and removal of static signposting advising of the changes to bus stop locations and any other relevant information; and

- (e) funding of bus company personnel to manage changes on bus routes for a minimum of two days after each change to a bus route, or as otherwise agreed to by the NSW Bus and Coach Association.

7.4. Temporary roadways and detours

OpCo must maintain any temporary roadways and detours in use during construction and any local roads used by construction traffic, to provide a safe, trafficable condition for all classes of vehicles that may use them.

Areas that were road shoulders prior to commencement of OpCo's work but have become pavements for OpCo's temporary roadways are considered to be temporary roadways and detours and must be maintained by OpCo.

This work includes maintenance of the existing pavements, linemarking, kerb and gutter, road shoulders and verges, ancillary services, roadside environment, drainage, signage, trimming of vegetation and housekeeping. OpCo must repair any potholes, surface drainage blockages or other failures without delay. OpCo must remove debris of any type, including animal carcasses, without delay.

OpCo must re-apply linemarking as needed to clearly delineate traffic lanes for the duration of the temporary traffic arrangements.

7.5. Maintenance of new roadways opened to traffic

OpCo must carry out routine maintenance of newly constructed roadway assets within the limits of the Construction Site, until Completion. This will include cleaning of kerbs and gutters, clearing of drainage blockages, removal of debris from roadway, grass mowing and trimming of vegetation, as applicable.

8. Opening New Roadways to Traffic

OpCo must complete all relevant permanent signposting, pavement markings, safety barriers and traffic signals required under the deed prior to opening of any part of the SLR Works to traffic.

OpCo must remove all temporary traffic control devices no longer required for the safety of traffic, when any part of the SLR Works is opened to traffic.

OpCo must give TfNSW's Representative at least ten working days written notice of the date of opening any part of the SLR Works to traffic. OpCo must determine the procedure for opening through consultation with TfNSW's Representative, the relevant Authority and NSW Police Force.

9. Traffic and Transport Communications

9.1. Overall requirements

OpCo must liaise, consult and communicate with TfNSW, the community, Authorities, agencies and all other Stakeholders during OpCo’s Activities, in relation to its obligations and responsibilities for the management of the road networks and traffic systems.

The liaison, consultation and communication process must:

- (a) ensure that timely, accurate and comprehensive traffic and transport information is provided to all potential and existing road users to optimise their travel options and to reduce the traffic and transport impacts due to OpCo’s Activities; and
- (b) allow and accommodate community feedback to OpCo in relation to traffic and transport management issues.

Traffic and transport communications must be addressed in accordance with Appendix 8 (*Stakeholder and Community Engagement*).

9.2. Traffic and Transport Liaison Group

Traffic and Transport Liaison Groups (TTLG) will be established by TfNSW, one for the City of Sydney LGA and one for the Randwick City Council LGA. Each TTLG will provide a forum for discussion of all traffic, transport and road safety matters associated with Delivery Activities including, but not limited to:

- (a) construction staging (existing or proposed);
- (b) traffic operations, including changes in traffic flows and traffic management works and parking restrictions;
- (c) community concerns and comments;
- (d) impacts on road based public transport operations;
- (e) pedestrians and cyclists; and
- (f) communication strategies and actions.

The TTLG for each LGA will be chaired by the TfNSW Representative and be held on a rolling six week basis, or at another frequency that is acceptable to all members of the group.

OpCo must attend meetings of both groups.

Other key participants in the TTLGs may include, as appropriate from time to time, representatives from identified in Table 9:

- TfNSW;
- RMS;
- TMC;
- NSW Government
- City of Sydney;

- Randwick City Council;
- NSW Police Force;
- Australian Turf Club;
- University of New South Wales;
- NSW Government Department of Premier and Cabinet (Protocols & Special Events);
- NSW Government Department of Planning and Infrastructure;
- Centennial Park and Moore Park Trust;
- Sydney Trains (City of Sydney TTLG only); and
- Early Works Contractor.

The TTLG for each local government area will invite other organisations to attend meetings on an as needs basis. These organisations include, but not limited to:

- (a) Airport Motorway Limited;
- (b) Ambulance Service of New South Wales;
- (c) Bicycle NSW;
- (d) Botany Bay City Council;
- (e) BusNSW;
- (f) Comfort Delgro Cabcharge (Hillsbus) and other private bus operator(s);
- (g) Disability Council NSW;
- (h) Fire & Rescue NSW;
- (i) Forest Coach Lines;
- (j) Harbour City Ferries and other relevant ferry operator(s);
- (k) Infrastructure NSW;
- (l) Pedestrian Council of Australia;
- (m) NRMA;
- (n) NSW Taxi Council;
- (o) NSW Trains;
- (p) State Transit Authority of NSW;
- (q) Sydney Cricket & Sports Ground Trust;
- (r) Sydney Harbour Foreshore Authority;
- (s) Sydney Ports Corporation;

- (t) Sydney TAFE;
- (u) Transdev; and

9.3. Dissemination of information to the community

OpCo must comply with the relevant requirements of SPR Appendix 8 (*Stakeholder and Community Engagement*) for dissemination of traffic and transport information to the community.

OpCo must submit all information to be released to the community in relation to OpCo's management of the road network and traffic systems affected by OpCo Activities to TfNSW's Representative and the relevant Authority and must obtain the relevant approval prior to its distribution.

The minimum requirements for dissemination of information to the community in relation to the management of the road networks and traffic systems are detailed in Table 1 and Table 2.

Table 1 Minimum Requirements for the Dissemination of Information to the Community (excluding the Print Media)

Requirements	Frequency
Provide full details on the impacts of OpCo's Activities on the road network and traffic systems on the project website	Updated on a weekly basis
Provide temporary large driver advisory advance notice static signposting on roads approaching the Construction Site. The minimum size is to be 1800 x 1200 with the design to satisfy AS 1743.	Provided at least three weeks prior to traffic changes
Provide temporary large direction signposting to direct motorists to residences and businesses directly affected by the construction activities. The minimum size is to be 1800 x 1200 with the design to satisfy AS 1743.	Adhoc basis depending on impact caused by the construction stage.
Provide temporary notices and signposting at bus stops detailing any changes to bus, routes, bus stops, timetables and services frequencies due to OpCo's Activities.	Provided at least ten days prior to a change to any bus service.
Provide temporary notices and signposting at pedestrian and cyclist crossings of the Construction Site and routes around the Construction Site detailing any changes to these facilities due to OpCo's Activities.	Provided at least ten days prior to a change to any pedestrian or cycle route.
Provide variable message signs	Provided at least seven days prior to traffic changes

Requirements	Frequency
Provide radio advertising	Negotiate with each radio station and implement a protocol for publicising every traffic change through their traffic reporters, including paid advertisements if necessary.
Provide full details on the impacts of OpCo’s Activities on the road network and traffic systems in the newsletters issued as part of the community involvement and consultation process.	Provided as per the relevant requirements of SPR Appendix 8 (<i>Stakeholder and Community Engagement</i>).
Provide leaflets to letterboxes of local properties, residences and businesses outlining the Project, its current and next construction stage and changes and impacts on traffic conditions, including on-street parking conditions, the number of traffic lanes and turn movements, changes to cyclist and pedestrian crossings and access routes and changes to bus routes, services frequencies and stops.	Prepared and distributed leaflets at least two weeks prior to the start of every design and construction activity that involves a change to the road networks and systems of three or more days duration. Distributed to all properties, residences and businesses directly affected by, and within 500 m of, the changes to the road networks and traffic systems.
Provide full details on the impacts of OpCo’s Activities on the road network and traffic systems in all the Project display centres.	Display at least two weeks prior to the start of every design and construction activity that involves a change to the road networks and systems of three or more days duration
Provide e-mail, telephone, facsimile and postal contacts for interaction with the community and to receive comments concerning traffic issues associated with OpCo’s Activities.	Available at all times during OpCo’s Activities.
Maintain a register of all views, complaints and comments received from the community, including details on the date received, location, subject matter, name and address of the member of the community, actions taken, responses given and any information related to the issues. Provide a summary report to TfNSW’s Representative on the contents and status of the register.	Maintain the register continuously. Provide the report monthly
Provide e-mail, telephone and facsimile facilities between OpCo, TfNSW and TMC.	Provide the facilities continuously.

Table 2 Minimum Requirements for the Dissemination of Information to the Community through the Print Media

Nominated Newspapers	Information to be Disseminated	Requirements
Sydney Morning Herald Daily Telegraph Central Sydney Southern Courier Wentworth Courier Inner West Courier (when OpCo activities lie within the distribution area).	Advertisements must be placed in all the relevant nominated newspapers to provide information on changed traffic conditions that are likely to result in traffic delays and congestion in the distribution areas of the newspapers. These advertisements can be combined with any advertisements required under ROL conditions.	Advertisements must ; <ul style="list-style-type: none"> • be located in the first 20 pages of the newspaper (or first half of the newspaper if it has less than 40 pages); and • be placed prior to every design, construction and maintenance activity that involves a change to the road networks and systems of three or more day's duration. • provide e-mail, telephone, facsimile and postal contacts to receive comments concerning traffic issues associated with OpCo's Activities.

10. Traffic and Transport Incident Management

10.1. Overall requirements

OpCo must manage and control traffic and traffic movements that are within the limits of the SLR Site, including the management of responses to minor incidents, in accordance with the traffic management, control and operational protocols, procedures, processes, systems and communications between OpCo and the TMC.

Minor incidents include:

- (a) broken down vehicles;
- (b) any OpCo activity that blocks traffic and transport movements when a ROL has not been issued;
- (c) minor non-injury vehicle and pedestrian accidents; and
- (d) vehicular and other obstructions disrupting traffic flows.

The management and control of traffic and traffic movements must be achieved by:

- (a) the supply, implementation, provision and operation of infrastructure, services, systems and resources; and
- (b) traffic monitoring and incident management, including an incident detection and management system and incident response plans.

10.2. Emergency services, Utility Service owners and Authority access requirements

OpCo must provide the required vehicular access for emergency services, Utility Service owners and Authorities to maintain existing services through SLR Sites unless otherwise agreed by TfNSW's Representative.

10.3. Traffic monitoring and incident management

OpCo must:

- (a) develop, procure, implement and have operational all infrastructure, systems, plans and other resources for traffic monitoring and incident management prior to the commencement of OpCo's Activities in an area affecting the existing road network;
- (b) detect and log traffic incidents;
- (c) implement traffic incident responses, both ad hoc and planned, when minor incidents are logged, including the provision of assistance to motorists in stalled vehicles;
- (d) monitor and control the access and egress of OpCo's traffic, plant and equipment from the Construction Site and the road network;
- (e) monitor road-based public transport movements that are affected by OpCo's Activities on the road network;

- (f) respond to emergency situations on the Construction Site;
- (g) advise the TMC immediately of the nature of any matter within OpCo's knowledge which is likely to affect, or is affecting, the free flow of traffic, including:
 - i. unusual traffic congestion;
 - ii. any action OpCo proposes to take in relation to the SLR Works;
 - iii. any action by any third party;
 - iv. any unplanned lane, road, footpath or cycleway closure; or
 - v. any traffic incident along or adjacent to the Construction Site.
- (h) OpCo must advise and keep the TMC informed on the schedule and progress in rectifying the matter referred to in (g) above.

10.4. Incident detection and management system

OpCo must implement, operate and maintain an incident detection and management system that provides a high-level response to any planned or unplanned incident occurring on the road network which affects the normal flow of traffic.

The incident detection and management system must:

- (a) detect the presence of an incident on the road network;
- (b) supply a recommended pre-planned incident response to detected incidents;
- (c) provide the services to manage, clear and make good all minor incidents;
- (d) monitor the extent of traffic congestion and queuing imposed by the incident;
- (e) clear down the incident response plans on clearance of the incident; and
- (f) maintain event logs showing the progress and process in clearing incidents.

OpCo must provide the appropriate equipment, plant, safety equipment vehicles and human resources, including tow trucks, to respond to and clear all minor incidents.

The incident detection and management system must have an incident logging system that records in a strict time sequence each individual event and action imposed and taken by OpCo in response to incidents.

All actions undertaken by OpCo must be logged in an event log file. OpCo must transmit all the incident data to RMS, in a format and frequency acceptable to the TMC.

10.5. Incident response plans

Incidents that are detected and declared in the incident detection and management system must produce an OpCo response that is managed through an incident response plan (IRP) to:

- (a) mitigate the effect of the incident;
- (b) clear the incident;

- (c) return the road network and traffic systems to normal conditions as soon as possible; and
- (d) review the effectiveness of responses and recommend improvements to the incident response plan.

OpCo must investigate, develop and formalise a comprehensive suite of IRPs for the road network and traffic systems. Alternative traffic routes and the appropriate associated infrastructure requirements must be identified and included in the IRPs.

IRPs must cover all the anticipated planned and unplanned minor incidents that could occur, with due recognition given to the type and nature of the incident, the time of day and the location on the road network. The IRP must address the immediate safety issues on carriageways in the local area surrounding the incident.

11. Traffic and Transport Management Reporting Requirements

OpCo must report to TfNSW's Representative, the relevant TTLG and other relevant Stakeholders on all traffic and transport management issues on the road networks and traffic and bus operations that relate to OpCo's Activities, including performance measured against the specified targets and objectives.

These requirements are to be read in conjunction with those stipulated in Appendix 10 (*Reporting Requirements*).

11.1. Reporting during the Delivery Phase

The Delivery Phase Progress Report must include, as a minimum, in a separate section a summary of:

- (a) current and upcoming critical issues, including those identified by TfNSW's Representative, TTLG and other relevant Stakeholders, and the proposed measures to address these issues;
- (b) a summary of existing and proposed ROLs, together with details on the status and critical impacts of the ROLs;
- (c) recent and proposed changes to traffic and parking management and their impacts on the operation of the road networks and traffic systems;
- (d) media or community information released and proposed to be released;
- (e) recent traffic and pedestrian accidents on and in the vicinity of the SLR Site and traffic management works, including cumulative totals;
- (f) construction scheduling for OpCo's Activities, including the current status of all construction stages and impacts on traffic management and approved ROLs;
- (g) approved and anticipated ROL applications, together with any associated issues of concern to OpCo, TfNSW's Representative, the TTLG and other relevant stakeholders, including:
 - i. comparisons of base-case performance indicators with those for the current and proposed traffic conditions and the achievement of the specified targets;
 - ii. comparisons of current and modelled traffic volumes at intersections compared with the base-case volumes; and
 - iii. comparison of current and modelled traffic travel times on routes compared with the base-case times;
- (h) community and media comments and complaints in regards to traffic and transport and OpCo's response to these comments and complaints.

11.2. Reporting during the Operations Phase

A report must be submitted to TfNSW's Representative eight weeks, twenty-six weeks and annually thereafter after Completion that includes, as a minimum, a summary of:

- (a) current and upcoming critical issues, including those identified by TfNSW's Representative, relevant Authorities, and other relevant Stakeholders, and the proposed measures to address these issues;
- (b) recent and proposed changes to traffic and management that impacts Operational Activities;
- (c) media or community information released and proposed to be released for traffic and transport management affected by maintenance works;
- (d) traffic and pedestrian crashes on the Permanent Light Rail Corridor for the preceding period, including cumulative totals;
- (e) maintenance scheduling for OpCo's Activities, including the impacts on traffic management and approved ROLs;
- (f) approved and anticipated ROL applications, together with any associated issues of concern to OpCo, RMS, and other relevant Stakeholders;
- (g) community and media comments and complaints in regards to maintenance works that affect traffic and transport management and OpCo's response to these comments and complaints.

The format of the reports must be easily understood and acceptable to RMS and the TTLG and other stakeholder groups.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 11 – TfNSW’s General Specification G22 – Safety Management

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Foreword

Base Specification

This document is based on RMS QA Specification D&C G22 Edition 2 Revision 2 (IC-DC-G22) and TfNSW Standard Requirements TSR S1 –Safety Management Version 3.0 (5TP-FT-332/3.0).

1. General

1.1 Introduction

This general specification sets out the work health and safety (WHS) and rail safety requirements that must be met by OpCo during the performance of OpCo's Activities.

The management system(s) for WHS and rail safety are to show how OpCo will integrate with the other management plans and systems with a focus on leadership and culture for workers and how the impact on the public and the community will be managed both during the Delivery Phase and the Operations Phase.

WHS and rail safety during the Operations Phase are to be covered in the Safety Management System and must comply with the Australian Standards for rail safety management systems.

1.2 Interpretation and definitions

For definitions not specified in this document refer to the deed and Appendix 1 (*Definitions and Acronyms*).

A reference to an "Annexure" is a reference to an Annexure attached to this document, unless stated otherwise.

A reference to a "clause" is to a clause in this document, unless stated otherwise.

In this document, the following terms have the following meanings:

- (a) **"Australian Standards"** means codes, standards and specifications published by Standards Australia;
- (b) **"Corporate WHS Management System"** means a corporate level system that details the organisational structure, policies, procedures, practices, resources and responsibilities for WHS management;
- (c) **"Project WHS Management Plan"** means a document setting out the specific WHS resources, consultation and risk management processes, responsibilities, procedures and practices for a particular project;
- (d) **"Safe Work Method Statement"** means a statement for a work activity having a health or safety risk, that identifies the measures to be used to manage those risks;
- (e) **"Site-specific Safety Management Plan"** means a plan that identifies the hazards associated with particular work along with the risk control measures that will be implemented to adequately protect people from the risk of injury or illness;
- (f) **"WHS Act"** means the Work Health and Safety Act 2011 (NSW);
- (g) **"WHS Regulations"** means the Work Health and Safety Regulation 2011 (NSW);
- (h) **"Work Health and Safety Manager"** means the person appointed to the position of Work Health and Safety Manager by OpCo; and
- (i) **"WorkCover"** means the WorkCover Authority of New South Wales.

1.3 Standards and Guidelines

OpCo must comply with all relevant Standards and Guidelines (listed in Appendix 34 (*Standards and Guidelines*)).

2. General Work Health and Safety Requirements

2.1. Work Health and Safety obligations

Without limiting the deed, OpCo must during the performance of OpCo's Activities comply with and ensure that Staff comply with:

- (a) WHS Legislation;
- (b) NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013) and any subsequent updates;
- (c) relevant Australian Standards for OpCo's Activities; and
- (d) relevant standards and codes of practice, including the Safe Work Australia codes of practice, for OpCo Activities;

OpCo must ensure that all personnel take sufficient steps to provide a working environment that is safe and without risk to WHS.

OpCo must, as a minimum, maintain and demonstrate compliance with:

- (a) all applicable duties specified in the WHS Legislation, including duties imposed on employers, controllers, occupiers, principal contractors and subcontractors;
- (b) all WHS policies, procedures and measures implemented or adopted by TfNSW which are in any way applicable to the deed or the performance of OpCo's Activities; and
- (c) all WHS policies, procedures and measures implemented or adopted by the controllers of any premises at or within which OpCo will perform OpCo's Activities.

In the event of any inconsistency between and within the requirements of Legislation, the NSW Government Work Health and Safety Management Systems and Auditing Guidelines, relevant Australian Standards, relevant standards and codes of practice and any WHS policies, procedures or measures, OpCo will comply with requirement that produces the higher level of work health and safety.

2.2. Work Health and Safety responsibilities

OpCo must at all times identify and exercise all necessary precautions to ensure the WHS of Staff, TfNSW's personnel and members of the public on or in the vicinity of the SLR Site who may be affected by OpCo's Activities.

3. Management System Requirements

3.1. Corporate WHS Management System

Without limiting the deed, OpCo must have a Corporate WHS Management System that complies with the requirements of section 2.1. OpCo must implement and maintain that Corporate WHS Management System during the performance of OpCo's Activities.

OpCo must notify TfNSW's Representative and provide details of any change to OpCo's Corporate WHS Management System within 5 Business Days of that change occurring.

OpCo must coordinate and direct OpCo Contractors so that all WHS matters are managed in accordance with OpCo's Corporate WHS Management System.

3.2. Project WHS Management Plan

As part of the Safety Management Plan, OpCo must include a Project WHS Management Plan which incorporates Site-specific Safety Management Plans and Safe Work Method Statements, which comprehensively address all WHS issues. The Project WHS Management Plan must comply with the "Project WHS Management Plan" requirements of the NSW Government Work Health and Safety Management Systems and Auditing Guidelines.

The sections of the Project WHS Management Plan relevant to a stage of construction must be made available to Staff working at the SLR Site during that stage.

The Project WHS Management Plan must document the procedures for the management, control, authorisation and recording of changes to the Project WHS Management Plan, including Site-specific Safety Management Plans and Safe Work Method Statements.

Without limiting the requirements of the deed for OpCo to undertake the ongoing development, amendment and updating of Project Plans, OpCo must also schedule a review of and revise the Project WHS Management Plan under any of the following situations:

- (a) where there is evidence the risk assessment is no longer valid;
- (b) where subsequent injury or incidents indicate the assessment of the risk may not have been adequate;
- (c) where there are changes to safe working requirements including changes in Legislation;
- (d) where there are changes to technology; or
- (e) where changes are proposed to OpCo's Activities that are being carried out.

3.3. Site-specific Safety Management Plans and Safe Work Method Statements

OpCo must ensure that Site-specific Safety Management Plans and Safe Work Method Statements are developed, implemented and maintained during the performance of OpCo's Activities and that OpCo's Activities are undertaken in a controlled and safe manner.

OpCo must regularly review the Site-specific Safety Management Plans and Safe Work Method Statements and ensure that they are effectively implemented and improved where this is required to ensure compliance with the requirements of the deed and this general specification.

The Project WHS Management Plan must include a consolidated list of all Safe Work Method Statements prepared by OpCo and OpCo Contractors.

4. Work Health and Safety Management

In addition to the requirements of section 4 of the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013) OpCo must comply with the obligations in this clause 4.

4.1. Work Health and Safety policy

OpCo must have a WHS policy that sets out OpCo's commitment to WHS. The WHS policy must include the commitments identified for an "OHS policy" in the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013) and be consistent with TfNSW's safety policy. OpCo's WHS policy must be included in the Project WHS Management Plan and must be:

- (a) signed and dated by OpCo's chief executive officer (or equivalent);
- (b) displayed at prominent locations on the SLR Site; and
- (c) reviewed and updated as required at least annually.

4.2. Safety culture

OpCo must encourage teamwork and involvement in promoting and maintaining a positive safety culture. OpCo must develop and implement processes and procedures that promote a safer and healthier workplace.

OpCo must establish and maintain an effective reporting system that facilitates the flow of information both within OpCo's organisation and between OpCo and OpCo Contractor's and TfNSW.

OpCo's safety culture processes, procedures and reporting system must be documented in the Project WHS Management Plan and must include processes and procedures for:

- (a) hazard reporting;
- (b) providing feedback on WHS issues and setting timeframes for providing feedback;
- (c) reducing the gap between "work as perceived" and "work as performed", including the measures to be taken to bridge the gap;
- (d) communication of shared leanings from successes and failures; and
- (e) incorporation of safety into the performance of OpCo's Activities.

4.3. Management responsibility

OpCo must identify the specific responsibilities and authorities for Staff who can have an effect on WHS. The Project WHS Management Plan must, as a minimum, define the WHS responsibilities, authorities and accountabilities for management and supervisory positions from the chief executive officer (or equivalent) to foreman / team leader level.

The Project WHS Management Plan must indicate the qualifications, experience and the names of OpCo's senior management representative and OpCo's Work Health and Safety Manager who have primary responsibility for ensuring that the Corporate WHS Management System and the Project WHS Management Plan are fully implemented whilst OpCo is carrying out OpCo's Activities.

OpCo must also identify clear WHS responsibilities and authorities for all other personnel undertaking OpCo's Activities. Responsibilities and authorities for WHS matters for all other

personnel undertaking OpCo's Activities must be clearly defined in job descriptions and documented in the Project WHS Management Plan.

4.4. Communication and consultation

4.4.1. Work Health and Safety consultation

The processes for WHS consultation must comply with the consultation obligations identified in the WHS Legislation and the Safe Work Australia Work Health and Safety Consultation, Co-operation and Co-ordination Code of Practice.

The WHS consultation processes and procedures must be documented in the Project WHS Management Plan and include processes and procedures for:

- (a) consultation with and between OpCo Contractor employee representatives;
- (b) managing WHS consultation and WHS issue resolution;
- (c) coordination of activities with all personnel who have a WHS responsibilities;
- (d) communication of OpCo's issue resolution and safety breach management procedures to all personnel undertaking OpCo's Activities;
- (e) display of statutory mandated notices on the SLR Site;
- (f) communication of safety and emergency protocols and procedures to all personnel undertaking OpCo's Activities;
- (g) development, implementation and management of pre-start meetings;
- (h) development, implementation and management of shift handover meetings; and
- (i) WHS meetings.

4.5. Work Health and Safety reporting

OpCo must provide WHS reporting in accordance with SPR Appendix 10 (*Reporting Requirements*).

OpCo must provide reports or other information relating to work health and safety upon request by TfNSW's Representative, including information relating to safety inspections, audits or assessments undertaken during the performance of OpCo's Activities.

4.6. OpCo Contractors

4.6.1. OpCo Contractor Site-specific Safety Management Plans and Safe Work Method Statements

Where an OpCo Contractor is engaged to perform any activities, then OpCo must provide the OpCo Contractor with the parts of the Project WHS Management Plan that are relevant to the work to be performed by the OpCo Contractor.

OpCo must ensure that the OpCo Contractor develops Site-specific Safety Management Plans and Safe Work Method Statements prior to commencing work on the SLR Site. The OpCo Contractor may use the format of OpCo's Site-specific Safety Management Plans and may prepare Site-specific Safety Management Plans and Safe Work Method Statements in conjunction with OpCo. However, the OpCo Contractor's Site-specific Safety Management Plans and Safe Work Method Statements must be presented under the OpCo Contractor's

letterhead, show the name and the registered office address of the OpCo Contractor and be signed and dated by a senior management representative of the OpCo Contractor.

Where an OpCo Contractor amends its Site-specific Safety Management Plans or Safe Work Method Statements, OpCo must ensure that the OpCo Contractor provides OpCo with copies of the amended Site-specific Safety Management Plans or Safe Work Method Statements (as applicable) before the work associated with the amendments commences.

Where OpCo amends its Project WHS Management Plan, OpCo must provide to OpCo Contractors any relevant sections of the amended Project WHS Management Plan.

4.6.2. Control of OpCo Contractors

OpCo must include WHS system requirements in the planning, selection and management of OpCo Contractors.

OpCo must undertake appropriate monitoring of every OpCo Contractor's work to ensure that the specified WHS system requirements are effectively implemented and all the activities undertaken by OpCo Contractors are carried in accordance with the Site-specific Safety Management Plans and Safe Work Method Statements.

For subcontracted work, OpCo must document in the Project WHS Management Plan the processes OpCo will implement to ensure OpCo Contractor compliance, including details of:

- (a) the duties of each OpCo Contractor in order to ensure OpCo Contractors comply with the WHS Legislation;
- (b) the duties OpCo will retain for management of site safety issues;
- (c) OpCo's surveillance program to monitor and document the effectiveness of each OpCo Contractor's Site-specific Safety Management Plans and Safe Work Method Statements; and
- (d) the actions OpCo will take in the event that OpCo Contractors are found not to be working to the requirements of the Project WHS Management Plan or OpCo Contractor's Site-specific Safety Management Plans and Safe Work Method Statements.

4.7. Purchasing

Without limiting OpCo's obligations under the WHS Legislation, OpCo's Project WHS Management Plan must include processes to safely manage purchasing and hiring and ensure that:

- (a) the requirements of the WHS Legislation relating to materials, plant and equipment, hazardous substances and dangerous goods are complied with;
- (b) all materials, plant, equipment, goods or substances bought or hired meet any applicable Australian Standards or other agreed standards and the requirements of the Australian Government Australian Safety and Compensation Council Guidance on Occupational Health and Safety in Government Procurement; and
- (c) before new materials, plant, equipment, goods or substances are introduced into the workplace, WHS hazards must be identified and the risks controlled, and consultation with the personnel involved must occur.

4.8. Design

The Contractor must, as a minimum, implement design procedures in accordance with the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013), Safe Work Australia Safe Design of Structures Code of Practice July 2012 and the National Standard for Plant [NOHSC:1010(1994)].

4.9. Risk management

4.9.1. General requirements

OpCo must develop appropriate risk management procedures to identify health and safety hazards and risks, assess hazards and risks and plan work processes to control and communicate those hazards and risks. The risk management procedures must comply with the Safe Work Australia How to Manage Work Health and Safety Risks Code of Practice, AS/NZS ISO 31000 Risk management - Principles and guidelines and ISO/IEC 31010 Risk management - Risk assessment techniques.

OpCo must demonstrate in the Project WHS Management Plan that the risks to health and safety associated with OpCo's Activities have been fully identified, assessed and eliminated, so far as is reasonably practicable, and where elimination of a risk to health and safety was not reasonably practicable, the risks to health and safety have been minimised so far as is reasonably practicable.

4.9.2. Risk assessment and risk control

OpCo must prepare a health and safety risk register and include the health and safety risk register in the Project WHS Management Plan. The WHS risk register must include:

- (a) a description of all health and safety hazards and risks and their likely impact;
- (b) the risk level assessed for each hazard and risk;
- (c) specific control measures, including safe work methods to be implemented to eliminate or reduce the hazards and risks;
- (d) the residual hazards and risks;
- (e) methods to be used to monitor effectiveness of safe work methods and control measures;
- (f) the personnel responsible for monitoring implementation of the control measures;
- (g) consultative processes employed by OpCo in relation to the hazards and risks and the personnel involved in the consultative process; and
- (h) demonstration that risks to health and safety have been eliminated, so far as is reasonably practical, and where elimination of risks to health and safety was not reasonably practicable, those risks to health and safety have been minimised so far as is reasonably practicable.

Each month, OpCo must review the risk assessment and risk control plan elements of the Project WHS Management Plan and submit to TfNSW's Representative written certification that the risk assessment and risk control plan covers all proposed activities with identified risks. Where new risks have been identified, OpCo must also certify that these risks have been addressed in accordance with this clause.

4.9.3. Identified risk activities

Without limiting the requirements of the WHS Legislation or the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013), OpCo must identify and address all WHS issues associated with the construction methods, plant and equipment and materials that will be used in the performance of OpCo's Activities, including any fire related risks associated with the construction methods, plant and equipment and materials that will be used in the performance of OpCo's Activities.

OpCo must give specific and detailed consideration to the following activities when conducting risk assessments and developing risk control plans:

- (a) manual handling;
- (b) use, installation, inspection and / or repair of vehicles, plant and equipment;
- (c) working at heights;
- (d) working adjacent to or over water;
- (e) working on or near roads;
- (f) working on or in the vicinity of railway lines;
- (g) working in confined spaces, including identifying and sign posting of confined spaces;
- (h) moving plant and equipment and traffic control;
- (i) hazardous substances and dangerous goods;
- (j) asbestos removal or disturbance;
- (k) electrical work;
- (l) prestressing;
- (m) excavation and earthworks;
- (n) blasting;
- (o) working near underground utilities;
- (p) working near overhead utilities;
- (q) use of mechanical lifting devices including cranes, hoists and forklifts;
- (r) tunnelling operations;
- (s) noise; and
- (t) all high-risk construction work as identified in the WHS Regulations and in the Safe Work Australia Construction Work Code of Practice July 2012.

4.10. Training

4.10.1. General requirements

OpCo must ensure that all Staff have received appropriate training in their WHS responsibilities. OpCo must undertake training needs analyses for all Staff to identify any

gaps and provide any additional training required prior to the personnel commencing work at the SLR Site. OpCo must ensure that:

- (a) training relates to hazards likely to be encountered on the SLR Site and includes control measures that have been developed in response to these hazards;
- (b) different training needs are identified, including new work activities, which will arise at different stages of OpCo's Activities and prepare and implement a program to meet these different training needs; and
- (c) training records are maintained in accordance with OpCo's Corporate OHS Management System.

OpCo must conduct WHS inductions for all Staff in accordance with the requirements of the WHS Legislation.

The Project WHS Management Plan must include processes to ensure compliance with all of the WHS induction obligations of the WHS Legislation and the training and induction requirements in this document.

The WHS inductions must, as a minimum, include the following:

- (a) project-specific inductions;
- (b) site-specific inductions;
- (c) task-specific inductions;
- (d) daily pre-start / pre-work briefings; and
- (e) visitor-specific inductions.

Without limiting the deed, OpCo is required to:

- (a) regularly review and update the WHS inductions and training to ensure that the WHS issues covered remain relevant to changing circumstances on the SLR Site;
- (b) ensure the trainers hold appropriate and valid qualifications in workplace training;
- (c) keep records of the qualifications of trainers;
- (d) keep a list of those Staff who have been trained, including details of the training, and provide written statements that the training has met the requirements of the WHS Legislation;
- (e) keep a copy of the written statement given to each participant in WHS inductions and training verifying that they have satisfactorily completed the induction or training, or in the absence of a statement, provide certification that the person has the necessary skills and experience to perform the work; and
- (f) ensure that OpCo Contractors have a system in place to ensure that the OpCo Contractor personnel do not start work unless the personnel have completed WHS inductions and training.

4.10.2. Project-specific inductions

OpCo must develop and deliver a project-specific safety induction program for Staff. The project-specific induction must include:

- (a) a description of the SLR Works and Temporary Works;

- (b) a description of OpCo's Activities;
- (c) a description of major hazards and their controls for the SLR Site and OpCo's Activities;
- (d) OpCo's commitment to compliance with the WHS requirements of the deed and all relevant Legislation;
- (e) emergency and evacuation plans (including the role of wardens and assembly points);
- (f) how to obtain first aid and the role of first aid officers;
- (g) incident and near miss investigation and reporting requirements;
- (h) fatigue management;
- (i) the drug and alcohol policy on the SLR Site;
- (j) the duties of personnel using or operating plant and equipment on the SLR Site; and
- (k) policies relating to personal protective equipment (including its use, maintenance and replacement).

4.10.3. Site-specific inductions

OpCo must develop and deliver a site-specific induction program that addresses the requirements of Site-specific Safety Management Plans. Each site-specific induction must address hazards which are likely to be encountered and the control measures that have been developed to mitigate such hazards. The site-specific inductions must include:

- (a) rail safety, if OpCo's Activities involves working on or in the vicinity of railway lines;
- (b) communication and consultation processes;
- (c) issue resolution processes;
- (d) emergency procedures, including evacuation procedures;
- (e) SLR Site security procedures;
- (f) WHS procedures; and
- (g) any other issues relevant to the site.

Site-specific inductions must be regularly reviewed and updated by OpCo to ensure that they remain relevant to OpCo's Activities being undertaken on the site.

4.10.4. Task-specific inductions

OpCo must develop and deliver a task-specific induction program that address:

- (a) high-risk construction work as identified in the WHS Regulations and in the Safe Work Australia Construction Work Code of Practice July 2012; and
- (b) work on or in the vicinity of railway lines.

4.10.5. Daily pre-start / pre-work briefings

OpCo must provide daily pre-start / pre-work briefings that cover the following:

- (a) the progress of the SLR Works and Temporary Works at specific work areas;
- (b) any changes to specific work areas expected during the day;
- (c) incidents and near misses;
- (d) complaints received that are applicable to the specific activity being undertaken and measures implemented to address or minimise those complaints;
- (e) plant and equipment changes;
- (f) traffic management changes; and
- (g) introductions for new personnel.

4.10.6. Visitor-specific inductions

OpCo must develop and deliver a visitor-specific induction program. OpCo must ensure that all visitors, including representatives from Authorities, TfNSW's personnel, stakeholders and the community, who are invited or brought onto the SLR Site, undergo the visitor-specific induction. The visitor-specific induction must include:

- (a) SLR Site safety rules;
- (b) personal protective equipment that must be worn while on the SLR Site;
- (c) site-specific hazards and controls that apply on the part of the SLR Site being visited;
- (d) safe access, egress and amenities;
- (e) emergency evacuation procedures; and
- (f) incident and near miss investigation and reporting requirements.

4.11. Inspection, testing and servicing

4.11.1. General requirements

OpCo must develop an appropriate system for the conduct of regular inspections, testing and monitoring and must as a minimum comply with the requirements for inspection, testing and monitoring outlined in the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013). The systems for inspection, testing and monitoring must be documented in the Project WHS Management Plan.

4.11.2. Work Health and Safety inspections

OpCo must conduct WHS inspections at least weekly to identify hazards associated with the SLR Works, the Temporary Works and OpCo's Activities, including all work and activities undertaken by OpCo Contractors.

OpCo must participate in joint work health and safety inspections with TfNSW's Representative on a monthly basis or more frequently as required by TfNSW's Representative. TfNSW's Representative may also separately conduct WHS inspections.

Following any WHS inspections, OpCo must act on any hazards identified by the inspection and the appropriate corrective actions must be documented and implemented in accordance with clause 4.12.5.

If WHS inspections indicate a non-conformance with WHS requirements, TfNSW's Representative may conduct a safety management system audit.

OpCo must ensure that appropriate and timely action is taken to eliminate or reduce identified hazards.

OpCo must develop and maintain WHS inspection registers for the SLR Works, Temporary Works and OpCo's Activities that, as a minimum, include:

- (a) the date of WHS inspections and the items / activities inspected,
- (b) the personnel present at WHS inspections;
- (c) the findings of the WHS inspection including any actions required by whom and by when; and
- (d) corrective action details including the corrective action required; priority and date for corrective action close out as well as the personnel accountable for the corrective action.

Records of WHS inspections are to be kept on the SLR Site and made available to TfNSW's Representative upon request.

4.11.3. Plant and equipment use

OpCo must certify that plant is safe and without risk to WHS when properly used. All plant must comply with the requirements of the WHS Legislation and the National Standard for Plant [NOHSC:1010 (1994)].

OpCo must allow inspection at any time by TfNSW's Representative of any plant or equipment that OpCo brings on to the SLR Site.

OpCo must as a minimum:

- (a) obtain relevant certificates, licences and permits that are required by WorkCover or any other relevant Authority, and make them available to TfNSW's Representative upon request;
- (b) maintain and use the plant and equipment in accordance with manufacturer's specification, standards or certified modification;
- (c) maintain records of inspections (those conducted daily and for other purposes), service, cleaning and maintenance and make these available to TfNSW's Representative upon request;
- (d) perform daily pre-start inspections of all plant and equipment;
- (e) ensure that all work performed in the inspection, servicing, cleaning and maintenance of plant is performed by competent personnel;
- (f) provide adequate information about the plant to ensure its safe use;
- (g) identify potential hazards associated with the use of plant and equipment and assess and control risks associated with the use of plant and equipment, including provision for all personnel working in or around plant, by the preparation of Safe Work Method Statements;
- (h) ensure that all of its personnel and any OpCo Contractor personnel who are required to use or operate plant or equipment are appropriately licensed or certified and have received the necessary training to operate the particular item and / or perform particular tasks;

- (i) remove any piece of plant or equipment when directed by TfNSW's Representative or WorkCover; and
- (j) make available for inspection any piece of plant or equipment when directed by TfNSW's Representative or WorkCover.

4.12. Incident management and corrective action

4.12.1. Emergency planning and response

The Project WHS Management Plan must identify the processes for site communication, external communication and communication with Staff in relation to notification of safety issues and emergencies. OpCo must maintain a current list of relevant contact names, telephone numbers and email addresses for the project. Contact details must be displayed on site in accordance with the requirements of the WHS Legislation.

The Project WHS Management Plan must include details for the SLR Site of:

- (a) emergency organisation, responsibilities, and emergency evacuation systems;
- (b) a list of key personnel with contact details, including all-hours telephone numbers;
- (c) details of emergency and other relevant services (including ambulance, fire brigade, spill clean-up services);
- (d) communications strategy (internal and external);
- (e) details of where information on hazardous materials is kept, including each material's potential impact to personnel upon exposure and measures to be taken in the event of accidental release; and
- (f) how first aid is to be administered on the SLR Site.

4.12.2. Investigation of incidents

OpCo must develop and implement processes and procedures for the investigation of all WHS incidents or near misses. OpCo must determine the cause of the incident or near miss and the actions and controls that are required to prevent a recurrence of the incident or near miss. The investigations must be completed impartially, without bias. The investigations must be carried out in accordance with the requirements of:

- (a) Transport for NSW Incident Reporting Recording and Investigation Standard 90-ST-001; and
- (b) Transport for NSW Incident Investigation Procedure 90-PR-003.

TfNSW's Representative and other nominated TfNSW personnel are to be advised of and given the opportunity to participate in the investigations in accordance with the documents noted in (a) and (b) above.

TfNSW's Representative may also participate in any investigation being undertaken by OpCo or initiate its own investigation. If TfNSW's Representative initiates its own investigation OpCo must provide TfNSW's Representative with all assistance required for the purposes of the investigation.

OpCo must progressively record the results of all investigations that it undertakes. OpCo must provide TfNSW's Representative with an interim investigation report within 24 hours of any request for an interim report from TfNSW's Representative. OpCo must attach any

statutory notifications forms, statutory notices and notice of any fines received in relation to the incident or near miss to the interim investigation report.

Minor investigation reports and major investigation reports must be submitted to TfNSW's Representative in draft form for review prior to finalisation. Minor investigation reports and major investigation reports must comply with the requirements of:

- (a) Transport for NSW Minor Investigation Report 90-FT-001; and
- (b) Transport for NSW Major Investigation Report Template 90-FT-178.

Final minor investigations reports must be issued to TfNSW's Representative within 20 Business Days of the occurrence of the relevant incident or near miss. Final major investigation reports must be issued to TfNSW's Representative within 30 Business Days of the occurrence of the relevant incident or near miss.

OpCo's incident and near misses investigation processes and procedures must be documented in the Project WHS Management Plan and must include:

- (a) timings for investigations;
- (b) levels of investigations to be undertaken;
- (c) composition of investigation teams;
- (d) qualifications and experience of investigation team members;
- (e) investigation report preparation and submission; and
- (f) personnel responsible for implementing actions and controls to prevent a recurrence of incidents and near misses.

4.12.3. Reporting of incidents

OpCo must develop and implement processes and procedures for the reporting of all WHS incidents or near misses. Reporting of incidents and near misses must comply with the requirements of Transport for NSW Incident Reporting Recording and Investigation Standard 90-ST-001.

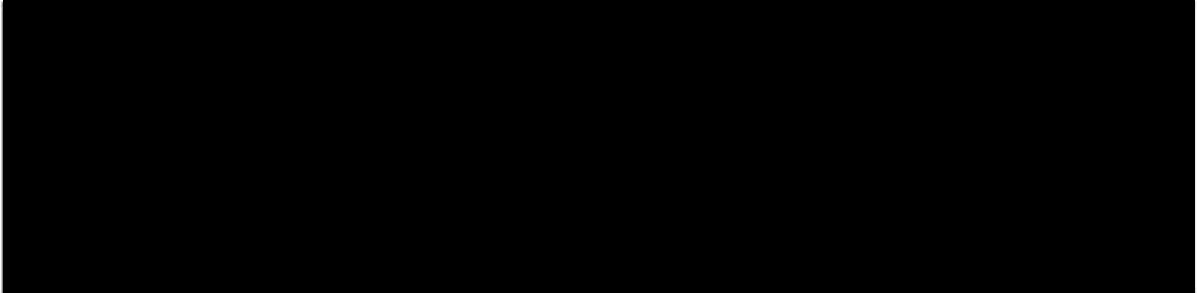
OpCo must immediately notify TfNSW's Representative of any WHS incidents and issue an incident report that complies with the requirements of Transport for NSW Safety and Environmental Incident Report 90-FT-002.

Where OpCo is required under the WHS Legislation to give a notice to WorkCover of an accident or incident occurring during the performance of OpCo's Activities, then OpCo must at the same time give a copy of that notice to TfNSW's Representative.

Where OpCo has been served any type of notice or fine by WorkCover then OpCo must immediately give a copy of that notice or fine to TfNSW's Representative. OpCo must also give notice to TfNSW's Representative of its proposed corrective action in response to the WorkCover notice or fine and advise TfNSW's Representative when the action has been completed and the notice rectified.

In addition to the notification requirements above, OpCo must promptly notify TfNSW's Representative of any lost time accident or injury and of any dangerous occurrence that occurs during the performance of OpCo's Activities.

OpCo's incident reporting processes and procedures must be documented in the Project WHS Management Plan.



Should an incident occur on or in relation to the SLR which relates to the rail safety on the Sydney Trains rail network, OpCo must immediately notify the Sydney Trains Rail Management Centre. Where an incident occurs on or in relation to the SLR on the road or has an impact on the road networks then OpCo must immediately notify the Traffic Management Centre.

All WHS Legislation 'Notifiable Incidents' and Rail Safety National Law 'Notifiable Occurrences' must be reported to TfNSW's Representative within two hours of OpCo becoming aware of the occurrence.

For WorkCover NSW defined Dangerous Incidents the person with management or control of a workplace must take measures to ensure so far as reasonably practicable, that the site where the Incident occurred is not disturbed until an inspector arrives at the site or any earlier time that an inspector directs.

For WHS Notifiable Incidents refer to sections 35, 36 and 37 of the WHS Act. WorkCover should be telephoned immediately on 13 10 50, in order that WorkCover may instigate its own investigations. Reporting can also be by electronic communication (using a mode of electronic communication approved by WorkCover) providing the information requested by WorkCover. OpCo must also provide TfNSW's Representative, with a copy of this electronic communication notice within two hours of the Notifiable Incident occurring.

Where any type of notice, infringement or fine by WorkCover NSW or the Independent Transport Safety Regulator (ITSR) has been issued to OpCo whilst undertaking OpCo's Activities, OpCo must immediately notify TfNSW's Representative and must provide TfNSW's Representative with a copy of the notice, infringement or fine within two hours of receiving it.

4.12.4. Reporting of hazards



4.12.5. Corrective action

OpCo must ensure WHS issues are appropriately addressed and similar issues do not reoccur and, as a minimum, comply with the requirements outlined in the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013) for corrective action.

If OpCo fails to comply with its WHS obligations under the deed, including a failure to:

- (a) comply with, and to ensure compliance by OpCo Contractors with, any requirements of its WHS obligations; or
- (b) act promptly by identifying, isolating and correcting issues when WHS system controls are observed not to be effective by OpCo, TfNSW’s Representative, or by any Authority having jurisdiction over the OpCo’s Activities or the SLR Site,

a Hold Point may be applied by TfNSW’s Representative.

HOLD POINT	(Where required by TfNSW’s Representative)
Process Held.	The process/es relevant to the non-conformance.
Submission Details.	Verification that the failure has been remedied and measures have been implemented to prevent recurrence.
Release of Hold Point.	TfNSW’s Representative will consider the submitted documents and may inspect the works subject to the failure prior to authorising the release of the Hold Point.

4.13. Handling, storage, packaging and delivery

OpCo must develop appropriate documentation for materials handling and manual handling of materials and must as a minimum comply with the requirements of the WHS Legislation and the requirements for handling, storage, packaging and delivery outlined in the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013).

This documentation must include, those hazards associated with manual handling, plant and hazardous substances. Regulatory requirements and guidance in relevant Australian Standards, other relevant standards and codes of practice for managing these hazards must be followed.

4.14. Internal reviews

OpCo must perform WHS audits as required under its Corporate OHS Management System and make the records of these audits available to TfNSW’s Representative upon request.

OpCo must perform audits of the Project WHS Management Plan in accordance with the requirements of the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013) and make the records of these audits available to TfNSW’s Representative upon request.

In addition to this OpCo must establish a program of internal review in accordance with the requirements for internal review outlined in the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013).

4.15. Documentation and records

Without limiting the deed, OpCo must maintain legible WHS records to demonstrate compliance with OpCo’s Corporate WHS Management System and the Project WHS Management Plan and must include all those records identified in section 4 of the NSW Government Work Health and Safety Management Systems and Auditing Guidelines. OpCo must allow inspection by TfNSW’s Representative of these records.

4.16. Safety change management

OpCo must manage the organisational structure of its project team as per the deed clause 9.16. This includes any changes to:

- (a) roles and responsibilities;
- (b) reporting and communication lines; and
- (c) individuals nominated for each position.

OpCo must develop and implement procedures for the management, control, authorisation and recording of changes to the safety procedures on the SLR Site. This includes:

- (a) changes to safe working requirements;
- (b) changes as a result of amendments to relevant Legislation;
- (c) changes in technology; and
- (d) procedures and processes that are covered under safety change management.

OpCo must not bring any plant or equipment to SLR Site that has been modified in any way unless approval has been received from the respective regulatory or certification Authority.

If OpCo's Activities involves work in or adjacent to the Permanent Light Rail Corridor and the rail environment, OpCo must develop and implement change management procedures in line with AS 4292.1 (2006) Railway Safety Management.

4.17. Alcohol and other drugs

A policy of zero tolerance of alcohol and illegal drug use applies to projects carried out for or controlled or managed by TfNSW. Alcohol and illegal drugs must not be permitted on the SLR Site or on premises controlled or managed by TfNSW.

OpCo must develop policies and procedures to ensure this policy of zero tolerance of alcohol and illegal drugs is adhered to at all times. OpCo must develop and implement effective drug and alcohol testing procedures. If OpCo's Activities involve work in or adjacent to the rail corridor and the rail environment, these procedures must be in line with the Rail Safety National Law (NSW), and the testing regime must include prestart testing prior to Track Possessions.

OpCo must ensure that all persons associated with OpCo's Activities (including Staff, visitors, and agents) are aware of their obligations to comply with all alcohol and drug requirements.

TfNSW's Alcohol and Other Drugs Standard 60-ST-010, prohibits any persons affected by alcohol or drugs from working on any projects carried out for or controlled or managed by TfNSW, regardless of their work location. Prescription and over-the-counter drugs may also affect a person's ability to work safely and TfNSW will determine its policy in relation to prescription and over-the-counter drugs on a case by case basis.

A breach of TfNSW's Alcohol and Other Drugs Standard will occur if:

- (a) drug levels are at or above the cut off level stipulated by the Australian Standard AS/NZS 4308:2008 Procedures for Specimen Collection and the detection and quantitation of drugs of abuse in urine; or
- (b) alcohol levels are above zero grams of alcohol in 210 litres of breath or 100 millilitres of blood.

Anyone that tests positive to alcohol or drugs or who refuses a drug or alcohol test must be removed from the SLR Site immediately, and TfNSW's Representative must be notified immediately.

OpCo must take disciplinary action against a person associated with OpCo's Activities who breaches TfNSW's Alcohol and Other Drugs Policy or who refuses a drug or alcohol test. The nature of the disciplinary action to be taken must be agreed upon by TfNSW's Representative.

A person associated with OpCo's Activities who breaches TfNSW's Alcohol and Other Drugs Standard may have their Rail Industry Safety Induction (RISI) card or any other competency cards removed. Rail safety workers who test positive to drug or alcohol tests or who tamper with, or refuse any test, may be subject to prosecution.

TfNSW may have any person who is suspected of being under the influence of alcohol or drugs while carrying out OpCo's Activities:

- (a) excluded from carrying out OpCo's Activities;
- (b) tested by an authorised testing officer, medical practitioner or the New South Wales Police Force; and/or
- (c) removed from the SLR Site.

All Staff may be subject to drug and alcohol testing by an authorised testing officer of TfNSW at any time whilst carrying out OpCo's Activities (including within OpCo's site amenities or facilities). Such testing will be in accordance with TfNSW's Alcohol and Other Drugs Standard and, if OpCo's Activities involves work in or adjacent to the rail corridor and the rail environment, the Rail Safety National Law.

OpCo must ensure that all Staff co-operate with any person administering investigation and testing procedures on TfNSW's behalf.

TfNSW will determine a test program and will select work locations for random testing. The locations will be selected for random testing in order to achieve an annual test rate of at least 25% of rail safety workers and 5% of non-rail safety workers. Due consideration will be given to the hours of work and the number of persons at each work location. The test program schedule of site visits will remain confidential and may be audited by officers of the Independent Transport Safety Regulator (ITSR). ITSR officers may also conduct random testing.

OpCo must provide TfNSW's authorised testing officers with access to the SLR Site and OpCo Contractors places of work to conduct the alcohol and other drug testing as required. The methods of administering and processing alcohol and other drug tests will be in accordance with AS/NZS 4308:2008 and, if OpCo's Activities involves work in or adjacent to the rail corridor and the rail environment, the Rail Safety National Law.

In the event of an Incident, OpCo's personnel on the SLR Site who were involved with or witnessed the Incident may not leave the SLR Site until they have undertaken drug and alcohol testing and TfNSW's Representative has agreed to their departure from the SLR Site. If individuals involved in or witness to the Incident are taken by ambulance to hospital, then the drug and alcohol testing will be undertaken at the hospital.

Each individual that signs on at the commencement of each shift will be declaring themselves to be free of drugs and alcohol.

4.18. Fatigue management, medical and health management

OpCo must prepare, document and implement a fatigue management program for all employees and OpCo Contractor's that is in accordance with WHS Legislation.

For workers carrying out railway safety work, OpCo must apply the following fatigue, medical and health management controls:

- (a) implement a fatigue management program that:
 - i. addresses the requirements of the Rail Safety National Law and TSR S1 Clause 4.18;
 - ii. restricts workers to no more than 12 hours worked at a time not including travel time to and from work, unless there is a declared Incident in which case work can be performed up to a maximum of 16 hours at a time, as long as workers are not required to drive a motor vehicle or operate heavy plant or equipment after the 12th hour;
 - iii. restricts workers that have worked more than 12 hours from driving after finishing work;
 - iv. includes periods of 11 hours rest away from work;
 - v. restricts the maximum number of work days to 12 work days in 14 consecutive days;
 - vi. minimises to five consecutive occasions where eight (8) hours are worked at night (i.e. after normal office hours) or four (4) consecutive occasions where 10 hours are worked at night or three (3) consecutive occasions where 12 hours are worked at night without a 48 hour rest break;
 - vii. ensures employees receive a minimum of 48 consecutive hours free of work in a 14-day period; and
 - viii. has the capacity to replace or relieve workers where unplanned or unavoidable extended hours have created a risk to employee health and safety;
- (b) inform such persons that they are subject to medical and health assessments in accordance with the National Standard for Health Assessments of Rail Safety Workers;
- (c) ensure that examinations under the National Standard for Health Assessments of Rail Safety Workers are undertaken and documented including re-examinations. The documented records must be maintained according to the State Records Act 1998 (NSW); and
- (d) inform such persons that additional medical and health assessments may be required to be undertaken where they are involved in a safety incident or where there is reasonable cause for concern that person may be unable to perform work safely (such as upon return from a long illness).

4.19. Personal Protective Equipment (PPE)

4.19.1. General requirements

OpCo must assess the personal protective equipment (PPE) required to undertake OpCo's Activities. OpCo must provide the necessary instruction and training to ensure that the PPE effectively protects against the risk for which it is provided.

OpCo must ensure that Staff carrying out work at the SLR Site:

- (a) is provided with, and wears at all times PPE that meets all relevant Australian Standards or manufacturers specifications where a standard is not available, and satisfies the following criteria:

- i. when working in the rail corridor meets the PPE requirements nominated by the Rail Operator in charge; and
 - ii. wears the following minimum PPE at all times - Hi visibility clothing, steel capped safety footwear, a safety helmet, safety eyewear and / or face protection appropriate for the task, full sleeved shirts with collars, long trousers and full fingered gloves (the type of glove is to be determined by the task and / or by a risk assessment).
- (b) In addition to (a) above, is provided with and wears, if required by the nature of the task and the environment, all necessary and appropriate PPE including:
 - i. respiratory protection (including particulate respirator, gas filter respirator and supplied air respirator);
 - ii. hearing protection; and
 - iii. sun protection; and
- (c) is provided with storage and hanging locations to allow PPE to be aired and dried.

Where the minimum PPE does not create the most suitable control for the task a risk assessment must be undertaken and defined controls incorporated into the SWMS (e.g. the use of steel capped gumboots during concrete pours).

4.19.2. Rail corridor-specific requirements

The following specific requirements apply when working in the rail corridor:

- (a) Wear at all times high visibility orange clothing (including high-visibility vest or shirt, and wet weather / winter upper body apparel) which:
 - i. is compliant with section 8 (Class D/N Garments) of AS 4602 High Visibility Safety Garments and the label clearly states that the clothing meets this standard and any others standards applicable;
 - ii. is approved by TfNSW;
- (b) Red, green or yellow PPE or clothing is not permitted to be worn at any time in the rail corridor.
- (c) Lace up, ankle length, steel capped safety footwear (elastic sided boots are not permitted on site) compliant with AS/NZS 2210 Occupational Protective Footwear;

4.20. Permits and licences

OpCo must obtain all permits and licences which are required to undertake OpCo's Activities and to deliver the SLR Works. OpCo must develop and implement procedures and processes that enable it to identify all required permits and licences (including design permits that are required for undertaking OpCo's Activities), and detail how and when they will be procured. Copies of the permits and licences must be available for issue to TfNSW's Representative upon request prior to the commencement of OpCo's Activities that relate to the licence or permit.

Without limiting the above requirement, the following activities are not permitted to commence without a permit/licence:

- (a) hot work including underground locations or outdoor locations;

- (b) work within “no-go zones” and “Accredited Persons Zone” associated with overhead power lines or other electrical equipment including any Asset Owner’s electrical infrastructure;
- (c) work in a confined space (including tunnels);
- (d) work on public roads;
- (e) demolition involving mobile cranes, a wrecking ball or the pulling down of a building with ropes or chains;
- (f) asbestos removal;
- (g) excavation work; and
- (h) rail safeworking arrangements including worksite protection brief.
- (i) total fire ban exemption from the NSW Rural Fire Commissioner

OpCo must ensure that all applicable Staff sign on and off the relevant permit when required to work in areas to which the permit applies.

All licences and permits must be available for inspection by TfNSW’s Representative at all times.

4.21. Working in and adjacent to the rail corridor and rail environment

Where there is an interface with an existing rail system then the requirements in this clause apply.

OpCo is to identify the potential rail interface locations and discuss these with TfNSW.

Current interface locations to be considered include the existing IWLR at Hay Street and George Street, the current IWLR at the old Rozelle goods yard.

The safety interface management strategy must provide the proposed arrangements for managing the risks to safety from the interface of SLR with:

- (a) the railway operations of other operators and with organisations controlling public or private roads, at rail or road crossings including the rail facilities, if applicable, including:
 - i. an approach to managing risks including a process for evaluation, testing and updating the interface details and risks;
 - ii. roles and responsibilities of each interface party including procedures by which each party will monitor and determine whether the other party complies with those responsibilities;
 - iii. a process for ensuring interface agreements are kept up to date and regularly reviewed;
- (b) any other organisations for which there may be an operational, technical, safety or other interface of any aspect of business that is an intended or accepted feature of SLR, and for each such organisation, the arrangements must include:
 - i. the key issues, including a measure of their significance and broad categories they can be assigned to;
 - ii. the proposed approach to the interface discussion or proposed interface arrangements that are envisaged;

- iii. the ongoing approach to communication; and
- iv. the responsibilities of each party as part of the management of the required interface.

5. Audits of OpCo Performance

Without limiting the deed, OpCo must allow TfNSW's Representative to conduct an audit (including surveillance and process audits) at any time on any or all aspects of the Project WHS Management Plan.

OpCo must also allow WorkCover and other Authorities to conduct audits of the Project WHS Management Plan at any time.

OpCo must make available all resources including documentation and personnel to support these audits as well as make suitable facilities available at the SLR Site to temporarily accommodate an audit team.

OpCo must:

- (a) make available all relevant information and records, including those of OpCo Contractor's for the purposes of audit and surveillance;
- (b) provide all reasonable assistance to TfNSW's Representative's nominated audit team and to WorkCover; and
- (c) follow internal review procedures provided for in the Corporate WHS Management System.

6. Non-Compliance

If during the performance of OpCo's Activities, TfNSW's Representative informs OpCo that it is the opinion of TfNSW's Representative that OpCo:

- (a) is not conducting OpCo's Activities in compliance with the Project WHS Management Plan, Site-specific Safety Management Plans, Safe Work Method Statements or relevant Legislation; or
- (b) has allowed a risk to the WHS of Staff, TfNSW's personnel or members of the public to have occurred,

then OpCo must immediately identify, isolate and correct that non-compliance or risk to WHS.

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

**Appendix 11 – TfNSW’s General Specification G71
– Construction Surveys**

Document Number: 3126322_12
Execution Version

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1. General

1.1. Introduction

This general specification contains the construction survey requirements for meeting spatial tolerances and quality assurance requirements specified in the deed, and include:

- (a) development and maintenance of a quality management system for survey, including survey equipment, in accordance with Appendix 11 (*TfNSW's General Specification Q6 – Quality Management*);
- (b) maintenance of the integrity of the Survey Control Network;
- (c) surveying techniques;
- (d) survey accuracies and tolerances;
- (e) survey deliverables; and
- (f) survey checks.

1.2. Definitions

For definitions not specified in this document refer to the deed and the SPR Appendix 1 (*Definitions and Acronyms*).

Unless stated otherwise, a reference to an "Annexure" is a reference to an Annexure attached to this document.

Unless stated otherwise, a reference to a "clause" is a reference to a clause in this document.

In this document the following words have the following meanings:

- (a) "**Angle of inclination and declination**" means the angle of the line of sight above or below horizontal, respectively;
- (b) "**Established Survey Mark**" means Established Survey Mark as identified in the Surveying and Spatial Information Regulation 2012.
- (c) "**Height of sight lines**" means, when used in relation to survey procedures, the minimum vertical distance from a straight line to the natural surface;
- (d) "**ICSM**" means the Inter-Governmental Committee on Surveying and Mapping; the body responsible for coordinating Commonwealth and State agencies who contribute to surveying and mapping at a national level to ensure continued cooperation and technical standards;
- (e) "**Identified Record**" means those project records identified in Table A2 of Annexure G71/A;
- (f) "**Line of sight**" means the straight line joining the total station, or any other survey instrument, to the target;
- (g) "**Model**" means the the electronic representation of the design prepared by CADD software to produce the Design Documentation drawings. It also refers to surface models for conformance verification and quantity surveys;
- (h) "**Nominated Authority**" means the person or entity that is identified by TfNSW's Representative as having the authority to release a Hold Point;
- (i) "**OpCo's Surveyor**" means any person, being an employee or OpCo Contractor engaged by OpCo, to carry out any survey work and who is qualified and experienced in accordance with the requirements of clause 1.3.2;

- (j) **"Primary Survey Control Marks"** means Survey Marks identified in the Design Documentation as Primary Survey Control Marks;
- (k) **"Resection"** means a Survey Technique for determining the three dimensional coordinates of the total station when set remotely from survey control marks by measurements to more than one survey control mark. Resection procedures must measure sufficient redundant data to enable a statistical adjustment, preferably by least squares, which calculates the minimum Residuals for each measurement;
- (l) **"Residuals"** means the difference between the original field measurement and the adjusted measurement when carrying out adjustments (least squares) where there are redundant measurements;
- (m) **"Sight Distance"** means, when used in relation to survey procedures, the length of the sight line;
- (n) **"Survey Control Mark "** means a permanent mark placed for the Survey Control Network, placed in accordance with the Surveying and Spatial Information Regulation 2012 but not necessarily a state coordinated permanent mark;
- (o) **"Survey Control Network "** means the Primary Survey Control Marks plus any additional survey control marks placed to extend the Survey Control Network or to replace the Primary Survey Control Marks;
- (p) **"Survey Mark"** means a survey peg, bench mark, reference mark, signal, alignment, level mark or any other mark used or intended to be used for the purpose of setting out, checking or measuring the Project Work and the Temporary Work;
- (q) **"Survey Procedures"** means the quality assured methods to control parameters that affect the accuracy of survey techniques;
- (r) **"Survey Techniques"** means a survey method, such as radiation, height determination or tacheometry surveys;
- (s) **"the Act"** means the Surveying and Spatial Information Act 2002 No. 83.

1.3. Quality assurance

1.3.1. Work process control

Survey must be treated as a separate application of work process control and OpCo must prepare documented procedures covering all equipment, measurement, calculation and records necessary to:

- (a) set out the SLR Works and Temporary Works;
- (b) verify conformity to this document in relation to dimensions, tolerances and three dimensional position;
- (c) determine lengths, areas, volumes and positions of materials and products satisfying project and absolute tolerance requirements in AHD for height and MGA for position; and
- (d) monitor movements and settlements of the SLR Works and Temporary Works.

The Quality Management Plan must detail all Survey Procedures that address the survey processes and controls used by OpCo to ensure that all survey requirements of the deed will be met and include all of the documents and information shown in Annexure G71/B. The Quality Management Plan must also address OpCo's Surveyor's understanding of their

responsibility for survey control and must include the details of all OpCo's Activities requiring survey work and identification of the surveying tasks that are assigned to OpCo's Surveyor.

The Survey Procedures and survey equipment used must be appropriate for attaining the level of accuracy required by this general specification. In addition, the Survey Procedures and survey equipment must be appropriate to measure movements and settlements not exceeding orders of accuracy as described in this general specification.

The Survey Procedures must address all errors introduced by survey methods, including due allowance for the effects of:

- (a) survey equipment capability and adjustment;
- (b) integrity of the existing state supplied Survey Control Network;
- (c) vertical refraction;
- (d) the grid scale factor;
- (e) the earth's curvature; and
- (f) the geoid-ellipsoid separation.

1.3.2. OpCo's Surveyor qualifications and experience

OpCo must ensure that qualified surveyors with a minimum qualification of a Diploma in Surveying, or a recognised equivalent, from a recognised tertiary institution and who possess at least five subsequent years practical experience in surveying must direct and take responsibility for all survey work.

OpCo must also ensure that:

- (a) cadastral activities requiring preparation of plans suitable for lodgement at Land and Property Information - NSW for registration are carried out in accordance with the Surveying and Spatial Information Regulation 2012 by a Registered Land Surveyor under the Act or are carried out under the supervision of a Registered Land Surveyor;
- (b) monitoring surveys are carried out by qualified surveyor(s) who possess at least five years satisfactory practical experience in monitoring surveys; and
- (c) other surveys must be carried out by qualified surveyor(s) who possess at least five years satisfactory practical experience in construction surveys.

1.3.3. Equipment

- (a) General

All monitoring and measuring devices must comply with SPR Appendix 11 (*TfNSW's General Specification Q6 – Quality Management*) and the Surveyor General's Directions in relation to survey equipment used for the SLR Works and Temporary Works. The term, "monitoring and measuring devices" in SPR Appendix 11 (*TfNSW's General Specification Q6 – Quality Management*) applies to all survey instruments and ancillary equipment. The Quality Management Plan must demonstrate how these devices meet the accuracy and precision requirements for their intended applications.

All other survey equipment used for the SLR Works and Temporary Works must have a calibration procedure and be in calibration at all times.

- (b) Survey software

OpCo must use the latest versions of either MicroStation or AutoCAD to support its integrated survey software environment for data acquisition and processing of survey data that allows editing and plotting in three dimensions. OpCo's Surveyor software

environment must enable all project survey data to be delivered to TfNSW's Representative as electronic 3D digital files.

1.3.4. Records

All survey records must be included in the quality records. Conformity verification field book pages must be clearly labelled, dated and signed by OpCo's Surveyor with cross-indexed references to equipment used and lot / component identification for traceability. The survey reports generated must reference conformity verification field book page numbers.

Where automatic data recording systems are used for verification surveys, a print out in whole or part of both raw (field) data and reduced data must be retained in a similar manner as conventional field books with the electronic file name of the file holding the recorded data is also referenced in the field books. All electronic files must be named in accordance with the TfNSW CAD Manual or as agreed with the TfNSW Representative.

(a) Audit Trail

Survey records must be sufficient to provide objective evidence that OpCo's Surveyor has completed all surveys in compliance with procedures and that all surveys attain the required accuracy. The survey records system must be indexed for easy retrieval of information and provide a clear audit trail of all surveys.

Procedures must be prepared that describe the records system. The procedures must include the method of storing and indexing electronic records and identify all computer software used for reduction of survey measurements and calculations.

(b) Storage

The OpCo's Surveyor must store survey records in accordance with the requirements of SPR Appendix 11 (*TfNSW's General Specification Q6 – Quality Management*) and must provide regular updates of all survey data in version controlled electronic files on DVD media.

(c) Hard Copy

OpCo's Surveyor must, at the time of survey, provide signed paper copies of survey reports in hardcopy and PDF format verifying product conformity and, for land survey work, provide hard copies of electronically collected survey data used for set out and product conformity surveys.

Survey data collected manually in survey field books form part of the survey records and must be provided as part of the survey data in hardcopy and in PDF format. Survey field books must be clear and legible, showing the date, purpose, and location of the survey. Each survey field book must be indexed.

On behalf of OpCo, OpCo's Surveyor must sign all paper copies of records containing all survey check lists, survey field measurements, data and reductions, survey reports, field books, diagrams and sketches used to set out the work, test the product for conformity or to determine quantities in accordance with this document. Where OpCo's Surveyor radiates or determines height difference by EDM trigonometrical heighting to set-out marks or measures to structures and uses computer software as an independent survey check, the field measurements, data and resulting computer reduction files must form part of the survey records.

(d) Calibration Records

Calibration records of survey equipment and daily checks as described in the Quality Management Plan must form part of the survey records.

(e) **Non-conformity Register**

The OpCo's Surveyor must maintain a register of any non-conformity reports raised on survey work or survey data carried out as part of OpCo's Activities in accordance with the Quality Management Plan. If training is required as a result of any non-conformance, a training register must be supplied with the survey data. If any non-conformance results in a change to the Survey Procedures or Survey Techniques full details of all the affects and proposed changes must be included in the non-conformity report.

1.4. Safe system of work

OpCo must carry out all survey work in compliance with the WHS Legislation and in compliance with the requirements of the deed. As a minimum, this requires a risk assessment and development of safe work method statements for all survey activities of OpCo's Surveyor and may include the engagement of dedicated accredited safety personnel.

1.5. Care of Survey Marks

OpCo must preserve and maintain all Survey Marks in their true positions.

2. The Survey Control Network

2.1. Integrity of the Survey Control Network

OpCo must obtain the current details of the Primary Survey Control Marks and all other information necessary for setting out and work-as-executed surveys of SLR Works and Temporary Works. OpCo must take responsibility for these marks and any additional marks that form the Survey Control Network and verify their integrity before commencing any survey activity.

HOLD POINT	
Process Held.	Determination of a Survey Control Mark forming part of the Survey Control Network.
Submission Details.	Survey report verifying coordination and level values of the Survey Control Marks including procedures for replacing any affected Primary Survey Control Marks where requested.
Release of Hold Point.	The Nominated Authority will consider the submitted documents and may inspect the mark, prior to authorising the release of the Hold Point.

OpCo must include checks to verify that coordinates of Survey Control Marks shown in the Survey Control Marks Register are correct at the time of survey, both in Australian Height Datum (AHD) for height, and Map Grid of Australia (MGA) for position.

2.2. Survey accuracy of the Survey Control Network

When verifying, breaking down or extending the Survey Control Network, OpCo's Surveyor must use survey methods that comply with the following standards of accuracy.

2.2.1. General construction activities

General construction activities include activities not addressed in clauses 2.2.2, 2.2.3 and 2.2.4. Survey controls for general construction activities must be established to an accuracy conforming to the requirements identified in Table G71.1 for "General Construction Activities"

2.2.2. Earthworks

Survey controls for earthworks, including for the formation and the Local Area Works, must be established to an accuracy conforming to the requirements identified in Table G71.1 for "Excavations and Earthworks".

2.2.3. Overbridges and civil structures

Survey controls for the overbridges and civil structures must be established to an accuracy conforming to the requirements of Table G71.1 for "Specialised Construction Activities".

2.2.4. Monitoring surveys

Survey controls for monitoring of vertical settlement and / or horizontal movement must be established to an accuracy conforming to the requirements of Table G71.1 for "Specialised Construction Activities".

2.2.5. Other surveys

Survey controls for other surveys must be established to an accuracy conforming to the requirements of Table G71.8.

2.3. Specified standards of accuracy

The classes identified in Table G71.1 are defined in Part A of Standards and Practices for Control Surveys (SP1) from the Intergovernmental Committee on Surveying and Mapping.

Table G71.1: Standards of Accuracy for the Survey Control Network

Standard of Accuracy	Horizontal Control		Vertical Control		
	Traditional Survey Methods	GNSS Techniques	Differential Levelling	Trigonometrical Levelling	GNSS Techniques
General Construction Activities	Class B	NA	Class LC	Class B	NA
Excavations and Earthworks	Class E	Class B	Class LE	Class D	Class B
Specialised Construction Activities	Class A	NA	Class LA	NA	NA

2.4. Care, protection and preservation of the Survey Control Marks

2.4.1. The survey infrastructure

OpCo must comply with the Surveyor General’s Directions for Survey Practice, Surveyor General’s Direction No. 11, “Preservation of the Survey Infrastructure”, in the treatment of Permanent Survey Marks and cadastral Survey Marks that may be affected by the SLR Works and Temporary Works.

OpCo is responsible for the preservation of permanent Survey Marks and the preservation of state control survey in accordance with the Act as amended.

OpCo must identify any cadastral Survey Marks and monuments that may be disturbed by the SLR Works and Temporary Works and take measurements and submit to the Nominated Authority sufficient information to enable re-establishment of the position of the cadastral infrastructure within the accuracy specified in the Surveying and Spatial Information Regulation 2012, in accordance with the Surveyor General’s Directions for Survey Practice, Surveyor General’s Direction No. 11.

OpCo must develop, maintain and extend the Survey Control Network as required for the accurate setting out, monitoring and work-as-executed surveys of the SLR Works and Temporary Works.

2.4.2. The Survey Control Network

OpCo must ensure that OpCo's Activities do not disturb the Survey Control Marks defining the Survey Control Network.

OpCo must position additional Survey Control Marks to break down the Survey Control Network with due regard to maximising their use and protection against disturbance by OpCo's Activities. This includes placing survey marks that are substantially stable at the time of survey. Where a Survey Control Mark is affected by the execution of SLR Works or Temporary Works, OpCo must establish other stable marks, of the same order of accuracy, clear of the SLR Works and Temporary Works, and prior to the commencement of the SLR Works and Temporary Works.

2.5. Survey Control Mark register

OpCo must maintain an up to date Survey Control Mark register of all Survey Control Marks that make up the Survey Control Network. This register forms part of the quality records and must be controlled in accordance with the Quality Management Plan. OpCo's Surveyor must issue TfNSW's Representative and the Independent Certifier with a controlled copy of the Survey Control Mark register and retain superseded copies.

Information contained in the Survey Control Mark register must include where applicable:

- (a) a unique number / identifier for each Survey Control Mark;
- (b) any other identifier such as an SSM number;
- (c) MGA easting and northing and AHD height of each Survey Control Mark, except marks used for reference sightings only;
- (d) chainage and offset of each Survey Control Mark in relation to a main control line of any part of the SLR Works and Temporary Works where one exists;
- (e) a description of the physical nature of each Survey Control Mark, such as "peg" or "drill hole"; and
- (f) a plan of the Survey Control Network with sketches of each Survey Control Mark.

3. General Survey Requirements

3.1. Product conformity survey

OpCo must adopt methods for product conformity surveys that ensure independence from the methods used to set out the SLR Works and Temporary Works. Measurements must be taken directly from Survey Control Marks where possible. Where the use of subsidiary Survey Marks is unavoidable for verification purposes, their position and level must be re-established.

Sampling the SLR Works and Temporary Works for conformity verification purposes must not be restricted to the locations used to set out the SLR Works and Temporary Works but must be undertaken in a random or unbiased manner at any location of the SLR Works and Temporary Works to verify conformity with the final Design Documentation and this general specification.

OpCo must submit a survey report for each lot or component where design levels, position and/or tolerances have been specified or identified in the final Design Documentation. The survey report must show the specified value versus the actual value for position (defined by grid co-ordinates or chainage and offset), level and tolerance as appropriate and must be certified by OpCo's Surveyor.

All project survey data must be delivered to TfNSW's Representative or the Independent Certifier as electronic 3D digital files in either DGN or DWG format.

4. Surveying Techniques

4.1. General

This clause contains orders of accuracy for horizontal (two dimensional) coordinates and height or vertical control (the third dimension). OpCo must comply with these orders of accuracy for the delivery of the SLR Works and the Temporary Works.

For the purpose of this clause an EDM tacheometry survey determines horizontal coordinates and vertical levels simultaneously.

Except for monitoring surveys, Survey Procedures using traditional survey techniques of radiation and height determination, as well as global positioning system (GPS) procedures, that are capable of meeting the specified orders of accuracy, may be used provided that the techniques can be verified as being capable of meeting the required orders of accuracy and confidence levels of correctness, eliminating gross errors.

Prior to commencement of any survey work, OpCo must submit to the Nominated Authority details of the proposed Survey Procedures together with evidence that those procedures are capable of achieving the specified orders of accuracy and reliability.

SURVEY HOLD POINT	
Process Held.	Use of quality Survey Procedures and NSW state survey directions.
Submission Details.	Survey Procedures with evidence that those procedures are capable of achieving the specified orders of accuracy. Verification methodologies to ensure elimination of gross errors
Release of Hold Point.	The Nominated Authority will consider the submitted documents prior to authorising the release of the Hold Point.

4.2. Orders of accuracy for horizontal coordinates

Table G71.2: Orders of Accuracy

Order of Accuracy ⁽¹⁾	Estimated Accuracy ⁽²⁾
1H	2 mm
2H	5 mm
3H	10 mm
4H	15 mm
5H	50 mm
6H	200 mm

Notes for Table G71.2:

- (1) A reference notation for each order of accuracy.
- (2) Quoted as one standard deviation and is relative to the survey control marks used for the survey.

4.3. Orders of accuracy for vertical control

Table G71.3: Orders of Accuracy for Vertical Control

Order of Accuracy ⁽¹⁾	Estimated Accuracy ⁽²⁾
1D	0.5 mm
1Da	<1.5 mm
1E	<1 mm
2E	1.5 mm
3E	3 mm
2D	5 mm
4E	10 mm
5E	50 mm
6E	60 mm

Notes for Table G71.3:

- (1) A reference notation for each order of accuracy. The letters E and D refer to EDM trigonometrical heighting and to differential leveling techniques respectively. The orders of accuracy apply regardless of the Survey Techniques used.
- (2) Quoted as one standard deviation and is relative to the Survey Control Marks used.

4.3.1. Differential levelling

Where differential levelling techniques are used OpCo must develop and use procedures that achieve the two orders of accuracy for differential levelling that are shown as 1D and 2D in Table G71.4 of this document.

4.3.2. EDM trigonometrical heighting

For EDM trigonometrical heighting procedures, OpCo must control errors caused by determining the height of the total station, as well as determining the height difference between the total station and the surveyed point. Where a Resection procedure is used to determine the height of the total station, it must measure redundant data and calculate heights by an adjustment that calculates 3D residuals.

(a) Survey checks for EDM trigonometrical heighting

(i) Survey checks by esiduals:

OpCo must use the Residuals calculated by Resection software to verify the accuracy of the height of the total station axis. This check is mandatory for orders of accuracy 1E, 2E, and 3E where a Resection determines the height of the total station axis. For orders of accuracy 1E, 2E, and 3E, OpCo must investigate where the difference between the means of the Residuals to any two survey control marks is greater than 5 mm, (where a Residual is the difference between the adopted height of the total station axis and an axis height determined by a single face sighting of the total station to a survey control mark). The mean of the Residuals must apply where there is more than one sighting to the same Survey Control Mark.

For order of accuracy 4E, when using a Resection procedure, the difference between the Residuals for any two stations must not exceed 9mm.

OpCo must investigate and take appropriate corrective action where mean Residuals exceed the limits identified in this clause as described by a particular order of accuracy.

OpCo must notify TfNSW's Representative and the Nominated Authority of any changes to the 3D coordinates of the Survey Control Marks as a result of the investigation.

(ii) Survey check by Survey Control Marks:

OpCo must, before commencing measurements after establishing the height of the total station axis, determine coordinates of a Survey Control Mark by EDM trigonometrical heighting and compare its measured height with its recorded height. This survey check applies to all EDM trigonometrical heighting orders of accuracy as identified in Table G71.4.

Table G71.4: Allowable Height Differences with Survey Control Marks for Orders of Accuracy

Order of Accuracy	Max Sight Distance	Min Height of Sight Line	Allowable difference
1E	70 m	1.5 m	5 mm
2E	100 m	1.5 m	5 mm
3E	100 m	1.5 m	5 mm
4E	150 m	1.5 m	10 mm
5E	200 m	1.0 m	25 mm
6E	200 m	1.0 m	25 mm

The Sight Distance and height of sight line limits shown in Table G71.4 must be adhered to for this survey check.

(iii) Timing:

The survey checks for orders of accuracy 1E to 6E, as identified in Table G71.4, must be carried out immediately after determining the height of the total station axis and before commencing measurements.

A further survey check must also be carried out and recorded hourly or at the completion of each set up, whichever is the lesser.

4.4. EDM tacheometry surveys

EDM tacheometry procedures must record the following data and be included in the survey records:

- (a) field measurements used to determine coordinates and heights of all resected stations;

- (b) Residuals of measurements used to determine coordinates and heights of resected stations;
- (c) coordinates and heights of resected stations;
- (d) coordinates and heights of all survey control marks used for each survey, including survey control marks used to determine coordinates and heights of the total station by a Resection procedure;
- (e) all field measurements required to carry out the survey;
- (f) the grid scale factor applied;
- (g) survey checks to verify the accuracy of the survey;
- (h) reduction of all radiated points to MGA grid coordinates or chainage, offset and height for three dimensional surveys;
- (i) the purpose, location and date of survey; and
- (j) unique identification of each survey for traceability.

4.4.1. Survey checks for EDM tacheometry surveys

When carrying out EDM tacheometry surveys, OpCo must apply the survey check applicable for the order of accuracy for EDM trigonometrical heighting component of the survey, as identified in clause 4.3.2. OpCo must also compare its measured horizontal coordinates with approved recorded values to verify horizontal orders of accuracy given in Table G71.2.

4.5. GNSS survey

OpCo must apply the following techniques for surveys using real time kinematic (RTK) Global Navigation Satellite System (GNSS) equipment for construction set out and conformity:

- (a) The minimum standard GNSS equipment must have the following characteristics:
 - (i) GNSS receivers capable of recording carrier waves;
 - (ii) authorisation for frequency to operate a two way radio from Australian Communication Authority for GNSS operations; and
 - (iii) braced support or alternate tripod adaptor for the antenna pole.
- (b) For each construction activity, the instrument's threshold setting must be no greater than one third of the spatial tolerance of the product.
- (c) Validate equipment and 3D error surface of survey by occupying established survey control marks and comparing surveyed coordinates with established recorded coordinates.
- (d) Record all measurements including quality checks.
- (e) Where possible and practical for general set out, measure between surveyed points by traditional survey methods to verify survey and to determine order of accuracy of survey achieved.
- (f) The methodology for modelling the geoid and its effects on heights must be documented and validated.
- (g) Use of multiple base stations including SYDNET should be noted and the mean position determination recorded as the measured position. Differences about the mean greater than 30mm in position will suggest an unacceptable result and both measurements should be re-observed to determine the best observations with programmed time separation.

- (h) Real time GNSS procedures must not be used for height determination where a construction accuracy of less than 30 mm is specified.

5. Additional Survey Requirements

5.1. Surveys of pavements, excavations, retaining walls and embankments

Survey Techniques for setting out and conformity verification surveys of pavement, earthworks, retaining walls and embankments must be capable of achieving the orders of accuracy identified in Table G71.5. Where EDM tacheometry procedures are used, they must satisfy both the horizontal and vertical requirements identified in Table G71.5.

Table G71.5: Surveying Procedures for Pavements, Earthworks, Retaining Walls and Embankments

Surface	Orders of Accuracy		Check Measurements to Survey Control Mark		Common Points Ht. Difference	Sampling Plan Horizontal Difference
	Horizontal	Vertical (Trigonometrical Heighting)	Horizontal	Vertical		
(a)	(b)	(c)	(d)		(e)	(f)
Pavement (Reinforced / Plain Concrete)	2H	1E	20 mm	4 mm	5 mm	5 m
Earthworks	5H	5E	20 mm	10 mm	50mm	
Earth Retaining Structures	4H	4E	20 mm	10 mm	10 mm	10 m

Notes for table G71.5:

- (a) Surface or item being surveyed
- (b) & (c) Orders of accuracy for horizontal and heights assigned to each surface, refer Clauses 2.2 and 2.3.
- (d) Measured differences to survey control mark columns show the allowable horizontal and height differences between survey control mark coordinates, by the survey and by the adopted values, for the survey to comply
- (e) Allowable height difference of common points by two abutting surveys before an investigation is required
- (f) Sampling plan chainage difference gives the difference in chainage of points along strings for sampling locations

Sampling plan for conformity verification surveys of pavements, earthworks, retaining walls and embankments

OpCo must select sampling points from defined grid patterns, where the grid is formed by equally spaced points in strings that run approximately parallel to the length of the construction. The sampling points in each string must be no less than the intervals shown in column (f) of Table G71.5.

OpCo must determine the spacing of strings in accordance with Table G71.6.

Table G71.6: Sampling Plan

Asset or Asset Component	Grid Pattern	Spacing of Strings
Pavements	2m	2m
Earthworks	5m	5m
Retaining Walls	2m	1m

5.2. Surveys of stormwater drainage systems

OpCo must comply with the orders of accuracy for the stormwater drainage structures contained in Table G71.7 of this general specification. Where EDM tacheometry Survey Procedures are used, the survey checks identified in Table G71.7 of this general specification must also be complied with.

Table G71.7: Orders of Accuracy for drainage structures surveys

Activity	Orders of Accuracy		Survey checks to survey control mark	
	Horizontal	Vertical	Horizontal	Height
Kerb & Gutter	3H	3E	20 mm	5 mm
Concrete pipes, box culverts, headwalls and wing walls, energy dissipators, inlet and outlet structures	3H	4E	20 mm	10 mm
Gully pits and junction boxes	3H	4E	20 mm	10 mm
Lintel, covers and gratings when adjoining:	3H	3E	20 mm	5 mm
Kerb & gutter	3H	3E	20 mm	4 mm
Concrete pavement	3H	3E	20 mm	5 mm
Asphalt pavement	3H	3E	20 mm	5 mm
Open drains	5H	5E	50 mm	30 mm

5.3. Surveys of overbridges and civil structures

- (a) Survey during construction
- OpCo's Surveyor must extend the 1H and 1D survey control to enable set-out and measurement of the overbridges and civil structures as described below.
- A. All surveyed overbridges and civil structures must be represented in a digital 3D computer model in either microstation DGN or Autocad DWG format.
 - B. Files must be provided together with plots, drawings and reports to TfNSW's Representative and the Independent Certifier.
 - C. The 3D model must show a clear differentiation between design points and surveyed points using layers, colours and other visual symbology.
- (b) As-built survey
- (i) OpCo's Surveyor must undertake the as-built survey of overbridges and civil structures as soon as practicable after the completion of the overbridges and civil structures. The computed horizontal, vertical offset of the components of the overbridges and civil structures relative to the setout dimension must be plotted giving an indication of potential out of tolerance based on a survey of order of accuracy 1H and 1D.
 - (ii) OpCo's Surveyor must demonstrate to TfNSW's Representative and the Independent Certifier that the as-built surveyed components of the overbridges and civil structures are within the dimensional tolerances and that there are no non-conformities. This survey of the components must be carried out at not greater than 5m intervals.
- (c) As-built position report
- (i) OpCo must submit to TfNSW's Representative and the Independent Certifier a detailed report and 3D CAD files for each completed overbridge and civil structures. The report must include drawings to show typical cross sections and linings. All out of tolerance areas must be highlighted.

Table G71.8: Orders of Accuracy for Other surveys for Construction and Progressive As-Built Surveys

Activity	Orders of Accuracy		Survey checks to survey control mark	
	Horizontal	Vertical	Horizontal Difference	Height Difference
Viaducts, Station Platforms and Excavations	3H	4E	10 mm	10 mm
Rock bolt positions:				
• Head	5H	5E	50mm	50mm
• End of embedment	6H	5E	200mm	50mm
Existing infrastructure (including Utility Service)	5H	5E	50 mm	50 mm
Local Area Works and Property Works	4H	4E	20 mm	20 mm
Temporary Works				
Fixtures, fittings, sumps and all other features including those provided for OpCo;	3H	4E	10 mm	10 mm
Certification of compliance that project assets comply with the location, dimension, tolerance, grade and other requirements in the deed	3H	4E	10 mm	10 mm

5.4. Monitoring surveys

5.4.1. Monitoring plan

OpCo must detail the methodology and procedures for monitoring vertical and horizontal settlements and movements in the Quality Management Plan. The methodology and procedures for monitoring various structures must contain, as a minimum, the following:

- (a) a drawing setting out clearly the purpose and locations of the monitoring points;
- (b) proposed method of installing these monitoring points to ensure that they will survive the intended monitoring period;
- (c) methods of re-establishing the surface monitoring points in the event of accidental obliteration of such point(s);
- (d) Survey Techniques to achieve the stated order of accuracies;
- (e) frequency of monitoring surveys; and
- (f) method to provide an early warning of out of tolerance structural movement to demonstrate magnitude and direction.

5.4.2. Order of accuracy for monitoring surveys

Table G71.9 sets out the orders of accuracy required for monitoring surveys.

Table G71.9: Orders of Accuracy for Monitoring Surveys

Asset or Asset Component	Horizontal Order of Accuracy	Vertical Order of accuracy
Concrete Structures	1H	2E
Embankments	5H	5E
Adjoining Property structures	3H	4E

Annexure G71/A Schedules of Hold Points and Identified Records

Table A1 Schedule of Hold Points

Clause	Description
2.1	Survey report verifying coordination and level values of the Survey Control Marks
4.1	Survey Procedures with evidence that those procedures are capable of achieving the specified orders of accuracy

Table A2 Schedule of Quality Records and Identified Records

Clause	Description
2.1	Survey report verifying Survey Control Marks
2.6	Survey Control Mark register
1.9.1	Survey report verifying conformity
2.1	Survey procedures applicable to the SLR Works and Temporary Works
2.3.2.1	Survey check by Survey Control Marks
2.4	EDM tacheometry survey
2.5	GNSS survey
2.7.1	Monitoring plan including initial measurements
3.9	Evidence that GNSS quality factors are continuously monitored

Annexure G71/B Planning Documents

The following is a summary of documents and information that OpCo must include in the Quality Management Plan.

Clause	Description
1.3.1	Procedures to for all types of surveys and survey checks, verify conformity and measure quantities
1.3.2	Responsibilities of OpCo's Surveyors
2.5	Management of the Survey Control Marks register
5.1.1	Sampling plan to report survey results
	Management of the survey and 3D digital computer files, CAD drafting and report formats
	Management of work instructions



**Transport
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Schedule E1 Scope and Performance Requirements

Appendix 12 – Construction Traffic and Transport Management Constraints

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Execution Version

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1. Overview and Scope

1.1. General

- (a) This Appendix sets out the construction traffic and transport obligations that must be addressed by OpCo while undertaking Delivery Activities.
- (b) These obligations are in addition to OpCo's duty to address specific construction traffic and transport impacts (referenced in Section 9 of this document) during the construction phase that are detailed in Technical Paper 2: Construction Traffic and Transport Management Strategy (CTTMS) within Volume 2 of the Environmental Impact Statement.
- (c) The CTTMS was based on the final definition design prepared by TfNSW in mid 2013 (not the reference design). The CTTMS identified one likely approach to construction setting out the framework by which adverse impacts of construction on the operation of the transport network could be managed. The CTTMS identified proposed transport management measures that could be adopted to mitigate these potential impacts.
- (d) It is noted that the CTTMS was not updated for the reference design however there are still specific sections of the CTTMS are still valid, refer to Section 9 of this Appendix.

2. Objectives

- (a) The objectives for the construction traffic and transport management are detailed in Table 1.

Table 1 Construction traffic and transport management objectives

Key result area	Construction objective
Worksite operation	<ul style="list-style-type: none"> ▪ Minimise local precinct impacts. ▪ No worker injury accidents during construction ▪ No injury accidents to members of the public because of construction
Property access	<ul style="list-style-type: none"> ▪ Minimise disruption to businesses, residents and users local to construction sites ▪ Provide advance notice of upcoming works and traffic arrangements ▪ Maintain vehicle access to hospitals and emergency providers at all times ▪ Develop alternate strategy for providing access to properties, in consultation with property owners and businesses ▪ Consult public and private owners to agree options to maintain proposed operations during the works
Pedestrians and cyclists	<ul style="list-style-type: none"> ▪ Minimise disruption to pedestrians and cyclists on footpaths and crossings at intersections ▪ Maintain pedestrian access to properties during the works ▪ Maintain adequate conditions for security of footpaths at night / daytime, including lighting, surface free of trip hazards, overlooking (visibility to and from adjacent sites) of paths
Traffic operations	<ul style="list-style-type: none"> ▪ Provide advance notice of upcoming works and traffic arrangements ▪ Provide directional / detour signage to direct drivers around / away from work areas ▪ Minimise the number of traffic changes to assist legibility for drivers ▪ Minimise conflict between bus routes and traffic detour routes ▪ Promote alternate travel times, modes and routes for drivers with CBD destinations or travelling across CBD
Communications	<ul style="list-style-type: none"> ▪ Implement communications plan to notify changes to transport operations ▪ Provide advance notice of upcoming works and traffic arrangements ▪ Promote new bus routes and stops, preferred traffic routes and detours

3. Traffic management principles

3.1. Principles

- (a) The principles of the Construction Traffic and Transport Management Strategy (CTTMS) are:
- i. implement end-state transport arrangements, where appropriate, and compatible with construction requirements, such as:
 - A diversion of bus services, moving towards the end-state bus arrangements identified in Sydney City Centre Bus Plan;
 - B closure of minor side road junctions and laneways proposed for closure at end-state;
 - C enhancements to east-west capacity of cross streets, where possible and required to mitigate long-term changes to traffic patterns;
 - ii. minimise traffic disruption by undertaking intersection works at nights and on weekends and when there is no major scheduled special events (e.g. avoid New Years Eve, Australia Day, City to Surf, Sydney Running Festival);
 - iii. provide clearly defined pedestrian paths and fencing to separate the pedestrian path from the worksite and prevent random crossings;
 - iv. review traffic signal operation for turning movement conflicts with pedestrians crossing at intersections and vehicles on access lanes and accessing worksites;
 - v. minimise the number of traffic changes to optimise the network operation for the public, businesses and emergency services;
 - vi. maintain access along George Street for local access and emergency services. These access corridors may be via open access lanes outside the worksite boundary or via controlled access lanes through the worksite;
 - A the open access lanes may be used by construction vehicles. Pull-off areas, between gaps in barriers, must be provided to allow construction vehicles to stand clear of the open access lanes;
 - B the controlled access lanes through the worksite must be managed by traffic controllers. The location of both the open and controlled access lanes may be shifted within the roadway to suit the current work zone (must still comply with standards and road safety requirements). Generally, controlled access lanes are proposed in the pedestrianized section of the CBD and Devonshire Street;
 - vii. maintain property access based on a hierarchy of frequency of use and subject to agreement with property owners and business operators:
 - A infrequent access must be managed by traffic controllers on an ad hoc basis and/or scheduled deliveries outside work hours;
 - B an access lane must be maintained at all times for properties with frequent deliveries, unless otherwise agreed with the property owners or building management;

- C where feasible an open access lane must be retained for 24 hour property access. Where this is not feasible, traffic controllers must manage property access via controlled access lanes, 24 hours per day, or as otherwise required to meet the needs of frontage properties;
- viii. work at intersections must be staged to maintain key traffic movements. Intersections may be closed during nights and at weekends and traffic diverted via alternate routes. The closure of these intersections will be conditional on the alternate route remaining open; and
- ix. disruptive major works must be scheduled to target times of lower traffic movement.

4. Pedestrian and cycle traffic management

4.1. Pedestrian

- (a) OpCo must take the following pedestrian traffic management measures:
- i. existing longitudinal pedestrian footpaths (pedestrian movements running parallel to the SLR alignment) will be maintained either in their current form, or on an alternative adjacent alignment. Wherever possible works on footpaths (where required) will be scheduled to occur outside of peak pedestrian times;
 - ii. where construction works require full or partial occupation of the existing footpath, OpCo must temporarily narrow footpaths around the worksite or to divert pedestrians to adjacent footpaths via safe crossing facilities with the appropriate barriers and signage. Any diversions may require pedestrian demand modelling and must be agreed with the relevant Authorities;
 - iii. footpath widths are to allow two-way pedestrian traffic that meets the pedestrian demand and has sufficient space provided to accommodate prams, strollers and wheelchairs without requiring temporary widening from their existing width prior to construction commencement. Footpaths shall have a nominal minimum temporary width of the lesser of the existing width or 3.0m within the CBD and 1.5m outside the CBD or a lesser width if approved by the relevant council;
 - iv. access to shops must be available for the public during business hours. Where excavation works limit accessibility to a shop during business hours, OpCo must provide safe and secure temporary access incorporating handrails where required. All temporary works must be in accordance with the relevant local council standards and Appendix 11 (*TfNSW's General Specifications*);
 - v. OpCo must provide additional traffic control at locations where there is an interaction between pedestrians and construction vehicles; and
 - vi. existing transverse pedestrian movements that cross the SLR at intersections must be maintained at existing pedestrian crossing facilities using existing traffic control signals or controlled by traffic controllers, unless approved otherwise by TfNSW.
- (b) The following mid-block transverse pedestrian crossings must be maintained by OpCo during construction of the SLR Works:
- i. George Street, between King Street and Market Street (Strand Arcade / Mid City Centre);
 - ii. George Street, between Market Street and Park Street / Druitt Street (Queen Victoria Building);
 - iii. George Street, between Hunter Street and King Street (Martin Place);
 - iv. George Street, between Bathurst Street and Liverpool Street (central street intersection - Event Cinema);
 - v. Eddy Avenue, between Elizabeth Street and Pitt Street (outside Central Station forecourt);
 - vi. Devonshire Street, between Riley Street and Marlborough Street (opposite Ward Park);

- vii. High Street, between Clara Street and Avoca Street;
 - viii. High Street, corner of Wansey Road (at UNSW);
 - ix. Anzac Parade, between High Street and Barker Street (at UNSW); and
 - x. along Anzac Parade mid-block crossings are to be provided at existing locations or no greater than 300m from another crossing.
- (c) The total number and extent of mid-block crossings during construction will be subject to pedestrian demand modelling and approval by the relevant Authorities.
 - (d) Mid-block crossings must have a nominal minimum temporary width of 4.0m within the CBD and 3.0m outside the CBD, subject to risk based assessment and pedestrian demand modelling.
 - (e) The width of the mid-block crossing at Martin Place will require pedestrian demand modelling to determine the optimum width during construction. Approval will be by the relevant Authorities. It is anticipated that a larger crossing or multiple crossings will be required at this location to accommodate the high pedestrian flows.

4.2. Cycle routes

- (a) Where the SLR Works will impact cycling routes, OpCo must provide alternative cycle routes. OpCo must consult with local bicycle user groups, local communities, and relevant authorities regarding any proposed alternative route. OpCo must submit that proposal and summaries of that consultation for approval by TfNSW prior to implementation.
- (b) The existing shared pedestrian and cycle path along the Royal Randwick Racecourse frontages of Alison Road and Wansey Road is to be closed for the duration of the Delivery Activities. Prior to closure of this shared path OpCo must signalise the Alison Road and Wansey Road intersection and install the appropriate signage to direct pedestrians and cyclists to use the opposite footpaths on Wansey Road (eastern side) and Alison Road (northern side). OpCo must also implement a diversion strategy for the cyclists until the final works are completed.

5. Property access

- (a) OpCo must comply with the requirements contained within Schedule B6 (*Section Access Schedule*).

6. Parking

6.1. Off-street parking

- (a) OpCo must:
- i. unless otherwise approved, maintain all existing signage and off-street car parking areas during the Delivery Activities;
 - ii. without limiting the details set out in the Schedule B6 (*Section Access Schedule*), not reduce the existing capacity of off-street car parks without the prior approval of the relevant Authorities;
 - iii. where off-street parking is affected, provide off-street parking in alternative areas as close as possible to existing areas so that there is no net loss of off-street parking, except for the Kingsford Terminus area which will be addressed by TfNSW;
 - iv. notify affected car park users of the alternative car parking areas at least 10 Business Days prior to the decommissioning of any car park; and
 - v. where necessary, widen and or lengthen the existing vehicular driveways to allow safe entry and exit turning movements (swept path) without requiring access into the construction area.

6.2. On-street parking and general kerbside use

- (a) OpCo must mitigate the impacts of loss of on-street parking as much as practicable, and must coordinate the on-street parking requirements with the local councils.
- (b) Notwithstanding 6.2(a), OpCo must not commence construction works along the affected part of the SLR alignment until the alternative on-street parking arrangements as detailed in the CTTMS are implemented for:
- i. loading zone and disabled parking;
 - ii. parking permit schemes surrounding the project corridor; and
 - iii. parking configuration adjustments, including time of day duration restrictions, in surrounding streets.
- (c) OpCo is to provide alternate bus, coach and taxi zones for those zones impacted by construction worksites prior to commencement of works, including appropriate consultation with councils and transport operators.

7. Events

- (a) OpCo must accommodate all Class 1 Events and Class 2 Events during the Delivery Phase, which may affect haulage routes, delivery operations and require road occupancy licence conditions to be adjusted.
- (b) OpCo must manage the coordination of traffic during Class 1 Events and Class 2 Events in the immediate vicinity of the Delivery Activities that is affected by the Delivery Activities and the Delivery Activities that may be affected by such traffic;
 - i. in consultation with the Traffic and Transport Liaison Group as described in TfNSW's General Specification G10 (*Traffic and Transport Management*) in Appendix 11 (*TfNSW's General Specifications*); and
 - ii. to be consistent with TfNSW's General Specification G10 (*Traffic and Transport Management*) in Appendix 11 (*TfNSW's General Specifications*).
- (c) OpCo must incorporate known Class 1 Events and Class 2 Events into the Delivery Program.
- (d) OpCo must detail responses and contingencies to Class 1 Events and Class 2 Events in the TMP regularly updated with input from organisers and other Stakeholders such as City of Sydney, Randwick Council, State Emergency Services and RMS.
- (e) During Class 1 Events, OpCo must suspend those parts of the Delivery Activities which impact on the Class 1 Event for the duration of the Class 1 Event, unless agreed otherwise by the Class 1 Event organiser.
- (f) During Class 2 Events, OpCo must arrange Delivery Activities so as to not adversely impact on the Class 2 Event for the duration of the Class 2 Event, unless agreed otherwise by the Class 2 Event organiser.
- (g) During Class 1 Events and Class 2 Events at Moore Park, haulage routes to the tunnel site (Moore Park East and West) must not impact on the traffic of the surrounding area. Should OpCo have use of the construction parking area within Moore Park East, the parking area must be vacated by OpCo two hours before gates open for parking to the public for Class 1 Events and Class 2 Events, or otherwise agreed with the Centennial Park and Moore Park Trust. OpCo must not use Driver Avenue during Class 1 Events and Class 2 Events.
- (h) With respect to New Years Eve, OpCo must liaise through TfNSW with CoS and, based on qualitative and quantitative review of event pedestrian movements, undertake a risk-based assessment to determine an appropriate response with respect to pedestrian flows, alternate routes and downstream constraints on pedestrian movements. This may include requirements to temporarily re-open the width of a lane or lanes through work areas along George Street from Alfred Street to Goulburn Street (inclusive) for pedestrian access to the extent reasonable and feasible. Any temporary works required to reinstate a lane or lanes through the George Street work areas will require approval from CoS by means of a restoration plan that includes risk assessments. OpCo must coordinate any additional requirements with CoS and Department of Premier and Cabinet and liaise with TfNSW in relation to such requirements.

- (i) With respect to the Vivid Festival, OpCo must shut down Section TA-CB01 (First Fleet Park) by 5pm on each night of the Vivid Festival, which runs for approximately 12 days commencing on or about late May to early June.

8. Emergency and Utility Services Maintenance Access

- (a) OpCo must implement measures to facilitate movement of emergency vehicles and Utility Service maintenance vehicles through or around the Construction Site at all times.

9. Traffic Configuration Responsibility

- (a) The table below details OpCo's responsibility for traffic configuration responsibilities by referencing key documentation, principally Technical Paper 2: Construction Traffic and Transport Management Strategy (CTTMS) within Volume 2 of the *CBD and South East Light Rail Project Environmental Impact Statement*. The CTTMS outlines potential traffic and transport impacts during construction and identifies proposed transport management measures that must be adopted to mitigate these impacts.
- (b) The CTTMS was prepared with reference to the final definition design prepared by TfNSW and identifies one likely approach to construction setting out the framework by which adverse impacts of construction on the operation of the transport network can be managed.

Table 2 Traffic Configuration Responsibilities

Precinct	Scope	Document Reference	Responsibility	Timing
CBD	Relocation of existing bus services from George Street and Chalmers Street	Sydney City Centre Bus Plan (SCCBP) and South East Bus Plan	TfNSW	30 September 2015, or agreed otherwise by OpCo giving TfNSW a minimum of 3 months' notice of any required changes to this date
CBD	Two-way operation of Pitt Street north of Bridge Street	CTTMS - Section 3.2.2.1	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Two-way operation of Hunter Street with Margaret Street	CTTMS - Section 3.2.2.1	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Installation of a temporary roundabout at the George Street / Albert Street intersection (if required by OpCo staging)	CTTMS - Section 4.2.5	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Closure of Jamison Street at George Street with turnaround facility	CTTMS - Section 4.2.6	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Amendments to the signalized intersection of Jamison Street and York Street	CTTMS - Section 4.2.6	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Closure of Bond Street at George Street	CTTMS - Section 4.2.7	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP

Precinct	Scope	Document Reference	Responsibility	Timing
CBD	Closure of Barrack Street at George Street	CTTMS - Section 4.2.7	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	De Mestre Place left in-left out at George Street	CTTMS - Section 4.2.7	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Closure of Temperance Lane at George Street	CTTMS - Section 4.2.8.2	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Ultimo Road left in-left out at George Street	CTTMS - Section 4.2.10.2	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Left only from Campbell Street to George Street	CTTMS - Section 4.2.11.2	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Closure of Rawson Lane	CTTMS - Section 4.2.12	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Relocation of coach bays on Eddy Avenue to Lee Street forecourt and Chalmers Street	CTTMS - Section 4.2.12	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
CBD	Relocation of special events buses and rail replacement services, stops and taxi zone to south of Devonshire Street and other streets as required.	CTTMS - Section 4.2.15.1	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
Surry Hills	Closure of Devonshire Street	CTTMS - Section 4.3.1	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
Surry Hills	Closure of Buckingham Street, Holt Street, Clisdell Street, Waterloo Street and High Holburn Street at Devonshire Street	CTTMS - Section 4.3.1	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
Surry Hills	Install loading zones on Holt Street, Waterloo Street and Riley Street	CTTMS - Section 4.3.4	TfNSW	As agreed between OpCo and TfNSW during the development (and updating) of the TTMP
Surry Hills	Taxi zone relocation to Chalmers Street, south of Devonshire Street	CTTMS - Section 4.3.8	TfNSW	As agreed between OpCo and TfNSW during the development (and updating) of the TTMP

Precinct	Scope	Document Reference	Responsibility	Timing
Moore Park	Restriction of one-way bus movements on the busway within Moore Park. Affected buses need to use Anzac Parade	CTTMS - Section 4.4.5	TfNSW	As agreed between OpCo and TfNSW during the development (and updating) of the TTMP
Moore Park	Class 1 Event and Class 2 Event bus services provision	CTTMS - Section 4.4.5.1	TfNSW	Ongoing
Randwick	Removal of bus stop on the westbound lane of Alison Road, east of Darley Road. Discussions with ATC to facilitate pedestrian movements within the racecourse land	CTTMS - Section 4.6.6.1	OpCo	As agreed with RMS/TMC during the development (and updating) of the TTMP
Randwick	Bus route 357, 400 and 410 diversion via Blenheim Street	CTTMS - Section 4.6.6.2	TfNSW	As agreed between OpCo and TfNSW during the development (and updating) of the TTMP
Randwick	Explore bus priority measures on Alison Road	CTTMS - Section 4.6.6.3	TfNSW	As agreed between OpCo and TfNSW during the development (and updating) of the TTMP
Randwick	Relocation of the bus stop to west of Wansey Road on High Street for University bus services	CTTMS - Section 4.6.6.5	TfNSW	As agreed between OpCo and TfNSW during the development (and updating) of the TTMP

10. Specific Traffic Configuration

- (a) This section details specific traffic configuration site constraints which OpCo must manage during the Delivery Phase of the project. This section should also be read in conjunction with Schedule B6 (*Section Access Schedule*) as well as Schedule B2 (*Action in complying with Planning Approvals*).
- (b) Traffic crossing the worksite at intersections must be maintained at all times (as per the end-state arrangements) except for approved closures. Closure times for night and weekend works will be subject to approval by the relevant Authorities.
- (c) OpCo must ensure that the Traffic and Transport Management Plan, in addition to fulfilling the requirements of Appendix 11 (*TfNSW's General Specification G10 - Traffic and Transport Management*) in Appendix 11 (*TfNSW's General Specifications*), explains and supports the traffic management solutions that will be required to enact the delivery program.

10.1. CBD

10.1.1. CBD road section works

- (a) When undertaking Delivery Activities that affect the CBD road network OpCo must:
 - i. to the extent practicable without impacting program, stage works in George Street so that the Sections north of Bathurst Street (in particular Bathurst Street to Hunter Street) are occupied prior to occupying Sections south of Bathurst Street;
 - ii. if any variations to requirements of Section 10.1.1(a)(i) of this Appendix are proposed, the Traffic and Transport Management Plan must detail the justification for the variations and demonstrate that all necessary traffic management requirements will be implemented; and
 - iii. comply with the constraints listed in Table 3, unless otherwise approved by the relevant Authorities.

Table 3 CBD Road Section Constraints

ROAD	Roadway Construction Constraints
Alfred Street	<ul style="list-style-type: none"> • Pitt Street to remain open (two way) in accordance with Table 2 and a connection from Pitt Street to George Street via Alfred Street to be maintained open to traffic (two way) until George Street works between Alfred Street and Hunter Street allow traffic to be diverted to its final configuration. • On opening of George Street to traffic between Hunter Street and Alfred Street, Pitt Street at Alfred Street, and Alfred Street, are to be closed to traffic. • Close access to general traffic at the Loftus Street Intersection.
George Street	<ul style="list-style-type: none"> • Maintain a single northbound controlled access lane between Hunter Street and Essex Street, except during Utility Services diversion works. • Maintain a single open traffic lane northbound between Essex Street and Alfred Street. • Maintain a single controlled access lane between Hunter Street and Bathurst Street in a southbound direction.

ROAD	Roadway Construction Constraints
	<ul style="list-style-type: none"> Maintain a single northbound traffic lane (or two northbound traffic lanes where possible) between Liverpool St and Bathurst Street and a northbound dual right turn into Bathurst Street. Maintain two northbound traffic lanes on George Street between Rawson Place and Liverpool Street. Maintain left turns from the kerbside lane at the intersection of: George Street into Hay Street; George Street into Goulburn Street; and George Street into Liverpool Street. As late as practicable, without impacting programme, the two northbound lanes may be reduced to a single northbound lane between Hay Street and Goulburn Street, with the allocation of a left turn bay from George Street to Goulburn St.
Rawson Place	<ul style="list-style-type: none"> OpCo may close Rawson Place to normal traffic during construction except for when undertaking works at the intersection of Pitt Street / Rawson Place / Eddy Avenue when two westbound lanes must be provided in Rawson Place subject to the minimum intersection requirements as specified in Table 5.
Eddy Avenue	<ul style="list-style-type: none"> OpCo is to stage construction works on Eddy Avenue to maintain access to Sydney Trains ramp at all times via Chalmers Street / Eddy Avenue / Pitt Street. Prior to removing the existing coach parking along the southern kerb line at the railway frontage, OpCo must construct and commission the new coach stop on Eddy Ave.. Stage works in Eddy Avenue as late as practicable, without impacting programme, and Stage the works in Eddy Avenue and initially implement three left turn lanes from Eddy Avenue westbound into Pitt Street southbound and a bus only right turn lane from Eddy Avenue westbound into Pitt Street northbound. Then as late as practicable, without impacting programme, implement two left turn lanes from Eddy Avenue westbound into Pitt Street southbound and a bus only right turn lane from Eddy Avenue westbound in Pitt Street northbound.
Chalmers Street	<ul style="list-style-type: none"> Divert normal traffic around the section via Randle Street and Elizabeth Street Maintain a single northbound bus lane (no stops) on Chalmers St between Randle Street and Elizabeth Street. This lane must permit northbound through movements onto Elizabeth Street and left turn movements into Eddy Avenue. Note this bus lane can also be used for local access. Maintain a bi-directional cycle lane through Chalmers Street during construction. For northbound traffic on Elizabeth Street, introduce "No Left Turn" from Elizabeth Street to Eddy Avenue. Maintain the single northbound bus lane through Chalmers Street, for as long as practical.

- (b) Controlled access lanes are only for the use of emergency services, local access vehicles and OpCo.

10.1.2. CBD intersection works

- (a) CBD intersection works must be undertaken during weekends and weeknights, unless approved otherwise by the relevant Authorities.
- (b) Additional conditions for closure of intersections after occupation by OpCo of George Street, are documented in Tables 4 and 5.

- (c) Prior to occupation of George Street by OpCo, TfNSW will use best endeavours to assist OpCo in obtaining Approvals from TMC for OpCo to occupy CBD intersections. OpCo must coordinate the CBD intersection works with the intersection works undertaken by the Managing Contractor.

Table 4 CBD Intersection Constraints

Intersection of George Street at	Condition of closure	Additional constraints
Rawson Place	Maintain eastbound and westbound through traffic on Eddy Avenue	<ul style="list-style-type: none"> Maintain access to Sydney Central YHA and for service vehicles on Rawson Lane. Allowance must be made for some reversing of trucks into Rawson Lane.
Hay Street	Maintain IWLR services on weekdays. Temporary closure of IWLR on weekends	<ul style="list-style-type: none"> Provide signage, traffic controllers and shuttle bus transfers for IWLR passengers, where installation of turnouts, and commissioning of signalling at the junction, requires weekend closure of the existing IWLR and access to Central Station. Short running of the IWLR during weekend closures would require shuttle bus transfers to connect to Central Station. Buses may be permitted to use Hay Street between Pitt Street and George Street and turn left onto George Street during this time, to permit IWLR passenger transfer.
Goulburn Street	Liverpool Street open Bathurst Street open	<ul style="list-style-type: none"> Provide advance warning and directional signage to redirect Goulburn Street traffic, e.g. Harris Street / Pier Street to Harbour Street to Bathurst Street (eastbound) or westbound on Liverpool Street or Park Street traffic to exit south (or north) on Harris Street. Maintain car park access to Goulburn Street frontage and two way traffic east of George Street. Maintain bus access eastbound to Park Street.
Liverpool Street	Park Street / Druitt Street open Goulburn Street open	<ul style="list-style-type: none"> Maintain Goulburn Street open and Park Street open. Sign posting and advance warning.
Central Street & Wilmot Street	Access via Pitt Street to remain open	<ul style="list-style-type: none"> Provide southbound service lane on George Street, between Wilmot and Central Street.
Bathurst Street	King Street open	<ul style="list-style-type: none"> Provide advance warning and directional signage of detour. Maintain three lanes eastbound on Bathurst Street across George Street during normal operations.

Intersection of George Street at	Condition of closure	Additional constraints
Park Street/ Druitt Street	Bathurst Street open Market Street open	<ul style="list-style-type: none"> Divert general westbound traffic to Market Street. Maintain Liverpool Street as a secondary route, if additional capacity required. Stage intersection works to maintain single lane westbound bus only movement through intersection.
Market Street	Druitt Street open Liverpool Street open	<ul style="list-style-type: none"> Maintain Goulburn Street as a secondary route to Liverpool Street, subject to required capacity.
King Street	Bathurst Street open	<ul style="list-style-type: none"> Maintain Bathurst Street eastbound. Promote Grosvenor Street eastbound (in lieu of King Street) for Sydney Harbour Bridge traffic. Provide advance warning and directional signage to redirect diverted traffic.
Hunter Street	Bridge Street open	<ul style="list-style-type: none"> Maintain Bridge Street westbound.
Margaret Street	Bridge Street westbound open Jamison Street open, with single NB lane on George Street maintained	<ul style="list-style-type: none"> Maintain Bridge Street as a secondary route, if additional capacity required. Implement staged intersection works as required for Hunter Street to Margaret Street section of George Street. Maintain access to Jamison Street during Margaret Street closure.
Bond Street	Closed at George Street and provide two way access to Pitt Street	
Jamison Street	Closed at George Street and provide two way access to York Street	<ul style="list-style-type: none"> Jamison Street closed at George Street with a turn around facility provided for vehicles on Jamison Street. Directional and intersection signage. Two way movement on Jamison Street and traffic signal modifications at York Street.
Barrack St	Closed at George Street and provide two way access to York Street	

Intersection of George Street at	Condition of closure	Additional constraints
Bridge Street	Hunter Street westbound is open, if Bridge Street westbound closed Margaret Street open.	<ul style="list-style-type: none"> Maintain Hunter Street to Margaret Street westbound connection as alternate route with George Street open between Hunter Street and Margaret Street.
Dalley Street	Closed at George Street. Two way access from Pitt Street	<ul style="list-style-type: none"> Provide two way movements to Pitt Street.
Grosvenor Street	Grosvenor Street eastbound can be closed and King street to remain open Bridge Street westbound to be maintained.	<ul style="list-style-type: none"> Stage intersection works to maintain two lanes on Grosvenor Street westbound at all times.
Essex Street	Access via Harrington Street at Grosvenor Street maintained	<ul style="list-style-type: none"> Remove kerb extension north western corner to allow northbound open lane between Essex Street and Alfred St.
Blue Anchor Lane	Access via Essex Street and northbound open access lane	<ul style="list-style-type: none"> Maintain access to Blue Anchor Lane during construction.
Alfred Street / Circular Quay Station		<ul style="list-style-type: none"> Convert Pitt Street north of Bridge Street to two way traffic. Provide U-turn facility on Pitt Street, south of Alfred Street. Provide U-turn facility on Loftus Street north of Reiby Place. Provide roundabout at north of the George Street / Alfred Street intersection, for U-turn for coaches up to 14.5m lengths travelling from The Rocks.

Table 5 Rawson Place / Pitt Street / Eddy Avenue Constraints

Intersection of	Condition of closure	Additional Conditions
Rawson Place / Pitt Street / Eddy Ave	Maintain two lanes in Rawson Place	<p>For nights and weekends (following occupation of any George Street Sections):</p> <ol style="list-style-type: none"> 1. Pitt Street southbound - One lane southbound 2. Pitt Street northbound - One dedicated through lane and two dedicated right turn lanes or the provision of a right turn from George Street northbound into Rawson Place, with two lanes available in Rawson Place 3. Eddy Avenue westbound - Provision of two left turn lanes either into Pitt Street or via Rawson Place into George Street. 4. Eddy Avenue eastbound - Unaffected from the intersection of Pitt Street. <p>An opportunity also exists for long term closures of the intersection, however this is dependant upon the Bus Plan and relocation of buses out of George Street. If the buses have not been relocated out of George Street and OpCo has not occupied any Sections in George Street, then the following could be implemented.</p> <p>Long term closures (constraint - no occupancy of any George Street Sections) -</p> <ol style="list-style-type: none"> 1. Pitt Street southbound - One lane southbound 2. Pitt Street northbound - Two lanes northbound, lane one would be a shared through and right turn and lane two would be a dedicated right turn 3. Eddy Avenue westbound - Provision of two Left turn lanes either into Pitt Street or via Rawson Street into George Street. 4. Eddy Avenue eastbound - Unaffected from the intersection of Pitt Street.

10.1.3. Supporting CBD Roadworks

- (a) Prior to commencement of construction works in the CBD, OpCo must implement various traffic changes to the local CBD road network identified in Table 6. In addition, OpCo will also be responsible for the implementation of mitigation measures as identified through the TMP process.

Table 6 Local road network changes proposed during construction – CBD Precinct

Road	Changes to Local Road network
Pitt Street	Pitt Street must be converted to provide two-way traffic movements north of Bridge Street to allow for local property access. Access from the east must be via Loftus Street and Reiby Place. Northbound vehicles on Pitt Street must be able to turn around prior to the worksite and exit southbound. The turning head must enable medium sized trucks turning. For larger vehicles, a three point turn would be required. The turning head must be located within Herald Square.
De Mestre Place	De Mestre Place must operate as left-turn entry and exit to George Street. Based on the likely driveway geometry and available lane width, it may be necessary to limit the size of trucks to a maximum of 8.8 metres in length. This would be adequate for typical small to medium sized trucks, which currently service the lane and would be confirmed in discussions with business owners, if required.
Temperance Lane	Temperance Lane must be closed to traffic with no access provided.
Wilmot and Central Streets	The existing one-way movement on Wilmot Street and Central Street must be reversed with Wilmot Street becoming one-way westbound to George Street (left-out only) and Central Street becoming one-way eastbound from George Street (left-in only). This will require a southbound lane to be maintained on George Street for circulation between Wilmot Street and Central Street. The width of this southbound lane and turning geometry will limit truck sizes to 8.8 metres. This limitation will need to be agreed with businesses using the lane and the NSW Police.
Ultimo Road	Ultimo Road must be limited to let in left-out traffic movements via the northbound access lane on George Street. Pedestrian access must be maintained to existing signal crossings or traffic controllers must be provided for short-term works.
Rawson Lane	Close Rawson Lane at Rawson Place, which is consistent end-state arrangements. Access to Sydney Central YHA, emergency and service vehicles must be maintained on Rawson Lane. OpCo is to coordinate the closure and consult with relevant stakeholders, in particular YHA, TfNSW and CoS.
Eddy Avenue	The proposed Eddy Avenue works must remove existing coach parking along the southern kerb line at the railway frontage. The Eddie Avenue coach facilities are to be relocated to the western forecourt on Lee Street and Chalmers Street. The existing bus operations along Eddie Avenue will continue during construction, in particular the university express services will be maintained on Eddie Avenue. OpCo is to coordinate the bus relocation with TfNSW, Bus Operators and CoS.

Road	Changes to Local Road network
Randle and Elizabeth streets	<p>The end-state general traffic arrangements for Randle Street and Elizabeth Street must be completed prior to closing Chalmers Street. This includes:</p> <ul style="list-style-type: none"> • Reverse the operation of Randle Street and provide two general northbound lanes and one northbound bus lane on Randle Street. • Two-way traffic on Elizabeth Street between Randle Lane and Eddy Avenue. • Two northbound and two southbound lanes on Elizabeth Street including and additional bus lane on either side of Elizabeth Street between Randle Lane and Foveaux Street. • Prohibit right turn from Elizabeth Street into Randle Lane.

10.2. Surry Hills

10.2.1. Devonshire Street route works

- (a) OpCo must comply with the following constraints when undertaking Delivery Activities that affect the Surry Hills area roads, as listed in Table 7.

Table 7 Local road network changes proposed during construction – Surry Hills

Road	Roadway Construction Constraints
Devonshire Street	<ul style="list-style-type: none"> • Full road closure between Chalmers Street and Crown Street during construction. • Through-traffic must be maintained across Devonshire Street at Chalmers Street (into Randle Street), at Elizabeth Street and at Crown Street. • Property access must be maintained at all times through the worksite. • Between Crown Street and Burke Street a single eastbound traffic lane must be maintained at all times. • The end state configuration of the Bourke Street / Devonshire Street / Parkham Street intersection must be completed prior to closing Parkham Place. • Reinstate one-way traffic on Adelaide Street between Little Riley and Steel Street prior to taking possession of Devonshire Street. • Reinstate operation of Cooper Street and Riley Street intersection prior to taking possession of Devonshire Street. • Vehicles access to all adjacent properties must be maintained during the closure of Devonshire Street. Waterloo Street and Riley Street must remain open during the closure of Devonshire Street. • Traffic controllers must be used to guide private vehicles between their driveways and Waterloo Street when works are undertaken adjacent to Waterloo Street.

10.2.2. Devonshire Street intersection works

- (a) Surry Hills works are to be staged and all intersection works within the Surry Hills precinct are to be undertaken during weekends and weeknights. Specific details relating to the closures are outlined in Table 8.
- (b) Additional Conditions of Intersection are documented in Table 8.

Table 8 Local road network changes proposed during construction – Surry Hills

Intersection of Devonshire St at	Condition of closure
Chalmers Street at Randle Street	<ul style="list-style-type: none"> Chalmers Street / Randle Street intersection reconstructed for through movement to Randle Street, reversing existing southbound movement allowing large vehicles turning left from Randle Street to Elizabeth Street northbound. Introduce two-way traffic (northbound) lanes Elizabeth Street between Randle Street and Eddy Avenue. Geometry and traffic signal operation modified for northbound movement on Elizabeth Street at Eddy Avenue intersection. Access to Beattie Lane provided. Maintain one lane northbound during full closures of this intersection.
Elizabeth Street	<ul style="list-style-type: none"> Minimum two through lanes must be provided for through movements.
Clisdell Street	<ul style="list-style-type: none"> Provide turning circle on Clisdell Street, clear of the intersection with Devonshire Street, prior to closing access.
Crown Street	<p>Staged construction works to be undertaken during weekends and night works with the following minimum constraints:</p> <ul style="list-style-type: none"> Maintain traffic in both directions on Crown Street.
Bourke Street	<p>Staged construction works to be undertaken during weekends and or night works with the following minimum constraints:</p> <ul style="list-style-type: none"> Maintain existing functions at the intersection.

10.3. South Dowling Street regrading works

- (a) Construction and subsequent road closures across South Dowling Street and the Eastern Distributor can only be undertaken during night shifts. Weekend closures will need to be negotiated separately with TMC. For South Dowling Street, construction is to be undertaken in one directional flow at a time. During construction works at these sites, traffic must be diverted via alternate corridors using the shortest route possible to be agreed with relevant Authorities. Concurrent works affecting South Dowling Street and the Eastern Distributor cannot be undertaken.

10.4. Moore Park

- (a) OpCo must comply with the following constraints when undertaking Delivery Activities that affect the Moore Park network as listed in Table 9 requirements:

- (b) Prior to OpCo's partial occupation of the existing Moore Park Busway for Delivery Activities:
- iv. TfNSW has agreed to run northbound buses only on Moore Park Busway during construction. South bound buses will be diverted onto Anzac Parade; and
 - v. OpCo will be responsible to coordinate with TfNSW / RMS and TMC and manage the relocation of the southbound buses.

Table 9 Local road network changes proposed during construction – Moore Park

Intersection of Lang Road at	Condition of closure
Anzac Parade	<ul style="list-style-type: none"> Full closures of Lang Road can be undertaken during night works. Close Lang Road from Anzac Parade to Driver Avenue. Divert westbound traffic on Lang Road via Driver Avenue and Moore Park Road. Divert eastbound traffic on Cleveland Street via Anzac Parade, Moore Park Road and Driver Avenue. No construction works at intersection to be undertaken that may effect Class 1 Events or Class 2 Events at Moore Park precinct.

10.5. Kensington / Kingsford (Anzac Parade south of Alison Road)

10.5.1. Anzac Parade route works

- (a) OpCo must comply with the following constraints when undertaking Delivery Activities that affect the Anzac Parade network as listed in Table 10.

Table 10 Local road network changes proposed during construction – Kensington / Kingsford

Road	Roadway Construction Constraints
Anzac Parade	<ul style="list-style-type: none"> Close a single lane in each direction on Anzac Parade, with the exception being 100m on the approach to and departure from the intersections at Barker Street and High Street Closure of additional lanes on Anzac Parade, with TMC approval (night and weekend works). Maintain suitable pedestrian fencing on Anzac Parade in the median and/or on the footpath at the existing locations unless agreed by the TfNSW Representative. No long-term reduction in capacity to occur on Anzac Parade from intersection of Todman Avenue north (towards Alison Road) if works are being undertaken on Alison Road at the same time.

10.5.2. Anzac Parade intersection works

- (a) During intersection works all existing traffic signals are to remain operational or with the appropriate approved traffic control arrangements.

- (b) Intersection works are to be staged. Works in the Kingsford precinct are to be undertaken during weekends and weeknights. Specific details relating to the closures are outlined in Table 11.

Table 11 Local road network changes proposed during construction – Kensington / Kingsford

Intersection of Anzac Parade at	Condition of closure
Alison Road	<p>Construction works to be staged as night works and or weekends with the following minimum constraints except as approved by RMS TMC for short term closures:</p> <ul style="list-style-type: none"> • There must be at least one lane available for turning movements during off peak, except for the right turn from Alison Road to Anzac Parade (northbound) which must be 2 lanes at all times. • All through lanes must have a minimum two lanes. • No construction works at intersections to be undertaken that may impact Class 1 Events or Class 2 Events at Royal Randwick Racecourse or the Moore Park precinct.
Todman Avenue	<p>Construction works to be staged during night works and or weekends with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain Todman Avenue westbound shared through left hand turn lane and a right hand turn only lane. • Maintain Todman Avenue eastbound with a shared through left hand turn lane. • Maintain no right turn from Todman Avenue westbound to Anzac Parade. • The intersection of Doncaster Avenue and Anzac Parade must remain open with no weekend works occurring. • No construction works at the intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse. • All existing exclusive left and right turn bays to be maintained. • All prohibited end state movements to be implement during construction. • All other existing movements must have a minimum of one lane except for the eastbound right turn from Todman Avenue which requires a minimum of two lanes. • The works have to be completed in Todman Avenue prior to the commencement of works in Doncaster Avenue and Day Avenue. • Provide two right turn bays from Anzac Parade southbound into Todman Avenue westbound. Right turn bays can be reduced down to one during nights and weekends. • Stop the northbound bus-lane (between High Street and Todman Avenue) short of the Todman Avenue intersection and slew the two through lanes to allow one right turn bay (of suitable length) into Todman Avenue from Anzac Parade.

Intersection of Anzac Parade at	Condition of closure
Doncaster Avenue	<p>Construction works to be undertaken at nights and or weekends with the following minimum constraints:</p> <ul style="list-style-type: none"> • Todman Avenue and Anzac Parade intersection open with the appropriate detours in place. • No construction works at the intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse. <p>Establishment of end-state configuration:</p> <ul style="list-style-type: none"> • Maintain Anzac Parade southbound left turn into Doncaster Avenue • Maintain Doncaster Avenue southbound left turn into Anzac Parade • Implement Anzac Parade northbound no right turn into Doncaster Avenue only after completion works in Todman Avenue.
High Street	<p>Construction works to be undertaken at nights and or weekends with the following minimum constraints:</p> <ul style="list-style-type: none"> • No construction works at the intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse. • Maintain northbound and southbound lanes on Anzac Parade. • Maintain left turn from High Street to Anzac Parade. • Barker Street intersection must remain open.
Day Avenue	<p>Establishment of end-state configuration.</p> <ul style="list-style-type: none"> • Maintain Day Street eastbound left turn into Anzac Parade. • Implement Day Avenue eastbound no right turn into Anzac Parade.
Barker Street	<p>Construction works to be undertaken during nights and or weekends (subject to approvals from relevant Authorities) with the following minimum constraints:</p> <ul style="list-style-type: none"> • Middle Street / Strachan Street / Anzac Parade intersection open with no turning restrictions. • Meeks Street / Borrodale Street / Anzac Parade intersection open with no tuning restrictions. • High Street intersection open with no restrictions.
Nine Ways (Gardeners Road / Rainbow Street / Bunnerong Road)	<p>Staged construction works to be undertaken during nights and or weekends with the following minimum constraints:</p> <ul style="list-style-type: none"> • Close a single lane on Anzac Parade in each direction. • Maintain an Anzac Parade southbound right turn bay into Gardeners Road. • Maintain all left turn movements at the intersection. • OpCo to propose a methodology for construction of this intersection. OpCo must submit it to TfNSW's Representative for review and approval of the relevant Authorities.

Intersection of Anzac Parade at	Condition of closure
Wallace Street	Establishment of end-state configuration. <ul style="list-style-type: none"> Maintain Wallace Street westbound left turn into Anzac Parade. Close through traffic to prevent access to Anzac Parade northbound.
Sturt Street	Establishment of end-state configuration. <ul style="list-style-type: none"> Implement traffic control signals at the intersection.

10.6. Randwick

10.6.1. Randwick area route works

- (a) OpCo must comply with the following constraints when undertaking Delivery Activities that affect the Randwick area network, as listed in Table 12:

Table 12 Local road network changes proposed during construction – Randwick

ROAD	Roadway Construction Constraints
Alison Road	<ul style="list-style-type: none"> All existing movements must be maintained, except movements prohibited in the end-state. As a minimum there must be at least one lane available for turning movements. Maintain a minimum of two lanes in each direction. All existing exclusive left and right turn bays to be maintained unless prohibited in the end-state. Maintain 50m right turn bay from Alison Road to Darley Road westbound or end-state configuration. Alison Road / Wansey Road / Prince Street intersection must have traffic control signals installed and subsequent pedestrian diversion implemented prior to the commencement of Delivery Activities on Wansey Road and before prohibiting the right turn into John Street. Maintain a suitable pedestrian barrier on Alison Road in the median and/or on the footpath as per the existing locations unless agreed by the TfNSW Representative.
Wansey Road	<ul style="list-style-type: none"> A single traffic lane to be maintained from Alison Road to Arthur Street in the southbound direction. A single traffic lane to be maintained from High Street to Arthur Street in the northbound direction. Alison Road / Wansey Road / Prince Street intersection must have traffic control signals installed and subsequent pedestrian diversion implemented prior to the commencement of Delivery Activities on Wansey Road and Alison Road.

ROAD	Roadway Construction Constraints
High Street	<ul style="list-style-type: none"> • Maintain a single traffic lane westbound along High Street at all times. • High Street / Wansey Road intersection and High Street / Botany Street intersection must be staged during weeknights and / or weekends. • Relocate of the existing taxi zone on High Street (outside of Prince of Wales Hospital) to Clara Street, opposite the existing taxi zone (and adjacent to the bus stops) prior to the commencement of construction works. • Maintain the non-signalised pedestrian crossing near the entrance of Prince of Wales Hospital. • Maintain or relocate bus stops on High Street prior to construction.
Belmore Road	<ul style="list-style-type: none"> • A single traffic lane to be maintained in a southern direction.
Avoca Street	<ul style="list-style-type: none"> • A single traffic lane to be maintained in each direction along Avoca Street outside peak periods; or • alternatively a minimum of two lanes in one direction on Avoca Street, with diversions around Belmore Road / Cuthill Street. • AM & PM Weekday peak, maintain a minimum of two lanes of travel in each direction during each works stage.
Cuthill Street	<ul style="list-style-type: none"> • Maintain existing right and left turn lanes.

10.6.2. Randwick area intersection constraints

Intersection works are to be staged. Works in the Randwick precinct are to be undertaken during weekends and weeknights. Specific details relating to the closures are outlined in Table 13.

Table 13 Local road network changes proposed during construction – Kensington / Kingsford

Intersection of	Condition of closure
Alison Road and Doncaster Road	Staged construction works to be undertaken during nights and or weekends with the following minimum constraints: <ul style="list-style-type: none"> • Maintain two directions of traffic in both directions on Alison Road. • Closure of additional lanes on Alison Road will TMC approval (night and weekend works). • Maintain Alison Road westbound right turn into Moore Park Busway. • Maintain Doncaster Avenue northbound right turn and left turn into Alison Road. • No construction works at intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse.
Alison Road and main Entrance into Royal Randwick Racecourse	<ul style="list-style-type: none"> • Maintain access during construction. • No construction works at intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse.

Intersection of	Condition of closure
Alison Road and Darley Street	<p>Construction works to be undertaken during night works and or weekends with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain two directions of traffic in both directions on Alison Road. • Closure of additional lanes on Alison Road will require TMC approval (night and weekend works). • Maintain Darley Road southbound two right turn lanes and a left turn lane in Alison Road. • Maintain Alison Road eastbound left turn into Darley Road. • Maintain Alison Road westbound right turn into Darley Road. • Access to be maintained to Royal Randwick Racecourse during construction. • No construction works at intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse.
Alison Road and John Street	<p>Construction works to be undertaken during nights and or weekends with the following minimum constraints:</p> <ul style="list-style-type: none"> • The right turn ban from Alison Road to John Street to be implemented after the Alison Road / Wansey Road intersection end-state arrangement is implemented. • Maintain John Street southbound left and right turns.
Alison Road and Cowper Street	<p>Establishment of end-state configuration.</p> <ul style="list-style-type: none"> • Maintain Alison Road eastbound left turn into Cowper Street. • Maintain Cowper Street southbound left and right turns onto Alison Road.
Alison Road / Wansey Road and Prince Street	<ul style="list-style-type: none"> • Implement new traffic control signals before ban of right turn into John Street from Alison Road.
Wansey Road and Arthur Street	<ul style="list-style-type: none"> • Maintain left turn and right turn from Wansey Road to Arthur Street during construction.
High Street and Wansey Road	<p>Construction works to be undertaken during night works and or weekend with the following minimum constraints.</p> <ul style="list-style-type: none"> • Maintain High Street eastbound left turn into Wansey Road. • Maintain High Street westbound right turn into Wansey Road. • High Street and Botany Street intersection to remain open. • No construction works at intersection to be undertaken when Class 1 Events or Class 2 Events occur at Royal Randwick Racecourse.

Intersection of	Condition of closure
High Street and Botany Street	<p>Construction works to be undertaken during night and/or weekend with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain a one lane of traffic in both directions on Botany Street. • Maintain a one lane of traffic on High Street in westbound direction. • Prohibit right turn from High Street to Botany Street.
High Street and Clara Street	<p>Stage construction works to be undertaken during the weekend with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain a one lane of traffic on High Street in westbound direction.
High Street / Belmore Road / Avoca Street	<p>Stage construction works to be undertaken during the weekend with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain a one lane of traffic in both directions on Avoca Street. • Maintain a one lane of traffic on High Street. • Maintain a one lane of traffic on Belmore Road. • Maintain Avoca Street northbound left turn into Belmore Road. • Maintain Belmore Road southbound through access and right turn into Avoca Street.
Avoca Street and Cuthill Street	<p>Stage construction works to be undertaken during the weekend with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain Cuthill Street westbound two right hand turn lanes into Avoca Street with one shared left hand turn lane
Belmore Road / Coogee Bay Road / Perouse Road / Cuthill Street	<p>Stage construction works to be undertaken during the weekend with the following minimum constraints:</p> <ul style="list-style-type: none"> • Maintain Belmore Road left turn into Coogee Bay Road. • Maintain Perouse Road left turn into Cuthill Street. • Maintain Coogee Bay Road through lane to Cuthill Street and a left turn lane into Perouse Road.

10.7. Temporary Traffic Diversions During Moore Park Tunnel Construction

- (a) OpCo must comply with the following constraints when undertaking Delivery Activities that affect Anzac Parade as a result of the tunnel works.

Road	Roadway Construction Constraints
Anzac Parade (at tunnel site between Lang Road and Moore Park)	<p>Provide three northbound and three southbound lanes on Anzac Parade at all times.</p> <p>The lane requirements for Anzac Parade in the construction state (above the tunnel site) are:</p> <ul style="list-style-type: none"> • Desirable minimum lane widths = 3.0m, however lane widths of less than 3.0m

Road	Roadway Construction Constraints
Road)	<p>will be considered on a straight alignment and would be subject to approval by the relevant Authorities.</p> <ul style="list-style-type: none"> • Desirable barrier offsets = 300mm, however further reductions in these offsets will be considered where safe and appropriate and where agreed with the relevant Authorities. • The preferred temporary design speed for Anzac Parade construction staging is 60km/hr. However a 50 km/hr design speed with a 40km/hr signposted roadwork speed limit is acceptable in situations where the geometry for 60km/hr design speed cannot be achieved. • Lane diversions are to be made on the eastern and western verges, with an aim to reduce the impact to the trees on both sides of Anzac Parade.



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 13 – Stops

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1. Overview and Scope

1.1. General

- (a) This Appendix describes design objectives and requirements for:
- i. the CSELR Stops;
 - ii. interchange requirements at CSELR Stops;
 - iii. CSELR Stop canopies;
 - iv. platform; and elements fixed on platforms including access ramps/stairs; and
 - v. Staff facilities.

1.2. Scope

- (a) OpCo must provide the CSELR Stops and facilities which must:
- i. be safe and functional; and
 - ii. be highly visible and accessible for all users.
- (b) The CSELR Stops and facilities works must be in accordance with the performance and technical requirements in this Appendix.
- (c) The CSELR Stops and facilities works must be in accordance with Schedule B3 (*Requirements of Third Parties*).

1.3. Overview

- (a) The CSELR Stops must contribute to delivering an exemplar high quality light rail system.
- (b) OpCo must use TfNSW's nine Customer drivers of Customer satisfaction, and the design objectives outlined in section 2, to deliver a Customer-focused design, and to:
- i. provide a seamless, easy to use and high quality transport experience that maximises a positive Customer experience;
 - ii. be innovative in concept, elegant and contemporary in expression, functional and flexible in planning, and finely crafted in detail;
 - iii. create a seamless integration of engineering and architectural requirements; and
 - iv. enhance the character of the landscape and communities through which CSELR passes, considering existing and planned future context.
- (c) The CSELR Stops must:
- i. be consistent with a modern, efficient, rapid transport system;
 - ii. offer an attractive and comfortable journey experience; and

- iii. provide a safe, inspiring and uplifting civic presence that provides a positive and lasting legacy for future generations.

2. Design Objectives

2.1. Context

- (a) The CSELR Stops must identify with, protect and enhance the heritage, environment and landscape of the CBD and South East areas of Sydney.
- (b) OpCo's design must provide a seamless fit of the CSELR facilities within the urban environment, through sensitive integration of new built elements within both existing and future context with consideration of scale, height, character, massing and materials.
- (c) Each CSELR Stop must incorporate accessible design principles and connect directly and safely to the local network of streets, walkways and parks. The CSELR Stops must consider connectivity to adjacent evolving land uses.
- (d) The CSELR Stop elements must reinforce the broader aspirations of the SLR in its role as a stimulus for efficient inter-modal public transport, enhanced community benefits, and as a place making driver.

2.2. Customer requirements

- (a) The CSELR Stops must be designed in direct response to the Customer with consideration of Customer types and user requirements.
- (b) The Stops must be clean, orderly and with an attractive sense of place and scale that positively influences perceptions of the public transport system.
- (c) The Stops must function as a place to comfortably wait, with an attractive platform space that does not detract from the existing streetscapes.

2.2.1. Fast and efficient connections

- (a) OpCo must ensure that Customers can easily connect to and from other services and modes.
- (b) OpCo must ensure:
 - i. Customer access and egress to and from the CSELR Stops is fast and efficient;
 - ii. Customer transfer between transport modes is efficient through:
 - A. minimal Customer walk distance and transfer time when transferring between transport modes;
 - B. minimal level changes and road crossings;
 - iii. Customer queuing is encouraged in a manner that aids boarding and alighting; and
 - iv. LRV dwell times are minimised.

2.2.2. Weather protection

- (a) OpCo must ensure that Customers are protected from inclement weather while waiting at CSELR Stops.
- (b) OpCo must ensure Customers are provided with weather protection from rain, sun and wind at CSELR Stops:
 - i. while boarding and alighting;
 - ii. while waiting for service; and
 - iii. whilst accessing ticketing or information.

2.2.3. Seating, standing and waiting

- (a) OpCo must ensure that Customers are provided with a clean comfortable environment for seating, standing and waiting on platforms (and other spaces that form part of the interchange).
- (b) OpCo must ensure:
 - i. Customers are provided with:
 - A. comfortable seating at each CSELR Stop;
 - B. standing areas;
 - C. space for wheelchairs and prams;
 - ii. standing and seating areas are:
 - A. large enough to accommodate peak crowds;
 - B. will adapt to meet future demand;
 - iii. there are clear lines of sight to maximise visibility of approaching LRVs and/or buses;
 - iv. Customers have adequate personal space; and
 - v. the environment appears clean and can be kept clean.

2.2.4. Information

- (a) OpCo must ensure that Customer information is accurate, up to date and accessible, making it easier for Customers to navigate and use the service, in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (b) OpCo must ensure Customers are provided with:
 - i. dynamic service information including real-time arrival and departure times for light rail (and bus at interchanges);
 - ii. information on fares, ticketing and transport services;

- iii. maps of the local area; and
- iv. information on appropriate and/or required behaviours (e.g. non-smoking, standing behind marked lines etc).

2.2.5. Wayfinding

- (a) OpCo must ensure Customer wayfinding is accurate, up to date and accessible, making it easier for Customers to navigate and use the service, in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (b) OpCo must provide a safe, efficient and convenient CSELR Stop configuration for inter-modal transfer at interchanges.
- (c) OpCo must ensure:
 - i. Customers are provided with information and wayfinding consistent with principles specified in Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*);
 - ii. the physical environment is organised so as to aid intuitive wayfinding and avoid obstruction to Customer flows; and
 - iii. the visual environment is organised to avoid visual clutter and advertising is subsidiary to wayfinding and Customer information.

2.2.6. Customer Service

- (a) OpCo must ensure that Customers are provided with Staff assistance where appropriate.
- (b) OpCo must ensure that Customers are provided:
 - i. with access to helpful, knowledgeable and well presented Staff in visible locations at major Stops / interchanges (identified in sections 4.2.1 and 4.2.2), to ensure that customers are provided with assistance where appropriate; and
 - ii. with, at unstaffed interchanges, an environment designed to give helpful customer information and a sense of security.

2.2.7. Ticketing

- (a) OpCo must ensure that:
 - i. Customers are able to easily and conveniently purchase and use tickets for their journey; and
 - ii. Customers are provided with an appropriate number of ticket vending machines at convenient locations on or near CSELR Stops.

2.2.8. Accessibility

- (a) OpCo must provide readily identifiable and safe access points of entry and exit to every Stop, and ensure that Customers can easily access Stops.

- (b) OpCo must ensure:
- i. Customers have access to services in accordance with Disability Standards for Accessible Public Transport (DSAPT) requirements, including other requirements relevant to the Disability Discrimination Act (DDA); and
 - ii. in the event of conflicts in access movement from different modes of transportation, priority is given as follows:
 - A. pedestrian movement; higher than;
 - B. bicycle movement; higher than;
 - C. Light Rail movement; higher than;
 - D. bus movement; higher than;
 - E. taxi movement; higher than; and
 - F. kiss-and-ride movement.

2.2.9. Safety and security

- (a) The Stops must maximise all aspects of personal safety and security including the provision of appropriate active and passive surveillance and the application of CPTED principles.
- (b) OpCo must ensure that Customers are provided with safe access and a safe environment at Stops including appropriate crowd control measures, CCTV coverage, lighting and Help Points.

2.2.10. Spatial design and layout

- (a) OpCo must ensure CSELR Stops feature a smart design that is simple for Customers to navigate and can easily be maintained.
- (b) OpCo must ensure that the CSELR Stop includes:
- i. logical placement and clustering of Customer facilities and CSELR Stop furniture, which minimises clutter at the CSELR Stop;
 - ii. visibility of approaching LRVs and buses;
 - iii. simple and direct circulation paths for Customers; and
 - iv. adaptability for future growth or special events.
- (c) OpCo must cooperate with the CoS in accordance with its Public Art plan: City Art, Public Art Strategy (adopted 2011), and should not detract from or obstruct wayfinding sight lines.

2.2.11. Branding and identity

- (a) OpCo must ensure CSELR Stops have a distinct visual identity which Customers can recognise.

- (b) In accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*), OpCo must ensure:
- i. CSELR Stop name and / or identifier is clearly visible;
 - ii. the colour palette is coordinated through-out the Light Rail system, reflects the brand and is consistent with the design ethic; and
 - iii. design is consistent with the principles and specifications of TfNSW transport system brand.

2.3. Materials and finishes

- (a) OpCo must ensure that materials and finishes are chosen to achieve a contemporary style that is consistent with, a modern transport system.
- (b) The CSELR Stops must:
- i. create spaces that are cohesive, welcoming and attractive;
 - ii. be simple, elegant and aesthetically pleasant;
 - iii. use high quality and consistent materials, finishes and detailing; and
 - iv. use low maintenance materials and finishes to minimise life cycle costs.
- (c) OpCo must utilise materials and finishes of a quality not less than as required by the materials and finishes schedule included in the Concept Design.
- (d) OpCo must use high quality robust, durable and long-life materials that promote civic character for the CSELR Stops and are sympathetic with surroundings.
- (e) The materials and finishes for the CSELR Stops must not impede legibility, decision making and wayfinding.
- (f) OpCo's material selection must standardise materials and be designed to ensure safe installation, maintenance and replacement.
- (f) OpCo must achieve the minimum sustainability performance and technical requirements set out in Appendix 7 (*Sustainability*), and ensure:
- i. passive design measures including solar shading and consider weather protection elements;
 - ii. minimisation of energy consumption; and
 - iii. sustainable performance with the selection of appropriate equipment, fittings and material use.

2.4. Advertising

- (a) OpCo must not install any advertising on any part of the Stops.

3. Spatial and functional requirements

3.1. General

- (a) OpCo must:
- i. identify and resolve functionality conflicts throughout CSELR Stops, particularly at key Customer decision points such as CSELR Stop access points;
 - ii. consider the different requirements of arriving and departing Customers;
 - iii. ensure that each of the CSELR Stops includes movement capacity and configurations commensurate to the design capacity requirements in Appendix 38 (Minimum Service Requirements);
 - iv. design pedestrian spaces and thoroughfares to deliver a minimum Level of Service in accordance with Appendix 38 (Minimum Service Requirements);
 - v. design the CSELR Stops so that day-to-day operational and functional requirements are not readily compromised by emergency events;
 - vi. design the CSELR Stops to minimise the potential for littering and Graffiti and to achieve the cleanliness requirements of Appendix 39 (Operations and Customer Service Requirements);
 - vii. design the CSELR Stops to deliver a safe Customer experience by minimising hazards such as slips, trips and falls, exposure to light rail OHW infrastructure and protection from inclement weather; and
 - viii. ensure signage and wayfinding elements as described in Appendix 15 (Branding, Wayfinding, Signage and Customer Information) are fully integrated into the Stops.

3.2. Pedestrian movement and facilities

- (a) Stops must provide pedestrian routes that maintain clear sight lines between transport modes and key destinations.
- (b) OpCo must:
- i. reduce risk by highlighting all hazards with high luminance contrast finishes, special lighting or tactile paving in accordance with AS1428.1 and AS1428.2 (where more onerous);
 - ii. provide accessible paths of travel in accordance with AS1428.1 and AS1428.2 (where more onerous) and on all other desired lines of travel within the CSELR Stops;
 - iii. coordinate the location of signage, security, lighting and other street furniture into common locations and alignments to minimise clutter and facilitate free movement of pedestrian and cyclists; and
 - iv. provide suitable kerb and surface finishes such as tactile ground surface indicators to assist people with disabilities, as required by AS1428.4.1.

- (c) Pavements and pathways must be designed to transition in alignment and width as required to meet existing pathways at the extent of the project boundary works.

3.3. Stairs and ramps

- (a) The use of stairs must be avoided where possible.
- (b) Stairs may be used where level changes on pedestrian movement paths cannot be accommodated with ramps.
- (c) Where stairs are used, a clearly legible alternative accessible path must be provided.
- (d) Alternative accessible paths must be as close as possible and not isolated from the primary circulation route.
- (e) Wheeling ramps or channels for bicycles must be provided at stairs.
- (f) Ramps must only be used where walkways are not able to be provided.

3.4. CSELR Stop furniture

- (a) CSELR Stop furniture must include bench seating and rubbish bins, as described in section 5 of this Appendix.
- (b) CSELR Stop furniture must be functional, comfortable and designed to be easily maintained.
- (c) Trench grates must be used for all pavement surface drainage collection where drainage is not otherwise directed into planting areas and must be of 'hell guard' type.
- (d) CSELR Stop furniture must comprise a coordinated palette of considered elements that use a consistent design aesthetic.
- (e) CSELR Stop furniture must be consistently and legibly placed on CSELR Stops.
- (f) CSELR Stop furniture must not project into an access path or present a risk of collision by someone with poor vision.
- (g) CSELR Stop furniture and elements should not compete with or obstruct wayfinding sight lines.

3.5. Fencing

- (a) Fencing, including joints, junctions, fixings, and placement of support posts, must be fully integrated with all other CSELR Stop elements.
- (b) OpCo must develop and implement a CSELR fencing strategy based on the following types:
 - i. security fences within CSELR Stops;
 - ii. protection screens at CSELR Stops;
 - iii. pedestrian guard rails; and

- iv. general handrails.
- (c) Fencing must deter climbing, providing no footholds.
- (d) Fencing must integrate with the form, detail and materials of the other fencing types.
- (e) Fencing throughout the CSELR Stops must avoid creating dead ends or sight line conflicts.
- (f) Fencing designs must minimise the potential for Vandalism and Graffiti.
- (g) Where bollards are proposed to protect platforms, the materials, scale, location and detail design must integrate with the CSELR Stop furniture. All bollards must be luminance contrasted with their background and must be drop down type where entry of service traffic may be necessary.
- (h) Fence fixing points must be minimised with bolts, base plates and fixing mechanisms to be detailed in a consistent, rationalised and unobtrusive manner.
- (i) Fencing baseplates at CSELR Stops must be concealed below the surface finish.
- (j) Fencing designs must be configured to include child safety.

3.6. Closed circuit television

- (a) Refer to Appendix 23 (*Communications Systems and Passenger Information*) for CCTV technical requirements for CSELR Stops.
- (b) OpCo must provide full CCTV coverage of all Stops including Help Points and ticketing machines.
- (c) OpCo must:
 - i. coordinate closed circuit television (CCTV) camera and equipment positions with street furniture, signage and lighting locations to minimise visual and physical clutter;
 - ii. ensure that landscaping and other elements do not impede sight lines or obscure CCTV coverage;
 - iii. ensure CCTV camera and equipment and positions are vandal resistant; and
 - iv. ensure that all visible CCTV housing, brackets and support elements connecting CCTV cameras to CSELR Stop platform canopies match the colour and finish of the canopy support structure.

4. CSELR Stop Requirements

4.1. General

- (a) The CSELR Stops must meet all functional requirements for all operational modes as described in Appendix 38 (*Minimum Service Requirements*).
- (b) Space planning for normal operations must:
 - i. minimise congestion;
 - ii. be resilient to surges in demand and Service disruptions;
 - iii. provide sufficient space to enable efficient Customer movement and operational function;
 - iv. consider Customer's perception of comfort and safety during special events or other high-volume periods;
 - v. allow sufficient additional space for decision making;
 - vi. avoid cross-flows; and
 - vii. where possible avoid contraflows by separation of flows.
- (c) The spatial planning must provide sufficient space for Customers to wait in weather protected areas for all normal operational modes.
- (d) CSELR Stop planning must ensure that obvious routes and minimal travel distances are achieved, which are free from obstructions, have good sight lines and avoid dead ends and hiding places.
- (e) To the extent possible OpCo must enable construction of the future site-specific requirements, with minimum demolition.
- (f) All CSELR Stops must allow for future modular canopy extensions.
- (g) All CSELR Stops must allow a dedicated parking space for a Light Rail maintenance van to be parked not more than 50m from the CSELR Stop.

4.2. CSELR Stop locations

- (a) OpCo must provide CSELR Stops at all locations identified in the Environmental Requirements and Table 6 of this Appendix.

4.2.1. Interchange Stops

- (a) The function of the Interchange Stops listed in Table 1 is to provide efficient interchange between the CSELR and the broader TfNSW network.
- (b) OpCo will locate each Interchange Stop to provide safe, direct, and equitable access for Customers.
- (c) All Interchange Stops should:

- i. be convenient and minimise walk time / travel time for interchanging Customers and create convenient connections between transport modes;
 - ii. provide, for major bus and light rail interchanges, a consistent level and quality of Customer experience, as well as a consistent level and style of bus facilities at the interchange to ensure seamless integration for Customers;
 - iii. provide safe, direct, efficient, clear, legible and equitable access for interchanging Customers and walk up Customers, avoiding direct conflicts with other pedestrians;
 - iv. ensure that Customers have minimal walk distance and walk time when interchanging between services; and
 - v. ensure that level changes and road crossings are to be avoided if possible.
- (d) OpCo must locate each Interchange Stop to provide the specific, local requirements as described in Table 1.

Table 1 Interchange Stops

Stop Name	Interchange with Bus	Interchange with Rail	Interchange with IWLRL	Interchange with Ferry
Circular Quay	Alfred Street, Young Street and Phillip Street buses	Circular Quay Station		Circular Quay Ferries
Wynyard	York Street and Carrington Street buses	Wynyard Station and Wynyard Walk		
Queen Victoria Building	York Street	Town Hall		
Town Hall	Park Street, Drutt Street and Bathurst Street buses	Town Hall Station		
Chinatown			Capitol Square	
Rawson Place	Rawson Place, Pitt Street and George Street connecting and truncated buses	Central Station		
Central Station	Chalmers Street and Elizabeth Street buses	Central Station	Central Station	
Randwick	Belmore Road, Avoca Street and Cuthill Street connecting and truncated buses			
Kingsford	Anzac Parade connecting and			

Stop Name	Interchange with Bus	Interchange with Rail	Interchange with IWL	Interchange with Ferry
	truncated buses			

4.2.2. CSELR Stop-specific requirements

- (a) OpCo must ensure that the following CSELR Stop-specific requirements are achieved.
- (b) Circular Quay Stop must:
 - i. minimise CSELR Stop elements and platform furniture on the side platform adjacent the Circular Quay Station to minimise obstructions for pedestrians; and
 - ii. provide treatments, which deter pedestrians walking on powered track points on Alfred Street adjacent to the CSELR Stop.
- (c) Wynyard Stop must:
 - i. ensure adequate circulation space around the CSELR Stop for pedestrians in the George Street pedestrian zone;
 - ii. minimise CSELR Stop furniture and elements to maximise pedestrian movement and access along the northbound platform; and
 - iii. not used.
- (d) Queen Victoria Building Stop must:
 - i. minimise CSELR Stop elements and platform furniture on both side platforms to minimise obstructions for pedestrians; and
 - ii. if OpCo propose to provide overhead charging units, then they must be integrated such that the minimum provision for OHW Smartpoles® are provided, to minimise clutter on the footpath, and positioned such that they do not impact the CSELR Stop canopy extents, the location of platform CSELR Stop elements, and positioned high enough to allow all possible vehicles to pass including concrete high boom trucks.
- (e) Town Hall Stop must:
 - i. provide safe, direct and legible access to existing vertical transport for DDA access; and
 - ii. provide adequate circulation space around the CSELR Stop for pedestrians in the George Street pedestrian zone.
- (f) Not used.
- (g) Rawson Place Stop must:
 - i. ensure any necessary retaining walls and traffic barriers are to match the materials and finishes of traffic barriers provided on other CBD CSELR Stops; and

- ii. provide stopping capacity for at least 2 outbound (west) buses (approximately 45m), stopping and passing lanes, and cross platform interchange with SLR services.
- (h) Central Station Stop must:
 - i. safeguard for future construction zones, adjacent the side platform, for vertical transport connecting the CSELR Stop to the proposed East – West concourse at Central Station Stop, in accordance with Appendix 38 (*Minimum Service Requirements*); and
 - ii. minimise general footpath and zones Stop platform fixed items where possible, to assist with passenger flows during Special Events.
- (i) Surry Hills Stop must:
 - i. integrate the northbound side platform flush with the levels along the frontage of Ward Park.
- (j) Moore Park Stop must:
 - i. minimise general footpath and CSELR Stop platform fixed items where possible, to assist with passenger flows during Special Events; and
 - ii. ensure that necessary crowd control barriers are provided to ensure safe pedestrian marshalling and movement into and out of the CSELR Stop.
- (k) UNSW – Anzac Parade Stop must:
 - i. minimise the impact to existing significant trees adjacent the CSELR Stop.
- (l) Royal Randwick Racecourse Stop must:
 - i. be located to optimise passenger access to and from Randwick TAFE and Darley Road; and
 - ii. minimise general footpath and CSELR Stop platform fixed items where possible, to assist with passenger flows during Special Events.
- (m) Randwick Stop must:
 - i. be an integrated multi-modal facility, offering seamless service, modal interchange and a consistent quality of Customer experience for bus and Light Rail Customers;
 - ii. incorporate design consistency to ensure that Customers' perception is of a single, integrated transport network rather than separate, unrelated bus and CSELR Stops;
 - iii. provide a stopping capacity for at least 3 inbound buses (approximately 60m) on Belmore Road adjacent to the CSELR Stop together with stopping and passing lanes for buses;
 - iv. provide stopping capacity for 4 outbound buses (approximately 80m in total) on Avoca Street and Cuthill Street together with stopping and passing lanes for buses; and

- v. minimise the impact to existing significant trees adjacent the CSELR Stop and within High Cross Park.
- (n) Kingsford Stop must:
- i. be an integrated multi-modal facility, offering seamless service, modal interchange and a consistent quality of Customer experience for bus and Light Rail Customers;
 - ii. incorporate design consistency to ensure Customers' perception is of a single, integrated transport network rather than separate, unrelated bus and CSELR Stops; and
 - iii. provide stopping capacity for at least 3 buses (approximately 60m), stopping and passing lanes in each direction (inbound and outbound) and cross platform interchange with the SLR services.

4.3. Planning criteria and Level of Service

- (a) OpCo must demonstrate the CSELR Stop design Fruin Level of Service (LoS) achieves the requirements of Appendix 38 (*Minimum Service Requirements*), Required Services, for each CSELR Stop area and function.
- (b) OpCo must use the peak period LoS provided in Appendix 38 (*Minimum Service Requirements*), Required Services, and in Table 2 below for planning and spatial design of each CSELR Stop.
- (c) OpCo must use the queuing and space criteria as defined in Table 2 for vertical transportation (VT) calculations and CSELR Stop design.
- (d) For island platforms, where additional space exists within the median, this may be considered within the platform queuing LoS calculation.

Table 2 Peak period LoS criteria

Criteria	Fruin LoS	Level
Footpaths	Walkway	C
Platform	Queuing	C
Pedestrian crossing reservoir spaces	Queuing	D

4.3.1. Run-off requirements

- (a) Run-offs are spaces required to direct passengers away from stairs and ramps and to provide clear landing area for following passengers.
- (b) CSELR Stops must incorporate the minimum run-off requirements as set out in Table 3.

Table 3 Minimum run-off requirements

Run-off Minimum Dimensions		Distance
A	Stairs and ramps to passageways (Moore Park Stop)	4m
B	CSELR Stop Access Point to public domain cross-flow or circulation	6m

4.3.2. Vertical transport

- (a) OpCo must determine the capacity of the vertical transport to platform to be installed at Moore Park Stop based on the following:
- i. the CSELR Stop design capacities provided in Appendix 38 (*Minimum Service Requirements*), Required Services;
 - ii. not used;
 - iii. OpCo's fire and life safety (FLS) strategy;
 - iv. platform clearance as defined from the time the first person onto a platform to the last person onto the vertical transport;
 - v. platform loading for peak event scenarios; and
 - vi. all other design considerations for the CSELR Stop.

Table 4 Not Used

- (b) Public stairs to deal with changes in level must meet the following requirements:
- i. where height of stair risers above 5.3m a minimum of 2 mid landings are required;
 - ii. public stairs must be a minimum clear width of 2m if predominantly used for unidirectional flow, and minimum clear width of 2.4m if predominantly used for bidirectional flow;
 - iii. OpCo must provide public stairs as required in DSAPT 2002, with a tread and riser dimension:
 - A. Tread 300mm;
 - B. Riser 150mm;
 - iv. public stairs must not have open risers; and
 - v. configuration of stair flights must provide an equal spacing of treads for each flight, or as close as possible, and have a maximum of 14 risers per flight.
- (c) Public ramps to deal with changes in level must meet requirements to achieve accessibility for mobility-restricted passengers.
- (d) Vertical transportation must have full CCTV coverage.

4.3.3. Minimum headroom

- (a) The CSELR Stop public areas must provide the minimum headroom indicated in Table 5.

Table 5 Minimum headroom

Stop Element	Minimum Headroom (to soffit lining)
Public stairs and ramps	2.4m
Underside of signage / PIDs	2.5m
Anzac Parade Pedestrian Footbridge Public stairs and ramps	2.1m

- (b) Minimum headroom must be calculated as the vertical distance between the finished floor level and the underside of the element on lowest obstruction, excluding suspended signage.
- (c) Headroom spaces of 2.1m or less under stairs and ramps must be enclosed by a continuous barrier to a minimum height of 1m.

4.4. CSELR Stop Access Points

- (a) CSELR Stop Access Points must meet the performance criteria for pedestrian circulation and queuing as outlined in section 4.3 of this Appendix.
- (b) OpCo must locate each CSELR Stop Access Point in accordance with Table 6.
- (c) CSELR Stop Access Points must include the following elements:
- i. dedicated queuing zones and run-offs;
 - ii. orientation space for arriving and departing Customers; and
 - iii. prevention of accidental or deliberate vehicle access to the CSELR Stop platform(s).
- (d) CSELR Stop Access Points must incorporate the following:
- i. a smooth logical and intuitive flow of Customers; and
 - ii. full CCTV coverage.
- (e) Each CSELR Stop must include the following elements:
- i. Customer and community information as required in Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*);
 - ii. passenger information displays as required in Appendix 23 (*Communications Systems and Passenger Information*); and

- iii. ticketing equipment (including CLD, DVM and FLR (fixed location reader)) as required in Appendix 24 (*Ticketing System Support Infrastructure*).

Table 6 CSELR Stop Access Points

Stop	Platform Type	Access	Access along rear edge of Platform(s), flush (where possible) with adjacent footpath
Circular Quay	Side Platform	Both ends	Yes
	Island Platform	Both ends	No
Grosvenor Street	Island Platform	Both ends	No
Wynyard	Side Platform (George Street pedestrian zone)	Both ends	Yes
Queen Victoria Building	Side Platform (George Street pedestrian zone)	Both ends	Yes
Town Hall	Side Platform (George Street pedestrian zone)	Both ends	Yes
Chinatown	Island Platform	Southern end	No
Rawson Place	Side Platform (with bus interchange at one platform)	Both ends	No
Central Station	Side Platform	Both ends	Yes, on inbound platform
Surry Hills	Side Platform	Both ends	Yes, on inbound platform

Stop	Platform Type	Access	Access along rear edge of Platform(s), flush (where possible) with adjacent footpath
Moore Park	Island Platform	Northern end	No
Carlton Street	Island Platform	Northern end	No
Todman Avenue	Island Platform	Southern end	No
UNSW Anzac Parade	Island Platform	Both ends	No
Strachan Street	Island Platform	Northern end	No
Kingsford	Side Platform (with bus interchange at both platforms)	Both ends	No
Royal Randwick Racecourse	Island Platform	Both ends	No
Wansey Road	Island Platform	Both ends	No
UNSW – High Street	Island Platform	Both ends	No
Randwick	Side Platform (with bus interchange at one platform)	Both ends	No

4.5. CSELR Stop-specific pedestrian crossings

- (a) Refer to Appendix 16 (*Road Works*) for detailed requirements regarding signalised pedestrian access to CSELR Stop platforms which include crossing a vehicular lane.
- (b) OpCo must ensure that the width of pedestrian crossings is not less than the minimum as required by RMS.

- (c) Pedestrian access to the CSELR Stop platforms, where access only crosses light rail tracks, must include DDA compliant pedestrian crossings as follows:
- i. Central Stop - a pedestrian crossing with LRV priority must be provided at both the southern and northern ends of the island platform to provide access across the Light Rail tracks to the western side of Chalmers Street;
 - ii. Eddy Avenue coach platform – an unsignalised pedestrian crossing with LRV priority must be provided at the western end of the Eddy Avenue coach platform to provide access across the light rail tracks to the Central Station colonnade;
 - iii. Surry Hills Stop – an unsignalised pedestrian crossing with LRV priority must be provided at the western end of the Surry Hills Stop to provide access to both side platforms;
 - iv. Royal Randwick Racecourse Stop - an unsignalised pedestrian crossing with LRV priority must be provided at both the northern and southern ends of the CSELR Stop to provide access to the Stop platform from the footpath along the northern side of Alison Road; and
 - v. Wansey Road Stop - an unsignalised pedestrian crossing of the inbound light rail track with LRV priority must be provided at both ends of the Wansey Road Stop to provide access to the island platform.

4.6. Platforms

4.6.1. CSELR Platforms

- (a) OpCo must ensure that the platforms provide:
- i. unimpeded sight lines along the entire length of the platform, open and spacious Customer circulation and waiting areas;
 - ii. accessible movement, manoeuvring and boarding for the whole extent in accordance with DSAPT; and
 - iii. features to assist all Customers who may be unfamiliar with the CSELR Stop environments.
- (b) Platform configuration must allow for:
- i. minimum step and gap between platform and LRV (note that DSAPT permits ramp deployment in specific circumstances); and
 - ii. a continuous path along the full length of the platforms, defined as a minimum unobstructed circulation width of 1200mm along the length of the platform. The width must be calculated from the inside edge of the longitudinal TGSi (i.e. width of TGSi and offset from platform edge cannot be included in the circulation width calculation). For island platforms, 2 circulation paths, one on each side of the platform, must be provided.
- (c) If OpCo relocates the existing Capitol Square Stop then OpCo must:

- i. where possible ensure that rear edge of platforms are flush and tie in with the adjacent footpath, with footpaths regraded as required;
 - ii. where regrading of footpaths is required they are to be designed to maximum falls as specified in Appendix 14 (*Public Domain*);
 - iii. ensure that adjacent property awnings and building thresholds are not impacted and that existing accessible entrances are maintained;
 - iv. ensure that if existing trees are impacted that replacement trees are planted to the requirements of Appendix 14 (*Public Domain*);
 - v. provide new CSELR Stop canopies as per the requirements in Table 9 below;
 - vi. provide all CSELR Stop elements, services cabinets, canopy structures, lighting and the like in accordance with this Appendix, and then located to ensure a continuous path of travel in accordance with 4.6.1(b)(ii) above;
 - vii. maintain north-south pedestrian crossing at the corner of George Street and Hay Street; and
 - viii. ensure all new materials and finishes match those proposed at the adjacent Chinatown Stop.
- (d) Location of equipment, components and signage must not obstruct pedestrian movement or sight lines along platforms circulation zones.
- (e) Not Used.
- (f) Where buses share Light Rail lanes, OpCo must ensure that for all platforms within this alignment, permanent measures are provided continuously along the junction of the track slab and platform, for the entire length of the platform, to deter buses from impacting the platform edge.
- (g) Not Used
- (h) Not Used.
- (i) Platform minimum widths are required to comply with the DDA and DSAPT and the anticipated future patronage demands during peak times and events, in accordance with Appendix 38 (*Minimum Service Requirements*).

Table 7 NOT USED

- (j) not used.
- (k) Not Used.
- (l) Platform finish level must be designed to fall away from the platform front edges to facilitate drainage and to reduce the risk of wheelchairs, strollers and the like rolling onto the tracks.
- (m) Surfaces must be even and sudden change in cross-fall must be avoided.
- (n) CSELR Stop platforms must include an undercover dedicated wheelchair area in accordance with DDA requirements.

- (o) All paving surfaces and surface elements must be slip resistant, including:
 - i. non-slip when wet or dry; and
 - ii. paving surface materials must be wet rated at least R11 resistance as defined in Table 5 of AS4586.
- (p) Trip hazards on platforms must be minimised by avoiding manholes or service pits on platforms, which must not be located within 600mm of the platform edge. To reduce the likelihood of tripping floor or ground surfaces on continuous accessible paths of travel and circulation spaces must be provided in accordance with AS 1428.1:2009.
- (q) Materials and surface finishes must ensure colour and luminance contrast between surface elements must be considered when choosing materials in accordance with AS 1428.
- (r) TGSIs must be provided in accordance with AS 1428; and as specified in detail in section 7 of this Appendix.
- (s) Surface drainage must be provided to ensure that:
 - i. surfaces are free draining;
 - ii. surface water does not pond in any pedestrian area; and
 - iii. opportunities to capture and recycle stormwater drainage to irrigate adjacent planted areas are maximised.
- (t) Maintenance requirements, including:
 - i. surfaces must be easy to maintain and clean and allow for the ready removal of spills, stains and Graffiti.

4.7. CSELR Stop platform canopy

4.7.1. General

- (a) OpCo must ensure each CSELR Stop platform canopy provides the extent of coverage to the “usable platform area” at each CSELR Stop as required in Tables 8 and 9 of this Appendix.
- (b) “Usable platform area” is defined as the platform surface area (minimum length x minimum width) excluding:
 - i. ramps leading to the platform; and
 - ii. barrier / kerb interface with adjacent roads and ramps.
- (c) OpCo must ensure the platform canopy provides protection from the weather, sun, rain and glare, and covers the following areas:
 - i. the circulation space in front of all Customer service information displays and the ticketing machines;
 - ii. priority seating and wheelchair waiting spaces as required by DSAPT adjacent undercover bench seats;

- iii. circulation space in front of the emergency help telephone; and
 - iv. circulation space in front of each door of any lift.
- (d) OpCo must ensure that the platform canopy:
- i. is not be climbable;
 - ii. has a front edge which does not project more that 200mm beyond the front edge of the platform, taking in account transit space, OHW and other safety requirements;
 - iii. achieves a minimum visual impact in the CSELR Stop setting and provides a light and open appearance;
 - iv. includes a continuous gutter along the low point of the canopy that allows for adequate drainage of the canopy through water collection and connection to recycling system or stormwater drainage system;
 - v. conceals all downpipes within the canopy structural supports;
 - vi. conceals all services, conduits, etc, within the structural members and cladding elements;
 - vii. integrates CCTV and PA speakers within the canopy soffit, structural members or cladding elements, such that they are not seen as an 'add-on';
 - viii. has structural support base plates and holding down bolts etc that are fully concealed below the finished surface level of the platform;
 - ix. allows maximum ease of movement by locating the platform canopy supports;
 - A. along the rear edge of the platform on side platforms;
 - B. centrally on island platforms;
 - x. has support structure which takes up minimum platform surface area;
 - xi. has the minimum edge fascia depth;
 - xii. does not obstruct key sight lines or pedestrian movement;
 - xiii. discourages bird roosting;
 - xiv. minimises visual impacts on adjacent properties in of colour, glare and physical form; and
 - xv. integrates signage and customer information in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (e) Platform canopy height must be:
- i. a minimum of 3500mm from finished floor level at the platform edge to the lowest point of the underside of the canopy soffit; and
 - ii. a minimum of 2500mm from finished floor level to the underside of any passenger information displays or other fittings.

- (f) OpCo must ensure that cleaning, inspection and maintenance requirements can be undertaken without closure of adjacent roads and other specific requirements of the WorkCover Authority of NSW.
- (g) Platform canopies must be safely maintained from the platform, and not adjacent Light Rail tracks or vehicular traffic lanes.
- (h) OpCo must ensure that vertical glass wind break screens are able to be cleaned safely on both sides from the CSELR Stop platform.
- (i) OpCo must ensure that vertical glass wind break screens adjacent road lanes provide protection for Customers should the glass break, through the provision of interlinking handrails in accordance with the requirements of AS1288 Clause 7.2.3 (c).
- (j) Where regular maintenance access across a roof is required, a safe walkway must be defined and roof finishes suitably protected.

4.7.2. Modular canopy

- (a) OpCo must ensure that the platform canopies are modular in design, achieving the following:
 - i. a contemporary and elegant design that is able to integrate within it a representative range of local character settings along the SLR;
 - ii. a maximum of 3 degrees fall on the roof plane, to maintain a horizontal appearance of the canopy, whilst maintaining water drainage and avoiding water ponding etc;
 - iii. the roof plane of the canopy is separate from the vertical wind break plane such that they appear to be two distinctly separate horizontal and vertical elements;
 - iv. equal spacing between canopy support columns not less than 4m;
 - v. equal spacing of vertical wind break panels and soffit cladding panels;
 - vi. consistent structural column sizes across the whole canopy;
 - vii. standard panel sizes for ease of replacement;
 - viii. additional modules can be easily added should CSELR Stops in the future require greater canopy coverage, and that additional modules match the existing materials and finishes of the canopy and CSELR Stop elements on the platform ensuring that all services can be easily added, coordinated and concealed, such that:
 - A. space provision for future canopy column structural footings for the full length of all platforms is provided;
 - B. future concealed canopy drainage can easily be connected to existing concealed canopy drainage minimising impacts on SLR operations; and
 - C. all additional conduits, services etc relating to the installation of additional modular elements can be connected to existing CSR minimising impacts on SLR operations;

4.7.3. Canopy types and coverage

- (a) OpCo must provide canopy types in accordance with Table 8 below.
- (b) OpCo must provide canopies in locations shown in Table 9 below, unless OpCo satisfies TfNSW and obtains TfNSW's approval, that in the CDB satisfactory Customer shelter can be provided by considering nearby building awnings.
- (c) Not used.
- (d) Not used.
- (e) Canopy design must be based on boarding demand at CSELR Stops, AM peak, PM peak, events, type of platform (side, island, terminus, cross-platform interchanges), access to platforms, surrounding environment, and encourage an even distribution of demand along the LRV vehicles where possible.
- (f) Canopy design must ensure that the NSW Fire and Rescue fire appliances can safely access adjacent buildings.

Table 8 Platform canopy types

Canopy Size	Minimum Width	Minimum Length
Small	Width of platform 200mm set back from the front edge of the platform	Approx 35% of platform length
Medium	Width of platform 200mm set back from the front edge of the platform	Approx 50% of platform length
Large	Width of platform 200mm set back from the front edge of the platform	Approx 70 of platform length

Table 9 Platform canopy coverage

Stop	Platform Type	Canopy Size	Canopy Location on Platform
Circular Quay	Side Platform Terminating	None	N/A
	Island Platform Terminating	Small	Central
Grosvenor Street			
	Island Platform	Small	Central

Stop	Platform Type	Canopy Size	Canopy Location on Platform
Wynyard	Side Platform northbound	Small	Central
	Side Platform southbound	Large	All
Queen Victoria Building	Side Platform northbound	Small	Central
	Side Platform southbound	Medium	Southern end
Town Hall	Side Platform northbound	Small	Central
	Side Platform southbound	Small	Central
Chinatown	Island Platform	Small	Central
Rawson Place	Side Platform northbound	Small - See Note 1 below	Central - See Note 1 below
	Island Platform	Large	All
Central Station	Side Platform northbound	Small	Central
	Island Platform	Large	All
Surry Hills	Side Platform northbound	Small	Central
	Side Platform southbound	Small	Central
Moore Park	Island Platform	Large	All

Stop	Platform Type	Canopy Size	Canopy Location on Platform
Carlton Street			
	Island Platform	Small	Central
Todman Avenue	Island Platform	Small	Southern end
UNSW – Anzac Parade	Island Platform	Large	All
Strachan Street	Island Platform	Small	Central
Kingsford	Island Platform northbound	Large	All
	Island Platform southbound	Large	All
Royal Randwick Racecourse	Island Platform	Large	All
Wansey Road	Island Platform	Small	Central
UNSW – High Street	Island Platform	Large	All
Randwick	Island Platform Terminating	Large	All
	Side Platform Terminating	None	N/A

Note 1: OpCo must maximise coverage while considering existing awnings and providing fire appliance access to the Sydney Central YHA and 790 on George Backpackers

4.8. Lighting

- (a) OpCo must prepare a lighting strategy and incorporate lighting for all CSELR Stops.
- (b) The lighting design strategy must be well-considered, integral and complement the CSELR Stop designs.
- (c) OpCo must coordinate lighting with Customer facilities, secondary facilities, signage, CSELR Stop furniture and architectural finishes within CSELR Stops.
- (d) OpCo's lighting design must:
 - i. promote a memorable, consistent and high quality experience;

- ii. not be driven by technical requirements alone, but by creative, innovative solutions, which deliver a functional and compliant scheme;
 - iii. deliver a visually comfortable environment free of glare and obtrusive light, within the CSELR Stops;
 - iv. reinforce the visibility of CSELR Stops as attractive and welcoming elements within the local context;
 - v. consider and respond to the location and surroundings of the CSELR Stops;
 - vi. promote a safe environment that is accessible for all Customers;
 - vii. enhance the architectural and Public Domain elements; the materiality and form of the spaces and structures, promoting quality and a well-considered architectural environment;
 - viii. ensure that signage and service information is clearly legible and that key service points (ticketing machines, help points etc) are strongly illuminated;
 - ix. minimise hotspots, glare and dark spots across and signage and Customer information faces, as per AS 1428.2 Illumination levels;
 - x. not be imposing on the space or negatively affect the architectural environment;
 - xi. be integrated within built elements to promote a fully coordinated solution;
 - xii. eliminate shadowing caused by incidental obstruction of light by structural or other elements;
 - xiii. utilise direct and indirect illumination to ensure appropriate balance of light and perceived brightness;
 - xiv. use various colour temperatures with deliberate intent in defining points of interest, enhancement of daylight ingress, creating a sense of safety and creating an inviting environment;
 - xv. implement the use of current lighting technologies and future-proof the lighting scheme through the specification of modular and upgradable equipment;
 - xvi. provide light levels that vary, creating visual hierarchy and enabling a visually stimulating journey for Customers;
 - xvii. provide illumination levels appropriate for ease of wayfinding;
 - xviii. incorporate energy saving luminaires and switching control systems to minimise energy consumption appropriate to the natural lighting levels;
 - xix. provide lighting and light levels that are adequate for CCTV and other security systems operations; and
 - xx. ensure that signage and service information is clearly legible and key service points, such as ticket machines and Help Points are illuminated.
- (e) OpCo's luminaire and lamp sources selection must satisfy the following requirements:
- i. use of high quality lighting equipment;

- ii. luminaires located in exterior areas must have a minimum IP rating of IP65;
 - iii. luminaires mounted in locations that require a maintenance ladder must include lanyards on removable components to facilitate lamp replacement and cleaning;
 - iv. light sources must have a colour rendition of no less than 80 in line with CIE-1960;
 - v. all luminaires within public spaces with mounting heights at or below 2.4m above finished floor level must have a minimum IK Rating of 10;
 - vi. all luminaires within public spaces with mounting heights above 2.4m above finished floor level must have a minimum IK Rating of 8;
 - vii. surface temperatures of luminaires at or below 2.4m from finished floor level must not exceed 50°C;
 - viii. light output ratio combined with the reflector and optics must deliver a minimum of 60% light output ratio, in accordance with AS/NZS1680;
 - ix. light fittings must provide 60% of the lamp lumen output of the fitting in the peak intensity, as defined by the fitting beam angle;
 - x. OpCo must select from the following range of light sources:
 - A. high efficient LED or equivalent;
 - B. compact fluorescent;
 - C. circular and linear T5 fluorescent;
 - D. metal halide;
 - xi. luminaires must only be mounted in accordance with luminaires and lamp manufacturers' recommendations;
 - xii. all fittings including control gear and lamps must be appropriately temperature rated for mounting in their intended location;
 - xiii. all lighting control equipment must be electronic;
 - xiv. all fluorescent and LED lighting control equipment must be high frequency;
 - xv. light sources must have an efficacy of not less than 60 lumens / Watt;
 - xvi. light sources must have a lamp life of not less than 10,000 hours;
 - xvii. light sources, excluding signage, must have a colour range of between 2700K and 4500K in accordance with CIE-1931; and
 - xviii. luminaries lighting below platform canopies must be recessed in canopy soffits.
- (f) To control glare from the luminaires, the CSELR Stop lighting must:
- i. use accessories on fittings to minimise glare;

- ii. use appropriate beam angles on luminaires to ensure lighting is focussed where required, that spill light is minimised and direct views into a light source are minimised;
 - iii. use high quality reflectors that have a maximum of 40% spill light outside of the peak intensity as defined by the fitting beam angle;
 - iv. where luminaires are lighting a horizontal surface, use mounting locations of luminaires which ensure that the angle of the luminaires do not exceed 45 degrees from the vertical;
 - v. where luminaires are lighting a vertical surface and the angle of adjustment justifies a greater than 45 degree position, ensure that direct views to the light source are eliminated or obscured;
 - vi. ensure light spill and light pollution externally are avoided in accordance with AS 4282; and
 - vii. where up lighting is used for planting and feature lighting, ensure the luminaires have glare control accessories with appropriate beam angles and directionality to ensure spill light is minimised.
- (g) The CSELR Stops illuminance levels must be designed based on the following:
- i. The light level must be calculated in line with the Illuminating Engineering Society of North America (IESNA) handbook; and
 - ii. OpCo must provide lighting performance in accordance with the minimum lighting levels in Table 10, as a minimum.
- (h) Luminaires must be maintained and replaced during daylight hours.

Table 10 Platform lighting performance

Area / Zone / Element	Minimum average horizontal illuminance (lux)	Minimum vertical illuminance (lux)
General		
Undercover areas of platform	40lx (equivalent to AS1680 – interior circulation)	7lx (in line with AS1158.3.1 – P6 category)
Open areas of platform	21lx (in line with AS1158.3.1 – P6 category)	7lx (in line with AS1158.3.1 – P6 category)

4.9. Integrated services cabinet

- (a) OpCo must ensure that all platform service equipment, including communications / PA, ETS Equipment, CCTV equipment, electrical / UPS, Help Point, customer information equipment, must be integrated into a single cabinet, with the following features:
- i. external dimensions not more than 800mm in depth;
 - ii. where a combined services and ticket cabinet is proposed, the cabinet must provide a recess suitable for housing the ticket machine to achieve an integrated arrangement;
 - iii. must not protrude into accessible paths of travel;
 - iv. be located along the centreline of the platform for island platforms;
 - v. be located along the rear edge of platforms for side platforms;
 - vi. be constructed such that individual secure lockable doors to each compartment facing the platform face, be aligned and flush with surrounding panels and / or doors;
 - vii. be constructed such that individual panels to each compartment facing adjacent roadways, have secure lockable fixings and are removable;
 - viii. all doors and fixed panels have equal vertical and horizontal aligned joints;
 - ix. be constructed from 316 stainless steel panels;
 - x. ensure that all ventilation louvres where required are integrated flush with the surrounding doors and / or panels; and
 - xi. when cabinet faces are not immediately adjacent to roadways, allow for integrated poster cases to accommodate the relevant customer information, including network and line maps and ticketing information, as required in Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).

5. Customer facilities

5.1. CSELR Stop elements

- (a) CSELR Stop elements must include:
- i. ticketing in accordance with Appendix 24 (*Ticketing System Support Infrastructure*), and including:
 - A. Cash Load Device (CLD) and Disposable Vending Machine (DVM);
 - B. Fixed Location Readers (FLR) on each Platform;
 - ii. the following Customer amenities:
 - A. seating;
 - B. rubbish bins;
 - iii. concealed hearing loops, which must be provided to all CSELR Stops in accordance with Appendix 23 (*Communications Systems and Passenger Information*); and
 - iv. the following information and signage:
 - A. information and signage elements in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*);
 - B. Passenger Information Displays in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*);
 - C. Bus PIDs at Kingsford, Randwick and Rawson Place in accordance with Appendix 23 (*Communications Systems and Passenger Information*) and Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (b) OpCo must ensure that the configuration of CSELR Stop elements on platforms are set out in accordance with: Placement of Opal Devices on Light Rail – Guidelines (Doc ref A2982150), and CBD and South East Light Rail Ticketing – Requirements (Doc ref A1559029).
- (c) OpCo must ensure the CSELR Stop elements on platforms meet the following requirements:
- i. where a split platform arrangement is provided for a CSELR Stop:
 - A. single ticket machines accessible to users are located on the platform with the larger boarding peak patronage;
 - B. multiple ticket machines are equally located on each platform;
 - C. integrated services cabinets are located on the platform with the non-peak boarding patronage;
 - D. Help Points are integrated with cabinet furniture;

- ii. are minimised beneath canopies to maximise covered waiting space;
- iii. are grouped along the platform to minimise clutter at the CSELR Stop;
- iv. establish rules-of-thumb for the placement of CSELR Stop elements to achieve a consistent, familiar language for all CSELR Stops;
- v. are clear of circulation paths and appropriately located for each CSELR Stop; and
- vi. FLRs are generally located:
 - A. at the end of platforms for end-loaded CSELR Stops, and / or at points to service equal number of LRV doors for side-loaded CSELR Stops;
 - B. not used;
 - C. not used;
 - D. the reader face is parallel to the path of travel;
 - E. clear of other obstructions on the platform to maintain visual connectivity and access along the path of travel; and
 - F. away from end of platform access ramps to provide level queuing area at the FLR bollard.

5.2. Signage and Customer information

- (a) Signage requirements must be in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (b) Customer information facilities including passenger information displays, notice boards, ticketing equipment (including, DVM and FLR) and Help Points must be grouped and integrated within dedicated zones.
- (c) Signage and Customer information must be coordinated:
 - i. to achieve unobstructed sight lines and legibility of the signage;
 - ii. with adjacent architectural finishes; and
 - iii. with CSELR Stop spatial planning.

5.3. Seating

- (a) OpCo must ensure seating is robust and suitable for a busy public transport environment.
- (b) OpCo must ensure that the design aesthetics are in keeping with the design aesthetic of the canopy elements.
- (c) OpCo must provide bench seating at each CSELR Stop, and ensure:
 - i. priority seating is located adjacent to dedicated wheelchair waiting zones under covered areas of the platform; and

- ii. seating is located clear of passenger information signage panels.
- (d) OpCo must provide the bench seating appropriate for each CSELR Stop, as described below:
- i. generally for island platforms:
 - A. a minimum of four bench seating types, providing seating for 12 persons;
 - B. have equal number of seats facing each platform;
 - C. located along the centreline of the platform, and evenly distributed along its length;
 - D. integrated with the modular canopy and glazed wind screen designs;
 - ii. generally for each side platform:
 - A. a minimum of four bench type seats, providing seating for six persons per platform, 12 persons per CSELR Stop;
 - B. located along the rear edge of platforms, and evenly distributed along its length; and
 - C. integrated with the modular canopy and glazed wind screen designs.
- (e) Public seating must:
- i. be set back from the accessible paths of travel in accordance to DSAPT;
 - ii. be functional, comfortable and designed to be easily maintained;
 - iii. include arm rests which are in accordance with AS 1482.2 and discourage persons from lying on the seating;
 - iv. when glazed wind screens are not provided behind the bench seat, four seating positions per platform must have backrests, be under cover and be close to the platform services cabinet;
 - v. be oriented towards the platform face;
 - vi. deter use by skateboarders;
 - vii. be resilient and of Graffiti-proof material;
 - viii. not allow liquid to pond on the surface;
 - ix. not incorporate back rests where the seats are located with double sided access;
 - x. have a stainless steel or cast aluminium frame and posts;
 - xi. have any slats running parallel to the front edge of the seat;
 - xii. be ergonomically designed;
 - xiii. be designed to deter vagrancy; and
 - xiv. be securely fixed with concealed fixings.

- (f) Seats must comply with the requirements of AS1428.2 and DSAPT 2002.
- (g) OpCo to provide lean bars at each CSELR Stop when bench seating cannot be provided, to ensure clear accessible paths of travel are maintained.

5.4. Rubbish bins

- (a) OpCo must not provide bins on CSELR Stops within the CoS LGA.
- (b) OpCo must provide on each CSELR Stop, outside of the CoS LGA, a minimum of 1 bin per platform, and / or 2 bins per platform for CSELR Stops with two access points and each bin is:
 - i. 80 litre capacity;
 - ii. covered and secured, including bird-proof lids (or similar);
 - iii. easily removable for maintenance;
 - iv. resilient and graffiti-proof material;
 - v. lockable;
 - vi. made with vandal resistant and robust materials;
 - vii. clearly identifiable;
 - viii. transparent (support structure and bags) for Moore Park Stop only at platform level;
 - ix. clearly labelled for waste and recyclables;
 - x. configured for chute heights in accordance with AS1428.2;
 - xi. mounted with concealed fixings; and
 - xii. located in the same or similar places on platforms for Customer consistency.
- (c) No plinth may be constructed on the platform, to house the bin.
- (d) OpCo must position bins near to CSELR Stop access and exit points, out of the primary circulation path, and away from seating and principal waiting areas.

5.5. Ticketing equipment

- (a) OpCo must provide space and supporting infrastructure at CSELR Stops for the Electronic Ticketing System (ETS) equipment as described in Appendix 24 (*Ticketing System Support Infrastructure*).
- (b) Ticketing equipment (including CLD and DVM) must be located undercover in a convenient and safe location and be recessed flush with adjacent wall surfaces.
- (c) CLD and DVM) must be integrated with an integrated service cabinet, consistently for all CSELR Stops.
- (d) CLD and DVM) must be clearly identifiable.

- (e) All ETS Equipment in public areas must be monitored by CCTV.

5.6. Help Points

- (a) OpCo must provide Help Points on each platform at each CSELR Stop as per Appendix 23 (*Communications Systems and Passenger Information*).
- (b) OpCo must also provide Help Points at the Moore Park Stop overhead concourse.
- (c) Help Points must be undercover and located at the service cabinet in a consistent configuration on all CSELR Stops.
- (d) Help Points must be clearly identifiable and include statutory signage located above the equipment.

5.7. Passenger information displays

- (a) OpCo must provide passenger information displays at each CSELR Stop as per Appendix 23 (*Communications Systems and Passenger Information*) and Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (b) Passenger information displays must be located such that the information is at 90 degrees to the platform edge.
- (c) Passenger information displays must be legible from all waiting areas on the platform.
- (d) The colour and finish of all visible framing, brackets and support structure is to match the colour and finish for the platform canopy support structure.
- (e) OpCo must provide Bus PIDs at Kingsford, Randwick and Rawson Place in accordance with Appendix 23 (*Communications Systems and Passenger Information*) and Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).

5.8. Commercial vending machines

- (a) OpCo must not install any vending machines at any CSELR Stops.

6. Staff Facilities

6.1. General Requirements

- (a) The works include the design, installation and commissioning of permanent buildings and associated works for Staff facilities.
- (b) OpCo must develop the design using a fully integrated approach, recognising the different functional requirements, statutory and regulatory requirements, planning approval conditions and community and stakeholder expectations.
- (c) OpCo must ensure that the components of all Staff facilities are designed in coordination with, and in collaboration between, its engineers, architects, urban designers and operations specialists.
- (d) OpCo must apply the following architectural and urban design principles:
 - i. promote a consistent design form, style and language of finishes across all building components that establish an identifiable family of elements;
 - ii. develop elegant, contemporary and well-proportioned designs that integrate all functional elements;
 - iii. develop a palette of materials, finishes and systems that are easy to maintain, clean and repair during the design life of the asset; and
 - iv. develop designs that are sustainable, efficient and responsive to the urban environment.
- (e) OpCo must ensure that the asset does not damage or have any adverse impacts on the amenity, aesthetics, safety, integrity, environment and function of adjacent properties in the vicinity of the site.

6.2. Scope

- (a) Without limiting the requirements of Appendix 29 (*Traction Power, Electrification Systems and Control*), OpCo must meet the following architectural and urban design requirements for all Staff facilities within the corridor.
- (b) OpCo must provide the following facilities as a minimum:
 - i. Staff facilities at terminus CSELR Stops: Randwick, Kingsford and Circular Quay, comprising 1 x unisex DDA accessible toilet.
- (c) OpCo must ensure that the following urban design and landscape requirements are achieved at:
 - i. Randwick Stop:
 - A. does not impede Light Rail driver sight lines or Customer key movement paths between Light Rail and bus modes;
 - B. does not impact on the war memorial located within High Cross Park;

- ii. Kingsford Stop; a single integrated building comprising substation, Staff facilities, and covered bicycle parking, which does not impede Light Rail driver sight lines or Customer key movement paths between Light Rail and bus modes; and
- iii. Circular Quay Stop: a Staff facility that may be stand alone or be integrated with existing facilities provided at Circular Quay station, and which:
 - A. does not impede Light Rail driver sight lines or Customer key movement paths between Light Rail, bus, train and ferry modes;
 - B. does not impact on the amenity of Alfred Street;
 - C. is a dedicated facility provided for Staff.
- (d) The provision and planning of facilities must comply with DDA requirements.

6.3. Materials, Finishes and Landscape screening

- (a) OpCo must provide architectural treatments to / or around Staff facilities that are sympathetic and complimentary to the surrounding urban environment.
- (b) OpCo must ensure:
 - i. that all doors and fixed panels have hidden fixings and equal vertical and horizontal aligned joints; and
 - ii. ensure that all ventilation louvres where required are integrated flush with the surrounding doors and/or panels.
- (c) OpCo must ensure that Staff facilities are treated, using the material type and finish in accordance with table 11 below:

Table 11 Material and finishes types to Staff facilities

Finish Type	Finish Quality	Material and Finish Description	Substation Locations
A	High Quality	Perforated aluminium, stainless steel, or powdercoated steel panels. Can be additionally screened with low level planting.	Circular Quay High Cross Park
B	Medium Quality	Composite aluminium or similar solid prefinished panels. Can be additionally screened with planting.	Kingsford

- (d) OpCo must provide landscape screening in accordance with Appendix 14 (*Public Domain*); and consider:
 - i. soft landscaping to / or adjacent to drivers' facilities to help minimise heat and glare, and improve visual amenity and screening.
- (e) Landscape screening and architectural treatments must:

- i. not impede access by vehicles or personnel; and
- ii. not provide areas of concealment of people.

7. Finishes, fixtures, Materials

7.1. General

- (a) OpCo must ensure the finishes, fittings, fixtures and Materials for CSELR Stops and Staff facilities are consistent, compatible and co-ordinated.
- (b) OpCo must ensure that Material selection optimises weather protection.
- (c) All finishes, fittings, fixtures and Materials must:
 - i. minimise discoloration, leaching, mould growth and deterioration due to wildlife, weathering and UV light;
 - ii. enhance spatial quality, visual surveillance, permeability, and encourage natural light entry;
 - iii. minimise hazards to Customers such as slip, trip and fall; rips and cuts;
 - iv. be coordinated with the CSELR Stop architectural, colour-coordination and Material response;
 - v. support the CPTED principles and enhance passive surveillance and perceived Customer and public levels of safety;
 - vi. be easily cleaned and maintained with minimum disruption to operations or Material performance;
 - vii. ensure that approved clear anti-graffiti coatings are applied to all exposed and accessible surfaces;
 - viii. be able to be spot repaired in the case of minor damage;
 - ix. be easily replaced without the removal of adjacent Materials and components;
 - x. discourage vandalism through appropriate Material selection and provide a high level of resistance to Vandalism;
 - xi. be well-considered in form, application and function to minimise dirt and dust build up from the surrounding environmental conditions;
 - xii. minimise horizontal surfaces and ledges that collect dust, dirt and soiling;
 - xiii. resist damage from LRV-generated vibrations;
 - xiv. achieve and maintain accessibility requirements for Customers and Staff;
 - xv. satisfy the sustainability objectives and requirements detailed in Appendix 7 (*Sustainability*);
 - xvi. be coordinated with signage and SLR branding elements; and
 - xvii. be in accordance with design life requirements detailed in section 5.2 of the SPR.
- (d) OpCo must use an industrial designer or suitably qualified designer for the design of all public area components.

- (e) Where Materials and finishes are used to provide enclosed or covered canopy they must be water tight and waterproof.
- (f) Standardisation must be provided to achieve a repetitive cladding and flooring geometry and soffit arrangement within the CSELR Stops.
- (g) Any visible fixings must be countersunk and recessed flush. Panel fixings must be concealed or set within shadow gaps with tamper-proof fixings.

7.2. Roofing

7.2.1. CSELR Stop platform canopies

- (a) OpCo must select from the following range of materials and finishes for canopies:
 - i. zinc composite sheet; and
 - ii. glazed canopy with approved white ceramic frit.
- (b) OpCo must select from the following range of materials and finishes for canopy fascias:
 - i. painted hot-rolled mild steel structural members with protective paint coating system;
 - ii. formed metal cover panel with powdercoat finish; and
 - iii. formed zinc composite sheeting.

7.2.2. Canopy soffits

- (a) Soffits must be designed to allow a visually integrated system of jointing, services, and acoustic treatments.
- (b) Suspended ceiling systems must provide access to concealed services and have mechanical fixings to withstand air uplift and downdrafts from LRV movements.
- (c) OpCo must select from the following range of Materials and finishes for soffits:
 - i. panelised pre-finished metal system; and
 - ii. Australian hardwood battens, Forest Stewardship Council of Australia (FSC) certified, with clear timber sealer, no-tint stain finish.

7.2.3. Gutters and down pipes

- (a) Gutters and down pipes must:
 - i. be visually integrated with the roof design;
 - ii. minimise bends; and
 - iii. be concealed.

7.2.4. Exposed structures

- (a) OpCo must ensure the design of exposed structures deters birds from roosting.
- (b) Additional deterrent measures (such as spikes) must be used only where hidden from view.
- (c) Corrosion protection systems and finishes to structural elements such as steel and concrete must be capable of recoating in situ to match adjacent finish, sheen, texture and colour.
- (d) Exposed structures must be painted mild steel.

7.2.5. Roof access

- (a) OpCo must provide roof access and safety for roofing in accordance with:
 - i. access for maintenance: AS1657;
 - ii. industrial fall-arrest systems and devices: AS1891 Parts 1-4;
 - iii. design loads: AS 1170; and
 - iv. any other specific requirements of the WorkCover Authority of NSW.

7.3. Platform flooring

- (a) CSELR Stop platforms, access ramps and stair floor material including set out, joints, expansion joints and access covers must be consistent throughout. OpCo must not use bitumen for any platform floor finish.
- (b) Floor finishes must be designed to withstand all necessary maintenance equipment loading.
- (c) Vertical tolerances (of floor finishes) must meet AS1428.1 clause 7.2.
- (d) The floor finish must withstand differential surface temperatures. Any movement must not result in permanent deformation.
- (e) Any junction between a floor and wall / column must facilitate the cleaning of the floor and ensure no damage to the floor and wall.
- (f) Floor finishes must resist staining, enable easy cleaning and maintenance, be water resistant and be hard wearing and durable.
- (g) Where localised areas of floor finishes are replaced due to damage, the replacement product must match the surrounding floor finish including colour, texture, orientation, level and jointing.
- (h) Expansion joints must be 316 stainless steel and be minimised.
- (i) Floor grouting colour must match the tile colour.
- (j) OpCo must ensure that the floor material and finish for CSELR Stop platforms is in accordance with the materials and finishes schedule included in the Concept Design.

7.3.1. Surface drainage

- (a) Surface drain covers must:
 - i. be 316 stainless steel;
 - ii. be secure, set flush with the adjacent flooring; and
 - iii. have slip resistance equivalent to that of adjacent flooring.
- (b) Grates and drains must not be located in primary pedestrian routes.
- (c) Grates and drains must not create hazards for high heels, bicycle wheels or wheelchair wheels.
- (d) Drainage grates within pedestrian areas must be 'heel-guard' type.

7.3.2. Access hatches

- (a) Access hatches must:
 - i. be set flush with the adjacent finished level;
 - ii. be discreetly located; and
 - iii. incorporate a discreet 316 stainless steel edge trim.
- (b) Access hatch materials and finishes must match the adjacent material with tile jointing and paving pattern to match the adjacent paving.

7.3.3. Tactile ground surface indicators (TGSIs)

- (a) TGSIs must:
 - i. be selected and applied in accordance with AS1428.4.1;
 - ii. be placed consistently within each CSELR Stop and across the CSELR; and
 - iii. have a luminance contrast to the background surface meeting clause 2.2 of AS1428.4.1 in both wet and dry conditions;
- (b) TGSi tile joints must align with floor tile joints which must also align where practical with movement joints.
- (c) OpCo must select from the following range of materials and finishes for TGSIs:
 - i. ceramic or reconstituted stone tiles; and
 - ii. stainless steel metal studs with R13 anti-slip as defined in AS/NZS4586.

7.4. Stairs

- (a) The design of balustrades on stairs include upstands at edges to must prevent objects from falling off the surface to the level below.

- (b) Materials and finishes for stairs in public areas must match the adjacent public area flooring, jointing and grouting.
- (c) OpCo must select from the following range of materials and finishes for stair nosing:
 - i. anti-slip and anti-wear stainless steel; and
 - ii. cast or extruded metal with abrasive anti-slip coloured inserts.
- (d) Egress and maintenance access stairs must be in accordance with OpCo's fire and life safety (FLS) strategy.
- (e) OpCo must select from the following range of materials and finishes for stairs at Moore Park Stop:
 - i. concrete must be wet rated at least R11 resistance as defined in Table 5 of AS4586; or
 - ii. tiles to match platform finish.

7.5. Handrails, balustrades, throw screens and screens

- (a) Handrails on stairs and ramps must comply with AS1428.1 and AS1428.2.
- (b) Handrails must have outer diameter between 30mm and 50mm.
- (c) Handrails and balustrades must have seamless joints.
- (d) Balustrades within the CSELR Stops must have a minimum height of 1200mm above finished floor level.
- (e) Materials and finishes for balustrades and screens are clear low iron glass.
- (f) Not used.
- (g) All connections between dissimilar metals to include a separation layer to prevent corrosion.
- (h) Balustrades and handrails must resist the working loads and be fit for purpose to withstand all dead and live loads on the balustrade elements and fixings.
- (i) Balustrades and handrails materials and components must meet the following requirements:
 - i. Aluminium:
 - A. selection of suitable aluminium alloys in profiles, sizes and grades, structural applications and applied finishes are to suit the functional requirements and conditions in accordance with AS/NZS1664 and ADCA Aluminium Standards and Data - Wrought products;
 - B. extrusions generally: to be aluminium alloy grade 6063 temper T5 or T6, in accordance with AS/NZS1866;
 - C. aluminium finishes: anodised in accordance with AS1231, to a minimum coating thickness of 25 microns;

- ii. glass:
 - A. general: glass balustrades must be laminated glass composed of toughened and annealed glass and clear pvb interlayer(s);
 - B. edges: flat polished and arrissed. Top edges are to be sealed with a flat aluminium or stainless steel strip bonded to the full thickness of the glass using a clear silicone elastomeric glazing sealant;
- iii. steel: hot rolled structural bars and sections in accordance with AS3679:300 mPa;
- iv. stainless steel:
 - A. weld type: butt;
 - B. internal weld category: level 2;
 - C. external weld category: class B;
 - D. welding materials: compatible with metal being welded; and
 - E. weld quality: free from imperfections such as cracks and pits. Grind and polish to give required surface finish.
- (j) Throw screens and safety barriers within CSELR Stops must be provided:
 - i. in areas where Customers cross over Light Rail tracks;
 - ii. where Customers are positioned close to overhead wires;
 - iii. that are of a minimum height in accordance with the AS5100 series; and
 - iv. that can be cleaned and maintained safely.
- (k) Screens with handrails within Moore Park Stop must be provided:
 - i. around mezzanine voids;
 - ii. that are a minimum of 1500mm high; and
 - iii. handrails are integral to the design and in accordance with AS1428.1.

7.6. Not Used

7.7. Glazing

- (a) This section describes the minimum acceptable requirements for the provision of glazing.
- (b) Glazing on platform canopies and wind screens must:
 - i. limit solar heat gain and UV penetration where enclosing or providing covered canopy; and
 - ii. minimise dirt and litter build-up and streaking.
- (c) Glazing must comply with the requirements of AS1288.

7.7.1. Performance criteria

- (a) Design and construction of glazing must satisfy the design intent and meet the performance and other requirements described in this section.
- (b) All glazing materials and workmanship must be undertaken by fully qualified, skilled and experienced personnel.
- (c) OpCo must provide glazing and associated work, which:
 - i. remains intact, weatherproof and waterproof (exterior systems only) under the ambient in-service and climatic conditions;
 - ii. withstands the anticipated loads without damage or impairment of performance;
 - iii. provides adequate means of dealing with thermal and differential movement;
 - iv. resists ambient climatic conditions; and
 - v. satisfies thermal, acoustic, and other specified performance criteria.
- (d) All elements of glazing works must:
 - i. be designed to withstand the most severe loading or load combinations from the loads specified herein; and
 - ii. comply with building regulations and statutory requirements regarding imposed loadings as applicable.
- (e) OpCo must ensure that design loads for design dead and live loads, are established from AS/NZS1170.1 incorporating amendments or in accordance with statutory regulations, whichever are the most stringent.
- (f) OpCo must ensure that wind load pressure coefficients are established in accordance with AS/NZS1170.2.
- (g) OpCo must ensure that structural design actions are in accordance with AS1170.4.
- (h) OpCo must ensure that in designing for thermal loads the following are considered:
 - i. thermal stability: no glass must suffer from thermal fracture; and
 - ii. thermal analysis: carry out a thermal analysis for all ordinary annealed glass applications, demonstrating that the glass will not suffer from thermal fracture. The analysis must consider: orientation, glass type, glazing method, framing material and framing colour.
- (i) OpCo must ensure that in designing for human live loads the following are considered:
 - i. horizontal glass configurations: glass on a CSELR Stop canopy etc. must be capable of supporting superimposed human live loads (e.g. maintenance personnel), without collapse, fracture, permanent distortion, failure of seals or fastenings, or other damage; and
 - ii. vertical glass configurations: platform wind breaks and glass in a balustrade system must be capable of supporting lateral human live loads (e.g. impact and

surge) without collapse, fracture, permanent distortion, failure of seals or fastenings, or other damage.

- (j) OpCo must ensure that in designing for incidental loads the following are considered:
 - i. make provision to accommodate incidental loads that may occur. Such loads must include but must not be limited to those resulting from manufacture, transport, and installation.
- (k) OpCo must ensure that in designing for displacement limits the following are considered:
 - i. glass deflection due to horizontal loads from serviceability wind pressure including operational air pressures due to running LRVs and ventilation requirements, as installed and without permanent deformation, must not exceed:
 - A. 4-sided support: span/90 or 20mm whichever is smaller; and
 - B. 2-sided support: span/90 or 35mm whichever is smaller.
- (l) OpCo must ensure that in designing for movements the following are considered:
 - i. general: provide for deflections, displacements and other movements within the glazed assemblies including but not limited to movements caused by deflections of building structure, ambient temperature changes, wind loads, and design dead and live loads; and
 - ii. accommodation: provide glazing to accommodate these movements silently and without permanent deformation, reduction of performance, or other detrimental effects.

7.7.2. Materials and components

- (a) OpCo must ensure that:
 - i. all glass panels at CSELR Stops must be laminated, and in combination with annealed, heat strengthened, or toughened as required by specific applications;
 - ii. glass and glazing materials provided are of a thicknesses to comply with AS1288; and
 - iii. all glass panels at CSELR Stops provide anti-Graffiti / surface protection film to all glass areas which are accessible.
- (b) All glazing at CSELR Stops must be designed to minimise fragmentation and panel separation associated with the threat protection requirements of the Security Management Plan.
- (c) Glass and glazing materials must:
 - i. for glass, be free from impurities or other defects which detract from appearance or interfere with performance under normal conditions of use;

- ii. for glazing plastics, be free from surface abrasions, and warranted by the manufacturer (for the design life) against yellowing or other colour change, loss of strength and impact resistance, and general deterioration;
 - iii. have glass tolerances (size, squareness and flatness) in accordance with AS/NZS2208;
 - iv. have plate and sheet:
 - A. for roller wave: maximum 0.15 mm. The peaks and troughs of the roller wave must run horizontally in the installed glass panes; and
 - B. for float glass quality: glazing select quality q3 in accordance with ASTM C 1036;
 - v. meet safety glass standards in accordance with AS/NZS2208;
 - vi. have a permanent standards mark;
 - vii. have heat soaking where required for all toughened and heat strengthened glass exposed to the exterior;
 - viii. for insulating glass units (double glazed units), comply with AS/NZS4666; 2012;
 - ix. have a blast resistant film as required by the Security Management Plan; and
 - x. for opacified glass, must comply with the American Society for Testing and Materials (ASTM) C 1048.
- (d) Glazing materials (including glazing compounds, sealants, gaskets, glazing tapes, spacing strips, spacing tapes, spacers, setting blocks and compression wedges) must be appropriate for the conditions of application and the required performance. Provide structural glazing materials where glass is not secured by other physical means.
- (e) Jointing materials must be compatible with each other and with the contact surfaces and non-staining to finished surfaces. Do not use bituminous materials on absorbent surfaces.
- (f) Elastomeric sealants must meet the following requirements:
- i. sealing compound (polyurethane, polysulphide, acrylic);
 - ii. single component: Type II, Class A;
 - iii. multi component: in accordance with the American Society for Testing and Materials ASTM C920;
 - iv. sealing compound (silicone);
 - v. single component: Class A; and
 - vi. multi component: in accordance with the American Society for Testing and Materials ASTM C920.
- (g) Pile weather strips must meet the following requirements:

- i. materials: polypropylene or equivalent pile and backing, low friction silicone treated, ultra violet stabilised; and
 - ii. finned type: a pile weather seal with a central polypropylene fin bonded into the centre of the backing rod and raised above the pile level.
- (h) Extruded gaskets and seals must meet the following requirements:
 - i. type: non-cellular (solid) elastopressive seals;
 - ii. material:
 - A. rubber products (neoprene, ethylene propylene diene monomer (EPDM) or silicone rubber): to BS4255:1;
 - B. flexible polyvinyl chloride (PVC): To BS2571, E type compounds, colour fastness grade B;
- (i) OpCo must apply the recommended primer to the surfaces in contact with sealant materials.
- (j) Movement joints must meet the following requirements:
 - i. depth of elastomeric sealant: one half the joint width, or 6 mm, whichever is the greater;
 - ii. foamed materials (in compressible fillers and backing rods): closed-cell or impregnated types that do not absorb water; and
 - iii. bond breaking: backing rods, and other back-up materials for sealants that do not adhere to the sealant.

7.8. Tiling and paving

- (a) This section describes the minimum acceptable requirements for the provision of exterior hard tile floor surfaces.
- (b) Tiling and paving materials and components must meet the following requirements:
 - i. ensure that all materials, components, treatments and proprietary products including membranes, acoustic / impact insulation, admixtures, adhesives, bedding materials, grouts, joint sealants, pre-sealers and finishing sealers and the like, are compatible when used in association with each other and the substrates. Comply with the manufacturers / suppliers published recommendations regarding all aspects;
 - ii. consistency: for the whole quantity of each material or product use the same source or manufacturer and provide consistent type, size, quality and appearance. Stone materials must come from the same area stock within the source quarry;
 - iii. exposed edges: in positions where the edge is exposed provide purpose-made border tiles with the exposed edge (whether round, square or cushion) glazed to match the tile face;
 - iv. adhesives in accordance with AS2358;

- v. premixed mortar must not be used;
- vi. cement type in accordance with AS3972;
- vii. white cement: iron salts content * 1%;
- viii. off-white cement: iron salts content * 2.5%;
- ix. sand: washed fine aggregate selected for grading. Clay content * 5%;
- x. lime: in accordance with AS1672.1;
- xi. water: in accordance with AS3958.1;
- xii. bedding mortar / screed:
 - A. proportioning: select proportions from the range 1:3 – 1:4 cement: sand. Provide minimum water and / or appropriate admixtures;
 - B. mixing: in accordance with AS3958.1;
 - C. reinforcement: 50 x 50 x 2.5mm galvanised wire mesh in accordance with AS3958.1;
 - D. admixtures: provide proprietary admixtures that are suitable for purpose for the particular circumstances, limitations and conditions of service;
 - E. use admixtures in accordance with the manufacturers' published instructions;
- xiii. external tiled areas reinforced polymer modified bedding mortar / screed:
 - A. proportioning: 1:4 cement: sand, together with an approved polymer admixture; and
 - B. reinforcement: 50 x 50 x 2.5mm galvanised wire mesh in accordance with AS3958.1.

7.8.1. Stone paving

- (a) Stone paving supply must meet the following requirements:
 - i. bedding and grouting mortar: use a mix which is suitable for the stone type and must contain an admixture which prevents efflorescence and leaching; and
 - ii. stone finishing: after paving installation is complete and thoroughly cleaned, apply a stone surface enhancer and hardener.
- (b) Any granite must be in accordance with AS3958 and AS/NZS4455.
- (c) Any blue stone must be in accordance with AS4459.
- (d) Natural stone pavements to be coordinated with structural and services requirements.

7.9. Painting

- (a) This section describes the minimum acceptable requirements for the provision of painting.
- (b) Coating systems to substrates must meet the following requirements:
 - i. consistent in colour, gloss level, texture and dry film thickness;
 - ii. free of runs, sags, brush marks, blisters, or other discontinuities;
 - iii. paint systems fully opaque;
 - iv. clear finishes at the level of transparency consistent with the product;
 - v. fully adhered;
 - vi. resistant to environmental degradation within the manufacturer's stated life span; and
 - vii. meet any specified performance requirements.
- (c) Painting processed in their entirety must be carried out in accordance with the published recommendations and instructions of each respective manufacturer.
- (d) Unless recommended otherwise by the manufacturer, each paint system must consist of at least 3 coats.
- (e) Paints and other materials must comply with Australian Paint Approvals Scheme specifications and are scheduled in the APAS "List of Approved Products".
- (f) Paints from different manufacturers must not be combined in a paint system.
- (g) Anti-Graffiti coatings must be applied to substrates where vertically and horizontally vulnerable to attack.
- (h) Painting must be well maintained and repainted on a cyclic regime to sustain surfaces that are not faded, scuffed or flaking.

7.10. Steel paint coatings

- (a) This section describes the minimum acceptable requirements for the provision of high performance coatings to the following steelwork elements:
 - i. external steelwork (exposed); and
 - ii. external steel cladding framing (concealed).
- (b) Steel paint coatings must meet the following requirements:
 - i. standards:
 - A. surface preparation and coating in accordance with AS/NZS2312;
 - B. metal finishing: preparation and pre-treatment of surfaces in accordance with AS1627.0;

- C. corrosion protection in accordance with AS/NZS2312;
- ii. manufacturer's instructions:
 - A. the complete scope in this section must be carried out in accordance with the manufacturer's published recommendations and instructions for each coating system;
 - B. supply coating materials and accessories in accordance with paint manufacturers recommendations;
- iii. protective and decorative coatings must:
 - A. provide functionality and maintainability;
 - B. retain substrate integrity for the design life through successive maintenance paintings;
 - C. minimise the average cost of service for corrosion protection;
 - D. lower risk to personnel, the public and the environment;
 - E. retain or enhance aesthetics where appropriate;
- (b) OpCo must conform to the requirements and recommendations of the coating manufacturer in all respects of applying steel paint coatings.
- (c) Durability of steel paint coatings must be in accordance with Table 12.

Table 12 Durability of steel paint coatings

Condition	Durability to ISO 12944	Environment classification
External steelwork (exposed)	High durability	C5M
External steel cladding framing (concealed)	High durability	C5M

7.11. Metalwork and metal fixtures

- (a) This section describes the minimum acceptable requirements for the provision of miscellaneous architectural metalwork and metal fixtures.
- (b) Metal fixtures and associated work must:
 - i. comply with relevant Standards and Guidelines, the NCC and regulations of Authorities;
 - ii. be durable and remain intact and serviceable under the in-service operating conditions of the building;
 - iii. withstand the in-service imposed loads without impairment of performance;
 - iv. provide adequate means of dealing with corrosion;

- v. provide adequate means of dealing with thermal movement and differential movement of the building structure;
 - vi. provide and maintain the design lines, section profiles and stiffness of components;
and
 - vii. satisfy other performance criteria if specified.
- (c) Design dead and live loads must be in accordance with AS/NZS1170.1 and AS/NZS1170.2, or in accordance with statutory regulations, whichever are the most stringent.
- (d) Design loads for balustrades must be in accordance with AS/NZS1170.1 Table 3.3.

8. Design Documentation

8.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage in addition to the requirements to Appendix 47 – Design Documentation Requirements.

8.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for CSELR Stops must include:
- i. drawings and specifications:
 - A. for all architectural elements OpCo must provide:1:200 site plans and site sections;
 - B. 1:200 (A1) plans, sections, and elevations defining the layout, construction, materials, finishes of the architectural works;
 - C. typical sketch details and wall sections of major architectural elements including walls, cladding, glazing, ceilings, floors, vertical transport elements, signage, lighting, heritage items;
 - D. preliminary materials, finishes and fittings schedule;
 - E. all drawings must show key dimension, primary service routes, relationship of public spaces and service facilities;
 - ii. a design report, in accordance with the SPR and the following specific deliverables:
 - A. a description and illustration of look, feel and function of the CSELR Stops;
 - B. a description and illustration of the CSELR Stop designs and Public Domain surrounding each CSELR Stop;
 - C. a description of impacts of the CSELR Stop canopies, including height, massing, scale, address and entry, heritage, view corridors, solar access, wind, access, traffic and transport circulation networks;
 - D. access plans identifying current and future pedestrian desire lines and key movement corridors;
 - E. preliminary wayfinding strategy;
 - F. signage strategy, hierarchy, locations and typical details integrated with each CSELR Stop;
 - G. heritage impact report describing the compliance of the design with all relevant heritage legislation and Environmental Impact Statements;
 - H. pedestrian modelling report describing the demand analysis assumptions and pedestrian modelling to verify the design achieves the Levels of Service requirements;

- I. access, cleaning and maintenance strategy;
 - J. preliminary accessibility plan and report to demonstrate compliance with the Disability and Discrimination Act 1992, National Code of Construction (NCC) and Australian Standards and the DSAPT;
 - K. preliminary crime prevention through environmental design review and report;
 - L. lighting design strategy describing the objectives, themes, strategies and implementation of the lighting design;
 - M. acoustic design strategy describing the compliance of the design with statutory controls, codes and standards and demonstrating the modelling of the internal acoustic environment;
 - N. NCC report demonstrating compliance of the design with the NCC, safety compliance and the fire engineering strategy;
 - O. CSELR Stop-specific sustainability provisions;
- iii. the following visualisation material fully coordinated with the drawings and design report. As a minimum, photorealistic 3D flythrough and photorealistic still images showing a minimum of the following CSELR Stops and surrounding Public Domain, illustrating the context, architectural and Public Domain design:
- A. Kingsford;
 - B. UNSW – Anzac Parade;
 - C. Randwick;
 - D. one CSELR Stop on High Street, Wansey Road or Alison Road;
 - E. Royal Randwick Racecourse;
 - F. Moore Park;
 - G. Central Station;
 - H. Rawson Place;
 - I. Not used;
 - J. one CSELR Stop within the George Street pedestrian zone;
 - K. Circular Quay;
 - L. each substation building type;
 - M. Western tunnel portal, Eastern Distributor rail overbridge, Olivia Gardens and Wimbo Park, George Street pedestrianised zone;
- iv. for each CSELR Stop demonstrate compliance with the requirements of the SPR;
- v. describe the sustainable design features and initiatives of the architectural and public domain design and compliance with the requirements;

- vi. describe the integration of the architectural design with related developments at the CSELR Stop and Public Domain by others;
- vii. preliminary external and internal materials, finishes and fixtures boards and a schedule describing:
 - A. product type, finish, colour, size, thickness and method of fixing;
 - B. manufacturer code number;
 - C. technical data, including test results to confirm compliance with this Appendix;
 - D. design life to replacement or refurbishment;
 - E. cross reference location of all materials and finishes on architectural drawings and schedules;
 - F. maximum replacement times from the time of damage; and
 - G. examples, including Quality Benchmarks, in existing buildings where the proposed fitting and fixture has been used and demonstrating its suitability for the Project in terms of robustness, withstanding wear and tear and maintaining appearance over the design life.

8.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for CSELR Stop and building spatial and functional requirements must include:
 - i. 1:100 (A1) plans, sections, and elevations fully defining the layout, preliminary construction method, materials, finishes of the architectural and public domain works;
 - ii. typical details of all architectural including walls, cladding, glazing, ceilings, floors, vertical transportation elements, signage, lighting, heritage items; and
 - iii. preliminary technical specifications.
- (b) Submit samples of all materials, finishes, fixtures and fittings visible within public areas (internal and external) with specification, design life and maintenance details for each.

8.4. Design Stage 3 Design Documentation

- (a) Design Stage 3 Design Documentation for the CSELR Stop and building spatial and functional requirements must include:
 - i. 1:100, 1:50, 1:20 (A1) plans, sections, elevations fully documenting the layout, final construction method, materials, finishes of the architectural and public domain works;
 - ii. full construction detailing;
 - iii. coordinated services drawings for all public areas of the CSELR Stops; and
 - iv. final technical specifications.

8.5. Quality Benchmarks, samples and prototypes

- (a) At least 9 months prior to commencement of construction of the first CSELR Stop or at such other time as approved by TfNSW's Representative, OpCo must complete and make available for inspection the prototype CSELR Stop required in accordance with the Third Party Agreement with the Council of the City of Sydney.
- (b) At least 9 months prior to commencement of construction of any paving in the George Street pedestrian zone or at such other time as approved by TfNSW's Representative, OpCo must complete and make available for inspection a prototype of the George Street pedestrian zone paving that meets the following requirements:
 - i. Is 10m long, measured from the middle of the permanent light rail corridor perpendicular to the corridor's alignment; and 5m wide measured parallel to the permanent light rail corridor;
 - ii. Includes all different paver types that will be used; and
 - iii. Demonstrates the required colour luminance contrast between the permanent light rail corridor and surrounding paved public domain.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 14 – Public Domain

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1. Overview and Scope

1.1. General

- (a) This Appendix describes design objectives and requirements for the Public Domain areas for the CSELR project.

1.2. Scope

- (a) OpCo must:
 - i design and construct all Public Domain areas for the CSELR project and be:
 - A. safe and functional; and
 - B. highly visible, and accessible for all users.
- (b) The Public Domain works must be in accordance with the performance and technical requirements in this Appendix.
- (c) The Public Domain works must be in accordance with Schedule B3, Requirements of Third Parties.

1.3. Overview

- (a) The CSELR Public Domain design must contribute to delivering an exemplar high quality light rail system.
- (b) OpCo must use the design objectives outlined in section 2 of this document to deliver a Customer-focused design, and to:
 - i inform their Public Domain designs to demonstrate design excellence in all Public Domain areas;
 - ii deliver a seamless, easy to use and high quality transport experience that maximises a positive Customer experience;
 - iii be innovative in concept, elegant and contemporary in expression, functional and flexible in planning, and finely crafted in detail;
 - iv create a seamless integration of engineering and architectural requirements;
 - v enhance the character of the landscape and communities through which CSELR passes, considering existing and planned future context; and
 - vi provide Public Domain with an enhanced streetscape that incorporates retention of existing trees as well as planting of new trees, together with a robust, considered and contextual landscape for the corridor.

2. Design Objectives

2.1. General

- (a) The CSELR Public Domain works must identify with, protect and not detract from the streetscape, heritage, environment and landscape of the CBD and South East precincts of Sydney.
- (b) The CSELR facilities must fit seamlessly within the urban environment, through sensitive integration of the new Public Domain within both existing and future context with consideration of maintaining and enhancing existing views, scale, height, character, massing and materials.
- (c) Important existing views must not be obscured and important vistas and visual connections must be recognised and enhanced.
- (d) All Public Domain areas must incorporate accessible design principles and must connect directly and safely to the local network of streets, walkways and parks and consider connectivity.
- (e) The Public Domain elements must reinforce the role of the CSELR in its role as a stimulus for efficient intermodal public transport, community benefits, and as a place making and city shaping driver.

2.2. Customer experience

- (a) The Public Domain must be clean, orderly and with an attractive sense of place and scale that positively influences perceptions of the public transport system.
- (b) The Public Domain must respond to the needs of all Customer types and user requirements, and respond to customer requirements for customer satisfaction (as described in the section 2.2 of the SPR) where relevant.
- (c) The CSELR Public Domain must maximise all aspects of personal safety and security through the provision of active and passive surveillance and the application of CPTED principles.
- (d) OpCo must:
 - i minimise travel and interchange times and create convenient connections between modes;
 - ii provide comfortable Public Domain environments that provide shade, shelter and resting points, provide options for accessible seating, standing and leaning in relative comfort for periods of time, and minimise wind and glare disturbance; and
 - iii provide easy to use environments that are clutter free, safe and maximise the consistent use of components and materials.

2.3. Legibility and coherence

- (a) OpCo must create legible Public Domain areas that facilitate easy to use interchange for Customers.
- (b) OpCo must provide Public Domain areas that are:

- i safe and functional;
 - ii highly visible, legible and accessible for all users; and
 - iii create an environment which is engaging and clutter free.
- (c) OpCo must provide safe and secure travel paths with high levels of activation and passive surveillance of public spaces.
- (d) OpCo must create legible and visible connections to existing streets around CSELR Stops and CSELR Stop precincts.

2.4. Access, wayfinding and connectivity

- (a) OpCo must provide a safe, efficient and convenient CSELR Stop configuration for inter-modal transfer.
- (b) OpCo must ensure Customer wayfinding is accurate, up to date and accessible, making it easy for Customers to navigate and use the service, in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (c) The design must provide accessible Public Domain areas with high levels of connectivity to the surrounding urban environment.
- (d) The Customer journey must be seamless and intuitive, with simple access and clear wayfinding.
- (e) The design of the Public Domain areas must provide safe, legible, efficient, convenient, obstruction free, direct and attractive routes for Customer access.
- (f) OpCo must avoid modal conflict for Customer safety.

2.5. Modal hierarchy

- (i) OpCo must adopt an integrated transport solution that applies a hierarchy of movement modes that places relative importance to each transport mode as follows:
 - i Priority 1: Pedestrian movement and access;
 - ii Priority 2: Bicycle movement and access;
 - iii Priority 3: Public transport movement and access;
 - iv Priority 4: Taxi movement and access; and
 - v Priority 5: Kiss and Ride.

3. Spatial and Functional Requirements

3.1. General

- (a) The Public Domain areas must provide convenient and direct access to public transport modes for all Customers.
- (b) OpCo must:
 - i ensure that each Public Domain area includes movement capacity and configurations commensurate with the design capacity requirements in accordance with Appendix 38 (*Minimum Service Requirements*);
 - ii provide Public Domain areas so that day-to-day operational and functional requirements are not readily compromised by emergency events;
 - iii provide Public Domain areas to minimise the potential for littering and Graffiti;
 - iv provide Public Domain areas to deliver a safe customer experience by minimising hazards such as slips, trips and falls, exposure to rail infrastructure and maximising protection from inclement weather; and
 - v ensure signage and branding elements are fully integrated into the Public Domain in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).

3.2. Scope

- (a) OpCo must design and provide Public Domain areas and service facilities including:
 - i shared paths, bicycle paths, and pedestrian paths;
 - ii bicycle facilities;
 - iii streets and road verges;
 - iv public spaces as part of the Public Domain;
 - v fencing;
 - vi street furniture, fixtures and fittings;
 - vii street tree planting;
 - viii other landscape treatments to streets, plazas, public open space, and other impacted areas; and
 - ix Street and Public Domain lighting.
- (b) OpCo must also provide:
 - i landscaping of earth mounding and cut and fill embankments;
 - ii stormwater management incorporating Water Sensitive Urban Design (WSUD) features;
 - iii noise walls and support systems;
 - iv light rail and pedestrian and cyclist bridges;

- v retaining and other civil structures; and
- vi lighting, signage and wayfinding integration.

3.3. Pedestrian movement and facilities

- (a) The Public Domain must provide pedestrian routes that maintain clear sightlines between transport modes and key destinations.
- (b) OpCo must:
 - i reduce risk by highlighting all hazards with high contrast finishes, special lighting or tactile paving, as required by AS1428.1 and AS1428.2;
 - ii provide accessible paths of travel as required by AS1428.1 and AS1428.2 and on all other desired lines of travel within the Public Domain areas;
 - iii coordinate the location of signage, security, lighting and other street furniture into common locations and alignments to minimise clutter and facilitate free movement of pedestrian and cyclists; and
 - iv provide suitable kerb and surface finishes as well as tactile ground surface indicators to assist people with disabilities, as required by AS1428.1 and AS1428.2.
- (c) Pavements and pathways must be designed to transition in alignment and width as required to meet existing pathways at the extent of the project boundary.

3.4. Bicycle facilities

- (a) OpCo must provide bicycle parking facilities to accommodate the number of bicycles defined in the transport requirement tables in section 7 of this Appendix for each class of bicycle parking.
- (b) Bicycle parking facilities must be provided according to the following classes as defined in AS/NZS 2890.3:
 - i Class 3 – bicycle parking rails.
- (c) OpCo must:
 - i locate bicycle parking in areas with good passive surveillance, that are in a highly visible and easily accessible location, close to the CSELR Stop, adjacent to access movement paths, and a maximum of 15m from CSELR Stop access points;
 - ii locate bicycle parking with clear sightlines between the public domain and CSELR Stops; and
 - iii provide clear and consistent signage to bicycle parking facilities from all networks.
- (d) Bicycle paths must be designed in accordance with 'Austroads – Guide to Road Design: Part 6A Pedestrian and Cyclist Paths', and connect with regional and local government cycle strategies.
- (e) Bicycle paths must be legible, with a distinct and identifiable character separate to the pedestrian and vehicular network.

- (f) Conflicts between pedestrians and cyclists, LRVs and cyclists and road traffic and cyclists must be minimised at high activity zones.
- (g) Provision for future additional bicycle parking facilities must be located with existing facilities where practical and feasible.

3.5. Service and emergency access

- (a) Service vehicle (all vehicle classes) access for all Public Domain areas must be addressed as part of the broader Stop access plans.
- (b) Movement paths for service and emergency vehicles must be legible to both vehicle drivers and pedestrians.
- (c) Service and emergency vehicle movement paths must be efficient and minimise movements and impacts on LRVs, pedestrian and bicycle movement functions.
- (d) Parking requirements for service and maintenance vehicles must be accommodated on-street or within a secured service facility area.

3.6. Private and service vehicle access

- (a) Private and service vehicle access for all Public Domain areas, including access to private driveways and loading docks, must be addressed as part of the CSELR project access plans.
- (b) Movement paths for private and service vehicles must be legible to both vehicle drivers and pedestrians.
- (c) Private and service vehicle movement paths must be efficient and minimise movements and impacts on LRVs, pedestrian and bicycle movement functions.

4. Structures Requirements

- (a) Without limiting the requirements of Appendix 18 (*Civil and Structural Works*), OpCo must meet the following design requirements.

4.1. Objectives

- (a) OpCo must:
- i apply the following design aesthetics principles:
 - A. promote a consistent design form, style and language of finishes across all structural components that establish an identifiable family of elements;
 - B. develop an elegant, contemporary and well-proportioned design that integrates all functional elements;
 - C. minimise the bulk of structures by maximising open spans and breaking down wall surfaces through proportioning, articulation, texturing, patterning and panel design;
 - ii integrate soft landscaping onto or adjacent to structures that limit heat and glare reflection and improve visual amenity and screening; and
 - iii maximise the opportunities for an integrated irrigation system using tanked rainwater or water gathered from other WSUD sources.

4.2. Light Rail bridges

4.2.1. Objectives

- (a) OpCo must provide bridge and viaduct structures with the following characteristics:
- i a consistent suite of simple and elegant structures, using a 'kit of parts' approach to the design of elements;
 - ii pier arrangements that minimise quantity and width of piers;
 - iii pier head-stocks are integrated into the superstructure of bridges;
 - iv a slim line cross-section through the overall bridge deck, including barriers;
 - v integrated configurations for barriers, lighting, signage, OHW supports and other furniture; and
 - vi a consistent treatment of abutments in regards to launching heights (transition from abutment wall to elevated structure) and surrounds to abutments.
- (b) Light Rail bridges must be in accordance with RMS 'Bridge Aesthetics Design Guideline to Improve the Appearance of Bridges in NSW, July 2012'.
- (c) Light Rail bridges must present smooth, clean lines and have a minimum structural depth that is consistent with their spans and method of construction.
- (d) Light Rail bridges must present holistic, coherent and symmetrical structures considering the proportion of all elements of the structure including any parapets, barriers, fencing, safety screens and other critical elements.

- (e) Signage must not be located on Light Rail bridges, except for bridge name plates.
- (f) OpCo must not allow any form of advertising or advertising signboards on any part of the bridge structure, stairs and ramps.
- (g) Connections between road and Light Rail and road and Light Rail bridge traffic barriers must be neat and simple.
- (h) Light Rail bridge parapets must:
 - i be elegant and attractive with neat, evenly spaced joints, smooth even lines and consistent high quality surfaces and colour;
 - ii have a top surface that angles towards the road to channel rainwater onto the bridge and minimise staining of the outside face of the parapet; and
 - iii be shaped to be self-cleaning.
- (i) Protection screens on Light Rail bridges must:
 - i be integrated with the design of the road and Light Rail bridge as a whole;
 - ii include post spacing to provide a pleasing and ordered visual relationship with other Light Rail bridge details, including safety barrier posts, lighting columns, OHW support structure and parapet joints;
 - iii not be attached to, or obscure the outer faces of the parapet; and
 - iv be integral with the shape and form of the parapets, including the traffic barrier railing system and any skirt systems.
- (j) Where Light Rail bridge barriers are of different heights to adjoining traffic barriers on the approach or departure, barriers must be provided with transitions of no steeper than 15:1 between the adjacent barriers.
- (k) Utility Services and future provisions for Utility Services must not be visible.
- (l) The thickness of the Light Rail bridge deck or parapets must not be increased above the minimum that is structurally required.
- (m) Light Rail bridges must be designed such that they are easily maintainable and do not promote Vandalism or Graffiti.
- (n) Methods of providing safe access for maintenance activities must be integrated into the overall design of the Light Rail bridge.

4.3. Eastern Distributor rail underbridge

- (a) OpCo must take account of the following contextual statements;
 - i high quality views exist from the surrounding buildings fronting South Dowling Street down and across over Moore Park; and
 - ii these views must be protected and design solutions must not detract from the overall amenity of the precinct.
- (b) OpCo must address the following specific principles:
 - i protect the views into and from the site of the Eastern Distributor rail underbridge; and

- ii ensure the extent of road re-grading along South Dowling Street is minimised, to maintain a step-free footpath along South Dowling Street northbound.
- (c) OpCo must ensure that the bridge:
- i maintains existing clearances to the Eastern Distributor;
 - ii incorporates a shared use path for pedestrians and cyclists, that connects on the eastern side with a shared use path through Moore Park West, and on the western side with a shared use path through the proposed extended Wimbo Park;
 - iii employs a distinctive and contemporary bridge architecture that responds to the amenity and parkland nature of the setting;
 - iv incorporates feature lighting to reinforce a dramatic statement at night; and
 - v provides a positive and well integrated image when viewed from all angles.

4.4. Pedestrian bridges over roadways

4.4.1. Objectives

- (a) Pedestrian bridges over roadways must be in accordance with the RMS "Bridge Aesthetics Design Guideline to Improve the Appearance of Bridges in NSW, July 2012".
- (b) Pedestrian bridges over roadways must:
- i ensure accessibility provisions meet AS1428.1 and AS1428.2 requirements;
 - ii be provided with ramps and stairs at both ends, where space is available;
 - iii be provided with ramps at each end of each bridge;
 - iv ensure that access ramps and stair design do not dominate views or detract from the expression of span of the pedestrian bridge;
 - v be supported by slimline piers that minimise visual clutter and obstruction to vehicles, and are enclosed to minimise rubbish, and maintain CPTED principles;
 - vi not allow any form of advertising or advertising signboards on any part of the bridge structure, abutments, stairs and ramps;
 - vii consider the RTA "Environmental Impact Assessment Guidance Note - Guidelines for landscape character and visual impact assessment in the design of the pedestrian bridges"; and
 - viii incorporate integrated safety screens that do not obscure the pedestrian bridge structure and that extend to the ends of the pedestrian bridge span.

4.5. Retaining structures and walls

- (a) OpCo must ensure that the following general principles are achieved:
- i wall elements relate strongly to other urban design elements of structures and promotes a cohesive language of form and style;

- ii the visual impact of retaining structures and walls is minimised by providing a minimum of 1.5m landscape area where possible to allow generous landscape buffers between the wall and adjacent environments;
 - iii the form alignment and finishes of walls respond to local landform to provide an integrated wall to landscape arrangement;
 - iv integrated surface treatments are applied to the walls to provide both a positive visual and graffiti-resistant outcome;
 - v walls and retaining structures share a consistency of form, regardless of structural typology or location to form a related family of wall types;
 - vi where over 1.5m in height, be concrete pre-cast fascia panel or in situ concrete walls, except where gabion walling is used;
 - vii be cohesive and unified with adjacent and associated elements including road and pedestrian bridges, noise barriers and landscaping;
 - viii drainage diverted away from the face of the retaining structure;
 - ix vertical or horizontal joints located at regular and consistent centres; and
 - x any vertical joints coordinated with the vertical joints or stanchions of related elements fixed to the tops of the walls.
- (b) Drainage pipework and equipment in other structures must be concealed excluding swales, catchpits, inlet structures and outlet structures.
- (c) Inside wall face invert must be drained to remove water and likelihood of settlement and erosion.
- (d) Shuttering and tie holes to retaining walls are to be arranged in a consistent pattern so that any shutter lines and tie holes expressed in the final product form a logical and consistent pattern as part of the whole wall. The pattern must be parallel to the vertical and horizontal line of the walls.
- (e) Keystone retaining systems must not be used.

4.6. Noise walls

- (a) Noise walls must be designed as a legible, consistent, 'whole of corridor' composition as viewed along both the internal and external alignment.
- (b) Noise walls must:
- i consider the RMS "Noise Wall Design Guideline in NSW, July 2012";
 - ii be of minimal, contemporary appearance, visually legible at speed for Customers within passing LRVs;
 - iii incorporate landscape strategies such as mounds, climbing plants and tree planting to reduce their visual impact;
 - iv follow linear alignments with long, even curvatures and run parallel with the light rail track;
 - v wherever possible, present a continuous top line (horizon) free of steps;
 - vi adopt rectilinear, modular wall panels throughout for consistency of appearance;

- vii terminate with a curved or raked wall section to integrate with adjacent structures or landform, or terminate by over lapping with adjacent structures in a planned and considered way; and
 - viii have any joint lines vertical and parallel, at regular and consistent centres.
- (c) Where steps within the length of noise walls are necessary due to unavoidable gradients, they must present a consistent and legible rhythm in the design. Steps are to be minimised as per the 'RMS Noise Wall Design Guideline in NSW, July 2012' document.
- (d) A minimum clearance of 1.5m must be provided on the outside of noise walls to any planting.

5. Trackform Treatment Requirements

5.1. General objectives and principles

- (a) Detailed trackform finishes and treatments are specified in section 7.
- (b) OpCo must ensure that an appropriate trackform treatment is provided that is consistent with the surrounding environmental context in terms of aesthetics, safety, use and materials.
- (c) During the design and construction of the trackform treatments, OpCo must ensure that the following principles are achieved:
 - i promote safe, legible and equitable movement across the light rail corridor using appropriate materials and finishes;
 - ii ensure trackform treatments are high quality and integrate with surrounding site features and environments; and
 - iii ensure surface treatment and construction techniques are chosen so that the trackform surface can be replaced (after maintenance works or accidental damage) locally without creating an obvious patchwork effect (e.g. long term supply of consistent materials and cutting out the full width of track between logical construction lines).

6. Public Domain Requirements

6.1. General objectives and principles

- (a) OpCo must provide Public Domain areas that:
 - i demonstrate design excellence in the whole and in each component part;
 - ii be simple, elegant and aesthetically pleasant;
 - iii utilise high quality and consistent materials, finishes and detailing; and
 - iv be architecturally innovative and creative.
- (b) Adaptation or augmentation to Public Domain areas must be done in a considered way so that these changes do not appear to be an add-on, in accordance with Appendix 36 (*Future Network*).
- (c) OpCo must use high quality robust, durable and long-life materials that promote a civic character for the Public Domain areas.
- (d) The materials and finishes for the Public Domain areas must not impede legibility, decision making and wayfinding, and where appropriate enrich the Public Domain accentuating movement areas around the CSELR Stops and CSELR Stop precincts.
- (e) OpCo's material selection must maximise economies of scale and be designed to ensure safe installation, maintenance and replacement.
- (f) OpCo's designs must achieve the minimum sustainability performance and technical requirements in accordance with Appendix 7 (*Sustainability*).
- (g) The design of the Public Domain areas must minimise energy consumption and promote sustainable measures through selection of equipment, fittings, material use and water management.
- (h) All elements designed within the Public Domain areas must maximise retention of existing trees and vegetation and consider existing views from and into the Project.
- (i) The collection, storage, amelioration and reuse of existing topsoil from within the corridor must be adopted for new landscape areas.
- (j) All pit lids in the Public Domain and footpaths must be finished to match surrounding paving treatment and pattern where infill pit lids are permissible by service authority.

6.2. Earthworks

- (a) The earthworks and stabilisation treatments must be designed to integrate with the adjacent finished surface level and must include the following features:
 - i the vertical and horizontal alignment of any earthwork batters must be feathered to meet the existing landform and landscape;
 - ii earthwork batters must not be steeper than 1v:3h gradient; and
 - iii landscape, structural mounding or fill earthworks must prioritise the use of suitable excavated material before additional material is introduced.

- (b) Where noise walls are used in combination with retaining structures, they must be a coordinated element and avoid awkward or uncoordinated connection details between materials and structures.
- (c) Where noise walls are mounted above retaining structures, the inner, track-side face of the noise wall must align with the face of the supporting structure beneath.

6.3. Footpaths

- (a) OpCo must develop and implement a CSELR pavement strategy that includes footpath materials for each precinct as outlined in section 8 of this Appendix.

6.4. Platform interface

- (a) OpCo must ensure that the interface between the platforms and any adjoining footpath pavements is carefully considered, so as to provide a seamless integration, where possible, between platform and adjoining pavement.

6.5. Stairs and ramps

- (a) The use of stairs must be avoided where possible.
- (b) Stairs may be used where level changes on pedestrian movement paths cannot be accommodated with ramps.
- (c) Where stairs are used, a clearly legible alternative accessible path must be provided.
- (d) Alternative accessible paths must be as close as possible to and not isolated from the primary circulation route.
- (e) Wheeling ramps or channels for bicycles must be provided at stairs where feasible.
- (f) Ramps must only be used where walkways are not able to be provided.

6.6. Street furniture

- (a) OpCo must provide street furniture that:
 - i includes bench seating, rubbish bins, water fountains, bollards, tree grates and trench grates;
 - ii is functional, comfortable and designed to be easily maintained; and
 - iii comprises a coordinated palette of considered elements that use a consistent design aesthetic.
- (b) Trench grates must be used for all pavement surface drainage collection where drainage is not otherwise directed into planting areas.
- (c) Street furniture must not project into an access path or present a risk of collision by someone with poor vision.
- (d) OpCo must coordinate selection of street furniture with the relevant key stakeholders, including but not limited to City of Sydney, Randwick City Council and Centennial Park and Moore Park Trust (CPMPT).

- (e) Where bollards are proposed, the material, scale, location and detail design must integrate with the Public Domain street furniture guides relating to relevant LGA guidelines.

6.7. Fencing and balustrades

- (a) OpCo must provide fences to perform the following functions:
 - i protection screen fences on pedestrian, LRV and vehicular bridges;
 - ii protection screen fences adjacent to pedestrian, LRV and vehicular bridges;
 - iii security fences within Public Domain areas;
 - iv pedestrian safety fences within Public Domain areas; and
 - v general handrails.
- (b) Fencing must be provided to all new and existing Light Rail overbridges in the Project.
- (c) All fencing types must share consistent form, detail and materials.
- (d) Fencing design must deter climbing, providing no footholds or handholds.
- (e) Fencing throughout the Public Domain areas must avoid creating dead ends or sight line conflicts.
- (f) Fencing designs must minimise the potential for Vandalism and Graffiti.
- (g) Security fencing types must be consistent across the CSELR project and respond to the contextual environment of the surrounding area, including provision for high quality fencing in Public Domain areas and security fencing protecting rail infrastructure.
- (h) Fence fixing points must be minimised with bolts, base plates and fixing mechanisms to be detailed in a consistent, rationalised and unobtrusive manner.
- (i) Fencing base plates must be concealed below the surface finish.

6.8. Landscape and Public Domain works

- (a) OpCo must provide landscape and Public Domain treatments for all Public Domain areas including:
 - i parkland areas within Moore Park where the alignment encroaches upon existing open space;
 - ii streetscape treatments where the project works encroach the existing street kerb and footpaths;
 - iii service facility areas such as depots and stabling yards;
 - iv stabilisation of earthworks;
 - v new Public Domain areas created by road closures;
 - vi new Public Domain areas created by building demolition; and

- vii restoration works to return disturbed existing landscape areas to original condition.
- (b) All permanent landscape and Public Domain works must:
 - i respond to and be consistent with adjacent established landscape treatments;
 - ii retain or minimise impact upon all existing heritage and significance listed trees and landscape features;
 - iii maximise the retention of existing trees and vegetation, with special consideration of impacts to existing tree roots;
 - iv provide a planting design and selection of plants that respond to the local soil, drainage, microclimate and development environment;
 - v comprise plant species that have minimal additional water requirements beyond the establishment phase;
 - vi comprise plant species that are demonstrated to require low maintenance and have drought tolerance;
 - vii ensure sight lines are maintained and signage is not obscured by planting; and
 - viii provide setbacks from planting to adjacent structures, street furniture and pathways to enable clear access for maintenance and visual inspections when landscape matures.
- (c) OpCo must provide a planted landscape buffer zone a minimum 5m wide to the northern boundary at the Randwick Light Rail Facility site.
- (d) Planting areas must be covered by a minimum of 75mm of organic mulch.
- (e) Mass planted areas must be designed to minimise the need for irrigation but where necessary, plants must be grouped to take advantage of the irrigation design layout.

6.8.1. Planting

- (a) OpCo must develop and implement a planting strategy in the following areas:
 - i George Street;
 - ii Devonshire Street;
 - iii Moore Park;
 - iv Alison Road and Wansey Road bounding Royal Randwick Racecourse site;
 - v Anzac Parade; and
 - vi High Street.
- (b) Planting in streets must:
 - i comply with the relevant LGA and / or CPMPT Street Tree Master Plans;
 - ii provide strong, legible structured planting that reinforces the spatial connectivity with adjacent areas;
 - iii where practical provide shade to reduce potential heat island effects and be positioned to provide amenity for Customers and the broader community;

- iv enhance environmental quality; and
 - v provide strong visual continuity, identity and character.
- (c) Planting in Public Domain areas must:
- i comply with the relevant LGA and / or CPMPPT Street Tree Master Plans;
 - ii provide shade to reduce potential heat island effects and be positioned to provide amenity for customers and the broader community; and
 - iii contribute to the visual integration of infrastructure elements where possible.
- (d) Planting within the Permanent Light Rail Corridor must:
- i be carefully integrated at Public Domain areas to ensure access is not required to the Permanent Light Rail Corridor for maintenance or rubbish removal; and
 - ii not be placed directly in front of vehicular or pedestrian gateways.
- (e) The mature height must be considered when selecting tree species so as to avoid encroachment upon the Light Rail OHW vegetation clearance zone, and any overhead wires, with any future tree growth.

6.8.2. Tree protection

- (a) OpCo must ensure the following tree protection guidelines are adhered to:
- i the retention and removal of existing trees must be determined in consultation with the relevant local government area or parklands authority;
 - ii OpCo must prepare relevant demolition and construction plans that clearly indicate existing trees to be removed and existing trees to be retained and protected;
 - iii OpCo must prepare a tree protection plan by a qualified arborist in order to specify measures that will be taken to ensure the ongoing health and stability of the trees;
 - iv OpCo must engage a Project arborist that must be qualified in arboriculture to Australian Qualifications Framework (AQF) level 5 or above, and have at least 5 years demonstrated experience in managing trees within complex development sites; and
 - v all trees marked to be retained must be protected in accordance with the AS 4970 Protection of Trees on Development Sites.

6.8.3. Irrigation

- (a) OpCo must provide automatic irrigation to all landscaped areas within the Construction Site that were previously irrigated by an automatic system. Automatic irrigation in these areas must be reinstated in coordination with the relevant LGA or property management.
- (b) Irrigation design must be based on the following requirements:
- i irrigation water must be delivered to the root zone through sub-surface dripline irrigation;

- ii irrigation reticulation must be made out of high density polyethylene (HDPE) or equivalent;
- iii the irrigation system must be equipped with a monitoring system that will provide information on soil moisture levels to minimise the waste of irrigation water;
- iv irrigation zones must be individually controlled to provide accurate management of irrigation water application;
- v site-wide water metering and monitoring of real-time leak detection must be implemented; and
- vi sub-surface irrigation equipment must be distributed evenly across the soil zone where tree pits are placed in pavements.

6.9. Lighting

(a) OpCo must:

- i coordinate lighting positions with street furniture, signage, advertising and planting locations to minimise visual and physical clutter within Public Domain areas;
- ii contribute to the implementation of the City of Sydney Council approved George Street Lighting Master Plan, and Randwick City Council's Street Lighting Master Plan;
- iii illuminance level must comply with relevant AS1158;
- iv ensure that planting does not impede the function of lighting coverage;
- v not be driven by technical requirements alone, but by creative, innovative solutions, which deliver a functional and compliant scheme;
- vi deliver a visually comfortable environment free of glare and obtrusive light, within the Public Domain areas;
- vii consider and respond to the location and surroundings of Public Domain areas;
- viii enable safe and intuitive circulation on footpaths and bicycle paths;
- ix create inviting Public Domain areas within the defined project corridor;
- x promote a safe environment that is accessible for all Customers;
- xi enhance the architectural and Public Domain elements; the materiality and form of the spaces and structures, promoting quality and a well-considered architectural environment;
- xii be integrated within built elements to promote a fully coordinated solution;
- xiii minimise shadowing caused by incidental obstruction of light by structural or other elements;
- xiv utilise direct and indirect illumination to ensure appropriate balance of light and perceived brightness;
- xv implement the use of current lighting technologies and future-proof the lighting scheme through the specification of modular and upgradeable equipment;

- xvi provide illumination levels appropriate for ease of wayfinding;
 - xvii incorporate energy saving luminaires and switching control systems to minimise energy consumption; and
 - xviii ensure lighting and light levels are adequate for CCTV and other security systems operations.
- (b) OpCo's luminaire and lamp sources selection must ensure:
- i high quality lighting equipment;
 - ii luminaires located in exterior areas have a minimum IP rating of IP65;
 - iii luminaires mounted in locations that require a maintenance climbing aid include lanyards on removable components to facilitate lamp replacement and cleaning;
 - iv light sources have a colour rendition of no less than 80 in line with CIE-1960;
 - v all luminaires within public spaces with mounting heights at or below 2.5m above finished floor level have a minimum IK Rating of 10;
 - vi all luminaires within public spaces with mounting heights above 2.5m above finished floor level have a minimum IK Rating of 8;
 - vii surface temperatures of luminaires at or below 2.5m from finished floor level not exceed 50°C when in use;
 - viii light output ratio combined with the reflector and optics deliver a minimum of 60% light output ratio, in accordance with AS/NZS1680; and
 - ix light fittings provide 60% of the lamp lumen output of the fitting in the peak intensity, as defined by the fitting beam angle.
- (c) OpCo must select from the following range of artificial light sources:
- i high efficient LED or equivalent;
 - ii compact fluorescent;
 - iii circular and linear T5 fluorescent; and
 - iv metal halide.
- (d) Luminaires must be mounted in accordance with luminaires and lamp manufacturers' recommendations.
- (e) All fittings including control gear and lamps must be appropriately temperature rated for mounting in their intended location.
- (f) All lighting control equipment must be electronic.
- (g) All fluorescent and LED lighting control equipment must be high frequency.
- (h) Light sources must have an efficacy of not less than 60 lumens / Watt.
- (i) Light sources must have a lamp life of not less than 50,000 hours.
- (j) Light sources, excluding signage, must have a colour range of between 2700K and 4500K in accordance with CIE-1931.
- (k) To control glare from luminaires, the Public Domain lighting must:

- i use accessories on fittings to minimise glare;
 - ii use appropriate beam angles on luminaires to ensure lighting is focussed where required, that spill light is minimised and direct views into a light source are minimised;
 - iii use high quality reflectors that have a maximum of 40% spill light outside of the peak intensity as defined by the fitting beam angle;
 - iv where luminaires are lighting a horizontal surface, use mounting locations of luminaires which ensure that the angle of the luminaires does not exceed 45 degrees from the vertical;
 - v where luminaires are lighting a vertical surface and the angle of adjustment justifies a greater than 45 degree position, ensure that direct views to the light source are eliminated or obscured;
 - vi ensure light spill and light pollution externally are avoided in accordance with AS 4282;
 - vii where up lighting is used for planting and feature lighting, ensure the luminaires have glare control accessories with appropriate beam angles and directionality to ensure spill light is minimised; and
 - viii minimise hotspots, glare and dark spots across signage and Customer information faces, as per AS 1428.2 Illumination levels.
- (I) The Public Domain illuminance levels must be designed based on the following:
- i The light level must be calculated in line with the Illuminating Engineering Society of North America (IESNA) handbook; and
 - ii OpCo must provide lighting performance in accordance with AS1680 and taking consideration to the surrounding area's illuminance levels.

7. Precinct-Specific Requirements

7.1. General objectives

- (a) This section describes the specific requirements which must be met by OpCo in respect of each precinct.
- (b) OpCo must maximise footpath widths for each precinct and subject to the constraints provided by:
 - i the Project area; and
 - ii other specific requirements in this Appendix.

7.2. CBD traffic precinct

- (a) The CBD traffic precinct is defined as:
 - i the corridor along George Street between the George Street / Alfred Street intersection and the George Street / Hunter Street intersection; and
 - ii the corridor along George Street between the George Street / Bathurst Street intersection, continuing along Rawson Place, Eddy Avenue and Chalmers Street to the Chalmers / Devonshire Street intersection.
- (b) OpCo must take into account the following contextual statements:
 - i within George Street, Rawson Place, Eddy Avenue and Chalmers Street, the streetscape quality is generally dominated by hard built edges, tight road widths and streetscape amenity compromised by existing narrow footpaths. However, along George Street, there is good urban amenity where the high quality granite paving exists that sets a quality precedent for future works within the CBD traffic precinct and CBD pedestrian precinct.
- (c) OpCo must address the following principles:
 - i increase the pedestrian amenity within the CBD traffic precinct during the day and night;
 - ii create, through the streetscape design, a transition from the car dominated, low pedestrian amenity George Street, Rawson Place and Chalmers Street, to a pedestrian friendly, high amenity streetscape environment;
 - iii maintain not less than the current pedestrian amenity adjacent to the Chalmers Street and Devonshire Street Central Station entries;
 - iv protect the cultural significance of the Ibero-American Plaza adjacent to the existing Devonshire Street rail entry and ensure that sculptural busts are protected, and reinstated in new approved locations within the plaza on plinths to match the existing condition; and
 - v pedestrian safety in the Central Station colonnade located on Eddy Avenue be maintained.
- (d) OpCo must ensure that the following urban and landscape design requirements are achieved:

- i the Ibero-American Plaza statues are retained and relocated within the plaza while maintaining sufficient pedestrian footpath widths adjacent to Central Station rail entry and Central Station Stop;
 - ii the existing brick wall in the small park at the corner of Eddy Avenue and Chalmers Street is to be reinstated along the new park edge, maintaining sufficient footpath space adjacent to the park;
 - iii high quality pedestrian barriers, stainless steel with glass infill, are to be installed between every arch of the Central Station colonnade located on Eddy Avenue. Such barriers are only to be fixed to the ground and are not to be fixed in any way to the sandstone arches. The barriers designs must be submitted for review and approval by the Department of Environment and Heritage;
 - iv all pedestrian crossings at intersections and adjacent to CSELR Stops within the CBD precincts are to be paved in accordance with section 8.1.2 (Trafficable Pavements);
 - v Eddy Avenue coach stop to provide a continuous barrier along the back face of the coach stop platform and the light rail tracks;
 - vi traffic barriers between Light Rail and traffic lanes at Rawson Place to be steel with frameless glass infill to match the platform canopy and City of Sydney furniture palette;
 - vii Rawson Place – ensure that any pedestrian footpath levels along the northern side of the street adjacent the McKell building maintain the existing provision for fire egress, fire booster cabinets, windows, and the like; and
 - viii bicycle storage facilities at Rawson Place and Chinatown Stops - 10 rack spaces per CSELR Stop.
- (e) OpCo must ensure that the following pavement requirements are achieved:
- i in relation to Public Domain pavements:
 - A. OpCo must develop and implement a pavement strategy for the George Street pedestrianised zone, using paving and finishes type in accordance with Table 1; and
 - B. vehicular and signalised crossings must be distinguishable and legible for all pedestrians. Tactile ground surface indicators (TGSIs) and bollards must be provided at intersections. Intersections are to be kerb free, using paving and finishes in accordance with Table 1;
 - ii in relation to trackform pavements:
 - A. high quality concrete unit pavers. The paving pattern and colouration must be designed as such that it minimises the visual impact of the rails within the streetscape. The paving is to be positioned as close as possible to the rails.

7.2.1. Eddy Avenue Public Domain

- (a) OpCo must address the following principles:
- i minimise impact to the sandstone archways of Central Station; and

- ii provide for a cycle connection from Chalmers Street, across Eddy Avenue to Belmore Park.

7.2.2. Chalmers Street Public Domain

- (a) OpCo must address the following principles:
 - i minimise impact to the sandstone archways of Central Station;
 - ii provide for a cycle connection from Prince Alfred Park through Chalmers to Eddy Avenue; and
 - iii minimise encroachment into the small park on the corner of Chalmers Street and Eddy Avenue.

7.3. CBD pedestrian precincts

- (a) CBD pedestrian precincts comprise of two zones:
 - i the George Street pedestrianised zone, which is defined as the corridor along George Street between Bathurst Street and Hunter Street; and
 - ii the Alfred Street pedestrianised zone, which is defined as the corridor at Circular Quay along Alfred Street between George Street and Loftus Street.
- (b) OpCo must take account of the following contextual statement(s):
 - i within George Street, the streetscape quality is generally dominated by hard built edges, tight road widths and streetscape amenity compromised by existing narrow footpaths; and
 - ii along the southern side of Alfred Street, there is an existing high quality pedestrian amenity comprising high quality granite paving, trees, bench seating and public art.
- (c) OpCo must address the following principles:
 - i increase the pedestrian amenity within the CBD pedestrian precincts during the day and night;
 - ii allow local access vehicles including delivery vehicles and authorised private vehicles to enter the Permanent Light Rail Corridor, subject to time of day agreements with the relevant local council;
 - iii space-proof for a future shared lane southbound along the eastern side of the Permanent Light Rail Corridor continuously from Hunter Street to Bathurst Street;
 - iv make provision for street trees, fixed and temporary street furniture; and lighting / OHW poles; and
 - v protect the cultural significance and key sightlines in and around the Sydney Town Hall, St Andrew's Cathedral, the Queen Victoria Building, and other key historic buildings fronting George Street.
- (d) OpCo must ensure that the following urban and landscape design requirements are achieved:
 - i minimise impacts to existing building awnings;

- ii minimise encroachment into existing footpaths;
 - iii the retention and removal of existing trees in agreement with City of Sydney;
 - iv comply with the Sydney Streets Design Code 2013 – City Centre and Gateways for all street design;
 - v the heritage significant Tank Stream Fountain is not to be impacted upon;
 - vi ensure that Smartpoles® along George St are spaced at maximum 20m centres, running parallel to and on both sides of the light rail corridor; and
 - vii minimise impacts on public art and work with local authorities on any necessary relocations.
- (e) In relation to street trees OpCo must:
- i ensure Smartpole® and tree locations are in an opposite pattern (not alternate or staggering);
 - ii equally space trees between Smartpoles® at maximum 20m centres where practical whilst maintaining service vehicle access to buildings along George St;
 - iii at key entries to landmark buildings provide a cluster of two trees between each smart pole at min 6.7m centres where practical; and
 - iv provide adequate setback from intersections.
- (f) OpCo must ensure that the following pavement requirements are achieved:
- i a pavement strategy for the George Street pedestrianised zone, using paving and finishes type in accordance with Table 1;
 - ii if levels of footpaths are altered the affected footpaths are to be rectified in agreement with City of Sydney; and
 - iii vehicular and signalised crossings must be distinguishable and legible for all pedestrians. TGSIs and bollards must be provided at intersections and intersections are to be kerb free, using paving and finishes in accordance with Table 2.
- (g) OpCo must ensure that the following street furniture requirements are achieved:
- i any fixed furniture items are not to be installed closer than 1400mm from the Dynamic Kinetic Envelope (DKE);
 - ii all street furniture is to be in accordance with the Sydney Streets Design Code 2013 – City Centre Standard Public Domain Furniture Palette;
 - iii furniture elements and their position within the George Street pedestrian zone are to be coordinated with CoS;
 - iv the alignment of all OHW poles, lighting poles and trees, where possible, such that their centrelines are not closer than 1400mm from the DKE;
 - v the inclusion of a pedestrian hazard warning strip to the outside of the track zone, as detailed in Table 1, and to the dimensions and specifications as follows:
 - A. to be 800mm wide with a continuous defined linear edge;

- B. to have a high luminance contrast (of not less than 45%) between the strip paving units and abutting adjacent surfaces;
 - C. to have a textural difference between the adjacent paving created by using a smaller paving unit size and increased mortar joints;
 - D. to be continuous for the entire length of the George Street pedestrianised zone; and
 - E. to be set out such that there is minimum 300mm from the outside face of the DKE.
- (h) OpCo must ensure the following trackform requirements are achieved:
- i a finish of high quality stone pavers. The paving pattern and colouration must be designed as such that it minimises the visual impact of the rails within the streetscape. The paving is to be extended as close as possible to the rails;
 - ii ensure that if a concrete haunch is required surrounding the rails, the treatment of the haunch is to be agreed with CoS;
 - iii a paving design that makes the track zone distinguishable from the wider pedestrian pavement;
 - iv that will reference and incorporate the CoS Public Domain requirements;
 - v a unit paver pattern, sizing and finish designed to a high level of detail, avoiding unnecessary cutting and allowances for paving gaps and tolerances to avoid pattern 'creep' and unnecessary cutting; and
 - vi ensure vertical and horizontal tolerances for avoidance of trip hazards.

Table 1 CBD pedestrian precincts pavement types

Type	Colour	Finish	Size
Standard City of Sydney Paving Module	Austral Black	Exfoliated	300 x 450 600 x 450 900 x 450
Standard City of Sydney Paving Module (future traffic zone)	Austral Black	Exfoliated	300 x 450 600 x 450 900 x 450
Vehicular Crossings	Bluestone	Heavy exfoliated	75 x 75
Service Vehicle Turning lane	Austral Black	Heavy exfoliated	150 x 150
Feature Paver	Bluestone or Austral Verde	Blasted or Bush Hammered	75 x 300
Hazard Warning strip	Min 45% colour contrast to adjacent pavers on either side of this zone	Exfoliated with split edge (to provide tactile warning in place of TGSIs)	150 x 150
Light Grey Track Paving	Harcourt Light Grey granite sett*	Exfoliated	150 x 150
Dark Grey Track Paving	Austral Black granite sett*	Exfoliated	150 x 150

- (i) OpCo must coordinate with the City of Sydney to agree a paving pattern for light grey track paving and dark grey track paving in Table 1 marked with an* (asterix), in the following manner:
- i implement a paving module that coordinates expansion joints in paving across the width of George Street;
 - ii within the track zone, light grey track paving comprises 95% of the pavers, with the remaining 5% dark grey track paving randomly spaced between this zone; and
 - iii from the outside face of the concrete track haunch to the inner edge of the hazard warning zone, light grey track paving comprises 30% of the pavers, with the remaining 60% dark grey track paving continuous along the hazard warning zone side, and grading back towards the track edge.

7.4. Surry Hills precinct

- (a) Surry Hills precinct is defined as the corridor between the Chalmers Street / Devonshire Street intersection and the western side of South Dowling Street.

- (b) OpCo must take into account the following contextual statements:
- i the precinct, largely characterised by the terraces of Devonshire St, is a narrow and in parts steep streetscape, creating a 'village' character, with limited space for the provision of street trees and street furniture;
 - ii Devonshire Street will become a traffic-calmed environment with two Light Rail tracks on the southern side, and a single eastbound traffic lane on the northern side;
 - iii Devonshire Street is approximately 900m long. Its character and land uses can be categorised into 3 sub-precincts:
 - A. Chalmers Street to Holt Street – approx. 15m wide street and highly active mixed use retail and commercial zone;
 - B. Holt Street to Crown Street - The most narrow section of Devonshire Street with a mixture of retail, compact residences and government housing; and
 - C. Crown Street to Bourke Street – approx. 18m wide with predominantly retail and commercial uses;
 - iv Devonshire Street is a major desire line connecting from Central Station to Moore Park;
 - v Wimbo Park and the existing Olivia Gardens apartments complex will be redeveloped as a new public park for the Surry Hills Community; and
 - vi a CSELR Stop located on Devonshire Street at the intersection of Riley Street alongside Ward Park.
- (c) OpCo must address the following principles:
- i Devonshire Street must be designed as an urban place with a high level of pedestrian amenity and with inherent traffic calming measures. Vehicular traffic planning must be integrated with the built form and spatial planning of the Public Domain;
 - ii loading and delivery zones (where required) must be integrated within the overall streetscape design;
 - iii where turning movements prohibit rear lane access for service vehicles, consider providing adequate loading areas in adjacent streets in consultation with the City of Sydney;
 - iv provide adequate loading zones in adjacent streets;
 - v retain local vehicle access to all properties;
 - vi a safe and legible streetscape is maintained for all users, ensuring the minimum use of bollards and other visual clutter;
 - vii the quality of Devonshire Street is enhanced to create a comfortable pedestrian environment, sensitive to the character of Surry Hills and integrates into the surrounding streetscape and 'village character';
 - viii an increase to the pedestrian amenity of the Surry Hills precinct during both day and night;
 - ix lighting along Devonshire Street is to meet the requirements of CoS;

- x ensure that any proposed street closures onto Devonshire Street are developed as a suite of 'pocket parks' / public open spaces, which may be used for a range of activities. It must allow for flexible uses which may facilitate pop-up events and installations;
 - xi promote a high level of pedestrian amenity along both sides of Devonshire Street and create opportunities for active footpaths;
 - xii consider Devonshire Street as a pedestrian focused street with only low-speed local vehicular traffic encouraged, ensuring traffic lane widths are kept to a minimum;
 - xiii establish a journey for pedestrians by providing a variety of spaces and intensity of uses that are climatically responsive and promote both social and outdoor / indoor interaction;
 - xiv distinguish key public spaces along Devonshire Street that will anchor the street to its surroundings and provide focused spots of activity;
 - xv create a permeable street that facilitates cross-street activation and promotes a high level of pedestrian amenity along both sides of Devonshire Street;
 - xvi employ WSUD initiatives where possible, e.g. utilising stormwater runoff as irrigation for tree pits;
 - xvii ensure provision for street trees, street lighting, fixed and temporary street furniture in reference to CoS design guidelines;
 - xviii consider raising major intersections where practical, to create a level crossing for pedestrians;
 - xix develop the site bounded by Bourke Street, South Dowling Street, (which includes the existing Wimbo Park), Nobbs Lane, and Parkham Lane into a new extension of Wimbo Park; and
 - xx provide (for St Peter's Church, on the corner of Marlborough and Devonshire Street), a parking space for hearse and limousines to the front forecourt of the existing church, ensuring vehicle turning movements can be achieved via access on Marlborough Street. This includes provision of a new gate and driveway.
- (d) OpCo must ensure that the following urban and landscape design requirements ,are achieved:
- i minimise impacts to existing building awnings;
 - ii minimise encroachment into existing footpaths;
 - iii align and equally space all OHW poles, lighting poles and trees where possible;
 - iv provide a new integrated frontage to Ward Park along Devonshire Street, integrating with the side platform of the Surry Hills Stop;
 - v any vertical separation device between the Light Rail corridor and the southern footpath must achieve 30% colour contrast and be minimal, elegant and unobtrusive within the streetscape;
 - vi in relation to furniture:

- A. be in accordance with the Sydney Streets Design Code – Village Centre and Activity Strip Furniture Palette; and
 - B. must consider bespoke elements within the pocket parks, in consultation with CoS;
- vii in relation to existing trees:
- A. existing street trees along the southern side of Nobbs Lane, the northern side of Parkham Lane, and on the eastern side of Bourke Street to be retained if practical; and
 - B. the existing large fig tree within the Langton Clinic car park on the South Dowling Street boundary is to be retained if practical;
- viii all new trees along Devonshire Street must be selected and located in consultation with CoS.
- (e) OpCo must ensure that the following pavement requirements are achieved:
- i in relation to Public Domain pavements:
 - A. OpCo must develop and implement a pavement strategy for the Surry Hills precinct, using paving and finishes in accordance with the CoS Streets Code - Village Centre Materials Palette;
 - B. if footpaths are disturbed, they are to be rectified;
 - C. intersections are to be kerb-free where practical. Ensure vehicular and paved signalised crossings are distinguishable and legible for all pedestrians. TGSIs and bollards must be provided at raised intersections and achieve the relevant standards;
 - D. all pedestrian crossings are to be paved and kerb-free where possible;
 - ii in relation to trackform finish:
 - A. OpCo may provide concrete unit pavers, concrete, or bitumen trackform finish (excluding the CSELR Stop precinct, at Ward Park, and at Wimbo Park / Olivia Gardens); and
 - B. the transition of trackform finish from the CBD traffic precinct to the trackform finish of the Surry Hills precinct must be carefully considered and integrated within the overall Public Domain design.

7.4.1 Devonshire Street road closures and pocket parks

- (a) OpCo must ensure that the following requirements are achieved:
- i utilise the opportunity for road closures to create a variety of local pocket parks and high quality community spaces;
 - ii consider each space as part of a sequence of spaces that provide points of interest, intrigue and / or refuge for pedestrians;
 - iii explore opportunities for bespoke design elements in all new public spaces;
 - iv develop and implement an integrated public art strategy that promotes fixed and temporary public art along Devonshire Street and adjacent spaces;

- v develop and implementing a Public Domain strategy for the Surry Hills precinct that incorporates the following requirements for each road closure and pocket park that are defined below:
 - A. Buckingham Street closure;
 - B. Devonshire Street Reserve (cnr Elizabeth and Devonshire Street);
 - C. Holt Street Road closure;
 - D. Clisdale Street Road closure;
 - E. Waterloo Street Road closure;
 - F. Ward Park;
 - G. High Holborn Street Road closure;
 - H. Edgely Street Reserve (cnr of Devonshire Street and Nickson Street); and
 - I. Wimbo Park and Olivia Gardens.

Table 2 New pocket parks and public space requirements

Item	Description	Min. Requirement
A Buckingham Street Closure (approx. 157m2)		
Program and Use	An intimate, local pocket park with activated edges. Providing opportunities for outdoor dining and seating associated with adjacent commercial premises. Providing flexibility between night and day uses and considering future changes in tenancy.	
Paving and Hard Surface Areas	Precast concrete unit paver consistent with Devonshire Street. Provide adequate circulation space and hard surface area to facilitate outdoor dining.	Refer to Sydney Streets Design code 2013 – Village Centres (Laneway / Shared Zones) Material Palette for finishes.
Tree Planting and Landscaping	Provide central turf area for sitting and passive recreation. Small deciduous tree species to create a well-scaled, intimate space.	min. 80m ² turf area Tree selection to be agreed with the City of Sydney. Refer to City of Sydney Street Tree Masterplan 2011.
Vehicle Access and Loading	No service access or loading required. Avoid use of bollards if practical. Landscaping to be used to prevent vehicular access.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for bollard specification.
Lighting	S3C Smartpole® along street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council) Any additional lighting required to use post top luminaires in accordance with the Sydney Streets Design Code 2013.	Refer to Sydney Streets Code 2013 – Village Centre and Activity Strip for type and finish.
Public Furniture	Fixed seating to be incorporated into the centre of the space.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette.
Bicycle Parking	Provide for minimum 6 bicycle parking spaces.	3 hoops min. Refer to Sydney Streets Code 2013 for type and finish.
B Devonshire Street Reserve (approx. 550sqm)		
Program and Use	An active urban plaza / open space. A key anchor point as part of the journey along Devonshire St. Provide opportunities for outdoor dining and seating associated with adjacent commercial premises. Improve	

Item	Description	Min. Requirement
	pedestrian permeability and amenity.	
Paving and Hard Surface Areas	Precast concrete unit paver consistent with Devonshire Street. Provide adequate circulation space and hard surface area to facilitate outdoor dining.	Min 60% hard paved area. Refer to Sydney Streets Design code 2013 – Village Centres and Activity Strips (General Street and Gateway types) Material Palette for finishes.
Tree Planting and Landscaping	Consider an alternative deciduous tree to maximise solar access into the plaza. Turf areas to be raised with integrated seating along edges.	Tree selection to be agreed with the City of Sydney. Refer to City of Sydney Street Tree Masterplan 2011.
Vehicle Access and Loading	Potential requirement to provide hard-standing for loading / emergency vehicles only.	To be explored in consultation with City of Sydney.
Lighting	S3C Smartpole® along street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council) Any additional lighting required in the plaza to use post top luminaires in accordance with the Sydney Streets Design Code 2013.	Refer to Sydney Streets Code 2013 - Village Centre and Activity Strip for type and finish.
Public Furniture	Fixed seating clusters with bins and bubblers incorporated into clusters.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette.
Bicycle Parking	Provide for minimum 10 bicycle parking spaces.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for type and finish.
C – Holt Street Road Closure (approx. 280sqm)		
Program and Use	A local public square. Provide opportunity for outdoor dining and seating associated with adjacent commercial premises. Provide flexibility between night and day uses. Consider future changes in tenancy. Respond sensitively to mitigate cross-sectional level difference and reduce physical barriers.	
Paving and Hard Surface	Precast concrete unit paver. Extend paving treatment to park across Devonshire Street	Min 60% hard paved area. Refer to Sydney Streets Design

Item	Description	Min. Requirement
Areas	to the Quaker Meeting Room (Lot 119-123)	code 2013 – Village Centres and Activity Strips (Laneways, Shared zones) Material Palette for finishes
Tree Planting and Landscaping	Retain existing evergreen trees on Holt Street if possible. Ensure that location of any new trees do not reduce solar access. Use landscaping / terracing to mitigate cross-sectional level difference.	Species selection in accordance with CPTED principles.
Vehicle Access and Loading	No vehicle access to buildings required. Provide adequate hard stand area for 1x loading / emergency vehicle. Ensure that any through movement is prevented. Avoid use of bollards as much as possible.	To be resolved in consultation with City of Sydney. Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for bollard specification
Lighting	S3C Smartpole® along street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council) Any additional lighting required in the plaza to use post top luminaires in accordance with the Sydney Streets Design Code 2013.	Refer to Sydney Streets Code 2013 - Village Centre and Activity Strip for type and finish.
Public Furniture	Fixed seating to be incorporated into terracing or change in levels. Number and location of bins, bubblers and other items to be agreed with the City of Sydney	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette
Bicycle Parking	Provide for minimum 6 bicycle parking spaces	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for type and finish
D Clisdale Street Closure (approx. 100sqm)		
Program and Use	A small pocket park.	
Paving and Hard Surface Areas	Precast concrete unit paver. Hard paving areas to be used for circulation space only.	Refer to Sydney Streets Design code 2013 – Village Centres and Activity Strips (Laneways and shared zones) Material Palette for finishes.
Tree Planting and Landscaping	Low planting to be incorporated around the vehicular turning head and if possible the provide planting in median. Explore opportunities to provide street trees	Species selection in accordance with CPTED principles.

Item	Description	Min. Requirement
	in keeping with Devonshire Street.	
Vehicle Access and Loading	No vehicle access to buildings required. Provide adequate hard stand area for 1x loading / emergency vehicle. Ensure that any through movement is prevented. Avoid use of bollards as much as possible.	To be resolved in consultation with City of Sydney. Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for bollard specification.
Lighting	S3C Smartpole® along street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council)	Refer to Sydney Streets Code 2013 - Village Centre and Activity Strip for type and finish.
Public Furniture	Explore raised planters as seating elements.	No seating required.
Bicycle Parking	No spaces required.	N/A
E Waterloo Street Closure (approx. 260sqm)		
Program and Use	A local public square and community hub. Provide opportunity for outdoor dining and seating associated with adjacent commercial premises. Provide flexibility between night and day uses. Consider future changes in tenancy (particularly with adjacent residence).	Plaza bound by Gladstone Street and Devonshire Street.
Paving and Hard Surface Areas	Precast concrete unit paver. Consider extending paving design across Devonshire Street to anchor the plaza.	Min 60% hard paved area. Refer to Sydney Streets Design code 2013 – Village Centres and Activity Strips Material Palette for finishes.
Tree Planting and Landscaping	Provide a landscape buffer to the adjacent residence - lot 154.	Min 100m ² (40%) soft landscaping. Species selection in accordance with CPTED principles. Tree selection to be agreed with the City of Sydney. Refer to City of Sydney Street Tree Masterplan 2011.
Vehicle Access and Loading	Maintain vehicular access to adjacent properties. Provide a 2 x hard-stand area for loading / emergency vehicles. Ensure that any through movement is prevented. Avoid use of bollards.	To be resolved in consultation with City of Sydney. Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain

Item	Description	Min. Requirement
		Furniture Palette for bollard specification.
Lighting	<p>S3C Smartpole® along Devonshire Street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council)</p> <p>Any additional lighting required in the plaza to use post top luminaires in accordance with the Sydney Streets Design Code 2013.</p> <p>Consider opportunity for bespoke suspended lighting.</p>	Refer to Sydney Streets Code 2013 - Village Centre and Activity Strip for type and finish.
Public Furniture	Separate fixed seating from outdoor dining areas. Number and location of bins, bubblers and other items to be agreed with the City of Sydney.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette.
Bicycle Parking	Provide space for minimum 10 bicycle parking spaces.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for type and finish.
F High Holborn Street Closure (approx. 100sqm)		
Program and Use	Local pocket park. Provide opportunity for outdoor dining and seating associated with adjacent commercial premises. Provide flexibility between night and day uses. Consider future changes in tenancy (particularly with adjacent community buildings).	
Paving and Hard Surface Areas	Precast concrete unit paver. Consider extending paving design across Devonshire Street to unify the opposite corner on Crown Street.	Refer to Sydney Streets Design code 2013 – Village Centres and Activity Strips Material Palette for finishes.
Tree Planting and Landscaping	Provide raised planting buffer to the end of the street closure.	<p>Min 30% soft landscaping area.</p> <p>Species selection in accordance with CPTED principles.</p> <p>Tree selection to be agreed with the City of Sydney. Refer to City of Sydney Street Tree Masterplan 2011.</p>
Vehicle Access and Loading	Maintain vehicular access to adjacent properties. Provide a 2 x hard-stand area for loading / emergency vehicles. Ensure that any through movement is prevented. Avoid	<p>To be resolved in consultation with City of Sydney.</p> <p>Refer to Sydney Streets Design Code 2013 - Village Centre and</p>

Item	Description	Min. Requirement
	use of bollards.	Activity Strips Public Domain Furniture Palette for bollard specification.
Lighting	S3C Smartpole® along Devonshire Street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council) Any additional lighting required in the plaza to use post top luminaires in accordance with the Sydney Streets Design Code 2013.	Refer to Sydney Streets Code 2013 - Village Centre and Activity Strip for type and finish.
Public Furniture	Location and amount of fixed seating and other furniture to be agreed with City of Sydney.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette.
Bicycle Parking	Provide for minimum 6 bicycle parking spaces.	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for type and finish.
G Edgely Reserve		
Program and Use	Local pocket park providing a residential street address.	Minimise impact to existing park and tie into existing levels
Paving and Hard Surface Areas	Precast concrete unit pavers along footpaths and interface with existing park only.	Refer to Sydney Streets Design code 2013 – Village Centres and Activity Strips Material Palette for finishes
Tree Planting and Landscaping	Ensure maximum soft landscaping area. Provide an address to the existing residences. Any new street trees to be in keeping with Devonshire Street	Retain existing trees if practicable Tree selection to be agreed with the City of Sydney. Refer to City of Sydney Street Tree Masterplan 2011
Vehicle Access and Loading	Maintain vehicular access to adjacent properties. Provide a 2 x hard-stand area for loading / emergency vehicles. Ensure that any through movement is prevented. Avoid use of bollards.	To be resolved in consultation with City of Sydney. Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette for bollard specification
Lighting	S3C Smartpole® along Devonshire Street edge. (Design of S3C Smartpole to be developed with OpCo lighting consultant and the City of Sydney Council)	Refer to Sydney Streets Code 2013 - Village Centre and Activity Strip for type and finish.

Item	Description	Min. Requirement
Public Furniture	Location and amount of fixed seating and other furniture to be agreed with City of Sydney	Refer to Sydney Streets Design Code 2013 - Village Centre and Activity Strips Public Domain Furniture Palette
Bicycle Parking	No spaces required.	

7.4.2 Ward Park

- (a) Opco must address the following principles:
- i provide a new integrated frontage to Ward Park along Devonshire Street, integrating with the side platform of the Surry Hills Stop;
 - ii ensure that the new frontage to the park along Devonshire remains consistent with the existing aesthetic and character of the park;
 - iii minimise impact to Ward Park as much as practicable;
 - iv minimise encroachment into the existing playing field as much as practicable;
 - v minimise encroachment into Government housing site;
 - vi ensure that existing footpaths widths are maintained along Devonshire Street;
 - vii provide min 10 bicycle parking spaces;
 - viii in relation to trackform finish:
 - A. OpCo must provide concrete unit pavers; and
 - B. the transition of one trackform finish to another must be carefully considered and integrated within the overall public domain design.

7.4.3 Wimbo Park / Olivia Gardens

- (a) Opco must address the following principles:
- i develop the site bounded by Bourke Street, South Dowling Street, which includes the existing Wimbo Park, Nobbs Lane, and Parkham Lane into a new extension of Wimbo Park, including the provisions outlined in Table 3 below;
 - ii provide a shared path or paths through Wimbo Park that connects to the Eastern Distributor rail bridge and integrates with the path network in Moore Park West;
 - iii ensure sight lines from Bourke Street to South Dowling Street are maintained in relation to CPTED principles and maintain passive surveillance;
 - iv all access to adjacent buildings and footpaths along South Dowling Street to be retained;
 - v minimise impact to existing mature fig tree within the Langton Clinic Carpark;

- vi ensure a well-considered interface between the shared path and the Langton Clinic;
- vii in relation to trackform finish:
 - A. OpCo must provide concrete unit pavers; and
 - B. the transition of one trackform finish to another must be carefully considered and integrated within the overall public domain design.

Table 3 Wimbo Park / Olivia Gardens requirements

Element	Description	No.	Finish
Car Parking	Kerbside parking as per AS 2890.5 along Parkham Lane.	8 spaces	asphalt
Car Parking	Angled Parking as per AS 2890.5 along Nobbs Lane.	25 angled spaces	asphalt
Path	Ensure interface between Langton Clinic and surrounding areas has necessary civil works if path is higher than 900mm above finished floor levels.		
Substation	Allow for surface substation located within the park.	1	

7.5. Moore Park precinct

- (a) Moore Park precinct is defined as the corridor between the western side of South Dowling Street, including the tunnel, to the northern side of the Anzac Parade / Alison Road intersection.
- (b) OpCo must take account of the following contextual statements:
 - i Moore Park precinct is dominated by an open parkland setting with the Entertainment Quarter set back from the light rail alignment;
 - ii Moore Park and Centennial Parklands and the Entertainment Quarter provide amenity for social activities, sporting events, training, and entertainment;
 - iii the precinct will be significantly transformed through the SCGSG Trust Master Plan in the future;
 - iv Moore Park precinct can be categorised into two distinct sub-precincts:
 - A. Moore Park East - defined as the corridor between the western side of South Dowling Street and the western side of Anzac Parade (including the western tunnel portal) and Moore Park Reserve; and
 - B. Moore Park West - defined as the corridor between the western side of Anzac Parade and to the northern side of the Anzac Parade / Alison Road intersection, including the eastern tunnel portal, Tramway Oval, and Showground Field, Federation Plaza, and the Parklands Sports Centre and adjacent playing fields.

- (c) OpCo must address the following principles:
- i retain the character of the Anzac Parade boulevard as a culturally and historically important tree-lined boulevard;
 - ii promote a high level of integration between the landscape and built form of Moore Park and Centennial Parklands and the Entertainment Quarter, Anzac Parade and adjacent land uses, in particular with the new Moore Park Stop;
 - iii promote and maintain a high level of pedestrian and cycle amenity along Anzac Parade, through Moore Park, across the Eastern Distributor Rail Underbridge, and connecting with Surry Hills;
 - iv minimise the extent and visual impact of both tunnel portals and dive structures into Moore Park, and integrate into the landscape of the park;
 - v maintain the amenity to Tramway Oval (Swans training ground) as agreed with the Centennial Park and Moore Park Trust;
 - vi ensure that the new landscape treatment matches adjacent landscape areas;
 - vii minimise impact on existing trees, retaining existing street trees along South Dowling Street where possible;
 - viii minimise the loss of existing fig trees on Anzac parade;
 - ix retain the character of Anzac Parade as a 'boulevard' streetscape;
 - x maximise the integration of the Light Rail infrastructure with the parklands area;
 - xi consider the interface between each area to ensure the design is seamlessly integrated with the surrounding landscape;
 - xii in relation to landscaping, paving and street furniture OpCo must comply with the requirements of the Centennial Park and Moore Park Trust; and
 - xiii explore opportunities for bespoke design elements in all new public spaces.
- (d) OpCo must ensure that the following urban and landscape design elements requirements are achieved:
- i ensure that a plaza is provided, sized to accommodate for queuing and marshalling of event customers, on the eastern side of the Moore Park Stop, integrating into the CSELR Stop and Moore Park surrounds;
 - ii the proposed shared pedestrian and cycle path is to be integrated into Moore Park's existing path network;
 - iii a direct connection to the existing Moore Park shared pedestrian and cycle path running parallel to South Dowling Street (north-south);
 - iv provide fencing to Tramway Oval;
 - v provide 10 rack spaces at the CSELR Stop; and
 - vi provide furniture in accordance with the Sydney Streets Design Code – Village Centre and Activity Strip Furniture Palette.
- (e) OpCo must ensure that the following requirements are achieved:
- i in relation to Public Domain pavements:

- A. Anzac Parade pedestrian / cycle connection between the Moore Park Stop and the existing shared path along the eastern side will be minimum 5.0m wide bitumen finish;
- B. Federation Place located at Lang Road and Anzac Parade carpark – surface finishes to match existing surface; and
 - ii trackform pavements to be in-situ concrete with a broomed finish.

7.5.1. Moore Park Reserve

- (a) OpCo must ensure that the following requirements are achieved:
 - i minimise encroachment into the existing parklands area; and
 - ii maintain all existing playing fields.

7.5.2. Moore Park Stop precinct and Tramway Oval

- (a) OpCo must minimise encroachment into the existing plaza area.

7.5.3. Federation Plaza

- (a) OpCo must ensure that the following requirements are achieved:
 - i minimise encroachment into the existing plaza area; and
 - ii any new paving works are to match existing material, paving type, pattern, and finish; where possible re-use existing paving material in new works.

7.5.4. Moore Park tunnel and portals

- (a) OpCo must ensure that the following requirements are achieved:
 - i any effects from de-watering must be managed to minimise the impacts to the existing fig trees within Moore Park;
 - ii consider options to mitigate water loss due to de-watering;
 - iii Moore Park western tunnel portal precinct - located in Moore Park West; provide a direct DDA-compliant, 6m wide, bitumen, shared path connection across Moore Park between existing playing fields to the connect to the proposed RMS footbridge;
 - iv Moore Park eastern tunnel portal precinct – located in Moore Park East adjacent to the Tramway Oval; provide screening elements to the portal and dive structure min 3m high;
 - v ensure that the screening elements and portal structures:
 - A. are sensitive to the parkland character;
 - B. use materials that are consistent with Moore Park; and
 - C. are robust, elegant and vandal proof.

7.6. Kensington / Kingsford precinct

- (a) Kensington / Kingsford precinct is defined as the corridor along Anzac Parade between the northern side of the Anzac Parade / Alison Road intersection, and the southern end of the Kingsford terminus.
- (b) OpCo must take account of the following contextual statements:
- i the Kensington / Kingsford precinct is characterised as a 'boulevard' streetscape with intermittent central island tree planting;
 - ii significant fig trees exist within UNSW along the Anzac Parade frontage; and
 - iii the town centres of Kensington and Kingsford.
- (c) OpCo must address the following principles:
- i retaining the character of Anzac Parade streetscape as a 'boulevard' streetscape;
 - ii retaining the significant fig trees along Anzac Parade at UNSW where practical;
 - iii providing a plaza connecting the existing UNSW pedestrian mall with the UNSW Anzac Parade Stop, maintaining clear and open sight lines, to ensure achievement of CPTED principles;
 - iv promoting a high level of pedestrian amenity along Anzac Parade, particularly around the town centres of Kensington and Kingsford;
 - v ensuring that Kingsford terminus operates as an effective interchange between cycle and Light Rail, and that undercover cycle parking is provided; and
 - vi ensure that Tay Reserve retains as many trees and green open space as practical, whilst providing a shared use path and pedestrian connections.
- (d) OpCo must ensure that the following urban and landscape design elements requirements are achieved:
- i minimise impacts to existing building awnings;
 - ii minimise encroachment into existing footpaths;
 - iii align and equally space all OHW poles, lighting poles and trees where possible;
 - iv any vertical separation device between light rail corridor and footpath must achieve 30% colour contrast and be minimal, elegant and unobtrusive within the streetscape;
 - v all street furniture is to be in accordance with the Randwick City Council Urban Elements Design Manual 2006;
 - vi existing street trees along Anzac Parade are to be retained if practical; and
 - vii all new trees along Anzac Parade must be selected and located in consultation with Randwick City Council.
 - viii bicycle storage facilities:
 - A. Kingsford Stop - provide 50 secure storage cage and 20 undercover rack spaces; and

- B. all other CSELR Stops within the Kensington / Kingsford precinct - 10 rack spaces per CSELR Stop. Bike rack locations to be finalised in collaboration with Randwick City Council in the public domain adjacent to the Stop.
- (e) OpCo must ensure that the following pavement requirements are achieved:
- i Public Domain pavements:
 - A. Anzac Parade footpaths around CSELR Stops – concrete unit pavers to match surrounding footpaths;
 - B. plaza linking pedestrian mall with the UNSW Anzac Parade Stop – trafficable interlocking concrete set pavers to create a high quality and durable finish to match the concrete unit pavers of the Stop platform; and
 - ii trackform pavements to be in-situ concrete with a broomed finish.

7.6.1. Tay Reserve

- (a) OpCo must ensure that the following requirements are achieved:
- i minimise impact to the existing Tay Reserve park, and existing trees; and
 - ii provide for a shared cycle and pedestrian pathway through the park that provides a connection from the Alison Rd / Anzac Pde intersection through to Anzac Parade at the south eastern corner of Tay Street.

7.6.2. University of NSW at Anzac Parade

- (a) OpCo must ensure that the following requirements are achieved:
- i minimise impact to the existing trees to the frontage of the University of NSW campus along Anzac Parade;
 - ii retain the existing width of pedestrian footpaths on both sides of Anzac Parade in front of the University; and
 - iii provide access from the CSELR Stop to the University Mall pedestrian walkway.

7.6.3. Nineways Intersection and Kingsford Stop Public Domain

- (a) OpCo must ensure that the following requirements are achieved:
- i minimise the number of traffic islands with any re-design of the Nineways Intersection;
 - ii maximise the amount of additional usable public space from any redesign of the Nineways Intersection;
 - iii maximise the amount of additional usable public space from any redesign of the Nineways Intersection; and
 - iv provide legible and safe access from the adjacent existing car park located in the median.

7.7. Randwick precinct

- (a) The Randwick precinct is defined as the corridor along Alison Road between the Anzac Parade / Alison Road intersection and the Randwick terminus.
- (b) OpCo must take account of the following contextual statements:
 - i the Randwick precinct is characterised by the significant existing fig and other trees, forming the boundary of the Royal Randwick Racecourse along Alison Road and Wansey Road; and
 - ii High Street is a narrow street servicing the Prince of Wales Hospital, and emergency vehicles will need to take priority along the corridor within the health precinct.
- (c) OpCo must address the following principles:
 - i retaining the overall character of Royal Randwick Racecourse;
 - ii promoting a high level of pedestrian and cycle amenity within the Randwick precinct; and
 - iii ensure the Randwick Stop operates as an effective interchange between cycle and Light Rail, and that undercover cycle parking is provided.
- (d) OpCo must ensure that the following urban and landscape design elements requirements are achieved:
 - i bicycle storage facilities:
 - A. Randwick Stop - provide 50 secure storage cage and 20 undercover rack spaces; and
 - B. all other CSELR Stops within the Randwick precinct - 10 rack spaces per CSELR Stop. Bike rack locations to be finalised in collaboration with Randwick City Council in the public domain adjacent to the Stop.
- (e) OpCo must ensure that the following requirements are achieved:
 - i in relation to Public Domain pavements:
 - A. Alison Road footpaths and shared pedestrian / cycle path around CSELR Stops – concrete unit pavers to match surrounding footpaths;
 - B. Wansey Road footpaths and shared pedestrian / cycle path around CSELR Stops – concrete brushed finish to match surrounding footpaths;
 - C. High Cross Park – footpaths are to be concrete unit pavers to match existing footpath pavers around the park;
 - D. Royal Randwick Racecourse Stop public domain material to be agreed with the Australian Turf Club; and
 - ii trackform pavements to be in-situ concrete with a broomed finish.
- (f) in relation to retaining walls along Alison and Wansey Road:
 - i avoid the use of gravity retaining systems;

- ii provide a balustrade (where required) that is consistent across the Royal Randwick Racecourse site;
- iii if a suspended slab on pier is the preferred construction method, OpCo must clad between the piers in a finish that is in keeping with the local character of the Royal Randwick Racecourse; and
- iv if a reinforced soil wall is the preferred construction method, OpCo must select a finish for the precast concrete panels that is in keeping with the local character of the Royal Randwick Racecourse.

7.7.1. Royal Randwick Racecourse Public Domain

- (a) OpCo must ensure that the following requirements are achieved:
 - i maintain the footpath connection on the southern side of Alison Road from Darley Street to Doncaster Avenue;
 - ii maintain the Royal Randwick Racecourse members' and public entrances (and their existing levels), ensuring re-grading works between the Royal Randwick Racecourse Stop are connected with not more than 4% crossfalls; and
 - iii promote a high level of integration between the landscape and built form of the Royal Randwick Racecourse, Alison Road and the Royal Randwick Racecourse Stop.

7.7.2. Alison Road Public Domain

- (a) OpCo must ensure that the following requirements are achieved:
 - i minimise any impacts to the existing trees within the Royal Randwick Racecourse boundary along Alison Road;
 - ii construct and locate shared pedestrian / cycle path to minimise impacts on the existing fig trees along Alison Road; and
 - iii provide separation devices between the cycle path and Light Rail tracks where the cycle path runs directly adjacent to Light Rail tracks.

7.7.3. Wansey Road Public Domain

- OpCo must ensure that the following requirements are achieved:
- i minimise any impacts to the existing trees within the Royal Randwick Racecourse boundary along Wansey Road;
 - ii construct and locate shared pedestrian / cycle path to minimise impacts on the existing trees along Wansey Road (considering light-weight elevated path construction to minimise impact on tree roots); and
 - iii provide separation devices between the cycle path and Light Rail tracks where the cycle path runs directly adjacent to Light Rail tracks.

7.7.4. Randwick Stop Public Domain and High Cross Park

- (a) OpCo must ensure that the following requirements are achieved:

- i ensure High Cross Park is designed to retain its high value character and amenity as well as providing effective interchange functions between Light Rail, bus, pedestrian and cycle, as well as maximising tree retention and 'green' space, including the provisions outlined in Table 4 below;
- ii the existing war memorial is not impacted in any way; and
- iii the Randwick Stop within High Cross Park must be an integrated multi-modal facility, offering seamless service or modal interchange and consistent quality of customer experience for bus and Light Rail Customers.

Table 4 High Cross Park requirements

Requirements	Description	No.	Surface Finish
Bicycle Parking	Undercover storage spaces	54	Stainless steel
War Memorial	Retained	N/A	N/A
Memorial Plaza	To be protected and retained in its existing lawn setting.	N/A	N/A
Raised Garden Area	Provide retaining walls where necessary, to maintain existing levels in garden areas where existing trees are to be retained.	N/A	N/A
Integrated building	Comprising driver facilities, substation	Refer Appendix 13 (Stops)	Refer Appendix 13 (Stops)
footpaths	Direct pedestrian paths connecting light rail and bus stops	N/A	Concrete Unit Pavers as per RCC Urban Elements Manual

8. General Performance and Technical Requirements

8.1. Footpath

8.1.1. General

- (a) All pavement types must:
- i not have a cross fall greater than 4%, or less than 1% in accordance with Appendix 16 (*Road Works*);
 - ii provide a positively drained surface with no pooling or ponding;
 - iii use planar grading with runoff directed to planting beds, kerbs and gutters and trench drainage;
 - iv have a minimum slip resistance classification (Class): W - as classified by AS/NZS 4586 (with the exception of gravel pavement areas), however distinct changes in slip resistance rating are discouraged between adjacent finishes. External paving units to be selected and installed with consecutive slip ratings. Abrupt changes in slip resistance ratings can increase the risk of slips, trips and falls;
 - v use a unit size and pattern suitable for required design loads;
 - vi use a bedding, base and subgrade suitable for required design loads;
 - vii adhere to maximum profile variation of 2mm, per AS 1428.1 (2009);
 - viii be selected in accordance with the Sydney Streets Design Code 2013 if located within the City of Sydney (CoS) LGA, including the Moore Park precinct; and
 - ix be selected in accordance with the Urban Element Design Manual 2006 (Revision P6) if located within the Randwick City Council (RCC) LGA.
- (b) All unit and granular pavements must be provided with a flush hot dip galvanised steel restraint to all edges adjacent to planting, turf and gravel areas.
- (c) Service access pits in pavement areas must have pavement infill access covers, with adjacent pavements type and patterns continued through the cover with matching paving joint pattern where infill pit lids are permissible by services authority.
- (d) Service access pits in pavement areas must be aligned to the pavement pattern orientation and be square and flush with adjacent pavement.
- (e) Pavement design must meet the requirements of clauses 6 and 7 of AS1428.1.
- (f) Mortar joints to comply with AS 1428.1 requirements.
- (g) Natural stone used in pavements must be selected, handled, prepared and laid in accordance with the requirements of the Australian Stone Advisory Association Natural Stone Design Manual.

8.1.2. Trafficable pavements

- (a) Trafficable pavements include paved crossings, occasional loaded footpaths and roadways and must:

- i in addition to the following requirements, must be paved with a suitable paving unit for required vehicle loads; and
 - ii provide a flush concrete restraint to all edges adjacent to an asphalt roadway.
- (b) In relation to the CBD traffic zones all pedestrian crossings along the Permanent Light Rail Corridor must:
 - i provide a stone sett in accordance with the Sydney Streets Design Code 2013 – City Centre and Gateways Material Palette; and
 - ii comply with the City of Sydney technical specification for stone sett pavements in roadways;
- (c) In relation to the CBD pedestrian zone:
 - i provide a stone sett in keeping with the paving design for light rail corridor, with a strengthened sub base suitable for required vehicle loads and turning movements; and
 - ii provide max 200mm wide stone flush kerb with light contrast to be distinguishable from the general pedestrian area.
- (d) In relation to Surry Hills:
 - i all streets that connect to Devonshire Street, creating crossing points for vehicles, must be paved with a suitable paving unit for light vehicle and loading traffic;
 - ii provide a concrete unit paver in accordance with the Sydney Streets Design Code 2013 – Village Centre and Activity Strips Material Palette; and
 - iii comply with the City of Sydney technical specification.

8.1.3. Platform interface

- (a) OpCo must ensure that the following platform interface requirements are achieved:
 - i comply with Appendix 13 (*Stops*) for platform pavements;
 - ii footpath pavements that adjoin platforms must have a pattern, colour, finish, and material that is aligned.
 - iii match paving jointing to paving used in the platform finish; and
 - iv where surface pavement joints are required, they must be 316 stainless steel.

8.1.4. Trackform pavements

- (a) OpCo must ensure that pavement units:
 - i align with jointing with trackform drainage and Public Domain elements where possible; and
 - ii continue through traffic intersections.

8.1.5. Gravel pavement

- (a) Low trafficked areas must be paved with gravel pavement where planting is not appropriate.

- (b) Gravel pavement must:
- i be decomposed granite or equivalent;
 - ii not be used as an alternative to trafficable pavement in streetscapes and Public Domain areas;
 - iii have a maximum 10mm aggregate diameter;
 - iv have a minimum depth of 100mm;
 - v not be used where grading exceeds 5% in any direction; and
 - vi be cement stabilised to engineering recommendations.

8.1.6. Tactile ground surface indicators

- (a) Tactile ground surface indicators must:
- i be selected and applied in accordance with AS1428.4.1;
 - ii be placed consistently along the CSELR;
 - iii be mechanically fixed to pavement surfaces;
 - iv for stainless steel and bronze, be R13 as defined in the anti-slip requirements of AS/NZS4586;
 - v have a luminance contrast to the background surface meeting clause 2.2 of AS1428.4.1 in both wet and dry conditions; and
 - vi align with paving joints.
- (b) Tactile ground surface indicators must align with paving joints.

8.1.7. Kerbs

- (a) OpCo must provide the following kerb types:
- i CBD Traffic precinct – concrete flush kerb to clearly demark the Light Rail track zone from the vehicular lanes;
 - ii CBD pedestrian precinct – 200mm wide stone flush-kerb to demark dedicated turning lanes at traffic intersections; and
 - iii Surry Hills precinct – Bluestone mountable kerb in accordance with the Sydney Streets Design Code.

8.2. Walls

8.2.1. General

- (a) All walls must provide positively drained capping or top surfaces to prevent pooling or ponding.
- (b) All walls must not have weep-hole or other wall face drainage systems.
- (c) Walls capping and tops of walls must address longitudinal changes of level in a controlled and consistent manner.

- (d) Exposed shotcrete is not to be used in publically accessible areas.

8.2.2. Concrete wall

- (a) Concrete walls must:
- i be used for walls up to 1.5m, at seating walls or other walls as necessary in Public Domain Type 1 and Public Domain Type 2 areas;
 - ii be in-situ or precast concrete;
 - iii be class 2C steel form finish as per AS3610;
 - iv be a minimum 400mm wide on the top surface;
 - v be provided with a 45mm chamfer to exposed edges; and
 - vi incorporate 316 stainless steel skate deterrents at maximum 2.0m spacing where walls are less than 1m high.
- (b) Where in situ concrete is used as a finished surface for retaining walls and other structures, formed surfaces must have a class 2 finish in accordance with AS3610.
- (c) Where in situ concrete used as a finished surface for retaining walls and other structures, unformed surfaces must have a:
- i flatness tolerance equal to class C in accordance with AS3610; and
 - ii manually levelled wood float and sponge surface finish in accordance with AS 3610.
- (d) Concrete in walls must be an off-white colour throughout.

8.2.3. Masonry unit wall

- (a) Masonry unit walls must:
- i be used for walls over 1.5m except where gabion retaining walls are used;
 - ii be concrete masonry split faced core filled block work;
 - iii be a consistent block size;
 - iv have a smooth face concrete capping unit;
 - v be charcoal or sandstone in colour; and
 - vi have a minimum convex curve radii of 6m.

8.2.4. Retaining walls

- (a) In situ concrete used as a finished surface for retaining walls and other structures must, for formed surfaces, have a class 2 finish in accordance with AS3610.
- (b) In situ concrete used as a finished surface for retaining walls and other structures must, for unformed surfaces, have a:
- i flatness tolerance equal to class C in accordance with AS3610; and

- ii manually leveled wood float and sponge surface finish in accordance with AS 3610.
- (c) Concrete in retaining walls must be an off-white colour throughout.

8.2.5. Cuttings, embankments, land form and slope stabilisation

- (a) The earthworks and stabilisation treatments must be designed to integrate with the adjacent existing ground level and must, as a minimum, include the following features:
 - i the vertical and horizontal alignment of any cutting and embankment batters must be feathered to meet the existing landform and landscape;
 - ii cutting and embankment batters must not be steeper than 1v:2h gradient;
 - iii in situ concrete used as a finished surface for retaining structures and other structures, must have a:
 - A. minimum flatness tolerance equal to class 3 in accordance with AS3610; and
 - B. manually levelled, wood float and sponge surface finish.

8.2.6. Anti-vandal treatment

- (a) The SLR Works must be designed to be vandal and tamper resistant.
- (b) Any operating panels and removable elements must only be capable of being opened or removed using specialist tools or machinery.
- (c) An anti-graffiti coating must be applied to the surfaces of all walls, structures and barriers to their full height above the adjacent finished surface level or any accessible foothold or area of the structure that is accessible from above.
- (d) Graffiti must be able to be removed without damage to the substrate.
- (e) The application of a clear anti-graffiti coating must have a consistent appearance and must minimise any difference in the visual appearance of the treated and untreated parts of the structure.
- (f) The clear anti-graffiti coating must be capable of being reapplied when required in order to maintain the performance characteristics of the coating.

8.3. Stairs and ramps

8.3.1. General

- (a) Stairs and ramps must:
 - i be positively drained to ensure no pooling or ponding of water; and
 - ii use satin finished stainless steel handrails.
- (b) All stairs must be provided with minimum 200mm wide concrete kerb edge or restraint wall to each edge.

8.3.2. Stairs

- (a) Public stairs to deal with changes in level must meet the following requirements:
- i where height of stair risers above 5.3m a minimum of 2 mid landings are required;
 - ii public stairs must be a minimum clear width of 2m if predominantly used for unidirectional flow, and minimum clear width of 2.4m if predominantly used for bidirectional flow;
 - iii OpCo must provide public stairs as required in DSAPT 2002, with a tread and riser dimension:
 - A. tread 300mm and
 - B. riser 150mm.
 - iv public stairs must not have open risers;
 - v configuration of stair flights must provide an equal number of treads for each flight, or as close as possible;
 - vi match adjacent paving finish where possible and be in-situ concrete if adjacent paths are asphalt;
 - vii incorporate an angled riser or other shadow-line recess to the riser; and
 - viii have 10mm pencil rounded step nosings.

8.3.3. Ramps generally

- (a) Ramps must be a minimum 1500mm wide.
- (b) Ramp kerbs must:
- i match the adjacent paving material and pattern;
 - ii have a slip resistance classification (Class): R11 - as classified by AS/NZS 4586; and
 - iii not intrude into pedestrian or bicycle movement paths.

8.3.4. Ramps at CSELR Stops

- (a) Ramps at CSELR Stops must:
- i be 1v:21h gradient where possible to avoid the need for handrails in accordance with AS1428.2; and
 - ii match the platform paving material and pattern.
- (b) Ramp kerbs must:
- i match the adjacent paving material and pattern; and
 - ii be flush with the platform level.

8.4. Street furniture

8.4.1. General

- (a) All street furniture types must:
- i be based on the relevant local authority public domain requirements;
 - ii use a consistent palette of materials;
 - iii use vandal and graffiti resilient materials;
 - iv use materials that are easily cleaned and maintained;
 - v have concealed footings and fixings;
 - vi provide a minimum 30% luminance contrast to the background environment;
 - vii be installed horizontally level with a height above ground level in accordance with clause 27.2 Note 1 in AS1428;
 - viii be selected in accordance with the Sydney Streets Design Code if located within the City of Sydney LGA, including the Moore Park precinct; and
 - ix be selected in accordance with the Urban Element Design Manual if located within the Randwick City Council LGA.

8.4.2. Bench seats

- (a) Bench seats must:
- i incorporate back rests where the bench seats are adjacent to other objects; and
 - ii not incorporate back rests where the bench seats are located with double sided access.

8.4.3. Bollards

- (a) Bollards must be used only where necessary to separate pedestrians and other streetscape elements from vehicles.

8.4.4. Rubbish bins

- (a) Rubbish bins must:
- i prevent rainwater, and pest and animal access;
 - ii include an ash receptacle only when placed in locations where smoking is not prohibited by the Smoke-free Environment Act 2000 (NSW);
 - iii accommodate a minimum 80 litre wheelie bin; and
 - iv be able to be grouped and signed to provide recycling options.

8.4.5. Tree grates and guards

- (a) Tree grates and guards must:

- i be used at tree positions in all pavements in accordance with the Sydney Streets Design Code if located within the City of Sydney LGA area, or Randwick City Council Public Domain manual if located within the Randwick City Council LGA area. If not prescribed by the Council then they must be 316 stainless steel;
- ii must be integrated into the tree pit design, and be as part of a designed suite of furniture;
- iii accommodate water sensitive urban design solutions;
- iv have a non-slip surface as required to achieve the slip resistance requirement of the adjacent pavement; and
- v meet the provisions of clause 7.5 in AS1428.1.

8.4.6. Tree pit design

- (a) OpCo must ensure the following tree pit design guidelines are adhered to:
 - i the soil volume of each tree pit is to be no less than 4.8 cubic metres per tree where space permits. The following points must be considered in the calculation of available soil volumes:
 - A. the space occupied by rock or other structural pavement supports must be excluded from the soil volume calculation;
 - B. existing site soil must be included in soil volume calculations only if it can be demonstrated that the soil has acceptable physical and chemical qualities to sustain long term tree growth and tree roots have unrestricted access to it; and
 - C. the alignment of service trenches, the space they occupy, and their possible restriction of natural root spread and development must be considered in the calculation of available soil volumes;
 - ii the tree pit system must be developed with consideration of existing site constraints and the need to provide adequate soil volumes;
 - iii the tree pit design must provide uncompacted soil suitable for tree growth beneath load bearing pavements. Examples of tree pit types include vaulted systems, structural soil (either premixed or mixed in situ), continuous soil trenches, and proprietary load bearing cells and matrixes;
 - iv consideration must be given to the need for gaseous exchange and aeration of the tree pit soil, as well as future access for the provision of soil treatments or amendments if necessary;
 - v the tree pit design must allow for the natural growth and development of the trees structural root system to ensure their long term structural stability;
 - vi root barriers must only be used when absolutely necessary to protect below ground services at risk of damage. In this regard, root barriers must only be used to surround and protect individual services within the root zone, rather than inhibiting root spread in any given direction;
 - vii tree pits must be designed to allow free and natural drainage wherever existing site soil conditions allow. Additional subsoil drainage and connections to

existing storm water infrastructure must be provided when necessary, and at the advice of the urban soil consultant;

- viii the trees will require irrigation to ensure proper establishment. The irrigation may be automatically or manually delivered. The tree pit design must accommodate the preferred method of irrigation; and
- ix the potential for harvesting surface stormwater and diverting it into the tree pits must be assessed and incorporated into the design whenever feasible.

8.4.7. Surface drainage

- (a) Without limiting the requirement of Appendix 30 (*Utility Services*), OpCo must meet the following design requirements and surface drain covers must:
 - i be 316 stainless steel except in pedestrian or shared zones be cast iron;
 - ii be 316 stainless steel at all CSELR Stops;
 - iii be set flush with the adjacent pavement; and
 - iv have slip resistance equivalent to that of the adjacent pavement.
- (b) Drainage grates within pedestrian or shared area must be 'heel guard' type.
- (c) Grates and drains must not be located in primary pedestrian routes.
- (d) Grates and drains must not create hazards for high heels, bicycle wheels or wheelchairs.
- (e) Grates and drains must align with adjacent paving.
- (f) Trench grates must:
 - i be aligned parallel to CSELR Stop or building edges;
 - ii use straight linear runs and avoid the use of mitre cutting as much as possible; and
 - iii be a maximum of 200mm wide.

8.5. Bicycle parking

8.5.1. General

- (a) OpCo must meet the following bicycle parking requirements:
 - i be in accordance with AS 2890.3-1993;
 - ii have concealed footings and fixings;
 - iii be selected in accordance with the Sydney Streets Design Code if located within the City of Sydney (Cos) LGA, including the Moore Park precinct;
 - iv be selected in accordance with the Urban Element Design Manual if located within the Randwick City Council (Rcc) LGA;
 - v be a high quality and corrosion proof material; and

- vi be a consistent type and shape, but alternative shapes may be used as a feature item in consultation with the local Council.

8.5.2. Bicycle parking rails – class 3

- (a) Bicycle parking rails must:
 - i accommodate storage of two bicycles; and
 - ii enable the bike frame to be easily secured with a standard lock.

8.6. Fencing and safety screens

8.6.1. General

8.6.2. Security fence

- (a) Security fencing must:
 - i be of a height to comply with the Security Management Plan; and
 - ii be powder coated black.

8.6.3. Balustrade and Handrails

- (a) This section describes the minimum acceptable requirements for the provision of balustrades and handrails.
- (b) Balustrades and handrails must resist the working loads and be fit for purpose to withstand all dead and live loads on the balustrade elements and fixings.
- (c) Handrails on stairs and ramps must:
 - i comply with AS1428.1 and AS1428.2, with no hooked end detail;
 - ii have outer diameter between 30mm and 50mm;
 - iii have seamless joints; and
 - iv have a continuous line to the top rail and not be stepped.
- (d) Balustrades along the CSELR must have a minimum height of 1200mm.
- (e) Balustrades and handrails materials and components must meet the following requirements:
 - i aluminium:
 - A. selection of suitable aluminium alloys in profiles, sizes and grades, structural applications and applied finishes must suit the functional requirements and conditions in accordance with AS/NZS1664 and ADCA Aluminium Standards and Data - Wrought products;
 - B. extrusions must be aluminium alloy grade 6063 temper T5 or T6, in accordance with AS/NZS1866;
 - C. aluminium finishes: anodised in accordance with AS1231, to a minimum coating thickness of 25 microns;

- ii glass:
 - A. glass balustrades must be laminated glass composed of toughened and annealed glass and clear pvb interlayer(s);
 - B. glass edges must be: flat polished and arrissed. Top edges must be sealed with a flat stainless steel or aluminium strip bonded to the full thickness of the glass using a clear silicone elastomeric glazing sealant;
- iii steel: hot rolled structural bars and sections in accordance with AS3679:300 mpa;
- iv stainless steel:
 - A. weld type: butt;
 - B. internal weld category: level 2;
 - C. external weld category: class B;
 - D. welding materials: compatible with metal being welded; and
 - E. weld quality: free from imperfections such as cracks and pits. Grind and polish to give required surface finish. Continuous exposed welds.

8.6.4. Protection screens

- (a) Protection screens must:
 - i comply with the requirements of AS5100 except as noted in this Appendix;
 - ii be a minimum of 3m high above the adjacent finished pavement level; and
 - iii have integrated junctions with adjacent fencing types to form a continuous visual and secure boundary to the rail corridor.

8.7. Landscape works

8.7.1. Topsoil and mulch

- (a) OpCo must:
 - i strip and store topsoil within all disturbed works areas for reuse in the landscape works;
 - ii undertake topsoil paedology survey and analysis within each topsoil landscape and vegetation community type along the CSELR corridor. Each topsoil landscape and vegetation community type must be tested in three locations (minimum of one test per 500m³ of stripped topsoil), each with three sampling depths of A1, A2 and B1 horizon; and
 - iii obtain recommendations for topsoil conditioning and management to meet the requirements of this Appendix from an appropriately qualified professional soil scientist with expertise in revegetation. A copy of these recommendations must be provided. This data must be used in the selection and design of the proposed landscape works.
- (b) All existing topsoil re-used within landscape works must be conditioned or improved to comply with recommendations in the topsoil report by the soil scientist.

- (c) Prior to the placement of topsoil, OpCo must continuously eradicate weeds in topsoil stored for reuse. When monitoring indicates that weed cover is reduced to less than 5% cover four weeks after the last spray, a final eradication spray must be undertaken.
- (d) Finished subgrade surfaces to planting and turf areas must be cultivated to a minimum of 150mm depth immediately prior to spreading of topsoil.
- (e) All planting areas must be provided with a minimum 100mm depth of organic mulch. Place the mulch so that it is not in direct contact with tree trunks. Feather mulch away from trunks at base of root ball.
- (f) All mulch must be free of deleterious and extraneous matter, including soil, weeds, rocks, twigs and the like.
- (g) Topsoil types and depths must be provided in accordance with Table 5 and Table 6.

Table 5 Topsoil types and depths

Soil Mix Type			1	2	3
Description / intended use			'A' Horizon (Topsoil) Amenity Turf Areas	'A' Horizon (Topsoil) General at-grade planting areas	In situ 'B' Horizon (subsoil) under amenity turf areas and at-grade planting areas
CSELR Stop precinct areas – installation min depth (mm)			200	400	300
Public Domain areas– installation min depth (mm)			100	300	200
Riparian zones – installation min depth(mm)			N/A	100	Ameliorate 150
pH in CaCl ₂ (1:2) ¹			5.8 to 7.2	5.8 to 7.0	5.8 to 7.2
Electrical Conductivity (1:2) ² (dS/m)			< 0.6	< 0.9	< 0.6
Cation Balance	Sodium ³	%ECEC	< 5	< 5	< 5
		SAR	< 15	< 15	< 15
	Potassium ³	%ECEC	5 to 15	5 to 15	5 to 15
		mg/kg	N/A	150 to 390	N/A
	Calcium ³	%ECEC	60 to 75	60 to 75	60 to 75
		mg/kg	N/A	1200 to 2400	N/A
Magnesium	%ECEC	15 to 25	15 to 25	15 to 25	

Soil Mix Type			1	2	3
	³	mg/kg	N/A	120 to 365	N/A
	Aluminium ³	%ECEC	< 2	<2	<2
Ca:Mg			3 to 7	3 to 7	3 to 7
Phosphate ⁴	P sensitive planting (mg/kg)		N/A	1.6 to 5	N/A
	General plantings (mg/kg)		20 to 50	10 to 30	N/A
Ammonium + Nitrate ⁵ (mg/kg)			20 to 100	10 to 50	N/A
Sulphate ⁶ (mg/kg)			20 to 50	20 to 50	N/A
Micronutrient analysis	Iron ⁶ (mg/kg)		76 to 150	76 to 150	N/A
	Manganese ¹² (mg/kg)		20 to 50	20 to 50	N/A
	Zinc ¹² (mg/kg)		6 to 12	6 to 12	N/A
	Copper ¹² (mg/kg)		7 to 30	7 to 30	N/A
	Boron ¹³ (mg/kg)		1.1 to 2.0	1.1 to 2.0	N/A
Organic Matter ⁷ (% by mass)			2 to 8	5 to 12	< 1
Bulk Density ⁸ (kg/L)			1.0 to 1.4	0.7 to 1.2	1.2 to 1.6
Toxicity Assessment ⁹ (%)			> 70	> 70	N/A
Percentage Clay (<0.002mm) (% by mass)			<8	10 to 20	10 to 20
Maximum Particle Size (mm)			20	50	50
Large Hard Particles ¹⁰	>2mm	% by mass	< 15	<60	< 65
	>20mm		< 5	<8	< 10
	>50mm		0	<1	<1
Permeability ¹¹ (cm/hr)			20 to 60	20 to 60	> 25

Table 6 Topsoil types and depth

Soil Mix Type		4	5	6	
Description/intended use		'A' Horizon (Topsoil) on-structure planting areas	'B' Horizon (subsoil) on-structure planting areas	'B' Horizon Backfill for tree planting positions	
CSELR Stop precinct areas – installation min depth (mm)		400	800	200 around root ball	
Public Domain areas– installation min depth (mm)		N/A	N/A	200 around root ball	
Riparian zones – installation min depth(mm)		N/A	N/A	200 around root ball	
pH in CaCl ₂ (1:2) ¹		6.0 to 6.8	5.8 to 7.2	5.8 to 7.2	
Electrical Conductivity (1:2) ² (dS/m)		< 1.2	< 1.0	<0.6	
Cation Balance	Sodium ³	%ECEC	< 5	< 5	< 5
		SAR	< 15	< 15	< 15
	Potassium ³	%ECEC	5 to 15	5 to 15	5 to 15
		mg/kg	150 to 390	N/A	N/A
	Calcium ³	%ECEC	60 to 75	60 to 75	60 to 75
		mg/kg	1200 to 2400	N/A	N/A
	Magnesium ³	%ECEC	15 to 25	15 to 25	15 to 25
		mg/kg	120 to 365	N/A	N/A
Aluminium ³	%ECEC	<2	<2	<2	
Ca:Mg		3 to 7	3 to 7	3 to 7	
Phosphate ⁴	P sensitive planting (mg/kg)	1.6 to 5	N/A	N/A	
	General plantings (mg/kg)	20 to 50	N/A	N/A	
Ammonium + Nitrate ⁵ (mg/kg)		30 to 100	N/A	N/A	

Soil Mix Type			4	5	6
Sulphate ⁶ (mg/kg)			20 to 50	N/A	N/A
Micronutrient analysis	Iron ⁶ (mg/kg)		76 to 150	N/A	N/A
	Manganese ¹² (mg/kg)		20 to 50	N/A	N/A
	Zinc ¹² (mg/kg)		6 to 12	N/A	N/A
	Copper ¹² (mg/kg)		7 to 30	N/A	N/A
	Boron ¹³ (mg/kg)		1.1 to 2.0	N/A	N/A
Organic Matter ⁷ (% by mass)			15 to 25	< 1	<1
Bulk Density ⁸ (kg/L)			0.5 to 1.0	0.5 to 1.0	1.2 to 1.6
Toxicity Assessment ⁹ (%)			> 70	N/A	N/A
Percentage Clay (<0.002mm) (% by mass)			10 to 20	10 to 20	<30
Maximum Particle Size (mm)			30	30	75
Large Hard Particles ¹⁰	>2mm	% by mass	<30	<30	< 65
	>20mm		<8	<8	< 10
	>50mm		0	0	<5
Permeability ¹¹ (cm/hr)			30 to 80	> 30	>25

Notes above refer to the following standards:

¹ AS4419 (2003) Appendix D

² AS4419 (2003) Appendix D

³ Method 15A1 Rayment & Higginson (1992)

⁴ Bray N^o2

⁵ AS4419 (2003) Appendix D and Bradley et al (1983)

⁶ Method 83.1 to 83.5 Black (1983)

⁷ Total C by Leco Furnace

⁸ AS4419 (2003) Appendix B

⁹ AS4419 (2003) Appendix F

¹⁰ SESL method based on BS1377-2 (1990)

¹¹ AS4419 (2003) Appendix H

¹² Method 83-1 to 83-5 Black (1983)

¹³ Method 12C2 Rayment & Higginson (1992)

8.7.2. Planting and turf

- (a) OpCo must engage a suitably qualified arborist to assess the condition of any existing trees to be retained and must adopt any recommended treatments and protection measures proposed to maximise the health and longevity of retained trees.
- (b) All groundcovers and grasses used in the Project must be planted at a density of six plants/m² and have a minimum 150mm diameter container size.
- (c) All shrubs used in the Project must be planted at a density of four plants/m² and have a minimum 75mm diameter container size.
- (d) All trees used in the permanent landscaping must have a minimum container size of 200 litres.
- (e) Seeding must not be used except for temporary stabilisation.
- (f) Turf species used must satisfy the following criteria:
 - i be demonstrably drought tolerant;
 - ii be suited to local climatic conditions;
 - iii be capable of maintaining a consistent leaf height of 25-50mm;
 - iv provide a consistent leaf colour presentation year round; and
 - v be hard wearing and suitable for high pedestrian traffic.
- (g) OpCo must use the plant species and application requirements in Tables 7, 8, and 9 as the basis for all planting schemes.

Table 7 Trees

TREE SPECIES	COMMON NAME	CBD						SURRY HILLS & MOORE PARK				KENSINGTON & KINGSFORD				RANDWICK								
		Streets			Parks	Streets	Parks			Streets	Stops			Streets		Parks								
		Alfred Street	George Street	Rawson Place	Eddy Avenue	Chalmer Street	Devonshire Street	Park on Chalmer Street	Devonshire Street	Ward Park, Surry Hills	Olivia Gardens & Wimbo Park	Moore Park West	Moore Park East	Anzac Parade	Carlton Street	Todman Avenue	UNSW – Anzac Parade	Strachan Street	Kingsford	Alison Road	Wansey Road	High Street	George Dan Reserve	High Cross Park
<i>Agathis robusta</i>	Queensland Kauri												X						X					X
<i>Agonis flexuosa</i>	Willow-leaved Peppermint Myrtle																							X
<i>Allocasuarina littoralis</i>	Black Sheoak								X															
<i>Angophora costata</i>	Smooth-barked Apple																			X			X	
<i>Araucaria columnaris</i>	Cook Pine																							X
<i>Araucaria heterophylla</i>	Norfolk Island Pine																							X
<i>Celtis australis</i>	European Nettle Tree																							
<i>Corymbia citriodora</i>	Lemon-scented gum																				X			X
<i>Elaeocarpus reticulatus</i>	Blueberry Ash								X															
<i>Eucalyptus haemastoma</i>	Scribbly gum																			X				X
<i>Ficus macrophylla</i>	Morton Bay Fig											X	X											X
<i>Ficus microcarpa var. hillii</i>	Hills Weeping Fig											X	X											
<i>Ficus rubiginosa</i>	Port Jackson Fig												X			X								X
<i>Gleditsia triacanthos 'Sunburst'</i>	Honey Locust							X																
<i>Jacaranda mimosifolia</i>	Jacaranda							X																
<i>Liriodendron tulipifera</i>	Tulip Tree					X	X	X	X															
<i>Livistona australis</i>	Cabbage Tree Palm											X	X	X	X	X	X	X						
<i>Lophostemon confertus</i>	Brush Box						X					X		X	X	X	X	X	X	X	X	X	X	X
<i>Pistachio chinensis</i>	Chinese Pistache																							X
<i>Platanus acerifolia</i>	London Plane	X		X	X	X									X	X	X	X						
<i>Podocarpus elatus</i>	Illawarra Pine																							X
<i>Sapium sebiferum</i>	Chinese Tallow																							X
<i>Tristaniopsis laurina</i>	Water Gum								X															X
<i>Washingtonia robusta</i>	Mexican Fan Palm											X												
<i>Zelkova serrata</i>	Japanese Zelkova	X																						

Table 8 Shrubs

SHRUB SPECIES	COMMON NAME	CBD						SURRY HILLS & MOORE PARK				KENSINGTON & KINGSFORD				RANDWICK							
		Streets					Parks	Streets	Parks			Streets	Stops			Streets	Parks						
		Alfred Street	George Street	Rawson Place	Eddy Avenue	Chalmer Street	Devonshire Street	Park on Chalmer Street	Devonshire Street	Ward Park, Surry Hills	Olivia Gardens & Wimbo Park	Moore Park West	Moore Park East	Anzac Parade	Carlton Street	Todman Avenue	UNSW - Anzac Parade	Strachan Street	Kingsford	Alison Road	Wansey Road	High Street	George Dan Reserve
<i>Agapanthus africanus</i>	African Lily							X	X	X													X
<i>Alternanthera dentata</i>	Ruby Leaf								X				X										X
<i>Asplenium australasicum</i>	Bird's Nest Fern								X														
<i>Banksia marginata</i>	Silver Banksia																						X
<i>Banksia spinulosa</i>	Hairpin Banksia																						X
<i>Callistemon citrinus</i>	Crimson Bottlebrush							X															X
<i>Carrisa 'Emerald Star'</i>	Natal Plum							X					X										X
<i>Ceratopetalum gummiferum</i>	NSW Christmas Bush							X															X
<i>Clivia miniata</i>	Kaffir Lily								X	X													
<i>Correa alba</i>	Coast Correa																						X
<i>Crinum pedunculatum</i>	Crinum Lily							X	X	X													
<i>Doryanthes excelsa</i>	Gynea Lily							X	X	X													X
<i>Eriostemon australasius</i>	Pink Wax Flower																						X
<i>Fatsia japonica</i>	Japanes Aralia								X														
<i>Hibbertia aspera</i>	Rough Guinea Flower							X	X	X													X
<i>Leptospermum polygalifolium</i>	Lemon Scented Tea Tree																						X
<i>Phormium tenax</i>	New Zealand Lily								X	X													
<i>Raphis excelsa</i>	Boadleaf Lady Palm							X	X														X
<i>Strelitzia reginae</i>	Bird of Paradise Plant							X	X														X
<i>Syzygium smithii</i>	Lilly Pilly							X	X	X													X
<i>Westringia fruticosa</i>	Coast Rosemary																						X

Table 9 Grasses and groundcovers

GRASSES & GROUNDCOVERS SPECIES	COMMON NAME	CBD								SURRY HILLS & MOORE PARK				KENSINGTON & KINGSFORD				RANDWICK									
		Stops							Parks	Stops		Parks		Stops				Streets		Parks							
		Circular Quay	Grosvenor Street	Wyndham	Queen Victoria Building	Town Hall	World Square	Rawson Place	Central Station	Park on Chalmers Street	Surry Hills	Moore Park	Ward Park, Surry Hills	Olivia Gardens & Wimbo Park	Moore Park West	Moore Park East	Carlton Street	Todman Avenue	UNSW – Anzac Parade	Strachan Street	Kingston	Royal Randwick Racecourse	Alison Road	UNSW High Street	Randwick	George Dan Reserve	High Cross Park
<i>Dianella caerulea</i>	Blue Flax Lily								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Dianella revoluta</i>	Mauve Flax Lily								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
<i>Dichelachne crinita</i>	Long Hair Plume Grass								X	X					X	X	X	X	X	X	X	X	X				
<i>Hedera helix</i>	English Ivy								X		X	X	X	X													
<i>Hypericum japonicum</i>	Matted St John's Wort										X	X															
<i>Imperata cylindrical</i>	Blady Grass								X	X	X		X		X	X	X	X	X	X	X	X	X	X		X	
<i>Lomandra glauca</i>	Pale Mat Rush											X		X													
<i>Lomandra longifolia</i>	Spiny Mat Rush								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
<i>Lomandra multiflora</i>	Many-flowered Mat Rush								X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	
<i>Microlaena stipoides</i>	Weeping Meadow Grass								X	X		X		X	X	X	X	X	X	X	X	X	X	X		X	
<i>Patersonia sericea</i>	Silky Purple Flag																									X	
<i>Philodendron xanadu</i>	Xanadu								X		X	X					X								X	X	
<i>Trachelospermum jasimonides</i>	Native Jasmin										X	X	X	X								X	X	X		X	
SEDGES																											
<i>Baumea articulata</i>	Jointed Twig Rush										X	X									X	X	X	X	X	X	
<i>Baumea rubiginosa</i>	Soft Twig Rush										X	X									X	X	X	X	X	X	
<i>Carex appressa</i>	Tall Sedge										X	X									X	X	X	X	X		
<i>Gahnia clarkei</i>	Sword Sedge										X										X	X	X	X			
<i>Isolepis nodosus</i>	Knobby Club-rush										X	X									X	X	X	X	X		
<i>Juncus usitatus</i>	Common Rush										X	X									X	X	X	X	X	X	

8.8. Concrete finishes

- (a) This section describes the minimum acceptable requirements for the provision of concrete finishes.
- (b) Formwork design and construction for formed surface finishes must be in accordance with AS3610.
- (c) OpCo must provide finishes to formed and unformed concrete surfaces which are:
 - i appropriate to the importance (visual or physical) of the concrete elements;
 - ii compatible with subsequent trades and finishes; and
 - iii compatible with the uses and functions.

8.9. Unit Paving

- (a) Unit paving installations must meet the following requirements:
 - i bedding and grouting mortar: use a mix which is suitable for the stone type and must contain an admixture which prevents efflorescence and leaching; and
 - ii stone finishing: after paving installation is complete and thoroughly cleaned, apply a stone surface enhancer and hardener.
- (b) Any granite must be in accordance with AS3958 and AS/NZS4455.
- (c) Any blue stone must be in accordance with AS4459.
- (d) Natural stone pavements to be coordinated with structural and services requirements.
- (e) Stone paving must be tested in accordance with the standards listed in Table 10.

Table 10 Testing standards for stone paving

Property to be tested	Test standard
Unconfined compressive strength (dry and saturated): intact rock core specimens	ASTM D7012
Unconfined compressive strength (dry and saturated): dimension stone	ASTM C170
Surface absorption rate	ASTM C97
Porosity	ASTM C97
Wet and dry density	ASTM C97
Modulus of rupture	ASTM C99
Sodium sulphate soundness	
Flexural strength	ASTM C880

8.10. Painting

- (a) This section describes the minimum acceptable requirements for the provision of painting.
- (b) Coating systems to substrates must meet the following requirements:
 - i consistent in colour, gloss level, texture and dry film thickness;
 - ii free of runs, sags, brush marks, blisters, or other discontinuities;
 - iii paint systems fully opaque;
 - iv clear finishes at the level of transparency consistent with the product;
 - v fully adhered;
 - vi resistant to environmental degradation within the manufacturer's stated life span; and
 - vii meet any specified performance requirements.
- (c) Painting processes in their entirety must be carried out in accordance with the published recommendations and instructions of each respective manufacturer.
- (d) Unless recommended otherwise by the manufacturer, each paint system must consist of at least 3 coats.
- (e) Paints and other materials must comply with Australian Paint Approvals Scheme specifications and are scheduled in the APAS "List of Approved Products".
- (f) Paints from different manufacturers must not be combined in a paint system.
- (g) Paint systems must comply with the requirements of appendix P Uniform Paint Standard to the Standard for the Uniform Scheduling of Drugs and Poisons.

8.11. Steel paint coatings

- (a) This section describes the minimum acceptable requirements for the provision of high performance coatings to the following steelwork elements:
 - i external steelwork (exposed); and
 - ii external steel cladding framing (concealed).
- (b) Steel paint coatings must meet the following requirements:
 - i standards:
 - A. surface preparation and coating in accordance with AS/NZS2312;
 - B. metal finishing: preparation and pre-treatment of surfaces in accordance with AS1627.0;
 - C. corrosion protection in accordance with AS/NZS2312;
 - ii manufacturer's instructions:

- A. the complete scope in this section must be carried out in accordance with the manufacturer’s published recommendations and instructions for each coating system;
- B. supply coating materials and accessories in accordance with paint manufacturers recommendations;
- iii protective and decorative coatings must:
 - A. provide functionality and maintainability;
 - B. retain substrate integrity for the design life through successive maintenance paintings;
 - C. minimise the average cost of service for corrosion protection;
 - D. lower risk to personnel, the public and the environment; and
 - E. retain or enhance aesthetics where appropriate.
- (c) OpCo must conform to the requirements and recommendations of the coating manufacturer in all respects of applying steel paint coatings.
- (d) Durability of steel paint coatings must be in accordance with Table 11.

Table 11 Durability of steel paint coatings

Condition	Durability to ISO 12944	Environment classification
External steelwork (exposed)	High durability	C5M
Internal steelwork (exposed)	High durability	C1
External steel cladding framing (concealed)	High durability	C5M
Internal steelwork (concealed)	High durability	C1

8.12. Metalwork and metal fixtures

- (a) This section describes the minimum acceptable requirements for the provision of miscellaneous architectural metalwork and metal fixtures.
- (b) Metal fixtures and associated work must:
 - i comply with relevant Standards, the BCA and regulations of Authorities;
 - ii be durable and remain intact and serviceable under the in-service operating conditions of the installation;
 - iii withstand the in-service imposed loads without impairment of performance;
 - iv provide adequate means of dealing with corrosion;
 - v provide adequate means of dealing with thermal movement and differential movement;

- vi provide and maintain the design lines, section profiles and stiffness of components; and
 - vii satisfy other performance criteria where specified.
- (c) Design dead and live loads must be in accordance with AS/NZS1170.1 and AS/NZS1170.2, or in accordance with statutory regulations, whichever are the most stringent.
- (d) Design loads for balustrades must be in accordance with AS/NZS1170.1 Table 3.3.

8.13. Testing Requirements

- (a) The Design Documentation must include independent test results for proposed paving materials.
- (b) Prior to paving construction, submit independent test results of paving product samples for batches utilised in the works, and independent test results of as-built paving.
- (c) Submit wet and dry slip test results for all paving materials at the time of construction to verify compliance with the relevant codes and standards.
- (d) Prior to paving construction, submit luminance test results for stair nosings, tactile ground surface indicators and street furniture in compliance with AS1428.1 and AS1428.2.
- (e) Submit independent test results of as-built exposed structural steel paintwork to verify compliance with the SPR.

9. Design Documentation

9.1. General

- (a) In addition to the requirements elsewhere in the SPR, OpCo must also provide the following specific Design Documentation for each construction material, finish and fixture, including:
- i manufacturer's recommended cleaning methodology;
 - ii maintenance requirements and frequency of maintenance;
 - iii repair or replacement methodology; and
 - iv design life to refurbishment or replacement.

9.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the Public Domain areas must include:
- i drawings and specifications:
 - A. for all landscape and Public Domain elements OpCo must provide:1:500 site plans and site sections;
 - B. 1:250 (A1) plans, sections, and elevations defining the layout, construction, materials, finishes of the architectural works;
 - C. typical sketch details and wall sections of major landscape architectural elements including walls, cladding, paving, vertical transport elements, signage, lighting, heritage items;
 - D. preliminary finishes schedule;
 - E. drawings must show key dimensions, primary service routes, relationship of public spaces, service facilities and future surrounding developments;
 - ii a design report, in accordance with the SPR and the following specific deliverables:
 - A. a description and illustration of look, feel and function of the Public Domain areas;
 - B. a description and illustration of each Public Domain precinct;
 - C. a description of impacts of the Public Domain structures on the existing context including size, landscape, massing, scale, heritage, view corridors, solar access, wind, access, traffic and transport circulation networks;
 - D. access plans identifying current and future pedestrian desire lines and key movement corridors;
 - E. relationship of Public Domain works with related adjacent development;
 - F. heritage impact report describing the compliance of the design with all relevant heritage legislation and Environmental Impact Statements;
 - G. access, cleaning and maintenance strategy;

- H. preliminary accessibility plan and report to demonstrate compliance with the Disability and Discrimination Act 1992, BCA and Australian Standards and the Disability Standard for Accessible Public Transport;
 - I. preliminary crime prevention through environmental design review and report;
 - J. lighting design strategy describing the objectives, themes, strategies and implementation of the lighting design;
 - K. Public Domain specific sustainability provisions;
- iii the following visualisation material fully coordinated with the drawings and design report, as a minimum:
- A. a photorealistic 3D flythrough of each CSELR Stop and precinct illustrating the context, external architectural and Public Domain design;
 - B. photorealistic still images describing the internal and external CSELR Stop spaces including Public Domain, circulation and platform areas;
 - C. photorealistic still images of describing the external service / egress buildings;
- iv for each CSELR Stop demonstrate compliance with the requirements of the SPR;
- v describe the sustainable design features and initiatives of the architectural and Public Domain design and compliance with the SPR;
- vi describe the integration of the landscape architectural design with related developments surrounding the Public Domain by others, and with future links to adjacent properties, interchanges;
- vii a preliminary materials, finishes and fixtures boards and a schedule, describing:
- A. product type, finish, colour, size, thickness and method of fixing;
 - B. manufacturer code number;
 - C. technical data, including test results to confirm compliance with this Appendix;
 - D. design life to replacement or refurbishment;
 - E. cross reference location of all materials and finishes on architectural drawings and schedules;
 - F. maximum replacement times from the time of damage; and
 - G. examples, including Quality Benchmarks, in existing installations where the proposed fitting and fixture has been used and demonstrating its suitability for the Project in terms of robustness, withstanding wear and tear and maintaining appearance over the design life.

9.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for Public Domain areas must include:

- i 1:100 (A1) plans, sections, and elevations fully defining the layout, preliminary construction method, materials, finishes of the Public Domain works;
 - ii typical details of Public Domain area elements including walls, cladding, paving, vertical transportation elements, signage, lighting, heritage items; and
 - iii preliminary technical specifications.
- (b) Submit samples of all materials, finishes, fixtures and fittings visible within Public Domain areas with specification, design life and maintenance details for each.

9.4. Design Stage 3 Design Documentation

- (a) Design Stage 3 Design Documentation for the Public Domain areas must include:
 - i 1:100, 1:50, 1:20 (A1) plans, sections, elevations fully documenting the layout, final construction method, materials, finishes of the architectural and public domain works;
 - ii full construction detailing;
 - iii coordinated services drawings for all Public Domain areas; and
 - iv final technical specifications.



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Schedules Part E (Volume 2 of 4)

December 2014



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Schedule E1 Scope and Performance Requirements

Appendix 15 – Branding, Wayfinding, Signage and Customer Information

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1. Overview and scope

1.1. General

- (a) This Appendix describes the design objectives, scope and performance requirements for branding, wayfinding and signage, and Customer information for SLR including CSELR Stops, interchanges, Public Domain, Light Rail Stabling and Maintenance Facilities and LRVs.
- (b) OpCo may use TfNSW brands, wayfinding design elements together with associated styles and templates for application, including typeface, logo, pictograms, maps and other communication devices only in accordance with this Appendix.
- (c) OpCo must comply with TfNSW specified requirements for branding, wayfinding (including signage) and Customer information.

1.2. Scope

- (a) OpCo must:
 - i. procure, build, install, maintain and provide sufficient locations for static and dynamic signage in accordance with TfNSW Wayfinding Guidelines;
 - ii. direct Customers to TfNSW information sources when necessary;
 - iii. report any issues and problems with Customer information (including static signs and printed material) to TfNSW in a timely way and consult with TfNSW for effective resolution of these issues;
 - iv. coordinate the wayfinding requirements with the design of CSELR Stops and the Public Domains;
 - v. only use sign types from the Light Rail Kit of Tools and Wayfinding Guidelines or as otherwise approved by TfNSW;
 - vi. only use TfNSW approved naming systems; and
 - vii. only use maps, timetables and templates approved by TfNSW.
- (b) OpCo must:
 - i. apply the Light Rail Wayfinding Guidelines coordinating signs and Customer information elements with other equipment and services;
 - ii. submit wayfinding signage proposals, during design and operation for regular consultation and review with TfNSW;
 - iii. be responsible for obtaining all Authority approvals;
 - iv. procure, build, install, maintain and update all signage and wayfinding as required; and
 - v. allow for easy updating of all permanent and printed signage and Customer information in line with any service changes, foreseeable or otherwise.

- (c) OpCo brand(s) must be only placed on Customer-facing elements as a co-brand to the TfNSW mode brand in formats, locations and relative scales in accordance with TfNSW Wayfinding Guidelines.

2. Branding

2.1. General

- (a) OpCo must ensure that elements described in 1.1(a) incorporate the TfNSW brand for the mode of service. The brand must be applied in a manner that enables the SLR to be identified as part of Sydney's integrated public transport network.
- (b) OpCo must create a visual language and use a colour palette in its design and finishes that is consistent with the colour palette in the TfNSW Light Rail Kit of Tools.
- (c) OpCo must not use bold primary colours or another distinctive colour scheme unless it can be demonstrated that it is complementary to and / or consistent with the TfNSW Light Rail Kit of Tools and brand styles.
- (d) OpCo may include the brand style in elements of the built environment and Customer-facing infrastructure and operating equipment, subject to consultation with TfNSW.

2.2. Brand applications

2.2.1. CSELR Stops and Public Domain

- (a) Any OpCo brand placement must be co-branded with the relevant TfNSW brand, and in a format and relative scale in accordance with the TfNSW Wayfinding Guidelines.

2.2.2. LRVs

- (a) OpCo must comply with TfNSW Livery Specifications for Light Rail Vehicles.
- (b) OpCo must provide:
 - i. information for Customers about any special services or conditions in the LRV (e.g. emergency Help Points) or pertaining to the seating area (e.g. marking preference seating for certain Customers);
 - ii. notices to Customers as to required behaviours and potential sanctions; and
 - iii. safety information that shows emergency routes and exits clearly and instructions for use of emergency equipment and devices.
- (c) OpCo must provide the LRV designs in accordance with the TfNSW Wayfinding Guidelines and the TfNSW Brand Strategy:

2.2.3. Uniforms, on-line, print, promotional and other materials

- (a) OpCo must ensure that all Customer-facing surfaces on vehicles, equipment, electronic displays, printed, promotional or other branded materials display the relevant TfNSW mode brand and OpCo brand in a manner that complies with the TfNSW Light Rail Kit of Tools.

3. Wayfinding and signage

3.1. General

- (a) OpCo must procure, build, install, operate and maintain on the SLR, a set of maps, signage and other wayfinding elements that comply with the TfNSW Wayfinding Guidelines and utilises its various components in a manner that enables Customers to easily navigate the SLR and the wider public transport network for Sydney.
- (b) All finishes, fixtures, furnishings and equipment must be consistent with the TfNSW Light Rail Kit of Tools and comply with TfNSW Wayfinding Guidelines.
- (c) OpCo must ensure that the physical design of the CSELR Stops and Public Domain, and the arrangement of furniture and equipment, provides an intuitive aid to wayfinding.
- (d) OpCo must procure, install, operate and maintain local area information at each CSELR Stop that enables efficient wayfinding within the local Public Domain.

3.2. Wayfinding: functional requirements

- (a) OpCo must design and install on CSELR, and operate and maintain on the SLR, a wayfinding and signage system that:
 - i. ensures Customers can easily identify and recognise the service, know how to gain access and exit, how to pay for travel, how to navigate through the SLR, and that provides clear, conspicuous, unambiguous information;
 - ii. enables Customers to easily locate and identify key areas, including: CSELR Stop Access Points, ticketing area, help point, vertical circulation, interchanges between other modes, streets and local landmarks;
 - iii. positions wayfinding signage such that it:
 - A. is placed consistently in all CSELR Stops in a manner that can be easily identified and understood by Customers from all expected viewing locations;
 - B. maximises sighting distances and takes account of Customer sight lines;
 - C. avoids congestion around pinch-points and areas of heavy Customer use; and
 - D. is integrated, where possible and where required, into the CSELR Stop canopy as per Appendix 13 (*Stops*);
 - iv. provides a clear indication of the location of help points, ticketing equipment (including CLDs), and any other relevant Customer facilities;
 - v. informs Customers of rules and procedures, such as non-smoking;
 - vi. ensures that advertising or other visual display materials do not interfere with, hinder or obstruct way-finding or other signage, and where present are in harmony with wayfinding, signage and other CSELR Stop design elements; and
 - vii. coordinates signage to ensure clarity and not cause contradiction or confusion.

3.3. Wayfinding and signage: CSELR Stops and Public Domain

- (a) Wayfinding and signage must not impact on the continuous access path requirements at each platform, to meet DDA statutory requirements and DSAPT requirements. The types of signs required, and their respective locations, must comply with the TfNSW Wayfinding Guidelines.
- (b) OpCo must provide sufficient wayfinding and signage to direct Customers to connecting modes of transport, where applicable.
- (c) OpCo must, as a minimum, direct Customers from the nearest cross streets to the relevant CSELR Stop, where required.

3.4. Wayfinding and signage: LRVs

- (a) OpCo must provide within each LRV, a system of signage and maps including:
 - i. dynamic Customer information, including next CSELR Stop;
 - ii. network map and information access; and
 - iii. line map.

3.5. Wayfinding and signage: operating requirements

- (a) OpCo must at all times:
 - i. maintain all signage in good condition, clearly legible, sufficiently illuminated to be clearly legible at night, clean and Graffiti free;
 - ii. update and replace signage as necessary to accurately reflect changes in operations, services or any other changes as instructed by TfNSW; and

promptly remove any unauthorised signs, stickers and notices and restore the surface on which they were installed.

4. Customer information

4.1. General

- (a) OpCo must ensure that the physical design of the CSELR Stops and Public Domain, and the arrangement of space provides for information display including noticeboard displays.

4.2. Customer information: functional requirements

- (a) OpCo must:
- i. provide static Customer information displays on CSELR Stop platforms, in locations that are easy for Customers to read and are protected from the weather;
 - ii. provide dynamic passenger information display(s) on all CSELR Stop platforms, that can be viewed from anywhere on the platform, as specified in Appendix 23 (*Communication Systems and Passenger Information*);
 - iii. ensure that Customer information about service status is displayed clearly, accurately, according to relative importance and in a timely manner to ensure that Customers are informed before they begin their journey as well as at all key decision points; and
 - iv. ensure the information provided is integrated and coordinated with the services of other transport operators to provide a holistic view of the local transport network and assist Customers to make seamless interchanges.

4.3. Customer information: dynamic signage

- (a) OpCo must provide Passenger Information Displays (PIDs) at the following locations:
- i. on each platform of every CSELR Stop such that a PID is visible and legible from all Customer waiting areas on the platform;
 - ii. in queuing areas for special event CSELR Stops (Central Station, Moore Park and Royal Randwick Racecourse); and
 - iii. on bus platforms at Kingsford, Randwick and Rawson Place interchanges.
- (b) Where LRVs in the same direction may depart from more than one platform, the PIDs must show from which platform the next service will depart.
- (c) OpCo must ensure all PIDs:
- i. are positioned such that they can be viewed from all customer waiting areas on the platform;
 - ii. are capable of displaying a range of font sizes and colours sufficient to enable high levels of legibility and visibility from all parts of the platform;
 - iii. have a matt finish, when suspended;
 - iv. when suspended, are not placed against a light source; and

- v. are positioned so as to enable clear unimpeded legibility.
- (d) For every dynamic sign at CSELR Stops and on board LRVs OpCo must provide digital voice announcements to Customers.

4.4. Customer information: Special Event signage

- (a) OpCo must ensure that temporary Special Event signage is installed prior to the commencement of a Special Event, and removed after the completion of a Special Event.
- (b) OpCo must ensure that all temporary signage is safely and securely installed and will not impact on permanent works when removed.

4.5. Customer information: operating requirements

- (a) OpCo must at all times:
 - i. maintain all static and dynamic Customer information displays in good condition, fully functional, properly illuminated, clean and graffiti free;
 - ii. update and replace signage as necessary to accurately reflect changes in operations, services or other changes, as required or as instructed by TfNSW;
 - iii. place any printed or digital marketing material according to sizes, zoning principles and locations as specified within the TfNSW Light Rail Wayfinding Guidelines;
 - iv. ensure there is sufficient stock available of printed materials to meet Customer demand, keep those printed materials current and promptly replace them on update; and
 - v. maintain a database of all printed materials installed on the system, and provide a copy to TfNSW in a timely way.

5. Design Documentation

5.1. General

- (a) OpCo must also provide at Design Stage 1, a report that demonstrates how the design complies with the specification and performance requirements for brand (including OpCo co-branding), wayfinding, signage and Customer information.



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Schedule E1 Scope and Performance Requirements
Appendix 16 – Road Works

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Attachment 1: CSELR Road and Traffic Requirements

Attachment 2: CSELR Traffic Signal Delay

1. Overview and Scope

1.1. General

- (a) This Appendix describes the scope and performance requirements of road works necessary to deliver the SLR.

1.2. Scope

- (a) OpCo must design and deliver all road works necessary to meet the performance requirements of the SLR Project and ensure integration of the SLR Works with the existing road network.
- (b) The scope of works for the road works includes modifications to existing road and road related infrastructure and establishment of new road and road related infrastructure within the SLR Site to accommodate the SLR, including:
- i road pavements for use by road vehicles, including access for operation and maintenance of the SLR;
 - ii driveways and property accesses;
 - iii footpaths, shared paths and cycleways;
 - iv signalised intersections, including integration with the light rail signalling and movement control system requirements;
 - v non-signalised intersections;
 - vi street lighting;
 - vii street furniture including safety barriers;
 - viii signage and delineation;
 - ix fencing of the road/light rail corridor where required; and
 - x coordination and integration of road works with the scope and performance requirements of all other work elements.
- (c) OpCo must design and construct coordinated road works infrastructure in accordance with the requirements of Schedule B3 (*Requirements of Third Parties*).
- (d) OpCo must design and construct coordinated road works infrastructure in accordance with the documented requirements and guidelines of the relevant Authority and asset owners.

2. Performance and Technical Requirements

2.1. General

- (a) OpCo must comply with the requirements set out in this Appendix, including the supplementary operational requirements defined in Attachment 1: CSELR Road and Traffic Requirements.
- (b) All road works and associated civil works must be carried out in accordance with the relevant Authority or asset owner's documented requirements and guidelines.
- (c) OpCo must design and construct the SLR Works and the Temporary Works such that disruption of traffic during construction is minimised.
- (d) OpCo's road works must be in accordance with Appendix 11 (*TfNSW General Specifications*) and the Standards and Guidelines.
- (e) At Design Stage 1 OpCo must demonstrate that the road works civil design is fully integrated with the design of the SLR Works and the other design disciplines.
- (f) The minimum clearance between the outer LRV DKE and the edge line or kerb line of adjacent roadway lanes, existing surfaces, utilities or other objects / structures must be as specified in Appendix 17 (*Trackwork*).
- (g) Simulation must be provided for each of the specified design vehicles at the specified design speed to demonstrate safe stopping sight distance and clearances have been achieved.
- (h) Existing access to adjacent properties shall be maintained except as noted otherwise in Attachment 1.

2.2. Signalised intersections and signalised pedestrian / cyclist crossings

- (a) OpCo must design and install / modify traffic signals at the intersections and pedestrian / cyclist crossing points set out in Attachment 1. The intersection and traffic signal layouts shall be in accordance with the functional layouts shown and described in Attachment 1 with LRV timings and priority as described in Attachment 2.
- (b) All existing CCTV at intersections must be retained.
- (c) All new traffic signals and changes to existing traffic signals and new traffic signals must comply with RMS requirements and the requirements of Appendix 21 (*Signalling and Movement Control*).
- (d) OpCo must provide a connection at the relevant traffic controller unit from all newly installed and modified traffic signals and CCTV to the Sydney Coordinated Adaptive Traffic System (SCATS).
- (e) New or modified traffic signals systems must:
 - i accommodate all LRV, motor vehicles, pedestrian, bicycle and other public transport movements as shown in Attachment 1;

- ii provide facilities at all signalised intersections to allow for the safe passage of pedestrians and cyclists at the locations nominated in Attachment 1;
 - iii make provision for both pedestrians and cyclists where a shared path crosses at the signals;
 - iv maintain existing access to adjacent properties;
 - v provide specific signals for the LRV driver for vehicle phasing and directions;
 - vi be designed and installed by competent traffic signal designers and installers experienced in similar traffic signal installations in accordance with RMS requirements; and
 - vii continue to operate automatically under local personnel control during a communications loss with SCATS.
- (f) Signalling and movement control requirements must be fully integrated with the design and installation of traffic signals for road vehicles, pedestrians and cyclists.
- (g) To the extent of any ambiguity or inconsistency between this Section 2.2.2 and the requirements of Appendix 21 (*Signalling and Movement Control*) in relation to the design and installation of traffic signals, the requirements of this Section 2.2.2 will prevail.

2.3. Other pedestrian and cyclist facilities

- (a) The SLR Works (including the Temporary Works and operations and maintenance) must allow for the safe passage of pedestrians and cyclists:
- i along and across the site to publicly accessible areas;
 - ii through and across the works within the public road network; and
 - iii to and from adjacent properties.
- (b) Additional location-specific requirements for pedestrians and cyclists must be as set out in Attachment 1.

2.4. Design vehicles

- (a) Road geometry must accommodate traffic movements for the largest vehicle able to use the public road network (without permit) in accordance with the RMS Supplements to the Austroads Guide to Road Design. It is acceptable for the design vehicle to encroach upon the tracks during the turning movements.
- (b) Provision shall be made for B-double and over-dimensioned vehicles along any designated B-double and over-dimensional routes shown in the RMS Restricted Access Vehicle Map Service:
http://www.rms.nsw.gov.au/heavyvehicles/oversizeovermass/rav_maps.html
- (c) Where there is an exception permitting a smaller design vehicle than defined above, the exception is identified in the design vehicle section of Attachment 1.

2.5. Design speed

- (a) The design speed for all roads shall be 10km/h in excess of the nominated posted speeds as defined in Attachment 1. Where existing conditions do not achieve these design speeds, the alignment shall be made no worse than existing.

2.6. Traffic lanes and footways

- (a) Normal minimum and desirable traffic lane widths are shown in Table 1.
- (b) Due to corridor width constraints there are some locations where it may not be possible to achieve the minimum requirements set out in Table 1. Where this is the case, Attachment 1 identifies the minimum widths that may be adopted. Notwithstanding the minimum widths identified in Attachment 1, every effort must be made to achieve the minimum widths set out in Table 1. OpCo must identify in the Stage 1 Design Documentation the actual widths achieved at each location where it is not possible to achieve the minimum requirements in Table 1.
- (c) OpCo must also identify in the Design Documentation any other locations where the minimum requirements in Table 1 have not been achieved.

Table 1 Minimum and desirable lane and footway widths

Location	Minimum (m)	Desirable (m)
Kerbside lane including kerbside bus lanes <i>(i) and (ii)</i>	3.2	3.5
Other lanes <i>(i) and (ii)</i>	3.0	3.5
Bus Stops	3.0	3.5
Parallel Parking	2.7	2.8
State Roads – Footway (face of kerb to edge of road reservation) <i>(iii)</i>	3.0	3.5
Regional Roads – Footway (face of kerb to edge of road reservation) <i>(iii)</i>	3.0	3.5
Local Roads – Footway (face of kerb to edge of road reservation) <i>(iii)</i>	3.0	3.5

Notes:

- (i) Widths for kerbside lanes measured to face of kerb.*
- (ii) Minimum lane widths are to be no less than existing except where noted in Attachment 1.*
- (iii) Width to be increased where high pedestrian volumes are anticipated, as noted in Attachment 1.*
- (iv) Where existing lane widths are less than the minimum noted in Table 1 and the lanes are not directly affected by the works, then existing lane widths may be retained.*

2.7. Side friction

- (a) Side friction factors in accordance with the RMS Supplements to the Austroads Guide to Road Design must be used in the determination of horizontal curve geometry.

2.8. Crossfalls and grades

- (a) The following requirements apply:
- i minimum desirable and maximum crossfalls and grades shall be in accordance with Table 2;

Table 2 Minimum and desirable crossfalls and grades

Lane Type	Minimum	Desirable Maximum	Absolute Maximum
Traffic lane cross fall (except at transitions)	2.5%	3%	5%
Footpath cross fall	1%	2.5%	4%
Roadway longitudinal grades	0.3%	4%	7%

- ii where existing grades and crossfalls are outside the limits in Table 2 exceptions may be permitted subject to minimising any worsening of the existing situation;
- iii OpCo must provide justification where desirable maximum crossfalls and grades cannot be practically achieved and absolute maximums have been used instead;
- iv rate of rotation for design speed less than or equal to 80 km/ h = 3.5%/ sec of travel;
- v rate of rotation for design speed greater than 80 km/ h = 2.5%/ sec of travel;
- vi rate of rotation for roads used by B-double vehicles shall be 2.5%; and
- vii roadway longitudinal grades must generally be no greater than existing grades. Any localised increases in grades must be minimised.

2.9. Sight distances

- (a) The horizontal and vertical sight distance for roads must comply with the requirements of the RMS Supplements to the Austroads Guide to Road Design for the specified design speeds. Sight distances for cars must be checked using the following criteria:
- i height of driver eye 1.10 m;
 - ii height of object 0.2 m, or 0.0m approaching intersections; and
 - iii reaction time 1.5 seconds.

2.10. Clearances

2.10.1. Vertical clearances

- (a) Minimum vertical clearances required for the SLR Works from the surface of the roads and shoulders to the soffits of structures, or underside of plant, equipment or fittings must be in accordance with Table 3.

Table 3 Minimum Vertical Clearances

Location	Minimum Vertical Clearance (m) (i)
New bridge structures over roads	5.5 (ii) 4.65 (Eastern Distributor)
Existing structures and new structures over roads which are extensions of an existing structure	Existing clearance from finished surfaces to be maintained
SLR overhead wiring over roads	Refer Appendix 29 (<i>Traction Power, Electrification Systems and Control</i>)
Above shared use paths and footpaths	2.5
Underpasses for shared use paths and footpaths and bridges above shared use paths and footpaths	3.0

Notes:

(i) All Vertical clearances must allow for future pavement and structure widening.

(ii) Includes an additional clearance of 100mm for future pavement overlays.

2.10.2. Lateral clearances

- (a) Lateral clearance from the edge of the travelled way to fixed road and SLR infrastructure shall be in accordance with clear zone requirements in the RMS Supplements to the Austroads Guide to Road Design. Where this is not possible the object must be made frangible or a safety barrier provided.
- (b) Where a safety barrier is provided, minimum working widths between the hazard and the barrier must be in accordance with RMS requirements.
- (c) Lateral clearance for dynamic sway of road vehicles to road and SLR infrastructure must be in accordance with working width requirements in the RMS Supplements to the Austroads Guide to Road Design.
- (d) The minimum clearance between the edge line or kerb line of the roadway and the LRV DKE must be as specified in Appendix 17 (*Trackwork*).

2.11. Kerb use management requirements

- (a) OpCo must develop and implement a kerb use management strategy which must comply with the requirements of Schedule B3 (Requirements of Third Parties) and be prepared in consultation with, and to the requirements of, the applicable "local traffic committees".
- (b) Minimum requirements for kerb usage for the affected roads are included in Attachment 1.
- (c) The kerb use management strategy must be included in the Design Stage 1 report and must consider as a minimum:
 - i on-street general parking;
 - ii on-street disabled parking;
 - iii loading zones;
 - iv taxi bays / ranks;
 - v mail box loading bays / accesses;
 - vi emergency vehicle bays;
 - vii bus route requirements including bus lanes, bus stops, bus stops for night bus services and for rail replacement services; and
 - viii waste management.

2.12. Drainage and flood control

- (a) For drainage requirements refer to Appendix 18 (*Civil and Structural Works*).

2.13. Pavement

- (a) In designing the pavements, OpCo must comply with the following Standards and Guidelines:
 - i new or widened pavements on State Roads must be designed in accordance with the RMS Supplements to the Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012);
 - ii new or widened pavements on all other roads must be designed in accordance with the Austroads Guide to Pavement Technology and the relevant Authority's documented requirements and guidelines;
 - iii existing pavements to be rehabilitated must be designed in accordance with the Austroads Guide to Pavement Technology Part 5: Pavement Evaluation and Treatment Design, Austroads Guide to Pavement Technology Part 8: Pavement Construction, and the Austroads Guide to Asset Management Part 5: Pavement Performance; and
 - iv RMS Technical Directions.
- (b) As a minimum requirement OpCo must:

- i provide correction course and dense graded asphalt wearing course overlays to existing pavements, with a minimum combined thickness of 45mm, where crossfalls of existing roadways are to be raised to match the new levels for the SLR Works;
 - ii where pavements are required to be lowered from their existing levels by more than 10mm, provide appropriate pavement design to achieve the nominated design life in accordance with Austroads Guide to Pavement Technology Part 5;
 - iii for existing roadways that are directly affected by the SLR Works, as a minimum, repair all visible or known defects and provide as a minimum a 45mm asphalt wearing course over existing pavements to facilitate re-linemarking, tidy up repairs, modifications to drainage and facilitate the installation of detector loops. This minimum overlay can be applied to the existing pavements that are to be retained and / or new pavement widening works. OpCo must locally profile pavements to ensure crossfalls comply; and
 - iv for existing roadways requiring changes to linemarking only, repair all visible or known defects in accordance with this section and mill and resheet to provide as a minimum a 45mm dense graded asphalt wearing course over existing pavements.
- (c) Pavement design and construction must be carried out in accordance with the documented requirements and guidelines of the relevant Authority, subject to meeting the Design Life requirements in SPR Main Body Table 2.
- (d) OpCo must design the pavements based on providing the minimum pavement depths necessary to achieve the following:
 - i Design for the minimum traffic volumes defined in the Traffic Volume Data for Sydney Region 2005, Part 1: AADT:
http://www.rms.nsw.gov.au/trafficinformation/downloads/aadtdata_dl1.html;
 - ii design for the example traffic load distribution for urban roads provided in the Austroads Guide to Pavement Technology; and
 - iii include an allowance for construction traffic loading during the construction phase, taking into account specialised equipment or traffic that may be utilised on constructed pavements.
- (e) Other requirements for the pavement works include:
 - i all shoulder and auxiliary lane pavements must be constructed using a pavement composition which is at least as thick as the adjacent traffic lanes;
 - ii all detector loops for the SLR Works must not be cut into concrete pavements, where used, unless additional reinforcing is incorporated;
 - iii pavement drains must be installed under new pavements and at the interface joint of new and existing pavements;
 - iv joints between new and existing pavement must be stepped and be in accordance with RMS requirements, and must not be located along wheel paths;
 - v OpCo must design the shared bus lanes, bus layover areas, bus stops and any bus only lane pavements for a minimum traffic loading (DESA) = 2.1×10^7 (per lane);

- vi pavements at shared bus lanes, bus layover areas, bus stops and any bus only lanes must be rigid concrete pavements with a coloured surface coating in accordance with RMS QA Specification R110 Coloured Surface Coatings for Bus Lanes and Cycleways;
- vii the surface evenness for final pavement surfaces must not exceed a maximum road roughness count of 40 counts per kilometre;
- viii pavements for cycleways must be in accordance with RMS documented requirements and guidelines and provided with a coloured surface coating in accordance with RMS QA Specification R110 Coloured Surface Coatings for Bus Lanes and Cycleways;
- ix in accordance with RMS documented requirements and guidelines, selection of the appropriate pavement type and configuration shall include consideration of:
 - A. adjoining pavement types;
 - B. construction and maintenance considerations;
 - C. total and differential settlement;
 - D. works under traffic; and
 - E. safety in design;
- x in accordance with RMS documented requirements and guidelines, different pavement types must not be used in adjacent lanes due to possible structural compatibility, drainage and safety issues. Pavement widening must match the existing pavement configuration as a minimum, subject to satisfying the pavement design life requirements; and
- xi in accordance with RMS documented requirements and guidelines, a construction tolerance must be added to the design thickness of the critical layer. The critical layer is defined as the layer that controls the design life of the pavement through its fatigue resistance or, in the case of granular pavement, it is the unbound granular base layer which protects the subgrade from rutting. In this case, the tolerance for granular base, asphalt, lean mixed concrete, bound material and concrete base is 10mm based on the use of automated level control. Where non-automated level control systems are used for construction, an additional 10mm tolerance may be required (see RMS specifications R71, R73, R75, R76 and R77).

2.14. Roadway signs and pavement markings

- (a) OpCo must design, supply, install and, where required in accordance with SPR Appendix 3 (*Assets*) maintain all signs and pavement markers and markings within the SLR Site throughout the Term, as required for the safety, guidance and direction of all traffic directly affected by the SLR Works in accordance with the RMS Delineation Manual.
- (b) The positioning of sign support systems must not impede or hinder the safe movement of pedestrians or cyclists on all pathways and footpaths.
- (c) All roadway signs and pavement marking shall be coordinated with the traffic signals (section 2.2) and Appendix 21 (*Signalling and Movement Control*).

- (d) Joins with existing line marking must be carried out carefully so as to result in a smooth transition and be legible under inclement weather conditions.
- (e) Removal of existing or temporary pavement marking by over painting is not permitted. Where pavement markings are to be modified, a new wearing course must be placed over the entire width of the roadway for the entire length of the amended pavement marking to provide a uniform surface finish, prior to the final pavement marking being undertaken, except where the extent of the overlay makes this impractical. Refer also to section 2.13 (b) (iv) above.
- (f) Special signage and pavement threshold markings prohibiting unauthorised vehicle entry to the SLR Site at potential access locations must be developed and provided with the Design Documentation. This signage must comply with the Road Rules, RMS requirements and be consistent with LRV operations.
- (g) OpCo must provide warning signs for cyclists in areas where they are likely to cross the track at angles less than 90 degrees.
- (h) All areas of restricted public access to the site must be signed so as to restrict public access.
- (i) OpCo must design and deliver appropriate signage and pavement markings for the following:
 - i a variable message sign on Anzac Parade southbound approaching Lang Rd for occasional closure of the left hand turn;
 - ii occasional diversion of Chalmers Street access traffic during special events; and
 - iii any other additional or special arrangement signage deemed necessary as a result of the design review process or to address issues raised in a road safety audit.
- (j) All proposals for roadway signs and pavement marking are subject to road safety audit requirements as set out in section 2.18
- (k) OpCo must develop the location and type of any regulatory signs and line markings (including for parking, no-stopping, bus lanes, clearways, loading zones etc.) in consultation with, and to the requirements of, the applicable "local traffic committees".

2.15. LRV Signals

- (a) LRV signals must comply with the requirements in Appendix 21 (*Signalling and Movement Control*).
- (b) LRV signals for LRV drivers must be integrated with the signalised intersection requirements in section 2.2 and must:
 - i be designed on the operating principle of "line of sight";
 - ii be located to the left hand side of the track as a preference and co-ordinated with the position of other signal aspects within the intersection;
 - iii incorporate LRV detection as required by Appendix 21 (*Signalling and Movement Control*);

- iv be designed so that if one detector fails it will not compromise the safe operations of the intersection or signalised pedestrian crossings;
- v incorporate an on-board, driver-actuated "ready to start" signal to the traffic signal controller where traffic signals are located immediately after a CSELR Stop;
- vi incorporate "T" aspects with suitable shielding devices to other drivers where required;
- vii be simple signals to ensure the safe operation of LRVs on single line sections and through junctions and any crossovers, turnouts and sidings;
- viii provide traffic signal detection devices to confirm the actual passage of LRVs through signalised intersections;
- ix be clearly visible from both tracks on sections where single line operation may be required from time to time and while single line operation is implemented; and
- x be of a nature that allows a request to proceed through the intersection to be initiated from both tracks approaching the intersection. On sections where single line operation may be required from time and while single line operation is implemented.

2.16. Street Lighting and LRV System Lighting

- (a) OpCo must design and construct lighting for the SLR Works and the Temporary Works and, to the extent that it is required for or affected by these works, for adjacent road reserve areas in accordance with AS/NZS 1158.1.1 category V3 or P3 (as applicable) unless otherwise required by TfNSW.
- (b) Where the Permanent Light Rail Corridor is fully segregated, the lighting can be reduced based on a risk assessment approach including all road safety audit recommendations.
- (c) All wiring (except within poles) and heavy duty rigid conduits must comply with AS/NZS 3000, and AS 2053 respectively.
- (d) Low-loss control equipment with a power factor greater than 0.9 must be used.
- (e) Road lighting equipment must be separately metered.
- (f) OpCo must where possible, ensure that all road lighting and equipment including conduits, service cables and cabinets required specifically for the SLR Works are located within the SLR Site.
- (g) Lighting poles, fittings, fixtures and wiring installed within pedestrian, cycle or shared use paths must be vandal resistant.
- (h) Lighting must be installed to the underside of bridges where required for affected roads, walkways, shared use paths, public space or public transport facilities.
- (i) Lighting to be handed back to a relevant Authority must be in accordance with the Authority's requirements.

2.17. Safety barriers

- (a) Roadside barriers including replacement barriers must be provided in accordance with the documented requirements and guidelines of RMS and the relevant Authority guidelines.

2.18. Road safety audits

- (a) OpCo must ensure that road safety audits (RSAs) are conducted in accordance with the TfNSW Centre for Road Safety Technical Direction - Policy for road safety audits of construction and reconstruction projects, and the TfNSW Centre for Road Safety Guidelines for Road Safety Audit Practices.
- (b) The RSAs must consider the operational safety of the SLR in terms of its interaction with road traffic and other road users including pedestrians and cyclists.
- (c) RSAs must be carried out at the stages listed below for the full extent of the SLR. The audits must be carried out by an independent qualified road safety audit team comprising a senior road safety auditor, a RMS representative, a TfNSW representative and an independent experienced light rail operator:
 - i a Stage 2 (Preliminary design stage) audit as part of Design Stage 1;
 - ii a Stage 3 (Detailed design stage) audit as part of Design Stage 2;
 - iii an updated Stage 3 (Detailed design stage) audit as part of Design Stage 3;
and
 - iv a Stage 4 Pre-opening RSA, sufficiently in advance of opening any part of the SLR Works to traffic or LRV operations so that any findings by the road safety auditor can be addressed and implemented before opening.
- (d) OpCo must address any findings and recommendations identified in the RSAs.
- (e) OpCo must obtain approval from the Independent Certifier as to the satisfactory closure of any RSA findings.
- (f) Copies of all RSAs, and corrective action plans must be promptly provided to the TfNSW's Representative.

3. Design Documentation

3.1. General

- (a) OpCo must provide Design Documentation in accordance with the requirements of SPR Appendix 47 (*Design Documentation Requirements*).
- (b) In addition to the requirements of SPR Appendix 47 (*Design Documentation Requirements*), OpCo must also provide the following specific Design Documentation in relation to each stage of design.

3.2. Design Stage 1 Design Documentation

- (a) The specific Design Stage 1 Design Documentation must include:
 - i "drive through" visualisations for road geometric design checking purposes using 12D or MX 3D rendered vehicle simulated drive throughs for all roads alignments including the LRV track. The visualisations must include road / SLR structures including lane configurations, trackforms / pavement delineation, walls, barriers or other road furniture within the roadway, SLR Site and LRV DKE + 300mm;
 - ii kerb use management strategy;
 - iii proposed pavement markings and road signage, including those required for LRV operations;
 - iv location and type of information signs, including regulatory, warning advisory and directional signs proposed within road reserves;
 - v locations where lane or footway widths are below the minimum requirements in Table 1; and
 - vi a Stage 2 preliminary design stage audit.

3.3. Design Stage 2 Design Documentation

- (a) The specific Design Stage 2 Design Documentation must include a Stage 2 Detailed design stage audit.

3.4. Design Stage 3 Design Documentation

- (a) The specific Design Stage 3 Design Documentation must include an updated Stage 3 Detailed design stage audit.

4. Testing and Commissioning

- (a) The specific Testing and Commissioning documentation must include a Stage 4 Pre-opening RSA, sufficiently in advance of opening any part of the SLR Works to traffic or LRV operations so that any findings by the road safety auditor can be addressed and implemented before opening.

5. Road and Traffic Requirements

- (a) Operational functional requirements for road works required at specific locations to accommodate the CSELR are defined in Attachment 1. Those functional requirements do not represent road or SLR geometric alignment requirements or exact intersection layouts.
- (b) Attachment 1 supplements the requirements defined in the previous sections of this Appendix, providing additional site-specific requirements for the road works.
- (c) The purpose of Attachment 1, read in conjunction with the previous sections of this Appendix, is to define the minimum operational requirements for the road works to be designed and delivered by OpCo while meeting the performance requirements of the SLR and ensuring integration of the SLR Works with the existing road network.
- (d) Requirements defined in Attachment 1 include functional layouts of the road works including lane configuration, minimum lane widths where these are below the general minimum requirements in Table 1, signposted speeds, design vehicle requirements where the design vehicle is a smaller vehicle than required in Section 2.4, kerb usage requirements, footway requirements and identification of intersections where traffic signals are required.
- (e) Attachment 1 is structured according to the Project Site Section numbers which are defined in Schedule B6 (*Section Access Schedule*).

Attachment 1:

CSELR Road and Traffic Requirements

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SLR Project Site No:

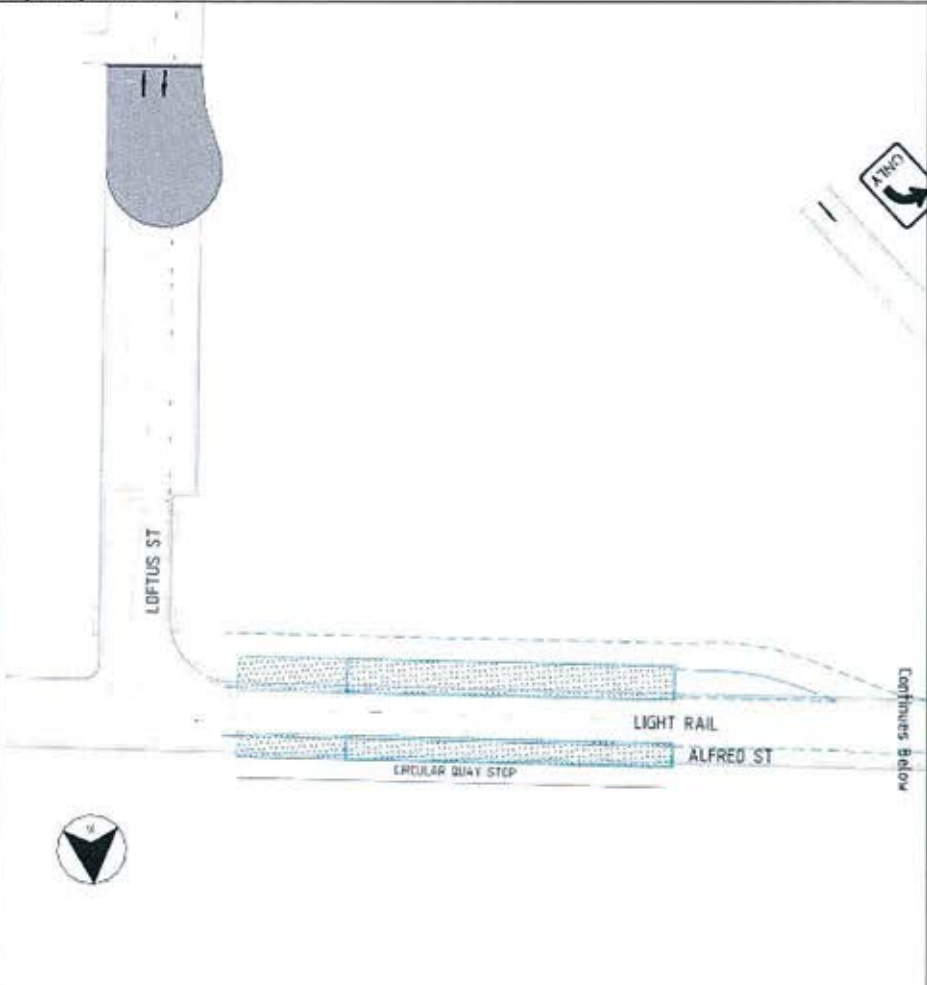
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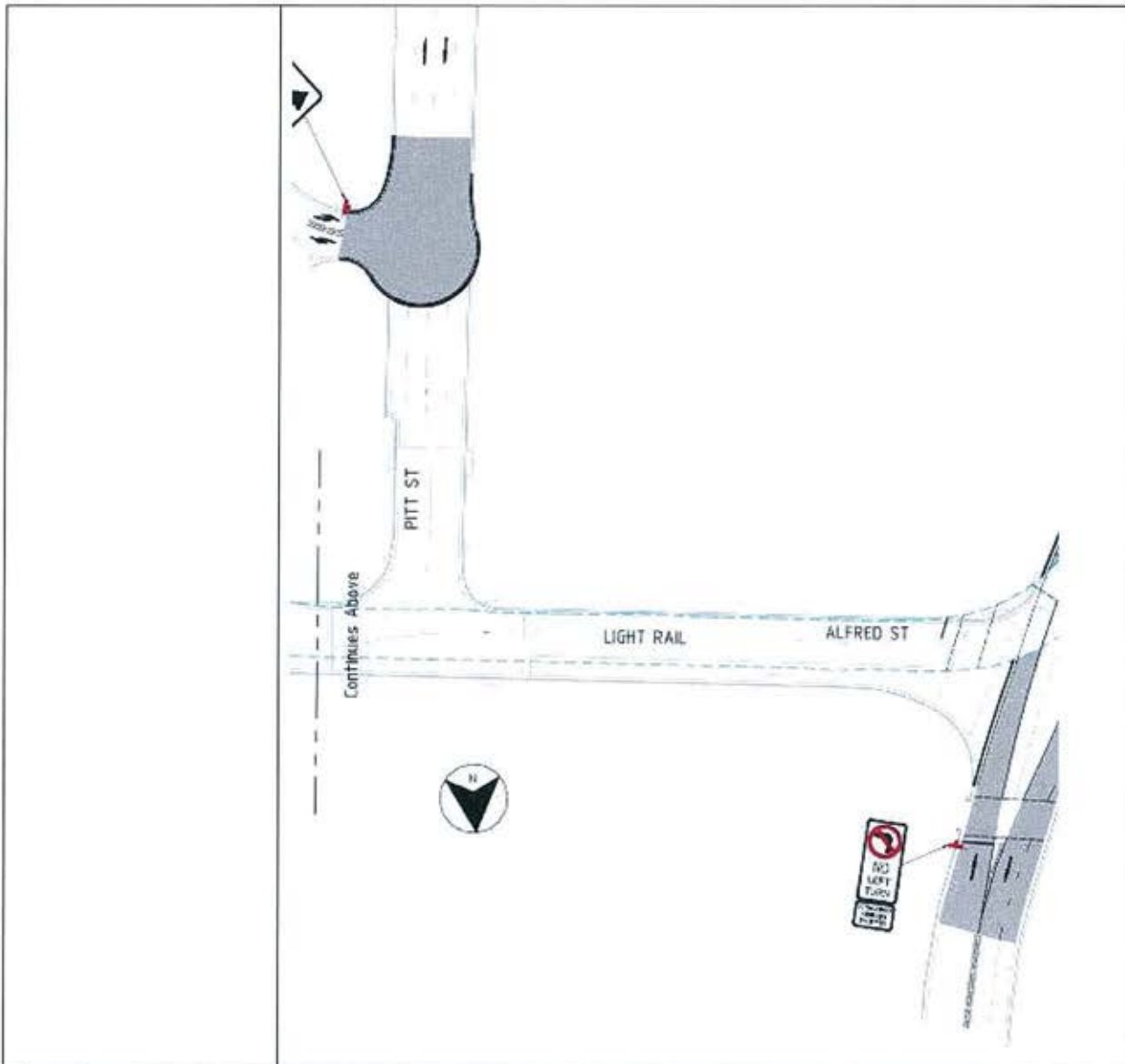
Precinct: CBD

Location:

Alfred St from Loftus St to George St, including intersections at:

- 1. Alfred St/Loftus St**
- 2. Alfred St/Pitt St**

Description	<p>Works on Alfred St from Loftus St to George St to accommodate the addition of light rail on Alfred St, including the Circular Quay Stop.</p> <p>Remove existing signals at Alfred St/Loftus St. Loftus St is to be closed just north of Customs House Lane, with turning head provided, and converted to two-way operation between Customs House Ln and Reiby Pl. The northern tip of the turning head is to be level with the flag post monument beside Customs House. Loftus St is to be pedestrianised to the north of the turning head.</p> <p>Remove existing signals at Alfred St/Pitt St. Pitt St is to be closed at Reiby Pl, with turning head provided, and converted to two-way operation between Reiby Pl and Bridge St. Pitt St is to be pedestrianised to the north of Reiby Pl. Note that the conversion of Pitt St to two-way operation between Reiby Pl and Bridge St will be carried out by others.</p> <p>Alfred St is to be pedestrianised from Loftus St to George St.</p>
Roads	Alfred St, Pitt St, Loftus St and Reiby Pl (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	



Speed	<ul style="list-style-type: none"> • Alfred St - signposted speed of 10km/h and design speed of 20km/h (pedestrianised zone). • Loftus St - signposted speed of 50km/h and design speed of 60km/h. • Pitt St - signposted speed of 50km/h and design speed of 60km/h. • Reiby PI - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For turning head at Loftus St, allow for a passenger vehicle (5.2m) and a 3-point turn by service vehicles (8.8m). • For turning head at Pitt St, allow for a passenger vehicle (5.2m) and a 3-point turn by service vehicles (8.8m).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide two-way on-road cycle route on Pitt St.
Footway requirements	<ul style="list-style-type: none"> • Alfred St is to be pedestrianised between George St and Loftus St.
Existing Traffic Control Signals (TCS)	<p>1. Alfred St/Loftus St TCS Drawing Number: 2681 Design Layout:7000.412.VV.2681 Sheet 9 Issue C Cable Installation: 7000.412.VV.2681 Sheet 10 Issue C Cable Connection Chart:7000.412.VV.2681 Sheet 11 Issue B</p>

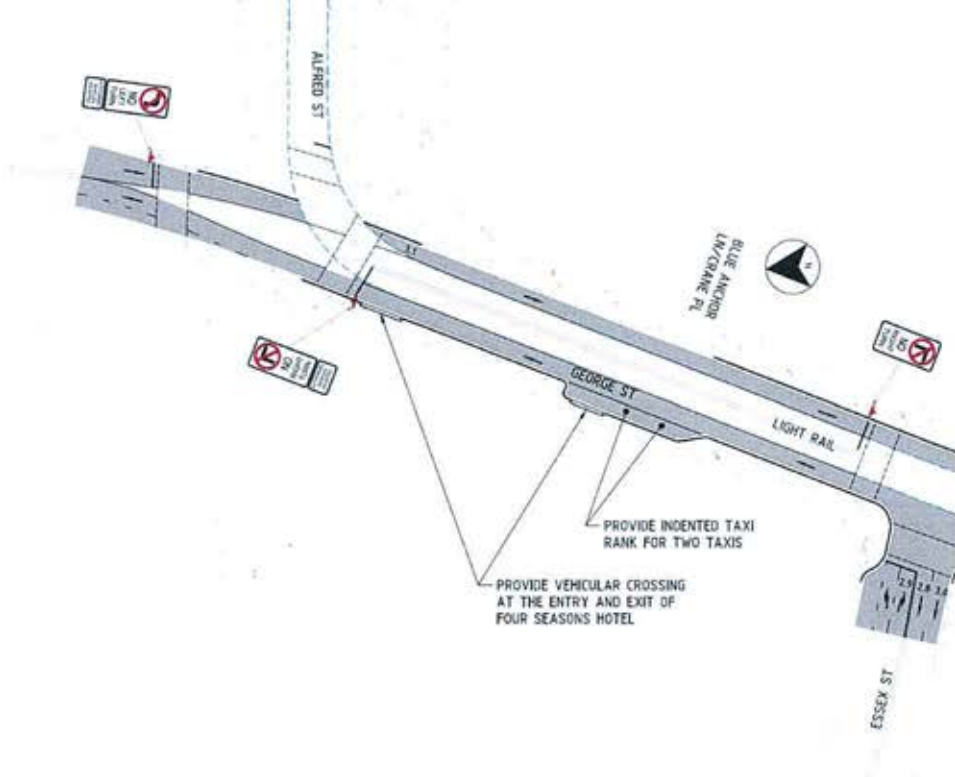
	<p>Red Light Camera Interface Connection: N/A</p> <p>2. Alfred St/Pitt St TCS Drawing Number: 2682 Design Layout: 7000.412.VV.2682 Sheet 14 Issue C Cable Installation: 7000.412.VV.2682 Sheet 15 Issue A Cable Connection Chart: 7000.412.VV.2682 Sheet 16 Issue A Red Light Camera Interface Connection: N/A</p>
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SLR Project Site No:
Location:

PS-CB29

Precinct: CBD

George St from Alfred St intersection to Essex St, including intersections at:
1. George St/Alfred St
2. George St/Blue Anchor Ln/Crane PI

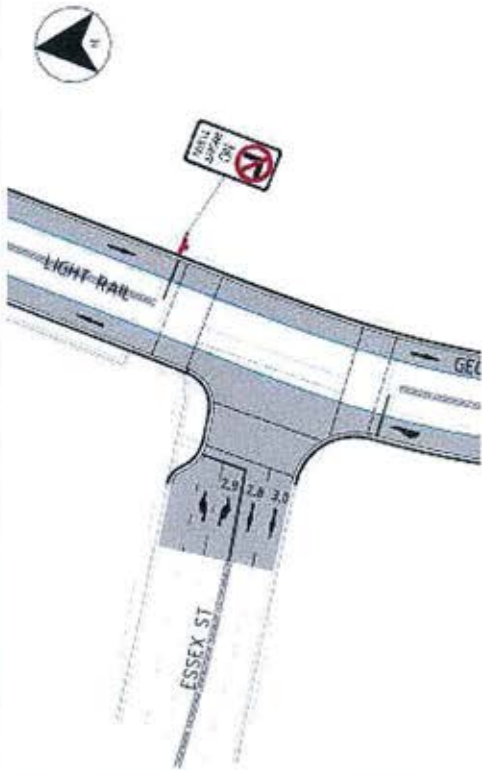
Description	<p>Works on George St from intersection with Alfred St to Essex St to accommodate the addition of light rail on Alfred St and George St. Provide one lane northbound and one lane southbound on George St from Alfred St to Essex St. Modify existing signalised intersection at George St/Alfred St, with lane arrangements as per functional layout. "Maintain entry and exit to Four Seasons Hotel, providing left-in and left-out access only."</p>
Roads	George St, Alfred St and Blue Anchor Ln/Crane PI (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	 <p>Note: There is an opportunity to consolidate the two pedestrian crossings of George Street into one to remove the southern pedestrian crossing which crosses the Light Rail alignment.</p>
Speed	<ul style="list-style-type: none"> Alfred St - signposted speed of 10km/h and design speed of 20km/h (pedestrianised zone). George St - signposted speed of 50km/h and design speed of 60km/h. Crane PI/Blue Anchor Ln - unchanged from existing.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane	<ul style="list-style-type: none"> Retain existing taxi rank on the western kerb of George St, to the north of Alfred St. Retain existing bus zones on the eastern and western kerbs of George St, to the north

requirements	of Alfred St. <ul style="list-style-type: none"> • “Remove existing taxi rank on west side of George Street and replace with indented taxi rank for two taxis. Taxi rank to be located immediately upstream of entry into Four Seasons Hotel.” • No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<ol style="list-style-type: none"> 1. George St/Alfred St TCS Drawing Number: 0233 Design Layout: 7000.412.VV.0233 Sheet 12 Issue C Cable Installation: 7000.412.VV.0233 Sheet 10 Issue D Cable Connection Chart: 7000.412.VV.0233 Sheet 11 Issue C Red Light Camera Interface Connection: N/A 2. N/A

SLR Project Site No:
Location:

PS-CB30
Intersection of George St/Essex St

Precinct: CBD

Description	Works on George St/Essex St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout. Provide kerb blister on the northern kerb of Essex St, to the west of George St, to reduce to one left turning lane.
Roads	George St and Essex St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> George St - signposted speed of 50km/h and design speed of 60km/h. Essex St - signposted speed of 50km/h and existing design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> Single Unit truck left turn from Essex St into George St uses LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0232 Design Layout: 7000.412.VV.0232 Sheet 4 Issue C Cable Installation: 7000.412.VV.0232 Sheet 5 Issue B Cable Connection Chart: 7000.412.VV.0232 Sheet 6 Issue A Red Light Camera Interface Connection: N/A

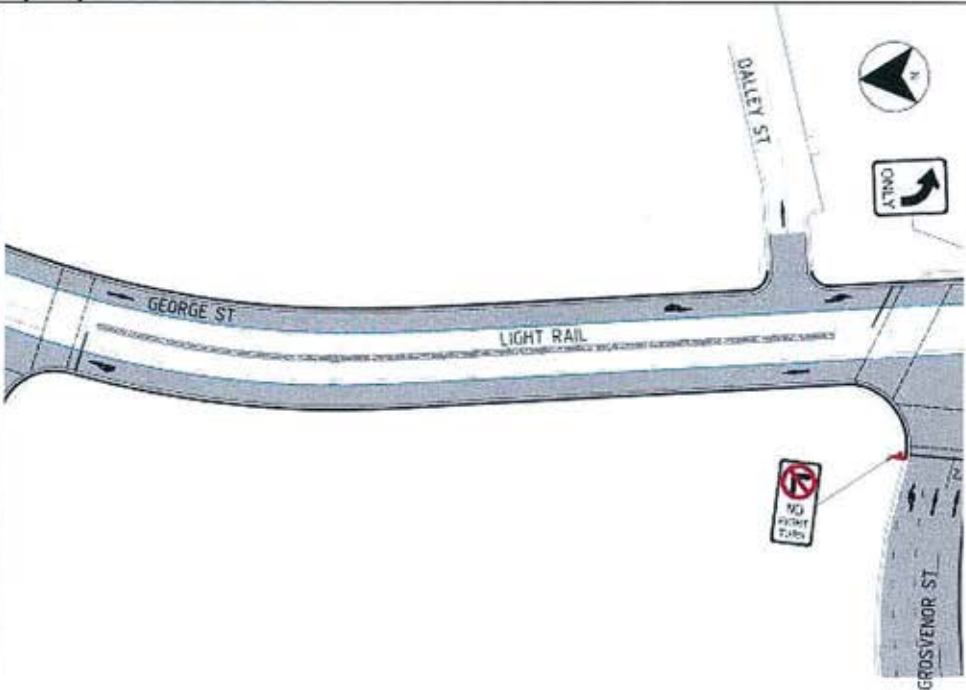
SLR Project Site No:

PS-CB31

Precinct: CBD

Location:

George St from Essex St to Grosvenor St, including the intersection of George St/Dalley St

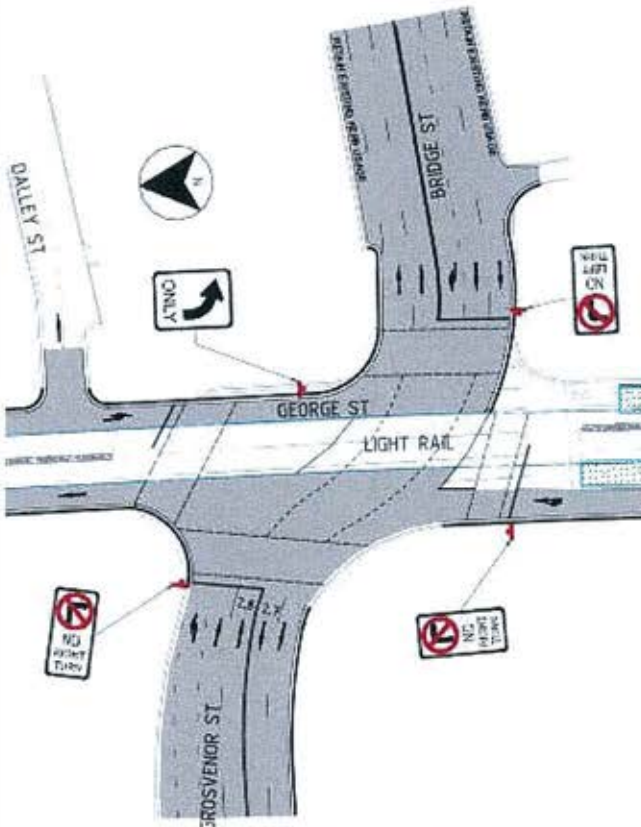
Description	Works on George St from Essex St to Grosvenor St to accommodate the addition of light rail on George St. Provide one lane northbound and one lane southbound on George St from Essex St to Grosvenor St.
Roads	George St and Dalley St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	 <p>The diagram shows a plan view of the intersection. George St runs horizontally across the middle. Dalley St runs vertically from the top, crossing George St. Grosvenor St runs vertically from the bottom, crossing George St. A light rail track runs horizontally through the center of George St, between the road lanes. A north arrow is in the top right. A 'LEFT TURN ONLY' sign is at the Dalley St intersection. A 'NO PARKING' sign is at the Grosvenor St intersection.</p>
Speed	<ul style="list-style-type: none"> George St - signposted speed of 50km/h and design speed of 60km/h. Dalley St - as existing.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For left turning movements into Dalley St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-CB02

Precinct: CBD

Intersection of George St/Bridge St/Grosvenor St

Description	Works on George St/Bridge St/Grosvenor St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	George St, Bridge St and Grosvenor St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> George St - signposted speed of 50km/h and design speed of 60km/h. Bridge St - signposted speed of 50km/h and existing design speed of 40km/h. Grosvenor St - signposted speed of 50km/h and existing design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing taxi rank, loading zone and parking on the southern kerb of Bridge St, to the east of George St. Retain existing loading zone and bus zone on the northern kerb of Bridge St, to the east of George St. Provide for connection to proposed on-road cycle route on Grosvenor St in both directions. No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0300 Design Layout: 7000.412.VV.0300 Sheet 17 Issue E Cable Installation: 7000.412.VV.0300 Sheet 22 Issue C</p>

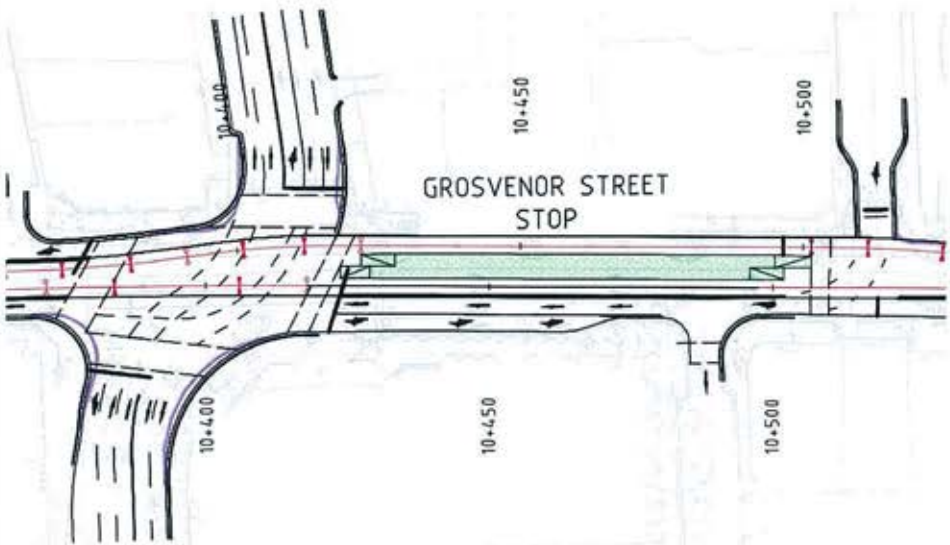
	Cable Connection Chart: 7000.412.VV.0300 Sheet 21 Issue D Red Light Camera Interface Connection: N/A
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SLR Project Site No:
Location:

PS-CB03

Precinct: CBD

George St from Bridge St/Grosvenor St to Hunter St/Margaret St, including intersections at:
1. George St/Jamison St
2. George St/Bond St

Description	Works on George St from Bridge St to Margaret St to accommodate the addition of light rail on George St, including the Grosvenor Street Stop. Provide one lane northbound on George St from Margaret St to Bridge St plus northbound left turn on George St into Bridge St. Modify existing signalised intersection at Bond St and incorporate with signals at Jamison St, with lane arrangements as per functional layout. Remove existing signalised pedestrian crossing of George St to the north of Bond St.
Roads	George St, Jamison St and Bond St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	 <p>Note:</p> <ul style="list-style-type: none"> • Bond St to be signposted as right out only into George St • George St to be signposted as no right turn into Bond St • George St to be signposted as no right turn into Bridge St • Bridge St to be signposted as no left turn into George St
Speed	<ul style="list-style-type: none"> • George St - signposted speed of 50km/h and design speed of 60km/h. • Jamison St - signposted speed of 50km/h and design speed of 60km/h. • Bond St - signposted speed of 50km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • Single Unit truck turn move encroaches on LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking on the southern and northern kerbs of Bond St. • Retain existing parking and loading zones on the southern and northern kerbs of Jamison St. • No stopping on George St. northbound.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	1. George St/Bond St TCS Drawing Number: 2290 Design Layout: 7000.412.VV.2290 Sheet 10 Issue D

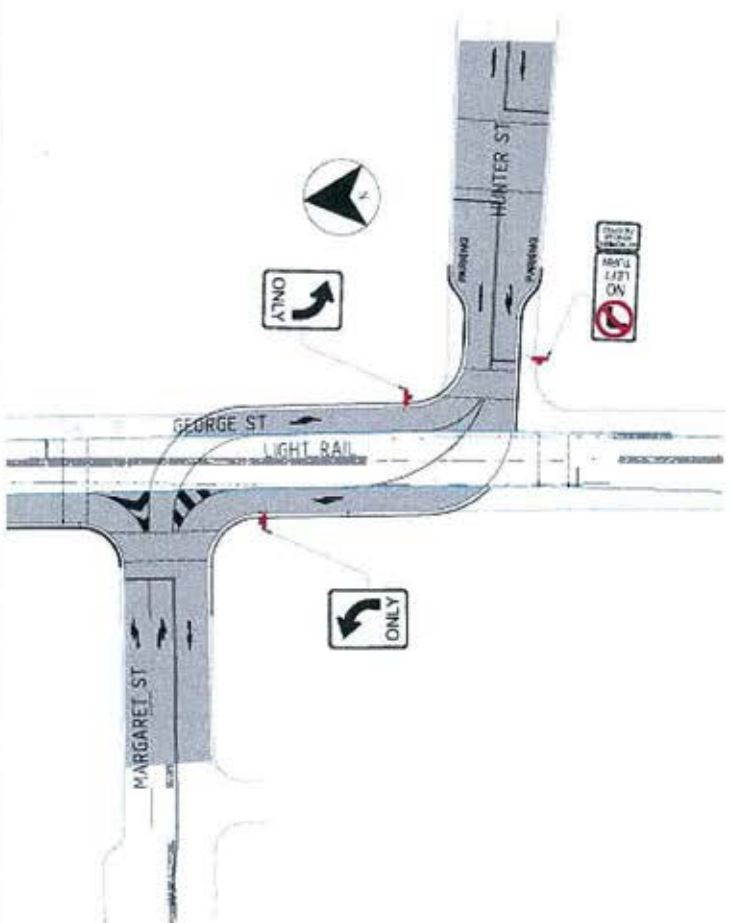
	Cable Installation: 7000.412.VV.2290 Sheet 11 Issue B Cable Connection Chart: 7000.412.VV.2290 Sheet 12 Issue B Red Light Camera Interface Connection: N/A 2. N/A
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SLR Project Site No:
Location:

PS-CB04

Precinct: CBD

Intersection of George St/Hunter St/Margaret St, including the signalised mid-block crossing of Hunter St, east of George St

<p>Description</p>	<p>Works on George St/Hunter St/Margaret St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersections to combine into one signalised intersection, with lane arrangements as per functional layout. Hunter St is to be converted to two-way operation between Pitt St and George St. Modify existing signalised mid-block pedestrian crossing of Hunter St, to the east of George St, to suit the conversion of Hunter St to two-way traffic between George St and Pitt St. Note that the conversion of Hunter St to two-way operation between George St and Pitt St will be carried out by others. Provide kerb blisters on both sides of Hunter St, east of George St to reduce to one lane eastbound and one lane westbound. Remove existing signalised pedestrian crossing of George St on the north side of Hunter St. Curtin PI is to remain closed at George St. Service vehicle access to the George St pedestrianised zone to be permitted from Hunter Street</p>
<p>Roads</p>	<p>George St, Hunter St and Margaret St (Local Roads)</p>
<p>Council</p>	<p>City of Sydney</p>
<p>Suburb</p>	<p>Sydney CBD</p>
<p>Intersection functional layout and minimum traffic lane widths</p>	

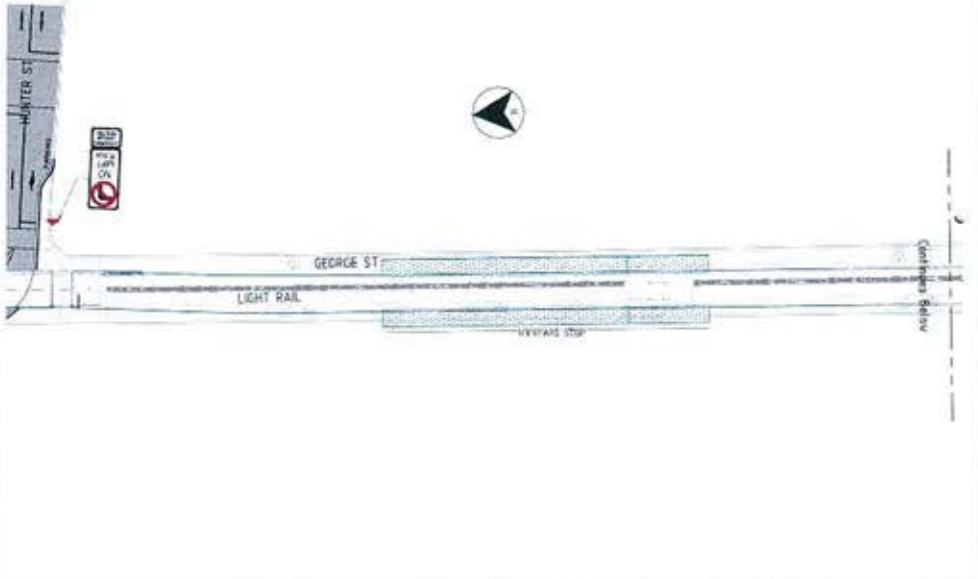
	Note – Margaret Street lane widths and skewed stop line position, as existing at the date of the deed, to be retained
Speed	<ul style="list-style-type: none"> • George St - south of Hunter St: restricted access. Signposted speed of 10km/h and design speed of 20km/h. • George St - north of Hunter St: signposted speed of 40km/h and design speed of 40km/h. • Margaret St - signposted speed of 40km/h and design speed of 40km/h. • Hunter St - signposted speed of 40km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For southbound restricted access on George St south of Hunter St, allow for an 8.8m service vehicle. • For the east-west connection between Hunter St and Margaret St in both directions, an 8m rigid vehicle without encroaching on the Permanent Light Rail Corridor for turning movements, with 8.8m rigid vehicle being permitted with encroachment of the Permanent Light Rail Corridor for turning movements. • Left turn from Margaret St to George Street northbound as per the current road geometry. • All service vehicle turning moves use LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide parking/taxi rank/loading zone on the southern and northern kerbs of Hunter St, to the east of George St. • Retain existing parking/loading zone on the southern kerb of Margaret St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0301 and 3012 (Hunter St pedestrian crossing, east of George St)</p> <p>Design Layout: 7000.412.VV.0301 Sheet 12 Issue G</p> <p>Cable Installation: 7000.412.VV.0301 Sheet 13 Issue B</p> <p>Cable Connection Chart: 7000.412.VV.0301 Sheet 14 Issue B, 7000.412.VV.3012 Sheet 3 Issue B</p> <p>Red Light Camera Interface Connection: N/A</p>

**SLR Project
Site No:**
Location:

PS-CB05

Precinct: CBD

George St from Hunter St to King St, including intersections at:
1. George St/Angel PI
2. George St/Martin PI
3. George St/Barrack St

Description	<p> Works on George St from Hunter St to King St to accommodate the addition of light rail on George St, including the Wynyard Stop. George St is to become a pedestrianised zone with one-way southbound restricted access from Hunter St to King St. Provide storage 1100mm clear of the DKE (300mm zone of influence + 800mm contrast strip) for one service vehicle (8.8m) on the George St southbound restricted access approach to the King St signalised intersection. Remove existing signalised mid-block pedestrian crossing of George St, north of Angel PI. Remove existing signalised mid-block pedestrian crossing of George St at Martin PI. Angel PI is to be closed at George St. Martin PI is to be closed at George St. Barrack St is to be closed at George St. </p>
Roads	George St, Angel PI, Martin PI and Barrack St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	

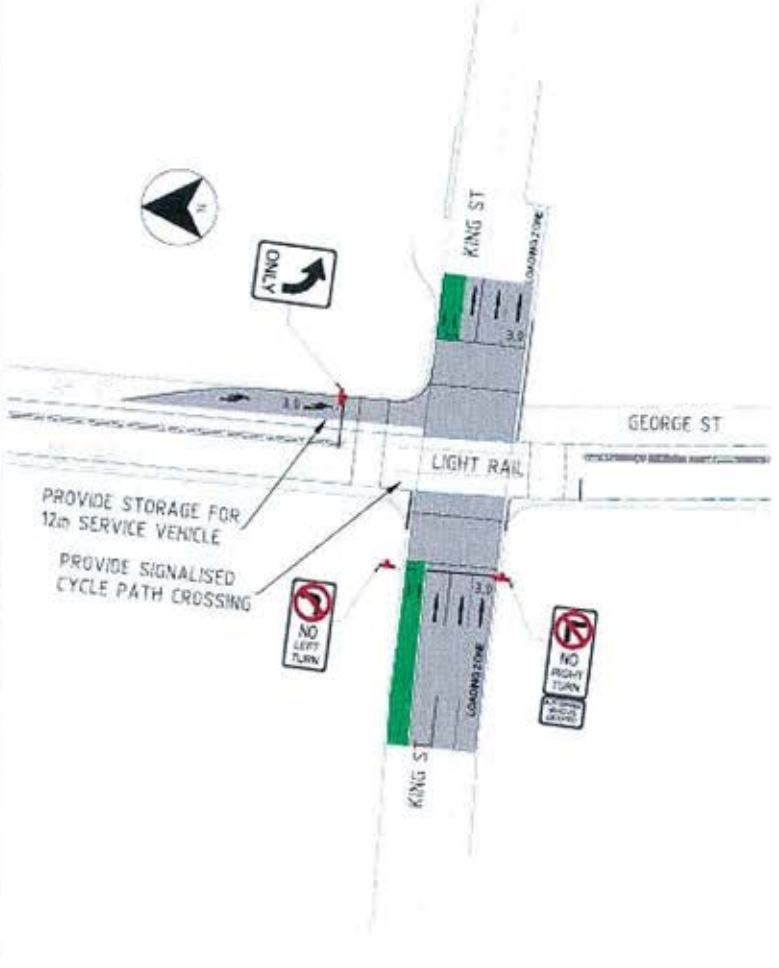
<p>Speed</p>	<ul style="list-style-type: none"> • George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h. • Angel PI - signposted speed of 10km/h and design speed of 20km/h. • Martin PI - signposted speed of 10km/h and design speed of 20km/h. • Barrack St - signposted speed of 10km/h and design speed of 20km/h.
<p>Design vehicles (exceptions)</p>	<ul style="list-style-type: none"> • For southbound restricted access on George St from Hunter St to King St, allow for an 8.8m service vehicle.
<p>On-street parking control and kerb lane requirements</p>	<ul style="list-style-type: none"> • Retain existing loading zones in Barrack St.
<p>Footway requirements</p>	<ul style="list-style-type: none"> • George St is to be pedestrianised.
<p>Existing Traffic Control Signals (TCS)</p>	<ol style="list-style-type: none"> 1. George St mid-block pedestrian crossing, north of Angel PI TCS Drawing Number: 0303 Design Layout: 7000.412.VV.0303 Sheet 3 Issue B Cable Installation: 7000.412.VV.0303 Sheet 4 Issue A Cable Connection Chart: 7000.412.VV.0303 Sheet 5 Issue A Red Light Camera Interface Connection: N/A 2. George St mid-block pedestrian crossing at Martin PI TCS Drawing Number: 2402 Design Layout: 7000.412.VV.2402 Sheet 17 Issue D Cable Installation: 7000.412.VV.2402 Sheet 18 Issue B Cable Connection Chart: 7000.412.VV.2402 Sheet 19 Issue C Red Light Camera Interface Connection: N/A 3. N/A

SLR Project
 Site No:
 Location:

PS-CB06

Precinct: CBD

Intersection of George St/King St

Description	Works on George St/King St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout. Civil works for two-way cycle path on King St to be constructed by others. OpCo to provide for signalising of cycle path across George St as part of signal modification works.
Roads	George St and King St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	 <p>The diagram illustrates the intersection of George St and King St, including a light rail corridor. Key features include: <ul style="list-style-type: none"> A north-south orientation with King St running vertically and George St running horizontally. A light rail corridor crossing the intersection. Proposed lane widths of 3.0m for various lanes. Signage: 'ONLY' with a right-turn arrow, 'NO LEFT TURN', and 'NO RIGHT TURN' signs. Notes: 'PROVIDE STORAGE FOR 12m SERVICE VEHICLE' and 'PROVIDE SIGNALISED CYCLE PATH CROSSING'. </p>
Speed	<ul style="list-style-type: none"> George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h. King St - signposted speed of 50km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For southbound restricted access on George St north of King St, allow for an 8.8m service vehicle. Vehicle traffics LRV corridor. For southbound restricted access on George St south of King St, allow for a 12.5m large rigid truck. Vehicle traffics LRV corridor.
On-street parking control and kerb lane	<ul style="list-style-type: none"> N/A


requirements	
Footway requirements	<ul style="list-style-type: none"> • George St is to be pedestrianised.
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0280 Design Layout: 7000.412.VV.0280 Sheet 18 Issue A Cable Installation: 7000.412.VV.0280 Sheet 15 Issue B Cable Connection Chart: 7000.412.VV.0280 Sheet 16 Issue B Red Light Camera Interface Connection: N/A

**SLR Project
Site No:**
Location:

PS-CB07

Precinct: CBD

George St from King St to Market St

Description	<p>Works on George St from King St to Market St to accommodate the addition of light rail on George St.</p> <p>George St is to become a pedestrianised zone with one-way southbound restricted access from King St to Market St.</p> <p>Provide storage 1100mm clear of the DKE (300mm zone of influence + 800mm contrast strip) for two large rigid trucks (12.5m) on the George St southbound restricted access approach to the Market St signalised intersection.</p> <p>Remove existing signalised mid-block pedestrian crossing of George St at The Strand Arcade.</p> <p>Temperance Ln is to be closed at George St.</p>
Roads	George St (Local Road)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	

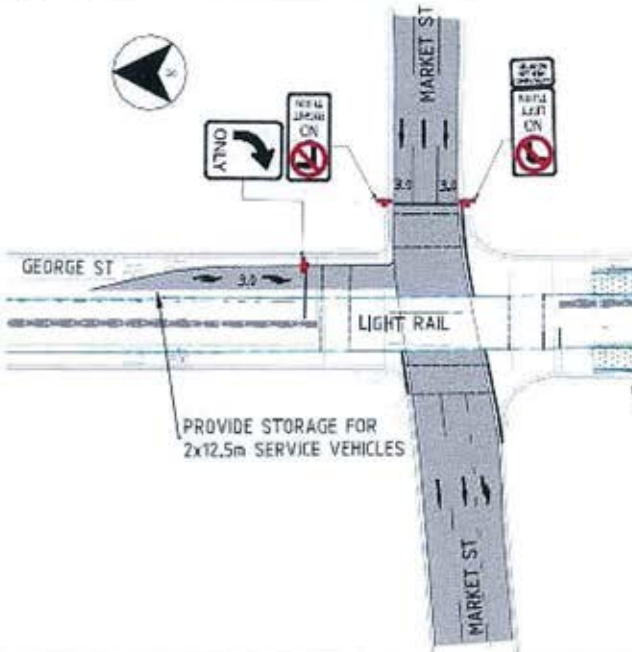
	<p>The diagram shows a plan view of George St and Market St. A light rail line runs horizontally across the middle. To the left, a dashed line indicates the light rail continues above. To the right, Market St intersects George St. A north arrow is in the top right. Traffic signs include an 'ATNO' sign with a right-turn arrow and a 'NO LEFT TURN' sign. A note points to a specific area on George St: 'PROVIDE STORAGE FOR 2x12.5m SERVICE VEHICLES'. Dimensions of 3.0m are marked at the intersection.</p>
<p>Speed</p>	<ul style="list-style-type: none"> George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h.
<p>Design vehicles (exceptions)</p>	<ul style="list-style-type: none"> For southbound restricted access on George St from King St to Market St, allow for a 12.5m large rigid truck. For turning movements to and from loading dock access at 420 George St, allow for a 12.5m rigid truck. For turning movements to and from the Swissotel and Tower Apartment car park shared with Myer loading dock, allow for a 6.4m small rigid truck. Vehicle traffics the LRV corridor. For turning movements to and from the Dymocks loading dock, allow for a 12.5m large rigid truck. Vehicle traffics the LRV corridor.
<p>On-street parking control and kerb lane requirements</p>	<ul style="list-style-type: none"> N/A
<p>Footway requirements</p>	<ul style="list-style-type: none"> George St is to be pedestrianised.
<p>Existing Traffic Control Signals (TCS)</p>	<p>TCS Drawing Number: 0089 Design Layout: 7000.412.VV.0089 Sheet 3 Issue B Cable Installation: 7000.412.VV.0089 Sheet 4 Issue A Cable Connection Chart: 7000.412.VV.0089 Sheet 5 Issue A Red Light Camera Interface Connection: N/A</p>

SLR Project
 Site No:
 Location:

PS-CB08

Precinct: CBD

Intersection of George St/Market St

Description	Works on George St/Market St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	George St and Market St (Local Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h. Market St - signposted speed of 50km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For southbound restricted access on George St north of Market St, allow for a 12.5m large rigid truck. Vehicle traffics the LRV corridor. For southbound restricted access on George St south of Market St, allow for an 8.8m service vehicle. Vehicle traffics the LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing taxi rank/loading zone on the northern kerb of Market St, to the east of George St.
Footway requirements	<ul style="list-style-type: none"> George St is to be pedestrianised.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0270 Design Layout: 7000.412.VV.0270 Sheet 24 Issue B Cable Installation: 7000.412.VV.0270 Sheet 22 Issue C Cable Connection Chart: 7000.412.VV.0270 Sheet 23 Issue C Red Light Camera Interface Connection: N/A</p>

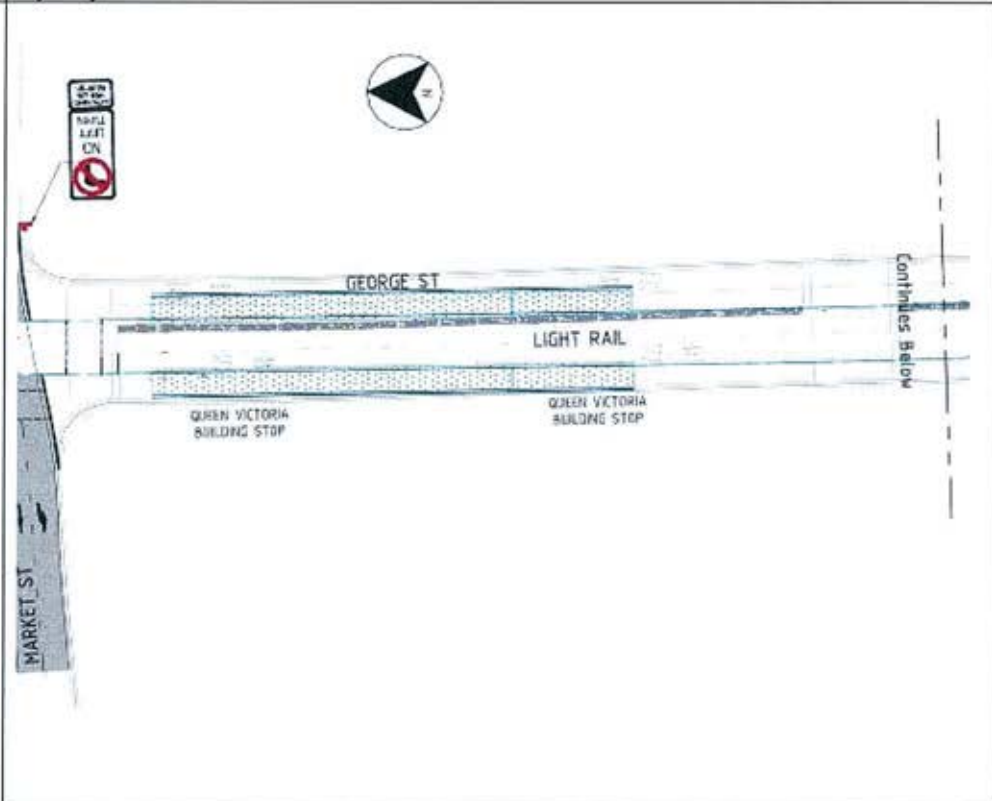
**SLR Project
Site No:**

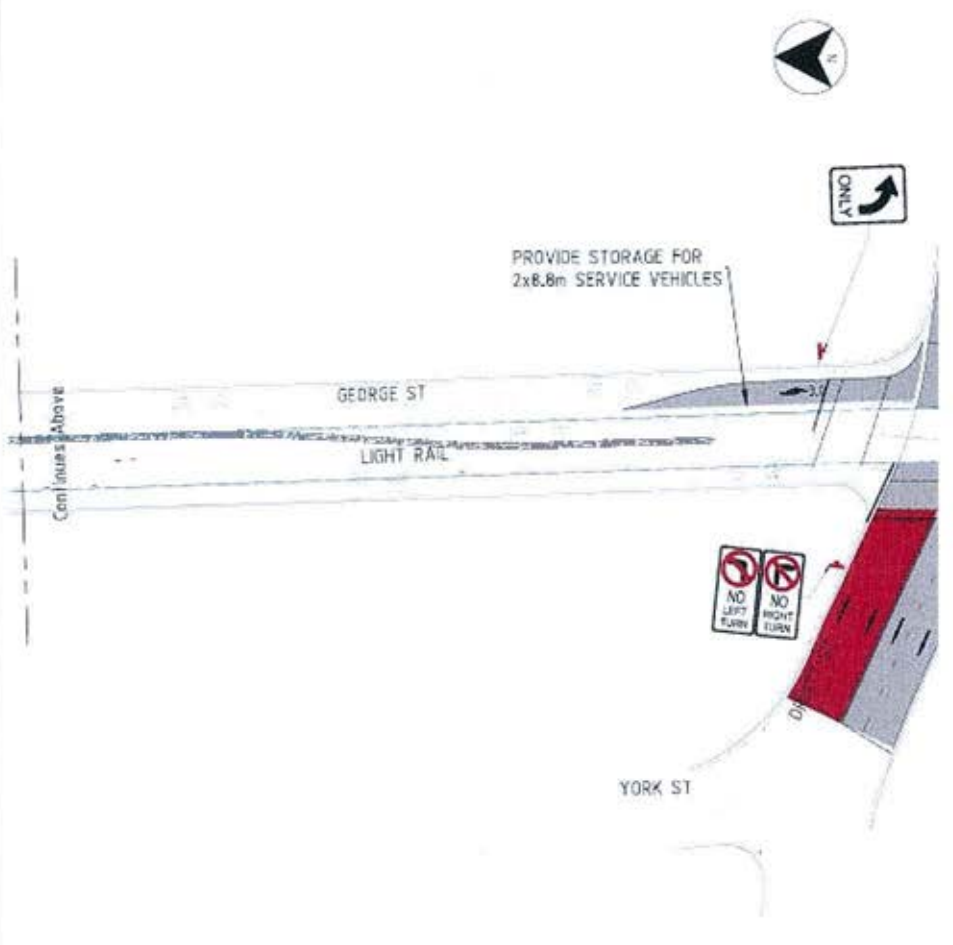
PS-CB09

Precinct: CBD

Location:

George St from Market St to Park St/Druitt St

<p>Description</p>	<p>Works on George St from Market St to Park St/Druitt St to accommodate the addition of light rail on George St, including the Queen Victoria Building Stop. George St is to become a pedestrianised zone with one-way southbound restricted access from Market St to Park St/Druitt St. Provide storage 1100mm clear of the DKE (300mm zone of influence + 800mm contrast strip) for two service vehicles (8.8m) on the George St southbound restricted access approach to the Park St/Druitt St signalised intersection. Remove existing signalised mid-block pedestrian crossing at Queen Victoria Building.</p>
<p>Roads</p>	<p>George St (Local Road)</p>
<p>Council</p>	<p>City of Sydney</p>
<p>Suburb</p>	<p>Sydney CBD</p>
<p>Intersection functional layout and minimum traffic lane widths</p>	

	 <p>The drawing shows a plan view of George St. A dashed line on the left is labeled 'Continues Above'. The road is labeled 'GEORGE ST' and 'LIGHT RAIL'. A north arrow is in the top right. A signpost shows a 'ONE WAY' sign pointing right. A note indicates 'PROVIDE STORAGE FOR 2x8.8m SERVICE VEHICLES' with a dimension of 3.0m. At the intersection with York St, there are two signs: 'NO LEFT TURN' and 'NO RIGHT TURN'. A red shaded area is shown at the intersection.</p>
Speed	<ul style="list-style-type: none"> George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For southbound restricted access on George St from Market St to Park St/Druitt St, allow for an 8.8m service vehicle. For turning movements from the Hilton Hotel Valet parking exit and to and from 478 George St/State Theatre Annex, allow for a 5.2m passenger vehicle.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> George St is to be pedestrianised.
Existing Traffic Control Signals (TCS)	<p> TCS Drawing Number: 2778 Design Layout: 7000.412.VV.2778 Sheet 6 Issue B Cable Installation: 7000.412.VV.2778 Sheet 7 Issue A Cable Connection Chart: 7000.412.VV.2778 Sheet 8 Issue A Red Light Camera Interface Connection: N/A </p>

SLR Project Site No:
 Location:

PS-CB10

Precinct: CBD

Intersection of George St/Park St/Druitt St

Description	<p>Works on George St/Park St/Druitt St intersection to accommodate the addition of light rail on George St.</p> <p>Modify existing signalised intersection with lane arrangements as per functional layout.</p> <p>Provide kerb blister on the southern kerb of Park St, to the east of George St, to reduce to two westbound through lanes.</p> <p>Incorporate York St/Druitt St signals into the phasing of the George St/Druitt St/Park St signals.</p>
Roads	George St, Park St, Druitt St (Regional Roads) and York St (Local Road)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h. Park St - signposted speed of 50km/h and design speed of 50km/h. Druitt St - signposted speed of 30km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For southbound restricted access on George St, allow for an 8.8m service vehicle.
On-street parking control and kerb lane	<ul style="list-style-type: none"> Retain existing bus zone on the northern kerb of Park St, to the east of George St. Replace existing loading zone with bus zone on the southern kerb of Park St, to the east of George St.

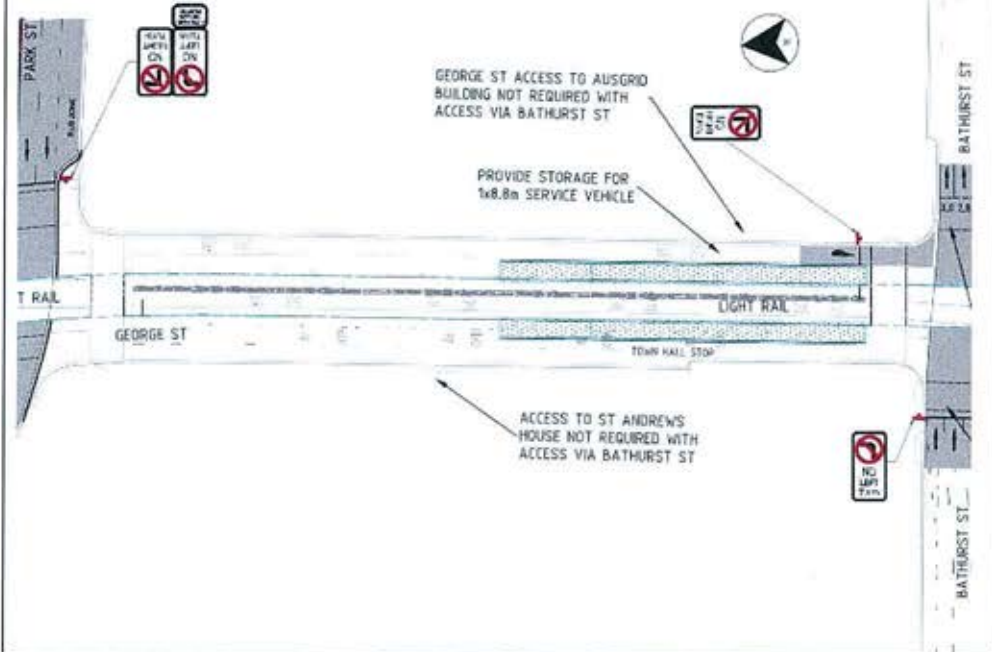
requirements	<ul style="list-style-type: none"> • Retain existing on-road cycle route on Park St/Druitt St in both directions.
Footway requirements	<ul style="list-style-type: none"> • George St is to be pedestrianised.
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0264 Design Layout: 7000.412.VV.0264 Sheet 28 Issue J Cable Installation: 7000.412.VV.0264 Sheet 31 Issue A Cable Connection Chart: 7000.412.VV.0264 Sheet 29 Issue G Red Light Camera Interface Connection: N/A

SLR Project Site No:
Location:

PS-CB11

Precinct: CBD

George St from Park St/Druitt St to Bathurst St

Description	<p>Works on George from Park St/Druitt St to Bathurst St to accommodate the addition of light rail on George St, including the Town Hall Stop.</p> <p>George St is to become a pedestrianised zone with one-way southbound restricted access from Park St/Druitt St to Bathurst St.</p> <p>Provide storage 1100mm clear of the DKE (300mm zone of influence + 800mm contrast strip) for one service vehicle (8.8m) on the George St southbound restricted access approach to the Bathurst St signalised intersection.</p>
Roads	George St (Regional Road)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> George St - restricted access. Signposted speed of 10km/h and design speed of 20km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For southbound restricted access on George St from Park St/Druitt St to Bathurst St, allow for an 8.8m service vehicle.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> George St is to be pedestrianised.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-CB12

Precinct: CBD

Intersection of George St/Bathurst St

Description	Works on George St/Bathurst St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	George St and Bathurst St (Regional Roads)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	<ul style="list-style-type: none"> To be in accordance with functional layout and minimum traffic lane widths shown in diagram for PS-CB13 George St northbound to be signposted right turn only into Bathurst St George St southbound to be signposted no right turn into Bathurst St Bathurst St eastbound to be signposted no left turn into George St
Speed	<ul style="list-style-type: none"> George St - south of Bathurst St: signposted speed of 50km/h and design speed of 60km/h. George St - north of Bathurst St: restricted access. Signposted speed of 10km/h and design speed of 20km/h. Bathurst St - signposted speed of 50km/h and design speed of 40km/h (provide stopping sight distance 1.10m to 0.00m approaching and through intersection).
Design vehicles (exceptions)	<ul style="list-style-type: none"> For southbound restricted access on George St north of Bathurst St, allow for an 8.8m service vehicle. For southbound George St into eastbound Bathurst St service vehicle traffics adjacent lanes. Eastbound Bathurst St into Southbound George St service vehicle traffics LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing loading/mail/parking on the southern kerb of Bathurst St, to the east of George St. Retain existing loading/parking zone on the northern kerb of Bathurst St, to the east of George St. Replace existing bus zone with parking/loading zone on the northern kerb of Bathurst St, to the west of George St.
Footway requirements	<ul style="list-style-type: none"> George St is to be pedestrianised to the north of Bathurst St.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 2632 Design Layout: 7000.412.VV.2632 Sheet 14 Issue C Cable Installation: 7000.412.VV.2632 Sheet 15 Issue B Cable Connection Chart: 7000.412.VV.2632 Sheet 16 Issue B Red Light Camera Interface Connection: N/A</p>

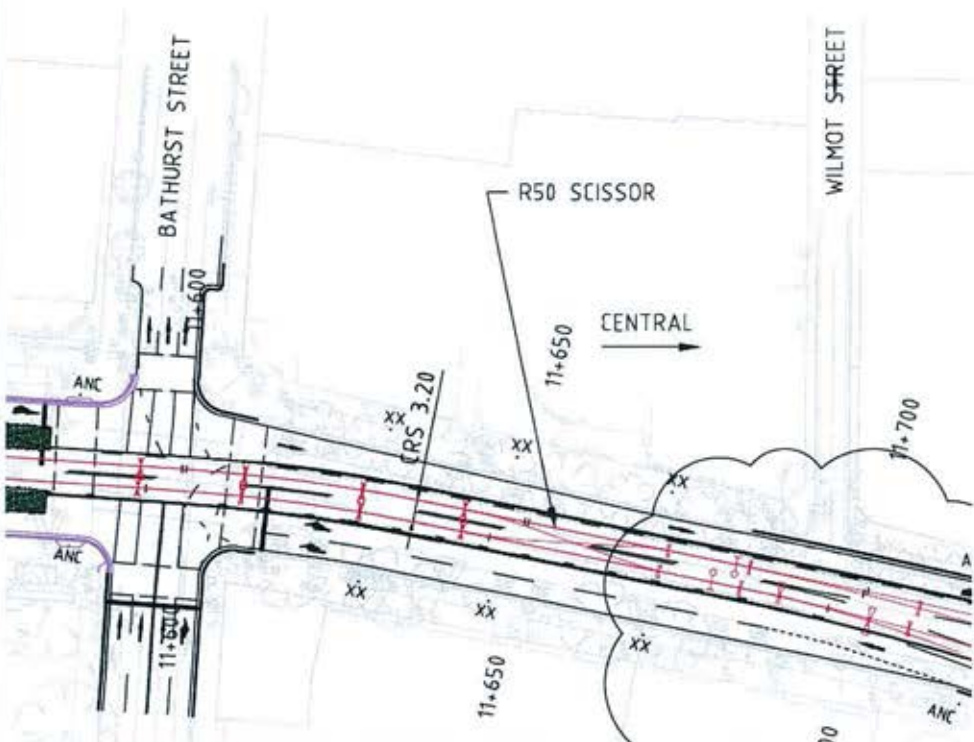
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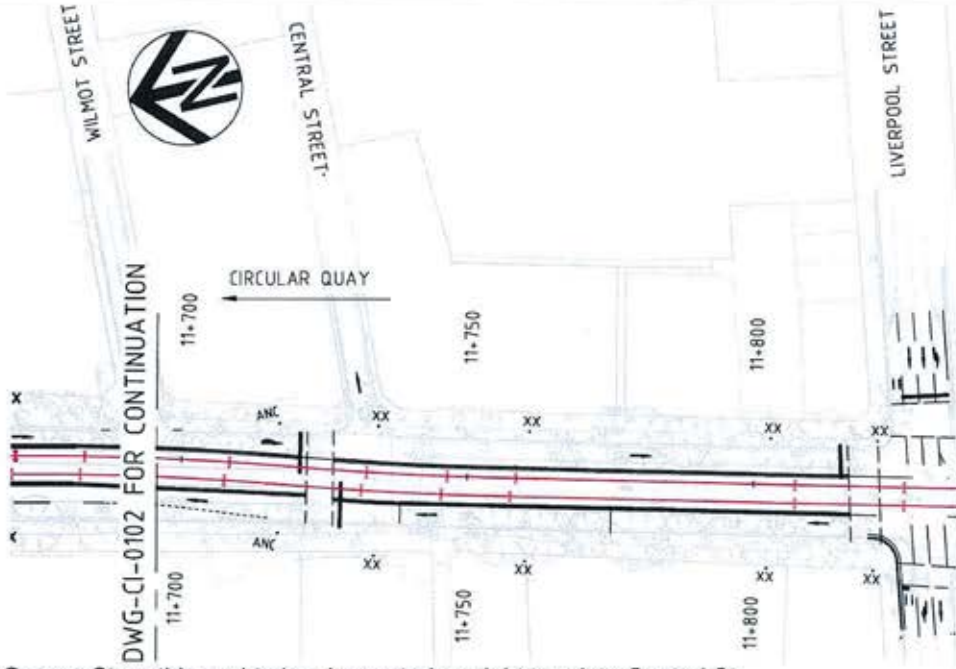
PS-CB13

Precinct: CBD

Location:

George St from Bathurst St to Liverpool St, including intersections at:
 1. George St/Wilmot St
 2. George St/Central St

Description	<p>Works on George from Bathurst St to Liverpool St to accommodate the addition of light rail on George St, including the World Square Stop. Provide one lane northbound and one lane southbound on George St from Bathurst St to Liverpool St, and an additional dedicated right turn lane on the northbound approach to Bathurst St. Reverse direction of flow on Central St and Wilmot St. Wilmot St to become one-way westbound. Central St to become one-way eastbound. Modify existing signalised intersection at George St/Central St with lane arrangements as per functional layout.</p>
Roads	George St (Regional Road), Wilmot St and Central St (Local Roads).
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • George St northbound to be signposted right turn only into Bathurst St • George St southbound to be signposted no right turn into Bathurst St • Bathurst St eastbound to be signposted no left turn into George St <p>Note: City of Sydney had (at the date of the deed) closed Wilmot Street at George Street and converted it to two way with all access off Pitt Street.</p>

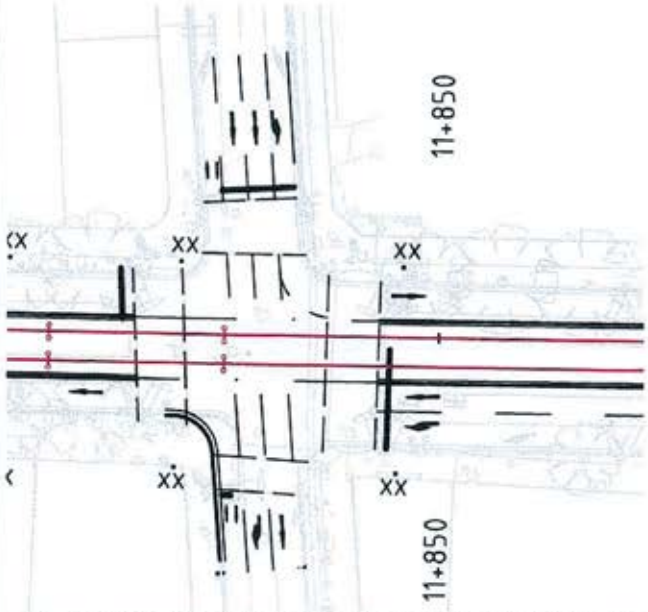
	 <ul style="list-style-type: none"> • George St northbound to be signposted no right turn into Central St • George St southbound to be signposted no right turn into Liverpool St • Liverpool St westbound to be signposted no right turn into George St <p>Note: City of Sydney has (at the date of the deed) works planned to relocate the signalised crossing at Central Street to the south side of the Central Street intersection.</p>
Speed	<ul style="list-style-type: none"> • George St - signposted speed of 50km/h and design speed of 60km/h. • Wilmot St - as existing. • Central St - as existing.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • Single unit truck from Wilmot St into George St traffics LRV corridor. • Single unit truck left turn George St into Central St traffics wrongside LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing loading zone on Central St. • No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<ol style="list-style-type: none"> 1. N/A 2. George St/Central St TCS Drawing Number: 1621 Design Layout: 7000.412.VV.1621 Sheet 9 Issue C Cable Installation: 7000.412.VV.1621 Sheet 10 Issue A Cable Connection Chart: 7000.412.VV.1621 Sheet 11 Issue B Red Light Camera Interface Connection: N/A

SLR Project Site No:
Location:

PS-CB14

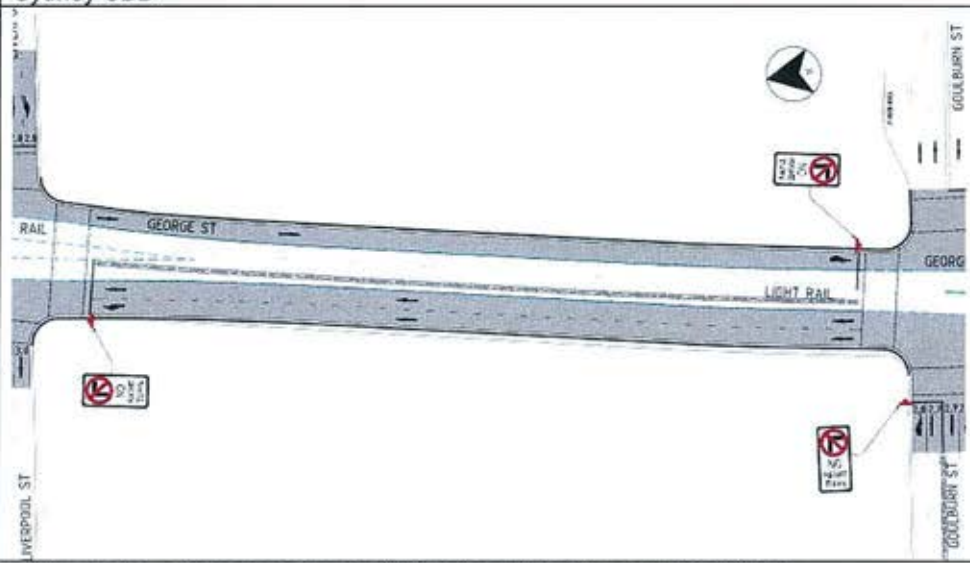
Precinct: CBD

Intersection of George St/Liverpool St

Description	Works on George St/Liverpool St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout. Civil works for two-way cycle path on Liverpool St to be constructed by others. OpCo to provide for signalling of cycle path across George St as part of signal modification works.
Roads	George St (Regional Road) and Liverpool St (Local Road)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • George St northbound to be signposted no right turn into Liverpool St • George St southbound to be signposted no right turn into Liverpool St • Liverpool St westbound to be signposted no right turn into George St • Cycle path on northside of Liverpool St to be provided with signalised crossing of Light Rail
Speed	<ul style="list-style-type: none"> • George St - signposted speed of 50km/h and design speed of 60km/h. • Liverpool St - signposted speed of 50km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • Single Unit Truck and service vehicle turns from westbound Liverpool St into southbound George St traffics adjacent lane and LRV corridor. • Single Unit Truck and service vehicle turns from northbound George St into westbound Liverpool St traffics adjacent lanes.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing loading zone on the southern kerb of Liverpool St, to the west of George St. • Retain existing taxi rank on the southern kerb of Liverpool St, to the east of George St. • No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0262 Design Layout: 7000.412.VV.0262 Sheet 14 Issue D Cable Installation: 7000.412.VV.0262 Sheet 15 Issue B Cable Connection Chart: 7000.412.VV.0262 Sheet 16 Issue B

	Red Light Camera Interface Connection: N/A
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SLR Project Site No: PS-CB15 **Precinct:** CBD
Location: George St from Liverpool St to Goulburn St

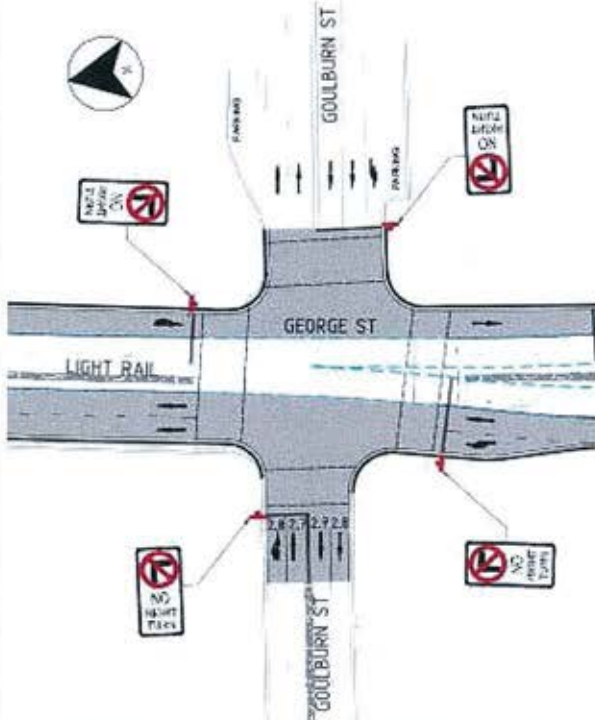
Description	Works on George from Liverpool St to Goulburn St to accommodate the addition of light rail on George St. Provide two lanes northbound and one lane southbound on George St from Liverpool St to Goulburn St.
Roads	George St (Regional Road)
Council	City of Sydney
Suburb	Sydney CBD
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> George St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project
 Site No:
 Location:

PS-CB16

Precinct: CBD

Intersection of George St/Goulburn St

Description	Works on George St/Goulburn St intersection to accommodate the addition of light rail on George St. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	George St and Goulburn St (Regional Roads)
Council	City of Sydney
Suburb	Sydney CBD to the north of Goulburn St. Haymarket to the south of Goulburn St.
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> The single pedestrian crossing at the northern end of the Chinatown Stop shown above is not required provided that safe pedestrian access is provided between the Light Rail tracks from the northern end of the Stop to the pedestrian crossing at the George St / Goulburn St intersection. Left turn lane George northbound to westbound Goulburn St to be provided without adjusting George St western kerb.
Speed	<ul style="list-style-type: none"> George St - signposted speed of 50km/h and design speed of 60km/h. Goulburn St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> Single Unit Truck for left turn movement traffics adjacent lanes. Single unit truck westbound Goulburn St into southbound George St traffics through lane and LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing loading zone/parking on southern kerb of Goulburn St, to the east of George St. Retain existing on-road cycle route in both directions on Goulburn St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0261 Design Layout: 7000.412.VV.0261 Sheet 31 Issue C Cable Installation: 7000.412.VV.0261 Sheet 32 Issue B

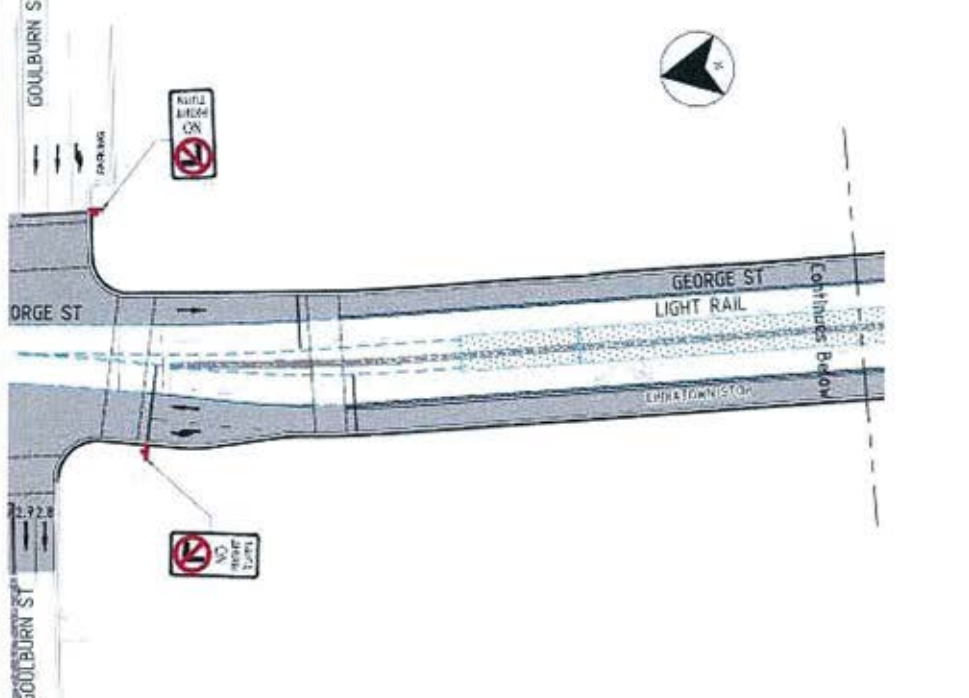
	Cable Connection Chart: 7000.412.VV.0261 Sheet 33 Issue B Red Light Camera Interface Connection: N/A
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**SLR Project
Site No:**
Location:

PS-CB17

Precinct: CBD

**George St from Goulburn St to Hay St, including the intersection at
George St/Campbell St**

Description	<p>Works on George St from Goulburn St to Hay St to accommodate the addition of light rail on George St, including the Chinatown Stop.</p> <p>Provide one lane northbound and one lane southbound on George St from Goulburn St to Hay St, with an additional dedicated left turn lane on the northbound approach to Goulburn St, with a minimum length for one light vehicle.</p> <p>Modify existing signalised intersection at George St/Campbell St with lane arrangements as per functional layout.</p>
Roads	George St (Regional Road) and Campbell St (Local Road)
Council	City of Sydney
Suburb	Haymarket
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • The single pedestrian crossing at the northern end of the Chinatown Stop shown above is not required. • Left turn lane George northbound to westbound Goulburn St to be provided without adjusting George St western kerb.

	<p>The diagram shows a street layout with Campbell St running north-south, George St running east-west, and Hay St running north-south. A light rail line runs east-west between Campbell St and Hay St. Key features include: <ul style="list-style-type: none"> George St: A 'NO LEFT TURN' sign at the intersection with Campbell St, and 'ONLY' directional signs for traffic moving east. Campbell St: A 'NO STOPPING' sign on the northern side. Hay St: A 'NO STOPPING' sign on the northern side. Light Rail: A 'NO STOPPING' sign on the northern side of the corridor. Other: A 'NO STOPPING' sign on the southern side of George St, and a 'NO STOPPING' sign on the southern side of Campbell St. </p>
Speed	<ul style="list-style-type: none"> George St - signposted speed of 50km/h and design speed of 60km/h. Campbell St - signposted speed of 50km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> Single Unit Truck Campbell St into George St traffics LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing loading zone/parking on the northern kerb of Campbell St, to the east of George St. No stopping on George St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 2602 Design Layout: 7000.412.VV.2602 Sheet 11 Issue C Cable Installation: 7000.412.VV.2602 Sheet 12 Issue B Cable Connection Chart: 7000.412.VV.2602 Sheet 13 Issue B Red Light Camera Interface Connection: N/A</p>

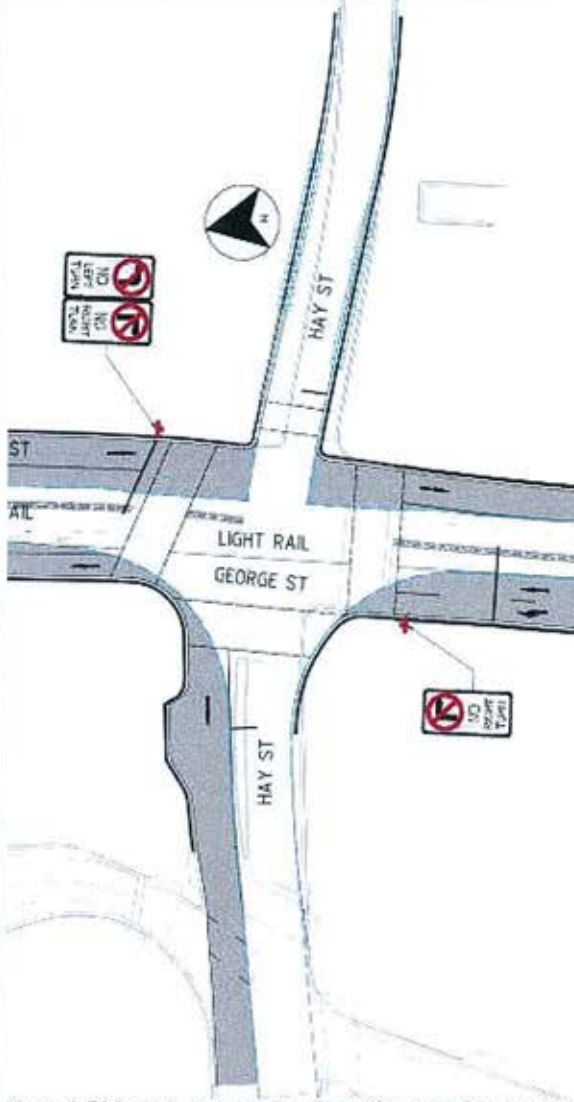
**SLR Project
 Site No:
 Location:**

PS-CB18

Precinct: CBD

Intersection of George St/Hay St and Hay St from Dixon St to Parker St, including intersections at Hay St/Parker Ln and Hay St/Sussex St/Thomas St.

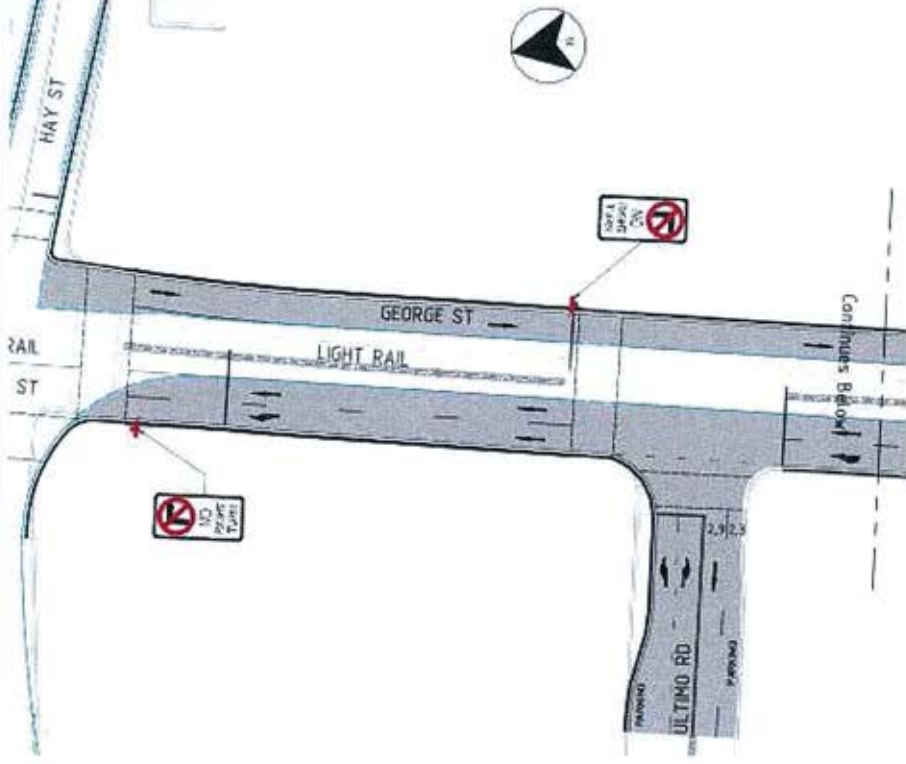
Description	<p>Works on George St/Hay St intersection, and on Hay St from Dixon St to Parker St, to accommodate the addition of light rail on George St, including new turnouts and realignment of part of the Inner West Light Rail.</p> <p>Hay St is to remain closed to general traffic to the east of George St, for use by light rail only.</p> <p>Provide one lane westbound on Hay St from George St to Dixon St.</p> <p>Modify existing signalised intersection of George St/Hay St with lane arrangements as per functional layout.</p> <p>Incorporate Hay St/Sussex St/Thomas St signals into the phasing of the George St/Hay St signals.</p>
Roads	George St, Hay St (Regional Roads), Parker St, Parker Ln, Sussex St and Thomas St (Local Roads)
Council	City of Sydney
Suburb	Haymarket

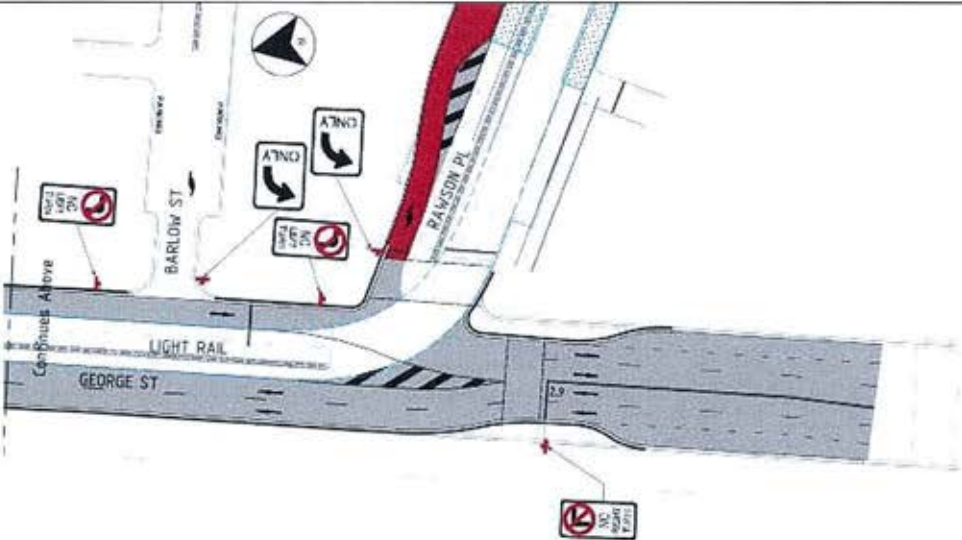
<p>Intersection functional layout and minimum traffic lane widths</p>	 <p>Note. LRV track connection from George Street northbound to Hay Street west bound not provided.</p>
<p>Speed</p>	<ul style="list-style-type: none"> • George St - signposted speed of 50km/h and design speed of 60km/h. • Hay St - signposted speed of 50km/h and design speed of 60km/h. • Parker St - as existing. • Parker Ln - as existing. • Sussex St - as existing. • Thomas St - as existing.
<p>Design vehicles (exceptions)</p>	<ul style="list-style-type: none"> • N/A
<p>On-street parking control and kerb lane requirements</p>	<ul style="list-style-type: none"> • Retain existing on-road cycle route in both directions on Hay St.
<p>Footway requirements</p>	<ul style="list-style-type: none"> • N/A
<p>Existing Traffic Control Signals (TCS)</p>	<p>George St/Hay St TCS Drawing Number: 0259 Design Layout: 7000.412.VV.0259 Sheet 19 Issue G Cable Installation: 7000.412.VV.0259 Sheet 20 Issue D Cable Connection Chart: 7000.412.VV.0259 Sheet 21 Issue C</p>

	Red Light Camera Interface Connection: N/A
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SLR Project Site No: PS-CB19 **Precinct:** CBD

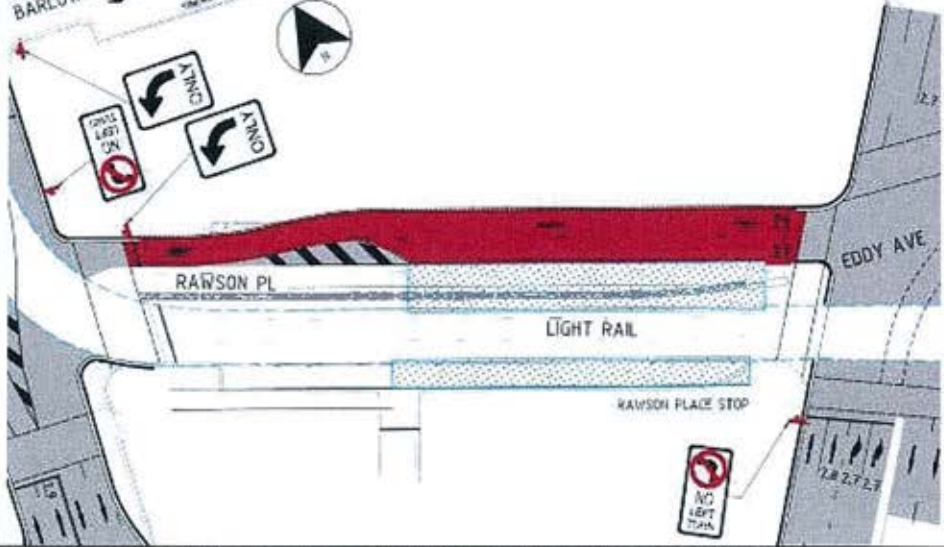
Location: George St from Hay St to the intersection of George St/Rawson PI, including intersections at:
 1. George St/Ultimo Rd
 2. George St/Barlow St
 3. George St/Rawson PI

Description	Works on George St from Hay St to the intersection of George St/Rawson PI to accommodate the addition of light rail on George St and Rawson PI. Provide two lanes northbound and one lane southbound on George St from Hay St to Rawson PI. Modify existing signalised intersection at George St/Ultimo Rd with lane arrangements as per functional layout. Provide kerb blister on the northern kerb of Ultimo Rd, to the west of George St, to reduce to one left turning lane and one right turning lane. Modify existing signalised intersection at George St/Rawson PI with lane arrangements as per functional layout. Provide kerb blisters on both sides of George St, south of Rawson PI to reduce to two lanes northbound and two lanes southbound.
Roads	George St (Regional Road), Ultimo Rd, Barlow St and Rawson PI (Local Roads)
Council	City of Sydney
Suburb	Haymarket
Intersection functional layout and minimum traffic lane widths	 <p>Note. Provide two left hand turn lanes into George Street from Ultimo Road rather than one lane left and one lane right as shown in the diagram above.</p>

	 <p>Note. Pedestrian crossing of George Street on northern side of George Street to Rawson Place intersection to be provided if pedestrian movements require this.</p>
Speed	<ul style="list-style-type: none"> • George St - signposted speed of 50km/h and design speed of 60km/h. • Ultimo Rd - signposted speed of 50km/h and design speed of 60km/h. • Barlow St - signposted speed of 50km/h and design speed of 60km/h. • Rawson Pl - signposted speed of 40km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turn from Rawson Pl to George St southbound, allow for articulated bus (19.0m) and long rigid bus (14.5m). • Single Unit Truck from Barlow St into George St traffic LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing loading zone/parking on the southern kerb of Ultimo Rd, to the west of George St. • Provide loading zone/parking on the northern kerb of Ultimo Rd, to the west of George St. • Retain existing on-road cycle route in both directions on Ultimo Rd. • Retain existing loading zone/parking on the southern and northern kerbs of Barlow St, to the east of George St. • Remove existing bus zone on the western kerb of George St and replace with a taxi rank, to the south of Rawson Pl, south of the new kerb blister. • Retain existing loading zone/parking on the eastern kerb of George St, to the south of Rawson Pl, south of the new kerb blister.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<ol style="list-style-type: none"> 1. George St/Ultimo Rd TCS Drawing Number: 1837 Design Layout: 7000.412.VV.1837 Sheet 7 Issue C Cable Installation: 7000.412.VV.1837 Sheet 8 Issue A Cable Connection Chart: 7000.412.VV.1837 Sheet 9 Issue A Red Light Camera Interface Connection: N/A 2. N/A 3. Rawson Pl/George St TCS Drawing Number: 0297 Design Layout: 7000.412.VV.0297 Sheet 10 Issue D Cable Installation: 7000.412.VV.0297 Sheet 11 Issue B Cable Connection Chart: 7000.412.VV.0297 Sheet 12 Issue B Red Light Camera Interface Connection: N/A

SLR Project Site No: PS-CB20
 Location: Rawson Pl from Pitt St to George St

Precinct: CBD

Description	Works on Rawson Pl from Pitt St to George St to accommodate the addition of light rail on Rawson Pl, including the Rawson Place Stop. Provide one westbound bus only through lane and one westbound bus only set down lane, adjacent to the light rail platform, on Rawson Pl from George St to Pitt St, on the northern side of the light rail tracks. Rawson Ln is to be closed at Rawson Pl.
Roads	Rawson Pl (Local Road)
Council	City of Sydney
Suburb	Haymarket
Intersection functional layout and minimum traffic lane widths	 <p>The diagram illustrates the intersection layout for Rawson Pl. It shows a north-south road layout. At the top, Barlow St is indicated. Rawson Pl runs east-west. Light rail tracks are shown in the center, with the 'RAWSON PLACE STOP' located on the southern side. To the north of the tracks, there are two bus lanes: one for 'BUS ONLY' and another for 'BUS ONLY' with a 'NO LEFT TURN' sign. A 'NO LEFT TURN' sign is also shown on the southern side of the road. To the east, Eddy Ave is shown. A north arrow is present in the upper right quadrant of the diagram.</p>
Speed	<ul style="list-style-type: none"> Rawson Pl - signposted speed of 40km/h and design speed of 40km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> Rawson Pl to become a transit mall with bus and light rail access only.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
 Location:

PS-CB21

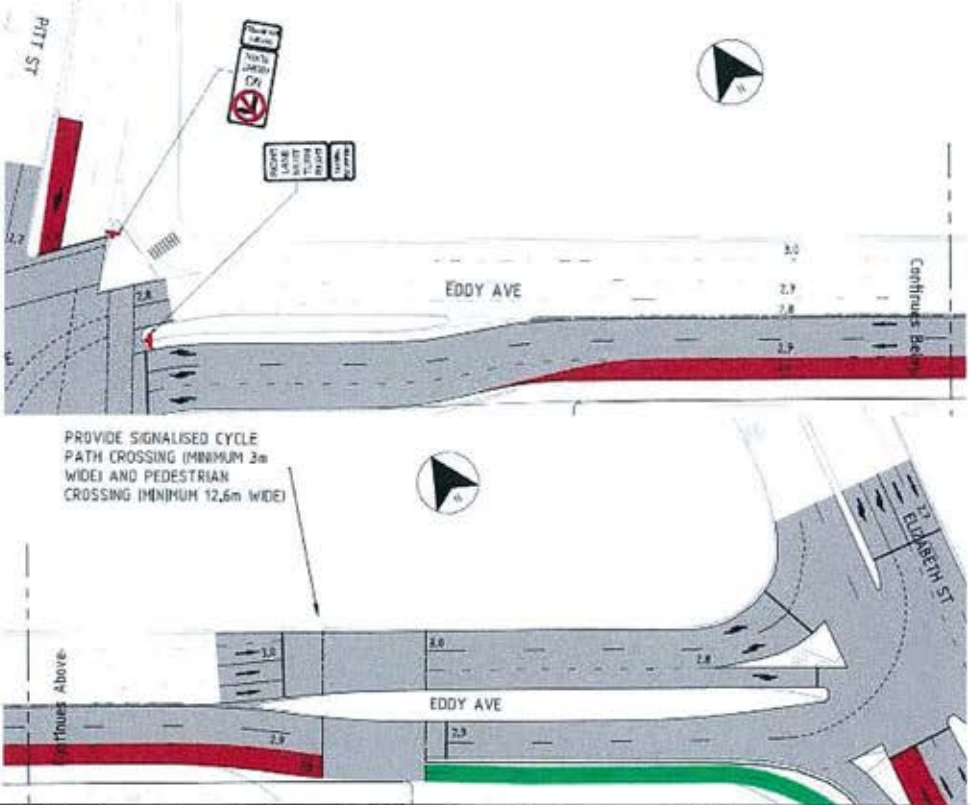
Precinct: CBD

Intersection of Eddy Ave/Pitt St/Rawson PI

Description	Works on Eddy Ave/Rawson PI/Pitt St intersection to accommodate the addition of light rail on Rawson PI and Eddy Ave. Modify existing signalised intersection with lane arrangements as per functional layout. The two lanes on Eddy Av leading into the intersection are to become left hand turn lanes. The right hand turn lane on Eddy Av into Pitt St is to be developed on the approach to the intersection.
Roads	Eddy Ave (Regional Road), Pitt St and Rawson PI (Local Roads)
Council	City of Sydney
Suburb	Haymarket
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Eddy Ave - signposted speed of 50km/h and design speed of 60km/h. Rawson PI - signposted speed of 40km/h and design speed of 40km/h. Pitt St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For right turn from Pitt St southbound into Rawson PI westbound, allow for articulated bus (19.0m) and long rigid bus (14.5m) into either the bus set down lane or the bus through lane.
On-street parking control and kerb lane	<ul style="list-style-type: none"> Retain existing loading zone/parking on the eastern kerb of Pitt St, to the north of Eddy Ave. Retain existing bus zone on the western kerb of Pitt St, to the north of Eddy Ave.

requirements	<ul style="list-style-type: none"> • Retain existing bus zone on the western kerb of Pitt St, to the south of Eddy Ave. • Retain existing one way on-road cycle route on Pitt St northbound.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0296 Design Layout: 7000.412.VV.0296 Sheet 9 Issue M Cable Installation: 7000.412.VV.0296 Sheet 10 Issue C Cable Connection Chart: 7000.412.VV.0296 Sheet 11 Issue C Red Light Camera Interface Connection: N/A</p>

SLR Project Site No: PS-CB22 **Precinct:** CBD
Location: Eddy Ave traffic lanes, coach stop and westbound coach set-down lane from Pitt St to Elizabeth St, and the signalised mid-block pedestrian crossing of Eddy Ave

Description	<p>Works on Eddy Ave traffic lanes, coach stop and westbound coach set-down lane from Pitt St to Elizabeth St to accommodate the addition of light rail on Eddy Ave. Provide two lanes westbound and four lanes eastbound on Eddy Ave from Pitt St to Elizabeth St.</p> <p>Provide a coach set-down platform for 4 coaches and westbound coach set-down lane between the light rail and traffic lanes.</p> <p>Modify existing signalised mid-block pedestrian crossing to extend over the light rail, and incorporate a cycle path crossing on the eastern side of the pedestrian crossing.</p>
Roads	Eddy Ave (Regional Road)
Council	City of Sydney
Suburb	Haymarket
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Eddy Ave - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing bus zones on the northern kerb of Eddy Ave. Extend existing bus zone on the northern kerb of Eddy Ave, at the western end, to provide an additional bus layover zone. Provide a coach set-down platform for 4 coaches and westbound coach set-down lane between the light rail and traffic lanes.
Footway requirements	<ul style="list-style-type: none"> Provide a 3.0m wide two-way cycle path on the southern side of Eddy Ave from Chalmers St to the existing signalised pedestrian crossing of Eddy Ave, between the light rail and the traffic lanes.
Existing Traffic	Eddy Ave mid-block pedestrian crossing:

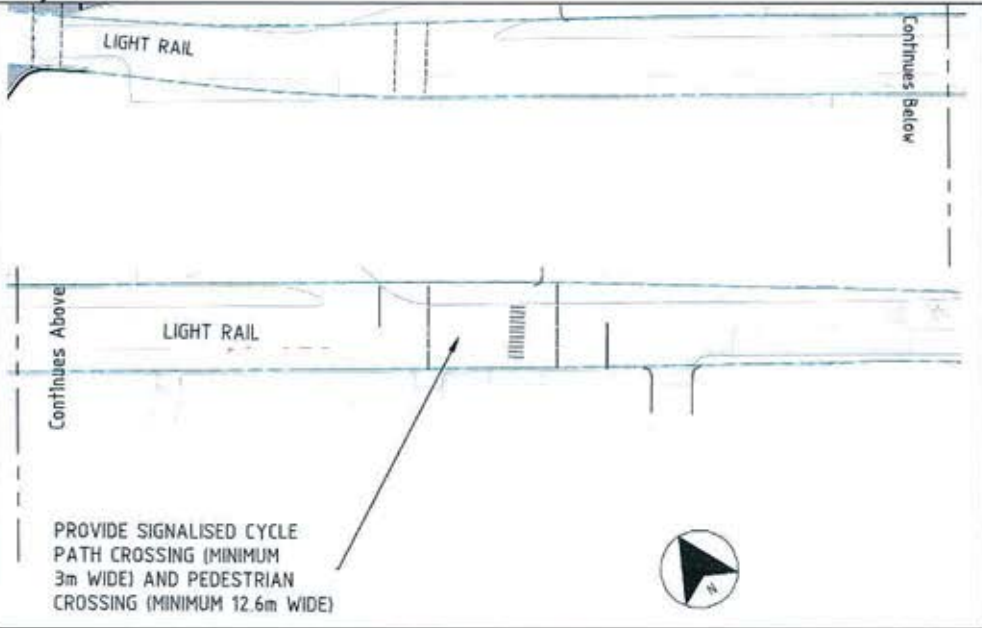
Control Signals (TCS)	TCS Drawing Number: 0263 Design Layout: 7000.412.VV.0263 Sheet 2 Issue B Cable Installation: 7000.412.VV.0263 Sheet 3 Issue C Cable Connection Chart: 7000.412.VV.0263 Sheet 4 Issue C Red Light Camera Interface Connection: N/A
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SLR Project Site No:
Location:

PS-CB32

Precinct: CBD

Existing Eddy Ave bus only lanes, including the extension of the signalised mid-block pedestrian crossing of Eddy Ave

Description	Works on Eddy Ave to remove bus only lanes and accommodate the addition of light rail on Eddy Ave. Modify existing signalised mid-block pedestrian crossing of the traffic lanes to extend over the light rail, and incorporate a cycle path crossing on the eastern side of the pedestrian crossing.
Roads	Eddy Ave (Regional Road)
Council	City of Sydney
Suburb	Haymarket
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Eddy Ave - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For turning movements into and from the Central Station service access, allow for 8.8m service vehicle access from the light rail tracks.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	Eddy Ave mid-block pedestrian crossing: TCS Drawing Number: 0263 Design Layout: 7000.412.VV.0263 Sheet 2 Issue B Cable Installation: 7000.412.VV.0263 Sheet 3 Issue C Cable Connection Chart: 7000.412.VV.0263 Sheet 4 Issue C Red Light Camera Interface Connection: N/A

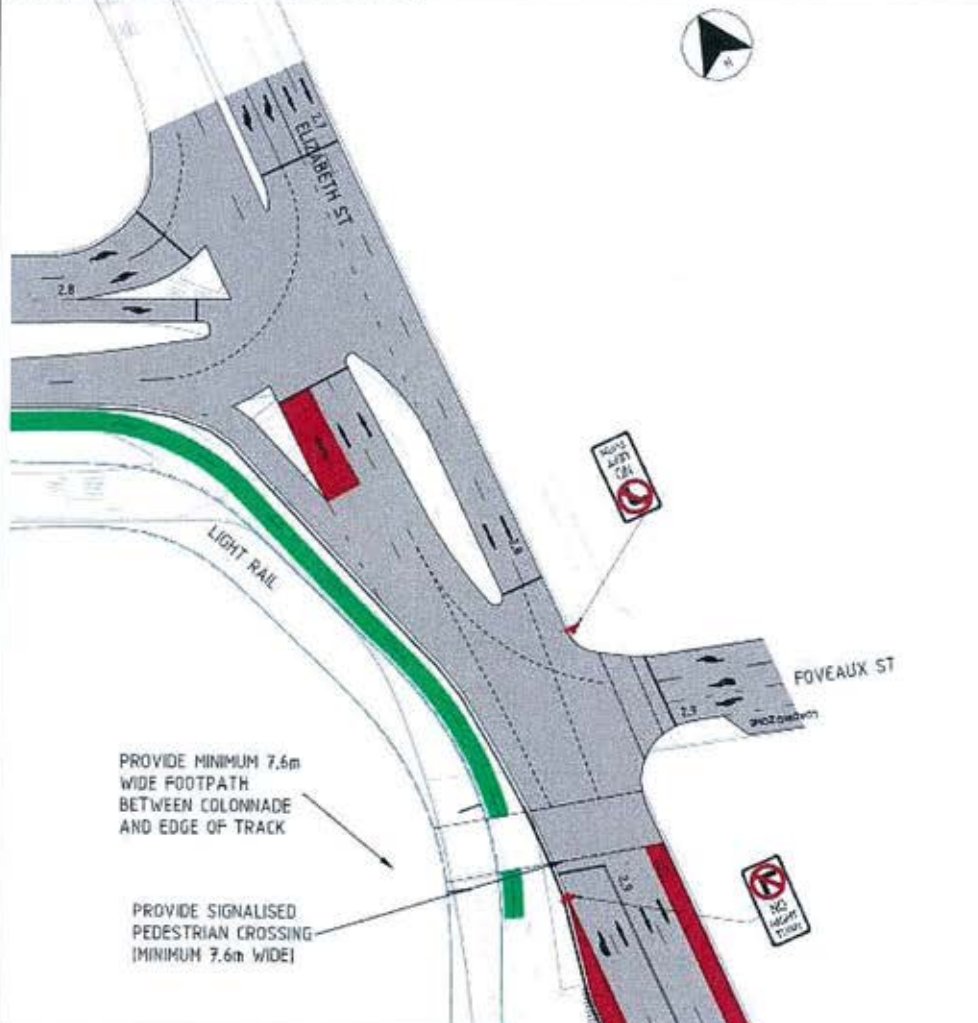
SLR Project Site No:

PS-CB23

Precinct: CBD

Location:

Intersection of Chalmers St/Foveaux St/Eddy Ave/Elizabeth St

Description	<p>Works on Chalmers St/Foveaux St/Eddy Ave/Elizabeth St intersection to accommodate the addition of light rail on Chalmers St and Eddy Ave. Modify existing signalised intersection with lane arrangements as per functional layout, and incorporating a shared path crossing of the light rail on Chalmers St. Elizabeth St is to become two-way between Randle St and Eddy Ave. Foveaux St is to remain one-way westbound. Close Central Station pedestrian access portal between Chalmers St and Elizabeth St.</p>
Roads	Chalmers St, Foveaux St, Eddy Ave and Elizabeth St (Regional Roads)
Council	City of Sydney
Suburb	Haymarket to the west of Chalmers St. Surry Hills to the east of Chalmers St.
Intersection functional layout and minimum traffic lane widths	 <p>Diagram illustrating the intersection functional layout and minimum traffic lane widths. The diagram shows Elizabeth St, Foveaux St, Eddy Ave, and Chalmers St. A light rail track is shown crossing the intersection. Key features include:</p> <ul style="list-style-type: none"> PROVIDE MINIMUM 7.6m WIDE FOOTPATH BETWEEN COLONNADE AND EDGE OF TRACK PROVIDE SIGNALISED PEDESTRIAN CROSSING (MINIMUM 7.6m WIDE) Signposted speed limits: 10km/h, 50km/h, and 60km/h. Signposted 'No Right Turn' and 'No Left Turn' signs.
Speed	<ul style="list-style-type: none"> Chalmers St - shared zone. Signposted speed of 10km/h and design speed of 20km/h. Foveaux St - signposted speed of 50km/h and design speed of 50km/h. Eddy Ave - signposted speed of 50km/h and design speed of 60km/h. Elizabeth St - signposted speed of 50km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A

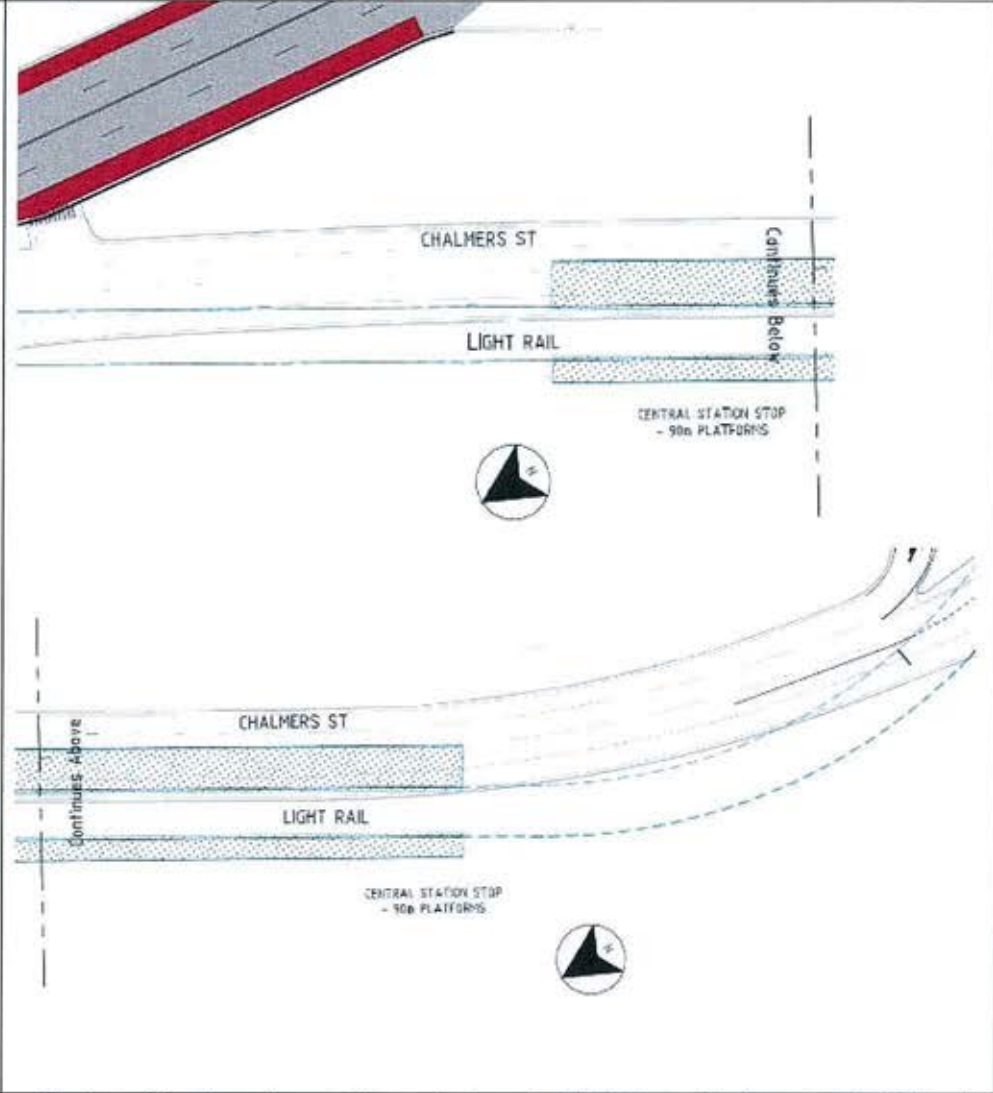
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing bus stop on the eastern kerb of Elizabeth St, to the south of Foveaux St. • Provide northbound bus zone on the western kerb of Elizabeth St at the approach to the signals. • Provide taxi zone on the southern kerb of Foveaux St, to the east of Elizabeth St.
Footway requirements	<ul style="list-style-type: none"> • Provide a 3.0m wide two-way cycle path on the southern side of Eddy Ave from Chalmers St to the existing signalised pedestrian crossing of Eddy Ave, between the light rail and the traffic lanes.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0293 Design Layout: 7000.412.VV.0293 Sheet 13 Issue H Cable Installation: 7000.412.VV.0293 Sheet 14 Issue D Cable Connection Chart: 7000.412.VV.0293 Sheet 15 Issue D Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:
Location:

PS-CB24

Precinct: CBD

Chalmers St from Elizabeth St to Randle St/Devonshire St

Description	<p>Works on Chalmers St from Elizabeth St to Randle St/Devonshire St to accommodate the addition of light rail on Chalmers St, including the Central Station Stop. Chalmers St is to be a shared zone (pedestrian, cyclist and local vehicle access), with local and service vehicle access from Chalmers St northbound via a left turn at the signalised intersection with Randle St/Devonshire St. Reverse direction of slip lane between Chalmers St and Randle St, providing local and service vehicle egress from Chalmers St southbound to Randle St northbound. Local and service vehicles to turn around in Chalmers St at loading docks and car parks to egress from Chalmers St southbound .</p>
Roads	Chalmers St (Regional road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Chalmers St - shared zone. Signposted speed of 10km/h and design speed of 20km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking	<ul style="list-style-type: none"> Retain existing bus stop on the eastern kerb of Elizabeth St, to the south of Foveaux

control and kerb lane requirements	St. <ul style="list-style-type: none"> • Provide northbound bus zone on the western kerb of Elizabeth St at the approach to the signals.
Footway requirements	<ul style="list-style-type: none"> • Provide shared zone on Chalmers St, on the eastern side of the Central Station Stop.
Existing Traffic Control Signals (TCS)	N/A

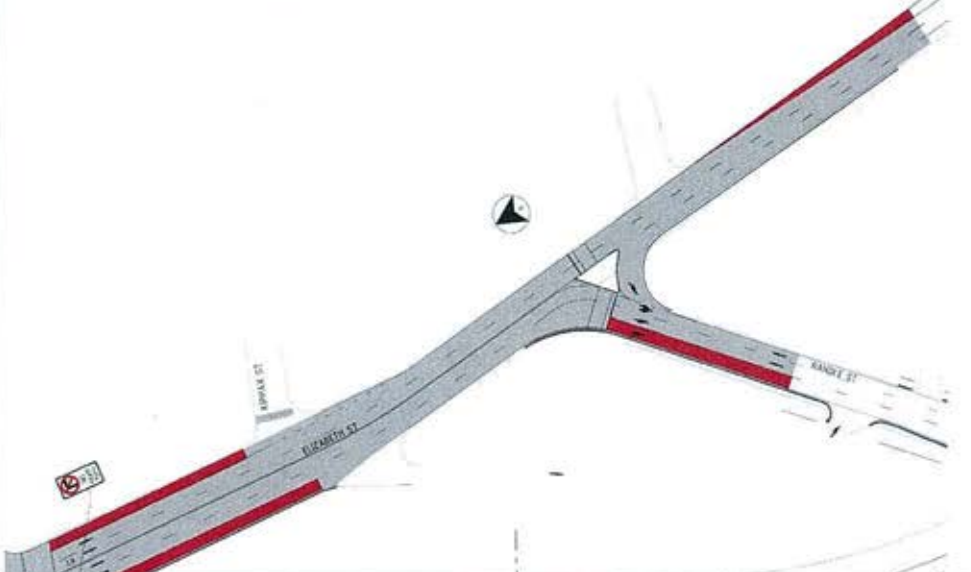
SLR Project Site No:

PS-CB26

Precinct: CBD

Location:

Elizabeth St from Chalmers St to Devonshire St, Randle St and Randle Ln, including the intersection of Elizabeth St and Randle St.

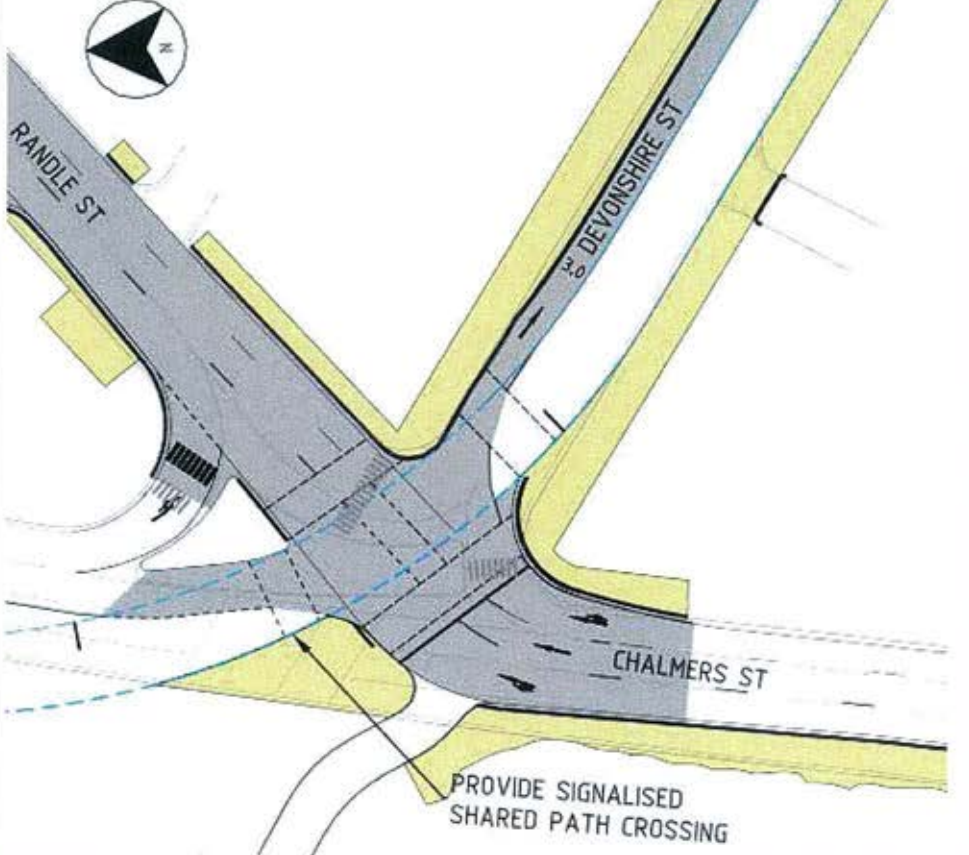
Description	<p>Works on Elizabeth St from Chalmers St to Devonshire St, on Randle St from Elizabeth St to Chalmers St/Devonshire St and on Randle Ln from Randle St to Elizabeth St to accommodate the diversion of traffic from Chalmers St.</p> <p>Provide signalised intersection of Elizabeth St/Randle St, with lane arrangements as per functional layout.</p> <p>Elizabeth St to become two-way between Randle St and Foveaux St.</p> <p>Provide two lanes southbound on Elizabeth St from Chalmers St to Devonshire St, and an additional bus set down lane on the southbound departure from Foveaux St.</p> <p>Provide two lanes northbound on Elizabeth St from Randle St to Chalmers St, and an additional bus set down lane on the northbound approach to Foveaux St.</p> <p>Reverse direction of flow on Randle St. Randle St to become one way northbound.</p> <p>Provide two lanes northbound on Randle St from Chalmers St and Elizabeth St, and an additional northbound bus lane adjacent to the western kerb.</p> <p>Randle Ln remains as one-way southbound.</p>
Roads	Elizabeth St, Randle St (Regional Roads) and Randle Ln (Local Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Elizabeth St - signposted speed of 50km/h and design speed of 60km/h. Randle St - signposted speed of 50km/h and design speed of 50km/h. Randle Ln - as existing.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing bus stop on the eastern kerb of Elizabeth St, to the south of Foveaux St. Provide northbound bus zone on the western kerb of Elizabeth St at the approach to the signals.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

**SLR Project
Site No:**
Location:

PS-SE01

Precinct: Surry Hills Moore Park

Intersection of Chalmers St/Randle St/Devonshire St

<p>Description</p>	<p>Works on Chalmers St/Devonshire St/Randle St intersection to accommodate the addition of light rail on Chalmers St and Devonshire St.</p> <p>Modify existing signalised pedestrian crossing of Chalmers St at Devonshire St to incorporate Chalmers St, Randle St and Devonshire St, with lane arrangements as per functional layout.</p> <p>Reverse direction of flow on Randle St. Randle St is to become one-way northbound. Chalmers St is to be a two-way shared zone to the north of Devonshire St, with local and service vehicle access from Chalmers St northbound via a left turn at the signalised intersection with Randle St/Devonshire St.</p> <p>Reverse direction of slip lane between Chalmers St and Randle St, providing local and service vehicle egress from Chalmers St southbound shared zone to Randle St northbound.</p> <p>Existing rail access driveway on the western side of Chalmers St to be shifted clear of stop line and pedestrian crossing.</p> <p>Provide cycle path connection from Prince Alfred Park to Chalmers St shared zone, on the west side of Chalmers St.</p>
<p>Roads</p>	<p>Chalmers St and Randle St (Regional Roads), Devonshire St (Local Road)</p>
<p>Council</p>	<p>City of Sydney</p>
<p>Suburb</p>	<p>Surry Hills</p>
<p>Intersection functional layout and minimum traffic lane widths</p>	
<p>Speed</p>	<ul style="list-style-type: none"> Chalmers St - south of Devonshire St: signposted speed of 50km/h and design speed of 60km/h. Chalmers St - north of Devonshire St: shared zone. Signposted speed of 10km/h and design speed of 20km/h.

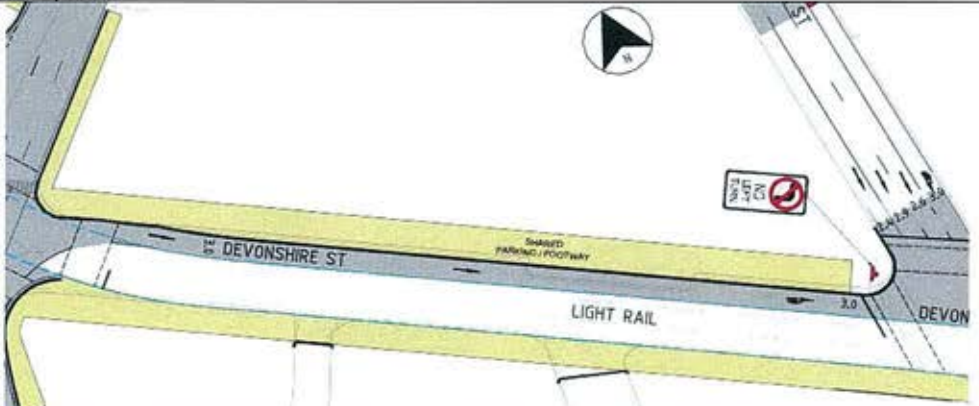
	<ul style="list-style-type: none"> • Randle St - signposted speed of 50km/h and design speed of 50km/h. • Devonshire St - signposted speed of 40km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking zone on the eastern kerb of Chalmers St, to the south of Devonshire St. • Provide bus zone on the western kerb of Chalmers St, to the south of Devonshire St.
Footway requirements	<ul style="list-style-type: none"> • Provide off-road cycle path in both directions on Chalmers St, connecting to an off-road cycle path in Prince Alfred Park, and to Eddy Ave.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 1733 Design Layout: 7000.412.VV.1733 Sheet 1 Issue B Cable Installation: 7000.412.VV.1733 Sheet 2 Issue A Cable Connection Chart: No drawing Controller Facility Schedule: VV.1733 Sheet 4 Issue A Red Light Camera Interface Connection: N/A</p>

**SLR Project
Site No:**
Location:

PS-SE59

Precinct: Surry Hills Moore Park

**Devonshire St from Chalmers St to Elizabeth St, including intersections
at:**
1. Devonshire St/Chalmers Ln
2. Devonshire St/Buckingham St

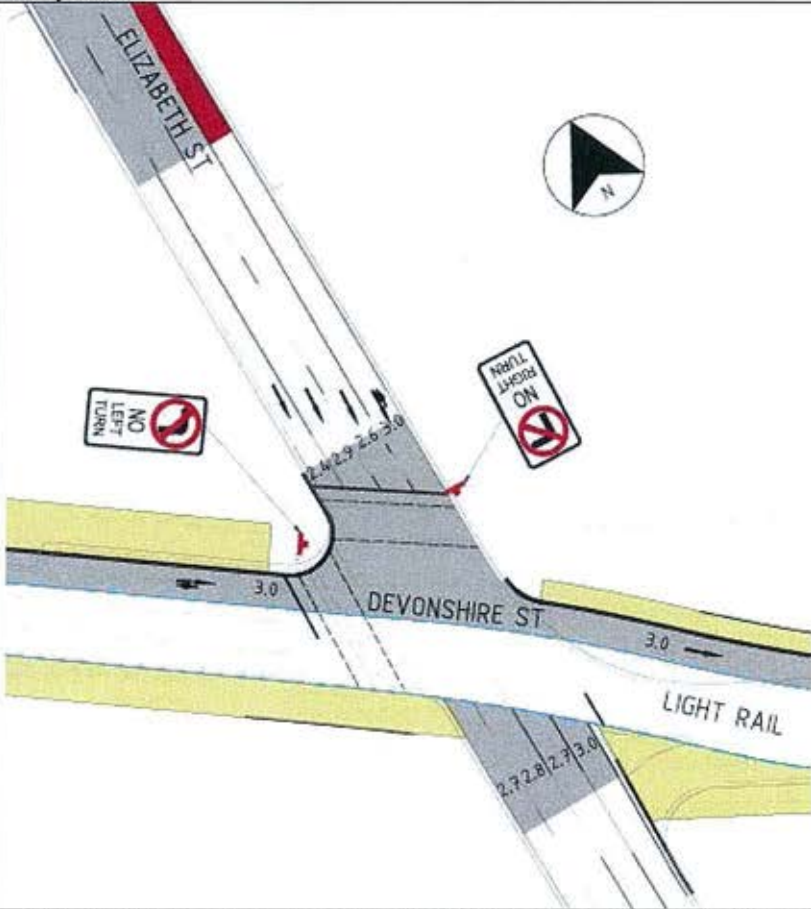
Description	<p>Works on Devonshire St from Chalmers St to Elizabeth St to accommodate the addition of light rail on Devonshire St. Provide one lane eastbound on Devonshire St from Chalmers St to Elizabeth St. Chalmers Ln is to be closed at Devonshire St, with the exception of right turns to Devonshire St eastbound by service vehicles. Buckingham St is to be closed at Devonshire St.</p>
Roads	Devonshire St, Chalmers Ln and Buckingham St (Local Roads)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	 <p>Note: Northern side Shared Parking / Footway to be limited to short sections for the purpose of servicing businesses with the majority of the path available for use by pedestrians.</p>
Speed	<ul style="list-style-type: none"> Devonshire St - signposted speed of 40km/h and design speed of 50km/h. Chalmers Ln - as existing. Buckingham St - as existing.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Provide shared parking and footway on the northern kerb of Devonshire St, to the east of Chalmers St. Remove existing cycle route markings, paint and signage on Devonshire St.
Footway requirements	<ul style="list-style-type: none"> Reinstate footpath on Devonshire St across road closures at Chalmers Ln (with a mountable kerb to allow right turns by service vehicles only), and at Buckingham St.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE02

Precinct: Surry Hills Moore Park

Intersection of Devonshire St/Elizabeth St

Description	Works on Devonshire St/Elizabeth St intersection to accommodate the addition of light rail on Devonshire St. Modify existing signalised intersection with lane arrangements as per functional layout. Remove existing slip lane from Devonshire St westbound to Elizabeth St southbound.
Roads	Devonshire St (Local road) and Elizabeth St (Regional Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Devonshire St - signposted speed of 40km/h and design speed of 50km/h. • Elizabeth St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • Single Unit Truck left turn from Elizabeth St southbound into Devonshire St south-eastbound traffics the LRV corridor.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking/loading zone on the western kerb of Elizabeth St, to the north of Devonshire St. • Retain loading zone on the western kerb of Elizabeth St, to the south of Devonshire St. • Remove existing cycle route markings, paint and signage on Devonshire St.
Footway requirements	<ul style="list-style-type: none"> • N/A

Existing Traffic Control Signals (TCS)	TCS Drawing Number: 1360 Design Layout: 7000.412.VV.1360 Sheet 1 Issue C Cable Installation: 0000.412.VV.1360 Sheet 2 Issue A Cable Connection Chart: 0000.412.VV.1360 Sheet 3 Issue C Red Light Camera Interface Connection: N/A
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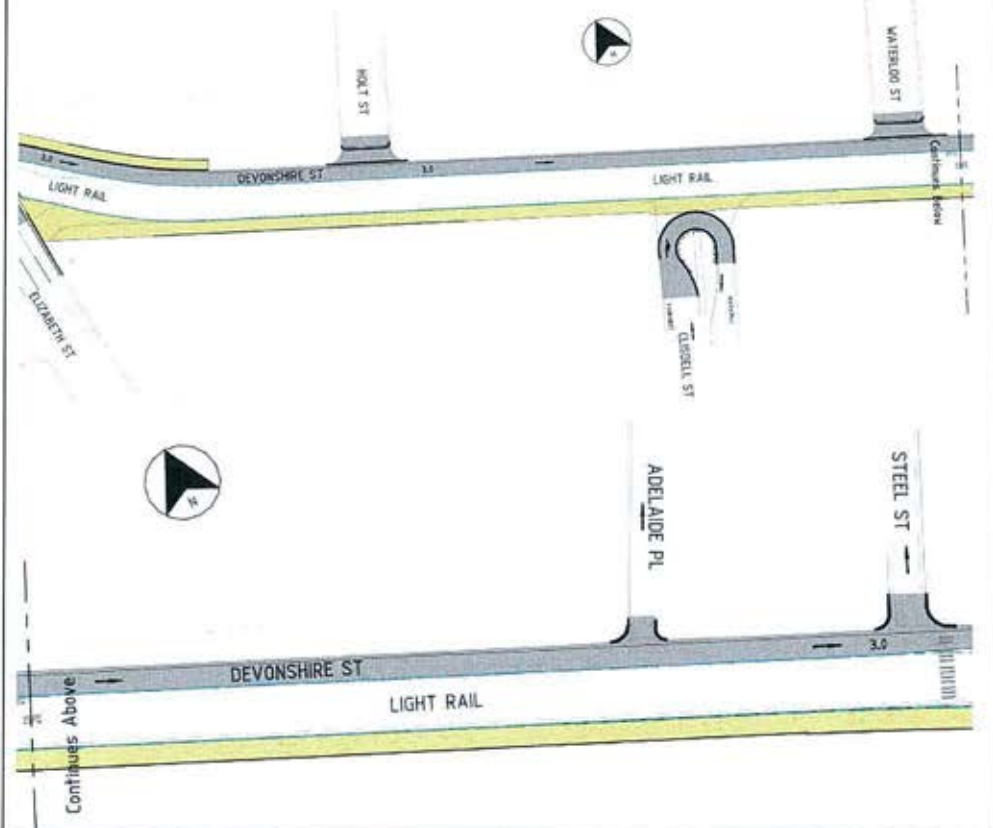
SLR Project
 Site No:

PS-SE03

Precinct: Surry Hills Moore Park

Location:

Devonshire St from Elizabeth St to the intersection of Steel St, including intersections at:
 1. Devonshire St/Holt St
 2. Devonshire St/Clisdell St
 3. Devonshire St/Waterloo St
 4. Devonshire St/Adelaide PI
 5. Devonshire St/Steel St

Description	<p>Works on Devonshire St from Elizabeth St to the intersection of Steel St to accommodate the addition of light rail on Devonshire St. Provide one lane eastbound on Devonshire St from Elizabeth St to Steel St. Holt St is to be closed at Devonshire St. Clisdell St is to be closed at Devonshire St, with a turning head provided. Waterloo St is to be closed at Devonshire St. Steel St is to remain one-way northbound.</p>
Roads	Devonshire St, Holt St, Clisdell St, Waterloo St, Adelaide PI and Steel St (Local Roads)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Devonshire St - signposted speed of 40km/h and design speed of 50km/h. • Holt St - signposted speed of 50km/h and design speed of 60km/h. • Clisdell St - signposted speed of 50km/h and 5km/h (turnhead) and design speed of 50km/h and 5km/h (turnhead). • Waterloo St - signposted speed of 50km/h and design speed of 60km/h. • Adelaide PI - signposted speed of 50km/h and design speed of 60km/h. • Steel St - signposted speed of 50km/h and design speed of 60km/h.

Design vehicles (exceptions)	<ul style="list-style-type: none"> • For turning head on Clisdell St, allow for a 5.2m passenger vehicle at 5km/h. • For left turning movements into Adelaide PI, allow for a 5.2m passenger vehicle, accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Steel St, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking on the eastern and western kerbs of Holt St. • Reduce existing parking zones on the eastern and western kerbs of Clisdell St necessary to accommodate the turning head. • Retain existing parking on the eastern and western kerbs of Waterloo St. • Retain existing parking on the western kerb of Steel St. • Remove existing cycle route markings, paint and signage on Devonshire St. • No stopping on Devonshire St eastbound.
Footway requirements	<ul style="list-style-type: none"> • Reinstate footpath on Devonshire St across road closures at Holt St, Clisdell St and Waterloo St.
Existing Traffic Control Signals (TCS)	N/A

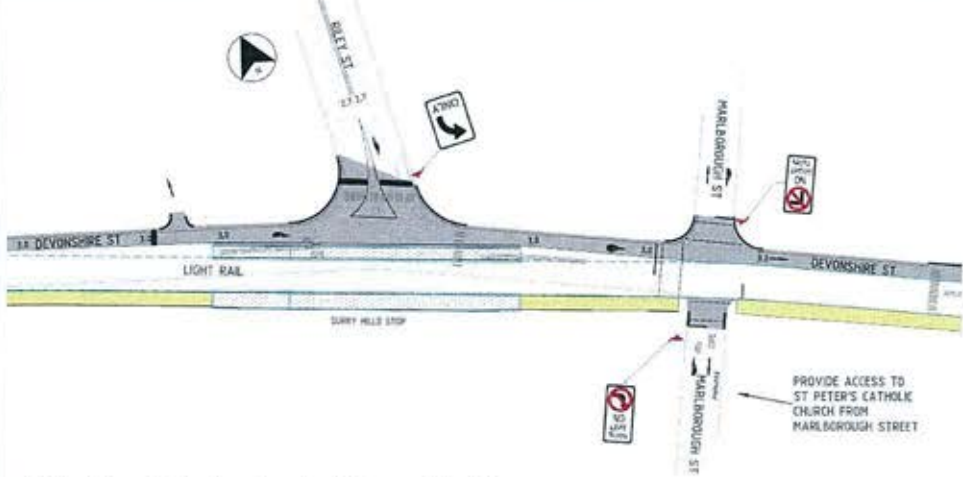
SLR Project Site No:

PS-SE04

Precinct: Surry Hills Moore Park

Location:

Devonshire St from Steel St to High Holborn St, including intersections at:
1. Devonshire St/Little Riley St
2. Devonshire St/Riley St
3. Devonshire St/Marlborough St

Description	<p>Works on Devonshire St from Steel St to High Holborn St to accommodate the addition of light rail on Devonshire St, including the Surry Hills Stop. Provide one lane eastbound on Devonshire St from Steel St to High Holborn St. Provide signalised intersection of Devonshire St/Marlborough St, with lane arrangements as per functional layout. Remove existing pedestrian crossing outside of St Peters Church.</p>
Roads	Devonshire St, Little Riley St, Riley St and Marlborough St (All Local Roads)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • Little Riley St to be closed at Devonshire St
Speed	<ul style="list-style-type: none"> • Devonshire St - signposted speed of 40km/h and design speed of 50km/h. • Little Riley St - closed at Devonshire St. • Riley St - signposted speed of 40km/h and design speed of 50km/h. • Marlborough St - north of Devonshire St: signposted speed of 40km/h and design speed of 50km/h. • Marlborough St - south of Devonshire St: signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements into and from Riley St, allow for vehicles up to an 8.8m service vehicle, accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Marlborough St northbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). • For left turning movements from Marlborough St southbound into Devonshire St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track).

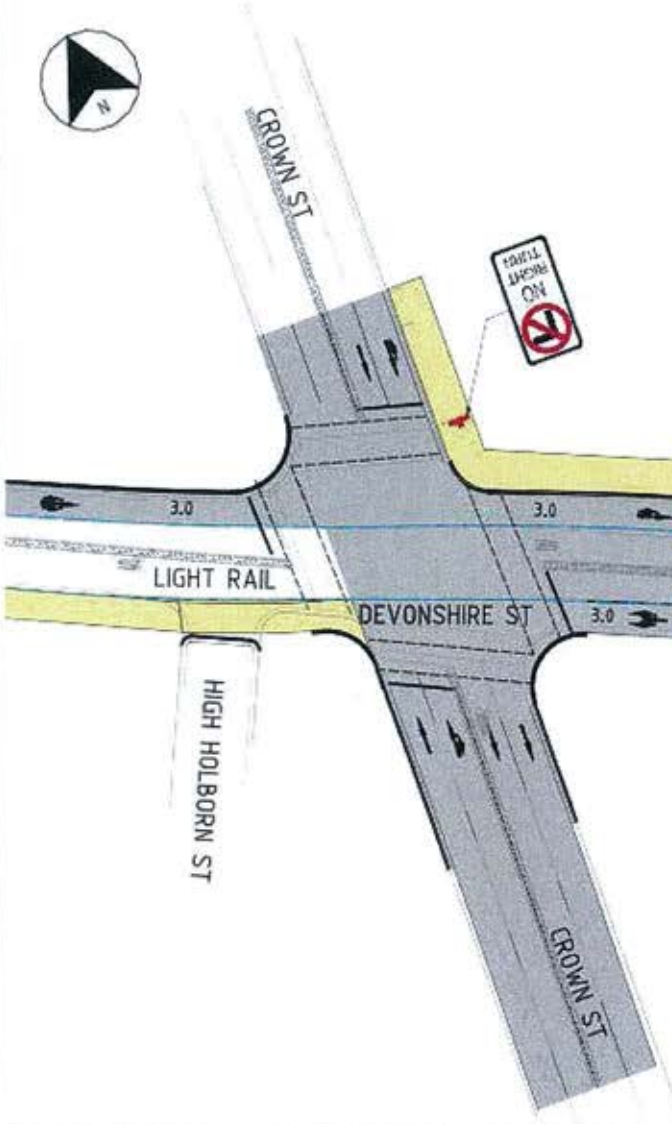
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking on the eastern and western kerbs of Riley St. • Retain existing parking on the eastern kerb of Marlborough St, to the south of Devonshire St. • Retain existing parking on the eastern and western kerbs of Marlborough St, to the north of Devonshire St. • Remove existing cycle route markings, paint and signage on Devonshire St. • Retain existing on-road cycle lane markings on Riley St in both directions. • Retain existing on-road cycle route on Marlborough St in both directions, to the south of Devonshire St.
Footway requirements	<ul style="list-style-type: none"> • Retain existing two way off-road cycle path in Ward Park.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
 Location:

PS-SE05

Precinct: Surry Hills Moore Park

Intersection of Devonshire St/Crown St/High Holborn St

Description	Works on Devonshire St/Crown St/High Holborn St intersection to accommodate the addition of light rail on Devonshire St. Modify existing signalised intersection, with lane arrangements as per functional layout. High Holborn St is to be closed at Devonshire St.
Roads	Devonshire St and High Holborn St (Local Roads), Crown St (Regional Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	 <p>Note: "No Left Turn" sign (in to Devonshire Street) to be installed on Crown Street north bound.</p>
Speed	<ul style="list-style-type: none"> • Devonshire Street - signposted speed of 40km/h and design speed of 50km/h. • Crown St - signposted speed of 40km/h and design speed of 50km/h. • High Holborn St - signposted speed of 40km/h and design speed of 50km/h.

Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements into Crown St northbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). • For left turning movements from Crown St southbound into Devonshire St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). • For left turning movements from Devonshire St westbound into Crown St southbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Northbound light rail track).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing bus zone on the eastern kerb of Crown St, to the south of Devonshire St. • Extend existing bus zone on the western kerb of Crown St, to the south of Devonshire St. • Retain existing loading zone and parking zone on the western kerb of Crown St, to the north of Devonshire St. • Retain existing parking on the eastern kerb of Crown St, to the north of Devonshire St. • Retain existing on-road cycle lane markings on Crown St in both directions. • Remove existing cycle route markings, paint and signage on Devonshire St.
Footway requirements	<ul style="list-style-type: none"> • Reinstate footpath on Devonshire St across road closure at High Holborn St.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0562 Design Layout: 7000.413.VV.0562 Sheet 1 Issue C Cable Installation: 7000.413.VV.0562 Sheet 2 Issue A Cable Connection Chart: 7000.412.VV.0562 Sheet 3 Issue A Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:

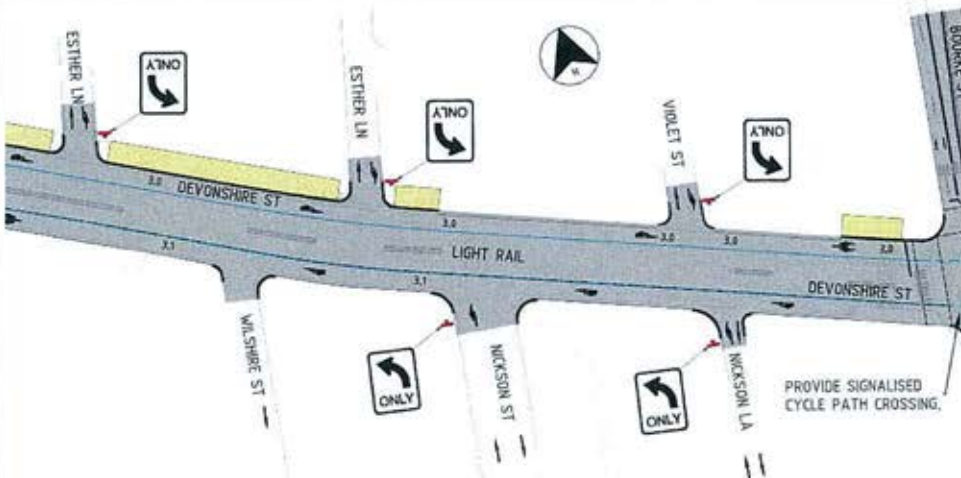
PS-SE06

Precinct: Surry Hills Moore Park

Location:

Devonshire St from Crown St to Bourke St, including intersections at:

1. Devonshire St/Esther Ln
2. Devonshire St/Wilshire St
3. Devonshire St/Esther Ln
4. Devonshire St/Nickson St
5. Devonshire St/Violet St
6. Devonshire St/Nickson Ln

Description	Works on Devonshire St from Crown St to Bourke St to accommodate the addition of light rail on Devonshire St. Provide one lane eastbound and one lane westbound on Devonshire St from Crown St to Bourke St.
Roads	Devonshire St, Esther Ln, Wilshire St, Nickson St, Violet St and Nickson Ln (Local Roads)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	 <p>Note: "No Right Turn" from Devonshire Street into Esther Lane, Violet Street, Nickson Lane, Nickson Street or Wilshire St.</p>
Speed	<ul style="list-style-type: none"> • Devonshire St - signposted speed of 40km/h and design speed of 50km/h. • Esther St - signposted speed of 40km/h and design speed of 50km/h. • Wilshire St - signposted speed of 40km/h and design speed of 50km/h. • Esther Ln - signposted speed of 40km/h and design speed of 50km/h. • Nickson St - signposted speed of 40km/h and design speed of 50km/h. • Violet St - signposted speed of 40km/h and design speed of 50km/h. • Nickson Ln - signposted speed of 40km/h and design speed of 50km/h.

Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements into Esther Ln allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements from Esther Ln into Devonshire St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Wilshire St, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Esther Ln allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements from Esther Ln into Devonshire St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Nickson St allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements from Nickson St into Devonshire St westbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Northbound light rail track), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Violet St allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements from Violet St into Devonshire St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements into Nickson Ln allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the light rail tracks), accepting that the normal clearances from the swept path may not be achieved. • For left turning movements from Nickson Ln into Devonshire St westbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Northbound light rail track), accepting that the normal clearances from the swept path may not be achieved.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking on the western kerb of Wilshire St. • Retain existing parking on the eastern kerb of Nickson St. • Remove existing cycle route markings, paint and signage on Devonshire St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	N/A

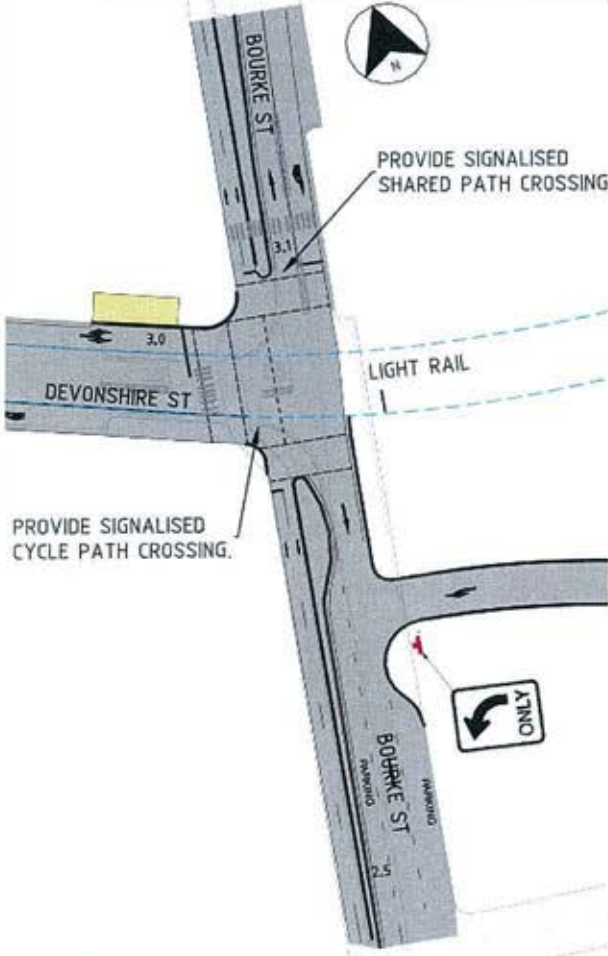
**SLR Project
Site No:**

PS-SE07

Precinct: Surry Hills Moore Park

Location:

Bourke St from Nobbs St to Parkham Ln, including intersections at:
1. Devonshire St/Bourke St
2. Bourke St/Parkham Ln

Description	Works on Bourke St from Nobbs St to Parkham Ln to accommodate the addition of light rail on Devonshire St and through Wimbo Park. Provide signalised intersection at Devonshire St/Bourke St with lane arrangements as per functional layout. Parkham Ln is to be one-way westbound and extended to connect to Bourke St.
Roads	Devonshire St and Parkham Ln (Local Roads), and Bourke St (Regional Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Devonshire St - signposted speed of 40km/h and design speed of 50km/h. • Bourke St - signposted speed of 40km/h and design speed of 50km/h. • Parkham Ln - signposted speed of 40km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements into Bourke St northbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). • Service vehicle left turn into northbound Bourke St uses LRV corridor and infringes into southbound Bourke St lane.

On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking on the eastern and western kerbs of Bourke St, to the north and south of Devonshire St. • Provide on-road cycle route on Parkham Ln westbound.
Footway requirements	<ul style="list-style-type: none"> • Retain existing two-way off-road cycle path on the western side of Bourke St.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:

PS-SE43

Precinct: Surry Hills Moore Park

Location:

Parkham Ln from Bourke St to Olivia Ln

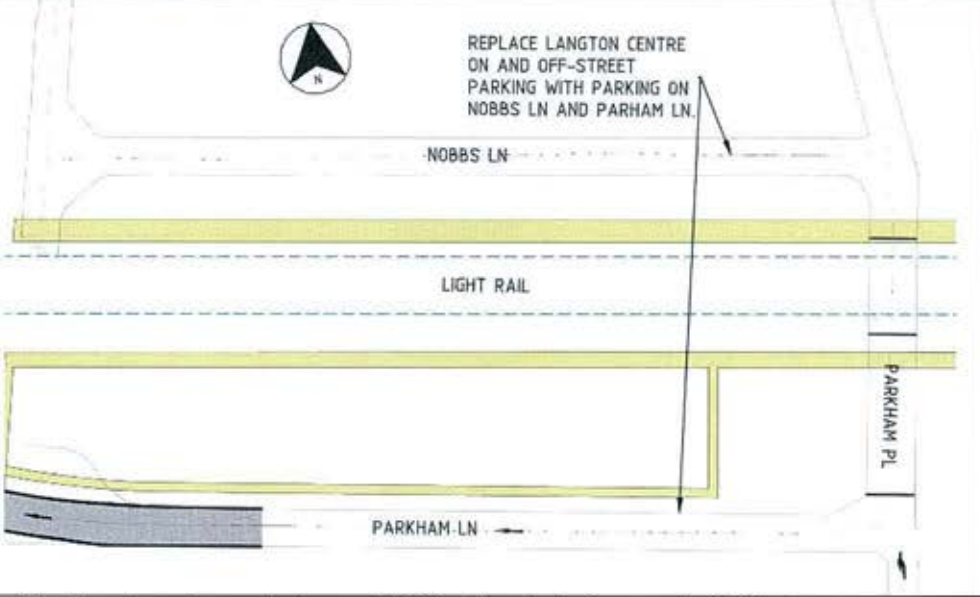
Description	Works on Parkham Ln from Bourke St to Olivia Ln to accommodate the addition of light rail through Wimbo Park. Parkham Ln is to be one-way westbound and extended to connect to Bourke St.
Roads	Parkham Ln (Local Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Parkham Ln - signposted speed of 40km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • N/A
Footway requirements	<ul style="list-style-type: none"> • Provide 3.0m wide two-way shared pedestrian and cycle path on the northern side of the light rail alignment, between Bourke St and Moore Park.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

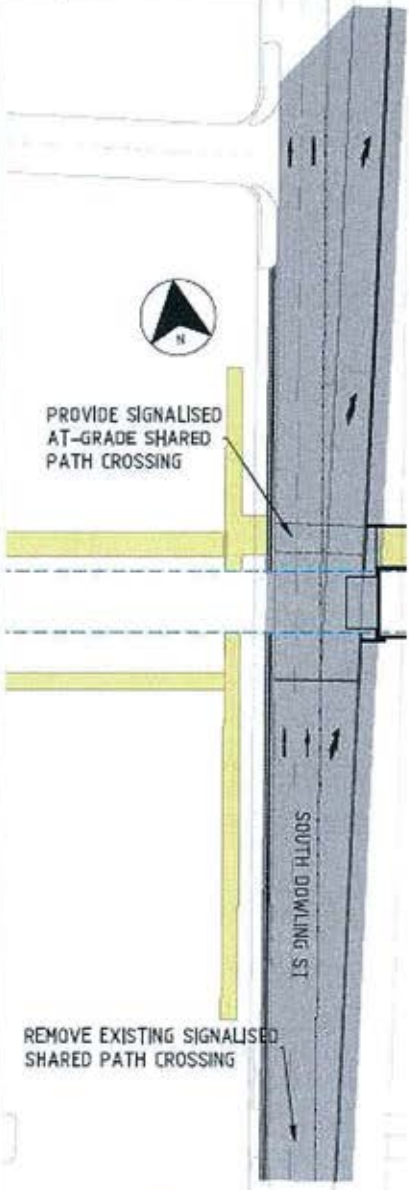
PS-SE44

Precinct: Surry Hills Moore Park

Works on Parkham PI from Parkham Ln to Nobbs Ln, on Parkham Ln from Olivia Ln to Parkham PI and on Nobbs Ln from Olivia Ln to Parkham PI, including intersections at:
1. Parkham Ln/Parkham PI
2. Parkham PI/Nobbs Ln

Description	Works on Parkham PI from Parkham Ln to Nobbs Ln, Parkham Ln from Olivia Ln to Parkham PI and Nobbs Ln from Olivia Ln to Parkham PI to accommodate the addition of light rail, with lane arrangements as per functional layout. Parkham Ln is to be one-way westbound and extended to connect to Bourke St. Parkham PI is to be closed at Nobbs Ln and Parkham Ln, and is to be one-way northbound to the south of Parkham Ln.
Roads	Parkham Ln, Parkham PI and Nobbs Ln (Local Roads)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Parkham Ln - signposted speed of 40km/h and design speed of 50km/h. • Parkham PI - signposted speed of 40km/h and design speed of 50km/h. • Nobbs Ln - signposted speed of 40km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Replace Langton Centre car parking by providing 26 parking spaces on the southern kerb of Nobbs Ln. • Provide 8 parking spaces on the northern kerb of Parkham Ln.
Footway requirements	<ul style="list-style-type: none"> • Provide 3.0m wide two-way shared pedestrian and cycle path on the northern side of the light rail alignment, between Bourke St and Moore Park. • Provide footpaths on the southern side of the light rail alignment, through Olivia Gardens from Olivia Ln/Parkham Ln to South Dowling St.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No: PS-SE08 Precinct: Surry Hills Moore Park
 Location: Intersection of light rail and South Dowling St northbound, including the existing signalised pedestrian crossing at Parkham St

Description	Works on the light rail and South Dowling St northbound including at grade crossing to accommodate the addition of light rail. Provide signalised intersection with lane arrangements as per functional layout. Remove existing signalised pedestrian crossing of South Dowling St at Parkham St.
Roads	South Dowling St (State Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	 <p>Note: Signalised crossing of Light Rail alignment to be placed on South Dowling Street footpath.</p>
Speed	<ul style="list-style-type: none"> • South Dowling St - signposted speed of 60km/h and design speed of 60km/h.

Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing on-street parking on west side of South Dowling St northbound except through new intersection.
Footway requirements	<ul style="list-style-type: none"> Provide signalised at-grade mid-block shared path or paths crossing South Dowling St, and connect to bridge overpassing the Eastern Distributor.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 2146 Design Layout: 0593.413.VV.2146 Sheet 4 Issue B Cable Installation: 0593.413.VV.2146 Sheet 5 Issue A Cable Connection Chart: 0593.413.VV.2146 Sheet 6 Issue A Red Light Camera Interface Connection: N/A</p>


SLR Project Site No:

PS-SE09


Precinct: Surry Hills Moore Park

Location:

Light rail bridge overpassing the Eastern Distributor

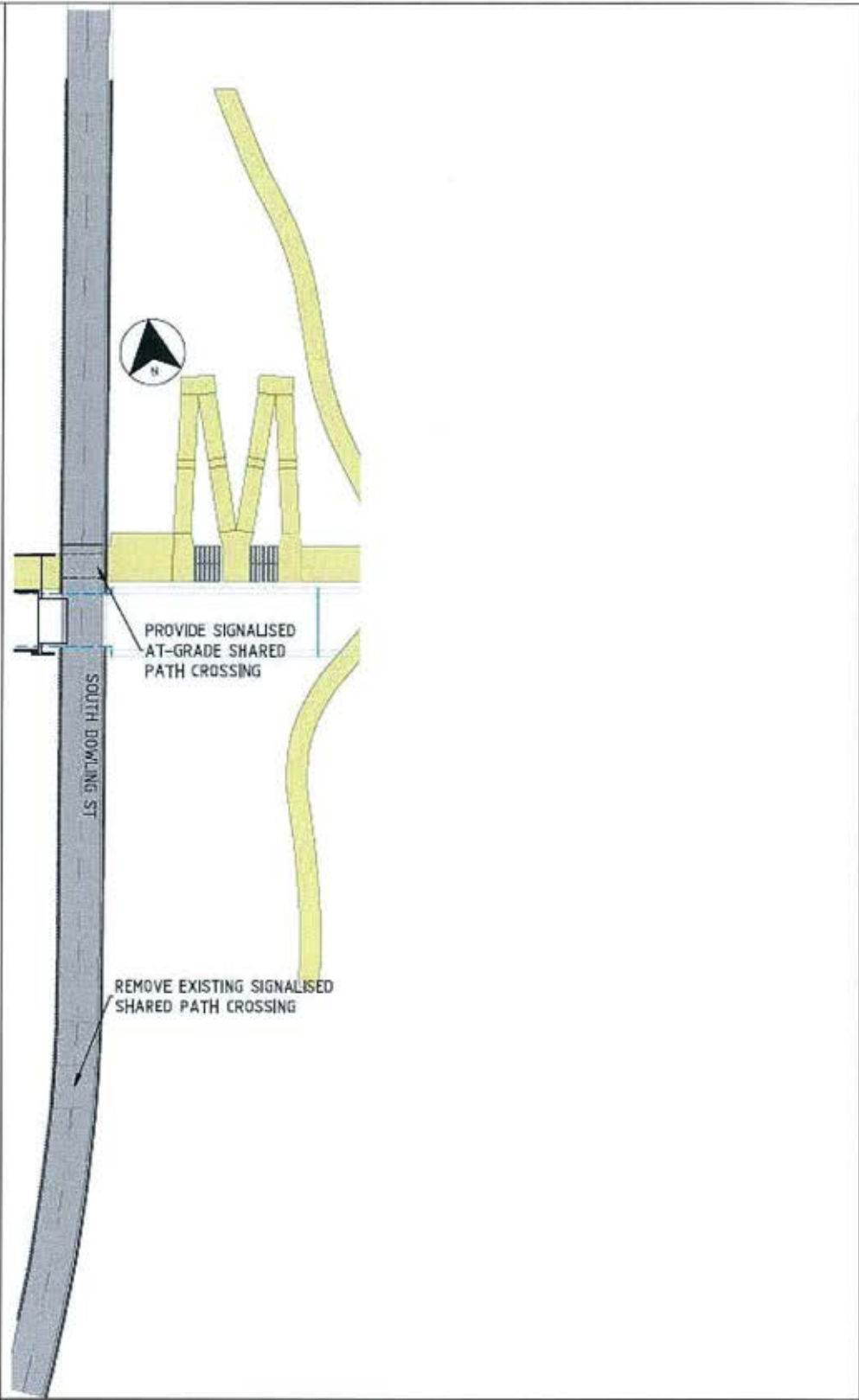
Description	Works to provide a bridge structure overpassing the Eastern Distributor to accommodate a light rail crossing with shared pedestrian and cyclist path.
Roads	Eastern Distributor (State Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Eastern Distributor - signposted speed of 80km/h and design speed of 90km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> Provide two-way shared pedestrian and cycle path or paths on the light rail bridge overpassing the Eastern Distributor. If a single path is provided, the path must have a minimum width of 5.0m. If two paths are provided, each path must have a minimum width of 3.0m.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No: PS-SE60 **Precinct:** Surry Hills Moore Park
Location: Eastern Distributor Motorway existing pedestrian bridge (near Parkham St)

Description	Works to remove the existing pedestrian bridge overpassing the Eastern Distributor Motorway at Parkham St.
Roads	Eastern Distributor (State Road)
Council	City of Sydney
Suburb	Surry Hills
Intersection functional layout and minimum traffic lane widths	
Speed	• Eastern Distributor - signposted speed of 80km/h and design speed of 90km/h.
Design vehicles (exceptions)	• N/A
On-street parking control and kerb lane requirements	• N/A
Footway requirements	• N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No: PS-SE10 **Precinct:** Surry Hills Moore Park
Location: Intersection of light rail and South Dowling St southbound, including the existing pedestrian signalised crossing at Parkham St

Description	Works on the light rail and South Dowling St southbound including at grade crossing to accommodate the addition of light rail. Provide signalised intersection with lane arrangements as per functional layout. Remove existing signalised pedestrian crossing of South Dowling St at Parkham St.
Roads	South Dowling St (State Road)
Council	City of Sydney
Suburb	Surry Hills

<p>Intersection functional layout and minimum traffic lane widths</p>	
<p>Speed</p>	<ul style="list-style-type: none"> • South Dowling St - signposted speed of 60km/h and design speed of 60km/h.
<p>Design vehicles (exceptions)</p>	<ul style="list-style-type: none"> • N/A

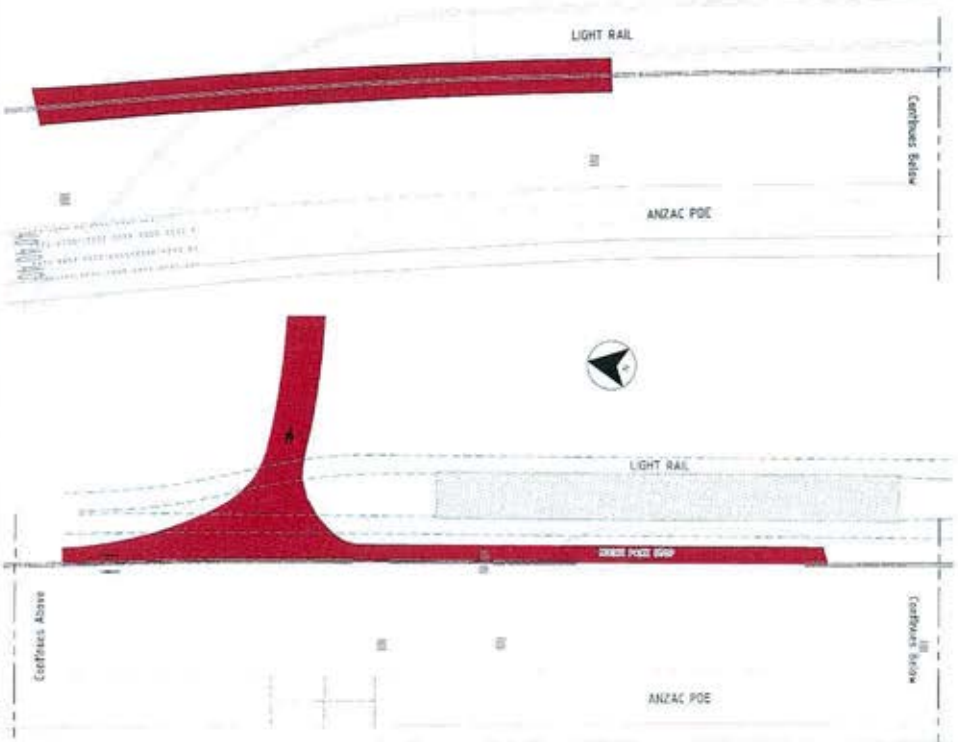
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • N/A
Footway requirements	<ul style="list-style-type: none"> • Provide signalised at-grade mid-block shared path or paths crossing South Dowling St, and connect to bridge overpassing the Eastern Distributor on the western side, and the Moore Park shared path on the eastern side.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 2146 Design Layout: 0593.413.VV.2146 Sheet 4 Issue B Cable Installation: 0593.413.VV.2146 Sheet 5 Issue A Cable Connection Chart: 0593.413.VV.2146 Sheet 6 Issue A Red Light Camera Interface Connection: N/A</p>

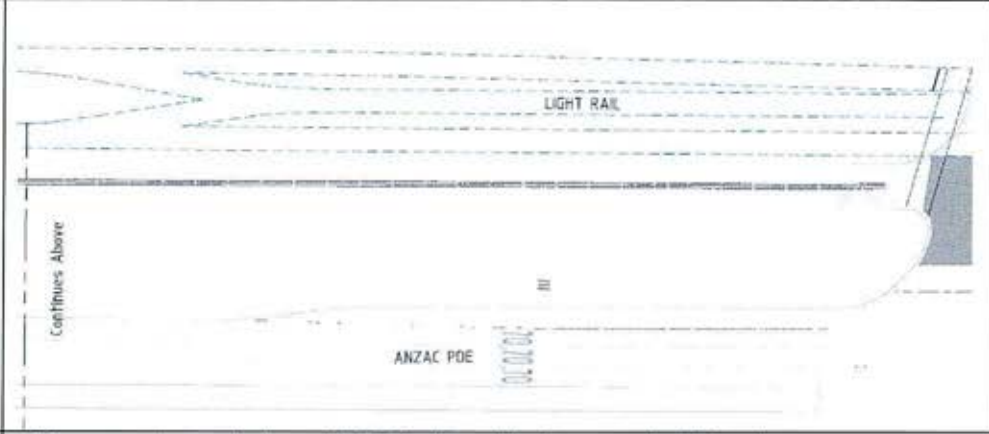
SLR Project Site No:
Location:

PS-SE46

Precinct: Surry Hills Moore Park

Moore Park Tramway Oval and Anzac Pde busway from the Moore Park Stop to Lang Rd

<p>Description</p>	<p>Works on Moore Park Tramway Oval and Anzac Pde busway to accommodate the addition of light rail in a dedicated light rail corridor on the eastern side of the Anzac Pde busway, from the Moore Park Stop to Lang Rd, including the Moore Park Stop. Remove existing busway central median and median fence, and realign existing southbound busway lane and kerb at Moore Park Stop. Retain one bus lane southbound and one bus lane northbound on the Anzac Pde busway. Relocate existing special event bus loop/busway exit connection to the north to avoid conflicts with the Moore Park Stop, and connect to the existing bus loop. Provide traffic signals at the bus loop/busway/light rail intersection. Relocate existing fence on the east side of the busway to the east side of the light rail corridor. Remove existing pedestrian crossing on Anzac Parade opposite event busway loop (alternative crossing provision via new pedestrian bridge) and extend current median fencing on Anzac Parade to prevent pedestrians from crossing Anzac Parade at grade.</p>
<p>Roads</p>	<p>Busway (Local Road)</p>
<p>Council</p>	<p>City of Sydney</p>
<p>Suburb</p>	<p>Moore Park</p>
<p>Intersection functional layout and minimum traffic lane widths</p>	

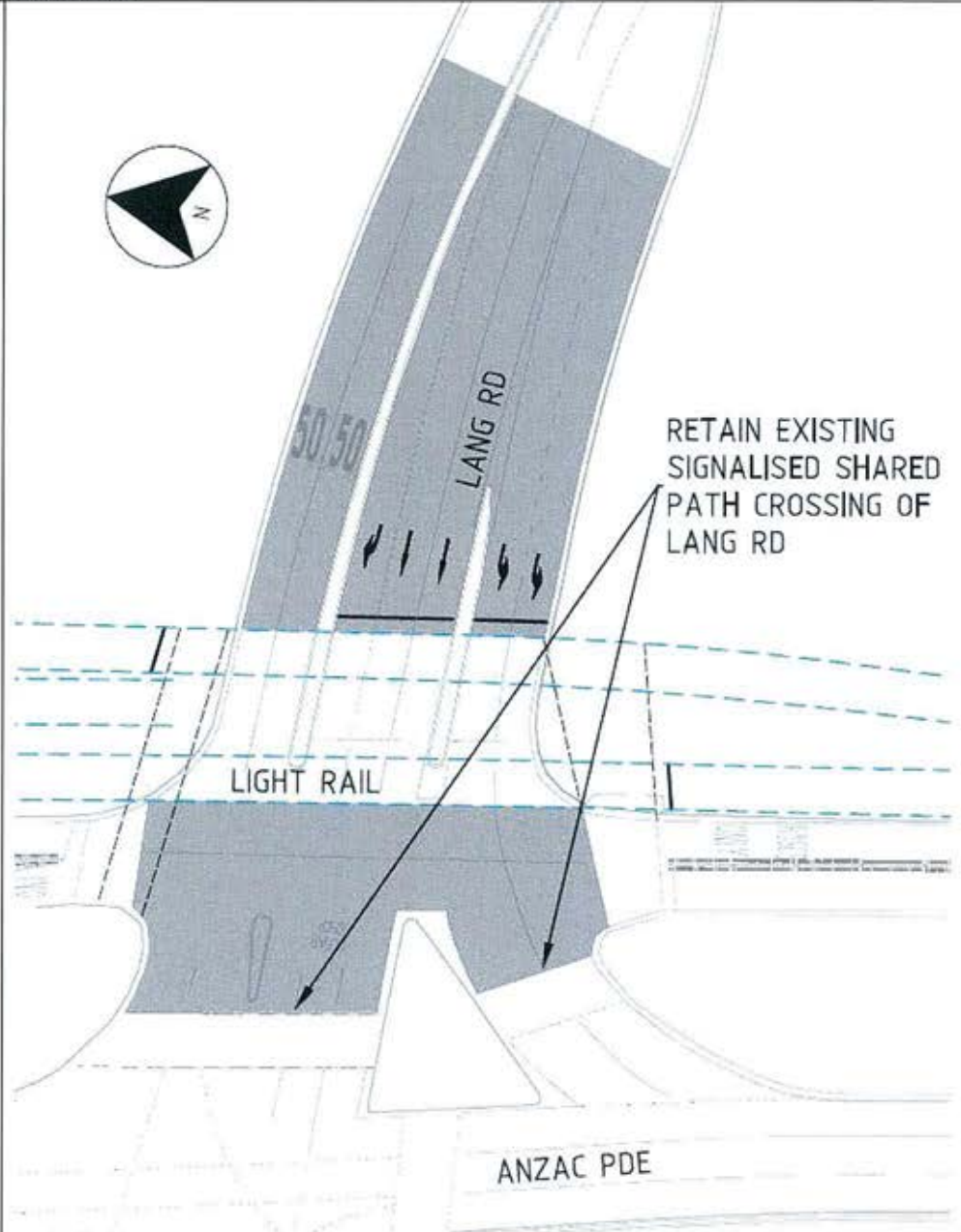
	
Speed	<ul style="list-style-type: none"> • Busway - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Remove existing bus stop on the eastern kerb of the busway, near the Moore Park Stop. • Remove existing bus stop on the western kerb of the busway, near the Moore Park Stop.
Footway requirements	<ul style="list-style-type: none"> • Retain existing 3.0m wide two-way off road shared pedestrian and cycle path on the eastern side of Anzac Pde, between the busway and traffic lanes.
Existing Traffic Control Signals (TCS)	N/A

**SLR Project
Site No:**
Location:

PS-SE11

Precinct: Surry Hills Moore Park

Intersection of Anzac Pde/Lang Rd/Cleveland St/busway

Description	Works on Anzac Pde/Lang Rd/Cleveland St/busway intersection to accommodate the addition of light rail in a dedicated light rail corridor on the eastern side of the Anzac Pde busway. Modify existing signalised intersection with lane arrangements as per functional layout. Relocate existing fence on the east side of the busway to the east side of the light rail corridor.
Roads	Anzac Pde and Cleveland St (State Roads), Lang Rd and Busway (Local Roads)
Council	City of Sydney
Suburb	Moore Park
Intersection functional layout and minimum traffic lane widths	 <p> The diagram illustrates the intersection layout. Anzac Pde runs horizontally at the bottom. Lang Rd runs vertically through the center. Cleveland St runs horizontally across the top. A new Light Rail corridor is shown as a blue-shaded area running horizontally across the middle, between Cleveland St and Anzac Pde. A north arrow is located in the upper left. A callout with arrows points to a specific crossing area on Lang Rd, labeled 'RETAIN EXISTING SIGNALISED SHARED PATH CROSSING OF LANG RD'. Lane markings and widths are indicated with dashed lines and arrows. </p>

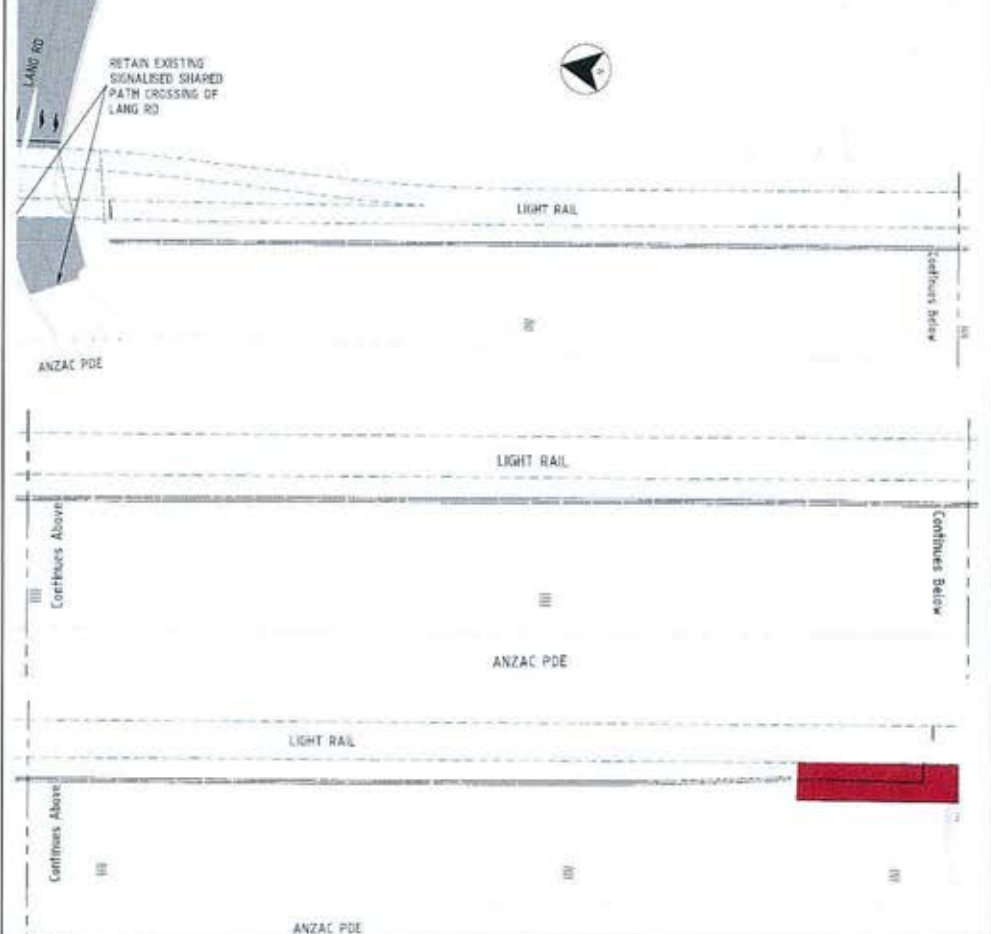
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 70km/h and design speed of 80km/h. • Lang Rd - signposted speed of 50km/h and design speed of 60km/h. • Cleveland St - signposted speed of 50km/h and design speed of 60km/h. • Busway - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • N/A
Footway requirements	<ul style="list-style-type: none"> • Retain existing 3.0m wide two-way off road shared pedestrian and cycle path on the eastern side of Anzac Pde, between the busway and traffic lanes. • Retain existing two-way off road shared pedestrian and cycle path adjacent to the southern side of Lang Rd.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0363 Design Layout: 0171.413.VV.0363 Sheet 16 Issue J Cable Installation: 0171.413.VV.0363 Sheet 17 Issue C Cable Connection Chart: 0171.413.VV.0363 Sheet 18 Issue B Red Light Camera Interface Connection: 0171.413.VV.0363 Sheet 19 Issue A</p>

SLR Project Site No:
Location:

PS-SE12

Precinct: Surry Hills Moore Park

Moore Park land and Anzac Pde busway from Lang Rd/Cleveland St to Robertson Rd

Description	<p>Works on the Anzac Pde busway from Lang Rd/Cleveland St to Robertson Rd to accommodate the addition of light rail in a dedicated light rail corridor on the eastern side of the Anzac Pde busway. Retain one bus lane southbound and one bus lane northbound on the Anzac Pde busway from Lang Rd to Robertson Rd. Relocate existing fence on the east side of the busway to the east side of the light rail corridor.</p>
Roads	Busway (Local Road)
Council	City of Sydney
Suburb	Moore Park
Intersection functional layout and minimum traffic lane widths	 <p>The diagram illustrates the intersection layout. It shows the Anzac Pde busway running horizontally, with a dedicated Light Rail corridor on its eastern side. Lang Rd crosses the busway from the top-left. A north-south axis is shown with a north arrow. Labels include 'ANZAC PDE', 'LIGHT RAIL', and 'LANG RD'. A note indicates to 'RETAIN EXISTING SIGNALISED SHARED PATH CROSSING OF LANG RD'. Vertical labels 'Continues Above' and 'Continues Below' are present on both sides of the busway. A red rectangle is located on the eastern side of the busway, near the bottom of the diagram.</p>
Speed	• N/A
Design vehicles (exceptions)	• N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing bus stop on the western kerb of the busway, to the south of Lang Rd. • Relocate existing bus stop on the eastern kerb of the busway, to the south of Lang Rd.
Footway requirements	<ul style="list-style-type: none"> • Retain existing 3.0m wide two-way off road shared pedestrian and cycle path on the eastern side of Anzac Pde, between the busway and traffic lanes.

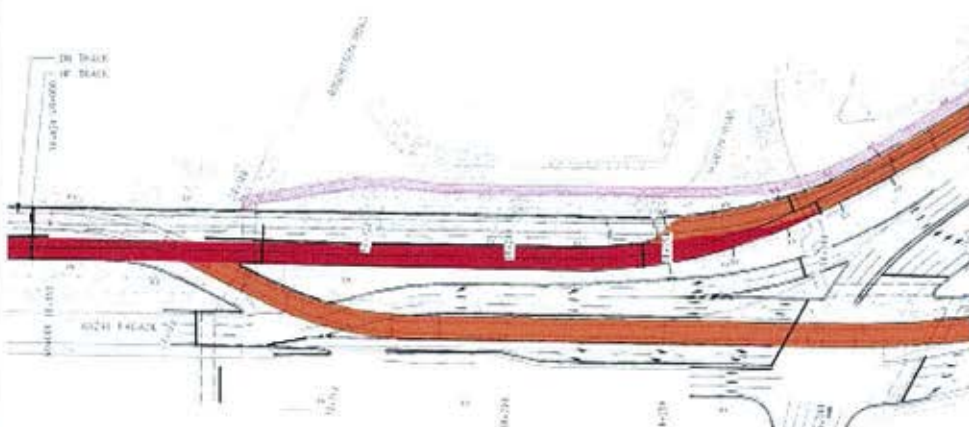
Existing Traffic Control Signals (TCS)	N/A
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SLR Project Site No:
Location:

PS-SE61

Precinct: Kingsford / Kensington

Intersection of Anzac Pde/Alison Rd/Dacey Ave

Description	<p>Works on Anzac Pde/Alison Rd/Dacey Ave intersection to accommodate the addition of light rail in Anzac Pde median and along Alison Rd. Modify existing signalised intersection, with lane arrangements as per functional layout. Provide clearances to a possible future flyover pier 0 as follows:</p> <ol style="list-style-type: none"> a) Provide for a minimum clearance of 2.5m from the centre of the future flyover pier to the outer edge line (DKE + 300mm) of the northbound light rail corridor. b) Provide for a minimum clearance of 2.0m from the centre of the future flyover pier to the edge of any adjacent traffic lanes. <p>Make allowance for possible adjustments of the Anzac Pde/Alison Rd/Dacey Ave intersection to accommodate a possible future flyover from Alison Rd westbound to Anzac Pde northbound.</p>
Roads	Anzac Pde, Dacey Ave and Alison Rd (State Roads)
Council	City of Sydney to the north of Alison Rd/Dacey Ave. Randwick City Council to the south of Alison Rd/Dacey Ave.
Suburb	Moore Park to the north of Alison Rd/Dacey Ave. Kensington to the south of Alison Rd/Dacey Ave.
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • Alison Rd westbound to be signposted no left turn into Anzac Pde southbound • Anzac Pde northbound to be signposted no right turn into Alison Rd eastbound
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 70km/h and design speed of 80km/h. • Alison Rd - signposted speed of 70km/h and design speed of 80km/h. • Dacey Ave - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	• N/A
On-street parking control and kerb lane requirements	• Retain existing bus zone on the southern kerb of Alison Rd, to the east of Anzac Pde.
Footway requirements	<ul style="list-style-type: none"> • Retain existing 3.0m wide two-way off road shared pedestrian and cycle path on the eastern side of Anzac Pde and into Alison Rd. • Provide 3.0m wide shared pedestrian and cycle path link between the Alison Rd signalised shared path crossing and the shared path crossing at Robertson Rd.
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0396 Design Layout: 0171.381.VV.0396 Sheet 11 Issue E Cable Installation: 0171.381.VV.0396 Sheet 14 Issue B Cable Connection Chart: 0171.381.VV.0396 Sheet 15 Issue B

	Red Light Camera Interface Connection: N/A
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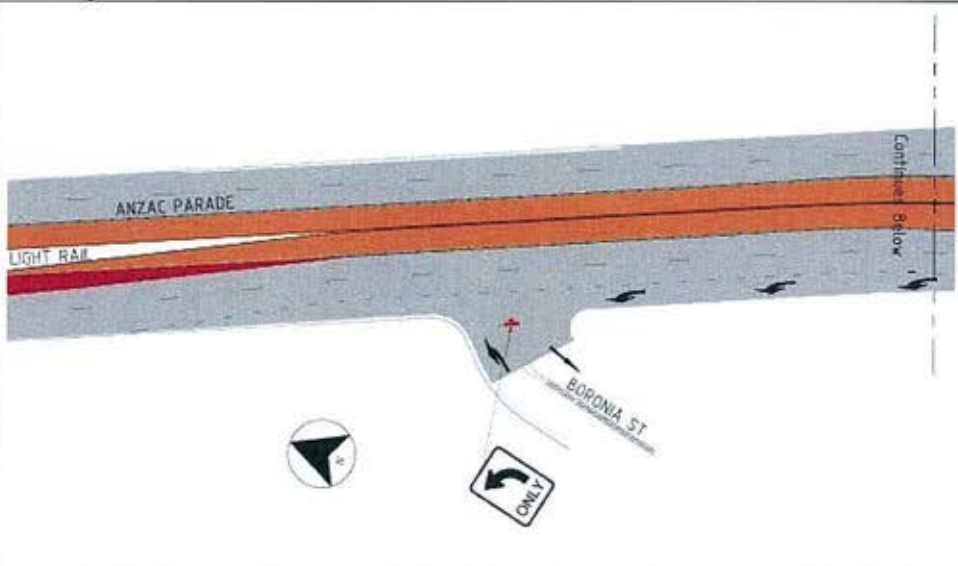
**SLR Project
Site No:**

PS-SE16

Precinct: Kingsford / Kensington

Location:

Anzac Pde from Tay Ln to Carlton St, including intersections at:
1. Anzac Pde/Boronia St
2. Anzac Pde/Abbotford St

Description	Works on Anzac Pde from Tay Ln to Carlton St to accommodate the addition of light rail on Anzac Pde. Provide two lanes northbound and two lanes southbound on Anzac Pde from Tay Ln to Carlton St, a shared bus and light rail corridor in the centre of Anzac Pde, and a city bound bus lane in the AM peak, to the north of Abbotford St.
Roads	Anzac Pde (State Road), Boronia St and Abbotford St (Local Roads)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	

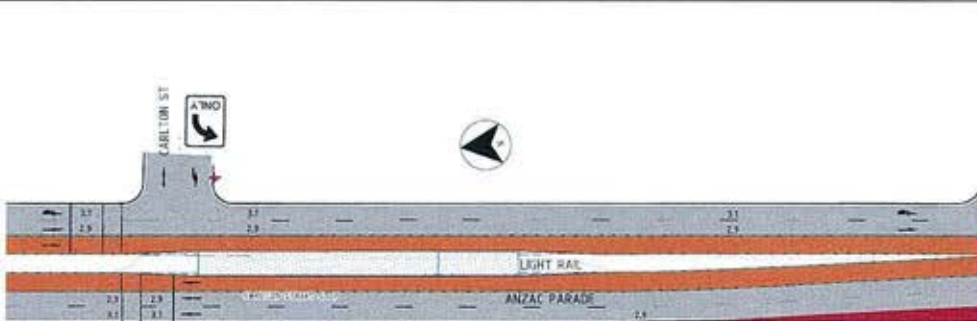
	<p>The diagram shows a plan view of the road layout. It features a central 'LIGHT RAIL' corridor running horizontally. To the north of the light rail is 'ANZAC PARADE' road, which curves to the right. 'ABBOTTFORD ST' is shown as a street crossing the light rail and Anzac Parade. A 'No Right Turn' sign is positioned at the intersection of Abbotford St and Anzac Parade. A north arrow is located below the main road section. Dimensions and lane markings are indicated along the length of the road.</p>
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Boronia St - signposted speed of 50km/h and design speed of 60km/h. • Abbotford St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing bus zone on the eastern kerb of Anzac Pde, to the north of Abbotford St. • Retain existing on-road cycle route on Boronia St in both directions.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>N/A</p>

SLR Project Site No:
Location:

PS-SE47

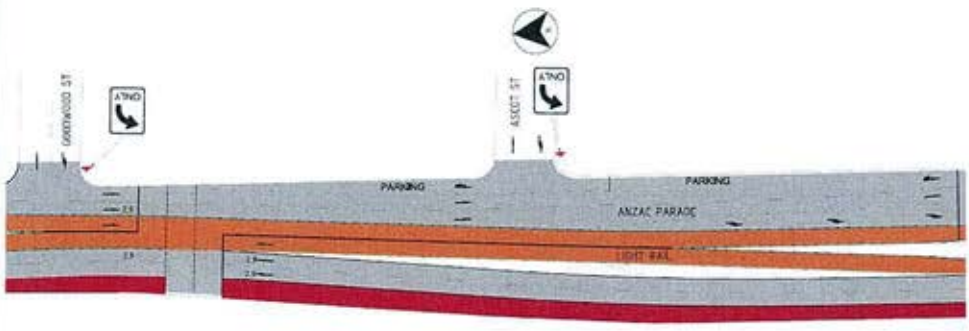
Precinct: Kingsford / Kensington

Anzac Pde from Carlton St intersection to Goodwood St

Description	Works on Anzac Pde from Carlton St intersection to Goodwood St to accommodate the addition of light rail on Anzac Pde, including the Carlton Street Stop. Provide two lanes northbound and two lanes southbound on Anzac Pde from Carlton St to Goodwood St, and a shared bus and light rail corridor in the centre of Anzac Pde. Provide signalised pedestrian mid-block crossing of Anzac Pde at the northern end of the Carlton Street Stop.
Roads	Anzac Pde (State Road) and Carlton St (Local Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. Carlton St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing bus zone on the western kerb of Anzac Pde, adjacent to Carlton St.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

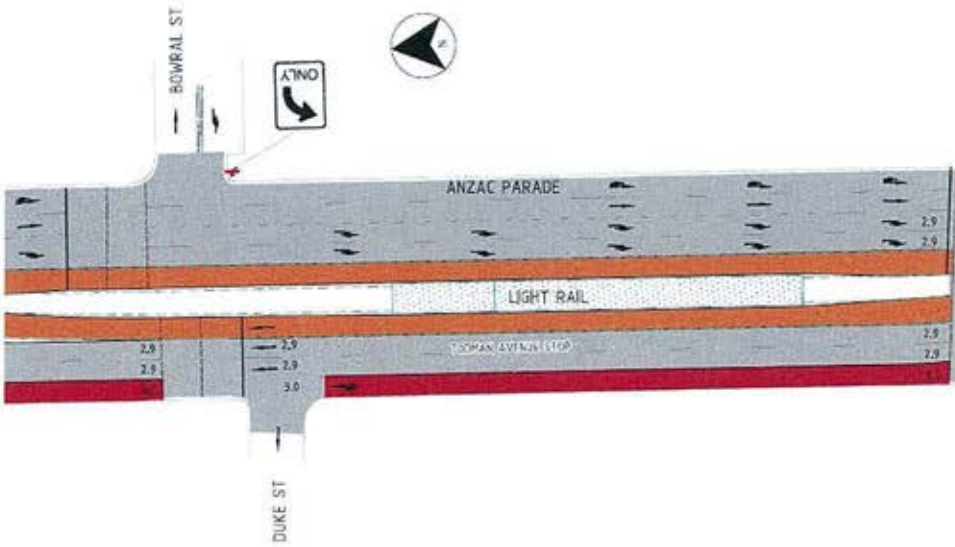
SLR Project Site No: PS-SE48 **Precinct:** Kingsford / Kensington

Location: Anzac Pde from Goodwood St intersection to Bowral St, including intersections at:
 1. Anzac Pde/Goodwood St
 2. Anzac Pde - Mid Block Crossing
 3. Anzac Pde/Ascot St

Description	<p>Works on Anzac Pde from Goodwood St intersection to Bowral St to accommodate the addition of light rail on Anzac Pde.</p> <p>Provide two lanes northbound and two lanes southbound on Anzac Pde from Goodwood St to Bowral St, a shared bus and light rail corridor in the centre of Anzac Pde, a city bound bus lane in the AM peak, an additional dedicated right turn lane on the southbound approach to Bowral St, and an additional southbound kerbside parking lane from the departure from Goodwood St to the approach to Bowral St.</p> <p>Modify existing signalised pedestrian mid-block crossing of Anzac Pde, to the south of Goodwood St.</p>
Roads	Anzac Pde (State Road), Goodwood St and Ascot St (Local Roads)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	 <p>The diagram shows a cross-section of Anzac Pde. From left to right, it shows the intersection with Goodwood St, a section with parking lanes on both sides, and the intersection with Ascot St. The main road has a central light rail lane, flanked by bus lanes, and then two general traffic lanes on each side. A north-south arrow is shown above the road.</p>
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Goodwood St - signposted speed of 50km/h and design speed of 60km/h. • Ascot St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide off-peak parking in the marked city bound bus lane. • Retain existing bus zones on the eastern and western kerbs of Anzac Pde, to the north of Ascot St. • Provide loading/parking zone on the eastern kerb of Anzac Pde, to the north and south of Ascot St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>1. N/A</p> <p>2. Anzac Pde mid-block pedestrian crossing, south of Goodwood St TCS Drawing Number: 2159 Design Layout: 0171.381.VV.2159 Sheet 1 Issue G Cable Installation: 0171.381.VV.2159 Sheet 4 Issue A Cable Connection Chart: 0171.381.VV.2159 Sheet 5 Issue A Red Light Camera Interface Connection: N/A</p> <p>3. N/A</p>

SLR Project Site No: PS-SE62 **Precinct:** Kingsford / Kensington

Location: Anzac Pde from Bowral St intersection to Todman Ave, including intersections at:
 1. Anzac Pde - Mid Block Crossing
 2. Anzac Pde/Bowral St
 3. Anzac Pde/Duke St

Description	Works on Anzac Pde from Bowral St intersection to Todman Ave to accommodate the addition of light rail on Anzac Pde, including the Todman Avenue Stop. Provide two lanes northbound and two lanes southbound on Anzac Pde from Bowral St to Todman Ave, a shared bus and light rail corridor in the centre of Anzac Pde, a city bound bus lane in the AM peak, and two dedicated right turn lanes on the southbound approach to Todman Ave. Modify existing signalised pedestrian mid-block crossing of Anzac Pde, at Bowral St.
Roads	Anzac Pde (State Road), Bowral St and Duke St (Local Roads)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. Bowral St - signposted speed of 50km/h and design speed of 60km/h. Duke St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Provide off-peak parking in the marked city bound bus lane.
Footway requirements	<ul style="list-style-type: none"> N/A

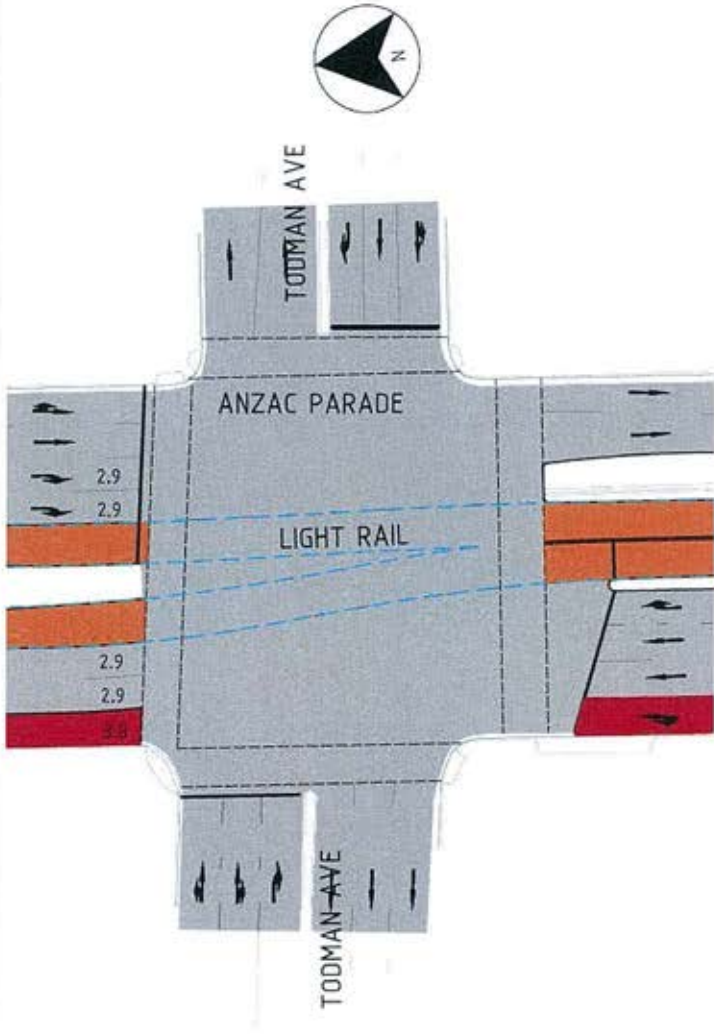
<p>Existing Traffic Control Signals (TCS)</p>	<ol style="list-style-type: none"> 1. Anzac Pde mid-block pedestrian crossing, north of Bowral St TCS Drawing Number: 1619 Design Layout: 0171.381.VV.1619 Sheet 1 Issue D Cable Installation: 0171.381.VV.1619 Sheet 2 Issue A Cable Connection Chart: 0171.381.VV.1619 Sheet 3 Issue A Red Light Camera Interface Connection: N/A 2. N/A 3. N/A
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SLR Project
 Site No:
 Location:

PS-SE17

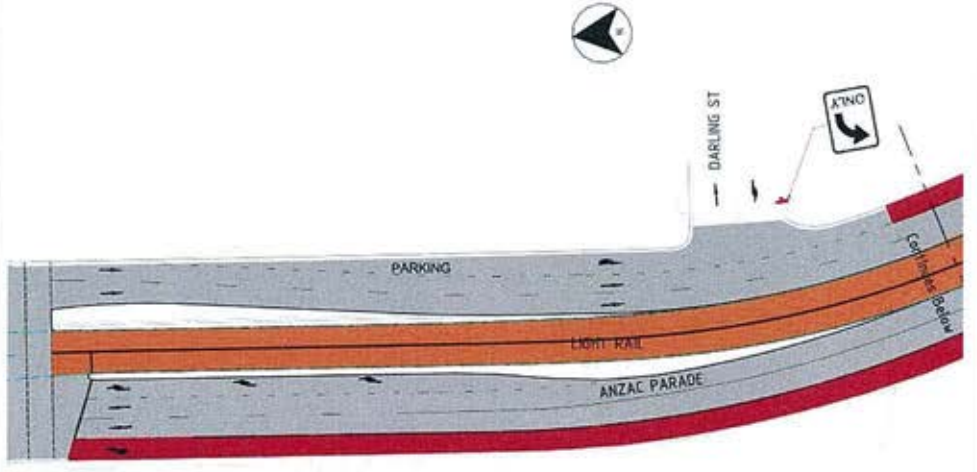
Precinct: Kingsford / Kensington

Intersection of Anzac Pde/Todman Ave

Description	Works on Anzac Pde and Todman Ave intersection to accommodate the addition of light rail on Anzac Pde. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	Anzac Pde (State Road) and Todman Ave (Regional Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	 <p>The diagram illustrates the proposed functional layout for the intersection of Anzac Parade and Todman Ave. Anzac Parade is shown as a wide horizontal road with a central section labeled 'ANZAC PARADE' and 'LIGHT RAIL'. Todman Ave runs vertically through the intersection. Lane widths are specified as 2.9m for various lanes. A north arrow is located at the top of the diagram.</p>
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Todman Ave - east of Anzac Pde: signposted speed of 50km/h and design speed of 60km/h. • Todman Ave - west of Anzac Pde: signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A

On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Extend existing bus zones on the eastern and western kerbs of Anzac Pde, to the north of Todman Ave. • Extend existing bus zone on the southern kerb of Todman Ave, to the west of Anzac Pde. • Provide bus zone on the northern kerb of Todman Ave, to the west of Anzac Pde.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0205 Design Layout: 0171.381.VV.0205 Sheet 1 Issue P Cable Installation: 0171.381.VV.0205 Sheet 9 Issue C Cable Connection Chart: 0171.381.VV.0205 Sheet 10 Issue C Red Light Camera Interface Connection: 0171.381.VV.0205 Sheet 11 Issue A</p>

SLR Project Site No: PS-SE18 **Precinct:** Kingsford / Kensington
Location: Anzac Pde from Todman Ave to Doncaster Ave, including intersections at:
 1. Anzac Pde/Darling St
 2. Anzac Pde/Addison St
 3. Anzac Pde - Mid Block Crossing

Description	<p>Works on Anzac Pde from Todman Ave to Doncaster Ave to accommodate the addition of light rail on Anzac Pde.</p> <p>Provide two lanes northbound and two lanes southbound on Anzac Pde from Todman Ave to Doncaster Ave, a shared bus and light rail corridor in the centre of Anzac Pde, a city bound bus lane in the AM peak, an additional dedicated right turn lane on the northbound approach to Todman Ave, an additional southbound kerbside parking lane from the departure from Todman Ave to Darling St, and an additional southbound bus lane from Darling St to the departure from the mid-block pedestrian crossing, south of Addison St.</p> <p>Modify existing signalised pedestrian mid-block crossing of Anzac Pde, south of Addison St, to a single-stage crossing.</p>
Roads	Anzac Pde (State Road), Darling St and Addison St (Local Roads)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	

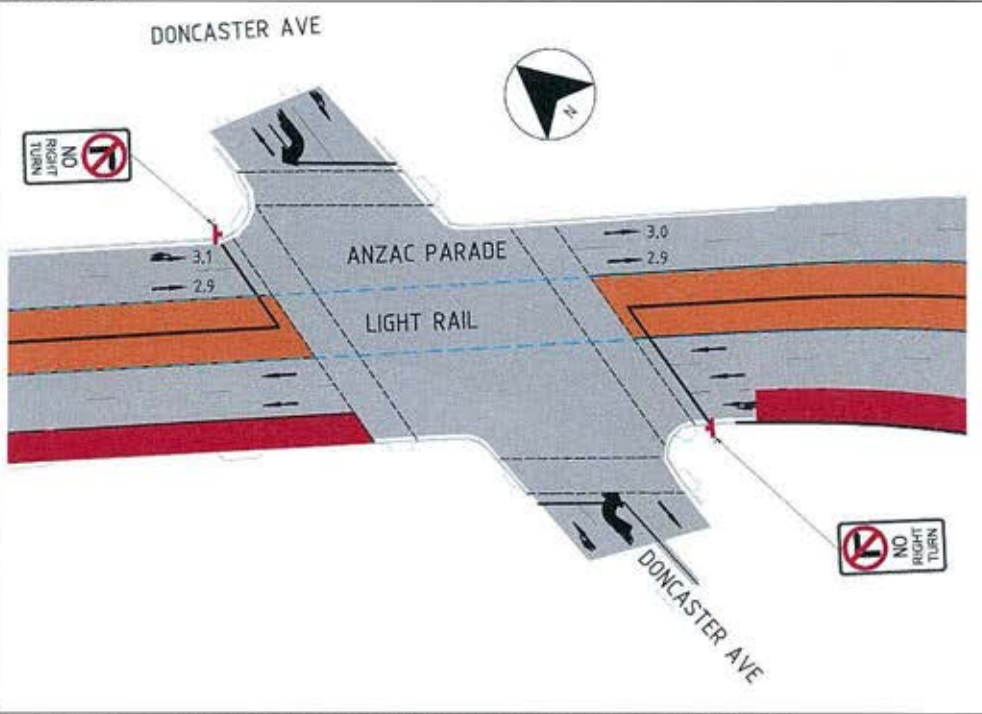
	<p>The diagram shows a plan view of the road layout. At the top, a road curves from left to right, labeled 'ANZAC PARADE'. Below this road is a 'LIGHT RAIL' track. Further down is another road labeled 'ANZAC PARADE' and 'DONCASTER AVE'. Lane widths are indicated with arrows and numbers: 2.8m for the top road, 2.9m for the middle road, and 3.1m for the bottom road. Signs include 'ONLY' with a left-turn arrow, 'NO RIGHT TURN', and 'NO U-TURN'. Directional labels 'Continues Above' and 'Continues Below' are present. North arrows are also shown.</p>
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Darling St - signposted speed of 50km/h and design speed of 60km/h. • Addison St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide off-peak parking in the marked city bound bus lane. • Retain existing loading zone/parking zone on the eastern kerb of Anzac Pde, to the north of Darling St. • Retain existing on-road cycle route on Addison St in both directions.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<ol style="list-style-type: none"> 1. N/A 2. N/A 3. Anzac Pde mid-block pedestrian crossing, south of Addison St TCS Drawing Number: 1697 Design Layout: 0171.381.VV.1697 Sheet 1 Issue F Cable Installation: 0171.381.VV.1697 Sheet 7 Issue B Cable Connection Chart: 0171.381.VV.1697 Sheet 8 Issue B Red Light Camera Interface Connection: N/A

SLR Project Site No:
Location:

PS-SE54

Precinct: Kingsford / Kensington

Intersection of Anzac Pde/Doncaster Ave

Description	Works on Anzac Pde/Doncaster Ave intersection to accommodate the addition of light rail on Anzac Pde. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	Anzac Pde (State Road) and Doncaster Ave (Local Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	 <p>The diagram shows a T-junction where Doncaster Ave (top and bottom) meets Anzac Parade (middle). A Light Rail line runs horizontally through the center of Anzac Parade. Lane widths are indicated: 3.1m for the leftmost lane on Doncaster Ave, 2.9m for the inner lane, 3.0m for the rightmost lane on Doncaster Ave, and 2.9m for the inner lane. 'NO RIGHT TURN' signs are shown at the intersections. A north arrow is also present.</p>
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. Doncaster Ave - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing on-road cycle lane markings on Doncaster Ave in both directions.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0557 Design Layout: 0171.381.VV.0557 Sheet 1 Issue L Cable Installation: 0171.381.VV.0557 Sheet 8 Issue E Cable Connection Chart: 0171.381.VV.0557 Sheet 9 Issue F Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:
 Location:

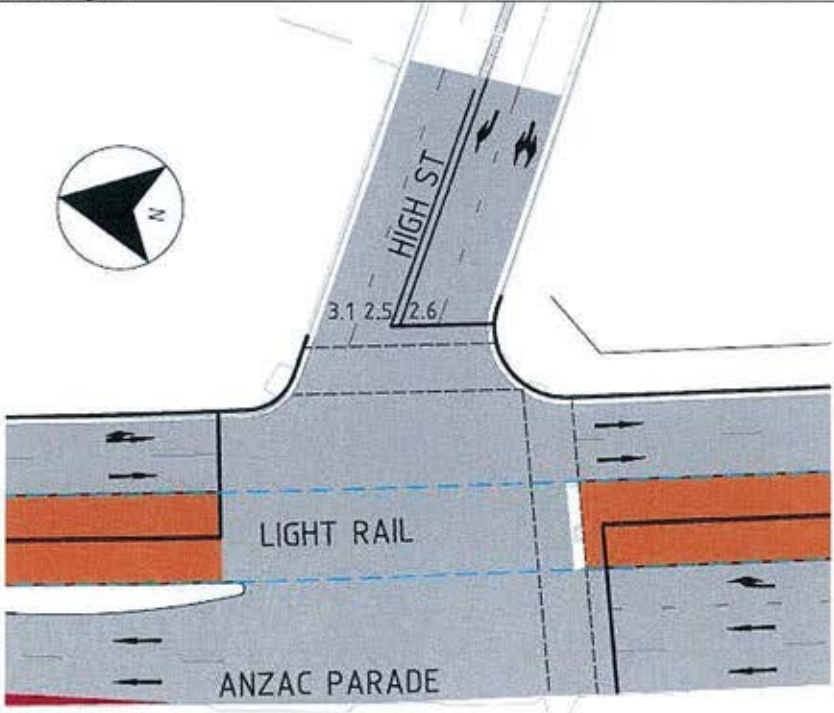
PS-SE55

Precinct: Kingsford / Kensington

Anzac Pde from Doncaster Ave to High St

Description	Works on Anzac Pde from Doncaster Ave to High St to accommodate the addition of light rail on Anzac Pde. Provide two lanes northbound and two lanes southbound on Anzac Pde from Doncaster Ave to High St, a shared bus and light rail corridor in the centre of Anzac Pde, and a city bound bus lane in the AM peak from the departure from High St to Doncaster Ave.
Roads	Anzac Pde (State Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Provide off-peak parking in the marked city bound bus lane.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No: PS-SE63 **Precinct:** Kingsford / Kensington
Location: Intersection of Anzac Pde/High St

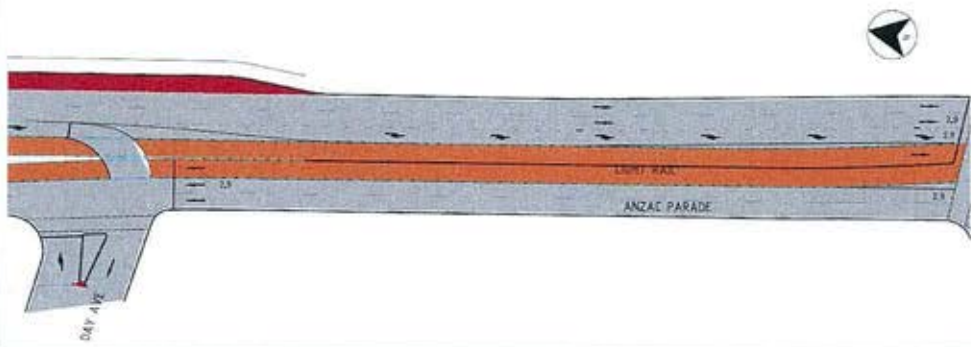
Description	Works on Anzac Pde/High St intersection to accommodate the addition of light rail on Anzac Pde. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	Anzac Pde (State Road) and High St (Local Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	 <p>The diagram shows a T-junction where High St meets Anzac Parade. High St has three lanes with widths of 3.1m, 2.5m, and 2.6m. Anzac Parade has two lanes. A Light Rail line runs east-west across the intersection. A north arrow is located in the top left corner of the diagram.</p>
Speed	<ul style="list-style-type: none"> Anzac Parade – signposted speed of 60km/h and design speed of 70km/h. High Street – signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing bus zone on the southern kerb of High St, to the east of Anzac Pde. Retain existing on-road cycle route on High St in both directions.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 1169 Design Layout: 0171.381.VV.1169 Sheet 1 Issue H Cable Installation: 0171.381.VV.1169 Sheet 9 Issue C Cable Connection Chart: 0171.381.VV.1169 Sheet 8 Issue F Red Light Camera Interface Connection: N/A</p>

SLR Project Site No: PS-SE19 Precinct: Kingsford / Kensington
 Location: Anzac Pde from High St to Day Ave, including the signalised mid-block pedestrian crossing adjacent to the UNSW University Mall

Description	<p>Works on Anzac Pde from High St to Day Ave to accommodate the addition of light rail on Anzac Pde, including the UNSW Anzac Parade Stop.</p> <p>Provide two lanes southbound and two lanes northbound on Anzac Pde from High St to Day Ave, a shared bus and light rail corridor in the centre of Anzac Pde, an additional dedicated right turn lane on the northbound approach to High St, and an additional dedicated right turn lane on the southbound approach to Day Ave.</p> <p>Provide signalised pedestrian mid-block pedestrian crossing of Anzac Pde, at the northern end of the UNSW Anzac Parade Stop.</p> <p>Modify existing signalised mid-block pedestrian crossing of Anzac Pde, at the southern end of the UNSW Anzac Parade Stop.</p>
Roads	Anzac Pde (State Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Anzac Parade – signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A

On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide a 55.5m long indented bus zone on the western kerb of Anzac Pde, adjacent to the UNSW Anzac Pde stop. • Provide a 55.5m long indented bus zone on the eastern kerb of Anzac Pde, south of the UNSW University Mall. • Remove existing bus zone on the eastern kerb of Anzac Pde, to the north of the UNSW University Mall.
Footway requirements	<ul style="list-style-type: none"> • Reinstate a 3.0m wide footpath alongside UNSW.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 1920 Design Layout: 0171.381.VV.1920 Sheet 4 Issue D Cable Installation: 0171.381.VV.1920 Sheet 6 Issue A Cable Connection Chart: VD006-18 Issue C Red Light Camera Interface Connection: N/A</p>

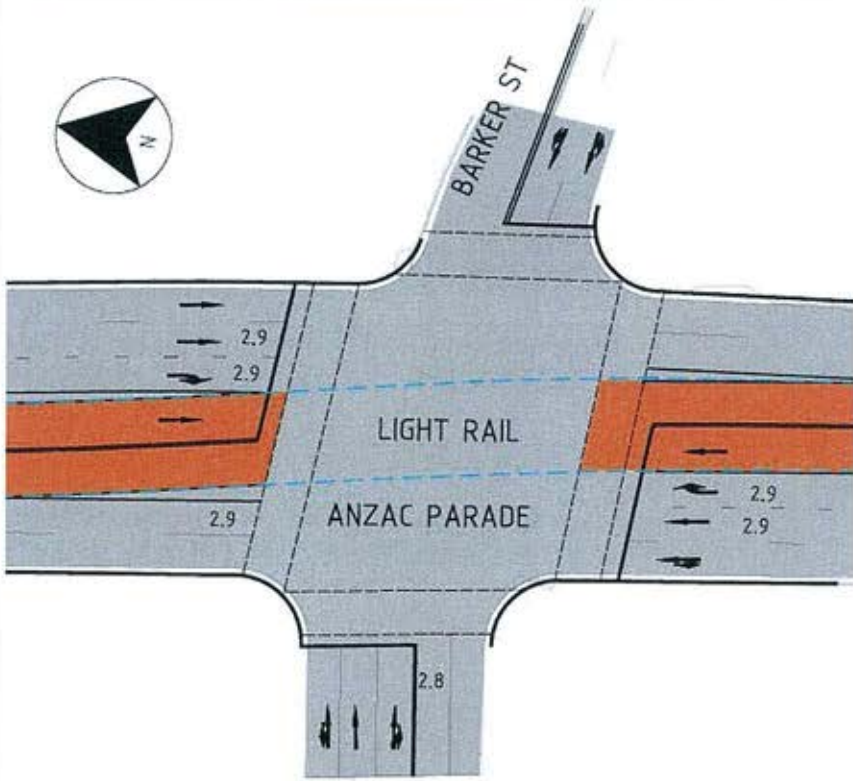
SLR Project Site No: PS-SE20 **Precinct:** Kingsford / Kensington
Location: Anzac Pde from Day Ave intersection to Barker St

Description	<p>Works on Anzac Pde from the Day Ave intersection to Barker St to accommodate the addition of light rail on Anzac Pde.</p> <p>Provide signalised intersection of Anzac Pde/Day Ave, with lane arrangements as per functional layout.</p> <p>Provide two lanes southbound and two lanes northbound on Anzac Pde from Day Ave to Barker St, a shared bus and light rail corridor in the centre of Anzac Pde, and an additional dedicated right turn lane on the southbound approach to Barker St.</p>
Roads	Anzac Pde (State Road) and Day Ave (Local Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. Day Ave - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing on-road cycle route on Day Ave in both directions. Provide a 55.5m long indented bus zone on the eastern kerb of Anzac Pde, south of the UNSW University Mall. Retain existing bus zones of the northern and southern kerbs of Day Ave, to the west of Anzac Pde.
Footway requirements	<ul style="list-style-type: none"> Reinstate a 3.0m wide footpath alongside UNSW.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE50
Intersection of Anzac Pde/Barker St

Precinct: Kingsford / Kensington

Description	Works on Anzac Pde/Barker St intersection to accommodate the addition of light rail on Anzac Pde. Modify the existing signalised intersection with lane arrangements as per functional layout.
Roads	Anzac Pde (State Road) and Barker St (Local Road)
Council	Randwick City Council
Suburb	Kensington to the north of Barker St. Kingsford to the south of Barker St.
Intersection functional layout and minimum traffic lane widths	 <p>Note: Error in drawing on Barker Street western side of intersection. Configurations on Barker St, existing at the date of the deed, to be provided..</p>
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. Barker St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 1189 Design Layout: 0171.381.VV.1189 Sheet 1 Issue F Cable Installation: 0171.381.VV.1189 Sheet 10 Issue A Cable Connection Chart: 0171.381.VV.1189 Sheet 11 Issue B Red Light Camera Interface Connection: N/A

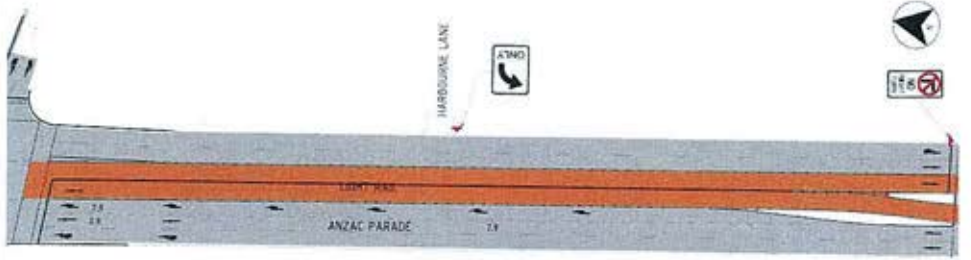
SLR Project Site No:

PS-SE51

Precinct: Kingsford / Kensington

Location:

Anzac Pde from Barker St to Middle St/Strachan St, including the intersection at Anzac Pde/Harbourne Ln

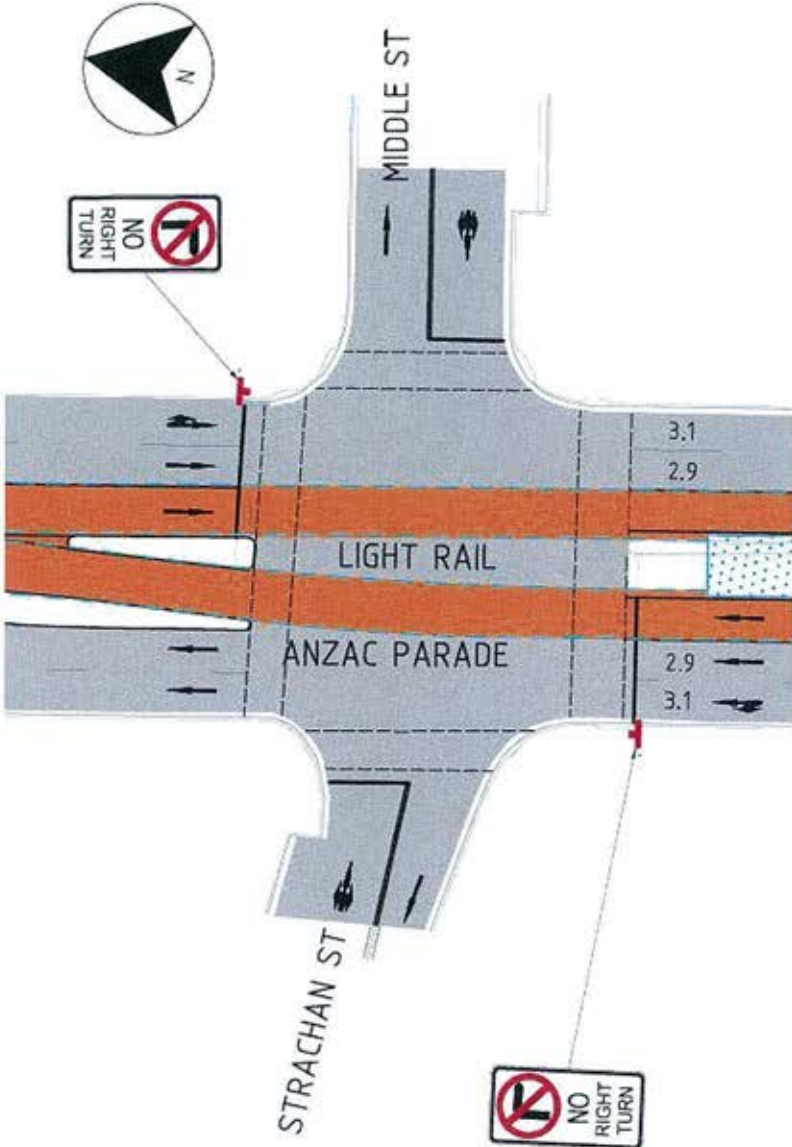
Description	Works on Anzac Pde from Barker St to Middle St/Strachan St to accommodate the addition of light rail on Anzac Pde. Provide two lanes southbound and two lanes northbound on Anzac Pde from Barker St to Middle St/Strachan St, a shared bus and light rail corridor in the centre of Anzac Pde, and an additional dedicated right turn lane on the northbound approach to Barker St.
Roads	Anzac Pde (State Road) and Harbourne Ln (Local Road)
Council	Randwick City Council
Suburb	Kingsford
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Harbourne Ln - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide bus zone on the eastern kerb of Anzac Pde, between Barker St and Harbourne Ln. • Retain existing bus zone on the eastern kerb of Anzac Pde, to the north of Middle St. • Provide bus zone on the western kerb of Anzac Pde, to the north of Strachan St.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
 Location:

PS-SE64

Precinct: Kingsford / Kensington

Intersection of Anzac Pde/Middle St/Strachan St

Description	Works on Anzac Pde/Middle St/Strachan St intersection to accommodate the addition of light rail on Anzac Pde. Modify the existing signalised intersection with lane arrangements as per functional layout.
Roads	Anzac Pde (State Road), Middle St and Strachan St (Local Roads)
Council	Randwick City Council
Suburb	Kingsford
Intersection functional layout and minimum traffic lane widths	 <p>The diagram illustrates the intersection layout. Anzac Parade runs horizontally across the center, with a light rail line crossing it. Middle St runs vertically from the top, and Strachan St runs vertically from the bottom. Lane widths are specified on the right side: 3.1m for the top-most lane, 2.9m for the lane below it, 2.9m for the lane above the light rail, and 3.1m for the bottom-most lane. Two 'NO RIGHT TURN' signs are shown, one at the intersection of Middle St and Anzac Parade, and another at the intersection of Strachan St and Anzac Parade. A north arrow is located in the top left corner.</p> <p>Note: If the design can accommodate the preference is for two east bound lanes out of Strachan Street and two west bound lanes out of Middle Street.</p>

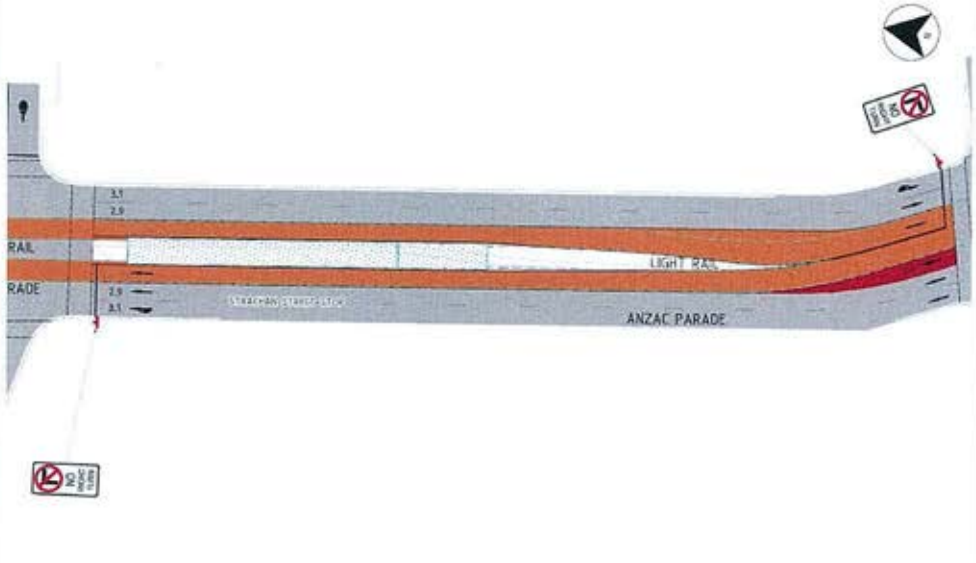
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Middle St - signposted speed of 50km/h and design speed of 60km/h. • Strachan St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • No Standing in kerb lanes.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 1136 Design Layout: 0171.381.VV.1136 Sheet 9 Issue F Cable Installation: 0171.381.VV.1136 Sheet 10 Issue A Cable Connection Chart: 0171.381.VV.1136 Sheet 7 Issue F Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:
Location:

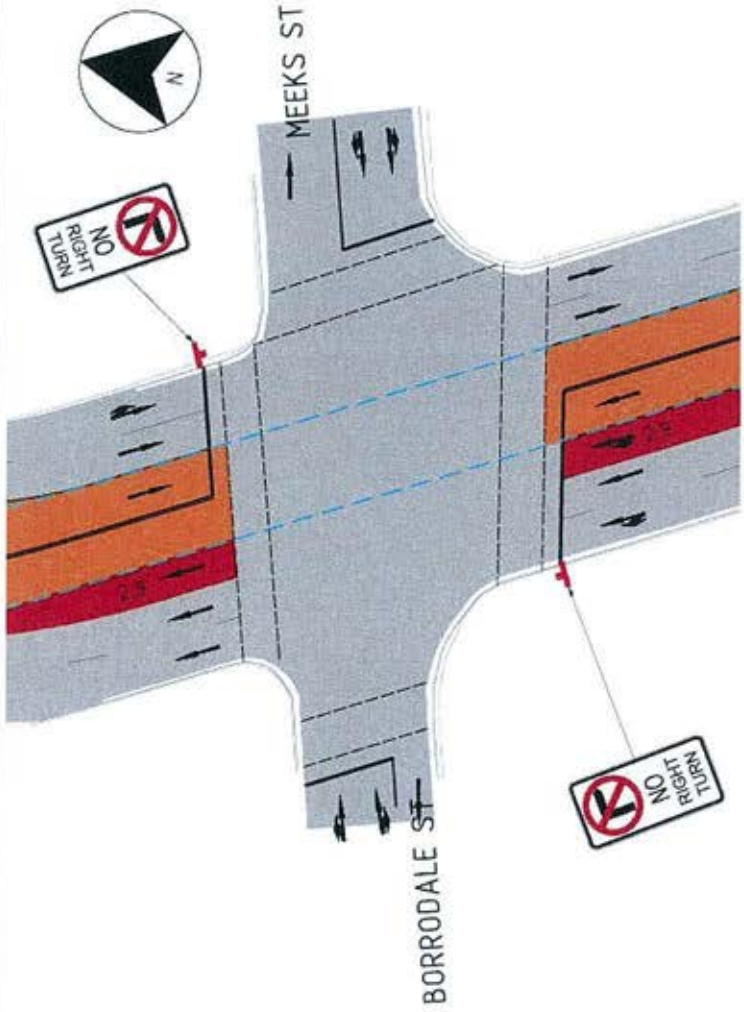
PS-SE52

Precinct: Kingsford / Kensington

Anzac Pde from Middle St/Strachan St to Meeks St/Borrodale Rd

Description	Works on Anzac Pde from Middle St/Strachan St to Meeks St/Borrodale Rd to accommodate the addition of light rail on Anzac Pde, including the Strachan Street Stop. Provide two lanes southbound and two lanes northbound on Anzac Pde from Middle St/Strachan St to Meeks St/Borrodale Rd, a shared bus and light rail corridor in the centre of Anzac Pde, and a bus jump start/merge lane adjacent to the shared bus and light rail corridor on the northbound departure from Meeks St/Borrodale Rd.
Roads	Anzac Pde (State Road)
Council	Randwick City Council
Suburb	Kingsford
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Anzac Pde - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> No Standing in kerb lanes.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project PS-SE74 **Precinct:** Kingsford / Kensington
Site No:
Location: Intersection of Anzac Pde and Meeks St/Borrodale Rd

Description	Works on Anzac Pde/Meeks St/Borrodale Rd intersection to accommodate the addition of light rail on Anzac Pde. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	Anzac Pde (State Road), Meeks St and Borrodale Rd (Local Roads)
Council	Randwick City Council
Suburb	Kingsford
Intersection functional layout and minimum traffic lane widths	 <p>Note: Arrow in the northbound bus lane at intersection should be straight only, not straight and left as shown.</p>
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Meeks St - signposted speed of 50km/h and design speed of 60km/h. • Borrodale Rd - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For intersection turning movements to and from the northbound bus merge lane to Borrodale Rd, allow for a 14.5m rigid bus.
On-street parking control and kerb lane	<ul style="list-style-type: none"> • Retain existing bus zones on the northern and southern kerbs of Meeks St, to the east of Anzac Pde. • Provide bus zone on the southern kerb of Borrodale Rd, to the west of Anzac Pde.

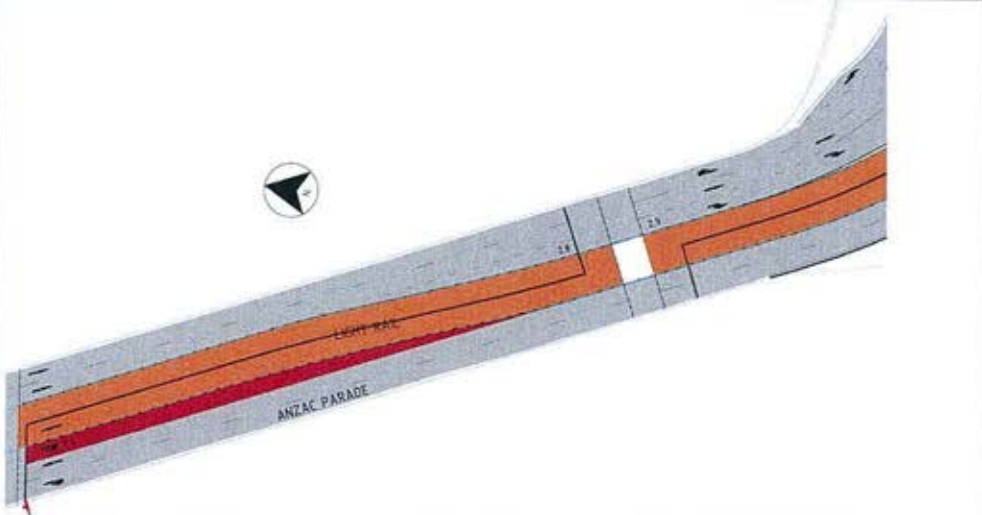
requirements	<ul style="list-style-type: none"> • No Standing on kerb lanes
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 1006 Design Layout: 0171.381.VV.1006 Sheet 1 Issue I Cable Installation: 0171.381.VV.1006 Sheet 7 Issue D Cable Connection Chart: 0171.381.VV.1006 Sheet 8 Issue E Red Light Camera Interface Connection: N/A

SLR Project Site No:
Location:

PS-SE53

Precinct: Kingsford / Kensington

Anzac Pde from Meeks St/Borrodale Rd to Nine Ways, including the existing signalised mid-block pedestrian crossing, north of Nine Ways

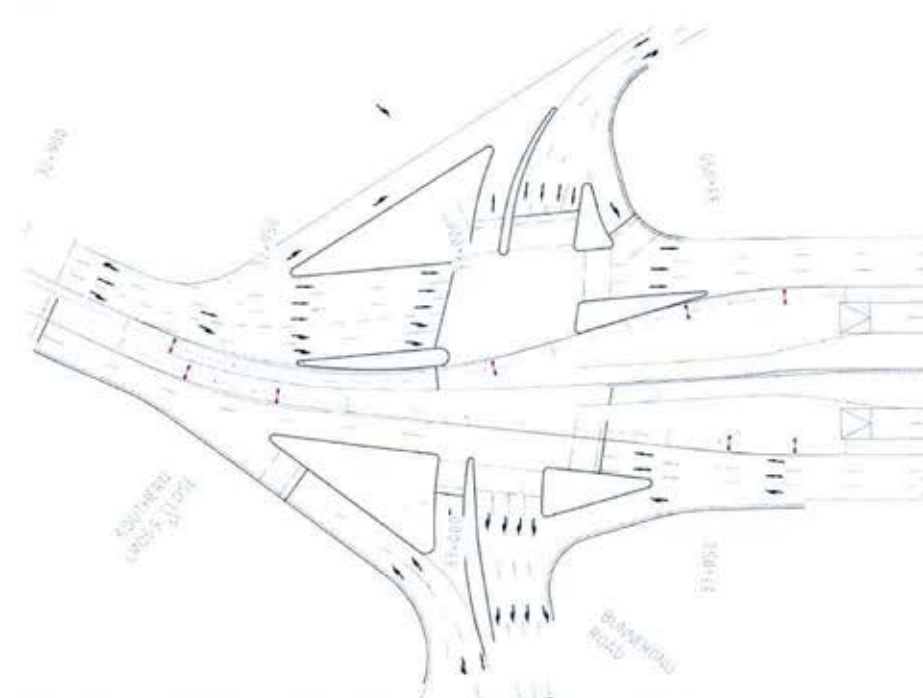
Description	<p>Works on Anzac Pde from Meeks St/Borrodale Rd to Nine Ways to accommodate the addition of light rail on Anzac Pde.</p> <p>Provide two lanes southbound and two lanes northbound on Anzac Pde from Meeks St/Borrodale Rd to Nine Ways, a shared bus and light rail corridor in the centre of Anzac Pde, an additional dedicated right turn lane on the southbound approach to Nine Ways, and a northbound bus jump start/turning lane on the northbound approach to Borrodale Rd/Meeks St, adjacent to the shared bus and light rail corridor.</p> <p>Modify existing signalised mid-block pedestrian crossing of Anzac Pde, to the north of Nine Ways.</p> <p>Southbound lanes in Anzac Parade between Meeks and Rainbow Streets to be developed as;</p> <ul style="list-style-type: none"> • Kerb side lane into two straight ahead lanes (outer lane connecting to a left hand slip lane into Rainbow Street), • Inside lane into two right hand turn lanes.
Roads	Anzac Pde (State Road)
Council	Randwick City Council
Suburb	Kingsford
Intersection functional layout and minimum traffic lane widths	 <p>Note: Arrow in the northbound bus lane at intersection should be straight only, not straight and left as shown.</p>
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Remove bus stops on the eastern kerb of Anzac Parade between Meeks and Rainbow Streets • Remove bus stops on western kerb of Anzac Parade between Gardners and Borrodale Roads • No standing in kerb lanes.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 1216 Design Layout: 0171.381.VV.1216 Sheet 1 Issue E Cable Installation: 0171.381.VV.1216 Sheet 5 Issue A Cable Connection Chart: 0171.381.VV.1216 Sheet 6 Issue B Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:
Location:

PS-SE21

Precinct: Kingsford / Kensington

Nine Ways intersection, including intersections at:
1. Anzac Pde/Rainbow St/Gardeners Rd
2. Rainbow St/Harbourne Rd
3. Bunnerong Rd/Gardeners Rd
4. Rainbow St - Mid Block Crossing

<p>Description</p>	<p>Works on the Nine Ways intersection to accommodate the addition of light rail on Anzac Pde. Provide a signalised intersection at Nine Ways, including Anzac Pde, Rainbow St and Gardeners Rd, with lane arrangements as per functional layout. Modify existing signalised intersection at Bunnerong Rd/Gardeners Rd with lane arrangements as per functional layout. Remove existing signalised mid-block pedestrian crossing of Rainbow St, to the east of Anzac Pde. Provide for buses to merge onto and from the shared bus and light rail corridor, at the Nine Ways intersection. The two Anzac Pde southbound lanes leading into the intersection must be developed as follows;</p> <ul style="list-style-type: none"> • Kerb side lane into two straight ahead lanes (outer lane connecting to a left hand slip lane into Rainbow St). • Inside lane into two right hand turn lanes.
<p>Roads</p>	<p>Anzac Pde, Rainbow St, Gardeners Rd and Bunnerong Rd (State Roads), Harbourne Rd (Local Road)</p>
<p>Council</p>	<p>Randwick City Council</p>
<p>Suburb</p>	<p>Kingsford</p>
<p>Intersection functional layout and minimum traffic lane widths</p>	 <ul style="list-style-type: none"> • Gardeners Rd northbound signposted as no right turn to Anzac Pde • Anzac Pde westbound signposted as no right turn to Gardeners Rd • Gardeners Rd southbound signposted as no right turn to Anzac Pde
<p>Speed</p>	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Rainbow St - signposted speed of 60km/h and design speed of 60km/h.

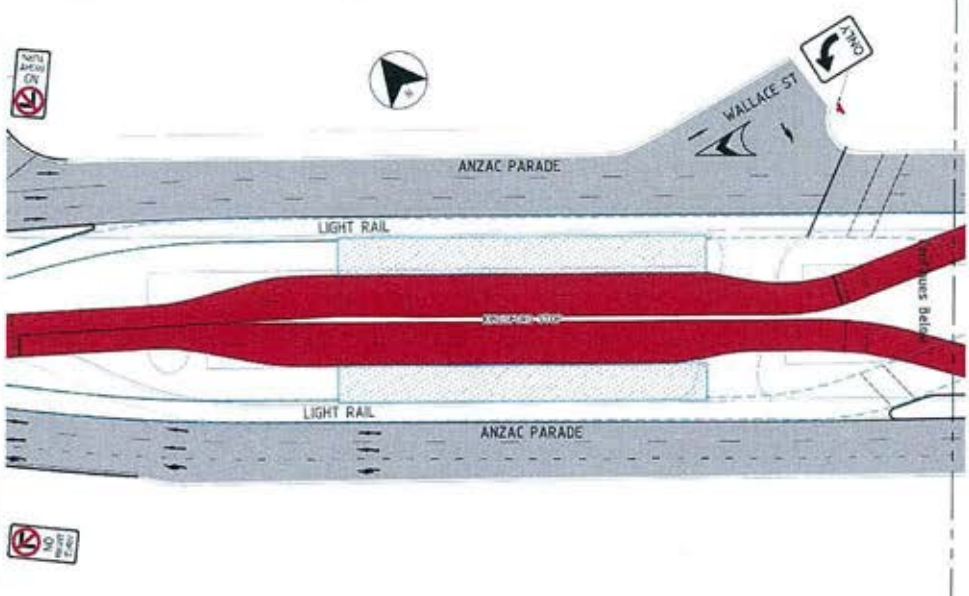
	<ul style="list-style-type: none"> • Bunnerong Rd - signposted speed of 60km/h and design speed of 70km/h. • Gardeners Rd - signposted speed of 60km/h and design speed of 70km/h. • Harbourne Rd - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • Harbourne Rd into eastbound Rainbow St. Single Unit Truck with encroachment. • Two lane right turn Anzac Pde into Gardners Rd – restricted combinations available.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • N/A
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<ol style="list-style-type: none"> 1. N/A 2. N/A 3. Bunnerong Rd/Gardeners Rd TCS Drawing Number: 2713 Design Layout: 0171.051.VV.2713 Sheet 1 Issue E Cable Installation: 0171.051.VV.2713 Sheet 4 Issue A Cable Connection Chart: 0171.051.VV.2713 Sheet 5 Issue A Red Light Camera Interface Connection: N/A 4. Rainbow St mid-block pedestrian crossing, east of Anzac Pde TCS Drawing Number: 4154 Design Layout: 0183.381.VV.4154 Sheet 1 Issue B Cable Installation: 0183.381.VV.4154 Sheet 2 Issue B Cable Connection Chart: VD006-19 Issue C Red Light Camera Interface Connection: N/A

**SLR Project
Site No:**
Location:

PS-SE22

Precinct: Kingsford / Kensington

Anzac Pde from Nine Ways to the south of Sturt St, including intersections at:
1. Anzac Pde/Wallace St
2. Anzac Pde - Mid Block Crossing
3. Anzac Pde/Sturt St

<p>Description</p>	<p>Works on Anzac Pde from Nine Ways to the south of Sturt St to accommodate the addition of light rail on Anzac Pde, including the Kingsford Stop (terminus). Provide three lanes northbound and three lanes southbound on Anzac Pde from Nine Ways to Sturt St, one bus through lane in each direction on the inside of the shared island platforms, and one bus set down lane in each direction, adjacent to the shared island platforms. Provide signalised intersection of Anzac Pde and Sturt St with lane arrangements as per functional layout. Provide for buses to merge onto and from the bus lanes in the centre of Anzac Pde, north of Sturt St. Provide signalised pedestrian crossing of Anzac Pde southbound traffic lanes, light rail and the bus lane, to the south of Wallace St. Provide signalised pedestrian mid-block crossings of the northbound light rail and bus lane, to the north of Sturt St. Remove existing signalised pedestrian mid-block crossing of Anzac Pde southbound, outside South Sydney Junior Rugby League Club.</p>
<p>Roads</p>	<p>Anzac Pde (State Road), Wallace St and Sturt St (Local roads)</p>
<p>Council</p>	<p>Randwick City Council</p>
<p>Suburb</p>	<p>Kingsford</p>
<p>Intersection functional layout and minimum traffic lane widths</p>	 <p>The diagram illustrates the proposed functional layout for Anzac Parade. It shows a north-south road with a central section highlighted in red, indicating the light rail alignment. The layout includes three lanes in each direction for the road, with bus lanes on the inner side of the light rail. Key features include: <ul style="list-style-type: none"> Northbound and southbound lanes for Anzac Parade. Light rail tracks running through the center. Wallace St intersecting from the north-east. Sturt St intersecting from the south. Signalised pedestrian crossings and mid-block crossings. Various traffic signs including 'No Left Turn', 'No Right Turn', and 'One Way'. A north arrow is also present. </p>

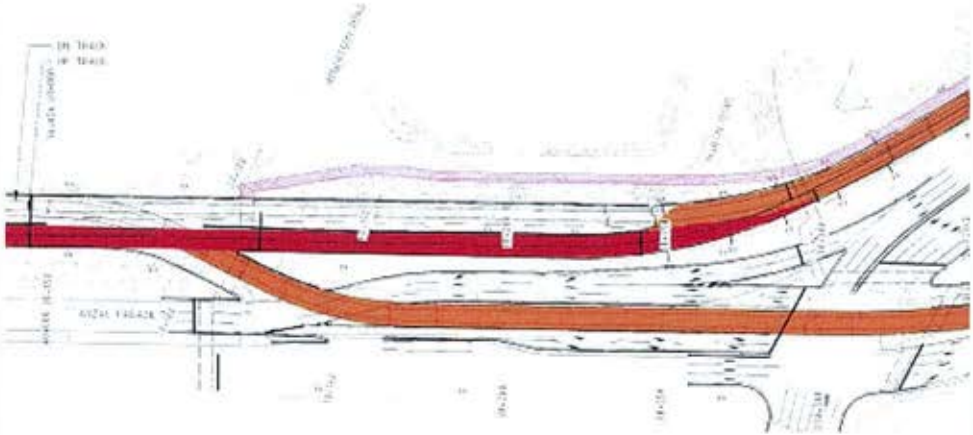
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 60km/h and design speed of 70km/h. • Wallace St - signposted speed of 50km/h and design speed of 60km/h. • Sturt St - signposted speed of 50km/h and design speed of 60km/h. • Busway within interchange – signposted speed of 30 km/h and design speed of 30 km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For all permitted intersection turning movements to and from the Kingsford Stop bus zones, allow for articulated bus (19.0m) and rigid bus (14.5m).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide taxi ranks at the Kingsford Stop. • Provide on-road cycle route on Sturt St in both directions. • Retain existing bus zone on the eastern kerb of Anzac Pde, to the south of Rainbow St. • Remove existing off-street parking spaces in the Anzac Pde median, in the footprint of the Kingsford Stop and bus lanes.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<ol style="list-style-type: none"> 1. N/A 2. Anzac Pde mid-block pedestrian crossing, south of Wallace St TCS Drawing Number: 3573 Design Layout: 2074.381.VV.3573 Sheet 1 Issue D Cable Installation: 2074.381.VV.3573 Sheet 2 Issue A Cable Connection Chart: VD006-19 Issue C Red Light Camera Interface Connection: N/A 3. N/A

SLR Project Site No:
Location:

PS-SE13

Precinct: Randwick

Light rail corridor and Anzac Pde busway from the northern side of Robertson Rd to Alison Rd, including the existing connections to the busway at Robertson Rd and Martin Rd

Description	<p>Works on the Anzac Pde busway from the northern side of Robertson Rd to Alison Rd to accommodate light rail in a dedicated light rail corridor on the eastern side of the Anzac Pde busway, and merging to a shared bus and light rail corridor to the south of Robertson Rd.</p> <p>Remove existing northbound and southbound busway connections to Anzac Pde, and modify existing signalised intersection to convert to a mid-block pedestrian crossing.</p> <p>Provide for buses to merge onto and from the shared busway and light rail corridor, to the south of Robertson Rd.</p> <p>Provide signalised shared path crossing of the busway and light rail corridor, north of Robertson Rd.</p> <p>Provide signalised shared path crossing of the light rail corridor, north of Alison Rd.</p> <p>Retain one bus lane southbound and one bus lane northbound on the Anzac Pde busway north of Robertson Rd to shared running section adjacent to Alison Rd. Provide bus stops to replace Robinson Road Stops in the precinct.</p> <p>Relocate existing fence on the east side of the busway to the east side of the light rail corridor.</p>
Roads	Anzac Pde (State Road), Busway (Local Road)
Council	City of Sydney
Suburb	Moore Park
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Anzac Pde - signposted speed of 70km/h and design speed of 80km/h. • Busway - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Relocate existing southbound bus stop on the eastern side of the busway, to the south of Robertson Rd. • Relocate existing northbound bus stop on the western side of the busway, to the south of Robertson Rd.
Footway requirements	<ul style="list-style-type: none"> • Modify existing 3.0m wide two-way off road shared pedestrian and cycle path on the eastern side of the Anzac Pde busway, crossing to the western side of the busway at Robertson Rd. • Provide a 3.0m wide shared path on the western side of the Anzac Pde busway, connecting to the existing shared path on the eastern side of Anzac Pde, and to the signalised shared path crossing of Alison Rd.

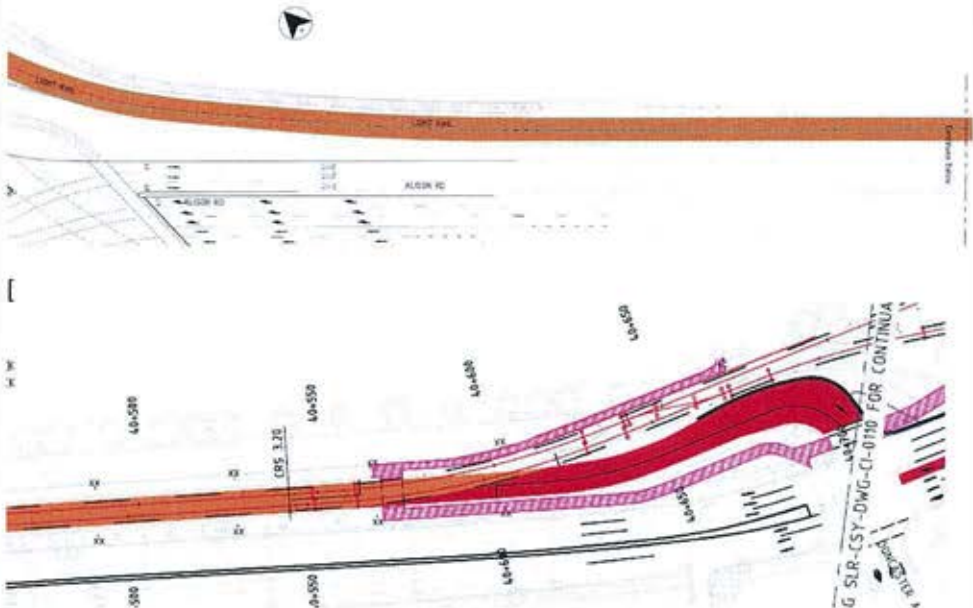
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 0710 Design Layout: 0171.413.VV.0710 Sheet 15 Issue A Cable Installation: 0171.413.VV.0710 Sheet 12 Issue D Cable Connection Chart: 0171.413.VV.0710 Sheet 14 Issue C Red Light Camera Interface Connection: N/A
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SLR Project Site No:
Location:

PS-SE14

Precinct: Randwick

Anzac Pde/Alison Rd busway from Martin Rd to Doncaster Ave

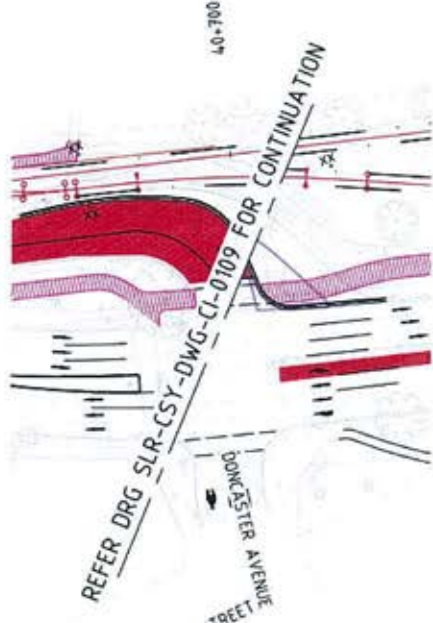
Description	<p>Works on the Anzac Pde/Alison Rd busway from Martin Rd to Doncaster Ave, to accommodate light rail in a shared busway and light rail corridor, merging to a dedicated light rail corridor to the west of Doncaster Ave.</p> <p>Provide signalised mid-block pedestrian crossing of the Alison Rd busway, to the west of Doncaster Ave.</p> <p>Retain one bus lane in each direction on the shared running section from Martin Rd to Doncaster Ave.</p> <p>Provide for buses to merge onto and from the shared busway and light rail corridor, west of Doncaster Ave.</p>
Roads	Busway (State Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <p>Note:</p> <ul style="list-style-type: none"> • Busway to be signposted as left turn only to Alison Road.
Speed	<ul style="list-style-type: none"> • Busway - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Relocate existing bus stops on the northern and southern kerbs of the busway, to the east of Doncaster Ave.
Footway requirements	<ul style="list-style-type: none"> • Modify existing 3.0m wide two-way off road shared pedestrian and cycle path on the northern side of Alison Rd, to the north of the shared bus and light rail corridor.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE23

Precinct: Randwick

Intersection of Alison Rd/Doncaster Ave/Busway

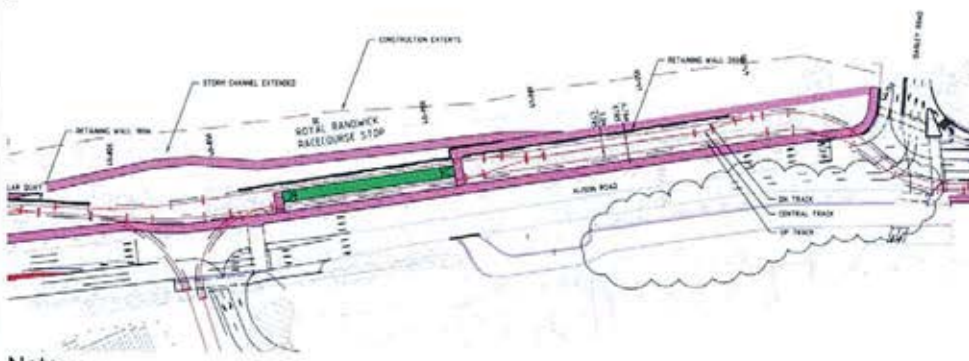
Description	Works on the Alison Rd/Doncaster Ave/busway intersection to accommodate the addition of light rail on Alison Rd. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	Alison Rd (State Road), Doncaster Ave (Regional Road) and Busway (Local Road)
Council	Randwick City Council
Suburb	Kensington
Intersection functional layout and minimum traffic lane widths	 <p>Note:</p> <ul style="list-style-type: none"> • Busway to be signposted as left turn only to Alison Road.
Speed	<ul style="list-style-type: none"> • Alison Rd - signposted speed of 70km/h and design speed of 80km/h. • Doncaster Ave - signposted speed of 50km/h and design speed of 60km/h. • Busway - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For turning movements to and from the busway, allow for articulated bus (19.0m) and rigid bus (14.5m).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Relocate existing bus stop on the northern kerb of Alison Rd, to the east of the signalised intersection with Doncaster Ave.
Footway requirements	<ul style="list-style-type: none"> • Retain existing two-way off road shared pedestrian and cycle path on the northern side of the busway.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0900 Design Layout: 0327.381.VV.0900 Sheet 6 Issue P Cable Installation: 0327.381.VV.0900 Sheet 14 Issue C Cable Connection Chart: 0327.381.VV.0900 Sheet 13 Issue E Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:
Location:

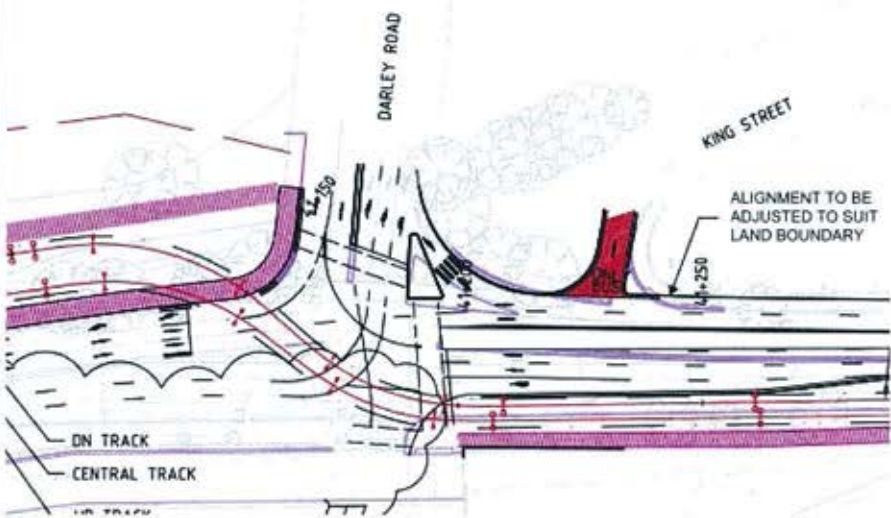
PS-SE24

Precinct: Randwick

Alison Rd from Doncaster Ave to Darley Rd, including the intersection of Alison Rd and the ATC main access

Description	<p>Works on Alison Rd from Doncaster Ave to Darley Rd to accommodate the addition of light rail on Alison Rd, including the Royal Randwick Racecourse Stop.</p> <p>Provide three lanes eastbound and three lanes westbound on Alison Rd from Doncaster Ave to Darley Rd, an additional dedicated right turn lane on the eastbound approach to the ATC access, and an additional dedicated bus only right turn lane on the westbound approach to Doncaster Ave.</p> <p>Provide signalised intersection at the ATC main access with lane arrangements as per functional layout.</p> <p>Provide signalised mid-block pedestrian crossing of the light rail at the western end of the Royal Randwick Racecourse Stop.</p>
Roads	Alison Rd (State Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <p>Note:</p> <ul style="list-style-type: none"> • Busway to be signposted as left turn only to Alison Rd. • Alison Rd westbound to be signposted as no right turn (buses excepted) to busway
Speed	<ul style="list-style-type: none"> • Alison Rd - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Relocate bus stop on the south kerb of Allison road from the east of Daley to the west of Daley adjacent to LRT stop. Locate a bus stop on the north kerb of Allison to the west of Daley.
Footway requirements	<ul style="list-style-type: none"> • Retain existing two-way off road shared cycle and pedestrian path on the northern side of Alison Rd, from Doncaster Ave to Darley Rd. • Reinstate footpath on the southern side of Alison Rd, from Doncaster Ave to the mid-block pedestrian crossing at the western end of the Royal Randwick Racecourse Stop. • Provide 3.0m wide footpath on the southern side of the light rail, from the mid-block pedestrian crossing to Darley Rd.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No: PS-SE29 **Precinct:** Randwick
Location: Intersection of Alison Rd/Darley Rd/ATC access, including the slip lane to King St

Description	Works on the Alison Rd/Darley Rd/ATC access intersection, including the King St slip lane, to accommodate the addition of light rail on Alison Rd. Modify existing signalised intersection with lane arrangements as per functional layout. Provide intersection stub for the ATC access, for extension by ATC. Provide one-way slip lane from Alison Rd eastbound to King St eastbound for buses only.
Roads	Alison Rd (State Road), Darley Rd (Regional Road) and King St (Local Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <p>Note:</p> <ul style="list-style-type: none"> Alison Rd eastbound at Alison Rd / Darley Rd intersection to be signposted as no right Alison Rd eastbound to be signposted as no left turn (buses excepted) to King St
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h. Darley Rd - signposted speed of 60km/h and design speed of 70km/h. King St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For slip lane to King St, allow for articulated bus (19.0m) and rigid bus (14.5m).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> Retain existing two-way off road shared cycle and pedestrian path on the northern side of Alison Rd, from Doncaster Ave to Darley Rd. Retain existing two-way off road shared cycle and pedestrian path on the western side of Darley Rd. Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail.
Existing Traffic Control Signals	TCS Drawing Number: 0357 Design Layout: 0327.381.VV.0357 Sheet 10 Issue B

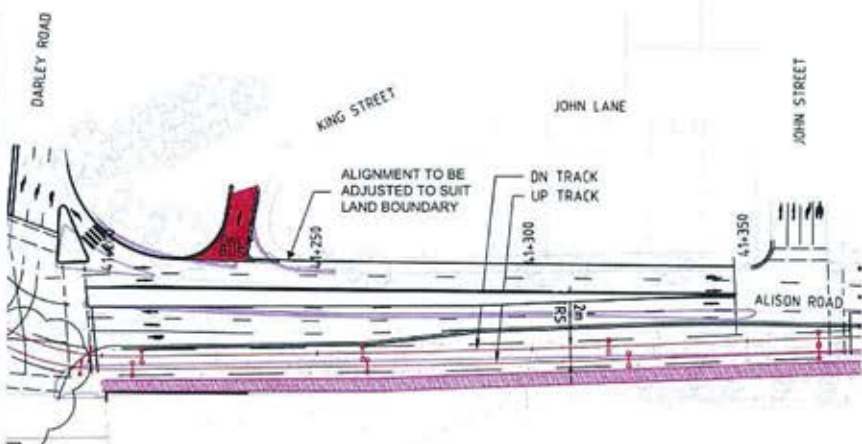
(TCS)	Cable Installation: 0327.381.VV.0357 Sheet 17 Issue A Cable Connection Chart: 0327.381.VV.0357 Sheet 18 Issue A Red Light Camera Interface Connection: N/A
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SLR Project Site No:
Location:

PS-SE65

Precinct: Randwick

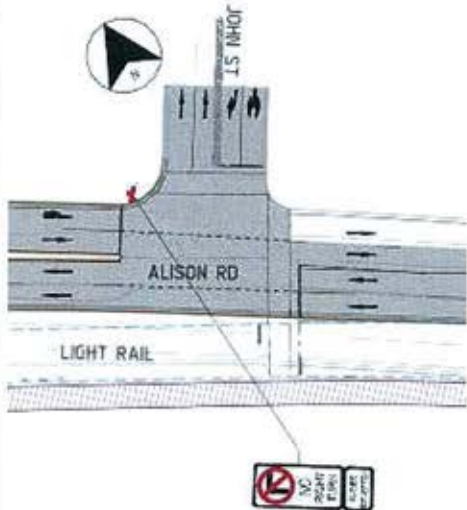
Alison Rd from Darley Rd to John St

Description	<p>Works on Alison Rd from Darley Rd to John St to accommodate the addition of light rail on Alison Rd.</p> <p>Provide two lanes eastbound and two lanes westbound on Alison Rd from Darley Rd to John St, an additional dedicated right turn lane on the westbound approach to Darley Rd/ATC access, and an additional shared through and left turn lane on the westbound approach to Darley Rd/ATC access.</p>
Roads	Alison Rd (State Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <p>The diagram shows a plan view of Alison Rd from Darley Rd to John St. It features two light rail tracks: a 'DN TRACK' (down) and an 'UP TRACK' (up). The road is divided into lanes for traffic. Key street crossings are labeled: DARLEY ROAD, KING STREET, JOHN LANE, and JOHN STREET. A note indicates that the alignment is to be adjusted to suit land boundaries. Stationing markers are shown at 4+250, 4+300, and 4+350. A 'C/S' (cross-section) line is also indicated.</p> <p>Note:</p> <ul style="list-style-type: none"> Alison Rd eastbound to be signposted as no left turn (buses excepted) to King St
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Remove all existing parking zones on both side of Alison Rd, from Darley Rd to John St.
Footway requirements	<ul style="list-style-type: none"> Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail, from Darley Rd to John St.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE66
Intersection of Alison Rd and John St

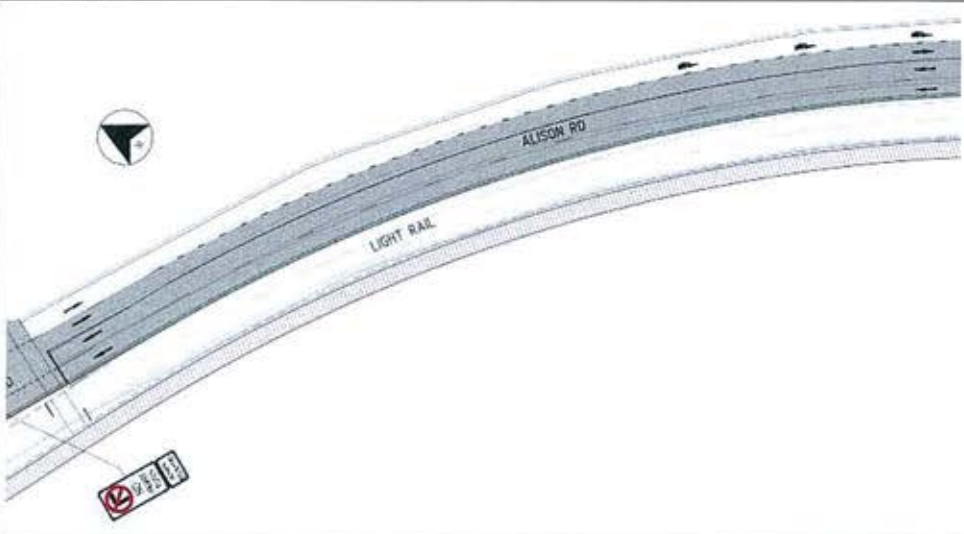
Precinct: Randwick

Description	Works on the intersection of Alison Rd and John St to accommodate the addition of light rail on Alison Rd. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	Alison Rd (State Road) and John St (Local Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h. John St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For turning movements to and from John St, allow for articulated bus (19.0m) and rigid bus (14.5m), with encroachment into other lanes permitted.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail.
Existing Traffic Control Signals (TCS)	TCS Drawing Number: 3044 Design Layout: 0327.381.VV.3044 Sheet 1 Issue B Cable Installation: 0327.381.VV.3044 Sheet 2 Issue A Cable Connection Chart: 0327.381.VV.3044 Sheet 3 Issue A Red Light Camera Interface Connection: N/A

SLR Project Site No:
Location:

PS-SE30
Alison Rd from John St to Cowper St

Precinct: Randwick

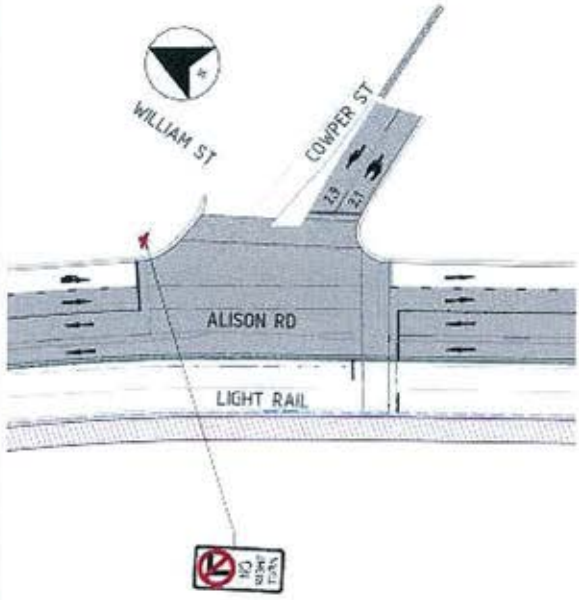
Description	Works on Alison Rd from John St to Cowper St to accommodate the addition of light rail on Alison Rd. Provide two lanes eastbound and two lanes westbound on Alison Rd from John St to Cowper St.
Roads	Alison Rd (State Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Remove all existing parking zones on both sides of Alison Rd, from John St to Cowper St.
Footway requirements	<ul style="list-style-type: none"> Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail, from John St to Cowper St.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE67

Precinct: Randwick

Intersection of Alison Rd/Cowper St/William St

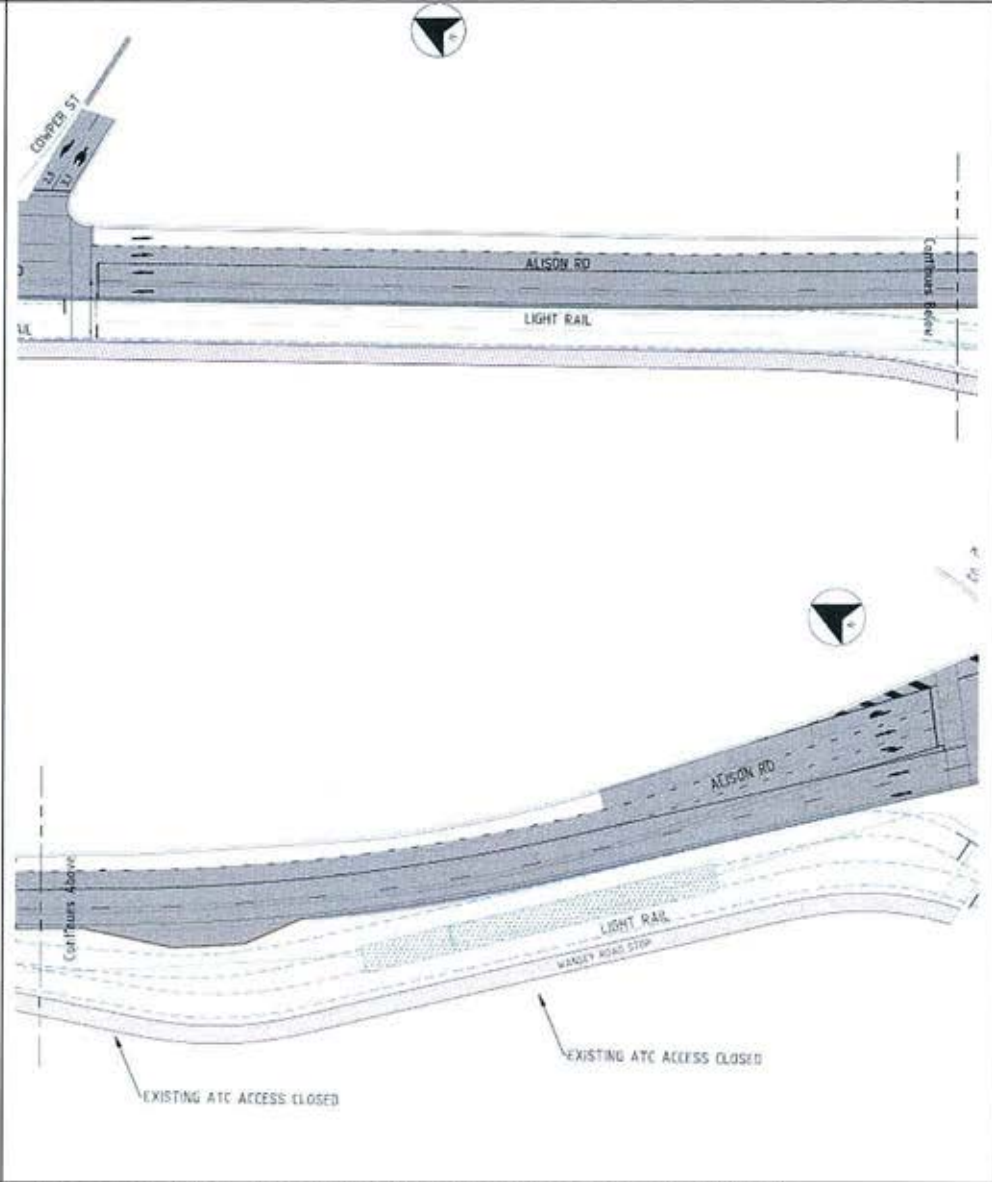
Description	Works on the intersection of Alison Rd/Cowper St/William St to accommodate the addition of light rail on Alison Rd. Modify existing signalised intersection of Alison Rd/Cowper St with lane arrangements as per functional layout.
Roads	Alison Rd (State Road), Cowper St (Regional Road) and William St (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h. Cowper St - signposted speed of 60km/h and design speed of 70km/h. William St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail.
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 0792 Design Layout: 0327.381.VV.0792 Sheet 7 Issue B Cable Installation: 0327.381.VV.0792 Sheet 8 Issue A Cable Connection Chart: 0327.381.VV.0792 Sheet 9 Issue C Red Light Camera Interface Connection: N/A</p>

SLR Project Site No:
Location:

PS-SE68

Precinct: Randwick

Alison Rd from Cowper St to Wansey Rd/Prince St

Description	Works on Alison Rd from Cowper St to Wansey Rd/Prince St to accommodate the addition of light rail on Alison Rd, including the Wansey Road Stop. Provide two lanes eastbound and two lanes westbound on Alison Rd from Cowper St to Prince St/Wansey Rd and an additional dedicated right turn lane on the eastbound approach to Wansey Rd.
Roads	Alison Rd (State Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb	<ul style="list-style-type: none"> Remove all existing parking zones on both sides of Alison Rd, from Cowper St to Wansey Rd/Prince St.

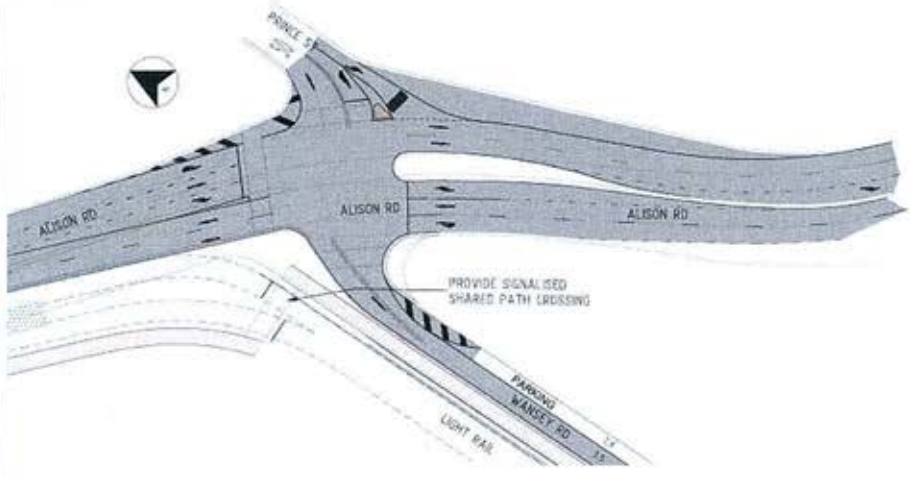
lane requirements	<ul style="list-style-type: none"> • Provide an indented parking bay for maintenance vehicles on the southern kerb of Alison Rd.
Footway requirements	<ul style="list-style-type: none"> • Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail, from Cowper St to Wansey Rd/Prince St.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE33

Precinct: Randwick

Intersection of Alison Rd/Prince St/Wansey Rd

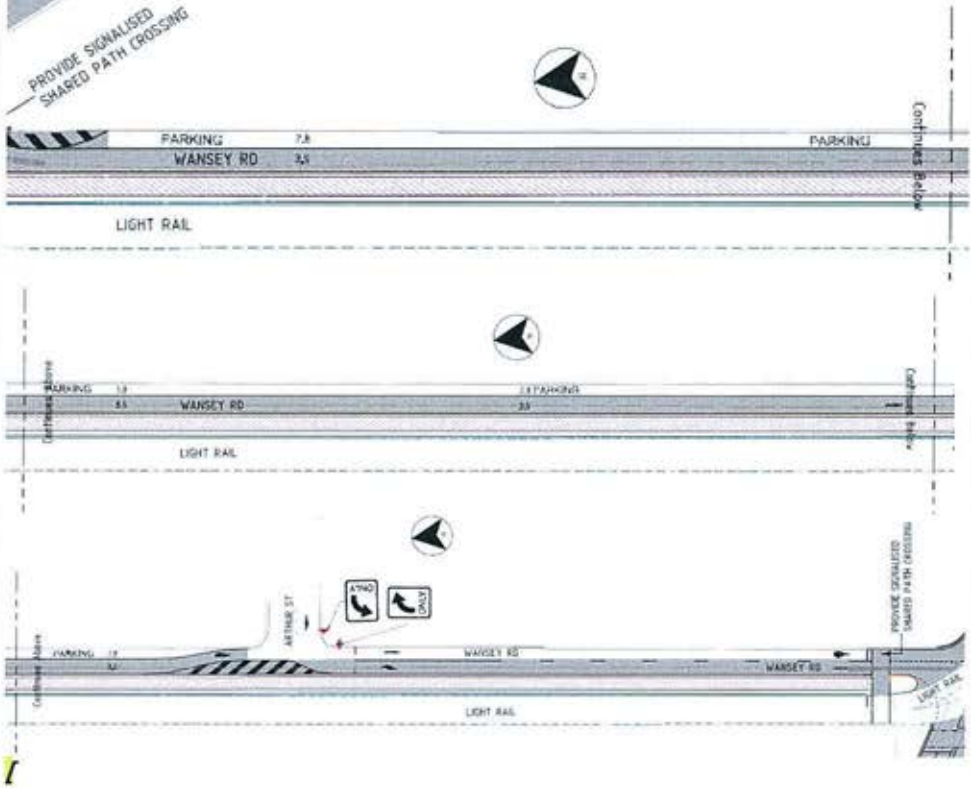
Description	Works on Alison Rd/Prince St/Wansey Rd intersection to accommodate light rail on Alison Rd and Wansey Rd. Provide signalised intersection with lane arrangements as per functional layout. Provide pedestrian crossing across Alison Road eastern approach to the intersection.
Roads	Alison Rd (State Road), Prince St and Wansey Rd (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> Alison Rd - signposted speed of 60km/h and design speed of 70km/h. Prince St - signposted speed of 50km/h and design speed of 60km/h. Wansey Rd - signposted speed of 40km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> N/A
Footway requirements	<ul style="list-style-type: none"> Reinstate 3.0m wide two-way shared cycle and pedestrian path on the southern side of the light rail. Provide 3.0m wide two-way shared cycle and pedestrian path on the western side of Wansey Rd between the light rail and traffic lane, with landscaping between the shared path and light rail.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE35

Precinct: Randwick

Wansey Rd from Alison Rd/Prince St to High St, including the intersection of Wansey Rd/Arthur St

Description	<p>Works on Wansey Rd from Alison Rd to High St to accommodate the addition of light rail on Wansey Rd.</p> <p>Provide one lane southbound on Wansey Rd between Alison Rd and Arthur St.</p> <p>Provide one lane northbound and one lane southbound on Wansey Rd between Arthur St and High St.</p> <p>Retain existing ATC access at the northern end of Wansey Rd by amending the entry, ramp and fence as required.</p> <p>Provide traffic signals for ATC traffic crossing the light rail and shared path.</p> <p>Retain existing ATC access at the southern end of Wansey Rd by amending the entry and fence as required.</p> <p>Provide a designated pedestrian crossing from the shared path to Arthur St.</p>
Roads	Wansey Rd and Arthur St (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Wansey Rd - signposted speed of 40km/h and design speed of 50km/h. • Arthur St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Retain existing parking zones on the eastern kerb of Wansey Rd, from Alison Rd to Arthur St. • Provide on-road cycle route on Arthur St in both directions between Wansey Rd and Belmore Rd.
Footway requirements	<ul style="list-style-type: none"> • Provide 3.0m wide two-way shared cycle and pedestrian path on the western side of Wansey Rd between the light rail and traffic lane, with landscaping between the

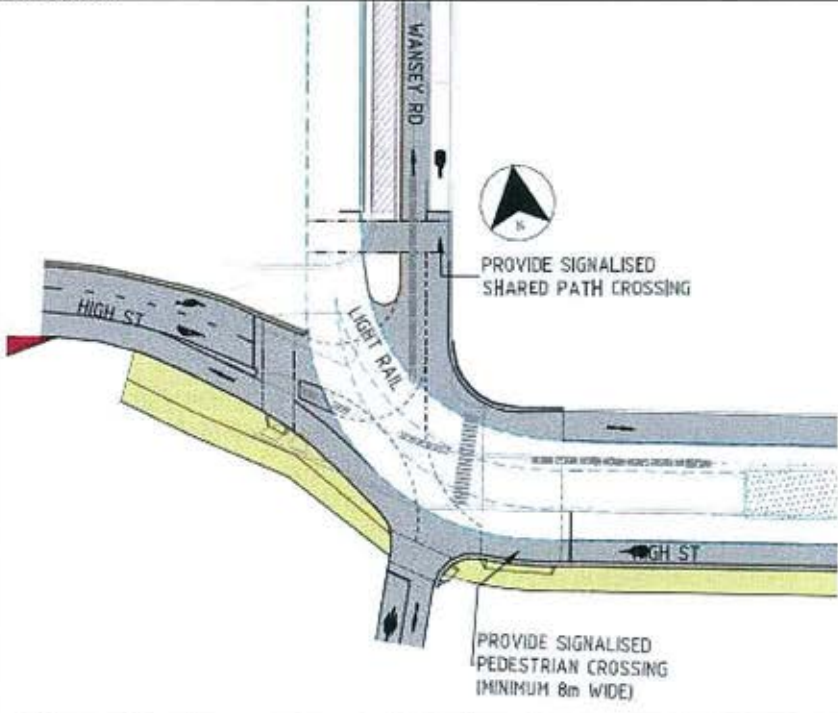
	shared path and light rail.
Existing Traffic Control Signals (TCS)	N/A

SLR Project
 Site No:
 Location:

PE-SE69

Precinct: Randwick

Intersection of Wansey Rd/High St/UNSW Gate 9

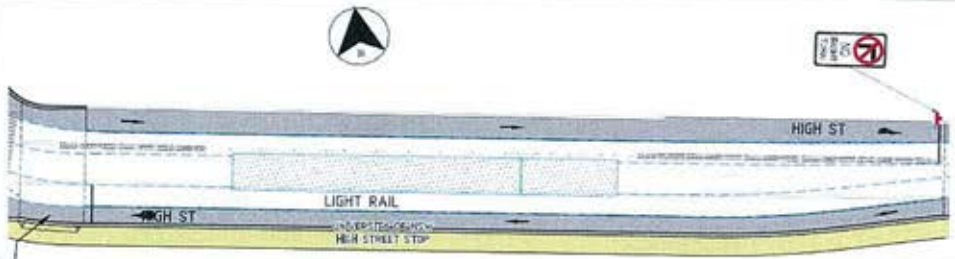
Description	Works on the Wansey Rd/High St/UNSW Gate 9 intersection to accommodate the addition of light rail on Wansey Rd and High St. Provide signalised intersection with lane arrangements as per functional layout.
Roads	Wansey Rd and High St (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> • Wansey Rd - signposted speed of 40km/h and design speed of 50km/h. • High St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements from Wansey Rd into High St, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). • For turning movements to and from UNSW Gate 9, allow for a 5.2m passenger vehicle. • For left turning movements from High Street into Wansey Rd, allow for an 8.8m service vehicle.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Remove existing cycle route markings, paint and signage on High St in both directions, to the east of Wansey Rd, with cyclists directed to Arthur St. • Retain existing on-road cycle route markings, paint and signage on High St in both directions, to the west of Wansey Rd. • Provide a 55.5m long indented bus zone on the southern kerb of High St, to the west of Wansey Rd.
Footway requirements	<ul style="list-style-type: none"> • Provide 3.0m wide two-way shared cycle and pedestrian path on the western side of Wansey Rd between the light rail and traffic lane, with landscaping between the shared path and light rail.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE36

Precinct: Randwick

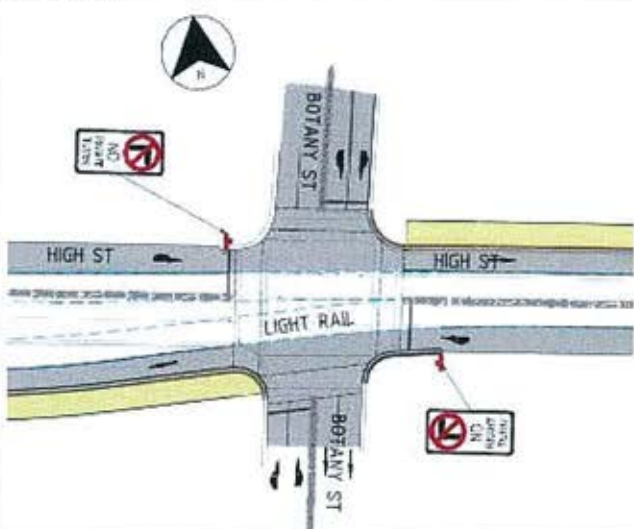
High St from Wansey Rd to Botany St

Description	Works on High St from Wansey Rd to Botany St to accommodate the addition of light rail on High St, including the UNSW High Street Stop. Provide one lane eastbound and one lane westbound on High St from Wansey Rd to Botany St.
Roads	High St (Local Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	
Speed	<ul style="list-style-type: none"> High St - signposted speed of 50km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Remove existing bus zone on the northern kerb of High St. Relocate existing bus zone on the southern kerb of High Street from the East of Wansey Road to the west of Wansey Road. Remove all existing parking/taxi/loading zones along High St between Wansey Rd and Botany St. Retain existing on-road cycle route on Botany St in both directions. Remove existing cycle route markings, paint and signage on High St in both directions.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE70
Intersection of High St/Botany St

Precinct: Randwick

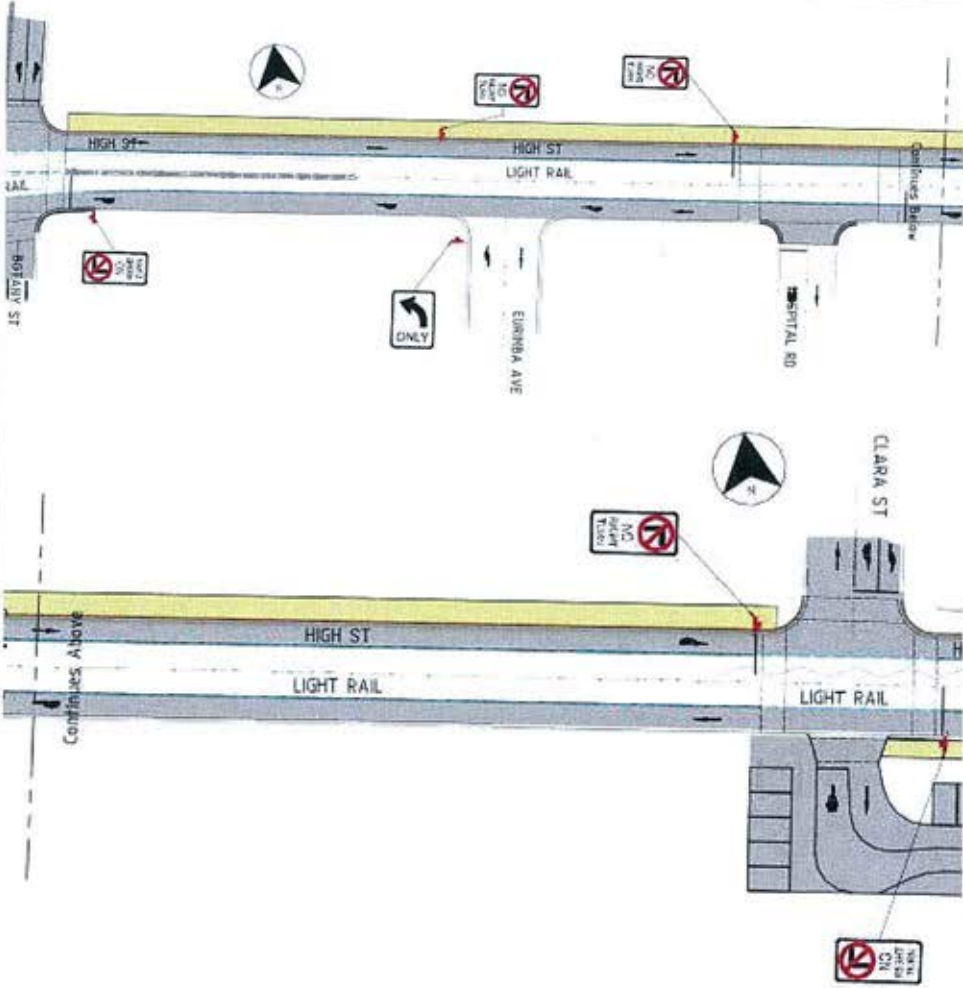
Description	Works on the High St/Botany St intersection to accommodate the addition of light rail on High St. Modify existing signalised intersection with lane arrangements as per functional layout.
Roads	High St and Botany St (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <p>The diagram shows a plan view of the intersection. Botany St runs north-south, and High St runs east-west. A light rail line runs east-west through the center of the intersection, crossing over Botany St. Lane markings and widths are indicated. Two 'No Left Turn' signs are shown: one on the eastbound side of High St and one on the southbound side of Botany St. A north arrow is also present.</p>
Speed	<ul style="list-style-type: none"> High St - signposted speed of 50km/h and design speed of 50km/h. Botany St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> For left turning movements from Botany St southbound into High St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). For left turning movements from Botany St northbound into High St westbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Northbound light rail track). For left turning movements from High St eastbound into Botany St northbound, allow for a 5.2m passenger vehicle, and for a 14.5m rigid bus (allowing encroachment onto the Southbound light rail track). For left turning movements from High St westbound into Botany St southbound, allow for a 5.2m passenger vehicle, and for a 14.5m rigid bus (allowing encroachment onto the Northbound light rail track).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> Retain existing bus zones on the eastern and western kerbs of Botany St, to the south of High St. Remove existing cycle route markings, paint and signage on High St in both directions.
Footway requirements	<ul style="list-style-type: none"> N/A
Existing Traffic Control Signals (TCS)	<p>TCS Drawing Number: 1213 Design Layout: 7000.381.VV.1213 Sheet 6 Issue A Cable Installation: 7000.381.VV.1213 Sheet 7 Issue A Cable Connection Chart: 7000.381.VV.1213 Sheet 8 Issue B Red Light Camera Interface Connection: N/A</p>

SLR Project
 Site No:
 Location:

PS-SE71

Precinct: Randwick

High St from Botany St to Clara St, including intersections at:
 1. High St/Eurimbla Ave
 2. High St/Hospital Rd

Description	<p>Works on High St from Botany St to Clara St to accommodate the addition of light rail on High St. Provide one lane eastbound and one lane westbound on High St from Botany St to Clara St. Provide signalised intersection at High St/Hospital Rd with lane arrangements as per functional layout. Allow right turn into Hospital Rd from High St eastbound by authorised vehicles.</p>
Roads	High St, Eurimbla Ave and Hospital Rd (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <p>• Error in diagram – for Hospital entrance / exit (opposite Clara St) refer to diagram in PS-SE72</p>
Speed	<ul style="list-style-type: none"> High St - signposted speed of 50km/h and design speed of 50km/h.

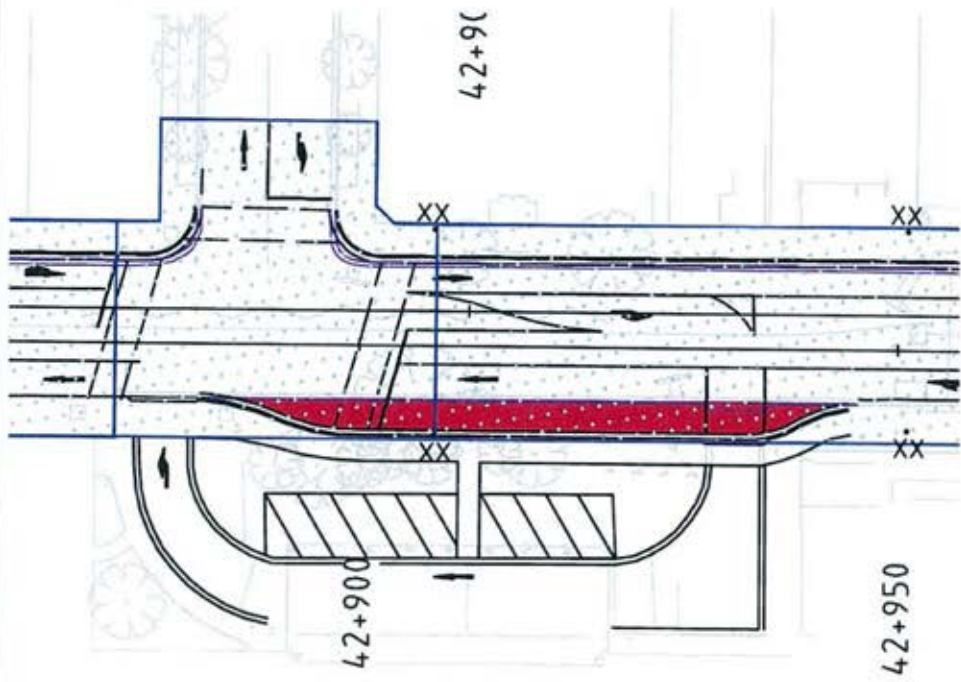
	<ul style="list-style-type: none"> • Eurimbla Ave - signposted speed of 50km/h and design speed of 60km/h. • Hospital Rd - signposted speed of 20km/h and design speed of 30km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements into and from Eurimbla Ave, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Northbound light rail track). • For left turning movements into and from Hospital Rd, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Northbound light rail track).
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Remove all existing parking/taxi/loading zones along High St between Botany St and Clara St. • Remove existing cycle route markings, paint and signage on High St in both directions.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project
 Site No:
 Location:

PS-SE72

Precinct: Randwick

Intersection of High St/Clara St/Prince of Wales Hospital access

Description	Works on the High St/Clara St/Prince of Wales Hospital access intersection to accommodate the addition of light rail on High St. Provide signalised intersection with lane arrangements as per functional layout. Retain existing hospital access functionality.
Roads	High St and Clara St (Local Roads)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • High St eastbound signposted as no right turn to Hospital at Clara St • High St westbound signposted as no right turn to Clara St
Speed	<ul style="list-style-type: none"> • High St - signposted speed of 50km/h and design speed of 50km/h. • Clara St - signposted speed of 50km/h and design speed of 60km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • For left turning movements from High St eastbound into Clara St northbound, allow for a 5.2m passenger vehicle, and for a 14.5m rigid bus (allowing encroachment onto the Southbound light rail track). • For left turning movements from Clara St southbound into High St eastbound, allow for a 5.2m passenger vehicle, and for an 8.8m service vehicle (allowing encroachment onto the Southbound light rail track). • For left turning movements into and from the Prince of Wales Hospital access, allow for a 5.2m passenger vehicle.
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Provide a 35m long indented bus bay on the southern kerb of High St, adjacent to the Prince of Wales Hospital. • Provide bus zones on the eastern and western kerbs of Clara St, to the north of High St. • Remove existing cycle route markings, paint and signage on High St in both directions.

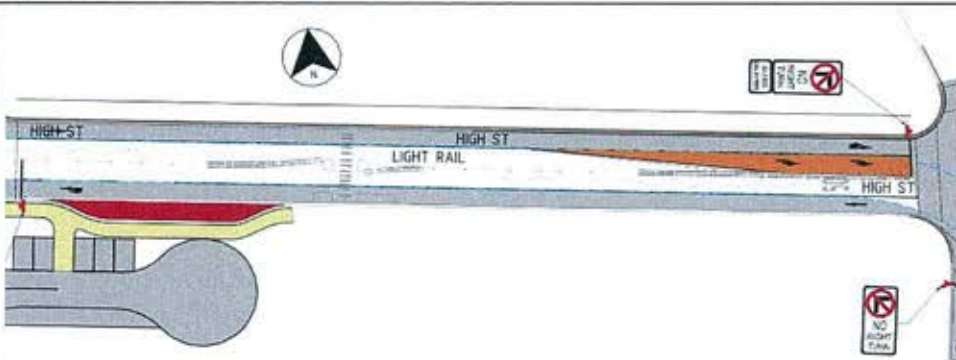
Footway requirements	<ul style="list-style-type: none">• Provide pedestrian access to the Prince of Wales Hospital.
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE73

Precinct: Randwick

High St from Clara St to Avoca St/Belmore Rd

Description	Works on High St from Clara St to Avoca St/Belmore Rd to accommodate the addition of light rail on High St. Provide one lane eastbound and one lane westbound on High St from Clara St to Avoca St/Belmore Rd, and an additional bus only right turn lane on the eastbound approach to Avoca St, with the turning lane sharing the light rail alignment.
Roads	High St (Local Road)
Council	Randwick City Council
Suburb	Randwick
Intersection functional layout and minimum traffic lane widths	 <ul style="list-style-type: none"> • Error in diagram – for Hospital entrance / exit refer to diagram in PS-SE72
Speed	<ul style="list-style-type: none"> • High St - signposted speed of 50km/h and design speed of 50km/h.
Design vehicles (exceptions)	<ul style="list-style-type: none"> • N/A
On-street parking control and kerb lane requirements	<ul style="list-style-type: none"> • Remove all existing parking/taxi/loading zones along High St between Clara St and Avoca St. • Remove existing cycle route markings, paint and signage on High St in both directions.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	N/A

SLR Project Site No:
Location:

PS-SE37

Precinct: Randwick

Avoca St from Cuthill St to High St/Belmore Rd, Belmore Rd from Avoca St/High St to Cuthill St/Coogee Bay Rd/Perouse Rd and Cuthill St from Belmore Rd/Coogee Bay Rd/Perouse Rd to Avoca St, including intersections at:

- 1. High St/Belmore Rd/Avoca St**
- 2. Belmore Rd/Coogee Bay Rd/Cuthill St/Perouse Rd**
- 3. Cuthill St/Avoca St**

Description	<p>Works on Avoca St from Cuthill St to High St/Belmore Rd, Belmore Rd from Avoca St/High St to Cuthill St/Coogee Bay Rd/Perouse Rd and Cuthill St from Belmore Rd/Coogee Bay Rd/Perouse Rd to Avoca St to accommodate the addition of light rail on High St and Belmore Rd, including the Randwick Stop. Provide three northbound lanes, two southbound lanes and one southbound bus set down lane on Avoca St from Cuthill St to High St/Belmore Rd. Provide left turn bus only slip lane from Avoca St southbound to Cuthill St eastbound. Provide one southbound lane, southbound parking, one northbound bus lane and one northbound bus set down lane, adjacent to the light rail platform, on Belmore Rd from Avoca St/High St to Cuthill St/Coogee Bay Rd/Perouse Rd. Provide three westbound lanes, one eastbound bus lane and one eastbound bus set down lane on Cuthill St. Modify existing signalised intersections with lane arrangements as per functional layout, at:</p> <ol style="list-style-type: none"> 1. High St/Belmore Rd/Avoca St 2. Belmore Rd/Coogee Bay Rd/Cuthill St/Perouse Rd 3. Cuthill St/Avoca St
Roads	Avoca St (State Road), High St, Belmore Rd, Coogee Bay Road, Cuthill St and Perouse Rd (Local Roads)
Council	Randwick City Council
Suburb	Randwick

<p>Intersection functional layout and minimum traffic lane widths</p>	<p>Note</p> <ul style="list-style-type: none"> • Error in diagram – a pParking to also be provided in Belmore Rd
<p>Speed</p>	<ul style="list-style-type: none"> • Avoca St - signposted speed of 60km/h and design speed of 60km/h. • High St - signposted speed of 50km/h and design speed of 50km/h. • Belmore Rd - east of High St: signposted speed of 60km/h and design speed of 70km/h. • Belmore Rd - west of High St - signposted speed of 50km/h and design speed of 60km/h. • Coogee Bay Rd - signposted speed of 60km/h and design speed of 70km/h, with a 40km/h school zone to the east of Perouse Rd. • Cuthill St - signposted speed of 60km/h and design speed of 70km/h. • Perouse Rd - signposted speed of 50km/h and design speed of 60km/h.
<p>Design vehicles (exceptions)</p>	<ul style="list-style-type: none"> • For right turning movements from High St eastbound into Avoca St southbound, allow for a 14.5m rigid bus. • For left turning movements from Avoca St northbound into High St westbound, allow for a 5.2m passenger vehicle, and for a 14.5m rigid bus (allowing encroachment onto the light rail tracks and right turn lane) • For left turning movements from Avoca St southbound into Clisdell St eastbound, allow for a 14.5m rigid bus.
<p>On-street parking control and kerb</p>	<ul style="list-style-type: none"> • Retain existing parking zones on Cuthill St. • Retain existing on-road cycle route on Coogee Bay Rd in both directions.

lane requirements	<ul style="list-style-type: none"> • Retain existing on-road cycle route on Perouse Rd in both directions. • Provide bus zones as per the stop design drawing.
Footway requirements	<ul style="list-style-type: none"> • N/A
Existing Traffic Control Signals (TCS)	<p>1. High St/Belmore Rd/Avoca St TCS Drawing Number: 0114 Design Layout: 0327.381.VV.0114 Sheet 8 Issue F Cable Installation: 0327.381.VV.0114 Sheet 11 Issue A Cable Connection Chart: 0327.381.VV.0114 Sheet 12 Issue C Red Light Camera Interface Connection: N/A</p> <p>2. Belmore Rd/Coogee Bay Rd/Cuthill St/Perouse Rd TCS Drawing Number: 0759 Design Layout: 0631.381.VV.0759 Sheet 1 Issue G Cable Installation: 0631.381.VV.0759 Sheet 4 Issue B Cable Connection Chart: 0631.381.VV.0759 Sheet 5 Issue B Red Light Camera Interface Connection: N/A</p> <p>3. Cuthill St/Avoca St TCS Drawing Number: 0518 Design Layout: 7000.381.VV.0518 Sheet 1 Issue H Cable Installation: 7000.381.VV.0518 Sheet 7 Issue A Cable Connection Chart: 7000.381.VV.0518 Sheet 8 Issue C Red Light Camera Interface Connection: N/A</p>

Attachment 2:

CSELR Traffic Signal Delay

1. Introduction

- (a) The operation of the CSELRVs is subject to the traffic signal control at signalised intersections. The phasing of these traffic signals is determined by RMS as part of their responsibility to manage the State's road network. OpCo shall make appropriate allowance for these intersection delays within the timetabling and operation of the CSELR services.

2. Definition of Traffic Signal Aggregate Delay

- (a) The Traffic Signal Aggregate Delay is defined as the 97th percentile of the Actual Traffic Signal Delay for each Required Service operated within a Service Period calculated monthly over the proceeding 3 consecutive Operating Months, but not including the first Operating Month commencing on the Date of Revenue Service. The Actual Traffic Signal Delay is the aggregate of the signal delays measured at each intersection on the Circular Quay - Randwick and Circular Quay - Kingsford routes in each direction determined by reference to the data agreed as accurate by OpCo and TfNSW pursuant to paragraph 3 below. In each case the delays will be measured for intersections in both directions.
- (b) The signal delay will be measured from the time the vehicle arrives and stops at the intersection stop line to the time the traffic signal allows the LRV to proceed. The signal delay time does not include any time associated with driver or LRV reaction times or any other factors that may delay the LRV. Should the LRV arrive at an intersection when the traffic displays a signal that allows it to proceed then there is zero delay.
- (c) Within 60 Business Days of Contract Close, the parties will develop a practice note to determine the methodology and appropriate traffic models for calculating the initial and ongoing Traffic Signal Aggregate Delay (for each relevant intersection and in the aggregate). The practice note is intended to facilitate the calculation of Traffic Signal Aggregate Delays but is not contractually binding on the parties.

3. Monitoring and Reporting of Traffic Signal Delay

- (a) OpCo shall monitor the Actual Traffic Signal Delay and provide the detailed reports to TfNSW as part of the monthly reporting requirements. Where OpCo wishes to rely on these results for the purposes of an Operations Activities Review pursuant to Clause 20.3(e)(ii) or 20.3(h) of the Operative Provisions OpCo must demonstrate to TfNSW's reasonable satisfaction that the Actual Traffic Signal Delay information included in the monthly reports relates to signal delays only and does not include other operational factors. OpCo must also allow TfNSW access to undertake whatever tests it believes are necessary to satisfy itself of the accuracy and/or reasonableness of the information included in the monthly report or otherwise provided by OpCo.

4. CSELR Traffic Signal Delay

- (a) For the purposes of preparing OpCo's Indicative Timetable, OpCo shall assume that the Traffic Signal Aggregate Delay for each Service Period will be:
- i Randwick to Circular Quay: 7.3 minutes;
 - ii Kingsford to Circular Quay 8.8 minutes;
 - iii Circular Quay to Randwick 7.0 minutes;

- iv Circular Quay to Kingsford 8.4 minutes.

5. Variation in CSELR Traffic Signal Delay

- (a) In conducting an Operational Activities Review for the purposes of Clause 20.3 (e) (ii) of the Operative Provisions the parties acknowledge that, with peak periods being operated with a 4 minute headway:
- (b) Where the Traffic Signal Aggregate Delay on services which operate on either the CSELR between Randwick to Circular Quay or between Kingsford and Circular Quay exceeds the applicable delay in paragraph 4 above by not more than 10% within any peak Service Period this can be accommodated without an increase in LRV fleet size or other operational resources.
- (c) Where the Traffic Signal Aggregate Delay within any peak Service Period is less than that described in paragraph 4 above by 35% or more on services which operate on the CSELR both between Randwick to Circular Quay and between Kingsford and Circular Quay OpCo shall prepare a new timetable reducing the number of LRVs and in-service hours required for service delivery by 2 CSELRVs for the corresponding peak Service Period and reducing the Monthly Service Payment by the Traffic Signal Aggregate Delay Amount defined in Clause 21 of Schedule D1 of the Project Deed net of any one-off costs to OpCo as a result of implementing such reductions.

6. IWLR Traffic Signal Delay

- (a) There is no requirement to monitor or report Traffic Signal Delay for the IWLR.



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 17 - Trackwork

Document Number: 3126379_16
Execution Version

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for new alignments and trackwork, and details the minimum standards and design policies to govern the engineering, materials, and construction standards for trackwork and its interfaces with other elements of the SLR Works, including bridges, box structures, approach slabs, signal system and drainage.

1.2. Scope

- (a) OpCo must provide alignments and trackwork to meet the service and system performance requirements of the SLR Works.

1.3. Definitions and Explanation of Terms

cant	For the purpose of SLR Works and to avoid confusion with road terminology, 'cant' is used to define the cross level / superelevation between the centres of the rail heads with a pivot point around the gauge face of the inside rail of a curved alignment, with the inside rail defined as the low rail. The outside rail will only be at a lower level than the inside rail in adverse / negative cant situations.
Embedded Track	Embedded Track is also referred to as paved or street track. There are many methods and materials that can be used to construct Embedded Track in order to produce different looks, including: block pavers, stamped concrete, standard concrete and sand-set pavers, among others.
Open Track	Open Track is the term used to refer to track built outside the limits of shared use zones. Open Track is characterised by fully exposed rail, typically built with cross ties and ballast but can also be Plinth Track.
Plinth Track	Plinth Track is the term used for rail fastened to a concrete slab or bridge deck using direct fixation fasteners. Direct fixation fasteners are typically spaced the same as the concrete crossties in ballast track.
TOR	Top of Rail – taken at the centre of the rail heads surface
Check Rail	The term Check Rail refers to an additional rail or specifically rolled steel section positioned a set distance from the low rail to provide a flangeway thus providing additional guidance to the wheelset.
Special Trackwork	Trackwork that requires fabrication in factory controlled conditions, including switches, crossings, insulated rail joints, expansion joints and pre-curved rail.

2. Performance and Technical Requirements

2.1. Rail Design Requirements

2.1.1. General

- (a) OpCo must provide an alignment design and trackwork which:
- i. is demonstrably and adequately safe against derailment for its whole life;
 - ii. supports the services required by Appendix 38 (*Minimum Service Requirements*);
 - iii. provides appropriate clearances between LRVs and other LRVs, other vehicles, fixed objects and pedestrians;
 - iv. provides a comfortable ride for passengers;
 - v. is durable and meets the design life requirements outlined in Table 2 of the SPR;
 - vi. minimises maintenance which will disrupt the provision of passenger services;
 - vii. minimises whole-of-life cost;
 - viii. complies with the noise and vibration requirements of Appendix 31 (*Noise and Vibration*) and the Environmental Requirements;
 - ix. allows for future network extensions or network expansions, in accordance with Appendix 36 (*Future Network*), with minimum disruption to passenger services;
 - x. connects the existing IWLR system with the CSELR system at the George Street / Hay street intersection, providing the necessary connections to allow travel between the CSELR and IWLR. CSELR southbound to IWLR westbound and IWLR eastbound to CSELR northbound connections must be built as part of CSELR construction; and
 - xi. provides compatibility between IWLR LRVs and CSELR alignment and track.
- (b) The design of CSELR must provide for the operation of LRVs of length to deliver the capacity requirements of the SPR. Central Stop and Moore Park Stop must be designed to provide for the event usage contemplated in the SPR.
- (c) The track should remain adequately safe against derailment and structural damage, and within alignment tolerances, if LRVs pass at 5kph overspeed or 10% above the design speed, whichever is the greater.
- (d) OpCo must carry out a wheel-rail interface (WRI) study, complying with the requirements set out in section 4.2 of this Appendix. It must optimise the whole of life performance of the LRVs and the trackwork, and must provide a report which describes, explains and justifies the design decisions which have been made.
- (e) OpCo must design and construct the network in accordance with the findings of the WRI study.
- (f) The rail alignment must be integrated with other roadway alignment and civil works design including utility services, CSELR Stops, urban design and landscaping.

- (g) Where practicable, OpCo should design the alignment to be straight across intersections including pedestrian crossings, in order to minimise construction time by allowing the use of precast track slabs of durable, long-lasting materials.
- (h) Grade crossing panels must be constructed with due regard to:
 - i. removability for track maintenance;
 - ii. electrical isolation;
 - iii. non-interference with electrical track circuits or rail fastenings;
 - iv. tire adhesion; and
 - v. pedestrian slip resistance.
- (i) Not used.
- (j) The track gauge must be 1435mm standard gauge measured between the inner (gauge) sides of the rail. Gauge widening on tight curves may be required subject to the wheel-rail interface recommendations as outlined in section 4.2 of this Appendix.
- (k) In this document, some track parameters have both a desirable and an absolute limit. Where OpCo intends to adopt a limit between the two or the absolute limit, it must justify this decision in the design report which accompanies the Design Documentation.

2.1.2. Horizontal Alignment Design

- (a) Horizontal alignment design parameters must relate to the rail centreline unless noted otherwise.
- (b) OpCo must ensure the following horizontal geometric parameters apply:
 - i. ensure the track alignment is designed for left hand track running and to minimise rail and wheel wear and related noise and vibration;
 - ii. optimise the alignment, ensuring that straights are as long as possible whilst maximising the radii of curves. Combinations of short straights and tight curves must not be used where a single larger radius curve can be used;
 - iii. compound circular curves may be used provided that they are connected by an adequate transition curve;
 - iv. desirable minimum horizontal element length 12m, with the absolute minimum being 7 m. Transitions must also be at least V/6 in length;
 - v. mainline horizontal curve radius must not be less than 25m. This may be reduced to an absolute value of 22m for connecting routes where no normal passenger service is expected, and for tracks in the Light Rail Maintenance and Stabling Facilities; and
 - vi. in tunnel sections, the design shall also allow for unrestricted reverse running conditions when establishing the alignment, clearances, and cant.
- (c) For mainline tracks, OpCo must design the applied cant and cant deficiency, and set curve speeds in accordance with the following:

- i. where possible sufficient cant must be applied to achieve 2/3 equilibrium cant for areas with constant operating speed;
 - ii. at intersections and other areas of heavy cross traffic the rails must match the profile of the road surface and, where practical, be kept in one plane;
 - iii. maximum applied cant on the system must be 110mm for slabtrack and 90mm for ballasted track;
 - iv. cant must be applied in multiples of 5mm;
 - v. minimum design applied cant must be 10mm;
 - vi. maximum cant gradient must be 1 in 400, minimum cant gradient must be 1 in 2500;
 - vii. desirable maximum cant deficiency must not exceed 90mm. The absolute maximum cant deficiency is 130mm;
 - viii. where possible, cant must be applied on constant grade sections and over the full length of transition curves;
 - ix. in exceptional circumstances the application of cant may be extended into the horizontal curve;
 - x. at sections with differing operating speeds the applied cant should not cause excess cant for the slowest speed;
 - xi. where LRVs are expected to stop the applied cant must not exceed 10mm;
 - xii. cant at CSELR Stops is not permitted;
 - xiii. where the rail alignment is immediately adjacent to general road traffic and cant is applied, the road interface must ensure the road surface is adequately drained to prevent ponding and road vehicle aquaplaning;
 - xiv. the maximum desirable adverse cant is zero, absolute 10mm;
 - xv. cant through switches and crossing is not permitted;
 - xvi. a maximum of 20mm excess cant is permitted to assist with matching the road profile at intersections only. This is applicable to tangent and curved track; and
 - xvii. tracks in Light Rail Maintenance and Stabling Facilities shall not be canted.
- (d) OpCo must design the horizontal transition curves in accordance with the following:
- i. transition curves must be of clothoidal form;
 - ii. transition curves must be used on all mainline tracks connecting tangents to curves and compound curves where the curve radius is less than 2500 metres;
 - iii. for turnouts and stabling track design a virtual transition length of equal to or greater than 1.8m must be used;
 - iv. the maximum rate of change of cant is 50mm/s as preferred limit value and 55mm/s as exceptional limit values;
 - v. desirable rate of change of cant deficiency is 55mm/s, absolute maximum rate of change of cant deficiency is 80mm/s; and

- vi. desirable minimum transition length is 12m, absolute minimum transition length is 7m in the main line. In the depot no transition curve are required.

2.1.3. Vertical Alignment design

- (a) Vertical alignment design parameters relate to the low rail unless noted otherwise.
- (b) OpCo must:
 - i. design a vertical alignment for all individual tracks;
 - ii. ensure the vertical alignment design represents the elevation of the top of the lowest rail;
 - iii. design the vertical alignment in accordance with the following:
 - A. the vertical alignment must consist of constant grades connected by vertical curves. An instantaneous change in grade of <0.2% is permissible without the use of vertical curves;
 - B. all vertical curves must be parabolic vertical curves having a constant rate of change in grade;
 - C. desirable minimum length of vertical curve is 12m, absolute minimum length of vertical curve is 10m;
 - D. desirable minimum length of constant grade is 12m, absolute minimum length is 10m. An exception to this rule is on George street between the Telstra tunnel (near Campbell Street) and the IWLR junction where it may be necessary to remove the adjoining straight;
 - E. desirable minimum vertical curve radius is 600m. Absolute minimum vertical curve radius is 350m;
 - F. vertical acceleration - 2.25%g (maximum), 3.25%g (exceptional). Minimum Radius given by:

$$R = V^2 / 1.2f$$

Where: R = equivalent vert curve radii in metres

V = Speed in kilometres per hour

F = %g

g = gravity (taken as 9.81m/s²);

- G. Where a combination of horizontal and vertical curves is unavoidable, the following design rules must be applied:
 - for Horizontal Curve Radius (Rh) between 40m and 70m, the Vertical Curve Radius (Rv) must be >3000m
 - for Horizontal Curve Radius (Rh) between 70m ≤ Rh ≤ 200m, the Vertical Curve Radius Rv must be > 1500m
 - where these values cannot be achieved, the overlappings must at least meet the following requirement:

- $R_h R_v \geq 25000$
 - wherever the above requirements cannot be satisfied, specific case by case joint analysis with the LRV supplier shall be conducted. Designs shall be approved at TfNSW's discretion. Approval will not be unreasonably upheld.
- iv. ensure the following gradient parameters apply:
 - A. grades must not exceed the maximums specified in the following table:

Table 1 Gradients

Condition	Desirable Maximum	Maximum	Absolute Maximum (i)
Mainline Track	3.5%	5.0%	7.0%
CSELR Stop	0.5%	2.5%	3.0% (outside DDA zones)
Yard	0.0%	0.5%	1.0%
Turnback track (ii)	0.0%	0.5%	1.0%
Stabling	0.0%	0.5%	1%

Notes:

- (i) The Absolute Maximum vertical grade is either constant, instantaneous or curve compensated;
- (ii) any location where the LRV cab may be left temporarily unattended, if the grade is greater than 0% the alignment must slope away from the main line in such a direction that a vehicle will roll towards a buffer stop or other safe location.

- v. the designed gradient must incorporate curve compensation by $(50 / R)\%$, in nominal cases up to $(80 / R)\%$ in exceptional circumstances, where R is the horizontal radii in 'm'. This should be evaluated when determining the maximum gradient of a section.

2.1.4. Other Alignment Design Considerations

- (a) CSELR Stops:
 - i. to the maximum extent feasible, where side Platforms are integral with the existing footpath the increased distance between the TOR and the top of Platform shall be achieved by lowering the TOR rather than raising the footpath:
 - A. the horizontal alignment should be tangent at all CSELR Stops throughout their entire length. The revised IWLR Stop on Hay Street Capitol Square may be on a horizontal curve/transition providing it is no worse than the existing;
 - B. where possible, the tangent must extend beyond either end of the CSELR Stop by at least 6m, or sufficient to prevent LRV throw from affecting platform offsets and heights, for any LRV which will operate at the CSELR Stop. Where LRV throw effects extend into the platform, the track

alignment and platform shall be designed to ensure the throw effects do not impact on step gaps at the nearest door;

- C. no gradient within the DDA accessible zone on a CSELR Stop may exceed 2.5%. Maximum permissible grade 3%;
- D. the CSELR Stop platforms must be of a length to provide for safely stopping an LRV with a suitable allowance for driver positioning error;
- E. no cant shall be applied within the CSELR Stop; and
- F. the approach alignment must be designed to suit the speed profile of a stopping LRV.

(b) Switches, crossings and rail expansion switches:

- i. all switches and crossings must be installed on a constant grade which does not exceed 4.5%;
- ii. switches and crossings must not be located in mixed trafficked areas unless there is no alternative. When unavoidable they must be located to reduce the exposure of pedestrians to the operating mechanisms;
- iii. all crossovers shall be located in parallel tracks where possible;
- iv. cant must not be applied through switches & crossings, except across the half union junction on George/Hay Street which may have a 1% crossfall;
- v. switches and crossings must be located on straight track where possible. An exception may be granted for the half union junction at George/Hay Street, subject to the WRI study recommendations;
- vi. straight and constant grade track to be extended 6m either side of the movable point work. In the exceptional case where this requirement cannot be met OpCo must provide evidence to TfNSW that the clearances proposed meet all relevant standards;
- vii. in certain circumstances, Special Trackwork may be located on curves, but only subject to the WRI study recommendations;
- viii. standard turnouts are to be used wherever possible, these being:
 - A. 1 in 7 with 100m switch radii;
 - B. 1 in 6 with 50m switch radii;
 - C. 1 in 5 with 35m switch radii; or
 - D. 1 in 4 with 25m switch radii (Turnback sidings, Terminus facilities, Light Rail Maintenance and Stabling Facilities only); and
- ix. point control and indication must comply with Appendix 21 (*Signalling and Movement Control*).

(c) Turnbacks / Sidings / Light Rail Maintenance and Stabling Facilities:

- i. stabling sidings must be straight track; and

- ii. all tracks entering the Light Rail Maintenance and Stabling Facilities must be either flat, pitched downward away from the main line, or dished to prevent any vehicles from rolling onto the mainline tracks.

2.2. Clearances

- (a) "DKE" refers to the largest DKE of any LRV which OpCo intends to operate at a given location. Unless full network compatibility is provide for all LRV types, OpCo must have in place effective arrangements to ensure that "out of gauge" LRV types are prevented from operating where compliant clearances are not provided.
- (b) Electrical clearances must comply with Appendix 29 (*Traction Power, Electrification Systems and Control*).
- (c) Clearances must also comply with RMS requirements and where RMS clearance requirements are not in accordance with the clearances given here, the greater clearance will apply.
- (d) OpCo must ensure that:
 - i. horizontal clearances comply with the requirements outlined in Table 2 below;
 - ii. these clearances represent minimum clearances. Greater clearance may be required in some circumstances, such as a footpath next to a light rail track where LRVs operate at high speed, depending on the other features which are provided to deter pedestrians form encroaching into the DKE; and
 - iii. any structure adjacent or above the CSELR track provide clearance to allow passage of IWLR rolling stock in accordance with Table 2.

Table 2 Horizontal Clearance requirements

Location	Comment	Value
Track centre spacing without OHW mast in median		3200mm desirable, 100mm between DKEs absolute.
Passing clearance between LRVs		100mm between DKEs
Clearance to OHW mast in median		100mm from DKE to nearest face of mast
Clearance to OHW mast not in median		600mm
Clearance to an isolated obstruction (<2m)	General	100mm from DKE
	None public (Light Rail Maintenance and Stabling Facilities)	100mm from DKE
To tunnel walls	Where emergency egress is between wall and the tracks	850mm from DKE
	Providing safe emergency egress is provided on other	200mm from DKE

	side of Vehicle and pedestrian access is restricted.	
To equipment or cabling running along or mounted on tunnel walls less than 2.1m above the finished floor level	Where emergency egress is between wall and the tracks	850mm from DKE
	Providing safe emergency egress is provided on other side of LRV and pedestrian access is restricted	200mm from DKE
To face of kerb or edge of a traffic lane or footpath		300mm from DKE
To a continuous obstruction (>600mm)		600mm from DKE
To any object in a pedestrianised precinct		1400mm (300mm outside DKE, plus 800mm tactile and visually –contrasting band, plus 300mm clearance

2.3. Design Requirements for Track System

2.3.1. General

- (a) OpCo must provide the track system in accordance with the following requirements:
- i. the LRV track system must be designed so that it integrates with the roads and associated civil works, utility services, CSELR Stops, and Public Domain works;
 - ii. the track must comply with the earthing and electrolysis requirements of Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*);
 - iii. the track system must accommodate the loads imposed by LRVs, vehicle loads as defined by AS5100 and the loads required by section 2.3.3.
 - iv. all track systems must be designed to minimise impact on existing underground structures including the reinstatement of waterproofing and protection slabs where required;
 - v. all trackforms must be designed to ensure that the resonant frequency does not coincide with that of the LRVs or maintenance vehicles in any operational scenario;
 - vi. the resonant frequency of each track form must not coincide with any structure on the SLR; and
 - vii. all track and trackforms must be designed and constructed to comply with the requirements of EN ISO 3095 and ISO 3381, in particular concerning the track roughness and the vertical and horizontal track decay rates, and noise levels.

2.3.2. Trackwork

- (a) All trackwork design must be based on a system proven in service under similar traffic conditions for a period of at least 5 years.
- (b) The track system design must have the following principal objectives:
 - i. to produce both a LRV trackwork and track bed that can be easily maintained, requires minimal maintenance intervention, is durable in service and provides adequate ride comfort in line with Appendix 37 (*Rolling Stock*) section 1.7;
 - ii. guides the LRV safely;
 - iii. is of sufficient strength to support the LRV, roadway and pedestrian loadings where applicable;
 - iv. supports a variety of surface treatments; and
 - v. minimises the risk factors which might lead to rail corrugation or other damage to the rail head and contact areas, such as at switches and crossings.
- (c) In designing the track system OpCo must ensure that the rail, any insulating material and affected road paving materials provide each other with adequate lateral and vertical restraint against movement or fatigue action and must not adversely affect the roadway or be likely to result in premature failure of the components of either the road or track system.
- (d) The following track system elements must be designed in accordance with AS 1085 or EN 13481 whichever is the most stringent:
 - i. all sleepers and bearers;
 - ii. rails;
 - iii. Check Rails;
 - iv. rail fastening system; and
 - v. rail pads and baseplates.
- (e) For all trackforms, it must be possible to renew the rails during a single continuous closure to Services not exceeding 48 hours in duration.

2.3.3. Track and Rail loading requirements

- (a) Track loading must be based on a static [REDACTED] axle load or the maximum actual axle load of the SLR LRVs, loaded to 6 passengers / sq m, whichever is the greater.
- (b) OpCo must ensure that all track and structures subject to live LRV loading are designed and constructed as a minimum in accordance with Austroads, AS 5100 and / or RMS's design requirements as appropriate for the proposed trackform type for the most onerous effects of live loading cases.
- (c) [REDACTED] loading, including the dynamic factor, must be assumed for all tracks where accessible to vehicular traffic. Irrespective of these requirements, OpCo must determine the worst case loadings for any component or part of any track form and apply suitable factors of safety in line with best practice in structural design.

- (d) The load factors in Table 3 must be adopted for the design of the LRV.

Table 3 Summary of load factors for LRV loading

Factor	Adopted Value
Dynamic Load Allowance (SLS, ULS)	
Dynamic Load Allowance (Fatigue)	
SLS Load Factor	
ULS Load Factor	

- (e) The loads in Table 4 must be adopted for the design as a minimum, where LL is the axle live load, except where the results of the WRI study demonstrate that greater values must be adopted. Dynamic load allowance must not be applied for centrifugal, braking or nosing forces, in accordance with AS5100.

Table 4 Summary of forces

Force	Adopted Value
Nosing (Lateral force on tangent track)	
Longitudinal braking and tractive	
Rolling	
Centrifugal (lateral force on curved track)	

2.3.4. Open Track

- (a) All Open Track of 175m radii or less must have a Check Rail mounted adjacent to the low rail. The Check Rail must:
- i. ensure the flangeway is set following the WRI recommendations; and
 - ii. extend 4m into the adjoining straight track.
- (b) Guard rails must:
- i. be installed on the approach to a major structure or where the risk of a derailment is sufficient to warrant its use;
 - ii. begin 20m prior to the hazard; and
 - iii. provide a gap of 250mm between the rail heads.
- (c) Where ballast track is used, OpCo must ensure that:

- i. the ballast track bed is designed in accordance with AS 1085 and AS 2758.7;
 - ii. ballast underneath the sleepers is at least 250mm in depth laid over a suitable subgrade;
 - iii. during the Operations Phase, the ballasted track system complies with the following line, level and twist requirements:
 - A. 3m twist which is not greater than 1 in 300;
 - B. rail level not out of absolute design level by more than 20mm for one rail or 40mm for both rails; and
 - C. track alignment not out of absolute design value by more than 25mm.
- (d) Plinth Track may only be used on structures and only where the tracks are segregated from other users such as road traffic and pedestrians.
- (e) Where Plinth Track is used, OpCo must ensure that:
 - i. the rail plinths provide adequate upper surface to take the necessary rail base plates and fixings and where necessary either a separate Check Rail or a plinth with integral upstand for derailment protection;
 - ii. the Plinth Track is designed in accordance with all relevant Australian Standards and any acceptable industry standards, including where applicable AS 5100;
 - iii. where the Plinth Track immediately follows a section of paved track on the road, the design at the commencement of the Plinth Track provides for adequate road vehicle deterrent measures whilst still allowing emergency and maintenance vehicle access; and
 - iv. unauthorised pedestrian access to Plinth Track sections is limited by physical measures and adequately signed without limiting operational safety, accessibility and availability.

2.3.5. Embedded Track

- (a) Where a concrete slab is used to form any of the track system it must be designed to the relevant Austroads or Australian Standard.
- (b) To allow for future services under the concrete track slab it must be capable of temporarily spanning (without traffic) an unsupported trench of up to 1.5m at the underside of the subbase across the full width of the slab. The trench will be perpendicular to the tracks and backfilled to provide full support to the track slab prior to traffic being permitted. OpCo shall be consulted prior to the selection of the trench location and must provide conditions for the execution of any works under the LRV corridor. This is only applicable at intersections.
- (c) Embedded Track must comprise a suitably designed concrete slab with ails in an encapsulation material as required to achieve noise and vibration and electrical isolation requirements.
- (d) The rails must be generally flush with the surrounding surface and the adjacent carriageway. The rail may sit slightly proud of the concrete to ensure the wheel does

not engage the concrete at any point in the life of the rail but must not present a trip hazard.

- (e) Where block paving surface treatments are within 3m of any rail track the subgrade, trackform and adjacent pavements must not deteriorate due to cyclical LRV loading, lack of adequate drainage or pumping of the subgrade during wet conditions.
- (f) OpCo must also comply with the following:
 - i. the track system drainage must consider drainage of the rail groove. The drainage shall be designed such that it does not become easily blocked by debris and that it has sufficient redundancy in the system to account for loss through blockage;
 - ii. the track system must be capable of accommodating a range of surface finishes in accordance with urban design requirements in Appendix 14 (*Public Domain*) including:
 - A. blocks or pavers;
 - B. concrete with various finishes;
 - C. asphaltic concrete road surfacing; and
 - iii. the minimum skid resistance for all surface materials, except the rail in a road, where vehicles other than the LRV have permitted / lawful access must be in accordance with Austroads Pavement Design Manual.
- (g) Joints in the trackform must be provided for shrinkage and creep as per Austroads, AS5100 or AS3600 as applicable.
- (h) Allowances must be made for rail boxes at traction cross bond location and points motorboxes and switches and crossings.
- (i) If the AVLS uses embedded loops for LRV detection, the trackslab design must be electrically and mechanically compatible with the chosen loop design.
- (j) Allowances must be made for the Combined Services Route (CSR) in the trackslab, where required.

2.3.6. Transition slabs

- (a) Transition slabs must be provided at all changes between ballasted and non-ballasted track forms. Transitions between track structures shall be designed to ensure suitable vertical and lateral stiffness transition occurs safely.
- (b) The design of transition slabs must be adequate to mitigate differential movement and settlement.
- (c) The design of the transition slab must achieve an adequate transition between the different track modulus.
- (d) The length of transition slabs must be appropriate for the line speed.
- (e) The design must ensure that the stresses apparent in the ballast over the transition slab are such that they never exceed the stable load carrying capacity of the depth of the ballast provided whilst at the same time offering a constant rate of change of

stiffness between the ballast and slab track or between the structure and the adjacent ballast track.

2.3.7. Drainage

- (a) Refer to Appendix 18 (*Civil and Structural Works*).

2.3.8. Rails

- (a) The absolute minimum length of rail between any joints, mechanical or welded must be 4.5m, except where a transition piece is used between dissimilar rail sections as described in section 2.3.9 (a) (vii) of this Appendix.
- (b) Rail inclination:
- i. the inclination of any rail head in plain line track must be in accordance with any recommendations of the WRI study report. Inclination may be achieved through inclination of the rail head profile or by rotating the rail profile; and
 - ii. changes in rail inclination, such as at switches and crossings must be achieved using a proven twist reducing method.
- (c) Rail sections and head profiles:
- i. all rails must comply with the following:
 - A. all rails must satisfy the electrical conductivity of the Stray Current and bonding requirements, refer to Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*); and
 - B. rails must be of a steel grade of at least R260, Brinell Hardness Test (BHN) > 260; Rm of at least 880N/mm²). Where hardening alloys are considered, care must be taken to ensure track brake efficiency in all conditions;
 - ii. the use of rail dampers is acceptable on Vignole rail sections (flat-bottomed rail sections) as part of OpCo's noise and vibration mitigation strategy. Where rail dampers are used OpCo must ensure that:
 - A. no maintenance of the rail damper is required within its Design Life;
 - B. rail dampers are factory pre-installed but are also capable of being applied on site if necessary; and
 - C. rail dampers must not interfere with other maintenance activities (such as alignment adjustment and tamping).
- (d) Rail in curves of radii equal to or less than 120 metres must be pre-curved using standard shop practices.

2.3.9. Rail joints

- (a) All rails must be continuously welded, and:
- i. all welds must comply with AS 1085;
 - ii. OpCo must demonstrate a suitable lateral restraint mechanism for welded trackwork supported on ballasted trackbed with radii of 250m or less;

- iii. all completed welded joints must be tested by OpCo for defects and must achieve a minimum hardness compatible with the rail steel;
 - iv. OpCo must maintain a record of all welding, inspection, testing, welding methodology and operator qualifications and provide copies of the records to TfNSW on request;
 - v. mechanical fishplate joints must not be used except in those locations where it is absolutely necessary; and
 - vi. joints between different rail sections must be made using special-purpose transition rails. Composite welds are not acceptable. A transition rail may be less than 4.5m long.
- (b) Insulated Rail Joints (IRJ) must:
- i. only be used where necessary for the safe operation of the system;
 - ii. when temporarily installed for OpCo's testing and commissioning purposes be removed on completion of the works and the tracks continuously welded.
 - iii. be a shop glued IRJ panel and welded into the line;
 - iv. be in accordance with AS1085.12; and
 - v. ensure the electrical resistance across the IRJs must be compatible with the signalling, telecommunications and control system and the power supply systems and all other PSR requirements.
- (c) Rail expansion joints must:
- i. present a continuous bearing surface to the wheel and accommodate all extremes of movement;
 - ii. accommodate a combination of bridge and rail movements; and
 - iii. not be located on structures wherever possible.

2.3.10. Special Trackwork

- (a) OpCo must provide the Special Trackwork in accordance with the following requirements:
- i. switches and crossing, and all the associated components, must be in accordance with EN:13232;
 - ii. switches and crossing must be fabricated with a BHN of 360 or greater;
 - iii. all crossing blocks must be cast centre block crossing with weldable legs or a cast manganese monoblock. Fabricated crossing shall not be used;
 - iv. all switches and crossing must be fully welded except where signalling requirements dictate the use of an IRJ;
 - v. all switches and crossing must be designed to withstand or be protected from the thermal expansion forces/movements;
 - vi. all facing switches must be protected with point indicators;

- vii. all switch motor boxes must be lockable; and
- viii. switch operation must conform to the requirements listed in Appendix 21 (*Signalling and Movement Control*).

2.3.11. Mechanical fixings and fasteners

- (a) OpCo must ensure that the components of the rail fastening system are mutually compatible in terms of loads, load paths, geometry, resilience, elasticity and manufacturing tolerances.
- (b) In the case of trackforms with concrete base slabs or where rails are on plinths or directly fixed to structural slabs or decks, OpCo must design and construct the fastening system to ensure that the system provides the correct degree of resilience in line with the noise and vibration attenuation requirements and to ensure a proper durable fixing of the rail in all operational loading conditions that are likely to occur.
- (c) In addition, the rail fastening system and its components must comply with EN 13232.

2.3.12. Signs, lines and corridor delineation

- (a) Where possible, the track structure must be nominally 125mm higher than any adjacent road reserve, to prevent illegal U-Turn and right turn manoeuvres. Where the vertical alignment does not permit this a raised median separator should be used to delineate the rail corridor. The heights and profiles of kerbs or median separators must be chosen depending on whether emergency or maintenance vehicles will need to mount them.
- (b) In addition to Appendix 14 (*Public Domain*), OpCo must design, supply, install and maintain the following signs:
 - i. permanent and temporary speed restriction signs;
 - ii. datum marker plates (ballasted track only);
 - iii. "no entry" signs both for road traffic and pedestrians where applicable; and
 - iv. fouling point markers.
- (c) All signs must conform to the requirements of AS 1742, Legislation and RMS requirements. Where there are no specific requirements in AS 1742, Legislation or specified by RMS, and signs are required they must be of a form to be agreed with RMS and ONRSR.
- (d) OpCo must satisfy both RMS and the ONRSR before installing any signs relating to the system on public roads.
- (e) Where speed restriction signs are placed at turnouts or crossovers, OpCo must supplement the permanent and temporary speed restriction signs with an arrow indicating the track direction to which the speed restriction applies.
- (f) For ballasted track, OpCo must provide and fix datum markers for alignment and level at each OHW mast, bridges, CSELR Stops and other permanent structures.

- (g) Fouling point markers must be provided on all converging tracks in the Light Rail Maintenance and Stabling Facilities, in stabling areas and for main line switches and crossings.

2.3.13. Noise and Vibration requirements

- (a) All trackform must satisfy the requirements for Noise and Vibration mitigation as detailed in Appendix 31 (*Noise and Vibration*).

2.3.14. Safety requirements

- (a) OpCo must design, construct, operate and maintain the SLR in accordance with Appendix 9 (*Safety and Systems Assurance*).
- (b) Line side safety provisions:
 - i. OpCo must provide safe access to enable routine and major maintenance operations during the life of the CSELR. OpCo must also provide safe access for maintenance vehicles;
 - ii. where a maintenance access walkway is required it must be continuous, step free, outside the DKE, and have a minimum width of 1000mm; and
 - iii. derailment protection provision must be addressed as part of a risk based assessment and derailment protection must be provided on all bridges, structures and elsewhere where a derailment would result in a significant and serious hazard to passengers, road vehicles, nearby pedestrians or assets.
- (c) Buffer stops suitable for the safe arresting of an LRV must be provided at the termination of all passenger-carrying tracks. The mainline buffer stops must meet the following conditions:
 - i. arrest a fully laden LRV coasting at 10km/h;
 - ii. have a form which is compatible with the front of all types of LRV which will approach them, and
 - iii. have a retardation rate that is unlikely to cause driver or passenger injury.
- (d) The design solution must take due regard of the local conditions, adjacent developments, pedestrian movements and general public realm requirements.
- (e) Other forms of LRV arrestor may be acceptable at non passenger-carrying locations. OpCo must justify any alternative proposal on the basis of risk assessment.
- (f) At the interface with pedestrian and cycle crossings OpCo must:
 - i. take particular care to ensure that, with the exception of the necessary groove in the rail or adjacent to the rail head to facilitate the passing of LRV wheels, the remaining surface is suitable for the safe passage of pedestrians or cyclists;
 - ii. design drainage for the rails and the surface at pedestrian and cyclist crossing facilities and in all areas where pedestrians or cyclists have access that does not pond or otherwise cause a hazard to pedestrians or cyclists;

- iii. ensure that all designated pedestrian track crossings satisfy the requirements of the Disability Discrimination Act and have a profile easily negotiated by the mobility impaired; and
 - iv. minimise the risk of a cyclist crossing the tracks at acute angles - refer to Appendix 16 (*Road Works*) for guidance.
- (g) OpCo must demonstrate signal sighting and sight stopping distances have been satisfied, including:
- i. the horizontal and vertical sight distance for rail alignment must comply with the RMS requirements for the service speeds;
 - ii. sight distances must be achieved, and suitably documented/illustrated using the following criteria:
 - A. height of Driver eye 2.0 m above rail level;
 - B. height of object 0.2 m; and
 - C. reaction time 2.0 seconds.

3. Installation requirements

- (a) Track maintenance requirements must be set out by OpCo in the operations and maintenance manual as required in Appendix 41 (*Manuals*).
- (b) Tracks must be installed to the tolerances in Table 5.

Table 5 Construction Tolerances

Item	Tolerance
Track Gauge (permissible variation in gauge from the design value)	
Absolute value	± 3mm
Relative value on a 3m chord	2mm
Vertical Alignment (permissible variation in level from the design value)	
Absolute Value	± 10mm (Embedded or Plinth Track) ± 15mm (Ballasted track)
Relative value on a 3m chord	3mm
No versine shall be of opposite sign to the designed versine	
Horizontal Alignment (permissible variation of the versine from the design value of the horizontal alignment)	
Absolute Value	± 4mm (Platform) ± 8mm (General)
Relative value on a 10m chord	1.5mm
Relative value on a 5m chord	1.0mm
No versine shall be of opposite sign to the designed versine	
Track cant (permissible variation design value)	
Absolute Value	± 5mm
Track Twist	
permissible addition to the design value of cant gradient over a 3m base lengths subject to the maximum vehicle limits)	1 in 1500
Switches and Crossings	

Item	Tolerance
Line, Level, Twist & Gauge	In accordance with the WRI study and the Switches and Crossing manufacturers' recommendations
Rail head Inclination	
	In accordance with the WRI study
CSELR Stops (construction of platform relative to track centreline)	
Horizontal	+5 -0mm
Vertical	+0 -5mm

4. Design Documentation

4.1. General

- (a) OpCo must provide 3-dimensional electronic CAD files of the alignment design at each Design Stage.
- (b) In addition to the requirements of Appendix 47 (*Design Documentation Requirements*), OpCo must also provide the following specific Design Documentation in relation to each stage of design.

4.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the trackwork must include:
 - i. the WRI study report which as a minimum, must include:
 - A. calculations and vehicle dynamic modelling to demonstrate that all combinations of LRV type, rail section, rail inclination, and wheel profile which will operate on the network are adequately safe against derailment, in all permitted states of wear and at all permitted speeds of operation. The study must cover both plain line and points and crossings;
 - B. calculations and vehicle dynamic modelling to demonstrate that wear rates of wheels and rails will be in accordance with good industry practice;
 - C. a recommendation as to whether the rail gauge should be widened on curves or not, with a justification for the recommendation; and
 - D. a recommendation as to what flange lubrication and rail head friction modification methods should be applied, with a justification for the recommendation;
 - ii. drawings, designs and calculations for:
 - A. track alignments for the main lines, following an operational simulation and the production of speed profiles appropriate to the alignment and LRV design;
 - B. track alignments for the Light Rail Maintenance and Stabling Facilities;
 - C. trackform and components for the main lines, including track on grade, track in tunnel and on structures, generally;
 - D. embedded rail track design that satisfies the structural loading requirements;
 - E. trackform types, including coordination of the interfacing disciplines, including CSR, drainage, surface finishes and foundation ground treatment;
 - F. trackform and components for the Light Rail Maintenance and Stabling Facilities;
 - G. noise and vibration modelling;
 - H. sighting distances and stopping distances;

- I. buffer stops;
- J. settlement;
- K. rail inclination in plain line; and
- L. signage for the safe operation of the SLR;
- iii. track alignment design details showing:
 - A. identification and naming of individual tracks;
 - B. horizontal setting out geometry details;
 - C. vertical setting out geometry details;
 - D. cant and deficiency design in conjunction with the normal and maximum LRV speed profiles with due consideration of providing a smooth, comfortable ride and future maintenance requirements;
 - E. clearances between the swept path of LRV and structure gauge and infringements into the structure gauge (such as platform edges);
 - F. turnout and type and layout; and
 - G. point machine configuration.
- (b) The alignment design must include demonstration that the following interfaces have been addressed:
 - iv. survey control;
 - v. clearance between the swept path of the LRV and all infrastructure;
 - vi. platform clearances and stepping distances;
 - vii. construction, maintenance and operation tolerances;
 - viii. wheel-rail interface issues;
 - ix. interactions between the track and its supporting structures, including all existing underground structures and ground foundations;
 - x. noise and vibration;
 - xi. safe walking route for emergency evacuation and maintenance;
 - xii. trackwork tolerances for calculating clearances;
 - xiii. tunnel construction and drainage;
 - xiv. formation and earthwork construction and drainage;
 - xv. the transition between different structures, foundation materials and track types, specifically addressing changes in track stiffness and potential settlements;
 - xvi. electrification including traction return, earthing and bonding and stray current protection, including proposed test method for stray current protection; and
 - xvii. services and rail systems infrastructure.

- (c) OpCo must provide strategies for:
- i. derailment containment identifying where this is to be incorporated into the trackform and the essential features of that design, including the risk assessment used to identify locations;
 - ii. gauging and clearances based on the dimensions and dynamics of the LRV;
 - iii. achieving and maintaining DDA compliant platform gaps and steps;
 - iv. installing and testing the trackwork to satisfy the electrolysis and stray current performance requirements; and
 - v. replacement of the rails at the end of their life.

4.3. Design Stage 2 Design Documentation

- (a) The Stage 2 Design Documentation for the trackwork must include:
- i. a noise modelling assessment to provide supporting demonstration of compliance to the criteria set out in the Environmental Impact Statement;
 - ii. updated drawings for trackform types, including coordination of the interfacing disciplines, including CSR, drainage, surface finishes and foundation ground treatment;
 - iii. construction and maintenance tolerances including methodology for measurement and the stipulation of limits for refurbishment and renewal;
 - iv. friction modification and flange lubrication;
 - v. method statements for the following construction and maintenance activities:
 - A. rail welding including inspection, testing and replacement welds;
 - B. rail bending;
 - C. rail stressing and maintenance of the stress free temperature;
 - D. rail profiling and grinding;
 - E. measurement and monitoring of stray current;
 - F. methodology to reduce stray current where levels do not meet the requirements of Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*);
 - G. trackform construction for all trackform types, including Embedded Track trackform;
 - H. maintenance welding to crossing noses;
 - I. turnout installation to include as a minimum a record of nominal masses of turnout components to be transported on site and in safe procedures for handling them;
 - J. alignment monitoring, testing and evaluation;

- K. track geometry measurement and recording; and
- L. rail replacement.

4.4. Design Stage 3 Design Documentation

- (a) The Stage 3 Design Documentation for the trackwork must include:
 - i. updated design reports from Design Stage 2; and
 - ii. construction approval from the relevant asset owner in relation to:
 - A. construction of trackform over any existing underground structures.

4.5. Track prototype

- (a) After all design packages related to trackwork have been certified in accordance with the deed by the Independent Certifier, OpCo must construct a 10m long section of demonstration Embedded Track in Sydney to trial the construction procedures and components to be used.

5. Testing and commissioning requirements

- (a) In addition to the requirements of Appendix 33 (*Testing and Commissioning*), the trackwork must undergo the following specific testing and commissioning activities:
- i. Site Acceptance Tests (SAT) in accordance with the nominated standards including the following:
 - ii. non-destructive testing of rail;
 - iii. non-destructive testing of welds;
 - iv. a full, baseline survey of the as-built track geometry must be undertaken to confirm that the alignment is in accordance with the certified Design Stage 3 Design Documentation before the running of LRVs commences;
 - v. discrete measurements must be taken by OpCo and must include:
 - A. track gauge;
 - B. applied cant;
 - C. twist;
 - D. deviations of as-built horizontal and vertical alignment of the installed tracks from the designed track geometry; and
 - vi. a gauging survey of the as-built infrastructure must be undertaken to confirm that clearances are in accordance with the certified Design Stage 3 Design Documentation before the running of LRVs commences.



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 18 – Civil and Structural Works

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1. Overview and scope

1.1. General

- (a) This Appendix describes the performance and technical requirements for the civil and structural works of the SLR Works.

1.2. Scope

- (a) OpCo must provide all the civil and structural elements for the SLR Works.
- (b) The civil and structural works include:
- i Moore Park Tunnel as follows:
 - A. Temporary Works;
 - B. permanent structural works; and
 - C. tunnel walkways;
 - ii bridge works, including the following new bridges:
 - A. Eastern Distributor rail bridge, including walkways, direct fix trackslab, protection screens, safety screens and noise barriers;
 - B. pedestrian bridge over Anzac Parade; and
 - C. not used;
 - iii CSELR Stops:
 - A. platforms, steps, canopy structures and barriers;
 - iv retaining walls including gravity walls, cantilever walls, abutment walls and piled walls for:
 - A. support of embankments, and cuttings throughout the Project Site;
 - B. line side facilities;
 - C. bridge abutments;
 - D. CSELR Stops; and
 - E. Light Rail Maintenance and Stabling Facilities;
 - v earthworks, including cuttings, fill embankments, and formation works for:
 - A. on-grade rail corridor;
 - B. CSELR Stops;
 - C. Light Rail Maintenance and Stabling Facilities;
 - D. bridge abutments; and
 - E. Moore Park tunnel;
 - vi stormwater drainage, including:

- A. identification, protection, relocation and/or adjustment of all existing drainage services, charted or uncharted, which may conflict with the SLR Works or Temporary Works;
 - B. surface, subsoil and underground track drainage for the new track formation and modifications to existing IWLR at crossing of Hay St and George St;
 - C. drainage of all new roadworks or modifications to roads;
 - D. drainage of new pedestrianised areas, including but not limited to George Street and Devonshire Street; including relocation or removal of existing kerb and gully system and provision of a new drainage system;
 - E. drainage of walkways and footpaths including all pits and pipes;
 - F. drainage systems for all retaining structures and buildings;
 - G. drainage of Light Rail Maintenance and Stabling Facilities;
 - H. drainage of platform canopies;
 - I. water quality treatment devices and integration of water sensitive urban design (WSUD) elements;
 - J. augmentation of the existing drainage system to suit the SLR Works;
 - K. provision of drainage at the base of each combined services route (CSR) pit and cable turning chamber;
 - L. provision of drainage at the base of new utility pits, if required, in accordance with the utility asset owners' requirements;
 - M. subsoil drainage behind kerbs, retaining walls, other structures and from tree pits and landscaping;
 - N. bridge drainage for the new structure over the Eastern Distributor;
 - O. drainage of the pedestrian bridge over Anzac Parade;
 - P. not used;
 - Q. tunnel drainage for the new tunnel at Moore Park; and
 - R. provision of scour protection at discharge locations to existing ground;
- vii flood mitigation/protection measures;
- viii CSR; and
- noise barrier walls, where required by Appendix 31 (*Noise and Vibration*) .

2. Performance and technical requirements

2.1. General

- (a) All civil and structural works must be designed and constructed in accordance with the relevant Standards and Guidelines to meet the requirements of the deed.
- (b) The following issues must be addressed by OpCo in the design of the civil and structural works:
 - i Design Life, durability, and whole of life cycle;
 - ii RAMS requirements;
 - iii architectural and urban design requirements;
 - iv fire and life strategy as required in Appendix 25 (*Fire Engineering*);
 - v flood protection;
 - vi impact of SLR Works on other parties; and
 - vii provision for future expansion, upgrades and improvement.
- (c) All civil and structural elements must be designed and constructed to ensure that all planned maintenance can be undertaken outside normal operations or without affecting the operation of LRVs during normal operations. Facilities shall be provided for easy access to vital details (e.g. joints) and monitoring, inspection and condition assessment of all structures.
- (d) Permanent structural elements, including ground anchors, rock bolts, soil nails, and batters are not permitted to extend outside of the Project Site.
- (e) Epoxy anchors, or other forms of structural anchorage which are reliant on adhesion, must not be used to support permanent or long term tensile loads imposed by structural elements where the failure of the structural element may result in a risk to life or reduction in operational performance. Conventional ground anchors, rock bolts and soil nails installed with cement grout may be utilised.

2.2. Design loading

2.2.1. General

- (a) The design loads must comply with the relevant Standards and Guidelines, in particular the following codes:
 - i AS/NZS 1170: Structural Design Actions Set;
 - ii AS1657: Fixed platforms, walkways, stairways and ladders - Design, construction and installation;
 - iii AS4678: Earth Retaining Structures; and
 - iv AS5100: Bridge Design Set.
- (b) All building structures must be designed to withstand earthquake forces to earthquake design category 'Type III' in accordance with AS/NZS1170.4.

- (c) All rail bridges and tunnels must be designed to withstand earthquake forces to earthquake design classification 'Type III' in accordance with AS5100.2.
- (d) All pedestrian bridges must be designed to withstand earthquake forces to earthquake design classification Type 'II' in accordance with AS5100.2.
- (e) The structural classification, where required, under AS4678 for earthquake design of the retaining walls, embankments, and batters must be designed for 'Classification C' load case as described in 'Table 1.1 Structure Classification'.
- (f) All permanent civil, retaining wall systems and structural elements of the SLR Works must be designed to accommodate the potential impact of a burst water main upon groundwater levels and hydrostatic pressures where existing or new water utilities are within proximity to the SLR Works. Design assessment may include risk based assessment with mitigation measures.

2.2.2. Operation and maintenance loads

- (a) The SLR Works must be designed to accommodate all loads associated with operation and maintenance activities of the SLR Works, including the following:
 - i railway loads:
 - A. all new structures which support railway loads must be designed to support the design light rail loading and the number of repetitions that are expected over the Design Life;
 - B. track loading shall be based on a static [REDACTED] axle load or the maximum axle load of the proponent's vehicle, or the results of the wheel / rail interface study, whichever is the greater;
 - C. OpCo must ensure that all track system and structures subject to live LRV loading are designed and constructed as a minimum in accordance with Austroads, AS 5100 and / or RMS design requirements listed in Appendix 34 (*Standards and Guidelines*), as appropriate for the most onerous effects of live loading cases;
 - ii CSELR Stops:
 - A. minimum imposed live load of [REDACTED];
 - iii public area floor loading:
 - A. minimum imposed live load of [REDACTED];
 - iv maintenance loads:
 - A. load associated with the general cleaning, inspection, and repair activities must be assessed based on the specific equipment and method used;
 - B. load associated with the plant and equipment delivery, installation, replacement and removal must be assessed individually.
 - v emergency service vehicle loads; and
 - vi air pressure:
 - A. structural elements that are subject to changes in air pressure, such as fire walls between tracks, must be designed to withstand the combined air

pressure loads on each side associated with LRV operations and the tunnel and CSELR Stop ventilation system.

- (b) The load factors in Table 1 shall be adopted for the LRV loading used in the design, for vertical, horizontal and axle loads.

Table 1 Summary of load factors for LRV loading

Factor	Adopted Value
Dynamic Load Allowance (SLS, ULS)	
Dynamic Load Allowance (Fatigue)	
SLS Load Factor	
ULS Load Factor	

- (c) The loads in Table 2 shall be adopted for the design as a minimum, where Live Load (LL) is the axle live load, except where the results of a Wheel Rail Interface study are greater.

Table 2 Summary of forces

Force	Adopted Value
Nosing (lateral force on tangent)	
Longitudinal braking and tractive	
Rolling	
Centrifugal (lateral force at curve)	

- (d) Dynamic load allowance shall be not applied for centrifugal, braking or nosing forces, in accordance with AS5100.

2.2.3. Surcharge loading

- (a) The surcharge loading imposed by existing roads, buildings or by currently planned and approved developments, must be individually assessed and addressed in the design of the SLR Works.
- (b) A tunnel structure subject to traffic loads must be designed to support a minimum surcharge load of [REDACTED]
- (c) Road traffic surcharge where applicable must be calculated in accordance with AS 5100.2 with load factors of [REDACTED] for SLS and [REDACTED] for ULS.
- (d) Tunnel structures are to be designed for all construction loadings.

- (e) All retaining walls, with the exception of bridge abutment walls and non-trafficable area (any area where a road vehicle is physically obstructed from travel), must be designed to support a minimum [REDACTED] traffic surcharge load immediately behind the tops of finished walls. Abutment walls to be separately assessed for the required surcharge.

2.2.4. Collision loads and risk review

- (a) OpCo must, as a minimum, undertake a detailed risk and mitigation review of all structural support elements, both existing and proposed, that may be impacted by road traffic or light rail traffic collision within the Project Site.
- (b) The design of structures and support elements (excluding overhead poles) that may be impacted by road traffic or light rail traffic must comply with the provisions of collision protection in section 11 of AS5100.1.
- (c) As a minimum, all piers, columns or walls whose nearest face may be impacted by light rail traffic shall be designed for the two point LRV impact loads, as indicated in Table 3. These two ultimate design point loads, P1 and P2, must not be applied simultaneously. The loads are to be applied as per the horizontal direction outlined in Table 3. Where supporting elements are located more than 10m away from the centre-line of the nearest track, OpCO must carry out a risk analysis to determine the required level of protection. Collision loads apply to ramps and stairways that are part of the structural members spanning across the track, but not separate ramps and stairways adjacent to the track in accordance with AS5100.2 Clause 10.4.1 and its commentary.

Table 3 Collision loads

Design Load	Application of Load	Load
P1	Single horizontal ultimate design load applied up to 1,100mm above track bed level	[REDACTED]
P2	Single horizontal ultimate design load applied between 1,100mm and 3,500mm above track bed level	[REDACTED]
Location	Direction of Load Application	
Within tunnels	To act in direction parallel to or up to 6 degrees from the direction of the adjacent track	
At crossovers within tunnels	To act parallel to or up to 10 degrees from the direction of the adjacent track within 1m of the ends of dividing walls	
Within the depot and outside of tunnels	To act in any direction. The design shall cater for the most adverse direction (s)	

- (d) [REDACTED]

2.2.5. Traffic loading for rail bridges

- (a) The design traffic loading for the rail underbridges, must include maintenance and emergency traffic vehicles.
- (b) OpCo must design the deck surface of rail underbridges to deter entry to all public vehicles, other than maintenance and emergency traffic vehicles.

2.2.6. Live loading for pedestrian bridges / suspended mezzanines

- (a) The pedestrian overbridges must be designed for a [REDACTED] loading over the full deck area.

2.3. Moore Park tunnel

2.3.1. General

- (a) The tunnel works to be completed as part of SLR Works must:
 - i. allow for future surcharge and/or other loading applied by the adjacent new pedestrian bridge crossing Anzac Parade;
 - ii. the tunnel design, including temporary works, must not adversely impact on the proposed new footbridge, which it is anticipated will be constructed over Anzac Parade before the SLR Works commence; and
 - iii. comply with the design and construction requirements of:
 - A. the RMS Bridgework Specifications;
 - B. the RMS Bridge Technical Direction Manual; and
 - C. appropriate RMS Technical Directions, where they contain design and design detailing requirements that are additional to the requirements of AS5100 Bridge Design Set, and other relevant Standards and Guidelines.
- (b) The minimum depth of fill above the tunnel crown or roof must make provision for buried utility services that traverse the tunnel alignment and be sufficient to allow landscaping and playing field surfaces to thrive. This requirement is not applicable to the portal structures. The minimum depth of fill above the tunnel crown or roof must be sufficient to allow landscaping and playing field surfaces to thrive.
- (c) The design of the tunnel and tunnel space proofing must consider construction and fabrication tolerances.
- (d) All tunnels must have a permanent and durable structure, consisting of permanent cast in situ concrete or precast concrete units.
- (e) The use of permanent ground anchors or other external anchoring system for permanent ground support is not permitted.

- (f) The use of permanent ground anchors or other external anchoring system to provide uplift resistance against flotation to satisfy global stability is permitted.

2.3.2. Anzac Parade Crossing

- (a) For the portion of the Moore Park tunnel which passes under Anzac Parade the following additional requirements shall apply:
 - i. Pedestrian access along both sides of Anzac Parade must be maintained during construction. Temporary diversion is permitted provided access is maintained;
 - ii. Pedestrian access must be fully reinstated to original position on completion of the permanent works;
 - iii. Design and construction of the tunnel must be undertaken such that the impact on the trees either side of ANZAC Parade, the bus lane adjacent to ANZAC Parade and on the Tramway Oval in East Moore Park are minimised and managed in accordance with the requirements set out in Appendix 14 (*Public Domain*);
 - iv. the minimum depth of fill above tunnel crown or roof must make provision for any buried utility services within the Anzac Parade road reserve that cross the tunnel alignment;
 - v. the tunnel must be designed and constructed to settlement limits of a maximum of 20mm with pavement distortion not exceeding 5mm over 2 metres in any direction for Anzac Parade;
 - vi. the tunnel must be designed for appropriate vehicle loadings along Anzac Parade as required by the Standards and Guidelines; and
 - vii. appropriate containment barriers must be provided at the portals of the tunnel in accordance with the relevant Standards and Guidelines.

2.3.3. Groundwater Control

- (a) The tunnel structures must be designed as undrained structures.
- (b) Groundwater seepage through the tunnel structure is not permitted, except as established within 2.3.4 and 2.3.5.

2.3.4. Watertightness of structures

- (a) The SLR Works must achieve the minimum degree of watertightness against the ingress of external groundwater listed in Table 4:

Table 4 Watertightness grade for services facility shafts and CSELR Stops

Element	Watertightness grade
(i) Moore Park tunnel	
Roof	B
Walls	B
Base slab	B
Sumps	C

Other areas not stated above	B
Retaining walls	B
Troughs	B

- (b) The watertightness grades are defined by the acceptable indications of water on the internal structure surface included in Table 5.

Table 5 Definitions of watertightness grades

Watertightness grade	Description
Grade A	The complete absence of any leakage, seepage and damp patches.
Grade B	Water indications limited to minor damp patches on the faces of interior surfaces for concrete and/or sprayed concrete elements while no visible flow of water occurs.
Grade C	Water indications limited to damp patches on the faces of interior surfaces and to minor weeping at construction joints for concrete and sprayed concrete elements.

- (c) OpCo must ensure that the degree of watertightness is maintained throughout the Design Life of the Asset.
- (d) The SLR Works must be designed to limit the effect on the groundwater management regime during construction, maintenance and operation, such that there is minimal adverse effect on the natural or built environment.

2.3.5. Groundwater seepage

- (a) In addition to satisfying the requirements of section 2.3.4, the groundwater seepage through the tunnel must not exceed:
- i. 2.0 ml per hour per m² of the concrete surfaces; and
 - ii. 5.0 ml per hour per m² of the concrete surfaces for any 10m length of concrete surface;
- throughout the Design Life.

2.3.6. Drainage and flood protection

- (a) Drainage and flood protection for the tunnel must comply with the drainage requirements in sections 2.8, 2.9 and 2.10.

2.3.7. Fire resistance

- (a) The fire resistance levels for civil and structural elements, including tunnel structures, must comply with the requirements of Appendix 25 (*Fire Engineering*).

2.3.8. Flotation

- (a) Underground structures must be stabilised against flotation at all stages of the construction and throughout the Design Life of the structure.
- (b) In the permanent condition, ground water levels must be based on the worst credible high water table.
- (c) Any imposed loads from developments or dead loads from any non-permanent structure that would be beneficial to stability against flotation must not be taken into account in the flotation assessment.
- (d) Allowance for future temporary excavation of 1.5m or the depth to the tunnel roof whichever is the lesser must be taken into account in the flotation assessment. Temporary excavation works include items such as excavation over the tunnel for placement and maintenance of utility services, road works on Anzac Parade, and other similar short term works which do not expose the whole surface of the tunnel, are generally short term (<3 months) in nature, and unlikely to be undertaken over a period when the ground saturation is such that the water table rises to the extent that the tunnel has a positive uplift.

2.4. Monitoring and Protection System Requirements

- (a) OpCo must develop, implement and maintain a real time ground condition and infrastructure monitoring and protection system that incorporates all the monitoring equipment, devices and instrumentation installed by OpCo.
- (b) The real time monitoring and protection system must allow OpCo to continuously monitor over time the actual effects of the SLR Works, the Temporary Works and OpCo's Activities on ground conditions and infrastructure.
- (c) OpCo must develop trigger levels ("Alert", "Action" and "Alarm") for all monitoring equipment, devices and instrumentation based on the Predicted Effects and Acceptable Effects for the ground conditions and infrastructure determined by OpCo.
- (d) OpCo must develop response plans based on the "Alert", "Action" and "Alarm" trigger levels. The response plans must clearly and comprehensively identify all adjustments to OpCo's Activities that are necessary to ensure that Acceptable Effects are not exceeded.
- (e) The real time monitoring and protection system must include a web-based GIS that provides access to all monitoring equipment, devices and instrumentation and associated monitoring data through a web portal interface.
- (f) The web-based GIS must, as a minimum, provide the following functionality:
 - i. export of monitoring data in excel spreadsheet format;
 - ii. plots of monitoring data against key factors including time, construction progress, excavation depth and proximity to monitoring equipment, devices and instrumentation;
 - iii. vector displacement plots overlaid on plans, sections and other background images;

- iv. comparative plots of monitoring data from all equipment, devices and instrumentation; and
- v. comparative plots of monitoring data against Predicted Effects, Acceptable Effects and "Alert", "Action" and "Alarm" trigger levels.

2.5. Bridge works

2.5.1. Structural performance and design requirements

2.5.1.1. General

- (a) Anti-throw screens must be provided to all pedestrian bridges and adjacent to the footpaths/ shared paths on the rail under bridges and over bridges (including the existing Catherine Street bridge) in accordance with the Standards and Guidelines.
- (b) OpCo must provide for the CSR requirements on the bridges as per section 2.11.
- (c) Utility Services on bridges must be provided and should meet the following requirements:
 - i. Utility Services conduits and pipes must extend through the abutments and be terminated in accordance with the Utility Service owner requirements;
 - ii. Utility Services conduits and pipes must not be visible from outside the rail corridor;
 - iii. Utility Services conduits and pipes must be located to ensure the future road or verge level provides cover in accordance with the relevant Utility Service owner requirements and must be protected from construction traffic loadings; and
 - iv. Utility Services conduits and pipes must be designed to ensure maintenance access has minimal impact on the track and road.
- (d) The bridges must have approach slabs that meet the following minimum requirements:
 - i. approach slabs must not be integral with the overbridges superstructure;
 - ii. traffic barriers, where required, must not be designed as an integral part of the approach slabs;
 - iii. in fill areas, provision must be made to enable jacking of the approach slabs after any settlement occurs; and
 - iv. the surface of bridge joints and approach joints must not deviate by more than 3mm when measured from a 3m straight edge, including surface seal and cover plate areas.
- (e) Where restraint blocks are provided on top of piers and abutments to transfer lateral loads, such as earthquake loads, from the overbridge superstructure to the overbridge substructure, a buffer elastomeric bearing strip or pad must be provided.
- (f) Crack control design for prestressed beams must be in accordance with section 8.6.2(a)(ii) in AS5100.5, except that the increment in steel stress must be limited to 160MPa as the load increases from the decompression state to the maximum combined serviceability limit state load.
- (g) Where the least dimension of a concrete element exceeds 1000 mm, the temperature differential across any face of the concrete element must not exceed

27°C during the curing period. Thermocouples should be located within the concrete element to monitor the maximum temperature and differential temperature across the concrete.

- (h) Bridges must not incorporate low ductility steel reinforcement Class L.
- (i) OpCo must comply with the following minimum requirements with respect to bridge abutments and piers:
 - i. where reinforced soil walls are used as the front face of an abutment, the design must incorporate a primary support system for the abutment headstock;
 - ii. abutments must be located a minimum of 1500mm away from the line of the front face of the adjacent retaining structures;
 - iii. abutment slope protection must be provided for all overbridges; and
 - iv. where bridges with bored piled foundations are required, at least 15% of the piles in a pile group (with a minimum of one pile per pile group) must be designed and constructed to include either embedded inclination gauges or a full depth 50mm inclinometer casing to allow for future installation of inclinometers or other form of incremental inclination monitoring. Inclinometer casings must be safely accessible during normal operations and must have removable and lockable caps.
- (j) Bridge access arrangements must comply to the following minimum requirements:
 - i. design of bridges must make provision for safe access to each separate bridge component, including bearings and utility services, without the need to disrupt or stop SLR LRV operations;
 - ii. permanent access for inspection, monitoring and repair or replacement of bridge components must be provided to the abutments of the bridges and must comply with RMS Bridge Technical Direction BTD2008/02;
 - iii. permanent access must be in accordance with AS1657 Fixed platforms, walkways, stairways and ladders – Design, construction and installation;
 - iv. an inspection and maintenance shelf must be provided a minimum depth of 1400mm and maximum depth of 1500mm below the lowest soffit of the superstructure at the abutment; and
 - v. safety railing must be provided at the inspection and maintenance shelf and must comply with AS1657 Fixed platforms, walkways, stairways and ladders – Design, construction and installation.

2.5.1.2. Eastern Distributor rail bridge

- (a) The trackform and deck design levels must be designed such that emergency vehicles can traverse the Eastern Distributor rail bridge.
- (b) Deterrent devices / measures must be installed to deter entry to the Eastern Distributor Bridge by general public and general vehicles.
- (c) The vertical clearance to the underside soffit of the rail underbridge must be a minimum 4.65m above the highest road level in the Eastern Distributor. This minimum vertical clearance is required in the permanent condition taking account of any deflections.

- (d) The structural depth of the Eastern Distributor rail bridge must be designed such that raising the surface levels at South Dowling Street (both north bound and south bound) is minimised to reduce the impact on the existing road design, pavements and visual impact.
- (e) The new abutments for the rail bridge must be designed such that there is minimal impact or movements on the existing retaining walls of the Eastern Distributor motorway. The location of the new abutments must be coordinated with the locations of the existing retaining walls and ground anchors.
- (f) Construction of the Eastern Distributor rail bridge must be such that the North bound and South bound traffic along the Eastern Distributor Motorway are not affected, during construction, other than during approved road closures.
- (h) The Eastern Distributor rail bridge must be designed to satisfy the requirements of the Noise and Vibration Study as detailed in Appendix 31 (*Noise and Vibration*).
- (i) The deck of the Eastern Distributor rail bridge must be waterproof and drainage must be directed away from the Eastern Distributor.

2.5.2. Pedestrian Bridge over Anzac Parade

- (a) OpCo must provide a pedestrian bridge over Anzac Parade. The pedestrian bridge must provide a safe and convenient link between the Moore Park Stop and Sydney Boys and Sydney Girls high schools.
- (b) The pedestrian bridge structure must span Anzac Parade and the adjacent shared path and bus corridor, and must be complete with associated finishes, utilities, services, foundations, abutments, supports, retaining walls, stairs and ramps.
- (c) The bridge structure should include:
 - i. pedestrian and cyclist access between ground level and bridge deck with associated floor finishes and meeting the requirements of the Disability Discrimination Act (DDA);
 - ii. a minimum clear spacing of 3.5m between handrails; and
 - iii. pedestrian bridge deck fall or change in gradients must be limited to 1:200 longitudinally and 1:40 cross falls.
- (d) OpCo must provide the following minimum bridge clearances to road and to road reserve:
 - i. Minimum vertical clearance of 5.5m to the underside of the pedestrian bridges above the roadway level;
 - ii. Standard RMS road clearance envelopes (refer to section 3.11 of RTA document 'Road Design Guideline - June 1999') and the following minimum clearances to bridge structures, fixture or finishes must be maintained across the road reserve:
 - A. minimum clearance of 4.25m at any road boundary or projection of a road boundary;
 - B. minimum clearance of 4.25m tapering to 4.50m at any road boundary or projection of a road boundary to an existing kerb line; and
 - C. minimum clearance of 5.25m between any kerb lines.

- (e) Lifts are only permitted to be used if there is no feasible arrangement of ramps that will comply with the Disability (Access to Premises — Buildings) Standards 2010.
- (f) The deck of the pedestrian bridge over Anzac Parade must be waterproof and drainage must be directed away from Anzac Parade.

2.5.3. Modifications to existing bridges

- (a) All modifications to existing bridges must comply with the urban design requirements in Appendix 14 (*Public Domain*).
- (b) Written approvals must be obtained from asset owner/approving Authority for all modifications to existing structures.

2.5.4. Removal of footbridge across the Eastern Distributor

- (a) OpCo must remove the existing footbridge across the Eastern Distributor opposite Parkham Street, Surry Hills, including:
 - i. removing the deck of the existing footbridge;
 - ii. removing the associated traffic control signals, signal controllers, signage and line marking of pedestrian crossings on the eastern and western carriageways of South Dowling Street;
 - iii. reconstructing the footpaths and kerbs at the crossing points to match the abutting footpath and kerb;
 - iv. constructing new landscaped areas at the crossing points to match the abutting landscaping; and
 - v. constructing new fencing (to match existing fencing) along the edge of the retaining walls of Eastern Distributor to close the gap created by removing the bridge deck.

2.6. Retaining walls

- (a) Unless stated otherwise in the SPR, the design of retaining wall structures, where supporting bridges, must be in accordance with the requirements of AS5100.3. Retaining walls that are not supporting bridge structures may be designed in accordance with the requirements of AS 4678. This will include walls within the depot, walls forming part of the LRV stops, boundary walls and other walls.
- (b) Retaining walls adjacent to RMS infrastructure must comply with RMS Technical Direction GTD 2012/001.
- (c) Reinforced soil walls must be designed and constructed in accordance with RMS D&C Specification R57 and D&C Specification R58.
- (d) Soil nail walls (including rock bolt walls) must be designed in accordance with BS8006-2 for soil nail design.
- (e) Soil nail walls (including rock bolt walls) must be constructed and tested in accordance with RMS D&C Specification R64. Hollow core soil nails may be utilised. Encapsulation may not be used where alternate durability measures are incorporated to achieve the required design life.

- (f) All mesh for gabion walls must be polyvinylchloride (PVC) coated.
- (g) All visible anchor bolt and rockbolt heads are to be recessed so that a uniform planar finish is achieved.
- (h) Retaining walls must be low maintenance and must not contain any prestressed elements such as ground anchors, or rock anchors that require restressing and servicing for the Design Life of the retaining walls. Ground anchors or rock anchors that do not require restressing for the Design Life of the retaining wall are permitted.
- (i) The steel components of retaining walls including soil nails, rock bolts, and dowels, must include the mitigation of the effects of stray currents in accordance with Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*).
- (j) A safety handrail or barrier must be provided on top of a retaining wall where the wall height exceeds 1m.

2.7. CSELR Stop Platforms

2.7.1. General

- (a) Platforms must be designed such that they satisfy the requirements of the CSR as detailed in section 2.11.
- (b) Platforms must be designed such that they satisfy the drainage requirements detailed in sections 2.8, 2.9 and 2.10.

2.7.2. Canopies

- (a) The primary structure must comply with the following minimum requirements:
 - i. all structural steelwork for the structure to be designed in accordance with AS 4100:1998;
 - ii. modular assembly and prefabrication shall be incorporated into the design and no site welding of elements is permitted; and
 - iii. steelwork shall be protected for external exposure in accordance with AS/NZS 2312:2002 and the associated architectural requirements.
- (c) The foundations must be within the footprint of the canopies and not encroach beyond.
- (d) The drainage systems of the canopy, where applicable, are to be designed in accordance with A3500.3:2003. The rainwater downpipe is to be concealed within the vertical structure.
- (e) The glazing must comply with the following minimum requirements:
 - i. glazing is to be designed in accordance with AS 1288:2006;
 - ii. vertical glazed elements, where required, should be designed as a handrail;
 - iii. the glazing should be heat treated laminated glass. The glass may be supported by either edge supports or patch fittings. The glass should not be framed; and
 - iv. the inclination of the roof should be chosen such that pooling does not occur in the glazing due to creep deformations.

- (f) All canopies must comply with the fire engineering requirements in Appendix 25 (*Fire Engineering*).
- (g) The roof of the canopy is to be designed as accessible in accordance with AS/NZS 1170.1:2002.

2.8. Earthworks

2.8.1. General

- (a) All earthworks must incorporate the urban design requirements in Appendix 14 (*Public Domain*).
- (b) Protection of the earthworks from scour and erosion, both during and after construction must be incorporated into the SLR Works.

2.8.2. Cuttings and embankments

- (a) Allowance for a minimum future temporary excavation of 1m at the toe of embankments, and cuttings must be included for all permanent formation earthworks.
- (b) Benches must be provided on all batter slope greater than 10m high to restrict the length of unbroken batter faces and to minimise erosion of soil and weathered materials. Bench widths on cuttings and embankments must be not be less than 4m wide.
- (c) Batter slopes, which are to be landscaped, must be no steeper than 3H:1V to facilitate maintenance and durability.
- (d) Batter slope designs must detail measures to prevent erosion of material from seams in cuttings that are prone to rapid weathering.

2.8.3. Track formation

- (a) Earthworks for track formation must provide sufficient widths to accommodate all infrastructure along the corridor including provisions for future track expansion as specified in the SPR.
- (b) Post construction settlement of all track supporting rail formation must not induce onerous maintenance requirements on the rail operation.
- (c) Earthworks for track formation must ensure positive drainage is provided to the rail corridor drains.
- (d) Where required, subsoil drainage measures must be provided, as appropriate, to improve the long term performance of the track subgrade and track bed.

2.8.4. Backfill and bulk fill

- (a) Backfill to excavations must be free of deleterious materials.
- (b) Earth backfill material must:
 - i. be either recycled inert material or virgin excavated natural material;
 - ii. be free of contamination;

- iii. have a maximum particle size of 100mm;
 - iv. be compacted to 95 % of standard maximum dry density; and
 - v. notwithstanding the general requirements of 2.8.4(b)i. and ii., material excavated within the project boundary may be re-used within the project boundary provided that the application is consistent with legislative requirements.
- (c) Where concrete is to be used as bulk fill or backfill, the concrete must have a compressive strength of no less than 10MPa determined in accordance with AS1012.9.

2.9. Hydrogeology and groundwater protection

2.9.1. General

- (a) The CSELR project must be designed to limit the effect on the hydrogeological environment during construction, maintenance and operation, such that there is minimal adverse effect on groundwater levels, flows or quality.

2.9.2. Strategy for compliance

- (a) OpCo must:
- i. collect hydrogeological information and make measurements sufficient to develop conceptual groundwater models at the appropriate scale to ensure that risks to the hydrogeological system are identified and adequately defined so that mitigation measures can be incorporated into the design;
 - ii. install monitoring instrumentation sufficient to establish a hydrogeological baseline before construction and continue measurement and collection of data during construction and operation sufficient to demonstrate that the hydrogeological performance requirements have been met;
 - iii. carry out hydrogeological analysis at all locations necessary and at appropriate scale, using recognised methods and tools, to assess the potential impacts of the project upon the groundwater environment and develop mitigation so as to achieve the performance requirements;
 - iv. carry out hydrogeological site investigation to acquire groundwater information and construct and calibrate a numerical groundwater model of the Botany Sand aquifer at the site of the Moore Park tunnel. Use the model to investigate alternative design and construction scenarios and to demonstrate that the performance requirements are being met; and
 - v. develop a robust and transparent framework for assessment of risks to the hydrogeological environment which will support decision making during design in order to achieve the performance requirements. This framework will be applied to the design of the Moore Park tunnel, and elsewhere as necessary, in order to assess the overall adverse impact to the groundwater system, considering the potential impacts of dewatering during construction and the long term impact of the impermeable structure on groundwater flow and levels.

2.9.3. Performance objectives

2.9.3.1. Minimise interference with aquifer recharge

- (a) Both the Sydney Basin Central aquifer and the Botany Sands aquifer receive a substantial proportion of their recharge from direct infiltration of rainfall over the permeable surface. Construction of CSELR elements which include impermeable surfacing will threaten the quantity, location and timing of such recharge. The design should adopt sustainable drainage principles and ensure the minimum disruption of natural recharge processes. Runoff from roofs and hard surfaces should be discharged to the ground as close as possible to where it fell as rain after appropriate treatment.

2.9.3.2. Minimise effects on groundwater flow

- (a) OpCo must design and method of construction of the CSELR should comply with the specified limits on leakage and groundwater inflow. Dewatering should be carried out only when necessary and to the minimum extent needed, and mitigation measures adopted where necessary to reduce the impact on the natural and built environment.

2.9.3.3. Avoid adverse effects on groundwater quality

- (a) Effects on groundwater quality may be caused during construction, when they are likely to be of short duration and potentially reversible, or during operation, when they may be permanent and irreversible. The design should consider all potential points of contact with the saturated or unsaturated aquifer and carry out the analysis and assessment necessary to characterise the risk and develop appropriate mitigation.

2.10. Drainage

2.10.1. Asset Owners and Consultation

- (a) OpCo must identify and consult with any drainage asset owners that may be impacted by the works.
- (b) OpCo must consult and coordinate directly with the stormwater drainage asset owners and/or their nominated representatives.
- (c) OpCo must provide a fully coordinated drainage solution in accordance with the requirements of and in agreement with the asset owners. The following drainage asset owners have been identified as affected by the Project:
 - i. Sydney Water;
 - ii. City of Sydney;
 - iii. Randwick City Council;
 - iv. Leichhardt City Council; and
 - v. Botany Bay Council.
- (d) Additional asset owners may be identified by OpCo during the course of the works.

2.10.2. Stormwater Protection / Relocation Works

- (a) OpCo must provide protection to existing stormwater drainage assets affected by the SLR Works that are deemed to require protection by the asset owner in accordance with the asset owner's requirements.
- (b) OpCo must relocate existing stormwater drainage assets affected by the SLR Works that are deemed to require relocation by the asset owner in accordance with the asset owner's requirements.
- (c) The Early Works described within Appendix 22 (*Early Works*) include some utilities protection and relocation works. OpCo must coordinate its design and construction works taking into consideration the Early Works package.
- (d) The Tank Stream is listed on the State Heritage Register. The heritage curtilage of the Tank Stream extends 3 metres in any direction from the physical structure containing the Tank Stream. Works at Alfred Street, where the top of the Tank Stream is approximately 1.5m below ground, are likely to be within this curtilage. OpCo must provide a detailed construction methodology to the satisfaction of City of Sydney Council and Sydney Water to avoid impact to the Tank Stream and its structure.

2.10.3. General

- (a) The drainage design must be in accordance with:
 - i. Australian Rainfall Runoff (ARR);
 - ii. the relevant Standards and Guidelines; and
 - iii. Austroads Part 5, 5A & 5B.
- (b) The drainage pipeline network must be self-cleansing where existing topography permits.
- (c) Appropriate blockage factors for the pit and pipe network must be incorporated.
- (d) For all drainage design, the storm modelled must be the duration producing the largest peak discharge for the ARI.
- (e) The drainage system design must:
 - i. model pit entry capacity;
 - ii. model by-pass flow to next pit;
 - iii. model overland flow times;
 - iv. model infiltration rates; and
 - v. provide a routed reach hydrograph.
- (f) Any existing inflows to the Project Site must be incorporated in to the drainage system.
- (g) The drainage systems must be designed for ease of maintenance.
- (h) Overland flow paths must be provided as follows:

- i. to convey major flows up to the 100 year ARI design storm event in accordance with the NSW Floodplain Development Manual and the relevant Council requirements, with the exception of:
 - A. where existing overland flow paths have capacity less than a 100 year ARI. In these areas, OpCo must ensure, to the extent that it is reasonable and feasible, that the SLR Works do not adversely impact flood immunity of existing properties; and
 - B. where the SLR Works result in a reduction in existing overland flow capacity. In these areas, OpCo must ensure, to the extent that it is reasonable and feasible, that such reductions do not adversely impact flood immunity of existing properties.
- (i) Where the SLR Works result in augmented underground drainage in lieu of lost overland flow capacity, OpCo must ensure and demonstrate that appropriate blockage factors have been incorporated in the design.
- (j) Where the SLR Works have increased the impervious catchment and therefore increased peak runoff, measures must be incorporated such that peak stormwater discharges from the Project Site do not exceed pre-development discharges.
- (k) OpCo must design any modifications to the existing drainage system required for the SLR Works such that upstream and/or downstream hydraulic capacity is not adversely affected.
- (l) Drainage pipes must be designed to meet the following minimum requirements:
 - i. Sydney Water and relevant Council requirements and supplementary specifications;
 - ii. the pipe classification and installation requirements in the Concrete Pipe Association's "Concrete Pipe Selection and Installation" guide;
 - iii. main drainage is not have a diameter less than 375mm within the road except where a pipe of this size cannot be physically located in the available space, in which case OpCo must obtain the prior written approval of the relevant Authority to the nominated diameter;
 - iv. be at a suitable depth to provide for connection of subsoil drainage systems; and
 - v. be designed to accommodate construction and maintenance activities.
- (m) Drainage systems must be designed for vehicular and/or imposed loading from rolling stock where appropriate.
- (n) All exposed surfaces of drainage equipment must be suitable to the normal surface use including where relevant road vehicular traffic loading (including if relevant abnormal loads), bicycle safe and heel safe wherever it is reasonable to expect surface use by cyclists and pedestrians and with secure fixings to ensure surface covers, gratings and frames remain in place in all surcharge conditions.
- (o) All surface drainage access covers, gratings and frames must as a minimum comply with the requirements of relevant Council and asset owner requirements.
- (p) All manhole covers in paved areas greater than 300mm in diameter to be in-filled to match the surrounding pavement.

- (q) All grated drains/kerb inlet pits must be stencilled “Just for Rain”.
- (r) Drainage from platform canopies must be directly connected to the drainage network.
- (s) Scour protection must be provided in all areas susceptible to scouring, including batters and culvert outlets.
- (t) Drainage pits must be provided at all changes of direction of the drainage line and every 100m on straight runs.
- (u) Along George Street some sections of stormwater systems are connected to sewer systems. Where these sections of stormwater systems are modified as part of the SLR Works trapped gully pits must be installed to ensure odours cannot leave the system.

2.10.4. Pavement Drainage

- (a) Design of new/modified pavement drainage systems in all areas affected by the Project must be for a 10 year ARI design event or the capacity of the existing drainage network immediately adjacent to, and on the upstream side of the works, whichever is greater. For modification of existing systems, the extent of works is limited to where the existing system is impacted by the Project only. For new systems which connect to existing systems, the existing system either side of the works is not required to be upgraded to allow for a 10 year ARI design event. New/modified pavement drainage systems in all areas affected by the project work must be designed to facilitate future upgrade of the downstream network to allow for a 10 year ARI design event.
- (b) No elements of the existing stormwater drainage network are to be downsized, even if their capacity exceeds the 1 in 10 year event.
- (c) OpCo must provide drainage infrastructure to meet or exceed RMS requirements and relevant Council requirements as applicable regarding:
 - i. cross drainage capacity for the design ARI event;
 - ii. flooded width;
 - iii. aquaplaning;
 - iv. maximum and minimum velocity limits;
 - v. ‘velocity x depth’ product; and
 - vi. scour, sedimentation and energy dissipation at outlets.
- (d) A comprehensive subsurface and sub-pavement drainage system must be provided for all pavements and trackslab. Where a minimum of 600mm depth of sand is encountered as subgrade material, subsurface drainage is not required.
- (e) OpCo must ensure that there are no effects of groundwater chemistry on the pavement subsurface and sub-pavement drainage system.
- (f) All road and SLR pavements in cuts must have sub-pavement drains on both sides, discharging into surface drainage pits at maximum 60m intervals.
- (g) Where the SLR Works require removal of existing kerbs containing private property downpipe connections through the kerb, downpipe connections must be re-

established to the below ground drainage network and inspection pipes must be provided.

2.10.5. Track Drainage

- (a) OpCo must provide all aspects of the track system so as to provide for free drainage of all surfaces, trackwork, rail grooves and ancillary equipment for example electrical and mechanical equipment associated with switches and turnouts and expansion joints.
- (b) OpCo must design the capacity of the track drainage system for the greater of:
 - i. a 10 year ARI;
 - ii. the design ARI that would apply should the adjacent road be designed to meet relevant Standards and Guidelines; and
 - iii. an ARI as defined by OpCo to achieve the required reliability of the SLR.
- (c) Requirement (b) above applies regardless of the existing drainage network capacity, to allow for the SLR to benefit from any future upgrades to the existing drainage network that may be undertaken by other parties.
- (d) OpCo must provide drainage to limit standing water at or adjacent to the track surface or ancillary equipment to a depth that will allow the LRV to operate unrestricted with reliability to achieve the performance requirements of the SLR Project. Standing water is acceptable in rail grooves at locations without longitudinal gradient where the water will be removed naturally by LRV movements and evaporation.
- (e) All track drainage system design must be integrated with the road drainage requirements of the relevant Council and/or Sydney Water as appropriate.

2.10.6. Bridge Drainage

- (a) All drainage works for bridges must comply with RMS requirements listed in Appendix 34 (*Standards and Guidelines*).
- (b) The runoff from bridge decks must be collected, treated in accordance with the water quality requirements of the Environmental Requirements and connected with approval of the relevant Authority to the nearest stormwater network.

2.10.7. Tunnel Drainage

- (a) Where drainage or sewerage pipes discharge from underground structures into the surface system, swan necks must be provided at a level above the 10,000 year ARI flood level.
- (b) If gravity drainage provisions are made, the drainage exit points must be above the 10,000 year ARI flood level to prevent any back flow of water into the sub-surface structures during flood events.
- (c) The drainage systems for the SLR Works must limit the effect on the groundwater and surface water regime such that there is no adverse effect on the natural or built environment beyond that permitted by the Environmental Requirements.

- (d) The tunnel drainage system must provide all facilities necessary to identify, isolate, treat and dispose of water to the requirements of the relevant Authorities and the Environmental Requirements.
- (e) OpCo must demonstrate that the strategy adopted for storage, discharge and (if required) treatment of water is in line with requirements of their adopted fire and life safety strategy.
- (f) The tunnel drainage system must provide appropriately sized clean water sumps which are suitably lined and sealed and vented to the atmosphere. Duty and stand-by pumps must be easily retrievable by vertical slide rails or block and tackle equipment, without adversely impacting the light rail operations.
- (g) Appropriate pump system redundancy must be provided.
- (h) The tunnel drainage system must provide for sumps and equipment to be designed for easy cleaning and maintenance. In particular, adequate space must be provided in all sumps to allow cleaning and maintenance of pipes, pumps and all associated equipment.

2.10.8. Drainage at Light Rail Maintenance and Stabling Facilities

- (a) OpCo must provide a drainage system at each of the Light Rail Maintenance and Stabling Facilities to deal with:
 - i. existing watercourses;
 - ii. leachate;
 - iii. surface water drainage and attenuation;
 - iv. harvested rainwater;
 - v. oily water collection and oil separation;
 - vi. track drainage;
 - vii. fire main discharge; and
 - viii. wash plant post-treatment residual discharge.

2.10.9. Water Quality and Water Sensitive Urban Design

- (a) The quality of all stormwater and groundwater discharge must meet the requirements of the Environmental Requirements and the Authorities.
- (b) Where the CSELR will adversely influence the quality of surface runoff, OpCo must include pre-treatment systems prior to discharge to a natural or man-made watercourse. Particular requirements are outlined below.
 - i. OpCo must give consideration to the receiving systems water quality in accordance with the Environmental Requirements, Authority requirements and ANZECC guidelines;
 - ii. SLR added contaminants which may require pre-treatment systems may include a combination of:
 - A. suspended solids;

- B. oxygen demanding substances, including chemical oxygen demand, total organic carbon and biological oxygen demand;
 - C. pathogens;
 - D. metals and heavy metals;
 - E. hydrocarbons and oils;
 - F. toxic trace organics and organic pesticides;
 - G. nutrient; and
 - H. general litter and debris;
- iii. OpCo must set SLR pre-discharge water quality targets, which must include allowances for ongoing pre-treatment system maintenance, monitoring, testing, remedial action and emergency action requirements;
 - iv. OpCo pre-treatment systems must include individual systems and combinations of systems, including:
 - A. vegetative swales, including filter strips and bio-swales;
 - B. infiltration systems, including filter trenches, soakage pits and porous pavements; and
 - C. filtration systems, including ponds, tanks, traps, sand filters and oil-water separators;
 - v. OpCo pre-treatment systems must not use chemical dosing to achieve SLR discharge water quality targets;
 - vi. where OpCo pre-treatment systems require ongoing maintenance, monitoring and field testing to confirm removal of contaminant prior to discharge, OpCo must regularly report the findings and proposed remedial actions to TfNSW in accordance with the reporting requirements of the deed;
 - vii. OpCo must meet the requirements of Appendix 19 (*Light Rail Maintenance and Stabling Facilities*) in relation to collection and treatment of stormwater at the Light Rail Maintenance and Stabling Facilities.
- (b) OpCo must meet the requirements outlined in Appendix 7 (*Sustainability*) in relation to water quality.
 - (c) OpCo must work with City of Sydney to investigate opportunities for water harvesting within the Project Site in accordance with the City of Sydney's Decentralised Water Master Plan.
 - (d) OpCo shall maximise the use of open swale drainage in lieu of underground pipes where space permits.

2.10.10. Climate Change

- (a) OpCo must demonstrate that the sensitivity of the drainage design for the SLR Works to climate change impacts has been quantified, in accordance with Appendix 7 (*Sustainability*) and the regulatory guidance defined in section 2.10.11, including impacts associated with:
 - i. sea level rise;

- ii. storm surge; and
 - iii. rainfall intensity increase.
- (b) OpCo must incorporate resilience to climate impacts within the Project, in accordance with Appendix 7 (*Sustainability*).

2.10.11. Flooding

- (a) Flood levels/impacts must be defined in accordance with:
- i. NSW Floodplain Development Manual;
 - ii. Department of Environment and Climate Change (DECC) Floodplain Risk Management Guideline – Practical Consideration of Climate Change; and
 - iii. DECC’s Draft Sea Level Rise Policy Statement.
- (b) Flood immunity criteria for the SLR Works must be achieved as outlined below:
- i. the threshold level of all entrances, ventilation openings and other vertical openings into underground light rail infrastructure must be at least 300mm higher than the surrounding finished ground level;
 - ii. horizontal openings at ground level such as hatches must be watertight;
 - iii. tunnel portals must be designed to deflect overland flows away from the tunnel portal for up to a 1:10 year ARI rainfall event, have localised portal drainage systems to capture and discharge the rainfall which lands directly on the portal decline for rainfall events up to a 1:10 year ARI rainfall event and have additional discharge capacity in tunnels sufficient to ensure that there is no disruption to LRV services in rainfall events up to a 1:100 year ARI rainfall event;
 - iv. design and operational measures must be implemented, and included in the relevant operational plans (e.g. Operational Plan, Business Continuity Plan), which deal with the restoration of LRV operations through tunnels in the case of service disruption due to water ingress into tunnels, following the causal event ceasing;
 - v. Light Rail Maintenance and Stabling Facilities must be located above the greater of:
 - A. the 1 in 100 year ARI flood level plus 500mm freeboard;
 - B. an immunity level that OpCo deems appropriate;
 - vi. main line top of rail: refer section 2.10.5(d) of this Appendix;
 - vii. SLR electrical and mechanical equipment, including within tunnels, must either be:
 - A. located above the 1 in 50 year ARI flood level; or
 - B. designed and rated for immersion/submergence to the extent predicted through flood modelling undertaken by OpCo.
- (c) The SLR Works must be designed such that there are no adverse hydraulic impacts and “no worsening” outside the Project Site arising out of rainfall events up to and including a 100 year ARI design rainfall event. These impacts include peak water

level, peak discharge and velocity. OpCo must undertake hydraulic modelling to demonstrate that this criterion is achieved.

2.10.12. Erosion and Sediment Control

- (a) Erosion and sediment control measures must be provided in accordance with Managing Urban Stormwater – Soils and Construction.
- (b) Collected stormwater during construction shall be treated and reused on site, for example in dust suppression spraying.

2.10.13. Safety requirements

- (a) OpCo must provide safe access to enable routine and major maintenance operations during the life of the SLR.
- (b) OpCo must design drainage for the rails and the pavement surface at pedestrian and cyclist crossing facilities and in all areas where pedestrians or cyclists have access that does not pond or otherwise cause a hazard to pedestrians or cyclists.

2.11. Combined Services Route

- (a) The CSR must provide the required pit and pipe infrastructure in accordance with relevant Standards and Guidelines to support the requirements detailed within the following SPR Appendices as a minimum:
 - i. Appendix 21 (*Signalling and Movement Control*);
 - ii. Appendix 23 (*Communications Systems and Passenger Information*);
 - iii. Appendix 26 (*Low Voltage Distribution and Building Services*);
 - iv. Appendix 27 (*Ausgrid High Voltage Supply and Reticulation*); and
 - v. Appendix 29 (*Traction Power, Electrification Systems and Control*).
- (b) Unless otherwise noted within the SPR Appendices, the pit and pipe infrastructure must provide 50% spare capacity (minimum) for the various systems detailed within the relevant SPR Appendices, except for 750v DC feeders which require one spare conduit. During construction of CSELR only one cable is permitted to be installed per conduit.
- (c) The CSR must provide diverse routing to support the requirements as detailed within the relevant SPR Appendices.
- (d) The CSR must be a secure pathway used to interface the rail system services at facilities such as CSELR Stops, wayside equipment, traction power substations, OCC and tunnel equipment.
- (e) The CSR must be designed to minimise interference with existing underground utilities and structures, including but not limited to locations such as Central Station Eastern Suburbs Railway Box, Town Hall Station, Queen Victoria Building Underpass, Galleries Victoria Underpass, Telstra tunnels and the Tank Stream. For any impacts to underground structures, concurrence to the design shall be obtained from the asset owner by OpCo.

- (f) The CSR must be installed in buried conduits and pits at regular intervals with the exception of areas such as viaducts, bridges or tunnels.
- (g) OpCo must ensure the following aspects of the CSR comply with relevant Standards and Guidelines:
 - i. heavy duty rigid conduits for the reticulation of services for operational use;
 - ii. minimum separation between conduits within the CSR;
 - iii. minimum separation between the CSR and existing utilities along the route; and
 - iv. the depth of cover for the CSR.
- (h) Where OpCo propose to provide a depth of cover that is less than the minimum requirement as specified in the Standards and Guidelines a reinforced protection slab must be provided as per relevant installation requirements as specified in Part 2 of AS/NZS 3000.
- (i) Draw chords must be provided in all conduits that are connecting from one pit to another.
- (j) If OpCo propose sharing of services within pits, the design must comply with the required separation, sub-ducting and/or compartmentalization as per relevant Standards and Guidelines.
- (k) Pit lids must be secure and trafficable for traffic loads as per relevant Standards and Guidelines.
- (q) Pits and conduits must:
 - i. be labelled and show clear indication of the service type; and
 - ii. be water free before cables are installed and remain free draining installation and commissioning.

2.12. Noise barrier walls

- (a) The design of noise barrier walls must comply with the requirements of the Noise and Vibration Study detailed in Appendix 31 (*Noise and Vibration*).
- (b) The design and construction of noise barrier walls must be in accordance with RMS D&C Specification R271.

3. Design Documentation

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Submission

- (a) Design Stage 1 Design Documentation for the civil and structural works must include:
- i. a staging and/or construction methodology section for Moore Park Tunnel and the bridge over the Eastern Distributor;
 - ii. a drawing of the tunnel space-proofing with detailed consideration of construction and fabrication tolerances shown;
 - iii. a durability assessment section;
 - iv. a draft version of any requirements resulting from the design that are required to be inserted into the operations and maintenance manual;
 - v. all design studies and input data used;
 - vi. risk assessment and mitigation review of all structural support elements that may be impacted by LRV or vehicle collision;
 - vii. general arrangement plans including elevations and sections for Moore Park tunnel and the bridge over the Eastern Distributor;
 - viii. drawings for all structures, including the Moore Park tunnel and Eastern Distributor rail bridge, indicating the coordination of the interfacing disciplines, including proposed services, utilities and ancillary elements;
 - ix. civil works drawings showing proposed finished surface levels, bulk earthworks, stormwater drainage network and typical details, retaining structures, access roads and proposed utility corridors;
 - x. the DKE and details of any permanent structural elements adjacent to, above or below the DKE;
 - xi. copies of all preliminary longitudinal and cross drainage calculations, outputs and hydraulic models. Descriptions of the individual model files, inputs, assumptions and their purpose must accompany the model files;
 - xii. in principle Approval from the relevant asset owner/approving Authority in relation to:
 - A. construction over any existing underground structures;
 - B. modification of any existing underground structures;
 - C. modification of any existing above ground structures adjustments to the existing drainage network;
 - D. adjustments to the existing drainage network;

- E. connections, including sizing of any discharge control measures;
 - F. achievement of discharge water quality criteria;
 - G. proposed flood impacts associated with the SLR;
- xiii. updated versions of the Tuflow and SOBEK hydraulic models supplied as Information Documents as part of the RFP, along with any additional models created by OpCo to assess flood immunity/flood impact. All files required to run the models, including detailed model documentation, must be provided, in a logical filing structure. Models are to incorporate the Design Stage 1 SLR alignment profile, 1D drainage network and proposed flood mitigation measures. Descriptions of the individual models files, inputs, assumptions and their purpose must accompany the model files;
- xiv. flood inundation extents (depths and levels), flow rates, velocities and flood impact (afflux) maps for 2,5,10,20,50,100 year ARI and PMF events, for the full extent of the SLR Project, as hard copies and as electronic files in GIS compatible format – ArcGIS;
- xv. a Flood Immunity and Flood Mitigation report, which shall include:
- A. details of the approach to flood immunity generally along the SLR alignment, including how the specified operational reliability requirements for the SLR will be achieved;
 - B. flood immunity plans showing the design ARI at each location at which the operation of the SLR is impacted by flooding;
 - C. details of proposed flood mitigation measures, including the design methodology, a summary of the performance in the 2, 5, 10, 20, 50,100 year ARI and PMF events and details of any operational or maintenance requirements for the mitigation measures to remain effective;
 - D. details of the portal protection strategy to provide flood immunity specified in this Appendix;
 - E. details of the Light Rail Maintenance and Stabling Facilities' flood protection strategy and demonstration of achievement of the flood immunity specified in this Appendix; and
- xvi. assessment of the sensitivity of the SLR flood impacts, flood protection and drainage performance to sea level rise, storm surge and rainfall intensity as a result of climate change.

3.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the civil and structural works must include:
- i. a comprehensive set of computations and all supporting studies, reports or analysis used to develop the structures, including the Moore Park tunnel and the rail bridge over the Eastern Distributor;
 - ii. a final version of any requirements resulting from the design that are required to be inserted into the operations and maintenance manual;

- iii. detailed general arrangement plans for each structure including coordination with services;
- iv. detailed reinforcement or construction drawings for each structure;
- v. testing and commissioning requirements, including hold and witness points;
- vi. completed drawings for all structures, including the Moore Park tunnel and Eastern Distributor rail bridge, indicating the coordination of the interfacing disciplines, including proposed services, utilities and ancillary elements;
- vii. copies of all final longitudinal and cross drainage calculations, outputs and hydraulic models. Descriptions of the individual models files, inputs, assumptions and their purpose must accompany the model files;
- viii. approval from the relevant asset owner in relation to:
 - A. construction over any existing underground structures;
 - B. modification of any existing underground structures;
 - C. modification of any existing above ground structures adjustments to the existing drainage network;
 - D. connections, including sizing of any discharge control measures;
 - E. achievement of discharge water quality criteria;
 - F. proposed flood impacts associated with the SLR;
- ix. updated versions of all hydraulic models. Models are to incorporate the Design Stage 2 SLR alignment profile, 1D drainage network and proposed flood mitigation measures. All files required to run the models, including detailed model documentation, must be provided, in a logical filing structure. Descriptions of the individual models files, inputs, assumptions and their purpose must accompany the model files;
- x. flood inundation extents (depths and levels), flow rates, velocities and flood impact maps for 2, 5, 10, 20, 50 and 100 year ARI and PMF events, for the full extent of the SLR Project, as hard copies and as electronic files in GIS compatible format – ArcGIS;
- xi. updated Flood Immunity and Flood Mitigation report; and
- xii. updated flooding/drainage climate change assessment.

3.4. Design Stage 3 Design Documentation

- (a) The specific Design Stage 3 Design Documentation for the civil and structural work must include:
 - i. detailed for construction and installation drawings for all structures including the Moore Park tunnel and the rail bridge over the Eastern Distributor;
 - ii. a final durability assessment section confirming the asset durability;
 - iii. for construction approval from the relevant asset owner in relation to:
 - A. construction over any existing underground structures;

- B. modification of any existing underground structures;
 - C. modification of any existing above ground structures;
 - D. adjustments to the existing drainage network;
 - E. connections, including sizing of any discharge control measures;
 - F. achievement of discharge water quality criteria;
 - G. proposed flood impacts associated with the SLR;
- iv. updated versions of all hydraulic models. Models are to incorporate the Design Stage 2 SLR alignment profile, 1D drainage network and proposed flood mitigation measures. All files required to run the models, including detailed model documentation, must be provided, in a logical filing structure. Descriptions of the individual models files, inputs, assumptions and their purpose must accompany the model files;
 - v. flood inundation extents (depths and levels), flow rates, velocities and flood impact maps for 2, 5, 10, 20, 50 and 100 year ARI and PMF events, for the full extent of the SLR Project, as hard copies and as electronic files in GIS compatible format – ArcGIS;
 - vi. updated Flood Immunity and Flood Mitigation Plan; and
 - vii. updated flooding/drainage climate change assessment.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 19 Light Rail Maintenance and Stabling Facilities

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for the Light Rail Maintenance and Stabling Facilities. Pyrmont existing facilities are not required to be modified or renewed to achieve compliance with this Appendix.

1.2. Scope

- (a) OpCo must:
- i design and construct the Light Rail Maintenance and Stabling Facilities to accommodate, at the Date of Completion and during the Operations Phase, the CSELRV fleet required by section 2.3 of Appendices 38 (*Minimum Service Requirements*) and Appendix 39 (*Operations and Customer Service Requirements*);
 - ii Not used;
 - iii without limiting the requirements of sections 1.2(a)(i) and (ii) of this Appendix, design and construct the Randwick Light Rail Facility to provide, at the Date of Completion and during the Operations Phase, capacity for a fleet of at least 32 CSELRVs comprising a minimum of:
 - A. 31 berths for stabling of initial CSELRV fleet clear of all adjacent tracks and not preventing normal movements through and around the Facility; and
 - B. 4 berths for maintenance and servicing of CSELRVs (which are in addition to the 31 stabling berths required by section 1.2(a)(iii)A.) of this Appendix; and
 - iv without limiting the requirements of sections 1.2(a)(i) and (ii) of this Appendix, design and construct the Rozelle Light Rail Facility to provide, at the Date of Completion and during the Operations Phase, a minimum of:
 - A. 4 berths for stabling of IWLRVs; and
 - B. 6 berths for maintenance of IWLRVs or uncoupled CSELRV units (which are in addition to the 4 stabling berths required by section 1.2(a)(iv)A. of this Appendix).

2. Performance and Technical Requirements

2.1. Facilities

- (a) The Light Rail Maintenance and Stabling Facilities must include at least the following facilities:
- i tracks for stabling of the CSELRV fleet required by section 2.3 of Appendix 38 (*Minimum Service Requirements*);
 - ii Not Used;
 - iii buildings and equipment for the maintenance and cleaning of the LRV fleet required to meet the requirements of Appendices 38 (*Minimum Service Requirements*) and 39 (*Operations and Customer Service Requirements*);
 - iv administration buildings for managing administration, operations and maintenance of the SLR;
 - v office facilities, Staff amenities and first aid facilities, capable of expansion to accommodate OpCo's proposed operation and maintenance Staff at opening plus 20%;
 - vi storage for spare parts for both LRVs and infrastructure;
 - vii provision for stabling and maintenance of Non-Revenue Vehicles (if any) as required by OpCo;
 - viii security systems;
 - ix landscaping, in any areas not otherwise used;
 - x bicycle and vehicle parking for SLR staff and visitors;
 - xi areas for the storage and collection of refuse and waste materials;
 - xii substations in accordance with the requirements of Appendix 26 (*Low Voltage Distribution and Building Services*) and Appendix 29 (*Traction Power, Electrification Systems and Control*); and
 - xiii noise and vibration mitigation features in accordance with the requirements of Appendix 31 (*Noise and Vibration*).
- (b) OpCo must conduct ergonomics and task studies, which must inform the design of all work locations to ensure an efficient and healthy working environment.

2.2. Layout

- (a) OpCo must provide a track layout such that shunting operations between the various areas within the Light Rail Maintenance and Stabling Facilities do not affect the mainline operations.
- (b) The layout must provide for a logical progression of LRVs around the site with a minimum of reversing or conflicting movements.

- (c) Entry and exit layouts must consider the effect of a derailment or failure on the run-out of vehicles for service, and seek to mitigate the risk or consequences of such a derailment or failure.
- (d) Crossings of internal site roads over rail tracks must be designed to minimise the number and risk of conflicts between road vehicles and LRVs.

2.3. Stabling

- (a) Any designated LRV stabling berth must:
 - i not be over points, or on entry / exit tracks, or in a wash plant or sand plant;
 - ii allow safe access to the LRVs for Staff; and
 - iii allow any activity which OpCo nominates will be carried out with the LRV stabled (such as a pre-service check of the LRV, or interior or exterior cleaning of the LRV) to be carried out safely and in compliance with OpCo's requirements.
- (b) Not used.

2.4. Maintenance

- (a) The Light Rail Maintenance and Stabling Facilities must include as a minimum:
 - i servicing tracks to undertake inspection, running maintenance and component exchange for all LRV types. These tracks must provide safe access to roof-mounted, underframe-mounted and bogie-mounted equipment and to door equipment;
 - ii facilities to undertake major LRV component exchange, including the exchange of roof-mounted equipment, doors, bogies, bogie-mounted equipment and interior fittings and equipment;
 - iii provision of facilities to operate and store critical tools and test equipment, including infrastructure maintenance tools, equipment and road vehicles;
 - iv provision of workshop facilities sufficient for the repair of exchanged LRV and infrastructure components where OpCo intends to repair them on site;
 - v an underfloor wheel lathe suitable for reprofiling the wheels of all types of LRV in use on SLR;
 - vi facilities for the adjustment of LRV suspension height after wheel reprofiling;
 - vii provision of facilities to undertake LRV body repair and refinishing;
 - viii provision of associated spare parts and consumables storage areas including the associated mechanical handling equipment, for both all LRV types and all infrastructure; and
 - ix technical plant rooms to support the maintenance activities.
- (b) If the main stabling location is not at the main maintenance location, OpCo must make provision for examination and minor repairs of LRVs at the main stabling location.
- (c) Not used.

- (d) OpCo must provide sufficient tools and equipment to undertake LRV and infrastructure maintenance activities.

2.5. Automatic LRV wash

- (a) OpCo must provide sufficient automated LRV washing machines to ensure that all LRVs are washed sufficiently frequently to meet the requirements of the deed and SPR Appendix 39 (*Operations and Customer Service Requirements*).
- (b) The LRV wash must:
 - i be capable of cleaning the sides and ends of the LRVs;
 - ii be capable of washing all types of LRV in use on SLR equally well;
 - iii comply with water discharge requirements of Sydney Water for acceptance into sewers;
 - iv interface with the Asset Information System to record all LRV washes, individually by LRV number, without manual intervention; and
 - v comply with the sustainability requirements of Appendix 7 (*Sustainability*).

2.6. Sanding

- (a) At the principal stabling location, OpCo must provide an automatic sand plant for replenishing LRV sand boxes.
- (b) The sand storage silo must be located so that sand can be delivered in bulk by road tanker.

2.7. Electrification System

- (a) OpCo must provide sectioning, isolation and earthing arrangements for the Traction Power Supply in the Light Rail Maintenance and Stabling Facilities such that required LRV and infrastructure maintenance can be carried out with a minimum of disruption to LRV movements and stabling.
- (b) The Traction Power Supply arrangements must comply with the requirements of Appendix 29 (*Traction Power, Electrification Systems and Control*).

2.8. Infrastructure Maintenance Vehicles

- (a) If OpCo provides any Non-Revenue Vehicles, the Light Rail Maintenance and Stabling Facilities must include facilities to allow them to be maintained.
- (b) OpCo must provide suitable and sufficient designated parking spaces for the proposed fleet of maintenance road and road-rail vehicles.

2.9. Civil works

- (a) OpCo must provide all necessary civil works at the Light Rail Maintenance and Stabling Facilities including:
 - i provision of light and heavy vehicle access from the local road network;

- ii connection to the SLR network;
- iii duct and cable routes;
- iv road and pedestrian access to all necessary areas of the Light Rail Maintenance and Stabling Facilities for emergency services, Staff, service vehicles, and stores delivery and collection;
- v at least one location within the Light Rail Maintenance and Stabling Facilities where an LRV, or modules of an LRV, can be delivered or taken away by a road vehicle;
- vi adequate vehicle and bicycle parking spaces for the planned Staff numbers and visitors, including change of shift requirements. Parking must comply with AS2890, including provision of accessible car parking spaces in accordance with current statutory requirements including the Disability Discrimination Act and design guides;
- vii space provision for the construction of 20% more parking spaces, with no adverse effects on the provision of Required Services during construction;
- viii stormwater drainage and all facilities required for treatment and discharge from the site up to and including the point of discharge;
- ix flood immunity and drainage in accordance with Appendix 18 (*Civil and Structural Works*);
- x civil works must comply with the requirements of Appendix 18 (*Civil and Structural Works*);
- xi trackwork must comply with the requirements of Appendix 17 (*Trackwork*); and
- xii noise and vibration mitigation in accordance with Appendix 31 (*Noise and Vibration*).

2.10. Administration and staff facilities

- (a) OpCo, in the provision of administration, training, management and supervisory facilities, must include as a minimum:
 - i facilities to house OpCo's management, administration and supervisory Staff located at that site;
 - ii facilities for the initial and ongoing training of OpCo Staff including its sub-contractors, suppliers and interfacing parties;
 - iii Staff amenities, including toilets, shower and locker rooms and recreation rooms for the Staff located at that site;
 - iv provision for an increase of 20% in direct operation and maintenance staff. If the facilities are not provided at the time of first construction, it must be possible to construct and commission any additional facilities with no adverse effect on provision of Required Services;
 - v technical plant rooms to support the contained services;
 - vi access control and security in accordance with OpCo's Security Management Plan; and

- vii a reception area.
- (b) All Staff facilities and office areas must be air-conditioned.
- (c) Reception and Staff sign-in / out counter must have a reasonable view of people entering and exiting the building.
- (d) At each Light Rail Maintenance and Stabling Facility, a single Staff meal room and recreational space is preferred, in order to encourage interaction between all OpCo Staff.
- (e) An open office floor plan to encourage intercommunication between OpCo Staff is preferred.

2.11. Architectural design

- (a) OpCo must develop the design using a fully integrated approach, recognising the different functional requirements, statutory and regulatory requirements, planning approval conditions and community and stakeholder expectations.
- (b) The design of the Light Rail Maintenance and Stabling Facilities must:
 - i create a built form that is attractive and responsive to the surrounding context;
 - ii incorporate CPTED principles;
 - iii ensure a consistent architectural approach and materials palette for all buildings and structures; and
 - iv integrate screening of plant and equipment to obscure them from view from the street frontages and the Public Domain.

2.12. Landscaping

- (a) The Light Rail Maintenance and Stabling Facilities must include landscape and urban domain treatments within and around the perimeter of the sites wherever space is available.
- (b) Soft landscaping to / or adjacent to facilities to help minimise heat and glare, and improve visual amenity and screening is preferred.
- (c) Landscape screening must not impede access to LRVs, road vehicles and personnel, nor provide areas of concealment of people.

2.13. Security

- (a) OpCo must provide security systems for the Light Rail Maintenance and Stabling Facilities, including as a minimum:
 - i fencing to the outer perimeter of the Light Rail Maintenance and Stabling Facilities commensurate with the value of the stabled LRVs and the criticality of the facilities to the operation of SLR;
 - ii vehicle, pedestrian and LRV access points which when they are closed provide a level of security equivalent to the fence;

- iii equipment to control vehicular and pedestrian access at each perimeter access point to enable security inspection of pedestrians and vehicles before they enter or leave the Light Rail Maintenance and Stabling Facilities;
- iv an intruder alarm system at the LRV access points which can distinguish between an LRV and a person when the gates are open, which is connected to the OCC via SCADA, and which will sound an alarm if a person passes through but not if an LRV does;
- v a key card access control system to the Light Rail Maintenance and Stabling Facilities and to the buildings within them;
- vi CCTV coverage of the site perimeter, site entrances / exits, building entrances / exits, stabling areas and any other critical location. CCTV systems must be integrated into the network-wide SLR CCTV system described in Appendix 23 (*Communications Systems and Passenger Information*); and
- vii an intruder alarm system for any part of buildings except areas which are continuously staffed.

2.14. Outdoor lighting

- (a) OpCo must provide outdoor lighting.
- (b) The outdoor lighting must include:
 - i general lighting of access roads and footpaths to the same standards as would apply to public roads and footpaths;
 - ii lighting of access routes in the LRV stabling areas;
 - iii external lighting of buildings for both access and security;
 - iv if LRV drivers are expected to verify the position of points from the LRV cab, sufficient lighting of the points to allow this to be done;
 - v security lighting of access gates;
 - vi general lighting of the car parking areas;
 - vii general area lighting of the external areas where necessary to allow for traffic and activities during the night; and
 - viii general security lighting suitable for use with the proposed CCTV cameras.
- (c) Lighting design must minimise overspill lighting into adjacent property.

2.15. Sustainability

- (a) OpCo must comply with the sustainability requirements of Appendix 7 (*Sustainability*).

3. Design Documentation requirements

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Submission

- (a) The Design Stage 1 Design Documentation for the Light Rail Maintenance and Stabling Facilities must include:
 - i a Stage 1 design report covering as a minimum:
 - A. an overarching description of all facilities to be established at each Light Rail Maintenance and Stabling Facility including overall functionality and individual element functionality; and discussion on how the design optimises operations;
 - B. description of the buildings at each Light Rail Maintenance and Stabling Facility, including architectural design concept, individual function and facilities of rooms and areas;
 - C. the security provisions for the Light Rail Maintenance and Stabling Facilities, including the security systems and, active and passive security;
 - D. outline equipment specifications and data sheets for all equipment to be provided where known;
 - E. a description of the arrangements for authorisation and control of LRV movements within each Light Rail Maintenance and Stabling Facility;
 - F. existing and proposed utilities, and preliminary confirmation of utility connection arrangements;
 - G. access provisions for vehicular and pedestrian traffic;
 - H. a preliminary analysis of the impacts of the design on the Public Domain, including concepts for outdoor lighting at the Light Rail Maintenance and Stabling Facilities;
 - I. the proposed sustainable design features in the design and demonstration of compliance with Appendix 7 (*Sustainability*); and
 - J. an ergonomics and task study report identifying the ergonomics and human factors for all work locations to ensure an efficient and healthy working environment;
 - ii a full set of preliminary drawings of each Light Rail Maintenance and Stabling Facility, showing as a minimum:
 - A. general arrangement plans, showing layout of traction supply equipment, access platforms, building footprints, track centres, turnouts, number and type of LRV berths, stabling lengths, fouling points, under floor wheel lathe, wash plant, surface structures, footpaths, landscaping, public domain works, fences, site boundaries, roadways (on and off-site), visitor and Staff

parking, delivery turning spaces, combined services and Utility Services, and any other essential infrastructure or known constraints;

- B. interface schematics of the building control systems, communications systems, the signalling and LRV control systems, the power control system, and the power supplies and utility connections;
- C. preliminary plans, elevations and sections of all structures and buildings including floor plans showing all equipment, room layouts and purposes, furniture and plant such as significant HVAC elements, cranes, lifting plant etc;
- D. preliminary room data sheets listing finishes and services required in each room / area;
- E. security equipment for active and passive security;
- F. preliminary construction and installation drawings; and
- G. general arrangement plans demonstrating the provisions made for additional vehicles and Staff as required in this Appendix.

3.3. Design Stage 2 Design Documentation

- (a) In addition to the requirements of section 3.2, the Design Stage 2 Design Documentation for the Light Rail Maintenance and Stabling Facilities must include:
 - i an updated design report covering the items listed in section 3.2 (a)(i);
 - ii equipment specifications and data sheets for all equipment to be provided; and
 - iii a full set of developed drawings listed in section 3.2 (a)(ii) and the following additional drawings:
 - A. elevations, sections and details showing layout of major plant and equipment such as cranes, lifting plant, traction supply equipment, access platforms, building footprints, track centres, turnouts, number and type of LRV berths, stabling lengths, fouling points, provision for underfloor wheel profiling machine, surface structures, footpaths, bridges, underpasses, landscaping, public domain works, fences, site boundaries, roadways (on and off-site), visitor and Staff parking, delivery turning circles, combined services and Utility Services, and any other essential infrastructure or known constraints;
 - B. detailed plans, elevations and sections of all structures and buildings showing; room layouts, details of all major architectural components including roofing, ceilings, walls, floors, facades, signage, lighting; technical specifications, fittings, fixtures, equipment schedules; training, office and Staff amenities, structure clearances to facilitate adequate circulation and access for pedestrians, battery trucks and forklifts; plant requirements for cranes and areas to be covered; and
 - C. building management, environmental control systems schematic drawing access control, intrusion detection and CCTV systems.

3.4. Stage 3 Design Documentation

- (a) In addition to the requirements of section 3.3 above, the Design Stage 3 Design Documentation must include the following specific requirements:
- i a final design report covering the items listed in sections 3.2 and 3.3;
 - ii a full set of final drawings listed in sections 3.2 and 3.3; and
 - iii any other documentation or representations necessary to convey OpCo's design intent.

3.5. Quality Benchmarks, samples and prototypes

- (a) OpCo must provide samples of all architectural and external finishes proposed as part of the Design Documentation including:
- i all external finishes – roofs, walls, gutters, doors, floor, windows, light fittings; and
 - ii external fittings and fixtures.

Sydney Light Rail

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Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 20 – Operations Control Centre

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for the Operations Control Centre (OCC) and the Central Control System (CCS).

1.2. Scope

- (a) OpCo must provide a single primary OCC as the base for overall management, centralised control and monitoring of all SLR operations.
- (b) OpCo may choose to provide one or more additional back-up OCCs to ensure that Required Services can continue if the primary OCC is unavailable.
- (c) Any OCC must include a CCS providing a user-friendly interface between SLR signalling, control and communication systems and the OCC operators.

2. Performance and technical requirements

2.1. General

- (a) As well as the control room itself, the OCC must include an equipment room.
- (b) OpCo must provide administration and Staff welfare facilities for the people who work at the OCC. These may be dedicated or, if the OCC is co-located with other SLR facilities and close to them, facilities may be shared with other Staff.
- (c) OpCo must conduct an ergonomics and control room design study including task analysis, ergonomics and human factors for the control room and all workstations within it, to ensure an efficient and healthy working environment.
- (d) OpCo must design and construct the OCC in accordance with the findings of the ergonomics and control room design study.
- (e) The design of the OCC must comply with ISO 11064.
- (f) An OCC location where the OCC Operators can observe LRV movements directly through the OCC windows is preferred.

2.2. CCS

- (a) OpCo must design and construct the CCS workstations in accordance with the findings of the ergonomics and control room design study.
- (b) OpCo must provide CCS workstations which integrate the CCS Connected Systems into a smaller number of user-friendly CCS workstations. The CCS Connected Systems include, as a minimum:
 - i. AVLS;
 - ii. SCADA;
 - iii. telephony;
 - iv. PA;
 - v. PIDs;
 - vi. Help Points;
 - vii. radio;
 - viii. CCTV;
 - ix. building management systems;
 - x. security systems;
 - xi. fire alarm systems; and
 - xii. the Asset Management System.
- (c) All workstations must be capable of the full CCS functionality. Where functionality is to be restricted to one or a smaller sub-set of operators, this must be controlled by the operator log-on.

- (d) A change of status of any piece of safety-critical equipment in a CCS Connected System must be logged and displayed on the CCS workstations within two seconds of the event occurring.
- (e) A commanded change of status of any piece of safety-critical equipment in a CCS connected system must occur within two seconds of the command being made.
- (f) All other status changes must be displayed within ten seconds of the change occurring.
- (g) Alarms must be presented in a clear, logical and user-friendly manner. The alarm hierarchy must reflect the safety-criticality and the criticality to passenger service delivery of the alarm event. OpCo must consider the recommendations of Engineering Equipment and Materials Users Association (EEMUA) report 191, "Alarms systems – a guide to design, management and procurement" in the development of the alarm strategy and hierarchy.
- (h) CSELR and IWLR must be presented in a consistent way on all CCS diagrams, and the same functions must operate in the same way across the entire network. CCS diagrams must be consistent with each other and with any view of LRVs in service from the control room window.
- (i) The OCC must include a spare CCS workstation, over and above a number of CCS workstations equivalent to the maximum number of OCC Staff OpCo intends to deploy at any one time.
- (j) There must be no single fault or power failure, which can cause all workstations to fail, or to fail to display up to date information, simultaneously.
- (k) If a CCS Connected System fails, there must be no failure of the CCS beyond the loss of functionality of the Connected System which has failed.
- (l) No failure of the CCS must cause failure of a CCS Connected System.
- (m) The CCS must produce data and reports required for the Service Payment Regime with a minimum of operator intervention, and must continue to do so when services are disrupted or operating in special event or other non-standard modes.
- (n) The system must be designed so as to provide assistance to the controllers when managing disruptions to the service. In particular, non-essential data entry (that which is needed only to provide records, rather than that which assists in real-time management) must be minimised.
- (o) All events must be logged in a format which allows log files to be searched, filtered, sorted and exported to a standard desktop spreadsheet program. The log must time-stamp all events and must preserve the order of occurrence of events accurately to better than 0.01 second resolution.
- (p) It must be possible to replay incidents for training and analysis after the event. A replay workstation must be provided for this purpose, which must not be located in the control room. The control room workstations must display only current data.

2.3. Other requirements

- (a) OpCo must consider its fire alarm system and response for the OCC and the building in which it is situated. The design must minimise the probability of a control

- room evacuation due to a false alarm or minor event in the building, whilst protecting the safety of OCC Staff in a fire which presents a genuine threat.
- (b) The OCC equipment room must be fitted with an automatic fire detection and suppression system which will minimise damage to the electronic equipment in the room in the event of a discharge.
 - (c) OpCo must conduct an assessment of the likelihood and consequences of a need to evacuate the control room or of the whole OCC becoming unavailable. Any enhancements to building services which are identified as necessary to reduce the likelihood of such an event, or any back-up OCC facilities to mitigate the consequences of it, must be provided. The results of this assessment must be documented as described in section 3.2 (a) (iii) of this Appendix.
 - (d) The OCC must comply as a minimum with the requirements for site and building security specified in Appendix 19 (*Light Rail Maintenance and Stabling Facilities*) for new OCC and Light Rail Maintenance and Stabling Facilities.
 - (e) Power supply arrangements for the OCC must comply with Appendix 26 (*Low Voltage Distribution and Building Services*).

3. Design Documentation requirements

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage1 Design Documentation

- (a) Design Stage 1 Design Documentation for the main OCC must include:
- i. preliminary drawings showing:
 - A. OCC room layout;
 - B. floor plans of the OCC building or OCC rooms if included within another building;
 - C. room schedule showing areas, proposed finishes and services;
 - D. building management, access control, intrusion detection and CCTV systems;
 - E. elevations (if the OCC is in a separate building);
 - F. architectural renderings of the control room;
 - ii. an ergonomics and control room design study report, identifying the ergonomics and human factors for all control and monitoring locations to ensure an efficient and healthy working environment. The ergonomics and control room design study report must include:
 - A. workstation design parameters, including but not limited to overall layout of controls and displays, ease of reach and ease of viewing, clarity of purpose and provision of help functions, character size, viewing distance, ease of adjustment and orientation and effects of glare, use of colour, use of sound, audible warnings / indications, use of human voice warnings / indications, adjustment for left and right handed operators and adequate provision of both desktop and storage space;
 - B. CCS display design parameters, including but not limited to legibility (when viewed from any position in the control rooms), clarity and ease of understanding of information to be displayed and use of colour;
 - C. seating parameters, including but not limited to height and posture, back, head and neck support and ease and range of adjustment;
 - D. room general parameters including but not limited to disposition of CCS workstations within the room (taking into account the need for communication between staff), overall room lighting and individual task lighting, staged lighting control (including lighting to specific areas of the control room), reduction of glare, control of ambient noise levels, use of soundproofing, use of natural light, heating, ventilation ease of cleaning and maintenance, access control systems, entry / exit doors and emergency evacuation routes;
 - E. design to minimise any effects of repetitive strain injury, in accordance with the specified ergonomic standards;

- F. evidence that all health and safety issues have been addressed to provide assurance that the operation of control room equipment, when operated in accordance with relevant standards, must not adversely affect the health of the operator in either the short or long term;
- iii. an OCC risk and response report, describing the process used to evaluate the likelihood and consequences of a control room evacuation or other event rendering the OCC not usable, and the design actions proposed as a result. If one or more back-up OCCs are proposed, descriptions of their location, layout and capability must be provided, together with a description of how control of the SLR network will be transferred from the main OCC to the back-up OCC(s) and vice versa; and
- iv. a CCS functional specification.

3.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the OCC must include:
 - i. a detailed OCC design report covering:
 - A. overall operations philosophy including OCC resilience and redundancy, demonstrating that the proposals made in the risk and response report have been incorporated into the design;
 - B. individual function and facility descriptions for the various components of the study;
 - C. DDA and BCA requirements compliance check;
 - D. CCS functionality description and screen layouts, demonstrating the incorporation of the results of the ergonomic study into the design; and
 - E. CCS resilience, demonstrating that the requirements of section 2.2 (j) have been complied with;
 - ii. detailed drawings and schematics showing:
 - A. OCC room layout;
 - B. floor plans of the OCC building or OCC rooms if included within another building;
 - C. room schedule showing areas, proposed finishes and services;
 - D. building management, access control, intrusion detection and CCTV systems;
 - E. elevations (if the OCC is in a separate building);
 - F. architectural renderings of the control room;
 - G. CCS interfaces with CCS Connected Systems;
 - iii. an update to the ergonomics and control room design study; and
 - iv. an update to the OCC risk and response report.

3.4. Quality Benchmarks, samples and prototypes

- (a) As part of Design Stage 3, OpCo must provide samples of the OCC building finishes, furniture and fixtures.

4. Testing and Commissioning

4.1. Factory Integration Test

- (a) OpCo must carry out a Factory Integration Test of the CCS and the CCS Connected Systems, using a simulator to provide vehicle location data and a simulated substation.
- (b) The test must include at least two CCS workstations.
- (c) The test must include at least two dummy Stops with actual PA, Help Points, CCTV, induction loop, fibre optic communication, and PID equipment.
- (d) The test must include at least two dummy LRVs with PA, Help Points, and radios.

4.2. IWLR Integration

- (a) OpCo must plan and carry out the transfer of control from the existing IWLR control room to the new network OCC in such a way as to:
 - i. maintain all safety-critical functionality throughout the transfer if IWLR services are operating or IWLR OHW is live; and
 - ii. minimise disruption to IWLR Operations and where disruption occurs, comply with the requirements of the SPR.



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 21 – Signalling and Movement Control

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for the signalling and movement control systems to be provided for the CSELR. If IWLR equipment has to be modified or renewed for other reasons, the modified system must comply with the requirements of this Appendix, but IWLR is not required to be modified or renewed solely to achieve compliance with this Appendix.
- (b) SLR is in principle a line of sight light rail system throughout. The signalling systems must therefore be designed such that the LRV emergency brake is only required in emergency and degraded conditions. In normal operation, only the service brake must be needed to stop at signals.
- (c) OpCo must provide signal systems at intersections and signalised pedestrian crossings which control conflicts between LRVs, road vehicles and pedestrians.
- (d) At certain locations, a means is also required to manage conflicts between LRVs.
- (e) Certain turnouts must be provided with detection and indication equipment, and this Appendix describes the requirements for such equipment.

1.2. Scope

- (a) OpCo must design, construct, test and commission:
 - i. an automatic LRV detection and location system;
 - ii. equipment to interface the LRV location system with local traffic signal controllers;
 - iii. road traffic signal controllers (some of which may be modified existing equipment);
 - iv. road traffic detectors (some of which may be existing equipment);
 - v. intersection signals (some of which may be modified existing equipment) for road traffic, pedestrians and LRVs;
 - vi. LRV signalling systems;
 - vii. equipment to interface LRV signalling systems with local traffic signal controllers; and
 - viii. point control, detection and indication equipment.
- (b) Road traffic signal controller personality software will be provided by TfNSW.
- (c) OpCo is not required to operate and maintain traffic signal controllers, road vehicle detectors, intersection signals and associated cabling.

2. Performance and technical requirements

2.1. Automatic Vehicle Locating System (AVLS)

- (a) OpCo must provide an AVLS, on board equipment and field equipment that are capable of locating the LRVs along the track for at least the following purposes:
- i. display on the OCC CCS, with sufficient accuracy to allow OCC Staff to make effective decisions about service regulation and incident management;
 - ii. comparison of the current and planned service, and provision of punctuality information to the CCS for display to the OCC Staff;
 - iii. recording of operational events and the production of data and reports for the purposes of the Service Payment regime;
 - iv. populating the Stop PIDs with next services data in accordance with the requirements of Appendix 23 (*Communications Systems and Passenger Information*);
 - v. data transfer to TfNSW and TMC to provide passenger information in accordance with the requirements of Appendix 23 (*Communications Systems and Passenger Information*);
 - vi. use by local traffic signal controllers to allow LRV priority and to prevent conflicts with road traffic and pedestrians at intersections;
 - vii. use by LRV signalling systems, to ensure avoidance of conflicts between LRVs; and
 - viii. use by points controllers, to allow power-operated points to operate and select the correct route.
- (b) The information sent by the AVLS and on-board equipment to the signalling and points control infrastructure must include the planned destination, so that drivers do not need to make route requests on the approaches to individual junctions.

2.2. Road Intersection Signalling

- (a) Light rail signals at road intersections must be in the form of red / yellow / white "T" signals which comply with AS 1742.14 and AS 2144.
- (b) All light rail signal heads at road intersections must use LED technology.
- (c) There must be a light rail intersection signal at the LRV stop line, preferably to the left of the track to which it applies.
- (d) Light rail signals at road intersections must be located so that the sight line requirements of AS 1742 (using LRV service braking performance) are met. Additional signal heads must be provided if required.
- (e) At each road intersection or signalled pedestrian crossing, and for each direction, the LRV detection system must include:
- i. a stop line detector;
 - ii. a cancel detector; and

- iii. advance detector(s), which must detect an approaching LRV to enable a light rail "proceed" signal to be displayed before the LRV reaches the point at which it would have to brake.
- (f) A previous road intersection detector may also act as an advance detector for a subsequent intersection.
- (g) Where a CSELR Stop is located on the approach to an intersection, a detector must be provided at the CSELR Stop and the detection system must be capable of detecting when the LRV is ready to depart from the CSELR Stop. This may be by means of a manual driver input from the LRV cab, an input from the door close signal on the LRV, or other means.
- (h) The LRV detection system must be able to create a LRV request and obtain a proceed aspect in the event of failure of an LRV transponder, a detector, the entire LRV detection installation at an intersection, any communications system which is used to transmit LRV signal requests, or any other single item of equipment or single system.
- (i) The signalling system must prevent the situation where if a signal changes from white 'T' to yellow 'T' an LRV approaching a signal can neither reach the stop line before the signal changes to red, nor stop in the available distance using the service brake. If it can occur under degraded conditions, systems must be provided to alert the LRV driver of the degraded mode.
- (j) Intersection signalling in any area where LRVs are to be operated in multiple units must support such operation with the same level of LRV priority as for the operation of single LRVs.
- (k) Under degraded operation it must be possible to operate a coupled pair of LRVs, either of which may be disabled, through signalled intersections. Priority need not be provided for such a movement.
- (l) CSELR LRVs must be fitted with signalling equipment necessary to allow operation on the IWLR, to the extent that OpCo intends to do so.
- (m) IWLR LRVs must be fitted with signalling equipment necessary to allow operation on CSELR, to the extent that OpCo intends to do so.

2.3. Light Rail Signalling

- (a) OpCo must provide signalling systems and procedures to manage conflicts between LRVs, and minimise delay to services at termini, turnback locations and light rail junctions, including the entrances and exits of Light Rail Maintenance and Stabling Facilities.
- (b) The LRV signalling must use recognised road or rail signalling principles and equipment. Vital signalling is not required provided sight lines are adequate at the proposed speed of operation to prevent collision in the event of a wrong-side failure.
- (c) Where OpCo wishes to manage conflicts between LRVs using only an operating procedure, OpCo must satisfy all relevant safety regulatory bodies that the proposed procedure reduces risk to an acceptable level.
- (d) Where an LRV signalling installation must be interlocked with a signalled road intersection:
 - i. failure of the LRV signalling system must not cause failure of the road intersection signalling;

- ii. failure of the road intersection signalling must not cause failure of the LRT signalling; and
 - iii. the number of signals and indicators to be observed by LRT drivers at any one location should be minimised.
- (e) LRV signalling systems must operate automatically in response to the approach of LRVs.
- (f) Points and LRV signal status must be reported to the OCC and be displayed on the OCC CCS.

2.4. Points

- (a) Power-operated points that are located where pedestrians are likely to walk must only operate when an LRV is in close proximity to the points and in line of sight of the driver, to ensure pedestrian safety. Where this is not practicable, OpCo must design the SLR to modify pedestrian access so as to avoid the points.
- (b) Points and point machines must not be located where road vehicles will regularly traverse them. Where it is physically possible for a maintenance road vehicle or an emergency services vehicle to run over them, points and point machines must be capable of being traversed without damage.
- (c) Power-operated points must not move whilst a LRV is traversing the points.
- (d) Power-operated points must also be manually operable by an authorised staff member. Facing point indication must continue to be provided.
- (e) Point machine chambers must incorporate drainage and rail groove drains must be provided upstream of points.
- (f) All facing points, except those within the Light Rail Maintenance and Stabling Facilities, must be equipped with detection. The points must indicate to the LRV driver that the switch rails are correctly located against the stock rails. This may be via an interlocking between points position and the LRT signalling system or a separate facing point indicator.
- (g) Manually controlled points must be trailable without damage and, after trailing, the switch rail must be properly set against the stock rail in the direction to which they have been trailed. A facing movement must be able to occur without risk of derailment.
- (h) Spring controlled points must be trailable without damage and, after trailing, must return to the pre-set position such as to allow a facing movement without risk of derailment.

2.5. Installation

- (a) Installation of the AVLS and signalling systems must be undertaken in accordance with internationally recognised standards, and RMS standards (as far as they are applicable).

3. Design Documentation Requirements

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the signalling and movement control system must include, for each terminus, crossover, turnback location, track junction and for the Moore Park tunnel:
- i. a diagram of the proposed track layout, showing all points (including which points are power-operated, spring-operated and manually-operated), signals, and LRV detectors;
 - ii. a description of the rationale for the track layout, demonstrating that it can support all the required services and frequencies described in Appendix 38 (*Minimum Service Requirements*);
 - iii. a description of the approach to manage LRV conflicts:
 - A. if the means of conflict management is procedure-based, a description of the procedure, a description of the arrangements which will be used to verify compliance with the procedure, and a statement of the steps being taken to satisfy all relevant safety regulators;
 - B. if the means of conflict management is a signalling system, a functional description of the proposed signalling system in terms of how LRVs will be detected, how their desired routing will be known, what logical rules will be applied to prevent conflicts, the extent of any proposed interlocking between points and signals, any proposed integration between the system and intersection signalling, and the physical signal aspects to be displayed to LRV drivers; and
 - iv. if the means of conflict management is a signalling system, a description of the proposed technology solution, including examples of its successful use elsewhere to meet comparable requirements, and the standards to be applied to the design and installation of the solution.
- (b) For intersection signalling:
- i. a description of how compliance with the requirements of section 2.2 will be achieved, with particular reference to 2.2(h) through 2.2(k).
- (c) For each intersection, a schedule of LRV detectors, including for each detector its location, a rationale for the selection of location and its function.
- (d) Preliminary specifications and data sheets for equipment to be used.

3.3. Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the signalling and train control system must include, for each LRV signalling installation, an update of the information provided at Design Stage 1, and additionally:
 - i. signalling layout plans;
 - ii. signalling logic and principles; and
 - iii. interlocking tables conforming as far as practicable to internationally recognised principles and layout.
- (b) Final specification and data sheets for equipment to be used.

4. Testing and commissioning requirements

- (a) OpCo must test and commission the signalling and movement control systems in accordance with the requirements of Appendix 33 (*Testing and Commissioning*).
- (b) In addition to the requirements of Appendix 33 (*Testing and Commissioning*), the signalling and movement control systems must undergo the following specific testing and commissioning activities:

4.1. Factory Acceptance Tests

- (a) OpCo must undertake Factory Acceptance Testing (FAT) of the LRV detection system under simulated conditions compatible with SLR environmental and operational requirements, unless it can demonstrate that it has been successfully used in a comparable application for at least 5 years.

4.2. Factory Integration Tests

- (a) OpCo must undertake a Factory Integration Test of the vehicle detection, data communication and CCS to demonstrate end-to-end communication from vehicle transponder to CCS display, unless the same sub-systems have been used successfully together in service on a similar project for at least two years. If OpCo wishes to rely on this rather than a Factory Integration Test, it must provide details of the system and test results to demonstrate compliance.
- (b) Some aspects of the Factory Integration Test may be accomplished by using simulators instead of the actual equipment. In all such cases, OpCo must justify that the proposed approach will be adequate to demonstrate that technical risks have been adequately covered.

4.3. Site Tests

- (a) Testing of the LRV signalling system must be undertaken by a person independent of the design of the signalling system. The tester must be demonstrably competent to test signalling principles for a rail system. Evidence of this competency must form part of the testing and commissioning documentation.
- (b) The Design Stage 1 documentation must be independently reviewed by the tester and the tester must agree to the suitability of the principles for use in this application.
- (c) Following the confirmation of the signalling principles, the tester must, independently of the designer, formulate a test plan around these principles using the proposed signalling layout and track plan for each signalled location. This plan will outline the tests to be performed on the simulator and those which must be repeated once physically installed.
- (d) The system chosen by OpCo must be capable of being simulated prior to installation. Once detailed design is complete, OpCo must provide to the tester a fully functional simulator upon which the tester can simulate the movement of LRVs to test the signalling principles. This must be done systematically to prove that the principles and the implementation of the principles are correct for this application. Upon completion of this simulator testing, the tester must approve the system for installation.

- (e) Once each light rail signalling system is installed, including any interface with intersection signalling, the tester will undertake the testing of the entire installed system. The interface testing must ensure that the interaction between the systems behaves as predicted in design. The testing of the LRV signalling system must confirm that the system behaves in a similar way to the behaviour in simulation. This is to be done with live vehicles where possible or by simulating the presence of a LRV on the rails. Test records, results and documentation must be provided to confirm the signalling system is fit for purpose.



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 22 – Early Works

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Attachments

- Attachment 1 – Package 1 Drawings
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- Attachment 6 – Proving Works
- Attachment 7 – Proving Works Other Areas
- Attachment 8 – Site Investigations for Alison Road Re-alignment

1. Overview

1.1. Introduction

- (a) The works items under the Managing Contractor Contract are divided into three packages as set out below.
- (b) TfNSW and the Managing Contractor will hold regular meetings to discuss the progress of the works and the schedule of upcoming works. One representative of OpCo may attend these meetings to enable OpCo to become aware of the progress of the works and the schedule of upcoming works. For the avoidance of doubt, OpCo is not required to attend or participate in the discussions at these meetings.

1.1.1. Package 1 Works

- (a) Package 1 Works includes the items of work listed below. The performance requirements for these items are summarised within this document.
 - 1.1 Demolition of Olivia Gardens
 - 1.2 Moore Park Tennis Centre Adjustments
 - 1.3 Not Used
 - 1.4 Tramway Oval Eastern Extension
 - 1.5 Inner West DDA Compliance

1.1.2. Package 2 Works

- (a) Package 2 Works includes the items of works at the intersections listed below.
 - 2.1 George Street / Essex Street intersection.
 - 2.2 George Street / Grosvenor Street / Bridge Street intersection.
 - 2.3 George Street / Hunter Street / Margaret Street intersection.
 - 2.4 George Street / King Street intersection.
 - 2.5 George Street / Bathurst Street intersection.
 - 2.6 George Street / Liverpool Street intersection.
 - 2.7 George Street / Goulburn Street intersection.
 - 2.8 Pitt Street/ Rawson Street intersection.

1.1.3. Package 3 Works – Other Works

- (a) Package 3 Works includes the items detailed in section 4 of this Appendix.

1.2. Abbreviations

AS	Australian Standard
CBR	California Bearing Ratio
CCTV	closed circuit television
CPMPT	Centennial Park and Moore Park Trust
DDA	Disability Discrimination Act
D&C	design and construct
IWLR	Inner West Light Rail
IWLRE	Inner West Light Rail Extension (Lilyfield to Dulwich Hill)
PID	Passenger Information Display Screen
PPP	Public Private Partnership
RMS	Roads and Maritime Services
SEM	Station Equipment Module
SLR	Sydney Light Rail
TVM	Ticket Vending Machine
WC	water closet

2. Package 1 Works

2.1. Portion 1.1 - Demolition of Olivia Gardens

- (a) The works for Portion 1.1 include the demolition of the Olivia Gardens apartments (3 Olivia Lane, Surry Hills NSW 2010).

2.1.1. Scope

- (a) The scope of the Works for Portion 1.1 will provide a site clear of all structures, services and vegetation. This includes:
- i. disconnection and removal of all existing utilities servicing the site, and protection of all existing utilities that traverse the site;
 - ii. removal of all contamination, including asbestos, found on the site;
 - iii. removal of all existing fencing and signs on site;
 - iv. removal of all existing roads and footpaths on site;
 - v. removal of all existing vegetation and trees on site;
 - vi. removal of all existing structures above ground slab and the ground slabs within the site area;
 - vii. puncturing of the existing basement slab at various locations to allow for water penetration through to the underlying soils;
 - viii. providing a safe site clear of all structures, services and vegetation; and
 - ix. leaving the site in a stable condition with erosion and sediment control measures in place.
- (b) The existing basement slab will be either removed entirely or left in-situ and punctured at various locations to allow for water penetration through to the underlying soils.
- (c) The site is defined on Drawing SLR-AUH-DM-014231 included in Attachment 1.

2.2. Portion 1.2 - Moore Park Tennis Centre Adjustments

- (a) Parklands Tennis Centre and Robertson Road Facilities (together termed Moore Park Tennis Centre) are located within the CPMP lands and are operated under licence by a private operator.
- (b) The proposed alignment of the light rail impacts the Parklands Tennis Centre by affecting the existing driveway entrance and car parking area. To facilitate the construction of the new light rail, TfNSW will provide alternative access and car parking to service the Tennis Centre.
- (c) The construction of the new light rail will directly impact the amenities building servicing the Robertson Road facilities. TfNSW will provide equivalent facilities in a new location to facilitate the project.

2.2.1. Scope

- (a) The scope for the works for Portion 1.2 includes:

- i. realigning the access driveway and car parking so that it is outside of the proposed light rail alignment and construction zone;
- ii. providing equivalent access and car parking facilities to those currently available to the Parklands Tennis Centre;
- iii. providing a 'kiss-and-ride' facility that allows for drop offs and pickups prior to the pavilion and the car park;
- iv. demolition and making good of existing facilities which will no longer be used;
- v. removal of all contamination, including asbestos, found on the site;
- vi. construction of a multi-purpose amenities building of the same size and function as the existing Robertson Road amenities building. The Managing Contractor will provide secure access to the new building; and
- vii. make provision for the future extension of the amenities building that will allow a new light rail substation (14.3m x 8.3m) to be added at a later date by OpCo. The Managing Contractor will ensure that no utility services are installed in the proposed location for the substation.

(b) Details of the scope are shown in Table 2-1 below:

Table 2-1 Parklands Tennis Centre and Robertson Road Facilities

Requirements	Description	Materials and Finishes
Existing Parklands Tennis Centre Building	Retain existing building and existing mature fig tree in courtyard.	N/A
Car parking	28 x car parking spaces as per AS 2890.1 (not less than the existing provision).	Interlocking concrete unit pavers to match existing. Pavement to City of Sydney standards.
	1 x Accessible car parking space as per AS 2890.6	Interlocking concrete unit pavers to match existing. Pavement to City of Sydney standards.
Entry road and kiss-and-ride	New entry road and kiss-and-ride drop off turning circle between the existing sports centre building and Anzac Parade. Road to extend to the car park. Speed humps are to be installed to promote traffic calming.	Interlocking concrete pavers to match existing Speeds humps are to be of high quality polyethylene black colour
Pedestrian footpaths	Connecting netball courts and public amenities building to car park.	Brick pavers to match existing footpath finish
Fixed Bollards on entry road	Provide fixed bollards along the edge of the entry road.	Relocate existing bollards and interlinking chains
Removable Bollards	Provide 2 removable bollards to between the car park and the service access road to the amenities block.	–To be agreed with CPMPT
Public amenity change rooms	Provide a new change room building that provides not less than the amenity of the existing change room building, with	To be agreed with CPMPT

Requirements	Description	Materials and Finishes
(internal)	<p>equivalent level of finish to a modern standard, to include at least:</p> <p>Publicly accessible male toilet with 2 x WCs, 2 x basins and 2 x urinals</p> <p>Publicly accessible female toilet with 4 x WCs</p> <p>1 x unisex accessible toilet and shower room</p> <p>1 x cleaner's cupboard</p> <p>1 x unisex change room with benches along the walls, 3 x showers and 1 x accessible shower</p> <p>Kiosk serving area and kitchen preparation space with extended covered roof area to kiosk serving area. Aluminium shutter to serving area.</p> <p>Store room with 2 x roller doors</p> <p>Multipurpose office room</p> <p>Multipurpose meeting room</p>	
Amenities Building (external)	All external materials to be durable and self-finished, i.e. not painted surfaces, to allow ease of cleaning and maintenance	Refer to Table 3-3 below.
Lighting	Lighting for car park and pedestrian footpaths	To be provided to match current lighting installed
Stormwater Drainage	Modifications and new stormwater drainage facilities	To City of Sydney Council standards
Line marking and signage	Road and car park line marking and signage	To RMS QA Specification R141 – Pavement Marking

Table 2-2 Amenities Building Requirements

Element	Material and description	Finish
External Walls	<p>Double brick cavity wall construction.</p> <p>Brick type: Boral blue or glazed brick outer leaf</p>	Boral Blue / Glazed

Element	Material and description	Finish
Windows	<p>Glass brick</p> <p>Operable windows to contain an appropriate locking mechanism to ensure the security of the building</p> <p>The Managing Contractor will install production cylinders provided by TfNSW which shall be keyed in accordance with the Trusts master keying matrix. Four cuts of each key are to be provided to TfNSW on handover of the building.</p>	Opaque
External Doors	<p>Steel frame, solid core timber leaf with Stainless steel sheet facing and returned of the edges</p> <p>Doors to contain an appropriate locking mechanism to ensure the security of the building</p> <p>The Managing Contractor will install production cylinders provided by TfNSW which shall be keyed in accordance with the Trusts master keying matrix. Four cuts of each key are to be provided to TfNSW on handover of the building.</p>	Coloured anodised battens. Painted steel frame.
Internal Doors	<p>Steel frame, solid core timber leaf with Stainless steel sheet facing and returned of the edges</p>	Painted steel frame. Coloured anodised sheet
Internal Walls	<p>Brick / block with set fibre cement walls to finish</p>	
Roof	<p>Steel profiled roof sheeting. Kliplok profile.</p>	Colourbond finish to roof sheet
External Gate	<p>Stainless Steel frame with anodised aluminium battens</p>	Coloured anodised

Element	Material and description	Finish
External Flat panels	Folded Anodised Aluminium panels	Coloured anodised
Awning Canopy	Polycarbonate roof sheeting and anodised aluminium battens	Coloured anodised, tinted polycarbonate roof sheeting
Facia and gutter	Folded Anodised Aluminium panels	Coloured anodised
Roller shutter	Anodised Aluminium slats	Coloured anodised

2.3. Not Used

2.4. Portion 1.4 - Tramway Oval Eastern Extension

- (a) Tramway Oval is the name given to the playing field which is located within Moore Park East and bounded by the existing busway to the west and a bus loop used for special event buses to the north, east and south (events bus loop).

2.4.1. Scope

- (a) The scope for the Works for Portion 1.4 includes:
- i. civil works required to extend the oval on the eastern boundary, without impacting the width of the existing busway;
 - ii. provision of the temporary bus turnaround in material to match existing bitumen bus loop. Works to include:
 - A Approximately 750m² of new roadway to match existing condition;
 - iii. associated services adjustments including drainage, irrigation, lighting (including field lighting) and power:
 - A new drainage to include raising existing drainage pit and grate on the eastern side of the oval up vertically 1.0m from its current position, installation of 200m of V-shape 300mm by 300mm concrete channel with connection into existing stormwater pit;
 - B new turf drains – 400m of 100mm dia agricultural drain;
 - iv. replacement line marking for 2 no. pedestrian crossings on the events bus loop;
 - v. extension of existing 1.2m high fence on the eastern edge of the oval by 50m at each end (north and south) for a total of 100m of new fence to match existing; and
 - vi. provision of appropriate risk controls e.g. improvements to pedestrian access, line marking, signage, provision of temporary or permanent fencing to the oval

and/or other measures. Any new fencing is to match existing fencing type, height, material and colour.

- (b) Note that the maintenance of the new turf will be by CPMPT.
- (c) The site is defined on drawing SLR-AUH-UD-008121.

2.5. Portion 1.5 - Inner West DDA Compliance Upgrades

2.5.1. Scope

- (a) The works for Portion 1.5 includes a range of upgrades at 14 IWLR Stops between the Central and Lilyfield. The scope of the works for Portion 1.5 is detailed in Attachment 2.

3. Package 2 Works

3.1. Overview

Table 3-1 Intersections

Portion Reference	Intersections	Site Area Drawings	Rev
2.1	George Street / Essex Street	SLR-AUH-CI-012037	H
2.2	George Street / Grosvenor Street / Bridge Street	SLR-AUH-CI-012031	I
2.3	George Street / Hunter Street / Margaret Street	SLR-AUH-CI-012036	H
2.4	George Street / King Street	SLR-AUH-CI-012038	H
2.5	George Street / Bathurst Street	SLR-AUH-CI-012039	H
2.6	George Street / Liverpool Street	SLR-AUH-CI-012040	H
2.7	George Street / Goulburn Street	SLR-AUH-CI-012041	H
2.8	Pitt Street / Rawson Street	SLR-AUH-CI-012033	H

(a) The site area drawings listed in Table 3-1 are contained in Attachment 3.

3.2. Scope

3.2.1. Intersection Works

- (a) The scope of works for the intersections identified in Table 3-1 above is as follows:
- i. removal of all Utility Services in the area denoted as the “Early Works Clearance Zone” on the respective drawings in Attachment 3 to this Appendix, except to the extent identified in Attachment 4 (*Items Remaining In Situ*) to this Appendix;
 - ii. for Utility Services being removed from the “Early Works Clearance Zone” which require adjustment, agree adjustment routes and construction details with the respective Utility Services Authority. All adjustments will be to a location outside the Early Works Clearance Zone and between the existing kerb lines (with the exception of any new communications pits that may be required which may be located on the footpath);
 - iii. removal of existing old tram infrastructure (rail and sleepers) from the intersection at Pitt/Rawson Streets (Portion Reference 2.8) only. Old tram infrastructure will not be removed from other intersections;

- iv. leave those Utility Services in the Early Works Clearance Zone as detailed in Attachment 4 - Items Remaining In Situ;
- v. leave those underground structures in the Early Works Clearance Zone identified on Attachment 5 – Structure Remaining in Situ;
- vi. undertake further localised trenching and potholing in a effort to locate further existing Utility Services as denoted on Attachment 6 (*Proving Works*) to this Appendix, and to identify potential relocation/tie in routes;
- vii. undertake a CBR test at formation level within each intersection in accordance with AS 5100 and the Austroads Pavement Design Manual; and
- viii. reinstate the road construction in accordance with the City of Sydney B6 Construction Specification "Roadways" Flexible Pavement Drawing for Roadways 3.1.1.

(b) The above works will be completed by the dates shown in Table 3-2 Below.

Table 3-2 Information Dates

Survey and Potholing Location	Information Dates	Comments
Route A (Hunter St to Bathurst St)	31 Jan 2015	Trenching Information
	30 Mar 2015	Appendix 22, Attachment 6 & 7 Proving Works
Route A (balance)	28 Feb 2015	Trenching Information
	30 Mar 2015	Appendix 22, Attachment 6 & 7 Proving Works
Route I2	31 May 2015	All scope
Route O2 (including Alternate Allison Rd scope)	30 Mar 2015	All scope
Route M	31 May 2015	All Scope

- (c) The scope of works for the areas outside of the intersections identified in Table 3-1 is as follows:
- i. undertake further localised trenching and potholing in an effort to locate existing Utility Services as denoted on Attachment 7 (*Proving Works Other Areas*) to this Appendix, and to identify potential relocation/tie in routes.
- (d) Following the completion of the above works, TfNSW will provide to OpCo:
- i. Construction 'as-builts';
 - ii. Updated UUS survey that includes diversions, trenching and potholing results; and
 - iii. CBR test results.

3.2.2. Site Investigations for Alison Road Re-alignment

- (a) The Managing Contractor will undertake site investigations listed in Attachment 8.
- (b) Following completion of the above work, TfNSW will provide results of the site investigations to OpCo.

4. Package 3 Works

4.1. Overview

Table 4-1 Package 3 Portions

Portion Reference	Key Intersections
Item 1	IWLR shelter and wayfinding upgrades
Item 2	St Peter's Catholic Church parking works

4.2. Scope of Work

4.2.1. Item 1 – IWLR Shelter Upgrade and Wayfinding

- (a) Item 1 works involve upgrades to the IWLR platform infrastructure at Stops Central and Lilyfield. The upgrade will apply the new shelter design which was developed for the IWLR to the existing light rail network in order to improve customer functionality and to allow integration of new wayfinding signage and other functional elements. The works also includes the installation of new stop furniture and the refurbishment of fixtures and finishes.
- (b) The Stops at which platform shelter upgrades are to be installed include Exhibition, Convention, Fish Markets, Wentworth Park, Glebe, Jubilee Park, and Rozelle Bay. Wayfinding will be updated at all of the Stops between Central and Lilyfield.
- (c) Detailed designs and associated reports will be provided to OpCo.
- (d) The scope for the works that will be completed at each Stop is provided in Table 4-2 below:

Table 4-2 Shelter Upgrade and Wayfinding Scope Items Per Stop

Stop	Scope Items
Central	<ul style="list-style-type: none"> • Install new wayfinding at one platform • Remove existing wayfinding • Install 2 new benches • Install 1 new bin • Remove 1 SEM • Paint 1 PID pole
Capitol Square	<ul style="list-style-type: none"> • Install new wayfinding (2 platforms) • Remove existing wayfinding • Remove TVM and disconnect services. Ensure finishing is consistent with existing platform. • Remove 2 Ticket Vending Machines

Stop	Scope Items
	<ul style="list-style-type: none"> • Remove 2 SEMs • Install 2 new bins • Paint 2 Passenger Information Display poles
Paddys Market	<ul style="list-style-type: none"> • Install new wayfinding (2 platforms) • Remove existing wayfinding • Remove 2 TVMs • Remove 2 SEMs • Install 2 new bins • Paint 2 Passenger Information Display poles
Exhibition Centre	<ul style="list-style-type: none"> • Install new wayfinding (2 platforms) • Remove existing wayfinding • Install 2 new Stop shelters • Remove 2 TVMs • Remove 2 SEMs • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping behind both platforms
Convention Centre	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Install 2 new Stop Shelters • Remove 2 TVMs • Remove 2 SEMs • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping behind both platforms
Pyrmont Bay	<ul style="list-style-type: none"> • Install new wayfinding

Stop	Scope Items
	<ul style="list-style-type: none"> • Remove existing wayfinding • Remove 2 TVMs • Remove 3 SEMs • Remove 2 existing bins • Install 2 new bins • Replace 6 existing benches with 6 new benches. • Paint fencing on entrance to the up platform, and handrails on the up and down platforms. • Paint fencing and railings on platforms, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping at entrance to the up platform, above stairs & alongside lift.
The Star	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Remove 2 TVMs • Remove 2 SEMs • Remove 7 existing bins • Install 7 new bins • Replace 10 existing 10 benches with 10 new benches • Paint 2 PID poles
John St Square	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Remove 1 TVMs • Remove 3 SEMs • Remove 2 existing bins • Install 2 new bins • Replace 10 existing benches with 10 new benches • Paint 2 PID poles • Paint handrails on the Up & Down platforms
Fish Market	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Install new Stop shelters

Stop	Scope Items
	<ul style="list-style-type: none"> • Remove 2 TVMs • Remove 2 SEMs • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping at entrance to the Up track platform at street level
Wentworth Park	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Install new Stop shelters • Remove 1 TVM • Remove 1 SEM • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, stairs and ramps • Landscaping behind platforms and along ramps for the Up & Down tracks
Glebe	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Install new Stop shelters • Remove 1 SEM • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, footbridge, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping behind the platforms and along the ramps for the Up & Down tracks
Jubilee Park	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Install new Stop shelters

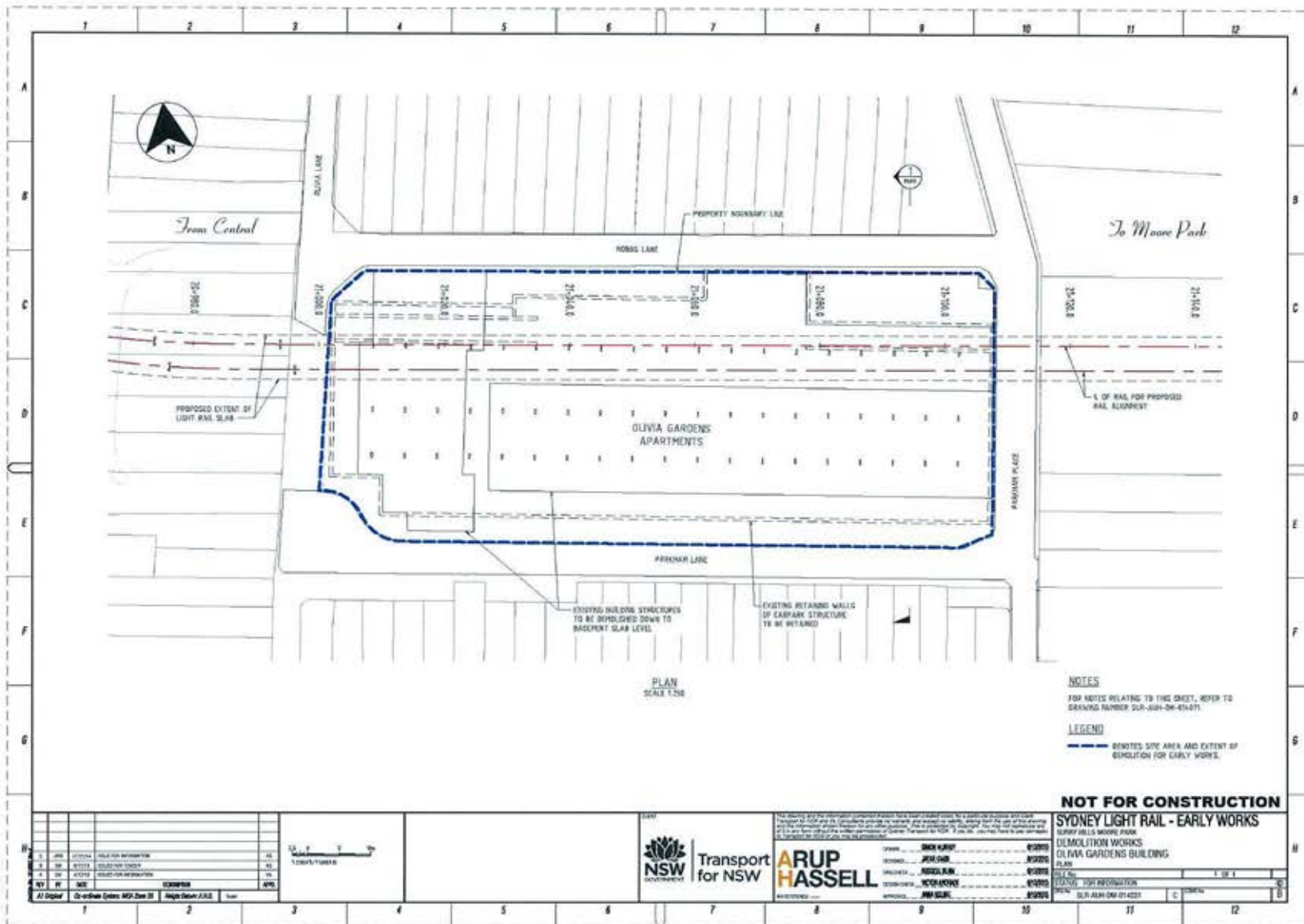
Stop	Scope Items
	<ul style="list-style-type: none"> • Remove 1 SEM • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, footbridge, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping behind the platforms and along the ramps for the Up & Down tracks
Rozelle Bay	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Install new Stop shelters • Remove 1 SEM • Remove 2 existing bins • Install 2 new bins • Paint fencing and railings on platforms, footbridge, stairs and ramps • Paint 2 PID poles • Paint light poles (2 per platform) • Landscaping entrance to the platform for the Down track.
Lilyfield	<ul style="list-style-type: none"> • Install new wayfinding • Remove existing wayfinding • Remove 1 existing bin • Install 1 new bin • Remove redundant PID pole • Replace 3 benches • Paint fencing and railings at the entrance to the platforms and stairs, the handrails on the platforms, and the structure lift entry shelter at the street & platform levels • Paint 1 PID pole • Paint light poles • Landscaping alongside Up track and alongside stairs at the entry

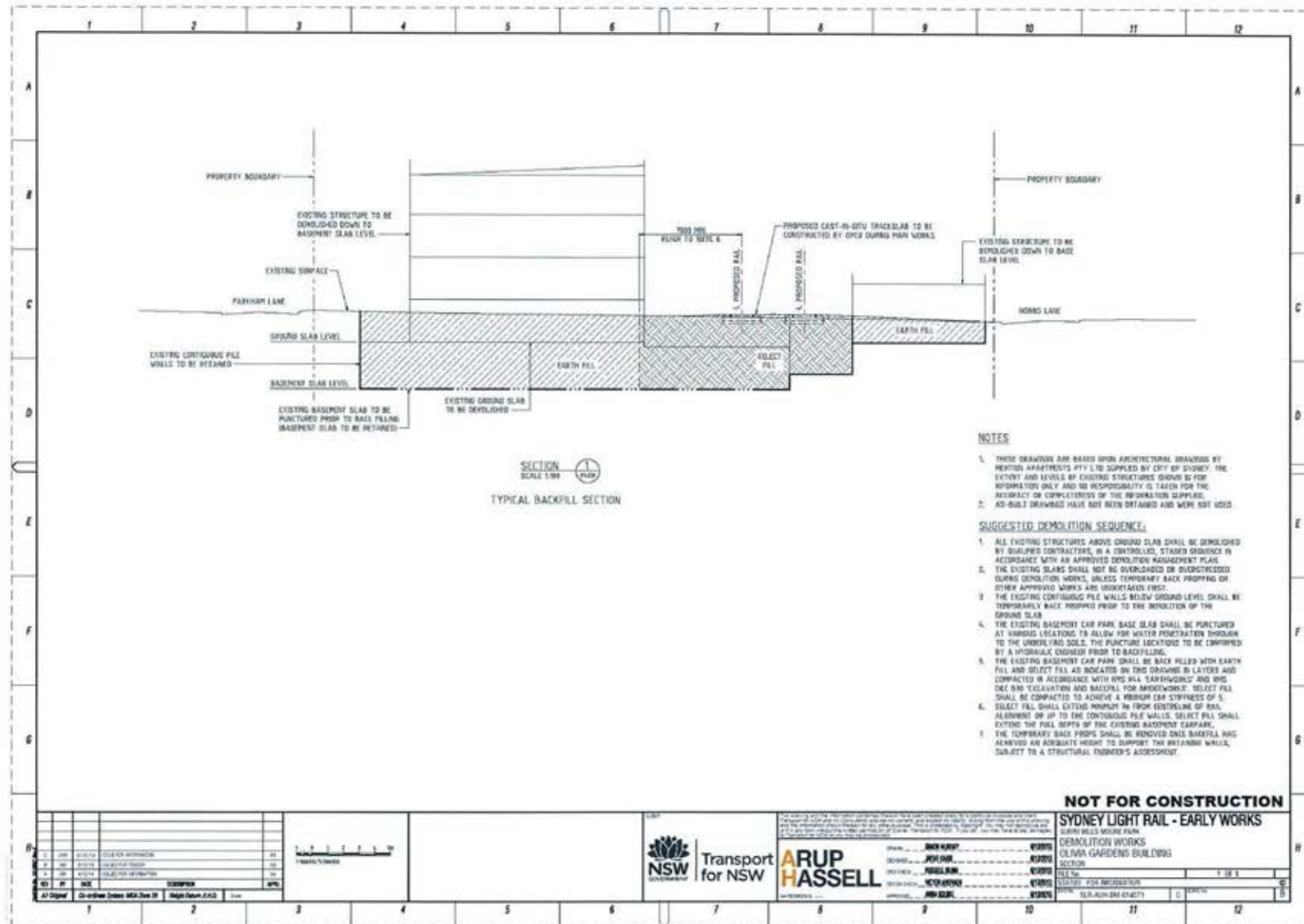
4.2.2. Item 2 – St Peter’s Catholic Church Parking Works

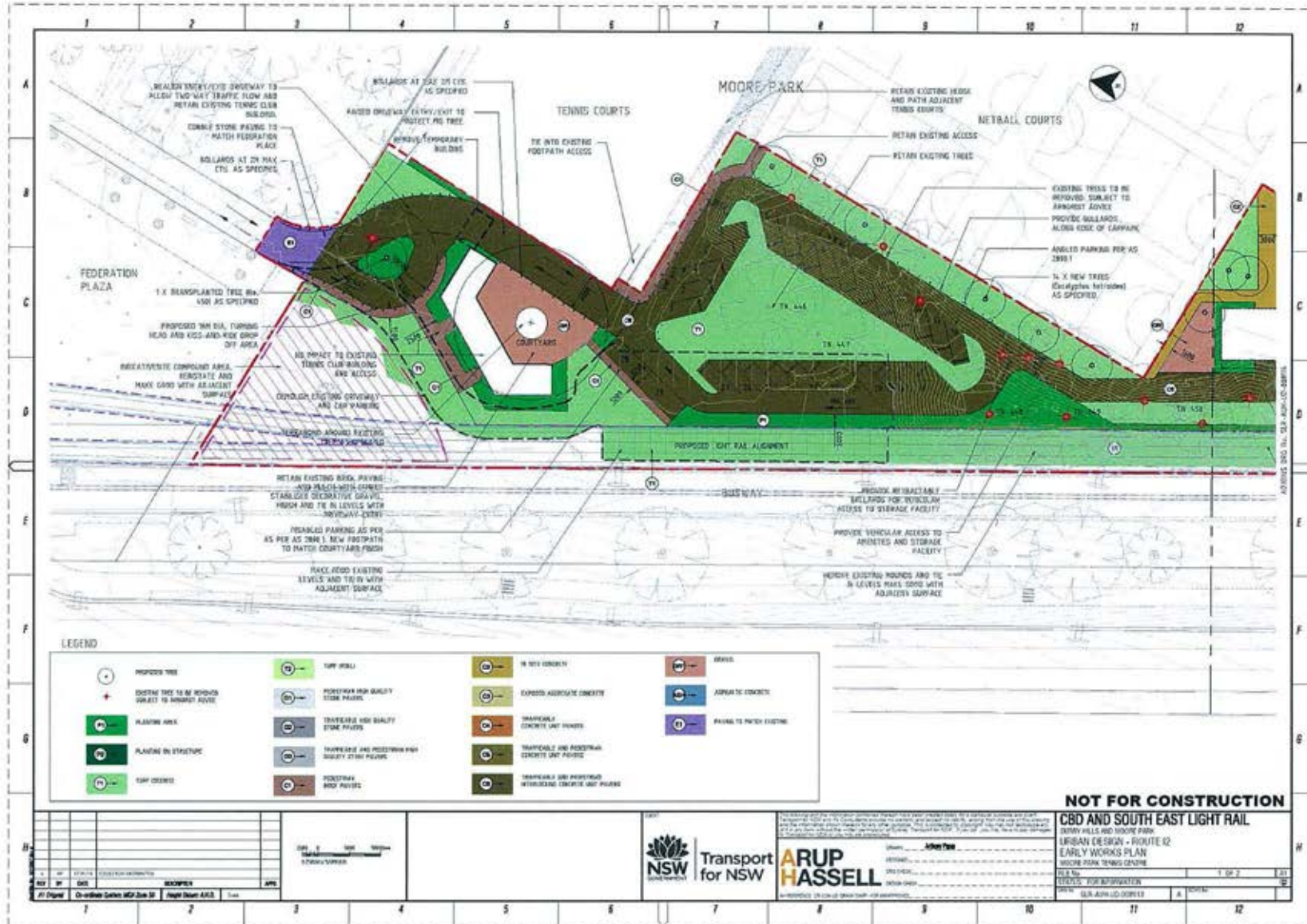
- (a) St Peters Church Surry Hills is on Devonshire Street. The existing road in front of the church is a single lane which is designated “No Stopping, Wedding and Funeral Vehicles Excepted”. This parking section is expected to be lost as a result of the CSELR project. Consequently additional off street parking will be provided within the Church grounds. This offset parking necessitates the relocation of the existing shrine on Parish land adjoining the Devonshire St boundary wall.
- (b) In order to make way for construction of the wedding and funeral parking area on Parish land, the following works will be completed:
- i. the statue which is the focal point of the shrine will be removed from the site for use elsewhere;
 - ii. the brickwork structure that houses the statue will be demolished; and
 - iii. as a replacement for the statue a new two dimensional religious image will be commissioned and mounted where it can be seen from the courtyard between the Church and the 1880 building.
- (c) In order to provide replacement wedding and funeral vehicle parking on Parish land:
- i. a new vehicle entrance with gates will be made near the NW corner of the 1880 building where the elevations of the Devonshire St footpath and the adjacent Parish land are aligned;
 - ii. the finished surface of the elevated area on which the shrine sits will be lowered so that its edges are continuous with the adjoining courtyard surface on the south and east sides; and
 - iii. a retaining wall will be constructed to suit the differential elevations on either side of the property boundary between the Devonshire St footpath and the new Parish land surface below the existing shrine.

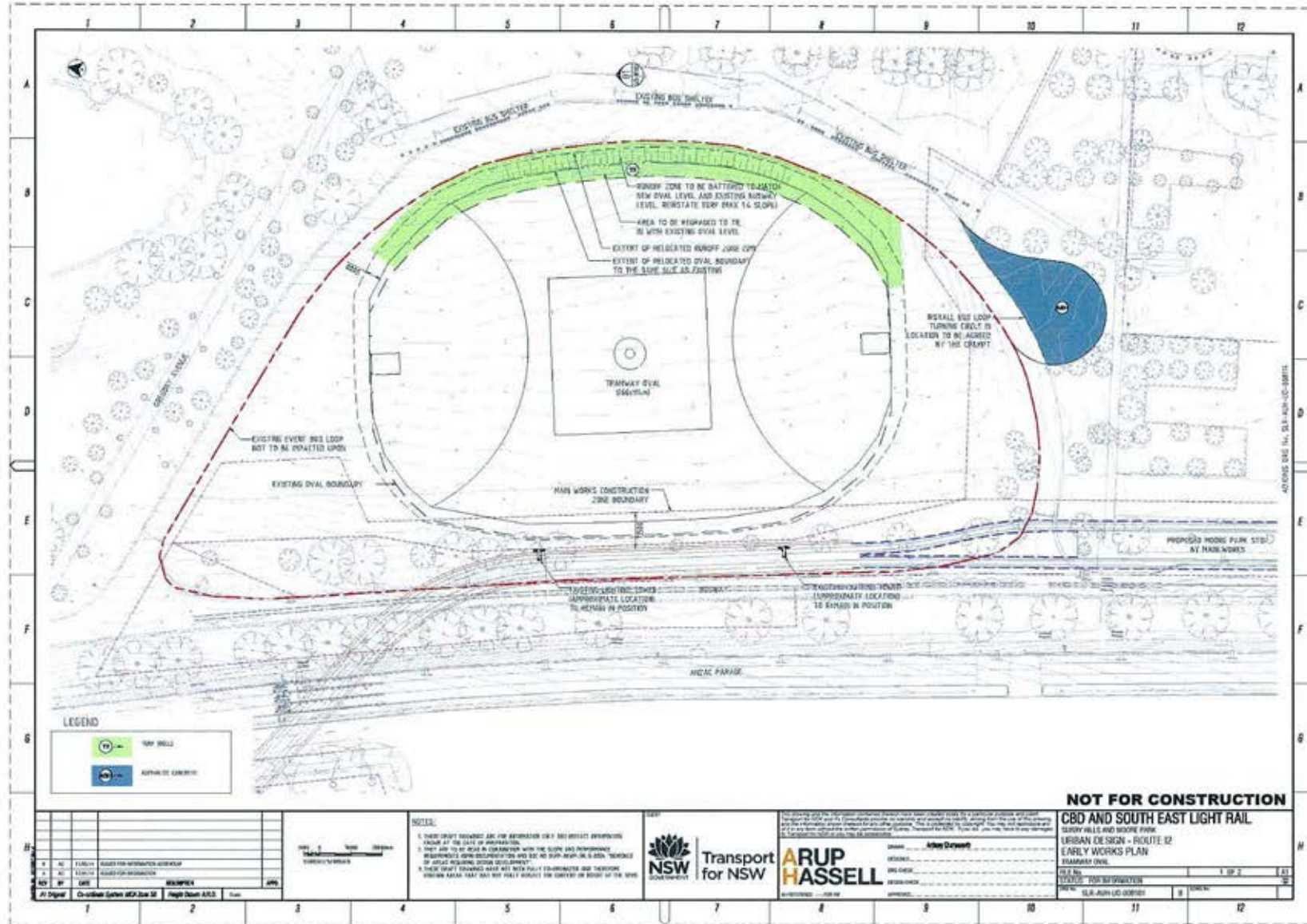
Attachment 1 – Package 1 Drawings

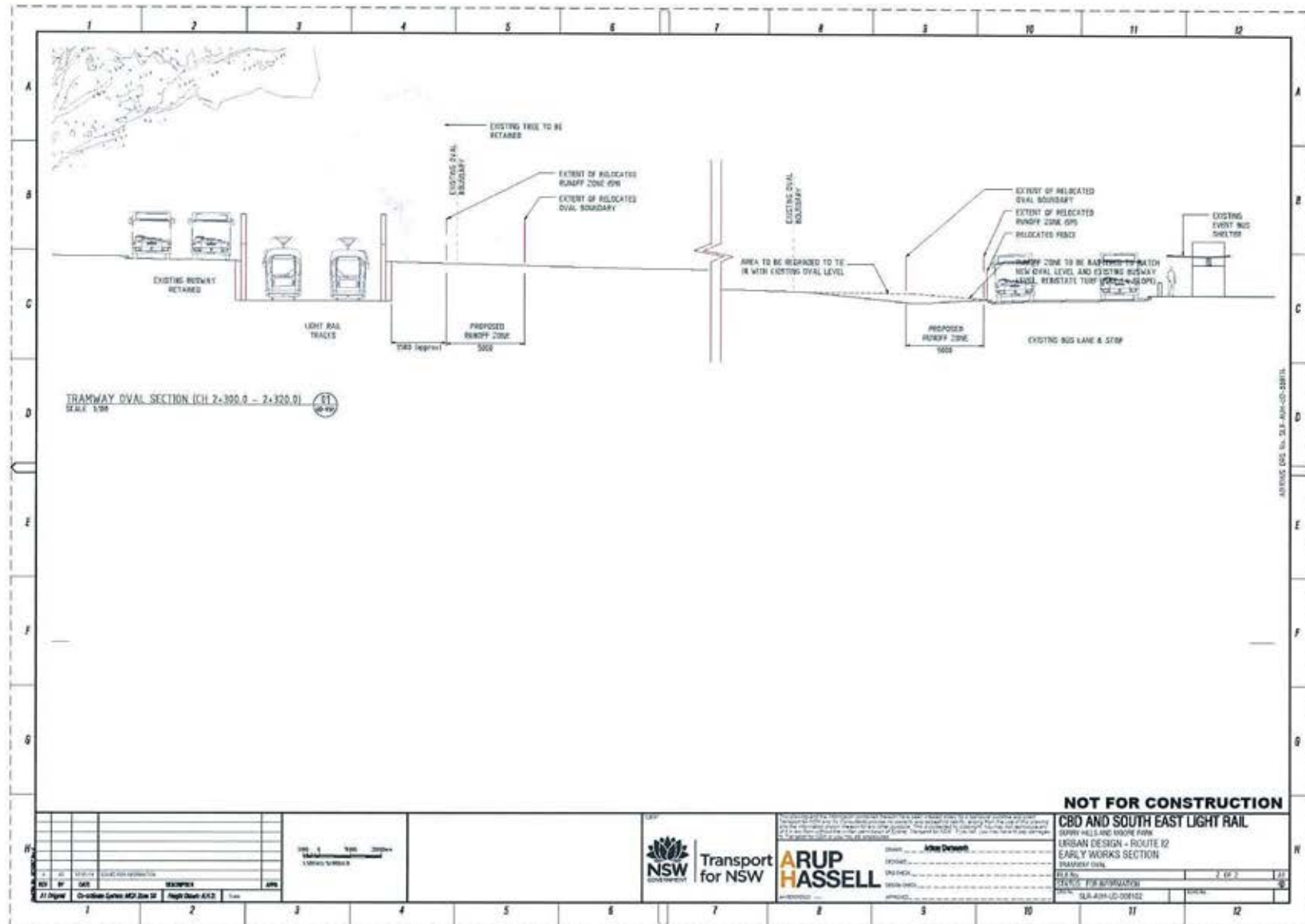
Portion Reference	Description	Drawing No	Date/Rev
1.1	Demolition of Olivia Gardens		
	Demolition Works, Olivia Gardens Building, Plan	SLR-AUH-DM-014031	C
	Demolition Works, Olivia Gardens Building, Section	SLR-AUH-DM-014071	C
1.2	Moore Park Tennis Centre		
	Urban Design - Route I2, Early Works Plan, Moore Park Tennis Centre, Plan – Sheet 1	SLR-AUH-UH-008113	A
	Urban Design - Route I2, Early Works Plan, Moore Park Tennis Centre, Plan – Sheet 2	SLR-AUH-UH-008114	A
1.3	Not Used		
1.4	Tramway Oval Eastern Extension		
	Urban Design - Route I2, Early Works Plan, Tramway Oval	SLR-AUH-UD-008101	B
	Urban Design - Route I2, Early Works Section, Tramway Oval	SLR-AUH-UD-008102	A














Attachment 2 – Inner West DDA Compliance Upgrade Schedule – SLR-AUH-GN-10505

SLR-AUH-GN-10505 Rev B




Sydney Metro Light Rail - Stop: Central


LOCATION		CENTRAL					
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
C-1	PLATFORM	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Some items, such as information boards, protrude into pedestrian paths of travel.		Relocate TINSW information boards only. Remove and dispose of ticket machine and small cabin. Provide luminance contrast on all signage and equipment that protrudes in paths of travel.
C-2	PLATFORM	6 10	Ramp and sloping sides shall be slip-resistant and of a colour that contrasts with the adjoining surface (AS 1428.2:1992 Clause 8.4.5).	NO	Step ramp sides do not have a contrasting surface with adjacent ground surface.		Replace tiles on ramp and sloping sides of ramp with slip-resistant tiles of a colour that is consistent with the existing tiles within the platform area and provides the required luminance contrast.

LOCATION			CENTRAL				
C-3	PLATFORM	2	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to:</p> <ul style="list-style-type: none"> - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. 	NO	<p>TGSIs are set back 600mm from the platform edge with an overall depth of 600mm.</p> <p>TGSIs do not achieve a luminance contrast of 30% to their background surface.</p>		<p>Ensure TGSIs achieve a luminance contrast of 30% to their background surface (to the platform side of the tactiles).</p> <p>Replace all TGSIs at the platform edge which are damaged / chipped.</p> <p>Existing TGSIs to be replaced are to be replaced in their current arrangement with new TGSIs that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.</p>


LOCATION			CENTRAL				
C-4	EXTERNAL FURNITURE	5	<p>If the walking distance between facilities and services along an access path exceeds 60m (including along the length of platforms), resting points must be provided (seats as per AS1428.2:1992 Clause 27.1) (DSAPT 5.1).</p> <p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). - With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	There are no rest stops or seating provided along the platform.		Please supply and install seats which comply with AS 1428.2 (1992) Clause 27.2.

LOCATION							
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
PM-1	PLATFORMS	3	<p>A manoeuvring area complying with AS1428.2:1992 Clause 6.2 (i.e. 1540mm minimum depth X 2070mm minimum length and not steeper than 1:40 gradient and crossfall) to be provided at each boarding point.</p> <p>The camber or crossfall of paths of travel must not exceed 1:40 (AS 1428.1:2001 Clause 5.6).</p>	NO	Crossfall to platform is upto 1:17.		Please provide a manoeuvring area complying with AS1428.2:1992 Clause 6.2




LOCATION							
PM-2	PLATFORMS	2	Grates on an accessible path of travel shall have spaces not more than 13mm wide and not more than 150mm long. If gratings have elongated openings, they shall be placed so that the long dimension is transverse to the dominance direction of travel. (AS 1428.1:2001 Clause 12).	NO	Grates to pits adjacent to rail tracks have openings which do not meet dimensional requirements outlined.		Supply and install grates in accordance with AS 1428.1:2001 Clause 12.
PM-3	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage / information posts and poles do not achieve a 30% luminance contrast to the bitumen platform surface. Some items, such as signage / information posts and poles protrude into pedestrian paths of travel.		Provide luminance contrast on poles of not less than 30%. Provide luminance contrast on all signage and equipment that protrudes in paths of travel.
PM-4	PLATFORMS	2	Warning TGSIs to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to: - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting.	NO	TGSIs are set back 600mm from the platform edge with an overall depth of 600mm. However, TGSIs do not achieve a luminance contrast of 30% to their background surface (to the platform side of the tactiles).		Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. Existing TGSIs to be replaced are to be replaced in their current arrangement with new TGSIs that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.




LOCATION						
PM-6	PLATFORMS		Additional comments	NO	<p>There are a lack of features to identify and delineate the Paddy's Market light rail platforms and tracks from the surrounding public square located between Paddy's Markets and the Sydney Entertainment Centre.</p> <p>Fully glazed side panels to platform shelters do not have any visual indication provided to the glazing.</p> <p>Emergency call button height is 1260mm AFFL.</p>	 <p>Emergency button to be relocated to relevant height in accordance with relevant Australian Standard.</p>
PM-7	RAMPS	2 6	The camber or crossfall of ramps and landings must not exceed 1:40 (AS 1428.1:2001 Clause 5.6).	NO		Modify camber or crossfall of ramps and landings so they do not exceed 1:40 as per AS 1428.1:2001 Clause 5.6.
PM-8	RAMPS	6 11	Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:- Handrail height between 865-1000mm.- Appropriate handrail extensions of not less than 300mm (450mm preferred).- Handrail terminations to be turned downwards or away to a side wall.- A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction.- Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.	NO	Handrails are not provided.	Please provide and install handrails on both sides of the ramp to meet AS 1428.1:2001 Clause 6.1; 10




LOCATION							
PM-9	RAMPS	6	<p>Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:</p> <ul style="list-style-type: none"> - A minimum height of 65mm. - The height to the top of the kerb or kerb rail must not be between 75-150mm AFFL. - Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL. - The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater than 100mm behind the ramp side face of the handrail. 	NO	Kerbs / kerb rails are not provided.		Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.
PM-10	RAMPS	6 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	TGSIs are not provided.		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)
PM-11	EXTERNAL FURNITURE	7	<p>If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).</p>	NO	No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.		Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.


LOCATION							
PM-12	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)).K11 	NO	<p>Seat height is 480mm.</p> <p>There are no arms or backs provided to the seating.</p>		<p>Please provide seats which comply with AS 1428.2 (1992) Clause 27.2</p>


LOCATION				EXHIBITION CENTRE STOP			
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
EC-1	PLATFORMS	2	<p>Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).</p>	NO	<p>Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.</p>		<p>Provide luminance contrast on poles of not less than 30%.</p> <p>Provide luminance contrast on all signage and equipment that protrudes in paths of travel.</p>





LOCATION			EXHIBITION CENTRE STOP				
EC-2	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. <p>(AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1)</p>	NO	<p>TGSIs have not been provided to all areas to identify all hazards (i.e. stairway).</p>		<p>Supply and install TGSIs at all hazards as per AS 1428.2 (1992) Clause 18.1.</p> <p>Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.</p>
EC-3	PLATFORMS		Additional comments	NO	<p>Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:35).</p> <p>The handle height to reach the emergency phone handle is 1250mm AFFL.</p>		<p>Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.</p>
EC-4	WALKWAYS	2	<p>Kerbs or kerb rails are required on walkways and landings where there is no balustrade or wall provided. A kerb and handrail, or a wall and handrail must protect each side of the walkway, otherwise the ground abutting the side of the walkway must extend horizontally for 600mm, following the grade of the walkway (AS 1428.1:2001 Clause 5.2 (d)).</p>	NO	<p>Kerb rails provided do not comply with AS 1428.1 (2001).</p>		<p>Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.</p>
EC-5	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-1000mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>270° handhold not provided along entire length of handrail.</p> <p>Handrails provided do not have sufficient extensions (i.e. less than 300mm).</p>		<p>Please provide and install handrails on both sides of the ramp to meet AS 1428.1:2001 Clause 6.1; 10</p>




LOCATION			EXHIBITION CENTRE STOP				
EC-6	RAMPS	6	<p>Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:</p> <ul style="list-style-type: none"> - A minimum height of 65mm. - The height to the top of the kerb or kerb rail must not be between 75-150mm AFFL. - Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL. - The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater than 100mm behind the ramp side face of the handrail. 	NO	<p>Kerb rail provided to one side of the ramp only.</p> <p>Kerb rail is not flush with the ramp-side face of the handrail.</p>		Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.
EC-7	RAMPS	6 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	No TGSIs provided at the base of the ramp.		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)
EC-8	STAIRWAYS	14	<p>Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>	NO	No luminance contrast provided to stair nosings.		Supply and install luminance contrast to nosings in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3.




LOCATION			EXHIBITION CENTRE STOP				
EC-9	STAIRWAYS	11 14	<p>Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-1000mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>No appropriate handrail extensions or domed buttons are provided.</p> <p>No handrail terminations are turned downwards.</p> <p>270° handhold is not provided along entire length of handrail.</p>		<p>Supply and install handrails to both sides of stairs as per AS 1428.1:2001 Clause 6.1; 9.2</p>
EC-10	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:</p> <ul style="list-style-type: none"> - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSIs do not provide sufficient contrast(outbound).</p> <p>TGSI not provided (inbound).</p>		<p>Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)</p>
EC-11	EXTERNAL FURNITURE	7	<p>If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).</p>	NO	<p>No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.</p>		<p>Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.</p>



LOCATION			EXHIBITION CENTRE STOP				
EC-12	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2. Seating in pedestrian areas, including, however not limited to:- Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2).- With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)).- When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)).</p>	NO	<p>Seat type A (inbound) height is 560mm.Seat type B (outbound) height is 550mm.There are no arms and backs provided to the seating.</p>		<p>Please supply and install seats which comply with AS 1428.2 (1992) Clause 27.2.</p>


LOCATION			CONVENTION CENTRE STOP				
ITEM NO.	LOCATIONS	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
CC-1	PLATFORMS	3	<p>A manoeuvring area complying with AS1428.2:1992 Clause 6.2 (i.e. 1540mm minimum depth X 2070mm minimum length and not steeper than 1:40 gradient and crossfall) to be provided at each boarding point.</p> <p>The camber or crossfall of paths of travel must not exceed 1:40 (AS 1428.1:2001 Clause 5.6).</p>	NO	<p>Crossfall to platform is upto 1:33.</p>		<p>Please provide a manoeuvring area complying with AS1428.2:1992 Clause 6.2</p>


LOCATION			CONVENTION CENTRE STOP				
CC-2	PLATFORMS	2	Grates on an accessible path of travel shall have spaces not more than 13mm wide and not more than 150mm long. If gratings have elongated openings, they shall be placed so that the long dimension is transverse to the dominance direction of travel. (AS 1428.1:2001 Clause 12).	NO	Grates provided do not comply (30mm x 110mm).		Supply and install grates in accordance with AS 1428.1:2001 Clause 12.
CC-3	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.		Provide luminance contrast on poles of not less than 30%.
CC-4	PLATFORMS	18	Tactile ground surface indicators must be installed on an access path to indicate: - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1)	NO	TGSIs have not been provided to all areas to identify all hazards (i.e. stairway).		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992) Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.
CC-5	PLATFORMS		Additional comments	NO	Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:33). The handle height to reach the emergency phone handle is 1250mm AFFL.		Emergency button to be relocated to relevant height in accordance with relevant Australian Standard.
CC-6	WALKWAYS	2	Kerbs or kerb rails are required on walkways and landings where there is no balustrade or wall provided. A kerb and handrail, or a wall and handrail must protect each side of the walkway, otherwise the ground abutting the side of the walkway must extend horizontally for 600mm, following the grade of the walkway (AS 1428.1:2001 Clause 5.2 (d)).	NO	Kerb rails provided are not compliant with AS 1428.1 (2001).		Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.




LOCATION			CONVENTION CENTRE STOP				
CC-7	RAMPS	10	Provide a smooth transition between abutting surfaces. A construction tolerance of 3mm for vertical differences is allowable, or 5mm where edges are rounded or bevelled. Gaps must not exceed 5mm in width (AS 1428.1:2001 Clause 5.1.2; 12).	NO	Uneven surface at base of the landing		Provide a smooth transition at base of landing in accordance with AS 1428.1:2001 Clause 5.1.2; 12.
CC-8	RAMPS	6 11	Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to: <ul style="list-style-type: none"> - Handrail height between 865-1000mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	Handrail is not continuous along entire length of ramp. Handrails height do not comply (i.e. over 1010mm). Handrails provided do not have sufficient extensions (i.e. less than 300mm).		Supply and install handrails to both sides of ramp as per AS 1428.1:2001 Clause 6.1; 9.2
CC-9	RAMPS	6	Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:- A minimum height of 65mm.- The height to the top of the kerb or kerb rail must not be between 75-150mmAFFL.- Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL.- The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater than 100mm behind the ramp side face of the handrail.	NO	Kerb rail provided to one side of the ramp only.Kerb rail is not flush with the ramp-side face of the handrail.Location of light post obstructs ramp.		Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.



LOCATION			CONVENTION CENTRE STOP				
CC-10	RAMPS	6 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	No TGSIs provided at the base of the ramp.		Please supply and install warning TGSIs at the base of ramp in accordance with AS 1428.4 (1992)
CC-11	STAIRWAYS	14	<p>Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>	NO	No luminance contrast provided.		Supply and install luminance contrast to nosings in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3.
CC-12	STAIRWAYS	11 14	<p>Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to:- Handrail height between 865 -1000mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and -A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction.- Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.</p>	NO	No appropriate handrail extensions or domed buttons are provided.No handrail terminations are turned downwards. 270° handholds are not provided along entire length of handrails.		Supply and install handrails to both sides of stairs as per AS 1428.1:2001 Clause 6.1; 9.2




LOCATION			CONVENTION CENTRE STOP				
CC-13	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:</p> <ul style="list-style-type: none"> - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	TGSI not provided (citybound).		Please supply and install warning TGSIs on stairs in accordance with AS 1428.4 (1992)
CC-14	EXTERNAL FURNITURE	7	<p>If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).</p>	NO	No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.		Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.


LOCATION			CONVENTION CENTRE STOP				
CC-15	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2. Seating in pedestrian areas, including, however not limited to:- Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2).- With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)).- When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)).</p>	NO	Seat type A height is 540mm. There are no arms and backs provided to the seating.		Please provide seats which comply with AS 1428.2 (1992) Clause 27.2



LOCATION			PYRMONT BAY				
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
PB-1	PLATFORMS	3	<p>A manoeuvring area complying with AS1428.2:1992 Clause 6.2 (i.e. 1540mm minimum depth X 2070mm minimum length and not steeper than 1:40 gradient and crossfall) to be provided at each boarding point.</p> <p>The camber or crossfall of paths of travel must not exceed 1:40 (AS 1428.1:2001 Clause 5.6).</p>	NO	Crossfall to platform is up to 1:38.		Please provide a manoeuvring area complying with AS1428.2:1992 Clause 6.2



LOCATION			PYRMONT BAY				
PB-2	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.		Provide luminance contrast on poles of not less than 30%.
PB-3	PLATFORMS		Additional comments	NO	Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:38). The handle height to reach the emergency phone handle is 1250mm AFFL.		Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.
PB-4	RAMPS	6 11	Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to: - Handrail height between 865-1000mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.	NO	Handrails provided do not have sufficient 270° handhold. Handrails are too high (1200mm).		Supply and install handrails to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10




LOCATION			PYRMONT BAY				
PB-5	RAMPS	6	<p>Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:- A minimum height of 65mm.- The height to the top of the kerb or kerb rail must not be between 75-150mmAFFL.- Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL.- The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater tahn 100mm behind the ramp side face of the handrail.</p>	NO	Kerbs to not extend along entire length of ramp.		Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.
PB-6	RAMPS	6 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	TGSIs are not setback 300mm on both top and bottom of the ramp.		Supply and install warning TGSIs in accordance with AS 1428.4 (1992), on both top and bottom of ramp.
PB-7	STAIRWAYS	14	<p>Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>	NO	Insufficient luminance contrast provided to nosings.		Supply and install luminance contrast to nosings in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3.


LOCATION		PYRMONT BAY					
PB-8	STAIRWAYS	11 14	Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to:- Handrail height between 865-1000mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and -A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction.- Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.	NO	Sufficient handrail extensions are not provided to the top and base of the stairway.		Supply and install handrails to both sides of stairs as per AS 1428.1:2001 Clause 6.1; 9.2
PB-9	STAIRWAYS	14 18	Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to: - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL.	NO	TGSIs are not setback 300mm on both top and bottom of some areas of the stairways.		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)
PB-10	LIFTS	13	Provide lift call buttons in accordance with AS 1735.12 (1999) Clause 7.1. Lift call buttons to be located on a level landing (1:40) not less than 500mm from any internal corners and at a height between 900mm and 1200mm (AS 1735.12:1999 Clause 7.3.1; 7.3.3).	NO	There is no Braille or tactile information provided to the buttons. A contrasting border / continuous illumination is not provided to the buttons.		Supply and install lift call buttons in accordance with AS 1735.12 (1999) Clause 7.1.



LOCATION			PYRMONT BAY				
PB-11	LIFTS	13 21	Provide a minimum of one control panel in the lift which meets AS 1735.12 (1999) Clause 7, including, however not limited to:- All control buttons and any security operating devices to be located at a height between 700-1250mm AFFL. - Control buttons to possess continuous illumination, or a border on or around the circumference of the button of no less than 3mm in width and minimum luminance contrast of 30% to the surrounding surfaces. - All control buttons, excluding the emergency stop button and communication button, to be identified by Braille and tactile characters on or adjacent to the button which possess minimum 30% luminance contrast with surrounding surfaces. - The communication button or controls must be located on the control panel at the right-hand end of the lowest row of control buttons and be identified with the standard communication symbol. The equivalent tactile symbol and Braille to be located either above the respective button, to the left, or on the face of the button.	NO	There are two lift control panels provided within the lift car. Generally, the controls panels meet the outlined requirements, however there is no continuous illumination provided to the control buttons. There is no Braille or tactile information provided to the buttons.		Supply and install a minimum of one control panel in the lift which meets AS 1735.12 (1999) Clause 7.
PB-12	LIFTS	13	Install visible indication adjacent to the lift entrance and within the lift car at a height of no less than 1800mm in accordance with AS 1735.12 (1999) Clause 8.	NO	Visible indication not provided.		Supply and install visible indication adjacent to the lift entrance and within the lift car at a height of no less than 1800mm in accordance with AS 1735.12 (1999) Clause 8.
PB-13	LIFTS	13	Provide automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.	NO	Audible information not provided.		Supply and install automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.


LOCATION			PYRMONT BAY				
PB-14	EXTERNAL FURNITURE	7	If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).	NO	No allocated spaces for wheelchair users were identified or designated, however there is sufficient seating space adjacent to accommodate a wheelchair seating space.		Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.
PB-15	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2. Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat type A height is 480mm. Back height is 950mm.</p> <p>Seat type B height is 400mm, no back.</p> <p>There are no arms provided to the seating.</p>		Please provide seats which comply with AS 1428.2 (1992) Clause 27.2


LOCATION			THE STAR				
ITEM NO.	LOCATIONS	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
S-1	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage / information kiosk does not achieve a 30% luminance contrast to the bitumen platform surface (i.e. black / stainless steel kiosk against bitumen surface). Generally, fixtures and fittings are located away from pedestrian paths of travel.		Provide luminance contrast on poles of not less than 30%.
S-2	PLATFORMS	2	Warning TGSIs to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to: - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting.	NO	TGSIs are set back 600mm from the platform edge with an overall depth of 600mm. TGSIs do not achieve a luminance contrast of 30% to their background surface.		Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. Existing TGSIs to be replaced are to be replaced in their current arrangement with new TGSIs that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.


LOCATION			THE STAR				
S-3	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1) 	NO	TGSIs have not been provided to all areas to identify all hazards (e.g. ramp from platform to track crossing points).		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992) Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.
S-4	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:- Handrail height between 865 -1000mm.- Appropriate handrail extensions of not less than 300mm (450mm preferred).- Handrail terminations to be turned downwards or away to a side wall.- A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction.- Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.</p>	NO	Handrails are provided, however, are not fully compliant with outlined requirements. Handrail terminations are not turned through 180 degrees or returned fully to wall or post.		Supply and install handrails to both sides of ramp as per AS 1428.1:2001 Clause 6.1; 9.2
S-5	RAMPS	6	<p>Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:</p> <ul style="list-style-type: none"> - A minimum height of 65mm. - The height to the top of the kerb or kerb rail must not be between 75-150mm AFFL. - Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL. - The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater than 100mm behind the ramp side face of the handrail. 	NO	Kerbs / kerb rails meeting outlined requirements are not provided to the ramp.	 	Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.




LOCATION			THE STAR				
S-6	RAMPS	6 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	TGSIs are not provided to the ramp.		Please supply and install warning TGSIs to ramp in accordance with AS 1428.4 (1992).
S-7	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:- To be setback 300mm from the edge of the stair tread with a depth of 600mm.- TGSIs may be reduced to a depth of 300mm in an enclosed stair.- TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.- To be installed such there is no likelihood of edges lifting.- Where handrails are not continuous and TGSIs are not provided a domed button to be installed.- TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL.</p>	NO	TGSIs do not achieve a luminance contrast of 30% to their background surface.		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)



LOCATION			THE STAR				
S-8	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height is 460mm.</p> <p>Back height is 890mm.</p> <p>Seating has no arms provided.</p>	 	Please provide seats which comply with AS 1428.2 (1992) Clause 27.2

LOCATION				JOHN STREET SQUARE			
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
JSS-1	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	<p>Signage and shelter posts and poles do not achieve a 30% luminance contrast to the bitumen platform surface.</p> <p>Some items, such as signage posts, fire hose reel cupboards protrude into paths of travel.</p>		<p>Provide luminance contrast on poles of not less than 30%.</p> <p>Provide luminance contrast on all signage and equipment that protrudes in paths of travel.</p>

LOCATION			JOHN STREET SQUARE				
JSS-2	PLATFORMS	2	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to:</p> <ul style="list-style-type: none"> - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. 	NO	<p>TGSIs are set back 600mm from the platform edge with an overall depth of 600mm.</p> <p>However, TGSIs do not achieve a luminance contrast of 30% to their background surface (to the platform side of the tiles).</p>		<p>Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.</p> <p>Existing TGSIs to be replaced are to be replaced in their current arrangement with new TGSIs that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.</p>
JSS-3	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1) 	NO	<p>TGSIs have not been provided to all areas to identify all hazards (e.g. stairway on outbound side of platform).</p>		<p>Please supply and install warning TGSIs in accordance with AS 1428.4 (1992) Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.</p>





LOCATION			JOHN STREET SQUARE				
JSS-4	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-100mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>Handrails are too high.</p> <p>Handrails do not allow for 270 degree handhold along entire length of handrail.</p> <p>Handrails provided do not have sufficient extensions (i.e. less than 300mm).</p> <p>Handrails do not extend full length of ramp.</p>		<p>Supply and install handrails to both sides of the ramp in accordance with AS 1428.1:2001 Clause 6.1; 10.</p>
JSS-5	RAMPS	6	<p>Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:</p> <ul style="list-style-type: none"> - A minimum height of 85mm. - The height to the top of the kerb or kerb rail must not be between 75-150mm AFFL. - Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL. - The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater than 100mm behind the ramp side face of the handrail. 	NO			<p>Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.</p>
JSS-6	RAMPS	6 18	<p>Warning TGSi's to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - To be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - To be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSi's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSi's to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSi's are not provided.</p>		<p>Please supply and install warning TGSi's in accordance with AS 1428.4 (1992)</p>




LOCATION			JOHN STREET SQUARE				
JSS-7	STAIRWAYS	14	Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).	NO	Warning strips do not meet outlined requirements.		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)
JSS-8	STAIRWAYS	11 14	Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to: - Handrail height between 865-100mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction, - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.	NO	Compliant handrail extensions are not provided to the base of the stairs.		Supply and install handrails to both sides of stairs as per AS 1428.1:2001 Clause 6.1; 9.2
JSS-9	STAIRWAYS	14 18	Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to: - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL.	NO	TGSIs are not provided to the stairway.		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)
JSS-10	LIFTS	13	Provide lift call buttons in accordance with AS 1735.12 (1999) Clause 7.1. Lift call buttons to be located on a level landing (1:40) not less than 500mm from any internal corners and at a height between 900mm and 1200mm (AS 1735.12:1999 Clause 7.3.1; 7.3.3).	NO	There is no Braille information provided to the buttons (tactile information only provided). A contrasting border / continuous illumination is not provided to the buttons.		Supply and install lift buttons in accordance with AS 1735.12 (1999) Clause 7.1 and AS 1735.12:1999 Clause 7.3.1; 7.3.3.



LOCATION			JOHN STREET SQUARE				
JSS-11	LIFTS	13 21	<p>Provide a minimum of one control panel in the lift which meets AS 1735.12 (1999) Clause 7, including, however not limited to:</p> <ul style="list-style-type: none"> - All control buttons and any security operating devices to be located at a height between 700-1250mm AFFL. - Control buttons to possess continuous illumination, or a border on or around the circumference of the button of no less than 3mm in width and minimum luminance contrast of 30% to the surrounding surfaces. - All control buttons, excluding the emergency stop button and communication button, to be identified by Braille and tactile characters on or adjacent to the button which possess minimum 30% luminance contrast with surrounding surfaces. - The communication button or controls must be located on the control panel at the right-hand end of the lowest row of control buttons and be identified with the standard communication symbol. The equivalent tactile symbol and Braille to be located either above the respective button, to the left, or on the face of the button. 	NO	<p>There are two lift control panels provided within the lift car.</p> <p>Generally, the control panels meet the outlined requirements, however, there is no continuous illumination or contrasting border provided to the control buttons and there is no Braille information provided (tactile information only).</p>		<p>Supply and install two control panels in the lift which meets AS 1735.12 (1999) Clause 7.</p>
JSS-12	LIFTS	13	<p>Provide automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.</p>	NO	<p>Audible information not provided.</p>		<p>Install automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.</p>
JSS-13	EXTERNAL FURNITURE	7	<p>If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).</p>	NO	<p>No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.</p>		<p>Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.</p>


LOCATION JOHN STREET SQUARE							
JSS-14	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height varies between 480-500mm.</p> <p>There are no arms or backs provided to the seating.</p>		<p>Please provide seats which comply with AS 1428.2 (1992) Clause 27.2</p>



LOCATION FISH MARKET STATION							
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
FM-1	PLATFORMS	2	The minimum unobstructed width of the platform (measured from the back of the tactile ground surface indicators to any obstruction) must be 1200mm (AS 1428.2:1992 Clause 6.4).	NO	Where signage positioned abstracts the walkway of the platform(outbound).		Relocated signage 1200mm from back of tactile ground surface indicators.
FM-2	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.		Provide luminance contrast on poles of not less than 30%.



LOCATION			FISH MARKET STATION				
FM-3	PLATFORMS		Additional comments	NO	The handle height to reach the emergency phone handle is 1250mm AFFL.		Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.
FM-4	RAMPS	6	<p>Kerbs or kerb rails are required on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5, including, however not limited to:</p> <ul style="list-style-type: none"> - A minimum height of 65mm. - The height to the top of the kerb or kerb rail must not be between 75-150mm AFFL. - Perforations greater than 20mm must not be provided within the kerb or kerb rail between 75-150mm AFFL. - The ramp side face of the kerb or kerb rail must be flush with the ramp-side face of the handrail, or located such that the ramp side face of the kerb or kerb rail is not greater than 100mm behind the ramp side face of the handrail. 	NO	<p>No continuous kerb rail provided.</p> <p>Kerb rail do not flush with the ramp - side face of the handrail.</p> <p>Kerb rails provided to one side of the ramp only.</p> <p>Handrails height (1140mm) provided do not comply.</p> <p>270° handhold is not provided along entire length of ramp.</p>	 	Please provide kerbs or kerb rails on ramps and landings where there is no balustrade or wall provided. Kerb or kerb rails to meet AS 1428.1 (2001) Clause 5.
FM-5	RAMPS	6 18	<p>Warning TGS's to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGS's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGS's to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	No TGS's provided .		Please supply and install warning TGS's in accordance with AS 1428.4 (1992)






LOCATION			FISH MARKET STATION				
FM-6	STAIRWAYS	14	Stair treads and nosings must not overhang beyond the face of the riser. An angled riser with a maximum set back of 25mm may be provided (AS 1428.2:1992 Figure 8).	NO	Nosings provided do not comply, overhang beyond the face of the riser (approx. 22mm).		Modify stair nosings so they are in accordance with AS 1428.2:1992 Figure 8.
FM-7	STAIRWAYS	14	Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).	NO	Warning strips are not provided to stairs. Warning strips do not appear to achieve 30% luminance contrast to the background surface.		Provide and install a warning strip in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3.
FM-8	STAIRWAYS	11 14	Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to: - Handrail height between 865-1000mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.	NO	Handrails are too high. Compliant handrail terminations are not provided at the base of the stair. No 270° grabhold provided.		Supply and install handrails to both sides of stairs as per AS 1428.1:2001 Clause 6.1; 9.2

LOCATION			FISH MARKET STATION				
FM-9	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:</p> <ul style="list-style-type: none"> - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>No TGSIs provided .</p> <p>No warning strips are provided.</p> <p>TGSIs are setback 240mm from edge of stair.</p>		Supply and install warning TGSIs in accordance with AS 1428.4 (1992)
FM-10	LIFTS	13	<p>Provide lift call buttons in accordance with AS 1735.12 (1999) Clause 7.1.</p> <p>Lift call buttons to be located on a level landing (1:40) not less than 500mm from any internal corners and at a height between 900mm and 1200mm (AS 1735.12:1999 Clause 7.3.1; 7.3.3).</p>	NO	<p>Lift call button is less than 500mm to the adjacent internal corner (approx. 240mm).</p> <p>There is no Braille or tactile information provided to the buttons.</p> <p>A contrasting border / continuous illumination is not provided to the buttons.</p>		Supply and install lift buttons in accordance with AS 1735.12 (1999) Clause 7.1 and AS 1735.12:1999 Clause 7.3.1; 7.3.3.



LOCATION			FISH MARKET STATION				
FM-11	LIFTS	13 21	<p>Provide a minimum of one control panel in the lift which meets AS 1735.12 (1999) Clause 7, including, however not limited to:</p> <ul style="list-style-type: none"> - All control buttons and any security operating devices to be located at a height between 700-1250mm AFFL. - Control buttons to possess continuous illumination, or a border on or around the circumference of the button of no less than 3mm in width and minimum luminance contrast of 30% to the surrounding surfaces. - All control buttons, excluding the emergency stop button and communication button, to be identified by Braille and tactile characters on or adjacent to the button which possess minimum 30% luminance contrast with surrounding surfaces. - The communication button or controls must be located on the control panel at the right-hand end of the lowest row of control buttons and be identified with the standard communication symbol. The equivalent tactile symbol and Braille to be located either above the respective button, to the left, or on the face of the button. 	NO	<p>There are two lift control panels provided within the lift car.</p> <p>Generally, the controls panels meet the outlined requirements, however, there is no continuous illumination or contrasting border provided to the control buttons.</p>		<p>Supply and provide control buttons to possess continuous illumination, or a border on or around the circumference of the button of no less than 3mm in width and minimum luminance contrast of 30% to the surrounding surfaces.</p>
FM-12	LIFTS	13	<p>Install visible indication adjacent to the lift entrance and within the lift car at a height of no less than 1800mm in accordance with AS 1735.12 (1999) Clause 8.</p>	NO	Visible indication not provided.		<p>Provide and install visible indication adjacent to the lift entrance and within the lift car in accordance with AS 1735.12 (1999) Clause 8.</p>
FM-13	LIFTS	13	<p>Provide automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.</p>	NO	Audible information not provided.		<p>Provide and install automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.</p>




LOCATION			FISH MARKET STATION				
FM-14	EXTERNAL FURNITURE	7	If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).	NO	No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.		Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.
FM-15	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2. Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height is 515mm.</p> <p>There are no arms and backs provided to the seating.</p>		Please provide seats which comply with AS 1428.2 (1992) Clause 27.2



WENTWORTH PARK							
LOCATION							
ITEM NO.	LOCATIONS	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
WP-1	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage and shelter posts and poles do not achieve a 30% luminance contrast to the bitumen platform surface. Generally, signage and advertising board are set back from pedestrian paths of travel. However, it is noted that at the top of the ramp to the city side of the platform signage and information booth are located along the path of travel.		Provide luminance contrast on poles of not less than 30%. Provide luminance contrast on all signage and equipment that protrudes in paths of travel.
WP-2	PLATFORMS	2	Warning TGSIs to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to: - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting.	NO	TGSIs are set back 600mm from the platform edge with an overall depth of 600mm. However, TGSIs do not achieve a luminance contrast of 30% to their background surface (to the platform side of the tactiles).		Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. Existing TGSIs to be replaced are to be replaced in their current arrangement with new TGSIs that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.



LOCATION				WENTWORTH PARK			
WP-3	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1) 	NO	<p>TGSIs have not been provided to all areas to identify all hazards (e.g. ramp on outbound side of platform).</p> <p>TGSIs at the railway crossing do not appear to achieve a luminance contrast of 30% to their background surface.</p>		<p>Please supply and install warning TGSIs in accordance with AS 1428.4 (1992)</p> <p>Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.</p>
WP-4	PLATFORMS		Additional comments	NO	<p>Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:38).</p> <p>The handle height to reach the emergency phone handle is greater than 1100mm AFFL.</p> <p>It is noted that the pedestrian path of travel from the outbound platform to Wattle Street does not meet the requirements of AS 1428.1 (2001) or AS 1428.2 (1992) for stairways or ramps. The path of travel between Wattle Street and the station incorporates a series of non-complying stairways and ramps (gradients ranging between 1:11-1:15).</p>	  	<p>Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.</p>
WP-5	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-1000mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>Handrails not provided to both sides of ramp.</p> <p>Handrails are too high.</p> <p>Handrails do not allow for 270 degree handhold along entire length of handrail.</p> <p>Handrails provided do not have sufficient extensions (i.e. less than 300mm).</p>		<p>Supply and install handrails to both sides of the ramp as per AS 1428.1:2001 Clause 6.1; 10.</p>





LOCATION				WENTWORTH PARK			
WP-6	RAMPS	6 18	<p>Warning TGSi's to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSi's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSi's to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	TGSi's are not provided.		Supply and install warning TGSi's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.




LOCATION				GLEBE			
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
G-1	PLATFORMS	2	<p>Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).</p>	NO	Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.		Provide luminance contrast on poles of not less than 30%.
G-2	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1) 	NO	TGSIs have not been provided to all areas to identify all hazards (i.e. stairway).		Please supply and install warning TGSi's in accordance with AS 1428.4 (1992) Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.


LOCATION			GLEBE				
G-3	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-100mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>Handrails provided to one side of the ramp only.</p> <p>No handrails extension provided.</p>		<p>Supply and install handrails to both sides of the ramp as per AS 1428.1:2001 Clause 6.1; 10.</p>
G-4	RAMPS	6 18	<p>Warning TGSI's to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSI's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSI's to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSI's are not provided to both top and bottom of the ramp.</p>		<p>Supply and install warning TGSI's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.</p>
G-5	STAIRWAYS	14	<p>Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>	NO	<p>No warning strips provided to stair nosings.</p>		<p>Supply and install warning strips on nosings in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3.</p>


LOCATION			GLEBE				
G-6	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:</p> <ul style="list-style-type: none"> - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSIs are not provided on both top and bottom of the stairway (both stairs).</p>		<p>Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.</p>
G-7	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height is 460mm.</p> <p>There are no arms and backs provided to the seating.</p>		<p>Please provide seats which comply with AS 1428.2 (1992) Clause 27.2</p>


LOCATION			JUBILEE PARK				
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
JP-1	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	<p>Signage and shelter posts and poles do not achieve a 30% luminance contrast to the bitumen platform surface.</p> <p>Generally, signage and advertising board are set back from pedestrian paths of travel.</p>		<p>Provide luminance contrast on poles of not less than 30%.</p> <p>Provide luminance contrast on all signage and equipment that protrudes in paths of travel.</p>
JP-2	PLATFORMS	2	Tactile ground surface indicators to be installed per AS 1428.4 (1992) Clause 6.7, extending the full length of the platform, and set back 300mm from the platform edge, with an overall depth of 300mm.	NO	<p>TGSI's are set back 600mm from the platform edge with an overall depth of 600mm.</p> <p>However, TGSI's do not achieve a luminance contrast of 30% to their background surface (to the platform side of the tactiles).</p>		<p>Provide luminance contrast between TGSI's and background surface (platform side) in accordance with AS 1428.4 (1992) Clause 6.7</p> <p>Existing TGSI's to be replaced are to be replaced in their current arrangement with new TGSI's that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.</p>



LOCATION			JUBILEE PARK				
JP-3	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1) 	NO	TGSIs have not been provided to all areas to identify all hazards (e.g. stairways, ramps on outbound side of platform).		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992) Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.
JP-4	PLATFORMS		Additional comments	NO	<p>Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:38).</p> <p>The handle height to reach the emergency phone handle is greater than 1100mm AFFL.</p>		Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.
JP-5	RAMPS	10	Provide a smooth transition between abutting surfaces. A construction tolerance of 3mm for vertical differences is allowable, or 5mm where edges are rounded or bevelled. Gaps must not exceed 5mm in width (AS 1428.1:2001 Clause 5.1.2; 12).	NO	There is an uneven transition between concrete and bitumen ground surfaces at the base of the ramp.		Provide a smooth transition between concrete and bitumen ground surfaces at the base of the ramp in accordance with AS 1428.1:2001 Clause 5.1.2; 12.
JP-6	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-100mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>Handrail is not continuous along entire length of ramp.</p> <p>Handrail provided to one side of ramp only.</p> <p>Handrails provided do not have sufficient extensions (i.e. less than 300mm).</p>	 	Supply and install handrails to both sides of the ramp as per AS 1428.1:2001 Clause 6.1; 10.




LOCATION			JUBILEE PARK				
JP-7	RAMPS	6 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSIs do not achieve a luminance contrast of 30% to their background surface (45% required per AS 1428 4.1 (2009)).</p>		<p>Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.</p>
JP-8	STAIRWAYS	14	<p>Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>	NO	<p>Warning strips do not appear to achieve 30% luminance contrast to the background surface.</p> <p>Warning strips are not provided to stairs.</p>		<p>Supply and install a warning strip with a minimum luminance contrast of 30% to the background in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>
JP-9	STAIRWAYS	11 14	<p>Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-100mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	<p>Handrails are too high.</p> <p>Compliant handrail terminations are not provided at the base of the stair.</p> <p>Compliant handrail extensions are not provided to the stairs.</p> <p>Handrails are not provided to both sides of all flights of stairs.</p>		<p>Provide and install handrails to both sides of a stair in accordance with AS 1428.1:2001 Clause 6.1; 9.2</p>




LOCATION			JUBILEE PARK				
JP-10	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:</p> <ul style="list-style-type: none"> - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSIs are not compliant.</p> <p>TGSIs are setback 240mm from edge of stair.</p> <p>A luminance contrast of 30% does not appear to be achieved.</p> <p>TGSIs are not provided to the stairway.</p>		<p>Supply and install warning TGSIs in accordance with AS 1428.4 (1992)</p>
JP-11	EXTERNAL FURNITURE	7	<p>If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).</p>	NO	<p>No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.</p>		<p>Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.</p>



LOCATION			JUBILEE PARK				
JP-12	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). -With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height is 470mm.</p> <p>There are no arms or backs provided to the seating.</p>		<p>Please provide seats which comply with AS 1428.2 (1992) Clause 27.2</p>



LOCATION			ROZELLE BAY				
ITEM NO.	LOCATIONS	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
RB-1	PLATFORMS	2	<p>Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).</p>	NO	<p>Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.</p>		<p>Provide luminance contrast on poles of not less than 30%.</p>




LOCATION			ROZELLE BAY				
RB-2	PLATFORMS	2	<p>Warning TGSi's to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to:</p> <ul style="list-style-type: none"> - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSi's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. 	NO	<p>TGSi's are set back 600mm from the platform edge with an overall depth of 600mm.</p> <p>However, TGSi's do not achieve a luminance contrast of 30% to their background surface (to the platform side of the tiles).</p>		<p>Supply and install warning TGSi's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions.</p> <p>Existing TGSi's to be replaced are to be replaced in their current arrangement with new TGSi's that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.</p>
RB-3	PLATFORMS	18	<p>Tactile ground surface indicators must be installed on an access path to indicate:</p> <ul style="list-style-type: none"> - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1) 	NO	<p>Handrails provided are too high(1100mm).</p> <p>No 270° c grabhold provided.</p>		<p>Supply and install handrails to both sides of the ramp as per AS 1428.1:2001 Clause 6.1; 10.</p> <p>Where TGSi's do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.</p>



LOCATION			ROZELLE BAY				
RB-4	PLATFORMS		Additional comments	NO	<p>Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:38).</p> <p>The handle height to reach the emergency phone handle is 1250mm AFFL.</p> <p>Northside of the footpath through adjacent parkland to The Crescent has uneven surfaces and width of the footpath varies between 800 - 1000 mm.</p>		Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.
RB-5	RAMPS	10	Provide a smooth transition between abutting surfaces. A construction tolerance of 3mm for vertical differences is allowable, or 5mm where edges are rounded or bevelled. Gaps must not exceed 5mm in width (AS 1428.1:2001 Clause 5.1.2; 12).	NO	There is an uneven transition between concrete and bitumen ground surfaces at the base of the ramp.		Provide a smooth transition between abutting surfaces between concrete and bitumen ground surfaces at the base of the ramp in accordance with AS 1428.1:2001 Clause 5.1.2; 12.
RB-6	RAMPS	6 11	<p>Handrails to be installed to both sides of the ramp per AS 1428.1:2001 Clause 6.1; 10, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-100mm. - Appropriate handrail extensions of not less than 300mm (450mm preferred). - Handrail terminations to be turned downwards or away to a side wall. - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	Handrail is not continuous along entire length of ramp.		Supply and install handrails on both sides of ramp as per AS 1428.1:2001 Clause 6.1; 9.2

LOCATION			ROZELLE BAY				
RB-7	RAMPS	6 18	<p>Warning TGSi's to be provided in accordance with AS 1428.4 (1992):</p> <ul style="list-style-type: none"> - to be provided at the commencement and conclusion of all ramps, set back 300mm from the ramp surface with an overall depth of 600mm. - to be provided at ramp landings and set back 300mm from the ramp edge for an overall depth of 300mm. - TGSi's to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - to be installed such there is no likelihood of edges lifting. - TGSi's to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	No TGSi's provided to ramp.		Supply and install warning TGSi's to the ramp in accordance with AS 1428.4 (1992)
RB-8	STAIRWAYS	14	<p>Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).</p>	NO	Warning strips do not appear to achieve 30% luminance contrast to the background surface.		Supply and install a warning strip in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3
RB-9	STAIRWAYS	11 14	<p>Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to:</p> <ul style="list-style-type: none"> - Handrail height between 865-1000mm, - Appropriate handrail extensions or provision of a domed button, - Handrail terminations to be turned downwards or away to a side wall, and - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction, - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface. 	NO	Compliant handrail terminations are not provided at the base of the stair.		Supply and install handrails on stairs as per AS 1428.1:2001 Clause 6.1; 9.2


LOCATION			ROZELLE BAY				
RB-10	STAIRWAYS	14 18	<p>Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to:</p> <ul style="list-style-type: none"> - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL. 	NO	<p>TGSIs are not compliant.</p> <p>TGSIs are setback 240mm from edge of stair.</p> <p>A luminance contrast of 30% does not appear to be achieved.</p>		<p>Supply and install warning TGSIs to stairways in accordance with AS 1428.4 (1992).</p>
RB-11	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). - With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height is 470mm.</p> <p>There are no arms or backs provided to the seating.</p>		<p>Please provide seats which comply with AS 1428.2 (1992) Clause 27.2</p>

LOCATION			LILYFIELD				
ITEM NO.	LOCATION	DSAPT PART	DISABILITY STANDARDS FOR ACCESSIBLE PUBLIC TRANSPORT (DSAPT)	DSAPT COMPLIANT	COMMENT	PHOTO	WORK PROPOSED
L-1	PLATFORMS	2	Poles, columns, stanchions, bollards and fixtures must not project into an access path. Obstacles that abut an access path must have a luminance contrast with a background of not less than 30% (DSAPT 2.5).	NO	Signage, posts, emergency phone, barrier gates and the like do not achieve a 30% luminance contrast to the bitumen platform surface.		Provide luminance contrast on poles of not less than 30%.
L-2	PLATFORMS	2	Warning TGSIs to be provided in accordance with AS 1428.4 (1992) Clause 6.7, including, however not limited to: - To extend for the full length of the platform, be setback 300mm from the edge of the platform with a depth of 300mm. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting.	NO	TGSIs are set back 600mm from the platform edge with an overall depth of 600mm. However, TGSIs do not achieve a luminance contrast of 30% to their background surface (to the platform side of the tactile).		Supply and install warning TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. Existing TGSIs to be replaced are to be replaced in their current arrangement with new TGSIs that have a complying colour contrast with the adjacent platform surface. Whilst the Standards have changed since these were installed, the tiles are to be in the current configuration. The new tiles to be installed are to match the tiles recently installed on the Inner West Extension.
L-3	PLATFORMS	18	Tactile ground surface indicators must be installed on an access path to indicate: - Overhead obstructions below a height of 2000mm. - Hazards within a circulation space or adjacent to a path of travel. - Pedestrian crossings at roadways (where the roadway is flush with the accessway). - Pedestrian crossing in high use vehicle areas, i.e. car parks. (AS 1428.2 (1992) Clause 18.1)(DSAPT 18.1)	NO	TGSIs have not been provided to all areas to identify all hazards (i.e. stairway).		Please supply and install warning TGSIs in accordance with AS 1428.4 (1992) Where TGSIs do not extend the full width of rail crossings, they are to be modified to ensure that they comply with the requirements of AS 1428.4.

LOCATION			LILYFIELD			
L-4	PLATFORMS		Additional comments.	NO	Platform surfaces slopes towards the front of the platform edge (crossfall up to 1:33). The handle height to reach the emergency phone handle is 1250mm AFFL.	 Emergency phone to be relocated to relevant height in accordance with relevant Australian Standard.
L-5	STAIRWAYS	14	Install a warning strip of not less than 50mm and not more than 75mm on the tread nosing and a strip no less than 25mm and not more than 50mm to be provided to the vertical riser refer Figure 9). Nosings must possess a minimum luminance contrast of 30% to the background. (AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3).	NO		 Supply and install a warning strip in accordance with AS 1428.1:2001 Clause 9.1(c); HB 197:1999 Table 3
L-6	STAIRWAYS	11 14	Handrails to be installed to both sides of a stair per AS 1428.1:2001 Clause 6.1; 9.2, including, however not limited to: - Handrail height between 865-100mm. - Appropriate handrail extensions or provision of a domed button. - Handrail terminations to be turned downwards or away to a side wall, and - A clearance of not less than 50mm to be provided between handrails and adjacent wall or other obstruction. - Where there is a background wall to the handrails, the handrails shall achieve a luminance contrast of not less than 30% to the wall surface.	NO	Compliant handrail extensions are not provided at the base of the stair.	 Supply and install handrails as per AS 1428.1:2001 Clause 6.1; 9.2
L-7	STAIRWAYS	14 18	Warning TGSIs to be provided in accordance with AS 1428.4 (1992), including, however not limited to: - To be setback 300mm from the edge of the stair tread with a depth of 600mm. - TGSIs may be reduced to a depth of 300mm in an enclosed stair. - TGSIs to achieve a luminance contrast of not less than 30% to the background surface and shall be slip resistant in wet and dry conditions. - To be installed such there is no likelihood of edges lifting. - Where handrails are not continuous and TGSIs are not provided a domed button to be installed. - TGSIs to be installed on an access path to indicate overhead obstructions below 2000mm AFFL.	NO	TGSIs are not provided to the stairway.	Supply and install warning TGSIs to the stairway in accordance with AS 1428.4 (1992)

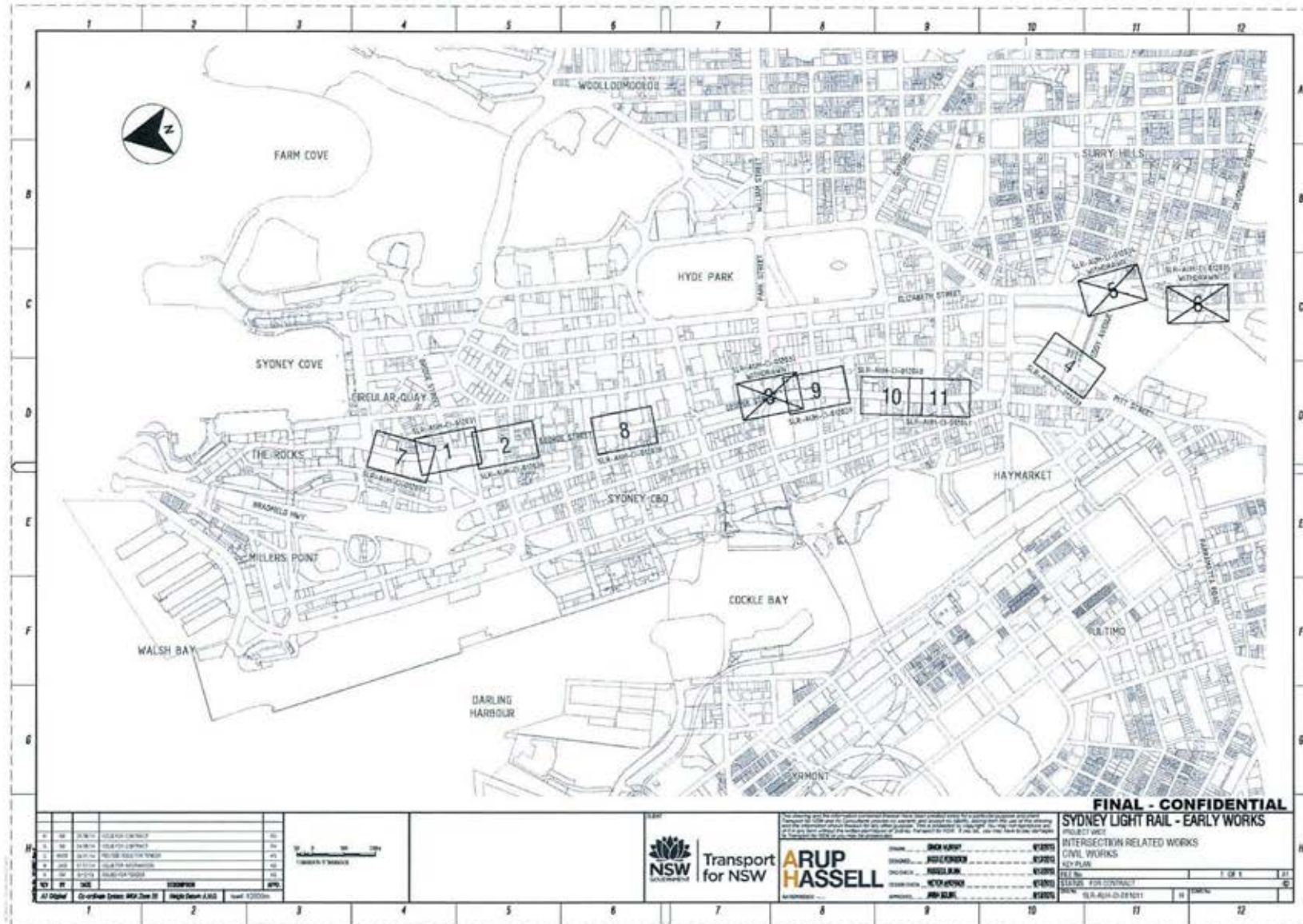
LOCATION			LILYFIELD				
L-8	LIFTS	13	<p>Provide lift call buttons in accordance with AS 1735.12 (1999) Clause 7.1.</p> <p>Lift call buttons to be located on a level landing (1:40) not less than 500mm from any internal corners and at a height between 900mm and 1200mm (AS 1735.12:1999 Clause 7.3.1; 7.3.3).</p>	NO	<p>Lift call button is less than 500mm to the adjacent internal corner (approx. 325mm).</p> <p>There is no Braille or tactile information provided to the buttons.</p> <p>A contrasting border / continuous illumination is not provided to the buttons.</p>		
L-9	LIFTS	13 21	<p>Provide a minimum of one control panel in the lift which meets AS 1735.12 (1999) Clause 7, including, however not limited to:</p> <ul style="list-style-type: none"> - All control buttons and any security operating devices to be located at a height between 700-1250mm AFFL. - Control buttons to possess continuous illumination, or a border on or around the circumference of the button of no less than 3mm in width and minimum luminance contrast of 30% to the surrounding surfaces. - All control buttons, excluding the emergency stop button and communication button, to be identified by Braille and tactile characters on or adjacent to the button which possess minimum 30% luminance contrast with surrounding surfaces. - The communication button or controls must be located on the control panel at the right-hand end of the lowest row of control buttons and be identified with the standard communication symbol. The equivalent tactile symbol and Braille to be located either above the respective button, to the left, or on the face of the button. 	NO	<p>There are two lift control panels provided within the lift car.</p> <p>Generally, the controls panels meet the outlined requirements, however, there is no continuous illumination or contrasting border provided to the control buttons.</p>		
L-10	LIFTS	13	<p>Install visible indication adjacent to the lift entrance and within the lift car at a height of no less than 1800mm in accordance with AS 1735.12 (1999) Clause 8.</p>	NO	<p>Visible indication not provided.</p>		<p>Supply and install visible indication adjacent to the lift entrance and within the lift car at a height of no less than 1800mm in accordance with AS 1735.12 (1999) Clause 8.</p>

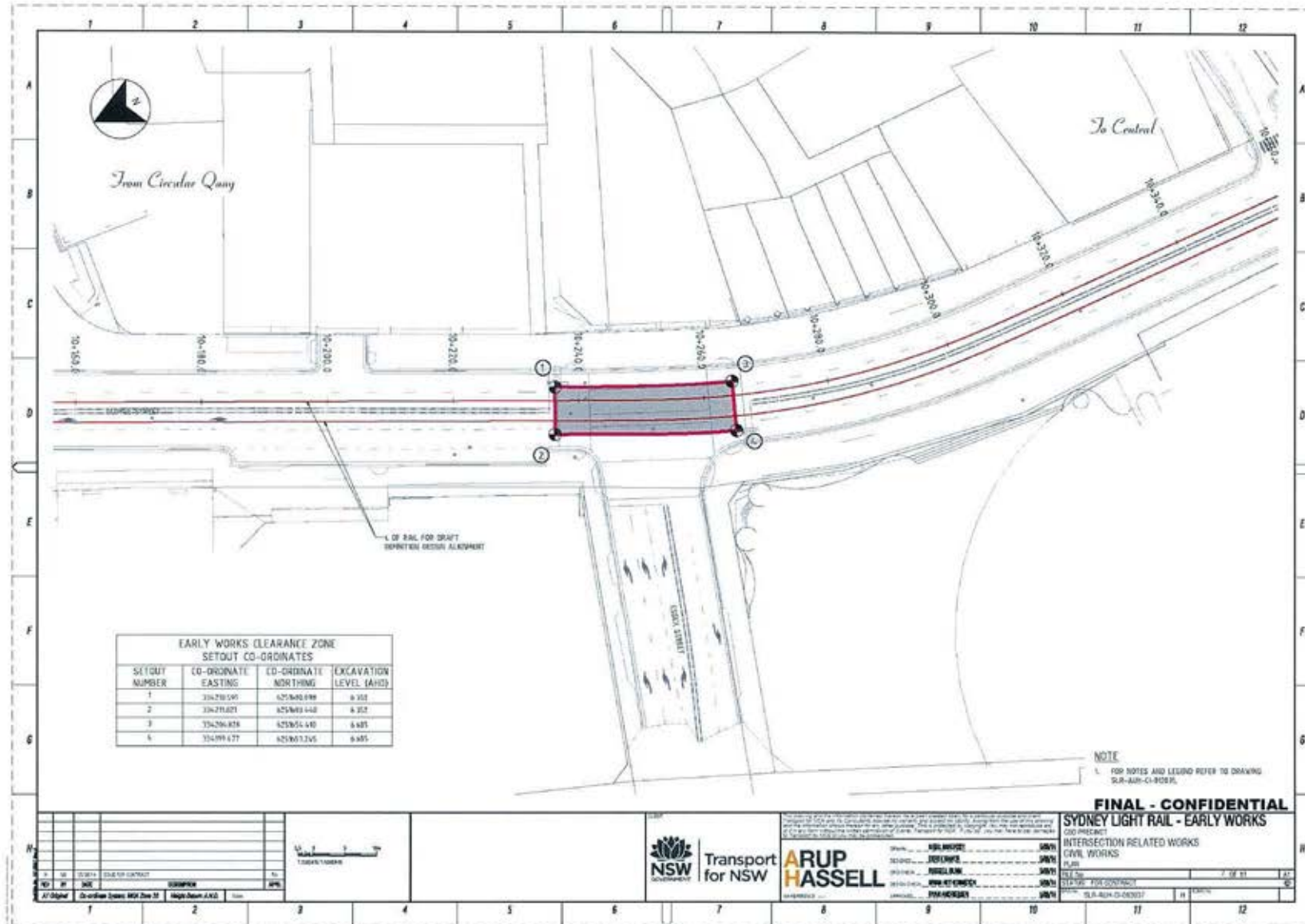
LOCATION			LILYFIELD				
L-11	LIFTS	13	Provide automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.	NO	Audible information not provided.		Supply and install automatic audible information within the lift car and upon lift arrival in accordance with AS 1735.12 (1999) Clause 8.
L-12	EXTERNAL FURNITURE	7	If a waiting area is provided, a minimum of 2 seats or 5% of the seats must be identified as available for passengers with disabilities, if required (DSAPT 7.1).	NO	No allocated spaces for wheelchair users were identified or designated, however there is sufficient space (and sheltered) adjacent seating to fit a wheelchair seating space.		Provide a wheelchair seating space and designated signage. A designated space is to be marked on the surface of the platform and identified with the internationally recognised stylised wheelchair sign to distinguish the usage of the space. The space is to be located as near as practical to the designated wheelchair boarding point indicated on the platform.

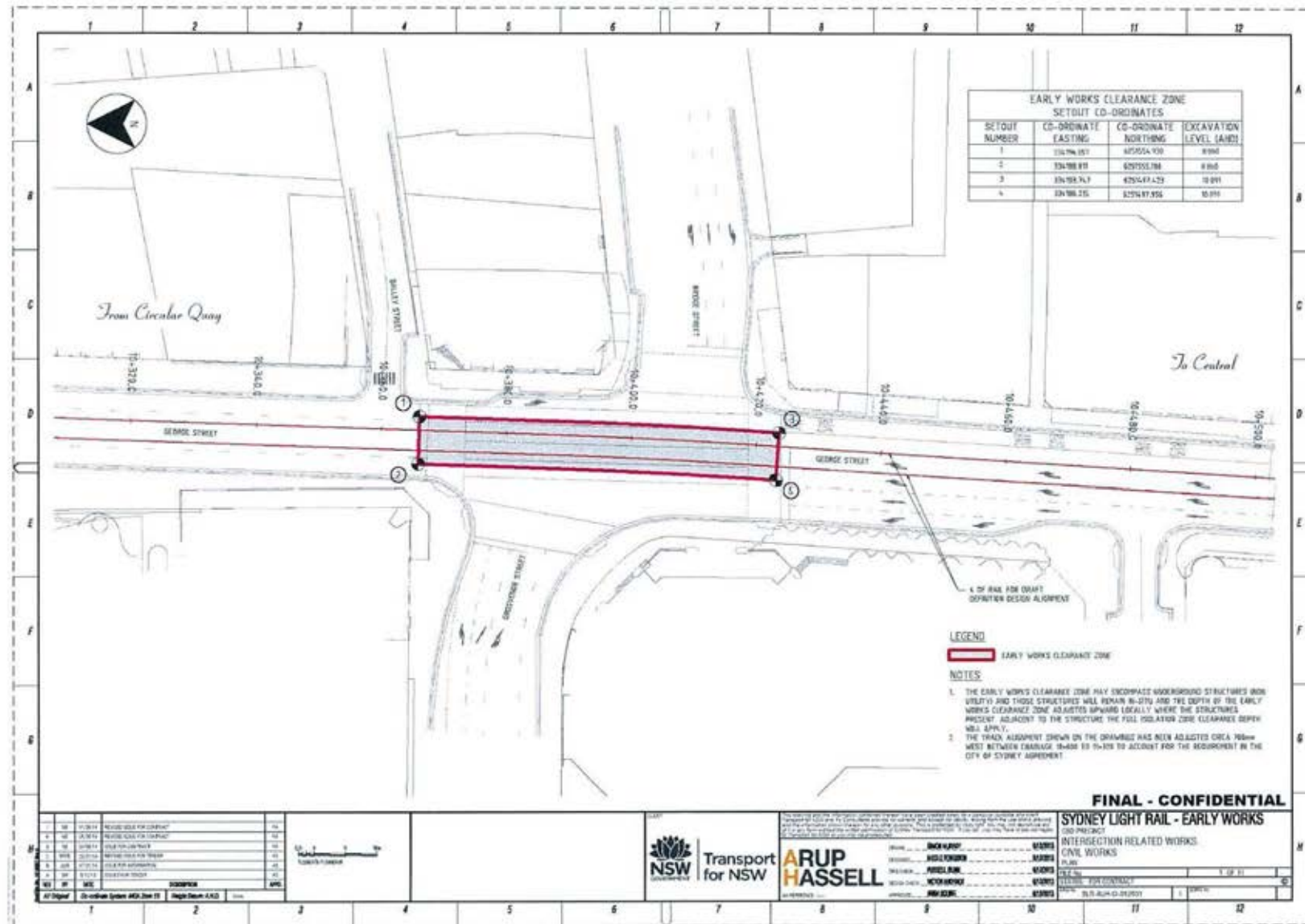
LOCATION			LILYFIELD				
L-13	EXTERNAL FURNITURE	23	<p>Seats must comply with AS 1428.2 (1992) Clause 27.2, Seating in pedestrian areas, including, however not limited to:</p> <ul style="list-style-type: none"> - Generally, a seat height of 400-450mm, however a seating height of 520mm is preferred where there is likely to be a high proportion of elderly users. Seats at lower heights may represent a hazard to people with vision impairments and older persons who may experience difficulty when lowering to the seated position (AS 1428.2:1992 Clause 27.2). - With side arms which extend a further 260mm +/- 40mm in height above the height of the seat, and a back height of 750mm – 790mm to be provided (AS 1428.2:1992 Clause 27.2). - The front of the seat shall have a clear space between any legs at ground level to within 150mm of the front edge of the seat, and to within 100mm of the seat height to allow for rearward adjustments of feet when rising (AS 1428.2:1992 Clause 27.2(a)). - When located outdoors, the top surface of seats should be angled appropriately (maximum slope of 100° - 105°) to enable adequate water run-off (AS 1428.2:1992 Clause 27.2 (e)). 	NO	<p>Seat height is 360mm.</p> <p>Back height is 810mm.</p> <p>There are no arms provided to the seating.</p>		<p>Please provide seats which comply with AS 1428.2 (1992) Clause 27.2</p>

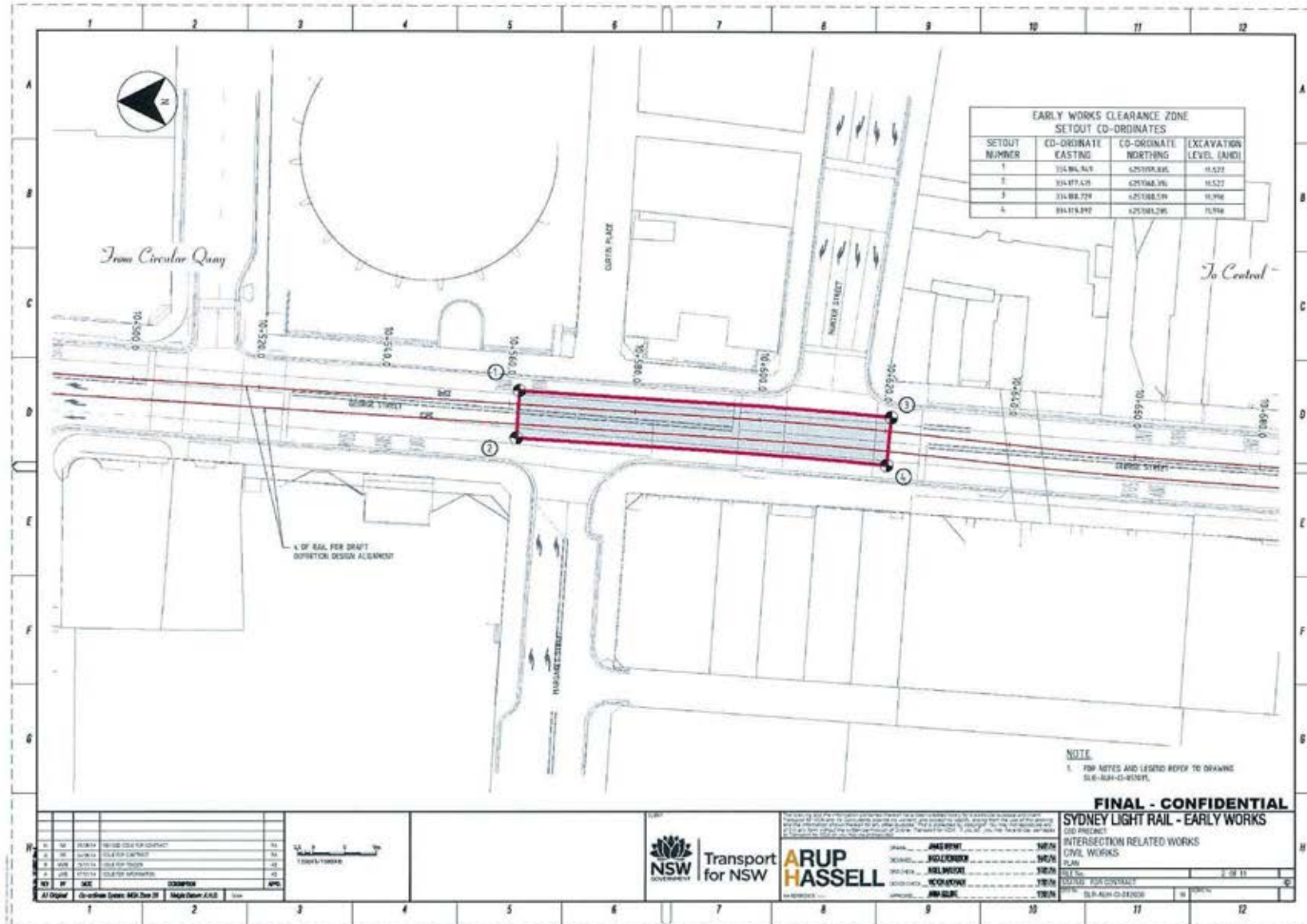
Attachment 3 – Package 2 Drawings and Schedules

Portion Reference	Description	Drawing No	Date/ Rev
2	General		
	Civil Works Key Plan	SLR-AUH-CI-011011	H
2.1	Essex Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012037	H
2.2	George Street / Grosvenor Street / Bridge Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012031	I
2.3	George Street / Hunter Street / Margaret Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012036	H
2.4	George Street / King Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012038	H
2.5	George Street / Bathurst Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012039	H
2.6	George Street / Liverpool Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012040	H
2.7	George Street / Goulburn Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012041	H
2.8	Pitt Street / Rawson Street		
	Intersection Related Works, Civil Works Plan	SLR-AUH-CI-012033	H









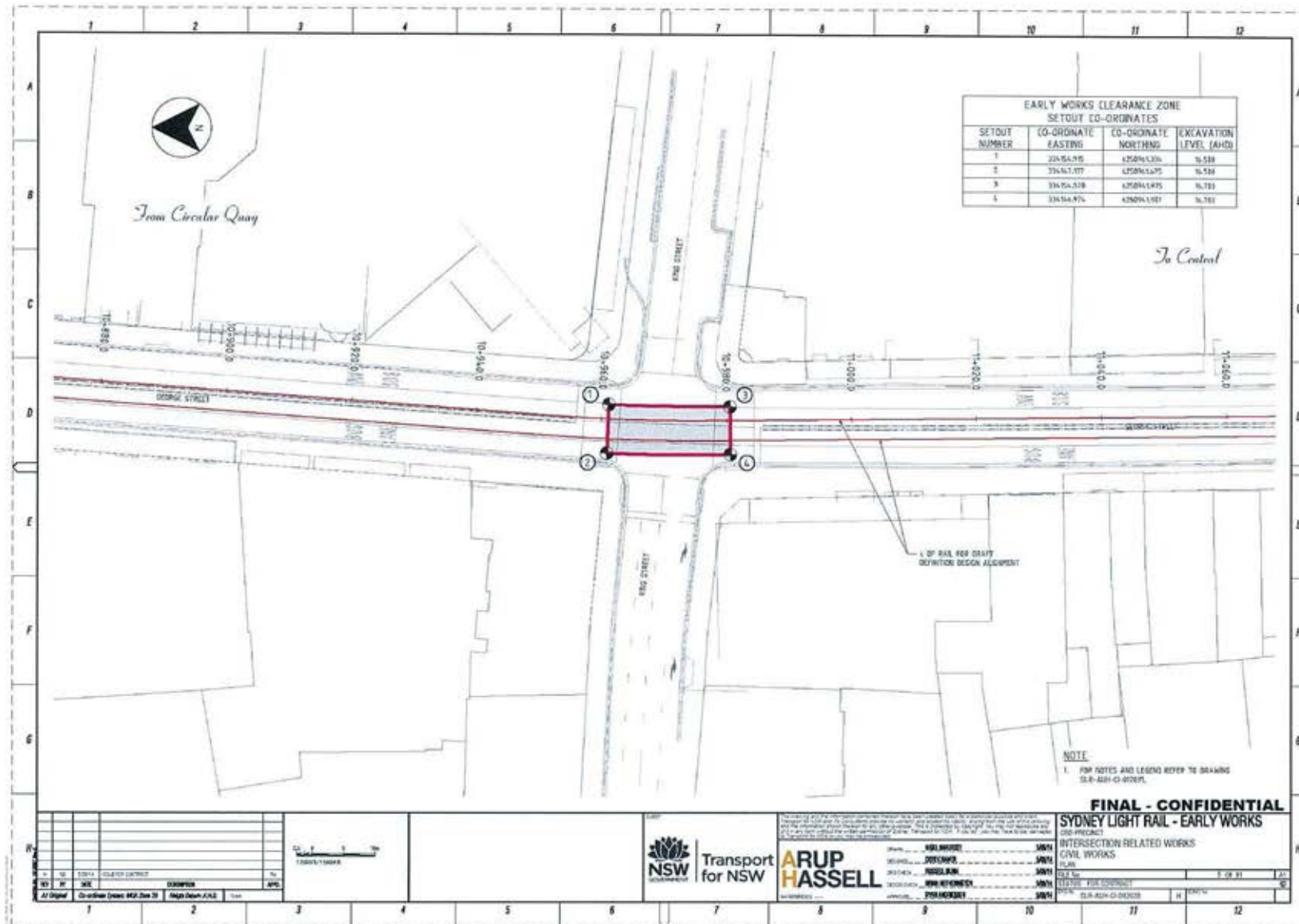
NO	REV	DATE	DESCRIPTION	BY	CHK
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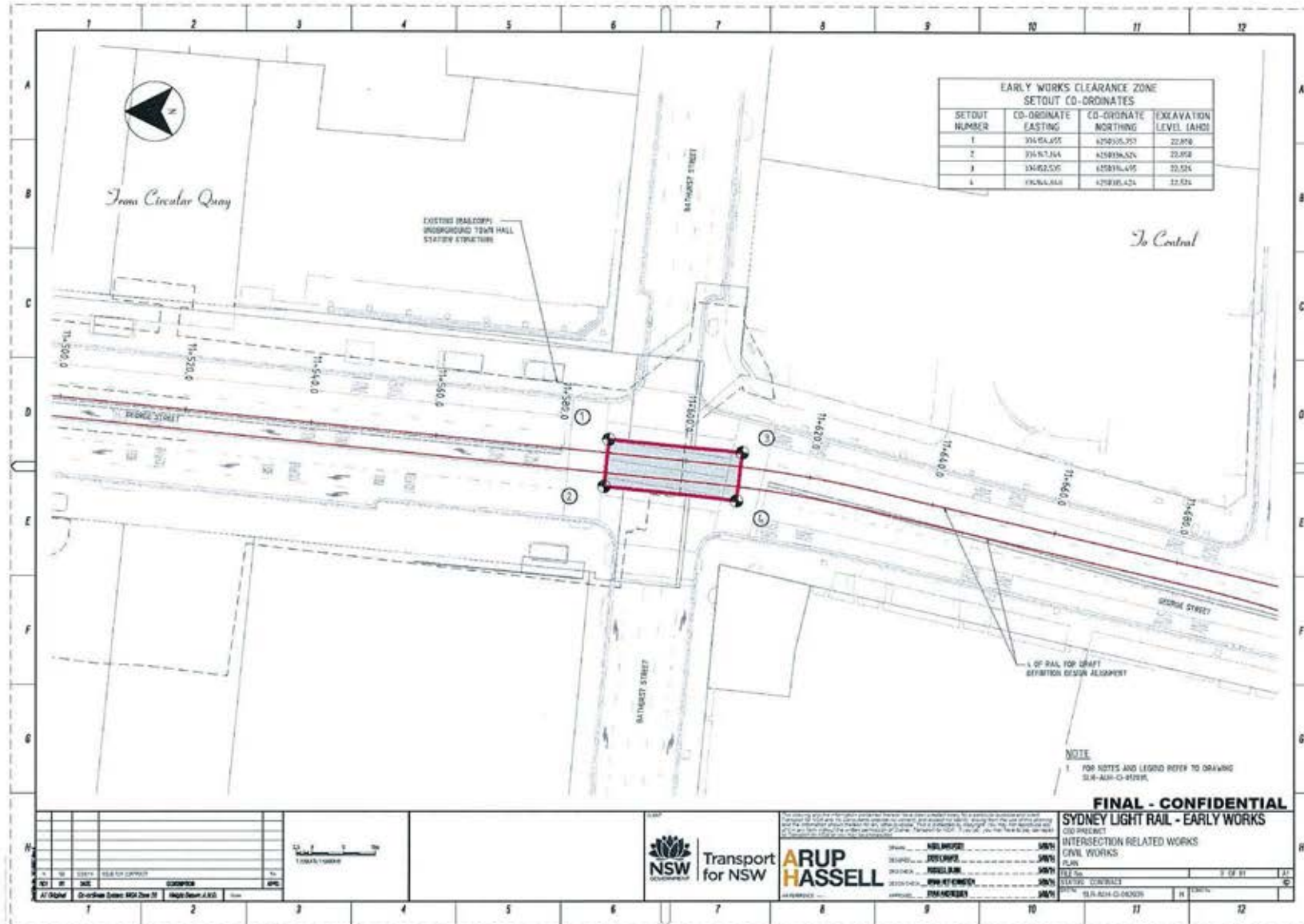
NSW Transport for NSW

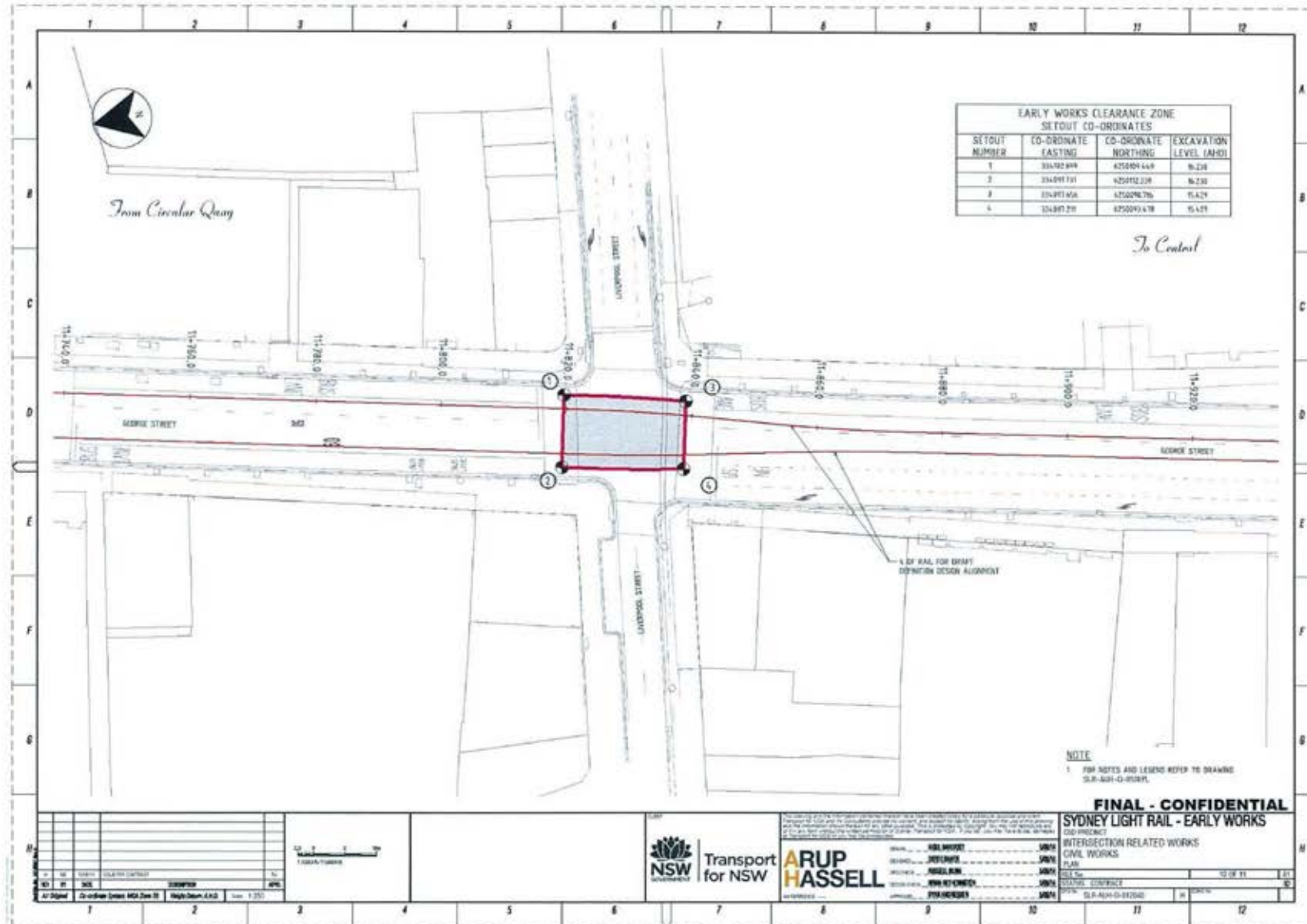
ARUP HASSELL

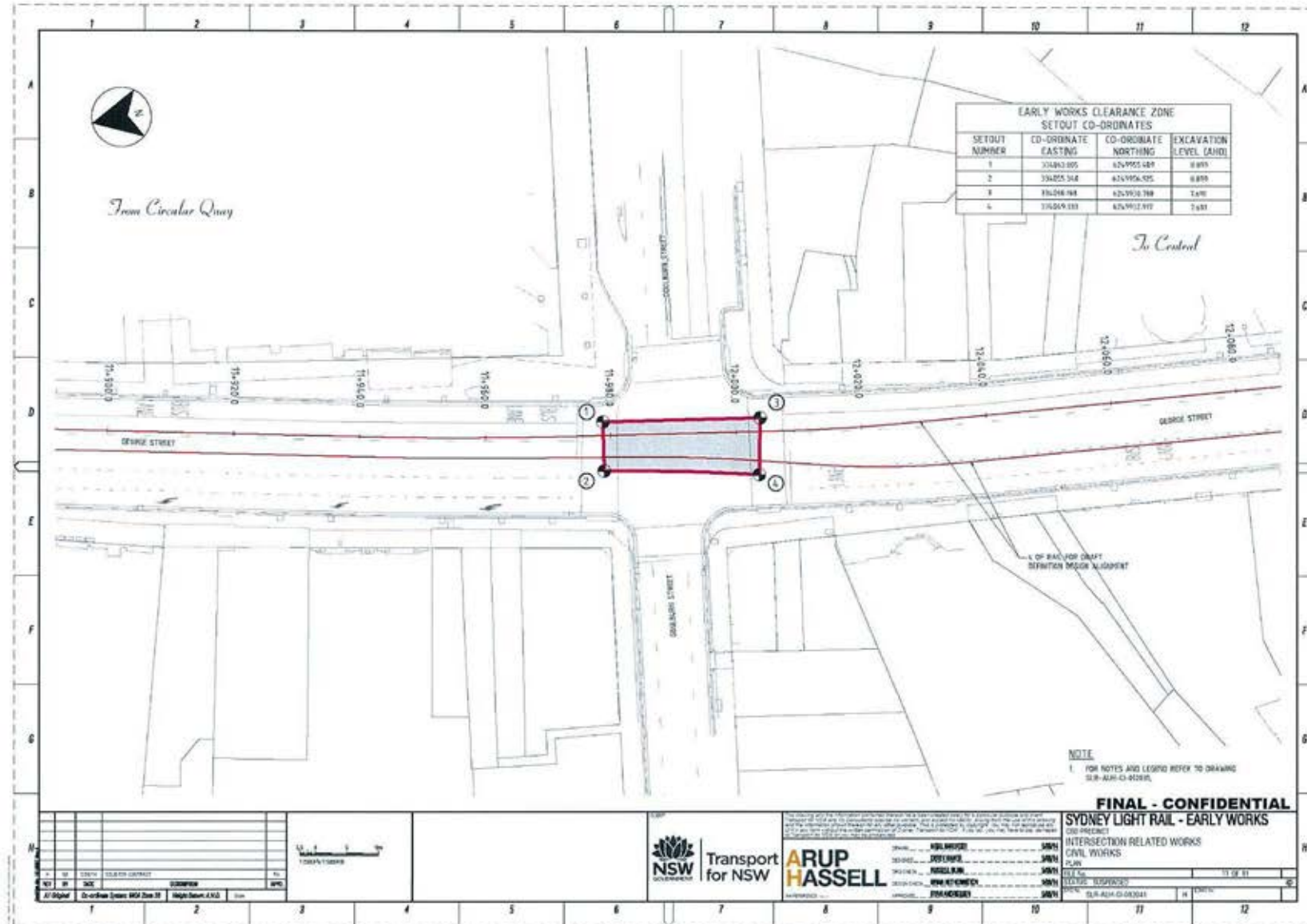
FINAL - CONFIDENTIAL
SYDNEY LIGHT RAIL - EARLY WORKS
INTERSECTION RELATED WORKS
CIVIL WORKS
PLAN

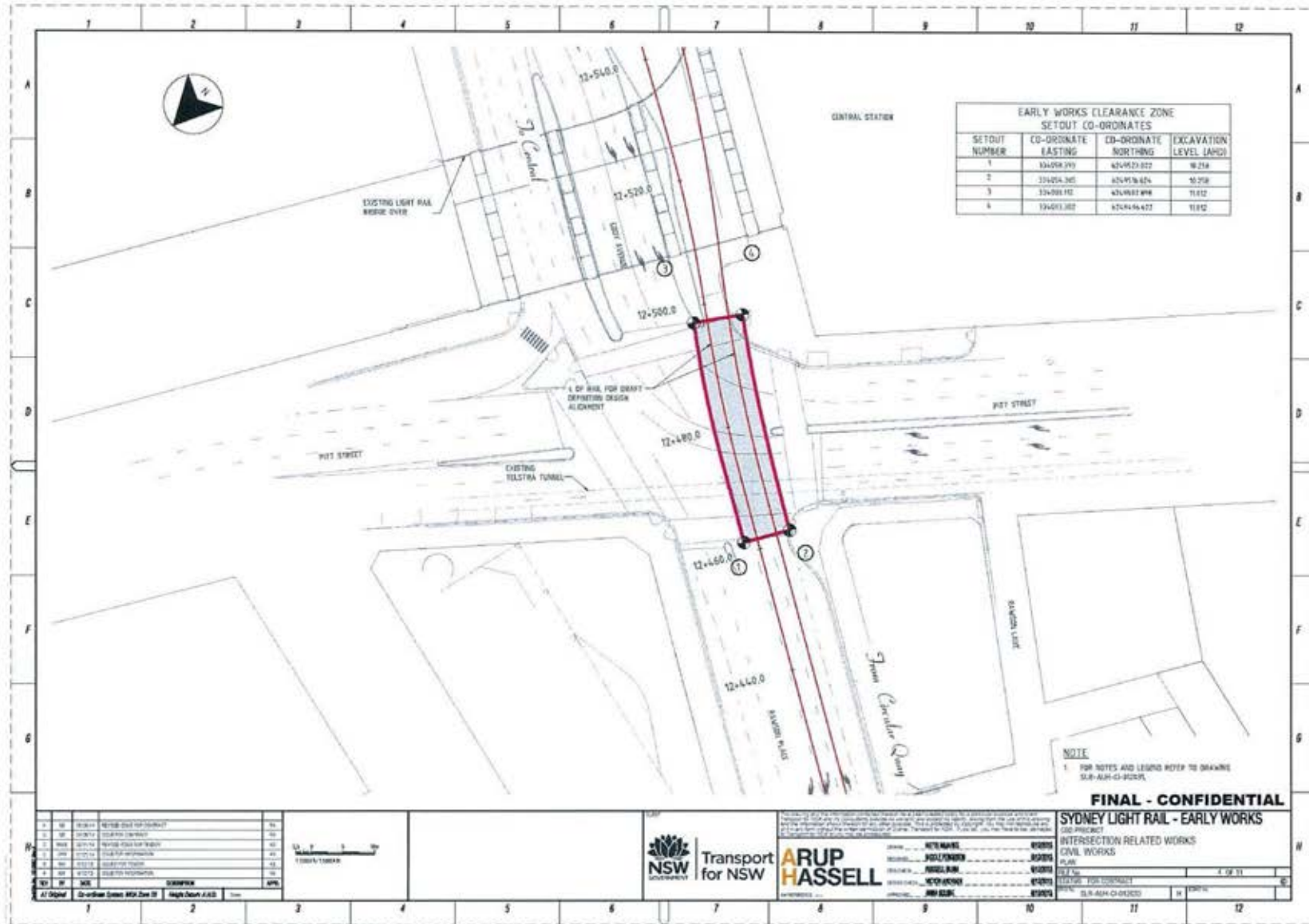
DATE: 11/01/2018
SCALE: 1:1000
DRAWN: JIM BLAKE
CHECKED: JIM BLAKE
APPROVED: JIM BLAKE











Attachment 4 – Items Remaining in Situ

Junction	Data Base ID	Asset ID	HLFC	Size	Chainage Start	Chainage Finish
Essex	6780	AUSG PIT_SY50389	Pit	180	10+241.0	10+248.0
Essex	4816	JEM_HP_10248	High Pressure	100	10+242.0	10+242.0
Essex	5761	SW_WW_1025	Wastewater	150	10+166.0	10+266.0
Essex	5449	SW_SW_1024	Manholes	375	10+252.0	10+252.0
Essex	5448	SW_SW_1016	Stormwater	600 x 900	10+135.0	10+331.0
Essex	5447	SW_SW_1014	Stormwater	900 x 750mm	10+140.0	10+251.0
Essex	10126	VS_F_10240_10241	Optic Fibre		10+240.0	10+241.0
Essex	5130	OPTU_F_E87_E293	Optic Fibre	100	10+259.0	10+260.0
Essex	10105	UECO_F_10252_10333	Optic Fibre	100	10+252.0	10+299.0
Essex	7372	VER_F_193_272	Optic Fibre	100	10+268.0	10+268.0
Bridge_Grosvenor	6821	AUSG PIT_SY51205	Pit	1.71m x 1.33m x 1.85m	10+393.0	10+396.0
Bridge_Grosvenor	6803	AUSG PIT_SY50714	Pit	180	10+411.0	10+414.0
Bridge_Grosvenor	6804	AUSG PIT_SY50720	Pit		10+414.0	10+418.0
Bridge_Grosvenor	6805	AUSG PIT_SY50729	Pit	180	10+424.0	10+429.0
Bridge_Grosvenor	6795	AUSG PIT_SY50644	Pit	1.1m x 2.9m	10+390.0	10+392.0
Bridge_Grosvenor	6610	AUSG AUX_SY50639_SY50644_9W	Auxiliary	180	10+391.0	10+391.0
Bridge_Grosvenor	10128	VS_F_10362_10364	Optic Fibre		10+362.0	10+364.0
Bridge_Grosvenor	10106	UECO_F_10341_10341	Optic Fibre	100	10+342.0	10+363.0
Bridge_Grosvenor	7368	VER_F_349_190	Optic Fibre	100	10+394.0	10+394.0
Bridge_Grosvenor	5762	SW_WW_1037	Manholes	300	10+365.0	10+366.0
Hunter_Margaret	11528	AUSG 11_SY51039_51040_4W	11kv	100	10+569.0	10+569.0
Hunter_Margaret	11530	AUSG 11_SY51042_SY51101_12W	11kv	*1000	10+598.0	10+607.0
Hunter_Margaret	6489	AUSG 11_SY50947_SY51042_22W	11kv	180	10+567.0	10+576.0
Hunter_Margaret	6814	AUSG PIT_SY51042	Pit	3 x 2.4 x 2.25m	10+577.0	10+577.0
Hunter_Margaret	6813	AUSG PIT_SY51040	Pit	2.8m x 2.2m	10+570.0	10+571.0
Hunter_Margaret	6818	AUSG PIT_SY51119	Pit	3.1 x 1.7 x 2.15m	10+607.0	10+607.0
Hunter_Margaret	6817	AUSG PIT_SY51101	Pit	1.8 x 3.1 x 1.75m	10+608.0	10+610.0
Hunter_Margaret	6822	AUSG PIT_SY51217	Pit	2 x 1.4 x 2.3m	10+609.0	10+609.0
Hunter_Margaret	10140	AAPT_F_10618_10660	Optic Fibre		10+618.0	10+660.0
Hunter_Margaret	10234	JEM_HP_10574WE	High Pressure	100	10+572.0	10+574.0
Hunter_Margaret	4864	JEM_LP_10799W	Low Pressure	110	10+491.0	11+156.0
Hunter_Margaret	5078	OPTU_F_E308_E316	Optic Fibre	100	10+604.0	10+831.0
Hunter_Margaret	5122	OPTU_F_E625_E98	Optic Fibre	100	10+604.0	10+608.0
Hunter_Margaret	5126	OPTU_F_E655_E624	Optic Fibre	100	10+607.0	10+617.0
Hunter_Margaret	12401	OPTU_TBC_E595_E601	Pipe	100	10+541.0	10+567.0
Hunter_Margaret	12358	OPTU_F_E601_E625	Pipe	100	10+576.0	10+576.0
Hunter_Margaret	12362	OPTU_F_E619_E617	Pipe	100	10+604.0	10+604.0
Hunter_Margaret	12363	OPTU_F_E619_E620	Pipe	100	10+604.0	10+607.0
Hunter_Margaret	12364	OPTU_F_E620_E616	Pipe	100	10+607.0	10+608.0
Hunter_Margaret	12365	OPTU_F_E620_E623	Pipe	100	10+611.0	10+611.0
Hunter_Margaret	12361	OPTU_F_E616_E932	Pipe	100	10+612.0	10+613.0
Hunter_Margaret	5453	SW_SW_1058	Manholes	560x830	10+608.0	10+609.0
Hunter_Margaret	5767	SW_WW_1058	Manholes	990X660	10+576.0	10+830.0
Hunter_Margaret	13041	UECO_F_10600_10625	Pipe	100	10+602.0	10+609.0
King	6845	AUSG PIT_SY52201	Pit	1.8 x 3 x 2.25m	10+975.0	10+982.0

Junction	Data Base ID	Asset ID	HLFC	Size	Chainage Start	Chainage Finish
King	6841	AUSG PIT_SY52168	Pit	1.8 x 1.8m	10+967.0	10+968.0
King	10143	AAPT F_10783_10978	Optic Fibre		10+783.0	10+978.0
King	5771	SW_WW_1083	Manholes	300	10+838.0	11+174.0
King	10766	UECO Tu_F_10816_10850	Optic Fibre	100	10+770.0	11+604.0
Bathurst	6869	AUSG PIT_SY53357	Pit		11+602.0	11+604.0
Bathurst	6872	AUSG PIT_SY53375	Pit	10.4 x 5 x 2.42m	11+602.0	11+606.0
Bathurst	12010	AAPT F_11602_11602	Pipe	100	11+602.0	11+609.0
Bathurst	5467	SW_SW_1165	Rodding Eye	400	11+608.0	11+740.0
Bathurst	7268	TELS F_MC_OC_11611_11612	Optic Fibre	100	11+602.0	11+612.0
Liverpool	6877	AUSG PIT_SY53628	Pit	3m (L) x 4.3m (W) x 2.52m (D)	11+828.0	11+833.0
Liverpool	12009	AAPT F_11601_11829	Pipe	100	11+764.0	11+938.0
Liverpool	12012	AAPT F_24722_24722	Pipe	100	11+834.0	11+834.0
Liverpool	12310	NGN_F_11836_11836	Pipe	100	11+836.0	11+836.0
Liverpool	10111	UECO F_11835_11835	Optic Fibre	100	11+826.0	11+827.0
Liverpool	5471	SW_SW_1183	Stormwater	900 x 750	11+826.0	11+834.0
Liverpool	5785	SW_WW_1183	Wastewater	914x1371	11+827.0	11+836.0
Goulburn	10176	SW_SW_1199	Stormwater	910 x 1370	11+990.0	11+993.0
Goulburn	5671	SW_WM_1199	Water main	250	11+989.0	11+989.0
Pitt	5677	SW_WM_1247	Water main	250	12+473.0	12+474.0
Pitt	10008	TELS Tu_12480	Tunnel	300	12+480.0	12+480.0
Pitt	7271	TELS F_MC_OC_12475	Optic Fibre	100	12+465.0	12+471.0
Pitt	10771	UECO Tu_F_12478_12478	Optic Fibre	100	12+479.0	12+485.0
Pitt	10156	VS_F_12488_12488	Optic Fibre		12+488.0	12+488.0
Pitt	12288	COS_SW_AP02459	Pipe	225	12+497.0	12+498.0
Pitt	12131	COS_SP_SP01349	Smartpole		12+498.0	12+498.0
Pitt	6974	COS_SP_SP01350	Smartpole		12+470.0	12+470.0
Pitt	10501	COS_SW_AP03000	Stormwater	225	12+491.0	12+491.0
Pitt	10495	COS_SW_AP02458	Stormwater	225	12+497.0	12+497.0

Notes

- Traffic induction ducts and loops will be left in situ
- 11/33/132kV Ausgrid Cables will be left in situ
- Pits and man made underground structures will be left in situ (pits, culverts, roofs etc)

Attachment 5 – Structure Remaining in Situ

Data Base ID	Asset ID	HLFC	Chainage Start	Chainage Finish	Description
13131	COS_U_HERITAGE	Unknown	11605	11605	Slit Trench data at Bathurst T-1342-1367 states "Sandstone advised by heritage not to dig or disturb".
7315	TELS_Tu_11836_11843	Tunnel	11843	11852	Telstra tunnel crossing George at Liverpool Street (south) intersection. Initial site investigations (UUS) show the tunnel at depth range of 850mm (E)-1300mm (W). Approx. 1000mm at centre of George Street. Slit trenching investigations show there is approximately 1.12m of cover to timber sleepers which appear to sit over the Telstra Tunnel roof which has a cover of approximately 1.28m.
10008	TELS_Tu_12480	Tunnel	12480	12480	Two tunnels under the alignment at Pitt Street, Eddy Avenue & Rawson Pl. a) Main tunnel (1750 H x 1600 W) cross Rawson / Eddy at Pitt Street b) Secondary tunnel (1430 H x 930 W) from the main tunnel to a manhole on the southwest corner of the Pitt / Rawson intersection. The condition of the main tunnel is noted as poor on the Telstra records. The slit trench investigations did not locate the tunnels, however a large steel plate with 300mm of cover has been identified. It is not clear whether this is related to the Telstra tunnel.

Attachment 6 – Proving Works

Junction	Data Base ID	Asset ID	HLFC	Size	Chainage Start	Chainage Finish	Description of Works / Dimensions
Essex	4816	JEM_HP_10248	High Pressure	100mm	10+242.0	10+242.0	Excavate at tie-in points 2m x 2m on plan to 0.5m depth below the existing pipe. Coordinates: 334216.29, 6251674.4 and 334197.93, 6251680.3. Excavate along proposed alignment between coordinates 334198.22, 6251680.56 and 334216.53, 6251674.85
Essex	5449	SW_SW_1024	Stormwater	375mm	10+252.0	10+252.0	Excavate 4no trenches 300mm wide on plan to 1.5m below current road level in equalateral directions (N,E,S,W) extending to a 2m radius from the centre of the manhole.
Essex	5447	SW_SW_1014	Stormwater	900 x 750mm	10+140.0	10+251.0	Excavate 4no trenches 300mm wide on plan to 1.5m below current road level in equalateral directions (N,E,S,W) extending to a 2m radius from the centre of the manhole.
Essex	7256	TELS_F_MC_LC_OC_10238_10243_6W	Optical fibre	100mm	10+245	10+246	Locate asset at this location. Confirm depth.
Bridge / Grovenor	13126	JEM_HP_SPARE_1	High Pressure	100mm	10+380.0	10+380.0	Proving works by trenching for proposed additional Jemena crossing between the reference designs DKE+700 to DKE+700 along coordinates 334198.66,6251551.05 to 334148.76, 6251550.98 to a depth of 1.5m from top of rail
Bridge / Grovenor	5763	SW_WW_1041	Waste Water	225mm	10+414.0	10+584.0	Survey MH at junction of George and Bridge (located between Ausgrid chambers in N-bound George).
Bridge / Grovenor	7257	TELS_F_MC_LC_OC_10329E_10293W_6W	Optical fibre	100mm	10+353	10+353	Locate asset at this location. Confirm depth.
Hunter Margaret	13127	JEM_HP_SPARE_2	High Pressure	100mm	10+580.0	10+580.0	Proving works by trenching for proposed additional Jemena crossing between the reference designs DKE+700 to DKE+700 along coordinates 334170.98, 6251306.52 to 334182.22, 6251305.33 to a depth of 1.5m from top of rail
Hunter Margaret	4864	JEM_LP_10799W	Low Pressure	12"	10+600	10+600	Pot-hole to confirm location of 12" cast iron (inserted with LP 110mm NY) on the western side of George St, south of the Margaret St intersection.
Hunter Margaret	5652	SW_WM_1061	Water main	300mm	10+609.0	10+610.0	Proving works by one trench to expose (top and sides) of water main between E: 334170.19 N: 6251317.05 to E: 334184.92 N: 6251310.07, including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Hunter Margaret	10234	JEM_HP_10574WE	High Pressure	100mm	10+572.0	10+574.0	Excavate at tie-in points 2m x 2m to 0.5m depth below the pipe. Coordinates 334187.48, 6251354.45 and 334173.42, 6251355.08 Excavate along proposed alignment between coordinates 334173.49, 6251355.87 to 334186.42, 6251355.24
Hunter Margaret	5453	SW_SW_1058	Stormwater	560mm x 830mm	10+608.0	10+609.0	Re-survey 2 No. chambers. Pit inspections
Hunter Margaret	5767	SW_WW_1058	Waste Water	960mm x 660mm	10+576.0	10+830.0	Undertake internal survey of 3 no. wastewater access chambers as follows providing they are confirmed as existing on site. They are located at the following coordinates (within SWC GIS records): - E: 334151 N: 6251351 - E: 334172 N: 6251270 - E: 334168 N: 6251209
King	6845	AUSG_PIT_SY52201	Pit	1.8 x 3 x 2.25m	10+975.0	10+982.0	Expose east side of AUSG_PIT_SY52201 to prove proposed relocation. Trench dimensions 1.85m wide x 1m long x 2.65m deep.
King	4864	JEM_LP_10799W	Low Pressure	12"	10+945	10+945	Confirm location of 12" cast iron (inserted with LP 110mm NY) and 100mm steel on the western side of George St, in between King St and Barrack St intersections. During slit-trenching, two 300mm cast iron mains were found in the vicinity. There is a need to confirm which cast iron main contains gas

Junction	Data Base ID	Asset ID	HLFC	Size	Chainage Start	Chainage Finish	Description of Works / Dimensions
King	5657	SW_WM_1097	Water main	250mm	10+964.0	10+984.0	Proving works by one trench to expose (top and sides) of water main between E: 334145.11 N: 6250958.93 to E: 334156.39 N: 6250958.00 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
King	13132	SW_WM_1098	Water main	250mm	10+984.0	10+984.0	Proving works by one trench to expose (top and sides) of water main between E: 334144.48 N: 6250945.6 to E: 334155.96 N: 6250944.34 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Liverpool	13129	JEM_HP_SPARE_4	High Pressure	100	11+830.0	11+830.0	Proving works by trenching for proposed additional Jemena crossing between the reference designs DKE+700 to DKE+700 along coordinates 334085.43, 6250099.13 to 334101.98, 6250096.31 to a depth of 1.5m from top of rail
Liverpool	5668	SW_WM_1184	Water main	600mm	11+837.0	11+838.0	Proving works by one trench to expose (top and sides) of water main between E: 334086.28 N: 6250101.26 to E: 334103.71 N: 6250098.16 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Liverpool	5667	SW_WM_1182	Water main	250mm	11+830.0	11+830.0	Proving works by one trench to expose (top and sides) of water main between E: 334088.94 N: 6250108.24 to E: 334104.38 N: 6250106.02 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Liverpool	5669	SW_WM_1185	Water main	250mm	11+835.0	11+852.0	Proving works by one trench to expose (top and sides) of water main between E: 334086.2 N: 6250097.17 to E: 334100.69 N: 6250093.84 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Liverpool	5471	SW_SW_1183	Stormwater	900mm x 750mm	11+826.0	11+843.0	Undertake 2 No. MH surveys. The manholes will be the next upstream and downstream manholes located along the storm water asset outside of the rail alignment.
Liverpool	5785	SW_WW_1183	Waste Water	914mm x 1371mm	11+827.0	11+836.0	Undertake 2 No. MH surveys. The manholes will be the next upstream and downstream manholes located along the storm water asset outside of the rail alignment. Undertake CCTV to investigate the potential for a buried MH to exist under the rail alignment.
Liverpool St.	7315	TELS_Tu_11836_11843	Tunnel		11+843.0	11+852.0	Locate tunnel at this position
Goulburn	10176	SW_SW_1199	Stormwater	910 x 1370mm	11+990.0	11+993.0	Proving works for proposed side entry manhole by excavating trench 2m wide and 1.5m deep from road level between co-ordinates E: 334051.82, N: 6249947.12 and E:334056.08, N:6249946.12.
Goulburn	5671	SW_WM_1199	Water main	250mm	11+989.0	11+989.0	Proving works by one trench to expose (top and sides) of water main between E: 334051.98 N: 6249952.79 to E: 334065.31 N: 6249950.25 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Goulburn	7250	TELS_F_LC_OC_12007_12010	Optical fibre	100mm	12+017.0	12+018.0	Locate asset at this location. Confirm depth.
Pitt	5677	SW_WM_1247	Water main	250mm	12+473.0	12+474.0	Proving works by one trench to expose (top and sides) of water main between E: 334065.60 N: 6249523.24 to E: 334055.17 N: 6249512.29 including a 2m x 2m on plan (to underside of the pipe) at the tie in point at start and finish locations.
Pitt	10008	TELS_Tu_12480	Tunnel	300	12+470.0	12+490.0	Telstra Tunnel suspected at 400-500mm below top of road. Steel plate at 300mm. Confirmation of tunnel depth required. Locate tunnel at this position. Tunnel splits in two sections. Possibly under steel plate.

Attachment 7 – Proving Works Other Areas

1. Works in relation to Sydney Water Assets

Pit Inspections					
Report	Data Base ID	Feature Code	Asset Description / name	Further survey requirements	Survey type
SLR_ODOP_SW_0004	5484	SW_SW_2009	Darling Harbour Location: Along Devonshire St	Attempt to Survey chambers (unless completed pit surveys are made available from previous surveys or pits are not visible on site) located at the following coordinates (within SWC GIS records): - E: 334189 N: 6249073 (may be SLR pit 'A1/S3') - E: 334227 N: 6249048 (may be SLR pit 'A1/SW11') - E: 334309 N: 6248985 - E: 334431 N: 3248919 - E: 334464 N: 6248905 (may be SLR pit 'A3/SW8') - E: 334524 N: 6248876 (may be SLR pit 'A3-4/SW9') - E: 334568 N: 6248859 (may be SLR pit 'A3-4/SW2') - E: 334635 N: 6248824	Pit inspections
SLR_ODOP_SW_0007	5447	SW_SW_1014	Queens Wharf Location: George St between Alfred and Essex St's.	Undertake internal survey of 3 No. stormwater access chambers (unless completed pit surveys are made available from previous surveys or pits are not visible on site) located at the following coordinates (within SWC GIS records): - E: 334282 N: 6251816 - E: 334243 N: 6251739 - E: 334186 N: 6251680	Pit inspections
SLR_ODOP_SW_0008	5448	SW_SW_1016	Essex St Location: George St between Alfred and Dalley Sts	Undertake internal survey of 3 No. stormwater access chambers (unless completed pit surveys are made available from previous surveys or pits are not visible on site) located at the following coordinates (within SWC GIS records): - E: 334287 N: 6251823 - E: 334196 N: 6251635 - E: 334192 N: 6251599	Pit inspections
SLR_ODOP_SW_0024	10176	SW_SW_1199	George St North Location: Junction of George and Campbell St.	Get cover lifted (unable to open on 1st pass) and pit survey undertaken for 'L 040B' (MH may be on 500mm branch line).	Pit inspections
SLR_ODOP_SW_0026	10066	SW_WW_1220	Hay St Submain Location: Hay St	Undertake 2 No. MH surveys. The manholes will be the next upstream and downstream manholes located along the storm water asset outside of the rail alignment.	Pit inspections
SLR_ODOP_SW_0004	5484	SW_SW_2009	SWC A3-4/SW9	Chamber pit report to be supplied (with chamber survey undertaken if required)	Pit inspections
			SWC A3/SW8	Chamber pit report to be supplied (with chamber survey undertaken if required)	Pit inspections
			SWC A1/SW11	Chamber pit report to be supplied (with chamber survey undertaken if required)	Pit inspections
			SWC B RD 02	Chamber pit report to be supplied (with chamber survey undertaken if required)	Pit inspections

Excavations					
Report	Data Base ID	Feature Code	Asset Description	Further survey requirements	Survey type
SLR_ODOP_SW_0018	5721	SW_WM_2241	WMWW01 1200mm dia crossing Anzac Avenue	Further excavations to confirm pipe construction details as it crosses the alignment	Excavation
SLR_ODOP_SW_0020	5730	SW_WM_3128	WMWR02 750mm dia. Location: Junction of Anzac Av. And Todman	Further excavations to confirm pipe alignment, depth and other utilities crossing the rail alignment. Required due to slit trenches hitting 'unknown use' shallow concrete structure.	Excavation
SLR_ODOP_SW_0027	10075	SW_WM_2022	WMCE04 600mm dia Junction of Devonshire and Elizabeth St's	Additional excavation down outside of the Ausgrid chamber to confirm pipe location and separation from Ausgrid chamber	Excavation
SLR_ODOP_SW_0028	10248	SW_WM_2020	WMPC23 1050mm dia Junction of Devonshire and Elizabeth St's	Additional slit trenches to confirm pipe depth, material and alignment as it crosses the rail alignment.	Excavation
SLR_ODOP_SW_0030	5707	SW_WM_2078	WMCE05 600mm dia Junction of Devonshire and Crown St's	Excavations to confirm cover to pipe as it crosses the rail alignment.	Excavation
SLR_ODOP_SW_0032	5723	SW_WM_3025	WMCN02 450mm dia Junction of Anzac Pde and Alison Rd	Undertake further pot holing to confirm pipe depth across full rail alignment.	Excavation
SLR_ODOP_SW_0033	11335	SW_WM_4240	WMWR02 750mm dia. Located within UINSW grounds along High St.	Potholing and some larger excavations to confirm pipe cover, joint type and pipe coating condition.	Excavation
SLR_ODOP_SW_0034	5725	SW_WM_3028	WMWR01 600mm dia Junction of Anzac Pde and Alison Rd	Further excavations to confirm pipe location and depth across the alignment as well as confirming presence, materials, details of the numerous 'unknown' pipes	Excavation
SLR_ODOP_SW_0035	5446	SW_SW_1006	Tank Stream Junction of Alfred and Pitt St's	Further excavation to confirm cover and extents of masonry structure as timber was found in slit trench excavation.	Excavation

2. Works in relation to Ausgrid Assets

Location	Chainage	Data Base ID	Asset ID	HLFC	Description of Works	Dimensions
Cnr Alfred and George St. at E: 334272.83 N: 6251769.84	10+126	6592	AUSG_132_SYJB22_SY51205_14W	132kv	Previous slit trench results indicate 270 mm to top of concrete protection layer. MC shall excavate across the width of, and down either side of the 132kv banking. The Ausgrid watching brief will then undertake further investigations to accurately prove depth of cover to top of cable.	3m(l) x 0.5m(w) x 1.2m(d)
3 no. excavations on Alison Rd between Darley Rd and Doncaster Ave. at: E: 336425.83 N: 6246823.07 E: 336283.01 N: 6246891.24 E: 336052.48 N: 6247000.37	40+600 to 41+050	6584	AUSG_132_ZN188_ZN2602_4W	132kv	Previous slit trenches did not prove 132kv location. MC shall excavate across the width of, and down either side of the 132kv banking. The Ausgrid watching brief will then undertake further investigations to accurately prove depth of cover to top of cable.	3m(l) x 0.5m(w) x 1.2m(d)
George St	10+150.0	6464	AUSG_11_SY50308_SY50312_14W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
South of Essex Street	10+275.0	6471	AUSG_11_SY50391_SY50464_4W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St	10+315.0	6471	AUSG_11_SY50391_SY50464_4W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St	10+330.0	6471	AUSG_11_SY50391_SY50464_4W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St	10+460.0	6729	AUSG_LV_SY50798_SY50797_6W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St	10+655.0	6496	AUSG_11_SY51605_SY51623_4W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset

Location	Chainage	Data Base ID	Asset ID	HLFC	Description of Works	Dimensions
George St near Martin Pl	10+835.0	6633	AUSG_11_SY51911_SY51973_10W_W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St near Martin Pl	10+835.0	6507	AUSG_11_SY51911_SY51973_10W_E	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St near Martin Pl	10+880.0	6513	AUSG_11_SY52024_SY27855_12W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St near Martin Pl	10+880.0	6634	AUSG_11_SY51973_SY27855_16W	11kv	Pot-holing to determine depth to top of conduit.	0.5m(l) x 0.5m(w) to top of asset
George St	10+655.0	6495	AUSG_11_SY51605_SY51619_12W	11kv	Pot-holing to determine depth to top of conduit. Between pits SY51605 and SY51619.	0.5m(l) x 0.5m(w) to top of asset

3. Works in relation to Telstra Assets

Location	Chainage	Data Base ID	Owner	Asset ID	HLFC	Description of Works	Dimensions
Alfred St.	10+020	7246	Telstra	TELS_F_LC_OC_10002_10023	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset
Alfred St.	10+035	7247	Telstra	TELS_F_LC_OC_10022N_10044	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset
Alfred St.	10+153	7248	Telstra	TELS_F_LC_OC_10116_10171_12W	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset
Grosvenor to Dalley	10+370	7313	Telstra	TELS_Tu_10349_10364	Tunnel	Locate tunnel on West side of track alignment.	0.5m(l) x 0.5m(w) to top of asset
Crossing George at Martin Pl.	10+482	7314	Telstra	TELS_Tu_10842_10859	Tunnel	Locate tunnel at this position	0.5m(l) x 0.5m(w) to top of asset
Devonshire and Elizabeth	20+245	7265	Telstra	TELS_F_MC_LC_OC_E_20233_20268	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset
Lang Rd.	22+060	7275	Telstra	TELS_F_OC_22062_22036_4W	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset
Avoca St.	42+942	7264	Telstra	TELS_F_MC_LC_OC_42940_42945	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset
Anzac	32+980	7301	Telstra	TELS_MC_LC_OC_32923_33023_12W	Optical fibre	Locate asset at this location. Confirm depth.	0.5m(l) x 0.5m(w) to top of asset

4. Works in relation to Jemena Assets

Location	Chainage	Data Base ID	Owner	Asset ID	HLFC	Description of Works	Dimensions
George Street	10+450	4864	Jemena	JEM_LP_10799W	Low Pressure	Pot-hole to confirm location of 12" cast iron (inserted with LP 110mm NY) on the western side of George St. During slit-trenching, two 300mm cast iron mains were found in the vicinity. There is a need to confirm which cast iron main contains gas	0.5m(l) x 0.5m(w) to top of asset
George Street	10+750	4864	Jemena	JEM_LP_10799W	Low Pressure	Pot-hole to confirm location of 12" cast iron (inserted with LP 110mm NY) on the western side of George St, north of Wynyard St intersection. During slit-trenching, two 300mm cast iron mains were found in the vicinity. There is a need to confirm which cast iron main contains gas.	0.5m(l) x 0.5m(w) to top of asset
Eddy/Elizabeth/Chalmers:	12+600	13175	Jemena	JEM_ISOL_12600	Isolated	Pot-hole/slit-trench to determine depth/location of Jemena isolated mains (24" at 8.5MBL, 12" at 9.4MBL, approx. 5m and 6m north of low pressure main shown on UUS)	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	30+300:	13176	Jemena	JEM_ISOL_30300	Isolated	Confirm 18" cast iron, at intersection of Anzac and Alison, is isolated (this will require the cast iron main to be exposed, and an investigative drill to be completed)	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	31+250	13177	Jemena	JEM_ISOL_REG_31250	Isolated	UUS/pot-hole to identify old secondary regulator set immediately north of the intersection with Todman Ave	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	31+290	13178	Jemena	JEM_ISOL_REG_31290	Isolated	UUS/pot-hole to identify old Gov pit immediately south of the intersection with Todman Ave	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	31+415	4879	Jemena	JEM_LP_31514_31868E	Low Pressure	Pot-hole to confirm depth/location of low pressure 18" cast iron main on Anzac Parade.	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	31+960	4879	Jemena	JEM_LP_31514_31868E	Low Pressure	Pot-hole to confirm depth/location of low pressure 18" cast iron main on Anzac Parade.	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	32+400	4883	Jemena	JEM_LP_32400EW	Low Pressure	Pot-hole to confirm depth/location of 6" cast iron crossing Anzac Parade	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	32+830:	13179	Jemena	JEM_ISOL_32830	Isolated	Pot-hole to confirm depth/location of 12" isolated cast iron main on Eastern side of Anzac Parade	0.5m(l) x 0.5m(w) to top of asset
Anzac Parade	32+960:	13180	Jemena	JEM_ISOL_32960	Isolated	Pot-hole to confirm depth/location of 12" isolated cast iron main crossing Anzac Parade from Rainbow St intersection to Bunnerong (crosses the high rail alignment in a north-south direction)	0.5m(l) x 0.5m(w) to top of asset
Alison Road	41+460:	13181	Jemena	JEM_ISOL_41460	Isolated	Pot-hole to confirm depth/location of 12" isolated gas main on the southern side of Alison Road, on the south-west corner of the intersection with Cowper St. Old Jemena maps show that there is an old "Gov pit" (decommissioned regulator set) in this location.	0.5m(l) x 0.5m(w) to top of asset
Alison Road	41+640:	13182	Jemena	JEM_ISOL_41640	Isolated	Pot-hole to confirm depth/location of 12" isolated gas main on the southern side of Alison Road	0.5m(l) x 0.5m(w) to top of asset
Alison Road	41+720:	13183	Jemena	JEM_ISOL_41720	Isolated	Pot-hole to confirm depth/location of gas main, on Alison Road near Wansey Road, and confirm if isolated or medium pressure inserted.	0.5m(l) x 0.5m(w) to top of asset
Avoca St.	42+950	10242	Jemena	JEM_MP_42955S	Medium Pressure	Pot-hole/slit-trench across Avoca St at Belmore Intersection to clarify utility information for Jemena mains in this area (Jemena maps only show 2 assets, GIS has 4 assets crossing the rail alignment)	0.5m(l) x 0.5m(w) to top of asset

Attachment 8 – Site Investigations for Alison Road Re-alignment

Additional investigation works along the revised alignment along the northern side of Alison Rd (see below). These works include:

- (a) Potholing Area 3 (shown in orange)
- (b) Utility pit lid lifting and conduit mapping / tracing Area 2 (shown in green, and also on top of the levee bank)
- (c) Feature and topographic survey Area 1 (shown in blue on the attachment)
- (d) Geotechnical and contamination assessments, including:
 - (i) CPT testing at 75m centres along the existing footpath on the levee bank
 - (ii) 3 x test pits to show formation material
 - (iii) 3 x test pits into the face to show construction data
 - (iv) DCP at test pits
 - (v) Hand logs of sites
 - (vi) Survey data of logs (GPS)
 - (vii) If organic or swamp materials are identified in the test pits, perform acid sulfate soil hydrogen peroxide field indicator testing
 - (viii) Material classification data on samples at test pit locations
 - (ix) Contamination testing on field samples
- (e) Heritage Assessment on Culvert and other ex Water infrastructure.
- (f) Tree Impact survey / report.



APPENDIX 22 ATTACHMENT 8 - ADDITIONAL MANAGING CONTRACTOR SCOPE OF SURVEY FOR AMENDED ALIGNMENT ON ALLISON ROAD



**Transport
for NSW**

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 23 – Communications Systems and Passenger Information

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1 Overview and scope

1.1 General

- (a) The communications systems provide the electronic communications and operator interfaces for the monitoring, supervision, security and operation of the SLR.
- (b) Voice and data communications systems and passenger information systems support OpCo's customer service and administrative functions.
- (c) This Appendix describes the scope and performance requirements for the communications systems for the SLR.

1.2 Scope

- (a) OpCo must provide the communications systems for the SLR.
- (b) The communications systems for the SLR must include:
 - i. a fixed data communications network;
 - ii. radio systems for the following SLR applications:
 - A. operational radio;
 - B. high bandwidth wireless data;
 - C. public telecommunications operators radio rebroadcasting;
 - D. emergency services radio rebroadcasting;
 - iii. centralised recording and storage;
 - iv. telephone system;
 - v. Passenger Information Displays (PIDs);
 - vi. public address system (PA);
 - vii. hearing augmentation;
 - viii. Help Points;
 - ix. closed circuit television system (CCTV);
 - x. precise clock system; and
 - xi. supervisory control and data acquisition system (SCADA).

2 Performance and technical requirements

2.1 General

2.1.1 Functional Requirements

- (a) The communications systems must provide secure voice, data and video signal communication for the SLR.
- (b) The following communications systems must be resilient, fault tolerant and include redundancy to ensure the performance and functionality is not impacted due to the failure of any individual component:
 - i. data communication network (fixed network);
 - ii. operational radio system (including LRV on-board radios);
 - iii. emergency services radio systems rebroadcasting;
 - iv. CCTV System (a single camera outage is tolerable but the outage effect must be confined to that camera image and it must be alarmed in CCS);
 - v. Help Points (a single Help Point outage is tolerable but the outage effect must be confined to that help point and it must be alarmed in CCS); and
 - vi. SCADA system.
- (c) All active elements of the communications systems must be electronically monitored in order to provide real time alert of fault conditions and provide fault data to assist in fault finding and repair. The communications system must include a network management system for the fixed data communications network.
- (d) Power back-up architecture and requirements must be in accordance with Appendix 26 (*Low Voltage Distribution and Building Services*).
- (e) The communications systems must be integrated and utilise the data communications network for long distance data transmission between various locations on the SLR.
- (f) The communications systems must be capable of being renewed or upgraded (due to obsolescence or being life expired) without degrading SLR operations.
- (g) The communications systems must be designed to accommodate future network extension or network expansion of the SLR as described in Appendix 36 (*Future Network*) without degrading the performance of the SLR.
- (h) The communications systems must be monitored and controlled by the Central Control System (CCS) located within the control room of the Operations Control Centre (OCC) as detailed within Appendix 20 (*Operations Control Centre*).
- (i) All underground communication cables must be of insect and rodent resistant type.
- (j) All communication cables installed in tunnels must be of low smoke zero halogen, fire retardant, insect and rodent resistant type.
- (k) All communication systems connected to the backbone must have 25% spare capacity, at time of commissioning.

- (l) Communications systems equipment with exposure to external elements must have suitable Ingress Protection (IP) ratings for the environment within which they are located.
- (m) Communications systems cabling must be terminated within patch panels, trays or enclosures and provided with patch cord management.
- (n) Communications systems equipment must be labelled and have record documentation as defined within AS3085.1.
- (o) Communications systems equipment located in any air-conditioned or forced ventilated environments must operate for the period of the UPS backup without air-conditioning and ventilation, unless these systems are also backed up.
- (p) The communications systems equipment at CSELR Stops must comply with the CSELR Stops architectural and urban design requirements detailed within Appendix 13 (*Stops*).
- (q) The communications systems equipment along the SLR corridor must comply with the design requirements detailed within Appendix 14 (*Public Domain*).

2.1.2 Open standards

- (a) The communications systems design must ensure that all devices are “commercial off the shelf” and require no modification to meet requirements of the deed.
- (b) All protocols utilised throughout the communications systems must be based on industry standard architectures and protocols.

2.1.3 Security requirements

- (a) OpCo must provide the communications systems with all security measures required to protect the SLR communication network from external interference.
- (b) All SLR radio communication links must be encrypted.
- (c) Communication systems security must be in accordance with the requirements of OpCo’s Security Management Plan.

2.1.4 Equipment spaces

- (a) The communications systems must be supported by permanent infrastructure including:
 - i. building spaces;
 - ii. ducted cable routes; and
 - iii. cable support systems.
- (b) Cables must be run within the Combined Services Route conduits where they run from pit to pit in accordance with Appendix 18 (*Civil and Structural Works*).
- (c) Separate cable routes must be provided for communications systems requiring a redundant configuration.
- (d) Equipment and cabinets provided in public areas must meet the requirements detailed in Appendix 13 (*Stops*) and Appendix 14 (*Public Domain*).

2.1.5 Spectrum licenses

- (a) OpCo must secure appropriate radio frequency spectrum licenses for SLR radio systems.

2.2 Applicability of requirements to IWLR

- (a) Unless otherwise stated, the existing communications systems and passenger information infrastructure on the IWLR do not need to comply with the requirements stated within this specification.
- (b) All new or renewed communications systems and passenger information infrastructure on IWLR must comply with the requirements stated within this specification.

2.3 Integration and compatibility between CSELR and IWLR Communications Systems

- (a) The following communication sub-systems for IWLR and CSELR must be integrated such that they function as one system from the LRV driver and OCC Operator perspective:
 - i. operational radio system;
 - ii. PA system;
 - iii. Passenger Information Displays (PIDs);
 - iv. Help Points;
 - v. emergency telephones;
 - vi. CCTV system; and
 - vii. SCADA system.

2.4 Interfaces

2.4.1 Fire Services Systems

- (a) The communications systems must support the requirements of Appendix 25 (*Fire Engineering*).

2.4.2 Third Parties

- (a) The communications systems must have external network interfaces to TfNSW, allowing SLR to receive:
 - i. bus service information;
 - ii. ferry service information;
 - iii. train service information;
 - iv. police and emergency services information; and

- v. information on incidents.
- (b) The communications system must have an external network interface to the Transport Management Centre (TMC), enabling the following functions:
 - i. TMC monitoring of the following SLR systems and devices:
 - A. CCTV video streaming 15fps with a maximum concurrent capacity of 5 streams;
 - B. SLR scheduling and timetable information; and
 - C. real time LRV location data;
 - ii. SLR monitoring of the following TMC systems and devices:
 - A. SLR road corridor CCTV video streaming 15fps with a maximum concurrent capacity of 5 streams; and
 - B. TMC road traffic information.
- (c) The communications systems must have an external network interface to the Electronic Ticketing System, as defined within Appendix 24 (*Ticketing System Support Infrastructure*).
- (d) OpCo must provide a real-time data feed to TfNSW in SIRI format that includes:
 - i. LRV locations;
 - ii. predicted LRV arrival times at all subsequent Stops on the trip;
 - iii. information on services and status of SLR lines and Stops; and
 - iv. real time running status information.
- (e) OpCo must provide a static data feed to TfNSW in SIRI format that provides:
 - i. upcoming timetable changes due to holidays, Special Events and maintenance works three weeks in advance of the scheduled changes; and
 - ii. no less than eight weeks in advance of future timetable information.
- (f) OpCo must provide an electronic feed of information in a format acceptable to TfNSW (including GTFS, GTFS-R and TransXchange as appropriate) to integrate into the TfNSW journey planner and feeds to other third parties to integrate into relevant systems.

2.5 Fixed-data communications network

- (a) OpCo must provide an internet protocol data communications network with sufficient bandwidth to meet the requirements for the transmission of voice, video and data including LRV location data.
- (b) The data communications network must act as the telecommunications bearer for all SLR fixed systems.
- (c) The data communications network must not use a third party carrier, including for link(s) to the existing IWLR data communications network.

- (d) Single-mode fibre optic cables must be used for the backbone data communications network to interconnect all of the communications systems.
- (e) The fibre optic cable must be terminated, spliced, patched and managed in dedicated distribution frames.
- (f) Patch panels or break-out trays must provide the connectivity between active equipment and the fibre optic backbone network.
- (g) As a condition of Final Completion, all backbone fibre optic cables must have a minimum of 50% unused fibres for future expansion.
- (h) As a condition of Final Completion, the network loading must not exceed 40% of the capacity of the network.

2.6 Radio systems

2.6.1 Operational radio system

- (a) OpCo must provide an integrated operational radio system throughout the SLR.
- (b) The operational radio system must provide radio bearer functionality for converged voice and data communication.
- (c) The operational radio system services must provide complete uninterrupted coverage across the SLR including tunnels on both CSELR and IWLR.
- (d) The operational radio system must include:
 - i. voice-based communication between:
 - A. OCC Operators, LRV drivers, platform staff, maintenance staff and on-board staff;
 - B. OCC Operators and passengers through the on-board LRV Public Address (PA) system; and
 - C. Customers and OCC Operators through Help Points on board LRVs;
 - ii. Data-based communication for:
 - A. real-time updates of short term text messages to LRV PIDs;
 - B. real-time updates to LRV PIDs of interchange bus running information;
 - C. LRV location information; to meet the requirements of the Scope and Performance Requirements;
 - D. precise clock information from OCC to LRVs;
 - E. notification of LRV emergency door release activation to CSS at the OCC; and
 - F. notification of LRV fire alarm indication to CSS at the OCC.
- (e) As a condition of Final Completion, the operational radio system must not be loaded at more than 40% of its data capacity whilst running the design 2 minute headway (through CBD) on the CSELR peak service and undertaking routine maintenance activities.

- (f) Voice radio terminals must be provided in the following locations:
 - i. in each LRV driver's cab;
 - ii. in maintenance vehicles;
 - iii. in the OCC control room; and
 - iv. at other locations to meet operational and maintenance requirements.
- (g) Each LRV must contain two independent voice radio units.
- (h) The voice radio system within the LRV driver's cab must be capable of hands-free operation.
- (i) The radio system must support pre-loaded text messaging between LRV driver's cab and OCC in both directions.
- (j) Portable radio handsets must be provided for operational and maintenance staff for use on the field.
- (k) Non-LRV radios must be equipped with location reporting and the locations of active radios must be capable of being displayed to OCC staff on a suitable map or system diagram.

2.6.2 High-bandwidth wireless data system

- (a) OpCo must provide a high-bandwidth wireless data system for data exchange between the LRVs and the OCC at Light Rail Maintenance and Stabling Facilities.
- (b) The system must provide the following functionality:
 - i. downloading the on-board CCTV surveillance recording to a central repository;
 - ii. downloading of LRV routine data logging to the LRV maintainer;
 - iii. downloading of LRV passenger loadings data;
 - iv. allow maintainers to access LRV status and fault information; and
 - v. daily uploading of data, on PIDs and digital displays on board the LRV.

2.6.3 Public telecommunications operator radio

- (a) Opco must ensure public telecommunications operator radio (mobile phone) coverage in underground areas of the CSELR.
- (b) The radio frequency range required for public telecommunications operator radio (mobile phone) is 700 MHz to 2.6GHz.
- (c) Opco is not required to improve public telecommunications operator radio (mobile phone) coverage through tunnels on the IWLR.

2.6.4 Emergency services radio

- (a) OpCo must ensure emergency services radio coverage within underground areas of the SLR.

- (b) Emergency radio rebroadcasting must be provided if voice communications for hand portable reception does not meet acceptable signal strengths to be agreed with emergency service organisations.
- (c) OpCo must comply with the relevant emergency service organisations' requirements to ensure that the emergency services radio rebroadcasting provided within underground areas meets with all of the relevant operational requirements.
- (d) Coverage within underground areas must be provided for the emergency service organisations in the following frequency bands, as a minimum:
 - i. Government Radio Network 403-420MHz; and
 - ii. Police and Emergency Services Radio 450-470MHz.
- (e) OpCo is not required to improve emergency services radio coverage through tunnels on the IWLR.

2.7 Centralised recording and storage

- (a) OpCo must provide centralised digital solution at the OCC to provide a single recording, playback and analysis platform for all operational voice and video data.
- (b) The centralised digital storage must include the ability to:
 - i. archive data onto external/removable media allowing offsite storage and playback on appropriate offsite equipment;
 - ii. archive locally stored data (e.g. on-board LRV data) to the centralised digital storage solution; and
 - iii. provide on-demand interrogation, upload, viewing, search and playback of previously stored data.
- (c) The centralised digital storage solution must include the facility for recording 24 hours a day and incorporate an internal digital storage capacity of:
 - i. not less than three months of voice conversation data;
 - ii. at least 31 days of CCTV camera video at a minimum of 25fps and full resolution;
 - iii. condition monitoring data for the Term; and
 - iv. CCS event recording data for the term, as defined within Appendix 20 (*Operations Control Centre*).
- (d) The voice recording system must record the following:
 - i. all voice conversations on the operational radio system;
 - ii. all telephone voice conversations to and from the CSS workstation in the OCC control room; and
 - iii. all emergency call voice conversations from Help Points to OCC control room.
- (e) OpCo must provide a centralised storage data backup facility. Data must be backed up at least daily.

2.8 Telephone system

- (a) OpCo must provide a telephone system for the SLR.
- (b) The telephone system must be a digital two-way voice communication system for operational and emergency use in the SLR.
- (c) The telephone system must include the provision of the following telephone services:
 - i. operational telephones, providing direct line connections between nominated locations and the OCC;
 - ii. general administrative telephones, providing direct line connections required by operations and administration staff, including external interfaces to the public switched telephone network; and
 - iii. emergency telephone services, providing high priority direct line connections between nominated locations and the OCC.
- (d) OpCo must provide telephones at the following nominated locations:
 - i. traction substations and sectioning huts;
 - ii. throughout the Light Rail Stabling and Maintenance Facilities, workshops, the OCC and administration buildings;
 - iii. telephones as determined from OpCo security and risk assessment; and
 - iv. telephones as determined by the FLS strategy.
- (e) The operational and general administrative telephone solution must consist of internet protocol-based private automated branch exchange (PABX) technology.
- (f) All SLR telephones must be capable of providing incoming SLR call location identification.
- (g) OpCo must provide a dedicated phone line to the OCC, to allow telephone communications in the event of PABX or power failure.

2.9 Passenger Information Displays (PIDs)

- (a) Unless otherwise stated, this section applies to PIDs located at Stops. PIDs located on board LRVs are described in Appendix 37 (*Rolling Stock*).
- (b) PIDs must be provided at CSELR Stops in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (c) OpCo must provide PIDs at CSELR Stops with the ability to show following information:
 - i. real-time service information for at least the next three vehicles in each direction of travel (destinations and departure time countdown);
 - ii. current time;
 - iii. space in which can be displayed one or more of:
 - A. current service level including service disruption information;

- B. Special Events and special services notices;
- C. safety messages; and
- iv. inter-connecting service information with public transport route names / numbers, destinations and real-time departure information.
- (d) As a minimum the PIDs must incorporate the following functionality and features:
 - i. utilise a common programming protocol;
 - ii. be individually addressable to display unique information to an individual screen set;
 - iii. provide a simple to use interface within the CCS workstation for the OCC Operators;
 - iv. anti-glare features;
 - v. IP rated to suit the environmental areas installed;
 - vi. be robust and vandal-proof;
 - vii. integrated with the precise clock system for accurate time management; and
 - viii. meet relevant standards applicable to contrast in all ambient light level conditions.
- (e) The PIDs must be capable of being remotely monitored and controlled from the CSS workstation at the OCC.
- (f) The CCS must have the capability to broadcast a message to:
 - i. all PIDs;
 - ii. user-configurable subsets of PIDs (by area, by direction, etc.) retained in memory;
 - iii. manually-configured specific subset of PIDs;
 - iv. all PIDs on any one platform; and
 - v. all PIDs on any one Stop.
- (g) The PID system must be capable of distinguishing between vehicles in service and vehicles not in service (test runs, driver training trips, etc.) and must not display vehicles not in service.
- (h) When any PID is showing a broadcast message, there must be a reminder message displayed on the CCS.
- (i) OpCo must provide PID with a high level of legibility and visibility, through applications of the following aspects:
 - i. hardware integration within a case that is similar in colour and form to the TfNSW wayfinding system;
 - ii. hardware installation at an appropriate height and location for viewing distances relevant to specific sites;
 - iii. content displayed compliance with AS 1428.2 (refer to section 17 'Signs');

- iv. the content display flexibility in terms of its scale, colour and font; and
- v. provision of anti-graffiti and weather proof systems, to ensure absolute legibility of content.

2.10 Public Address (PA) system

- (a) Unless otherwise stated, this section applies to the PA system located at Stops.
- (b) The PA system must have a user interface within the CCS workstation at the OCC.
- (c) The CCS must have the capability to broadcast a message to:
 - i. all platforms;
 - ii. user-configurable subsets of platforms (by area, by direction, etc.) retained in memory;
 - iii. manually-configured specific subset of platforms;
 - iv. any one platform; and
 - v. at any one Stop.
- (d) The PA system speakers must be arranged so that announcements will still be audible in the event of failure of any single speaker.
- (e) The PA system must provide automated and manually triggered announcements, and provide the facilities for live announcements to select zones throughout the SLR.
- (f) The PA system must include a local wireless microphone interface (and equipment) at all Stops for Staff to make manual announcements whilst located at the Stop platform and queuing areas.
- (g) The PA system must allow the OCC Operator to record real-time voice announcements for automatic replay to selected areas and LRVs.
- (h) The PA system must allow the OCC Operator to broadcast pre-recorded voice announcements for automatic replay to selected areas and LRVs.
- (i) When the PA system is repeatedly broadcasting a message from memory, there must be a reminder message displayed on the CCS.
- (j) The PA system must be designed with the following priority hierarchy:
 - i. local manual announcements;
 - ii. remote manual announcements; and
 - iii. automatic announcements.
- (k) The PA system must be designed to support OpCo's FLS strategy for the SLR.
- (l) The PA system must provide a speech transmission index of 0.5, where the ambient noise level is less than 85dB (A).
- (m) The PA system must minimise noise overspill beyond Stop precinct boundary areas.

- (n) The volume level of the PA system must automatically adjust to take into account the ambient noise in real-time at each location.
- (o) The PA system must suppress automatic announcements to speakers and hearing augmentation system whilst a Help Point call is in progress at that Stop.

2.11 Hearing augmentation

- (a) Unless otherwise stated, this section applies to the hearing augmentation system located at CSELR Stops. Hearing augmentation located on board LRVs is described in Appendix 37 (*Rolling Stock*).
- (b) OpCo must provide a hearing augmentation system at each CSELR Stop compatible with hearing aids fitted with a standard magnetic induction coil.
- (c) The hearing augmentation system must be designed to provide coverage to:
 - i. 100% of the area under the platform canopy for each CSELR Stop or as a minimum, the centre one-third of the platform for those without canopies;
 - ii. the area around the Help Points; and
 - iii. the area around the designated wheelchair boarding points.
- (d) The hearing augmentation system must align with PA zones, to ensure hearing impaired passengers receive the same message as other passengers.
- (e) An independent hearing augmentation system must be provided for each Help Point to enable passengers with a hearing impairment to interact with Staff.
- (f) The hearing augmentation must convey all public address announcements (manual and automatic).

2.12 Help Points

- (a) Unless otherwise stated, this section applies to the Help Points located at CSELR Stops, or any other fixed location. Help Points located on-board LRVs are described in Appendix 37 (*Rolling Stock*).
- (b) Help Points must be provided at CSELR Stops in accordance with Appendix 13 (*Stops*).
- (c) Help Points at CSELR Stops must provide emergency and information call buttons to allow call prioritisation.
- (d) Help Points must provide a two-way voice communication with the OCC.
- (e) In the event of a Help Point call being initiated, each Help Point must interface to the CCS to activate an instantaneous display of the dedicated CCTV camera to the OCC Operator and initiate a 2-way voice communication with the OCC Operator.
- (f) The system must be capable of running self-diagnostics and reporting to OCC on their status.
- (g) The system must be able to detect and notify the OCC any attempt to tamper with the Help Point or its cabling.

- (h) The Help Point must display a visual indication to the customers, that the system is operational (e.g. a display or light).

2.13 Closed Circuit Television (CCTV)

- (a) Unless otherwise stated, this section applies to the CCTV system at CSELR Stops, within the tunnel (if required by safety review) and tunnel portals or any other fixed location. CCTV located on board LRVs are described in Appendix 37 (*Rolling Stock*).
- (b) The design of the CCTV system must be in accordance with the following documents:
 - i. "NSW Government Policy Statement and Guidelines for the Establishment and Implementation of Closed Circuit (CCTV) in Public Places"; and
 - ii. "National Code of Practice for CCTV Systems for Mass Passenger Transport for Counter-Terrorism".
- (c) OpCo must provide a digital CCTV system to include coverage and functionality as necessary to comply with the deed and the Security Management Plan.
- (d) OpCo must provide CCTV coverage at locations that comply with the requirements of Appendix 13 (*Stops*) and Appendix 19 (*Light Rail Maintenance and Stabling Facilities*).
- (e) OpCo must provide CCTV coverage at CSELR Stops, within the tunnel (if required by safety review), tunnel portals, turn-backs, junctions and cross-overs allowing the OCC Operator to view the position of LRVs at those locations.
- (f) The CCTV system must be a digital internet protocol-based CCTV system.
- (g) The CCTV system must be capable of being monitored and controlled from the CCS workstation at the OCC.
- (h) All CCTV cameras must capture high quality video footage that is suitable for evidentiary submission in an Australian Court of Law.
- (i) OpCo must provide 1080P resolution, high-definition cameras with day/night functionality.
- (j) Compatible vari-focal, auto-iris, day / night lens must be fitted to all cameras.
- (k) Cameras must be fitted within tamper resistant environmental housings.
- (l) The CCTV management system must record all camera feeds using a high-efficiency H264-based video codec, with minimal compression settings.
- (m) It must be possible to export any portion of recorded footage onto removable media (portable hard drive, DVD or Blu-ray).
- (n) A digital watermark must be applied by the CCTV management system to each frame of recorded video footage such that it is possible to detect, through forensic data analysis, whether the video has been tampered with or modified in any way.
- (o) If OpCo proposes to modify any of the existing CoS or RMS CCTV installations OpCo must liaise with and gain acceptance for its proposed modifications from those parties.

- (p) A date/time and camera number imprint must be provided on the displayed and recorded CCTV footage.

2.14 Precise clock system

- (a) OpCo must provide a precise clock system that provides an accurate and reliable clock source to synchronise all SLR systems and equipment.
- (b) The precise clock system must use internet protocol-based synchronisation over the internet protocol network using network time protocol (NTP).
- (c) All precise clock equipment must be electronically monitored to ensure that a failure is detected and reported.
- (d) The precise clock system must be capable, as a minimum, of synchronizing from an external reference source, including GPS, and in free running mode.
- (e) The precise clock system must be used to synchronise the SLR systems and slave clocks.
- (f) Slave clocks must be provided at the OCC, and Light Rail Maintenance and Stabling Facilities to facilitate the synchronous time keeping of the SLR operations.
- (g) The clock system must adjust automatically for daylight saving time.

2.15 SCADA system

- (a) A Supervisory Control and Data Acquisition (SCADA) system comprising of Remote Terminal Units (RTUs) must be provided at each traction substation and sectioning hut to meet the remote control and indication requirements detailed in Appendix 29 (*Traction Power, Electrification Systems and Control*).
- (b) The SCADA system must have a user interface within the CCS workstation at the OCC.
- (c) OpCo must conduct a safety and commercial risk analysis to determine the redundancy and availability requirements of the SCADA system, its operator interface and the ability of the OCC Operators to control and monitor the various sub-systems (traction power in particular).
- (d) SCADA RTUs must be provided at all CSELR Stops to provide (as a minimum) indications for:
 - i. CSELR Stop 240VAC mains power failure;
 - ii. CSELR Stop equipment cabinet opening;
 - iii. network switch status;
 - iv. UPS Alarms;
 - v. equipment status data where required by this and any other Appendix; and
 - vi. indications determined necessary by OpCo's risk analysis.
- (e) SCADA RTUs must be provided at the OCC equipment room to provide indications for:

- i. equipment room mains power failure;
 - ii. network switch status;
 - iii. UPS Alarms; and
 - iv. any other indications determined necessary by OpCo's risk analysis.
- (f) SCADA RTUs must be provided for the control and indication of safety and ancillary equipment in SLR tunnels.
- (g) SCADA RTUs must be provided to support LV power indication requirements described in Appendix 26 (*Low Voltage Distribution and Building Services*).
- (h) SCADA RTUs must be provided for communication systems' equipment status at the location of radio base stations and at other locations as determined necessary by OpCo risk analysis.

3 Design Documentation

3.1 General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2 Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the communications systems must include:
- i. overall system description covering the principles of operation, overall functionality and individual element functionality during normal and degraded conditions including levels of redundancy;
 - ii. overall system architecture diagrams detailing each individual communications system, including interfaces;
 - iii. reliability, availability, maintainability, security and safety analysis for each of the communications systems;
 - iv. any other information required to support the initial preparations for the safety argument; and
 - v. hazard analysis and design studies for each of the communication systems provided.

3.3 Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the communications system must include:
- i. finalised system description and specification covering the communications operational philosophy, including interfaces;
 - ii. finalised single line and system block schematics for each individual communications sub-systems, showing design intent, connectivity and interfaces;
 - iii. finalised design specifications for each communications system including comprehensive performance details, functionality details, equipment specifications and datasheets;
 - iv. documentary evidence that the public telephone operator radio coverage will be provided in accordance with this Appendix;
 - v. documentary evidence that the emergency services radio coverage will be provided in accordance with this Appendix;
 - vi. coverage diagrams and calculations for radio systems, CCTV, PA and other communications systems;
 - vii. reliability, availability and maintainability and safety analysis for each of the communications systems;
 - viii. schedules of cabling and equipment for each of the communications systems;

- ix. demonstration of compliance with the Scope and Performance Requirements;
- x. availability calculations;
- xi. Testing, commissioning, inspection and maintenance plans; and
- xii. circuit wiring diagrams.

3.4 Design Stage 3 Design Documentation

- (a) Design Stage 3 Design Documentation for the communications system must include:
 - i. schedules of cabling and equipment for each of the communications systems;
 - ii. schedules of equipment assigned IP addresses for each of the communications systems;
 - iii. reliability, availability and maintainability and safety analysis for each of the communications systems; and
 - iv. finalised testing, commissioning, inspection and maintenance plans.

3.5 Quality Benchmarks, samples and prototypes

- (a) OpCo must provide the following quality samples with the Design Stage 3 Documentation:
 - i. Help Point;
 - ii. PA speaker;
 - iii. CCTV camera; and
 - iv. PIDs.

4 Testing and Commissioning Requirements

- (a) OpCo must test and commission the communications system in accordance with the requirements of Appendix 33 (*Testing and Commissioning*).
- (b) Testing and commissioning must minimise disruption to the operation of IWLR.
- (c) In addition to the requirements of Appendix 33 (*Testing and Commissioning*), the communications systems must undergo the following specific testing and commissioning activities:
 - i. OpCo must undertake an Integrated Factory Acceptance Test (IFAT) to prove the correct functionality and capacity requirements of the communications systems with the associated external systems;
 - ii. some aspects of the IFAT may be accomplished by using simulators instead of the actual equipment. In all such cases, OpCo must justify that the proposed approach is adequate to demonstrate satisfactory integration;
 - iii. the Site Tests must include the following items for communications systems:
 - A. functionality and performance of each sub-system;
 - B. end-to-end circuit tests for each voice, video and data communication channel;
 - C. all alarm points with simulated faults;
 - D. all protection mechanisms including hot-standby, parallel redundancy, automatic switch-over;
 - E. all operation modes and functions of all types of Universal Workstations;
 - F. coverage tests of signal strength measurements for radio systems;
 - G. coverage tests of viewing objects and quality for CCTV;
 - H. coverage tests of sound pressure level and speech intelligibility index measurements for PA;
 - I. substandard condition test;
 - J. cable tests and fibre tests; and
 - K. network tests of convergence time, protection time and bit error rates for data communications network.
- (d) OpCo must undertake testing to confirm the security of the communications systems is effective.

Sydney Light Rail

Public Private Partnership

Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 24 – Ticketing System Support Infrastructure

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements of the Electronic Ticketing System (ETS) supporting infrastructure for the SLR.
- (b) OpCo must provide the ETS supporting infrastructure to be incorporated into the CSELR Stops in accordance with this Appendix.
- (c) TfNSW will provide and install ETS Equipment as described in Schedule B1 (*Electronic Ticketing System and Interface*).

1.2. Scope

- (a) OpCo must provide:
 - i. ETS supporting infrastructure comprising of:
 - A. civil works including ducting, conduits and footings associated with below ground civil works;
 - B. power supply to all ETS Equipment including cabling and connections to circuit breakers and local distribution boards;
 - C. data communications to all ETS Equipment including cabling, connections to local area network switches, and interfacing to the SLR data communications network;
 - D. 24VDC power supply at each CSELR Stop for powering of fixed location readers (FLR);
 - E. circuit breakers and for each electrical feed to ETS Equipment; and
 - F. equipment required for OpCo's management information systems to access ETS computing systems;
 - ii. communication system security and access configuration;
 - iii. communications link between the ETS connection to OpCo's firewall and the SLR network;
 - iv. space at OCC for secure storage of consumables and rotables to support first line maintenance of ETS Equipment;
 - v. space at OCC for storage and charging of portable readers for use by Customer Service Officers;
 - vi. testing and commissioning of the ETS supporting infrastructure as defined in this SPR in accordance with Appendix 33 (*Testing and Commissioning*);
 - vii. deployment of ETS Equipment, in co-operation with TfNSW, on the SLR;
 - viii. TfNSW staff with access to Stops, the Stop services cabinets and the OCC equipment room for the purposes of installing, testing and commissioning and maintaining ETS Equipment in accordance with schedule B1 (*Electronic Ticketing and System Interface*); and

- ix. computing equipment within the OCC allowing web browser interface to ETS Equipment monitoring feed from ETS server.
- (b) In relation to ETS Equipment, TfNSW will be responsible for:
- i. provision, installation, testing and commissioning of ETS Equipment including FLRs, Station Computers, ticket vending machines, card top up machines, and portable readers;
 - ii. supply of all consumables and rotables;
 - iii. the development and implementation of a comprehensive training program (train-the-trainer) suitable for Staff involved in operating and maintaining ETS Equipment;
 - iv. cash servicing of ticket vending machines;
 - v. creation, maintenance and population of ETS configuration data; and
 - vi. provision of ticketing subject matter expertise in relation to SLR Works that impact ticketing.

1.3. ETS Responsibilities

- (a) Table 1 below lists the supply responsibilities relating to ETS Equipment at the OCC.

Table 1 ETS Responsibilities at the OCC

Element	Description	Responsibility
Data Communications Supply	All works, materials and labour, associated with the provision of communications to the OCC including interfacing with SLR LAN communications.	OpCo
Charging stations for portable card readers	All power and space required for portable card reader charging stations	OpCo
ETS Equipment monitoring computer	Computer equipment to interface (via web browser) to ETS server to receive and display ETS Equipment monitoring indications.	OpCo
Management information system	Management Information System to interface with ETS server to download usage data for production of reports by OpCo.	OpCo

- (b) The following table lists the supply responsibilities relating to ETS Equipment at Stops.

Table 2 ETS Responsibilities at Stops

Element	Description	Responsibility
Power supply -Stop distribution board to ETS device	All works, materials and labour, associated with the provision of a protected power connection to each and every ETS device. That is, all power cabling to equipment within the Stop including equipment powered by low voltage (240VAC) and ultra-low voltages (24VDC).	OpCo
Extra-low power supply units	All works, materials and labour, associated with the provision of extra-low power supply units (24VDC) for the conversion from the low voltage (240VAC) power supply to the extra-low voltage supply use to provide power to equipment.	OpCo
Data communications supply – SLR firewall to Stop data network switch	All works, materials and labour, associated with the provision of communications between Stops and the SLR firewalls and terminating at a network switch at the Stop. This must be achieved using the SLR communications backbone.	OpCo
Data communications supply –Stop data network switch to equipment	All works, materials and labour, associated with the provision of communications to each and every device at SLR. That is, all data cabling to equipment including the prescribed connector on the end of the cabling for ready for connection directly to each device.	OpCo
ETS Equipment supply	All hardware, software, training (train-the-trainer) and operational manuals, which together form the equipment at Stops.	TfNSW
Equipment installation	All works, materials and labour, associated with the installation of equipment at Stops, including physical installation of equipment, connection of data communications and connection power.	TfNSW
Equipment commissioning	All works, materials and labour, associated with the commissioning or otherwise bringing equipment into revenue service at Stops.	TfNSW
Civil works - ducting	All labour and materials associated with below ground civil works (such as trenching and ducting) and ancillary works (such as fencing) associated with equipment at Stops.	OpCo
Civil works - footing	All labour and materials associated with footings suitable for the installation of equipment including fixing material such as nuts and bolts.	OpCo

1.4. ETS reference documents

- (a) CBD and South East Light Rail Ticketing - Requirements (Doc ref A1559029).
- (b) Placement of Opal Devices on Light Rail - Guidelines (Doc ref A2982150).

2. Performance and Technical Requirements

2.1. General

- (a) OpCo must incorporate ETS Equipment into each CSELR Stop design in accordance with Appendix 13 (*Stops*).
- (b) OpCo must provide and locate ETS related way-finding and signage in accordance with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (c) OpCo must meet the requirements detailed in the documents referenced in section 1.4 (a).
- (d) OpCo must use the guidelines in the document referenced in section 1.4 (b) for the positioning of ETS Equipment.

2.2. ETS supporting infrastructure

2.2.1. Civil and spatial infrastructure

- (a) OpCo must provide space and supporting infrastructure within the CSELR Stop design for the ETS Equipment to be installed at each CSELR Stop.
- (b) OpCo must provide the following physical ETS supporting infrastructure:
 - i. ETS Equipment footings in accordance with ETS Equipment drawings;
 - ii. conduits to facilitate installation of ETS Equipment;
 - iii. spare conduit capacity to facilitate the installation of an additional FLR on single FLR poles; and
 - iv. 19 inch rack space within the CSELR Stop services cabinet to house the Station Computer for each CSELR Stop.
- (c) OpCo must provide communications and power cabling in separate conduits. Extra low voltage 24V DC power may be run within communications conduit.

2.2.2. Power infrastructure

- (a) OpCo must provide the following power supply infrastructure to support the ETS Equipment:
 - i. a IP56 rated 240VAC General Purpose Outlet (GPO) for each Cashless Load Device Type 3 (CLD3) and Disposable Vending Machine (DVM);
 - ii. general power outlets (GPOs) for ETS Equipment located in an office environment;
 - iii. separate power feeds with 20 Amp circuit breaker for each 240VAC supplied ETS Equipment such that the power may be disconnected independently from any other device;
 - iv. 24V DC power supply with sufficient capacity to provide power to all FLRs at each CSELR Stop;

- v. a separate power connection with flying leads (flying leads protruding 2m above the footing) with 2Amp circuit breaker fed from the 24VDC power supply for each FLR device, where there are two readers on a pole (i.e. a double FLR) then two cables will be required;
 - vi. co-located and clearly labelled circuit protection for ETS Equipment;
 - vii. four spare circuit breakers must be provided in each 240VAC circuit breaker panel supplying ETS Equipment; and
 - viii. spare circuit breakers must be provided in each 24V DC circuit breaker panel supplying ETS Equipment. The quantity of spare circuit breakers must exceed the number of installed single FLR poles at each CSELR Stop, with a minimum of 6 at each CSELR Stop. This is such that all single FLR poles can be fitted with an additional FLR.
- (b) The power distribution network must support the architecture described in the document referenced in section 1.4 (a).

2.2.3. Data communication infrastructure

- (a) OpCo must provide within the SLR data communications network at the OCC and to all Stops, an ETS virtual private network (VPN) that interfaces to the ETS network via a firewall internet protocol communications link.
- (b) OpCo must provide the following data communications infrastructure to support the ETS Equipment:
- i. patch panels and network switch ports to support all ETS Equipment including a provision of spare patch panel and network switch ports;
 - ii. spare patch panels and network switch ports exceeding the number of installed single FLR poles at each CSELR Stop, with a minimum of 6 at each CSELR Stop;
 - iii. two metres of slack cable emanating from the footing for footing-mounted ETS Equipment, where there are two readers on a pole (i.e. a double FLR) then two cables will be required;
 - iv. a dedicated bandwidth of 2Mbps must be available from the ETS – SLR boundary firewall to each CSELR Stop at all times;
 - v. data communications network to support 100Mbps bandwidth between the ETS – SLR boundary firewall to a single station at any point in time;
 - vi. 100Mbps bandwidth for the local data communications network at each CSELR Stop; and
 - vii. data communications equipment to support the ETS Equipment communication protocols.
- (c) All data cabling must be able and suitable to support a communications rate of at least 100Mbps.
- (d) All data cabling must be terminated with an RJ-45 plug.
- (e) The data communication network must support the SLR data communications architecture detailed in the document referenced in section 1.4 (a).

- (f) OpCo must provide data communication interfaces in accordance with the data communications protocols detailed in the document referenced in section 1.4 (a).
- (g) OpCo must provide all OCC networking equipment, computer workstation hardware and software to support all the SLR to ETS interface requirements.

2.2.4. ETS reporting, monitoring and management information

- (a) OpCo must provide computing equipment to access the ETS Equipment real-time monitoring system to allow Staff to monitor SLR ETS Equipment status. This does not need to be dedicated computing equipment. TfNSW will provide access to a service management monitoring tool for OpCo to monitor the real-time operational status of equipment operating along the SLR. TfNSW will provide training in the use of the service management monitoring tool provided by TfNSW.
- (b) OpCo must provide access to a service management monitoring tool for TfNSW to monitor the real time operational status of power and communication networks supplying equipment operating along the SLR.
- (c) OpCo must provide training in the use of the service management monitoring tool provided by OpCo.
- (d) OpCo must provide computing equipment to access the ETS fault management system to allow Staff to report and track ETS Equipment faults. This does not need to be dedicated computing equipment.
- (e) OpCo must obtain and utilise standard scheduled data extracts generated by the ETS core system that are relevant to OpCo’s light rail operation. Pre-formatted reports will not be provided to OpCo.
- (f) OpCo must provide a MIS reporting system to obtain, store, manipulate and generate business reports.
- (g) OpCo must ensure that only authorised people have access to ETS and any associated data bases. That is, OpCo must prevent unauthorised access to the extent of its operations.

2.3. ETS Equipment types

- (a) OpCo must provide ETS supporting infrastructure for the equipment listed below in Table 3.

Table 3 ETS Equipment Types

Equipment Type	Description
CLD3	Cashless Load Device (electronic funds transfer or EFT) - sales machine used by Customers to load stored value onto long-life smartcards or purchase a single trip disposable smartcard with payment by EFT only
DVM	Disposable Vending Machine - sales machine used by Customers to load stored value onto long-life smartcards or purchase a single trip disposable smartcard with payment by EFT and cash
SC	Station Computer - machine used as a data staging computer for the transmission of data from equipment to the ETS core system

Equipment Type	Description
FLR	Fixed Location Reader - revenue collection machine used by Customers to pay their fare at CSELR Stops by tapping on and tapping off
RPR	Read-only Portable Reader - checking device used by Customer Service Officers (CSOs) to check the contents and status of a Customer's smartcard
FPR	Full Function Portable Reader – checking and revenue collection device used by CSOs to check the contents and status of a Customer's smartcard and to allow Customers to pay their fare by tapping on and off

2.4. ETS Equipment power and spatial requirements

- (a) OpCo must supply ETS supporting infrastructure to meet the requirements detailed in Tables. 4 and 5.

Table 4 ETS Equipment power and spatial requirements

ETS Device Type	Size (W x H x D) mm approx.	Power Consumption
CLD3 (Cashless)	500 x 1650 x 630	2.5 Amps @240VAC
DVM (Cash)	1280 x 1650 x 630	2.5 Amps @240VAC
FLR pole (these can support up to two FLRs)	150 radius x 1200 or 1800	1.0 Amps @24VDC (per FLR)
Station Computer	3RU 19" Rack Space	1.0 Amps @240VAC
Read only portable reader (RPR) charging cradle.	4 off units each charging cradle 380 x 130 x 180 (desktop space)	5.0 Amps @240VAC

Table 5 Dimensions, mass and characteristics of FPR and RPR equipment

Characteristic	FPR	RPR
Dimensions	79W x 25D x 166H	68W x 35D x 141H
Weight	324 gm	140 gm
Cradle Dimensions	123W x 123D x 66.659H	68W x 40D x 50H
Qty Units Per Cradle	1	1
Cradle Power Consumption	240VAC to 5VDC USB Adaptor	240VAC to 5VDC USB Adaptor
Battery Life	2 Batteries required for 12 hour shift	1000 uses

Characteristic	FPR	RPR
Ethernet Connection Req'ed	Yes	No

2.5. ETS Equipment positioning

2.5.1. General Positioning

- (a) OpCo must determine positioning of ETS Equipment at all CSELR Stops.
- (b) ETS Equipment positioning and installation at CSELR Stops must meet the requirements in Appendix 13 (*Stops*).
- (c) ETS Equipment must be positioned using the guidance provided in the document referenced in section 1.4 (b).
- (d) Equipment must be positioned such that maintenance can be carried out safely and without disruption to road traffic or Operations Activities.
- (e) Equipment positions must not compromise the safety of the public and Staff.
- (f) Equipment positioning must meet the Disability Discrimination Act 1992 (DDA) requirements.
- (g) Equipment must be positioned so it is easily accessible and visible.
- (h) Equipment positioning must not cross or impede Customer flows.
- (i) Space must be provided within the CSELR Stop services cabinet for the installation of the Station Computer.
- (j) Lighting must be co-ordinated with ETS Equipment so that the equipment display screen is clear and legible.
- (k) ETS Equipment must have a consistency in positioning and signage methods, in order to facilitate easy customer way-finding and identification.

2.5.2. Ticketing usage characteristics

- (a) OpCo must position ETS Equipment at CSELR Stops to support the ETS ticketing usage characteristics described in this section.
- (b) The following characteristics must be supported:
 - i. the LRV will be the paid area, except in the initial IWLR Operation Phase up until the LTS End Date;
 - ii. the Stops will generally be unpaid areas;
 - iii. at some specific Stops the platform may be the paid area for that Stop, in which case placement may need to be re-considered;
 - iv. Customers will 'tap-on' at a FLR when arriving at a platform (by foot), prior to boarding an LRV;
 - v. Customers will 'tap-off' at an FLR when leaving a platform (by foot), after alighting from an LRV;

- vi. there will be no ETS Equipment on board LRVs;
- vii. in general, ticket barriers will not be installed at Stops;
- viii. Customers interchanging between SLR services within the same Stop will not be required to tap-off and tap-on at the interchange Stop;
- ix. Customers interchanging between SLR services at different Stops will be required to 'tap-off' when leaving (by foot) the first interchange Stop, and 'tap-on' when arriving (by foot) at the second interchange Stop;
- x. Customers interchanging between SLR and other modes of transport (bus, train, ferry) will be required to 'tap-on' when arriving (by foot) at the Stop and 'tap-off' when leaving (by foot) the Stop;
- xi. Customers interchanging between SLR and buses at Stops where there is a bus to LRV (or vice-versa) cross-platform interchange will be required to 'tap-on' prior to boarding a LRV and 'tap-off' upon alighting from a LRV; and
- xii. the CLD3 and DVM ticketing machines will not have an in-built facility to tap-on or tap-off.

2.5.3. Ticketing machines (CLD3 and DVM)

- (a) CLD3 and DVM equipment must be positioned:
 - i. underneath canopy area with appropriate weather protection such that the duration of sunlight falling directly on the information display screens is minimised or eliminated throughout each day and the year;
 - ii. within CCTV coverage;
 - iii. near to a Help Point;
 - iv. on level surfaces with a gradient or incline no more than 1:40; and
 - v. a minimum of 2 metres away from access points, egress points, stairs and ramps, except on platforms with open and level side access.

2.5.4. Card readers (FLR)

- (a) FLR equipment must be positioned:
 - i. on level surfaces with a gradient or incline no more than 1:40;
 - ii. a safe distance (nominally, 1.5 metres) from any stairs or ramps;
 - iii. such that there are a minimum of two FLRs at CSELR Stop entry / exit points to allow tag-on / tag-off in the event that one device is out of service (exceptions to this include provision of FLRs for lifts and on open plan side platforms with low Customer volumes);
 - iv. such that a FLR is within a distance (as defined in the document referenced in section 1.4 (b)) from each CLD3 and DVM to allow Customers to tap-on after reloading credit; and
 - v. to be able to process a surge of Customers alighting from a LRV.

- (b) OpCo must propose selection of tall or short FLR poles in accordance with guidelines in the document referenced in section 1.4 (b).

2.6. ETS Equipment quantities

- (a) OpCo must determine the minimum quantity of FLR, CLD3 and DVM needed at each CSELR Stop to meet the following:
 - i. the CSELR Stop design capacities provided in Appendix 38 (*Minimum Service Requirements*);
 - ii. patronage levels alighting and boarding at each platform;
 - iii. ETS Equipment positioning requirements as described in this Appendix;
 - iv. other requirements as defined in this Appendix;
 - v. the ETS requirements in the document referenced in section 1.4 (a); and
 - vi. the guidelines in the document referenced in section 1.4 (b).
- (b) Each CSELR Stop must contain one Station Computer within the CSELR Stop services cabinet.
- (c) OpCo must provision for as a minimum, the number of FLRs to cater for clearing of Customers alighting from a peak-load LRV based on the formula provided in the document referenced in section 1.4 (b).
- (d) OpCo must provision for as minimum, the number of FLRs for bus bays for a cross-platform bus interchange as described in the document referenced in section 1.4 (b).
- (e) OpCo must determine and advise TfNSW the quantity of read-only portable readers (RPR) it requires to support its operation of CSELR.
- (f) Storage capacity must be provided at the OCC or an alternative location to accommodate rotatable quantities of at least 5% of the total number of each model assigned to OpCo rounded up to a whole number, including:
 - i. read-only portable readers (RPR); and
 - ii. full function portable reader (FPR).

3. Design Documentation

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the SLR ETS must include:
- i. drawings and descriptions of the physical setting out, cable containments and power supply arrangements for the ETS supporting infrastructure at a typical island platform and side platform CSELR Stop;
 - ii. a full description of the ETS supporting infrastructure to be supplied and installed by OpCo; and
 - iii. all design details to be included. Design Documentation to be delivered in accordance with Appendix 13 (*Stops*), Appendix 18 (*Civil and Structural Works*), Appendix 23 (*Communications Systems and Passenger Information*) and Appendix 26 (*Low Voltage Distribution and Building Services*).

3.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the ETS supporting infrastructure must include:
- i. finalised single line and system block schematics for typical CSELR Stop configurations, showing design intent, connectivity and interfaces;
 - ii. schedules of cabling and equipment for each CSELR Stop and OCC;
 - iii. documentary evidence justifying OpCo's determination of the required quantity of ETS Equipment;
 - iv. demonstration of compliance with the performance specification; and
 - v. all design details to be included. Design Documentation to be delivered in accordance with Appendix 13 (*Stops*), Appendix 18 (*Civil and Structural Works*), Appendix 23 (*Communications Systems and Passenger Information*) and Appendix 26 (*Low Voltage Distribution and Building Services*).

3.4. Design Stage 3 Design Documentation

- (a) Design Stage 3 Design Documentation for the ETS supporting infrastructure must include:
- i. All design details to be included. Design Documentation to be delivered in accordance with Appendix 13 (*Stops*), Appendix 18 (*Civil and Structural Works*), Appendix 23 (*Communications Systems and Passenger Information*) and Appendix 26 (*Low Voltage Distribution and Building Services*).

4. Testing and Commissioning Requirements

- (a) OpCo must test and commission the ETS supporting infrastructure in accordance with the requirements of Appendix 33 (*Testing and Commissioning*).
- (b) Testing and commissioning must not disrupt the operation of IWLR.
- (c) All power and communication connections installed by OpCo must be pre-tested for connectivity prior to installation of TfNSW supplied ETS Equipment.
- (d) OpCo must provide on-site (at CSELR Stops and OCC) technical support during TfNSW installation, testing and commissioning of ETS Equipment.



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Sydney Light Rail
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Schedule E1 Scope and Performance Requirements
Appendix 25 – Fire Engineering

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1. Overview and scope

1.1. General

- (a) This Appendix describes the fire engineering scope and performance requirements for the SLR.
- (b) All buildings (including substations) must comply with Building Code of Australia (BCA) fire safety requirements.
- (c) OpCo must apply a risk-based approach to the design of the Moore Park tunnel, developed in accordance with the Building Code of Australia, AS 4825 Tunnel Fire Safety, International Fire Engineering Guidelines, relevant Standards and Guidelines, and OpCo's Fire and Life Safety (FLS) strategy.

1.2. Scope

- (a) OpCo must provide an acceptable level of safety for occupants and Staff in the event of a fire.
- (b) OpCo must determine and implement strategies and provisions, including minimisation of fire loads, limiting fire spread, protecting occupant egress routes and enabling emergency services intervention.
- (c) For buildings (including substations, the Moore Park Stop and all equipment rooms) OpCo must comply with the BCA. OpCo must satisfy the Independent Certifier that the design and construction comply with the BCA and must obtain all necessary certification.
- (d) For the Moore Park tunnel, OpCo must devise a detailed FLS strategy and analysis. The strategy must be documented in the fire engineering brief and the fire engineering report, as per International Fire Engineering Guidelines.
- (e) The FLS strategy must include:
 - i. managing and facilitating a stakeholder-driven fire engineering process;
 - ii. coordinating and undertaking stakeholder consultation;
 - iii. determining and justifying FLS provisions;
 - iv. developing and agreeing FLS documentation;
 - v. review at design stage of FLS provisions;
 - vi. review of construction and installation of FLS provisions;
 - vii. review of testing and commissioning of FLS provisions;
 - viii. certification of "as commissioned" infrastructure;
 - ix. input into emergency operation response plans; and
 - x. integration into an overall SLR system safety strategy.

2. Performance and technical requirements

2.1. Fire engineering process

- (a) OpCo must as a minimum:
- i. develop a Fire Engineering Brief (FEB) including associated stakeholder consultation and approvals / review;
 - ii. develop a Fire Engineering Report (FER) where the design elements are analysed and demonstrated to meet the agreed FEB acceptance criteria;
 - iii. develop design documentation related to fire safety where required by the FEB prior to construction; and
 - iv. set out the required normal and emergency response procedures that are an essential part of the fire strategy. These may be included as part of the FER, or as a separate document. These requirements are to be appropriately incorporated into OpCo's Project Plans.
- (b) The Qualified Fire Engineer (QFE) must as a minimum:
- i. review relevant construction documentation, and then confirm in a report that the documentation is in accordance with the requirements of the Fire Engineering Report; and
 - ii. undertake site inspections and witness testing of all fire safety systems and then confirm in a report that the completed works are in accordance with the requirements of the Fire Engineering Report.
- (c) OpCo must ensure that:
- i. relevant fire stakeholders are consulted during the development of the SLR fire engineered design; and
 - ii. the SLR fire engineering design, including all key design documents, is endorsed by relevant fire stakeholders.

2.2. Qualified Fire Engineer

- (a) OpCo must engage an individual to act as the Qualified Fire Engineer (QFE) to:
- i. lead the fire engineering design;
 - ii. witness the construction;
 - iii. witness the testing process; and
 - iv. co-ordinate all fire stakeholder consultation.
- (b) The QFE must :
- i. be a chartered engineer (CPEng) with Engineers Australia or equivalent; and registered on the National Professional Engineers Register in the specific area as 'Fire Safety Engineer';

- ii. have a minimum of ten years demonstrable experience as a fire engineer in a rail and tunnel environment; and
 - iii. have undertaken a fire engineering role on at least two projects of a similar nature.
- (c) The QFE is responsible for:
- i. initiating and managing FLS stakeholder consultation;
 - ii. planning, preparing and updating the FEB, FER and all other fire engineering reports; and
 - iii. confirming that the Moore Park tunnel as-built works, testing, commissioning, smoke testing, control system integration, operations and maintenance plans comply with OpCo's FLS strategy, the FEB and other fire engineering reports.

2.3. Proof engineer (fire)

- (a) OpCo must engage a proof engineer (fire) to carry out an independent design review and to provide proof certification of the SLR fire engineering design documentation.
- (b) The proof engineer (fire) must:
- i. be independent of OpCo and OpCo's design team including the QFE;
 - ii. be a chartered engineer (CPEng) with Engineers Australia or equivalent; and registered on the National Professional Engineers Register in the specific area as 'Fire Safety Engineer';
 - iii. have a minimum of ten years' experience as a fire engineer in a rail and tunnel environment;
 - iv. have undertaken a fire engineering role on at least two projects of a similar nature;
 - v. review the Design Documentation including providing an independent assessment of the Moore Park tunnel fire engineering design documentation and all design reports that are affected by the fire engineering requirements;
 - vi. undertake construction and commissioning reviews, including witnessing commissioning as necessary to verify that the design intent of the FLS strategy and provisions are met;
 - vii. provide documentation to confirm that the designed, constructed and commissioned Moore Park tunnel meets the FLS requirements;
 - viii. provide a written report to the TfNSW Representative, Independent Certifier and to fire stakeholders confirming acceptance of the FEB and the FER including:
 - A. compliance with relevant codes and standards; and
 - B. changes to design objectives or design input parameters; and
 - ix. provide written agreement to changes to design objectives or design input parameters.

2.4. Minimum fire system and design requirements

- (a) The tunnel design must be in accordance with the Building Code of Australia, and all systems to be adopted must comply with relevant Australian standards. The fire services systems must include, as a minimum, the following systems for the Moore Park tunnel.
- (b) The tunnel must provide:
 - i. adequate walkway(s) for egress and emergency access;
 - ii. a hydrant system, to a standard which OpCo must agree with Fire and Rescue NSW;
 - iii. emergency lighting and signage:
 - A. emergency lighting is required to relevant Australian standards, including AS 2293 (2005) and adapted to suit to a rail tunnel;
 - B. low level emergency lighting must be installed along the walkway(s) within the tunnel, to give an indication of the walkway edge;
 - C. signage must be installed to indicate the distance to each of the portals;
 - iv. coverage for emergency services radio, in accordance with Appendix 23 (*Communications Systems and Passenger Information*);
 - v. interfacing with other fire safety systems, as follows:
 - A. a signalling system must be provided, to ensure that a maximum of one LRV (or coupled pair of LRVs) is on each track in the tunnel at any one time;
 - B. a system must be provided to detect an LRV which has come to a halt in the tunnel. If this happens:
 - i the emergency lighting must automatically illuminate;
 - ii an alarm must sound in the OCC;
 - iii the signals which control entry to the tunnel must be set to stop; and
 - C. the system must be capable of being reset from the OCC.
- (c) OpCo may need to provide other FLS systems as required, to meet the requirements for FLS.

- (d) Design Documentation

2.5. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.
- (b) The Design Documentation must be in accordance with AS 4825 Tunnel Fire Safety and International Fire Engineering Guidelines.
- (c) The reports must include a Fire Engineering Brief and a Fire Engineering Report.

2.6. Design Stage 1 Design Documentation

- (a) OpCo must submit the complete Fire Engineering Brief, which must include the following report sections and commentary:
- i. project scope;
 - ii. relevant fire stakeholders;
 - iii. occupant characteristics;
 - iv. FLS strategy, setting out the overall strategy to tunnel fire safety;
 - v. fire engineering design process objectives;
 - vi. design inputs and assumptions;
 - vii. hazards and preventative measures;
 - viii. fire scenarios;
 - ix. trial design (fire safety measures required for the tunnel);
 - x. acceptance criteria;
 - xi. analysis and assessment methods; and
 - xii. software, tools and modelling systems used.
- (b) OpCo must submit a draft Fire Engineering Report, which must, in addition to the sections required in the FEB, include:
- i. a description of interfaces with other systems and project elements;
 - ii. results of all calculations and analysis to demonstrate the FLS objectives have been met; and
 - iii. preliminary fire safety design (commensurate with level of detail required to support the results of the analysis, and to inform the design team and stakeholders of the required systems and features in the tunnel).
- (c) The documentation must be endorsed by the QFE as author or checker.
- (d) OpCo must submit the proof engineer (fire) report referred to in section 2.3(b)(viii).

2.7. Design Stage 2 Design Documentation

- (a) OpCo must provide final versions of the Fire Engineering Brief and the Fire Engineering Report, with evidence that all required stakeholders have been consulted and have agreed the content of the documents.
- (b) The documentation must be endorsed by the QFE as author or checker.
- (c) The proof engineer (fire) must provide written confirmation that the documentation and the design comply with all requirements of the deed and relevant standards.

2.8. Approvals

- (a) OpCo must take responsibility for approval or referrals agreement with the relevant stakeholders.

- (b) Testing and commissioning requirements
- (a) OpCo must test and commission the fire safety systems in accordance with the requirements of Appendix 33 (*Testing and Commissioning*).
- (b) In addition to the requirements of Appendix 33 (*Testing and Commissioning*), the systems must undergo the following specific testing and commissioning activities:
 - i. all testing and commissioning must be in accordance with Australian standards;
 - ii. the testing and commissioning must demonstrate the correct set of responses for the systems, when carrying out full functional testing for the tunnel as a whole;
 - iii. OpCo must provide documentation by the QFE that the installed and commissioned works meet the requirements of the SLR fire engineering documentation and relevant standards; and
 - iv. the proof engineer (fire) must provide documentation that the installed and commissioned works meet the requirements of the SLR fire engineering documentation and relevant standards.



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Schedule E1 Scope and Performance Requirements

Appendix 26 – Low Voltage Distribution and Building Services

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1. Overview

1.1. General

- (a) This Appendix describes the scope and performance requirements for the Low Voltage Distribution System and LV installations (an electrical installation as defined in the New South Wales *Electricity Supply Act 1995*, operating at low voltage) for the SLR.

1.2. Scope

- (a) OpCo must provide LV Distribution Systems for supply to:
- i. CSELR Stops;
 - ii. Light Rail Maintenance and Stabling Facilities;
 - iii. the OCC;
 - iv. roadway lighting;
 - v. any SLR telecommunications infrastructure at other places;
 - vi. power outlets on Smartpoles® as required by CoS; and
 - vii. any relocated third party infrastructure such as traffic signals.
- (b) OpCo must provide LV installations for:
- i. CSELR Stops;
 - ii. Light Rail Maintenance and Stabling Facilities;
 - iii. the OCC;
 - iv. roadway lighting;
 - v. any SLR telecommunications infrastructure at other places;
 - vi. power outlets on Smartpoles® as required by CoS; and
 - vii. any relocated third party infrastructure such as traffic signals.
- (c) OpCo must provide LV metering for:
- i. CSELR Stops; and
 - ii. Light Rail Maintenance and Stabling Facilities.
- (d) OpCo must provide the LV Distribution Systems and LV installations for roadway lighting, traffic signals, CoS power outlets, etc. in accordance with the responsible Authority requirements and transfer them to the responsible Authority upon completion.

2. Performance and technical requirements

2.1. General

- (a) OpCo must provide a safe, efficient and reliable LV Distribution System that must provide electrical power supply to all Loads throughout the entire SLR to support operations and service requirements as outlined in Appendix 38 (*Minimum Service Requirements*) and 39 (*Operations and Customer Service Requirements*).
- (b) OpCo must define and categorise all Loads as:
 - i. Safety Service Loads: system loads that are deemed essential to support Customers, public, operators and maintainers health and safety during normal, degraded and emergency operation;
 - ii. Operations Critical Loads: system loads that are essential to support the service delivery requirements of Appendices 38 (*Minimum Service Requirements*) and 39 (*Operations and Customer Service Requirements*); and
 - iii. Normal Loads: system loads which, if de-energised, would have no immediate effect on safety or the provision of Required Services.
- (c) OpCo must make provision for the LV Distribution System and Loads to be extended with no interruption to the provision of Required Services.

2.2. LV Distribution System

- (a) The LV Distribution System and Load configuration must ensure that no failure of any single component will prevent Required Services being maintained.
- (b) The following requirements for Time to Restore must be incorporated in the design:
 - i. for Safety Service Loads and Operations Critical Loads, 15 minutes as a maximum; and
 - ii. for Normal Loads, 24 hours.
- (c) The LV Distribution System must provide an Uninterruptible Power Supply (UPS) to Loads that cannot sustain short-term switching outages for the duration of the switching outage.
- (d) All main LV switchboards supplying Fire and Life Safety Service Loads must be contained within areas that have a minimum fire resistance level (FRL) of 120/120/120 and be consistent with OpCo's Fire and Life Safety (FLS) strategy and the requirements of Appendix 25 (*Fire Engineering*).
- (e) The LV Distribution System must, as a precondition to Final Completion, have a minimum of 20% electrical and spatial spare provision and capacity for general system expansion.
- (f) The LV Distribution System power factor must be maintained at a minimum of 0.95.
- (g) Electricity generated from renewable energy sources within the Permanent Light Rail Corridor must be metered.
- (h) Electrical meters must:
 - i. have an accuracy class of 0.2 over the full power factor range;

- ii. be able to provide current, voltage, kWh consumption and maximum demand in real time; and
 - iii. be installed for reading locally and remotely.
- (i) The LV Distribution System must be remotely monitored by the Central Control System (CCS) as detailed in Appendix 20 (*Operations Control Centre*) with transmission of inputs via the SCADA system detailed in Appendix 23 (*Communications Systems and Passenger Information*).
- (j) For safety systems to be maintained, tunnel LV supplies must be from two separate, independent sources.

2.3. Back-up Time

- (a) OpCo must undertake a safety, commercial risk and FMECA analysis to determine the extent and duration of any power back-up system to support the Operations Activities.
- (b) OpCo must provide the necessary power back-up systems to support the outcome of (a) above.
- (c) As a minimum, unless item (a) above results in a more stringent Back-up Time, all Safety Service Loads and Operations Critical Loads must be supplied with a 3-hour back-up, for the following:
- i. Operations Control Centre (OCC);
 - ii. Traction Power System SCADA; and
 - iii. CSELR Stops.
- (d) For other Safety Service Loads and Operations Critical Loads, OpCo must provide a minimum time in accordance with relevant standards. In all cases the Back-up Time must support OpCo's FLS strategy and as required in Appendix 25 (*Fire Engineering*).

2.4. Switchboards and distribution boards

- (a) All main LV switchboards must be enclosed. LV switchboards at CSELR Stops and must be located within the integrated services cabinet enclosure.
- (b) Indoor switchboards and distribution boards must have a minimum IP rating of IP21.
- (c) Outdoor distribution boards must have a minimum IP rating of IP65.
- (d) Main LV switchboards that require N-1 rated supplies must have separate bus sections for these supplies.
- (e) Electrical metering must be provided on the incoming supplies at each LV main switchboard used to supply CSELR Stops and tunnels.
- (f) Any secondary revenue electrical supplies must have tariff metering in accordance with Ausgrid requirements.
- (g) Sub-metering must be provided for final Loads of over 100 kVA.
- (h) Switchboards must be form four in accordance with AS/NZS 3439.1.

- (i) All switchboard and distribution board neutral busbars must be the same size as the phase busbars.
- (j) The LV switchboard and distribution boards supplying Operations Critical Loads must be monitored by the CCS. This monitoring must include, as a minimum, status of LV switchboard circuit breakers, distribution boards main switch, local remote control status, metering, incoming supply and protection.
- (k) LV main switchboards must provide the status of main switches to the CCS.

2.5. Solar photovoltaic cells

- (a) Any solar photovoltaic system supplied must be industrial grade and include the following:
 - i. DC isolation of the cells;
 - ii. high grade inverter;
 - iii. AC metering;
 - iv. AC isolation; and
 - v. monitoring of status and alarms by the CCS.

2.6. Uninterruptable power supply

- (a) OpCo must supply a UPS that must:
 - i. be distributed via fixed wiring;
 - ii. be industrial grade;
 - iii. include:
 - A. maintenance bypass;
 - B. static transfer switch;
 - C. batteries with minimum Design Life of seven years; and
 - D. monitoring by the CCS to provide UPS AC supply or battery power source status and general alarms.

2.7. General installation

- (a) All LV equipment must be:
 - i. protected before and after installation;
 - ii. inspected upon delivery with regard to procurement specifications and general condition; and
 - iii. stored appropriately to ensure the maintenance of the condition with regard to exposure to both environmental and construction related conditions.
- (b) All installed equipment must be adequately protected prior to commissioning in order to ensure the maintenance of the condition of the equipment during construction.

- (c) Cutting and patching work will not be acceptable.
- (d) All services in public areas are to be embedded or concealed in a manner that:
 - i. ensures that adequate access is permitted for maintenance of the service;
 - ii. does not diminish the aesthetic appeal of the installation;
 - iii. does not undermine the integrity of any substrate it is embedded in; and
 - iv. does not undermine the integrity of any surface it is mounted to.
- (e) All penetrations must be constructed to maintain the relevant fire resistance level.
- (f) All penetrations in waterproofing must be sealed to retain the waterproofing rating.
- (g) All supports are to be designed and installed to accommodate the loads supported.
- (h) Pits and conduits must be provided in accordance with the CSR requirements in Appendix 18 (*Civil and Structural Works*).
- (i) Cable pulling tensions must not exceed the manufacturers limit during installation:
 - i. all cable pulls are to be planned with prior estimation of maximum anticipated tensions; and
 - ii. assessment is to be made prior to all cable pulls to determine the methods used to monitor the tension during the pull.
- (j) Cable pulling rollers and lubricating additives must not undermine the integrity of the cable or cable containment system.
- (k) Cable bending radii must not be less than the manufacturer's specifications:
 - i. during storage prior to and during construction; and
 - ii. during all stages of installation.

2.8. Cable installation

- (a) LV Distribution System cable installation within the CSELR tunnel, track and associated areas must not:
 - i. interfere with other services;
 - ii. be surface mounted in public areas; and
 - iii. encroach into identified public access routes.
- (b) OpCo must provide, as a precondition to Final Completion, spare cable containment system(s) spatial capacity and thermal de-rating, including:
 - i. the higher of one additional cable or 25% of additional design / route capacity, for areas that are inaccessible for future cable containment installation; and
 - ii. the higher of one additional cable or 20% of additional design / route capacity, for areas that are accessible for future cable containment installation.
- (c) Cables within any underground substations and tunnels must be low smoke, zero halogen and have low flame propagation properties tested to AS/NZS 1660 (set) of standards.

- (d) The design must ensure that any electro-magnetic field (EMF) is mitigated for the installation of new Utility Services in close proximity to existing installations.

2.9. Power Outlets on Smartpoles®

- (a) Power outlets on Smartpoles® in pedestrian areas of George Street and Alfred Street must be provided in accordance with the Development Agreement between TfNSW and the City of Sydney (CoS).
- (b) Separate metering must be provided for the supplies to the CoS power outlets.
- (c) The diversity factor applied in designing the supply to the CoS power outlets must be not less than that advised by CoS.
- (d) The segregation and earthing of the CoS power outlets and related equipment must be in accordance with the earthing and bonding concept for the SLR Works.

3. Design Documentation

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Documentation

- (a) The Design Stage 1 Design Documentation for the LV Distribution System and electrical building services must include:
- i. LV system modelling for all Operations Activities in all operational modes;
 - ii. site plans showing sufficient dimensions that the relevant lengths of cable runs can be determined;
 - iii. power supply design study, which includes a safety, commercial risk and FMECA analysis to determine the extent and duration of any power back-up system to support the Operation Activities;
 - iv. a narrative and single line drawings of the necessary power back-up systems;
 - v. the power supply design study must determine:
 - A. the size of the Loads;
 - B. the autonomy time required;
 - C. the recharge time following a blackout; and
 - D. the architecture of the intended uninterruptible power supply systems;
 - vi. single line diagrams;
 - vii. maximum demand calculations for each load;
 - viii. cable route diagrams;
 - ix. LV distribution equipment sizes;
 - x. other discipline interfaces Approvals from the relevant Authorities and other relevant stakeholders for relevant Operations Activities;
 - xi. confirmation of conformance to relevant standards and requirements;
 - xii. cost benefit analysis of options and final selection; and
 - xiii. lighting level calculations.

3.3. Design Stage 2 Design Documentation

- (a) The Design Stage 2 Design Documentation for the LV distribution and electrical building services must include:
- i. LV electrical protection schemes, including discrimination studies;
 - ii. design studies, including fault level, voltage drop and cable sizing calculation;

- iii. third party technical and operational agreements;
- iv. designer's risk assessment and traceability;
- v. cable selection, cable schedule and cable routing arrangements;
- vi. fully dimensioned and confirmed site plans;
- vii. protection setting calculations;
- viii. test and commissioning plans;
- ix. detailed bills of material covering all items;
- x. specifications or datasheets for LV distribution items; and
- xi. switchboard and equipment general arrangement drawings.



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Schedule E1 Scope and Performance Requirements

**Appendix 27 – Ausgrid High Voltage Supply and
Reticulation**

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1. Overview and Scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for the High Voltage (HV) Reticulation Systems comprising the power supplies from the Ausgrid network to the Traction Power Supply and the high voltage connections between Traction Power Substations (TPSs). The scope and performance requirements for the SLR traction power substations are set out in Appendix 29 (*Traction Power, Electrification Systems and Control*).
- (b) The primary supplies to the Traction Power Supply must be at high voltage (11kV) and be supplied from the Ausgrid network.
- (c) HV power supply sources have been identified in liaison with Ausgrid for all TPSs. For the outer area TPSs, (all substations except Circular Quay, Martin Place and Hay Street) specific Ausgrid 11kV HV supply sources have been identified and illustrated within the "Traction Power Supply – Formal Enquiry" reference document.
- (d) OpCo must deliver the SLR CBD Area 11kV Ring which will be part of the SLR Assets.

1.2. Scope

- (a) OpCo must provide the HV Reticulation Systems that include as a minimum:
 - i all necessary augmentation and extensions to the Ausgrid 11kV network, including cable route, cables, pilot cables, switchgear, and other necessary equipment; all in accordance with Ausgrid's requirements;
 - ii all necessary Ausgrid service and metering equipment in accordance with Ausgrid's requirements including any required auxiliary systems including protection, control and monitoring devices;
 - iii all necessary cable route and cables for the SLR CBD Area 11kV Ring;
 - iv earthing systems necessary for the HV Reticulation Systems; and
 - v lightning and surge protection equipment.
- (b) OpCo must provide revenue metering at the TPSs for each incoming 11kV feeder from Ausgrid.

2. Performance and Technical Requirements

2.1. Capacity and reliability requirements

- (a) The HV Reticulation Systems must deliver power to run the traction power and electrification system in accordance with the requirements of Appendix 29 (*Traction Power, Electrification Systems and Control*).
- (b) The HV Reticulation Systems must be capable of supporting the Operations Activities and the service requirements as outlined in Appendices 38 (*Minimum Service Requirements*) and 39 (*Operations and Customer Service Requirements*).
- (c) The HV Reticulation Systems sizing must provide at least 20% reserve capacity for future extensions of the SLR network.
- (d) The Redundancy level for the HV power supply and HV Reticulation Systems must collectively be a minimum of N-1.
- (e) Other than in the SLR CBD Area 11kV Ring, adjacent TPSs must be fed from different zone substations. Should a specific Ausgrid zone substation provide HV supplies to two electrically adjacent TPSs, the supplies must be supplied from independent busbars within the Ausgrid zone substation. Subject to Ausgrid loading requirements and connection approval conditions, the SLR CBD Area 11kV Ring must be configured so that physically adjacent substations are not normally fed from the same circuit originating from Belmore Park Zone Substation.
- (f) Each end of each section of the SLR CBD Area 11kV Ring must be provided with a SCADA controlled circuit breaker in order that any fault can be quickly localised and supply restored. Line-differential protection must be provided for each segment in the ring main circuits to provide fast clearing of faults, good discrimination, and minimise consequential damage.
- (g) The two independent 11kV cables supplying the SLR CBD Area 11kV Ring must be laid in independent cable routes from Belmore Park Zone Substation to the SLR to eliminate vulnerability to a single "dig in" or similar event. Within the SLR, the two 11kV cables must be routed within the trackslab in separate ducts. Spare ducts must be provided for 11kV cables along all parts of the SLR CBD Area 11kV Ring route.
- (h) The HV Reticulation Systems must satisfy the infrastructure installation technical requirements of a New South Wales distribution network service provider (DNSP).

2.2. Safety and equipment rating requirements

- (a) All HV power supply and HV Reticulation Systems and subsystems must ensure touch and accessible potentials on any part of the system or adjacent infrastructures comply with EN50122-1.
- (b) The design of the HV Reticulation Systems must ensure the safety of all personnel associated with the maintenance of the system, including as a minimum security padlocking of interlocks.
- (c) The equipment must be capable of withstanding the maximum prospective fault level under all reasonably foreseeable feeding conditions and known Ausgrid network upgrades.

2.3. Control and monitoring

- (a) Where appropriate, and as permitted by Ausgrid, status indication of the Ausgrid equipment at the CSELR substations and the dedicated circuit breakers at Belmore Zone Substation must be provided to the SLR SCADA system.
- (b) Data monitoring and acquisition for the HV Reticulation Systems must include, as a minimum, energy consumption (to tariff metering standards), and individual AC feeder currents.

2.4. Spatial Provisions for Ausgrid

- (a) At Traction Power Substations which are connected to the Ausgrid network OpCo must provide space to house Ausgrid required electrical equipment and is to arrange any necessary easements for cables and for access to such equipment.

3. Design Documentation

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the HV Reticulation Systems must include:
- i 11kV single line diagrams showing the HV Reticulation Systems and sufficient of the up-stream Ausgrid network to demonstrate that the required (n-1) Redundancy will be achieved;
 - ii indicative route layouts for the HV Reticulation Systems;
 - iii power demand calculation to ascertain the electrical requirements of the SLR electrical network, comprising calculations and simulations of traction power loads of the LRV operational network;
 - iv network and load flow study for periods of peak traffic including:
 - A. network simulation in emergency feeding conditions for Ausgrid supply, traction and HV substations, defining the potential scenarios of emergency feeding levels within the HV reticulation network;
 - B. short-circuit study for the HV reticulation network for all feeding scenarios; and
 - C. study of harmonics and power quality at connection points of the Ausgrid supply and HV Reticulation Systems to the traction substations with respect to compatibility limits defined by AS61000.3:2000, Energy Networks Association and electricity supply authorities.

3.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the Ausgrid supply and HV Reticulation Systems must include:
- i the final versions of the information submitted as part of Design Stage 1;
 - ii approvals from the relevant Authorities, and other relevant stakeholders for relevant Operations Activities;
 - iii third party technical and operational agreements;
 - iv cable infrastructure layouts, including Dial Before You Dig coordination; and
 - v all Design Documentation required to meet Ausgrid requirements.



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Schedule E1 Scope and Performance Requirements

Appendix 28 – Earthing and Bonding, Electrolysis and EMC

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1. Overview

1.1. General

- (a) This Appendix describes the scope, and the functional, performance, configuration, and interface requirements for Earthing and Bonding Systems, Electrolysis and Electromagnetic Compatibility (EMC) for the CSELR.
- (b) The CSELR Earthing and Bonding Systems must be designed, constructed, tested, and commissioned to ensure the outcomes below, in the following priority order:
 - i. protection of persons;
 - ii. protection of the system and third party infrastructure;
 - iii. assurance of Asset operability;
 - iv. ease of maintenance; and
 - v. ease of construction.
- (c) The CSELR Electrolysis prevention, mitigation and monitoring system must be designed, constructed, tested and commissioned to ensure the outcomes below, in the following priority order:
 - i. protection of persons; and
 - ii. protection of the system and third party infrastructure.
- (d) The CSELR systems must, in terms of EMC, be designed, constructed, tested, commissioned, and maintained to ensure the outcomes below, in the following priority order:
 - i. protection of persons;
 - ii. protection of the system and third party infrastructure; and
 - iii. assurance of Asset operability.
- (e) The CSELR must be designed, constructed, tested, commissioned, and maintained in compliance with the relevant parts of applicable Standards and Guidelines, Appendix 34 (*Standards and Guidelines*) in particular AS 61000, EN 50122-1, EN 50122-2, EN 50162, EN 50126, ARPANSA texts and BS 8020.

2. Scope

- (a) OpCo must mitigate the Stray Current and Electrolysis impact of the CSELR.
- (b) OpCo must provide electrical Earthing and Bonding Systems, which must include as a minimum, the following sub-systems:
 - i. earthing systems for high voltage, low voltage and communications infrastructure;
 - ii. bonding arrangements for connection of infrastructure components to rail as appropriate;
 - iii. isolation arrangements and measures; and
 - iv. lightning protection systems for the protection of people and equipment, as appropriate.
- (c) OpCo must provide Electrolysis prevention, mitigation and monitoring systems, which must include the following sub-systems as a minimum:
 - i. measures to minimise the flow of DC traction current between the running rails and earth (including to buried metallic assets);
 - ii. continuous monitoring of rail to earth potential at appropriate locations to detect situations where increased flow of DC traction current between the running rails and earth might be occurring;
 - iii. provisions to facilitate correlation testing by the NSW Electrolysis Technical Committee in relation to buried metallic assets; and
 - iv. provisions for the connection of drainage bonds or other active stray traction current mitigation equipment where required along the track as well as provisions to allow future monitoring and mitigation of stray traction current flow.
- (d) OpCo must provide a suitably qualified and experienced representative to interact with the NSW Electrolysis Technical Committee in relation to stray current electrolysis matters associated with the SLR. The representative must attend meetings and fulfil other reasonable requirements of NSW Electrolysis Technical Committee for participation in inspection, testing and other NSW Electrolysis Technical Committee tasks.

3. Performance and Technical Requirements

3.1. Earthing and Bonding System

- (a) The Earthing and Bonding Systems must be designed, constructed, tested and commissioned to provide:
 - i. safe electrical conditions;
 - ii. compliant operations;
 - iii. transfer potential compliance;
 - iv. touch and step potential compliance; and
 - v. lightning protection.
- (b) The design of the HV Earthing and Bonding Systems must be in accordance with the process outlined in Figure 8.1, AS 2067.
- (c) Where the LV Earthing and Bonding System is combined with the HV Earthing and Bonding System it must comply with AS/NZS 3000.
- (d) OpCo must ensure that no touch or step potential issues occur.
- (e) For the purpose of assessing step and touch potential hazards, all traction Electrification System supports that do not incorporate supplementary insulation must be treated as part of the Traction Return system.
- (f) DC touch potentials associated with the Traction Return system and traction Electrification System supports must be mitigated through the use of equipotential bonding and isolation to comply with EN 50122-1 and EN 50122-2.
- (g) OpCo must determine design targets for step and touch potential, earth potential rise and transfer of touch potential based on the following:
 - i. step and touch potential limits must be derived according to both ENA EG1 and AS/NZS 60479:
 - A. where the limits derived from AS/NZS 60479 are more onerous they must be combined with the limits derived from ENA EG1 to derive the upper limit of the range in which the potential may be accepted if no further measures can practically be included in the design to further reduce the potential;
 - B. where the limits derived from ENA EG1 are more onerous they must form the design target and the less onerous value derived from AS/NZS 60479 must be disregarded in the derivation of the upper limit of the range in which the potential may be accepted if no further measures can practically be included in the design to further reduce the potential;
 - ii. specific touch potential limits must be derived for swimming pool conditions for all residential land abutting the light rail alignment;
 - iii. consideration must be made for differentiation of allowable voltage for step and touch limits, which must be based on the degree of access (public or restricted);
 - iv. allowance for the impact of water and wet conditions;

- v. the resistivity of concrete must be based on the assumption that the concrete is wet; and
 - vi. OpCo must assume zero footwear resistance in public areas when calculating fault pathways.
- (h) Earthing and Bonding System performance with regard to the transfer of earth potential to metallic pipelines must comply with AS/NZS 4853.
- (i) OpCo must determine Earthing and Bonding System performance targets with regard to the transfer of potential to communications equipment that comply with AS/NZS 3835 (Set) in addition to the design target criteria derived from ENA EG1 and AS/NZS 60479.
- (j) For the purpose of the lightning risk assessment, the lightning protection system associated with the Operations Control Centre (OCC) must comply with Protection Level 1 as defined in AS/NZS 1768.

3.2. Electrolysis and Stray Current mitigation

- (a) The Electrolysis prevention, mitigation and monitoring systems must be designed, constructed, tested and commissioned to provide:
- i. safe electrical conditions;
 - ii. compliant operations; and
 - iii. effective management and mitigation of Stray Currents.
- (b) OpCo must identify structures and underground assets likely to be at risk from stray current corrosion resulting from construction and operation of the SLR.
- (c) OpCo must establish an electrolysis baseline of structure-to-earth potentials for those structures and underground assets identified in (b) above.
- (d) OpCo must implement measures to ensure that the operation of the SLR does not cause structure-to-earth potentials for structures and underground assets to increase to a level that is unacceptable to the asset owner.
- (e) OpCo must gain approvals for Electrolysis protection and corrosion control as required by the Electricity Supply (Corrosion Protection) Regulation 2008 - NSW.
- (f) The Traction Power Supply and Electrification System must ensure that:
- i. the Traction Return system:
 - A. is isolated from earth to minimise Stray Current in accordance with EN 50122-2 requirements;
 - B. includes systems for monitoring of Stray Current;
 - ii. the Traction Return earthing, bonding and isolation complies with the specific requirements of EN 50122-2 and AS 2832 relating to the control and mitigation of Stray Currents, including:
 - A. reinforcing within concrete sections must be connected together electrically between intervals determined in accordance with EN 50122-2;

- B. test points within concrete sections must be compliant with AS 2832.5 and they must be provided for each section; and
- C. insulated sections in reinforced concrete and isolating joints in metallic services must be co-ordinated such that they do not undermine the integrity of one another.

3.3. Electromagnetic Compatibility

- (a) The Electromagnetic Compatibility (EMC) management measures must be designed, constructed, and implemented to provide:
 - i. safe electrical conditions;
 - ii. compliant operations;
 - iii. Electromagnetic Compatibility; and
 - iv. effective management of interfaces with third parties with respect to EMC.
- (b) CSELR systems must be compliant with the following standards:
 - i. AS/NZS 61000 (all parts); and
 - ii. EN 50121 (all parts).
- (c) OpCo must implement an Electromagnetic Compatibility review for the SLR and prepare a report that assesses the potential impact on, and required mitigation works in relation to:
 - i. infrastructure and systems;
 - ii. adjacent third party infrastructure with particular focus on sensitive receptors including those in:
 - A. UNSW; and
 - B. Prince of Wales Hospital.
- (d) OpCo must carry out an Electromagnetic Compatibility review and prepare a report on the SLR Works to assess the potential impact of Operations Activities on project infrastructure, and on other infrastructure.
- (e) OpCo must implement the recommendations of the Electromagnetic Compatibility report and carry out field measurements for all operational modes and supply an independent verification certificate to confirm that OpCo Activities, including test and normal running of LRVs, do not have any adverse impacts on the condition or performance of:
 - i. infrastructure, including existing IWRL infrastructure; or
 - ii. adjacent third party infrastructure, with particular focus on sensitive receptors including those in:
 - A. UNSW; and
 - B. Prince of Wales Hospital.

- (f) Failure of any electromagnetic suppression components fitted to safety-critical systems must not cause that equipment to fail and cause an unsafe condition on the SLR when it is subjected to interference that is within the bounds of EN 50121.

4. Design Documentation Requirements

4.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

4.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the Earthing and Bonding Systems, Electrolysis and EMC systems must include:
- i. presentation of the Earthing and Bonding System strategy;
 - ii. presentation of the Electrolysis mitigation strategy;
 - iii. presentation of the EMC Plan;
 - iv. identification of anticipated fault levels and protection clearing times;
 - v. analysis of detailed services search data and site investigations and the subsequent identification of Earthing and Bonding Systems, Electrolysis and EMC hazards;
 - vi. development of soil resistivity profiles based on the analysis of measured soil resistivity data;
 - vii. determination of design limit criteria;
 - viii. assignment of design limits to identified hazards; and
 - ix. identification of interfaces with third party assets and evidence that consultation with the associated parties has been initiated (including negotiation of bulk supply point arrangements with the local distribution network provider).

4.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the Earthing and Bonding Systems, Electrolysis and EMC systems must include:
- i. approvals from utilities, Authorities, councils, regulatory bodies and other relevant stakeholders for relevant Delivery Activities;
 - ii. third party technical and operational agreements;
 - iii. system modelling, including Earth Potential Rise (EPR), step and touch potentials and rail to earth potentials for all foreseeable LRV operating patterns and all foreseeable traction power system operating configurations, EMC modelling in fault state in case of TPS out of order, and Stray Current modelling in case of track insulation faults;
 - iv. compliance with transfer, step and touch potential design criteria;
 - v. compliance with Stray Current management criteria;
 - vi. Traction Return schematics;

- vii. Traction Return arrangements, layouts and details, including rail isolation, cross-bonds, rail to earth voltage monitoring and leakage current monitoring;
- viii. earthing, bonding and isolation schematics;
- ix. earthing, bonding and isolation arrangements, layouts and details, including earthing grids, earth bars, miscellaneous steel requirements, platform screen doors, third party infrastructure and isolated supplies;
- x. equipment and plant room arrangements and layouts, including plans, elevations and cross sections;
- xi. cable infrastructure layouts, cross sections and details;
- xii. equipment operations and maintenance strategy and planning;
- xiii. equipment replacement methodology; and
- xiv. installation and workmanship details.

4.4. Design Stage 3 Design Documentation

- (a) Design Stage 3 Design Documentation for the Earthing and Bonding Systems, Electrolysis and EMC systems must include all the Design Stage 2 Design Documentation, developed to Design Stage 3.

5. Testing and Commissioning Requirements

- (a) OpCo must test and commission the Earthing and Bonding Systems, Electrolysis and EMC systems in accordance with the requirements of Appendix 33 (*Testing and Commissioning*).
- (b) In addition to the requirements of Appendix 33 (*Testing and Commissioning*), the Earthing and Bonding Systems, Electrolysis and EMC systems must undergo the following specific testing and commissioning activities:
 - i. as a minimum OpCo must provide type test and routine test certificates for the following equipment:
 - A. rail earth contactor (if used);
 - B. Traction Return to earth connection equipment;
 - C. Traction Return to earth connection current monitoring equipment;
 - D. high voltage surge protection devices; and
 - E. structure to rail overvoltage protection devices;
 - ii. as a minimum OpCo must undertake Site Acceptance Tests in all sections of the project including the tunnels, CSELR Stops and the Light Rail Maintenance and Stabling Facilities. Site Acceptance Tests must include:
 - A. earthing grid impedance tests;
 - B. current injection testing (high voltage earthing systems only);
 - C. rail to earth insulation tests (pre embedment);
 - D. rail to earth insulation tests (post embedment);
 - E. rail to earth voltage tests;
 - F. not used;
 - G. insulation testing of all traction electrification supports (including double insulation and associated test circuits);
 - H. insulation testing of all specific isolation measures implemented to mitigate Stray Current propagation and touch potentials between rail and earth; and
 - I. performance testing of any electrolysis drainage bonds or similar.



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Schedule E1 Scope and Performance Requirements
Appendix 29 – Traction Power, Electrification
Systems and Control

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1. Overview and Scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for the Traction Power Supply, Electrification Systems and Power Control Systems for the CSELR
- (b) OpCo must provide a:
 - i. safe, efficient and reliable power system to support operations and services requirements as outlined in Appendix 38 (*Minimum Service Requirements*) and Appendix 39 (*Operations and Customer Service Requirements*);
 - ii. system that minimises the visual impact of the Traction Power Supply and Electrification Systems in sensitive areas as outlined Appendix 14 (*Public Domain*);
 - iii. wire-free electrification system, extending as a minimum between Town Hall Stop and Circular Quay Stop;
 - iv. system that is resilient, modular and expandable to accommodate future network extension or network expansion as outlined in Appendix 36 (*Future Network*); and
 - v. system that minimises energy consumption and drives the sustainability requirements as outlined in Appendix 7 (*Sustainability*).

1.2. Scope

- (a) OpCo must provide a 750V DC Traction Power System for the CSELR.
- (b) The Traction Power System must consist of a network of Traction Power Substations (TPS) and all equipment between the Ausgrid interface points and the interface points on the overhead wiring, wire-free system, and the Traction Return systems.
- (c) The Project Site includes a number of Sections which may be suitable as substation sites. OpCo must confirm which of these sites are required, through traction power load flow and fault studies. If OpCo requires any additional sites or adjustments in sites then it is OpCo's responsibility to identify and procure those sites in accordance with clause 12.11 (*Extra Land*) of the Operative Provisions.
- (d) The Traction Power Supply and Electrification System must include:
 - i. Traction Power Supply equipment and cables, including Traction Return, rectification, protection and control equipment;
 - ii. overhead wiring systems, overhead supply conductors and supports along with a wire-free supply system;
 - iii. SCADA and communications equipment for operational control, monitoring and event logging, which must also control and monitor the IWLR;
 - iv. auxiliary systems and back-up power supply for operations critical and safety service components including protection, control and monitoring devices;
 - v. lightning and surge protection equipment;

- vi. power factor correction, harmonic suppression and filtering as required to meet Ausgrid requirements, NSW Service Installation Rules and relevant EMC standards;
 - vii. rail to earth voltage limiting devices; and
 - viii. isolation, earthing, and rail connecting equipment, both within substations and those located along the track.
- (e) OpCo must provide Operating Rules and Procedures in accordance with AS 2467, Attachment A.
- (f) For regulatory purposes the Traction Power System is deemed to be part of an electrical installation.

2. Performance and technical requirements

2.1. General

- (a) The Traction Power Supply and Electrification System must support the service requirements and headways set out in Appendix 38 (*Minimum Service Requirements*) and the Operations Management Plan.

2.1.1. Traction Power System



- (a) The Traction Power System must provide the following functions:
- i. distribute, transform, and control bulk high voltage supplies derived from the Ausgrid network and make supply available to LRVs via 750V Electrification System comprising an overhead line electrification system in the wired areas, and via other appropriate means in the wire-free areas;
 - ii. provide for the automatic detection, localisation and de-energisation of faults in order to protect persons, Assets, and the property of third parties;
 - iii. provide for the automatic detection, localisation and mitigation of other hazardous conditions in order to protect persons, Assets, and the property of third parties;
 - iv. provide for the remote monitoring, control and data recording of the high voltage AC, 750V DC and auxiliary elements;
 - v. provide for the isolation and short circuiting to rail of the 750V Electrification System at appropriate points to allow for the convenient planning and management of maintenance isolations, and an efficient and expeditious response to unplanned contingencies; and
 - vi. provide one or more mass trip functions at the OCC which will remove power from the overhead wire and wire-free system.
- (b) The Traction Power System must:
- i. be adequate to supply average electrical power demand and meet peak power demand in accordance with UNE-EN 60146-1-1 for type VI substations;
 - ii. be designed to ensure the supply voltage and permissible limits comply with IEC 60850;
 - iii. be protected against lightning and switching surge damage and incorporate surge arrestors and voltage limiting devices in accordance with EN 50526-1;
 - iv. incorporate sufficient diversity and Redundancy to support the system's operational requirements under all credible single fault and failure scenarios, including single equipment outage, single substation outage and single power utility supply outage;
 - v. follow guidance as set out in TR IEC 61000.3.6 for harmonic disturbance and meet Ausgrid and NSW Services Installation Rules Section 7 Requirements; and
 - vi. limit touch potential and accessible voltages in accordance with CENELEC standard EN 50122-1.
- (c) The Traction Power System must be configured in accordance with the following:

- i. the SLR CBD Area 11kV Ring must be provided with a SCADA controlled circuit breaker at each end of each section in order that any fault can be quickly localised and supply restored. Line-differential protection must be provided for each segment in the ring main circuits to provide fast clearing of faults, good discrimination, and minimise consequential damage;
 - ii. the Electrification System must be sectioned to accommodate all proposed operational modes and required contingencies;
 - iii. the Traction Power System must be 'unearthed', meaning the running rails must be well insulated from ground and there must be no intentional connection to ground (earth potential) under normal operating conditions. An earthed rail system is permissible in the depot areas provided that it does not cause the main-line rails to be earthed under normal conditions (except as LRVs transit insulated rail joints);
 - iv. the Traction Return must be through both running rails, cross-bonded as appropriate, and include appropriately sized negative cables between the running rails and the TPSs;
 - v. except at end of the lines and at depots and sectioning hut areas, all main line electrification system overhead wiring sections must be fed by two DC circuit breakers, via adjacent TPSs. If dual end feeding is required for reliability of supply, all sections must be fed by two Direct Current Circuit Breakers (DCCB). Where the two DCCBs are at the same TPS at the end of the line it is acceptable that the system be operated with one of the two DCCBs normally open; and
 - vi. if only a single feeder DCCB is provided at the TPSs at the Randwick and Kingsford termini provision must be made for the installation of a second DCCB and associated equipment to allow for extension of the line in accordance with Appendix 36 (*Future Network*).
- (d) The design process for the Traction Power System must include the following:
- i. a traction power model must be used to verify the proposed design of the Traction Power System. The traction power model must include computer generated simulations of the electrical system utilising proven traction power system software;
 - ii. the Traction Power System analysis must utilise the final LSR alignment, LRV performance and characteristics details and the operating plans (consist sizes, headways and passenger loadings) described in Section 2.1 (a) to (c) above, and must make allowance for the intended level of signal priority. The load flow study must be performed for Normal, Special Event and future operation scenarios and those outlined in the Operations Management Plan, on the loading of the Traction Power System. These must also be based upon worst case DC system loading. The analysis must include operation in all required contingencies, such as any one TPS off-line. The analysis must consider perturbations in the operation of the SLR system to ensure that the system has the capacity to supply foreseeable coincident peak demands from multiple LRVs. The load flow must confirm TPS capacity, location, system voltage levels at the contact wire / pantograph interface, average power demand and peak power demand. The load flow simulation will be conducted along the track every 10m. The analysis against touch potentials will be made on metallic parts within 4m areas of the track axis as required EN 50122-1, mainly for OHW zone as defined in EN 50122-1 & IEC 1332/03; and

- iii. OpCo must develop a protective device coordination plan and relay settings for the Traction Power System. OpCo must validate protection clearing times at normal trip settings.

2.2. Traction power substations

2.2.1. Performance and configuration Requirements

- (a) TPSs must comply with AS 3000, AS 2067 and the requirements of relevant Authorities.
- (b) Negative rail voltage rise at the substation must be limited to a maximum permissible 60V in the depot and 120V in the mainline in accordance with EN 50122-1. Rail to ground sensing devices must be implemented to monitor the negative voltage to ground and “clamp” the rails to ground upon exceeding the pre-set limit.
- (c) TPSs must be designed to facilitate installation of equipment and systems for easy access and handling all the operative elements of the installation. Removal and replacement of all large equipment (rectifier transformer, circuit breakers) must be achievable without structural modifications, and without unreasonable crange.
- (d) Maintenance access, both pedestrian and vehicular, must be provided.
- (e) OpCo must take whatever measures are necessary to protect the access ways and crane standing space required for replacing substation elements.
- (f) TPS equipment must be as standardised as possible and allow for interchanging of equipment and spare parts.
- (g) All Traction Power Supply substations and switch rooms must be consistent with OpCo’s Fire and Life Safety (FLS) strategy.
- (h) 
- (i) 
- (j) A land-line telephone must be provided at each TPS.
- (k) OpCo must provide an auxiliary power transformer supplying “house” power for the TPS building, with appropriate protection and disconnect devices on the primary and secondary. The auxiliary transformer must supply power to the AC distribution panel.
- (l) A negative grounding device must be supplied to monitor the potential between the negative bus and the TPS ground grid.
- (m) OpCo must demonstrate through a FMECA and hazard analysis that critical TPS control and monitoring supports Operations Activities under a failure of power supply to the TPS.
- (n) All above ground TPSs must be internally similar in dimensions, layout and equipment manufacture, as far as reasonably practical.
- (o) All below ground TPSs must comply with Fire and Life Safety standards and specifications, access and egress standards and be sealed from moisture ingress.

- (p) The TPS must be designed to minimise noise emissions and must adopt the same limit as set out in the Environmental Requirements and must comply with the Environmental Requirements.
- (q) TPSs must be designed to maintain the equipment room air temperature below the rated operating temperatures of the substation equipment. The design must consider the effect of elevated temperatures on the life of the electronics and batteries.
- (r) All traction power equipment and cables must be sized to support the maximum load and fault current that it is exposed to for the expected fault duration.
- (s) All indoor equipment and enclosures must have a minimum Ingress Protection (IP) rating of IP21.
- (t) The arrangements for the isolation and short circuiting to rail of the 750V Electrification System as required by section 2.1.1 (a)(v) must provide for the isolation to be adequately secured against control system failure, inadvertent operation and tampering by unauthorised persons. Appropriate provision must be made for securing the isolation and short circuiting points during any maintenance of the Power Control Systems.
- (u) The TPSs at the outer termini must be able to accommodate equipment for future extensions of the network.
- (v) Correct operation of the fault protection system must not rely on manual adjustment of setting to deal with different traction system contingency arrangements.
- (w) Protection function must not be embedded with PLC or SCADA software.

2.2.2. Fire protection requirements

- (a) Each TPS must be equipped with a fire alarm system which must detect and alarm upon detection of a smoke or fire event and report to the OCC.
- (b) The smoke detectors must be connected directly to the electrical SCADA system. A separate fire indication panel is not required.
- (c) Passive fire protection in the form of intumescent coatings for all main power cables must be provided. The materials used in the construction of the substation must be selected for low smoke evolution, low flame propagation, and low acid gas emission.
- (d) Appropriate provision must be made for fire suppression.

2.2.3. Traction power rectifier sets

- (a) The displacement power factor of the traction power rectifier unit must be greater than 95% lagging.
- (b) The traction power rectifier unit must be protected from damage due to surges and transients transmitted through the Ausgrid network with surge protection.
- (c) The traction power rectifier unit must comply with EN 50328 and AS 60146.
- (d) Rectifier transformers must not be force-cooled to achieve a higher thermal rating.

- (e) An accurate electro-thermal model must be available for the rectifier sets so that the equipment temperatures can be inferred from the current.
- (f) The rectifier and transformer audible sound levels must not exceed maximum values for the transformer as specified in EN 50329 and AS 60076 under any load condition.
- (g) The total harmonic distortion generated by the transformer and rectifier units must not exceed the requirements outlined in AS 61000-3-6 and Ausgrid Requirements.
- (h) The rectifier transformer and rectifier units must be duty class VI in accordance with AS 60146.
- (i) Rectifier enclosure energised / grounded protection must be provided which must detect when the enclosure has a positive to frame fault or when grounded. Upon detection of a positive to frame fault the rectifier set must be automatically shut down.

2.2.4. High Voltage AC switchgear

- (a) OpCo must provide:
 - i. metal clad switchgear which prevents the accidental contact of live parts by maintenance personnel, in line with AS 62271 and IEC 62271;
 - ii. multifunction protective devices for phase imbalance, overcurrent, under voltage, diagnostics, alarming, monitoring, data storage and power metering; and
 - iii. digital metering for:
 - A. AC voltage;
 - B. AC current; and
 - C. Power.

2.2.5. Positive 750V DC switchgear

- (a) DC switchgear must be metal enclosed single pole, draw-out type feeder breakers rated to interrupt maximum available fault current, in accordance with EN 50123 and IEC 61992.
- (b) The major elements of the TPS DC switchgear must consist of a main cathode circuit breaker, high speed DC feeder circuit breakers, and programmable logic controller (PLC) based controller with protection functions.
- (c) Protection and data storage devices must be provided for the DC circuit breakers. These devices must perform all the functions of overcurrent protection, breaker control, breaker monitoring, data storage, transfer trip, alarm summary storage, event summary storage, ammeter, voltmeter, SCADA interface for all required points in accordance with the SCADA I/O list , HMI interface for establishing and adjusting breaker protective parameters and visual display of metering.
- (d) Main cathode circuit breakers must meet the following requirements:
 - i. protect against reverse current;
 - ii. include a DC enclosure device to detect enclosure faults; and

- iii. provide an interlock to the AC breaker; and include a lockout device.
- (e) Feeder circuit breakers must meet the following requirements:
 - i. circuit breaker protection with instantaneous, long time and rate of rise overcurrent protection; and
 - ii. a transfer trip scheme to ensure all feeder circuit breakers supplying power to a faulted section must trip and de-energise the faulted section.
- (f) Equipment must be metal clad, in accordance with EN 50123 and IEC 61992, and must prevent the accidental contact of live parts by maintenance personnel.

2.2.6. Negative 750V DC switchgear

- (a) Each TPS must be furnished with a negative grounding device which must monitor the potential between the negative bus and the substation ground grid. The negative grounding device must provide an open circuit when the potential is at an acceptable level. The negative grounding device must close if the pre-set potential is exceeded. When the current has decreased below the pre-set level the negative grounding device may automatically open provided that this can be done safely.
- (b) The status of the negative grounding device must be reported to the OCC via SCADA.

2.2.7. Substation DC frame fault protection

- (a) DC enclosure energized / grounded protection must be provided which must detect when the switchgear has a positive to frame fault or when grounded. Upon detection of a positive to frame fault the substation must be automatically shut down. Fault protection status and alarms must be reported to the OCC via SCADA.

2.2.8. Rectifier control interlocks

- (a) The main cathode circuit breaker and the negative disconnect switch must be interlocked such that the cathode circuit breaker cannot be closed when the negative disconnect switch is open and the negative disconnect switch cannot be opened when the cathode circuit breaker is closed.

2.2.9. Substation control power

- (a) Control power in the TPS must be used for TPS controls, relaying, SCADA and other functions. The system must consist of a step-down transformer, battery bank, battery charger, DC distribution panels and all necessary equipment to provide a complete control power system.
- (b) The battery unit must be capable of supplying TPS demand to support control power for a minimum of four (4) hours unless a longer duration is identified in a FMECA and hazard analysis.
- (c) The battery must be sized based upon a load calculation incorporating TPS switching operations and all static TPS loads during normal and contingency operation.

2.2.10. Substation control and monitoring

- (a) The TPSs must be designed for unattended operation with remote supervision and control from the OCC.
- (b) The following Traction Power Supply and Electrification System equipment must be remotely controlled:
 - i. DC circuit breakers;
 - ii. AC circuit breakers;
 - iii. by-pass switches; and
 - iv. isolating switches.
- (c) The following SCADA I/O, at a minimum, must be incorporated into the Traction Power Supply and Electrification System functionality:
 - i. circuit breaker status;
 - ii. isolating switch status;
 - iii. transformer winding temperature warnings;
 - iv. battery charger status;
 - v. over current / earth fault trip;
 - vi. auxiliary power status;
 - vii. rail voltage limiting device status;
 - viii. frame leakage status;
 - ix. emergency trip activated status;
 - x. mass trip control status;
 - xi. staff help point button status.
 - xii. line differential alarm;
 - xiii. watchdog breaker fail scheme; and
 - xiv. trip circuit supervision.
- (d) Data monitoring and acquisition for Traction Power Supply and Electrification System equipment must include:
 - i. rectifier DC current;
 - ii. rectifier DC voltage;
 - iii. AC voltage;
 - iv. AC current;
 - v. power consumption for TPS;
 - vi. power consumption for auxiliary loads; and

- vii. rail-earth voltage limiting device status.

2.2.11. Substation earthing

- (a) A TPS earthing system must be provided for life safety and fault detection purposes. Earthing designs must use the latest versions of relevant Australian and international standards, and industry guides, including ENA EG1 – 2006, IEEE Standard 80-2000, AS/NZS 2067:2008, AS/NZS 3835:2006 and AS/NZS 3000:2000. The provisions of these and other relevant documents must be followed to provide an outcome that has used the as low as reasonably practicable principles.
- (b) Step and touch voltages must be calculated. ENA EG1-2006 must be used to determine step potential control limits. Touch potential limits for ENA EG1-2006 must be determined. When using ENA EG1-2006, "50kg limits" must be applied to all external areas with public access, and "70kg limits" must be applied to internal areas of the TPS.
- (c) Under all single phase to earth fault scenarios, the earth potential rise at any nearby communications or signal earthing systems must be less than the 430V limit or lower, if required by signalling surge protection system or RMS road traffic signal controls.
- (d) All system substation earth grids must be designed to ensure that there is no reliance on a single wire connection to electrodes or any part of the grid, which if broken may cause non-compliance to the applied safety standards.
- (e) The earthing system design must include appropriate treatment of metallic structures exterior to the TPS.
- (f) Surge protection must be provided for all cables entering and exiting the TPS.
- (g) All traction equipment (inside the substation) protected by 64 function relay of the TPS must be isolated from earth and connected to the earth grid through an earth fault detection system. The earth fault detection system must, upon detection of an earthed condition, disconnect the substation from sources of power and annunciate an alarm locally and at the OCC. All metallic non-current carrying parts that are not traction equipment (inside the substation) must be directly earthed.

2.2.12. DC feeder system

- (a) The DC feeder system must be provided and consist of all ducts, cabling and switching equipment necessary to connect the TPS to the overhead wiring, wire-free system and rail returns. All cable ratings must be based upon the worst case maximum currents indicated in the traction power model with any necessary de-rating due to duct bank routing and appropriate temperature rise. The positive DC feeder system must be designed to provide adequate rating and to maintain the electrification voltage within acceptable limits.
- (b) The DC negative feeder system must interface with the running rail Traction Return so as not to interfere with the LRV control system. The negative feeder system must maintain a low rail to ground voltage and provide sufficient current rating. The negative feeder system must be continuous through the four running rails including interlockings at all locations.
- (c) The running rails for each track must be cross-bonded to each other and to the other track at appropriate intervals. The cross-bonding arrangement must allow for the

removal and replacement of any one rail through the cross-bond zone without the need to disturb any other rails in order to reinstate the cross-bonds.

2.2.13. Cabling identification system

- (a) All cables must be appropriately identifiable at each end and within cable pits.

2.2.14. Architecture and urban design requirements

2.2.14.1. Objectives

- (a) OpCo must develop the design using a fully integrated approach, recognising the different functional requirements, statutory and regulatory requirements, Project Planning Approval conditions, and community and stakeholder expectations.
- (b) OpCo must ensure that the components of all substation and sectioning hut buildings are designed in coordination with, and in collaboration between, its engineers, architecture and urban designers, and operations specialists.
- (c) OpCo must apply the following architectural and urban design principles:
 - i. promote a consistent design form, style and language of finishes across all building components that establish an identifiable family of elements; and
 - ii. develop a palette of materials, finishes and systems that are easy to maintain, clean and repair during the design life of the asset.
- (d) OpCo must ensure that the asset does not damage or have any adverse impacts on the amenity, aesthetics, safety, integrity, environment and function of adjacent properties in the vicinity of the site.

2.2.14.2. General requirements

- (a) Without limiting the requirements of this Appendix OpCo must meet architectural and urban design requirements for all substations, and sectioning huts within the corridor for:
 - i. landscape screening and architectural materials and finishes to substations and sectioning huts;
 - ii. any necessary retaining walls; and
 - iii. security fencing and gates as required.
- (b) Each TPS must be designed to minimise its visual impact on the surrounding areas where it will be installed. Architectural treatment, to provide an acceptable appearance and blending with the surrounding environment, is required for all above ground TPSs.
- (c) OpCo must provide sufficient space for maintenance vehicle parking adjacent or within 50m of the substation.

2.2.14.3. Materials, finishes and landscape screening

- (a) OpCo must provide architectural treatments to / or around substations and sectioning huts that are sympathetic and complimentary to the surrounding urban environment.

- (b) OpCo must ensure:
 - i. that all doors and fixed panels have hidden fixings; and
 - ii. that all cladding panels have equal vertical and horizontal aligned panels and joints; and ensure that all ventilation louvers where required are integrated flush with the surrounding doors and/or panels.
- (c) OpCo must ensure that substations and sectioning huts are treated, using the material type and finish in accordance with Table 1 below:

Table 1 Material and finishes types to substations / sectioning huts

Finish Type	Finish Quality	Material and Finish Description	Substation Locations
A	High Quality	Perforated aluminium, perforated stainless steel, or perforated powdercoated steel panels. Can be additionally screened with low level planting.	Olivia Gardens Lang Road (Tennis Centre) Randwick Terminus Dacey Avenue Sectioning Hut
B	Medium Quality	Composite aluminium or similar solid prefinished panels. Can be additionally screened with low level planting.	Royal Randwick Racecourse (near existing entry off Alison Road) High Street (on Anzac Parade) Anzac Parade Stop Hay Street (carpark)
C	Base Quality	Prefinished metal faced insulated panels.	Chalmers Street (in disused rail building) Circular Quay (adjacent rail line and Four Seasons)
D	Underground Substation	Ensure that all access hatches and pit lids are flush with the surrounding surfaces and that materials and paving pattern match adjacent surfaces.	Martin Place

- (d) OpCo must provide landscape screening in accordance with Appendix 14 (*Public Domain*); and consider soft landscaping to / or adjacent to substations and sectioning huts to help minimise heat and glare, and improve visual amenity and screening.
- (e) Landscape screening and architectural treatments must:
 - i. not impede access by vehicles, personnel and emergency egress; and
 - ii. not provide areas that would allow concealment of people.

2.3. Drainage feeder system

- (a) Provision must be made for the monitoring and control of Stray Current through the use of drainage panels. The drainage panels must provide a means of permitting metallic utilities to connect to the substation negative bus. Provisions must be made to provide a raceway system to a demarcation pullbox for utility company drainage cables to be connected to the drainage system.

2.4. High Voltage AC feeder system

- (a) The high voltage AC feeder system must be provided and consist of all duct routes, cable pulling / turning and jointing pits necessary to connect the TPS to the Ausgrid supply switchgear in accordance with Ausgrid requirements.

2.4.1. Supply cable conduit routes

- (a) Cabling between the Ausgrid supply points and the TPSs must be provided in underground unplasticised polyvinyl chloride (uPVC) conduit routes, with the depth of the conduits at least 1000mm below surface level.
- (b) All underground cable routes must have a utility marking tape (with magnetic tracer) installed 300mm above concrete or PVC (polyvinyl chloride) danger slabs, installed 100mm above the top of the ducts.
- (c) Positive and negative feeders must not use a common cable pit.
- (d) Not used.
- (e) Ten percent (10%) spare duct must be included in each duct run.

2.4.2. Cabling identification system

- (a) All cables must be appropriately identifiable at each end and within cable pits.

2.5. Electrification System

- (a) The Electrification System must consist of an overhead wiring (OHW) system, and as a minimum be a wire-free system between Town Hall Stop and Wynyard Stop.
- (b) The wire-free system may be utilised at other locations to address specific issues such as low bridges.
- (c) TPSs must provide traction power to the Electrification System. The point of interface to the OHW and wire-free system will be the DC feeder cable connections at the output side of the DC circuit breakers and TPS bypass switch equipment located in each TPS.
- (d) The OHW system must be designed to meet:
 - i. line speed at the relevant location;
 - ii. clearance;
 - iii. mandatory national standards;

- iv. climatic and environmental conditions and constraints;
 - v. vehicle power consumption determined by the operational performance requirements; and
 - vi. traction power load flow simulation.
- (e) The OHW must be a single or a double contact wire with, if required, parallel underground helper cables of appropriate dimension to support operational voltage requirements.
 - (f) All traction feeder cabling at OHW feeder locations must be protected by voltage limiting devices (VLD) against lightning strikes.
 - (g) The OHW poles must be located in order to minimise the number of poles and reduce the visual impact of the system and minimise collision risk for both LRVs and road vehicles. For the placement of poles at intersections, OpCo must consider the requirements of "Guide d'implantation des obstacles fixes à proximité des intersections tramways / voies routières" Version 2 Dated 26/01/2012.
 - (h) The tension in the contact wire must comply with the permissible limits according to Table 1 of Chapter 3 for European networks of the standard EN50163.
 - (i) Sectioning of the OHW system is required at each TPS location.
 - (j) Outdoor OHW sectioning switches within public access areas must be adequately secured from public operation.
 - (k) OHW poles must be located to meet OHW performance criteria including maximum span lengths and maximum mid span offset. OpCo must liaise with TfNSW to determine final pole locations, the spacings of which will be required to satisfy City of Sydney road lighting levels in accordance with the 'Draft Sydney Lights Code 2006' and the City of Sydney Exterior Lighting Strategy.
 - (l) OHW poles must be identified with a unique identifier label.
 - (m) The Electrification System must comply with the requirement of RailCorp Engineering Standard: EP 00 00 00 13 SP 'Electrical Power Equipment – Design Ranges of Ambient Conditions'.
 - (n) OpCo must take into consideration and address any existing overhead obstructions including the three bridges over Eddy Avenue, buildings and aerial Utility Services that may impact the final layout.
 - (o) The contact wire must be auto-tensioned to maintain tension within +/- 5% of nominal by means of balance weight assemblies, which must be installed internally within anchor poles located at the ends of each tension length. Alternatively, for the tensioning device system, a solution which minimises visual impact can also be implemented: a compensated device with spring avoiding the use of counterweight. Turnouts, in compensated areas, may also be compensated by the use of a spring tensioning device. Suitable anchor arrangements must be used at or near the center of each tension length to prevent along-track movement of the contact wire at that point. All electrical connections to the contact wire must be made using high flexibility connections.
 - (p) The contact wire must be supported and registered by means of cantilevers or span wire arrangements attached to circular steel poles located beside each track. At special or complex locations such as track crossovers and intersections, or where

third party assets preclude the installation of poles, the contact wire may be supported by span wire arrangements mounted on poles located on the outer sides of the tracks. At platform locations and approaches, centre poles may be permitted. The contact wires must be offset (staggered) at registration points. The contact wire must not be supported from external structures such as buildings or other third party assets.

2.5.1. Design and aesthetics integration

- (a) This section must be read in conjunction with Appendix 14 (*Public Domain*).
- (b) OpCo must ensure the OHW infrastructure system is designed to minimise visual impact and the clutter of additional power lines.
- (c) OpCo must ensure that the design addresses the following objectives:
 - i. the positioning of OHW infrastructure is sympathetic to the local settings and environment; and
 - ii. OHW infrastructure located at CSELR Stops and along the corridor is considered together with platform structures to minimise visual clutter and reduce system site cross section.
- (d) OpCo must ensure that the design addresses the principle that support poles are of a contemporary and elegant design with a high quality finish, appropriate to the precinct settings, including:
 - i. finishes of the support pole and all struts are finished in the same high quality finish and colour; and
 - ii. promote the application of integrated surface treatments to the lower 3m of the pole measured from the finished ground surface that provide both a positive visual and graffiti-resistant outcome.
- (e) Refer to Appendix 14 (*Public Domain*) for required materials and finishes treatment to OHW infrastructure.
- (f) OpCo must ensure for the George Street pedestrianised zone that:
 - i. OHW elements are designed to minimise visual impact.; and
 - ii. not used.
- (g) TfNSW, in conjunction with City of Sydney has developed a joint use Smartpole® concept design for roadway lighting, traffic signals, City PA warning system, banners, street signs, OHW. The Smartpole® designed to support the OHW if needed, is a mandated requirement for OpCo to adopt including aesthetics and colour of poles within the City of Sydney portion of the route.

2.5.2. Electrical clearances

- (a) The static electrical clearance between 750 Volt DC live parts of the OHW and earth must be not less than 100mm under any conditions, in accordance with EN 50119.
- (b) Floating sections between insulators must be considered to be live for clearance purposes and 100mm static clearance applied under any conditions, in accordance with EN 50119.

- (c) The passing electrical clearance between earth and 750 Volt DC live parts of the OHW, including the dynamic movements of conductors and pantograph must be not less than 70mm under any conditions, in accordance with EN 50119.

2.5.3. Pantograph clearances

- (a) The mechanical clearance between any pantograph and common live metal must be not less than 150mm, except to steady arms attached to the contact wire, where the clearance must not be less than 15mm, in accordance with EN 50119.
- (b) Clearances must be achieved after the effects of track tolerances, wear and dynamic movement have been applied.

2.5.4. Personnel clearances to the OHW

- (a) The design must comply with EN 50122-1.
- (b) To minimise the electrical safety risks, electrical clearance must be maximised wherever practical, especially in areas of public and staff access.
- (c) Conductors passing over any area at CSELR Stops where persons might be present must be insulated.

2.5.5. Height and gradient requirements

- (a) Except within the tunnel and at the tunnel approaches where the approaches are not trafficable by road vehicles during normal operations, the minimum contact wire height at the lowest point in any given span must be not less than 5.5m above running rail level, or higher if required by Roads and Maritime Services. The contact wire height at supports must take into consideration the effect of wire sag and installation tolerance, including track construction and maintenance tolerances. The minimum contact wire height must take account of the full temperature range and the maximum tension loss condition. OpCo must obtain written approval from Roads and Maritime Services for the minimum contact wire height.
- (b) Contact wire gradients, and abrupt changes of contact wire gradient, must be minimised.

2.5.6. Critical speed

- (a) The OHW must be designed so that the critical speed is in excess of the maximum operating speed at the location.

2.5.7. Tension lengths

- (a) Maximum tension lengths must be designed to maintain suitable contact wire tension for the particular track configuration within safe working limits of the selected materials under all ambient and operating conditions.
- (b) Fully tensioned equipment must be suitably anchored to reduce the along-track movement of the OHW equipment and to minimise the repair work in case of a conductor breakage.
- (c) The maximum loss of tension for each tension length must be 5%.

2.5.8. Wiring at overlaps and turnouts

- (a) Overlaps must be used between adjacent tension lengths to provide mechanical continuity of the OHW and to permit passage of the LRV pantographs from one tension section to another.
- (b) The contact wire heights at overlaps and turnouts must be designed considering the mechanical properties of the OHW. The design must enable a smooth transition between adjacent contact wires without hard spots, by equalising the contact wire heights over approximately 3m to 4.5m of track. Sufficient electrical and mechanical clearances must be maintained between adjacent cantilevers and between the cantilever frames and adjacent conductors of the auto-tensioned contact wires for all ambient conditions.

2.5.9. System safety

- (a) As a minimum, the following items must be provided by OpCo in the design, specification, construction, and functionality of the OHW system:
 - i. the OHW system must be a double insulated system. Insulators are to be installed to minimise the 'live' envelope. There is to be no live bare OHW equipment beyond the zone projected vertically from the running tracks;
 - ii. all OHW poles must be uniquely identified with appropriate labelling aesthetically acceptable within the street environs;
 - iii. safety screens must be fitted at all locations where it is necessary to ensure personal safety and clearance limits to live equipment are observed; and
 - iv. OpCo must minimise the use of safety screens by improving electrical clearances or by removing the hazard altogether, wherever possible.

2.5.10. Pole deflection

- (a) Pole deflection plus foundation rotation during LRV operations must not exceed 50mm at contact wire height. Pole deflection at the top of the pole under maximum loading conditions must not exceed 1.5% of pole length. Overload factors must not be applied in the calculation of pole deflection.

2.5.11. Pole earthing and bonding

- (a) The OHW system must be in accordance with EN 50122-1.
- (b) On all shared lighting and OHW poles, the lighting equipment must be electrically insulated from the Traction Power System and separately bonded to earth or mounted, in accordance with EN 50122-1.
- (c) Not used.

2.5.12. Lightning and surge protection

- (a) Overvoltage protection for the OHW must be provided by lightning arrestors rated to withstand the maximum system voltage and anticipated voltages from any paralleling high voltage transmission lines onto the system conductors.

- (b) Surge arrestors must be fitted to all OHW feeders risers at TPSs, in areas of reduced electrical clearance between OHW equipment and earthed structures, at high points along the alignment, and at other identified locations considered susceptible to lighting strikes.
- (c) Surge arrestors must be mounted on the poles and provided with direct connections to local earth. All connections must be insulated from the poles.

3. Design Documentation Requirements

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Documentation

- (a) Design Stage 1 Design Documentation for the Traction Power Supply and Electrification System must include:
- i. equipment operations and maintenance strategy;
 - ii. performance and functional requirements in relation to Traction Power Supply and Electrification System SCADA, in particular system latency, master clock and event logging and recording;
 - iii. equipment replacement methodology;
 - iv. Traction Power Supply and Electrification System modelling for all Operations Activities, including normal operation, degraded operation and failure scenarios. The modelling details must include:
 - A. voltage drops and line voltage profiles;
 - B. instantaneous peaks and root mean squared power demand on each substation, showing % capacity;
 - C. instantaneous peak and root mean squared current on each substation, showing % capacity (this is to be evaluated over periods commensurate with the thermal time constants of the relevant equipment);
 - D. energy consumption and regenerative energy; and
 - E. rail voltage profiles;
 - v. sectioning and operating design, including single line diagrams and electrical schematics, demonstrating system configurations for all normal and degraded operating scenarios and for isolating sections for maintenance;
 - vi. protection study – protection philosophy, fault scenarios, minimum and maximum fault levels, equipment capability, protection discrimination curves, recommended protection settings and auto-reclose scheme;
 - vii. HV electrical protection scheme concept;
 - viii. insulation co-ordination study;
 - ix. substation design calculations – including heat loads, ventilation modelling, busbar ratings, battery loads, LV maximum demand / voltage drops / fault levels / fault loop impedance / short circuit protection discrimination / cable de-rating and all requirements of AS 3000 - clause 1.9.4, current transformer burdens, transformer bundling (if liquid filled transformers are proposed), structural & mechanical calculations;

- x. substation layout plans, sections and elevations – architecture and urban design, structural, civil, electrical equipment and building services;
- xi. demonstration of equipment accessibility;
- xii. substation earthing schematic, earth grid design and bonding details;
- xiii. cable route details;
- xiv. HV cable de-rating and voltage drop calculations;
- xv. SCADA I/O lists including transducer ratios for analog inputs;
- xvi. cable and termination schedules;
- xvii. signage schedule;
- xviii. equipment environment details and requirements;
- xix. fire and smoke compartmentalisation;
- xx. OHW configuration and typical arrangements;
- xxi. maximum calculated OHW temperature for each tension length based on results of traction power modelling;
- xxii. OHW tension length diagram and tension loss calculations;
- xxiii. OHW conductor and support details; and
- xxiv. OHW / pantograph security budget itemising the allowance for each component of the displacement of the contact wire from the pantograph centreline.

3.3. Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the Traction Power Supply and Electrification System must include:
 - i. all the nominated Stage 1 Design Documentation in its final form;
 - ii. approvals from the relevant Authorities and other relevant stakeholders for relevant Operations Activities;
 - iii. RMS written approval for the contact wire height; and
 - iv. third party technical and operational agreements.

4. Testing and Commissioning Requirements

- (a) OpCo must test and commission the Traction Power Supply and Electrification System in accordance with the requirements of Appendix 46 (*Site Investigation, Survey and Condition Monitoring*).
- (b) All traction power, electrification system and controls system equipment must be subjected to a Factory Acceptance Test (routine test) in line with the relevant Australian or International Standards.
- (c) In addition to the requirements of Appendix 46 (*Site Investigation, Survey and Condition Monitoring*), OpCo must undertake the following on site testing requirements for all Traction Power Supply and Electrification System equipment as a minimum;
 - i. continuity test;
 - ii. insulation resistance test;
 - iii. section polarity tests;
 - iv. four-wire micro-ohm test (also known as a Ductor test) of all DC positive and negative return cable joints;
 - v. all LV tests required by AS 3017;
 - vi. SCADA tests (all alarms simulated and received correctly at the operating centre, analogue measurement calibrated and tested at extremes of range and middle of range, remote control of ACCB's tested and all remote status monitoring confirmed as a minimum);
 - vii. operation / functionality tests (e.g. indicator lamps, current injection test for protection trip or frame leakage, trip tests, protection scheme simulation tests);
 - viii. in addition to the tests listed above, battery systems should also include discharge test of battery bank, calibration of battery charger, alarm notifications, DC sub circuits;
 - ix. REC operation and settings;
 - x. frame leakage protection; and
 - xi. pantograph running at normal operating speeds. The test must be carried out when the ambient temperature is in the range 10 to 30^o.
- (d) Compliance with the geometry design criteria must be established before the OHW will be deemed complete. The commissioning documentation is to include OHW geometry measurements over the full route as part of the Completion test results.

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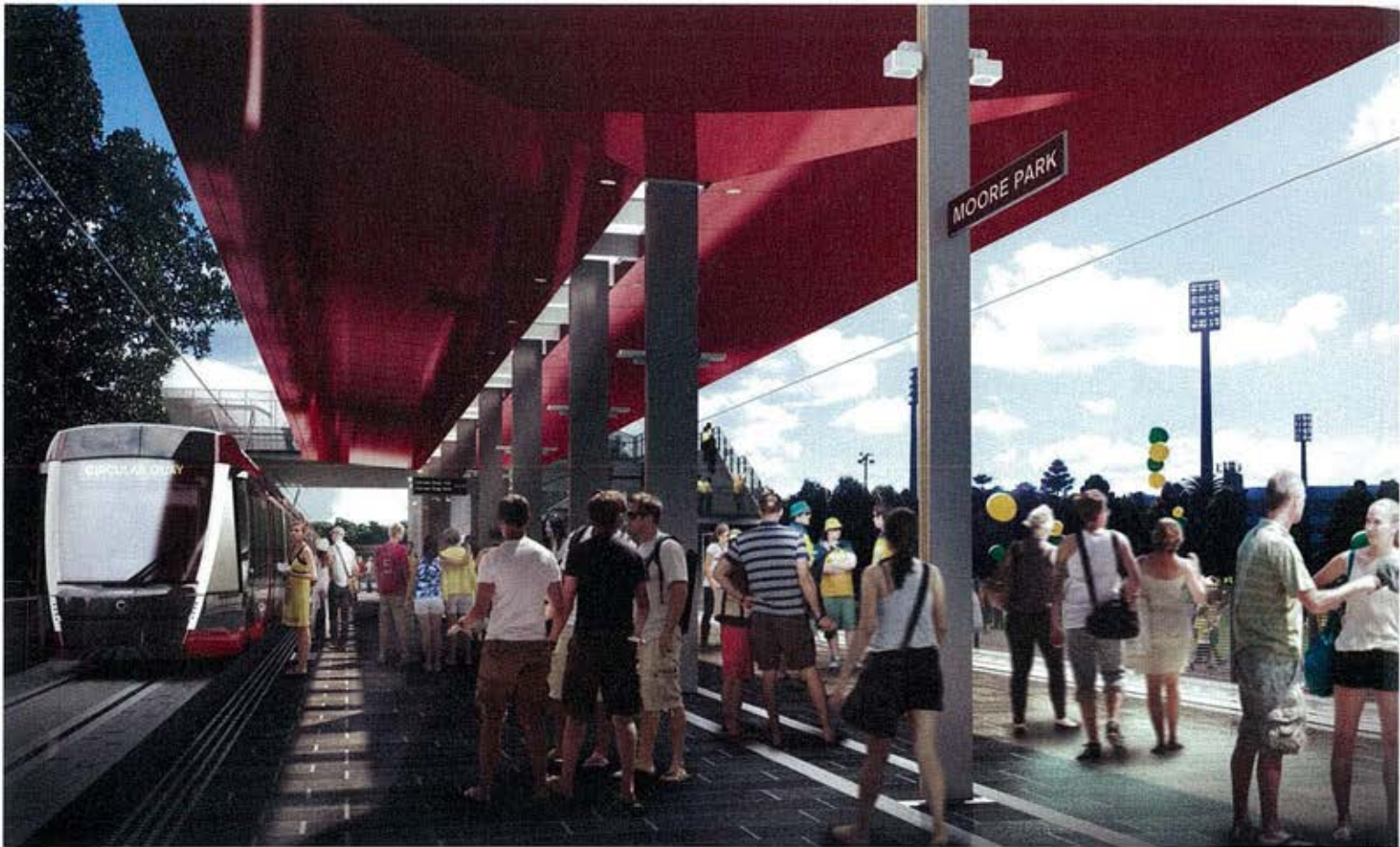


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Schedules Part E (Volume 3 of 4)

December 2014



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Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 30 – Utility Services

Document Number: 3126395_16
Execution Version

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for the protection and relocation of underground and overhead Utility Services.
- (b) OpCo must establish the location of all Utility Services which may be affected by the SLR Works, including the proposed construction, operation or maintenance methods.
- (c) OpCo must ensure that no damage is caused to Utility Services as a result of OpCo's Activities.
- (d) OpCo must assess risk for all Utility Services in consultation with the relevant Utility Services owner.
- (e) OpCo must provide protection to existing Utility Services deemed to require protection by, and in accordance with the Utility Services owner's requirements.
- (f) Where a Utility Service must be relocated, OpCo must relocate in accordance with the Utility Services owner's requirements.
- (g) OpCo must not cause any adverse impact on existing Utility Services, except where agreed to by the Utility Services owner, as a result of the works.
- (h) OpCo must coordinate and integrate all Utility Service related works.

1.2. Scope

- (a) OpCo must provide a fully coordinated Utility Services solution in accordance with the requirements of and in agreement with the Utility Services owners. An indicative list of Utility Service owners affected by the Project is provided in Table 1.

Table 1 Utility Service Providers

Utility Service Owners	Utility Service Type
AAPT / PowerTel	Telecommunications
AARNet	Telecommunications
Ausgrid	Electrical, Street Lighting
Centennial Park and Moore Park Trust	Various
City of Sydney	Electrical, Street Lighting, CCTV, Drainage
FirstPath	Telecommunications
Foxtel	Telecommunications
Jemena	Gas
Macquarie Telecom	Telecommunications

Utility Service Owners	Utility Service Type
NBNCo	Telecommunications
Nextgen	Telecommunications
NSW Police Force	CCTV, Emergency Warning Speakers
Optus	Telecommunications
Pipe Networks	Telecommunications
Primus Telecom	Telecommunications
Prince of Wales Hospital	Various
Randwick City Council	CCTV, Drainage
Randwick Racecourse Trust	Various
RMS	Electrical, CCTV, Emergency Warning Speakers, Intelligent Transport System
RailCorp	Electrical
Sydney Buses	Intelligent Transport System
Sydney Water	Water, Sewer, Drainage
Southern Cross	Telecommunications
Telstra	Telecommunications
Uecomm	Telecommunications
University of New South Wales	Various
Verizon	Telecommunications
Visionstream	Telecommunications
Vocus	Telecommunications

- (b) OpCo must identify and consult with all Utility Service owners that may be impacted by the works.

2. Performance and technical requirements

2.1. General

- (a) OpCo must comply with the Utility Services owners' requirements as contained within their standards unless departures from these standards are otherwise agreed with the Utility Service owner.

2.2. Design Criteria

2.2.1. General

- (a) Where feasible, Utility Service relocations must generally comply with the NSW Streets Opening Conference Guide to Codes and Practices for Streets Opening (The Guide).
- (b) OpCo must provide ducting or conduits for future Utility Services as required by the Utility Service owners or Authorities and in accordance with Table 2 below. OpCo must agree specific requirements with the relevant parties during the appropriate design stages.
- (c) Disruption in disconnecting and reconnecting Utility Services to individual landowners and occupiers must be kept to a minimum.
- (d) Affected landowners and occupiers must be consulted in a timely manner to arrange a mutually acceptable time for any works that may cause disruption before the commencement of the works in connection with the anticipated disruption.
- (e) Landowners and occupiers with special requirements regarding the continuity of supply of any Utility Service must be identified and consulted with to ensure all measures necessary are implemented to satisfy such requirements.
- (f) Depth of cover to Utility Services located below track supported by concrete slab must comply with the standards of the relevant Utility Service owner, unless a shallower depth is agreed with the relevant Utility Service owner.
- (g) Depth of cover to Utility Services located below track not supported by concrete slab must comply with AS4799.

Table 2 Ducting and Conduits for future Utility Services

Utility Service Owner or Authority	Requirement
Ausgrid	As detailed in Attachment 1 to this Appendix
City of Sydney	To comply with the Third Party Agreement between TfNSW and the Council of the City of Sydney, to the extent of OpCo's responsibility detailed in Schedule B3 (<i>Requirements of Third Parties</i>)
Jemena	As detailed in Design Basis Manual – Sydney Light Rail (Jemena Assets)
Randwick City Council	To comply with the Third Party Agreement between TfNSW and the Randwick City Council, to the extent of OpCo's responsibility detailed in Schedule B3 (<i>Requirements of Third Parties</i>)

Utility Service Owner or Authority	Requirement
Australian Turf Club	To comply with Schedule B3 (<i>Requirements of Third Parties</i>)
University of New South Wales	To comply with Schedule B3 (<i>Requirements of Third Parties</i>)

3. Design Documentation

3.1. General

- (a) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2. Design Stage 1 Design Documentation

- (a) The specific Design Stage 1 Design Documentation for the Utility Services must include as a minimum:
- i preliminary composite Utility Service plans and typical sections and details showing relocation/protection proposals;
 - ii a 3D model incorporating existing and proposed Utility Services, as well as all below ground elements of the Project; and
 - iii an updated Utility Services impact assessment schedule with additions and deletions from the schedule issued with the Concept Design package clearly highlighted.

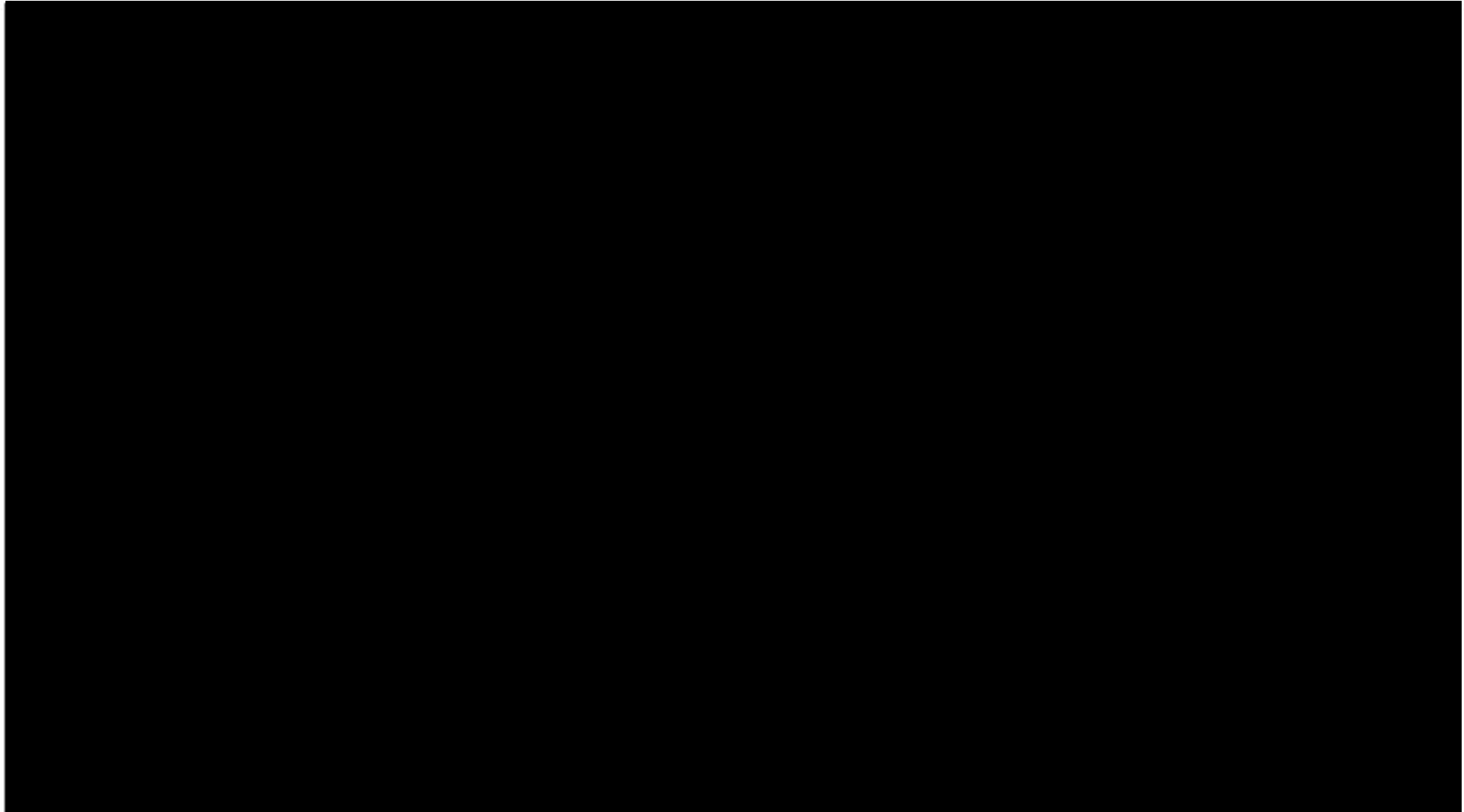
3.3. Design Stage 2 Design Documentation

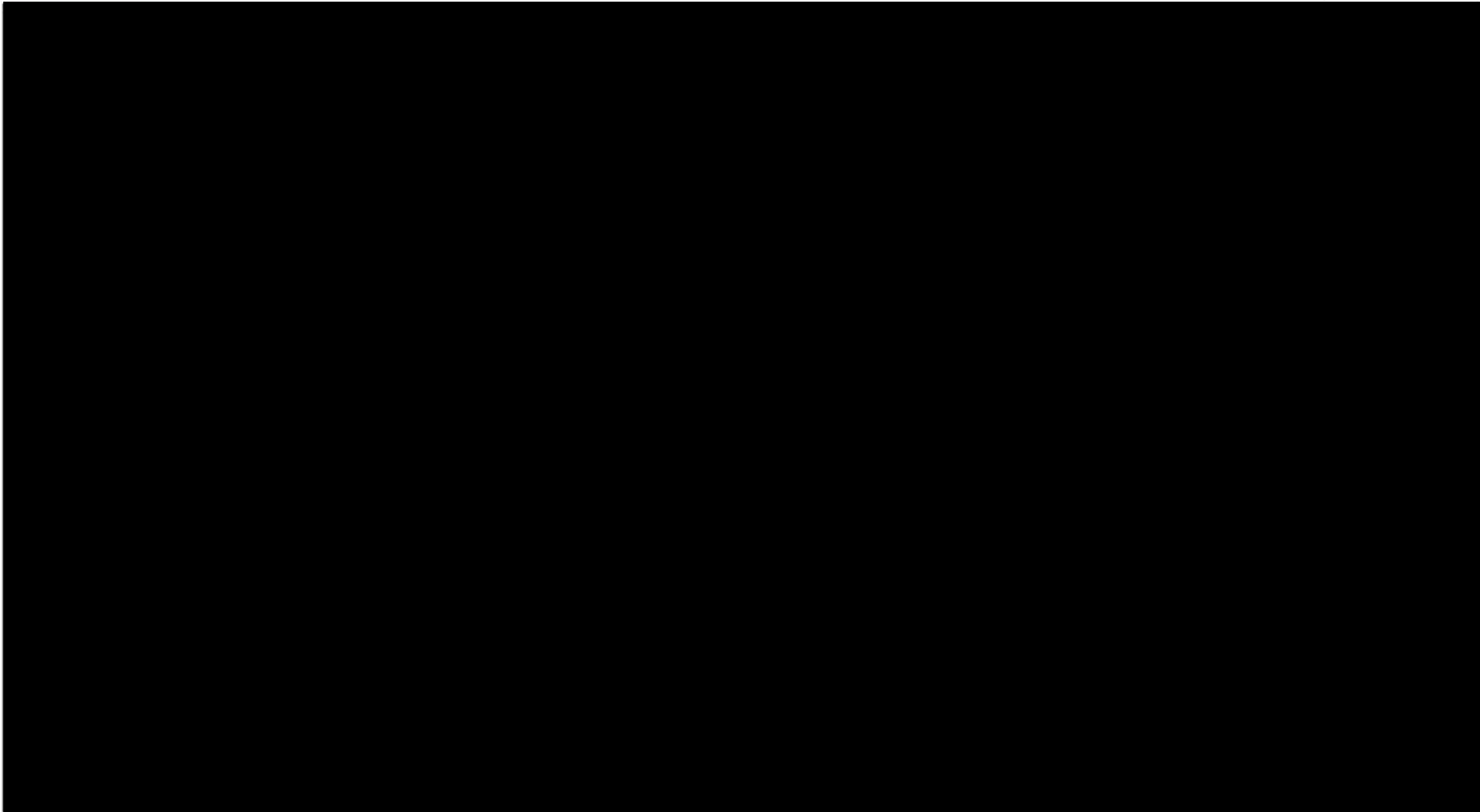
- (a) The specific Design Stage 2 Design Documentation for the Utility Services must include as a minimum:
- i detailed composite Utility Service plans and sections and details showing relocation / protection proposals;
 - ii a 3D model incorporating existing and proposed Utility Services, as well as all below ground elements of the Project; and
 - iii an updated Utility Services impact assessment schedule with additions and deletions from the schedule issued with the Design Stage 1 package clearly highlighted.

3.4. Design Stage 3 Design Documentation

- (a) The specific Design Stage 3 Design Documentation for the Utility Services must include as a minimum:
- i final composite Utility Service plans and sections and details showing relocation / protection proposals pre-approved by the Utility Service providers;
 - ii a 3D model incorporating existing and proposed Utility Services, as well as all below ground elements of the Project; and
 - iii an updated Utility Services impact assessment schedule with additions and deletions from the schedule issued with the Design Stage 2 package clearly highlighted.

Attachment 1: Ausgrid Requirements for future Utility Services







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Schedule E1 Scope and Performance Requirements

Appendix 31 – Noise and Vibration

Document Number: 3126396_12
Execution Version

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1. Overview and scope

1.1. General

- (a) This Appendix describes the scope and performance requirements for noise and vibration for the CBD and South East Light Rail (CSELR).

2. Performance and technical requirements

2.1. Guidelines

- (a) OpCo must;
- i. assess the noise and vibration from the CSELR in accordance with the Rail Infrastructure Noise Guideline (EPA 2013) and achieve the requirements contained therein;
 - ii. assess the noise from the substations, CSELR Stops and Light Rail Maintenance and Stabling Facilities in accordance with NSW Industrial Noise Policy, NSW EPA, 2000 and achieve the requirements contained therein;
 - iii. assess construction noise in accordance with Interim Construction Noise Guideline (ICNG), DECC, 2009 and achieve the requirements contained therein;
 - iv. assess construction traffic noise in accordance with NSW Road Noise Policy (RNP), NSW EPA, 2011 and achieve the requirements contained therein; and
 - v. assess vibration from the Light Rail Operations Activities and Delivery Activities in accordance with Assessing Vibration: Technical Guidelines, DEC, 2006 and achieve the requirements contained therein.

2.2. Operational Noise and Vibration Review

- (a) In addition to the Operational Noise And Vibration Review (ONVR) requirements in the Environmental Requirements, OpCo must undertake the following tasks in completing the ONVR:
- i. consider ground-borne noise and vibration; and
 - ii. consider airborne noise.

2.2.1. Ground-borne noise and vibration

- (a) When completing the ONVR, OpCo must:
- i. take into account the parameters listed in ISO14837-1; and
 - ii. include verification and justification that the ground-borne noise and vibration mitigation and maintenance measures nominated are feasible as defined in the Rail Infrastructure Noise Guideline (EPA 2013) and demonstrate that these measures have been used in other locations effectively.
- (b) In addition to the requirements of the Environmental Requirements OpCo must meet the ground-borne noise goals in Table 1 during Operations Activities.

Table 1 Ground-borne noise goals

Location	Goal
Offices	$L_{Amax (slow)}$ 45dBA
Cinemas	$L_{Amax (slow)}$ 35dBA (when in use)
Public halls	$L_{Amax (slow)}$ 35dBA (when in use)

Location	Goal
Lecture theatres	$L_{Amax (slow)}$ 35dBA (when in use)
Film / TV and music recording studios	NR15 (refer AS/NZS2107:2000)
Other critical spaces	Satisfactory levels in AS/NZS2107:2000

- (c) For LRV operations, the ground-borne vibration goals must be the “intermittent vibration” (preferred vibration dose values) as described in Assessing Vibration: a technical guideline (DECC, 2006).
- (d) In addition to the requirements of the Environmental Requirements, OpCo must meet the ground-borne vibration goals in Table 2 for ground-borne vibration resulting from Operations Activities.

Table 2 Ground-borne vibration goals

Location	Goal
Critical spaces with vibration sensitive equipment	Vibration Criterion (VC) curves in <i>ANC Guidelines - Measurement and Assessment of Ground-borne Noise & Vibration, Association of Noise Consultants (2012)</i> .

- (e) OpCo must undertake noise and vibration monitoring at ten sites, to be agreed between OpCo, TfNSW, UNSW and Prince of Wales Hospital, prior to the commencement of CSELR operation. OpCo must provide necessary noise and vibration mitigation measures to ensure that CSELR operation does not cause any material adverse impact, as determined by the monitoring at these sites.

2.2.2. Airborne noise

- (a) OpCo must:
 - i. include verification and justification that the airborne noise mitigation and maintenance measures nominated are feasible and have been used in other equivalent systems effectively.
- (b) In addition to the requirements of the Environmental Requirements, OpCo must meet the airborne noise trigger levels in Tables 3 and 4. Where these levels are not able to be met, reasonable noise mitigation measures to reduce noise impacts as much as practicable must be investigated.

Table 3 Airborne noise trigger levels for residential land use

Sensitive Land Use	Noise Trigger Level (dBA)	
	Day Time 7:00 am to 10:00 pm	Night Time 10:00 pm to 7:00 am
Residential	60 LAeq(15 hour) and 80 LAmax	50 LAeq(9 hour) and 80 LAmax

Note: LAmax refers to the maximum noise level not exceeded for 95 percent of LRV pass-by events and is measured using the “fast” response setting on a sound level meter.

Table 4 Airborne noise trigger levels for sensitive land uses other than residential

Sensitive Land Use	Noise Trigger Level dBA (when in use)
Schools, educational institutions and child care centres	40 LAeq(1 hour) Internal
Places of worship	40 LAeq(1 hour) Internal
Hospitals – wards and research facilities	35 LAeq(1 hour) Internal
Hospitals – other uses	60 LAeq(1 hour)
Open space – passive use (eg parkland, bush reserves)	60 LAeq(15 hour) Internal
Open space – active use (eg sports field, golf course)	65 LAeq(15 hour) Internal

2.3. LRV internal noise levels

- (a) OpCo must develop an integrated system design which takes into account the LRV design and the proposed maintenance strategies to comply with the internal LRV noise criteria listed in this section.
- (b) In a stationary LRV with doors closed and all auxiliaries operating, the noise level anywhere in the LRV must not exceed the following noise level when measured in accordance with ISO3381:
 - i. acceptance level of LAeq (20seconds) 65dBA.
- (c) For a LRV running at 60 km/h on open track with all doors closed, the 'total system' noise levels measured at 1.6m above floor level (standing areas) and 1.2m above floor level (seating areas) must not exceed the following levels when measured in accordance with ISO3381:
 - i. target level of LAeq(20seconds) 68dBA; and
 - ii. acceptance level of LAeq(20seconds) 70dBA.
- (d) For a LRV running at Maximum Operational Speed within the CSELR tunnels with all doors closed, the 'total system' noise levels measured at 1.6m above floor level (standing areas) and 1.2m above floor level (seating areas) must not exceed the following noise levels when measured in accordance with ISO3381:
 - i. target level of LAeq(20seconds) 82dBA; and
 - ii. acceptance level of LAeq(20seconds) 85dBA.
- (e) OpCo must ensure that internal LRV noise does not include audible tones. Where tonal noise is noticeable, this must be confirmed via acoustic measurement in accordance with Annex C of ISO1996-2 *Acoustics – Description, assessment and measurement of environmental noise – part 2: Determination of environmental noise levels* (2007). Where tonal noise is identified and the tonal audibility is 5 dB or greater, the tonal noise must be eliminated or shielded at the source.
- (f) During the Operations Activities, OpCo must ensure that there are no audible rattles, buzzes, hums, whines, whistles or squeals within the LRV. These must be subjectively determined with the human ear and if detected, the source of the

objectionable noise must be located and rectified eliminated or shielded at the source.

- (g) In determining whether the noise source is objectionable to a reasonable passenger, a range of factors must be considered, including:
 - i. the loudness of the noise compared with the ambient noise level;
 - ii. the character of the noise;
 - iii. the duration of the noise; and
 - iv. the regularity of the noise.

2.4. CSELR Stops

- (a) OpCo must design all public address (PA) systems and system for intercom and emergency purposes to achieve a speech intelligibility index of 0.5 required by AS1670.4.

2.5. Tunnel ventilation

- (a) Within tunnels, the maximum noise levels from any tunnel fan or tunnel fan shaft connection must not exceed the noise limits listed in Table 5.

Table 5 Noise criteria for tunnel fans and fan shaft connections

Measurement location	Noise criteria, L_{Aeq}
Less than 10 m from tunnel fan or fan shaft connection	90dBA
More than 10 m from tunnel fan or fan shaft connection	85dBA

2.6. System noise

- (a) External noise levels based on test conditions described in Section 6 of ISO3095 must not exceed the following values:
 - i. for a stationary LRV with all auxiliaries operating, the $L_{pAeq,T}$ noise level 7.5m from track centre at 1.2 m above track height must be no greater than 60 dBA;
 - ii. for a stationary LRV with all auxiliaries operating, the $L_{pAeq,T}$ noise level 7.5m from track centre at 3.5 m above track height must be no greater than 63 dBA;
 - iii. for an LRV running at speeds up to 60 km/h under all operating conditions, with all systems operating and the doors closed, the 95th percentile L_{AFmax} noise level measured at a point 7.5m from the centreline of track and 1.2m above rail level must be no greater than 82 dBA; and
 - iv. for an LRV running at speeds up to 60 km/h under all operating conditions, with all systems operating and the doors closed, the $L_{pAeq,Tp}$ noise level during a passby measured at a point 7.5m from the centreline of track and 1.2m above rail level must be no greater than 78 dBA.
- (b) The above noise levels must be met throughout the life of the CSELR.

2.7. Noise from mechanical systems

- (a) In addition to the noise criteria in the Environmental Requirements, OpCo must comply with the requirements set by AS/NZS2107, and the internal noise criteria illustrated in Table 6.

Table 6 Internal Noise Criteria

Space/Area	Maximum acceptable noise Level dBA (Leq)
Plant Rooms	85
Equipment Rooms and Electrical Rooms	75
Customer service desk/office	45
Staff room	40
Locker room	50
Store room	50
Garbage Room	65

- (b) For plant, equipment and Electrical Rooms:
- i. the criteria in Table 6 must be achieved when measured at 1m from equipment; and
 - ii. noise from ventilation systems must not exceed Leq 65dBA at 1m from any opening.
- (c) The above criteria do not apply to systems or components operating in emergency mode. In this situation, noise generated by the systems or their components must not exceed levels that affect speech intelligibility in egress paths, evacuation assembly areas, or operational or emergency control rooms or areas.
- (d) Noise from systems or components operating in emergency mode must not exceed 85dBA when measured at 1m from any air intake or discharge point, including internal registers and grilles.

3. Design Documentation

3.1. Land use report

- (a) In addition to the requirements of the Environmental Requirements, the land use report must identify the land use category and the associated construction and operational noise and vibration criteria at all sensitive receivers potentially impacted by the Project.

3.2. Operational noise and vibration review

- (a) In addition to the requirements in the Environmental Requirements, the ONVR must include:
 - i. a tabulation of where all sensitive receivers are positioned where they are within 100 m of the nearest track (or within 200m of the Light Rail Maintenance and Stabling Facilities), and/or where the predicted airborne noise, ground-borne noise or vibration levels are within 5dB of the applicable criteria; and
 - ii. the tabulation must include a unique identification nomenclature for each receiver, with its planned distance to the nearest track (Light Rail Maintenance and Stabling Facilities), receiver type, applicable criteria and predicted airborne noise, ground-borne noise and vibration levels, to be recorded.
- (b) The ONVR report must fully describe the design, assumptions, calculation process, mitigation strategy, maintenance strategy and other relevant factors to enable the ONVR to be independently verified by a noise and vibration expert.
- (c) The ONVR report must describe and quantify the accuracy of the input parameters and predictions, how any inaccuracies are proposed to be resolved or have been resolved during the design process.
- (d) The ONVR report must provide evidence that the noise and vibration prediction model has been validated via measurement and prediction on other rail systems / projects.
- (e) For the ground-borne noise assessment, the prediction model must be validated via measurements undertaken within the IWLR.

4. Testing and commissioning

4.1. General

- (a) In addition to the requirements of Appendix 33 (*Testing and Commissioning*), the noise and vibration mitigation measures must undergo the following specific testing and commissioning activities:

4.2. Measurements

- (a) During commissioning of the CSELR, OpCo must undertake noise and vibration measurements to confirm the predictions in the ONVR and identify if any additional mitigation measures are required to be implemented prior to the commencement of operations.
- (b) Measurement sites must be selected and submitted, together with a measurement plan for review by TfNSW at least six weeks prior to undertaking the measurements.
- (c) Measurements must be undertaken at a minimum of 12 sites.
- (d) The measurements must include at least four sites where the ground-borne noise and vibration levels are evaluated in addition to airborne noise.
- (e) At least 10 LRV pass-bys must be measured at each site in each direction.
- (f) A report covering the measurements must be submitted for review by TfNSW not later than four weeks after the measurements are completed, and must include 1/3 octave band noise and vibration levels for all measured events, in both electronic (Excel) and hard copy formats.
- (g) Details of the measurement locations, track features, LRV types and speed must be provided.
- (h) The measurement results must be compared with the predictions in the ONVR and comments provided on whether the noise and vibration criteria are likely to be complied with when operations commence.
- (i) An assessment of additional feasible and reasonable mitigation measures must be undertaken if recalibration of the noise and vibration models is required.
- (j) The report must fully describe the measurements and predictions to enable it to be independently verified by a noise and vibration expert.

4.3. Operational noise and vibration compliance testing

- (a) Operational noise and vibration compliance testing must be undertaken to meet the requirements in the Environmental Requirements.
- (b) The proposed measurement locations must be submitted, together with a measurement plan, for review by TfNSW at least 12 weeks prior to undertaking the measurements.
- (c) TfNSW must be given the opportunity to witness the measurements.
- (d) A draft report covering the measurements must be submitted for review by TfNSW not later than 6 weeks after the measurements are completed. The reporting format must be consistent with the requirements in the Environmental Requirements.
- (e) Following receipt of comments from TfNSW and other stakeholders, a final operational noise and vibration compliance testing report which is suitable for

submission to the Director-General of the Department of Planning and Infrastructure and the EPA must be submitted to TfNSW's Representative.



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Schedule E.1 Scope and Performance Requirements

Appendix 32 – Not Used

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Transport
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Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 33 – Testing and Commissioning

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1. Overview and scope

1.1. General

- (a) This Appendix provides the scope and performance requirements for testing and commissioning of the SLR.

1.2. Scope

- (a) OpCo must carry out the following Tests in accordance with this Appendix:

- i Factory-based Tests comprising:
 - A. Type Tests;
 - B. First Article Inspection Tests (FAIT);
 - C. Factory Integration Tests; and
 - D. Factory Acceptance Tests (FAT);
(Factory Tests);
- ii Site-based tests comprising:
 - A. installation and operation checks (IOC);
 - B. Site Acceptance Tests (SAT); and
 - C. System Integration Tests (SIT);
(Site Tests);
- iii Trial Running; and
- iv performance tests comprising:
 - A. Initial Performance Test;
 - B. Capacity Performance Test; and
 - C. Final Performance Test;
(Performance Tests).

2. General Requirements

2.1. General

- (a) OpCo must undertake the testing and commissioning of the SLR in a structured manner to ensure a logical progression through the testing activities.

2.2. Access to places of testing

- (a) OpCo must provide TfNSW's Representative and the Independent Certifier with access to the SLR Works and to all workshops and places of OpCo Contractors where the works are being carried out, or from where materials, manufactured articles, machinery, or equipment are being obtained for the SLR Works, for the purpose of examination and inspection of the materials and workmanship, and for the purpose of witnessing the Tests.

2.3. Test Procedures

- (a) Each Test Procedure must describe the manner in which OpCo proposes to conduct the Test and the equipment that OpCo proposes to use to conduct the Test.
- (b) Test Procedures must include:
 - i the extent of testing covered by each procedure;
 - ii preconditions to be met prior to commencement of testing;
 - iii a cross reference to the design identifying the exact purpose of each Test;
 - iv the method and sequence of testing;
 - v the relevant drawings;
 - vi the location of testing;
 - vii the safety management arrangements for the Test;
 - viii number of Test personnel and qualification requirements;
 - ix Test parameters to be measured;
 - x constraints to be applied during the Test;
 - xi defined pass and fail criteria;
 - xii if there is any element of subjectivity, such as adequacy of workmanship or finish, which parties can exercise such subjective judgement;
 - xiii format of the raw data for processing by OpCo;
 - xiv certified test instrumentation and test circuitry to be used during the Test;
 - xv pro formas to facilitate easy manual handwritten entries during the execution of the Tests; and
 - xvi consequential procedures or actions if the Test is unsuccessful.

2.4. Test Reports

- (a) Accurate results of all Tests must be recorded in a Test Report irrespective of whether the Test was passed or failed.
- (b) All Test Reports must be completed within 10 Business Days after completion of each Test.
- (c) All Test Reports must be available for inspection and or audit 10 Business Days after the completion of the Test.
- (d) OpCo must provide TfNSW and the Independent Certifier with electronic copies of the records for all of the Tests.
- (e) The Test Report and its supporting documentation must contain the following details:
 - i confirmation that the pre-conditions set out in the Test Procedure were met prior to the Test taking place;
 - ii material, equipment or part of the SLR Works tested;
 - iii location and size of the batch from which any test samples were taken or the location of the equipment that was tested;
 - iv reference to the relevant Test Procedures and Test Program;
 - v place of testing;
 - vi date and time and duration of Tests;
 - vii environmental conditions in the case of Site Acceptance Tests;
 - viii technical personnel supervising and/or carrying out the Tests with their signatures;
 - ix properties tested;
 - x use of test equipment with copy of its certification report;
 - xi method of testing;
 - xii readings and measurements taken during the Tests;
 - xiii Test results, including any calculations and graphs;
 - xiv whether the Test has passed or failed;
 - xv action taken or proposed if the Test failed; and
 - xvi any other details required by the deed.
- (f) All Test Reports must be signed by OpCo's Representative and must include copies of the actual handwritten results recorded during the Test using the pro formas from the Test Procedures.
- (g) Computer generated Test data will only be permitted where automatic data logging has been necessary to carry out the Test and required in the Test Procedure.

3. Types of Test

3.1. Type Tests

- (a) All materials, equipment, components, sub-assemblies or unit assemblies which have not been previously proven in service in an equivalent environment to SLR, and have not been Type Tested against a relevant recognised international standard, must be subjected to Type Testing to ensure that they meet all of the design requirements of the deed and are fit for purpose.
- (b) OpCo must identify any such materials, equipment, components, sub-assemblies and unit assemblies that are to be Type Tested.
- (c) Type Tests must be carried out on specific materials, equipment, components, sub-assemblies and unit assemblies to ensure that they perform to the limits of their design when subjected to all permutations and combinations of external conditions as defined in their design criteria.
- (d) Type Tests for specific materials, equipment, components, sub-assemblies and unit assemblies may be omitted where OpCo is able to produce certified documentation from previous tests that the Asset comprising the materials, equipment, components, sub-assemblies and unit assemblies meets the requirements of the deed.

3.2. First Article Inspection Test

- (a) All materials, equipment, components, sub-assemblies and unit assemblies, which have not been previously proven in service, in an equivalent environment to SLR, and have not been Type Tested against a relevant recognised international standard, must be subjected to a FAIT after completion of the detailed design and before the full manufacturing commences.
- (b) OpCo must provide documentary evidence of any material, equipment, component, sub assembly or unit assembly that has been proven in service or Type Tested.
- (c) All hardware aspects of the FAIT must be resolved before manufacturing commences.

3.3. Factory Integration Tests

- (a) Complex interfaces between different Assets must be subject to a Factory Integration Test where the combined functionality of the equipment and systems must be tested to ensure that they meet, in their combined form, the design requirements.
- (b) Factory Integration Tests must be comprehensive to verify that the integrated equipment and systems fulfil the deed requirements, including:
 - i interface check including input, output and data protocol when necessary; and
 - ii operational performance including full functional testing to the Design Documentation and the SPR.

3.4. Factory Acceptance Tests (Routine)

- (a) Where prescribed in the other Appendices or where identified in the Testing and Commissioning Plan (see Appendix 43 (*Project Plan Requirements*)) each item of equipment must be must be subjected to a FAT.
- (b) Where computer processor based Test equipment and simulation equipment is to be used, Tests must also include verification of the software used.

3.5. Site Tests and Trial Running

3.5.1. CSELR Site Tests

- (a) OpCo must carry out the following Site Tests on CSELR using the CSELRVs and may include if required the Additional Required CSELRVs and any Option 1A CSELRVs (if Pre-Agreed Option 1A has been exercised):
 - i static installation and operation checks must be carried out on all installed Assets, or groupings thereof, forming part of the SLR Works to ensure that they function correctly and meet the design requirements in a stand-alone manner after installation and are fit for purpose;
 - ii Site Acceptance Tests (SAT) must be carried out on all completed Assets to ensure that the Assets function correctly in a stand-alone manner after they have been installed, subjected to and passed the necessary installation and operation checks. SAT must include the execution of gauging and clearance checks on all completed infrastructure construction and installation; and
 - iii System Integration Tests must be carried out on "integrated" systems forming part of the SLR Works which have already been subject to and passed the necessary Site Acceptance Tests.
- (b) Site Tests must include, as a minimum:
 - i LRV braking performance under all passenger loading conditions;
 - ii gauging and clearance Test under all passenger loading conditions;
 - iii light rail facility (including Light Rail Maintenance and Stabling Facilities) compatibility Tests;
 - iv test running of all allowable moves in all allowable directions through all junctions and cross overs;
 - v EMC (including static testing over the infrastructure);
 - vi Electrolysis (stray traction current) Tests;
 - vii Substations, including all equipment, SCADA, associated building services and associated fire and life safety services;
 - viii LV services;
 - ix interoperability Tests between CSELR and IWLR;
 - x ride stability and comfort;
 - xi exterior and interior noise and vibration;

- xii journey time demonstration;
 - xiii radio system coverage Test for data and voice communication;
 - xiv intersection signalling Tests;
 - xv LRT signalling Tests;
 - xvi wire-free operation energy reserve Test;
 - xvii OHW section proving, insulation resistance tests, fault loop impedance measurements to validate DCCB settings;
 - xviii high voltage earthing system current injection Tests (step, touch and transfer potentials); and
 - xix passenger information system (PA, PID, help point) Tests.
- (c) OpCo must fully coordinate the requirements for all System Integration Tests with Authorities, and must review the SIT procedure with them where relevant.

3.5.2. Driver Training and Public Familiarisation for CSELR

- (a) OpCo may not commence :
- i public familiarisation of the CSELR until the Independent Certifier has certified the Site Tests have been passed; and
 - ii driver training on any section of the CSELR track until the Independent Certifier has certified that the Site Tests have been passed for such section of the CSELR track alignment.
- (b) OpCo must carry out driver training and public familiarisation for at least six weeks and LRVs must operate over each part of the network for at least five days per week during the familiarisation period.

3.5.3. CSELR Initial Performance Test

- (a) OpCo must not commence the Initial Performance Test for the CSELR until the Independent Certifier has certified that the CSELR Site Tests have been completed. This certificate will confirm that OpCo has complied with the requirements for supply of Manuals, tools and equipment, and spare parts.
- (b) OpCo must carry out the Initial Performance Test to demonstrate the fitness for purpose of CSELR.
- (c) OpCo must develop a Test timetable based on:
- i the timetable frequency and journey time in the initial passenger timetable; and
 - ii 16 hours as an operational day.
- (d) During the Test, CSELR must be operated as if in normal operations (but without Customers) in accordance with the Test timetable, operations and maintenance procedures, rules and instructions, using the CSELRVs excluding those identified by OpCo prior to the test as being the Additional Required CSELRVs and any Option 1A CSELRVs (if Pre-Agreed Option 1A has been exercised) for the duration of the

Initial Performance Test until all of the following performance requirements are achieved for a minimum of 5 days over a rolling, consecutive 7 day operating period:

- i CSELR availability performance: 90% of Regular Services, as described in Section 4.1 of Appendix 38 (*Minimum Service Requirements*);
 - ii CSELR Headway performance: 60% of Regular Services achieve the Headway requirement within a 2 minute tolerance, at the Headway monitored platforms as described in Appendix 38 (*Minimum Service Requirements*); and
 - iii CSELR journey time performance: 60% of Regular Services achieve the Maximum Journey Time within a 4 minute tolerance.
- (e) During the Initial Performance Test, only those Staff who will operate and maintain the system during the Full Operations Phase may carry out operations or maintenance functions, and these Staff must carry out their normal duties. OpCo may elect to have appropriately qualified experts onsite during the Initial Performance Test, and throughout the first months of Full Operations to monitor the performance of the Operations Activities.
- (f) The Initial Performance Test will not be passed unless all data required for the Service Payment regime is available for the full 7-day period.

3.6. IWLR Tests

- (a) OpCo must carry out at least the following Tests on IWLR:
- i static installation and operation checks must be carried out on all Assets or groupings thereof forming part of the SLR Works to ensure that they function correctly and meet the design requirements in a stand-alone manner after installation and are fit for purpose;
 - ii Site Acceptance Tests must be carried out on all IWLR Assets provided by OpCo to ensure that the Assets function correctly in a stand-alone manner after they have been installed on IWLR and been subjected to and passed the necessary installation and operation checks;
 - iii SAT must include the execution of gauging and clearance checks on all completed infrastructure construction and installation; and
 - iv System Integration Tests must be carried out on "integrated" systems forming part of the SLR Works, including Assets, which have already been subjected to and passed the necessary Site Acceptance Tests.
- (b) IWLR Tests must include as a minimum:
- i compatibility Tests for CSELR vehicles over the relevant IWLR infrastructure;
 - ii compatibility Tests for IWLR vehicles over the relevant CSELR infrastructure;
 - iii compatibility Tests for IWLR vehicles in any new Light Rail Maintenance and Stabling Facility which the vehicles will need to visit; and
 - iv full Tests of control and supervision of IWLR assets from any new OCC.

3.7. Trial Running of CSELR

- (a) OpCo must not commence Trial Running until the Independent Certifier has certified the IWLR Tests set out in section 3.6 and the CSELR Initial Performance Test set out in section 3.5.3 have been passed.
- (b) During Trial Running of CSELR, operation control of the entire SLR network must be exercised from the network OCC and IWLR must be operated in service to the normal passenger timetable.
- (c) OpCo must prepare, as part of the Operational Readiness Plan, a comprehensive set of tests to enable the Independent Certifier to certify the readiness of OpCo to provide safe and reliable Services with a high degree of confidence of meeting the expected performance criteria.
- (d) During Trial Running, only those Staff who will operate and maintain the system during the Full Operations Phase may carry out operations or maintenance functions, and these staff must carry out their normal duties. OpCo may elect to have appropriately qualified experts onsite during the Trial Running Period, and throughout the first months of Full Operations to monitor the performance of the Operations Activities.
- (e) Trial running will be carried out over a consecutive 7 day operating period. Trial Running will not be passed until data is available for the full 7-day period, and a dummy claim for payment including all the contractually required data has been made and agreed with TfNSW.
- (f) During Site Tests or Trial Running, OpCo must perform exercise based scenarios to demonstrate OpCo's competency to:
 - i manage the daily delivery of Required Services including unplanned service disruptions, both systems and Customer related;
 - ii manage the delivery of Special Event services to and from Moore Park and Royal Randwick Racecourse, and a truncated CBD service representing the New Year's Eve service;
 - iii adherence to policies, procedures and instructions;
 - iv deliver effective communications;
 - v understand the safety management requirements;
 - vi understand the quality management requirements;
 - vii understanding of the environmental management requirements;
 - viii be prepared for and efficiently execute emergency response, recovery and Incident investigation including interfaces with emergency service providers;
 - ix plan for and undertake scheduled maintenance;
 - x respond to unplanned maintenance;
 - xi manage operational interfaces with Sydney Trains, Transport Management Centre, taxi and bus service providers;
 - xii undertake data recording, reporting and analysis; and

xiii undertake general management and governance of OpCo's organisation.

3.8. Capacity Performance Tests

3.8.1. Introduction

- (a) OpCo must carry out the Capacity Performance Test using the CSELRVs excluding those identified by OpCo prior to the test as being the Additional Required CSELRVs and any Option 1A CSELRVs (if Pre-Agreed Option 1A has been exercised) for the duration of the Capacity Performance Test:
- i during the CSELR test period between commencement of Site Tests and completion of Trial Running; and
 - ii prior to the Final Performance Test.

3.8.2. Capacity Performance Test

- (a) OpCo must carry out Capacity Performance Tests to demonstrate the ability of the CSELR system to meet the design minimum Headway and capacity requirements specified in Appendix 38 (*Minimum Service Requirements*).
- (b) OpCo must develop Capacity Performance Tests based on providing the passenger capacities specified in section 2.2 of Appendix 38 (*Minimum Service Requirements*) using the inter-stop run and dwell times in the Indicative Timetable and the parties acknowledge that, acting reasonably, they will develop traffic signal phasing to apply for the duration of the Capacity Performance Tests which will enable the per hour direction passenger capacity requirements specified in section 2.2(b)(iii) of SPR Appendix 38 (*Minimum Service Requirements*) to be demonstrated.
- (c) The LRVs used in the test must be loaded to the equivalent of all seats occupied plus 6 Customers per m² standing (AW4).
- (d) During the Capacity Performance Test for Regular Services, the sections of the CSELR between Circular Quay and Town Hall, Town Hall and Central Station, Central Station and Moore Park, Moore Park and Randwick, and Moore Park and Kingsford must be operated as if in Revenue Service (without Customers) in accordance with the Capacity Performance Test timetables, operations and manuals, until the following performance requirements are achieved over a continuous typical 8 hour Regular Service operating period:
- i CSELR availability performance: 90% of Regular Services, as described in Section 4.1 of Appendix 38 (*Minimum Service Requirements*); and
 - ii CSELR Headway performance: 60% of Regular Services achieve the Headway requirement within a 2 minute tolerance, at the Headway monitored platforms as described in Appendix 38 (*Minimum Service Requirements*).
- (e) Recognising that there may be insufficient LRVs to demonstrate compliance with the requirements of section 2.2(b) of Appendix 38 (*Minimum Service Requirements*), during the CSELR Testing and Commissioning, OpCo must as a minimum separately demonstrate on each section identified in section 3.8.2(d), for a minimum 2 hour period, that the CSELR can provide the required Passenger and Special Event capacities with an AW4 test Load Condition.

- (f) During Capacity Performance Tests, only those Staff who will operate and maintain the system during the Full Operations Phase may carry out operations or maintenance functions, and these Staff must carry out their normal duties. OpCo may elect to have appropriately qualified experts onsite during the Capacity Performance Test and throughout the first months of Full Operations to monitor the performance of the Operations Activities.
- (g) During the Capacity Performance Tests, operation control of the entire SLR network must be exercised from the network OCC and IWLR (except as required to facilitate turnback operation to accommodate operations of the nature contemplated in section 3.8.2(e)) shall be operated in service to the normal timetable.

3.8.3. Final Performance Test

- (a) OpCo must not commence the Final Performance Test until:
 - i OpCo has complied with the Service requirements in the Operative Provisions; and
 - ii there are no Defects which, in the Independent Certifier's reasonable opinion, affect the public image of the SLR; and
 - iii the Independent Certifier has certified, in accordance with clause 18.5 of the Operative Provisions, that the Trial Running and the Capacity Performance Test have been passed.
- (b) OpCo must carry out the Final Performance Test using the CSELRVs excluding those identified by OpCo prior to the test as being the Additional Required CSELRVs and any Option 1A CSELRVs (if Pre-Agreed Option 1A has been exercised) for the duration of the Final Performance Test with a minimum of 3500 selected existing public transport users (who will travel for free) from the catchments serviced by the CSELR to demonstrate that OpCo is capable of providing Required Services with Customers.
- (c) During the Final Performance Test, in accordance with the Indicative Timetable for the Final Performance Test the SLR must be operated in accordance with service requirements in Appendix 38 (*Minimum Service Requirements*), until all of the following performance requirements are achieved for a minimum of 12 days over a consecutive 14 day rolling operating period:
 - i CSELR availability performance: 95% of Regular Services, as described in Section 4.1 of Appendix 38 (*Minimum Service Requirements*);
 - ii CSELR Headway performance: 80% of Regular Services achieve the Headway requirement within a 2 minute tolerance, at the Headway monitored platforms as described in Appendix 38 (*Minimum Service Requirements*); and
 - iii CSELR journey time performance: 82.5% of Regular Services achieve the Maximum Journey Time within a 4 minute tolerance.

3.8.4. Testing Relief

- (a) If during the CSELRV Initial Performance Test, the Capacity Performance Test or the Final Performance Test an event occurs which would entitle OpCo to relief from Availability Deductions and Timeliness Deductions under clause 18.1 (*Relief from Availability Deductions and Timeliness Deductions*) of Schedule D1 (*Service*

Payment Regime) (a **"Testing Interference Event"**) then for the purposes of determining compliance with any testing requirements:

- i any minimum compliance or overall testing period will be suspended for the duration of the Testing Interference Event;
- ii any minimum compliance or overall testing period will recommence once the Testing Interference Event ceases;
- iii the duration of the Testing Interference Event will not count towards any minimum compliance or overall testing periods;
- iv any minimum compliance or overall testing period will be extended by the duration of the Testing Interference Event so that the period is equal to the periods that would have applied had the Testing Interference Event not occurred; and
- v any minimum compliance or overall testing period will not restart as a result of the Testing Interference Event occurring.



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Schedule E1 Scope and Performance Requirements

Appendix 34 – Standards and Guidelines

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1. Overview and scope

1.1. General

- (a) This document provides the minimum engineering standards and guidelines that OpCo must utilise to design, procure, build, test, commission, maintain and operate the Sydney Light Rail.
- (b) The list of standards and guidelines within this document is not definitive.
- (c) The list of engineering standards and guidelines is divided into two categories:
 - i. standards include mandatory criteria and characteristics that must be met in carrying out OpCo's Activities; and
 - ii. guidelines are not standards, but are formal guides and handbooks issued by a variety of organisations.
- (d) To the extent that Australian Standards do not exist for any element of the OpCo's Activities, OpCo must use relevant international or European norm (EN) standards.
- (e) The standards used must be Australian, internationally or nationally recognised and if any alternative standard is proposed OpCo must ensure that the alternative standard used complies with the requirements of TfNSW and is of an equivalent or higher standard than those proposed in this Appendix.
- (f) The hierarchy of the standards is as follows:
 - i. Australian Standards (AS, AS/NZS) - Australian standards that are directly applicable to the activity. Note that this grouping includes International Standards that have been formally assessed by Standards Australia as applicable to the Australian context of use and have an allocated Australian AS or AS/NZS designation;
 - ii. International standards (ISO, IEC, IEEE, CENELEC, ITU) & European Norms (EN, TSI) that are directly applicable to the activity but not formally endorsed as an Australian Standard;
 - iii. National Standards such as ANSI, BS, or DIN that are directly applicable to the activity; and
 - iv. standards from bodies who are recognised by a National standards body.
- (g) Wherever two or more standards apply to the same issue, or conflicts arise between standards, the more stringent requirement must apply.

2. Standards and Guidelines

2.1. Standards

- (a) The standards, handbooks, specifications and procedures to be used include the following, which are available from the issuing organisations. Reference to a standard also includes any amendments or supplements to the standard.

Reference	Title of Standard
ANSI/EIA-632	Processes for engineering a system
ANSI/EIA-649-A	National Consensus Standard for Configuration Management
AS 1028	Power reactors and earthing transformers
AS 1049.1	Telecommunication cables - Insulation, sheath and jacket - Materials
AS 1049.2	Telecommunication cables - Insulation, sheath and jacket - Test methods
AS 1055.1	Acoustics - Description and measurement of environmental noise - General procedures
AS 1085.1	Railway track material - Steel rails
AS 1085.14	Railway track material - Prestressed concrete sleepers
AS 1085.19	Railway track material - Resilient fastening assemblies
AS 1100 (Set)	Set of standards: Technical drawing
AS 1189: 0-24	Data processing - Vocabulary (Parts 0 to 24)
AS 1231	Aluminium and aluminium alloys – Anodic oxidation coatings
AS 1243	Voltage Transformers for Measurement and Protection
AS 1288	Glass in Buildings – Selection and Installation
AS 1289 (Set)	Set of standards: Methods of Testing Soils for Engineering Purposes
AS 1306	High Voltage AC switchgear and control gear - Disconnectors (Isolators) and earthing switches
AS 1319	Safety signs for the occupational environment
AS 1324 (Set)	Set of standards: Air Filters for use in general ventilation and air conditioning
AS 1345	Identification of the contents of pipes, conduits and ducts

Reference	Title of Standard
AS 1418.1	Cranes, hoist and winches - General Requirements
AS 1418.3	Cranes, hoists and winches - Bridge, gantry, portal (including container cranes) and jib cranes
AS 1428.1	Design for access and mobility - General requirements for access - New building work
AS 1428.2	Design for access and mobility - Enhanced and additional requirements - Buildings and facilities
AS 1428.5	Design for access and mobility - Communication for people who are deaf or hearing impaired
AS 1562.1	Design and installation of sheet roof and wall cladding - Metal
AS 1562.3	Design and installation of sheet roof and wall cladding - Plastic
AS 1627 (Set)	Set of standards: Metal finishing - Preparation and pre-treatment of services
AS 1657	Fixed platforms, walkways, stairways and ladders - Design, construction and installation
AS 1668.2	The use of ventilation and air conditioning in buildings – mechanical ventilation in buildings
AS 1668.2 Amdt 1	The use of ventilation and air conditioning in buildings– mechanical ventilation in buildings
AS 1668.2 Supp 1	The use of ventilation and air conditioning in buildings – ventilation design for indoor containment control
AS 1670.1	Fire detection, warning, control and intercom systems – Systems design, installation and commissioning - Fire
AS 1670.4	Fire detection, warning, control and intercom systems - System design, installation and commissioning - Sound systems and intercom systems for emergency purposes
AS 1672.1	Lime and limestones – Limes for building
AS 1725.1	Chain link fabric fencing - Security fences and gates - General requirements
AS 1726	Geotechnical site investigations
AS 1742.2	Manual of uniform traffic control devices - General introduction and index of signs

Reference	Title of Standard
AS 1742.3	Manual of uniform traffic control devices - Traffic control devices for works on roads
AS 1742.4	Manual of uniform traffic control devices - Speed controls
AS 1742.5	Manual of uniform traffic control devices - Street name and community facility name signs
AS 1742.6	Manual of uniform traffic control devices - Tourist and service signs
AS 1742.7	Manual of uniform traffic control devices - Railways crossings
AS 1742.9	Manual of uniform traffic control devices - Bicycle facilities
AS 1742.10	Manual of uniform traffic control devices - Pedestrian control protection
AS 1742.11	Manual of uniform traffic control devices - Parking controls
AS 1742.12	Manual of uniform traffic control devices - Bus, transit, tram and truck lanes
AS 1742.13	Manual of uniform traffic control devices - Local area traffic management
AS 1742.14	Manual of uniform traffic control devices - Traffic signals
AS 1742.15	Direction signs, information signs and route numbering
AS 1743	Road Signs - Specifications
AS 1798	Lighting poles and bracket arms - Preferred dimensions
AS 1824.1	Insulation co-ordination - Definitions, principles and rules
AS 1824.2	Insulation co-ordination – (phase-to-earth and phase-to-phase above 1kV) – Application guide
AS 1851	Routine service of fire protection systems and equipment
AS 1851:2005	Maintenance of fire protection systems and equipment
AS 1866	Aluminium and aluminium alloys – Extruded rod, bar, solid and hollow shapes
AS 1905.1	Components for the protection of openings in fire-resistant walls - Fire-resistant doorsets
AS 1939	Degrees of protection provided by enclosures for electrical equipment (IP Code)
AS 1940	The storage and handling of flammable and combustible liquids

Reference	Title of Standard
AS 2067	Substations and high voltage installations exceeding 1 kVac
AS 2074	Cast steels
AS 2118.1	Automatic fire sprinkler systems - General systems
AS 2150	Hot mix asphalt - A guide to good practice
AS 2159	Piling - Design and Installation
AS 2293.1	Emergency Escape lighting and exist signs for buildings - System Design, Installation and Operation
AS 2293.2	Emergency Evacuation Lighting for Buildings - Inspection and Maintenance
AS 2339	Traffic signal posts and attachments
AS 2358	Adhesives – For fixing ceramic tiles
AS 2419.1	Fire hydrant installations – System design, installation and commissioning
AS 2423	Coated steel wire fencing products for terrestrial, aquatic and general use
AS 2441	Installation of fire hose reels
AS 2467	Maintenance of electrical switchgear
AS 2578	Traffic signal controllers
AS 2650	Common Specifications for high-voltage switchgear and controlgear standards
AS 2670.2	Evaluation of Human Exposure to Whole Body Vibration - Continuous and Shock Induced Vibration in Buildings (1-80Hz)
AS 2700	Colour Standards for General Purposes
AS 2758 (Set)	Set of standards; Aggregates for Rock and Engineering Purposes
AS 2777.1	Information processing systems - Open Systems Interconnection - Basic reference model - The basic model
AS 2777.2	Information processing systems - Open systems interconnection - Basic reference model - Security architecture
AS 2777.3	Information processing systems - Open systems interconnection - Basic reference model - Naming and addressing

Reference	Title of Standard
AS 2777.4	Information processing systems - Open systems interconnection - Basic reference model - Management framework
AS 2834	Computer accommodation
AS 2870	Residential slabs and footings
AS 2876	Concrete kerbs and channels (gutters) – Manually or machine placed
AS 2885.1	Pipelines - Gas and Liquid Petroleum - Design and Construction
AS 2885.3	Pipelines - Gas and liquid petroleum – Operation and maintenance
AS 2890.1	Parking facilities - Off-street car parking
AS 2890.2	Parking facilities – Off-street commercial vehicle facilities
AS 2890.3	Parking facilities - Bicycle parking facilities
AS 2890.6	Parking facilities - Off-street parking for people with disabilities
AS 3137	Approval and test specification - Luminaires (lighting fittings)
AS 3590.1	Screen-based workstations - Visual display units
AS 3590.3	Screen-based workstations - Input devices
AS 3600	Concrete Structures
AS 3610	Formwork for concrete
AS 3666.1	Air Handling and Water Systems of buildings - Microbial Control - Design, Installation and Commissioning
AS 3679 (Set)	Set of standards: Structural Steel
AS 3700	Masonry Structures
AS 3715	Metal finishing – Thermoset powder coating of architectural applications of aluminium and aluminium alloys.
AS 3727	Guide to residential pavements
AS 3780	The storage and handling of corrosive substances
AS 3990	Mechanical equipment – Steelwork
AS 3958.1	Ceramic Tiles – Guide to the installation of ceramic tiles

Reference	Title of Standard
AS 3972	General purpose and blended cements
AS 3995	Design of steel lattice towers and masts
AS 3996	Access covers and grates
AS 4044	Battery chargers for stationary batteries
AS 4049 (Set)	Set of standards: Paints and related materials - Pavement marking materials
AS 4100	Steel Structures
AS 4282	Control of the obtrusive effects of outdoor lighting
AS 4292.1	Railway safety management - General requirements
AS 4292.2	Railway safety management - Track, civil and electrical infrastructure
AS 4292.3	Railway safety management - Rolling stock
AS 4292.4	Railway safety management - Signalling and telecommunications systems and equipment
AS 4292.5	Railway safety management - Operational systems
AS 4292.7	Railway safety management - Railway safety investigation
AS 4418.1	Supervisory control and data acquisition (SCADA) - Generic telecommunications interface and protocol - General
AS 4418.2	Supervisory control and data acquisition (SCADA) - Generic telecommunications interface and protocol - Fire alarm systems.
AS 4419	Soils for landscaping and garden use
AS 4454	Compost, soil conditioners and mulches.
AS 4459 (Set)	Set of standards: Methods of sampling and testing ceramic tiles
AS 4586	Slip resistance classification of new pedestrian surface materials.
AS 4678	Earth-retaining structures
AS 4687	Temporary fencing and hoardings
AS 4702	Polymeric cable protection covers

Reference	Title of Standard
AS 4799	Installation of underground utility services and pipelines within railway boundaries
AS 4806.2	Closed circuit television (CCTV) - Application guidelines
AS 4825	Tunnel fire safety
AS 4970	Protection of trees on development sites
AS 5100.2	Bridge Design - Design Loads
AS 5100.5	Bridge design - Concrete
AS 5100.6	Bridge design - Steel and composite construction
AS 5100.7	Bridge design - Rating of existing bridges
AS 5334	Climate Change Adaptation for Settlements and Infrastructure
AS 60038	Standard Voltages
AS 60044.1	Instrument transformers - Current transformers (IEC 60044-1 Ed.1.2 (2003) MOD)
AS 60044.2	Instrument transformers - Inductive voltage transformers(IEC 60044-2:Ed.1.2 (2003) MOD)
AS 60076.1	Power Transformers - General
AS 60146.1.3	Semiconductor converters - General requirements and line commutated converters - Transformers and reactors
AS 60598.1	Luminaires - General requirements and tests
AS 60598.2.22	Luminaires - Particular requirements - Luminaires for emergency lighting
AS 60870.1.1	Telecontrol equipment and systems - General considerations - General principles
AS 60947 (Set)	Set of standards: Low Voltage Switchgear and control gear
AS/CA S002	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public Switched Telephone Network
AS/CA S003.1	Requirements for Customer Access Equipment for connection to a Telecommunications Network - General

Reference	Title of Standard
AS/CA S003.2	Requirements for Customer Access Equipment for connection to a Telecommunications Network - Analogue and TDM based technologies
AS/CA S003.3	Requirements for Customer Access Equipment for connection to a Telecommunications Network - Packet and cell based technologies
AS/CA S004	Voice performance requirements for Customer Equipment
AS/CA S008	Requirements for customer cabling products
AS/CA S009	Installation requirements for customer cabling (Wiring Rules)
AS IEC 60300.3.11	Dependability management - Application guide - Reliability centred maintenance
AS IEC 61131 (Set)	Set of standards: Programmable controllers
AS IEC 62508	Guidance on human aspects of dependability
AS ISO 14064 (Set)	Set of standards: Greenhouse gases – Specification with guidance at the project level and organisation level for quantification and reporting of greenhouse gas emission reductions and removal enhancements
AS ISO 14520 (Set)	Set of standards: Gaseous fire extinguishing systems
AS ISO 15489.1	Records management - General
AS ISO 15489.2	Records management - Guidelines
AS/NZS 1020	The control of undesirable static electricity
AS/NZS 1158 (Set)	Set of standards: Lighting for roads and public spaces
AS/NZS 1163	Cold-formed structural steel hollow sections
AS/NZS 1170	Structural design actions – General principles
AS/NZS 1170.2	Structural design actions - Wind actions
AS/ANZ 1170.4	Structural design actions - Earthquake actions in Australia
AS/NZS 1359 (Set)	Set of standards: Rotating electrical machines
AS/NZS 1428.4.1	Design for access and mobility - Means to assist the orientation of people with vision impairment - Tactile ground surface indicators

Reference	Title of Standard
AS/NZS 1530.3	Methods for fire tests on building materials, components and structures – Simultaneous determination of ignitability, flame propagation, heat release and smoke release.
AS/NZS 1554 Set	Set of standards: Structural steel welding
AS/NZS 1562.2	Design and installation of sheet roof and wall cladding - Corrugated fibre-reinforced cement
AS/NZS 1660.1	Test methods for electric cables, cords and conductors - Conductors and metallic components
AS/NZS 1664 (Set)	Set of standards: Aluminium structures
AS/NZS 1680	Interior lighting - Safe movement
AS/NZS 1680.1	Interior and workplace lighting - General principles and recommendations
AS/NZS 1680.2.1	Interior and workplace lighting - Specific applications - Circulation spaces and other general areas
AS/NZS 1680.2.2	Interior and workplace lighting - Specific applications - Office and screen-based tasks
AS/NZS 1680.2.3	Interior and workplace lighting - Specific applications - Educational and training facilities
AS/NZS 1680.5	Interior and workplace lighting - Outdoor workplace lighting
AS/NZS 1668.1	The use of ventilation and air conditioning in buildings – Fire and smoke control in multi-compartment buildings
AS/NZS 1768	Lightning protection
AS/NZS 1891.1	Industrial fall-arrest systems and devices - Harnesses and ancillary equipment
AS/NZS 1891.2	Industrial fall-arrest systems and devices - Horizontal lifeline and rail systems
AS/NZS 1891.3	Industrial fall-arrest systems and devices - Fall-arrest devices
AS/NZS 1891.4	Industrial fall-arrest systems and devices - Selection, use and maintenance
ASNZS 1906.1	Retroreflective materials and devices for road traffic control purposes - Retroreflective sheeting
AS/NZS 2053 (Set)	Set of standards: Conduit and fittings for electrical installations

Reference	Title of Standard
AS/NZS 2144	Traffic Signal Lantern
AS/NZS 2179 (Set)	Set of standards: Specifications for rainwater goods, accessories and fasteners - Metal shape or sheet rainwater goods, and metal accessories and fasteners
AS/NZS 2201 (Set)	Set of standards; Intruder alarm systems
AS/NZS 2208	Safety glazing materials in buildings
AS/NZS 2276.2	Cables for traffic signal installations - Feeder cable for vehicle detectors
AS/NZS 2276.3	Cables for traffic signal installations - Loop cables for vehicle detectors
AS/NZS 2311	Guide to the painting of buildings
AS/NZS 2312	Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
AS/NZS 2373	Electric cables - Twisted pair for control and protection circuits
AS/NZS 2648.1	Underground marking tape - Non-detectable tape
AS/NZS 2832 (Set)	Set of standards; Cathodic protection of metals
AS/NZS 3000	Electrical Installation (known as Australian / New Zealand wiring rules)
AS/NZS 3013	Electrical installations - Classification of the fire and mechanical performance of wiring system elements
AS/NZS 3014	Electrical installations - Electric fences
AS/NZS 3016	Electrical installations - Electric security fences
AS/NZS 3017	Electrical installations - Verification Guidelines
AS/NZS 3080	Information technology - Generic cabling for commercial premises
AS/NZS 3084	Telecommunications installations - Telecommunications pathways and spaces for commercial buildings
AS/NZS 3085.1	Telecommunications installations - Administration of communications cabling systems - Basic requirements
AS/NZS 3102	Electric duct heaters

Reference	Title of Standard
AS/NZS 3111	Approval and test specification - Miniature overcurrent circuit-breakers
AS/NZS 3112	Approval and test specification - Plugs and socket-outlets
AS/NZS 3439.3	Low-voltage switchgear and control gear assemblies - Particular requirements for low-voltage switchgear and control gear assemblies intended to be installed in places where unskilled persons have access for their use - Distribution boards
AS/NZS 3500 (Set)	Set of standards: Plumbing and drainage
AS/NZS 3661.2	Slip resistance of pedestrian surfaces - Guide to the reduction of slip hazards
AS/NZS 3679.1	Structural steel - Hot-rolled bars and sections
AS/NZS 3679.2	Structural steel - Welded I sections
AS/NZS 3725	Design for installation of buried concrete pipes
AS/NZS 3750 (Set)	Set of standards: Paints for Steel Structures
AS/NZS 3827.1	Lighting system performance - Accuracies and tolerances - Overview and general recommendations
AS/NZS 3827.2	Lighting system performance - Accuracies and tolerances - Compliance requirements
AS/NZS 3835.1	Earth potential rise - Protection of telecommunications network users, personnel and plant - Code of practice
AS/NZS 3835.2	Earth potential rise - Protection of telecommunications network users, personnel and plant - Application guide
AS/NZS 3845	Road safety barrier systems
AS/NZS 4295	Analogue speech (angle modulated) equipment operating in land mobile and fixed services bands in the frequency range 29.7 MHz to 1 GHz
AS/NZS 4325.1	Compression and mechanical connectors for power cables with copper or aluminium conductors - Test methods and requirements
AS/NZS 4382	Preparation of function charts for control systems
AS/NZS 4383 (Set)	Set of standards: Preparation of documents used in electrotechnology

Reference	Title of Standard
AS/NZS 4455 (Set)	Set of standards: Masonry units, pavers, flags and segmental retaining wall units
AS/NZS 4536	Life cycle costing - An application guide
AS/NZS 4663	Slip resistance measurement of existing pedestrian surfaces
AS/NZS 4667	Quality requirements for cut-to-size and processed glass
AS/NZS 4671	Steel reinforcing materials
AS/NZS 4680	Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
AS/NZS 4801	Occupational Health and Safety Management Systems – Specification with guidance for use
AS/NZS 4802.1	Information processing systems - Local area networks - Overview of local area network standards
AS/NZS 4802.2	Information processing systems - Local area networks - Logical link control
AS/NZS 4802.3	Information processing systems - Local area networks - Carrier sense multiple access with collision detection access method and physical layer specifications
AS/NZS 4802.6	Information processing systems - Local area networks - Distributed queue dual bus access method and physical layer specifications
AS/NZS 4802.12	Information technology - Local area networks - Demand-priority access method, physical layer and repeater specifications
AS/NZS 4804	Occupational health and safety management systems - General guidelines on principles, systems and supporting techniques
AS/NZS 4805.1	Accessories for electric cables - Test requirements - Power cables with extruded insulation for rated voltages from 1.9/3.3 (3.6) kV up to and including 19/33 (36) kV
AS/NZS 5000.1	Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 kV
AS/NZS 5070.1	Siting and operation of radio communications facilities - General guidelines for fixed, mobile and broadcasting facilities including fixed location satellite earth stations independent of the operating frequency
AS/NZS 60265.1	High-voltage switches - Switches for rated voltages above 1 kV and less than 52 kV
AS/NZS 60479-1	Effects of current on human beings and livestock – General aspects

Reference	Title of Standard
AS/NZS 60950.1	Information technology equipment - Safety - General requirements
AS/NZS 61000.4	Electromagnetic Compatibility (EMC): Testing and measurement techniques (All parts)
AS/NZS 61000.6.2	Electromagnetic Compatibility (EMC): General Standards - Immunity for Industrial Environments
AS/NZS 61558.2.4	Safety of power transformers, power supply units and similar products for supply voltages up to 1,100V - Particular requirements and tests for isolating transformers and power supply units incorporating transformers
AS/NZS CISPR 22	Information technology equipment – Radio disturbance characteristics – Limits and method of measurement
AS/NZS IEC 61935.1	Specification for the testing of balanced and coaxial information technology cabling-installed balanced cabling as specified in ISO/IEC 11801 and related standards
AS/NZS IEC 61935.2	Testing of balanced communication cabling in accordance with ISO/IEC 11801 - Patch cords and work area cords.
AS/NZS ISO 717.1	Acoustics - Rating of sound insulation in buildings and of building elements - Airborne sound insulation
AS/NZS ISO 9000	Quality management systems – Fundamentals and Vocabulary
AS/NZS ISO 9001	Quality management systems - Requirements
AS/NZS ISO 31000	Risk management - Principles and guidelines
AS/NZS/ISO/IEC 24702	Telecommunications installations - Generic cabling - Industrial premises
AS/RISSB 7660	Railway Network Control Mobile Communication Systems
ASTM C920	Standard Specification for Elastomeric Joint Sealants
ASTM C1036	Standard Specification for Flat Glass
ASTM C1048	Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass
BS 2571	Specification for general-purpose flexible PVC compounds for moulding and extrusion
BS 4255:1	Rubber used in preformed gaskets for weather exclusion from buildings. Specification for non-cellular gaskets

Reference	Title of Standard
BS 6290-2	Lead-acid stationary cells and batteries. Specification for the high-performance Plante positive type
BS 6290-3	Lead-acid stationary cells and batteries. Specification for the flat positive plate type
BS 6387	Specification for performance requirements for cables required to maintain circuit integrity under fire conditions
BS 7385.2	Evaluation and measurement for vibration in buildings - Guide to damage levels from groundborne vibration
BS 7430	Code of practice for protective earthing of electrical installations
BS 8081	Code of practice for ground anchorages
BS 8903	Principles and framework of procuring sustainably. Guide
BS EN 423	Resilient floor coverings. Determination of resistance to staining
BS EN 433	Resilient floor coverings. Determination of residual indentation after static loading
BS EN 673	Glass in building. Determination of thermal transmittance (U value). Calculation method
BS EN 755-1	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Technical conditions for inspection and delivery
BS EN 755-2	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Mechanical properties
BS EN 755-3	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Round bars, tolerances on dimensions and form
BS EN 755-4	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Square bars, tolerances on dimensions and form
BS EN 755-5	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Rectangular bars, tolerances on dimensions and form
BS EN 755-6	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Hexagonal bars, tolerances on dimensions and form
BS EN 779	Particulate air filters for general ventilation. Determination of the filtration performance
BS EN 755-1	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Technical conditions for inspection and delivery

Reference	Title of Standard
BS EN 755-2	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Mechanical properties
BS EN 755-3	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Round bars, tolerances on dimensions and form
BS EN 755-4	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Square bars, tolerances on dimensions and form
BS EN 755-5	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Rectangular bars, tolerances on dimensions and form
BS EN 755-6	Aluminium and aluminium alloys. Extruded rod/bar, tube and profiles. Hexagonal bars, tolerances on dimensions and form
BS EN 1399	Resilient floor covering. Determination of resistance to stubbed and burning cigarettes
BS EN 1537	Execution of special geotechnical works. Ground anchors
BS EN 1538	Execution of special geotechnical works. Diaphragm walls
BS EN 8006-2	Code of practice for strengthened / reinforced soils. Soil nail design.
BS EN 10025-5	Hot rolled products of structural steels. Technical delivery conditions for structural steels with improved atmospheric corrosion resistance
BS EN 12299	Railway applications. Ride Comfort for Passengers. Measurement and evaluation
BS EN 12663-1	Railway applications. Structural requirements of railway vehicle bodies. Locomotives and passenger rolling stock (and alternative method for freight wagons)
BS EN 13272	Railway applications. Electrical lighting for rolling stock in public transport systems
BS EN 13452-1	Railway applications. Braking. Mass transit brake systems. Performance requirements
BS EN 13749	Railway applications. Wheelsets and bogies. Methods of specifying structural requirements of bogie frames
BS EN 13481-5	Railway applications. Track. Performance requirements for fastening systems. Fastening systems for slab track with rail on the surface or rail embedded in a channel
BS EN 13848-1	Railway applications. Track. Track geometry quality. Characterisation of track geometry

Reference	Title of Standard
BS EN 13848-3	Railway applications. Track. Track geometry quality. Measuring systems. Track construction and maintenance machines
BS EN 14363	Railway applications. Testing for the acceptance of running characteristics of railway vehicles. Testing of running behaviour and stationary tests
BS EN 14531-1	Railway applications. Methods for calculation of stopping distances, slowing distances and immobilisation braking. General algorithms utilising mean value calculation for train sets or single vehicles
BS EN 14750-1	Railway applications. Air conditioning for urban and suburban rolling stock. Comfort parameters
BS EN 14750-2	Railway applications. Air conditioning for urban and suburban rolling stock. Type tests
BS EN 14752	Railway applications. Body entrance systems
BS EN 14813-1	Railway applications. Air conditioning for driving cabs. Comfort parameters
BS EN 15227	Railway applications. Crashworthiness requirements for railway vehicle bodies
BS EN 15427	Railway applications. Wheel/rail friction management. Flange lubrication
BS EN 15663	Railway applications. Definition of vehicle reference masses
BS EN 45545 (Set)	Set of standards: Railway Applications. Fire protection on railway vehicles
BS EN 50119	Railway applications. Fixed installations. Electric traction overhead contact lines
BS EN 50121 (Set)	Set of standards: Railway Applications. Electromagnetic compatibility
BS EN 50122-1	Railway applications. Fixed installations. Electrical safety, earthing and the return circuit. Protective provisions against electric shock.
BS EN 50122-2	Railway applications. Fixed installations. Electrical safety, earthing and the return circuit. Provisions against the effects of stray currents caused by DC traction systems
BS EN 50123 (Set)	Railway Applications - Fixed Installations - D.C. Switchgear
BS EN 50124-1	Railway applications. Insulation coordination. Basic requirements. Clearances and creepage distances for all electrical and electronic equipment

Reference	Title of Standard
BS EN 50126	Railway applications. The specification and demonstration of reliability, availability, maintainability and safety (RAMS)
BS EN 50128	Railway applications. Communications, signalling and processing systems. Software for railway control and protection systems
BS EN 50129	Railway applications. Communication, signalling and processing systems. Safety related electronic systems for signalling
BS EN 50149	Railway applications. Fixed installations. Electric traction. Copper and copper alloy grooved contact wires
BS EN 50155	Railway applications. Electronic equipment used on rolling stock
BS EN 50160	Voltage characteristics of electricity supplied by public electricity networks
BS EN 50162	Protection against corrosion by stray current from direct current systems
BS EN 50163	Railway applications. Supply voltages of traction systems
BS EN 50206-2	Railway applications. Rolling stock. Pantographs. Characteristics and tests. Pantographs for metros and light rail vehicles
BS EN 50215	Railway applications. Rolling stock. Testing of rolling stock on completion of construction and before entry into service
BS EN 50238	Railway applications. Compatibility between rolling stock and train detection systems
BS EN 50264-1	Railway applications. Railway rolling stock power and control cables having special fire performance. General requirements
BS EN 50264-2	Railway applications. Railway rolling stock power and control cables having special fire performance. Cables with crosslinked elastomeric insulation. Single core cables
BS EN 50264-3	Railway applications. Railway rolling stock power and control cables having special fire performance. Cables with crosslinked elastomeric insulation with reduced dimensions. Single core cables
BS EN 50272-1	Safety requirements for secondary batteries and battery installations. General safety information
BS EN 50272-2	Safety requirements for secondary batteries and battery installations. Stationary batteries
BS EN 50306-1	Railway applications. Railway rolling stock cables having special fire performance. Thin wall. General requirements

Reference	Title of Standard
BS EN 50306-2	Railway applications. Railway rolling stock cables having special fire performance. Thin wall. Single core cables
BS EN 50306-3	Railway applications. Railway rolling stock cables having special fire performance. Thin wall. Single core and multicore cables (pairs, triples and quads) screened and thin wall sheathed
BS EN 50306-4	Railway applications. Railway rolling stock cables having special fire performance. Thin wall. Multicore and multipair cables standard wall sheathed
BS EN 50317	Railway applications. Current collection systems. Requirements for and validation of measurements of the dynamic interaction between pantograph and overhead contact line
BS EN 50318	Railway applications. Current collection systems. Validation of simulation of the dynamic interaction between pantograph and overhead contact line
BS EN 50328	Railway applications. Fixed installations. Electronic power converters for substations
BS EN 50329	Railway applications. Fixed installations. Traction transformers
BS EN 50345	Railway applications. Fixed installations. Electric traction. Insulating synthetic rope assemblies for support of overhead contact lines
BS EN 50367	Railway applications. Current collection systems. Technical criteria for the interaction between pantograph and overhead line
BS EN 50382-1	Railway applications. Railway rolling stock high temperature power cables having special fire performance. General requirements
BS EN 50382-2	Railway applications. Railway rolling stock high temperature power cables having special fire performance. Single core silicone rubber insulated cables for 120°C or 150°C
BS EN 50388	Railway applications. Power supply and rolling stock. Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability
BS EN 50500	Measurement procedures of magnetic field levels generated by electronic and electrical apparatus in the railway environment with respect to human exposure
BS EN 50526-1	Railway applications. Fixed installations. DC surge arresters and voltage limiting devices. Surge arresters
BS EN 50526-2	Railway applications. Fixed Installations. D.C. surge arresters and voltage limiting devices. Surge arresters

Reference	Title of Standard
BS EN 62271 (Set)	Set of standards: High-voltage switchgear and control gear
BS EN 62305-1	Protection against lightning. General principles
BS EN 62561	Lightning Protection System Components (LPSC): (Parts 1-4)
CSA C9M	Dry Type Transformers
DD CLC/TS 50238-2	Railway applications. Compatibility between rolling stock and train detection systems. Compatibility with track circuits
DD CLC/TS 50238-3	Railway applications - Compatibility between rolling stock and train detection systems. Compatibility with axle counters
DIN 27201.5	State of railway vehicles - Basic principles and production technology – Part 5: Checking of wheel forces and vertical wheelset forces of railway vehicles
DIN 5566.1	Railway vehicles - Driver cabs – Part 1: General requirements
DIN 5566.3	Railway vehicles - Driver cabs – Part 3: Additional requirements for urban and suburban rolling stock
ETSI ETS 300 392 Set	Terrestrial Trunked Radio (TETRA): Voice and Data (V+D) standards
ETSI ETS 300 394 Set	Terrestrial Trunked radio (TETRA): Conformance Testing
ETSI ETS 300 395 Set	Terrestrial Trunked Radio (TETRA): Speech CODEC for full-rate traffic channel
ETSI ETS 300 396 (Set)	Set of standards: Terrestrial Trunked Radio (TETRA): Technical requirements for Direct Mode Operation (DMO)
HB 167	Security risk management
HB 90.3	The Construction Industry Guide to ISO 9001
HB 29	Communications cabling manual - Module 2: Communications cabling handbook
IEC 60038	IEC standard voltages
IEC 60085	Electrical insulation - Thermal evaluation and designation
IEC 60086-1	Primary batteries - Part 1: General
IEC 60183	Guide to the Selection of high-voltage cables

Reference	Title of Standard
IEC 60255	Measuring relays and protection equipment
IEC 60287 (Set)	Set of standards: Electric cables - Calculation of the current rating
IEC 60300-3-4	Dependability management – Part 3-4: Application guide – Guide to the specification of dependability requirements
IEC 60349-2	Electric traction - Rotating electrical machines for rail and road vehicles - Part 2: Electronic converter-fed alternating current motors
IEC 60479-1	Effects of current on human beings and livestock – Part 1: General aspects
IEC 60502	Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV)
IEC 60529	Degrees of protection provided by enclosures (IP Code)
IEC 60571	Railway applications – Electronic equipment used on rolling stock
IEC 60706-2	Maintainability of equipment - Part 2: Maintainability requirements and studies during the design and development phase.
IEC 60812	Analysis techniques for system reliability - Procedure for failure mode and effects analysis (FMEA)
IEC 60850	Railway applications - Supply voltages of traction systems
IEC 60896-11	Stationary lead-acid batteries - Part 11: Vented types - General requirements and methods of tests
IEC 61000: Parts 1- 4	Electromagnetic compatibility (EMC)
IEC 61133	Railway applications – Rolling stock – Testing of rolling stock on completion of construction and before entry into service
IEC 61287-1	Railway applications - Power convertors installed on board rolling stock - Part 1: Characteristics and test methods
IEC 61373	Railway applications - Rolling stock equipment - Shock and vibration tests
IEC 61375-1	Electronic railway equipment - Train communication network (TCN) - Part 1: General architecture
IEC 61375-2-1	Electronic railway equipment - Train communication network (TCN) - Part 2-1: Wire Train Bus (WTB)
IEC 61375-2-2	Electronic railway equipment - Train communication network (TCN) - Part 2-2: Wire Train Bus conformance testing

Reference	Title of Standard
IEC 61375-3-1	Electronic railway equipment - Train communication network (TCN) - Part 3-1: Multifunction Vehicle Bus (MVB)
IEC 61375-3-2	Electronic railway equipment - Train communication network (TCN) - Part 3-2: MVB (Multifunction Vehicle Bus) conformance testing
IEC 61375-3-3	Electronic railway equipment - Train communication network (TCN) - Part 3-3: CANopen Consist Network (CCN)
IEC 61881-1	Railway applications – Rolling stock equipment – Capacitors for power electronics – Part 1: Paper/plastic film capacitors
IEC 61992	Railway applications - Fixed installations - DC switchgear
IEC 62236-3-1	Railway applications - Electromagnetic compatibility - Part 3-1: Rolling stock - Train and complete vehicle
IEC 62271-1	High-voltage switchgear and control gear - Part 1: Common Specifications
IEC 62271-100	High-voltage switchgear and control gear - Part 100: Alternating current circuit-breakers
IEC 62271-200	High-voltage switchgear and control gear - Part 200: AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV
IEC 62271-202	High-voltage switchgear and control gear - Part 202: High-voltage/low voltage prefabricated substation
IEC 62271-301	High-voltage switchgear and control gear - Part 301: Dimensional standardisation of high-voltage terminals
IEC 62278 Ed. 1.0	Railway applications - Specification and demonstration of reliability, availability, maintainability and safety (RAMS)
IEEE 80	IEEE Guide for Safety in AC Substation Grounding
IEEE 485	Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications
IEEE 802	Local and Metropolitan Area Networks (Parts 1, 2, 3, 15, 16, 17, 20, 21, 22)
ISO 105-B02	Textiles - Tests for colour fastness - Part B02: Colour fastness to artificial light: Xenon arc fading lamp test
ISO 2631-1	Mechanical vibration and shock -- Evaluation of human exposure to whole-body vibration -- Part 1: General requirements
ISO 3095	Railway applications – Acoustics - Measurement of noise emitted by railbound vehicles

Reference	Title of Standard
ISO 3381	Railway applications - Acoustics - Measurement of Noise Inside Railbound Vehicles
ISO 3538	Road Vehicles – Safety glazing materials – Test methods for optical properties
ISO 4649	Rubber, vulcanised or thermoplastic – determination of abrasion resistance using rotating cylindrical drum device
ISO 7619-1	Rubber, vulcanised or thermoplastic – determination of indentation hardness: Durometer method (Shore hardness)
ISO 9001	Quality management systems - Requirements
ISO 9050	Glass in building – Determination of light transmittance, solar direct transmittance and related glazing factors
ISO 9241: (Parts 1-17)	Ergonomics of human-systems interaction
ISO 11064 (Set)	Set of standards: Ergonomic design of control centres
ISO 11600	Building construction – Jointing products – Classification and requirements for sealants
ISO 12944 (Set)	Set of standards: Paints and Varnishes
ISO 13350	Industrial fans – Performance testing of jet fans
ISO 14001	Environment Management Systems – Requirements with guideline for use
ISO 14040	Environmental Management - Life Cycle assessment – Principles and Framework
ISO 14044	Environmental Management – Life Cycle Assessment – Requirements and guidelines
ISO 19011	Guidelines for auditing management systems
ISO 15686-5	Buildings and constructed assets -- Service-life planning - Part 5: Life-cycle costing
ISO 31000	Risk management - Principles and guidelines
ISO 55000	Standards for Asset Management
ISO/IEC 14763-2	Information technology - Implementation and operation of customer premises cabling - Part 2: Planning and installation
ISO/IEC 15288	Systems and software engineering - System life cycle processes

Reference	Title of Standard
ISO/IEC 26514	Systems and software engineering - Requirements for designers and developers of user documentation
ISO/IEC/IEEE 29148	Systems and software engineering - Life cycle processes - Requirements engineering
ITU-T Rec. G.652	Characteristics of a single-mode optical fibre and cable
ITU-T Rec. G.655	Characteristics of a non-zero dispersion-shifted single-mode optical fibre and cable
NOHSC 1010	Safe Work Australia: National Standard for Plant
SIR NSW	Service and Installation Rules of New South Wales
T MU AM 01001 ST	Life Cycle Costing
T MU AM 01002 ST	Maintenance Requirements Analysis Manual
T MU AM 01003 ST	Development of Technical Maintenance Plans
T MU AM 02001 ST	Asset Information Management
T MU HF 00001 ST	Human Factors Integration - General Requirements
T MU MD 00002 ST	Network Standards Governance
T MU RS 01000 ST	Structural Integrity and Crashworthiness of Passenger Rolling Stock
T MU TE 81003 ST	Test Processes and Documentation for Programmable Electronic Systems and Software
TR IEC 61000.3.6	Electromagnetic compatibility (EMC) - Limits - Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems
TS 10500	AEO Authorisation Government Framework
TS 10501	AEO Guide to Authorisation

Reference	Title of Standard
TS 10502	AEO Authorisation Requirements
TS 10503	AEO Guide to Engineering Competence Management
TS 10504	AEO Guide to Engineering Management
TS 10505	AEO Guide to Requirements Definition and Analysis
TS 10506	AEO Guide to Verification and Validation
TS 10507	AEO Guide to Systems Integration
TS 10751	Configuration Management Guide
TS 10752	Railway Asset Product Configuration
TS 10753	Assurance and Governance Plan Requirements
TS 10765	Concessions to ASA Requirements
TS 20001	System Safety Standard for New and Altered Assets
UIC 518	Testing and approval of railway vehicles from the point of view of their dynamic behaviour – safety, track fatigue and ride quality
UIC 564-2	Regulations relating to fire protection and firefighting measures in passenger carrying railway vehicles or assimilated vehicles on international services
UIC 581	Wagons, Levage and Relevage
UIC 617-7	Regulations concerning conditions of visibility from driving compartments of electric powered stock
UIC 651	Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers

2.2. Guidelines

- (a) Guidelines such as handbooks, specifications and procedures from operators and other organisations are to be used in the design, construction, maintenance and operation of Sydney Light Rail as a guide, unless it is specified elsewhere that they must be used. The guidelines include the following, which are available from the issuing organisation. Where the documents are not readily available by searching the internet, copies have been provided as Information Documents.

Issuing Organisation	Reference	Title of Guideline
American National Standards Institute (ANSI)	ANSI/AIAA G-043A-2012E	Guide to the Preparation of Operational Concept Documents
American National Standards Institute (ANSI)	ANSI/GEIA HB-649	Configuration Management Package
Ausgrid		Electricity Network Operation Standards
Ausgrid	NS130	Specification for Laying Underground Cables up to 22kV
Ausgrid	NS156	Working near or around underground cables
Ausgrid	NS168	Specification for the design and construction of underground sub-transmission lines
Aust. Building Codes Board		International Fire Engineering Guidelines (2005)
Aust. Civil Aviation Safety Authority		Hazard Lighting Requirements (if needed)
Aust. Communications and Media Authority	RALI LM 8	Radio Assignment and Licensing Instruction (RALI): Frequency Assignment Requirements for the Land Mobile Service
Aust. Department of the Environment	Australian Greenhouse Office	Climate Change Impacts and Risk Management: A Guide for Business and Government
Aust. Department of Infrastructure and Regional Development		National Code of Practice for CCTV Systems for Mass Passenger Transport for Counter-Terrorism
Aust. Government	Australian Design Rule 13/00	Installation of Lighting and Light Signalling Devices on other than L-Group Vehicles
Aust. Government		Australian Safety and Compensation Council Guidance on Occupational Health and Safety in Government Procurement
Aust. Green Infrastructure Council		Guidelines for Climate Change Adaptation (AGIC Rev 2.1, Oct. 2011)
Aust. Procurement and Construction Council		National Code of Practice for the Construction Industry

Issuing Organisation	Reference	Title of Guideline
Aust. & NZ Environment and Conservation Council (ANZECC)		Australian and New Zealand Guidelines for Fresh and Marine Water Quality
AustRoads	AGPT02-08	AustRoads Guide to Pavement Technology - Part 2: Pavement Structural Design (with RMS Supplement)
AustRoads	AGPT02-12	AustRoads Guide to Pavement Technology Part 2: Pavement Structural Design (with RMS Supplement)
AustRoads	AGPT03-09	AustRoads Guide to Pavement Technology Part 3: Pavement Surfacing (with RMS Supplement)
AustRoads	AGPT04-07	AustRoads Guide to Pavement Technology Part 4: Pavement Materials (with RMS Supplement)
AustRoads	AGPT07-09	AustRoads Guide to Pavement Technology Part 7: Pavement Maintenance (with RMS Supplement)
AustRoads	AGPT10-09	AustRoads Guide to Pavement Technology Part 10 - Sub surface drainage
AustRoads	AGRD05-10	AustRoads Guide to Road Design Part 5: Drainage Design
AustRoads	AGRD06/09	AustRoads Guide to Road Design Part 6: Roadside Design, Safety and barriers (with RMS Supplement)
AustRoads	AGRD06-10	AustRoads Guide to Road Design, Safety and Barriers
AustRoads	AGRD06A/09	AustRoads Guidelines Part 6A: Pedestrian and Cyclist Paths
AustRoads	AGRD06B/09	AustRoads Guide to Road Design, Roadside Environment (with RMS Supplement)
AustRoads	AGRS01-13	AustRoads Guide to Road Safety Part 1: Road Safety Overview
AustRoads	AGRS02-13	AustRoads Guide to Road Safety Part 2: Road Safety Strategy and Evaluation
AustRoads	AGRS03-08	AustRoads Guide to Road Safety Part 3: Speed Limits and Speed Management
AustRoads	AGRS04-09	AustRoads Guide to Road Safety Part 4: Local Government and Community Road Safety

Issuing Organisation	Reference	Title of Guideline
AustRoads	AGRS05-06	AustRoads Guide to Road Safety Part 5: Road Safety for Rural and Remote Areas
AustRoads	AGRS06-09	AustRoads Guide to Road Safety Part 6: Road Safety Audit
AustRoads	AGRS07-06	AustRoads Guide to Road Safety Part 7: Road Network Crash Risk Assessment and Management
AustRoads	AGRS08-09	AustRoads Guide to Road Safety Part 8: Treatment of Crash Locations
AustRoads	AGRS09-08	AustRoads Guide to Road Safety Part 9: Roadside Hazard Management
AustRoads	AP-G34-13	AustRoads Design Vehicles and Turning Path Templates
British Standards Institution	BS 8020	Tools for live working. Specification for insulating hand tools for work on or near conductor rail systems operating at voltages up to 1000 V a.c. or 1500 V d.c
British Standards Institution	EC2	Eurocode 2: Design of Concrete Structures - Part 1-2: General Rules - Structural Fire Design, European Committee for Standardization, Brussels, Belgium
Center for Disease Control (US)		Unified Process Practices Guide
Centennial Park and Moore Park Trust		Tree Masterplan for The Centennial Parklands
City of Sydney		City Art Public Art Strategy (City of Sydney)
City of Sydney		Central Sydney Development Control Plan (Onsite Parking)
City of Sydney		Central Sydney Development Control Plan (Pedestrian Amenity)
City of Sydney		Central Sydney On-Street Parking Policy

Issuing Organisation	Reference	Title of Guideline
City of Sydney		<p>Public Domain codes and specifications including:</p> <p><u>Public Domain Codes</u></p> <ul style="list-style-type: none"> ▪ Public Domain Manual ▪ Sydney Streets Code ▪ Sydney Streets Technical Specification ▪ Sydney Parks Code ▪ Sydney Lights Code ▪ George Street Lighting Masterplan <p><u>Sydney Signage Code</u></p> <ul style="list-style-type: none"> ▪ Legible Sydney: Wayfinding Strategy ▪ Legible Sydney: Design Manual ▪ Sydney Park Signage Code and Design Manual ▪ Taxi Rank Signage – Design Manual ▪ Public Transport Wayfinding Signage ▪ Street Name Signage Specification ▪ Bicycle network Directional Signage – Design Guidelines ▪ Community Signage – Design Manual ▪ Temporary Signage Manual ▪ Regulatory Signage Manual <p><u>City of Sydney Tree Management</u></p> <ul style="list-style-type: none"> ▪ Tree Management Policy ▪ Street Tree Masterplan ▪ Sydney DCP 2012: Tree Management Controls <p>Urban Forest Strategy</p>
City of Sydney		Cycle Strategy and Action Plan 2001-2017
City of Sydney		Development Specification for Civil Works – Design and Construction
City of Sydney		Decentralised Energy Master Plan - Trigeneration 2010-2030
City of Sydney		Decentralised Water Master Plan 2012-2030

Issuing Organisation	Reference	Title of Guideline
City of Sydney		South Sydney Development Specification for Civil Works
City of Sydney		Standard Grates and Pit Covers
City of Sydney		George Street Concept Design Parts 1-2
City of Sydney		Green Star Rating by Green Building Council Australia
City of Sydney	Doc No. 298016 LR	Interim Pavement Design and Construction Guidelines
Considerate Contractors Scheme (UK)		Code of Considerate Practice
Construction Industry Research and Information Association (UK)	CIRIA C580	Embedded Retaining Walls - Guidance for Economic Design
Docklands Light Railway (Transport for London)	DLR ES-401	Engineering Standard ES-401: Permanent Way Standards (Draft)
Department of Defense (US)	Mil-HDBK-1472F	Human Engineering
Department of Defense (US)	MIL-HDBK-338 B	Military Handbook: Electronic Reliability Design Handbook
Department of Defense (US)	Mil-HDBK-46855A	Department of Defence Handbook: Human Engineering Program Process and Procedures
Department of Defense (US)	MIL-STD-2155 (AS)	Failure Reporting And Corrective Action
Department of Defense (US)	MIL-STD-882D	System Safety Program Plan
Department of Environment and Climate Change NSW	DECC 2009/265	Interim Construction Noise Guideline
Department of Environment and Climate Change NSW		Practical Consideration of Climate Change

Issuing Organisation	Reference	Title of Guideline
Department of Environment and Climate Change NSW		Draft Sea Level Rise Policy Statement
Department of Transport (US)	DOT/FAA/CT-96/1	Human Factors Design Guide (HFDG)
Economic Commission for Europe of the United Nations (UN/ECE)	Regulation No. 43	Uniform provisions concerning the approval of safety glazing materials and their installation on vehicles
Editions Techniques Ferroviaires (French Railway Technical Publications)	UIC 518	Testing and approval of railway vehicles from the point of view of their dynamic behaviour - Safety - Track fatigue - Ride quality
Editions Techniques Ferroviaires (French Railway Technical Publications)	UIC 564-2	Regulations relating to fire protection and firefighting measures in passenger carrying railway vehicles or assimilated vehicles used on international services
Editions Techniques Ferroviaires (French Railway Technical Publications)	UIC 581	Wagons - Levage - Relevage
Editions Techniques Ferroviaires (French Railway Technical Publications)	UIC 617-7	Regulations concerning conditions of visibility from driving compartments of electric powered stock
Editions Techniques Ferroviaires (French Railway Technical Publications)	UIC 651	Layout of driver's cabs in locomotives, railcars, multiple-unit trains and driving trailers
Engineering Equipment & Materials Users Association (UK)	EEMUA 191	Alarm Systems - A Guide to Design, Management and Procurement
Energy NSW	EC7	Guide to the Prevention of Unauthorised Access (Electricity Council of New South Wales)
Energy NSW		Code of Practice (Electricity): Service and Installation Rules of NSW
Engineers Australia: National Committee on Water Engineering (NCWE)	ARR	Australian Rainfall & Runoff - A Guide to Flood Estimation, Institution of Engineers, Australia

Issuing Organisation	Reference	Title of Guideline
Engineers Australia: National Committee on Water Engineering (NCWE)		Australian Runoff Quality – A Guide to Water Sensitive Urban Design.
Energy Supply Association		ENA Customer Guide to Electricity Supply
Energy Supply Association	EG1	ENA Substation Earthing Guide
Federal Aviation Authority (US)	HF-STD-001	Human Factors Design Standard (HFDS)
French Energy Ministry (Ministère de l'Écologie du Développement durable et de l'Énergie)		Guide d'implantation des obstacles fixes à proximité des intersections tramways / voies routières. Version 2 Dated 26/01/2012
French Standards Organisation	NF F 16-101	Railway Rolling Stock Fire Behaviour Choice of Materials
French Standards Organisation	NF F 16-102	Railway Rolling Stock Fire Behaviour Choice of Materials for electrical equipment
German Federal Regulations	BOStrab	German Federal Regulations on the Construction and Operation of Light Rail Transit Systems
German Federal Regulations	BOStrab- Lichtraum- Richtlinien	Preliminary Guidance for Calculation of Gauges for Tramcars in accordance with the German Federal Regulations on the Construction and Operation of Light Rail Transit System
German Federal Regulations	BOStrab- Trassierungsri chtlinie	Guidelines for the track aligning according to the decree of construction and operation
German Federal Regulations	TR Sp	TR Spr - Annex 1 - Annex 4 Regulations on the Guidance of Rail LRVs in accordance with the German Federal Regulations on the Construction and Operation of Light Rail Transit Systems (BOStrab), Guidance Regulations (SpR)
German National Standards Organisation (DIN)	DIN 51130	Testing of floor coverings - Determination of the anti- slip property - Workrooms and fields of activities with slip danger, walking method - Ramp test
Green Building Council of Australia	NSW Govt	Public Building Pilot: Challenge of Ecological Value Calculator Guide (GBCA 2010)

Issuing Organisation	Reference	Title of Guideline
Global Reporting Initiative	GRI 3.1	Sustainability Reporting Guidelines
Institute of Electrical and Electronics Engineers	IEEE Std 802.3™	IEEE Standard for Information technology - Telecommunications and information exchange between systems - Local and metropolitan area networks - Specific requirements - Part 3: Carrier sense multiple access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications
International Commission on Illumination	CIE 129	International Commission on Illumination - Guide for Lighting of Exterior Work Areas
International Standards Organisation	ISO 14224	Petroleum, petrochemical and natural gas industries - Collection and exchange of reliability and maintenance data for equipment
International Standards Organisation	ISO/IEC 26702	Systems engineering - Application and management of the systems engineering process
International Telecommunications Union	ITU Directive	Protection of telecommunication lines against harmful effects from electrical power and electrified railway lines: Danger and Disturbance
National Association of Home Builders (US)	ISBN: 97861342413 04	Crime Prevention Through Environmental Design (CPTED) Principles - Timothy D Crowe
National Fire Protection Association (US)	NFPA130	Standard for Fixed Guideway Transit and Passenger Rail Systems
National Specification System of Australia (Natspec)	Natspec 1152	Road Openings and Restorations
National Specification System of Australia (Natspec)	Natspec 1391	Service Conduits
National Specification System of Australia (Natspec)	Natspec 1392	Trenchless Excavation
NSW Environment & Heritage		Floodplain Development Manual – the management of flood liable land

Issuing Organisation	Reference	Title of Guideline
NSW Environment & Heritage		NSW Coastal Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Coastal Risk Assessments
NSW Environment & Heritage	Blue Book	Managing Urban Stormwater - Soils and Construction
NSW EPA	Protection of the Environment Operations (POEO) Act	Assessing Vibration: A Technical Guideline (DECC 2006)
NSW EPA	Protection of the Environment Operations (POEO) Act	Waste Classification Guidelines
NSW EPA	Protection of the Environment Operations (POEO) Act	Assessing vibration: a technical guideline (February 2006)
NSW EPA		NSW Industrial Noise Policy
NSW EPA		Rail Infrastructure Noise Guideline, 2012
NSW Government		Environmental Incident Classification and Reporting
NSW Government		Environmental Management System Guidelines
NSW Government	IR Guidelines	Industrial Relations Management Guidelines (December 1999)
NSW Government		Policy Statement and Guidelines for the Establishment and Implementation of Closed Circuit Television (CCTV) in Public Areas
NSW Government (NSW Apprenticeships)		Training Management Guidelines (February 2009)
NSW Rural Fire Service		Standards for Asset Protection Zone
NSW WorkCover	WC03558	Confined spaces: Code of practice

Issuing Organisation	Reference	Title of Guideline
Office of Rail Regulation (UK)	Railway Safety Publication 2	Guidance on Tramways
Railway Group Standards (UK)	GM/RT2472	Data Recorders on Trains – Design Requirements
Rail Industry Safety and Standards Board (RISSB)		National Code of Practice Accessible Rail (25/03/2011)
Randwick City Council		Randwick Street Tree Master Plan
Randwick City Council		Development Control Plan (Parking)
RMS		Delineation Manual
RMS		Supplement to Austroads Guide to Traffic Management
RMS		Traffic Control at Work Sites manual
RMS		Traffic Signal Design Manual
RMS		Road Pavement Asset Management Plan
RMS		NSW bicycle guidelines
RMS	RMS D&C 3051	Unbound and Modified Base and Sub-Base Materials for Surfaced Road Pavements
RMS	RMS D&C 3052	Material to be Bound (MTBB) for Base and Sub-Base Materials for Surfaced Road Pavements
RMS	RMS D&C 3151	Cover Aggregate for Sprayed Bituminous Surfacing
RMS	RMS D&C 3152	Aggregates for Asphalt
RMS	RMS D&C 3202	Wax Emulsion Concrete Curing Compound
RMS	RMS D&C 3204	Preformed Joint Fillers for Concrete Road Pavements and Structures
RMS	RMS D&C 3211	Cements, Binders & Fillers

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C 3252	Polymer Modified Binder
RMS	RMS D&C 3253	Bitumen for Pavements
RMS	RMS D&C 3254	Bitumen Emulsion
RMS	RMS D&C 3256	Comminuted Scrap Rubber
RMS	RMS D&C 3258	Aggregate Precoating Agent (for Bitumen)
RMS	RMS D&C 3259	Bitumen Adhesion Agent (for Bitumen)
RMS	RMS D&C 3261	Cutback Bitumen
RMS	RMS D&C 3266	Coldmix Asphalt
RMS	RMS D&C 3268	Aggregate Precoating Agent (for Polymer Modified Bitumen)
RMS	RMS D&C 3269	Bitumen Adhesion Agent (for Polymer Modified Bitumen)
RMS	RMS D&C 3351	Road Marking Paint
RMS	RMS D&C 3352	Fluorescent Plastic Traffic Cones
RMS	RMS D&C 3353	Glass Beads (For Application to Road Marking Materials)
RMS	RMS D&C 3354	Adhesives for Raised Pavement Marker Installation
RMS	RMS D&C 3357	Thermoplastic Road Marking Material
RMS	RMS D&C 3359	Profile Thermoplastic Road Marking Material
RMS	RMS D&C 3360	Two Part Cold Applied Road Marking Material

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C 3385	Barrier Boards
RMS	RMS D&C 3400	Manufacture and Delivery of Road Signs
RMS	RMS D&C 3411	Supply of Guide Posts - Timber
RMS	RMS D&C 3412	Supply of Guide Posts – Non-Timber
RMS	RMS D&C 3552	Drainage Pipe (Corrugated Perforated Plastic)
RMS	RMS D&C 3553	Seamless Tubular Filter Fabric
RMS	RMS D&C 3555	Drainage Pipe (Slotted Fibre-Reinforced Concrete)
RMS	RMS D&C 3556	Strip Filter (Geocomposite Plastic)
RMS	RMS D&C 3651	Paints and Thinners for Steelwork
RMS	RMS D&C 3851	Steel Tapered Lighting Columns
RMS	RMS D&C B30	Clearing, Excavation and Backfill for Bridgeworks
RMS	RMS D&C B50	Driven Reinforced Concrete Piles
RMS	RMS D&C B51	Driven Prestressed Concrete Piles
RMS	RMS D&C B53	Driven H-Section Steel Piles
RMS	RMS D&C B54	Driven Tubular Steel Piles
RMS	RMS D&C B57	Driven Cast-in-Place Concrete Piles
RMS	RMS D&C B58	Permanently Cased Cast-in-Place Reinforced Concrete Piles

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C B59	Bored Cast-in-Placed Reinforced Concrete Piles (Without Permanent Casing)
RMS	RMS D&C B61	Driven Composite Piles
RMS	RMS D&C B63	Concrete Injected (CFA) Piling
RMS	RMS D&C B80	Concrete Work for Bridges
RMS	RMS D&C B82	Shotcrete Work
RMS	RMS D&C B110	Manufacture of Pretensioned Precast Concrete Members
RMS	RMS D&C B113	Post-Tensioning of Concrete
RMS	RMS D&C B114	Permanent Rock Anchors
RMS	RMS D&C B115	Precast Concrete Members (Not Pretensioned)
RMS	RMS D&C B150	Erection of Pretensioned Precast Concrete Members
RMS	RMS D&C B152	Incrementally Launched Prestressed Concrete Girders
RMS	RMS D&C B153	Erection of Precast Concrete Members (Not Pretensioned)
RMS	RMS D&C B170	Supply and Installation of Void Formers
RMS	RMS D&C B200	Fabrication of Major Steel Structural Members
RMS	RMS D&C B204	Welding of Bridges and Other Road Structures
RMS	RMS D&C B220	Protective Treatment of Steelwork
RMS	RMS D&C B240	Supply of Bolts, Nuts, Screws and Washers

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C B241	Manufacture and Supply of Minor Steel Items
RMS	RMS D&C B242	Manufacture and Supply of Aluminium Railings
RMS	RMS D&C B245	Fabrication of Aluminium Structural Members
RMS	RMS D&C B246	Manufacture and Supply of Minor Aluminium Items
RMS	RMS D&C B260	Erection of Structural Steelwork
RMS	RMS D&C B261	Erection of Structural Aluminium
RMS	RMS D&C B264	Erection of Barrier Railings and Minor Components
RMS	RMS D&C B280	Unreinforced Elastomeric Bearing Pads and Strips
RMS	RMS D&C B281	Laminated Elastomeric Bearings
RMS	RMS D&C B282	Pot Bearings – Structural Steel
RMS	RMS D&C B283	Pot Bearings – Stainless Steel
RMS	RMS D&C B284	Installation of Bridge Bearings
RMS	RMS D&C B310	Compression Joint Seals
RMS	RMS D&C B312	Cold Applied Elastomeric Joint Sealants
RMS	RMS D&C B315	Elastomeric Strip Seal Expansion Joints
RMS	RMS D&C B316	Modular Bridge Expansion Joints
RMS	RMS D&C B318	Bonded Metal-Elastomer Expansion Joints

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C B319	Proprietary Aluminium Expansion Joints
RMS	RMS D&C B341	Demolition of Existing Structure
RMS	RMS D&C B344	Sprayed Bituminous Waterproofing Membrane for Concrete Bridge Decks
RMS	RMS D&C B345	Supply of Bridge Nameplates
RMS	RMS D&C G36	Environmental Protection (Management System)
RMS	RMS D&C G38	Soil And Water Management (Soil And Water Management Plan)
RMS	RMS D&C G39	Soil and Water Management (Erosion and Sediment Control Plan)
RMS	RMS D&C P3074A	Design, Supply and Delivery of a Solar Powered, Trailer Mounted, Variable Message Sign (VMS)
RMS	RMS D&C R11	Stormwater Drainage
RMS	RMS D&C R15	Kerbs and Gutters
RMS	RMS D&C R16	Precast Reinforced Concrete Box Culverts
RMS	RMS D&C R22	Corrugated Metal Structures
RMS	RMS D&C R23	Plastic Flexible Pipes
RMS	RMS D&C R24	Precast Concrete Arches
RMS	RMS D&C R31	Vertical Wick Drains
RMS	RMS D&C R32	Subsurface Drainage – Materials
RMS	RMS D&C R33	Trench Drains

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C R37	Intra-pavement Drains
RMS	RMS D&C R38	Edge Drains
RMS	RMS D&C R39	Drainage Mats
RMS	RMS D&C R40	Horizontal Drains
RMS	RMS D&C R44	Earthworks (Cut, Fill, Imported Fill and Imported Selected Material)
RMS	RMS D&C R49	Construction of Verges
RMS	RMS D&C R50	Stabilisation Of Earthworks
RMS	RMS D&C R53	Concrete (for general use), Mortar and Grout
RMS	RMS D&C R55	Rock Filled Gabions and Mattresses
RMS	RMS D&C R57	Design of Reinforced Soil Walls
RMS	RMS D&C R58	Construction of Reinforced Soil Walls
RMS	RMS D&C R63	Geotextiles (Separation and Filtration)
RMS	RMS D&C R64	Soil Nailing
RMS	RMS D&C R67	High Strength Geosynthetic Reinforcement
RMS	RMS D&C R68	Shotcrete Works Without Steel Fibres
RMS	RMS D&C R71	Unbound Pavement Course (Normal Duty)
RMS	RMS D&C R73	Heavily Bound Pavement Course (Plant Mixed Using Slow Setting Binders)

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C R75	In Situ Pavement Recycling By Deep-Lift Cementitious Stabilisation
RMS	RMS D&C R82	Lean-Mix Concrete Subbase
RMS	RMS D&C R83	Jointed Concrete Base
RMS	RMS D&C R84	Continuously Reinforced Concrete Base
RMS	RMS D&C R90	Roller Compacted Concrete Subbase
RMS	RMS D&C R92	Shotcreting, Tensioned Mesh and Rockbolting
RMS	RMS D&C R101	Cold Milling of Road Pavement Materials
RMS	RMS D&C R106	Sprayed Bituminous Surfacing (with Cutback Bitumen)
RMS	RMS D&C R107	Sprayed Bituminous Surfacing (with Polymer Modified Binder)
RMS	RMS D&C R109	Bituminous Slurry Surfacing
RMS	RMS D&C R110	Coloured Surface Coatings for Bus Lanes and Cycleways
RMS	RMS D&C R111	Sprayed Bituminous Surfacing (with Bitumen Emulsion)
RMS	RMS D&C R116	Asphalt (Dense Graded and Open Graded)
RMS	RMS D&C R121	Stone Mastic Asphalt
RMS	RMS D&C R123	Thin Open Graded Asphalt Surfacing
RMS	RMS D&C R131	Guide Posts
RMS	RMS D&C R132	Safety Barrier Systems

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C R141	Pavement Marking
RMS	RMS D&C R142	Raised Pavement Marking
RMS	RMS D&C R143	Signposting
RMS	RMS D&C R145	Pavement Marking (Performance Based)
RMS	RMS D&C R151	Street Lighting
RMS	RMS D&C R152	Emergency Telephones
RMS	RMS D&C R153	Tunnel and Underpass Main Switchboard, Distribution Boards and Control Panels
RMS	RMS D&C R154	Tunnel and Underpass Electrical Services Works
RMS	RMS D&C R158	Road Tunnel and Underpass Lighting
RMS	RMS D&C R173	General Concrete Paving
RMS	RMS D&C R174	Landscape Maintenance
RMS	RMS D&C R176	Native Seed Collection
RMS	RMS D&C R178	Vegetation
RMS	RMS D&C R179	Landscape Planting
RMS	RMS D&C R201	Fencing
RMS	RMS D&C R257	Design guidance on noise walls
RMS	RMS D&C R271	Design and Construction of Noise Walls

Issuing Organisation	Reference	Title of Guideline
RMS	RMS D&C TSI-SP-017- ITSP	Construction of Underground Cableways
RMS	RMS QA Specification B220	Protective Treatment of Bridge Steelwork
RMS	RMS QA Specification M20	Maintenance Intervention and Investigatory Requirements (Pavements)
RMS	RMS QA Specification M200	Maintenance Rectification Requirements (Pavements)
RMS	RMS QA Specification M200	Earthworks for Road Rebuilding
RMS	RMS QA Specification M60	Maintenance Investigation & Investigatory Requirements (Traffic Facilities)
RMS	RMS QA Specification M600	Maintenance Rectification Requirements (Traffic Facilities)
RMS	RMS Test Methods	Various; including: T102; T103; T105; T108; T109; T111; T117; T119; T120; T131; T162; T166; T173; T198; T223
RMS	RTA / Pub.11.050	AustRoads Guide to Pavement Technology with RMS Supplement
RMS	RTA / Pub.11.092	AustRoads Guide to Road Design with RMS Supplement
RMS	RTA / Pub.11.093	AustRoads Guide to Road Design with RMS Supplement
RMS	RTA / Pub.11.094	AustRoads Guide to Road Design with RMS Supplement
Safe Work Australia		Work Health and Safety Consultation, Co-operation and Co-ordination Code of Practice
Safe Work Australia		How to Mange Work Health and Safety Risks Code of Practice
Safe Work Australia		Safe Work Hazardous manual Tasks Code of Practice

Issuing Organisation	Reference	Title of Guideline
Safe Work Australia		Managing the Risks of Falls at Workplaces Code of Practice
Safe Work Australia		Labelling of Workplace Hazardous Chemicals Code of Practice
Safe Work Australia		Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice
Safe Work Australia		Managing the Risks of Hazardous Chemicals in the Workplace Code of Practice
Safe Work Australia		Confined Spaces Code of Practice
Safe Work Australia		Managing Noise and Preventing Hearing Loss at Work Code of Practice
Safe Work Australia		Managing the Works Environment and Facilities Code of Practice
Safe Work Australia		How to Safely Remove Asbestos Code of Practice
Safe Work Australia		How to Manage and Control Asbestos in the Workplace Code of Practice
Safe Work Australia		First Aid in the Workplace Code of Practice
Safe Work Australia		Construction Work Code of Practice
Safe Work Australia		Preventing Falls in Housing Construction Code of Practice
Safe Work Australia		Managing Risks of Plant in the Workplace Code of Practice
Safe Work Australia		Safe Design of Structures Code of Practice
Safe Work Australia		Demolition Works Code of Practice
Safe Work Australia		Welding Processes Code of Practice
Safe Work Australia		Spray Painting and Powder Coating Code of Practice
Safe Work Australia		Abrasive Blasting Code of Practice
Safe Work Australia		Working in the Vicinity of Overhead and Underground Electric Lines Draft Code of Practice

Issuing Organisation	Reference	Title of Guideline
Safe Work Australia		Safe Design, manufacture, Import and Supply of Plant Draft Code of Practice
Safe Work Australia		Scaffolds and Scaffolding Work Draft Code of Practice
Safe Work Australia		Tree Trimming and Removal Work – Crane Access Method Draft Code of Practice
Safe Work Australia		Industrial Lift Trucks Draft Code of Practice
Safe Work Australia		Formwork and Falsework Draft Code of Practice
Safe Work Australia		Cranes Draft Code of Practice
Safe Work Australia		Traffic management in Workplaces Draft Code of Practice
Standards Australia	AS IEC 60300.3.12	Dependability management - Application guide - Integrated logistic support
Standards Australia	AS ISO 10007	Quality management system - Guidelines for configuration management
Sydney Water Corporation		Guidelines for Building Over/Adjacent to Sydney Water Assets
TfNSW		Department of Transport Best Practice Guidelines for Public Transport Signage and Information
TfNSW	EP 00 00 00 08 SP	RailCorp Standard - Safe Limits of DC Voltages
TfNSW	EP 00 00 00 13 SP	Railcorp Engineering Standard - Electrical Power Equipment - Design Ranges Of Ambient Conditions
TfNSW	EP 08 00 00 07 SP	Railcorp Standard – Safety Screens for Bridges over 1500V OHW Equipment
TfNSW	EP 12100010 SP	RailCorp: Electrical Engineering Standard - System Substation Earthing
TfNSW	EP 12100020 SP	RailCorp: Electrical Engineering Standard - Low Voltage Distribution Earthing
TfNSW	EP 20 00 04 05 SP	RailCorp Engineering Electrical Standard - Cable Pits
TfNSW	ESB 004	RailCorp Stations & Buildings Standards - Station Services and Systems

Issuing Organisation	Reference	Title of Guideline
TfNSW	ESC 200	RailCorp Engineering Civil Standard - Track System
TfNSW	ESC 210	RailCorp Engineering Civil Standard - Track Geometry Stability
TfNSW	ESC 215	RailCorp Engineering Civil Standard -Transit Space
TfNSW	ESC 220	RailCorp Engineering Civil Standard - Rail and Rail Joints
TfNSW	ESC 250	RailCorp Engineering Standard Civil - Turnouts and Special Trackwork
TfNSW	ESC 301	RailCorp Engineering Civil Standard -Bridges - load rating
TfNSW	ESC 310	RailCorp Engineering Civil Standard -Underbridges
TfNSW	ESC 320	RailCorp Engineering Civil Standard -Overbridges and Footbridges
TfNSW	ESC 330	RailCorp Engineering Civil Standard -OHWS & Signal Gantries
TfNSW	ESC 340	RailCorp Engineering Standard-Tunnels
TfNSW	ESC 350	RailCorp Engineering Civil Standard -Retaining walls & platforms
TfNSW	ESC 360	RailCorp Engineering Civil Standard - Miscellaneous structures
TfNSW	ESC 361	RailCorp Engineering Civil Standard - Buffer Stops
TfNSW	ESC 362	RailCorp Engineering Civil Standard -Track Slab
TfNSW	ESC 370	RailCorp Engineering Civil Standard - Airspace developments
TfNSW	ESC 380	RailCorp Engineering Civil Standard - External developments
TfNSW	ESC 410	RailCorp Engineering Standard Geotechnical - Earthworks and Formation
TfNSW	ESC 420	RailCorp Engineering Civil Standard -Track Drainage
TfNSW	ESC 510	RailCorp Engineering Civil Standard - Boundary fencing

Issuing Organisation	Reference	Title of Guideline
TfNSW	ESC 540	RailCorp Engineering Civil Standard - Service Installations Within the Rail Corridor
TfNSW	ESC 550	RailCorp Engineering Civil Standard - Access Roads
TfNSW	ESG 006	RailCorp Signals - Rolling Stock Interface Requirements - Rolling Stock Signalling Interface Requirements
TfNSW		Sydney Light Rail Western Extension System Specification Volume 1
TfNSW	A1559029	CSELR Ticketing Requirements
TfNSW		NSW Ministry of Transport Introduction to Graphic Standards for Public Transport Information, 2008
TfNSW		NSW Sustainable Design Guidelines For Rail
TfNSW		RailCorp Design Guidelines for the Upgrade and Construction of New and Existing Train Stabling Yards and Turnback Sidings
TfNSW		RailCorp Draft Environmental User Requirements 2007
TfNSW		RailCorp Station Design Standard Requirements 2008
TfNSW	RSS-001	RailCorp Security Standard - Stations
TfNSW	RSS-002	Stabling Locations & Maintenance Centres
TfNSW	RSSB	Understanding Human Factors
TfNSW	RSSB	Engineering Safety Management (The Yellow Book), Issue 4
TfNSW	SLRP-00WP-GN-R-0005	Sydney Light Rail Strategic Plan Engineering, Light Rail Systems and Urban Design Feasibility Design Report - Volume 5 - Urban Design
TfNSW	SPC 251	RailCorp Engineering Civil Specification - Turnout & Special Trackwork Components
TfNSW	SPC 411	RailCorp Engineering Specification Geotechnical - Earthwork Materials
TfNSW	SPC 511	RailCorp Right of Way Specification - Boundary Fences

Issuing Organisation	Reference	Title of Guideline
TfNSW	SPG 1858	RailCorp Signals - Equipment Specifications - Track Circuit Types Characteristics and Applications
TfNSW	TMC 101	RailCorp Engineering Civil Manuals -Track Service Schedules
TfNSW	TMC 331	RailCorp Engineering Civil Manual -Design of Overhead Wiring Structures and Signal Gentries
TfNSW	TMC 401	RailCorp Engineering Manual Geotechnical - Geotechnical Risk Assessment and Hazard Management Guidelines
TfNSW	TMC 404	RailCorp Engineering Manual Geotechnical - Recognising Geotechnical Problems
TfNSW	TMC 411	RailCorp Engineering Manual Geotechnical - Earthworks
TfNSW	TMC 421	RailCorp Civil Manual - Track Drainage Manual
TfNSW (ASA)	T MU AM 00002 GU	Assurance and Governance Plan - Guidelines
TfNSW (ASA)	T MU AM 04001 PL	TfNSW Configuration Management Plan
TfNSW (ASA)	T MU AM 06003 TI	Development of a Transport Network Architecture Model
TfNSW (ASA)	T MU HF 00001 GU	AEO Guide to Human Factors Integration
TfNSW (ASA)	T MU MD 00001 SP	Network Standards Numbering System
TfNSW (ASA)	T MU MD 00003 GU	Guide to Independent Safety Assessment
TfNSW (ASA)	T MU MD 00004 TI	Independent Safety Assessor (ISA) Requirements (interim)
TfNSW (ASA)	TMD 0001	CAD and Drafting Manual (consists of Sections 1 to 8), RailCorp
TfNSW	9TD-SD-066	Chemical Storage and Spill Response Guidelines
TfNSW	1TP-PO-002	Environmental Policy

Issuing Organisation	Reference	Title of Guideline
TfNSW	90-FT-002	Safety and Environmental Incident Report
TfNSW	90-ST-001	Incident Reporting Recording and Investigation Standard
TfNSW	90-PR-003	Incident Investigation Procedure
TfNSW	90-FT-001	Minor Investigation Report
TfNSW	90-FT-178	Major Investigation Report Template
TfNSW	90-FT-096	Monthly Safety Statistics & Incident Summary
TfNSW	30-FT-292	Hazard Report
TfNSW	60-ST-010	Alcohol and Other Drugs Standard
TfNSW	7TP-ST-146	Water Discharge and Reuse Guideline
TfNSW		Editorial Style Guide
TfNSW		NSW Sustainability Targets
TfNSW		NSW Sustainability Guidelines
TfNSW		NSW Sustainable Design Guidelines; version 3.0
TfNSW		Light Rail Kit of Tools
TfNSW		Uniform Guidance – Light Rail
TfNSW		Wayfinding Guidelines
TfNSW		Livery Specifications for Light Rail Vehicles
TfNSW	A2982150	Placement of Opal Devices on Light Rail - Guidelines
TfNSW		SLR Skills and Employment Framework
TfNSW		SLR Skills and Employment Targets
TfNSW		CBD and South East Light Rail Sustainability Strategy
TfNSW	PE-ST-157/1.0	TfNSW Planning & Environment: Construction Noise Strategy

Issuing Organisation	Reference	Title of Guideline
TfNSW	TfNSW Centre for Road Safety	Technical Direction - Policy for road safety audits of construction and reconstruction projects
TfNSW	TfNSW Centre for Road Safety	Guidelines for Road Safety Audit Practices.
TfNSW	A1559029	Placement of Opal Devices on Light Rail Guidelines
TfNSW	A2982150	CSELR Ticketing Requirements
Transportation Research Board (TRB) (US)	Report 155	Transit Cooperation Research Program (TCRP): Track Design Handbook for Light Rail Transit
Utah Transit Authority		Light Rail Design Criteria – Chapter 1 General Requirements (November 2007)
VicRoads	TCS 001-2	Traffic signal mast arms, joint use arms, joint use poles and rigid street lighting poles
VicRoads	TCS 011-1	Roadside cabinets
VicRoads	TCS 016 - 3	The supply of cables for traffic signal controllers
VicRoads	TCS 023 – 2.1	The supply of cables for traffic signal installations
VicRoads	TCS 054 - 2	The installation of inductor detector loops
Water Services Association of Australia	WSA 02-2002-2.2	Sewerage Code of Australia, Sydney Water Edition, Version 3
Water Services Association of Australia	WSA 03-2011-3.1	Water Supply Code of Australia, Sydney Water Edition - 2012
World Resources Institute and World Business Council for Sustainable Development		Greenhouse Gas Protocol



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Schedule E.1 Scope and Performance Requirements

Appendix 35 – Authorised Engineering Organisation

Document Number: 3126587_13
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1. Overview and scope

1.1. Overview

- (a) This Appendix contains engineering and competency management requirements that OpCo must meet. OpCo must obtain and maintain Authorised Engineering Organisation (AEO) status from the Assets Standard Authority (ASA) for the SLR Works.
- (b) The AEO authorisation requirements are described in the Asset Standards Authority Standard TS10502.

1.2. Scope

- (a) OpCo must provide assurance of its technical capabilities across all engineering services and disciplines covering the full asset life cycle.
- (b) OpCo is required to implement appropriate management systems and arrangements to demonstrate both initial and continuing compliance with the requirements of the ASA in relation to OpCo's AEO authorisation.

2. Authorisation requirements

2.1. Authorisation

- (a) TfNSW requires OpCo to gain AEO status for all engineering services and disciplines required for the SLR Works (section 2.2) across all asset lifecycle stages and activities required for the SLR Works (section 2.3).

2.2. Engineering Services and Disciplines

- (a) OpCo must provide formally qualified and experienced personnel to carry out OpCo's Activities.
- (b) OpCo must gain AEO status for all specialist engineering services and disciplines listed in the Asset Standards Authority document TS10502-AEO Authorisation Requirements, required to deliver the SLR Works.

2.3. Asset Lifecycle Stages and Activities

- (a) OpCo must gain AEO status for all activities listed in Asset Standards Authority document TS10510 for the following asset lifecycle stages:
 - i. design;
 - ii. fabrication / manufacturing;
 - iii. installation;
 - iv. integration, testing and commissioning;
 - v. asset maintenance; and
 - vi. decommission and disposal.

2.4. Management requirements

- (a) OpCo must produce an AEO Authorisation Management Plan in accordance with Appendix 43 (*Project Plan Requirements*).

3. Surveillance Activities

3.1. General

- (a) OpCo will be subject to surveillance activities on its continued compliance with the AEO authorisation requirements in section 2 of this Appendix, in accordance with clause 45 of the Operative Provisions.

3.2. Engineering assurance surveillance

- (a) TfNSW's Representative may periodically perform selective assessments and health checks of the components of OpCo's engineering assurance process for the services and disciplines for which it has authorisation, to ensure that both process and product are compliant with AEO authorisation requirements.

3.3. Regular and random audits

- (a) Audits may cover processes, products and facilities.
- (b) Audits will be carried out against predetermined criteria defined in standard audit checklists that are developed from the level of confidence the AEO assessment provides in OpCo's engineering management function, delivery issues or risk levels.
- (c) Audits will also be carried out to determine how OpCo assures its supply chain including sample audits of OpCo's Contractors who may or may not be AEOs themselves.
- (d) OpCo must maintain records of all audits conducted by OpCo, including non-conformances and corrective actions. TfNSW will inspect samples of OpCo's audit records as required.

3.4. Corrective actions

- (a) The corrective action process will:
 - i. identify findings;
 - ii. include consultation between the parties to agree on corrective action plans; and
 - iii. set agreed time frames for implementing corrective actions.
- (b) OpCo may propose alternative solutions to the corrective actions proposed by TfNSW for consideration. These may be adopted if agreed by TfNSW.
- (c) In the event of consistently poor performance by OpCo in the AEO services and disciplines for which it has been authorised, TfNSW may consider and implement a range of actions, including:
 - i. recommending future improvements (where general compliance is adequate);
 - ii. requiring corrective actions (with timescales to implement corrective action); and
 - iii. recommend to ASA that OpCo's AEO status be reviewed.



**Transport
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Schedule E1 Scope and Performance Requirements
Appendix 36 – Future Network

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1. Overview and Scope

1.1. Definitions

- (a) Within this Appendix the following definitions are used:
- i. Network Extensions – being the extensions to the SLR itself, extending the SLR services, described in section 2 of this Appendix.
 - ii. Network Expansions – being the new light rail lines in addition to the SLR, introducing light rail to corridors not served by SLR, described in section 2 of this Appendix.

1.2. General

- (a) In addition to the requirements of section 3.5 and 3.6 of the Scope and Performance Requirements, OpCo must provide specific Design Documentation in relation to Network Extensions and Network Expansions as detailed below.

2. Performance Requirement – Network Extensions

- (a) OpCo must ensure that allowance is made in the SLR Works for Network Extensions as detailed in Table 1 below so that the ability to implement those Network Extensions, technically and cost effectively, is not compromised by implementation of the SLR.

Table 1 Network Extensions

	Network Extension	Track Kilometres	Stops
i.	Kingsford to Malabar	~5 km	8
ii.	Randwick to Coogee	~1.5 km	3
iii.	Circular Quay to Barangaroo	~2km	4

- (b) At each design stage OpCo must provide Design Documentation including commentary (in the design report) and drawings demonstrating how the terminus designs safeguard the Network Extensions. This Design Documentation must as a minimum include details on:
- i. a horizontal and vertical alignment of future track connection beyond the termini showing how future track will be connected;
 - ii. location of trackside infrastructure for the SLR to safeguard the alignment described in i) above; and
 - iii. where utilities and services are to be removed, relocated or installed, as required for the SLR, these works will not prejudice the alignment described in i) above.
- (c) At each design stage OpCo must provide documentation demonstrating how the proposed Operations Control Centre (OCC) and rail systems will be expanded to manage and control future Network Extensions.

3. Performance Requirement – Network Expansions

- (a) OpCo must ensure that, where technically feasible, allowance is made in the SLR Works for Network Expansions as detailed in Table 2 below so that the ability to implement Network Expansions, technically and cost effectively, is not compromised by implementation of the SLR.
- (b) SLR configuration must be able to be maintained following Network Expansion.

Table 2 Network Expansions

Location	Minimum additional Light Rail connections to support potential network expansion
i. Intersection of George Street and Alfred Street	George Street - George Street (across Alfred Street)
ii. Intersection of Devonshire Street and Crown Street;	Crown Street – Crown Street (across Devonshire Street)
iii. Intersection of Eddy Avenue and Pitt Street	Pitt Street – Pitt Street (across Eddy Avenue) Eddy Avenue – Pitt Street (East to South)
iv. Intersection of Rawson Place and George Street	George Street - George Street (across Rawson Place)
v. Intersection of George Street and Liverpool Street	Liverpool Street – Liverpool Street (across George Street)
vi. Intersection of George and Hay Street	George Street – Hay Street (North to West)

- (c) At each design stage OpCo must provide Design Documentation that includes commentary (in the design report) and drawings demonstrating how the designs safeguard the Network Expansions detailed in Table 2, and as a minimum include details on:
 - i. the horizontal and vertical alignment of future track connection or crossings;
 - ii. the location of trackside infrastructure for the CSELR to safeguard the alignment described;
 - iii. where utilities and services are relocated, as required for the proposed network so as to safeguard the alignment described in i) above;
 - iv. location and depth of conduits safeguarding the alignment described in i) above; and
 - v. a statement outlining how the design minimises impacts of the Network Expansion works on SLR service delivery during the Operations Phase.



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Schedule E.1 Scope and Performance Requirements
Appendix 37 – Rolling Stock

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1 Overview and Scope

1.1 Introduction

- (a) This Appendix describes the scope and performance requirements for the Rolling Stock which includes CSELRVs and Non-Revenue Vehicles where required for the SLR.
- (b) The requirements include design, construction, testing, commissioning, operation, maintenance and hand-back of the Rolling Stock fully customised and suitable for service on SLR.
- (c) The CSELRV will provide a high level of customer amenity in line with TfNSW's requirements offering:
 - i. easy access;
 - ii. high passenger comfort;
 - iii. low internal and external noise levels;
 - iv. a sense of security;
 - v. high quality passenger information systems;
 - vi. a comfortable temperature controlled environment, high quality clean light and low levels of ambient noise; and
 - vii. comfortable, ergonomically designed seating.
- (d) In addition, deliverables to enable the CSELRV to be operated, modified, repaired and maintained throughout the Design Life of the CSELRV are to be provided including:
 - i. electrical and mechanical drawings;
 - ii. technical maintenance plan and maintenance instructions;
 - iii. Equipment Spares;
 - iv. specialist maintenance tools (including software tools);
 - v. training materials;
 - vi. operating instructions; and
 - vii. documentation suitable to support any operator's application for Accreditation as a Rolling Stock operator in NSW.

2 Performance and Technical Requirements

2.1 Key requirements

- (a) The primary objective of the CSELRV is to convey passengers between CSELR Stops in accordance with the SPR in all passenger load conditions (refer to Table 2).
- (b) The Rolling Stock must be capable of operation in the Over Head Wire free section.
- (c) The Rolling Stock must be able to operate on the IWLR network (as defined in section 2.30).
- (d) The CSELRV must comply with the key requirements in Table 1 below:

Table 1 Key Requirements

Characteristic	Requirement
Track gauge	1,435mm
Floor configuration	100% Low Floor
Minimum percentage of seated to total capacity at AW3 loading	23.2%
Power supply	750V DC (nominal) overhead
Vehicle configuration	Driving cabs at both ends to allow bi-directional operation

2.2 General requirements

- (a) The CSELRV must:
 - i. be capable of operation in the SLR operating environment (see SPR section 5.1) meeting all performance and minimum operating standards;
 - ii. comply with the Disability Discrimination Act 1992 (Cth) and the Disability Standards for Accessible Public Transport 2002, as amended;
 - iii. incorporate current technology proven in comparable light rail environments;
 - iv. be designed and built to internationally recognised standards;
 - v. have a minimum Design Life of 30 years;
 - vi. include redundancy within the equipment and systems to eliminate the risk of a single point failure disabling a complete LRV; and
 - vii. be suitable for use by 5th percentile Australian females to 95th percentile Australian males (in both passenger and crew areas).

- (b) All onboard sub-system clocks must be synchronised with system time.

2.3 Load conditions

- (a) The CSELRV useable standing area must be calculated in accordance with EN15663 - Railway applications — Definition of vehicle reference masses.
- (b) All load cases used in the CSELRV design must be from internationally recognised standards or design guides.
- (c) Any calculations must assume 75kg is the mass of a person (without luggage) for use in design, testing and passenger loading calculations.

Table 2 Load Conditions to be used for design purposes

Load Condition	Definition
AW0	An empty LRV with no passengers onboard and in a serviceable condition (Tare).
AW1	An LRV with all seats (including tip-up seats) occupied.
AW2	An LRV with all seats (excluding tip-up seats) occupied and standing passengers at 2 passengers per m ² .
AW3	An LRV with all seats (excluding tip-up seats) occupied and standing passengers at 4 passengers per m ² .
AW4	An LRV with all seats (excluding tip-up seats) occupied and standing passengers at 6 passengers per m ² .

2.4 Electromagnetic Compatibility

- (a) The Rolling Stock must be designed to meet the Electromagnetic Compatibility (EMC) requirements of Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*).
- (b) The design of the CSELRV and its sub-systems must control the levels of radiation to ensure that medical devices such as pacemakers and hearing aids and personal electronic equipment such as computers, mobile phones and audio equipment are not affected by operation of the CSELRV.

2.5 Earthing

- (a) All Rolling Stock metallic boxes, cases, conduits and enclosures containing electrical equipment, which are not intended to be part of the live circuit, must be earthed in accordance with internationally recognised standards.

2.6 Dynamic performance and ride

2.6.1 Ride quality

- (a) The CSELRV ride quality must not be degraded by wear or ageing of suspension components, or when operating with two LRVs coupled.

- (b) The ride quality requirements must be met for both the AW0 and the AW4 loading conditions over the full range of speed and track conditions up to the design speed of the CSELRV.

2.6.2 Outlines and clearances

- (a) The static, kinematic and swept outlines of the Rolling Stock must be compatible with the structure outline and track spacing on the SLR so as to provide safe clearances between CSELRV and infrastructure, and between passing LRVs.

2.6.3 Dynamic performance

- (a) The Rolling Stock must be dynamically stable (i.e. resistant to ‘hunting’), safe against derailment and apply acceptable track forces under all operating conditions, including load and speed, over the proposed infrastructure on the SLR, including permitted maintenance tolerances for the proposed infrastructure.

2.6.4 Vibration

- (a) The CSELRV must comply with the vibration requirements in Appendix 31 (*Noise and Vibration*).
- (b) The CSELRV carbody and bogie design must ensure that the carbody structural modes of vibration are not excited by, and do not resonate, due to interaction with bogie suspension modes, body mounted equipment, bogie equipment components, body-bogie attachments, wheels and / or track features.

2.7 Noise

- (a) The Rolling Stock must comply with the noise requirements in Appendix 31 (*Noise and Vibration*).
- (b) Noise emissions from the CSELRV (measured internally and externally) must be non-tonal such that the sound pressure level in each unweighted one-third octave band does not exceed the level of the adjacent sides on both sides by:
 - i. 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz;
 - ii. 8 dB or more if this centre frequency is between 160 and 400 Hz; or
 - iii. 15 dB or more if this centre frequency is below 160 Hz.

2.8 Rolling Stock performance

- (a) The CSELRV must have braking, acceleration and a maximum speed that enables the service requirements defined in the SPR to be achieved.
- (b) The CSELRV must have a demonstrated ability to start and operate on all combinations of grades and curves on the SLR.
- (c) The CSELRV must be able to operate without any detrimental effect on performance of the CSELRV or the onboard systems for the range of operating voltages available from the SLR overhead line supply.

- (d) The acceleration and braking rates of the CSELRV must be achieved under all passenger loading conditions (refer to Table 2).
- (e) When coupled the LRVs must be able to be operate in passenger service with no loss of functional or operational performance, under all load conditions.
- (f) A single unit of CSELRV must be able to couple to a disabled LRV (including a IWLRV with adapting device in AW0) and tow or propel it to a Light Rail Maintenance and Stabling Facility. The single unit of CSELRV must be able to meet this requirement in any load combination and under all track conditions.

2.9 Bodyshell and structure

2.9.1 Design and finish

- (a) The CSELRV must be designed to internationally recognised crashworthiness design principles by way of a total systems approach, using crash energy management principles to limit the buff loads in a controlled manner, including CSELRV based energy absorbing collision elements.
- (b) The CSELRV energy absorption features must be horizontally and vertically aligned with the energy absorption features on the IWLRV.
- (c) The CSELRV must be finished in a livery that reflects the TfNSW Livery Specifications for Light Rail Vehicles.
- (d) The CSELRV exterior finish must not be affected by the multiple application and removal of advertising vinyls.
- (e) The CSELRV exterior finish must not be affected by vehicle cleaning using an automatic wash plant and commercially available cleaning agents.

2.9.2 Jacking and lifting points

- (a) The Rolling Stock must be equipped with jacking and lifting points to allow lifting and / or re-railing, on all track forms including within the confines of the maintenance facilities, Stop platforms and any other raised or below grade structures.

2.9.3 Attachment of exterior equipment or components

- (a) The failure of a single fixing must not lead to equipment or other components becoming detached from the Rolling Stock or exceeding the kinematic envelope.

2.9.4 Glazing

- (a) All glazing must comply with internationally recognised standards.
- (b) Broken windows must be retained in situ and held intact to allow the Rolling Stock to complete its journey without endangering Staff or passengers.

2.10 Couplers

- (a) The CSELRV must be fitted with couplers with an electrical head on both ends which allow coupling between LRVs and facilitate full functionality of onboard systems.
- (b) The couplers must be able to mechanically couple a CSELRV single unit to the IWLRVs for recovery purposes with adapting device.
- (c) The couplers must be shrouded when not in use.

2.11 LRV monitoring system

- (a) The CSELRV must be fitted with an onboard LRV monitoring system.
- (b) The onboard LRV monitoring system must:
 - i. interface with and monitor the various sub systems and equipment throughout the CSELRV;
 - ii. display fault information to the driver (for CSELRV faults that affect operational performance or require driver action);
 - iii. display fault information to the maintenance staff; and
 - iv. store faults and diagnostic information for wireless transfer to a central data storage facility whilst the CSELRV is at the Light Rail Maintenance and Stabling Facilities.
- (c) The LRV monitoring system must record, as a minimum, the performance and availability of the following systems:
 - i. onboard Public Address (PA);
 - ii. onboard Passenger Information Displays;
 - iii. onboard CCTV;
 - iv. onboard emergency Help Points;
 - v. saloon temperatures; and
 - vi. doors enabled and doors locked.

2.12 Power and traction supply

- (a) It must be possible to isolate the Rolling Stock from the Traction Power System without having to access the roof area.

2.13 Propulsion (traction) system

- (a) In the event of a failure of one set of traction equipment, the CSELRV must be capable of operating unassisted out of passenger service, utilising the remaining functional traction equipment to be able to return to a Light Rail Maintenance and Stabling Facility, albeit at reduced speed if necessary.

2.14 Roll back prevention

- (a) The CSELRV must be fitted with a system to automatically prevent uncontrolled movement in either direction from standstill under any combination of load and gradient in all driving modes and regardless of driver action.

2.15 Brake System

- (a) The brake blending system must maximise the use of the regenerative brake to minimise brake pad wear and maximise energy efficiency.
- (b) The CSELRV must be fitted with an automatic park brake system to prevent uncontrolled movement of CSELRV in either direction from standstill (under any combination of load and gradient).

2.16 Bogies and suspension

- (a) The leading wheels of the CSELRV must be fitted with obstruction deflectors to prevent obstructions on the track passing beneath the wheels and to minimise injuries to pedestrians.

2.17 Passenger interior

2.17.1 General

- (a) The CSELRV must have no finger trap hazards.
- (b) The CSELRV must have no areas where hazardous or malicious items may be concealed.
- (c) The CSELRV must be fitted with LED interior lighting.
- (d) The CSELRV seating must be cushioned.
- (e) The CSELRV must be equipped with an emergency lighting mode for use in the event of a power and traction supply failure.
- (f) The CSELRV interior finishes must not be affected by multiple application and removal of advertising vinyls.
- (g) The CSELRV interior must meet the TfNSW Livery Specifications for Light Rail Vehicles.
- (h) The interior signage must be consistent with Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*).
- (i) The interior of each CSELRV must incorporate space for:
 - i. statutory notices;
 - ii. passenger notices; and
 - iii. TfNSW network map in accordance with the TfNSW branding requirements.
- (j) The flooring must be slip resistant in both wet and dry conditions.

- (k) The flooring's slip resistance must not reduce with wear.
- (l) All floor covering material and joins must be impervious and chemically unaffected by water, paint, human waste, Graffiti removers, train wash solutions, cleaning solutions, food and drink spills.
- (m) The floor design must allow the floor covering to be removed without damage to the floor substrate or sub structure.
- (n) All access panels to equipment must be locked with access only permitted to authorised staff.
- (o) The CSELRV must have emergency equipment fitted as required by OpCo's Fire and Life Safety (FLS) strategy.
- (p) The CSELRVs must be fitted with stop request buttons to enable Customers to alert the drivers to their intention to disembark at the next Stop.

2.17.2 Vandal resistance

- (a) The interior and exterior design, including the materials and the finishes must be vandal resistant.
- (b) The interior and exterior must not be affected by cleaning materials and techniques used to remove Graffiti.
- (c) The design of the interiors must minimise visible screws or gaps and prevent vandals from removing equipment or accessing areas behind panelling or covers.
- (d) The design of the CSELRV must prevent riding on the exterior of the CSELRV. All hand and foot holds must be eliminated.

2.18 Heating, ventilation and air conditioning system

- (a) The CSELRV must be fitted with a heating, ventilation and air conditioning (HVAC) system.
- (b) It must be possible for the driver to separately control the temperature and supply air flow volume in the driving cabs.
- (c) The HVAC system must be suitable for operation in the Sydney environment as detailed in SPR section 5.1 Table 1 and operation must be as defined below:
 - i. whilst operating or stabled in exterior shade temperatures of up to 35°C, together with the rating conditions specified below, the passenger HVAC equipment must be capable of maintaining a passenger saloon internal temperature of not greater than 26°C. The driving cab HVAC equipment must be capable of maintaining a driving cab internal temperature of not greater than 24°C. Rating conditions for operation of the HVAC system:
 - A. solar load of 700 W/m² for one side and one end of the LRV;
 - B. passenger loading of AW3;
 - C. normal fresh air volumes;

D. fresh air conditions as per external dry bulb with a moisture content of 14.2 g/kg; and

E. doors on one side opening as per nominated standard;

ii. for exterior shade temperatures above 35°C but below 40°C the passenger saloon interior temperature may vary in relation with the exterior shade temperature but not exceed the values given in the equation below:

$$T_{\text{inside}} = T_{\text{exterior}}/2.5 + 12^{\circ}\text{C};$$

iii. for exterior shade temperatures above 40°C but below 45°C the passenger saloon interior temperature may vary in relation with the exterior shade temperature but not exceed the values given in the equation box below:

$$T_{\text{inside}} = T_{\text{exterior}}/2.5 + 14.5^{\circ}\text{C};$$

iv. for exterior shade temperatures above 35°C but below 45°C the driving cab interior temperature may vary in relation with the exterior shade temperature but not exceed the values given in the equation below:

$$T_{\text{inside}} = T_{\text{exterior}}/2.5 + 10^{\circ}\text{C};$$

v. within the limits of the cooling capacity of the passenger HVAC system, the temperature controller must control the interior temperature to a maximum of 24°C when the HVAC system is in cooling mode;

vi. the HVAC system's heating capacity must be capable of maintaining an internal temperature of 22°C, with no solar or passenger / crew loads and with doors on one side opening as per nominated standard, at an external temperature of - 2°C; and

vii. the HVAC system must continue to operate with exterior shade temperatures above 45°C but less than the maximum temperature detailed in Table 1 in section 5.1 of the SPR. In these conditions, passenger saloon and driving cab interior temperatures are permitted to rise above the values given by the equations in (ii), (iii) and (iv) above.

- (d) The HVAC system must be designed and manufactured in accordance with the Australia and New Zealand refrigerant handling code of practice (2007).
- (e) There must be no condensate or rainwater leaks into the CSELRV from the HVAC system.
- (f) The design of the HVAC units and the ducting must ensure that the air is evenly and uniformly distributed throughout the passenger saloon, vestibule and gangway areas such that dead zones or temperature gradients are minimised.
- (g) The design of the HVAC units and the ducting must ensure that the air is evenly and uniformly distributed within the driver's cab and that there are no dead zones or temperature gradients.
- (h) In the case of a power supply failure the HVAC units must provide emergency fresh air ventilation to dilute carbon dioxide levels with a people load of AW4.

2.19 Door system

2.19.1 Passenger doors

- (a) The CSELRV must be fitted with sufficient doors to achieve the dwell time required to meet the service requirements defined in the SPR and evacuation times defined in OpCo's FLS strategy.
- (b) The design of the door installation must meet the dwell time and evacuation performance requirements defined in the SPR for a load condition of AW4.
- (c) The doors must be integrated with both the propulsion and brake system to ensure that a CSELRV cannot move with any passenger doors open.
- (d) The CSELRV door system must allow for 2 modes of operation:
 - i. direct opening and closing of the doors by the driver; and
 - ii. opening of each individual door by the passenger (inside and outside) following release by the driver.
- (e) It must be possible for all operators to isolate and mechanically lock out of service individual sets of doors.
- (f) If a particular set of doors is not going to open (due to being locked out of service or held closed due to platform length), a pre-recorded announcement on the PA, and a message on Passenger Information Displays must be made to inform passengers in the vicinity of these doors.
- (g) The door system must incorporate an obstruction detection function to detect the presence of, and release of, any obstruction that is caught in or fouling the door throughout the entire closing cycle.
- (h) The maximum door closing force must not exceed 150N at any time.

2.19.2 Emergency door release

- (a) The CSELRV must be fitted with internal and external emergency door releases (EDRs) to facilitate emergency evacuation.
- (b) The external EDRs must be accessible from both platform and track level.
- (c) The height of the internal EDRs must be in accordance with AS1428.1 (2001) clause 11.1.2.
- (d) Internal EDRs must be interlocked to prevent doors from being opened whilst the LRV is in motion.
- (e) EDRs must be equipped with features to discourage improper or accidental operation.
- (f) There must be an indication in the active driver's cab and at the OCC to enable easy identification of which EDR has been operated.
- (g) In the event that an EDR is operated the CCTV camera with coverage of that EDR must be displayed to the driver.
- (h) After operation, the EDR must only be able to be reset by authorised persons.

- (i) The force required for passengers to manually open the doors must comply with internationally recognised standards, and not be more than 150N.
- (j) Internal and external EDRs must be operable irrespective of the availability of the normal power supplies.
- (k) Internal and external EDRs must function irrespective of vehicle orientation, such as during a derailment or roll-over situation.
- (l) Interlocking between the EDR and the braking and traction systems must enable the driver to select a suitable location to stop the CSELRV before the doors fully open if the vehicle is not adjacent to a platform.

2.20 Passenger information and communications system

- (a) The CSELRV must be fitted with an integrated passenger information and communications system providing information to passengers, Staff and systems on the SLR.
- (b) The passenger information and communication system must be capable of providing next Stop, destination and interchange information.
- (c) The passenger information and communication system must be capable of the following communications:
 - i. live public address announcements by the driver or OCC staff;
 - ii. non-routine, but pre-recorded announcements which can be initiated by the Driver or OCC staff; and
 - iii. automatic pre-recorded announcements made throughout the CSELRV.
- (d) Under all service conditions and in all locations announcements must have a speech transmission index of at least 0.6 when measured in accordance with IEC 60268 section 16.
- (e) The PA system must not be affected by the loss of main power or multiple door operations (opening and closing) while the CSELRV is at a Stop.
- (f) External destination indicators must be provided on the front and rear of the CSELRV.
- (g) A minimum of two external destination indicators must be provided per side of the CSELRV.
- (h) The side external destination indicators must be located so as to not be obscured by the doors during normal modes of operation.
- (i) Internal PIDs must be based upon LCD technology.
- (j) Internal PIDs must enable passengers to read the information from all seating and standing locations within the vehicle without turning more than 90°.
- (k) Hearing augmentation facilities must be fitted to the LRV for hearing impaired passengers.

- (l) The hearing augmentation must convey all PA announcements (manual and automatic).
- (m) The CSELRV must be fitted with Help Points in the passenger saloon to provide discrete communication between the driver and the passenger at that Help Points location.
- (n) The Help Points must provide an alarm to the driver when operated.
- (o) In the event that a Help Point is operated the CCTV camera with coverage of that Help Point must be displayed to the driver.
- (p) If the driver does not answer the Help Point call within 60 seconds then the call must be transferred to the OCC.
- (q) The CSELRV must be fitted with a Help Point in each allocated space in the LRV.

2.21 Passenger Counting System

- (a) The CSELRV must be fitted with a passenger counting system with sufficiently high fidelity to determine how many people boarded and alighted from the CSELRV at each Stop.
- (b) The passenger count information must be recorded by the LRV and downloaded whilst the CSELRV is at a Light Rail Maintenance and Stabling Facility.

2.22 Signalling and vehicle control

- (a) The CSELRV must comply with the requirements of Appendix 21 (*Signalling and Movement Control*).
- (b) The CSELRV must be fitted with the necessary onboard equipment:
 - i. to interface with the traffic light control system to facilitate prioritisation of the CSELRV through traffic lights on the SLR;
 - ii. to automatically set powered points to the correct position as the CSELRV approaches; and
 - iii. for the driver to manually set the powered points from the driver's cab.
- (c) The CSELRV must be fitted with the necessary on board equipment to enable the AVLS to determine and report the location of the CSELRV on the SLR.

2.23 Closed circuit television

- (a) The CSELRV must be fitted with digital colour Closed Circuit Television (CCTV) system with onboard recording of all cameras in accordance with Appendix 23 (*Communications Systems and Passenger Information*).
- (b) CCTV Cameras must provide complete coverage of passenger saloons and both driving cabs.
- (c) Forward-facing CCTV cameras must be provided in both driving cabs.

- (d) External CCTV cameras must be provided giving full visibility of all passengers (including children) entering and exiting the vehicle.
- (e) External CCTV cameras must clearly capture footage from all doors.
- (f) Onboard recording equipment must be capable of recording a minimum of 10 day's footage.
- (g) Onboard recording equipment must only be accessible by authorised persons and the storage media must be removable without affecting the data stored.
- (h) The CCTV footage must be able to be used as evidence in court proceedings. For these purposes:
 - i. the quality of the CCTV footage must be sufficient for the purpose of recording events and identifying individuals; and
 - ii. OpCo must be able to properly authenticate the CCTV footage.

2.24 Data logger

- (a) The CSELRV must be fitted with data loggers which meet the minimum requirements outlined in ONRSR Rail Safety Compliance Code – Data Loggers.
- (b) All data loggers on board the CSELRV must record the same information.
- (c) It must be possible to download the data loggers without accessing the roof area.
- (d) Data loggers must only be accessible by authorised persons.
- (e) The storage media must be removable by authorised persons without affecting the data stored.
- (f) The data loggers must have sufficient capacity to record and store a minimum of 30 days of operational data before overwriting.

2.25 Driving cab and controls

- (a) The driving cab must be sealed against dust and water.
- (b) The driving cab must be designed and sealed to prevent drafts and whistles under all operating conditions.
- (c) The windscreen must be impact and spall resistant and comply with internationally recognised standards.
- (d) The windscreen must have minimal distortion of vision over the whole of the vision area and must not cause secondary image separations that may cause confusion or distraction to the driver.
- (e) The windscreen must not cause any colour diffraction effects that are noticeable to the driver.
- (f) The transmissive colour of the windscreen must not adversely affect the perceived colours of objects, particularly of colour light signals or traffic lights.

- (g) Appropriate means (visibility aids) must be provided to maintain sighting, visibility and optical requirements through the windscreen under all internal and external ambient conditions, including: rain, solar glare, dust, high humidity, etc.
- (h) The light sources and indicators used in the driving cab must be designed and positioned so that they do not affect the driver's night vision or cause glare or reflection on the driving cab windscreen or other cab interior surfaces.
- (i) The driving cab finishes must minimise glare and reflection.
- (j) The CSELRV must be fitted with an externally sounding bell and horn.
- (k) The horn and bell noise levels must be adjustable by maintenance staff.
- (l) The CSELRV must be fitted with external lights including, but not limited to, headlamps, rear position lamps (tail lights), stop lamps (brake lights) and direction-indicator lamps.
- (m) External lights must comply with the requirements of Vehicle Standard (Australian Design Rule 13/00 – Installation of Lighting and Light Signalling Devices on other than L-Group Vehicles) 2005 and referenced documents.
- (n) Direction indicator lights must be capable of operation as hazard warning lights (i.e. both sides operating together).
- (o) All control labelling, digitally displayed messages and component identification markings must be in English.
- (p) Each driving cab of the CSELRV must be fitted with a speedometer that provides readouts in km/h.
- (q) The driving cab and the cab desk controls must be secure from unauthorised access.
- (r) The driving cab structure, trim panels and equipment must be accordance with internationally recognised standards to maximise the sight lines from the driving cab.

2.26 Auxiliary inverter and batteries

- (a) The auxiliary power network must provide redundancy to mitigate the risk of a failure in the power supply and associated equipment causing complete failure of the CSELRV to operate under its own power.
- (b) The auxiliary supply arrangement must ensure that if one inverter fails, lighting and air conditioning is still available throughout the CSELRV.
- (c) It must be possible to isolate any onboard batteries without having to access the roof area.
- (d) The CSELRV must be fitted with batteries capable of maintaining ventilation and emergency lighting as required by OpCo's FLS strategy, but for at least 30 minutes.

2.27 Fire performance and emergency equipment

- (a) The CSELRV must be designed and constructed to provide a level of fire safety for a predominantly above ground CSELRV operation including street running, operation on viaducts and in tunnel sections in accordance with OpCo's FLS strategy.
- (b) Materials used must comply with the requirements of internationally recognised fire performance standards.
- (c) Onboard fire extinguishers that are suitable for fighting fires on board must be provided in accordance with OpCo's FLS strategy.

2.27.1 Fire and smoke detection systems

- (a) The CSELRV must be fitted with fire and smoke detection systems with functionality in accordance with OpCo's FLS strategy.
- (b) The fire and smoke detection systems must:
 - i. be capable of providing a pre-alarm (warning) and an alarm;
 - ii. fail 'right side' and must be able to detect an open circuit in the smoke detection system wiring; and
 - iii. provide an alarm to the driver and OCC staff when triggered.

2.28 Future-proofing

- (a) The design and construction of the CSELRV and all associated equipment and systems must allow for upgrade and replacement as technology advances and improvements in performance of systems, or changes in operating requirements occur.
- (b) Key wiring looms, connectors and the coupler electrical connection(s) must include or allow an additional capacity as a condition of Final Completion to accommodate any additional equipment that may be retrofitted to the CSELRV in the future.
- (c) The traction and braking systems must incorporate flexibility to alter the acceleration and deceleration rates.
- (d) The vehicles must include wiring and space provision for the installation of Wi-Fi equipment for use by passengers and other authorised persons.

2.29 Workmanship

2.29.1 General

- (a) Finishing materials must be applied to commercially acceptable tolerances with respect to flatness, finish and fitting of joints, as applicable.
- (b) Materials must be integrally coloured, of uniform colour throughout the CSELRV, and fabricated to extend durability and provide consistency of appearance throughout the life of the CSELRV.

- (c) The design of all components must provide protection from damage arising from vermin, including insects, arthropods, birds and rodents.
- (d) The entire CSELRV structure, including any associated attachments, must be free from sharp edges, weld spatter and swarf.

2.29.2 Welding

- (a) All welding must be in accordance with internationally recognised standards.
- (b) The surface of welds must not adversely affect the appearance of the CSELRV.

2.29.3 Electrical apparatus, wiring and components

- (a) All wiring, cables and connectors must be fixed and supported to prevent:
 - i. chaffing; and
 - ii. connectors working loose.
- (b) Ducts and conduits must be designed to prevent the ingress of dust, water and liquids.

2.30 Interoperability on Inner West Light Rail network

- (a) To achieve interoperability on the Inner West Light Rail network to enable LRVs access to the Rozelle Light Rail Facility (without passengers) without modification to the infrastructure or the IWLRVs the CSELRV must:
 - i. be compatible with the IWLR including:
 - A. width at platform height in all load conditions;
 - B. nominal height of the floor above rail level (ARL) at the door opening in an unloaded condition with new wheels;
 - C. maximum grade (demonstrated, all conditions);
 - D. maximum speed (continuous rating);
 - E. minimum curve radius;
 - F. minimum and maximum wire heights;
 - G. minimum and maximum traction supply voltages;
 - H. back to back wheel dimensions;
 - I. wheel profile;
 - J. signalling system and track circuits;
 - K. kinematic envelope; and
 - L. axle load;
 - ii. be able to apply appropriate braking effort independent of the wheel / rail interface for operation on the gradients on the down colonnades;

- iii. be able to operate on all combinations of grades and curves found on the IWLR network;
 - iv. be fitted with bodyside doors on both sides of the CSELRV;
 - v. be fitted with Transitag (Part Number 054716-11) or compatible transponders to interface with the traffic light system on the IWLR, indicating that a LRV is present, triggering a proceed (white T) aspect;
 - vi. be capable of operating through foreseeable standing water depths; and
 - vii. comply with the noise and vibration requirements of the Planning Approvals.
- (b) Regenerative braking by the CSELRVs must not raise the Traction Power Supply voltage above the high voltage protection setting of the IWLRVs.
- (c) The CSELRVs must not be adversely affected by the maximum Traction Power Supply voltage as a result of regenerative braking by the IWLRVs.
- (d) Any friction modification products applied by the CSELRV during operation must not remove or negatively affect the performance of the friction modification products applied by the IWLRV.

2.31 Equipment Spares and Special Tools

- (a) OpCo must provide Equipment Spares to support the operation of the CSELRV.
- (b) OpCo must provide specialist maintenance tools to support the operation of the CSELRV.

2.32 Non-Revenue Vehicles

- (a) Any infrastructure maintenance vehicles used on the SLR must meet the requirements of this Appendix, where appropriate, for the function and operation of the vehicle and as a minimum meet the requirements for:
 - i. signalling and vehicle location systems;
 - ii. traffic light control systems;
 - iii. track gauge and profile;
 - iv. kinematic envelope;
 - v. communication systems; and
 - vi. grades and curves.

3 Design Documentation

3.1 General

- (a) OpCo must submit Design Documentation by sub-system as defined in its work breakdown structure.
- (b) Submissions must clearly identify design features that have been customised for use on SLR.
- (c) Plans issued by OpCo must explain how OpCo will apply their quality management system and internal processes to the SLR project and include cross-reference to the relevant processes where appropriate.
- (d) OpCo must provide the following specific Design Documentation in relation to each Design Stage.

3.2 Design Stage 1 Design Documentation

- (a) Design stage 1 Design Documentation for the CSELRV must include:
 - i. electrical and mechanical drawings of the CSELRV, its sub-systems and equipment;
 - ii. a technical description of the CSELRV, its sub-systems and equipment and the CSELRV's interfaces with the infrastructure and shore-based equipment;
 - iii. a description of how the LRV has evolved from earlier LRV designs and details of any customisation to meet the requirements of the SLR Project;
 - iv. a list of the relevant standards for the CSELRV, its sub-systems and equipment;
 - v. a list of the manufacturers of the sub-systems and equipment and evidence of previous usage together with performance experience during that usage;
 - vi. a description of the system architecture and identification of any new CSELRV system design;
 - vii. a calculation of the heat emissions from the CSELRV, its sub-systems and equipment including braking;
 - viii. a gauging study detailing how the proposed CSELRV will interface with fixed infrastructure;
 - ix. a mass schedule detailing the mass of all major equipment and the CSELRV. The mass schedule must include wheel and axles loads under both AW0 and AW3 conditions;
 - x. an Electromagnetic Compatibility (EMC) Plan describing the EMC management processes that will be applied by the OpCo during the design and Testing of the CSELRV;

- xi. a FLS Strategy Plan describing the fire management processes to be applied during the design of the CSELRV and an initial assessment of the CSELRV fire load;
- xii. a Noise Management Plan describing how the noise management considerations are incorporated into the design of the CSELRV;
- xiii. a Human Factors and Ergonomics Assessment describing how Human Factors and Ergonomics considerations will be incorporated in the design of the CSELRV;
- xiv. a Disability Standards Compliance Plan detailing how the requirements of the Disability Standards for Accessible Public Transport will be incorporated into the design of the CSELRV; and
- xv. heating ventilation and air conditioning performance calculations.

3.3 Design Stage 2 Design Documentation

- (a) Design Stage 2 Design Documentation for the CSELRV must include:
- i. updated documentation issued for Design Stage 1 (see section 3.2 i to vi);
 - ii. a gauging report including static, kinematic and swept outlines drawings and confirmation that the CSELRV will be compatible with the structure outline and track spacing on the SLR. The report must include discussion on any modifications required to the IWLR network infrastructure;
 - iii. a mass report providing a complete mass breakdown for the CSELRV including axle and wheel loads, tolerances and margins;
 - iv. specifications for the CSELRV equipment and sub-systems;
 - v. a fire report detailing:
 - A. the fire management process applied during the design of the CSELRVs,
 - B. a complete fire load breakdown for all non-metallic materials to be fitted to the CSELRV; and
 - C. a summary of the systems installed on the CSELRV to achieve the requirements of OpCo's FLS strategy;
 - vi. vehicle dynamics calculations including wheel unloading, derailment factors etc for the CSELRV;
 - vii. bogie curving performance calculations for all bogie modules;
 - viii. tractive effort and braking effort curves for the range of anticipated line voltages including regenerative braking data;
 - ix. details of the utilisation of the dynamic and friction brake ,the control strategy and the sequence of events and provisions which ensure braking is continued should a failure or discontinuity occur within the dynamic braking system;
 - x. braking stopping distance calculations in all braking modes including emergency brake applications;

- xi. interior layout drawings and an updated copy of the design report;
- xii. initial RAMS analyses for the CSELRV;
- xiii. dwell time calculations and simulations;
- xiv. calculations and simulations related to CSELRV performance, including run times, energy consumption and degraded mode operation;
- xv. structural analysis of the CSELRV bodyshell, key systems, sub-systems and equipment;
- xvi. a finalised bodyshell design evaluation identifying modes of vibration between the bodyshell and bogie and confirmation that these modes of vibration do not lead to structural resonance, noise generation or reduction of bodyshell fatigue life;
- xvii. performance of condition monitoring systems;
- xviii. the results of all simulations and studies;
- xix. a human factors report covering driving cab controls, key passenger controls and maintenance activities detailing how human factors have been considered during the design development of the CSELRVs;
- xx. an ergonomics report for the driving cab and passenger saloon detailing how ergonomics has been considered during the design development of the LRVs;
- xxi. HVAC performance calculations;
- xxii. battery charger and auxiliary inverter rating calculations;
- xxiii. an updated list of Special Tools;
- xxiv. a testing and commissioning plan that defines the method of validation for each of the Rolling Stock specification requirements;
- xxv. draft training materials, operating and maintenance manuals; and
- xxvi. initial verification requirements matrix confirming that compliance to technical requirements has been achieved. The matrix needs to include, but not limited to, all technical requirements from this Appendix and the output of the RAMS and HazID analysis.

3.4 Design Stage 3 Design Documentation

- (a) Design Stage 3 Design Documentation for the CSELRV must include:
- i. finalised versions of documentation issued for Design Stage 2 (see section 3.3);
 - ii. an accessibility report describing how compliance with the Disability Discrimination Act 1992 (Cth) and the Disability Standards for Accessible Public Transport 2002 has been achieved; and
 - iii. test specifications including, but not limited to, type and routine tests for all equipment, systems, sub-systems, and the completed CSELRV.

4 Testing and commissioning requirements

4.1 General

- (a) OpCo must test and commission the CSELRVs in accordance with the requirements of Appendix 33 (*Testing and Commissioning*) and section 4.1 of SPR Appendix 37 (*Rolling Stock*).
- (b) The testing and commissioning conducted on the CSELRVs must include, but not be limited to, the testing defined in IEC-61133 - Railway applications - Rolling stock - Testing of the CSELRVs on completion of construction and before entry into service. The full scope of testing undertaken must be defined using industry norms and best practice, internationally recognised standards and the risk and hazard analysis undertaken as part of this project. The Testing must verify that key systems and subsystems operate in accordance with the specified technical requirements and that all safety requirements have been met.
- (c) OpCo must conduct tests, inspections, analyses, demonstrations or audits as defined in the Testing and Commissioning Plan and provide documentary evidence to demonstrate that each requirement of the Rolling Stock specification is achieved in the CSELRV design. Where commonality with equipment fitted to existing CSELRVs exists then evidence and results of the testing conducted and commentary on its suitability as evidence must be provided.
- (d) OpCo must conduct routine tests of the key systems and functions on each CSELRV in order to confirm that each CSELRV is correctly manufactured according to the CSELRV specification and Final Design Documentation.
- (e) Static and dynamic type and routine testing must be completed before shipping to Sydney.
- (f) Tests must be conducted on and using the CSELRVs to demonstrate that the CSELRV is compatible with, and can safely and reliably operate on, the SLR including the IWLR, with the IWLRVs and that each CSELRV has not been affected by the delivery. These tests are to be conducted following delivery to the SLR site. Tests required include, but may not be limited to:
 - i. Static functional tests;
 - ii. braking system performance;
 - iii. propulsion system performance;
 - iv. signalling / infrastructure/traffic light operation system compatibility;
 - v. Light Rail Maintenance and Stabling Facilities interfaces (Type test only);
 - vi. Recovery;
 - vii. Re-railing (Type test only); and
 - viii. noise emissions.

4.2 Each Additional Required CSELRV and each Pre-Agreed Option 1A CSELRV

- (a) OpCo must test and commission the Additional Required CSELRVs and Pre-Agreed Option 1A CSELRVs in accordance with the Testing and Commissioning Plan which will include a section related to the testing and commissioning of the Additional Required CSELRVs.
- (b) The testing and commissioning conducted on the CSELRVs must include, but not be limited to, the testing defined in IEC-61133 - Railway applications - Rolling stock - Testing of the CSELRVs on completion of construction and before entry into service. The full scope of testing undertaken must be defined using industry norms and best practice, internationally recognised standards and the risk and hazard analysis undertaken as part of this project. The Testing must verify that key systems and subsystems operate in accordance with the specified technical requirements and that all safety requirements have been met.
- (c) To the extent that the Additional Required CSELRVs and Pre-Agreed Option 1A CSELRVs include any modification in comparison to the CSELRVs, OpCo must conduct in relation to the modifications the tests, inspections, analyses, demonstrations or audits as defined in the Testing and Commissioning Plan and provide documentary evidence to demonstrate that each requirement of the Rolling Stock specification is achieved in the CSELRV design. Where commonality with equipment fitted to existing CSELRVs exists then evidence and results of the testing conducted and commentary on its suitability as evidence must be provided.
- (d) OpCo must conduct routine tests of the key systems and functions on each Additional Required CSELRV and Pre-Agreed Option 1A CSELRVs in order to confirm that each Additional Required CSELRV and Pre-Agreed Option 1A CSELRVs is correctly manufactured according to the CSELRV specification and Final Design Documentation.
- (e) Static and dynamic routine testing must be completed before shipping to Sydney.
- (f) Tests must be conducted on and using the Additional Required CSELRVs and Pre-Agreed Option 1A CSELRVs to demonstrate that the Additional Required CSELRV and Pre-Agreed Option 1A CSELRV is compatible with, and can safely and reliably operate on, the SLR including the IWLR, with the IWLRVs and that each Additional Required CSELRV and Pre-Agreed Option 1A CSELRV has not been affected by the delivery. These tests are to be conducted following delivery to the SLR site. Tests required include, but may not be limited to:
 - i. Static functional tests;
 - ii. braking system performance;
 - iii. propulsion system performance;
 - iv. signalling/infrastructure (e.g overhead wire, traction power supplies)/traffic light operation system compatibility;
 - v. recovery; and
 - vi. noise emissions.

5 Documentation Requirements

- (a) In addition to those documents already identified in the requirements above, a summary of documentation that OpCo is required to prepare and submit is provided in Table 3 below. The table also sets out the required status at the key stages in the project life cycle. OpCo must submit the relevant documents in the required form and at the required time as set out in Table 3.

Table 3 Documentation Requirements

	Documentation content	Recipient	Issue date	Min Review Frequency
LRV Delivery Plan	Description of the delivery process for the LRVs including design, production, quality management, client interaction, dispatch from the manufacturing facility, mode and method of transport for each stage of delivery and introduction into revenue service	IC and TfNSW	First issue 3 months before dispatch of the first CSELRV from OpCo's manufacturing facility	After delivery of each CSELRV
System Hazard Analysis	System safety hazard analysis for LRV including systems and sub-systems	IC and TfNSW	First issue Design Stage 1 and with each Safety Case	Continuous
Design Certification	Certification that the CSELRVs have been designed in accordance with the Contract, including the SPR, the OpCo's quality management system and the Design Management Plan and Project Standards list	IC	For each key design configuration (including but not limited to): <ul style="list-style-type: none"> • End of detailed design (Design Stage 3 3) • Delivery to Sydney • Operational ready 	As required
Construction Certificate	Certification that each of the LRVs have been constructed in accordance with the Contract, including the CSELRV Specification and the Final Design Documentation with cross reference to the design configuration of the CSELRV	IC	Prior to dispatch of CSELRVs from OpCo's manufacturing facility	Revised certificates required after any modifications to / or addition of configurable items
Failure Modes, Effects and Criticality Analysis (FMECA)	Subsystem level FMECA in accordance with relevant standard	IC and TfNSW	First issue Design Stage 2 and with the safety case – Design and Construction	As required
Design Management Plan	Description of the processes in place to manage the development and validation of the design	IC and TfNSW	First issue three months after Financial Close. Updated documents at subsequent design stages	Annually
Design Review Work Breakdown Structure	CSELRV system and sub-system breakdown to be used in packaging Design Review Submissions	TfNSW	First issue 2 months prior to the commencement of the Design Stage 1	Quarterly

Documentation content		Recipient	Issue date	Min Review Frequency
LRV Livery Design	Visual design of livery design for CSELRV	TfNSW	First issue at Design Stage 1 submission. Updated documents at subsequent design stages	As required
Testing and Commissioning Plan	Description of testing process and plans, details of any track access and other items which the Supplier requires and an indicative schedule including, but not limited to, development testing type testing, routine testing and commissioning testing	IC and TfNSW	Design Stage 1 draft issue; and Design Stage 2 submission	As required
Test Report Summary	Summary of reports issued and their status for each LRV	IC and TfNSW	Design Stage 2 - First issue. Final issue as a precondition to Operational Ready	As required
Configuration Management Plan	A description of the process used to manage the configuration of the LRVs, their equipment and software versions	IC and TfNSW	First issue 2 months after Financial Close. Updated documents at subsequent design stages	Annually
Master Configuration Status List	List of items that the configuration is to be recorded and reported, including software versions	TfNSW	First issue 2 months after Financial Close	As required
Configuration Register	Record of configured items fitted to each CSELRV, including software versions	TfNSW	First issue prior to dispatch of LRVs from OpCo's manufacturing facility. Updated register at delivery	As required
Quality Guide	A description and photographs of acceptable fit and finish for the CSELRVs for use in manufacture and inspection activities. This document shall provide guidance for staff from both the OpCo and TfNSW's organisations in order to assess the manufacturing quality of the CSELRVs	TfNSW	First issue 6 months after Financial Close. Updated documents at subsequent design stages	As required

	Documentation content	Recipient	Issue date	Min Review Frequency
FLS strategy plan	A description of the fire management process to be applied during the fire load design of the CSELRV	IC and TfNSW	First issue at Design Stage 1 submission. Updated documents at subsequent design stages	As required
Noise management plan	A description of the noise management considerations that are incorporated into the CSELRV design	IC and TfNSW	First issue at Design Stage 1 submission. Updated documents at subsequent design stages	As required
Disability standards compliance plan	a description detailing OpCo's compliance with the requirements of the Disability Standards of Accessible Public Transport in its design of the CSELRV		First issue at Design Stage 1 submission. Updated documents at subsequent design stages	As required



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 38 – Minimum Service Requirements

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1. Overview and scope

1.1. General

- (a) This Appendix 38 describes the minimum CSELR system capability and the performance and Contract Service Level Requirements for the SLR with respect to Regular Services and Special Event services.
- (b) Section 2 describes the system capacity requirements.
- (c) Section 3 describes the system performance requirements for the SLR.
- (d) Section 4 describes the Contract Service Level Requirements from commencement of services. These services include Regular Services as required each day of the year.
- (e) The Contract Service Level Requirements are described in relation to:
 - i. the Regular Services, as required each day of the year and described in section 4.1 of this Appendix 38;
 - ii. Special Event services as described in section 4.2 of this Appendix 38, and which shall be provided in addition to the Regular Services described in section 4.1; and
 - iii. with the exception of the school Special Event service described in section 4.2.1, Special Event services are provided subject to fleet availability.
- (f) Reference to time within this Appendix 38 is to local Sydney time.
- (g) For the purposes of this Appendix 38, the CSELR is considered to comprise the following four zones;
 - i. CBD zone, from Circular Quay to Central Station;
 - ii. Surry Hills / Moore Park zone, from Central Station to the junction of the Kingsford and Randwick branches;
 - iii. Kingsford branch, from Kingsford Interchange to the junction with the Randwick branch; and
 - iv. Randwick branch, from the Randwick Interchange to the junction with the Kingsford branch.
- (h) The CSELR Stops in each zone are shown in Table 1.

2. Capacity requirements

- (a) This section describes the system and infrastructure capacity requirements. This reflects the future potential increase in services resulting from increased patronage.

2.1. CSELR Stop capacity

- (a) The CSELR Stop boarding and alighting design capacity requirements for CSELR are included in Table 1 and Table 2.

Table 1 CSELR one hour peak boarding and alighting CSELR Stop design

Zone	CSELR Stop	Design Capacity			
		Northbound		Southbound	
		Boardings	Alightings	Boardings	Alightings
CBD zone	Circular Quay	0	1,000	1,000	0
	Grosvenor Street	500	1,500	1,500	500
	Wynyard	500	2,500	2,500	500
	Queen Victoria Building	1,000	1,500	1,500	1,000
	Town Hall	500	1,000	1,000	500
	Chinatown	2,000	500	500	2,000
	Rawson Place	1,500	1,500	1,500	1,500
	Central Station	500	4,000	4,000	500
Surry Hills / Moore Park zone	Surry Hills	1,000	500	500	1,000
	Moore Park	500	500	500	500
Kingsford branch	Carlton Street	500	500	500	500
	Todman Avenue	500	500	500	500
	UNSW Anzac Parade	3,000	500	500	3,000
	Strachan Street	1,500	500	500	1,500
	Kingsford	2,000	0	0	2,000
Randwick branch	Royal Randwick Racecourse	1,000	500	500	1,000
	Wansey Road	1,000	500	500	1,000
	UNSW High Street	3,000	500	500	3,000
	Randwick	1,500	0	0	1,500

Table 2 CSELR Special Events Stop design boarding and alighting design capacities per hour

CSELR Stop	Design Capacity			
	Northbound		Southbound	
	Boardings	Alightings	Boardings	Alightings
Town Hall	1,000	2,500	2,500	1,000
Central Station	0	18,000	18,000	0
Moore Park	18,000	2,000	2,000	18,000
Royal Randwick Racecourse	4,500	1,000	1,000	4,500

2.2. CSELR Infrastructure capacity

- (a) The CSELR infrastructure must be designed on the basis of LRVs at AW3 load condition.

- (b) The CSELR infrastructure (excluding the CSELRVs and the Light Rail Maintenance and Stabling Facilities) must as a minimum be designed and constructed to have the per hour per direction passenger capacity for a combination of Regular Services and/or Special Event services for each CSELR section as follows:
- i. 9,000 between Circular Quay Stop and Central Station Stop;
 - ii. 10,800 between Central Station Stop and Moore Park Stop for a combination of Regular Services and Special Event Services, however the Headway for Required Services must not be less than 5 minutes in the CBD and Surry Hills / Moore Park zones and 10 minutes in the Kingsford and Randwick branches if the total capacity of Regular Service plus Special Event services between Central Station Stop and Moore Park Stop is greater than 9,000 passengers per hour per direction;
 - iii. 13,980 between Central Station Stop and Moore Park Stop when operated with Special Event Services only;
 - iv. 9,000 between Moore Park Stop and the Alison/Anzac Intersection;
 - v. 7,500 between the Alison/Anzac Intersection and Royal Randwick Racecourse Stop, however the Headway for Required Services must not be less than 5 minutes in the CBD and Surry Hills / Moore Park zones and 10 minutes in the Kingsford and Randwick branches if the total capacity of Regular Service plus Special Event services between Alison/Anzac Intersection and Royal Randwick Racecourse Stop is greater than 4,500 passengers per hour per direction;
 - vi. 4,500 between Royal Randwick Racecourse Stop and Randwick Stop; and
 - vii. 4,500 between the Alison/Anzac Intersection and Kingsford Stop.
- (c) The CSELR (excluding the CSELRVs and the Light Rail Maintenance and Stabling Facilities) must have all necessary infrastructure for the delivery of Special Event services, including the capacity to meet the requirements specified in section 2.1 Table 2 for Special Event services between:
- i. Central Station Stop and Moore Park Stop;
 - ii. Central Station Stop and Royal Randwick Racecourse Stop;
 - iii. Town Hall Stop and Randwick Stop; and
 - iv. Town Hall Stop and Kingsford Stop.
- (d) The testing of these requirements will be done in accordance with SPR Appendix 33 (*Testing and Commissioning*).

2.3. CSELRV Fleet Capacity

- (a) The CSELRV fleet must comprise sufficient vehicles to ensure delivery of the Regular Services and school Special Event services at the required performance levels plus a 5 Additional Required CSELRVs. OpCo must make due allowance for spare vehicles for maintenance, repair or other requirements not including the Additional Required CSELRVs.
- (b) Service planning for Special Events must have regard to availability of vehicles not otherwise required for the Regular Services. OpCo must plan maintenance and other activities, such that the fleet available for Special Events is maximised.
- (c) The CSELRV fleet to provide the Required Services must be not less than 25 vehicles, including any spare vehicles. In addition to the fleet provided for the

Required Services, OpCo must ensure there will be 5 Additional Required CSELRVs to provide additional services requested by TfNSW, including Services Changes requested under Schedule D1, unless otherwise agreed by TfNSW. If following any Operations Activities Review, TfNSW directs a Modification that results in OpCo being able to provide the Required Services with less than 25 CSELRVs, including any spare vehicles, it is acknowledged that the CSELRVs no longer required will be used to provide additional services requested by TfNSW, including Service Changes requested under Schedule D1, unless otherwise agreed by TfNSW. All CSELRVs, including the Additional Required CSELRVs, may be rotated between those for Required Services, any additional services and as spare vehicles.

2.4. CSELR Headways

- (a) The CSELR infrastructure (excluding the CSELRVs and the Light Rail Maintenance and Stabling Facilities) must be designed and constructed to ensure the system can operate at headways consistent with the capacities described in section 2.2 for both Regular Services and Special Event services, including appropriate allowances for headway variability.
- (b) The testing of these requirements will be done in accordance with SPR Appendix 33 (*Testing and Commissioning*).

2.5. IWLR system capacity

- (a) The IWLR system capacity must not be reduced below the IWLR capacity existing at the date of the deed. The Asset Management Plan must document maintenance of the existing IWLR Assets in a manner that doesn't result in a reduction in system capacity.

3. System Performance Requirements

3.1. Light Rail availability

- (a) OpCo must deliver the following SLR availability performance:
 - i. 99.5% of Regular Services set out in section 4 of this Appendix 38.

3.2. Light Rail headway

- (a) For the purposes of measuring Headway performance the Headway for each Regular Service Period in section 4 of this Appendix 38 must apply from Last Service in the preceding Service Period.
- (b) OpCo must deliver the following performance:
 - i. 90% of CSELR Regular Services achieve the Headway requirements within a 2 minute tolerance in each direction at the following Headway monitored platforms:
 - A Town Hall Stop;
 - B Central Station Stop; and
 - C Moore Park Stop;
 - ii. 90% of IWLR Regular Services achieve the Headway requirements within a 2 minute tolerance in each direction at the following Headway monitored platforms:
 - A Convention Stop;
 - B Wentworth Park Stop; and
 - C Lilyfield Stop.

3.3. Light Rail journey time

- (a) For the purposes of measuring Maximum Journey Time performance the journey time for each Regular Service in either direction must be measured from:
 - i. departing the Origin Stop; to
 - ii. arriving at the Destination Stop; and
 - iii. include Dwell Time as described in section 3.3.1 of this Appendix 38.
- (b) OpCo must deliver the following SLR Maximum Journey Time performance each month:
 - i. 97% of CSELR Regular Services journey times from Circular Quay to Kingsford do not exceed the Maximum Journey Time of 38 minutes and 30 seconds;
 - ii. 97% of CSELR Regular Services journey times from Kingsford to Circular Quay do not exceed the Maximum Journey Time of 40 minutes;
 - iii. 97% of IWLR Regular Services journey times from Circular Quay to Randwick do not exceed the Maximum Journey Time of 37 minutes and 30 seconds;

- iv. 97% of IWLR Regular Services journey times from Randwick to Circular Quay do not exceed the Maximum Journey Time of 38 minutes and 30 seconds;
 - v. 97% of IWLR Regular Services journey times between Central Station and Dulwich Hill do not exceed the Maximum Journey Time of 36 minutes and 45 seconds; and
 - vi. 97% of IWLR Regular Services journey times between Dulwich Hill and Central Station do not exceed the Maximum Journey Time of 37 minutes and 15 seconds.
- (c) The Maximum Journey Times for the purposes of Schedule D1 must be the same as the Maximum Journey Times referred to in paragraph (b) above.

3.3.1. Dwell Time

- (a) OpCo must ensure that Dwell Times reflect the level of passenger demand at each Stop at the relevant time of day.

4. Contract Service Level Requirements

- (a) This section describes the level of service to be provided from the commencement of Regular Service on the IWLR and First Passenger Service on the CSELR;
- (b) Recognising that there will be changes to patronage demand over time, TfNSW will amend the Contract Service Level Requirements from time to time. Schedule D1 of the deed describes the process for Service Changes.
- (c) OpCo must provide operations protocols that address the requirements of section 4 in this Appendix 38. As a minimum these protocols must provide a clear understanding of how OpCo will engage and agree with TfNSW the procedures to be adopted for Service Changes:
 - i. in the first 6 months following Completion; and
 - ii. after the first 6 months following Completion.

4.1. Regular Services

- (d) Each CSELR Regular Service must start from either
 - i. Circular Quay Stop or Kingsford Stop and operate for the full length of this CSELR route; or
 - ii. Circular Quay Stop or Randwick Stop and operate for the full length of this CSELR route.
- (e) Each CSELR Regular Service must be spaced at even Headways along the Surry Hills / Moore Park zone, CBD zone, Kingsford branch and Randwick branch.
- (f) Each IWLR Regular Service must start from either Central Station Stop or Dulwich Hill Interchange Stop and operate for the full length of the IWLR.
- (g) Each IWLR Star City Regular Service must start from either Central Station Stop or Star City Stop.
- (h) Regular Services must stop at every Stop where boarding or alighting of passengers is required.

4.1.1. First Service and Last Service

- (a) OpCo must provide First Service and Last Service in accordance with Table 3 below:
 - i. Services are required every day of the year with First Service departure and Last Service departures as per Table 3 below.

Table 3 First Service and Last Service Departures

Service	First Service Departure	Last Service Departure	First Service Departure	Last Service Departure	First Service Departure	Last Service Departure
	Mon - Fri Ex Pub Hol	Mon - Fri Ex Pub Hol	Sat	Sat	Sun/ Pub Hol	Sun/ Pub Hol
Circular Quay Stop to Randwick Stop	05:01	01:07 (Mon-Thurs) 01:07 (Fri only)	05:09;30	01:07	05:09;30	01:04;30
Randwick Stop to Circular Quay Stop	05:05	01:05 (Mon-Thurs) 01:03 (Fri only)	05:10;30	01:03	05:10;30	01:05;30
Circular Quay Stop to Kingsford Stop	05:07	01:01 (Mon-Thurs) 01:02 (Fri only)	05:02	01:02	05:02	00:57
Kingsford Stop to Circular Quay Stop	05:09;30	01:09;30 (Mon-Thurs) 01:06;30 (Fri only)	05:01;30	01:06;30	05:01;30	00:56;30
Central Station Stop to Dulwich Hill Interchange Stop	06:00	23:00 (Mon-Thurs) 24:00 (Fri only)	06:00	23:15	06:00	23:00
Dulwich Hill Interchange Stop to Central Station Stop	05:50	23:06 (Mon-Thurs) 00:06 (Fri only)	05:44	23:06	05:44	23:06
Central Station Stop to Star City Stop	23:30 (00.30 Fri only)	05:30	23:30	05:30	23:30	05:30
Star City Stop to Central Station Stop	23:45 (00.45 Fri only)	05:45	23:45	05:45	23:45	05:45

4.1.2. Monday to Thursday Regular CSELR Service

- (a) OpCo must provide the CSELR Regular Services Monday to Thursday, excluding public holidays, as shown in Tables 4 and 5. Capacity requirements are based on an AW3 Load Condition.

Table 4 Monday to Thursday CSELR Regular Services between Kingsford Stop and Circular Quay Stop

CSELR Regular Services Monday to Thursday between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	12	1,500	12	1,500
07:00-07:59	AM peak shoulder	8	3,000	8	3,000
08:00-08:59	AM peak	8	3,000	8	3,000
09:00-9:29	AM peak shoulder	8	3,000	8	3,000
09:30-16:29	Inter-peak	8	2,250	8	2,250
16:30-16:59	PM peak shoulder	8	3,000	8	3,000
17:00-18:29	PM peak	8	3,000	8	3,000
18:30-18:59	PM peak shoulder	8	3,000	8	3,000
19:00-21:59	Evening	10	1,800	10	1,800
22:00-01:00	Night	12	1,500	12	1,500

Table 5 Monday to Thursday CSELR Regular Services between Randwick Stop and Circular Quay Stop

CSELR Regular Services Monday to Thursday between Randwick Stop and Circular Quay Stop			
Operating Hours	Service period	To Circular Quay	To Randwick

		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	12	1,500	12	1,500
07:00-07:59	AM peak shoulder	8	3,000	8	3,000
08:00-08:59	AM peak	8	3,000	8	3,000
09:00-9:29	AM peak shoulder	8	3,000	8	3,000
09:30-16:29	Inter-peak	8	2,250	8	2,250
16:30-16:59	PM peak shoulder	8	3,000	8	3,000
17:00-18:29	PM peak	8	3,000	8	3,000
18:30-18:59	PM peak shoulder	8	3,000	8	3,000
19:00-21:59	Evening	10	1,800	10	1,800
22:00-01:00	Night	12	1,500	12	1,500

4.1.3. Friday CSELR Regular Service

- (a) OpCo must provide the CSELR Regular Services for Fridays, excluding public holidays, as shown in Tables 6 and 7. Capacity requirements are based on an AW3 Load Condition.

Table 6 Friday Regular Services between Kingsford Stop and Circular Quay Stop

Regular Services Friday between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	12	1,500	12	1,500
07:00-07:59	AM peak shoulder	8	3,000	8	3,000
08:00-08:59	AM peak	8	3,000	8	3,000
09:00-9:29	AM peak shoulder	8	3,000	8	3,000
09:30-16:29	Inter-peak	8	2,250	8	2,250
16:30-16:59	PM peak shoulder	8	3,000	8	3,000
17:00-18:29	PM peak	8	3,000	8	3,000
18:30-18:59	PM peak shoulder	8	3,000	8	3,000
19:00-21:59	Evening	10	1,800	10	1,800
22:00-01:00	Night	10	1,800	10	1,800

Table 7 Friday CSELR Regular Services between Randwick Stop and Circular Quay Stop

Friday CSELR Regular Services between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	12	1,500	12	1,500
07:00-07:59	AM peak shoulder	8	3,000	8	3,000
08:00-08:59	AM peak	8	3,000	8	3,000
09:00-9:29	AM peak shoulder	8	3,000	8	3,000
09:30-16:29	Inter-peak	8	2,250	8	2,250
16:30-16:59	PM peak shoulder	8	3,000	8	3,000
17:00-18:29	PM peak	8	3,000	8	3,000
18:30-18:59	PM peak shoulder	8	3,000	8	3,000
19:00-21:59	Evening	10	1,800	10	1,800
22:00-01:00	Night	10	1,800	10	1,800

4.1.4. Saturday CSELR Regular Services

- (a) OpCo must provide the CSELR Regular Services for Saturdays as shown in Tables 8 and 9. Capacity requirements are based on an AW3 Load Condition.

Table 8 Saturday CSELR Regular Services between Kingsford Stop and Circular Quay Stop

CSELR Regular Services Saturday between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	15	1,200	15	1,200
07:00-11:59	Morning	10	1,800	10	1,800
12:00-15:59	Day	10	1,800	10	1,800
16:00-21:59	Evening	10	1,800	10	1,800
22:00-01:00	Night	10	1,800	10	1,800

Table 9 Saturday CSELR Regular Services between Randwick Stop and Circular Quay Stop

CSELR Regular Services Saturday between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	15	1,200	15	1,200
07:00-11:59	Morning	10	1,800	10	1,800
12:00-15:59	Day	10	1,800	10	1,800
16:00-21:59	Evening	10	1,800	10	1,800
22:00-01:00	Night	10	1,800	10	1,800

4.1.5. Sunday and Public Holiday CSELR Regular Services

- (a) OpCo must provide the CSELR Regular Services for Sundays and public holidays as shown in Tables 10 and 11. Capacity requirements are based on an AW3 Load Condition.

Table 10 Sunday and public holiday Regular Services between Kingsford Stop and Circular Quay Stop

CSELR Required Services Sunday and Public Holidays between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	15	1,200	15	1,200
07:00-11:59	Morning	10	1,800	10	1,800
12:00-15:59	Day	10	1,800	10	1,800
16:00-18:59	Evening	10	1,800	10	1,800
19:00-01:00	Night	15	1,200	15	1,200

Table 11 Sunday and public holiday CSELR Regular Services between Randwick Stop and Circular Quay Stop

CSELR Regular Services Sunday and Public Holidays between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
05:00-06:59	Early AM	15	1,200	15	1,200
07:00-11:59	Morning	10	1,800	10	1,800
12:00-15:59	Day	10	1,800	10	1,800

CSELR Regular Services Sunday and Public Holidays between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
16:00-18:59	Evening	10	1,800	10	1,800
19:00-01:00	Night	15	1,200	15	1,200

4.1.6. IWLR Regular Services

- (a) OpCo must provide the IWLR Regular Services as listed in Tables 12, 13, and 14.

Table 12 Monday to Friday IWLR Regular Services, excluding public holidays, between Dulwich Hill Stop and Central Station Stop

IWLR Regular Services Monday to Friday between Dulwich Hill Stop and Central Station Stop			
Operating Hours	Service Period	Headway (minutes)	
		To Central Station	To Dulwich Hill
06:00 – 07:00	Early Morning	15	15
07:00 – 10:00	AM Peak	10	10
10:00 – 15:00	Inter-peak	15	15
15:00 – 18:00	PM Peak	10	10
18:00- 21:00	Evening	15	15
21:00 – 23:00 Mon -Thurs 21:00-24:00 Friday only	Night	15	15

Table 13 Saturday IWLR Regular Services between Dulwich Hill Stop and Central Station Stop

IWLR Regular Services Saturday between Dulwich Hill Stop and Central Station Stop			
Operating Hours	Service Period	Headway (minutes)	
		To Central Station	To Dulwich Hill
06:00 – 07:30	Early Morning	24	24
07:30 – 09:00	Morning	15	15
09:00 – 21:30	Day	15	15
21:30 – 23:00	Night	15	15

Table 14 Sunday and public holiday IWLR Regular Services between Dulwich Hill Stop and Central Station Stop

IWLR Regular Services Sunday between Dulwich Hill Stop and Central Station Stop			
Operating Hours	Service Period	Headway (minutes)	
		To Central Station	To Dulwich Hill
06:00 – 07:30	Early Morning	24	24
07:30 – 09:00	Morning	15	15
09:00 – 10:15	Early Day	15	15
10:15 – 17:15	Day	10	10
17:15 – 21:30	Evening	15	15
21:30 – 23:00	Night	15	15

4.1.7. IWLR Star City Regular Services

OpCo must provide the IWLR Regular Star City Services as listed in Table 15.

Table 15 Daily IWL Regular Services between Star City Stop and Central Station Stop

IWL Regular Star City Services between Star City Stop and Central Station Stop			
Daily Operating Hours	Service Period	Headway (minutes)	
		To Central Station	To Star City
23:00 – 06:00 (24.00 – 06.00 Fri only)	Late Night	30	30

4.2. Special Events services

- (a) OpCo must provide the Special Event services which are in addition to Regular Services subject to section 1.1. (e) iii and capacities are based on AW3 Load Condition. The parties acknowledge, that traffic signal phasing at specific intersections may impact on OpCo's ability to deliver the capacities specified in this section 4.2. In the event that traffic signal phasing at specific intersections do have an impact on OpCo's ability to deliver the capacities specified in this section 4.2 then the parties acknowledge that, acting reasonably, they will develop alternative traffic signal phasing arrangements to apply for the duration of the Special Event services which will enable the per hour direction passenger capacity requirement specified in section 4.2 to be delivered.
- (b) OpCo must through a process of fleet planning, maximise fleet availability during periods of Special Events. With the exception of the school Special Event service, described in section 4.2.1, Special Event services are provided subject to fleet availability.
- (c) Representative timings of the Special Event services are described in the following Tables 16 to 32. TfNSW may adjust operational hours for Special Event services and to ensure integration with other public transport operations.
- (d) OpCo must engage with TfNSW and Special Event organisers and develop protocols to be implemented for Special Event services. As part of these protocols OpCo must as a minimum:
 - i. prepare a Special Events annual services plan within one month of receiving the annual Special Event program from TfNSW;
 - ii. update the Special Events plan as required based on updates received from TfNSW;
 - iii. design the Special Event services in co-operation with the Special Event organisers and TfNSW;
 - iv. prepare Special Events services operating schedule 7 days prior to each Special Event;
 - v. provide a Special Event services program for the required Special Event services in Tables 16 to 32;

- vi. provide flexibility in the Special Event services to allow for changes in the timing of the Special Event; and
 - vii. prepare a Special Events impact and planning protocol.
- (e) For each Special Event operation OpCo must provide:
- i. effective coordination with Special Event organisers; TfNSW and other stakeholders (including TfNSW, NSW Police Force, RMS, and Sydney Buses);
 - ii. both Regular Services and Special Event services;
 - iii. Special Event processes and procedures including Special Event Incident management protocols;
 - iv. Staff to manage and deliver the Special Event services;
 - v. communications, coordination and customer service associated with the Special Event services;
 - vi. Customer information on the Special Event services;
 - vii. appropriate signage, wayfinding, ticketing and queuing systems to manage the surge in Customers;
 - viii. cleaning of the relevant Stops within 2 hours after the Special Events completion; and
 - ix. reporting as required in SPR Appendix 10 (*Reporting Requirements*).
- (f) TfNSW recognises that the quantity of Special Events and the date, day and time of day of Special Events will change from time to time and sometimes at short notice. The process for Service Changes and adjustments for Special Event services are described in Schedule D1 of the Project Deed. In summary TfNSW will:
- i. specify a Special Event services requirement as described in this section 4.2;
 - ii. provide OpCo with updated Special Event program on an annual and monthly basis;
 - iii. provide OpCo with updates to the program, if necessary, with a minimum 24 hours notice;
 - iv. approve the Special Event services designed by OpCo, including staffing levels;
 - v. specify any special ticketing or fare requirements in relation to the Special Event;
 - vi. in consultation with OpCo and acting reasonably, specify Special Event KPIs; and
 - vii. in consultation with OpCo and acting reasonably, specify reporting requirements.

4.2.1. Central Station to Moore Park school additional capacity services

- (a) OpCo must provide CSELR Special Event services which are delivered through additional capacity over the Regular Services minimum passenger capacity requirements during school term Monday to Friday, excluding Public Holidays,

between Central Station Stop and Moore Park Stop as listed in Tables 16 and 17. Capacity requirements are based on an AW3 Load Condition. The school additional capacity is not a dedicated or limited service for schoolchildren.

Table 16 CSELR school additional capacity between Central Station Stop and Moore Park Stop

CSELR School additional capacity between Central Station Stop and Moore Park Stop			
Operating Hours	Service Period	Number of Services	Minimum Additional Capacity Requirements
08:15 – 08:45	AM Peak	As required	600 passengers

Table 17 CSELR school additional capacity between Moore Park Stop and Central Station Stop

CSELR school additional capacity between Moore Park Stop and Central Station Stop			
Operating Hours	Service Period	Number of Services	Minimum Additional Capacity Requirements
15:15 – 15:45	PM Peak	As required	600 passengers

4.2.2. Anzac Day SLR Special Event services

- (a) OpCo must provide SLR Special Event services for Anzac Day as listed in Tables 18, 19 and 20. Capacity requirements are based on an AW3 Load Condition.

Table 18 CSELR Special Event Services Anzac Day stopping all CSELR Stops between Kingsford Stop and Circular Quay Stop

CSELR Special Event services Anzac Day between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
03:00-05:00	Early AM	15	1,200	15	1,200

Table 19 CSELR Special Event services Anzac Day stopping all CSELR Stops between Randwick Stop and Circular Quay Stop

CSELR Special Event services Anzac Day between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
03:00-05:00	Early AM	15	1,200	15	1,200

Table 20 IWLR Special Event Services Anzac Day stopping all IWLR Stops between Dulwich Hill Stop and Central Station Stop

IWLR Special Event services Anzac Day between Dulwich Hill Stop and Central Station Stop					
Operating Hours	Service period	To Central Station		To Dulwich Hill	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
03:00-06:00	Early AM	15	800	15	800

4.2.3. Sydney Mardi Gras (Saturday evening event) CSELR Special Event services

- (a) OpCo must provide CSELR Special Event services for the Sydney Mardi Gras as listed in Tables 21 and 22. Capacity requirements are based on an AW3 Load Condition.

Table 21 CSELR Special Event services for the Sydney Mardi Gras stopping all CSELR Stops between Kingsford Stop and Circular Quay Stop

CSELR Special Event services Mardi Gras between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
01:00-02:00	Late Night	15	1,200	15	1,200

Table 22 CSELR Special Event services for the Sydney Mardi Gras stopping all CSELR Stops between Randwick Stop and Circular Quay Stop

CSELR Special Event Services Mardi Gras between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
01:00-02:00	Late Night	15	1,200	15	1,200

4.2.4. First Night of the Sydney Festival CSELR Special Event services

- (a) OpCo must provide CSELR Special Event services for the first night of the Sydney Festival subject to this being a Friday or Saturday evening as listed in Tables 23 and 24. Capacity requirements are based on an AW3 Load Condition.

Table 23 CSELR Special Event services first night of the Sydney Festival stopping all CSELR Stops between Kingsford Stop and Circular Quay Stop

CSELR Special Event services Sydney Festival first night between Kingsford Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
01:00-01:30	Late Night	15	1,200	15	1,200

Table 24 CSELR Special Event services first night of the Sydney Festival stopping all CSELR Stops between Randwick Stop and Circular Quay Stop

CSELR Special Event services Sydney Festival first night between Randwick Stop and Circular Quay Stop					
Operating Hours	Service period	To Circular Quay		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
01:00-01:30	Late Night	15	1,200	15	1,200

4.2.5. New Years Eve/Day SLR Special Event services

- (a) OpCo must provide SLR Special Event services for New Years Eve/Day listed in Tables 25, 26 and 27. Capacity requirements are based on an AW3 Load Condition.

Table 25 CSELR Special Event services New Years Day stopping all CSELR Stops between Kingsford Stop and Town Hall Stop

CSELR Special Event Services New Years Day between Kingsford Stop and Town Hall Stop					
Operating Hours	Service period	To Town Hall		To Kingsford	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
01:00-04:00	Late Night	10	1,800	10	1,800

Table 26 CSELR Special Event services New Years Day stopping all CSELR Stops between Randwick Stop and Town Hall Stop

CSELR Special Event services New Years Day between Randwick Stop and Town Hall Stop					
Operating Hours	Service period	To Town Hall		To Randwick	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
01:00-04:00	Late Night	10	1,800	10	1,800

Table 27 IWL Special Event services New Years Day stopping all IWL Stops between Dulwich Hill Stop and Central Station Stop

IWL Special Event services New Years Day between Dulwich Hill Stop and Central Station Stop					
Operating Hours	Service period	To Central Station		To Dulwich Hill	
		Maximum Headway in minutes	Minimum Passenger Capacity per hour	Maximum Headway in minutes	Minimum Passenger Capacity per hour
23:00-04:00	Late Night	10	1,200	10	1,200

4.2.6. Moore Park precinct Special Events services

(a) OpCo must provide the Special Event services for Moore Park precinct Special Events described in Tables 28 and 29.

Table 28 Summary of Moore Park precinct crowd levels and Special Events

Special Event Type	Special Event Crowd Level	Number of Moore Park Special Events per year
Low	Between 5,000 and 20,000	37
Medium	Between 20,000 and 30,000	14
High	Greater than 30,000	5

Table 29 Summary of Moore Park precinct crowd levels and Special Event services

Special Event Crowd Level	Central Station Stop to Moore Park Stop Special Event Services Requirements				Moore Park Stop to Central Station Stop Special Event Services Requirements				No. Events per annum
	Duration	Start of Service Period		Minimum Capacity per hour of regular service (trunk) + special service	Duration	Start of Service Period		Minimum Capacity per hour of regular service (trunk) + special service	
Low	60 minutes	45 minutes before event start		5,400 passengers	60 minutes	5 minutes before event finish		7,200 passengers	37
Medium	75 minutes	60 minutes before event start		7,200 passengers	60 minutes	5 minutes before event finish		10,800 passengers	14
High	90 minutes	75 minutes before event start		7,200 passengers	75 minutes	15 minutes before event finish		10,800 passengers	5

4.2.7. Royal Randwick Racecourse Special Events Services

(a) OpCo must provide the Special Event services for Royal Randwick Racecourse Special Events described in the Tables 30 and 31.

Table 30 Summary of Royal Randwick Racecourse crowd levels and Special Events

Special Event Type	Special Event Crowd	Number of Royal Randwick Racecourse events per year
Low to Medium	Between 5,000 and 30,000	25
High	Greater than 30,000	1

Table 31 Summary of Royal Randwick Racecourse crowd levels and required Special Event services

Special Event Crowd Level	Central Station Stop to Royal Randwick Racecourse Stop Special Event Services Requirements				Royal Randwick Racecourse Stop to Central Station Stop Special Event Services Requirements				No. Events per annum
	Duration	Start of Service Period		Minimum Capacity per hour of regular service (Randwick branch) + special service	Duration	Start of Service Period		Minimum Capacity per hour of regular service (Randwick branch) + special service	
Low to Medium	60 minutes	45 minutes before event start		3,600 passengers	60 minutes	15 minutes before event finish		5,400 passengers	25
High	75 minutes	60 minutes before event start		conveying 5,400 passengers	90 minutes	30 minutes before event finish		5,400 passengers	1

4.2.8. CBD Special Events services

- (a) OpCo must provide the Regular Services in this Appendix 38 during CBD Special Events with the exception that Town Hall Stop is the terminus in place of Circular Quay Stop, as described in Table 32 below.

Table 32 Special Event services between Kingsford Stop and Town Hall Stop; and between Randwick Stop and Town Hall Stop.

Special Event Type	Required Special Event Services		Regular Services Elsewhere
	To/From	To/From	
12 Special Events per year, including New Years Eve, Anzac Day March, George Street Parades, Protest Marches . <ul style="list-style-type: none"> Special Event timetable between Kingsford Stop and Town Hall Stop and Randwick Stop and Town Hall Stop at a Headway no less frequent than that for the Regular Services at the time of day of the Special Event No passenger operation north of Town Hall Stop 	Kingsford Stop / Randwick Stop	Town Hall Stop	Light Rail Line closed north of Town Hall Stop due to Special Event

4.2.9. Central Station to University of NSW Special Event services

- (a) OpCo must provide processes, procedures and Staff to manage Customer service for passengers travelling between Central Station Stop and University of NSW High Street Stop and Anzac Parade Stop as required for Special Event services for the AM peak and PM peak service periods during University of NSW semesters Monday to Friday, excluding Public Holidays.
- (b) TfNSW will monitor demand between Central Station Stop and University of NSW and will advise OpCo if additional CSELR Services are required.

4.3. Service disruptions

- (a) If an Incident, failure or OpCo predetermined activity prevents part of the SLR being operated, OpCo must provide Services over the maximum part of the route where possible, dependent upon the location and nature of the Incident. These Services during service disruptions are referred to as degraded mode operations.
- (b) OpCo must provide degraded mode operations on the SLR at Headways consistent with the Headways for the time of day for Regular Services.



Transport
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Project Deed

Schedule E1 Scope and Performance Requirements

Appendix 39 – Operations and Customer Service Requirements

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1. Overview and scope

1.1. General

- (a) This Appendix describes the operations and Customer service requirements for SLR during the Operations Phase.
- (b) This Appendix also outlines the presentation requirements for SLR during the Operations Phase.

2. Operations and Customer services

2.1. LRV drivers

- (a) LRV drivers must be trained, and where appropriate accredited or certified to the appropriate level, to satisfy OpCo's operating requirements.
- (b) The following are the minimum required areas of training for LRV drivers:
 - i. LRV operation, including related road rules;
 - ii. disability obligations;
 - iii. emergency management; and
 - iv. Light Rail safety.

2.2. Customer Service Officers

- (a) OpCo must provide appropriately trained, and where applicable, accredited or certified, Customer Service Officers to fulfil the Customer service requirements in accordance with the Customer Service Plan and ETS Equipment operation requirements in this Appendix.
- (b) Customer Service Officers must be trained and competent to:
 - i. provide Customer service and assistance functions including identifying and responding to Customers, especially Customers with disabilities including those with sensory and cognitive impairments, that may require assistance at Stops and on LRVs with:
 - A. boarding and leaving LRVs;
 - B. ETS Equipment usage;
 - C. ticketing, fare information and advice in relation to the SLR and other transport services;
 - D. journey planning including interchanging with other transport services; and
 - E. information on the local area; and
 - F. selling Legacy Tickets until the LTS End Date;
 - ii. check ticket status through the use of ETS hand held devices;
 - iii. provide feedback response and handling;
 - iv. respond to Incidents:
 - A. in accordance with the incident response policies, procedures, rules and instructions;
 - B. as directed by the OCC; and
 - C. within the timeframes in accordance with Appendix 10 (*Reporting Requirements*) and the SPR;

- v. report and address any issues that compromise the achievement of the Minimum Operating Standards;
 - vi. manage lost property in accordance with procedures agreed with TfNSW;
 - vii. administer first aid;
 - viii. inform Customers on Stops or on LRVs of Service status and, the wider TfNSW service status or any other situation that may arise from time to time impacting Service using, where appropriate:
 - A. Public Address (PA) system;
 - B. Passenger Information Displays (PID); and
 - C. temporary notices.
- (c) During Special Events, OpCo must:
- i. establish Special Event wayfinding and signage measures;
 - ii. provide sufficient Customer Service Officers at all Stops associated with Special Event services to manage Customer requirements, within the Permanent Light Rail Corridor and on the immediate approaches to the Stop;
 - iii. pro-actively manage Customer safety including controlling platform and LRV crowding levels;
 - iv. co-ordinate with Special Event controllers and emergency services personnel;
 - v. provide additional CSOs to assist with the management of intending Light Rail users outside of the Permanent Light Rail Corridor, as directed by the NSW Police Force or Special Event controllers;
 - vi. keep Customers informed of Service status changes during the Special Event, including for interconnecting services; and
 - vii. assist Customers to navigate the network safely and efficiently.

2.3. Ticketing and revenue protection

2.3.1. Ticketing operations

- (a) OpCo must provide ticketing operations functions for SLR, including:
- i. displaying the TfNSW-supplied ETS terms of use at Stops, clearly visible to Customers; and
 - ii. providing Customers with information and directions in line with TfNSW's Customer service principles for ticketing, including:
 - A. when observed, advise Customers of their obligations to be in possession of the applicable ticket prior to boarding LRVs;
 - B. when observed, direct Customers to purchase tickets when they are not in possession of the applicable ticket prior to boarding LRVs;
 - C. when observed, direct Customers to purchase tickets when they are in possession of a defective ticket prior to boarding LRVs;
 - D. advise Customers on how to obtain assistance with a defective ticket; and

- E. assisting non-smartcard ticket holders to identify the nearest location to obtain a ticket;
- (b) OpCo must operate the ETS Equipment in accordance with the ETS manuals.
- (c) OpCo must nominate and make available appropriate Staff to be trained by TfNSW in ETS Equipment “Train the Trainer” training.
- (d) OpCo must train its Staff in the operation and first-line maintenance of ETS Equipment in accordance with the ETS manuals and the ETS training materials provided.
- (e) OpCo must provide security and asset protection for all ETS Equipment installed, or in its possession.
- (f) OpCo will be provided access to ETS web-based monitoring tools in respect of the ETS Equipment on SLR.

2.3.2. Revenue protection

- (a) OpCo must minimise fare evasion on SLR including undertaking the following:
 - i. operating in accordance with all relevant TfNSW policies;
 - ii. developing and maintaining a Revenue Protection Plan;
 - iii. enforcing revenue protection on the SLR, including the issuance of penalty notices in accordance with the Passenger Transport Act 1990;
 - iv. directing identified fare evaders to vacate the LRV at the first opportunity where it is safe to do so;
 - v. assisting TfNSW and the State Debt Recovery Office (as appropriate) in the prosecution of offenders pursued as a result of OpCo issued penalty notices;
 - vi. producing a monthly fare evasion report as specified by TfNSW; and
 - vii. co-operating with and providing access to Transport Officers and NSW Police to enable them to undertake revenue protection surveys.

2.3.3. ETS maintenance

- (a) OpCo must carry out first-line maintenance of ETS Equipment in accordance with ETS manuals, including:
 - i. exterior cleaning and Graffiti removal of ETS Equipment using cleaning products in accordance with ETS manuals requirements;
 - ii. replenishing consumables in ETS Equipment including receipt paper and smartcards;
 - iii. clearing paper jams and similar faults in ETS Equipment;
 - iv. monitoring ETS Equipment, on a device by device basis, for any operational problems, including any problems with power and data communications; and
 - v. promptly rectifying any first-line maintenance problem with ETS Equipment or problem with the power and data communication network.
- (b) In respect of damage and vandalism to ETS Equipment:
 - i. OpCo must provide surveillance of ETS Equipment to deter vandalism;

- ii. subject to paragraph (iii) below, if ETS Equipment is vandalised or damaged, TfNSW must repair Major Vandalism and OpCo must repair Minor Vandalism repair, where:
 - A. "Major Vandalism" means vandalism or damage which is the result of acts whereby a device contains broken components rendering it unusable for its intended purpose or there is a significant adverse impact on the Customer use of the device; and
 - B. "Minor Vandalism" means vandalism or damage which is the result of acts whereby devices have been damaged or defaced but not to the level where the device is unusable for its intended purpose, for instance, as a result of abuse by individuals scratching surfaces or applying graffiti to the device; and
 - iii. OpCo must reimburse TfNSW for the cost of repairs to or replacement of any ETS Equipment which is vandalised or damaged due to a wrongful omission of OpCo or its Staff.
- (c) Where OpCo is not responsible for the rectification of an ETS Equipment problem or is otherwise unable to determine the cause of the problem, OpCo must promptly notify the ETS Contractor of the problem in accordance with the ETS communications protocols;
- (d) OpCo must notify the ETS Contractor of planned outages of power and data communications in relation to ETS Equipment in accordance with the ETS communications and interface protocols.
- (e) OpCo must:
- i. manage its inventory of ETS equipment and consumables (including ordering, receipt and distribution) held by OpCo to maintain uninterrupted operation of the ETS Equipment;
 - ii. securely store ETS equipment and consumables;
 - iii. report to TfNSW:
 - A. each ETS fault;
 - B. each month on details of the inventory of ETS equipment and consumables supplied by TfNSW currently held by OpCo; and
 - iv. participate in joint operator ticketing specific forums hosted by TfNSW as notified by TfNSW from time to time.

3. Operations

3.1. Operations Control Centre

- (a) OpCo must operate the Operations Control Centre (OCC) on a continuous 24 hours per day 7 days a week basis to centrally manage the following SLR operations and maintenance functions, as a minimum:
- i. Light Rail operations;
 - ii. communications both internal and external;
 - iii. Customer information;
 - iv. Customer service delivery;
 - v. security and access control;
 - vi. Incident response and management;
 - vii. power supply management;
 - viii. maintenance planning and co-ordination;
 - ix. system alarm monitoring and fault response; and
 - x. ETS operations, including supporting infrastructure.
- (b) OpCo must provide redundancy for the OCC such that the SLR operations and maintenance functions described in section 3.1(a) can continue in the event the OCC becomes unavailable.

3.2. Operations interfaces

3.2.1. Rail, bus, ferry and taxi companies

- (a) OpCo must develop, consult, implement, maintain and comply with operations protocols with train, bus, ferry and taxi operators in relation to communications and governance arrangements for each location where train, bus, ferry and taxi services interface with SLR.
- (b) The operations protocols must:
- i. be prepared and submitted to TfNSW no later than 40 Business Days prior to the commencement of the Operations Phase;
 - ii. be updated and submitted to TfNSW no later than 100 Business Days prior to the commencement of the Full Operations Phase;
 - iii. address, as a minimum, the following:
 - A. planned and unplanned service disruption communications arrangements including the operations of replacement bus services;
 - B. Customer information;
 - C. Special Events; and
 - D. Incident response and management;

- (c) OpCo must not commence Operations Activities until the operations protocols have been submitted to TfNSW and the time specified in section 3.2.1(d) has expired without TfNSW having issued a notice under that section during that time.
- (d) TfNSW's Representative may (but is not obliged to) review the operations protocols and notify OpCo if, in the opinion of TfNSW's Representative, the operations protocols do not comply with the requirements of the deed (with reasons), within 20 Business Days following submission of the operations protocols to TfNSW's Representative.
- (e) If TfNSW's Representative notifies OpCo that the operations protocols do not comply with the requirements of the deed, OpCo must resubmit the operations protocols and clause 3.2.1(d) will reapply.

3.2.2. Transport Management Centre

- (a) OpCo must in consultation with TMC develop, implement, maintain and comply with operations protocols that incorporate joint operational plans, procedures and instructions for the management of activities including:
 - i. the development of an appropriate replacement bus service operational response plan based on the expected degraded mode operational scenarios detailed in the Operations Plan;
 - ii. communication protocols between control centres;
 - iii. the status of the Services;
 - iv. planned and unplanned service disruption information including the requirements for replacement bus services;
 - v. Customer information and coordination of assistance;
 - vi. Incident response and management; and
 - vii. Special Events.
- (b) The operations protocols must be prepared and submitted to TfNSW no later than 100 Business Days prior to the commencement of the Operations Phase in accordance with the Operations Management Plan requirements; and
- (c) OpCo must not commence Operations Activities until the operations protocols have been submitted to TfNSW and the time specified in section 3.2.2(d) has expired without TfNSW having issued a notice under that section during that time.
- (d) TfNSW's Representative may (but is not obliged to) review the operations protocols and notify OpCo if, in the opinion of TfNSW's Representative, the operations protocols do not comply with the requirements of the deed (with reasons), within 20 Business Days following submission of the operations protocols to TfNSW's Representative.
- (e) If TfNSW's Representative notifies OpCo that the operations protocols do not comply with the requirements of the deed, OpCo must resubmit the operations protocols and clause 3.2.1(d) will reapply.

3.2.3. NSW Police Force and emergency services

- (a) OpCo must provide the NSW Police Force access to the SLR at all times and provide emergency services access as required during times of Incident and emergency.

- (b) OpCo must, upon request, provide the NSW Police Force with assistance, information, data, equipment, resources and materials as may reasonably be required to satisfactorily perform its obligations.
- (c) OpCo must liaise with emergency services as necessary to:
 - i. obtain input and advice into the development of Special Event, incident and emergency policies, procedures, rules and instructions and Operations Interface Protocols;
 - ii. accommodate respective interface requirements with SLR; and
 - iii. develop protocols for Special Events, Incidents and emergencies, including requirements for dealing with Customers with disabilities and the safe management of Customers under the influence of alcohol and other drugs including first-aid administration on the SLR.
- (d) OpCo must support the objectives and requirements of the Transport Security (Counter Terrorism) Act 2008 (Cth); and the Federal Government's alert level of preparedness for terrorism according to the National Counter Terrorism Plan and the Anti-Terrorism Act (No.2) 2005 (Cth).
- (e) OpCo must provide training to emergency services (and where appropriate adjacent business and property owners) in the Incident response policies, procedures, rules and instructions.
- (f) OpCo must undertake a minimum of two joint training exercises with emergency services (and where appropriate adjacent business and property owners) in the first year of full operation, and a minimum of one joint training exercise each year throughout the Term to verify the adequacy of the Incident response policies, procedures, rules and instructions and competency of personnel. At least one in every two of these joint training exercises must be done in the Moore Park Tunnel.
- (g) OpCo must maintain ongoing communications with representatives of the emergency services and comply with their reasonable requests for access to SLR and its facilities for their orientation and training.
- (h) OpCo must proactively work with TfNSW, NSW Police Force and other transport operators by:
 - i. cooperatively gathering and reporting intelligence on Graffiti and Vandalism offenders;
 - ii. promptly reporting incidents of Graffiti and Vandalism;
 - iii. consulting on issues regarding the prevention and monitoring of Graffiti and Vandalism; and
 - iv. assisting in the prosecution of Graffiti and Vandalism offenders.

3.2.4. ETS communications and interface protocols

- (a) OpCo and the ETS Contractor must develop, agree, implement, maintain and comply with operations protocols that incorporate operational plans, procedures and instructions for the operation and maintenance of ETS Equipment and systems including the requirements of section 2.3 of this Appendix.

4. Presentation requirements

4.1. Stops and other Assets

- (a) OpCo must:
- i. ensure all safety and security equipment required by the Light Rail Operating Manuals is accessible at Stops, complete, undamaged and certified for use;
 - ii. ensure Stops and other Assets meet the Minimum Operating Standards;
 - iii. ensure all Stop entrances and exits are unobstructed for Customers to purchase tickets and board from the First Service each day;
 - iv. clean Stops and other Assets as required:
 - A. remove loose rubbish, including discarded newspapers, confectionery wrappers, bottles, cans and gum;
 - B. ensure Stops are free from offensive odours and are free of dirt, grime or staining;
 - C. ensure litter bins are not overflowing and are free from grime, dirt and staining;
 - D. remove Graffiti and rectify Vandalism;
 - v. where toilet facilities are provided, maintain in a clean and serviceable condition with equipment and consumables available at all times;
 - vi. deal in a timely manner with any incidents including litter, food or drink spills that occur from time to time and which make portions of the Stops or Assets unsuitable or unhygienic for waiting Customers;
 - vii. maintain buildings and fences in accordance with the Minimum Operating Standards;
 - viii. maintain and prevent obstructions to footpaths, ETS Equipment, cycle ways and pedestrian areas; and
 - ix. maintain vegetation in accordance with the Minimum Operating Standards.

4.2. LRVs

- (a) OpCo must:
- i. ensure all safety and security equipment required by the Light Rail Operating Manuals is accessible on each LRV, complete, undamaged and certified for use;
 - ii. ensure LRVs meet the Minimum Operating Standards;
 - iii. clean LRVs before commencing First Service each day, and as required, to ensure:
 - A. loose rubbish including discarded newspapers, confectionery wrappers, bottles, cans and gum, do not accumulate;
 - B. LRVs are free from offensive odours;

- C. LRV interior surfaces and windows including seats, are free of dirt, grime, sand or staining;
 - D. Graffiti is removed and Vandalism rectified;
 - E. LRV external surfaces are free from dirt, Graffiti, grime, staining and dust build up; and
- iv. respond to and address any incidents (e.g. litter, food or drink spills) that occur from time to time, which are deemed to make portions of the LRV unsuitable or unhygienic for carrying Customers, to ensure the Minimum Operating Standards are met.

4.3. Permanent Light Rail Corridor

- (a) For the Permanent Light Rail Corridor, OpCo must:
- i. ensure all safety and security equipment required by the Light Rail Operating Manuals is accessible, complete, undamaged and certified for use;
 - ii. ensure the Assets meet the Minimum Operating Standards;
 - iii. remove Graffiti;
 - iv. maintain and prevent obstructions to roads, footpaths, cycle ways and pedestrian areas;
 - v. maintain landscape areas in accordance with the Minimum Operating Standards;
 - vi. ensure and maintain the provision of information to mandate, warn or guide users about the use of facilities and associated equipment in accordance with the SPR and Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*);
 - vii. remove any rubbish as follows:
 - A. for hazardous material within 2 hours; and
 - B. for material which has a negative impact (including visual) as soon as practical, but in any event no longer than within the next Business Day of being detected.

4.4. Additional Areas

- (a) OpCo must:
- i. monitor and report the presence of Graffiti and Vandalism in the Additional Areas in accordance with the Minimum Operating Standards; and
 - ii. only remove Graffiti and rectify Vandalism if given notice to do so by TfNSW in accordance with clause 20.15 (b) and (c) of the Operative Provisions.

4.5. Staff

- (a) OpCo must:
- i. ensure a high standard of personal presentation and grooming is maintained by Staff in accordance with OpCo's staff presentation standards;

- ii. ensure that Staff, whose duties bring them into the view of or contact with Customers, wear a uniform complying with the TfNSW Uniform Guidance – Light Rail; and
- iii. define the minimum requirements to be met for personal presentation, grooming and wearing of uniforms.



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 40 – Asset Information Management
Systems

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1. Overview and scope

1.1. General

- (a) This Appendix describes the requirements which must be met by OpCo with respect to the Asset Information Management Systems for Sydney Light Rail (SLR) during Operations Phase.

2. Asset Information System

2.1. Asset Information System requirements

- (a) OpCo must provide, maintain, update and support an Asset Information System (AIS).
- (b) The AIS must cover all Assets.
- (c) The AIS must be capable of managing and integrating all Asset data, plans, Manuals, and activities into a comprehensive information system.
- (d) OpCo is responsible for ensuring that the quality of AIS data is at the highest standards at all times and is an accurate representation of the true condition and status of all Assets.
- (e) The AIS, and the data held within it, will be the property of TfNSW.
- (f) OpCo must make available to TfNSW all data and reports held in the AIS in password-protected real-time format which incorporates full monitoring, review, searching and custom report generation facilities.
- (g) OpCo must handover the AIS inclusive of all data to TfNSW at the end of the Term.
- (h) The AIS must be able to support the reporting requirements specified in Appendix 10 (*Reporting Requirements*).
- (i) The AIS must comply with the requirements of the ASA standard T MU AM 02001 ST Assets Information Management.

2.2. Information requirements

- (a) Assets must be labelled including as a minimum:
 - i. civil (includes over and under bridges, tunnels, retaining walls etc);
 - ii. Stops, interchanges and buildings (includes Light Rail Maintenance and Stabling Facilities buildings, support buildings, passenger lifts, fencing etc);
 - iii. signals, controls and communications (includes signalling, passenger information, Help Points, CCTV, public address systems, LRV detection, operations control equipment and communication cabling etc);
 - iv. Light Rail Vehicles;
 - v. electrical (includes OHW, poles, HV feeds, substations, Stop supplies etc);
 - vi. track (includes plain track and turnouts etc);
 - vii. mechanical (includes ventilation fans and pumps); and
 - viii. maintenance plant and equipment.
- (b) Assets must be identified as being either fixed or non-fixed, and either linear or discrete.
- (c) OpCo must ensure that the AIS includes the following information for all Assets by Asset Category:
 - i. design information (i.e. design documentation, calculations, drawings etc.);

- ii. as built information;
 - iii. supplier / vendor information;
 - iv. Asset type, function and output association;
 - v. Asset identifier including serial number;
 - vi. age of Asset;
 - vii. Asset profile and historical profile changes;
 - viii. location of Assets;
 - ix. current operational status;
 - x. failure profile including operational impact assessment ,failure history and reliability analysis aligned with FMECA (Failure Mode, Effects, and Criticality Analysis);
 - xi. maintenance history, including pre-approval activities and warranty history;
 - xii. forward Asset maintenance and Replacement and Refurbishment plans;
 - xiii. manufacturer’s maintenance requirements;
 - xiv. Asset Design Life and remaining life;
 - xv. Asset dependency conditions;
 - xvi. planned, actual, and projected financial cost;
 - xvii. Asset condition data and models;
 - xviii. testing and commissioning records;
 - xix. inventory of spares and consumables;
 - xx. inventory records of spares;
 - xxi. materials and consumable listings;
 - xxii. quotation and prices;
 - xxiii. minimum levels for re-ordering;
 - xxiv. Asset criticality;
 - xxv. special conditions (i.e Environmental, Heritage, Confined space, Dangerous materials etc.); and
 - xxvi. capital acquisition cost, depreciation and residual value.
- (d) The AIS must hold supporting information including:
- i. Manuals;
 - ii. original equipment manufacturer Manuals;
 - iii. cleaning Manuals;
 - iv. Asset Maintenance Standards (i.e. Technical Maintenance Plans – TMP);

- v. training materials, and
 - vi. drawings.
- (e) Asset records must be structured to reflect the requirements of the Asset Management Plan.

2.3. Asset Information System design requirements

- (a) The AIS must:
- i. be a modular enterprise management system, and able to meet all SLR requirements;
 - ii. be able to export data in standard industry format retaining all Asset details and hierarchies;
 - iii. have the capability of integrating Asset data into a common user format;
 - iv. be capable of providing integrated Asset information (including Asset performance) within a "dashboard" format to TfNSW and all approved Stakeholders;
 - v. have the capability for scheduling, prioritising and altering Asset Management Activities;
 - vi. provide records in respect of inventory management, generation of works orders, bills of materials, tracking of costs and Asset warranty data;
 - vii. be capable of recording all Asset management schedules undertaken as far as is practicable using remote electronic input technology;
 - viii. as far as practicable, interface with applicable:
 - A. LRV running, delay capturing and fault attribution systems;
 - B. financial systems;
 - C. procurement systems;
 - D. human resource systems;
 - E. Condition Monitoring Systems;
 - ix. record and report on Asset failure system responses;
 - x. have the capability to produce reports on the performance of all Assets including defect analysis;
 - xi. have the capability of exporting data in commonly used formats (e.g. Excel spreadsheet); and
 - xii. provide support for the development of maintenance and performance models for all Assets during the Full Operations Phase.

2.4. Data population

- (a) OpCo must ensure that any SLR Works Asset management information provided under clause 21.7 of the Operative Provisions is incorporated into the AIS when the information becomes available.

- (b) OpCo must ensure that prior to Completion, the AIS is populated with all relevant Asset management information for all Assets.

2.5. Interim AIS

- (a) Prior to commencing the IWLR Operations Phase must produce an interim AIS that covers all IWLR Assets.
- (b) OpCo must ensure that:
 - i. the interim AIS has been tested and is fully functional and able to provide support for the development of maintenance and performance models for all IWLR Assets during the IWLR Operations Phase;
 - ii. sufficient Staff and TfNSW staff must have been trained in the use of the AIS. OpCo must provide a separate training environment for the AIS to enable training of TfNSW staff without affecting the integrity of the interim AIS data;
 - iii. system administration capability is in place; and
 - iv. relevant TfNSW nominated staff have been given access to the AIS.

2.6. Utilisation of the Asset Information System

- (a) OpCo must:
 - i. ensure that all Asset Management Activities are planned, controlled, recorded and monitored over the full life cycle of the Asset by the AIS;
 - ii. record all Asset information in the AIS and keep such information up-to-date and accurate throughout the Term, including changes arising from:
 - A. configuration changes to Assets;
 - B. like-for-like exchange of components;
 - C. Asset faults reported and corrective actions taken;
 - D. Asset Management Activities undertaken;
 - iii. use the AIS to generate reports on:
 - A. the achieved performance and condition of the Assets;
 - B. Asset use covering as a minimum:
 - i. LRVs and Non-Revenue Vehicles;
 - ii. track;
 - iii. passenger lifts;
 - iv. passenger communication systems;
 - v. passenger security equipment including Help Points; and
 - vi. maintenance plant such as the wheel lathe, LRV wash plant and other maintenance systems;
 - iv. plan and coordinate all Asset Management Activities through the AIS, including:

- A. the prioritisation of work activities;
 - B. the production of work orders;
 - C. track possession and access planning;
- v. ensure that all Asset Management Activities are recorded within 24 hours of the activity taking place;
 - vi. ensure that the AIS maintains accurate current and historical record of all data;
 - vii. use the AIS to support Asset performance analysis with the objective of forecasting failures and exchanging such Assets prior to failure;
 - viii. record the Spares and consumables inventory data within the AIS and ensure that such data is updated as required;
 - ix. ensure that upgrades to the AIS (software, operating system or hardware) are possible without any interruption to Required Services or Operations Activities;
 - x. provide the necessary database tools, Manuals, documentation and training required to enable the maintenance and exporting of AIS data to be performed;
 - xi. provide on-going training on the AIS for TfNSW's staff;
 - xii. conduct validation checks at intervals of at least 6 months to establish the accuracy, validity and currency of all data held in the AIS; and
 - xiii. allow TfNSW to audit the validity, accuracy and currency of all data held within the AIS at any time.



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 41 - Manuals

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1. Overview and scope

1.1. General

- (a) This Appendix describes the minimum requirements which must be met by OpCo with respect to the development and provision of Manuals for SLR.
- (b) The Manuals are:
 - i. Light Rail Operating Manuals containing the policies, rules, procedures and instructions for the operation of SLR; and
 - ii. Operations and Maintenance Manuals containing asset operating and maintenance procedures and instructions for all systems and equipment on SLR.
- (c) OpCo must:
 - i. develop and implement the Manuals as a Condition Precedent to Completion and develop and implement the Manuals for the IWLR prior to the commencement of the IWLR Operations Phase;
 - ii. maintain, update and improve the Manuals at least annually throughout the Term in accordance with the deed:
 - A. to incorporate any changes to applicable law or standards;
 - B. to incorporate any changes to OpCo's Accreditation or other consents, permits or approvals;
 - C. in response to any Modifications which have been agreed by TfNSW;
 - D. to incorporate any experience gained during operation of SLR;
 - iii. undertake the provision of the Services and Asset Maintenance Activities in accordance with the Manuals; and
 - iv. provide TfNSW with a soft copy in native format and at least three bound hard copies of all required Manuals.

1.2. Manual submission for CSELR

- (a) OpCo must submit to TfNSW and the Independent Certifier:
 - i. the draft Manuals 90 days prior to any training taking place in relation to the Manual's content;
 - ii. the initial Manuals, 60 days prior to the commencement of Trial Running, incorporating any comments from the Independent Certifier in relation to non-compliance with the requirements of the deed; and
 - iii. the final Manuals, at the conclusion of Trial Running, incorporating any lessons learnt from the Trial Running.

1.3. Manual submission for IWLR

- (a) OpCo must submit to TfNSW and the Independent Certifier:

- i. the draft Manuals prior to the date that is the latter of 75 days prior to commencement of the IWLR Operations and 30 days after Financial Close;
- ii. the initial Manuals 30 days prior to commencement of the IWLR Operations;
and
- iii. the final Manuals, prior to commencement of the IWLR Operations, incorporating any updates resulting from comments from the Independent Certifier in relation to non-compliance with the requirements of the deed.

2. Minimum requirements

2.1. Manuals

2.1.1. General

- (a) OpCo must provide:
- i. an Operation and Maintenance Manual for each key element of each Asset Category, asset item, and Asset sub-item;
 - ii. a Light Rail Operating Manual for, but not necessarily limited to:
 - A. normal operations;
 - B. Special Event operations;
 - C. degraded operations;
 - D. incident response and management;
 - E. safety and security;
 - F. Stop operations;
 - G. operation of the Light Rail Maintenance and Stabling Facility;
 - H. operation of the Operations Control Centre (OCC);
 - I. asset maintenance operational interfaces;
 - J. management systems operational interfaces;
 - K. operations management and administration;
 - L. operations communications and information dissemination; and
 - M. Staff training and competence management.

2.1.2. Scope and structure

- (a) OpCo must prepare each Manual using the standard format as detailed in sections 2.1.4 and 2.1.5 of this Appendix.
- (b) No section of this standard format is to be omitted. Where a section is not applicable, the words 'Not Applicable' or similar must be included under the section heading.
- (c) Detailed information can be provided in other documents provided that these documents comply with the requirements of this Appendix and are fully cross referenced in the Manuals.
- (d) Where references to other documents are included in the Manuals, the reference must include the reference document number and the location within that document where the relevant information can be found.
- (e) Manuals should be specific to the equipment supplied and not a generic document covering a range of equipment with further varied accessories.
- (f) Manuals must be written in clear concise English and in the present tense.

- (g) Documents must be presented in a format that can be utilised for staff training and familiarisation.
- (h) Diagrams must provide a visual understanding of equipment and the maintenance task.
- (i) Documents must be able to be reproduced without incurring extra fees.

2.1.3. Inclusion of drawings and photographs

- (a) Figures and pictures must be included in the Manuals where this is appropriate. For example, figures and pictures must be used to:
 - i. present information which is difficult to describe by text alone; and
 - ii. provide identification of Special Tools and Equipment, parts and other such items.
- (b) Halftone figures (photographs), where used, must be suitable for electronic scanning and photocopying without loss of detail.

2.1.4. Standard format – Operations and Maintenance Manuals

- (a) The Operations and Maintenance Manuals must be presented in a format consistent with that identified in Table 1 below.

Table 1 Standard format – Operations and Maintenance Manuals

Reference	Description
1) General	<p>Front Cover</p> <p>The front cover of the Operations and Maintenance Manual must contain:</p> <ul style="list-style-type: none"> a) TfNSW logo; b) Sydney Light Rail; c) document description consisting of the key element description (e.g. asset type or discipline); d) Operations and Maintenance Manual; and e) document number.
2) General	<p>Page Headers</p> <p>The page headers of the Operations and Maintenance Manual must contain the project name and the document description.</p>
3) General	<p>Page Footers</p> <p>The page footers of the Operations and Maintenance Manual must contain:</p> <ul style="list-style-type: none"> a) the document number and revision number; and b) page numbers in the format "Page x of y". Page numbers must be continuous throughout the main chapters of the document and not reset at section breaks.

Reference	Description
4) General	<p>Revision History</p> <p>The revision history of the Operations and Maintenance Manual must be included in a "Revision Control Table" at the start of the Manual. The revision control table must provide, for each revision:</p> <ul style="list-style-type: none"> a) revision letter or number with no decimal places; b) date of revision; and c) summary of change(s) in comparison to the previous version.
5) General	<p>Glossary of Terms</p> <p>A glossary of terms for each Operations and Maintenance Manual must be included at the start of the Manual, including all acronyms and technical terms listed in the Manual.</p>
6) General	<p>Table of Contents</p> <p>A table of contents, listing sections and sub-sections of the Operations and Maintenance Manual.</p>
7) Section 1	<p>Purpose of the Operations and Maintenance Manual</p> <ul style="list-style-type: none"> a) brief description of the Operations and Maintenance Manual's purpose, structure and content; b) identification of asset owner, OpCo, subcontractors and other involved parties; and c) tabulation of subcontractors and Utilities Service providers, together with contact details for each significant element of the Assets.
8) Section 2	<p>Description of the System</p> <ul style="list-style-type: none"> a) an overview of sufficient detail to provide the reader with an understanding of the whole of the system; b) location plan / diagram with introductory text to identify the main components of the system and the interfaces; and c) detailed description of each of the elements of the Assets covered by the Operations and Maintenance Manual to complement the location plan, including all equipment, components, systems and items, with a tabulation of dimensions, performance ratings, and asset number, information and attributes.

Reference	Description
9) Section 3	<p>System Interfaces</p> <ul style="list-style-type: none"> a) details of all systems with which this system interfaces; b) description of how these interfaces operate (i.e. how this system works with impacts on the other systems); c) impacts of system failures either by this system or by other systems, impacting on this system; d) summary diagrams of the various utilities and services including communication services, electrical services, drainage, fire services, water treatment and utilities, gas, sewer, stormwater and water; and e) references of where further information for the interfacing systems can be found.
10) Section 4	<p>Detailed Technical Description and Operating Guides</p> <ul style="list-style-type: none"> a) detailed technical description of the asset, aimed at operators and maintainers, and covering each element of the system, including all equipment, components, systems and items; and b) detailed operating guides.
11) Section 5	<p>Safety and Environment</p> <ul style="list-style-type: none"> a) consolidation of all relevant safety issues associated with the system (may be duplicating content of supplier / manufacturer manuals located elsewhere in the Manual), noting all hazards and highlighting specific risks; b) tabulation or listing of emergency contact organisations, personnel or positions, phone / fax numbers and operational procedures relating to emergencies; and c) provision of suppliers' material safety data sheets.
12) Section 6	<p>FMECA / RAMS</p> <ul style="list-style-type: none"> a) statement of whether FMECA was carried out. Explanation of the basis for original design and equipment selected for installation (e.g. performance requirements); and b) statement of whether RAMS was carried out. Reports are to include actual calculations.
13) Section 7	<p>Asset Register</p> <p>Comprehensive Asset register including system subsystems and equipment details.</p>

Reference	Description
14) Section 8	<p>Spares</p> <p>Detail the Spares schedule and the operating period addressed by the Spares and include details of:</p> <ul style="list-style-type: none"> a) the level at which spares are to be held (e.g. component, assembly, sub-system or system level); b) expected failure rates; c) maintenance policies that the spares selection is based on; d) expected procurement lead time; e) ongoing availability of Spares; f) spare parts list including both supplier and manufacturers part numbers and lead time to order; g) Special Tools and Equipment required for maintenance; h) storage requirements, including storage environmental constraints such as temperature and humidity; and any other requirement; and i) Spares schedule, divided into "general spares" and "Insurance spares" categories.
15) Section 9	<p>Maintenance</p> <ul style="list-style-type: none"> a) step by step instructions in preventative and corrective maintenance procedures, nominating the work to be carried out by qualified tradespersons and others, and the designated service periods, such as service hours or distance; b) relevant maintenance standards; c) maintenance instructions for each of the service periods subdivided into the following categories: unit running, unit stopped; d) location of maintenance action (on-system, in workshop etc); e) consumables and Special Tools and Equipment required; f) list of recommended lubricants, stating quantities, methods and frequency for application; g) troubleshooting instructions in tabular form listing "fault", "possible cause" and "remedial action", with testing regimes and instructions; h) schedule of Special Tools and Equipment and facilities; and i) schedule of finishes containing the finishing materials installed with descriptive details, location, manufacturer, colour, cleaning instructions, warranties, maintenance requirements and contacts for supply / repairs.

Reference	Description
16) Section 10	<p>Training Program</p> <ul style="list-style-type: none"> a) program of appropriate training for operation and maintenance personnel; b) train the trainer style Manuals appropriate to the personnel associated with the operation and maintenance of the system; and c) Catalogue of training presentations, course handouts for learners, trainer guidance Manual for each course, examination sheets, video demonstrations of key activities and requirements for any parts, tools or materials required as part of the training programme. These training materials referred to in the catalogue must be included and stored in the quality management system document register.
17) Section 11	<p>Installation, Commissioning & Overhauling</p> <ul style="list-style-type: none"> a) details of standards and procedures for mounting or erecting, wiring or setting up, and commissioning equipment; b) all testing and commissioning certificates and all associated commissioning and test results issued in respect of the SLR Works and Third Party Works for the system / sub-system and equipment; c) system configuration information, including protection settings for electrical equipment; and d) unless otherwise contained in the technical maintenance plans or service schedules, step by step instructions and procedures for complete overhauls, indicating those procedures to be carried out by qualified tradespersons, described under at least the following subheadings: <ul style="list-style-type: none"> i. dismantling; ii. cleaning, inspection, repair and adjustment; iii. reassembly; and iv. final checks and unit running.
18) Section 12	<p>Manufacturer's / Supplier's Operations and Maintenance Manuals, Equipment Warranties and Compliance Certificate</p> <ul style="list-style-type: none"> a) manufacturer's operations and maintenance manuals must as a minimum include the LRVs, maintenance vehicles, substations, OCC, traction power systems, communication systems, wheel lathe, wash plant, sanding plant, maintenance and stabling facility plant and equipment (can be embedded in the Operations and Maintenance Manual or delivered as a separate referenced document); b) relevant warranties and guarantees and Design Life for each major item of equipment; and c) compliance certificates as required by specific items of plant, equipment and works.

Reference	Description
19) Section 13	<p>Other Information</p> <p>a) relevant information not specifically covered in the previous sections.</p>
20) Section 14	<p>Document Reference List</p> <p>a) reference list of all documents and drawings referred to in the body of the Operations and Maintenance Manual as well as those not specifically referenced but which are required to complete the documentation related to the asset;</p> <p>b) references must be listed in order of type and document number, and provide the title of each document;</p> <p>c) examples of contents are:</p> <ul style="list-style-type: none"> i. Asset registers; ii. calculations; iii. certificates, warranties and guarantees; iv. commissioning results; v. drawings; vi. procedures; vii. quality forms and records; viii. reference Manuals; ix. schedule of finishes; x. service schedules; xi. software; xii. Spares schedule; xiii. technical specifications and reports; xiv. technical maintenance plans; and xv. training Manuals.

2.1.5. Standard format – Light Rail Operating Manuals

- (a) The Light Rail Operating Manuals must be presented in a format consistent with that identified in Table 2 below. As a minimum Light Rail Operating Manuals must include where relevant separate Operating Manuals for the:
- i. LRVs;
 - ii. maintenance vehicles;
 - iii. substations;

- iv. OCC systems;
- v. traction power systems;
- vi. communication systems;
- vii. wheel lathe;
- viii. wash plant;
- ix. sanding plant;
- x. Light Rail Maintenance and Stabling Facility plant and equipment;
- xi. track and track infrastructure;
- xii. bridges; and
- xiii. tunnels.

Table 2 Standard format – Light Rail Operating Manuals

Reference	Description
1) General	<p>Front Cover</p> <p>The front cover of the Light Rail Operating Manuals must contain:</p> <ul style="list-style-type: none"> a) The TfNSW logo; b) Sydney Light Rail; c) the document description consisting of the key element description (e.g. area or discipline) and the words "Light Rail Operating Manual"; and d) the document number.
2) General	<p>Page Headers</p> <p>The page headers of the Light Rail Operating Manual must contain the project name and the document description.</p>
3) General	<p>Page Footers</p> <p>The page footers of the Light Rail Operating Manual must contain:</p> <ul style="list-style-type: none"> a) the document number and revision number; and b) page numbers in the format "Page x of y". Page numbers must be continuous throughout the main chapters of the document and not reset at section breaks.
4) General	<p>Revision History</p> <p>The revision history of the Light Rail Operating Manual must be included in a "Revision Control Table" at the start of the Manual. The revision control table must provide, for each revision:</p> <ul style="list-style-type: none"> a) revision letter or number with no decimal places; b) date of revision; and

Reference	Description
	c) summary of change(s) in comparison to the previous version.
5) General	<p>Glossary of Terms</p> <p>A glossary of terms for each Light Rail Operating Manual must be included at the start of the Manual, including all acronyms and technical terms listed in the Manual.</p>
6) General	<p>Table of Contents</p> <p>A table of contents, listing sections and sub-sections of the Light Rail Operating Manual.</p>
7) Section 1	<p>Purpose of the Light Rail Operating Manuals</p> <p>a) brief description of the Light Rail Operating Manual's purpose, structure and content;</p> <p>b) identification of document owner and other involved parties; and</p> <p>c) tabulation of relevant interfacing parties, together with contact details for each significant element of the Assets.</p>
8) Section 2	<p>Operating Policies and Standards</p> <p>a) inclusion of the relevant policies (e.g. safety, customer service); and</p> <p>b) inclusion of the relevant operating standards.</p>
9) Section 3 onwards	<p>The Rules, Procedures and Instructions for the particular area</p> <p>a) comprehensive step by step rules, procedures and instructions for the operations processes to be followed for the particular subject matter and area of operation.</p>
10) Section 4	<p>Training Program</p> <p>a) program of appropriate training for operation and maintenance personnel;</p> <p>b) train the trainer style Manuals appropriate to the personnel associated with the operation and maintenance of the system; and</p> <p>c) catalogue of training presentations, course handouts for learners, trainer guidance Manual for each course, examination sheets, video demonstrations of key activities and requirements for any parts, tools or materials required as part of the training programme. These training materials referred to in the catalogue must be included and stored in the quality management system document register.</p>
11) Section 5	<p>Manufacturer's / Supplier's Operations and Maintenance Manuals.</p> <p>a) manufacturer's operations and maintenance manuals (can be embedded in the Light Rail Operating Manual or delivered as a separate referenced document).</p>
12) Section 6	<p>Other Information</p> <p>a) relevant information not specifically covered in the previous sections.</p>
13) Section 7	<p>Document Reference List</p>

Reference	Description
	<p>a) reference list of all documents and drawings referred to in the body of the Light Rail Operating Manual as well as those not specifically referenced but which are required to complete the documentation related to the asset.</p> <p>b) references must be listed in order of type and document number, and provide the title of each document.</p> <p>c) examples of contents are:</p> <ul style="list-style-type: none"> i. asset registers; ii. calculations; iii. drawings; iv. procedures; v. quality forms and records; vi. reference Manuals; and vii. training Manuals.



**Transport
for NSW**

**Request for Proposal
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Schedule E1 Scope and Performance Requirements
Appendix 42 – Additional Environmental
Requirements**

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1. Overview and Scope

1.1. General

- (a) OpCo must ensure that the requirements of the NSW Government Environmental Management System Guidelines and AS/NZS ISO 14001:2004 are implemented as they apply to OpCo's Activities.
- (b) The environmental requirements contained within this Appendix are in addition to any requirements prescribed in the Environmental Requirements.

2. Environmental Representative

- (a) OpCo must action any findings by the Environmental Representative (ER) from site inspections or document reviews within the timeframes reasonably required by the ER.
- (b) OpCo must include in the Construction Environmental Management Plan (CEMP) a lead performance indicator for close-out of the findings of the ER within the timeframes specified in the CEMP or as reasonably required by the ER.

3. Environmental Management System

- (a) OpCo must maintain an accredited Environmental Management System (EMS) under AS/NZS ISO 14001:2004 for the duration of its activities.
- (b) OpCo must require that all OpCo Contractors work under the EMS.

4. Environmental Policy

- (a) OpCo must develop and implement an environmental policy which commits OpCo to meet the requirements of the Environmental Documents and these environmental requirements.
- (b) The policy must be signed by the OpCo Chief Executive Officer or a person with suitable delegated authority.
- (c) The policy must complement and support the achievement of sustainability requirements as detailed in Appendix 7 (*Sustainability*).
- (d) The policy must be explained to and understood by the employees of OpCo and OpCo's Contractors.

5. System Planning

5.1. Compliance management

- (a) OpCo must work with TfNSW to develop, implement and maintain an environmental assurance framework to track compliance with the environmental documents.
- (b) OpCo must submit to the TfNSW Representative a report every six months that demonstrates ongoing compliance with the Environmental Documents.

5.2. Environmental risk assessment

- (a) OpCo must undertake a comprehensive and site-specific environmental risk assessment in conjunction with construction personnel and the Environmental Representative, prior to the commencement of Delivery Activities (including pre-construction works).

5.3. Environmental performance indicators

- (a) OpCo must establish lead environment performance indicators for monthly reporting environmental performance to the TfNSW Representative.
- (b) As a minimum the environmental indicators must include:
 - i time taken to address and complete environmental improvements resulting from ER site inspections;
 - ii specific environmental performance data as required in the CEMP and / or the Environmental Documents, and graphical analysis and presentation to demonstrate changes (improvement) over time; and
 - iii environmental awareness monitoring across the OpCo and OpCo Contractors workforces.

6. Environmentally sensitive areas

- (a) OpCo must ensure that the details and locations of environmentally sensitive areas are clearly identified and specific protection measures communicated through:
 - i site inductions and site-specific training (e.g. toolbox talks); and
 - ii inspections, work plans and physical marking (if possible).
- (b) OpCo must undertake regular, rigorous monitoring and inspection to ensure that environmental protection measures are effective for environmentally sensitive areas.
- (c) OpCo must develop and implement a project-wide environment monitoring program that specifically identifies environmentally sensitive areas.

7. Implementation

7.1. Resources and responsibilities

- (a) OpCo must provide sufficient personnel meeting the competency requirements and experience in construction environmental management to ensure effective implementation of the CEMP(s) during delivery.
- (b) OpCo's environmental manager must be based at the location of the Delivery Activities and be present during all inspections undertaken by the ER.

7.2. Environmental requirements as part of site inductions

- (a) OpCo must ensure its employees and the employees of OpCo's Contractors engaged in carrying out the Delivery Activities are inducted and trained in the environmental requirements for the Delivery Phase to achieve a level of awareness and competence appropriate to their assigned activities.
- (b) The environmental policy (as per section 4 of this Appendix) must form part of the site induction.
- (c) The environmental requirements of the induction must include training of relevant persons in the efficient use of plant and materials to minimise all potential environmental impacts including noise, air pollution, water pollution, waste, contamination and hours of work and any other medium to high environmental risks identified by the risk assessment.
- (d) OpCo must have procedures in place to make sure that any person who has not been inducted does not work on the construction aspects of the Delivery Activities.

7.3. Competence, training and awareness

- (a) OpCo must develop and deliver environmental awareness programs across OpCo and OpCo's Contractors employees to continually improve the level of environmental awareness.
- (b) OpCo must develop and implement environmental training programs that cover all relevant environmental issues, direction on the proper implementation and maintenance of erosion and sedimentation controls, out-of-hours works, sensitive receivers and environmentally sensitive areas / aspects.
- (c) OpCo must develop and document a training plan that describes the minimum level of training, experience and qualifications required for employees of OpCo and OpCo's Contractors, scheduled dates for training and procedures for training.
- (d) OpCo must establish and maintain a register of environmental training carried out including dates, names of people who have completed the training and details of the trainer.
- (e) OpCo must regularly assess environmental awareness across OpCo's and OpCo's Contractors' employees, to maintain and measure levels of environmental awareness.

7.4. Notification of incidents

- (a) During the Delivery Activities OpCo must notify TfNSW's Representative and other nominated TfNSW personnel of all environmental incidents in accordance with Environmental Incident Classification and Reporting – 9TP-PR-105.

7.5. Emergency planning and response

- (a) OpCo must comply with AS/NZS ISO 14001:2004 (specifically clause 4.4.7) in respect to emergency planning and response.
- (b) OpCo must prepare a program of environmental incident simulation drills, and run an environmental scenario drill at least annually.

7.6. OpCo's Contractor requirements

- (a) OpCo must develop and maintain a robust system for informing OpCo's Contractors regarding environmental obligations for undertaking works for the Delivery Activities.
- (b) When engaging OpCo's Contractors, OpCo must:
 - i include environmental management requirements and conditions consistent with the deed in the planning, selection and management of OpCo's Contractors;
 - ii ensure OpCo's Contractors are advised in writing of the Environmental Requirements and, if relevant, the Planning Approval conditions and any other applicable Authority requirements, prior to commencing any work;
 - iii undertake a review of OpCo's Contractors' documentation to verify compliance with the CEMP; and
 - iv undertake appropriate monitoring of each OpCo's Contractors environmental protection measures to ensure that the specified environmental protection requirements are effectively implemented and maintained.

7.7. Dust and air management

- (a) OpCo must take all reasonable steps to minimise dust and air pollution arising from the Delivery Activities. Mitigation measures must be implemented and may include:
 - i ensuring that all loads entering or leaving the Construction Site are covered;
 - ii ensuring that adequate truck and equipment washing facilities are in place;
 - iii ceasing works when conditions are excessively dusty until dust suppression can be adequately carried out;
 - iv maintaining vegetation as long as possible prior to clearing;
 - v revegetating as soon as possible after or, where possible, during works, including use of interim sterile cover crops; and
 - vi regular watering of substrates and temporary access roads.
- (b) The proposed mitigation measures must be documented in the CEMP.

7.8. Water, erosion and sediment management

- (a) OpCo must supply, install and maintain adequate stormwater and runoff controls in accordance with "The Blue Book" (Managing Urban Stormwater: Soils and Construction 2004 - 4th Edition (Landcom / Department of Housing)), which may include:
 - i erosion controls;
 - ii sediment controls;
 - iii water management controls; and

- iv strict containment of washed-down concrete trucks and pumps.
- (b) OpCo must undertake daily inspections to verify the adequacy of its environmental control measures, document these inspections and retain a record at the Construction Site.

7.9. Flora and fauna

- (a) OpCo must minimise the footprint of Delivery Activities, as far as practicable.
- (b) OpCo must identify and implement methods to reduce the removal of trees during Delivery Activities.
- (c) OpCo must protect any vegetation and trees to be retained in accordance with measures set out in the CEMP. Trees in close proximity to Delivery Activities must be protected with timber post and wire, or other sturdy protective measures.
- (d) In the event of physical damage to any tree to be retained, OpCo must promptly engage the services of a qualified arborist to inspect the damage and recommend a progressive course of action to be taken by OpCo to rectify the damage.

7.10. Car parking

- (a) OpCo must minimise the number of on-road car spaces that are affected during the Delivery Phase and Operations Phase.
- (b) OpCo must develop and implement a car parking staging strategy to align with staging of Delivery Activities to manage and minimise loss of car parking.
- (c) OpCo must nominate the retained number of parking spaces, and the minimum number of parking spaces to be provided for each stage of the Delivery Activities.
- (d) OpCo must investigate alternative car parking arrangements for locations where temporary loss of parking will occur during Delivery Activities.

7.11. Operational requirements from Approvals for Light Rail between the CBD and Wentworth Park

- (a) OpCo must in carrying out the Operations Activities:
 - i comply with noise restrictions within the Capital Theatre, being:
 - A. NR 18 in the body of the theatre;
 - B. NR 25 on the stage;
 - ii comply with City of Sydney's electromagnetic interference restrictions;
 - iii maintain loading and setdown access to the Capital Theatre in Hay Street and include how this will be achieved in the Traffic and Transport Management Plan;
 - iv limit LRV travel speed to no greater than 20 kilometres per hour in the shared zone between Pitt and George Streets;
 - v prevent damage to stonework at Central Station, or if any stonework damage is caused at Central Station as a result of Operations Activities then OpCo must repair the damage as soon as reasonably possible; and
 - vi meet noise requirements of the Environmental Protection Authority, being
 - A. LAeq (24 hour) = 60dBA (Melbourne Standard);
 - B. for the nearest residential receptor or any other critical noise sensitive location;

- C. LAeq (12 hour) 7.00am to 7.00pm not to exceed 60 dBA;
- D. LAeq (4 hour) 7.00pm to 11.00pm not to exceed 55 dBA; and
- E. LAeq (8 hour) 11.00pm to 7.00am not to exceed 50 dBA;

7.12. Operational requirements for the Casino

Except as expressly set out in this deed, OpCo must ensure that operation of the SLR through the Casino complies with the requirements of this section 7.12.

(a) Operating noise and vibration criteria

In carrying out the Operations Activities, the noise and vibration generated by the SLR at the Casino should not exceed the following criteria:

- i. Tactile (Ground-Borne) Vibration Criteria - tactile (ground-borne) vibration measured at the base of building columns adjacent to the light rail track at the Casino:

Octave Band Centre (Hz)/ Location	31.5	63	125	250
Lyric Theatre – Grid 16/Q	100	84	77	69
Showroom Theatre – Grid 35/PQ	101	82	74	69
Theatre Foyers – Grid 24/P	105	88	76	73

- ii. Casino Noise Level Criteria - regenerated (ground-borne) noise measured in the centre of each occupied space:

Noise level within Casino		
Lyric Theatre	≤NR15 (25 dBA) No response required	>NR15 (25dBA) Response required in accordance with clause 7.12(b)
Show Theatre	≤NR30 (35 dBA) No response required	>NR30 (35dBA) Response required in accordance with clause 7.12(b)
Theatre Foyers	≤ 50 dBA No response required	>50 dBA Response required in accordance with clause 7.12(b)

(b) Location and method of measurement

- i. In relation to the Tactile (Ground-borne) Vibration:

- A ground vibration levels are to be measured at the base of building columns adjacent to the light rail track closest to the above grid reference during the passage of LRVs. Seatings for the transducers are to be prepared on the non-isolated structure to allow the measurements; and

- B measurements are to be carried out using a Triaxle Transducer located so that one axis is horizontal and perpendicular to the track. The maximum octave band RMS velocity levels for each LRV pass-by are to be measured in each axis for each of the 20 consecutive LRV passbys. The arithmetic average of the measured levels is to be calculated for each axis.
- ii. In relation to the Casino Noise Level Criteria:
 - A regenerated (ground borne) noise levels measured in the centre of each occupied space within the Casino. The maximum level in each octave band from 31H to 8kH is to be measured during each of 20 consecutive LRV passbys. The arithmetic average of the twenty maximum levels recorded in each octave band is to be recalculated to determine the average octave band levels. From these, the overall A-weighted level and noise rating is to be calculated. All noise level measurements are to be carried out using a Sound Level Meter complying with the Type 1 requirements of Australian Standard 1259.1 Sound Level Meters- Part 1:Non-Intergrating;
 - B noise levels should be measured when the light rail is operating but no other sources are present; and
 - C the measurement method should take account of any other background noise sources that are present to determine the net contribution of light rail operations and measurements should be taken only when other noise sources are minimised.
- iii. Frequency of measurement will be as specified by TfNSW.

(c) Response Plan

If either the Tactile (Ground-Borne) Vibration Criteria or the Casino Noise Level Criteria at section 7.12(a) is exceeded, OpCo must:

- i immediately notify TfNSW and provide all initial details as required by TfNSW;
- ii provide all information and assistance required by TfNSW in order for TfNSW to comply with its obligations under the Deed of Release between the Department of Transport, New South Wales Casino Control Authority and the SHCP dated 15 August 1997 (Deed of Release);
- iii consult with TfNSW and SHCP and provide any information as may be reasonably required in order for TfNSW to comply with the Deed of Release; and
- iv take all steps required by TfNSW to implement temporary remedial action and long term remedial action to mitigate any effect as contemplated by the Deed of Release.

8. Control of environmental records

- (a) OpCo must comply with AS/NZS ISO 14001:2004 clause 4.5.4 Control of Records.
- (b) OpCo must demonstrate compliance with the environmental requirements through concise and appropriately detailed environmental records that include:
 - i details of qualifications of personnel;
 - ii design review records (where applicable);
 - iii monitoring and inspection reports;
 - iv induction and training records;
 - v reports of environmental issues, Incidents and complaints and action taken to rectify these;
 - vi internal and external audit reports;
 - vii evidence of action taken as a result of a recommendation from such meetings;
 - viii records of OpCo's Contractors monitoring their own activities;
 - ix records of OpCo's monitoring of OpCo's Contractors' activities;
 - x non-conformance and corrective action records; and
 - xi risk management records.
- (c) OpCo must retain all environmental records for a period of no less than 5 years from the Date of Completion.
- (d) OpCo must provide the TfNSW Representative with copies of the environmental records as listed in Table 1. For those records not required to be stored on-site, they must be forwarded to the TfNSW Representative within three Business Days of the request.

9. Environmental Records

- (a) OpCo must keep environmental records as listed in Table 1.
- (b) All records must be made available to the TfNSW Representative.
- (c) The documents identified in Table 1 with an "*" must be forwarded to the TfNSW Representative, and OpCo must ensure that the TfNSW Representative has the latest version of the records at all times.
- (d) Where OpCo is required to forward records to the TfNSW Representative, OpCo must submit one original and three copies (one of which is unbound) of each document (including draft and final reports, specifications, drawings, plans, etc) for the TfNSW Representative's review.
- (e) OpCo must submit an electronic copy on CD / DVD in .pdf and native formats (such as Microsoft Word, Microsoft Excel, CAD in *.dwg or *.dgn) of documents.

Table 1: Environmental Records

Required Record or Reference	TfNSW Representative to be issued with
Environmental manual, environmental policy, Construction Environmental Management Plan, and applicable Environmental Management System procedures.	*
List of who holds issued documents on a register of current document issue / revisions	
Index of all environmental records (prior to Completion)	*
Records of management reviews for the project	
Personnel qualifications / skills records	
Induction and training records	
Environmental control and constraints maps	*
Records of work environment controls	
Minutes of tender / Contract reviews	
Evidence of environmental inputs / outputs and outputs into the design process including sustainability initiatives	
Surveillance, audit of OpCo's Contractors' environmental performance and controls	*
Procedures describing how to control work processes and continual demonstration of effective environmental controls	*
Register of equipment with calibration frequency and certificates	
Work method statements	*

Required Record or Reference	TfNSW Representative to be issued with
Schedule of Inspection and test plans	*
Inspection and test plans	*
Customer satisfaction records and actions taken to improve customer satisfaction	
Audit reports	*
Records / checklists of inspection and testing	*
Contractor's non-conformance reports and register	*
TfNSW environmental non-compliance reports	*
Records of analysis of data generated during the Term	
Corrective action reports and register	
TfNSW system deficiency notices	*
Preventive action reports and register	*



**Transport
for NSW**

Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 43 – Project Plan Requirements

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Execution Version

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1. Overview and Scope

1.1 General

- (a) This Appendix describes the requirements for the Project Plans required for the SLR.

1.2 Scope

- (a) Each Project Plan must contain, as a minimum, the contents specified in the relevant sections of this Appendix.
- (b) Each Project Plan must also contain the following information:
 - i. the purpose and objectives of the Project Plan;
 - ii. any policy statements that relate to the Project Plan;
 - iii. a table cross-referencing OpCo's information, documentation, policies, processes and procedures associated to the Project Plan;
 - iv. a reference list that identifies any Legislation, Authority Approvals, standards, codes, programs, agreements and proposed agreements, drawings and reports that are applicable with the Project Plan;
 - v. the reporting methodology to be used to address the specified reporting requirements in the relevant sections of SPR Appendix 10 (*Reporting Requirements*), including any reporting templates to be used; and
 - vi. a compliance table that cross references the specific Project Plan requirements documented in this Appendix, including associated reference documents, with the applicable Project Plan section number.
- (c) Where Project Plan content requirements overlap, OpCo may avoid duplication by cross referencing.
- (d) Except as otherwise required (including in paragraph (e) below), OpCo may combine and integrate the requirements of the various Project Plans detailed in this Appendix.
- (e) The Strategic Business Plan, Safety and Systems Assurance Plan, Construction Environmental Management Plan, Operations Phase Environmental and Sustainability Plan and the Safety Management Plan must be produced separately.
- (f) Where OpCo elects to combine Project Plans, all the requirements pertaining to individual Project Plans detailed in this Appendix must be addressed in the combined Project Plan or Project Plans.
- (g) OpCo must clearly identify in any combined Project Plan which Project Plan requirements detailed in this Appendix have been addressed in the combined plan.
- (h) OpCo acknowledges that the initial Project Plans do not necessarily meet all requirements of the deed including this Appendix, but will provide:
 - i. the minimum basis for content of the relevant Project Plan, without limiting clause 8 of the Operative Provisions; and
 - ii. minimum OpCo commitments in relation to the relevant Project Plan.

2. Project Plan Submission and Update

- (a) All Project Plans identified in this Appendix must be submitted and updated:
 - i. in accordance with the times set out in Table 1; and
 - ii. where reasonably requested or required by TfNSW's Representative or any Authority.
- (b) Unless otherwise stated in Table 1, the Project Plans must be submitted to TfNSW's Representative and, during the Delivery Phase, to the Independent Certifier as required by clause 8 of the Operative Provisions.
- (c) The Project Plans must be approved by OpCo's relevant management representative and OpCo's chief executive officer (or equivalent) prior to submission.
- (d) OpCo must undertake the ongoing development, amendment and updating of the Project Plans to ensure they remain aligned with project priorities, risk areas and requirements, including taking into account:
 - i. status and progress of OpCo's Activities;
 - ii. changes in the design, delivery and/or operations processes and conditions;
 - iii. lessons learnt during the delivery and/or operations processes and activities;
 - iv. changes in other related Project Plans;
 - v. requirements and matters that are not covered by the existing Project Plans;
and
 - vi. changes to the Project Plans as directed by TfNSW's Representative under the deed.

Table 1 Submission and update of Project Plans

Project Plan	Initial Project Plan	Project Plan submission date	Update frequency	Applicable to:			
				IWLR Operations Phase	Delivery Phase	Full Operations Phase	
1	Strategic Business Plan	Nil	50 Business Days from date of the deed	Annually	✓	✓	✓
2	Quality Management Plan	Nil	50 Business Days from date of the deed	Annually	✓	✓	✓
3	Construction Environmental Management Plan	Nil	60 Business Days from date of the deed	Annually until Completion		✓	
4	AEO Authorisation Management Plan	Nil	50 Business Days from date of the deed	6 monthly	✓	✓	✓
5	Safety and Systems Assurance Management Plan	Schedule F5	50 Business Days from date of the deed	Annually	✓	✓	✓
6	Accreditation Management Plan	Nil	50 Business Days from date of the deed	Annually	✓	✓	✓
7	Safety Management Plan	Nil	50 Business Days from date of the deed	Annually	✓	✓	✓

Project Plan	Initial Project Plan	Project Plan submission date	Update frequency	Applicable to:			
				IWLR Operations Phase	Delivery Phase	Full Operations Phase	
8	Risk Management Plan	Nil	50 Business Days from date of the deed	6 monthly	✓	✓	✓
9	Stakeholder and Community Engagement Plan	Nil	60 Business Days from date of the deed	Quarterly until Completion		✓	✓
10	Configuration Management Plan	Nil	100 Business Days from date of the deed	Annually		✓	✓
11	Delivery Phase Sustainability Plan	Nil	60 Business Days from date of the deed	Annually until Completion		✓	
12	Training Management and Competency Plan	Nil	60 Business Days from date of the deed	Annually	✓	✓	✓
13	ICT & Software Systems Management Plan	Nil	100 Business Days from date of the deed	Annually, and at Design Stage 1, Design Stage 2 and Design Stage 3	✓	✓	✓
14	Interface Management Plan	Nil	50 Business Days from date of the deed	Annually	✓	✓	✓
15	Workplace Relations Management Plan	Schedule F6	100 Business Days from date of the deed	Annually	✓	✓	✓

Project Plan	Initial Project Plan	Project Plan submission date	Update frequency	Applicable to:			
				IWLR Operations Phase	Delivery Phase	Full Operations Phase	
16	Human Resources Plan	Nil	100 Business Days from date of the deed	Annually	✓	✓	✓
17	Business Continuity Plan	Nil	50 Business Days from date of the deed	Annually	✓		✓
18	Operations Phase Environmental and Sustainability Plan	Nil	60 Business Days from date of the deed	Annually	✓		✓
19	Skills and Employment Delivery Plan	Nil	100 Business Days from date of the deed	Annually		✓	
20	Delivery Management Plan	Nil	50 Business Days from date of the deed	Annually until Completion		✓	
21	Construction Management Plan	Nil	60 Business Days from date of the deed	Annually until Completion		✓	
22	Utility Service Treatment Plan	Schedule F8	50 Business Days from date of the deed	Quarterly until Completion		✓	
23	Manufacturing and Procurement Plan	Nil	100 Business Days from date of the deed	Annually until Completion		✓	

Project Plan	Initial Project Plan	Project Plan submission date	Update frequency	Applicable to:			
				IWLR Operations Phase	Delivery Phase	Full Operations Phase	
24	Design Management Plan	Nil	50 Business Days from date of the deed	Annually		✓	✓
25	Traffic and Transport Management Plan	Schedule F7	50 Business Days from date of the deed	Quarterly until Completion		✓	✓
26	Testing and Commissioning Plan	Nil	150 Business Days from date of the deed	Annually until Completion		✓	
27	Electromagnetic Compatibility Plan	Nil	240 Business Days from date of the deed	Annually		✓	✓
28	Stray Current Plan	Nil	50 Business Days from date of the deed	Annually	✓	✓	✓
29	Property Management Plan	Nil	50 Business Days from date of the deed	Annually		✓	
30	Operations Management Plan	Nil	100 Business Days from the date of the deed	Annually	✓		✓
31	Transition In Management Plan	Schedule F3	100 Business Days from the date of the deed	N/A	✓		

Project Plan	Initial Project Plan	Project Plan submission date	Update frequency	Applicable to:			
				IWLR Operations Phase	Delivery Phase	Full Operations Phase	
32	Operational Readiness Plan	Nil	100 Business Days from date of the deed	Annually until Completion	✓		✓
33	Customer Service Plan	Schedule F2	50 Business Days from date of the deed	Annually	✓	✓	✓
34	Revenue Protection Plan	Nil	100 Business Days from the date of the deed	Annually	✓		✓
35	Asset Management Plan	Schedule F4	100 Business Days from date of the deed	Annually	✓	✓	✓
36	Maintenance Plan	Nil	100 Business Days from the date of the deed	Annually	✓	✓	✓
37	Security Management Plan	Nil	100 Business Days from date of the deed	Annually	✓	✓	✓
38	Incident Management Plan	Nil	100 Business Days from date of the deed	Annually	✓	✓	✓
39	Transport Integration Plan	Nil	120 Business Days from date of the deed	Annually	✓		✓

Project Plan		Initial Project Plan	Project Plan submission date	Update frequency	Applicable to:		
					IWLR Operations Phase	Delivery Phase	Full Operations Phase
40	Transition Out Management Plan	Nil	100 Business Days from the date of the deed	Annually	✓		✓

3. Project Plan Requirements

3.1 Contract Management Plans

3.1.1 Strategic Business Plan

- (a) OpCo must develop, implement and maintain a Strategic Business Plan which identifies how OpCo intends to manage the SLR PPP and OpCo's key relationships over the Delivery Phase, IWLR Operations Phase and Full Operations Phase.
- (b) The key purpose of the Strategic Business Plan is to:
 - i. describe OpCo's overall vision and management approach; and
 - ii. demonstrate how the project objectives will be achieved.
- (c) The Strategic Business Plan must, as a minimum, address and detail:
 - i. the vision statement for the SLR;
 - ii. partnering and working relationships;
 - iii. management approach and key initiatives;
 - iv. the management team and structure;
 - v. key entities;
 - vi. management plans and systems; and
 - vii. key activities.
- (d) The Strategic Business Plan must include an executive summary which must provide a concise summary of the Strategic Business Plan's key features during the:
 - i. Delivery Phase;
 - ii. IWLR Operations Phase;
 - iii. transition from Delivery Phase to Full Operations Phase;
 - iv. Full Operations Phase; and
 - v. transition out phase.
- (e) The vision statement must outline OpCo's overall vision for the SLR PPP and OpCo's commitments that demonstrate how:
 - i. the vision is to be delivered; and
 - ii. the SLR project objectives will be achieved.
- (f) The partnering and working relationships component of the Strategic Business Plan must include a:
 - i. statement of partnering that incorporates the following four elements: role clarity, commitment, trust and culture. The statement must include details on the Delivery Phase, IWLR Operations and Full Operations Phase with particular emphasis on:

- A. how OpCo will work in a partnering relationship with TfNSW particularly in the areas of service delivery, customer satisfaction and transport planning;
 - B. how OpCo will work cooperatively with other public transport providers, regulators, the community and other stakeholders;
 - C. the proposed approach to create and deliver sustained value;
 - ii. statement of how OpCo will manage working relationships with and between the Core Contractors and Significant Contractors during the Delivery Phase, IWLR Operations and Full Operations Phase;
 - iii. description of initiatives that are to be implemented to promote partnering and good working relationships during:
 - A. the Delivery Phase, IWLR Operations and Full Operations Phase generally; and
 - B. the period up to one year after the next update of the SPR is due.
- (g) The management approach and key initiatives component of the Strategic Business Plan must:
 - i. detail the overall management strategies and integrated approach to:
 - A. key systems and processes, including third party accreditations;
 - B. responding to the requirements of the Rail Safety National Law, the Rail Safety Regulations and the Safety Management System;
 - ii. include an outline of the approach to ensure the delivery of whole of life outcomes;
 - iii. include an outline of initiatives that will be implemented to ensure high quality Customer service provision during the:
 - A. period up until the next Strategic Business Plan update;
 - B. Delivery Phase;
 - C. initial 12 months of operation of IWLR;
 - D. initial 12 months of operation of SLR post Completion;
 - E. first five years of operation of SLR post Completion;
 - F. remainder of the Term;
 - iv. include an outline of how the future proofing is being addressed; and
 - v. include an outline of approach to Asset management.
- (h) The management team and structure component of the Strategic Business Plan must:
 - i. provide OpCo's overall senior (executive) management personnel and organisation structures for the Delivery Phase, IWLR Operations, transition from delivery to operations, and the Full Operations Phase, including:
 - A. key personnel;

- B. overall senior management personnel and reporting structure within OpCo and the Core Contractors and Significant Contractors;
- C. interfaces with the management teams associated with implementing OpCo's Activities, including those covered by other Project Plans;
- ii. identify any changes planned to the organisation structures or senior (executive) management personnel in the period up until the next Strategic Business Plan update;
- iii. provide a strategy and nominated resource pool for supplementing or replacing the key personnel in the event that particular individuals are no longer available;
- iv. provide curriculum vitae of the personnel nominated for each role identified as an attachment to the Strategic Business Plan;
- v. provide role descriptions for each position in the management team structure as an attachment to the Strategic Business Plan and identifying the:
 - A. responsibilities;
 - B. levels of authority; and
 - C. necessary qualifications, skills and experience.
- (i) The key entities component of the Strategic Business Plan must:
 - i. identify key entities (including Core Contractors and Significant Contractors) responsible for each major activity during the Delivery Phase, IWLR Operations and the Full Operations Phase;
 - ii. outline for each entity the:
 - A. scope of work;
 - B. contracting relationship through to OpCo; and
 - C. period of the contract.
- (j) The management plans and systems component of the Strategic Business Plan must provide:
 - i. a description of the overall strategy for management systems, processes and plans, including their purpose;
 - ii. a description of the processes for establishing, integrating and maintaining all management systems, processes and plans;
 - iii. the structure showing all the Project Plans and demonstrating how each interfaces with, or relates to, the other Project Plans, including the Strategic Business Plan;
 - iv. a cross referencing plan that identifies the relationship between the proposed Project Plans and the plans required by this Appendix. This should identify where the requirements of this Appendix will be fulfilled;
 - v. for each proposed Project Plan that differs from those in this Appendix provide a summary that outlines:
 - A. the plan's purpose;

- B. the plan's content, including any content additional to that required by this Appendix;
- C. the key resources to be applied in developing and implementing the plan;
- D. other information that OpCo considers relevant;
- vi. a structure and description of all management systems and processes that clearly demonstrates how they interface with, or relate to, the other systems and processes and to the Project Plans;
- vii. details on business systems and processes to be implemented and utilised including:
 - A. purpose and description;
 - B. provider;
 - C. resources, including personnel and system requirements;
 - D. status, including timing for implementing or updating;
 - E. accessibility for TfNSW;
 - F. relevance to achieving the Project objectives; and
- viii. details on OpCo's information technology strategy and forward planning, including those related to recurring activities, incremental upgrades, updates and maintenance and operation of information technology assets.
- (k) The Strategic Business Plan must include a summary of key activities to be undertaken in the period up until the next Strategic Business Plan update including:
 - i. key mobilisation and demobilisation activities; and
 - ii. planned achievement of key milestones.

3.1.2 Quality Management Plan

- (a) OpCo must develop, implement and maintain a Quality Management Plan which identifies how OpCo will comply with the quality requirements of the deed.
- (b) The Quality Management Plan must comply with AS/NZS/ISO9001.
- (c) The Quality Management Plan must satisfy the requirements of Appendix 11 (*TfNSW's General Specification Q6 – Quality Management System*) in SPR Appendix 11 (*TfNSW's General Specifications*).
- (d) The Quality Management Plan must contain a schedule of identified Hold Points and Witness Points and identify the nominated Authority for the release of Hold Points. The schedule of Hold Points and Witness Points must include, as a minimum:
 - i. all Hold Point and Witness Points nominated in the SPR and associated appendices and as nominated by the Independent Certifier as contemplated by clause 5.4(g)(iii) of the Operative Provisions;
 - ii. any Witness Points required by TfNSW's Representative; and
 - iii. sufficient additional Hold Points as necessary to ensure that OpCo's Activities and related activities are undertaken in a manner consistent with the Integrated Management System.

- (e) The Quality Management Plan must, as a minimum, address and detail:
- i. OpCo's quality team organisational structure including:
 - A. the Quality Manager who has the defined authority and responsibility for ensuring that the requirements in the Quality Management Plan are implemented and maintained;
 - B. key personnel;
 - C. authority and roles of key personnel both within OpCo and OpCo Contractors;
 - D. accountabilities and lines of responsibility and communication;
 - E. the minimum skill levels, qualifications, experience and required competencies for each role;
 - F. how OpCo's quality team interfaces with the overall project organisation structure;
 - ii. how inspection, witnessing, monitoring and reporting will be undertaken;
 - iii. systems, processes and procedures which give effect to and co-ordinate the implementation of each Project Plan;
 - iv. the durability of the SLR Works in every aspect of OpCo's Activities;
 - v. procedures for the production, management and control of quality records and Identified Records;
 - vi. the proposed methodology and scope for the review and witnessing of carrying out of the construction of SLR Works, and validating and certifying that the construction of the SLR Works is in accordance with the Design Documentation;
 - vii. procedures for notifying TfNSW's Representative and the Independent Certifier before any Hold Point or Witness Point is to occur;
 - viii. structured and verifiable processes and procedures for monitoring and ensuring compliance of OpCo's Activities with the requirements of the deed, and for the rectification of any non-conformances in respect of non-conformances, improvement opportunities and the taking of corrective action, including reporting procedures;
 - ix. auditing procedures for the Quality Management Plan; and
 - x. interfaces with other Project Plans and how these are managed.

3.1.3 Construction Environmental Management Plan

- (a) OpCo must develop, implement and maintain a Construction Environmental Management Plan (CEMP) that identifies how OpCo will comply with the environmental management requirements of the deed across the five precincts identified in section 1.2 of Appendix 8 (*Stakeholder and Community Engagement*). The CEMP must include separate sections and sub-sections for each precinct as relevant to the aspects and impacts in that precinct.

- (b) The CEMP must comply with the NSW Government Environmental Management Systems Guidelines (3rd Edition, August 2013 (updated 16 September 2013)) and be consistent with the requirements of the Environment Documents.
- (c) The CEMP must form part of the OpCo's Environmental Management System, which must comply with the documentation requirements of AS/NZS 14001:2004 Environmental management systems.
- (d) The CEMP must identify procedures that will be implemented to manage:
 - i. changes to the Environment or generally accepted environmental management practices, new risks to the Environment, any pollution, Contamination or Change in Law;
 - ii. how design and construction changes will consider environmental requirements and be environmentally assessed;
 - iii. any Incidents arising from OpCo's Activities; and
 - iv. requests or requirements of the NSW Department of Planning and Infrastructure, NSW Environment Protection Authority or any other Authority.
- (e) The CEMP must address and detail:
 - i. management strategies for environmental compliance and review of the performance of environmental controls;
 - ii. processes and methodologies for surveillance and monitoring;
 - iii. processes for Incident and emergency response;
 - iv. a schedule of the environmental issues for each part of the Construction Site;
 - v. processes for the development of environmental construction method statements;
 - vi. processes and methodologies for monitoring, auditing, corrective action and reporting on environmental performance including environmental compliance tracking;
 - vii. processes for identifying the need for, and undertaking consistency assessments against Environmental Requirements, including the role of TfNSW;
 - viii. mechanisms, timing and processes for obtaining and managing Environment Protection Licenses; and
 - ix. interfaces with other Project Plans.
- (f) The CEMP must describe the roles, responsibilities and delegations of personnel responsible for managing and undertaking Delivery Activities. The CEMP must address and detail:
 - i. the names, responsibilities and authorities of the site management personnel for implementing the CEMP, monitoring its effectiveness, environmental input to design, rectifying any environmental deficiencies and keeping environmental records;

- ii. nominate a member of the site management team who is the authorised contact person for TfNSW's Representative and the EPA for all environment-related issues;
 - iii. identify the OpCo environmental manager who reports to OpCo senior management, and is suitably qualified and experienced, and has defined authority and responsibility to ensure that the requirements of the CEMP are implemented and maintained;
 - iv. detail the working relationship between the designated OpCo environmental manager and other persons involved with the implementation of the CEMP including commercial, quality, program/planning, design, safety, community, construction etc; and
 - v. the CEMP must include the environmental competency framework that will be applied for all personnel involved with Delivery Activities. The competency framework must address and detail:
 - A. specific discretionary and mandatory training programs for achieving and maintaining environmental competency for the Delivery Phase Workforce;
 - B. Environment and sustainability leadership and awareness programs; and
 - C. the metrics that will be reported, program review, and methods to maintain a high of environmental awareness across the OpCo and subcontractor Workforce.
- (g) The CEMP must document a procedure to verify that the Delivery Activities are compliant with the requirements of the deed and Environmental Requirements. The CEMP must address and detail:
- i. frequency of surveillance and periodic and planned inspections (both physical and desk-top type reviews) to verify the adequacy of controls for all environmental aspects of the Delivery Activities and document these via inspection records;
 - ii. planned internal reviews of the Environmental Requirements that make up the environment management system, including management plans, procedures and forms;
 - iii. planned reviews of subcontractor systems and works, including off-site inspections as appropriate;
 - iv. document inspection and test plans for all inspections and testing required for Delivery Activities; and
 - v. audit schedule for internal and external (independent) environmental audits.
- (h) OpCo must document the system and procedures for managing non-conformance and corrective actions for environmental management of Delivery Activities. The CEMP must include:
- i. procedures for identifying non-conformance, non compliance with law and / or Environment Documents, corrective action and preventative action that meet the requirements of AS/NZS ISO 9001;
 - ii. detailed procedures and protocols for classification and reporting of non-conformances and non-compliances; and

- iii. an environmental inspection and audit schedule of internal and external (third party) audits must be provided.
- (i) The CEMP must include a code of conduct for construction contractors. This code must be developed and communicated across the OpCo Delivery Phase Workforce and consider the following themes as defined in the UK Considerate Contractor Scheme:
- i. enhancing the appearance;
 - ii. respecting the community;
 - iii. protecting the Environment;
 - iv. securing everyone's safety; and
 - v. caring for the Workforce.
- (j) The CEMP must detail a robust Incident management system that includes the following:
- i. definitions and classifications for describing an Incident;
 - ii. protocols and clear communication strategy in the case of an emergency;
 - iii. notification requirements to relevant public authorities, a list of emergency response personnel with contact details and a 24 hour contact number;
 - iv. a list of resources (addressing both physical and human resources) with a description of their function and their contact details (or location in relation to physical resources) that will be made available immediately in the event of an environmental Incident;
 - v. details of emergency services including specialist environmental response organisations that may be required (e.g. emergency containment and clean up);
 - vi. details of immediate containment measures to be implemented in the event of an emergency situation;
 - vii. a program of environmental Incident simulation drills, including annual drills; and
 - viii. identification of other plans or interface documents that are relevant for Incident management during Delivery Activities.
- (k) The CEMP must also include, as separate sub-plans a:
- i. Construction Noise and Vibration Management Plan;
 - ii. Dust and Air Quality Management Plan;
 - iii. Greenhouse Gas Management Plan;
 - iv. Soil and Water Management Plan;
 - v. Contamination Management Plan
 - vi. Waste Management and Recycling Plan;
 - vii. Vegetation Management Plan; and
 - viii. Construction Materials Sustainable Procurement Plan.

- (l) In addition to the Environmental Requirements the Construction Noise and Vibration Management Plan (CNVMP) must detail the framework and mechanisms for noise and vibration management and mitigation of all potential noise and vibration impacts from the Delivery Activities. The CNVMP must:
- i. demonstrate how the noise and vibration management is linked with scheduling of works;
 - ii. detail the decision-making framework that OpCo will apply for prioritising high-noise generating works to minimise community impact;
 - iii. include the identified locations and specification of location-specific CNVMPs to be developed in the detailed design phase when more information is available on the schedule for the works and the equipment to be used;
 - iv. identify opportunities for community involvement in developing the CNVMPs including options for community agreement / negotiation when planning out of hours works; and
 - v. identify innovative technologies that OpCo will employ to manage and minimise noise impacts and include processes for the examination of all reasonable and feasible measures including any suggested by TfNSW's Representative.
- (m) In addition to the dust management requirements outlined in the Environmental Requirements, OpCo must prepare a Dust and Air Quality Management Plan that:
- i. identifies air quality triggers and procedures for dealing with significant dust generating activities, with the aim of minimising impacts to surrounding sensitive receivers;
 - ii. details a strategy for reviewing construction activities following receipt of dust complaints;
 - iii. details implementation measures to minimise dust and potential air quality impacts; and
 - iv. details the frequency of monitoring and reporting for compliance with dust and air quality management requirements.
- (n) OpCo must prepare a Greenhouse Gas Management Plan that details:
- i. implementation measures to be employed to minimise greenhouse gas emissions;
 - ii. measures to reduce fuel consumption by operating plant / machinery / vehicles for the duration of construction;
 - iii. energy efficiency opportunities during construction that will apply to site offices;
 - iv. green travel plans that will be applied across the workforce to encourage car-sharing, public transport use, and travel to work by active transport modes (walking and cycling); and
 - v. a decision-making framework for site personnel to reduce greenhouse gases through sustainable choices.
- (o) In addition to the requirements identified in the Environmental Requirements, OpCo must prepare a Soil and Water Management Plan that:

- i. includes a construction phase water balance study that models the sources, and uses of potable and non-potable water (stormwater, groundwater, recycled water) with the objective of minimising the quantity of potable water use during Delivery Activities;
 - ii. identifies initiatives that will be implemented to maximise water re-use, including from captured stormwater, wastewater and groundwater suitable for use during Delivery Activities;
 - iii. identifies methods that will be implemented to minimise soil disturbance during construction;
 - iv. details site protocols for managing soils to minimise mobilisation of soils by air, water, or vehicle movement;
 - v. details methods and procedures for monitoring and reporting water usage (potable and non-potable), water quality, site discharge volumes;
 - vi. details the methods to develop and implement location-specific erosion and sediment control plans in accordance with "The Blue Book" (Managing Urban Stormwater: Soils and Construction 2004 - 4th Edition (Landcom/Department of Housing));
 - vii. details a procedure for site water discharge and reuse. The procedure should be consistent with TfNSW Water Discharge and Reuse Guideline - 7TP-ST-146;
 - viii. identifies the standards and inspection regime that OpCo will apply for the maintenance of erosion and sediment controls; and
 - ix. identifies the proposed water source(s) intended for use and the required licences to be obtained prior to the commencement of construction activities.
- (p) For the purposes of the Soil and Water Management Plan, the Project Site must be subdivided into sections based on the separate catchment areas that will be affected by the OpCo's Activities. In addition to the area bounded by the SLR Site, the sections must include:
- i. access and haulage tracks;
 - ii. borrow pits;
 - iii. stockpile and storage areas;
 - iv. Temporary Works areas;
 - v. materials processing areas;
 - vi. compound areas, such as OpCo's facilities; and
 - vii. concrete and asphalt batching areas.
- (q) The Soil and Water Management Plan must include a map that shows the locations of the above in addition to any other activities that may impact on water quality. The map must include details of how the site is subdivided into separate catchment areas.
- (r) In addition to the requirements of the Environmental Requirements OpCo must prepare a Contamination Management Plan which must:

- i. identify areas of known Contamination as identified in the Environmental Requirements;
 - ii. detail protocols for managing contaminated material, including testing, classification, separation, containment;
 - iii. detail processes and methodology that will be implemented in the event of unexpected contamination finds; any land contamination caused by OpCo; and
 - iv. detail remediation management processes that will be implemented in the event of remediation being required.
- (s) In addition to the requirements of the Environmental Requirements, the Waste Management and Recycling Plan which must:
- i. identify measures to minimise waste through application of the waste hierarchy – avoidance, reduction, reuse, recycling;
 - ii. identify the key waste streams that will occur as a result of Delivery Activities;
 - iii. present a decision-making framework that will be applied to Delivery Activities to reduce waste and promote resource efficiency;
 - iv. methods that will be implemented for tracking waste, and auditing waste disposal;
 - v. sustainable procurement principles that will be applied to sourcing of materials that consider the full lifecycle of materials utilised; and
 - vi. provide a template that will be used for data capture and reporting.
- (t) In addition to the requirements of the Environmental Requirements, Opco must prepare a Vegetation Management Plan which must include:
- i. methods and procedures to reduce the footprint of Delivery Activities and minimise vegetation impact;
 - ii. methods and procedures for the production and stockpiling of mulch from native trees that have been removed during clearing and grubbing;
 - iii. methods and procedures that will be implemented in the event that additional vegetation (in excess of that identified in the Environmental Requirements) will be impacted during Delivery Activities;
 - iv. methods and procedures that will be implemented to maintain good vegetation health (for significant trees) when works are in the vicinity of the vegetation; and
 - v. inspection, monitoring and corrective action schedule.
- (u) OpCo must prepare a Construction Materials Sustainable Procurement Plan. This plan must demonstrate the methodologies, processes and procedures that will be implemented to meet the requirements of SPR Appendix 7 (*Sustainability*).

3.1.4 AEO Authorisation Management Plan

- (a) OpCo must develop, implement and maintain an AEO Authorisation Management Plan that describes how OpCo will obtain and maintain AEO status for the SLR Works and the Temporary Works from the Asset Standards Authority.

- (b) The AEO Authorisation Management Plan must document how OpCo will fulfil each of the mandatory requirements listed in the ASA Standard TS 10502 “AEO Authorisation Requirements”.
- (c) The AEO Authorisation Management Plan must include at least the following sub-plans as stand-alone documents:
 - i. Safety and Systems Assurance Plan;
 - ii. Configuration Management Plan; and
 - iii. Design Management Plan.
- (d) The AEO Authorisation Management Plan must document reliability, availability and maintainability (RAM) management arrangements that are compliant with the requirements of EN50126 Railway applications - The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS).
- (e) The AEO Authorisation Management Plan must outline the approach for establishing a RAM analysis framework (including function analysis and failure modes, effects and critical analysis) to demonstrate that the overall SLR performance objectives defined in SPR Appendix 38 (*Minimum Service Requirements*) can be achieved.

3.1.5 Safety and Systems Assurance Management Plan

- (a) OpCo must develop, implement and maintain a Safety and Systems Assurance Management Plan as a stand alone sub-plan of the AEO Authorisation Management Plan.
- (b) The Safety and Systems Assurance Management Plan must document how OpCo will fulfil each of the mandatory requirements for systems assurance and systems safety assurance listed in the ASA Standard TS 10502 “AEO Authorisation Requirements” for the SLR Works and the Temporary Works.
- (c) The Safety and Systems Assurance Management Plan must describe the processes and techniques to be used in presenting the safety argument using Goal Structuring Notation.
- (d) The Safety and Systems Assurance Management Plan must address all of the requirements for safety engineering and assurance activities detailed in the ASA Standard TS 20001 “System Safety Standard for New or Altered Assets”.
- (e) The Safety and Systems Assurance Management Plan must outline the overall approach and processes for fire and life safety engineering, in accordance with the Environmental Planning and Assessment Regulation 2000.

3.1.6 Accreditation Management Plan

- (a) OpCo must develop, implement and maintain an Accreditation Management Plan which identifies how OpCo will comply with the requirements of the Rail Safety National Law (NSW) and the safety requirements of the deed.
- (b) The Accreditation Management Plan must include a rail safety Accreditation strategy that:
 - i. demonstrates how Accreditation is to be obtained and maintained for:

- A. taking over operations of the IWLR;
 - B. operation of the IWLR;
 - C. the SLR Works; and
 - D. the SLR upon commencement of Full Service Operations;
- ii. identifies the entity or entities that will hold Accreditation through the Delivery Phase, the IWLR Operations Phase and the Full Operations Phase;
- iii. details:
- A. the proposed organisational structure including, details of personnel, Authorities and roles, lines of responsibility and communication, minimum skill and competency levels, relationships and interfaces with overall project organisational structure;
 - B. the proposed staging and timing for obtaining rail safety Accreditation in accordance with the deed and to meet the requirements of the Rail Safety National Law;
 - C. the extent and potential source of any documentation, information, records and any other assistance OpCo will require in connection with its Accreditation, in respect of the SLR Works;
 - D. the strategy and timing for liaison with the Office of the National Rail Safety Regulator and other necessary interfacing parties covering rail safety, including fire brigades, police and other transport operator;
 - E. the processes, procedures and actions required to ensure compliance with all conditions of such Accreditation; and
- iv. includes consultation arrangements with each stakeholder organisation.

3.1.7 Safety Management Plan

- (a) OpCo must develop, implement and maintain a Safety Management Plan in accordance with OpCo's Safety Management System that identifies how OpCo will comply with WHS and rail safety legislation for OpCo's Activities.
- (b) The Safety Management Plan must identify how OpCo will comply with the WHS requirements of the deed, the WHS legislation, and must be consistent with the NSW Government Work Health and Safety Management Systems and Auditing Guidelines (Edition 5, September 2013).
- (c) The Safety Management Plan must be consistent with the Rail Safety National Law and the Preparation of a Rail Safety Management System Guideline issued by the Office of the National Rail Safety Regulator and AS4292.1 and AS4292.2.
- (d) The Safety Management Plan must address the requirements in Appendix 11 (*TfNSW's General Specification G22 – Safety Management*) in SPR Appendix 11 (*TfNSW's General Specifications*).

3.1.8 Risk Management Plan

- (a) OpCo must develop, implement and maintain a Risk Management Plan that identifies how OpCo will comply with the risk management requirements of the deed.

- (b) For the purposes of the Risk Management Plan, a risk includes any event or uncertainty that has the potential to impact the achievement of either TfNSW's or OpCo's objectives with regard to the SLR, including those set out in clause 4 of the Operative Provisions.
- (c) The Risk Management Plan must address all of OpCo's Activities and must include as a minimum:
- i. details of OpCo's approach to risk management and its risk framework, processes and internal controls to manage risks in accordance with ISO 31000;
 - ii. processes and procedures for the systematic identification, assessment, treatment and management of hazards and risks;
 - iii. details on how OpCo will embed risk management through the supply chain and into the various functions, procedures and activities necessary to achieve optimal risk management outcomes;
 - iv. details on how OpCo's decision making processes and risk management systems are aligned;
 - v. details of OpCo's organisational structure that identifies risk management roles, responsibilities, and accountabilities, and the expertise required to perform such roles;
 - vi. consultative processes employed by OpCo in relation to identified risks and the personnel involved in the consultative process;
 - vii. the means to identify and quantify risk situations as they emerge and to initiate corrective action immediately, regardless of the timing relative to planned risk management process reviews;
 - viii. details on how the Risk Management Plan will be implemented;
 - ix. details on the timing and scope of OpCo's internal and external risk review processes, compliance, and audit related activities, including methods used to monitor effectiveness of risk control and treatment measures;
 - x. details of internal and external reporting of risks and risk management;
 - xi. schedule of key risks and associated treatments, together with key strategies applied to reduce risks associated with OpCo's Activities;
 - xii. details of any specific measures OpCo will adopt to minimise risks to TfNSW's stakeholders and any third party stakeholder; and
 - xiii. details of any additional risk reduction measures or strategies OpCo will adopt.
- (d) The Risk Management Plan must outline the framework and approach for developing, utilising, and maintaining a risk management information system (risk register) capable of reporting risk information as required by SPR Appendix 10 (*Reporting Requirements*).
- (e) OpCo must maintain an up-to-date risk register, consistent with the requirements of the Risk Management Plan, which is inclusive of the following:
- i. a description of all risks applicable to all stages and phases including transition between phases and their likely impact;
 - ii. analysis, assessment and evaluation of all risks;

- iii. details of specific risk control measures and proposed treatments for identified risks to eliminate or reduce risks;
- iv. the current and residual risk level assessed for each risk in terms of consequence and likelihood in a manner compatible to that of TfNSW;
- v. methods to be used to monitor effectiveness of control measures;
- vi. the personnel responsible for managing the risk and monitoring implementation of treatment measures; and
- vii. demonstration that risks to safety have been eliminated, or have been minimised and managed so far as is reasonably practicable.

3.1.9 Stakeholder and Community Engagement Plan

- (a) OpCo must develop, implement and maintain a Stakeholder and Community Engagement Plan which identifies how OpCo will comply with the stakeholder and community engagement requirements of the deed during the Delivery Phase and Full Operations Phase.
- (b) OpCo must revise the Stakeholder and Community Engagement Plan (including revising OpCo's approach to stakeholder and community engagement, if necessary) in response to the impact of OpCo's Activities on stakeholders and the community, on an as-needs basis or at least annually.
- (c) The Stakeholder and Community Engagement Plan must, as a minimum, address and detail the:
 - i. stakeholder and community engagement team structure, including key personnel, authority and roles of key personnel, lines of responsibility and communication, minimum skill levels of each role and interfaces with the overall project organisation structure;
 - ii. procedures and processes for the identification and management of community engagement issues and dealing with stakeholders;
 - iii. strategies to provide opportunities and encourage community feedback;
 - iv. processes to provide regular easily accessible, transparent and inclusive information to the community and stakeholders;
 - v. processes to report back on outcomes and the reasons for decisions to those stakeholders and community members consulted;
 - vi. strategies for the management of community engagement issues and dealing with stakeholders;
 - vii. community engagement reporting and process;
 - viii. specific key messages that will be used in information materials and when responding to enquiries and complaints;
 - ix. development and implementation of community and consultation tools;
 - x. community and stakeholder consultation and the procedures, processes and timeframes for undertaking this consultation;
 - xi. innovative programs, processes and methodologies to engage with and provide support to local communities, including engagement with schools, seniors,

- environmental groups, sporting groups, young people, businesses and other community groups;
- xii. processes for the management of enquiries and complaints;
 - xiii. processes for Incident management;
 - xiv. communication protocols and procedures including those associated with Approvals and handling enquiries from media and political representatives;
 - xv. processes for monitoring, evaluation and reporting;
 - xvi. stakeholder and community engagement site induction information to be provided to Staff;
 - xvii. policies and procedures for ensuring OpCo's Contractors comply with the communications requirements of the deed;
 - xviii. analysis of other major projects/influences around the Construction Sites with the potential to result in cumulative impacts to the community and strategies for managing these combined impacts;
 - xix. a comprehensive breakdown of local issues that may require specific local management or community engagement activities;
 - xx. analysis of major sporting, cultural and entertainment events that are expected to occur and may be impacted by OpCo's Activities, and strategies for the management of community and stakeholder engagement in relation to these events;
 - xxi. analysis of likely requirements for public awareness campaigns to support the safe and efficient introduction of SLR;
 - xxii. details of proposed 'marketing' activities planned to be undertaken by OpCo regarding its activities, including procedures for obtaining approval from TfNSW prior to planning and implementing any such activities;
 - xxiii. details of OpCo's nominated 24 hour contact numbers for management of complaints and enquiries; and
 - xxiv. interfaces with other Project Plans.
- (d) The Stakeholder and Community Engagement Plan must include a comprehensive list of community engagement issues relating to OpCo's Activities and a comprehensive list of stakeholders and stakeholder issues/interests.
 - (e) The Stakeholder and Community Engagement Plan must identify and provide contact details for OpCo's personnel that are responsible for the management of complaints and enquiries.
 - (f) The Stakeholder and Community Engagement Plan must include a program for the implementation of community engagement activities. This program must include key dates for the commencement and conclusion of construction activities, associated impacts to the community and OpCo's proposed strategy for minimising impacts and informing the community.
 - (g) The Stakeholder and Community Engagement Plan must include the following sub-plans:

- i. Stakeholder and Community Engagement Sub-Plans that are specific to each of OpCo's construction sites that comply with the requirements of the Environmental Requirements;
- ii. a Local Business Engagement Plan for each of the precincts identified below:
 - A. CBD;
 - B. Surry Hills;
 - C. Moore Park;
 - D. Randwick;
 - E. Kensington/Kingsford; and
 - F. the locality of the Rozelle Light Rail Facility;
- iii. the Local Business Engagement Plan must contain an overall business engagement strategy which includes:
 - A. analysis of key issues and impacts for businesses in each of these precincts;
 - B. policies, processes, and procedures for managing and minimising impacts on businesses affected by OpCo's Activities;
 - C. key activities and timing for the development and implementation of the Local Business Engagement Plan for each precinct; and
- iv. a Business Management Plan that complies with the requirements of the Environmental Requirements.

3.1.10 Configuration Management Plan

- (a) OpCo must develop, implement and maintain a Configuration Management Plan as a stand alone sub-plan of the AEO Authorisation Management Plan.
- (b) The Configuration Management Plan must document how OpCo will fulfil each of the mandatory requirements for configuration management listed in the ASA Standard TS 10502 "AEO Authorisation Requirements" for the SLR Works and the Temporary Works.
- (c) The Configuration Management Plan must comply with ASA Standard TS 10750: 2013 "TfNSW Rail Assets Configuration Management Plan" and ASA Standard TS 10751 "Configuration Management Guide" amended by:
 - i. substituting the words "SLR Assets" for the words "railway assets" in ASA Standard TS 10750 and ASA Standard TS10751; and
 - ii. recognising that OpCo is the AEO that has been delegated responsibility and authority for making network configuration decisions for Assets.
- (d) The Configuration Management Plan must include a description of how stakeholder input is obtained, recorded and addressed, noting that TfNSW will have up to three observerson OpCo's Configuration Control Board for the SLR Assets.
- (e) The Configuration Management Plan must cover at least the following configuration items:
 - i. all Assets including LRVs;

- ii. all operating and maintenance procedures and operating and safeworking rules;
- iii. all manuals (including training manuals and material), drawings and procedures that can be affected as a result of a configuration change; and
- iv. any tools and equipment needed to perform a given task that can be affected as a result of a configuration change.

3.1.11 Delivery Phase Sustainability Plan

- (a) OpCo must develop, maintain and implement a Delivery Phase Sustainability Plan which identifies how OpCo will comply with the sustainability requirements of the deed.
- (b) The Delivery Phase Sustainability Plan must, as a minimum, address and detail:
 - i. the sustainability management team structure, including key personnel authority and roles of key personnel, lines of responsibility and communication, minimum skill levels of each role and interfaces with the overall project organisation structure;
 - ii. a sustainability policy statement and strategies for adaptation to climate change, resource management (including energy, water and waste), social sustainability, and procurement;
 - iii. the sustainability awareness programs that OpCo will develop and maintain continual improvement for sustainable behaviour across the OpCo workforce;
 - iv. sustainability initiatives to be implemented during the performance of OpCo's Delivery Activities to meet the requirements and sustainability targets in SPR Appendix 7 (*Sustainability*);
 - v. the processes and activities for tracking the identification and implementation of sustainability initiatives;
 - vi. the processes and methodologies for embedding sustainability initiatives into OpCo's Activities;
 - vii. the processes and methodologies for assurance, monitoring, auditing, corrective action, continuous improvement and reporting on sustainability performance;
 - viii. the processes and procedures for undertaking climate change risk assessments, including nominating gateways requiring a climate change risk review;
 - ix. the processes and procedures for the identification and implementation of climate change adaptation measures;
 - x. an outline of the systems that will be used to support sustainability management;
 - xi. the processes and methodologies for monitoring, auditing and the taking of corrective action;
 - xii. an environmental performance declaration for LRVs noting the minimum requirement for recyclability is 95%; and
 - xiii. interfaces with other Project Plans.

- (c) The Delivery Phase Sustainability Plan must also include, as separate sub-plans:
- i. a Delivery Phase Carbon and Energy Management Plan;
 - ii. a Sustainable Design Implementation Plan;
 - iii. an Infrastructure Sustainability Rating Management Plan; and
 - iv. Sustainable Procurement Plan.
- (d) The Delivery Phase Carbon and Energy Management Plan must address and detail:
- i. a description of the overall approach to the identification of opportunities to reduce carbon emissions, energy use and embodied lifecycle impacts of OpCo's Activities;
 - ii. low carbon strategies and initiatives that will be implemented to minimise the carbon emissions associated with the Delivery Activities;
 - iii. energy efficiency strategies and initiatives that will be implemented to minimise energy use associated with the Delivery Activities;
 - iv. a carbon emission estimate determined using a carbon footprint assessment undertaken in accordance with ISO 14064-1, ISO14064-2 and ISO14064-3 that incorporates direct and indirect emissions associated with electricity and fuel consumption, on-site process emissions and embodied emissions for all concrete and steel used in Delivery Activities. The carbon foot printing model to be used must be described;
 - v. a life cycle assessment undertaken in accordance with ISO14044 for all concrete and steel used for the design and construction of the SLR Works and Temporary Works and identify material selection strategies and initiatives that will be implemented to minimise the environmental impacts associated with the Delivery Activities; and
 - vi. a strategy for how environmental control and lighting systems will be designed and operated to minimise overall energy consumption.
- (e) The Sustainable Design Implementation Plan must address and detail:
- i. the processes and methodologies for implementing all of the 'compulsory initiatives' identified for light rail infrastructure and the 'discretionary initiatives' that OpCo will implement to achieve at least 80% of the discretionary points available in the TfNSW – NSW Sustainable Design Guidelines Version 3.0;
 - ii. the integration of the applicable sustainable design initiatives across all project design disciplines to achieve a Gold design rating using the TfNSW Sustainable Design Guidelines version 3.0;
 - iii. the integration of climate adaptation strategies into the design and to demonstrate design for climate-resilient infrastructure;
 - iv. the development and application of a decision making framework for materials selection to minimise carbon and water intensity;
 - v. demonstrates how the design of the CSELR meets the principles of ecologically sustainable development as outlined in s6(2) of the Protection of the Environment Administration Act 1991; and

- vi. nominates a member of the OpCo design team with appropriate competency, qualifications and experience as responsible for assuring TfNSW's Representative that sustainability measures are appropriately addressed.
- (f) The Infrastructure Sustainability Rating Management Plan must be developed in consultation with and to the standard required by the Infrastructure Sustainability Council of Australia.
- (g) The Sustainable Procurement Plan must address and detail:
 - i. sustainable procurement initiatives that OpCo will implement to provide environmental and social improvement;
 - ii. a robust system for informing subcontractors regarding sustainable procurement obligations for purchase of materials, goods and services;
 - iii. procurement processes that comply with the requirements of BS 8903 and use the ISCA IS Rating Tool in the selection of subcontractors and suppliers;
 - iv. the framework that OpCo will implement to maximise opportunities for Australian and New Zealand small and medium enterprises participation; and
 - v. the framework that OpCo will implement for identifying and procuring suitable products with low life cycle environmental and social impacts.

3.1.12 Training Management and Competency Plan

- (a) OpCo must develop, implement and maintain a Training and Competency Management Plan which identifies how OpCo will comply with the training and competency management requirements of the deed.
- (b) The Training and Competency Management Plan must include as a minimum:
 - i. the training and competence management organisation structure, including key personnel, authority and roles of key personnel, lines of responsibility and communication, minimum skill levels of each role and interfaces with the overall project organisation structure;
 - ii. the curriculum vitae of personal nominated for each role identified;
 - iii. the training and competency management guidelines including the training and assessment policy;
 - iv. address how OpCo will comply with the Asset Standards Authority competence management requirements for an Authorised Engineering Organisation in the planning, delivery and operation of the infrastructure and services of SLR including:
 - A. arrangements for executing engineering services in a competent and systematic way;
 - B. processes to ensure that engineering assurance is performed by Staff who have been assessed and verified as competent under the AEOs own competence arrangements; and
 - C. arrangements to demonstrate that Staff have the necessary knowledge, skills and experience to competently and safely discharge their duties in providing engineering services;

- v. systematic and comprehensive arrangements for managing the skills and competency of the overall workforce including the plans, processes, tools and methods for:
 - A. identifying professional development and training needs, considering:
 - i. prior learning and experience as a valid basis for competence development and assessment; and
 - ii. training requirements and procedures with law enforcement agencies, other emergency service providers and with other relevant transport providers;
 - B. identifying potential skill shortages and how they might be addressed;
 - C. planning, implementation and recording of relevant professional development and training activities to enhance the knowledge and skills of the members of the Workforce, and the organisation as a whole;
 - D. periodic (re-)assessments of Workforce competence;
 - E. certification processes, including those required for Workforce members undertaking systems assurance activities, testing and verification activities, and rail safety work as defined in the Rail Safety National Law;
 - F. establishing and maintaining competence records and a register of Staff, containing appropriate and timely information about all competence aspects of members of the Workforce, including arrangements for professional and technical updating, competency assessment and certification;
 - G. methodologies for Workforce skill acquisition and use including:
 - i. approaches to the provision of relevant training including delivery methods and sources;
 - ii. details of industry qualifications required for defined occupations;
 - iii. a schedule of training, competence assessment programs and periodic proficiency testing by job function, and a resourcing schedule for instructors;
 - iv. a detailed description of the training facilities and activities required, including where these will be located, including for those to be provided at the Light Rail Maintenance and Stabling Facilities;
 - v. a description of course content and training materials, including trainer guides, a list of training syllabi, presentations, learner notes and special tools or equipment such as simulators and Rolling Stock;
 - vi. a description of how quality of teaching, training and assessment will be evaluated, including training program development and delivery, trainer and assessor competence, resourcing and measurements of learner outcomes;
 - vii. analysis of possible industry and skills partnerships;
 - viii. use of existing government training, development and employment programs;

- ix. an indication of how structured training outcomes will be achieved including reporting of targets and achievements as required by the training management guidelines;
- x. a detailed description of the process needed for OpCo to plan, implement and manage training throughout the Term; and
- xi. an analysis of Workforce development funding and programs including subsidies and grants.

3.1.13 ICT & Software Systems Management Plan

- (a) OpCo must develop, implement and maintain an ICT & Software Systems Management Plan which identifies the procedures, processes and management systems for all ICT and software.
- (b) The ICT and Software Systems Management Plan must:
 - i. document the software engineering processes adopted as part of OpCo's systems engineering framework with specific treatment of the software implementation process in accordance with ISO/IEC 12207 (2008) Systems and Software engineering – software life cycle processes;
 - ii. include a detailed description of the processes to identify and manage all safety critical items and reliability critical items for ICT and software; and
 - iii. include a detailed description of the SIL derivation process for ICT and software, with reference to AS 61508 Functional safety of electrical / electronic / programmable electronic safety-related systems, along with OpCo's method of internal approval of the derived SILs.
- (c) The ICT and Software Systems Management Plan must clearly describe OpCo's strategy for actively managing all ICT and software systems including equipment and components over the term.
- (d) The ICT and Software Systems Management Plan must address the processes, methods, and standards, which are applied to ICT and software systems including:
 - i. requirement analysis, functional allocation, architecting and design;
 - ii. testing and acceptance strategies including test cases and pass/fail criteria;
 - iii. software quality assurance;
 - iv. software security, including user access policies;
 - v. procurement and development;
 - vi. integration and testing including hardware unit testing, software unit testing and hardware and software integration testing;
 - vii. deployment to operation and acceptance;
 - viii. ongoing operational support, including support subsystems;
 - ix. change and defect management;
 - x. maintenance, both scheduled and preventative;
 - xi. enhancement;

- xii. transition:
 - A. to a major new version;
 - B. to a new infrastructure base; and
 - C. through replacement by a different software system.
- (e) The ICT & Software Systems Management Plan must identify key ICT and software design personnel responsible for implementing the ICT & Software Systems Management Plan. Key ICT and software design personnel must be tertiary educated and experienced in the use of structured, analytical software engineering methods.
- (f) OpCo must develop and deliver software documentation that provides sufficient detail to enable the software to be supported and maintained throughout the planned life of the SLR. For all software developed or significantly modified for the SLR, this must include:
 - i. software detail design documentation;
 - ii. software product technical specification, including source code and details of the software development environment;
 - iii. identification and designation of all safety-critical software systems; and
 - iv. software integrity test results.

3.1.14 Interface Management Plan

- (a) OpCo must develop, implement and maintain an Interface Management Plan which identifies how OpCo will comply with the interface management requirements of the deed.
- (b) The Interface Management Plan must include:
 - i. the communication, interfaces and integration management strategies, processes and procedures for cooperation and coordination with OpCo and other parties including:
 - A. the Core Contractors and Significant Contractors;
 - B. the Managing Contractor;
 - C. TfNSW's Representative, Utility Service providers, Authorities, Local Government, Sydney Trains, the ETS Contractors and other third parties involved in or affected by OpCo, as required;
 - ii. interface information schedules;
 - iii. collaborative interface problem resolution processes;
 - iv. details on any dedicated interface management resources and their roles and responsibilities; and
 - v. interfaces with other Project Plans.

3.1.15 Workplace Relations Management Plan

- (a) OpCo must develop, implement, and maintain a Workplace Relations Management Plan that is prepared in accordance with the requirements of the Implementation

Guidelines to the NSW Code of Practice for Procurement: Building and Construction.

3.1.16 Human Resources Plan

- (a) OpCo must develop, implement, and maintain a Human Resources Plan which identifies how OpCo will comply with the human resources requirements of the deed.
- (b) The Human Resources Plan must describe the processes to be applied to managing human resources in respect of OpCo's Activities.
- (c) The Human Resources Plan must include arrangements for Staff, including permanent, contract and casual Staff, and for the interface with TfNSW's and other organisations' human resources activities where these are or may be affected by OpCo's Activities.
- (d) The Human Resources Plan must cover, on an individual or collective basis as appropriate, selection, recruitment, termination, consultation, negotiation, discipline, grievance and welfare arrangements.
- (e) The Human Resources Plan must describe arrangements for:
 - i. developing job descriptions, including the minimum competence requirements, skills and proficiency level relevant for the functions, tasks and activities for all positions, and considering relevant:
 - A. external qualification standards;
 - B. industry competency management requirements;
 - ii. recruitment, including identification and selection and induction of Staff; and
 - iii. assigning employees to roles and positions.

3.1.17 Business Continuity Plan

- (a) OpCo must develop, implement and maintain a Business Continuity Plan which details how the deed requirements for the continuity of service provision will be maintained during natural or man-made disasters, Incidents and events, including those events that disrupt OpCo's organisation or performance.
- (b) The Business Continuity Plan must address, as a minimum:
 - i. the method and expected time frames required before normal operations will be restored after any disaster, Incident or event, including any intermediate stages and timings;
 - ii. damage assessment, management and control measures;
 - iii. organisational arrangements including crisis team identification, roles, authorities, training, management and succession, and information dissemination;
 - iv. the establishment and operation of crisis centres;
 - v. the management of critical information and communication systems, including restoration and protection of data;

- vi. the management of critical business processes including to rail safety, work health and safety, operational performance, financial and accounting, HR and payroll, information and communications technology and procurement; and
- vii. the role and responsibilities of OpCo Core Contractors and Significant Contractors in meeting the requirements of the Business Continuity Plan.

3.1.18 Operations Phase Environmental and Sustainability Plan

- (a) OpCo must develop, maintain and implement an Operations Phase Environment and Sustainability Plan that forms part of OpCo's Environmental Management System that must comply with the documentation requirements of AS/NZS ISO 14001 Environmental Management Systems.
- (b) The Operations Phase Environmental and Sustainability Plan must, as a minimum, address and detail:
 - i. the environmental and sustainability management team structure, including key personnel, authority and roles of key personnel, lines of responsibility and communication, environment and sustainability competency framework for each role and interfaces with the overall project organisational structure;
 - ii. an environment and sustainability policy statement and strategies for adaptation to climate change, resource management (including energy, water and waste), procurement, social sustainability and environmental management;
 - iii. sustainability initiatives to be implemented during the Operations Activities to meet the sustainability targets nominated in SPR Appendix 7 (*Sustainability*);
 - iv. the outline of systems that will be used to support environmental and sustainability management including the:
 - A. management strategies for ongoing compliance with Environmental Requirements;
 - B. management responsibilities and procedures for regular review of the operational risks including climate risks, and procedures to review and revise operational environmental risks through planning and implementation;
 - C. management strategies for the review of the performance of environmental controls;
 - D. processes and methodologies for surveillance and monitoring;
 - E. processes for Incident and emergency response;
 - F. processes for the development of environmental work method statements;
 - G. processes and methodologies for monitoring, auditing, corrective action, continuous improvement and reporting on environmental and sustainability performance including environmental compliance tracking;
 - H. processes and methodologies for embedding sustainability initiatives into operations and maintenance processes;
 - I. approach to sustainable procurement including:
 - i. the processes and procedures that will be used to provide environmental and social improvement;

- concrete and steel consumed. The carbon foot printing model to be used must be described;
- v. an estimate for the total SLR energy demand;
 - vi. the assumptions and benchmarks that support the energy demand estimate, and a range for the level of confidence in the estimate;
 - vii. the explanation for what the major factors for change in actual energy consumption are compared to the estimate;
 - viii. an indication for the magnitude of impact each factor would have on the actual SLR energy demand;
 - ix. a strategy for how environmental control and lighting systems will be operated to minimise overall energy consumption;
 - x. a profile of regenerated energy, with respect to traction energy, under all operating scenarios; and
 - xi. energy efficiency strategies including key initiatives that contribute to the energy efficient operation of the SLR and how OpCo will ensure that maximum utilisation of these energy efficient systems will be maintained through the Term.
- (f) The Integrated Water Management Plan must address and detail:
- i. the water-hierarchy that will be applied to the SLR operations;
 - ii. the personnel responsible for data collection and reporting against water usage targets;
 - iii. annual efficiency targets for the SLR operational water use by water source;
 - iv. monitoring of potable and non-potable water consumed and sources of the water balance study for the operational water use for the SLR and a comparison with actual data;
 - v. water, including mains water supply, harvested rainwater and stormwater;
 - vi. re-use or disposal of groundwater from the tunnel;
 - vii. monitoring of water quality and opportunities for improved water quality at the Light Rail Maintenance and Stabling facilities, and Stops;
 - viii. a program of water efficiency investigations and commitments for implementation; and
 - ix. a program for reduction of potable water use to achieve the operational potable water usage target.
- (g) The Operations Waste and Recycling Management Plan must address and detail:
- i. measures to minimise waste through application of the waste hierarchy – avoidance, reduction, reuse, recycling;
 - ii. identification of the key waste streams that will occur as a result of Operational Activities;
 - iii. present a decision-making framework that will be applied to Operational Activities to reduce waste and promote resource efficiency;

- iv. methods that will be implemented for tracking waste, and auditing waste disposal;
 - v. sustainable procurement principles that will be applied to sourcing of materials and products that consider the full lifecycle of materials utilised; and
 - vi. the template that will be used for data capture and reporting.
- (h) The Operations Vegetation Management Plan must address and detail:
- i. an outline of the biodiversity and landscaping commitments required by the Environmental Requirements;
 - ii. the identification of landscaped areas, sensitive sites (for example bushcare sites) and vegetative privacy mitigation;
 - iii. the identification of habitat areas for species or areas of vegetation communities listed under the Threatened Species Conservation Act 1995 and Environment Protection and Biodiversity Conservation Act 1999;
 - iv. strategies that will be implemented for maintaining landscaped areas and non-landscaped vegetated areas; and
 - v. weed management measures.
- (i) The Heritage Management Plan must address and detail:
- i. an outline of the heritage commitments required by the Environmental Requirements;
 - ii. the identification of all listed items and areas of heritage significance including heritage buildings, structures, items, relics, gardens, landscapes, views, trees or places of heritage significance;
 - iii. the identification of all items of heritage interpretation;
 - iv. the identification of the potential archaeological sites along the route;
 - v. strategies and management measures for maintenance and repairs of listed heritage items, in consultation with the asset owner and in accordance with relevant legislation and guidelines; and
 - vi. strategies that will be implemented for maintaining items of heritage interpretation.

3.1.19 Skills and Employment Delivery Plan

- (a) OpCo must develop, implement and maintain a Skills and Employment Delivery Plan which identifies how OpCo will comply with the skills and employment delivery requirements of the deed.
- (b) The Skills and Employment Delivery Plan must address and detail:
- i. key personnel, authority and roles of key personnel, lines of responsibility and communication, relevant experience and qualifications, minimum skill levels of each role and interfaces with the overall project organisation structure;
 - ii. education and training providers, employer services providers or other organisations involved in the delivery of the Project;

- iii. types of nationally recognised and accredited training that are expected to be offered and the main beneficiaries of the training;
 - iv. trades or occupational areas offering apprenticeship opportunities;
 - v. employment status of Apprentices to include directly employed and /or sourced via a group training organisation or similar body;
 - vi. strategies for engaging with employment support agencies to aid recruitment and access to job candidates;
 - vii. strategies for engagement with local community groups and other organizations to maximise local employment opportunities;
 - viii. planned content and delivery modes for education program;
 - ix. strategies to assess local sourcing options to support local entrepreneurship and supplier diversity;
 - x. actions to be taken to ensure the support of sub-contractors; and
 - xi. how sub contractor's performance and compliance will be managed.
- (c) The Skills and Employment Delivery Plan must include as separate sub-plans:
- i. Skills and Employment Targets Delivery Profile (SETDP);
 - ii. Workforce Profile and Gap Plan; and
 - iii. Skills and Employment Plan for Sub-contractors.
- (d) OpCo must utilise the SLR Skills and Employment Target Delivery Profile template. The SETDP must:
- i. address planned delivery for the first 36 months of the contract and be updated annually, projecting forward 36 months;
 - ii. provide output figures for the SETDP that indicate the number of new starts (numbers or persons) for each quarter against the relevant skills and employment areas;
 - iii. address the following skills and employment areas, addressing requirements set out in the SLR Skills and Employment Framework and SLR Skills and Employment Themes and Targets:
 - A. Sustainable Job starts;
 - B. Sustainable Job starts (local);
 - C. work placement (age 16+);
 - D. Apprentices (new starts);
 - E. Apprentices (existing);
 - F. scholars, cadets and graduates;
 - G. talent program;
 - H. leadership and management;

- I. skills training;
 - J. Ambassador Program; and
 - K. work experience (age 14+).
- (e) The Workforce Profile and Gap Plan must be prepared using the SLR Workforce Profile and Gap Plan template.
- (f) OpCo must provide Skills and Employment Plans for Sub-contractors with contracts value exceeding \$500,000.

3.2 Project Delivery Plans

3.2.1 Delivery Management Plan

- (a) OpCo must develop, implement and maintain a Delivery Management Plan which identifies the procedures, processes, management personnel and management systems which OpCo will utilise during performance of the Delivery Activities.
- (b) The Delivery Management Plan must address and detail as a minimum:
- i. OpCo's organisational team structures for the purposes of project management functions, that interface with the overall management structure included in the Strategic Business Plan. They must also include:
 - A. key delivery management personnel;
 - B. authority and roles of key delivery management personnel;
 - C. lines of responsibility and communication;
 - D. the minimum skill levels of each role;
 - E. interfaces with the overall project organisational structure;
 - ii. management processes for project time and quality control;
 - iii. processes to identify and manage work to be subcontracted, including quality, safety, environmental and communication aspects of that work;
 - iv. strategies and processes for the engagement and management of OpCo Contractors;
 - v. management strategies for Utility Service Works and Local Area Works, including coordination and interfacing with Authorities;
 - vi. the method for engaging Authorities and recording outcomes of any communications and agreements with Authorities;
 - vii. processes and methodologies for ensuring that the SLR Works and Temporary Works are safe and fit for their intended purpose;
 - viii. how verification and validation of the SLR Works and Temporary Works will be undertaken;
 - ix. procurement and Supply Chain details for major construction materials including concrete and reinforcement;

- x. the process for developing, updating, and managing the Delivery Program, including the identification and integration of the timing of key milestones and targets;
- xi. issues management processes including the management and operation of the issues management database;
- xii. the approach to resources management;
- xiii. the approach to delivery management reporting in accordance with SPR Appendix 10 (*Reporting Requirements*);
- xiv. the approach to interface management with other Project Plans;
- xv. the approach to records and document management, including procedures for uploading of information and data into the project document collaboration system;
- xvi. the Approvals OpCo must obtain, together with a strategy and process for obtaining all required Approvals, as an attachment to the Delivery Management Plan;
- xvii. the process for the development, implementation and update for the Project Plans relevant to project delivery, including a summary that lists all Project Plans. This table must be based upon this Appendix 43 Table 1 and is to include:
 - A. the Project Plan title;
 - B. reference number;
 - C. submission date;
 - D. update frequency;
 - E. summary of reporting requirements;
 - F. responsible person;
- xviii. the process for ensuring deed deliverables are submitted in accordance with the deed requirements, including the development of a deed deliverables register; and
- xix. the process for assurance auditing that includes the surveillance, self-checking and audit to confirm compliance of the activities specified in each Project Plan.

3.2.2 Construction Management Plan

- (a) OpCo must develop, implement and maintain a Construction Management Plan which identifies how OpCo will comply with the construction requirements of the deed.
- (b) The Construction Management Plan must, in relation to the SLR Works and the Temporary Works, as a minimum, address and detail the:
 - i. construction management team structure that interfaces with the overall project management structure and includes:
 - A. key personnel and their respective authority and roles;

- B. lines of responsibility and communication;
 - C. minimum skill level and experience for each role;
 - ii. physical resources including major items of plant, equipment and materials;
 - iii. management and handling of construction materials, including on site storage and haulage arrangements;
 - iv. strategies for managing construction noise and vibration within requirements;
 - v. site establishment (including all site offices and facilities along the route) and management including the layouts of all major construction sites;
 - vi. construction methodology including:
 - A. construction staging diagrams;
 - B. time chainage diagram;
 - C. construction techniques, including drawings outlining proposed methods;
 - D. construction timing and program;
 - vii. processes for construction risk assessment and construction risk mitigation;
 - viii. processes for the development and management of work method statements;
 - ix. how performance and durability requirements will be addressed, satisfied, and recorded during the Delivery Activities;
 - x. technical specifications and construction standards;
 - xi. processes and methodologies for ensuring:
 - A. safety in design is incorporated into the Delivery Activities;
 - B. the adequacy and safety of Temporary Works;
 - C. the involvement of designers during the construction of the SLR Works and Temporary Works;
 - D. the provision of up-to-date information to TfNSW's Representative and the Independent Certifier; and
 - E. the development and storage of work as executed Design Documentation;
 - xii. construction documentation applicable to each construction package;
 - xiii. access to the Construction Site and to properties affected by the Delivery Activities;
 - xiv. management of safety and Incidents during construction, including reporting procedures for Incidents;
 - xv. maintenance methods to be used during construction; and
 - xvi. interfaces with other Project Plans.
- (c) The Construction Management Plan must include work method statements for greenfield locations:

- i. outlining the approach to construction management, interface with the Managing Contractor Contractor (where applicable), constructability, and sequencing and staging;
- ii. detailing off-site construction management, including:
 - A. strategies and methodology for the management of impacts on road traffic, pedestrian and public areas, and local businesses;
 - B. identification of primary haulage routes, including staging or marshalling areas and any major road or intersection changes required to support LRV and Non-Revenue Vehicle delivery;
 - C. the minimisation of impacts on adjacent landowners access points;
 - D. proposed hours of work, including discussion on any movements at peak hour, inter-peak and weekend movements;
 - E. proposed local traffic control measures and processes;
- iii. detailing on-site construction management, including:
 - A. site access and movement controls;
 - B. utilisation of worksites and areas;
 - C. temporary and/or permanent services and facilities;
 - D. safety and security of worksites, facilities and services; and
 - E. proposed location(s) of site and field offices.

3.2.3 Utility Service Treatment Plan

- (a) OpCo must develop, implement and maintain, a Utility Service Treatment Plan which identifies how OpCo will treat, including investigating, protecting, modifying, relocating and providing for, all Utility Services to comply with the Utility Service requirements of the deed.
- (b) The Utility Service Treatment Plan must include, as a minimum, the processes and procedures for:
 - i. the requirements specified in Schedule B4 (*Requirements for Utility Provider Agreements*), including the design and approval process, construction and inspection requirements, handover process and access and maintenance requirements;
 - ii. list of all Utility Services to be treated. The list must include risks and mitigation measures for each Utility Service;
 - iii. key delivery management personnel in the Utility Services treatment team, including a Utilities Services interface manager and description of how they will manage the interface with all Utility Service Authorities and owners;
 - iv. lines of responsibility and communications within the Utility Services treatment team and to Utility Service Authorities and owners;
 - v. detailed construction methodologies and associated inspection and test plans;
 - vi. methodology for handover and acceptance; and

- vii. traffic management arrangements during the treatment of Utility Services in accordance with Appendix 11 (*TfNSW's General Specifications G10 – Traffic and Transport Management*) in Appendix 11 (*TfNSW's General Specifications*).

3.2.4 Manufacturing and Procurement Plan

- (a) OpCo must develop, implement and maintain a Manufacturing and Procurement Plan which:
 - i. identifies how OpCo will comply with the requirements of the deed relating to manufacture and procurement of major equipment and systems, including those related to Significant Contractors carrying out the Delivery Activities; and
 - ii. demonstrates processes, procedures and resources to manage the specification, design, manufacture, off site Testing and commissioning and delivery of the major equipment.
- (b) The Manufacturing and Procurement Plan must address and detail, as a minimum:
 - i. project management organisation and responsibilities that interfaces with the overall project management structure, including:
 - A. key personnel and their respective authority and roles;
 - B. lines of responsibility and communication;
 - C. minimum skill level and experience for each role;
 - ii. the provision of deliverable documents;
 - iii. the location where the manufacturing will be carried out;
 - iv. the project management systems and controls that comply with the requirements of the deed, and the Configuration Management Plan, ensuring that:
 - A. all work in connection with the design and manufacture and commissioning is fully and clearly specified;
 - B. plans are developed for the completion of all tasks and requirements;
 - C. controls provide clear visibility of progress toward completion of all tasks;
 - D. risks are identified and incorporated into the Risk Management Plan; and
 - E. requirements and arrangements for delivery and insurances are clearly identified.
- (c) The Manufacturing and Procurement Plan must include with respect to LRVs, as a minimum:
 - i. overall manufacturing strategy including for car assembly and delivery;
 - ii. Supply Chain description for all major LRV systems and components, including:
 - A. car body structure;
 - B. bogies;
 - C. traction (propulsion) system;

- D. LRV management system;
 - E. passenger door;
 - F. detrainment ramp;
 - G. HVAC system; and
 - H. auxiliary power supply;
- iii. describe how this plan interfaces with the Design Management Plan, the Safety and Systems Assurance Management Plan and the RAM elements of the AEO Authorisation Management Plan;
 - iv. for each place of manufacture, identify:
 - A. previous experience in similar components and systems;
 - B. known and predicted workload and manufacturing capacities; and
 - C. manufacturing competence;
 - v. initial manufacturing schedule that is integrated into the overall Delivery Program, and provides duration and linkage logic;
 - A. procurement of critical and long lead items;
 - B. first article inspections;
 - C. manufacturing stations and associated durations;
 - D. key static testing activities and associated durations;
 - E. key document reports preparation and submission;
 - F. any activity that is required to be witnessed or reviewed by TfNSW's Representative;
 - vi. quality assurance and control measures, including Witness Points or Hold Points required by TfNSW's Representative; and
 - vii. key risks and mitigation measures.

3.2.5 Not Used

3.2.6 Design Management Plan

- (a) OpCo must develop, implement and maintain a Design Management Plan as a stand alone sub-plan of the AEO Authorisation Management Plan.
- (b) The Design Management Plan must document how OpCo will comply with the design requirements of the deed and meet the Asset Standards Authority Requirements for an Authorised Engineering Organisation for the SLR Works and the Temporary Works.
- (c) The Design Management Plan must, as a minimum, address and detail:
 - i. OpCo's design team organisational structure including:
 - A. key design personnel;

- B. authority and roles of key design personnel;
 - C. lines of responsibility and communication;
 - D. the minimum skill and competency levels of each role;
 - E. relationships and interfaces with the overall project organisational structure;
- ii. the establishment of design packages, including the scope and package numbering. The packages must be selected to suit the design development processes, activities and requirements, including the interfaces and interrelationships between system and sub system elements. Each design package must be a self-contained entity that facilitates the design review, verification and certification processes;
 - iii. the list of engineering standards and guidance documents to be used by OpCo for each component of the SLR Works and the Temporary Works in accordance with the following categories:
 - A. regulatory documents;
 - B. engineering design standards;
 - C. engineering construction standards;
 - D. engineering maintenance standards; and
 - E. guidance documents;
 - iv. strategies, processes and methodologies for:
 - A. use of the SLR requirements and traceability register for ensuring functionality, performance, durability, design life and fitness for purpose, survey and other requirements are met;
 - v. the design review and feedback processes, including:
 - A. processes, methodologies, and timing for the preparation and submission of Design Documentation for each design package, and the linkage between the design packages;
 - B. how conditions to certification will be managed including dependencies between design packages;
 - D. processes for design presentations including timing, level of documentation to be presented, presentation methods and feedback procedures;
 - E. design management processes for the review of proposed design changes, including verification and certification of the changes by the SLR Independent Certifier;
 - F. the design elements and packages to be reviewed by the Urban Design Reference Group;
 - G. processes for the management of requests for information, modifications and updating of Design Documentation;
 - vi. processes for design safety audits (including road safety audits and crime prevention through environmental design audits);

- vii. processes for design risk assessment and design risk mitigation, including a register of key design risks and proposed mitigation measures;
- viii. processes and methodologies for ensuring safety in design is incorporated into the SLR Works and the Temporary Works, and demonstrate evidence that: Design Documentation for each design component at Design Stage 1, Design Stage 2 and Design Stage 3 includes a safety in design section; and
- ix. processes for identifying and managing design changes that may result in an inconsistency with the Environmental Requirements and may require a modification to the Environmental Requirements.

3.2.7 Traffic and Transport Management Plan

- (a) OpCo must develop, implement and maintain a Traffic and Transport Management Plan which identifies how OpCo will comply with the traffic and transport requirements of the deed.
- (b) The Traffic and Transport Management Plan must, as a minimum, address and detail:
 - i. the traffic management strategies to minimise and mitigate impacts caused by OpCo's Activities during all phases of the Project including to optimise road safety and to comply with the requirements of the deed;
 - ii. the methodologies and specific measures for the safe and efficient movement and management of all road users using the road networks and traffic systems that are affected by OpCo Activities, including the efficient flow of traffic around OpCo's work areas;
 - iii. the construction traffic and transport constraint requirements in SPR Appendix 12 (*Construction Traffic and Transport Management Constraints*);
 - iv. the requirements of the following TfNSW documents:
 - A. Sydney City Centre Access Strategy; and
 - B. Sydney City Centre Bus Plan;
 - v. continuity of normal bus services, including to and from University of NSW, and Special Events to and from Randwick Racecourse and Moore Park;
 - vi. the emergency services, Utility Service providers and Authority vehicle access requirements and how these requirements will be provided during OpCo Activities;
 - vii. the methodology for safe passage of pedestrians and cyclists;
 - viii. OpCo's Delivery Phase traffic access/egress routes;
 - ix. OpCo's methodology and processes for Class 1 Events, Class 2 Events and Special Events that affect OpCo Activities; and
 - x. the processes to be used by OpCo for temporary traffic control arrangements that are specified in TfNSW's General Specification G10 – Traffic and Transport Management in Appendix 11 (*TfNSW's General Specifications*).

3.2.8 Testing and Commissioning Plan

- (a) OpCo must develop, maintain and implement a Testing and Commissioning Plan.
- (b) The Testing and Commissioning Plan must, as a minimum, identify, address and detail:
 - i. how OpCo will comply with the testing and commissioning requirements of the deed to validate all aspects of the requirements including those developed by OpCo in accordance with the Design Management Plan and the AEO Authorisation Management Plan;
 - ii. all Assets and the integration of the Assets;
 - iii. how OpCo will align with Good Industry Practice;
 - iv. testing of all of the requirements of the Environmental Requirements on an ongoing basis;
 - v. all systems and subsystems to be introduced to or modified on the SLR as part of the SLR Works, including:
 - A. Stops and light rail infrastructure;
 - B. LRVs;
 - C. Light Rail systems;
 - vi. the Test Program for each Asset, with each Test Program including:
 - A. all Tests;
 - B. the duration of each Test;
 - C. the sequence of Tests;
 - D. the interrelationship between Tests on different Assets;
 - E. integration with other Assets;
 - F. any contingency;
 - G. responsibilities for delivering the Tests;
 - H. TfNSW's Representative witness requirements;
 - vii. the verification regime;
 - viii. the competency management arrangements for each Test;
 - ix. the location and equipment necessary for each Test;
 - x. the process for ensuring Test equipment is calibrated and certified for the testing being undertaken;
 - xi. the tests that will be undertaken through simulation;
 - xii. how any contingency will be managed for any re-Tests;
 - xiii. the strategy for dealing with conflicts between Tests requiring access to the same test facilities at the same time;

- xiv. how training of operational Staff will be undertaken to meet the performance requirements at each stage of Testing as identified in SPR Appendix 33 (*Testing and Commissioning*);
 - xv. be incorporated into an overall quality assurance regime;
 - xvi. the Failure Report Analysis and Corrective Action System (FRACAS) to be used during testing and commissioning;
 - xvii. address the elements of the Systems Engineering Management Plan pertaining to verification and validation;
 - xviii. include a communication protocol for the advice of, and reporting of, all Tests; and
 - xix. highlight key risks and contingencies.
- (c) OpCo must detail how each Test will be certified, where Test records are kept and for how long they will be retained.
 - (d) The Testing and Commissioning Plan must address both the Delivery Phase and the introduction of new Assets or Modifications to Assets as part of the Operations Activities.
 - (e) During Testing and commissioning activities, OpCo must issue monthly updates to the Test Programs to reflect any changes and also to show the status of each activity.
 - (f) The Testing and Commissioning Plan must show the detailed Test Program for the following 60 days with an indicative Test Program for the following year updated as required or at a minimum of monthly.
 - (g) OpCo must ensure that time is provisioned within the Testing and Commissioning Plan for necessary alterations to equipment, systems and designs to be undertaken, together with re-testing prior to final commissioning.

3.2.9 Electromagnetic Compatibility Plan

- (a) OpCo must develop, implement, and maintain an Electromagnetic Compatibility Plan (EMC Plan), which identifies how OpCo will comply with the EMC requirements of the deed.
- (b) The EMC Plan must include, as a minimum:
 - i. the overall philosophy for the management of EMC issues in the design, construction, commissioning and operations of the SLR;
 - ii. a strategy of how OpCo will comply with the EMC requirements of SPR Appendix 28 (*Earthing and Bonding, Electrolysis and EMC*) and other EMC requirements of the deed;
 - iii. details of a systems assured approach to managing, testing and verification of EMC;
 - iv. a process to demonstrate that the complete SLR solution, including, all of its sub-systems, components and proposed installation methods, is EMC compliant;

- v. a process for identifying sensitive receivers and assets possibly at risk of electromagnetic interference resulting from the construction and operation of the SLR;
- vi. a process for establishing an EMC baseline survey of the sensitive receivers and assets possibly at risk of electromagnetic interference resulting from the construction and operation of the SLR;
- vii. a process for conducting post-commissioning survey of the EMC status of those sensitive receivers and assets surveyed in the baseline;
- viii. OpCo's strategy for dealing with situations where EMC results indicate that construction activities and the operation of the SLR are likely to cause materially adverse impact on operation of sensitive receivers and assets;
- ix. OpCo's strategy and arrangements for monitoring and controlling EMC compliance, as generated by the Assets, throughout the construction and operation of the SLR;
- x. an EMC hazard analysis;
- xi. a methodology for ensuring compatibility with Sydney Trains;
- xii. a methodology to determine and prevent mutual and cross systems interference;
- xiii. an EMC and radiation compliance matrix which must also be updated on an ongoing basis;
- xiv. a list of the documentation to be submitted for review in order to demonstrate the applicable Standards and Guidelines have been met; and
- xv. a methodology to demonstrate compliance of the SLR Works with relevant Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) guidelines, and relevant International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines.

3.2.10 Stray Current Plan

- (a) OpCo must develop, implement, and maintain a Stray Current Plan, which identifies how OpCo will comply with the stray current requirements of the deed.
- (b) The Stray Current Plan must include, as a minimum:
 - i. the overall strategy, design, construction and management philosophy;
 - ii. reference to the stray current minimisation concept in the SLR design;
 - iii. design development process, including:
 - A. OpCo's approach to design packages;
 - B. Testing of systems;
 - iv. the process for identifying structures possibly at risk of electrolysis stray current corrosion resulting from the construction and operation of the SLR;

- v. the process for establishing an electrolysis baseline of structure to earth potentials for structures possibly at risk of electrolysis stray current corrosion resulting from the construction and operation of the SLR;
- vi. the process for ensuring that the required level of track insulation resistance is achieved as an outcome of the construction process for the CSELR;
- vii. the process for conducting the post-construction survey of the electrolysis status of those structures surveyed in the baseline;
- viii. the process for conducting the post-commissioning survey of the electrolysis status of those structures surveyed in the baseline;
- ix. OpCo's strategy for dealing with situations where electrolysis test results indicate that the operation of the SLR is causing problematic potentials to occur on structures;
- x. OpCo's arrangements for representation and participation in the activities of the Sydney Electrolysis Committee;
- xi. OpCo's arrangements for monitoring the electrolysis performance of the SLR Assets through the operating phase of SLR and rectifying unacceptable conditions; and
- xii. arrangements to complete activities including the specification, design, integration or testing of the SLR systems with relevance to the stray current outcomes.

3.2.11 Not Used

3.2.12 Not Used

3.2.13 Property Management Plan

- (a) OpCo must develop, implement and maintain a Property Management Plan which describes the procedures and processes OpCo will implement to manage property issues including site investigation, condition surveys and monitoring and infrastructure surveys.
- (b) The Property Management Plan must, as a minimum, address in detail how OpCo will:
 - i. undertake site investigation, condition surveys and monitoring and infrastructure surveys as required by SPR Appendix 46 (*Site Investigation, Survey and Condition Monitoring*);
 - ii. identify, manage and record risks/contingent liabilities, stakeholders, impacted adjoining land and assets;
 - iii. manage and mitigate those risks directly related to the potential damage of property as a consequence of OpCo's Activities;
 - iv. identify actual damage, how it occurred and how that damage will be rectified;
 - v. identify disputes in relation to damage and how each dispute will be processed, managed and resolved; and
 - vi. manage project relations with all adjoining owners and TfNSW.

3.3 Operations Plans

3.3.1 Operations Management Plan

- (a) OpCo must develop, implement and maintain an Operations Management Plan which describes how OpCo will comply with the operations requirements of the deed.
- (b) The Operations Management Plan must include the minimum operating standards in relation to the minimum operational, passenger information, security equipment, presentation and passenger amenity standards for:
 - i. Staff;
 - ii. LRVs;
 - iii. Stops;
 - iv. road intersections;
 - v. Light Rail Maintenance and Stabling Facilities; and
 - vi. other Assets including the tunnels, bridges and ancillary buildings.
- (c) The Operations Management Plan must include:
 - i. the methodology (operations strategy) for the governance of the Operations Activities and the associated operational interfaces;
 - ii. the process for the development of and content for the SLR operating policies, procedures, rules and instructions for:
 - A. Operations Control Centre operations during normal, degraded and Incident operations;
 - B. SLR operations during normal, degraded and Incident operations, including compliance to minimum operating standards;
 - C. SLR operations during Special Events;
 - D. Stop operations during normal, degraded, Special Event and Incident operations;
 - E. Light Rail Maintenance and Stabling Facilities for normal, degraded, Special Event and Incident operations;
 - F. possession planning and implementation;
 - G. operations safety management;
 - H. operations quality management;
 - I. security management including access control;
 - J. operations management and administration including performance monitoring, reporting and compliance;
 - K. Incident response and management including business continuity; and
 - L. communications including information storage and dissemination.

- (d) The Operations Management Plan must include OpCo's operations team organisational structures for the Operations Phase, including the Staff levels for OpCo and OpCo Contractors by day and period of day, as a minimum for:
- i. management and administration;
 - ii. the Operations Control Centre;
 - iii. LRV operations;
 - iv. Stop operations;
 - v. Special Events;
 - vi. Asset maintenance including presentation and cleaning; and
 - vii. security.
- (e) The Operations Management Plan must include OpCo protocols for engagement with TfNSW and other stakeholders for:
- i. service planning and operational development;
 - ii. communicating and managing Service level adjustments; and
 - iii. communicating and managing Special Event Operations Activities.

3.3.2 Transition In Management Plan

- (a) OpCo must develop, implement and maintain a Transition In Management Plan, in relation to the IWLR.
- (b) The Transition In Management Plan must, as a minimum:
- i. identify all documents relevant to the operation and maintenance of the IWLR;
 - ii. identify all legal arrangements pertinent to the IWLR which will require transfer from TfNSW to OpCo or authorised nominees, including:
 - A. contracts;
 - B. interfaces;
 - C. agreements;
 - D. warranties, guarantees and licenses;
 - E. Intellectual Property rights;
 - F. supply and procurement arrangements;
 - iii. identify the approach to the establishment of Asset Information System and Asset management process;
 - iv. identify all configuration change, safety, Accreditation, Environment, and quality actions prior to the commencement of operations;
 - v. detail the process for identifying all Assets to be handed over from TfNSW to OpCo, and detail for each Asset:
 - A. its location;

- B. its condition;
 - C. special issues or notes;
 - vi. identify all activities required for the physical handover of Assets, Special Tools and Equipment, maintenance equipment, spares and consumables from TfNSW to OpCo or authorised nominees;
 - vii. identify the scope of all training required that will be required for OpCo and/or any authorised nominee;
 - viii. identify the arrangements for the recruitment of existing personnel and any associated workplace relations requirements;
 - ix. establish the process and resources required to facilitate the above, and commence operations on the Date for Revenue Service;
 - x. identify each party's respective responsibilities with respect to each of the actions identified within the above; and
 - xi. establish the procedure, and identify resources for, TfNSW to respond to any requests for information received from OpCo or its authorised nominees pertinent to handover of the IWLR.
- (c) The Transition In Management Plan must detail the timescales, and sequencing of actions needed to complete the following before the handover date:
- i. collect all information and data identified in part (b) above; and
 - ii. complete all transfers and actions identified in part (b) above, pursuant to the handover requirements.

3.3.3 Operational Readiness Plan

- (a) OpCo must develop, implement and maintain an Operational Readiness Plan which identifies how OpCo will plan for and achieve the milestones required to ensure operational readiness for the SLR. The Operations Readiness Plan must separately identify the specific requirements for both the existing IWLR and the CSELR.
- (b) The Operational Readiness Plan must include a program of transition detailing the migration and governance requirements, in the case of the CSLER, from testing and commissioning to Trial Running, and in the case of the IWLR, up until readiness for Revenue Service.
- (c) The Operational Readiness Plan must include, through reference to the Human Resources Plan and Training Management Plan:
- i. a recruitment program detailing the numbers and category of Staff to be recruited for the Operations Phase; and
 - ii. a training program detailing the numbers and category of Staff to be trained including external emergency service personnel and subcontractors for the Operations Phase.
- (d) The Operations Readiness Plan must, through reference to the Operations Management Plan and Asset Management Plan include a development program for all policies, procedures, rules and instructions documentation.

- (e) The Operations Readiness Plan must include a Trial Running program in accordance with SPR Appendix 33 (*Testing and Commissioning*) in relation to the CSELR.
- (f) The Operations Readiness Plan must identify and program operations readiness activities related to:
 - i. safety assessment and Accreditation;
 - ii. commercial agreements and interface protocols;
 - iii. Indicative Timetable or service frequency requirements;
 - iv. industrial relations;
 - v. operations and Asset maintenance standards, policies, procedures, rules and instructions;
 - vi. purchase and / or availability of operations equipment;
 - vii. purchase and / or availability of maintenance equipment;
 - viii. purchase and/ or availability of spare parts;
 - ix. Incident preparedness and response, and services training;
 - x. ticketing systems;
 - xi. passenger information;
 - xii. maintenance of the Urbos 3 LRVs and security systems;
 - xiii. interfaces with other service providers; and
 - xiv. external works.

3.3.4 Customer Service Plan

- (a) OpCo must develop, implement and maintain a Customer Service Plan which identifies how OpCo will comply with the Customer service requirements of the deed.
- (b) The Customer Service Plan must, as a minimum, address and detail:
 - i. OpCo's Customer service model including Staff competencies, roles, deployment and responsibilities;
 - ii. ensuring equitable access for all Customers;
 - iii. Customer communication and other interfaces throughout the journey including, with reference to SPR Appendix 15 (*Branding, Wayfinding, Signage and Customer Information*) during normal, degraded and planned service disruption operations;
 - iv. Customer and Staff safety and security;
 - v. Special Event Services support;
 - vi. ticketing, revenue protection and mitigation of fare evasion;
 - vii. operational integration with other public transport services;

- viii. Customer feedback and lost property management;
- ix. Customer service training and development of Staff; and
- x. measures and strategies to ensure Customer engagement in maintaining high standards and the continuous improvement of service delivery.

3.3.5 Revenue Protection Plan

- (a) OpCo must establish a revenue protection strategy and develop, implement and maintain a Revenue Protection Plan in accordance with the requirements of the deed.
- (b) The Revenue Protection Plan must be updated annually.
- (c) The Revenue Protection Plan must describe how OpCo will assist TfNSW and the State Debt Recovery Office, as appropriate, in the prosecution of fare evaders.
- (d) The Revenue Protection Plan must describe how OpCo will liaise with TfNSW Transport Officers in order to carry out specified co-operation protocols to enforce and reduce fare evasion, and to co-operate with bi-annual fare evasion surveys.
- (e) The Revenue Protection plan must, as a minimum:
 - i. define the process to be implemented to enforce and reduce fare evasion;
 - ii. identify and describe the resources to be deployed by route, day and time;
 - iii. identify any key initiatives and campaigns;
 - iv. describe the process for the recording of data in respect of patronage and validations and inspections by service, route, day and time;
 - v. describe the procedure and processes to be implemented in the event of encountering fare evasion; and
 - vi. identify the maintenance requirements, frequency and activities in relation to the ETS and Legacy Ticketing System (LTS) equipment.

3.3.6 Asset Management Plan

- (a) OpCo must establish, an Asset Management System and develop, implement and maintain an Asset Management Plan in accordance with the requirements of the deed, and with the Asset Standards Authority Requirements for an Authorised Engineering Organisation for the planning, delivery and operation of the infrastructure and services of the SLR.
- (b) The Asset Management Plan must define the policy, the strategy and objectives, and as a minimum:
 - i. contain the high level principles by which OpCo is going to apply Asset management to achieve the intended outcomes of the Strategic Business Plan;
 - ii. define the overall scope and objectives of the Asset Management System;
 - iii. ensure that the Assets maintain the capability to meet service and system performance requirements;
 - iv. describes how innovation will be incorporated in the application of Asset Management practises and processes;
 - v. defines the methodologies which will be used to promote improvement of Asset performance and the introduction of new technology;

- vi. defines the Asset Management principles which will be used by OpCo in respect of:
 - A. the adherence to applicable laws and regulations;
 - B. the provision of resources to deliver the Asset Management Activities;
 - C. the approach to system safety risk, reliability risk and availability risk;
 - D. the approach to achieving lowest whole of life costs for all Assets, while meeting business and operational requirements;
 - E. the change management processes, which will be applied to the Asset Management System;
- vii. indicates how the Asset Management Plan will enable the Asset management objectives and minimum service requirements of SPR Appendix 38 (*Minimum Service Requirements*) and Operations and Customer service requirements of SPR Appendix 39 (*Operations and Customer Service Requirements*) to be achieved;
- viii. provides an inventory and description of Assets by Asset Category including all work-as-executed Design Documentation;
- ix. provides an outline of key performance and condition (over time) targets for each Asset Category that will be necessary to realise the Asset management objectives;
- x. a description of the performance assessment regime that will be used to monitor how actual performance and condition of Assets compares with targets;
- xi. identifies drivers of Asset interventions by Asset Category;
- xii. identification of interdependency between Asset Categories;
- xiii. provides a plan for the assessment of Assets, with results contained in a monthly Asset Performance Report, which identifies: condition by Asset Category including information on:
 - A. assessment of Asset condition and residual life;
 - B. emerging latent Defects;
 - C. specific Assets which may degrade due to exposure to the environment and the elements;
 - D. specific Assets which are subject to accelerated wear or deterioration;
 - E. specific Assets which may or will require renewal and replacement before the end of Design Life or residual life;
- xiv. the assessment of Asset condition and residual life for IWLR Assets must be undertaken within 6 months of the Date of Revenue Service, in accordance with internationally recognised standard. This will include a technical and functional performance assessment and determination of residual life for all IWLR Assets.
- xv. a spares and consumables strategy for each Asset Category which must include:

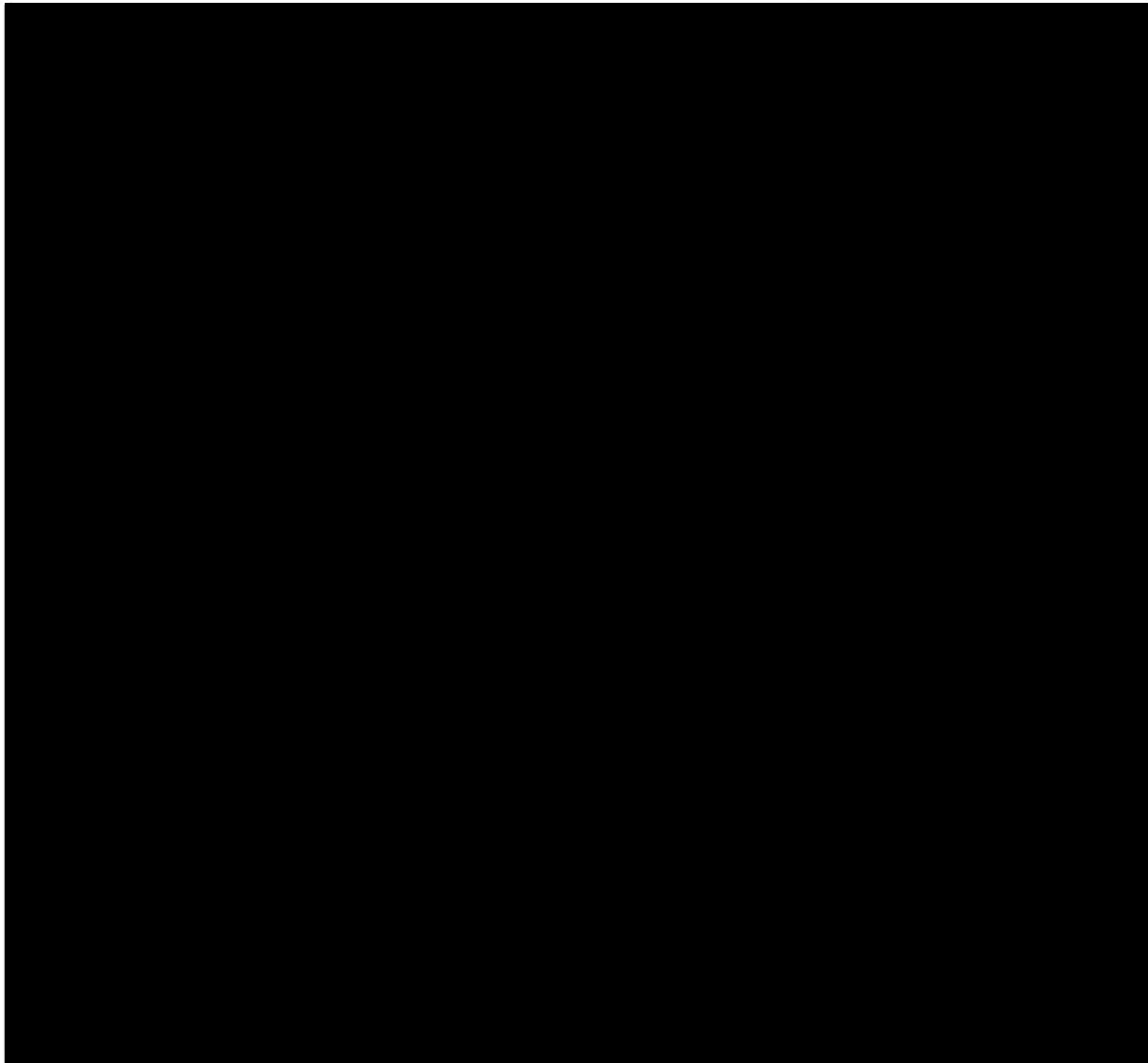
- A. plans for maintaining a sufficient inventory of spares such that all necessary maintenance can be performed;
 - B. plans for replenishing spares stocks and repair strategies;
 - C. plans for storage of spares including off-site storage;
 - D. variation processes to manage the spares pool;
 - E. processes for the modification of spares;
 - F. plans for the management of warranties;
 - G. plans to ensure continuity of supply;
 - H. obsolescence management plans;
 - I. plans to minimise spares deterioration whilst in storage;
- xvi. an Asset Replacement and Refurbishment forecast for the following 30 years;
- xvii. an Asset Replacement and Refurbishment program for all Asset Categories for the following 15 years defining:
- A. Assets to be renewed with supporting justification;
 - B. timing of works;
 - C. locations and scope of works;
 - D. duration of work and potential service disruption; and
 - E. options to minimise service disruption.

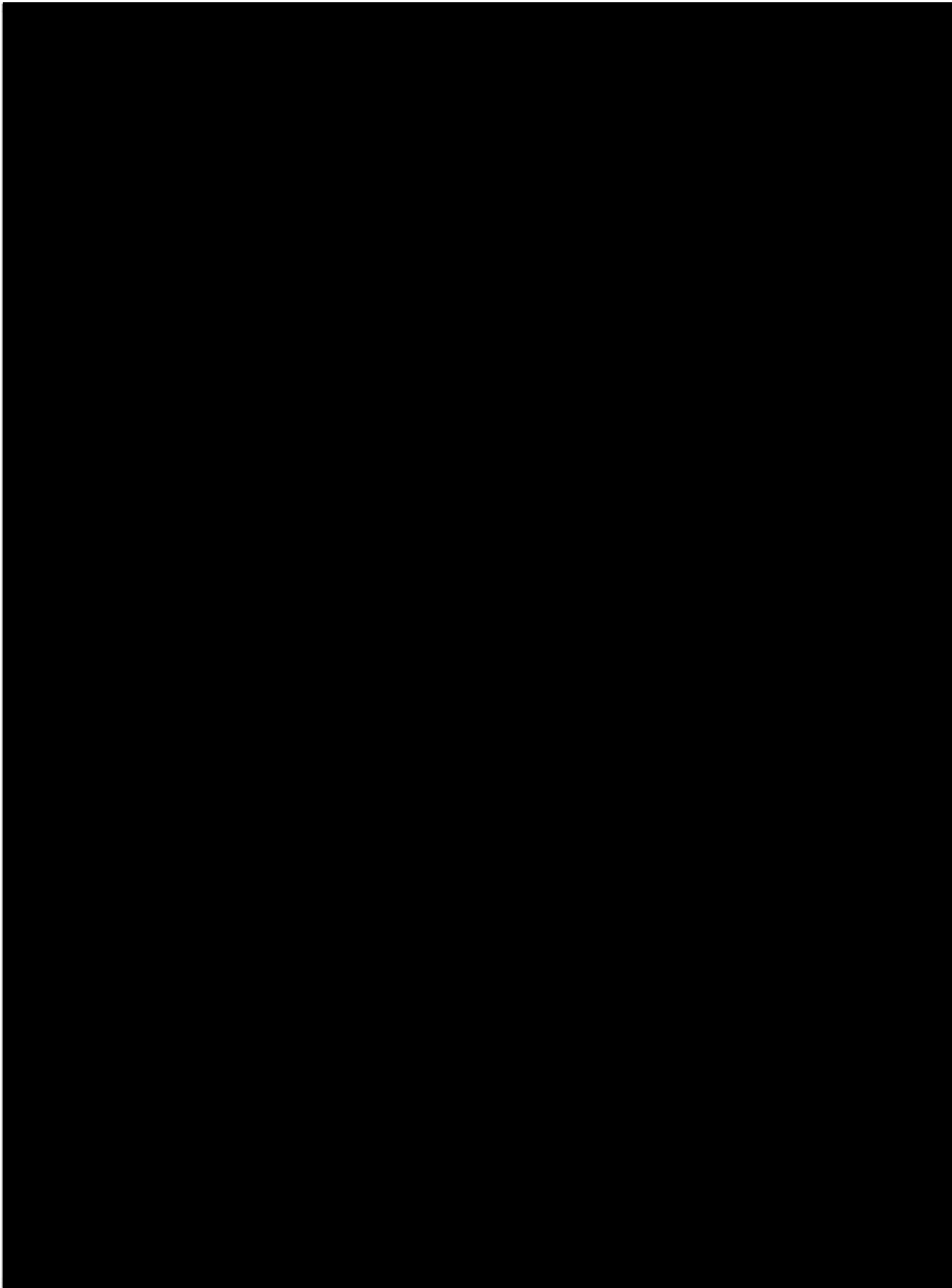
3.3.7 Maintenance Plan

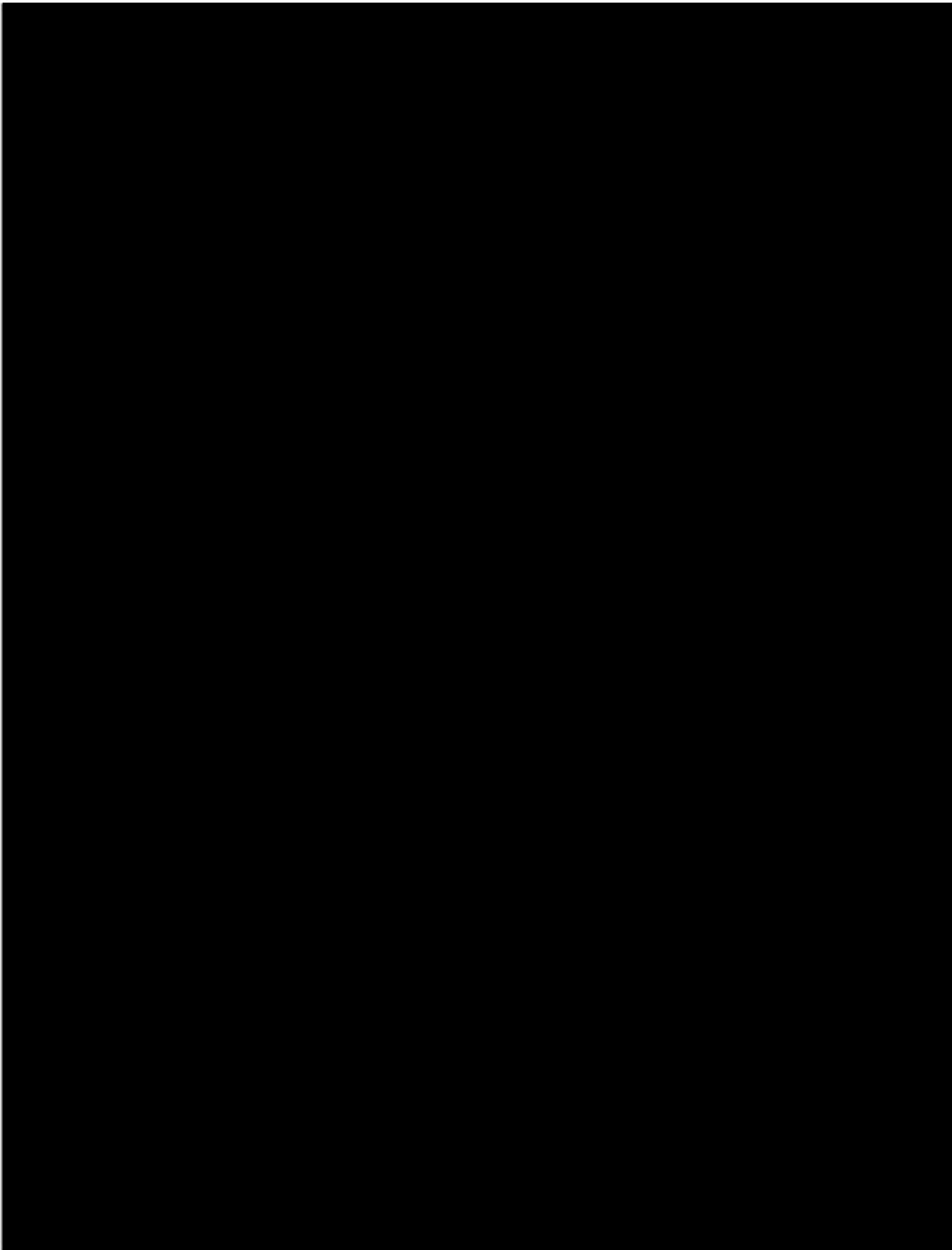
- (a) OpCo must develop, implement and maintain a Maintenance Plan which describes how OpCo will comply with the maintenance requirements of the deed.
- (b) The Maintenance Plan must provide an updated annual Maintenance Works Program, prior to the start of each year, which describes in detail the Asset interventions to be carried out during the following 24 months.
- (c) The Maintenance Plan must as a minimum:
 - i. define in detail the Asset Management Activities for each Asset Category, including Technical Maintenance Plans that have been developed in accordance with T MU AM 01003 ST;
 - ii. identify the necessary activities to ensure the Design Life and Extended Design Life of CSELR Assets or residual life of IWLR Assets will be achieved;
 - iii. incorporate Asset remediation activities which have been agreed with TfNSW;
 - iv. include sufficient detail to facilitate effective monitoring and control of all Asset Management Activities; and
 - v. be updated and reported on a monthly basis.
- (d) The Maintenance Plan must contain the following information:
 - i. a program for the implementation of maintenance activities;

- ii. a summary of key Asset performance risks which will be addressed by the program;
- iii. Asset Management Activities broken down by Asset Category, anticipated date of intervention, duration of activity and quantities of inspections, maintenance and Replacement and Refurbishment activities;
- iv. details of how OpCo will work within planned engineering allowances and mitigate against potential disruptions to the Required Services;
- v. details of activities which will be undertaken to improve or sustain performance including reliability improvement modifications, technology upgrades, replacement of obsolete or life-expired equipment, acquisitions and any system expansion projects; and
- vi. the method and frequency for condition monitoring, and the condition indicator which will be used to determine the requirements for additional Asset Management Activities.

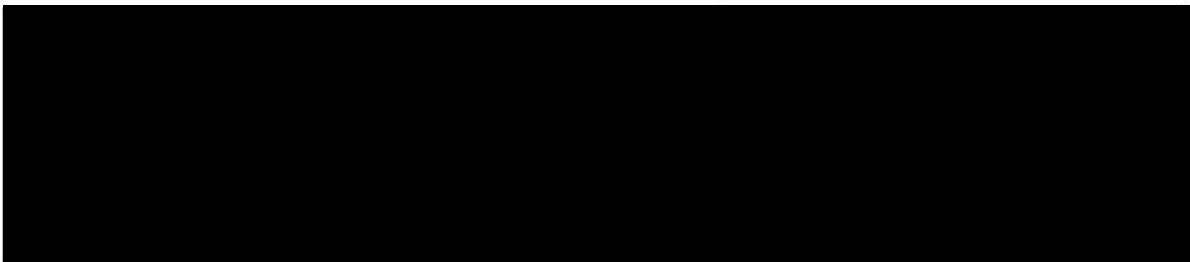
3.3.8 Security Management Plan

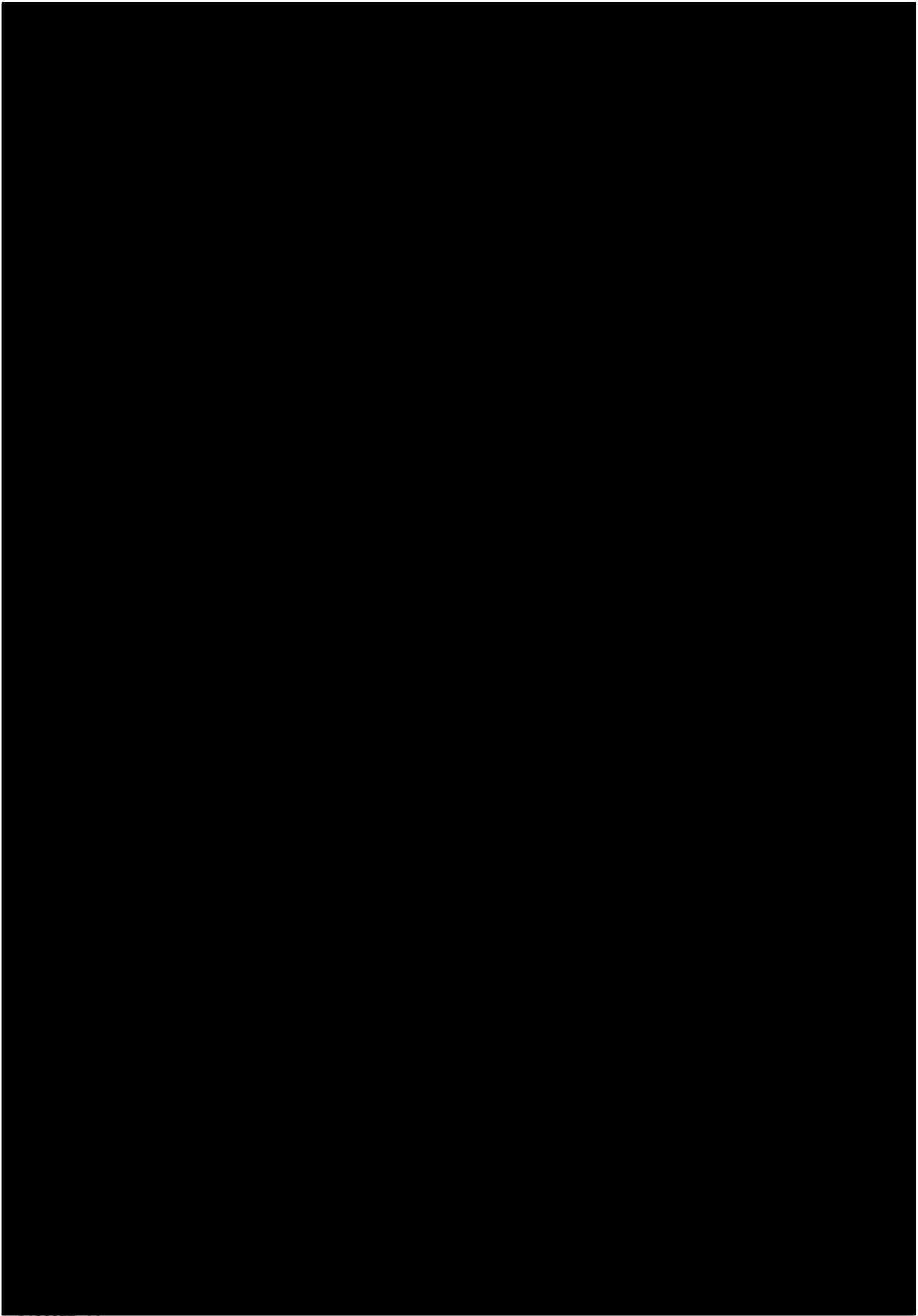


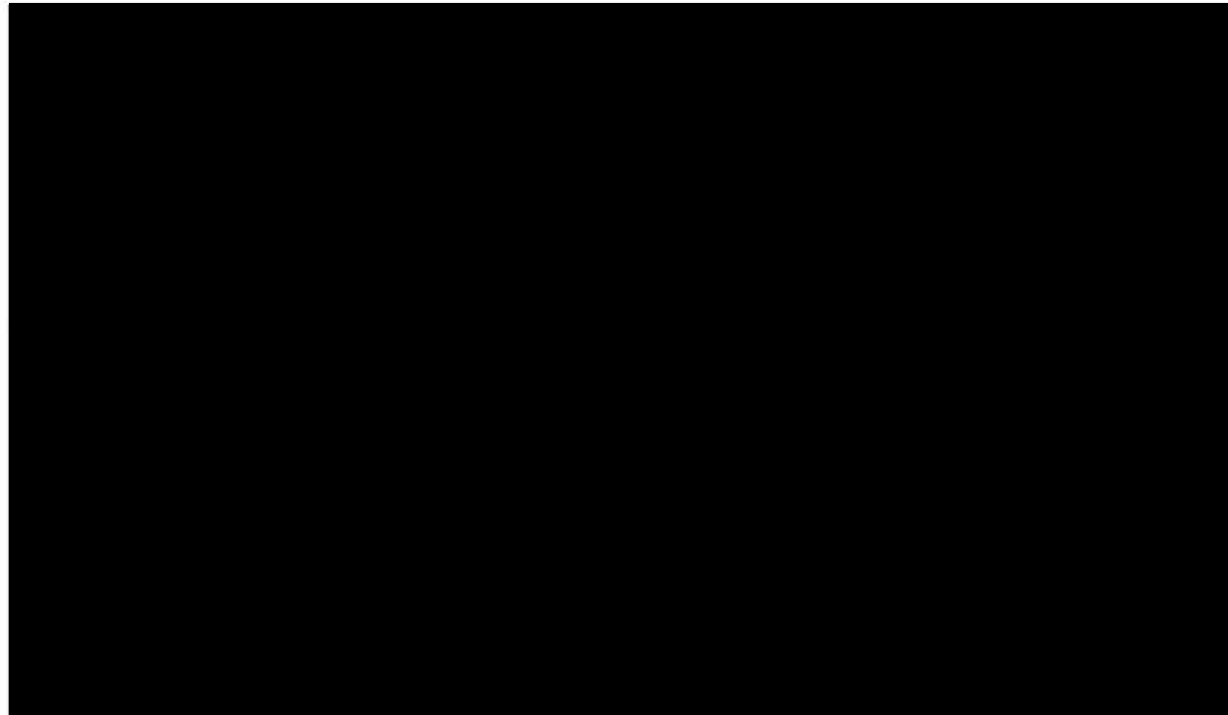




3.3.9 Incident Management Plan







3.3.10 Transport Integration Plan

- (a) For the Full Operations Phase, OpCo must develop, implement and maintain a Transport Integration Plan which identifies the methods, systems, timeframes and procedures to enable OpCo to comply with the transport integration requirements of the deed.
- (b) The Transport Integration Plan must address how OpCo intends to:
 - i. achieve transport integration outcomes for Customers;
 - ii. coordinate required LRV Services with services of other transport operators and authorities;
 - iii. integrate Stop infrastructure with other transport facilities within each Stop interchange;
 - iv. monitor integration of transport operations; and
 - v. identify and respond to change in environmental and operation influences.
- (c) The Transport Integration Plan must, as a minimum:
 - i. identify relevant modes of transport arriving at an Interchange Stop and the way each will be managed;
 - ii. identify the relevant transport and Stop precinct operators, Authorities and stakeholders;
 - iii. describe how OpCo will ensure that the SLR is operationally integrated with other transport modes, networks, facilities and services;
 - iv. address coordination of first and last Required LRV Services with other service providers;
 - v. demonstrate how information regarding planned and unplanned changes to LRV Services is exchanged with the media and other service providers;

- vi. demonstrate achievement of service requirements as outlined in the Integrated Public Transport Service Planning Guidelines issued by Transport Services Division;
- vii. describe how OpCo will coordinate with Stop precinct stakeholders, including government and private transport operators and Authorities, local councils, land owners, tenants, community, user groups and event organisers, for:
 - A. management of relationships with Stop precinct stakeholders, including details of relevant OpCo personnel responsible;
 - B. methods to identify and engage with new Stop precinct stakeholders;
 - C. methods to identify and engage with the operators of new transport services;
 - D. sharing of information;
 - E. participation in place branding;
 - F. participation in community engagement;
 - G. participation with Special Events management/organisers;
 - H. methods for coordination of Special Events, service disruption, maintenance and accident events;
- viii. identify physical elements provided by OpCo to achieve physical integration with other transport networks and facilities, with elements outside the extent of the SLR, including:
 - A. pedestrian facilities including Customer connections, footpaths, pedestrian infrastructure;
 - B. bicycle parking, bicycle end of trip facilities and cycleways;
 - C. shared paths;
 - D. bus bays, bus lanes, bus priority measures and facilities and layover space;
 - E. taxi ranks;
 - F. kiss-and-ride drop-off and pick-up locations;
 - G. off-street and on-street car parking facilities;
 - H. local road works;
- ix. identify elements provided by OpCo to achieve transport integration outcomes for Customers, including elements outside the extent of the SLR, for:
 - A. dynamic Customer information within Stops and interchanges;
 - B. printed Customer information within Stop and interchanges;
 - C. remotely accessible Customer information;
 - D. signage and wayfinding within the Stops and interchanges;
 - E. CCTV and security information systems at transport interchanges;

- x. set out OpCo's arrangements for the management and maintenance of the transport integration elements, including ownership, operation, maintenance and coordination between OpCo, transport operators and Authorities and Stop and Public Domain stakeholders;
- xi. set out OpCo's strategies for the continuous improvement of physical, operational and Customer integration, including:
 - A. monitoring of use and performance of elements of transport integration provided by OpCo;
 - B. Stop maintenance and service vehicle access;
 - C. mechanisms to identify, and respond to changes in:
 - i. passenger demand;
 - ii. Stop and Public Domain land use;
 - iii. other public transport operations and services;
 - iv. new public transport networks, operators and services;
 - D. mechanisms to respond to issues arising from section 3.3.10(c)(vi)B above, including:
 - i. elements owned or operated by OpCo; and
 - ii. elements owned or operated by relevant transport and Station Precinct operators, Authorities and stakeholders.

3.3.11 Transition Out Management Plan

- (a) OpCo must develop, implement and maintain a Transition Out Management Plan which identifies how OpCo will comply with the transition out provisions of the deed, in particular clauses 21.12 and 44.
- (b) The Transition Out Management Plan must, as a minimum:
 - i. identify all subcontracts relevant to the SLR which may require transfer from OpCo to TfNSW or authorised nominees;
 - ii. identify all activities required to meet the requirements of the deed, including clauses 21.12 and 44;
 - iii. identify all activities required for the physical handover of special tools, maintenance equipment, Spares and consumables from OpCo to TfNSW or authorised nominees;
 - iv. identify the scope of all training required that will be required for TfNSW and/or any authorised nominee;
 - v. establish the process and resources required to facilitate the above;
 - vi. identify the management, operations and maintenance systems, including software licenses and ongoing software maintenance costs to be transitioned; and
 - vii. workforce transition and workplace relations requirements prior to handback.

- (c) The Transition Out Plan must include a handback program detailing the timescales, and sequencing of actions needed to complete the following before the end of the Term:
- i. collect all information and data identified in part (b) above;
 - ii. complete all transfers and actions identified in part (b) above, pursuant to the handback requirements; and
 - iii. any Special Tools and Equipment to carry out the maintenance.



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Schedule E1 Scope and Performance Requirements
Appendix 44 – Not Used

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Refer to Schedules Part E (Volume 4 of 4) for SPR Appendix 45 (Concept Design)



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Schedule E1 Scope and Performance Requirements

Appendix 46 – Site Investigation, Survey and Condition Monitoring

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1. General Obligations

- (a) OpCo is responsible for managing the SLR Site, including minimising the impact of OpCo's Activities on the SLR Site and adjoining owners during any investigations, construction and rectification activities.
- (b) OpCo must undertake all site investigations, condition surveys, condition monitoring and infrastructure surveys required for OpCo's Activities in accordance with this Appendix.

2. Site Investigation

- (a) OpCo must undertake all site investigations required for the performance of OpCo's Activities.
- (b) Geotechnical site investigation work must be undertaken in accordance with AS1726.
- (c) OpCo must maintain records of all tests, site investigation and geotechnical reports (including position and elevation survey).
- (d) Site investigations, in conjunction with the design process, must identify all ground conditions and infrastructure conditions (including the condition of roads, parks and other publicly accessible areas, footpaths, shared paths and cycleways, Utility Services, railways, buildings and other structures) which may be affected by the SLR Works, the Temporary Works or OpCo's Activities.
- (e) Where ground conditions or infrastructure are expected to be affected by the SLR Works, the Temporary Works or OpCo's Activities, OpCo must diligently monitor the actual effects in accordance with the requirements of section 4.3 of the SPR.
- (f) All site investigations must be included in the Design Documentation in the following electronic formats:
 - i. .pdf; and
 - ii. ASCII data file in AGS format.
- (g) Site investigation digital data files must comply with RMS Custom AGS Format Data Dictionary "AGS 3.1 RTA 1.1", Revision 6 April 2007.
- (h) All insitu test results, including cone penetration, stress, packer permeability and pressure meter test results, groundwater monitoring and laboratory test results related to site investigations must be provided in .xls electronic format.
- (i) All contamination laboratory test results must be provided in environmental data management software (ESDAT) electronic lab data format.

3. Condition Surveys

3.1. General

- (a) Without limiting the requirements of the Environmental Requirements, OpCo must undertake pre-construction ground and infrastructure condition surveys to establish the condition of all existing ground and infrastructure which could be affected by OpCo's Activities prior to commencing any activity which could affect existing ground conditions or infrastructure (including roads and roadway infrastructure,

parks and other publicly accessible areas, footpaths, shared paths and cycleways, Utility Services, railways, buildings and other structures).

- (b) The pre-construction ground and infrastructure condition surveys must be conducted with the agreement of the property owner and any occupier and be completed at least 30 days prior to OpCo commencing the relevant activity. OpCo must prepare a detailed record that, as a minimum, includes dated photographs of the pre-construction conditions of all ground and infrastructure which may be affected and summary description of the pre-construction condition of the ground and infrastructure.
- (c) OpCo must provide property owners or occupiers with a notice proposing at least two alternative dates for carrying out pre-construction ground and infrastructure surveys. If a property owner or occupier does not provide OpCo with sufficient access to carry out a pre-construction ground and infrastructure survey within 21 days of the latest date which OpCo included in the notice, OpCo must give TfNSW's Representative a copy of the notice and a signed statement by OpCo to the effect that the property owner or occupier has not provided sufficient access to carry out the pre-construction ground and infrastructure survey.
- (d) OpCo must provide TfNSW's Representative and the Independent Certifier and the owner and/or occupier with a hard copy and an electronic copy in .pdf format of the survey report promptly, and in any event within 5 Business Days, after OpCo receives the report.
- (e) All construction ground and infrastructure condition surveys must be carried out by an independent and appropriately qualified and experienced assessor for the specific element of ground or infrastructure being surveyed.
- (f) Infrastructure condition surveys must be undertaken in accordance with the requirements in AS4349.1.

3.2. Condition surveys of buildings

- (a) OpCo must ensure that the processes and procedures for performing all condition surveys on buildings are based on industry best practices. Examples of acceptable standards for condition surveys of buildings include:
 - i. Sections 4 and 5 of the Royal Institute of Chartered Surveyors (RICS) Guidance Note 63/2010 Building Surveys and technical due diligence; and
 - ii. AS 4349 – Inspection of buildings – general requirements, and with specific regard to the heritage elements within the site.
- (b) OpCo's reports on condition surveys of buildings must as a minimum record the following features:
 - i. major features of the buildings and developments including location, type, construction, age and present condition, including any defects or damage;
 - ii. type of foundations including columns, walls and retaining structures;
 - iii. an assessment of the susceptibility of the building to further movement or stress;
 - iv. an assessment of the effectiveness of water-proofing systems in basements to the anticipated movements caused by the OpCo's Activities; and

- v. an assessment of the susceptibility of the building to changes in water levels resulting from OpCo's Activities.
- (c) Existing levels of aesthetic damage are to be recorded in accordance with the assessment requirements of 'Building Damage Classification', by Burland et al., 1977 and Boscardin and Cording, 1989 or another similar or equivalent assessment method to the satisfaction of the TfNSW's Representative.

3.3. Construction phase monitoring

- (a) OpCo must implement a monitoring and inspection regime for properties with the potential to be detrimentally or negatively affected during construction by OpCo's Activities. The monitoring and inspection regime must address the requirements of the deed, Planning Approvals and Third Party Agreements.

3.4. Post-construction condition surveys

- (a) OpCo must undertake post-construction ground and infrastructure surveys to establish the condition of all ground and infrastructure (including the ground and infrastructure subject to pre-construction ground and infrastructure condition surveys) which may have been affected by OpCo's Activities.
- (b) The post-construction ground and infrastructure surveys must be:
 - i. carried out within 15 Business Days after the completion of all activities which may affect ground conditions and infrastructure; and
 - ii. conducted with the agreement of the property owner and any occupier and must include a detailed record (including dated photographs) of the post-construction conditions of the ground conditions and infrastructure.
- (c) OpCo must ensure that post-construction building condition surveys are performed to the same standards as the pre-construction building condition surveys. OpCo must ensure that the same surveyor performs both the pre and post construction condition surveys on a particular building.
- (d) OpCo must provide property owners or occupiers with a notice proposing at least two alternative dates for the carrying out of post-construction ground and infrastructure surveys. If a property owner or occupier does not provide OpCo with sufficient access to carry out a post-construction ground and infrastructure survey within 21 days of the latest date which OpCo included in the notice, OpCo must give TfNSW's Representative a copy of the notice and a signed statement by OpCo to the effect that the property owner or occupier has not provided sufficient access to carry out the post-construction ground and infrastructure survey.

3.5. Reports

- (a) OpCo must submit each pre-construction survey report (in hard copy and .pdf format) to TfNSW's Representative and the Independent Certifier and the owner and/or occupier within 5 Business Days after OpCo receives the report.
- (b) OpCo must submit each post-construction condition survey report (in hard copy and .pdf format) to TfNSW's Representative and the Independent Certifier within 10 Business Days of the survey. For building surveys each report must contain a certificate from the engineer or surveyor who performed the survey certifying that the survey has been completed and is an accurate assessment of the building's condition.

- (c) The post-construction property condition survey report(s) must include a determination of the cause of any monitored change or damage identified (if any) since the pre-construction or previous construction survey(s) and OpCo's proposed remedial works or activities. If any damage is found to have been caused by OpCo's Activities, OpCo must:
 - i. provide TfNSW's Representative with a proposal setting-out the remedial action required; and
 - ii. obtain the property owner's acceptance, in a form agreed to by TfNSW, of the compensation, repair or reinstatement work, and release from future claims and actions.
- (d) If no damage is found to have been caused by OpCo's Activities, OpCo must:
 - i. write to the property owner and provide a copy of both reports for the property owner's records; and
 - ii. provide TfNSW's Representative with a copy of all records for its future reference.
- (e) As a condition precedent to Completion, OpCo must issue to TfNSW' Representative, the Independent Certifier and the property owner and/or occupier a hard copy and an electronic copy in .pdf format of the pre-construction and post-construction survey report except where the property owner or occupier does not provide sufficient access to complete the pre-construction ground and infrastructure survey or the post-construction ground and infrastructure survey in which case OpCo must issue to TfNSW's Representative and the Independent Certifier a hard copy and an electronic copy in .pdf format of the notice and the signed statement of the relevant owner or occupier.

4. Survey

- (a) OpCo must provide and verify survey control for OpCo's Activities.
- (b) Prior to commencing any activity which could affect existing infrastructure (including roads, railways, utility services and buildings), OpCo must undertake a survey to identify and record the location of the site boundary in relation to existing infrastructure.
- (c) OpCo must provide TfNSW's Representative with a report on the location of the site boundary in relation to existing infrastructure prior to commencing the relevant OpCo Activity.
- (d) OpCo must promptly provide TfNSW's Representative and the Independent Certifier with two copies of all property and land surveys, including progressive copies of such documents as each is developed.
- (e) Survey undertaken by OpCo must comply with the requirements Appendix 11 (*TfNSW General Specifications - G71 Construction Survey*).
- (f) OpCo must avoid where possible disturbance of established survey marks and must re-establish any such marks disturbed or affected by OpCo's Activities, in accordance with the requirements of relevant Authorities and the requirements in Appendix 11 (*TfNSW General Specifications - G71 Construction Survey*).

- (g) OpCo must, as a minimum, establish permanent survey marks, at the following locations within the SLR Site:
- i. Circular Quay Stop;
 - ii. Central Station Stop;
 - iii. Moore Park Stop;
 - iv. Randwick Stop;
 - v. Kingsford Stop; and
 - vi. Randwick Light Rail Facility.
- (h) The permanent survey marks must be placed in accordance with the requirements of the Surveying and Spatial Information Regulation 2012 (NSW) and the requirements in Appendix 11 (*TfNSW General Specifications - G71 Construction Survey*).



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Appendix 47 – Design Documentation Requirements

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1. General Requirements

- (a) OpCo must manage the design process for the SLR Works and the Temporary Works in accordance with the Design Management Plan.
- (b) All Design Documentation must be in English and in metric units.
- (c) OpCo must provide any necessary translations of supporting documentation at the time of submission of the Design Documentation.
- (d) OpCo must provide two printed copies and one electronic copy of the Design Documentation to the Independent Certifier, and four printed copies and one electronic copy of the Design Documentation to TfNSW.
- (e) OpCo must provide copies of referenced standards, if required by the Independent Certifier or TfNSW.
- (f) OpCo may deliver drawings in A3 size but must deliver drawings in the original size on the request of TfNSW's Representative or the Independent Certifier. Irrespective of the original size of drawings, and unless otherwise agreed by TfNSW's Representative, the electronic copy must be capable of generating legible prints when reduced to A3 size.
- (g) Each set of drawings must have a drawing index. The drawing index must itself form the first drawing(s) in the series.
- (h) All drawings must comply with the requirements of the ASA CAD manual or the CAD manuals of other asset owners as applicable. (TMD 0001, CAD and Drafting Manual).
- (i) OpCo must provide calculations necessary to support the design upon request of TfNSW or the Independent Certifier.
- (j) OpCo must provide computer analyses and data necessary to support the design proposals in an electronic native format that allows interrogation, manipulation and re-calculation upon request of TfNSW or the Independent Certifier.
- (k) OpCo must provide samples, prototypes and assemblies for testing and quality review upon request of TfNSW or the Independent Certifier.
- (l) OpCo must provide any other information necessary to enable TfNSW and the Independent Certifier to undertake the review of the Design Documentation.
- (m) In relation to the design presentation workshops required by clause 13.6 of the Operative Provisions, OpCo must notify TfNSW and the Independent Certifier of each upcoming design presentation at least 10 Business Days prior to the planned presentation date.

2. Design Stages

- (a) All Design Documentation must be submitted for review.
- (b) The Design Documentation must be submitted to the Independent Certifier and TfNSW as a minimum:
 - i. at the completion of the preliminary design stage for each design package (“Design Stage 1”);
 - ii. at the completion of the substantially complete design stage for each design package (“Design Stage 2”); and
 - iii. at the completion of the final design stage for each design package, including all design outputs required to allow construction, and related construction packages (“Design Stage 3”).
- (c) OpCo may propose, in its Design Management Plan, to remove either a Design Stage 1 or a Design Stage 2 submission for a specific design package. TfNSW may, at its absolute discretion, agree to the removal of a Design Stage for a specific design package. Where a Design Stage is removed, OpCo must include all the requirements for that Design Stage in the subsequent Design Stage submission of the Design Documentation for the design package.
- (d) The Design Documentation submitted for review must be submitted in design packages as detailed in the Design Management Plan.
- (e) If OpCo splits or combines any of the design packages, OpCo must include in the combined or split design package all relevant requirements, information, descriptions including a traceability matrix to the previous design packages to ensure that the Independent Certifier and TfNSW can adequately review the design package.
- (f) The Design Documentation submitted for each Design Stage must include the requirements of any specific Design Documentation requirements described in other Appendices.

3. Design Reports

- (a) The Design Documentation for each design package must include a comprehensive design report which describes the basis for the design development of the design package.
- (b) The design report must be prepared progressively and submitted at each Design Stage.
- (c) The design report, as a minimum, must identify, address and include:
 - i. the scope of the design package, part or element;
 - ii. a description of the overall system and sub-systems;
 - iii. a list of all documents and deliverables that make up the design package;
 - iv. a list of all referenced standards and design guidelines applicable to the design package;
 - v. references (including photographs) to any Quality Benchmarks, samples, scale models and prototypes to be submitted as part of the design package; and
 - vi. the relationship and/or reliance of the design package on other design packages.
- (d) The design report must identify and address all design inputs relevant to the design package including:
 - i. the requirements of the deed, including this SPR and the Concept Design;
 - ii. any departures from the Concept Design (and from the previous Design Stage if any) and the reasons for the changes;
 - iii. a list of all computer software to be used for analysis of the design or in preparation of the design package;
 - iv. performance criteria and measures to comply with the performance criteria specified for the discrete design components, parts or elements;
 - v. environmental and sustainability design criteria;
 - vi. not used;
 - vii. assumptions and constraints;
 - viii. interim design reviews in summary form;
 - ix. inputs from stakeholders and the community involvement process;
 - x. details of integration and multi-disciplinary design interface issues and risks associated with other discrete design elements and associated mitigation strategies;
 - xi. details of durability issues and risks, and measures to comply with the durability requirements for the discrete design components, parts or elements;

- xii. details of the processes for the development of software and application data for systems;
 - xiii. the design loadings, load combinations, exposure conditions and design standards that are adopted for the detailed design of the discrete design elements or components;
 - xiv. details of constructability issues and measures, including traffic management during construction of the SLR Works and the Temporary Works, where this influences design;
 - xv. any specialist engineering input and reports including geotechnical, groundwater, hydrology, flooding, noise and vibrations, materials testing, settlement and movement assessment, monitoring and infrastructure protection; and
 - xvi. justification of any proposed necessary relaxation from desired minima or maxima design parameters and use of corresponding absolute values.
- (e) The design report must identify and describe all design outputs relevant to the design package including:
- i. design drawings, calculations and schedules;
 - ii. details of any computer software proposed, and whether it is commercially available or is to be developed;
 - iii. details of proposed configuration of computer hardware resources including processor type, operating systems, development environment, capacity, interfaces and timing diagrams;
 - iv. details of functional analysis and requirements allocation, including functional flow block diagrams;
 - v. RAMS forecasts and FMECA for the system in accordance with the RAMS Plan;
 - vi. details of any alternative designs considered and the process used to determine the best option;
 - vii. details of manufacturing requirements, including special materials, tooling and processes to be developed or used in construction, operations and maintenance;
 - ix. detailed specifications for materials, finishes, equipment and systems;
 - x. the sustainability initiatives incorporated as part of the design package as required by Appendix 7 (*Sustainability*);
 - xi. design model verification; and
 - xii. the Predicted Effects requirements of section 4.3 of the SPR.
- (f) The design report must identify and describe the allowances for future network extensions and network expansions (systems and sub-systems) relevant to the design package including:
- i. how the future network extensions and network expansions can be accommodated;

- ii. details of the spare capacity incorporated in the design, in terms of additional route length and number of LRVs in service, without the addition of any further equipment racks, upgrading of power supply, accommodation and supporting building services; and
 - iii. details of any additional equipment and associated spatial, accommodation, power and building services facilities provided to support the future network extensions and network expansions.
- (g) The design report must identify and provide:
 - i. details of compliance with:
 - A. the requirements of clause 13 (Design) of the Operative Provisions;
 - B. the requirements of this SPR;
 - C. the Environmental Requirements,including identifying any potential inconsistency between these documents; and
 - ii details of compliance with:
 - A. any Authority Approvals and requirements; and
 - B. any other Approvals that OpCo is required to obtain for the design and construction of the SLR Works and the Temporary Works.
- (h) The design report must identify safety issues and other risks relevant to the design package, and describe measures to comply with the criteria specified for the discrete design elements and components, including:
 - i. details to address the requirements of security, fire and life safety, accessibility, passenger and staff safety;
 - ii. details to address the requirements for Accreditation;
 - iii. details to address the safe construction of the SLR Works and the Temporary Works; and
 - iv. all risks associated with the design and construction of the discrete design components, parts or elements and management strategies.
- (i) The design report must identify all Tests relevant to the design package, including the testing and commissioning requirements to be addressed in the Testing and Commissioning Plan, and contain any test results applicable to the Design Stage.
- (j) The design report must identify all Operations Phase requirements relevant to the design package, including:
 - i. maintenance issues, impacts and requirements;
 - ii. details of all maintenance and lifecycle issues to be addressed in the development of the Asset Management Plan; and
 - iii. details of all operational issues to be addressed in the Operations Plan.

- (k) The design report must include all comments received by OpCo from the Independent Certifier on prior Design Stage submissions, and a description of how these comments have been addressed

4. Design Stage 1 Design Documentation

- (a) The Design Stage 1 Design Documentation for each design package must include:
- i. a design report;
 - ii. a full set of preliminary general arrangement, design schematic and concept drawings;
 - iii. preliminary calculations including assumptions;
 - iv. preliminary details of all equipment, plant, materials and finishes;
 - v. a compliance check with the Environmental Requirements;
 - vi. any other Design Stage 1 design submission requirements described in the Appendices;
 - vii. any other details, calculations, models, drawings, reports or other information as reasonably requested by TfNSW or the Independent Certifier;
 - viii. an engineering assurance register in Microsoft Excel or Microsoft Word format; and
 - ix. a safety assurance statement.
- (b) The Design Stage 1 Design Documentation for each design package must be consistent with and a logical development of the Concept Design for the system, part or element (if included in the Concept Design) provided in Appendix 45 (*Concept Design*).

5. Design Stage 2 Design Documentation

- (a) The Design Stage 2 Design Documentation for each design package must include, as a minimum:
- i. an updated design report;
 - ii. a full set of developed drawings and schematics;
 - iii. final calculations including assumptions;
 - iv. complete details and selections of all equipment, plant, materials and finishes;
 - v. how comments made by the Independent Certifier on the Design Stage 1 Design Documentation have been addressed;
 - vi. a compliance check with the Environmental Requirements, in particular the Project Planning Approval;
 - vii. any other Design Stage 2 design submission requirements described in the Appendices to the SPR;
 - viii. an engineering assurance register in Microsoft Excel or Microsoft Word format; and
 - ix. a safety assurance statement.
- (b) The submission of the Design Stage 2 Design Documentation must represent the completion of the design definition for each design package. Further development of the design package in Design Stage 3 must be limited to design detailing and preparation of drawings suitable for construction.

6. Design Stage 3 Design Documentation

- (a) The Design Stage 3 Design Documentation for each design package must include:
- i. an updated and final design report;
 - ii. a full set of complete drawings suitable for construction of the SLR Works and the Temporary Works;
 - iii. verification of the Design Documentation against the design inputs, including achievement of acceptance criteria, safety, environmental and other management requirements for the Design Documentation;
 - iv. construction documentation for each construction package, including procurement specifications, technical specifications and testing, commissioning and acceptance criteria for the SLR Works and the Temporary Works;
 - v. a compliance check with the Environmental Requirements, in particular the Project Planning Approval;
 - vi. how comments made by the Independent Certifier on the Design Stage 2 Design Documentation have been addressed;
 - vii. evidence of any Approvals that OpCo is required to obtain for the design and construction of the SLR Works and the Temporary Works;
 - viii. an engineering assurance register in Microsoft Excel or Microsoft Word format;
 - ix. an independent security audit of the overall systems security;
 - x. a safety assurance statement; and
 - xi. any other Design Stage 3 design submission requirements described in the Appendices.
- (b) The Design Stage 3 Design Documentation for each discrete design component, part or element must include a durability assessment report that:
- i. identifies the exposure conditions expected to be encountered by the discrete design component, part or element, including severity of the soil and groundwater conditions and the environment within tunnels;
 - ii. includes available soil and groundwater test results;
 - iii. describes the expected and assumed degradation and corrosion processes associated with the environments to be encountered by the discrete design component, part or element;
 - iv. identifies the durability requirements and the performance criteria applicable to the discrete design component, part or element;
 - v. details any design work undertaken by or on behalf of OpCo in respect of the discrete design element component, part or element;
 - vi. summarises the Design Stages and reviews and includes responses to all previous review comments provided in relation to durability issues;

- vii. not used;
 - viii. identifies the critical durability issues with respect to construction of the discrete design element, component, part or element;
 - ix. identifies the inspection/monitoring and maintenance requirements in the construction and operation of the discrete design element component, part or element to achieve the durability requirements; and
 - x. includes any other information that TfNSW may reasonably request.
- (c) At least one hard copy of all Design Stage 3 Design Documentation that has been certified by the Independent Certifier must be kept on the Construction Site relevant to the Design Documentation, and made available for inspection by TfNSW and the Independent Certifier during the Delivery Phase.
- (d) All Design Documentation that is amended after being certified by the Independent Certifier, and any additional Design Documentation related to the design package that is required for construction purposes, must be submitted for Design Stage 3 design review in accordance with clause 13.7 of the Operative Provisions.

7. Additional submissions

- (a) In addition at Design Stage 1, Design Stage 2 and Design Stage 3, OpCo must submit the following documents:
- i. project safety hazard log;
 - ii. human factors assurance report; and
 - iii. operational noise and vibration review.

8. Quality Benchmarks, samples and prototypes

- (a) As part of the design submission and review process OpCo must prepare and submit to TfNSW and the Independent Certifier project specific quality samples and prototype installations of:
- i. passenger information displays;
 - ii. help points;
 - iii. light fittings; and
 - iv. balustrades and balusters.
- (b) The submission requirements for samples and prototypes stated in the Appendices are the minimum submission requirements for samples and prototypes. OpCo must submit enough quality samples and prototype installations to adequately demonstrate the Quality Benchmarks.
- (c) OpCo must construct, manufacture or procure and submit prototypes for all Quality Benchmarks. The Independent Certifier must certify that the submitted prototype is at least equivalent to the Quality Benchmark prior to OpCo proceeding with any equivalent permanent work. Once certified by the Independent Certifier, the project specific prototype will become the Quality Benchmark to be achieved in the SLR Works.
- (d) All sample and prototype submissions must be:
- i. photographed and referenced in the design report relevant to the design package;
 - ii. accompanied by relevant product data sheets and test certificates;
 - iii. permanently labelled with the submission details including date and description; and
 - iv. securely stored by OpCo in a dedicated facility for the duration of the Delivery Phase, unless otherwise agreed with TfNSW's Representative.

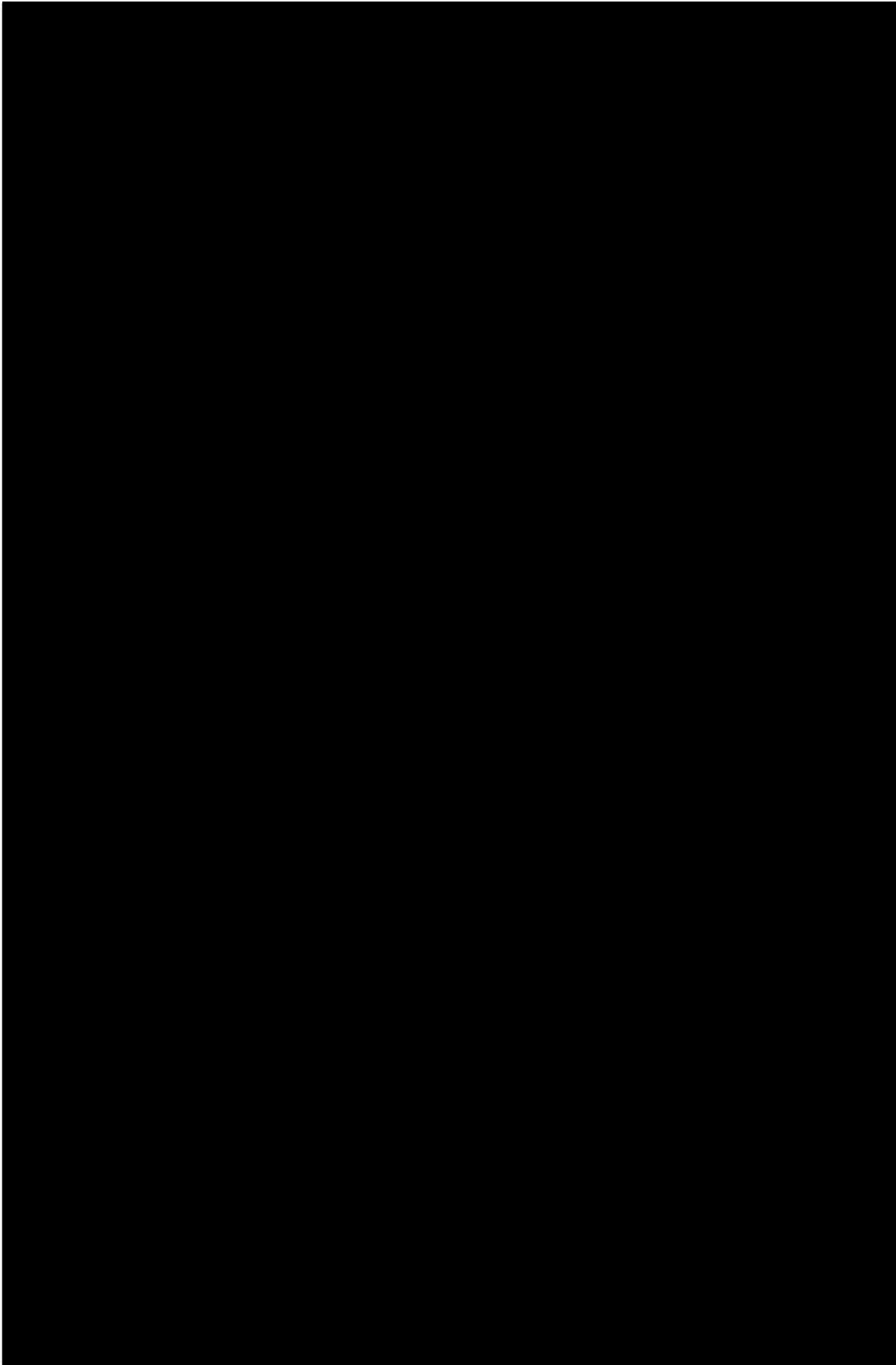


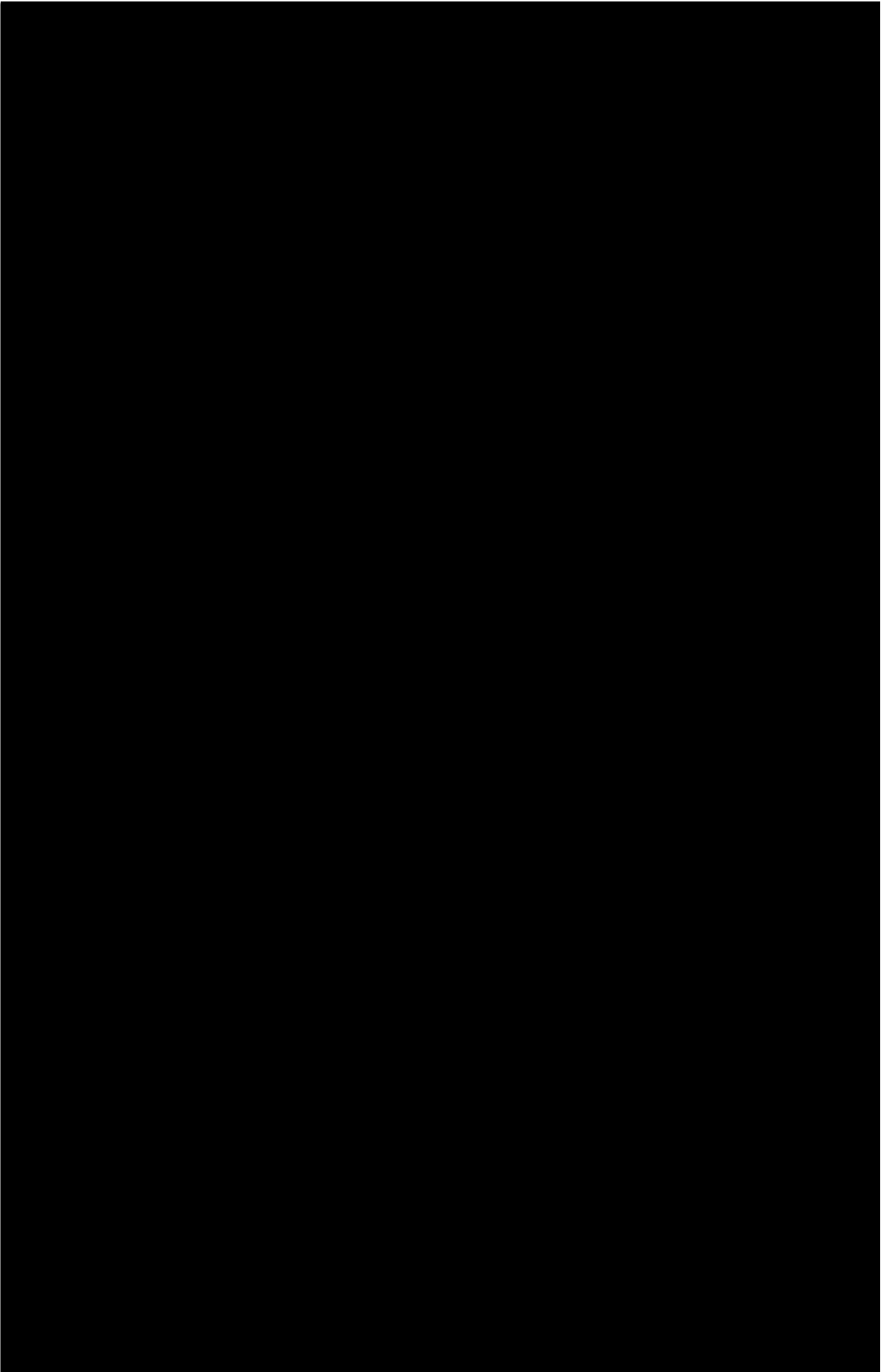
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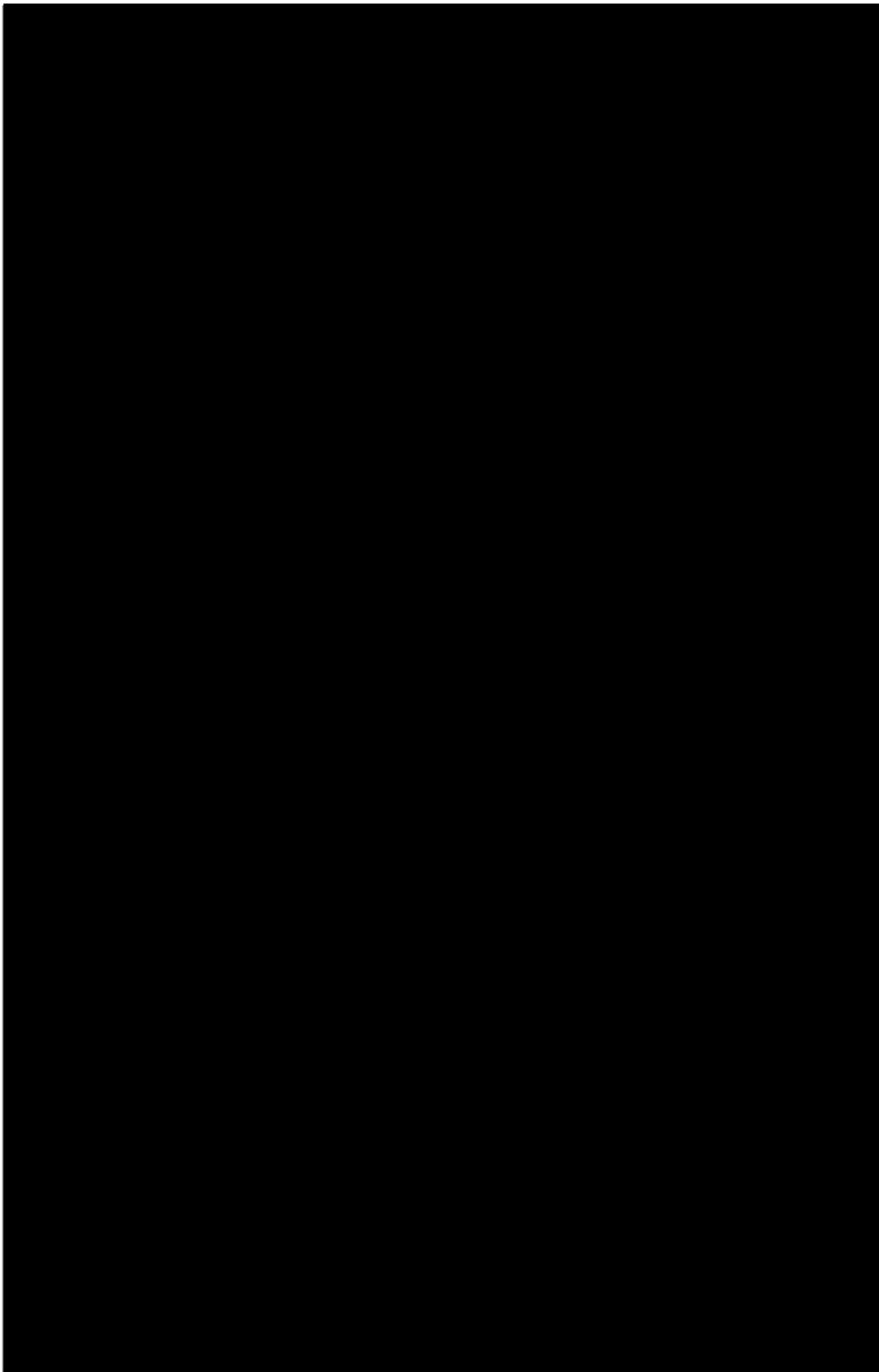
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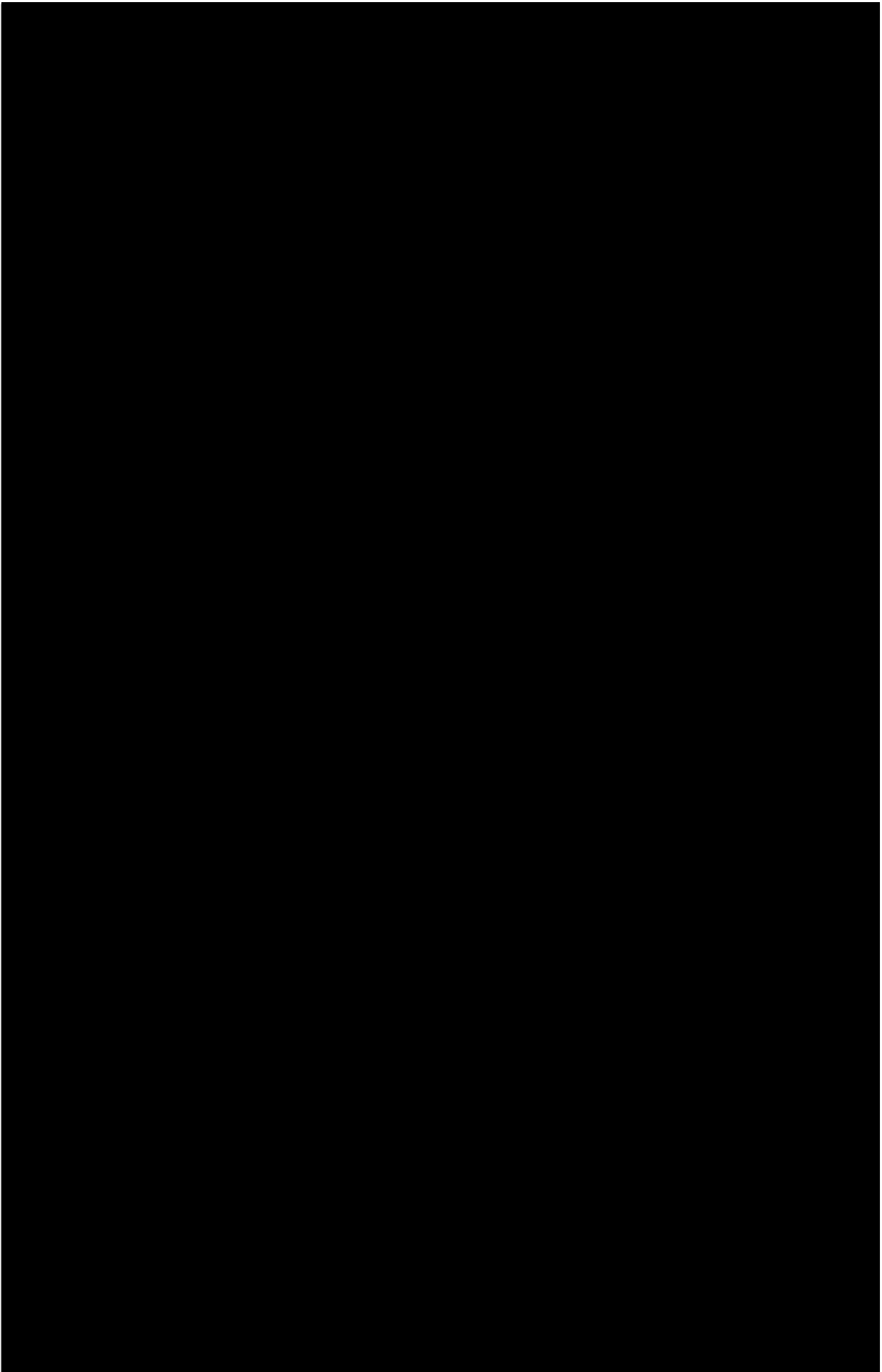
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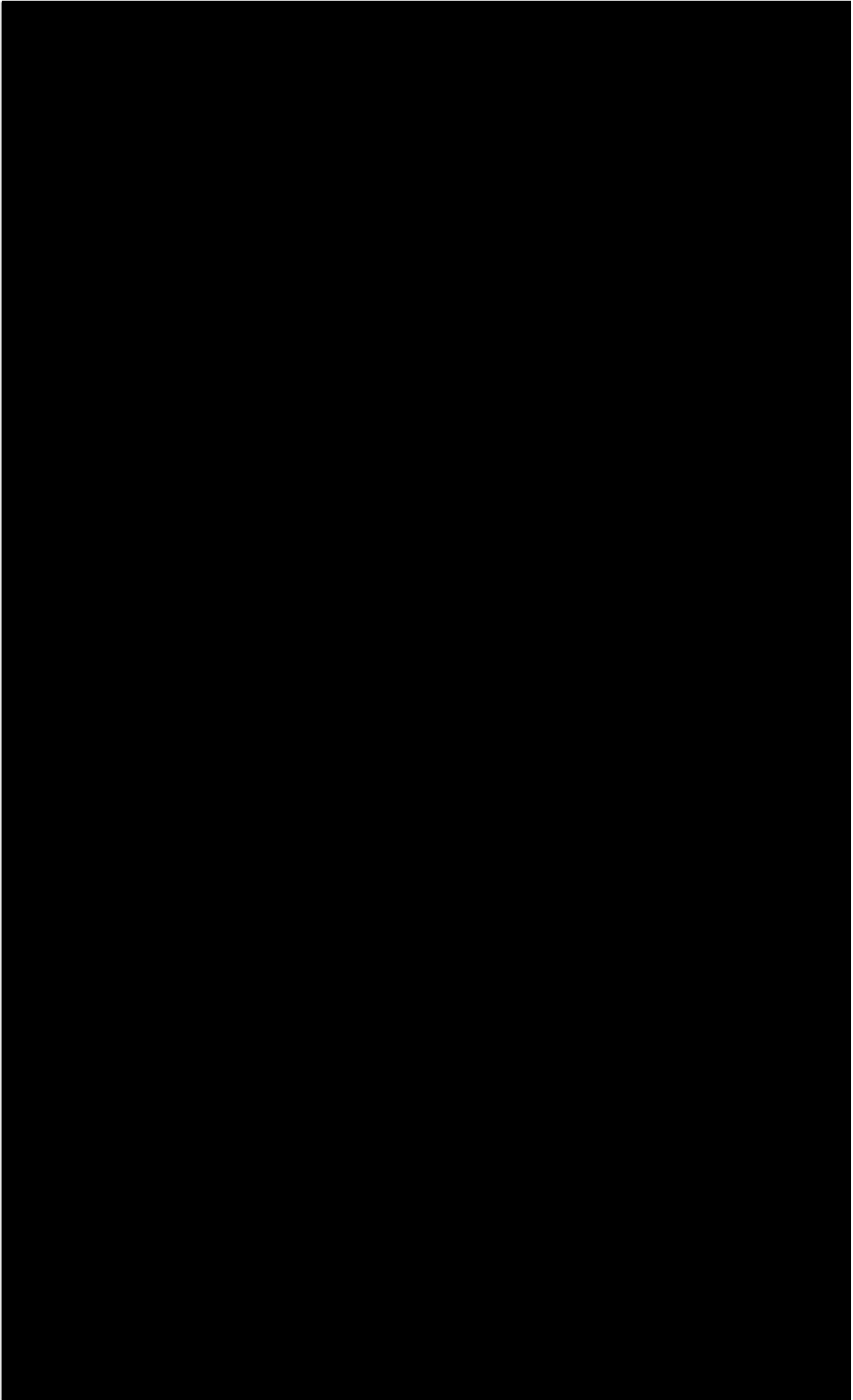


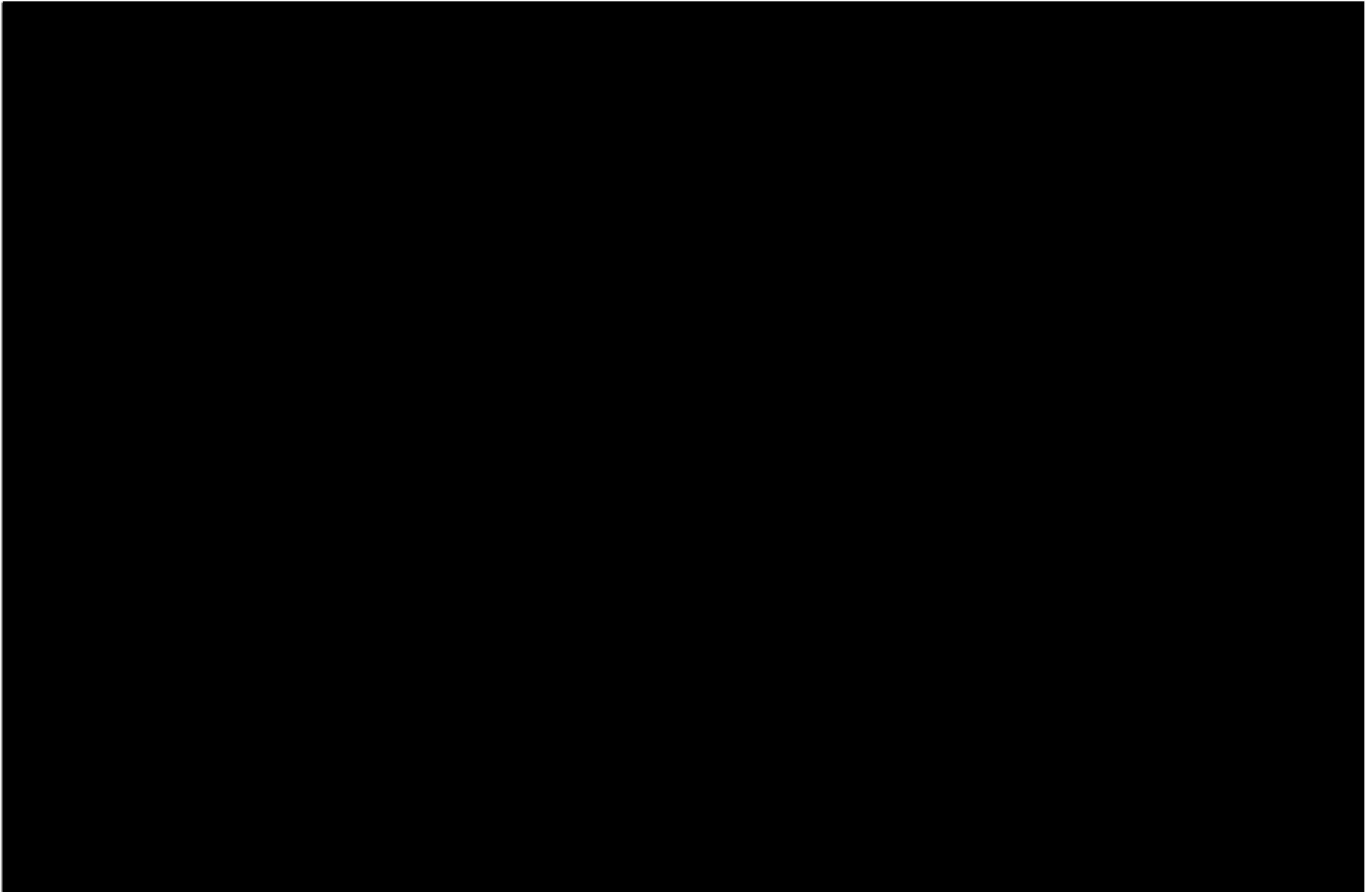






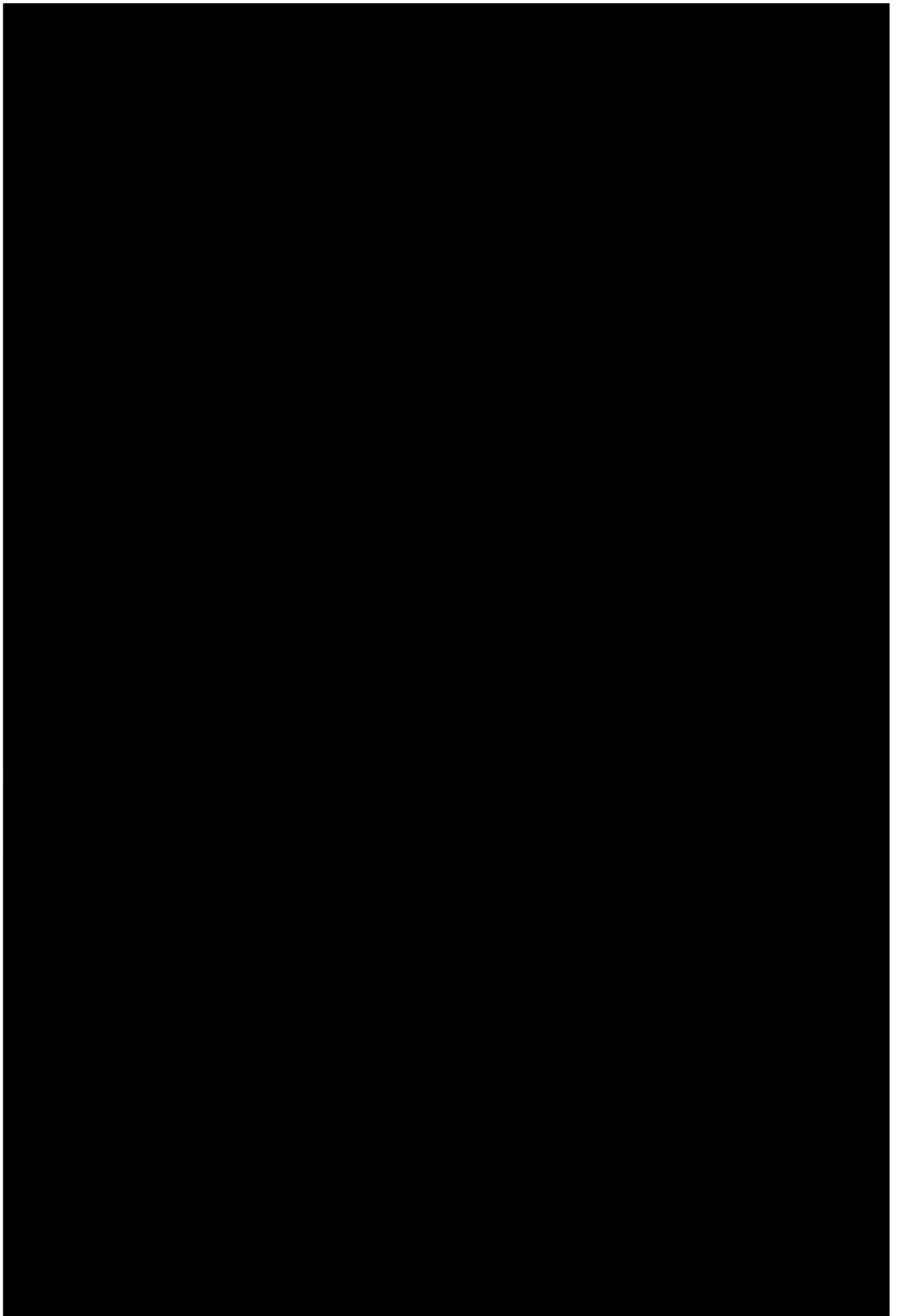


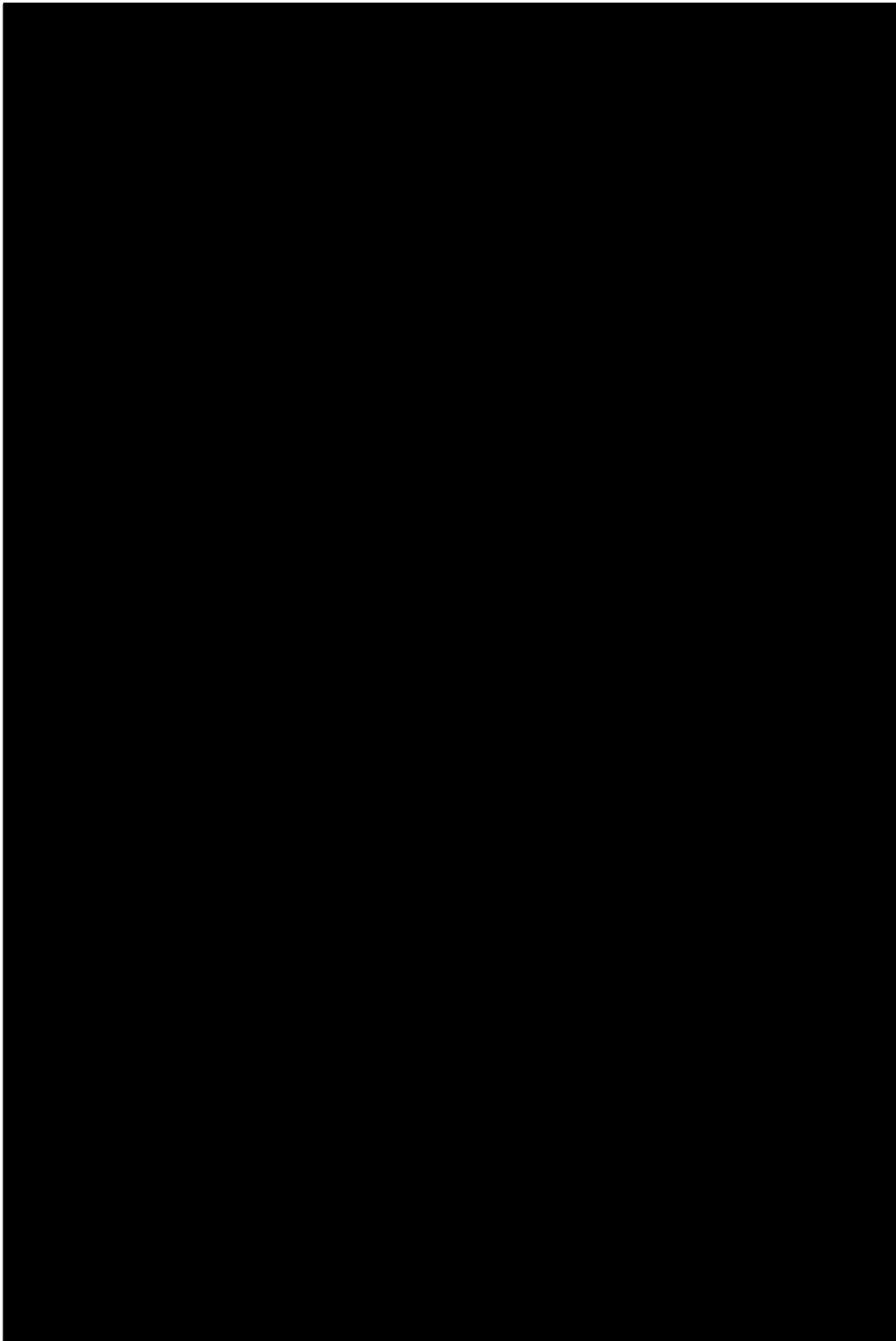


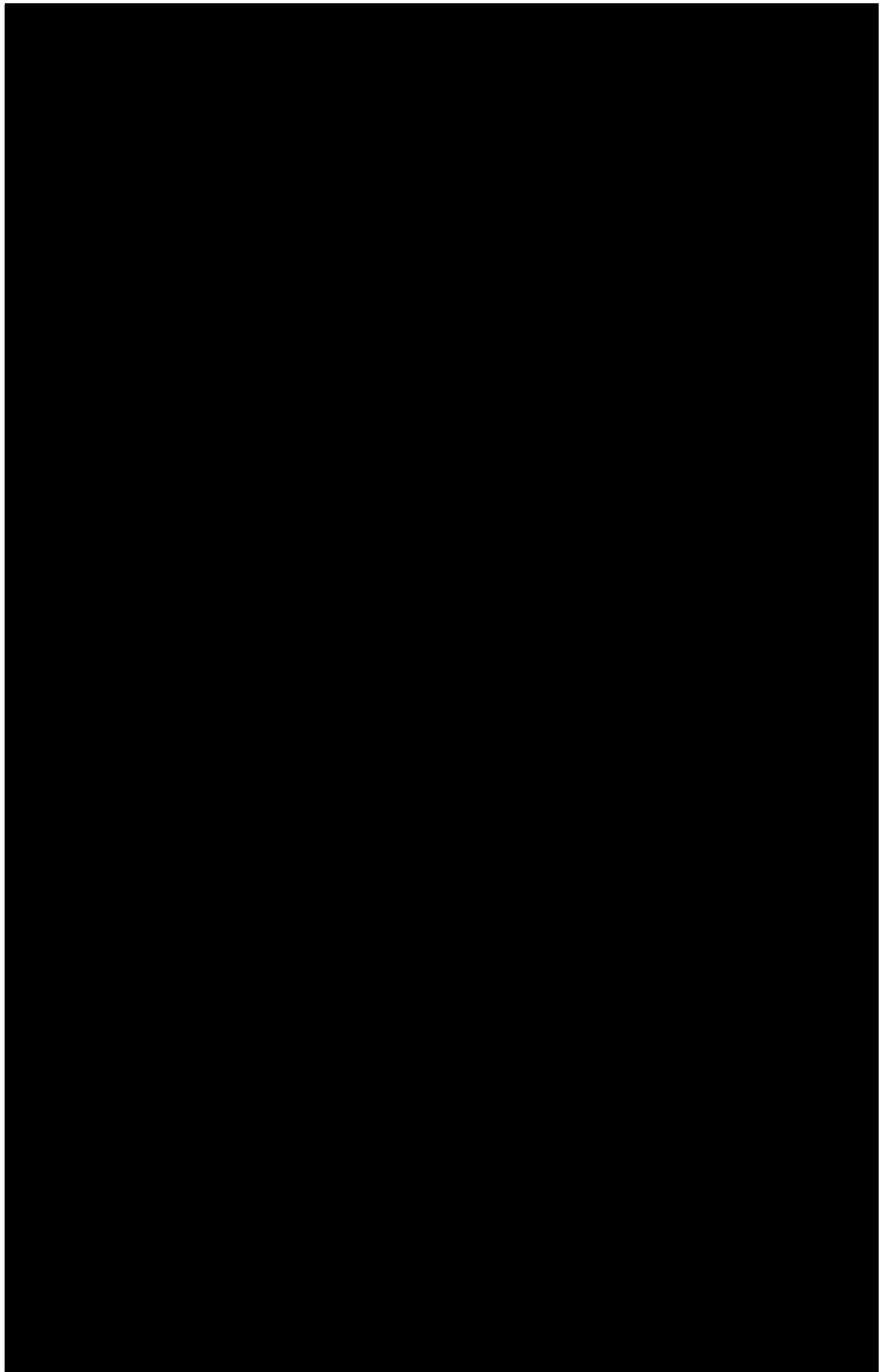


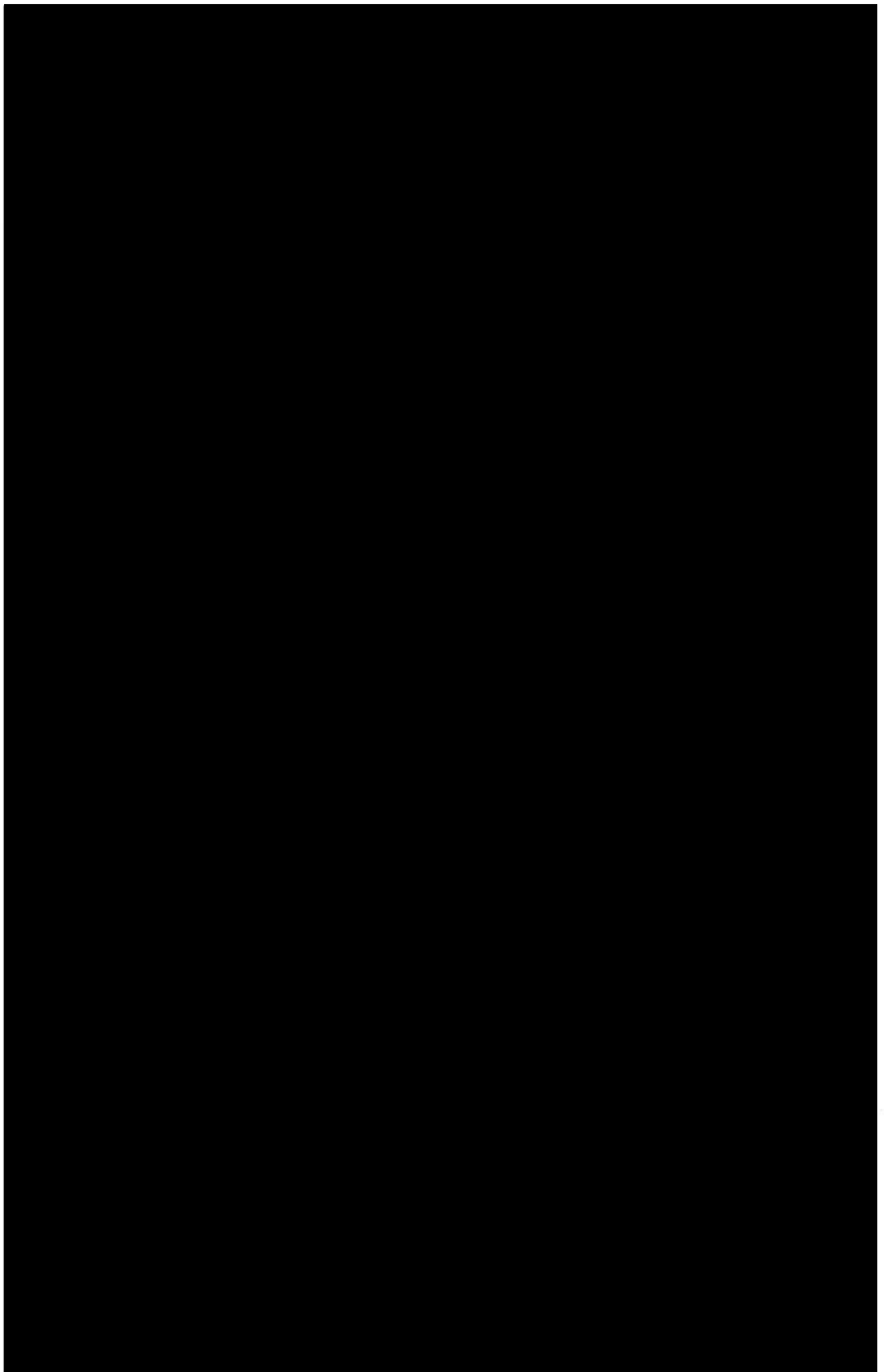


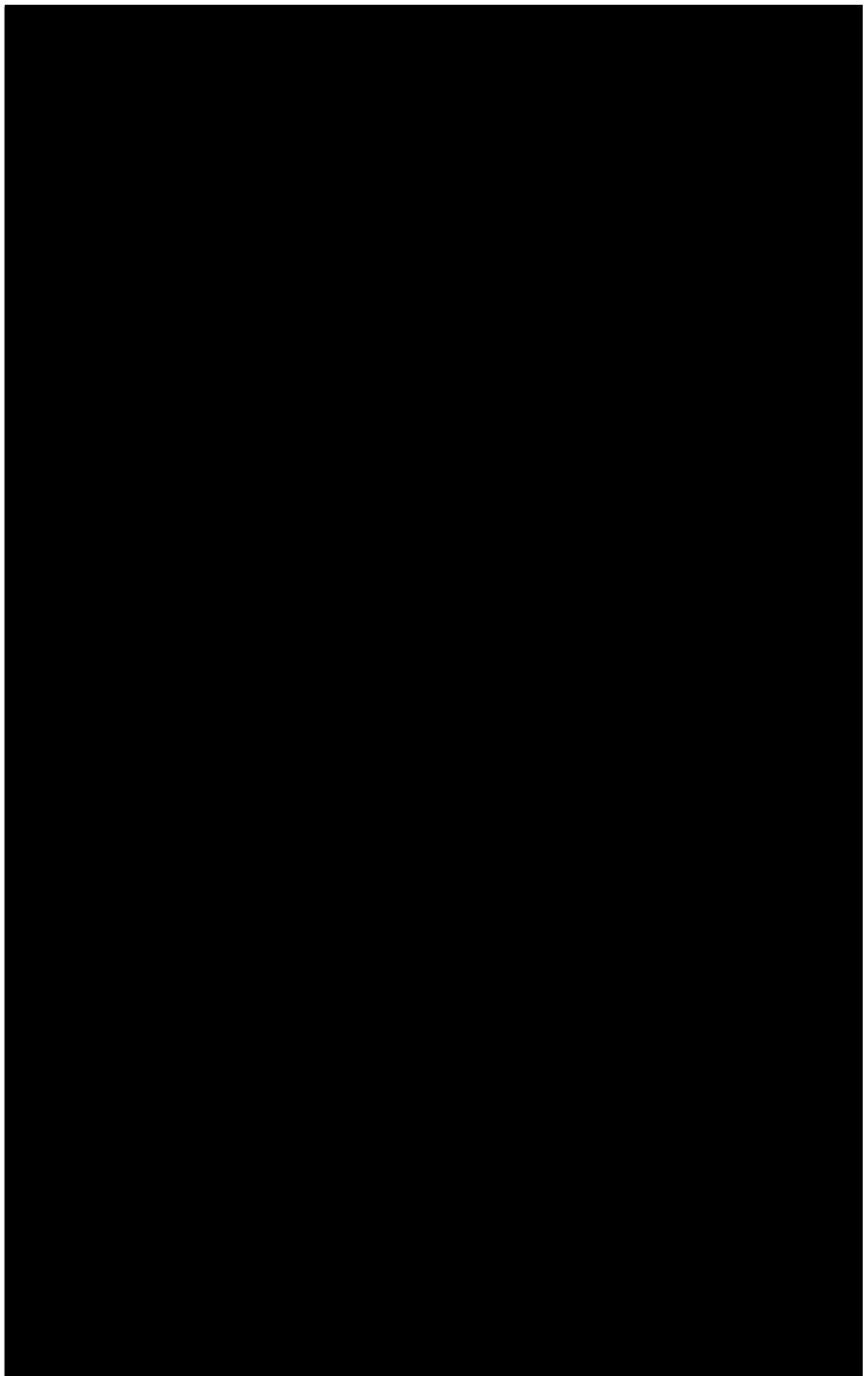


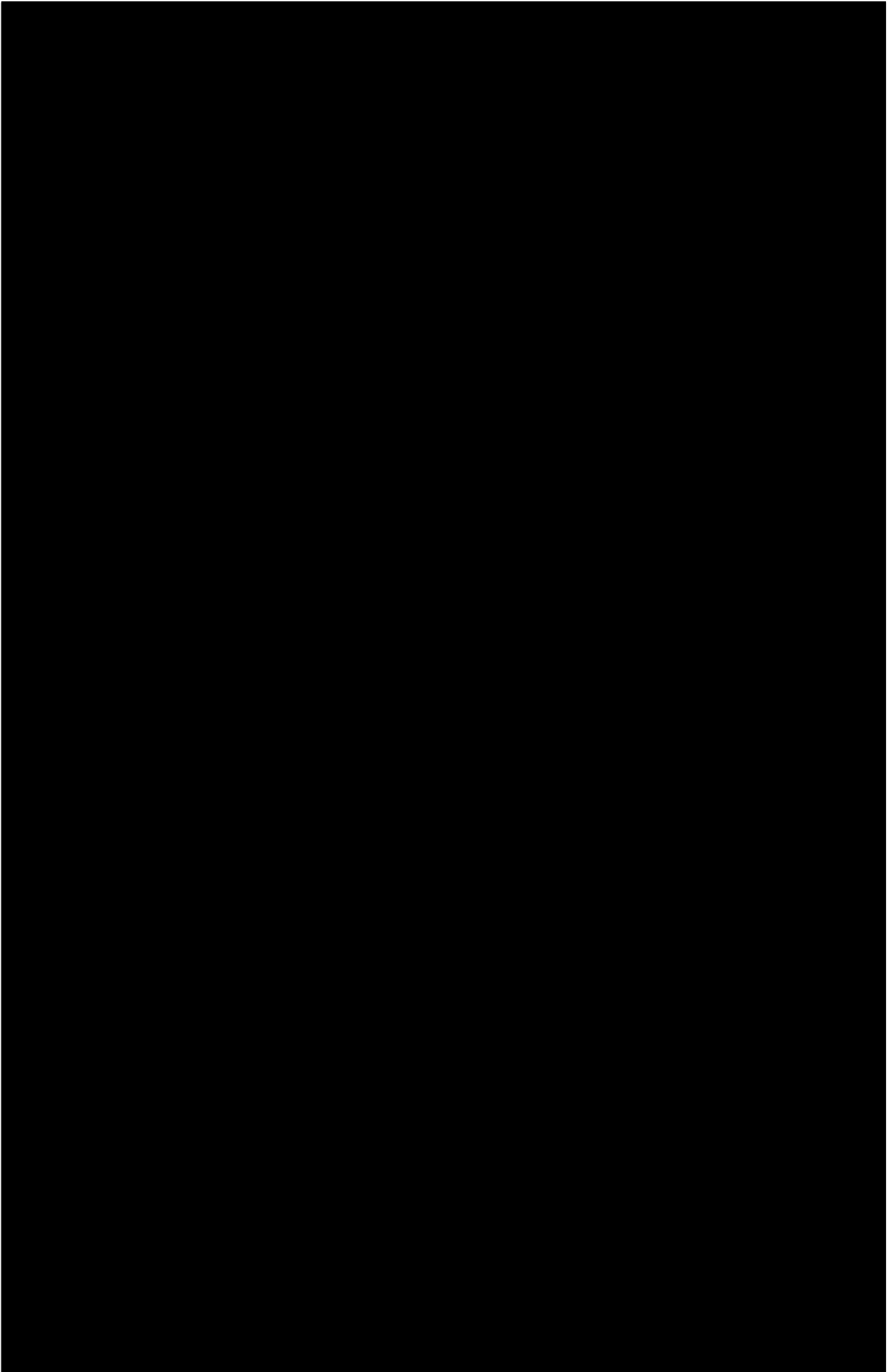


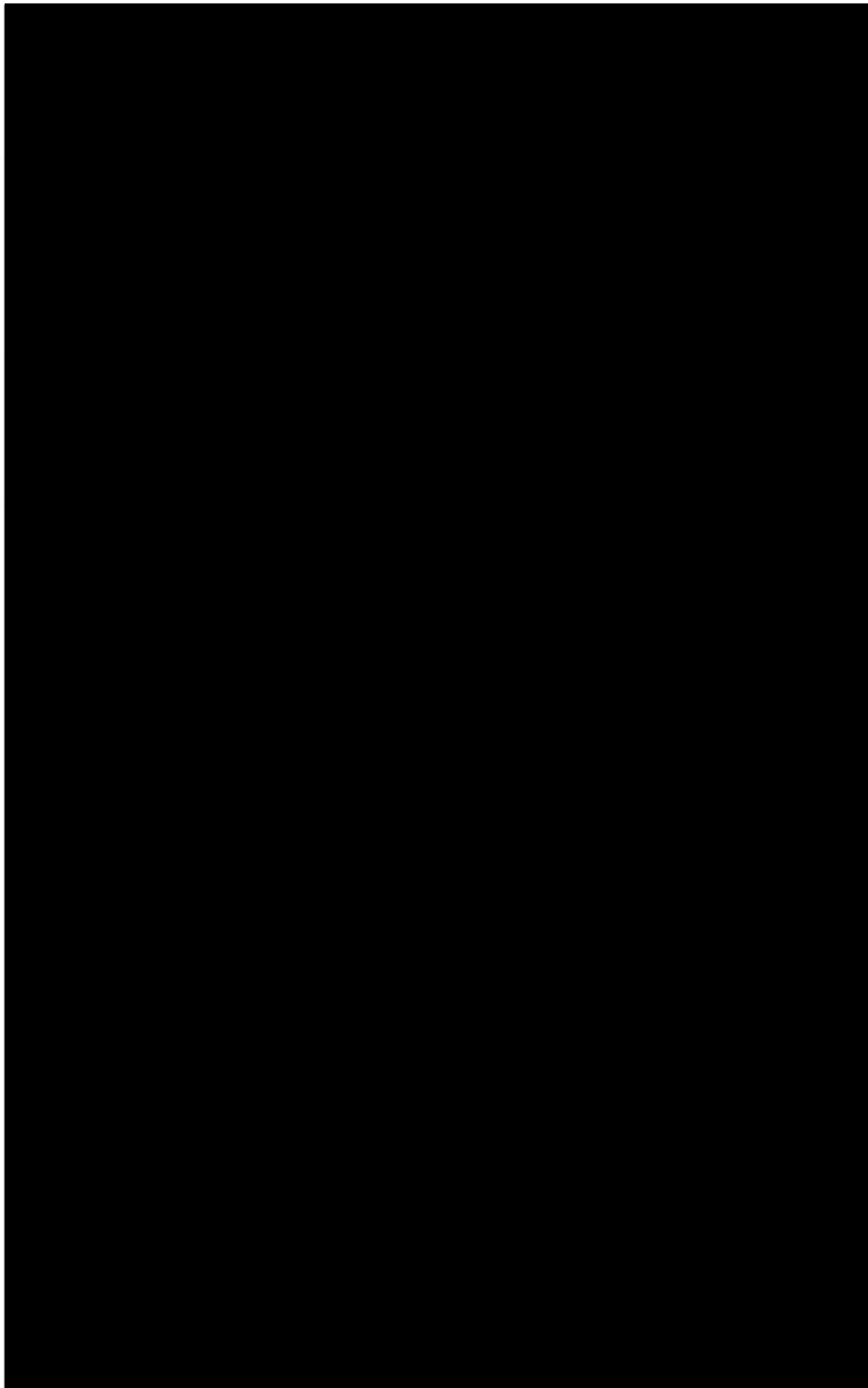


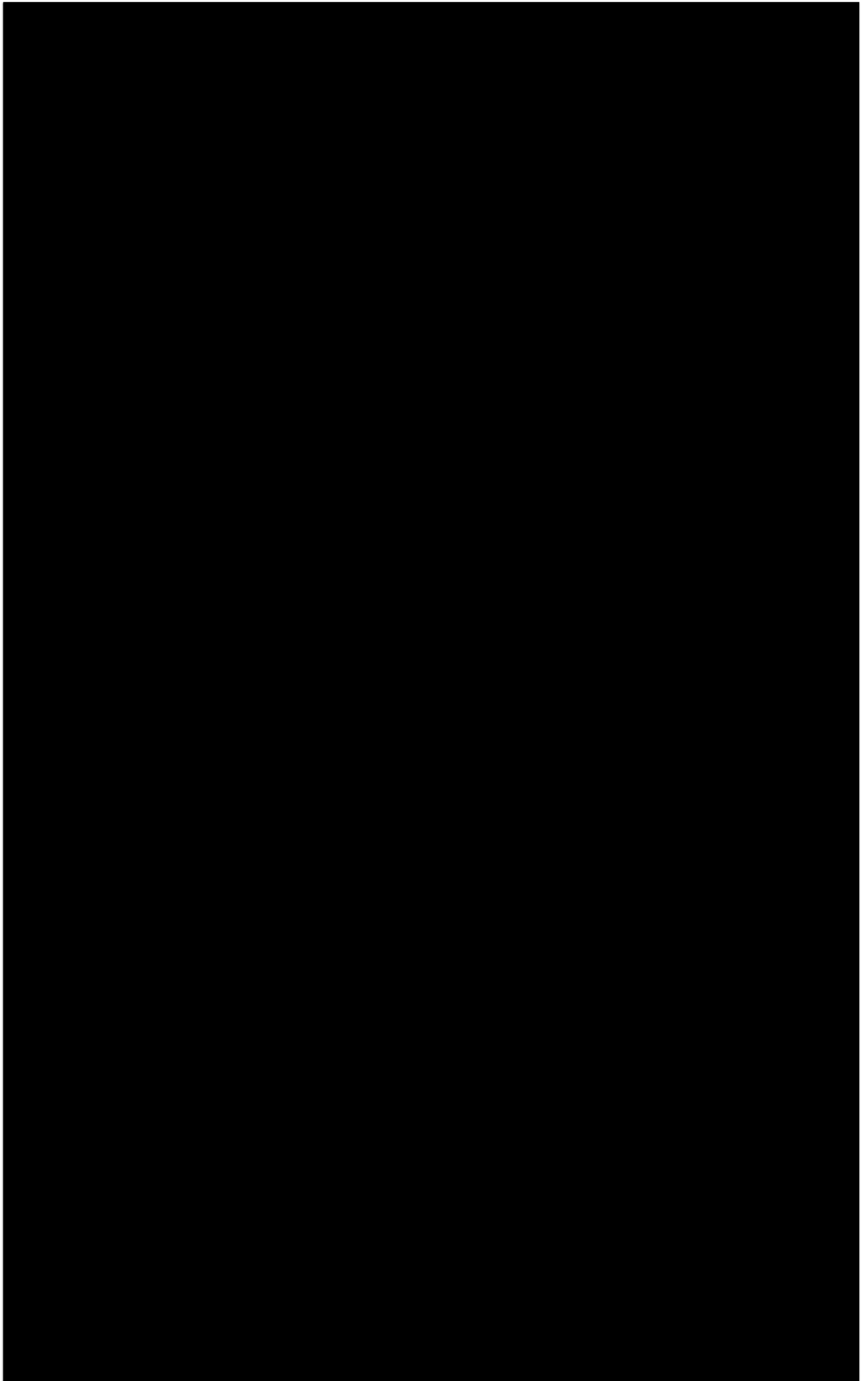


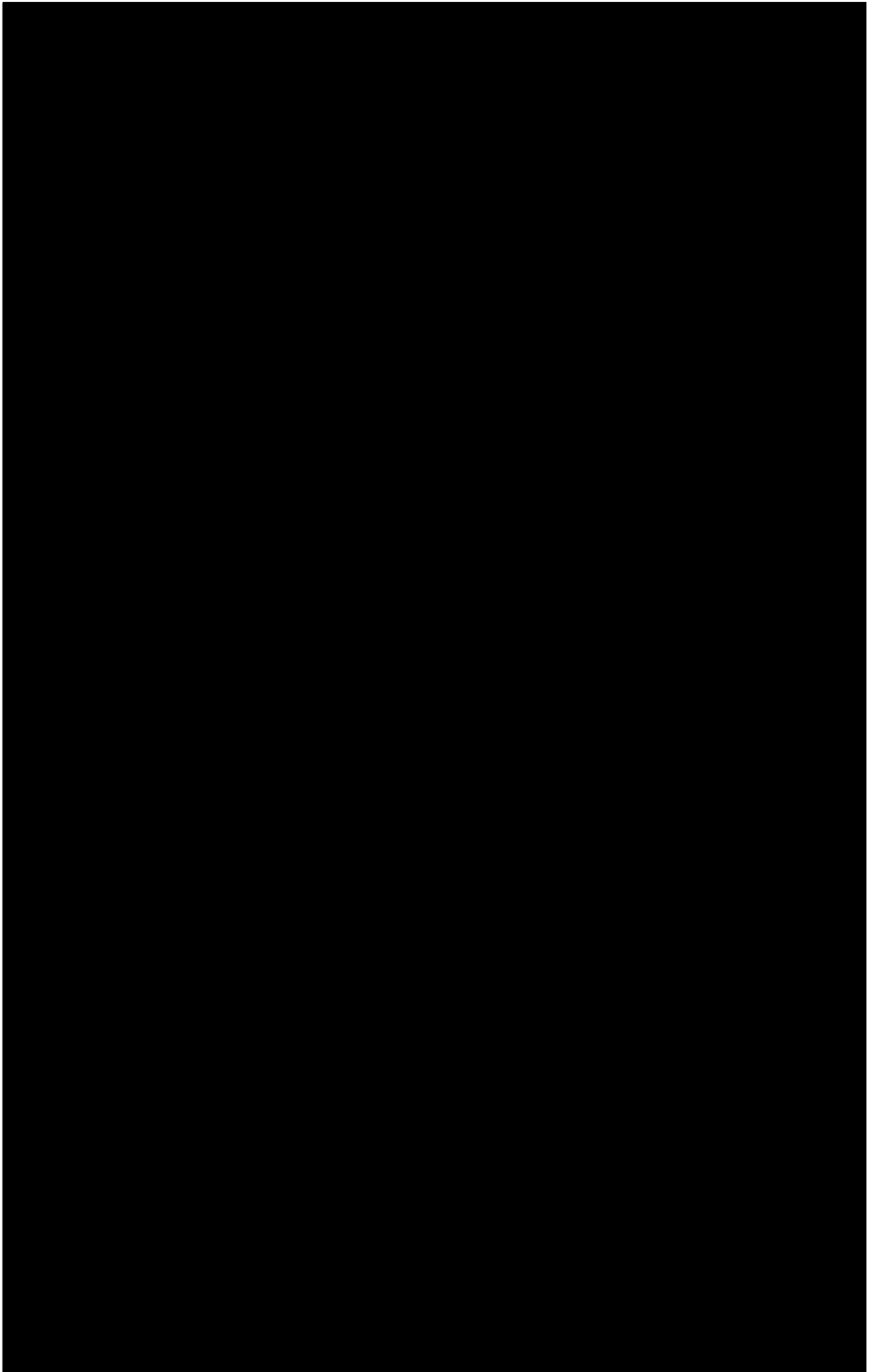


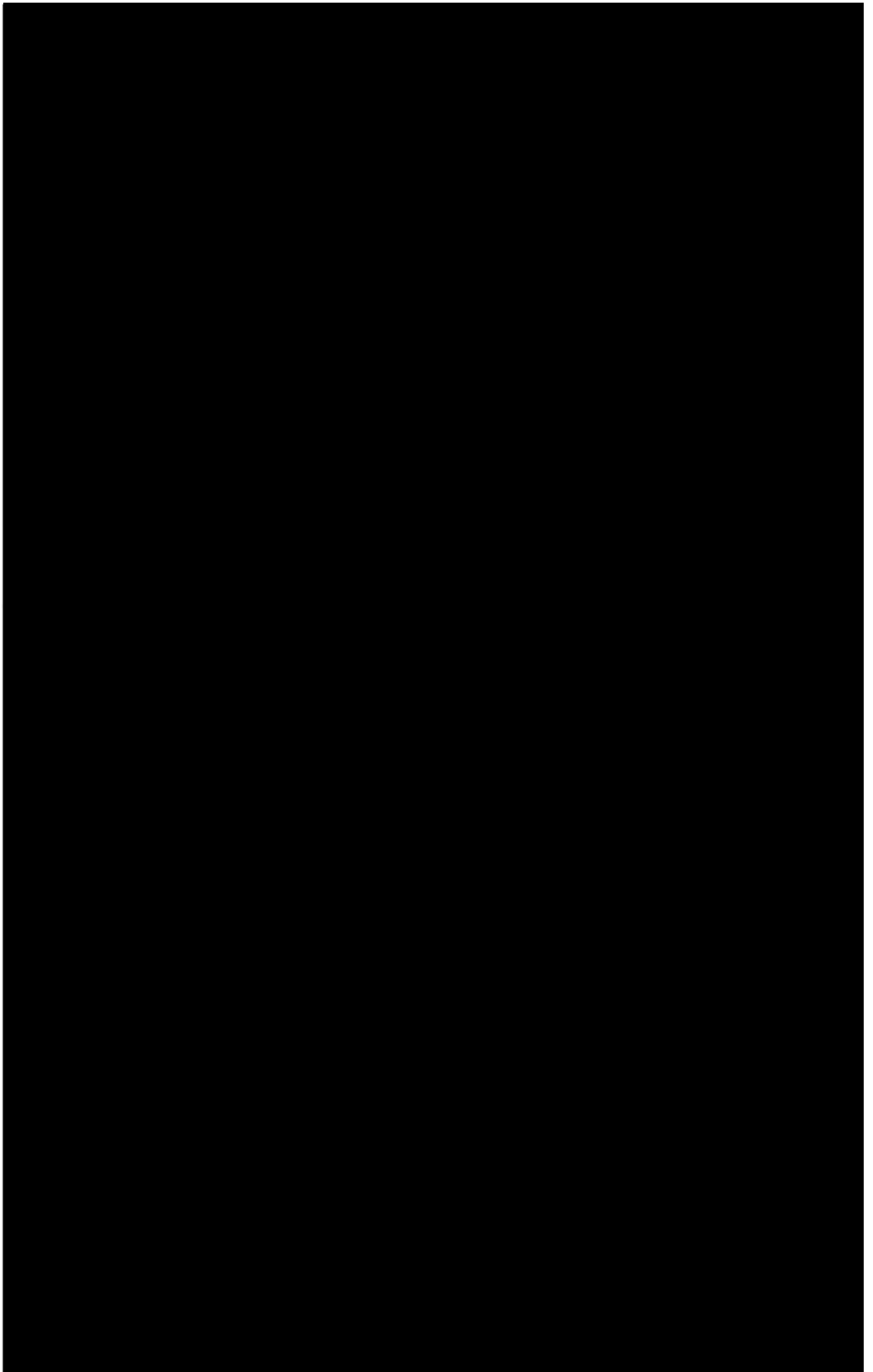


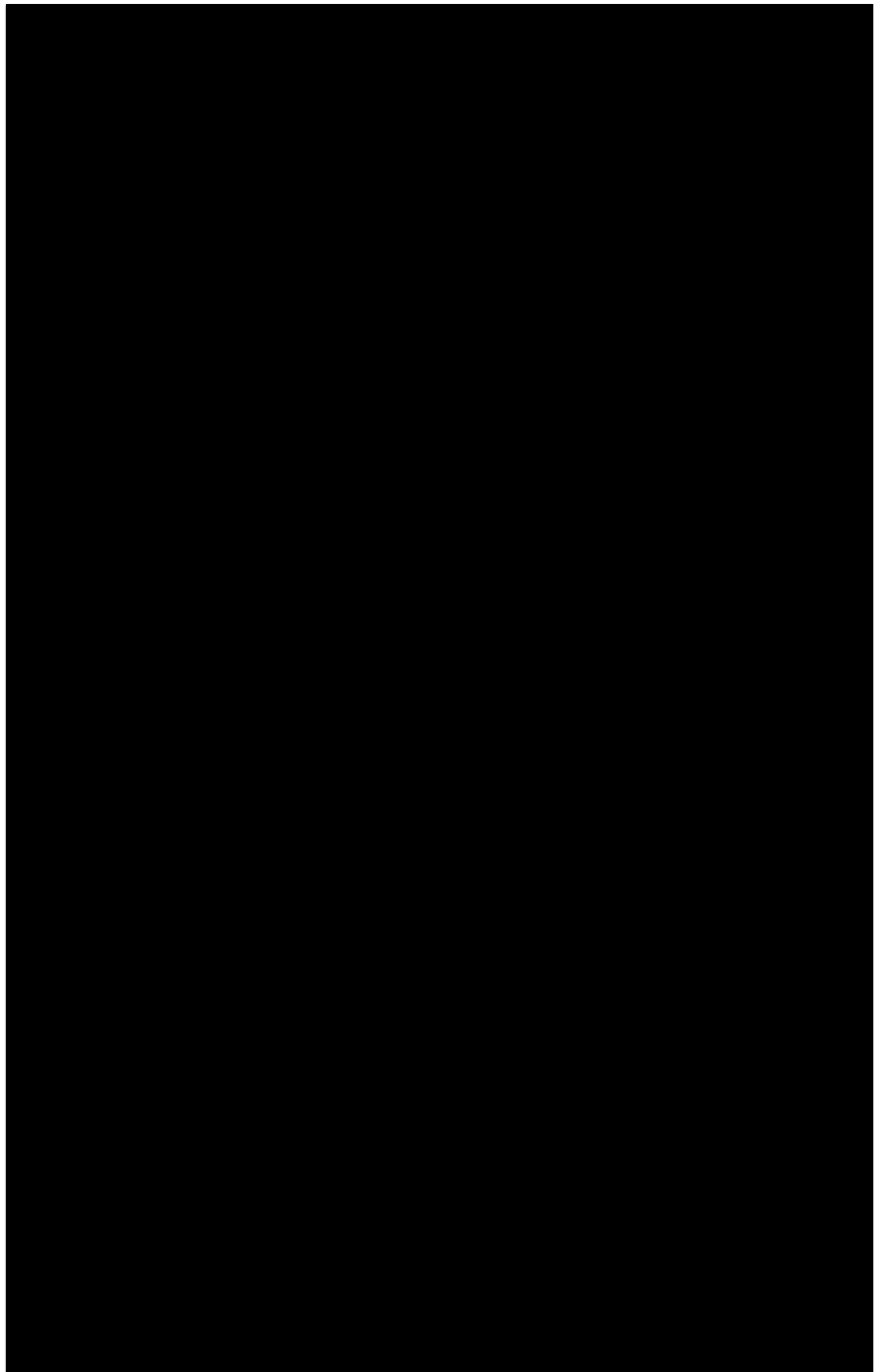


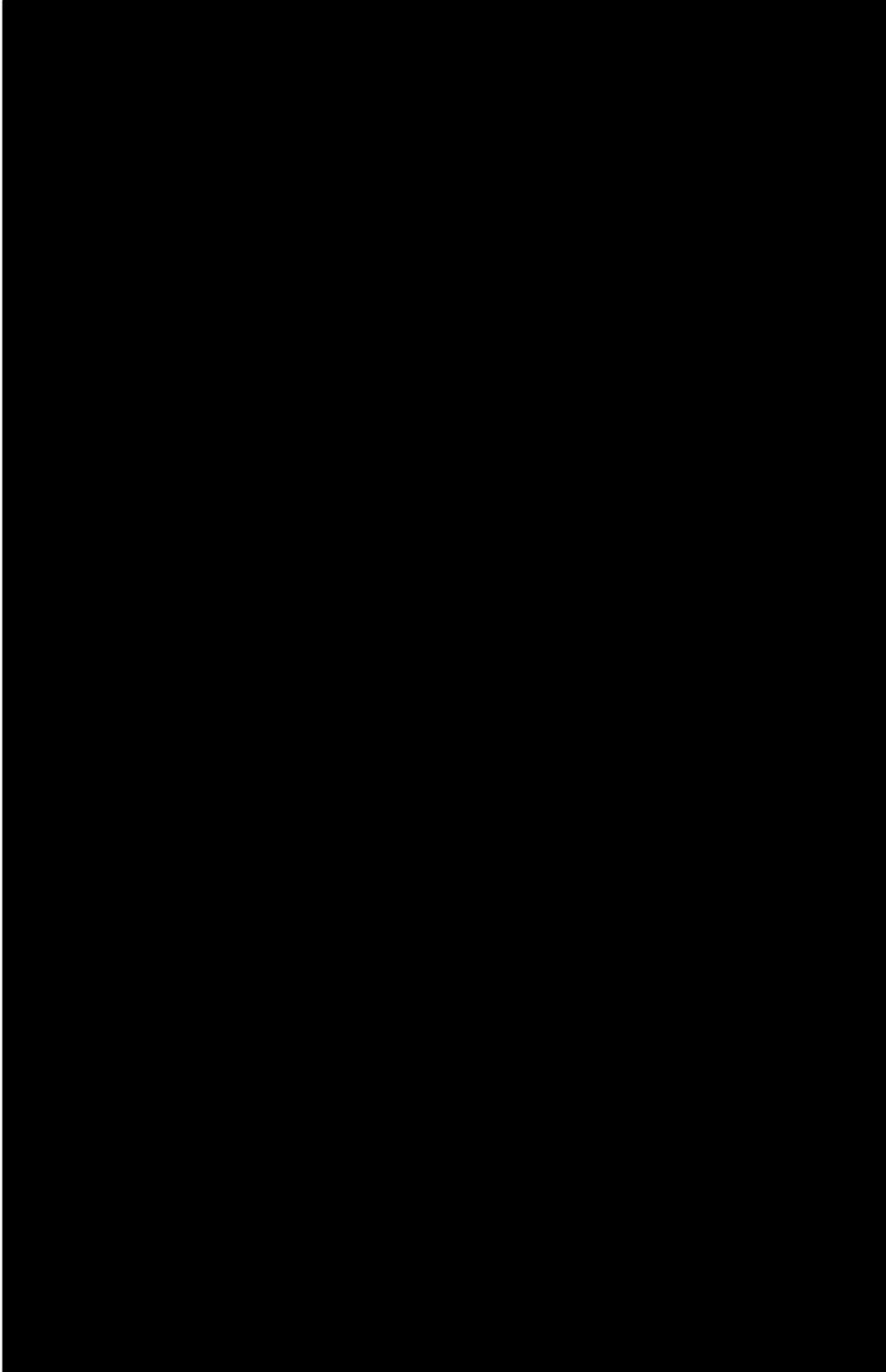


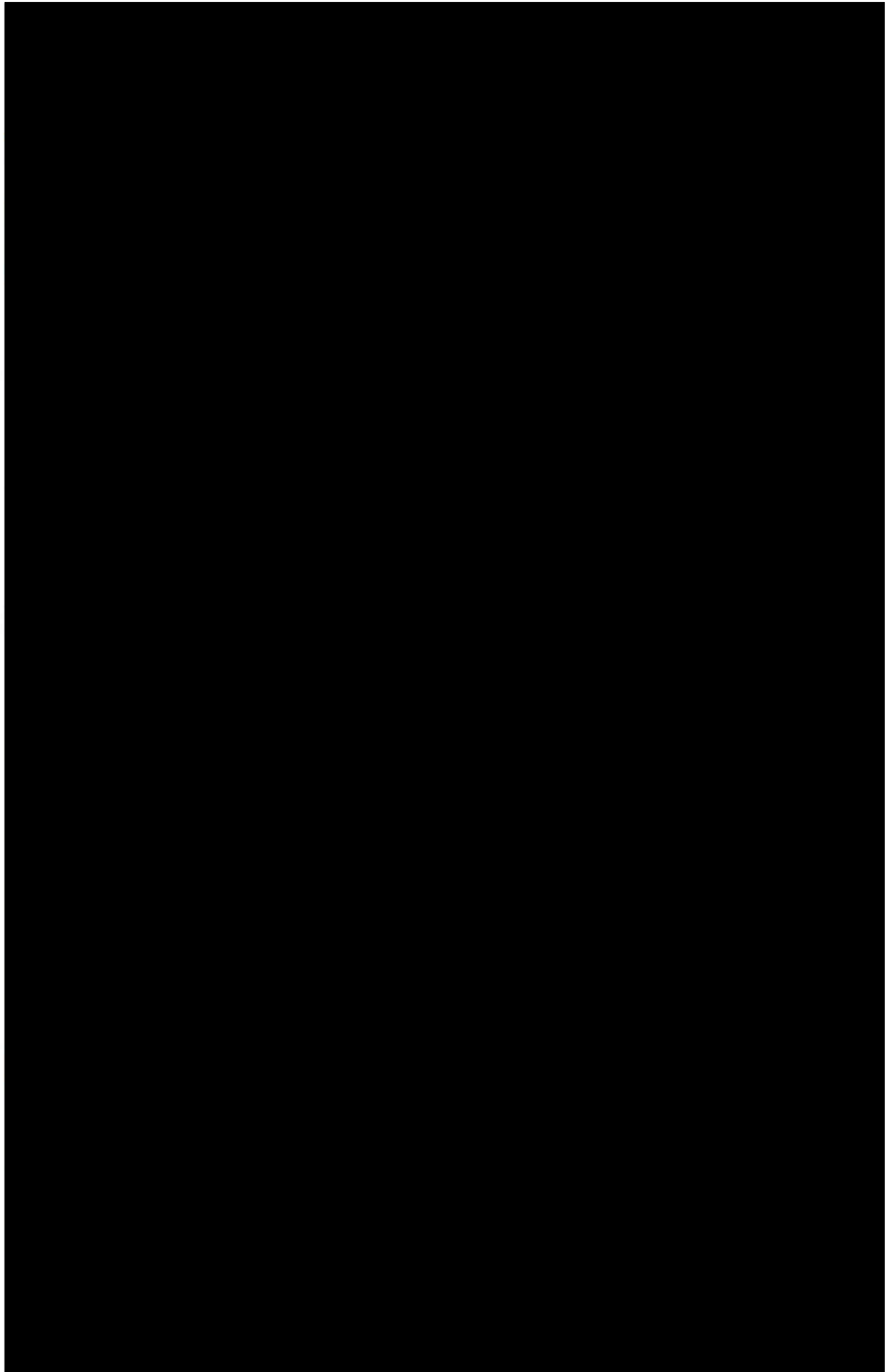


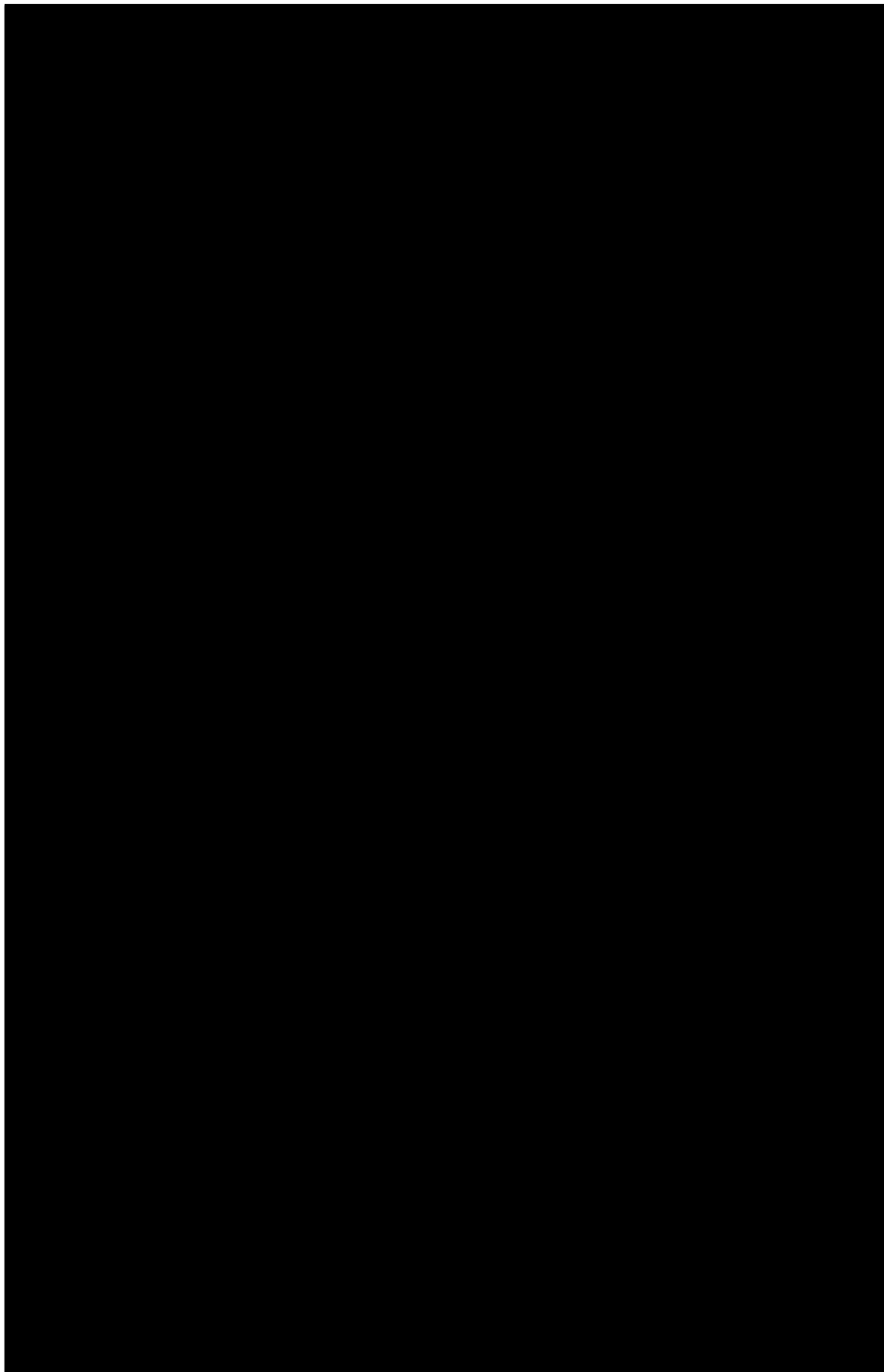


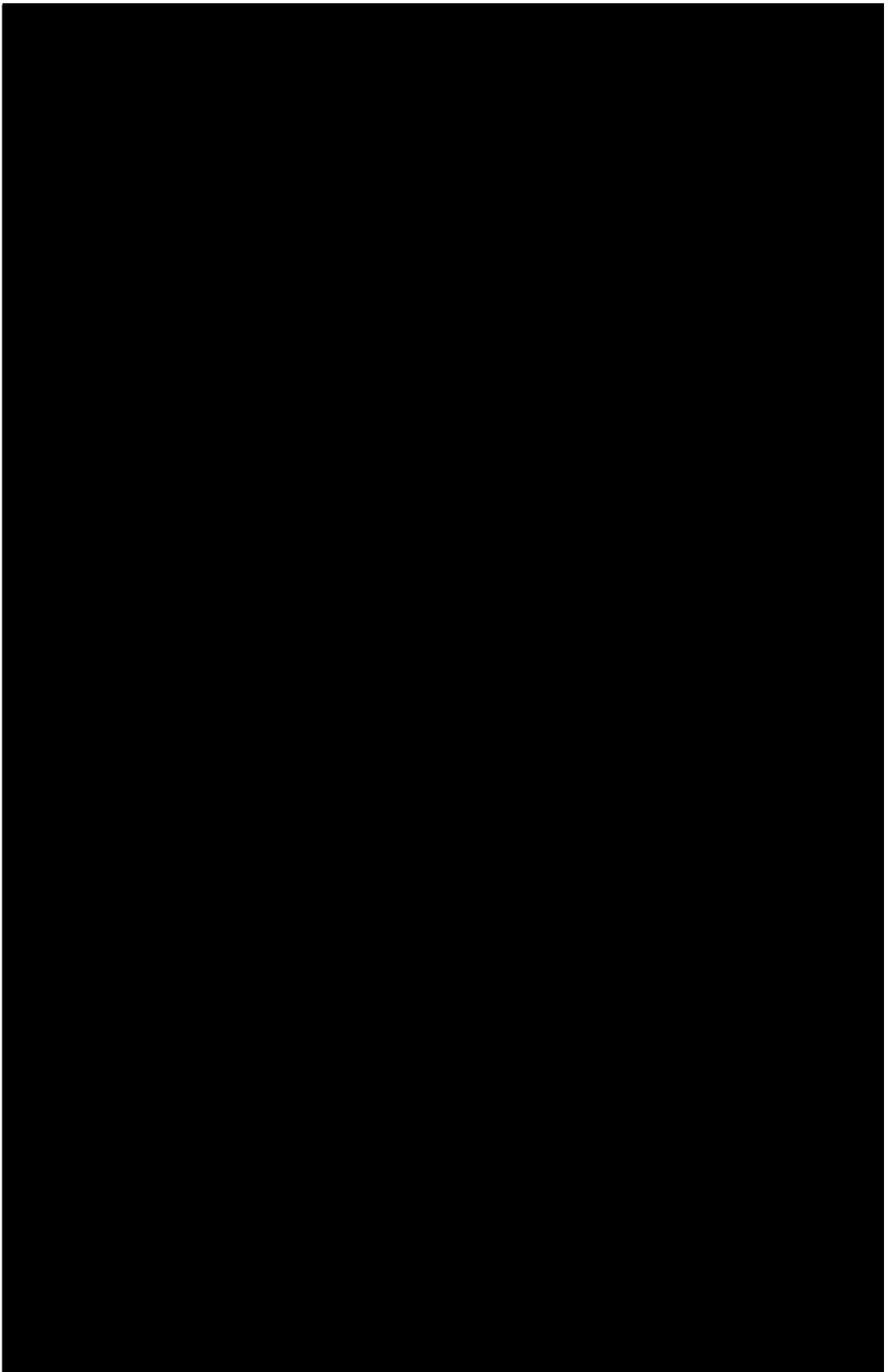


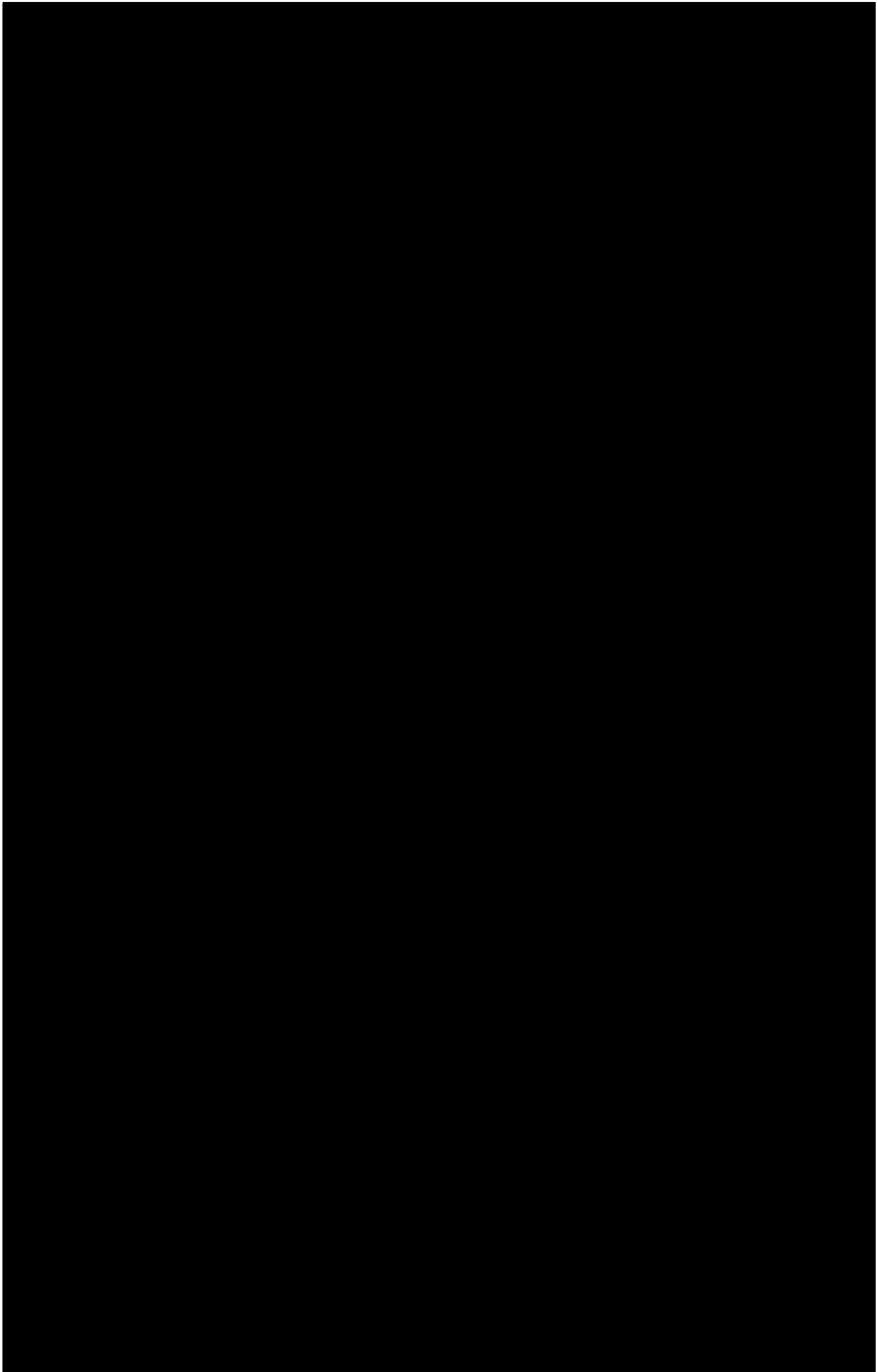


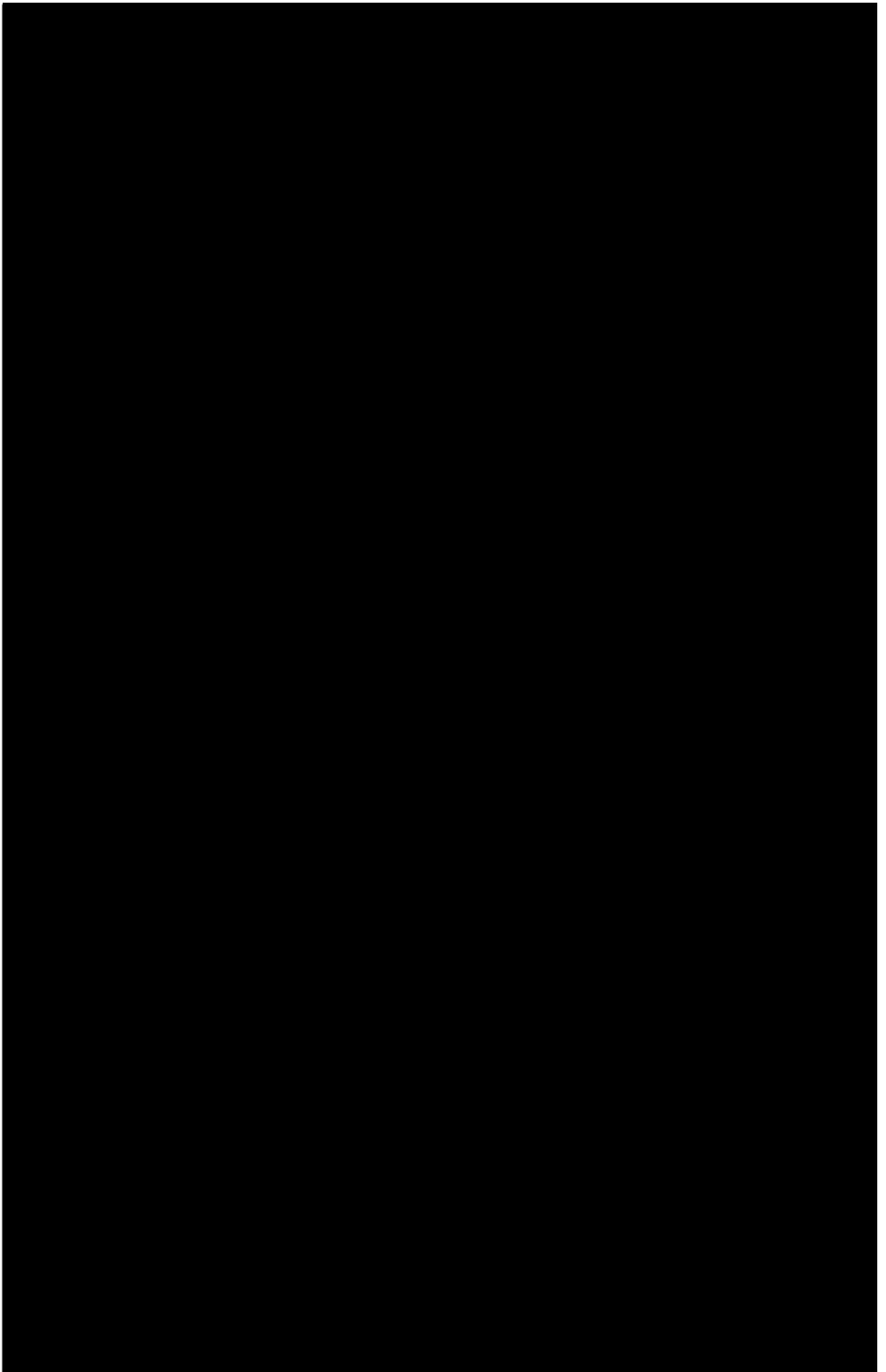


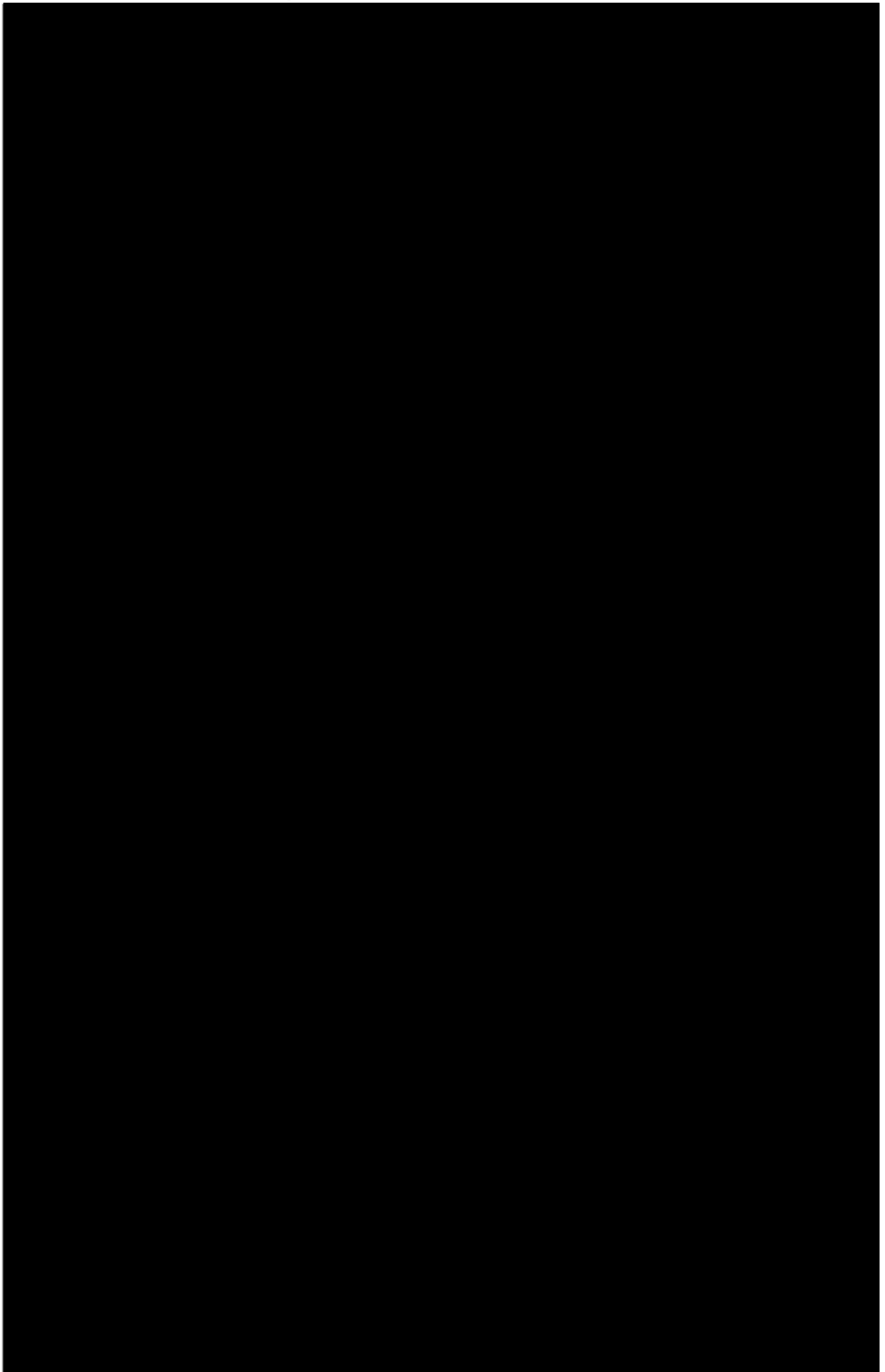


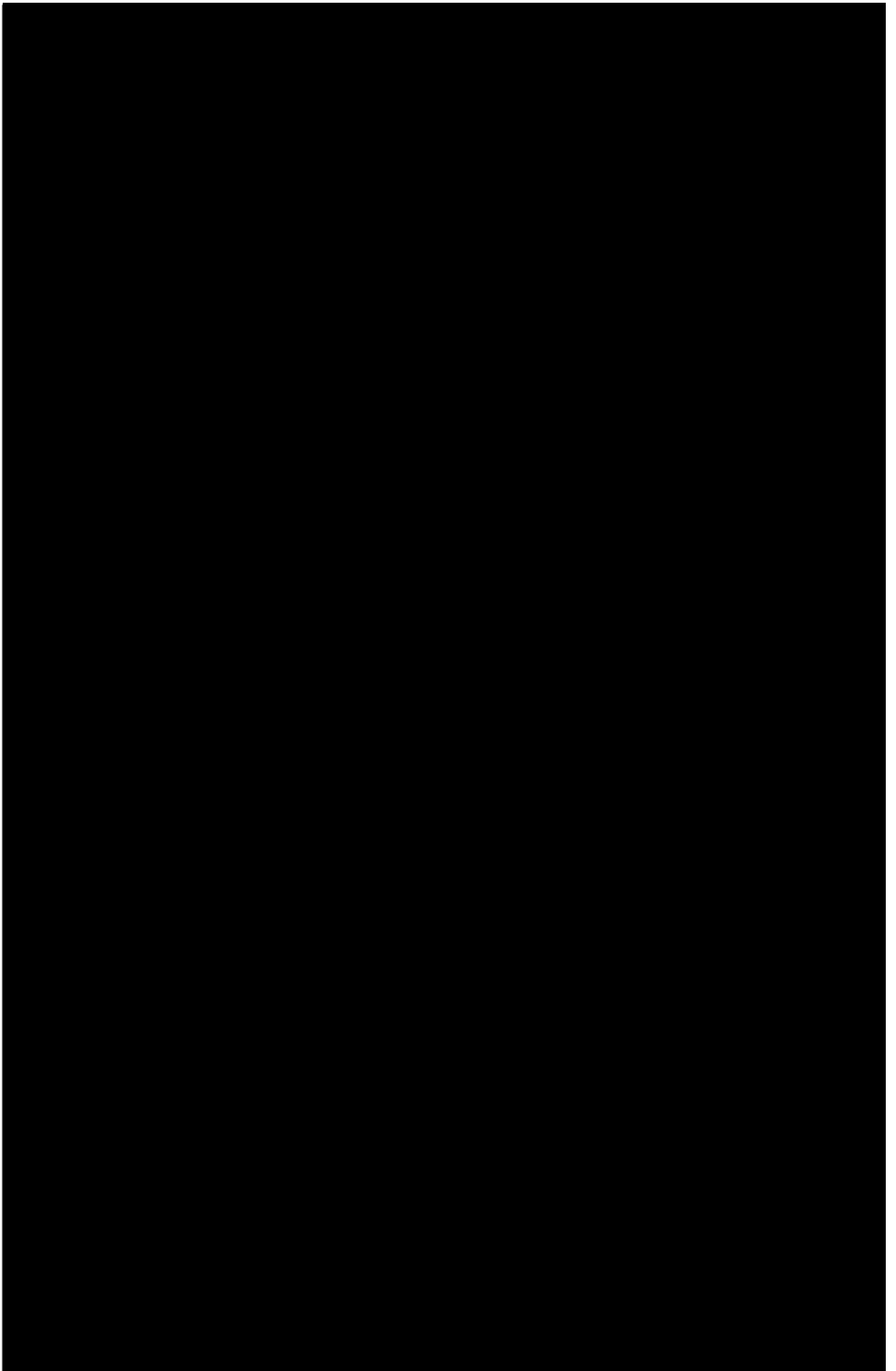




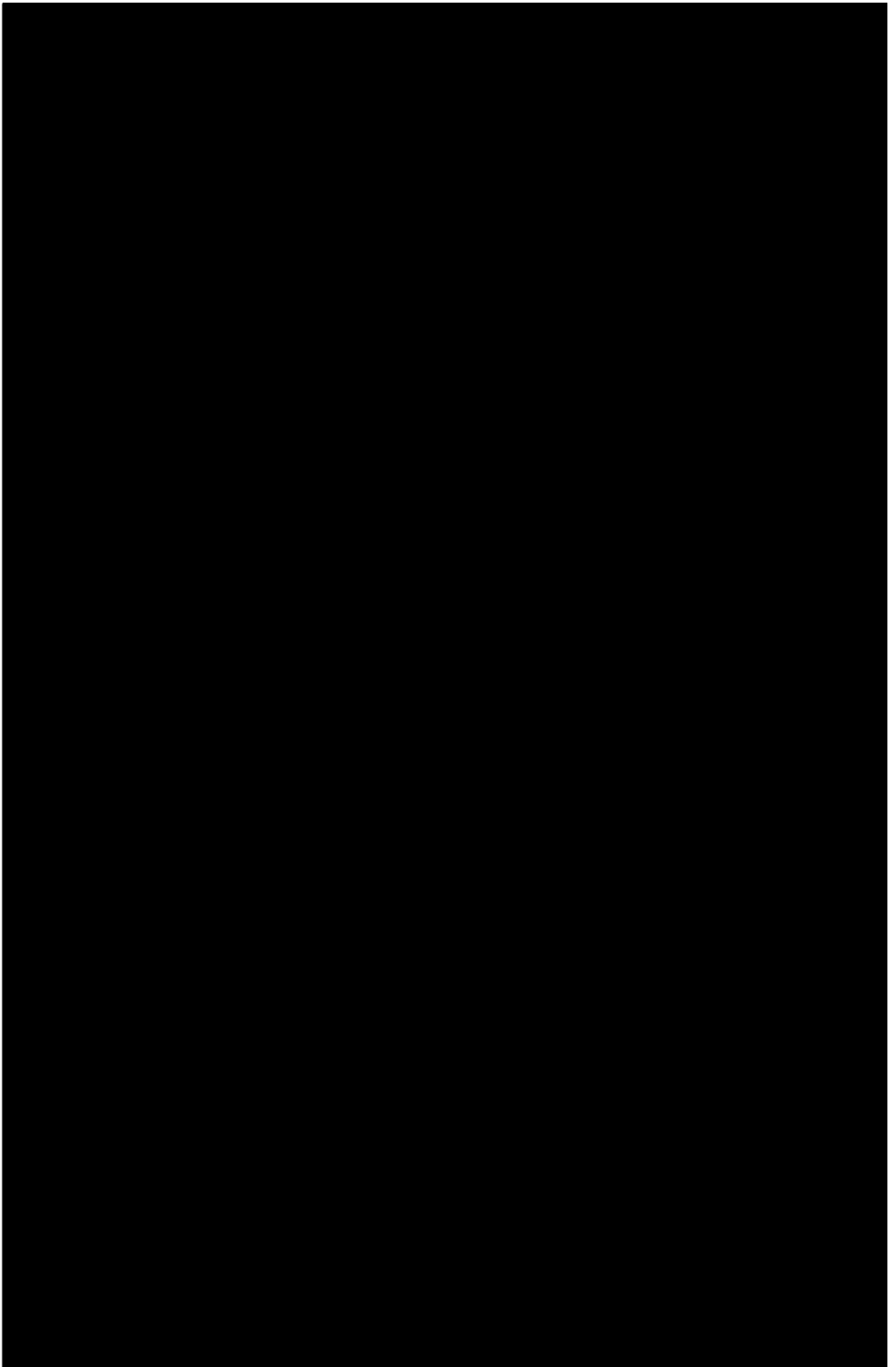


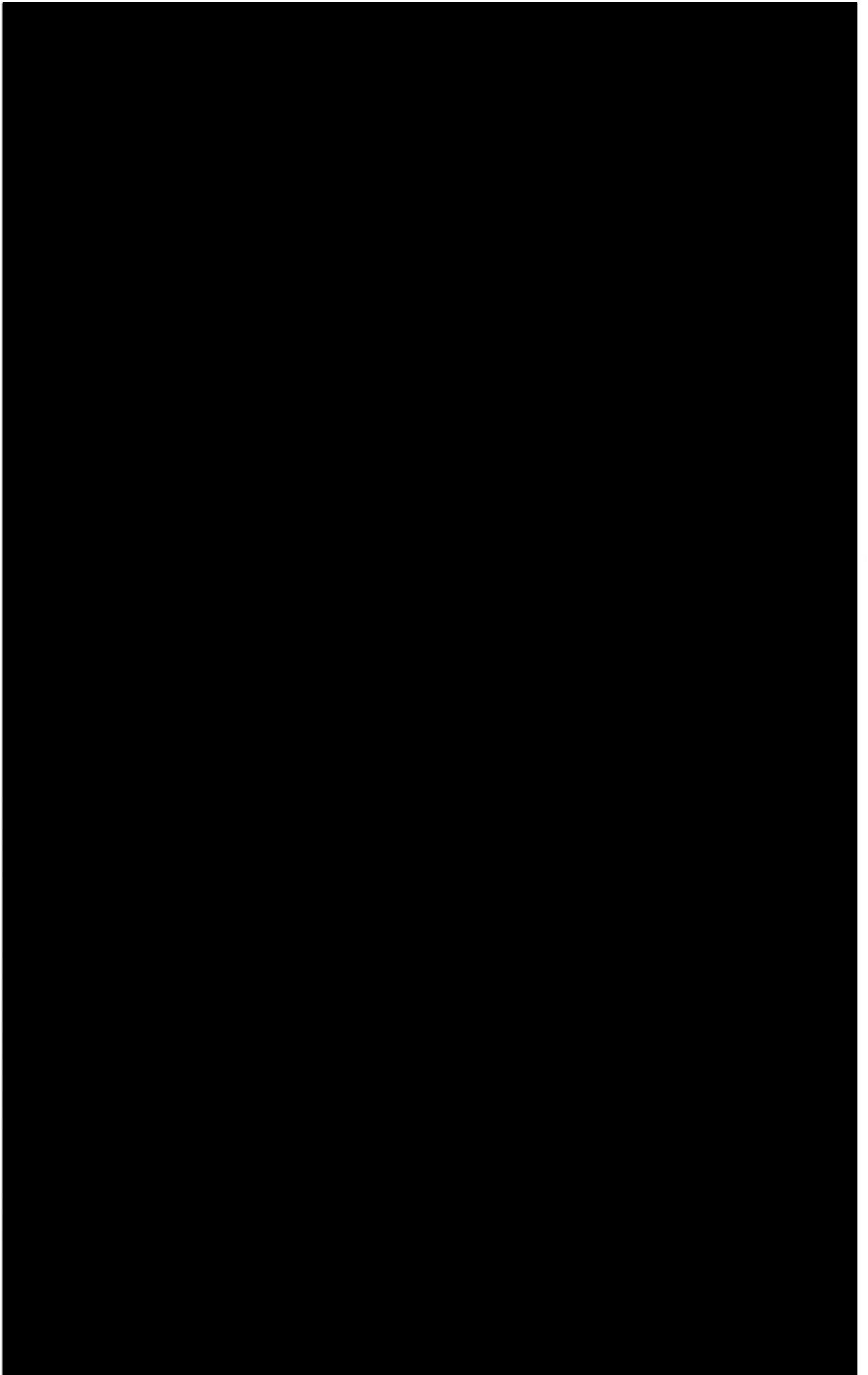


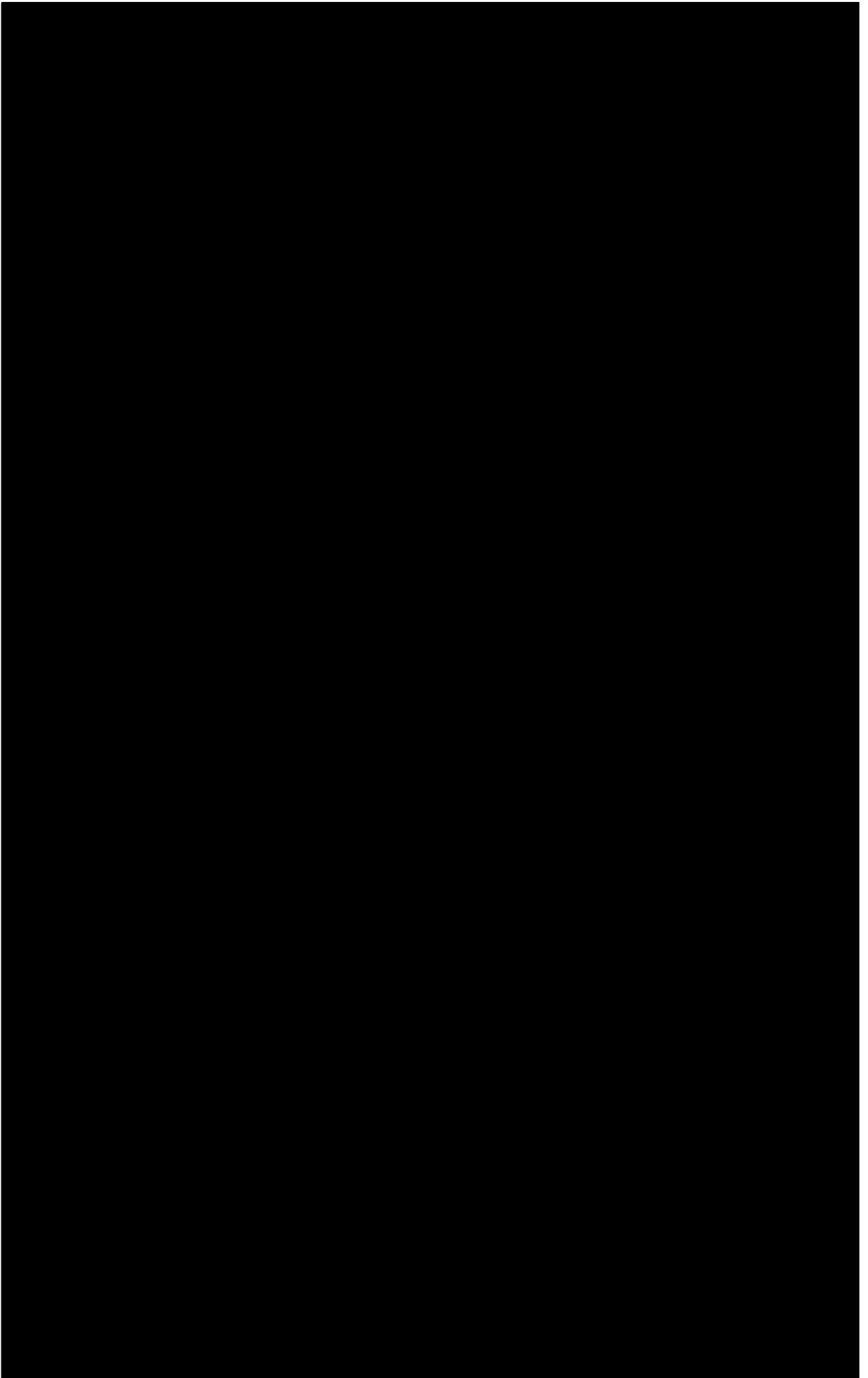


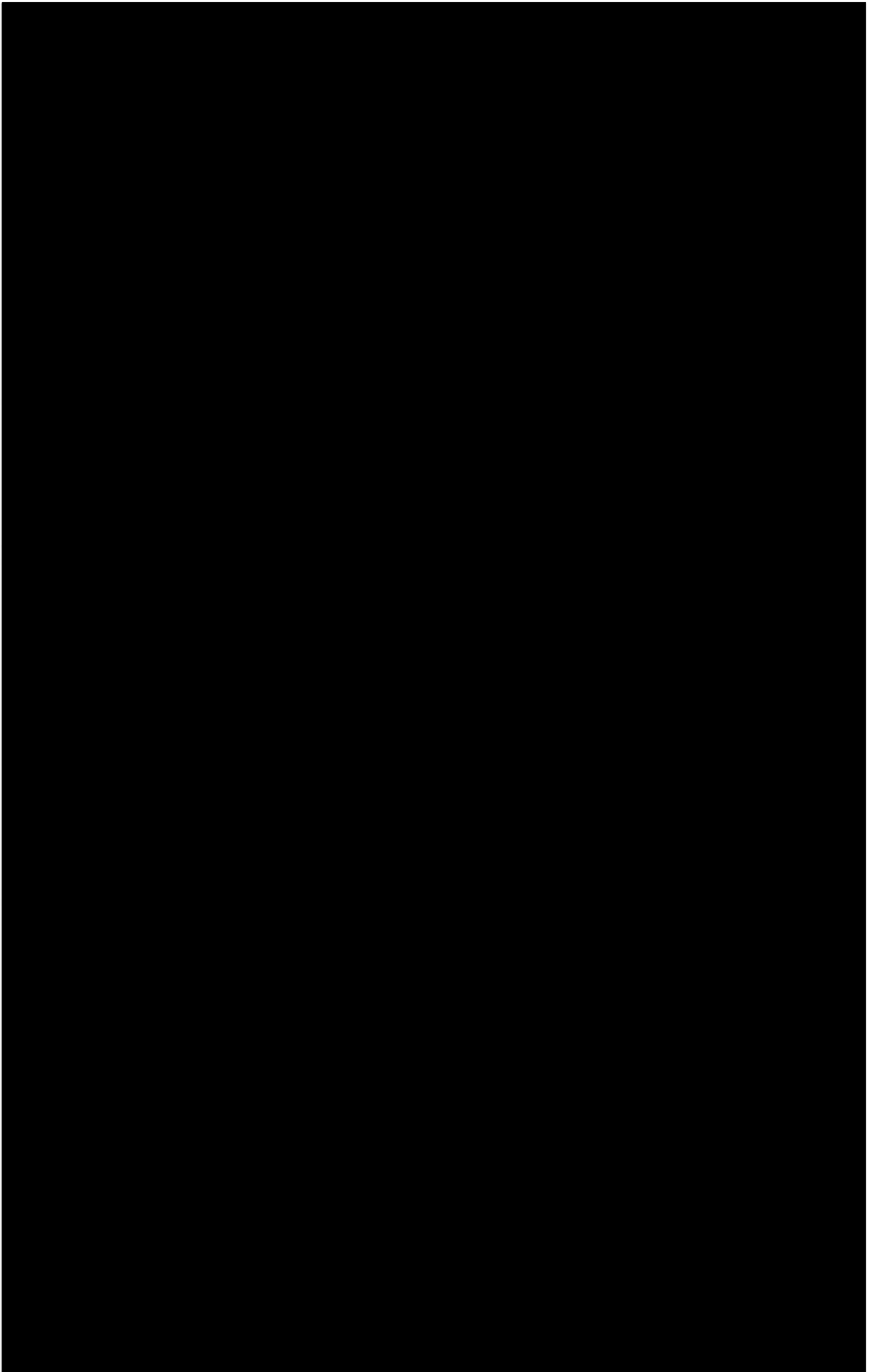


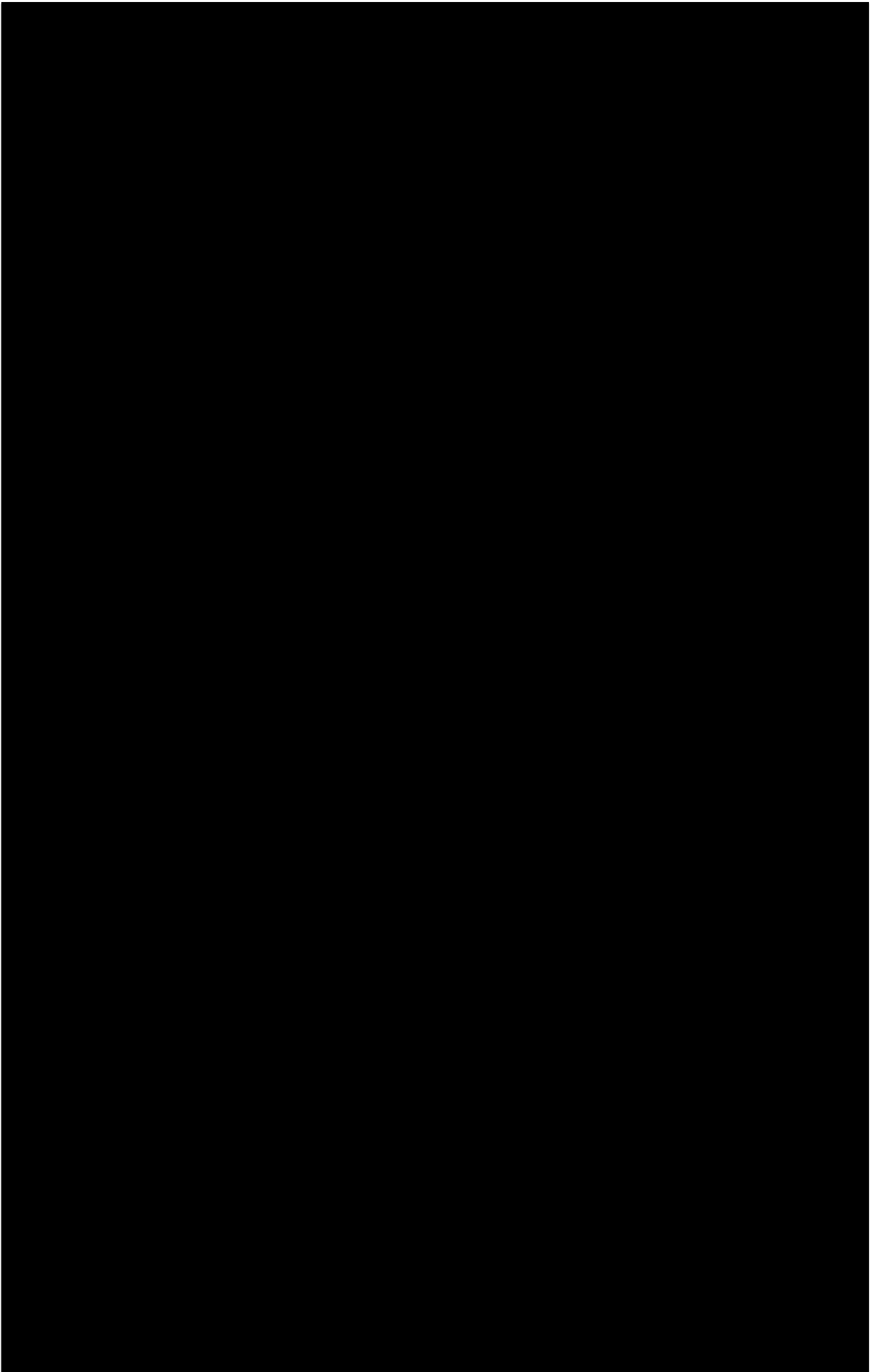


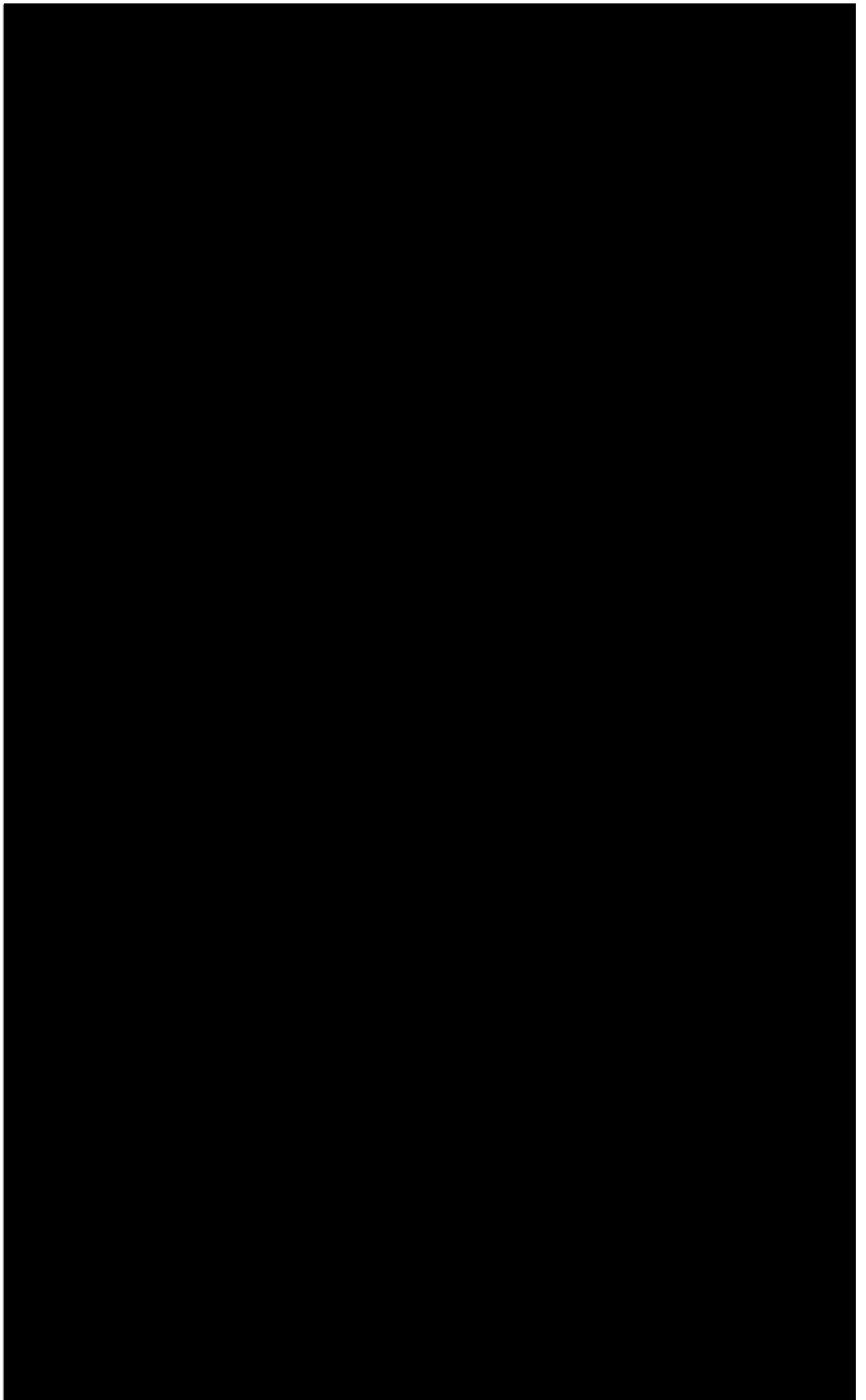


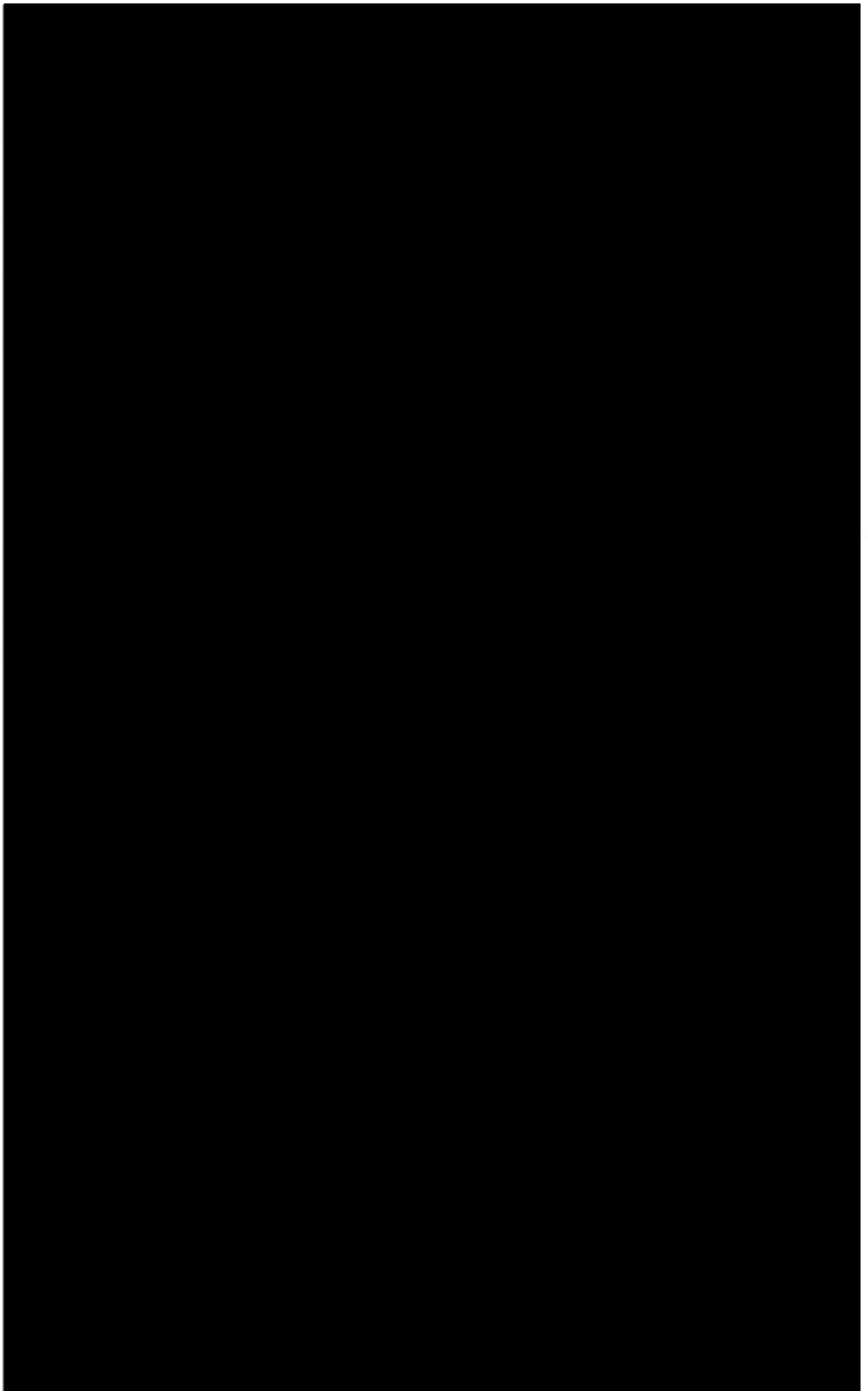


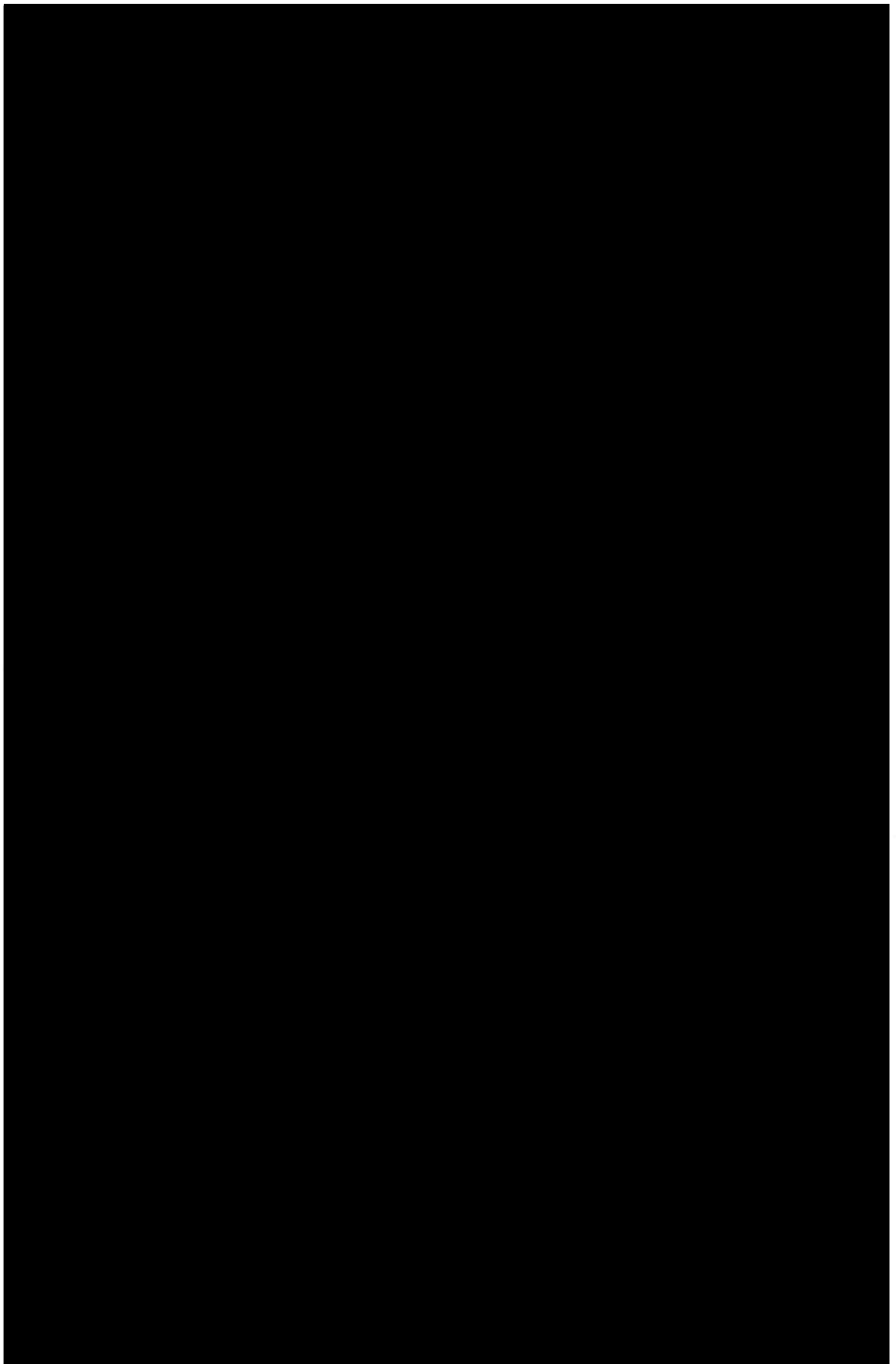


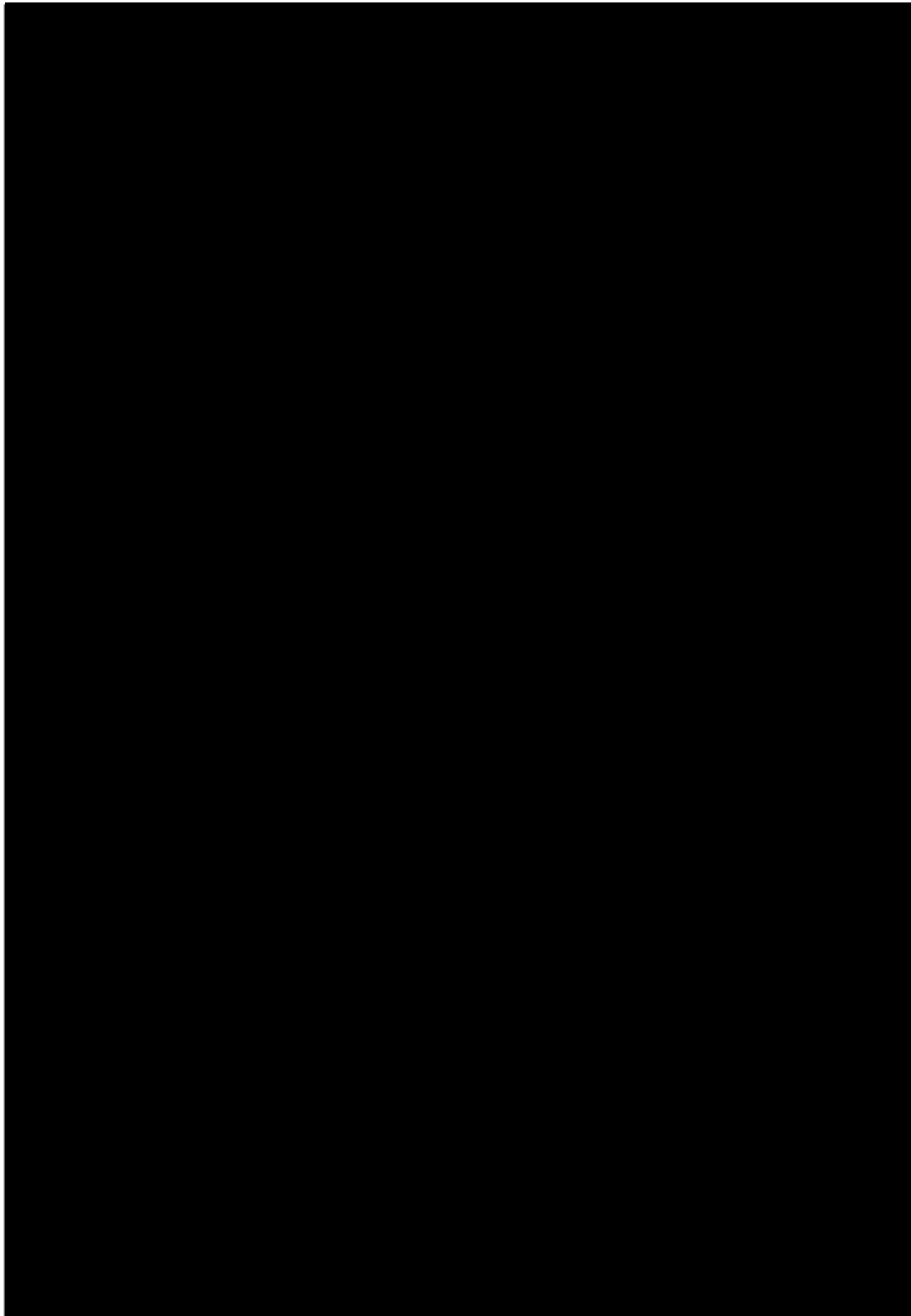


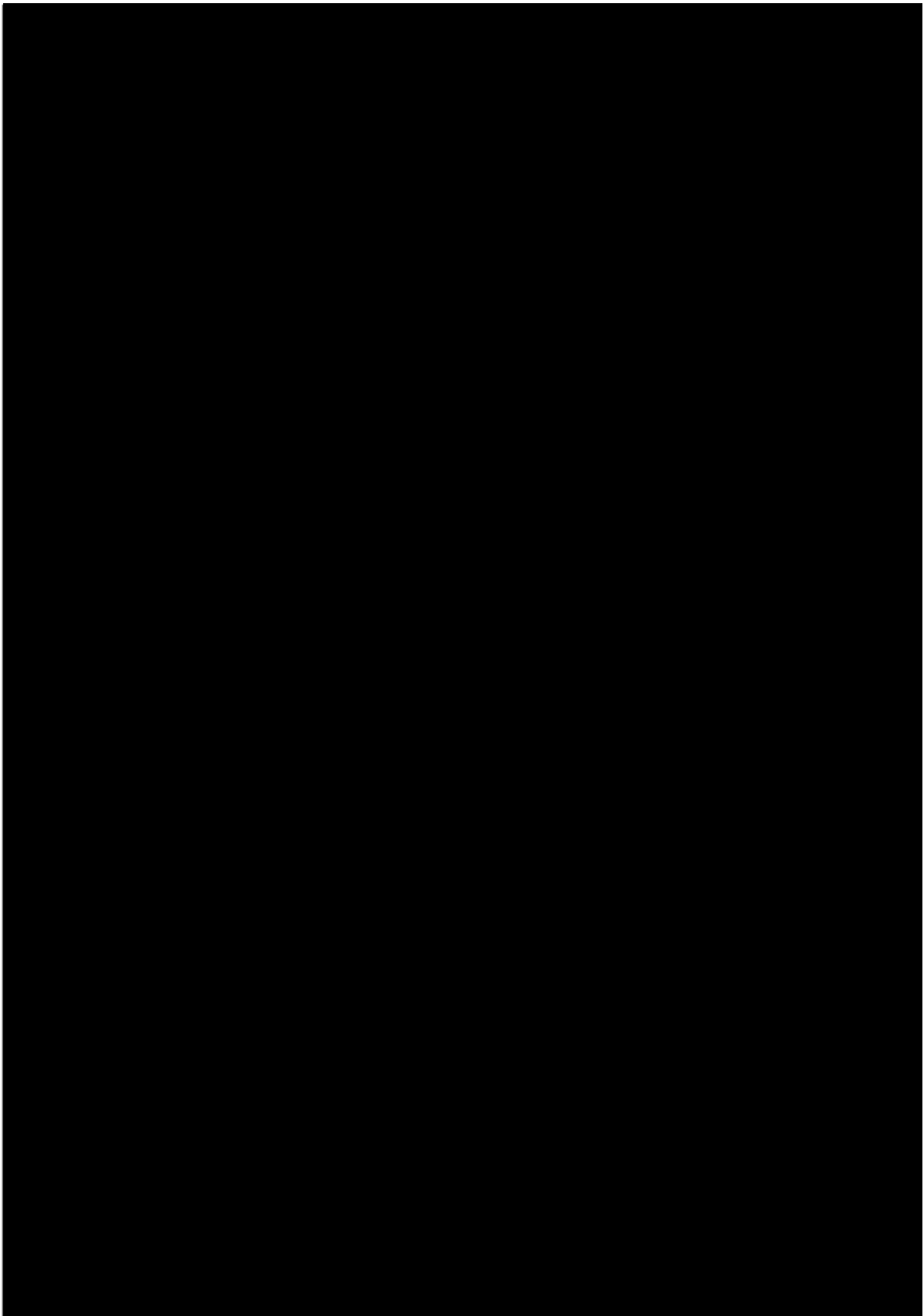














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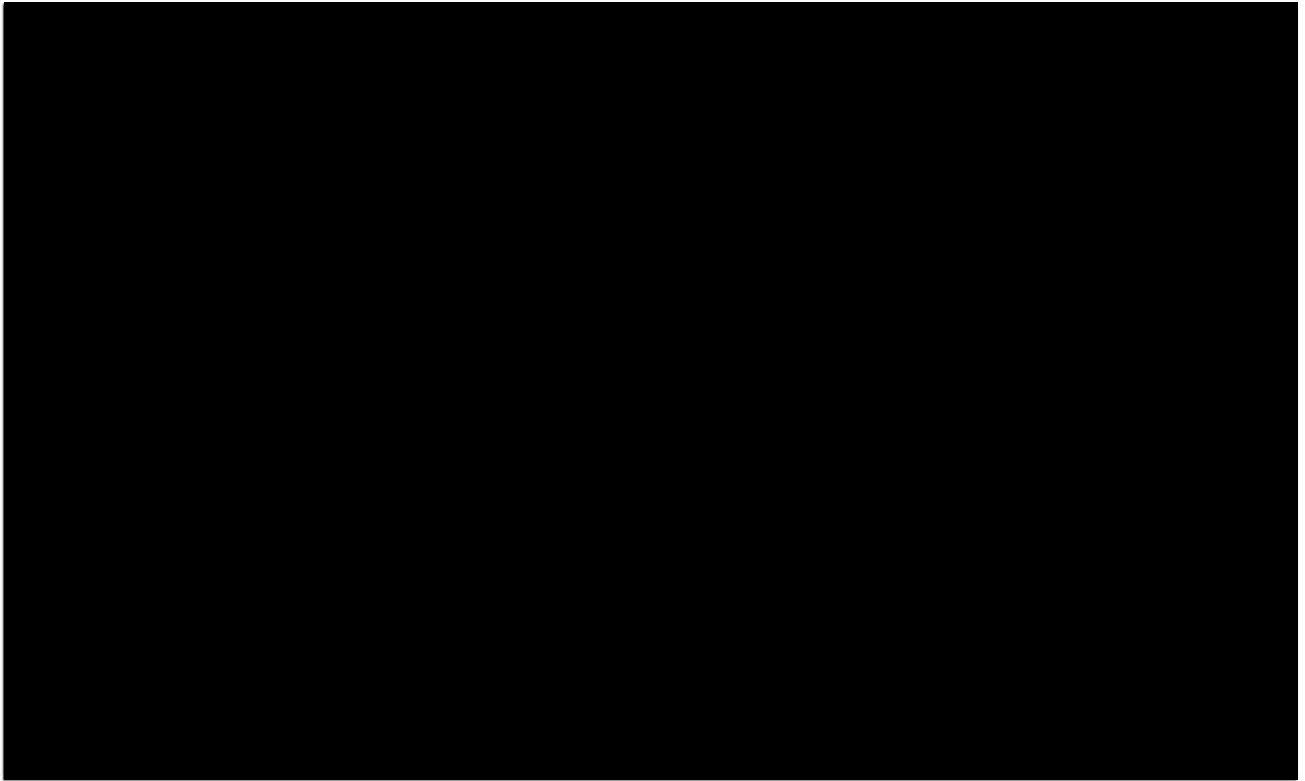
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Schedule E1 Scope and Performance Requirements

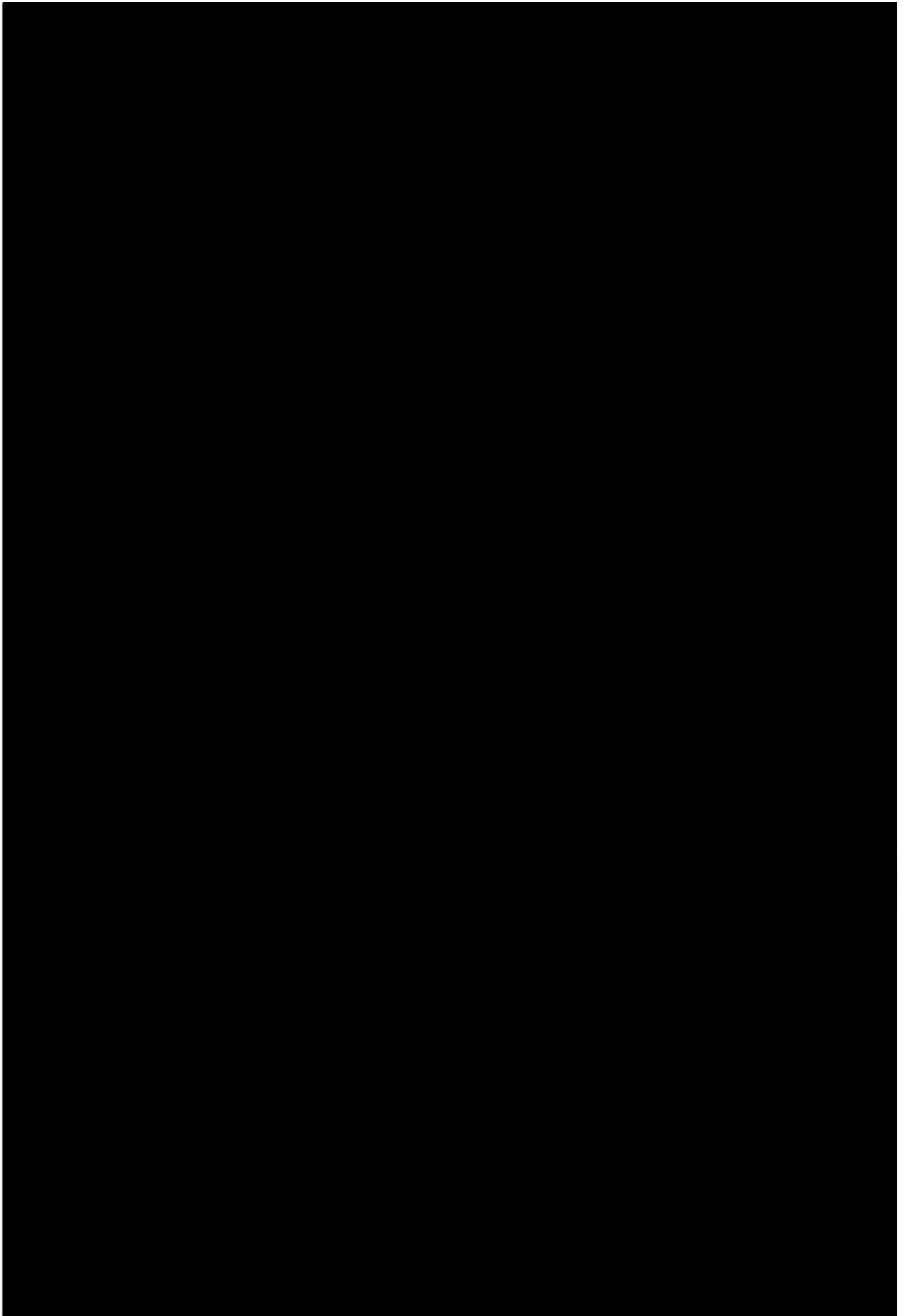
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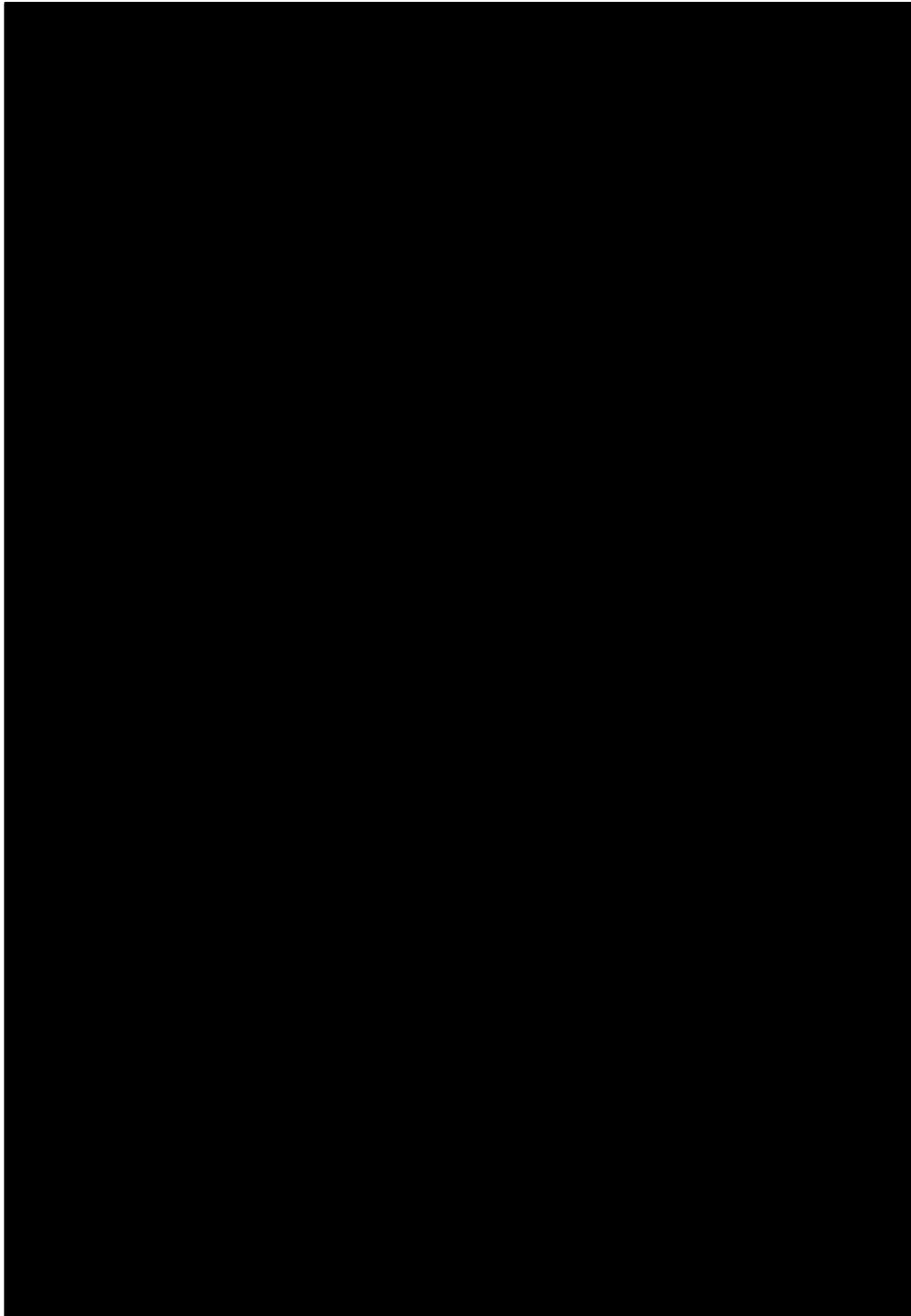
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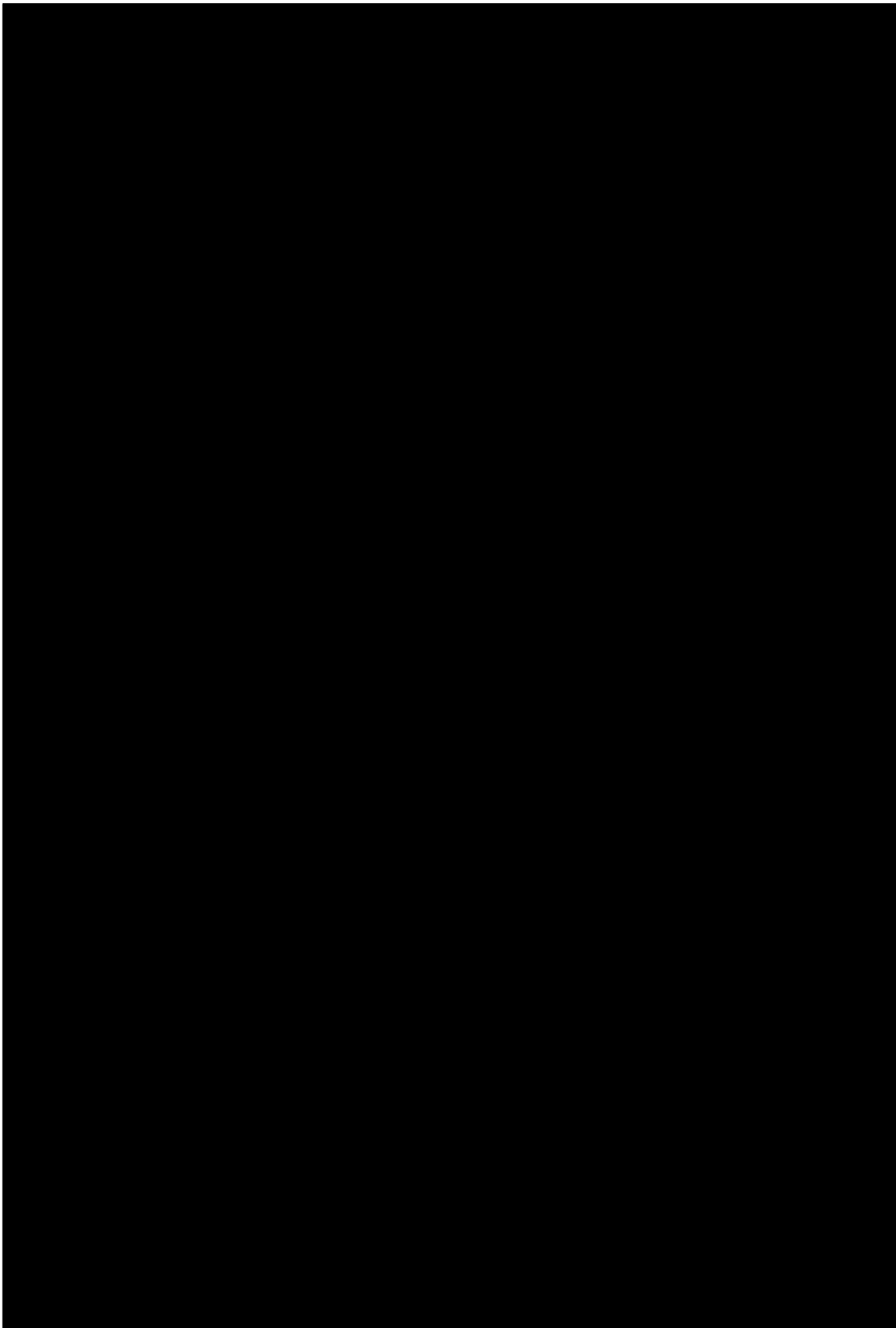


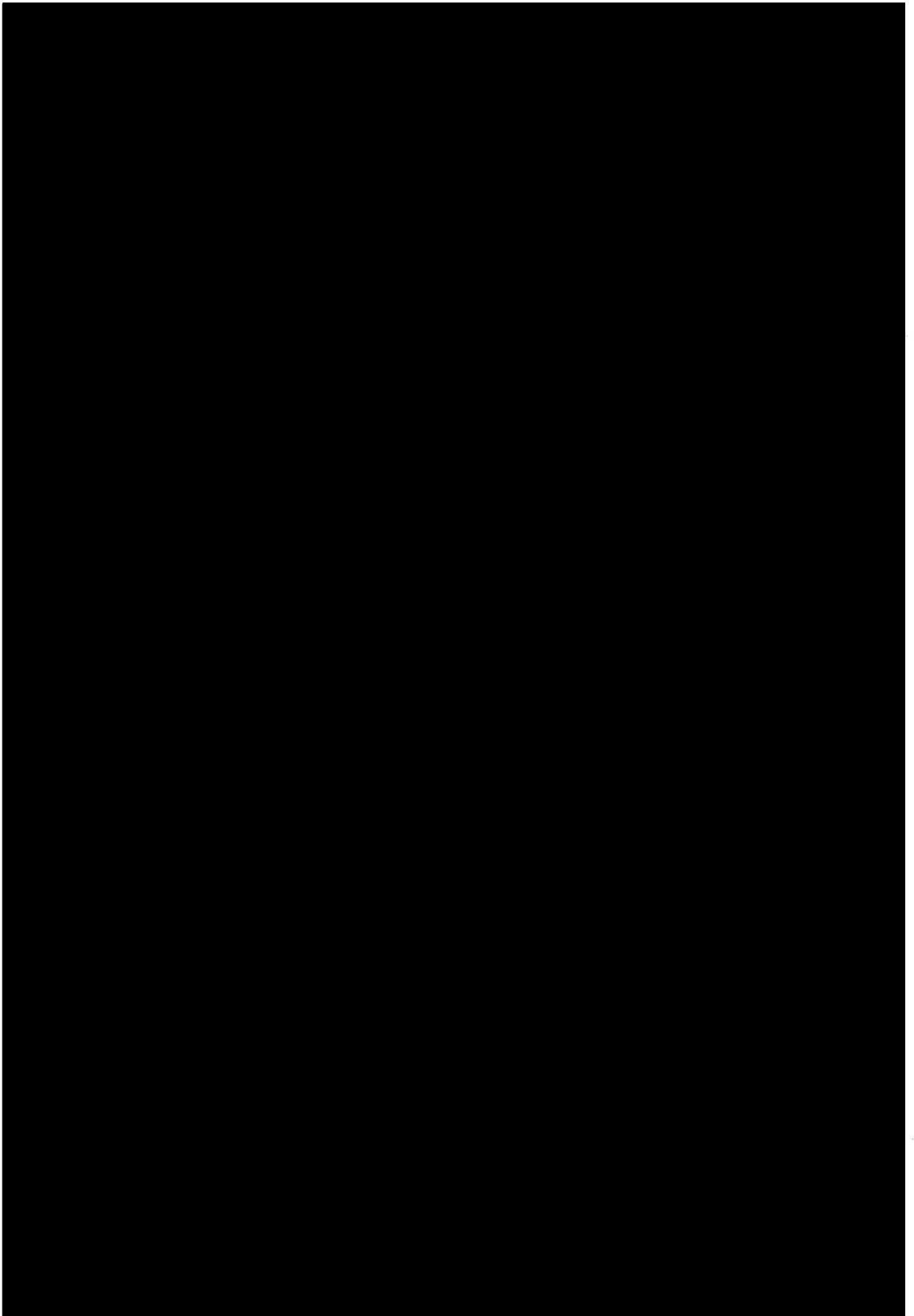


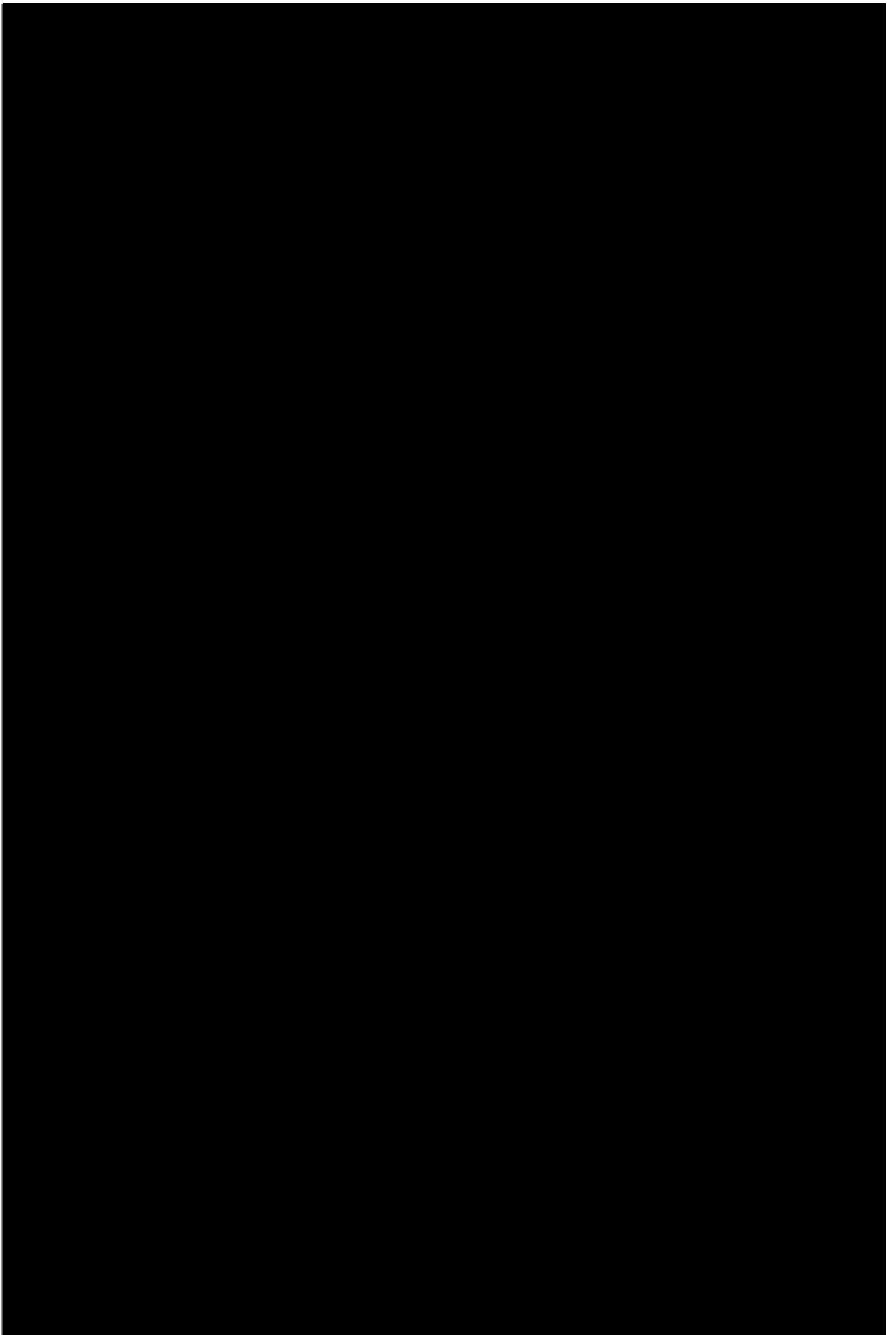


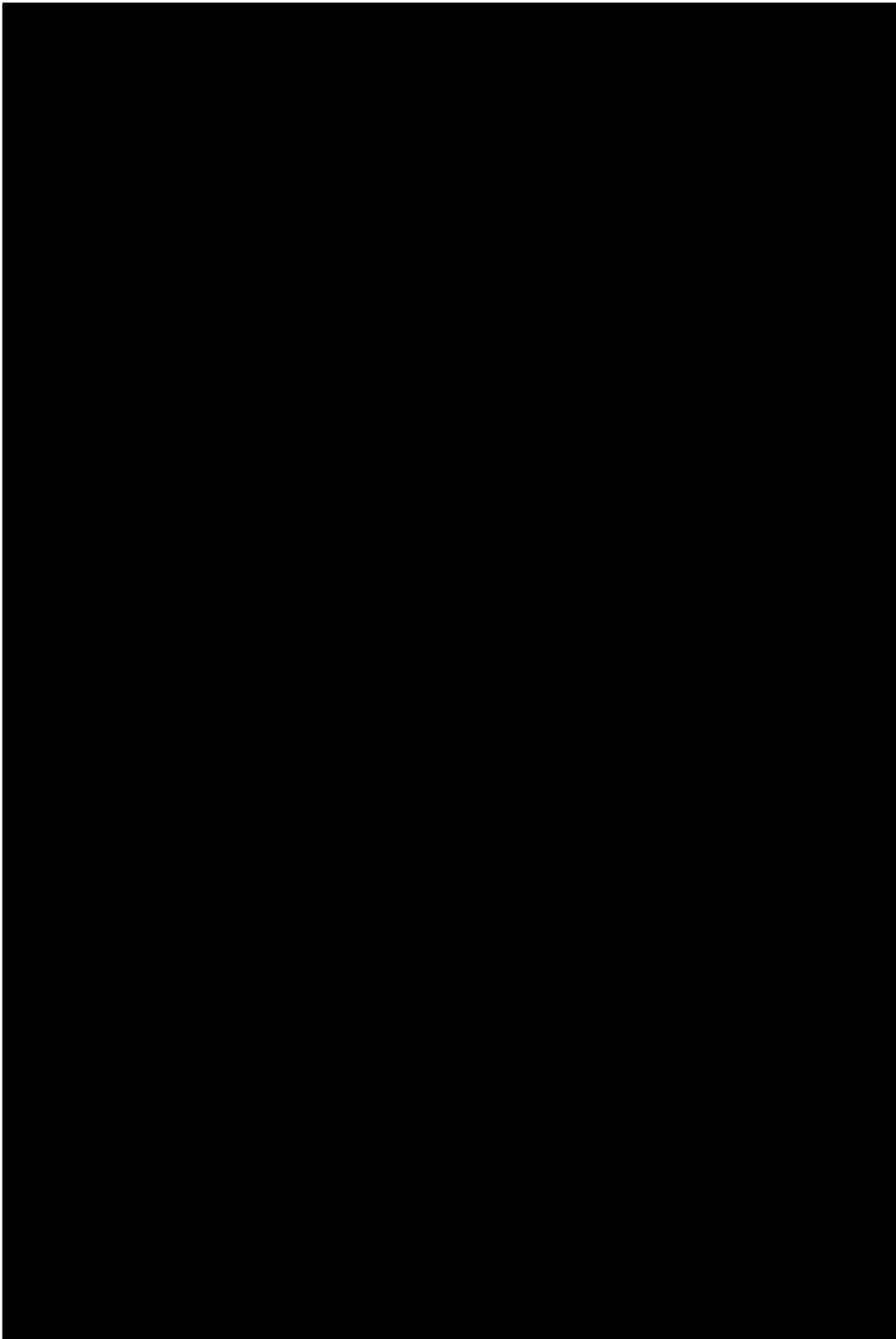


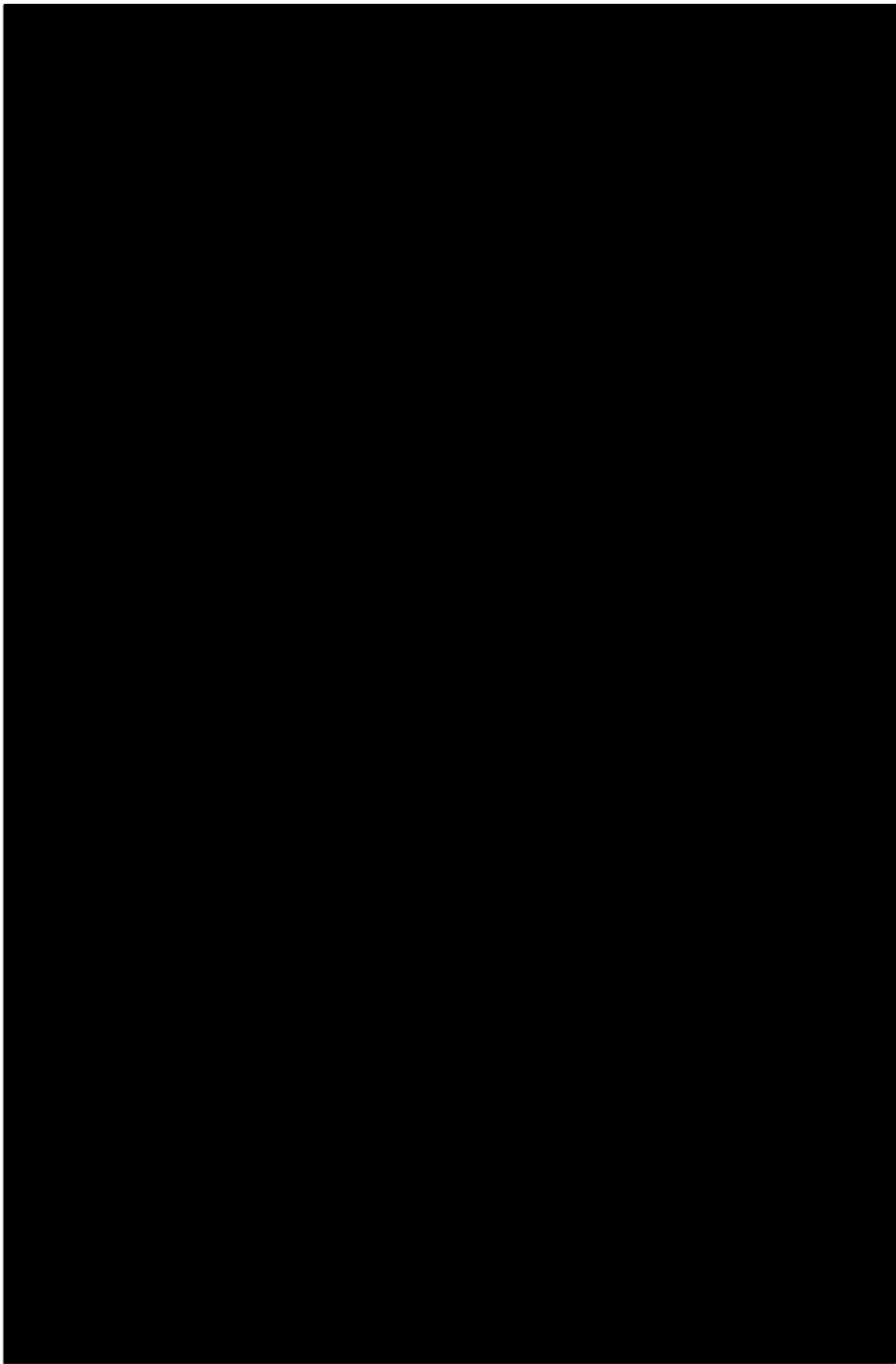


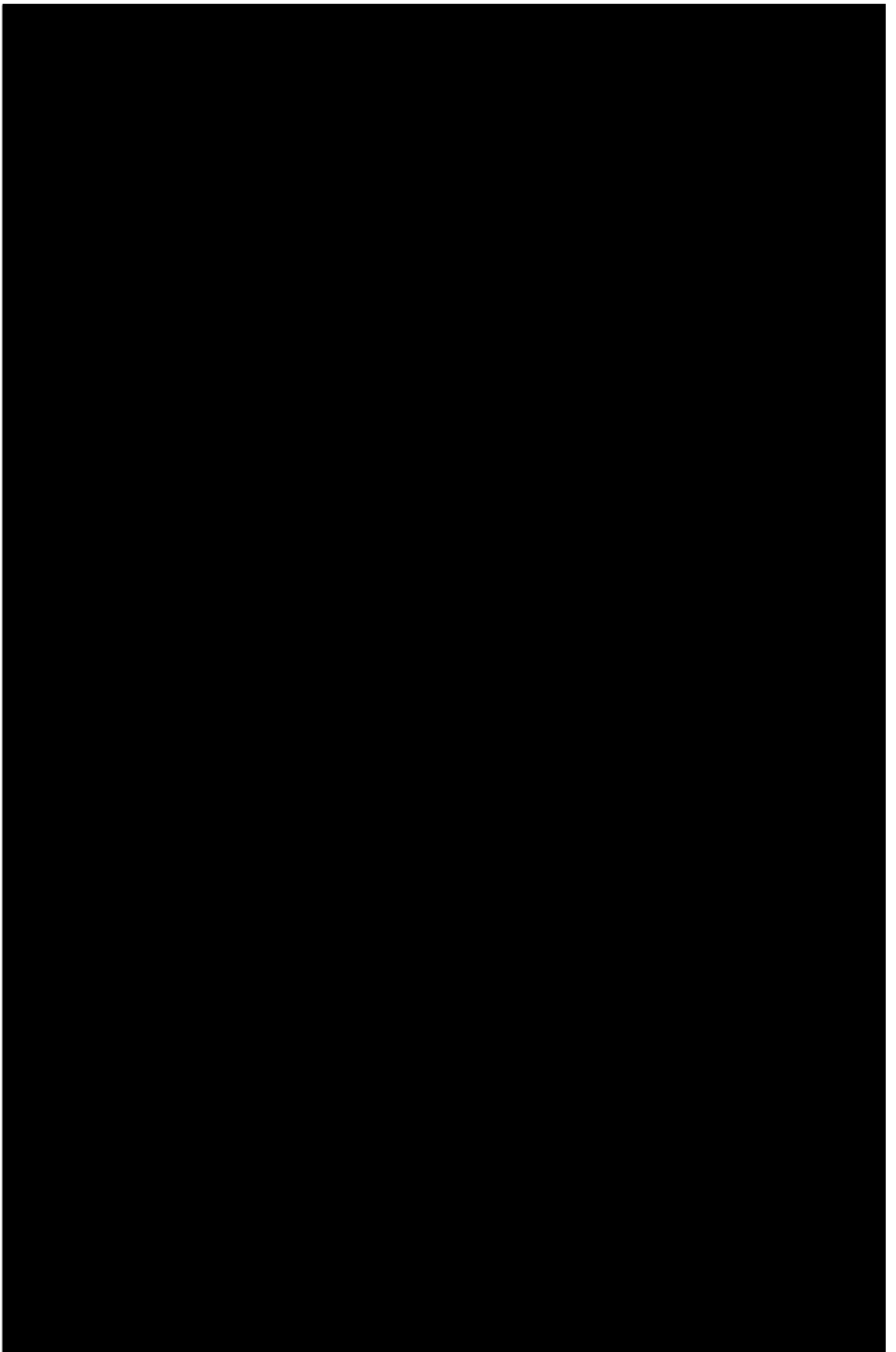




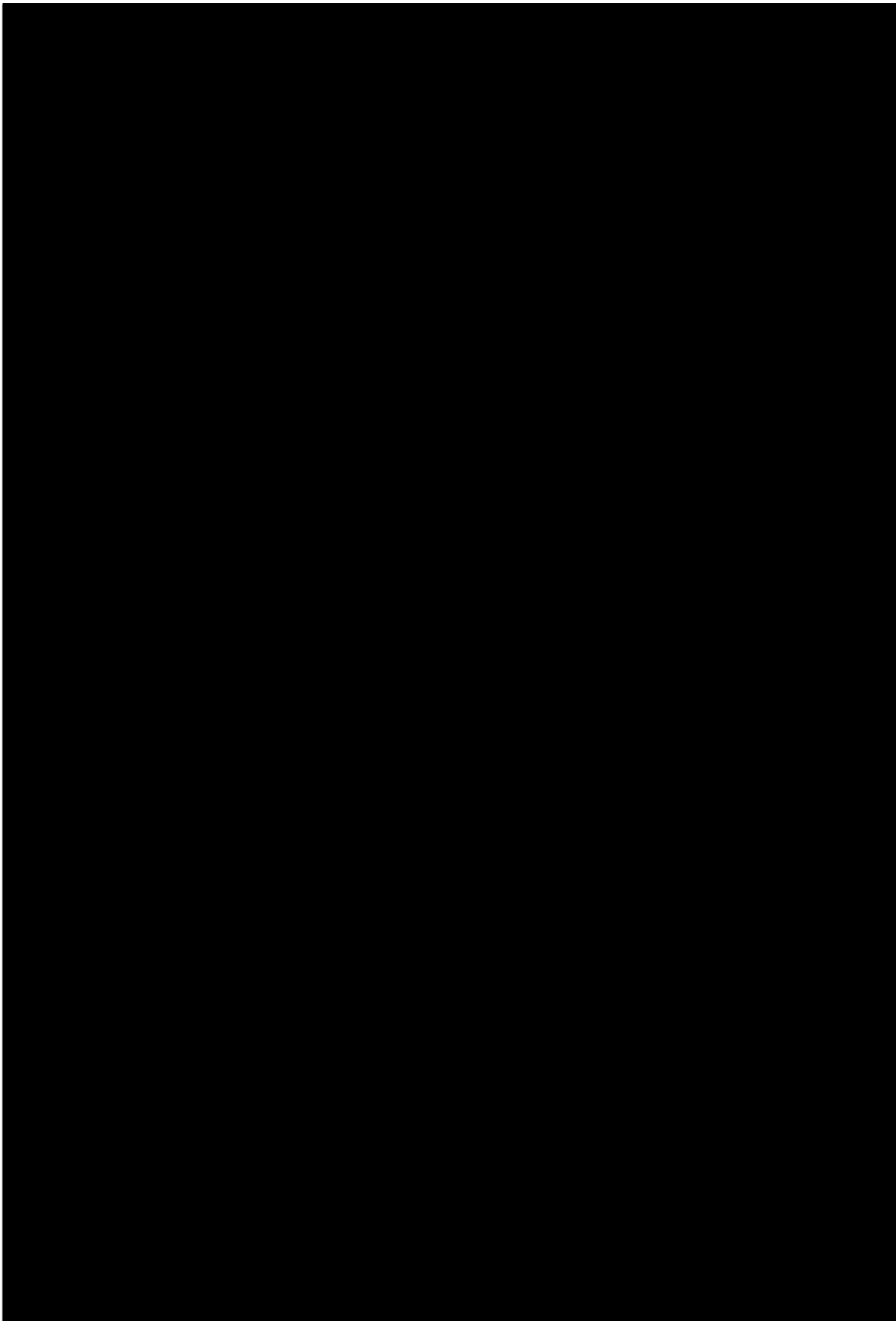


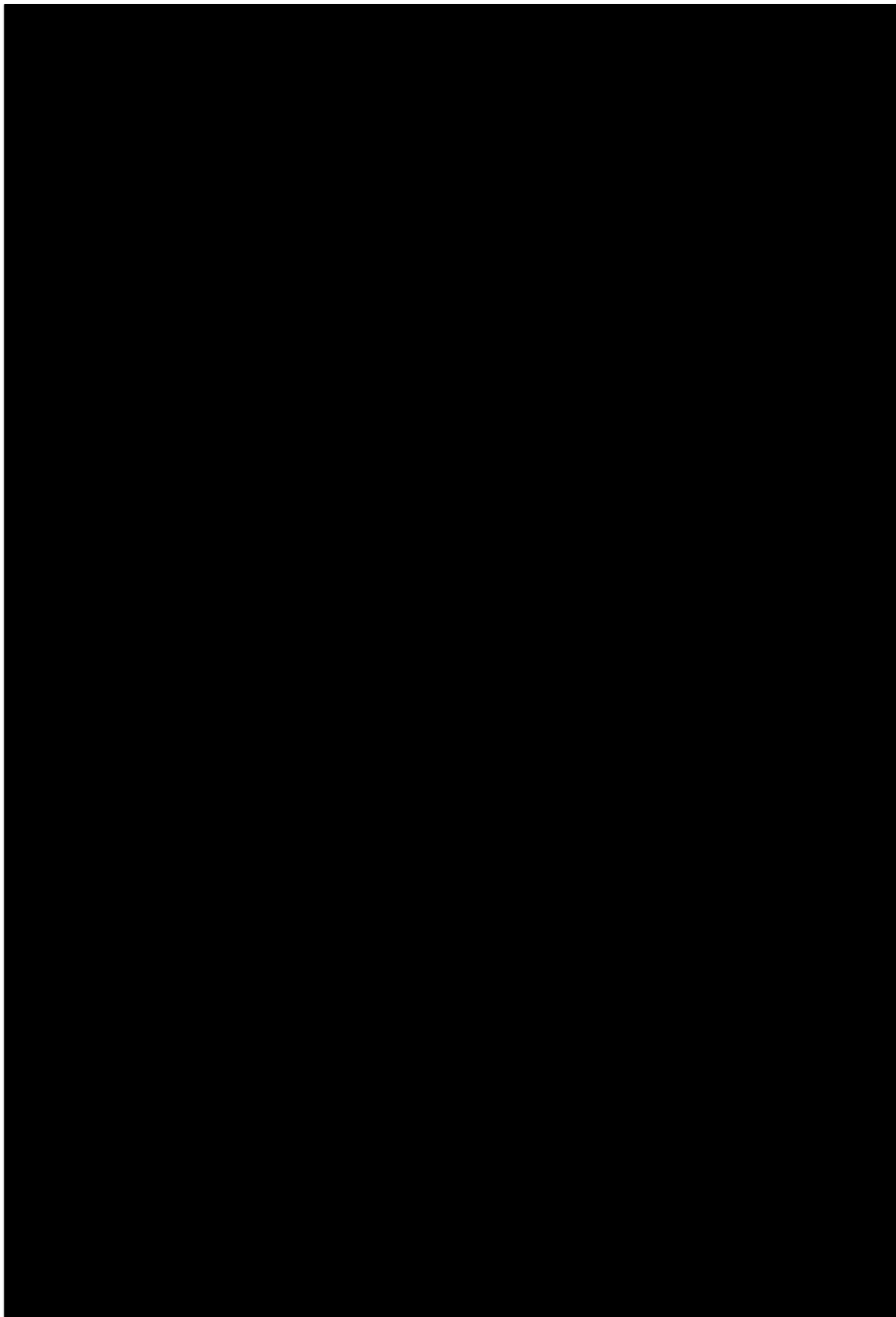


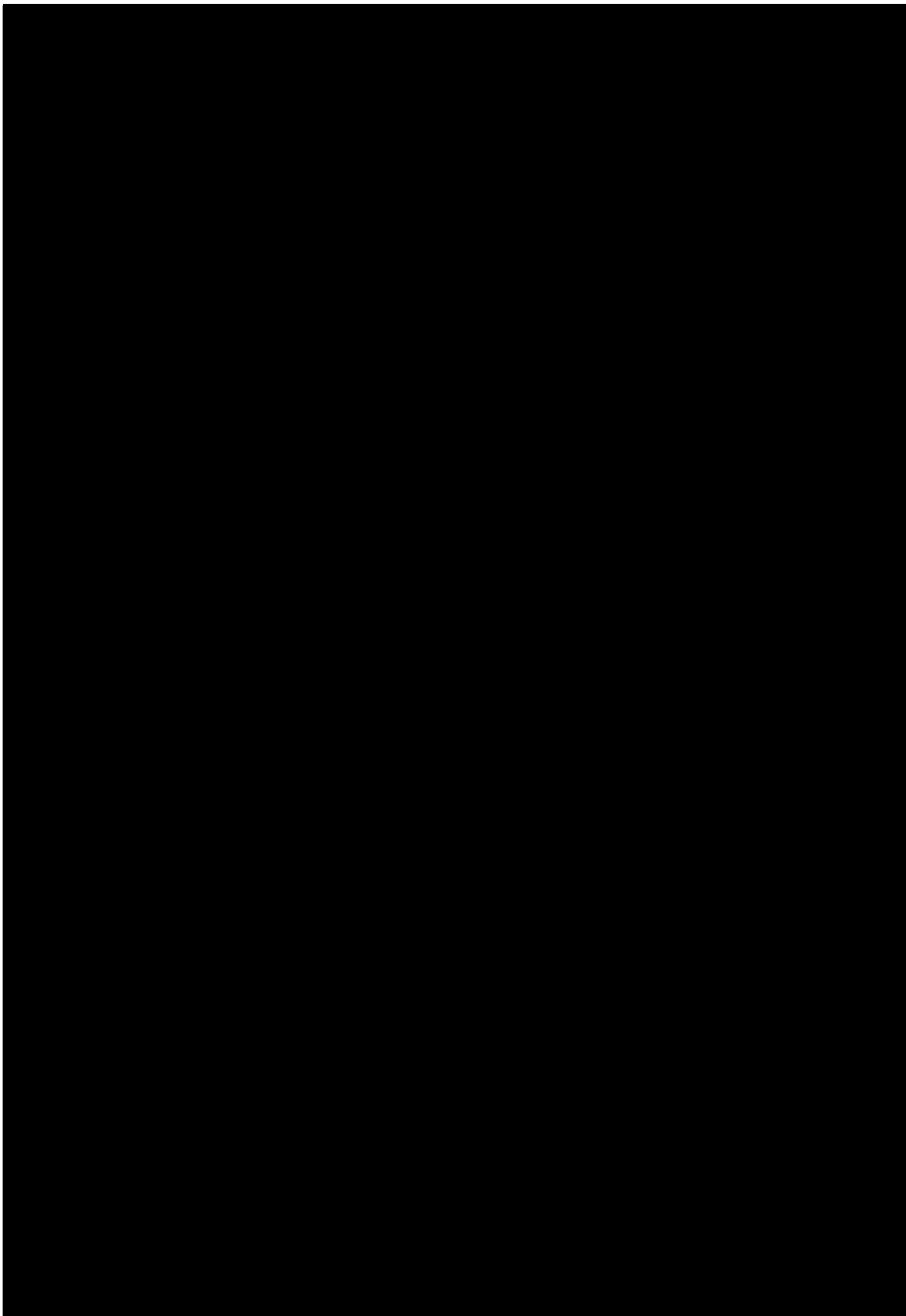


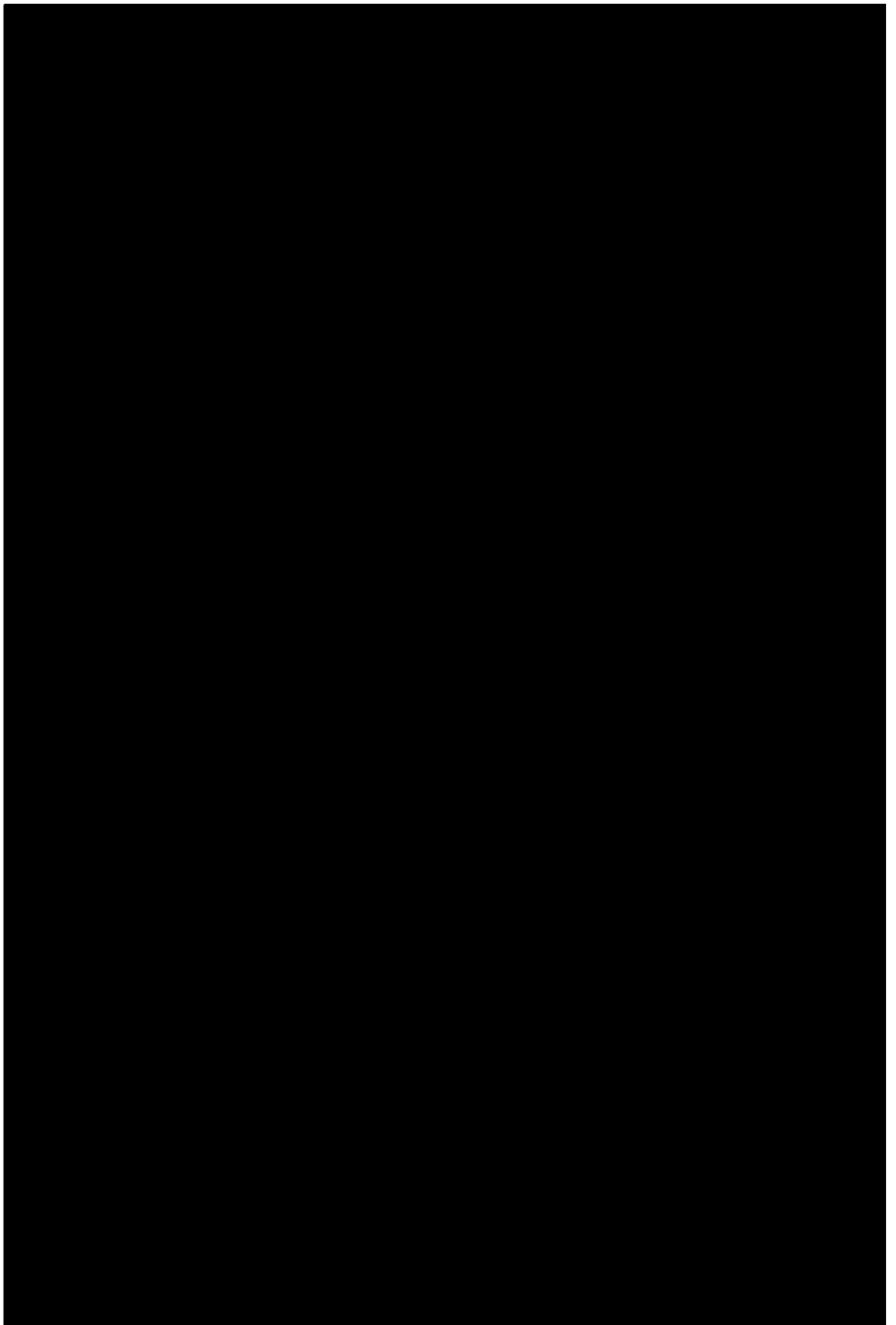


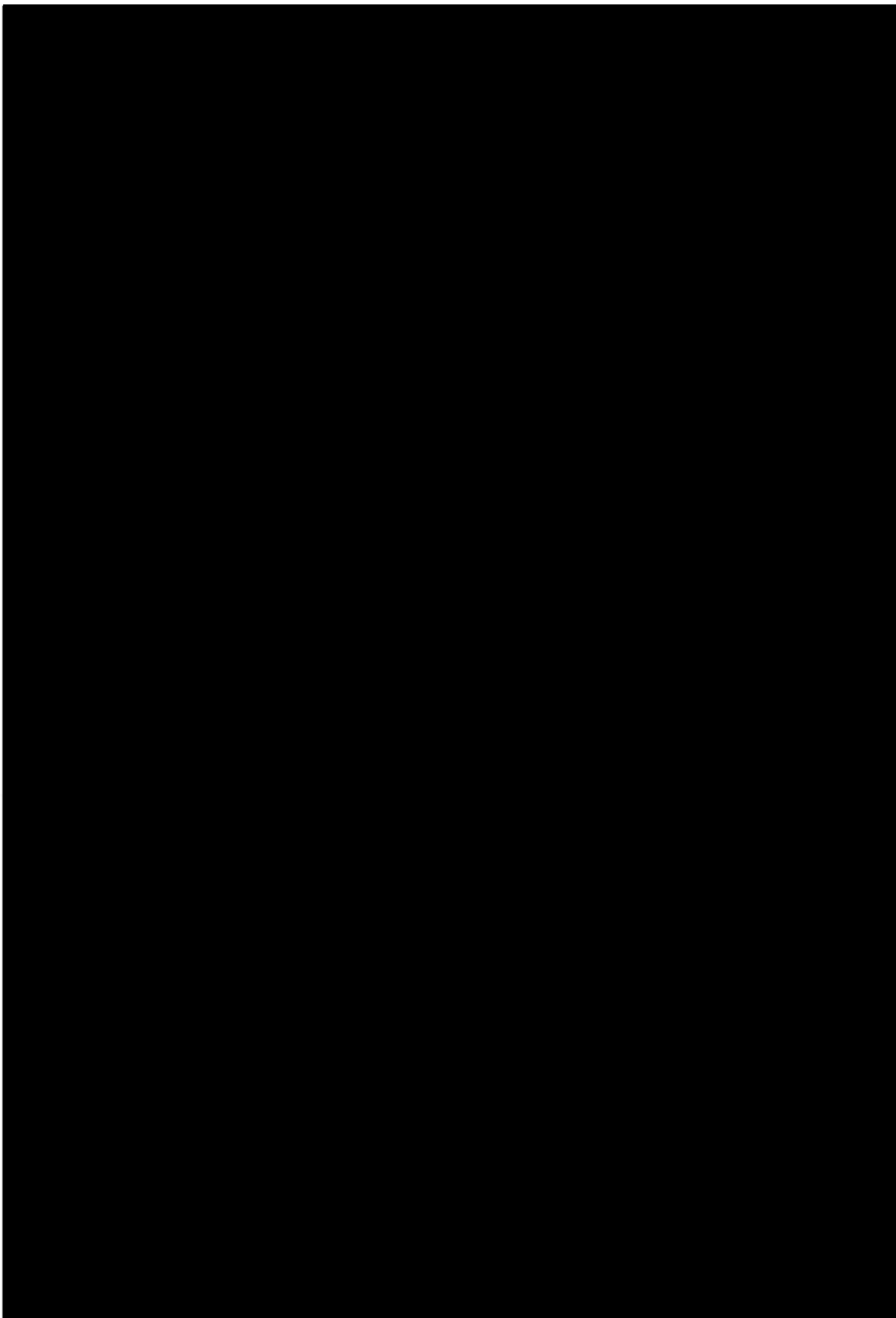


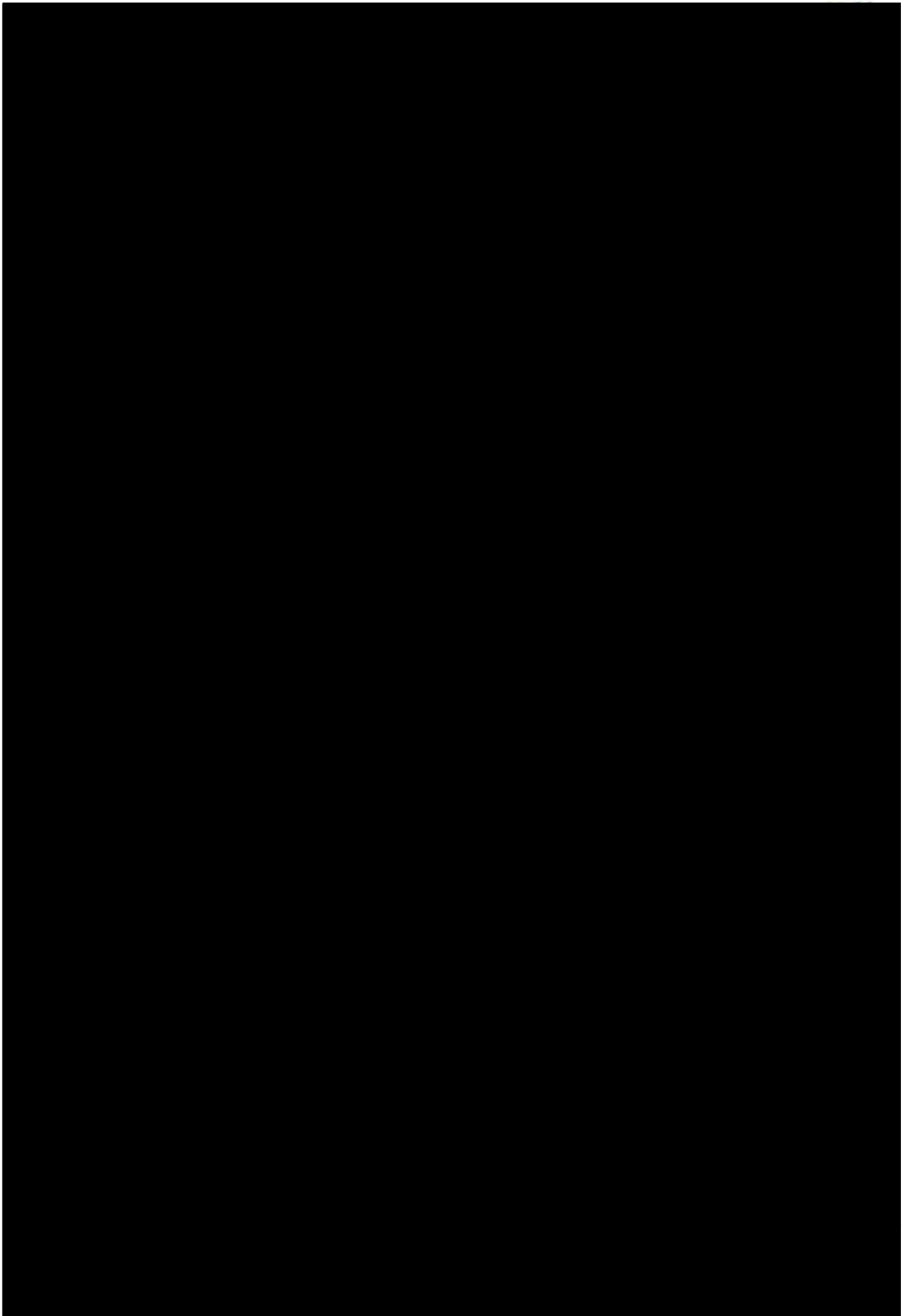


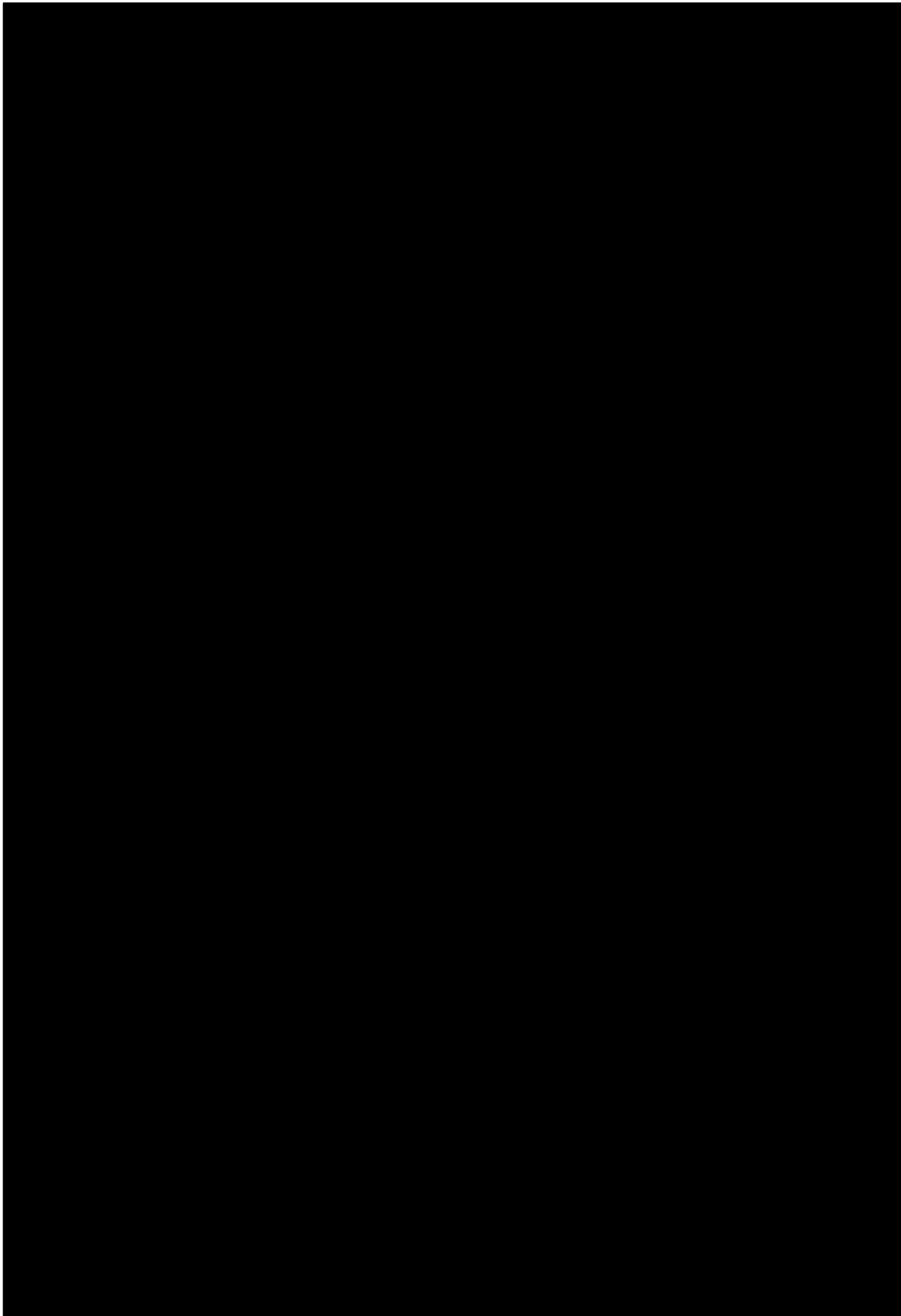


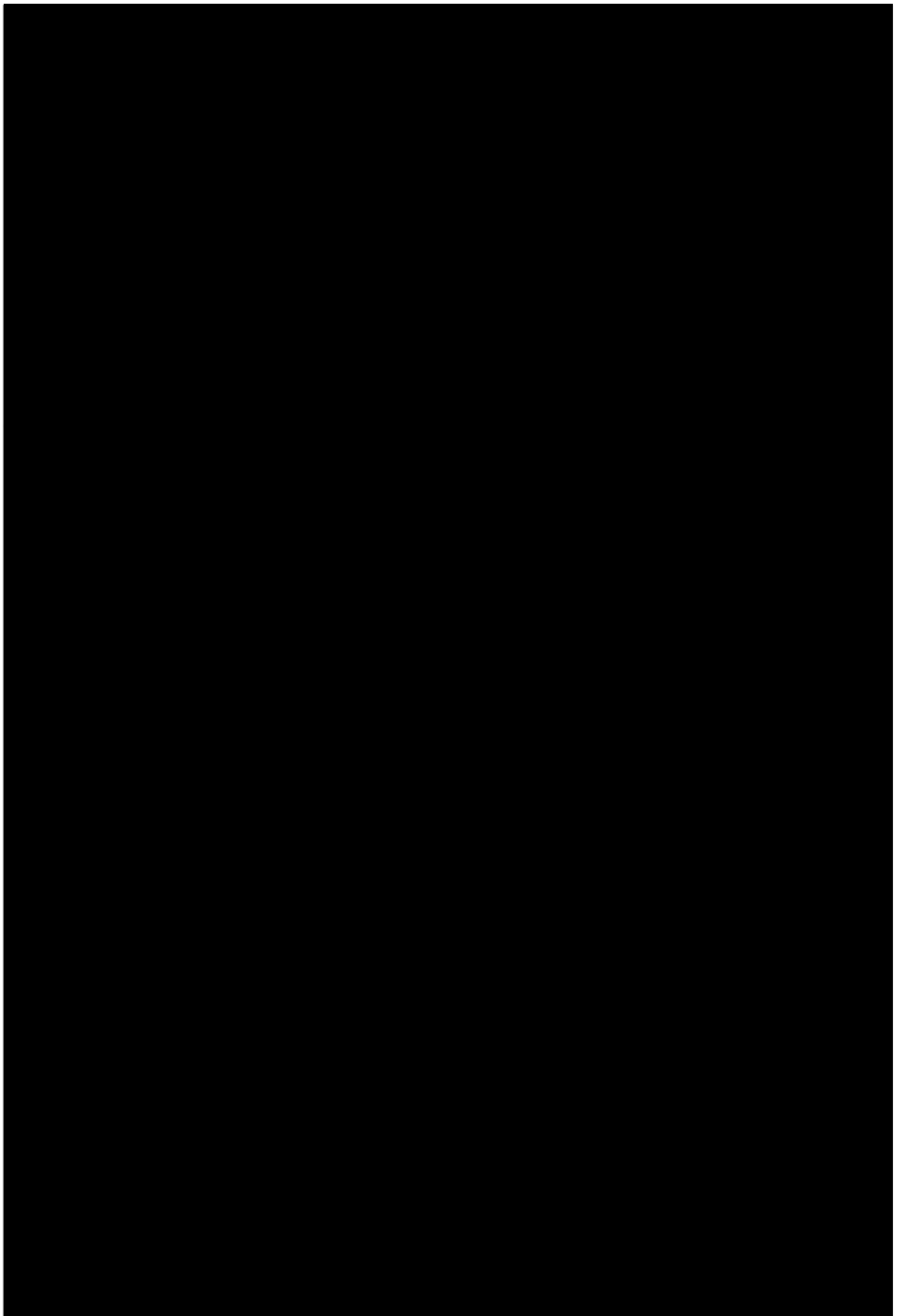


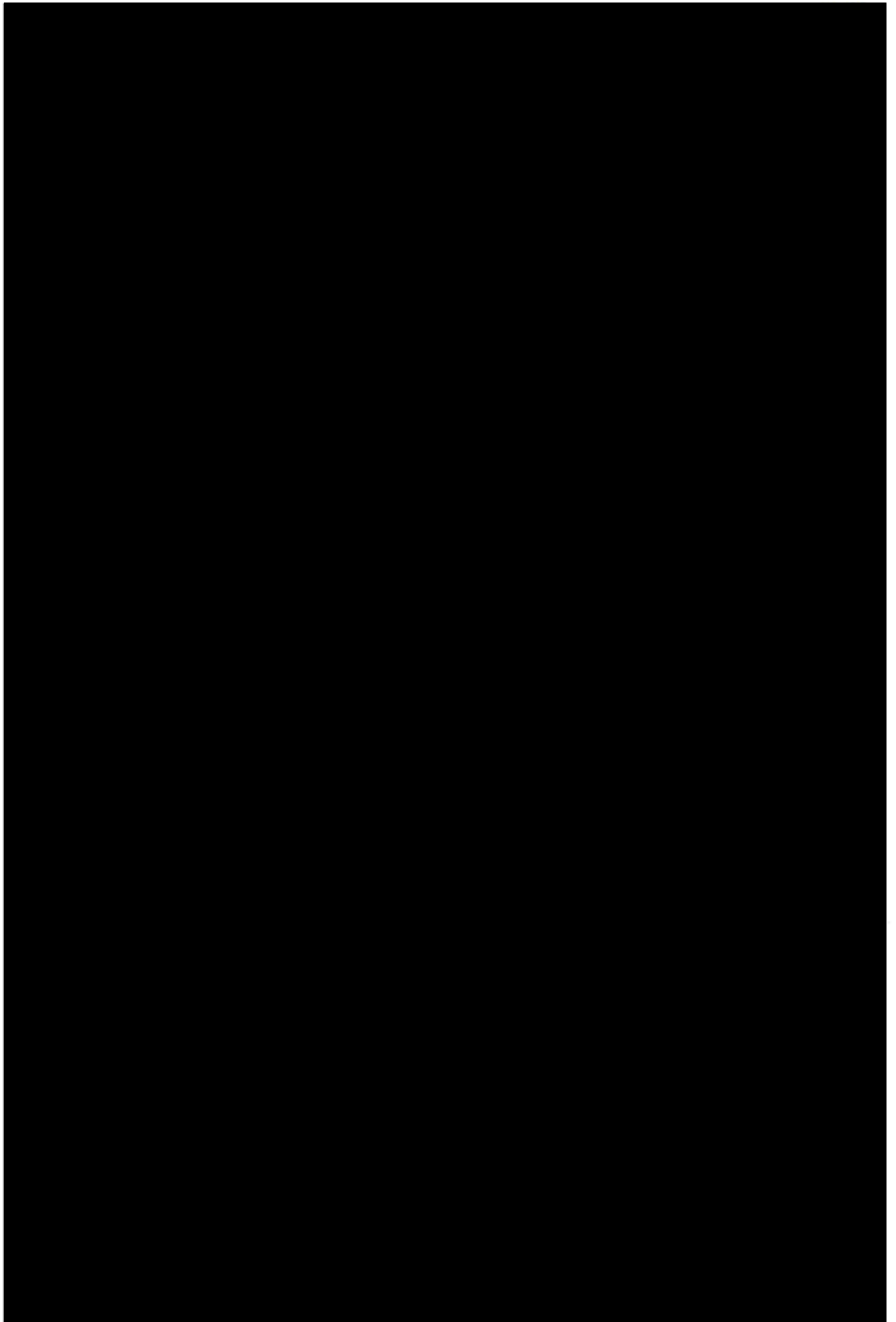


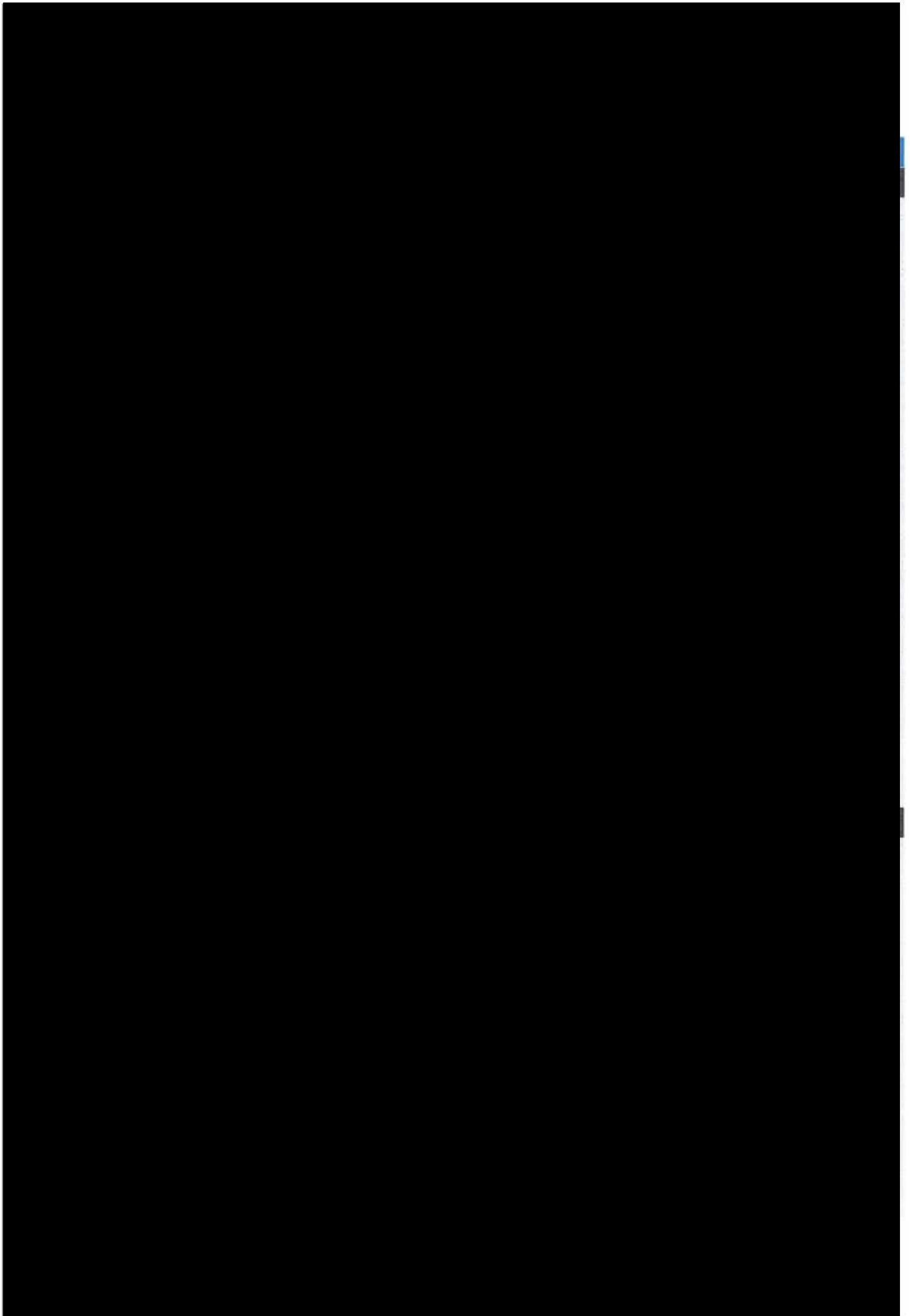


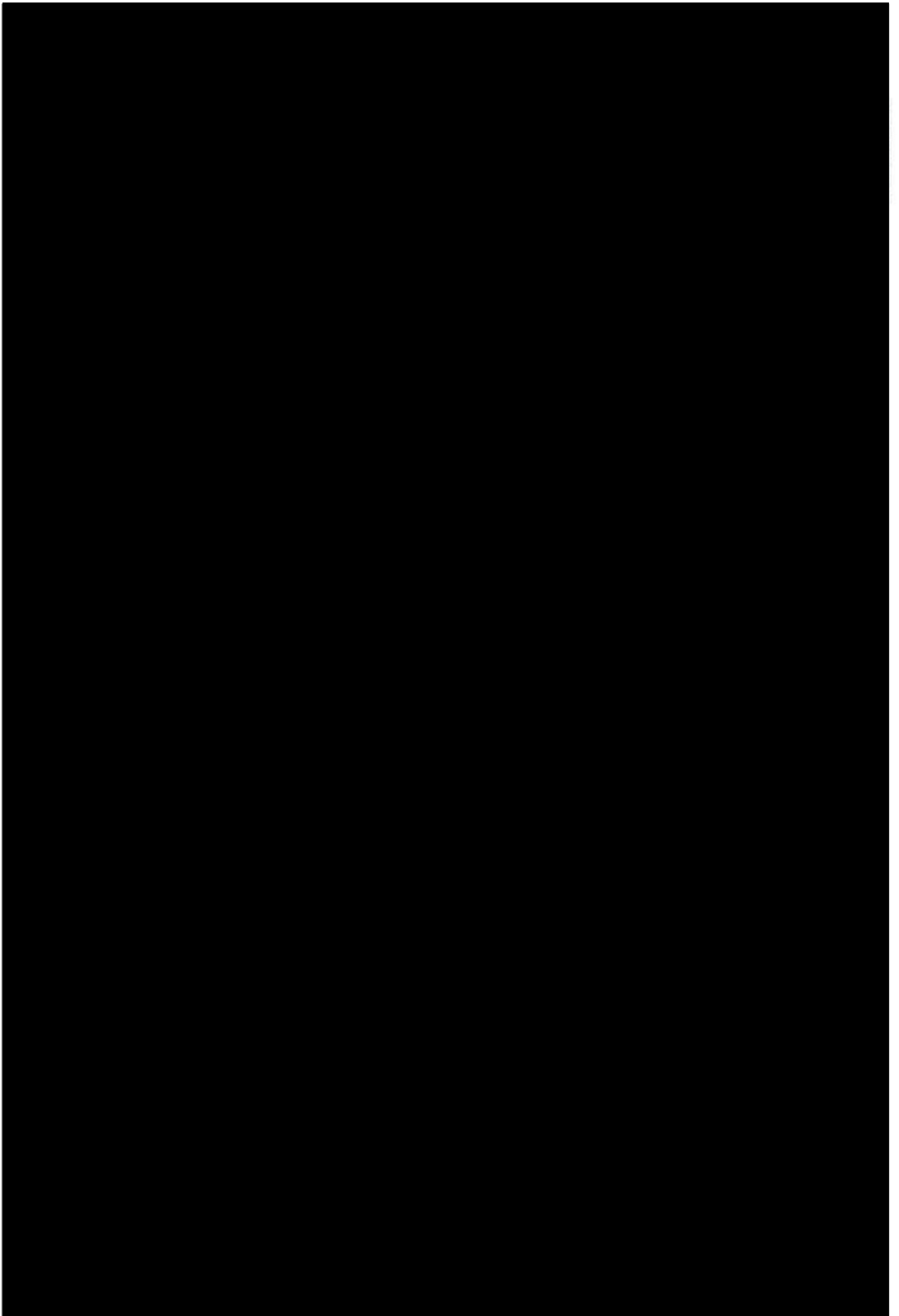


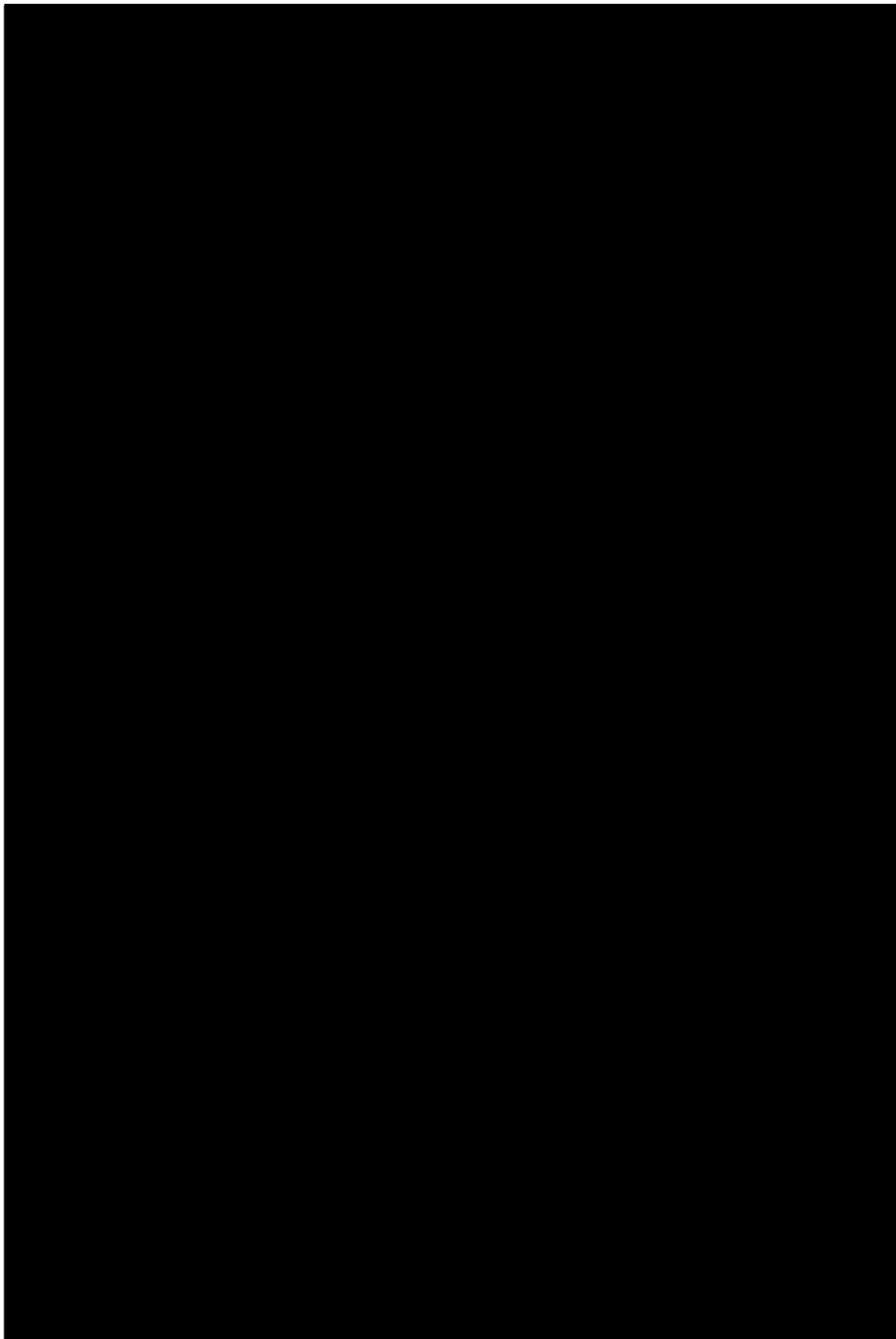




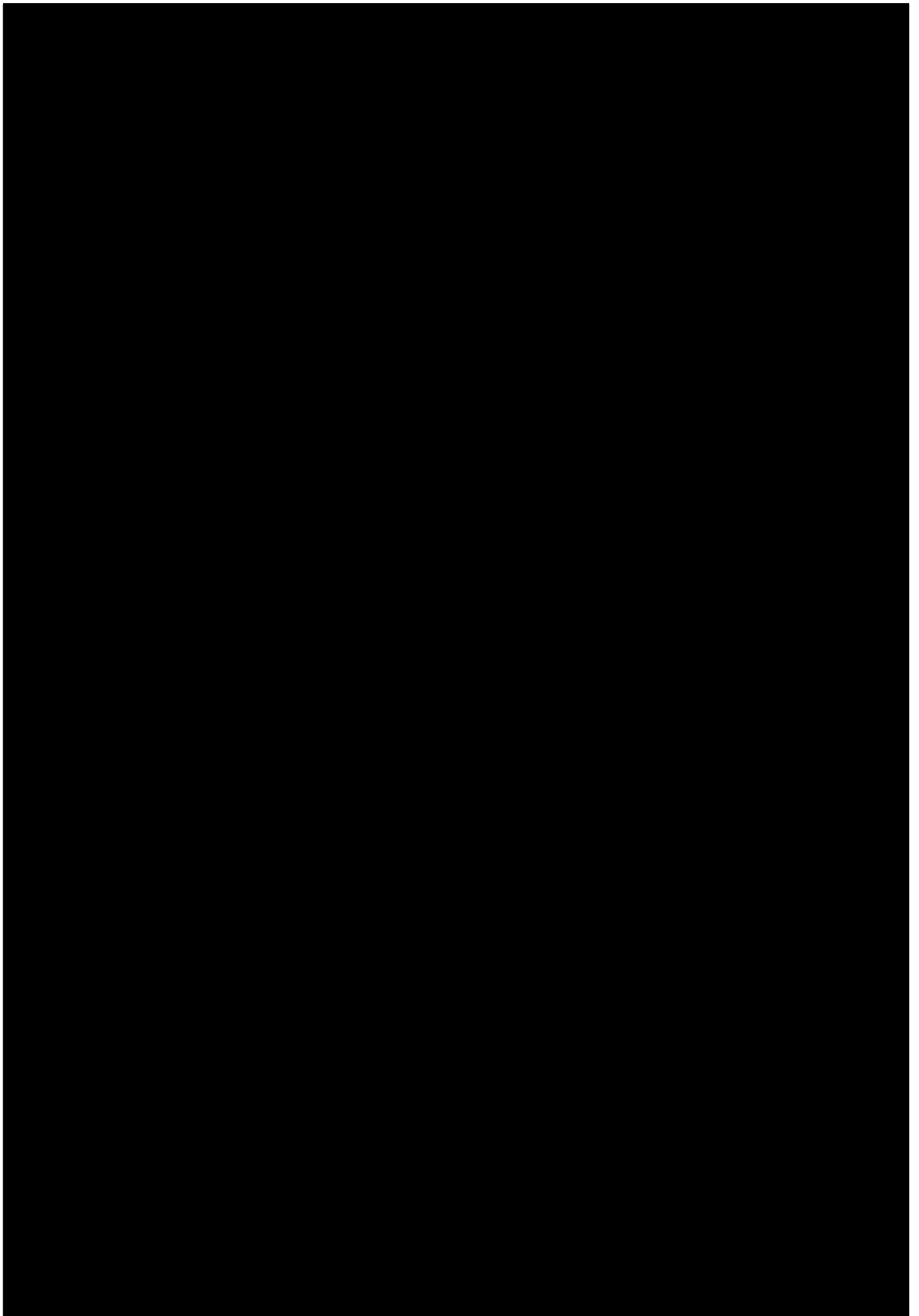


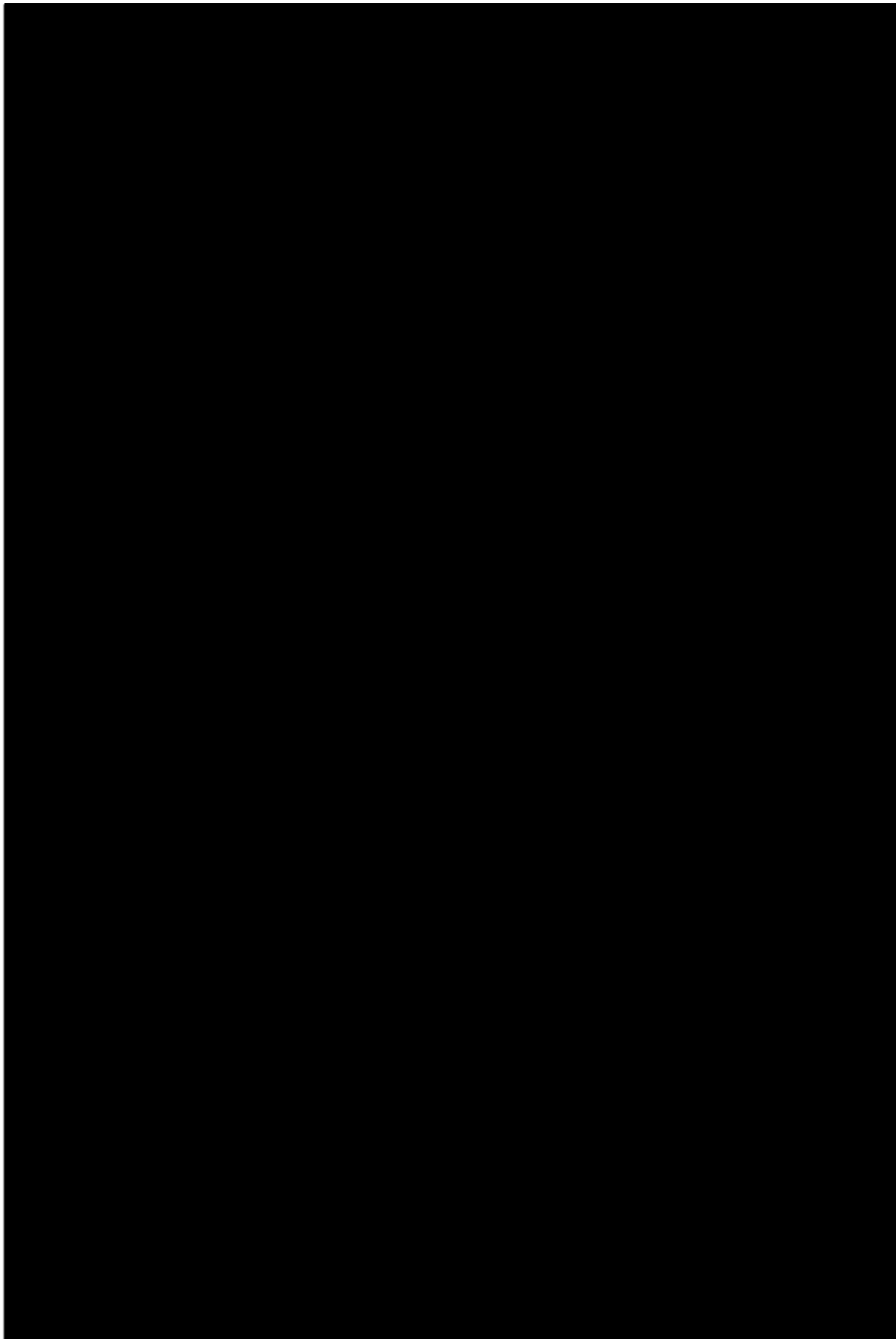


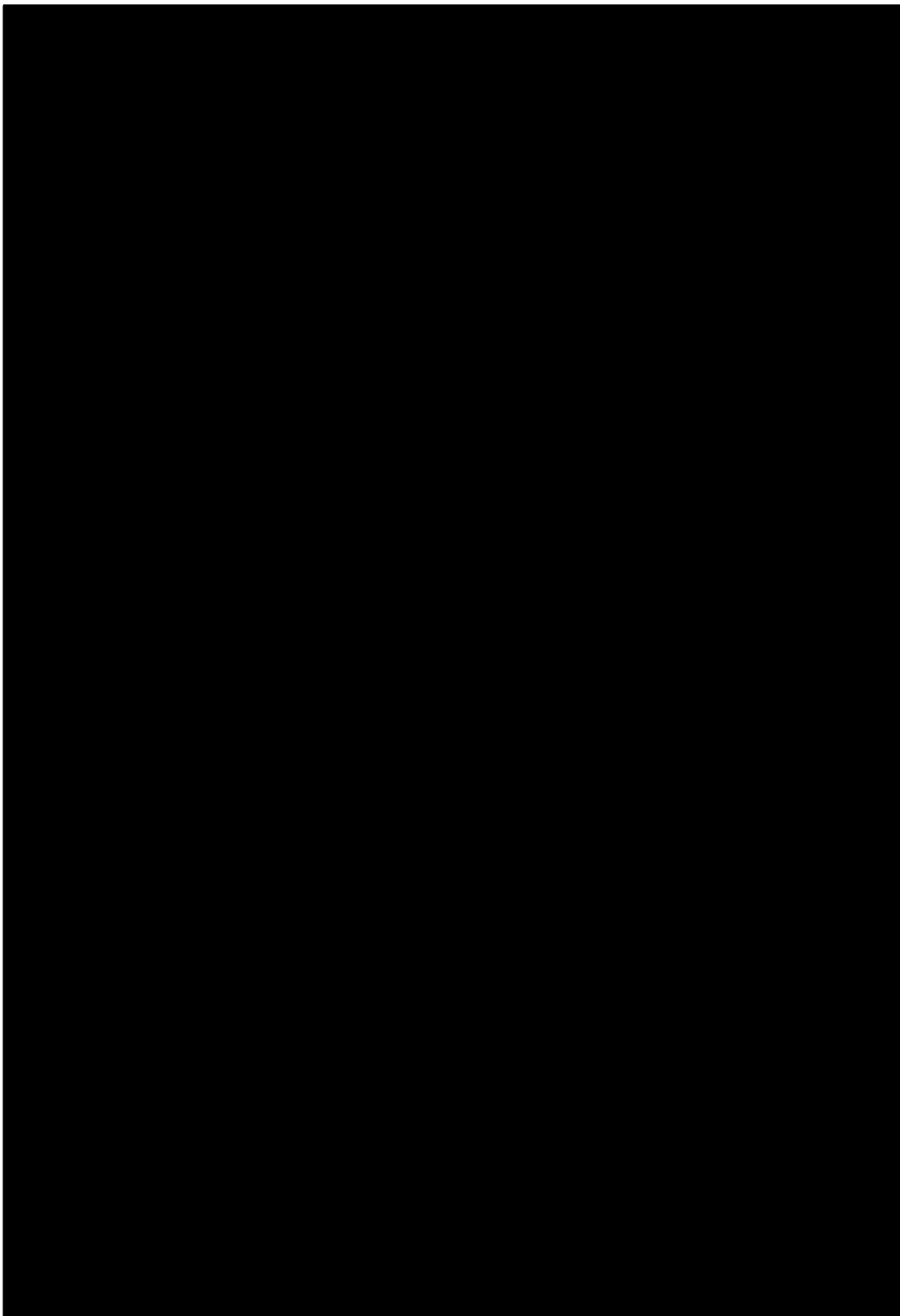


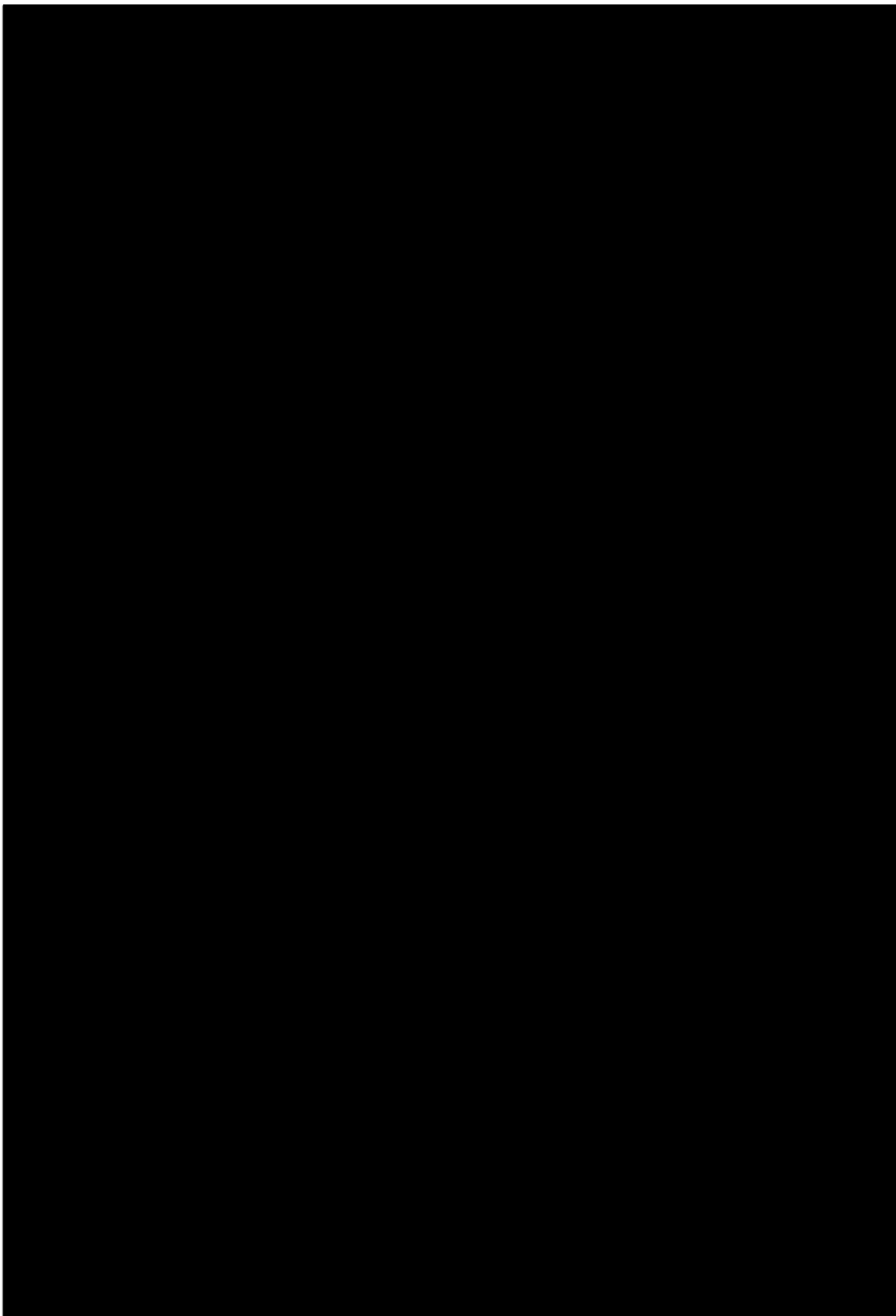


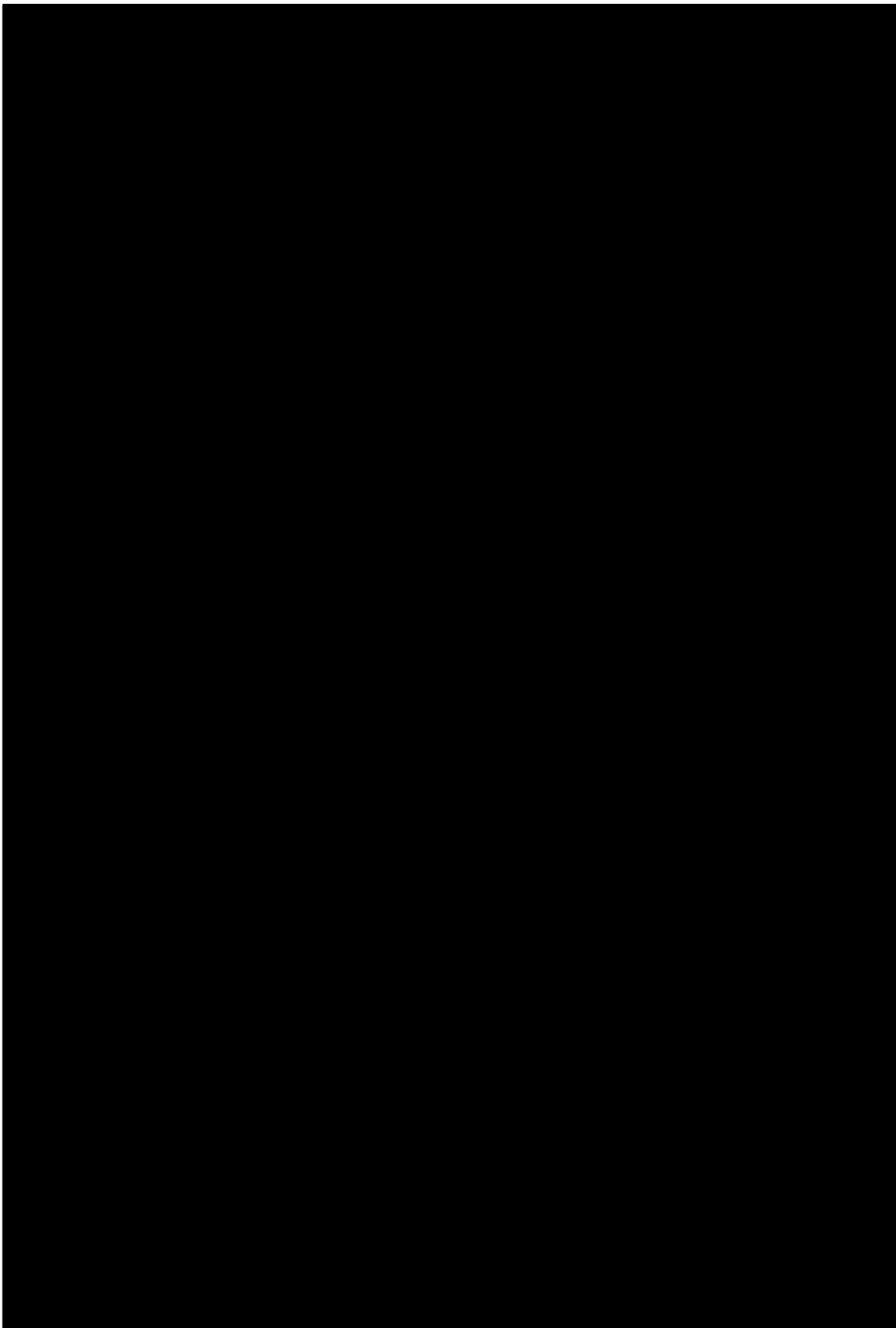


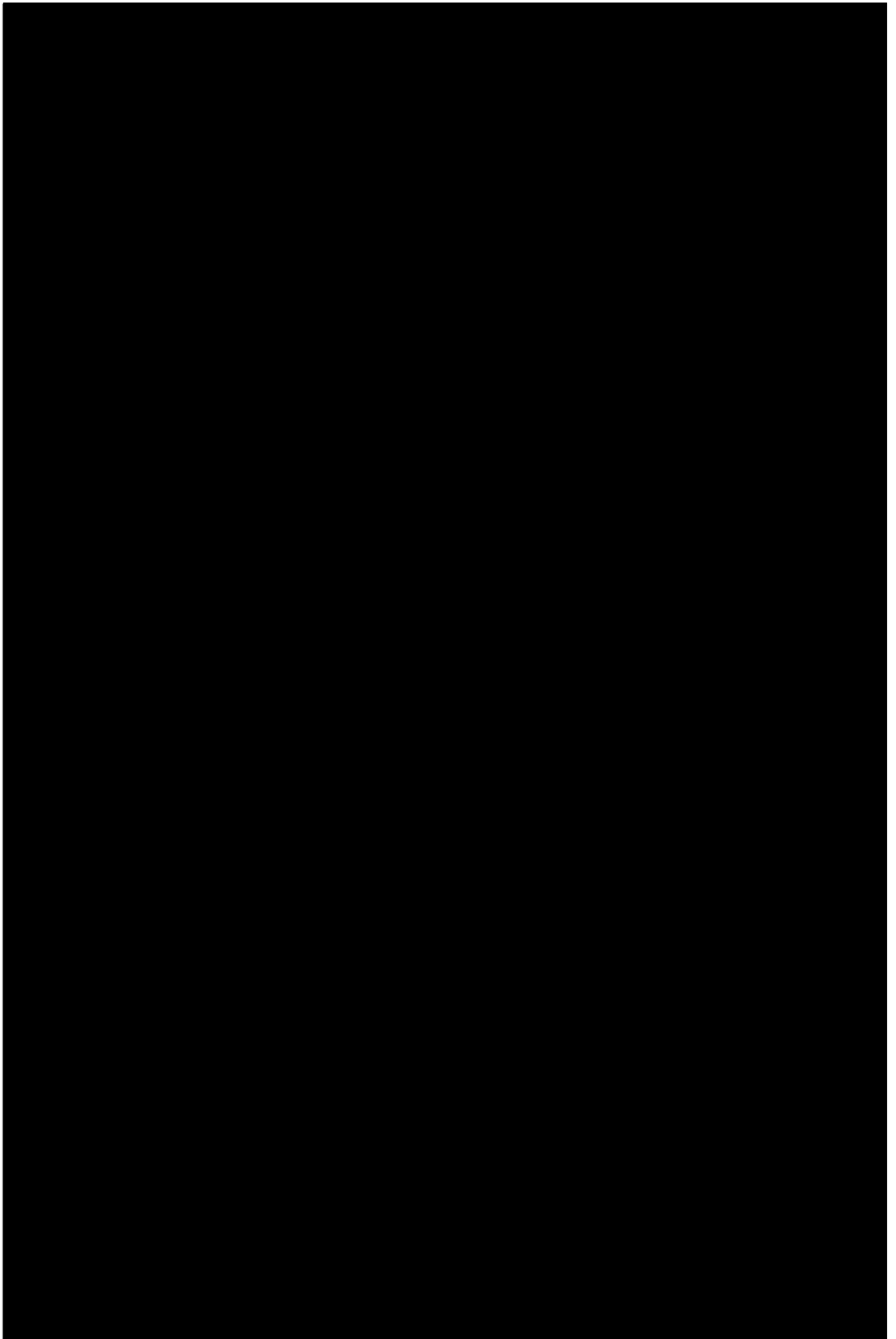


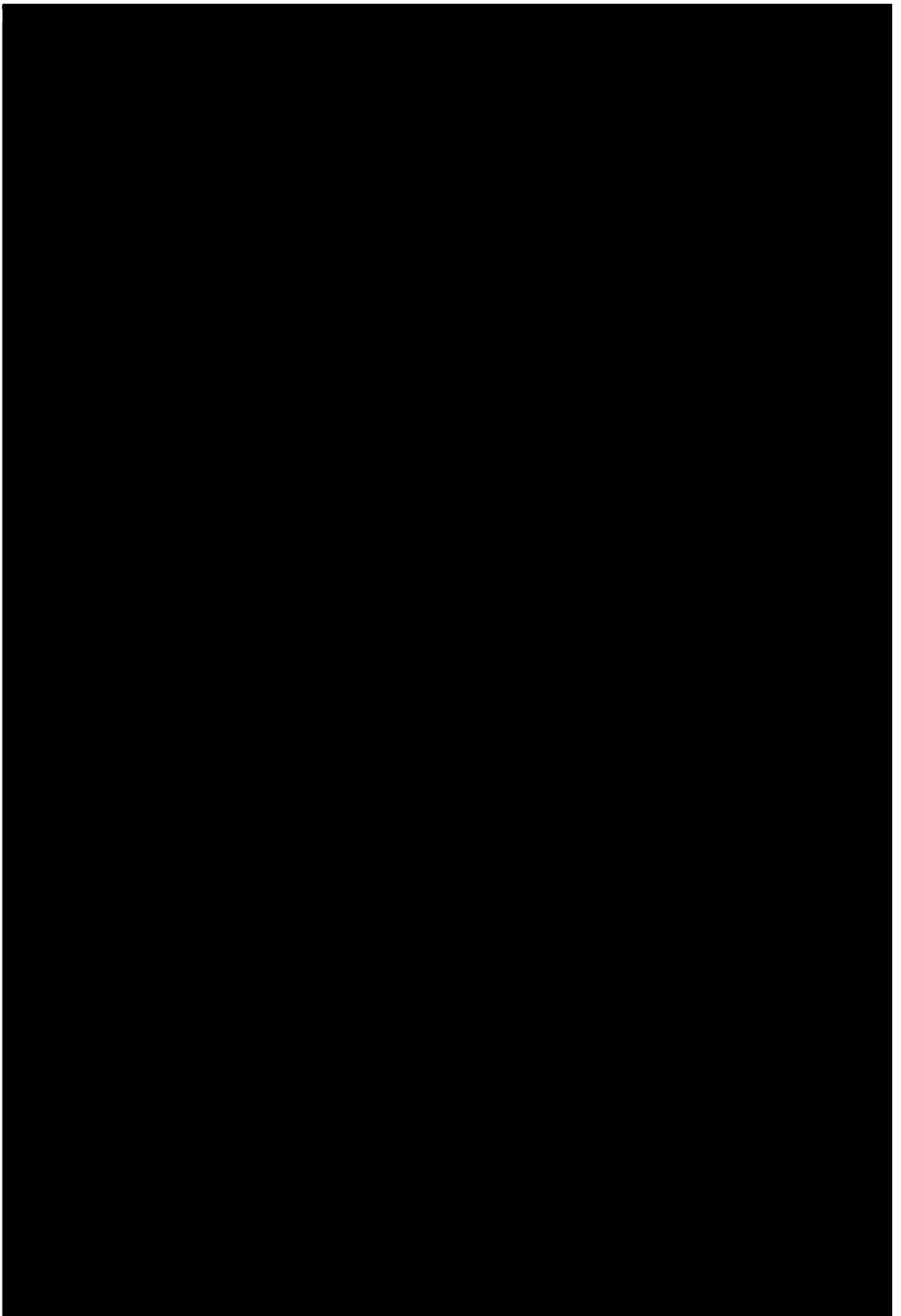


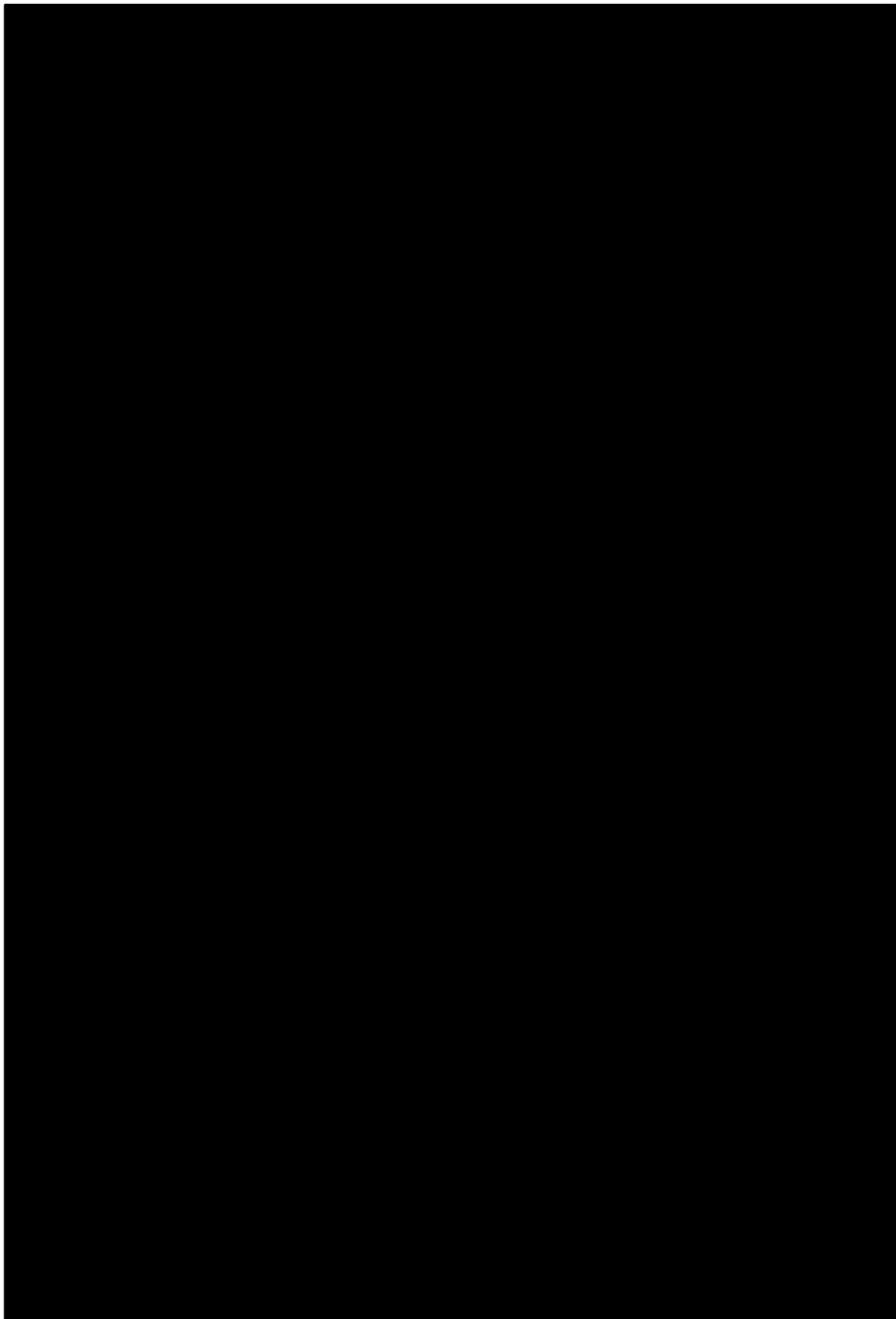


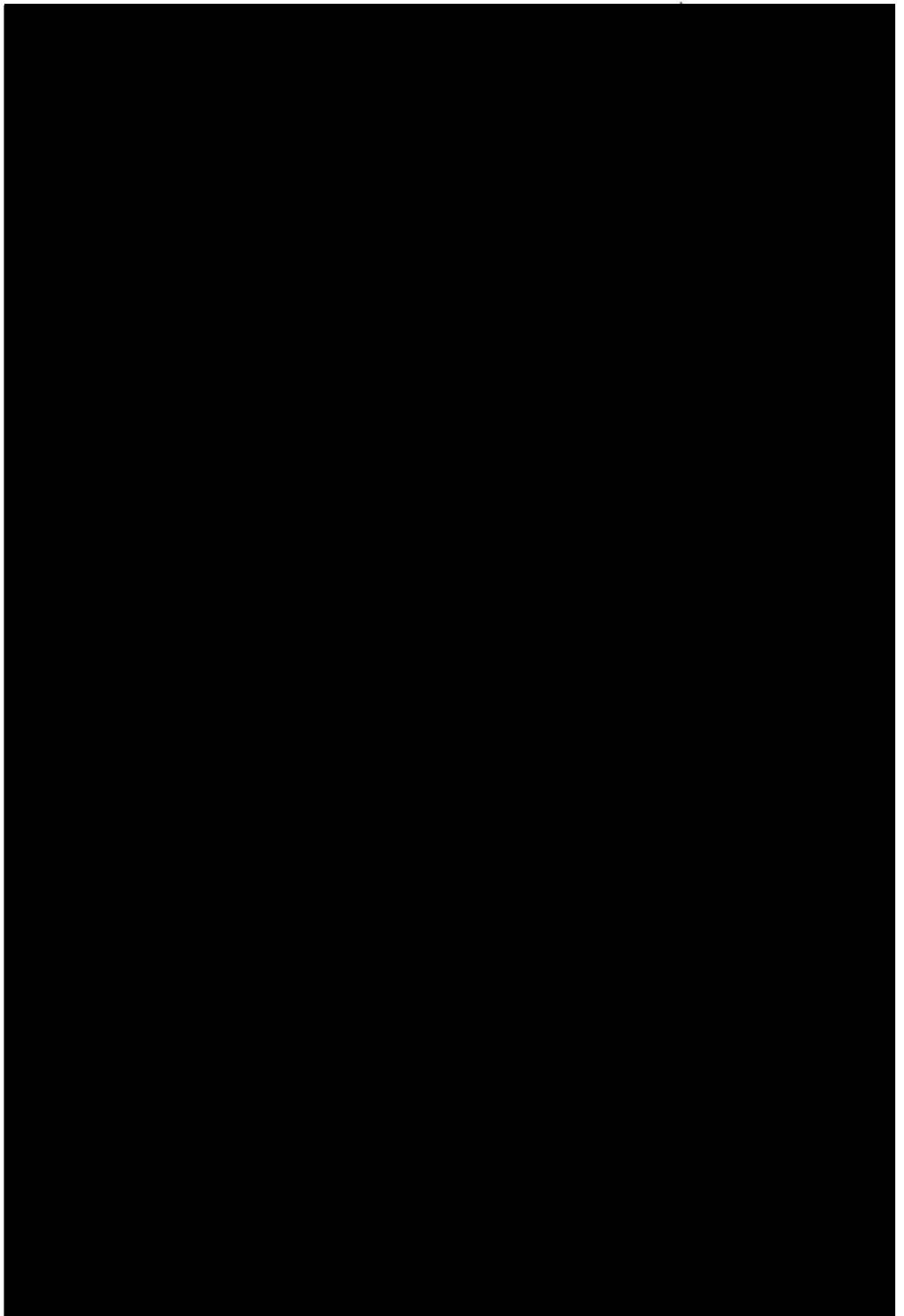


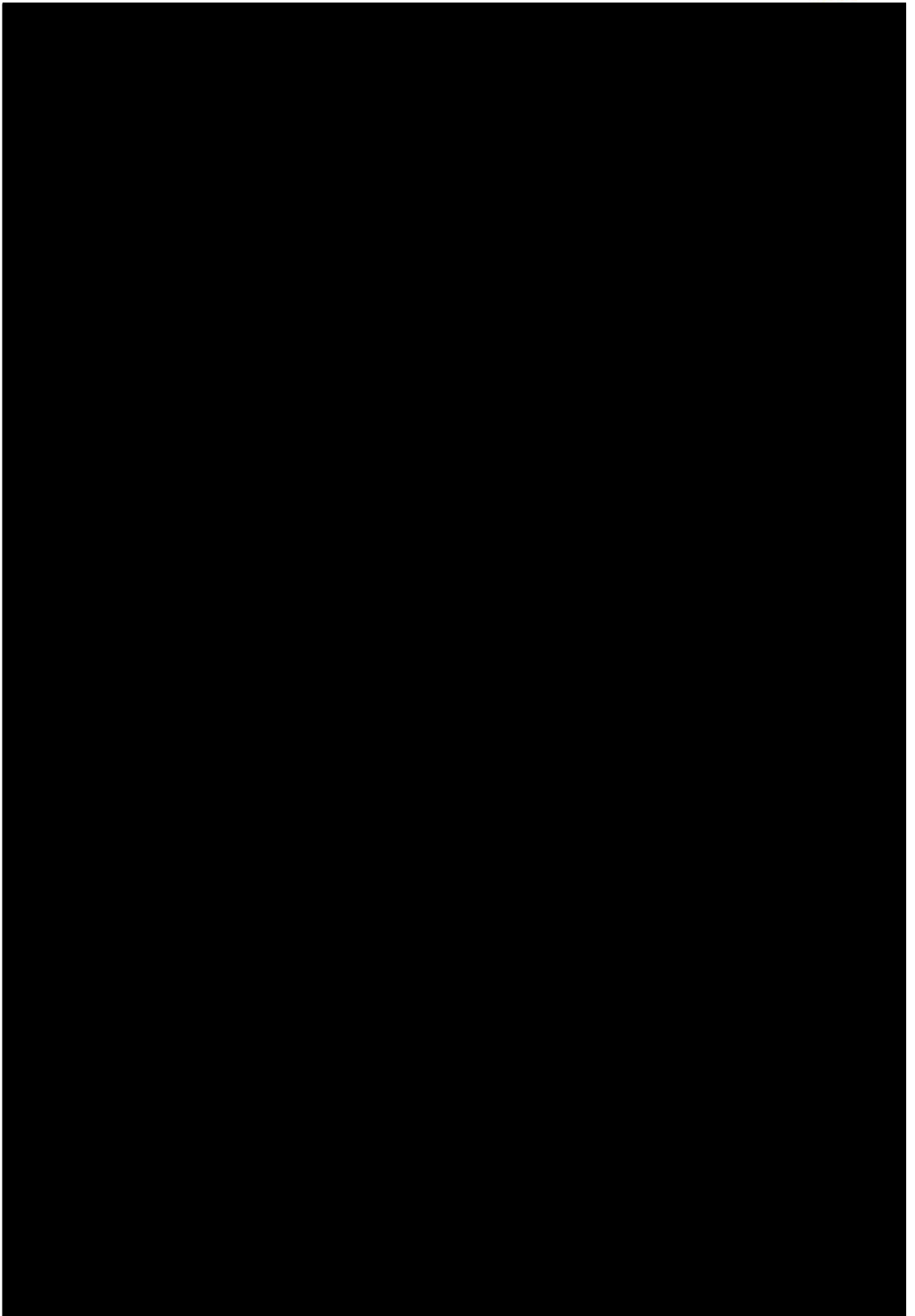


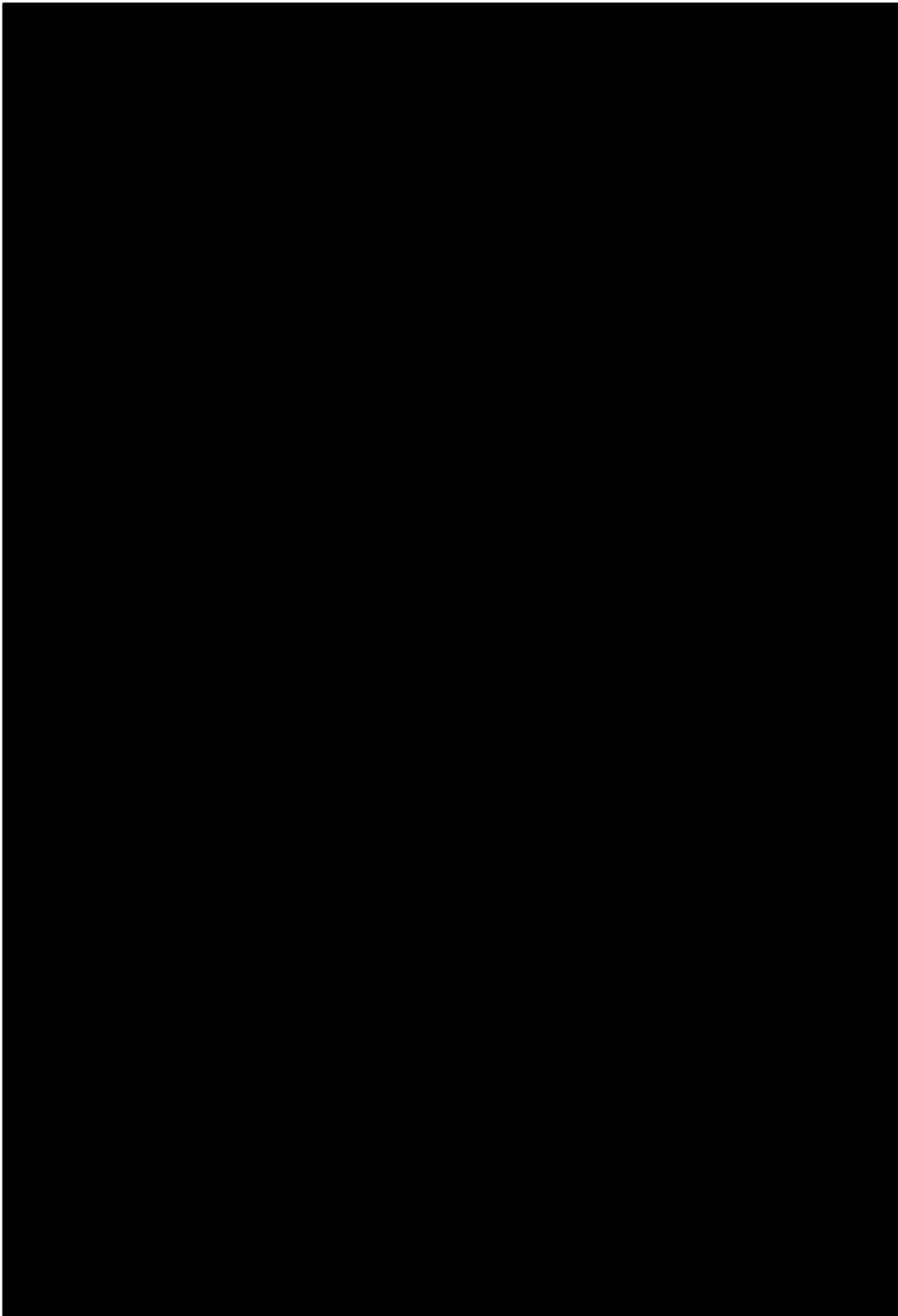




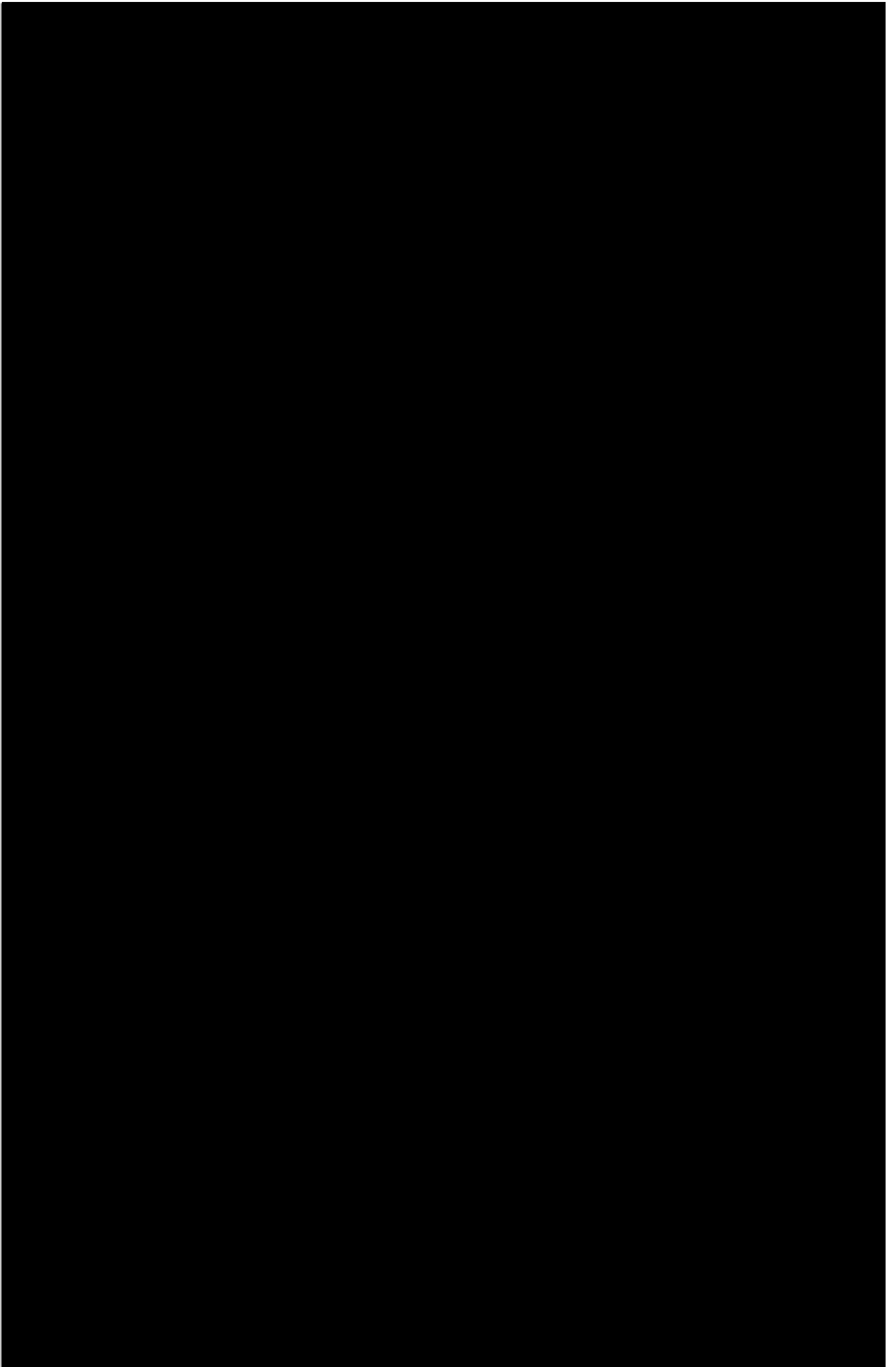


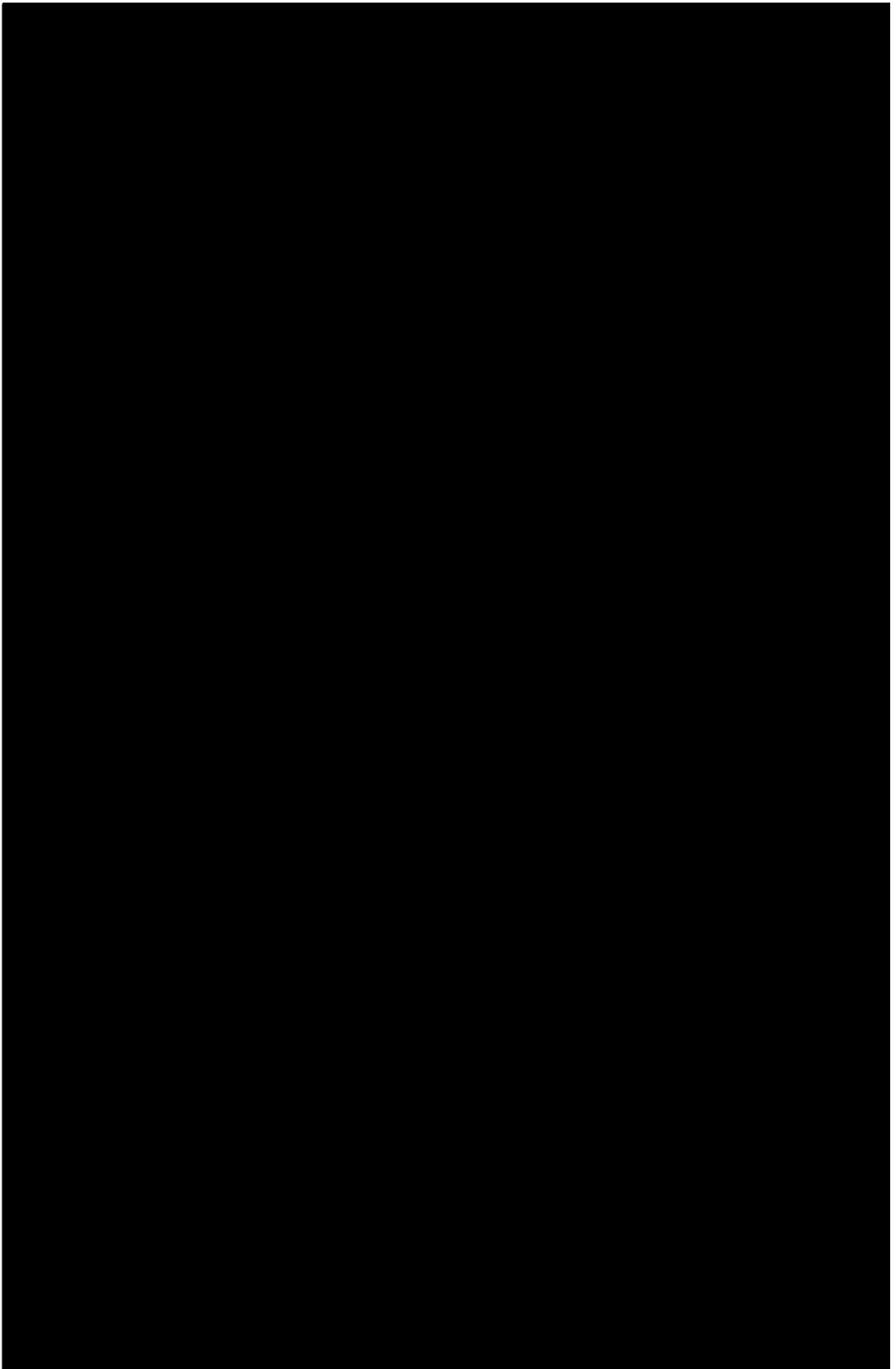


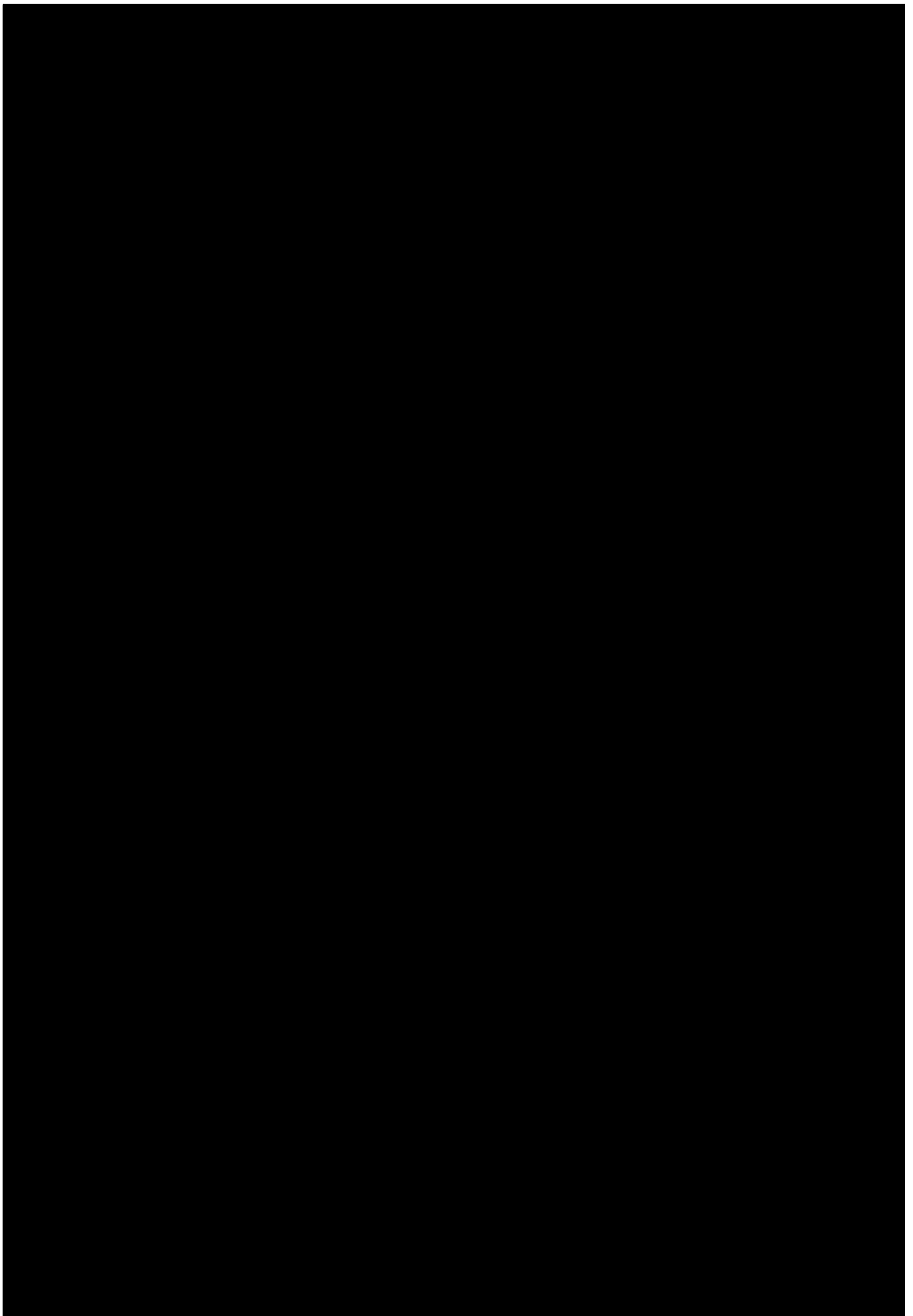


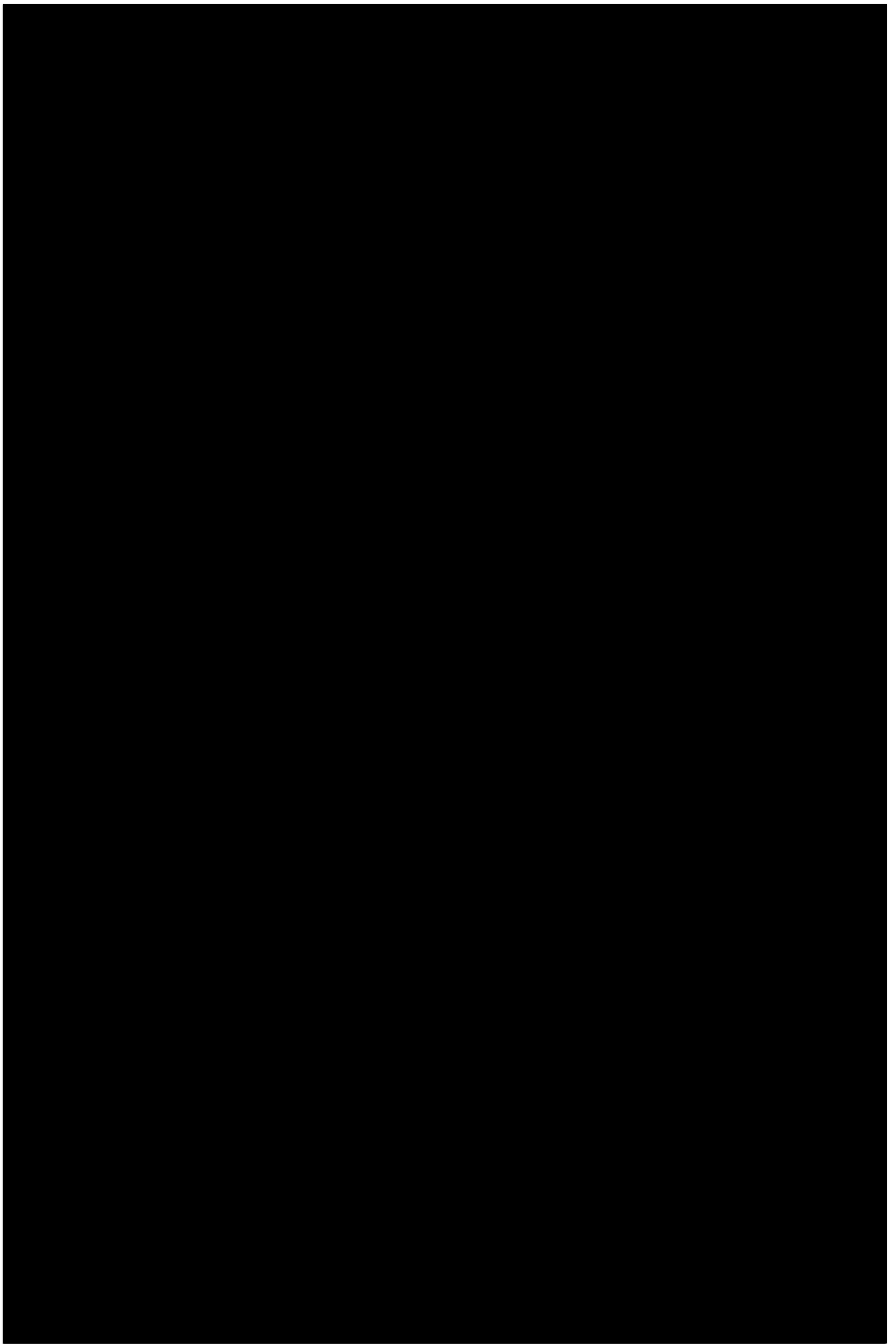


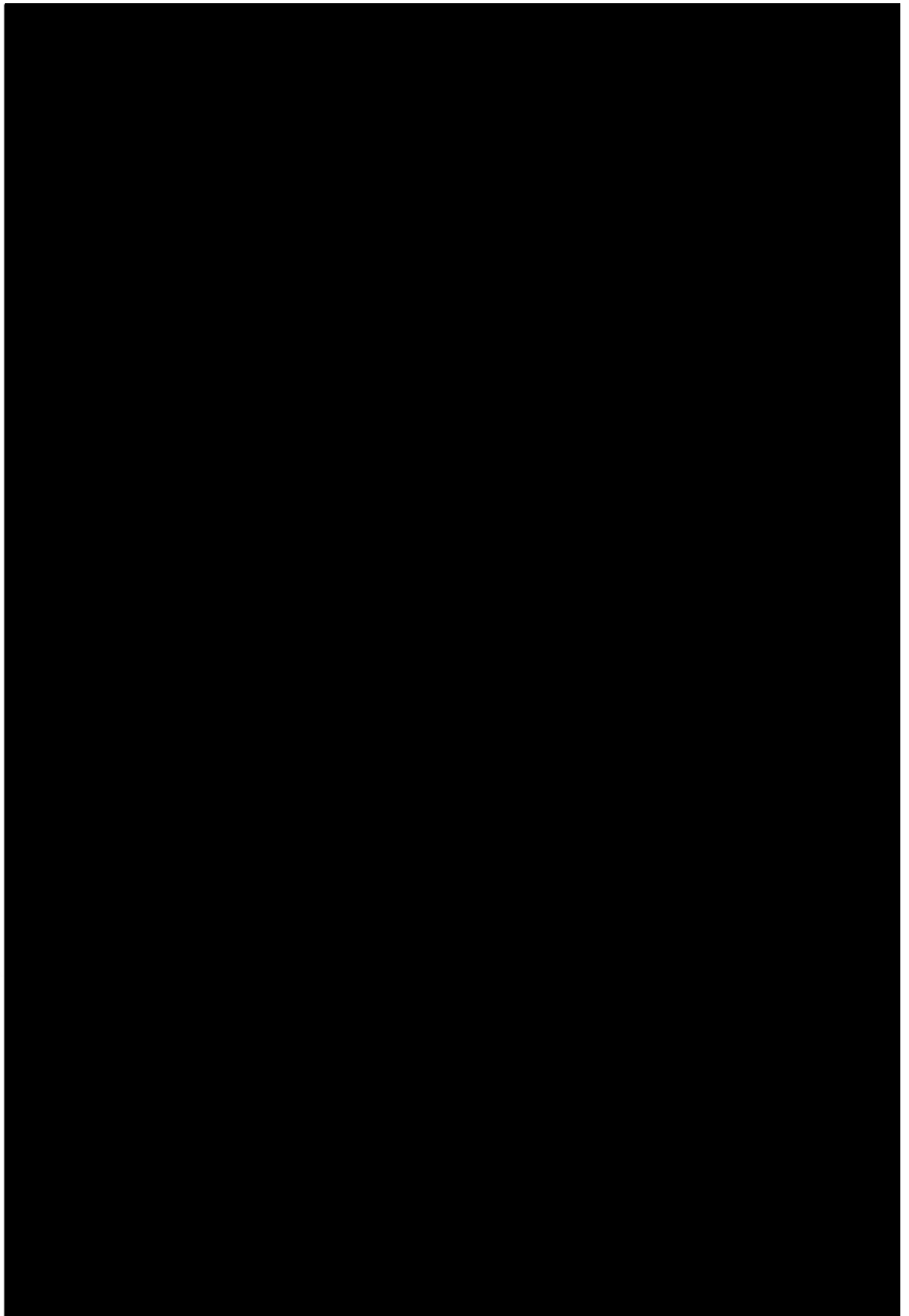




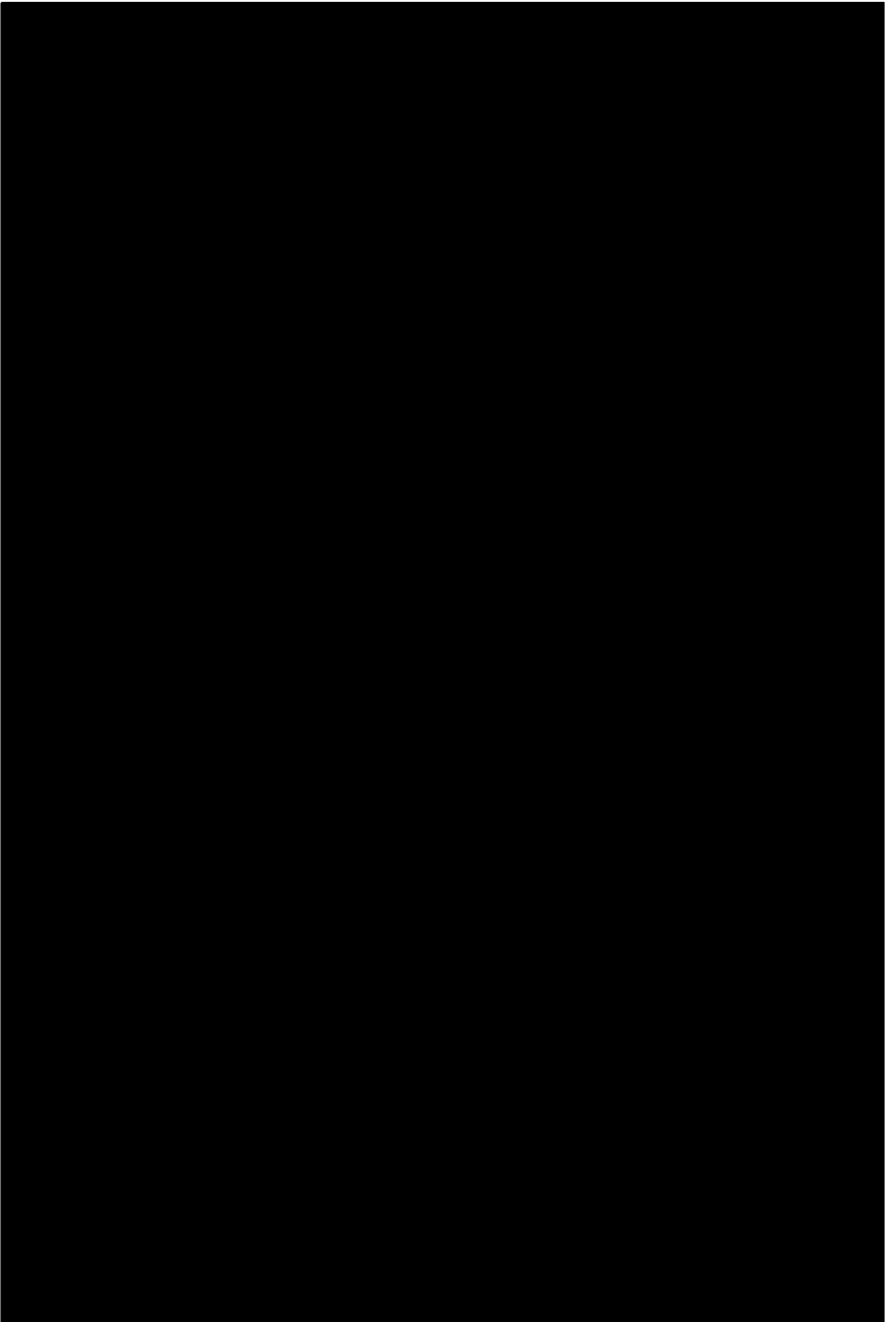


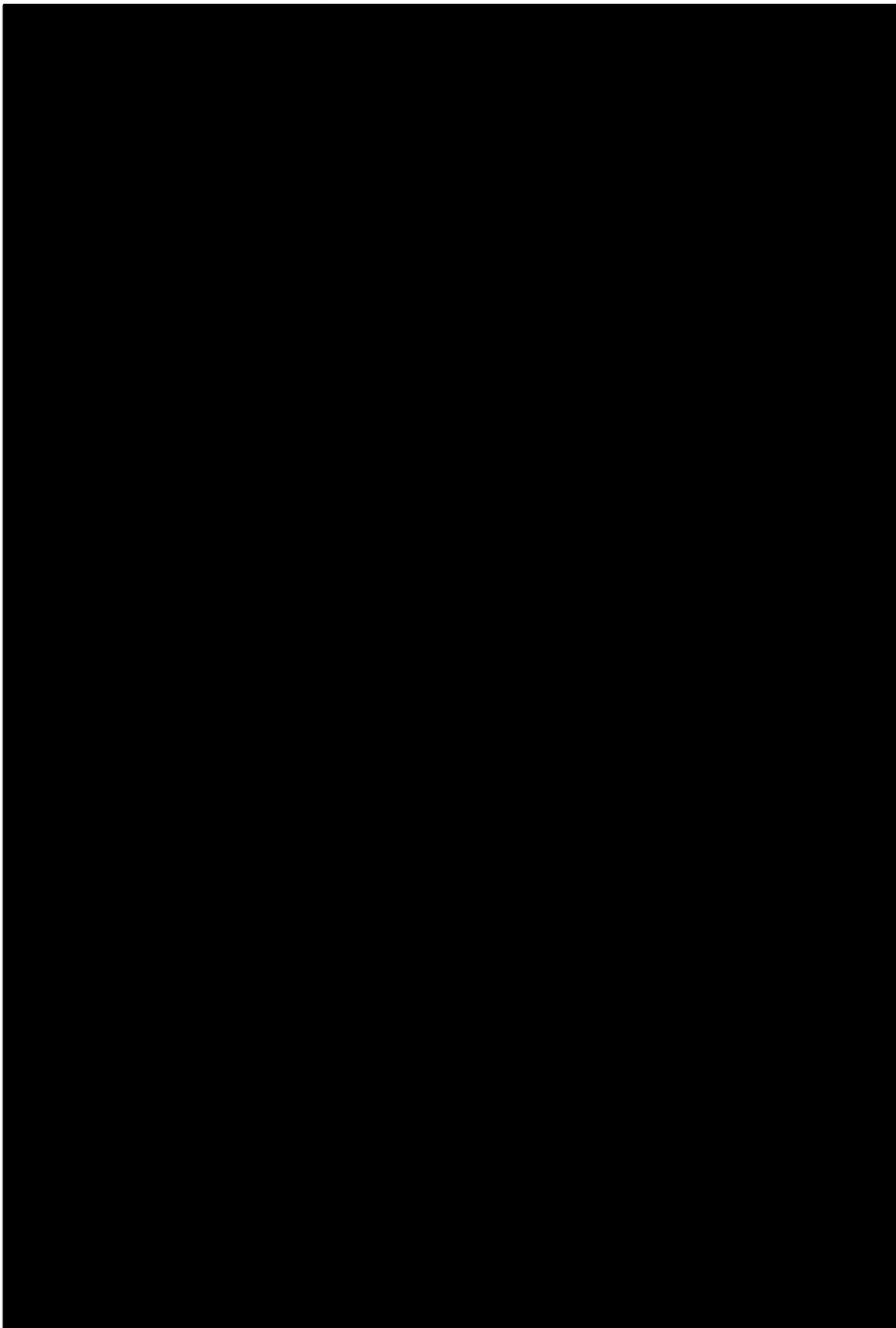


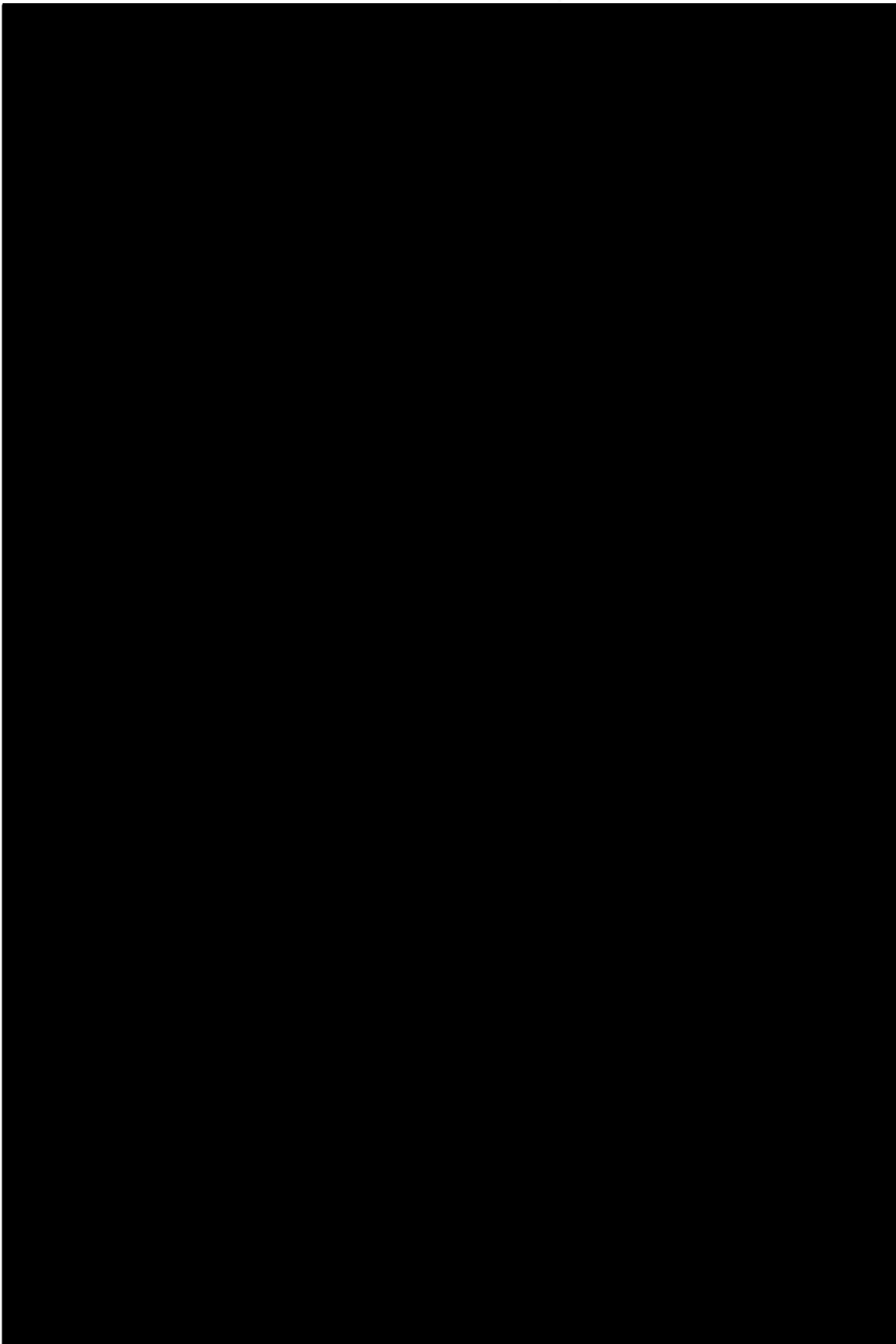


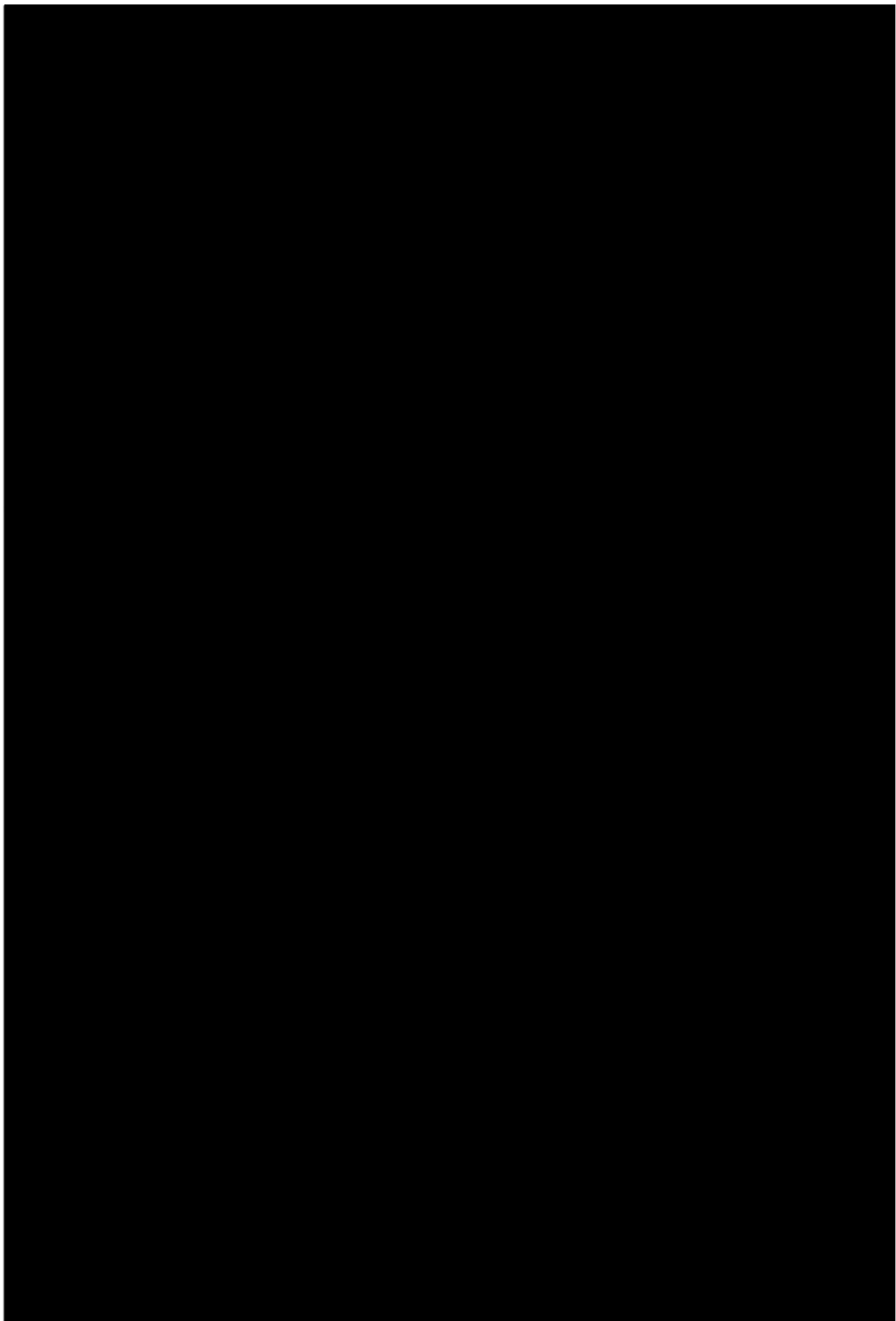


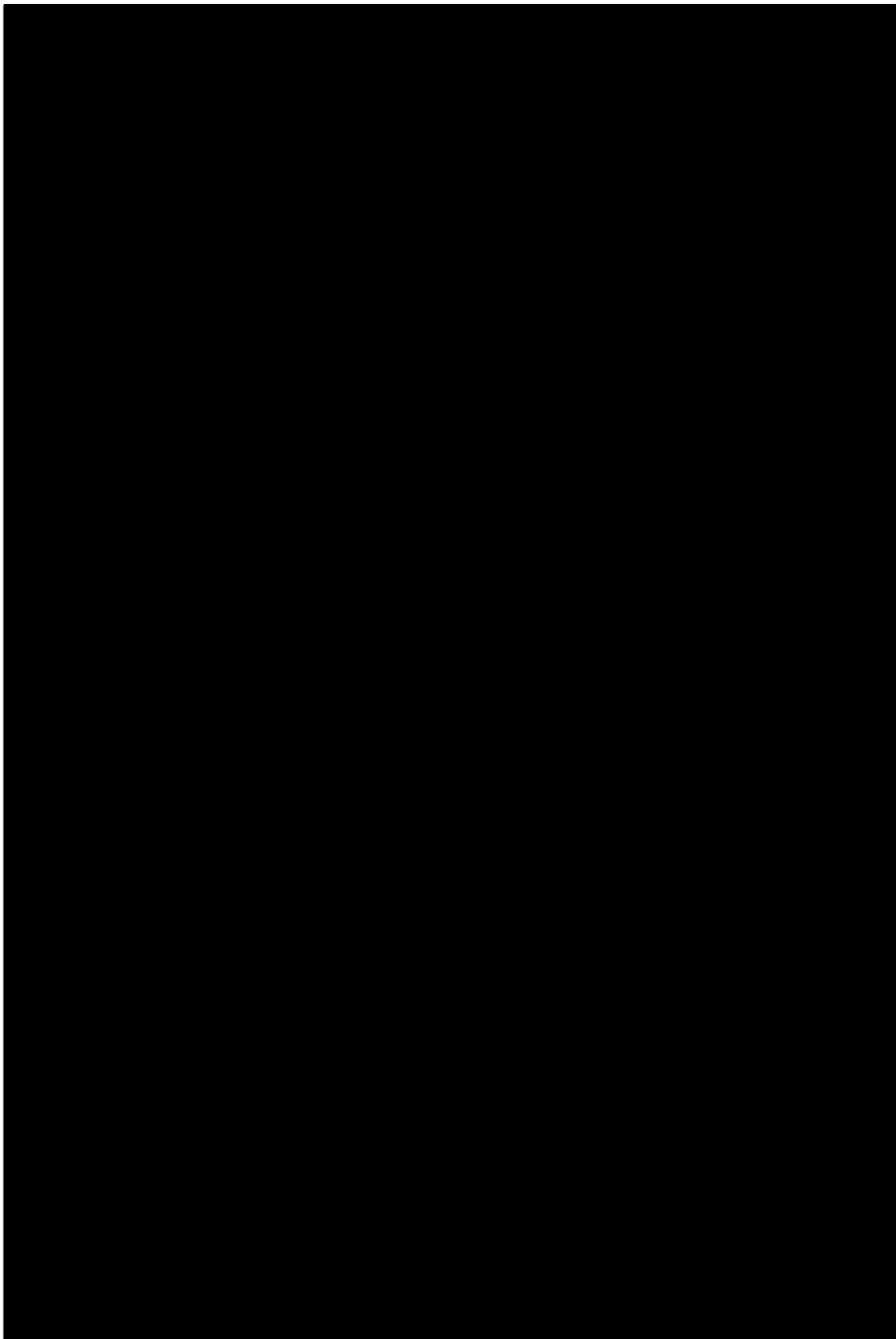


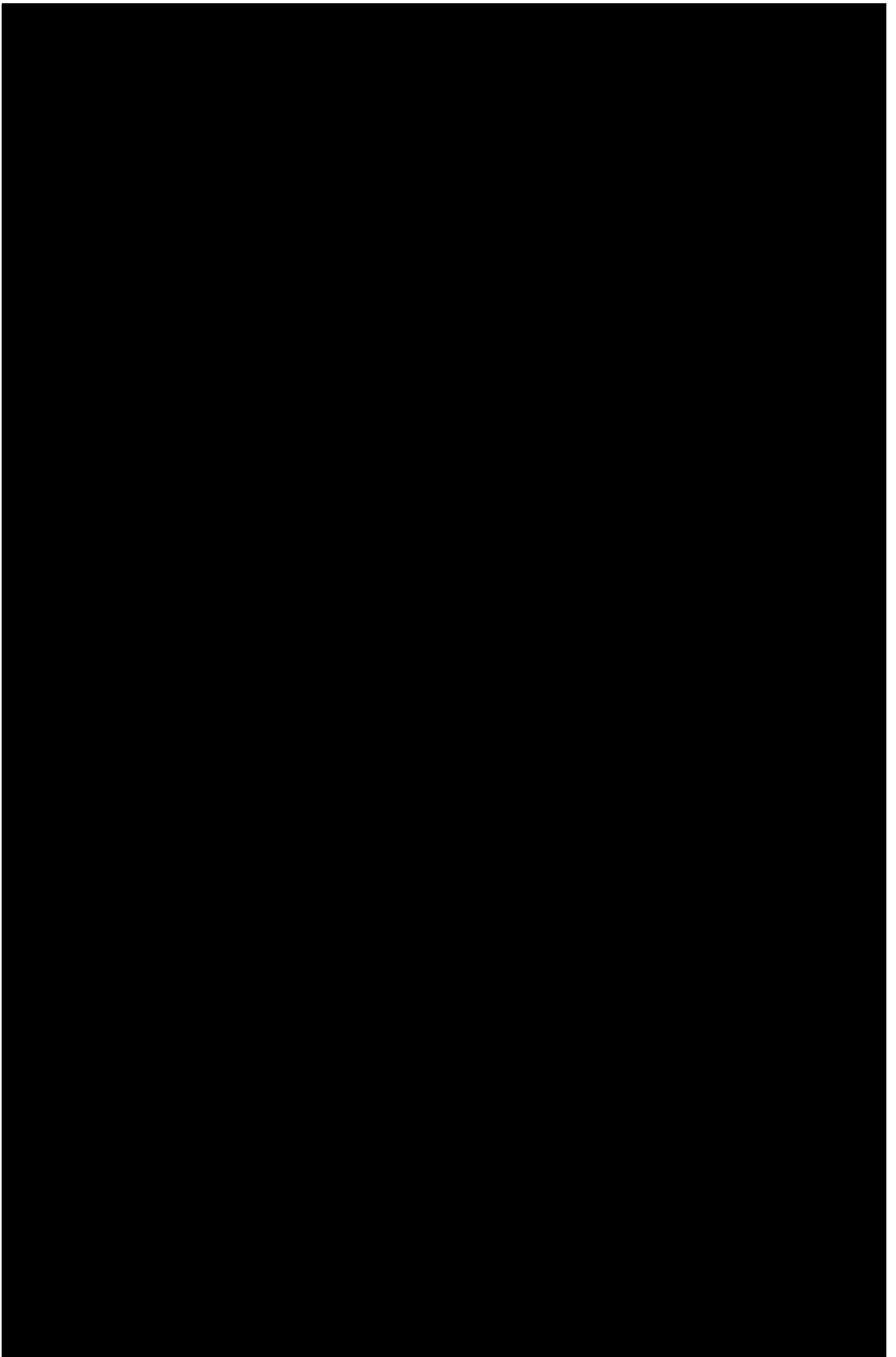


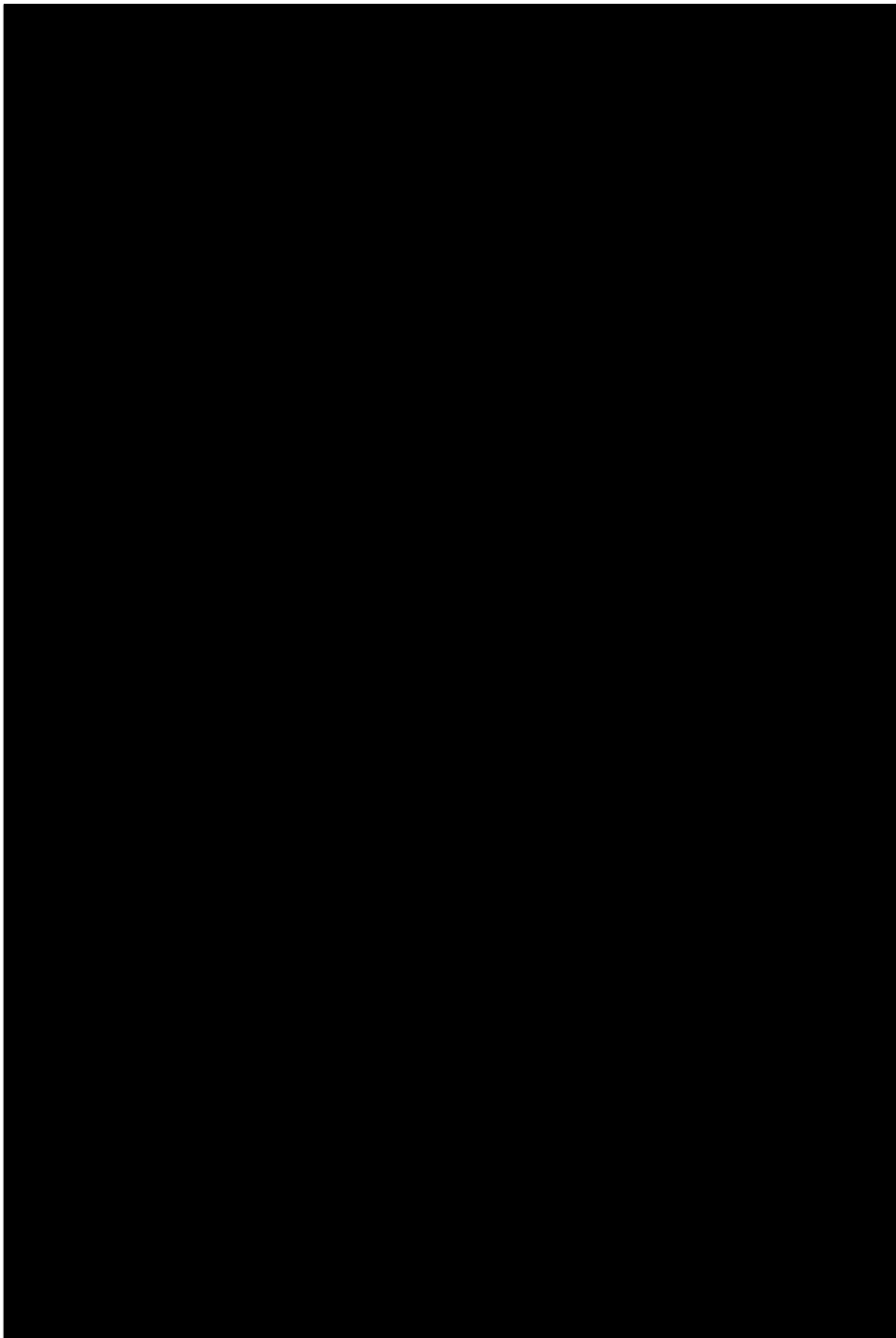


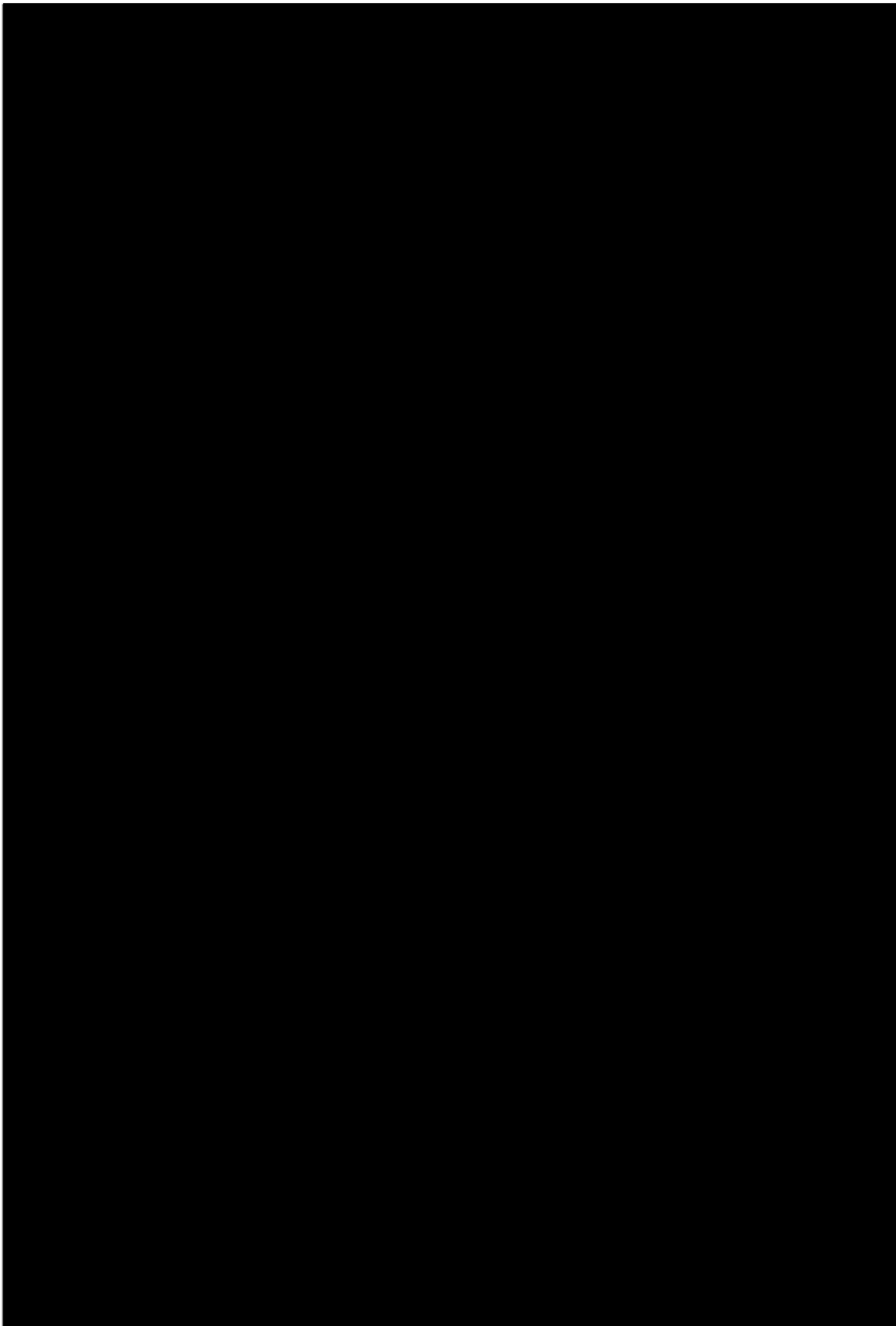


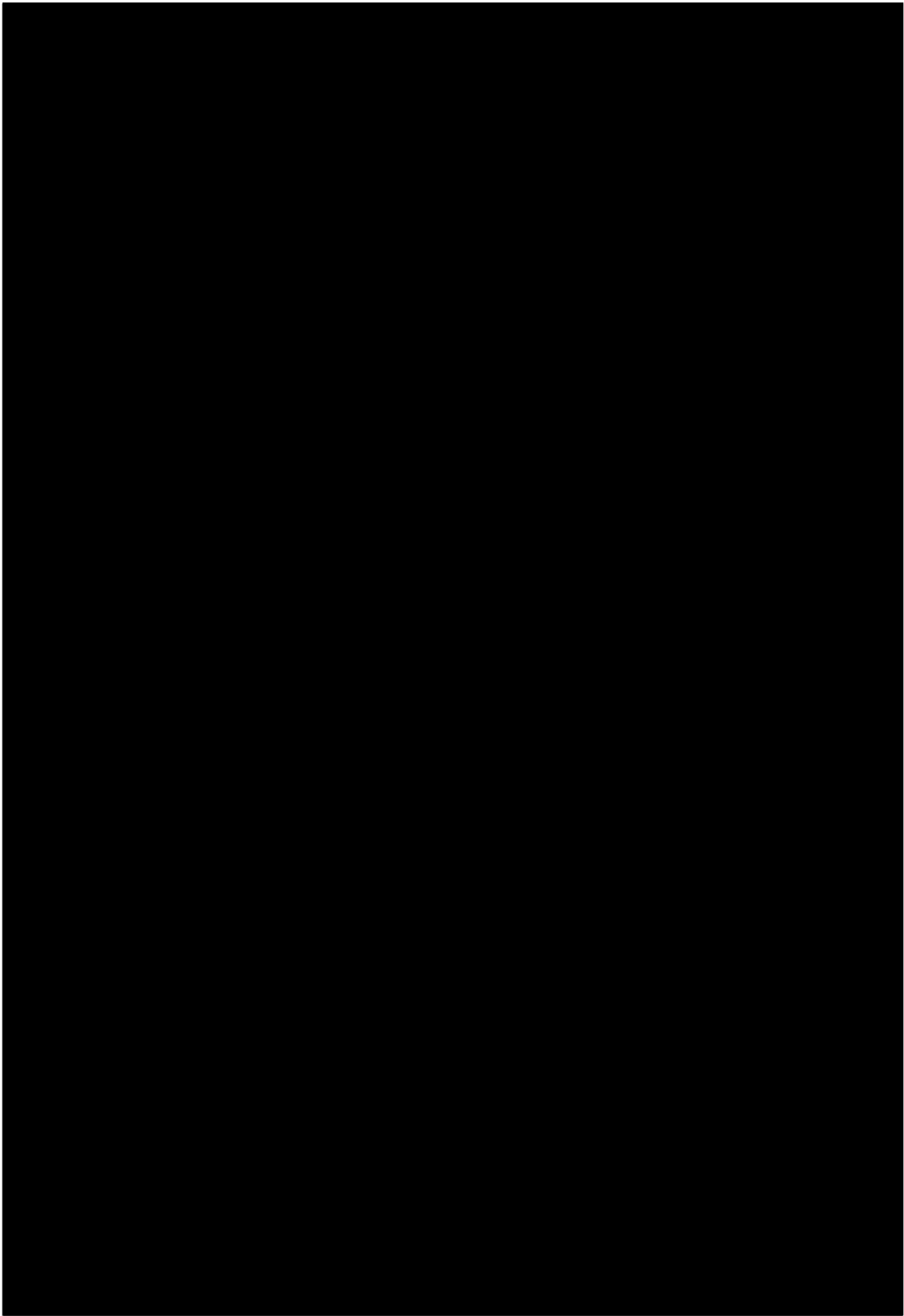


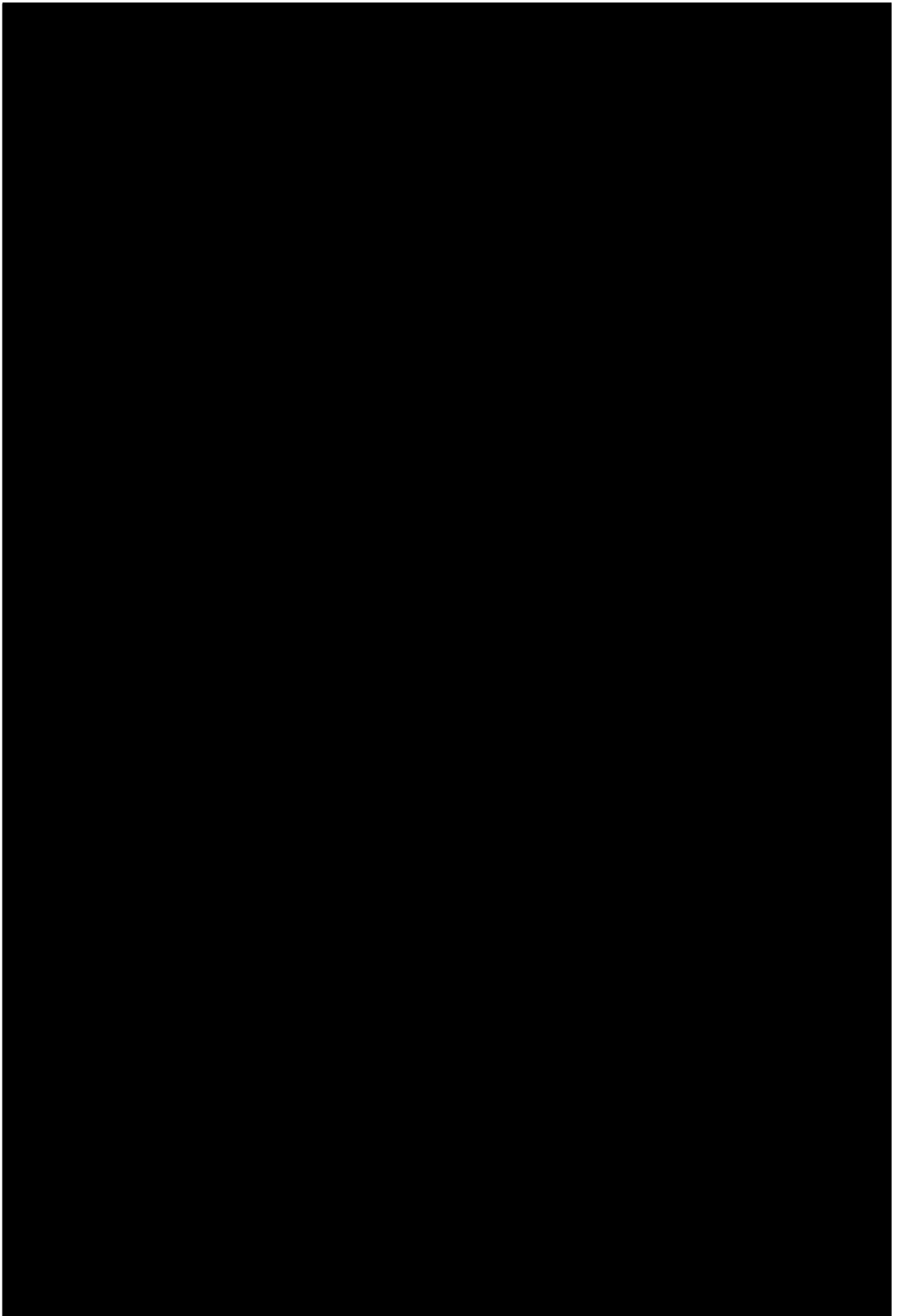


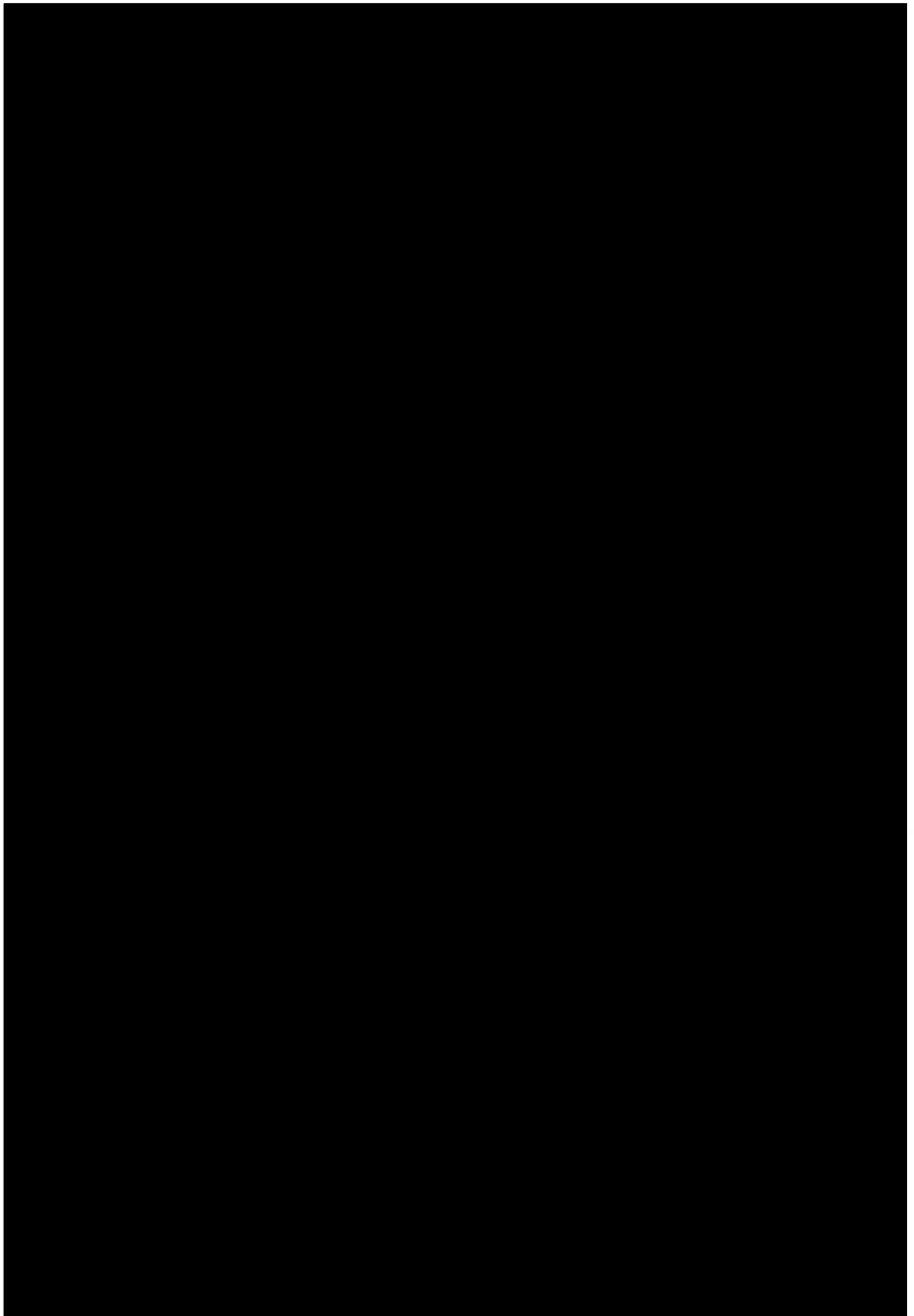


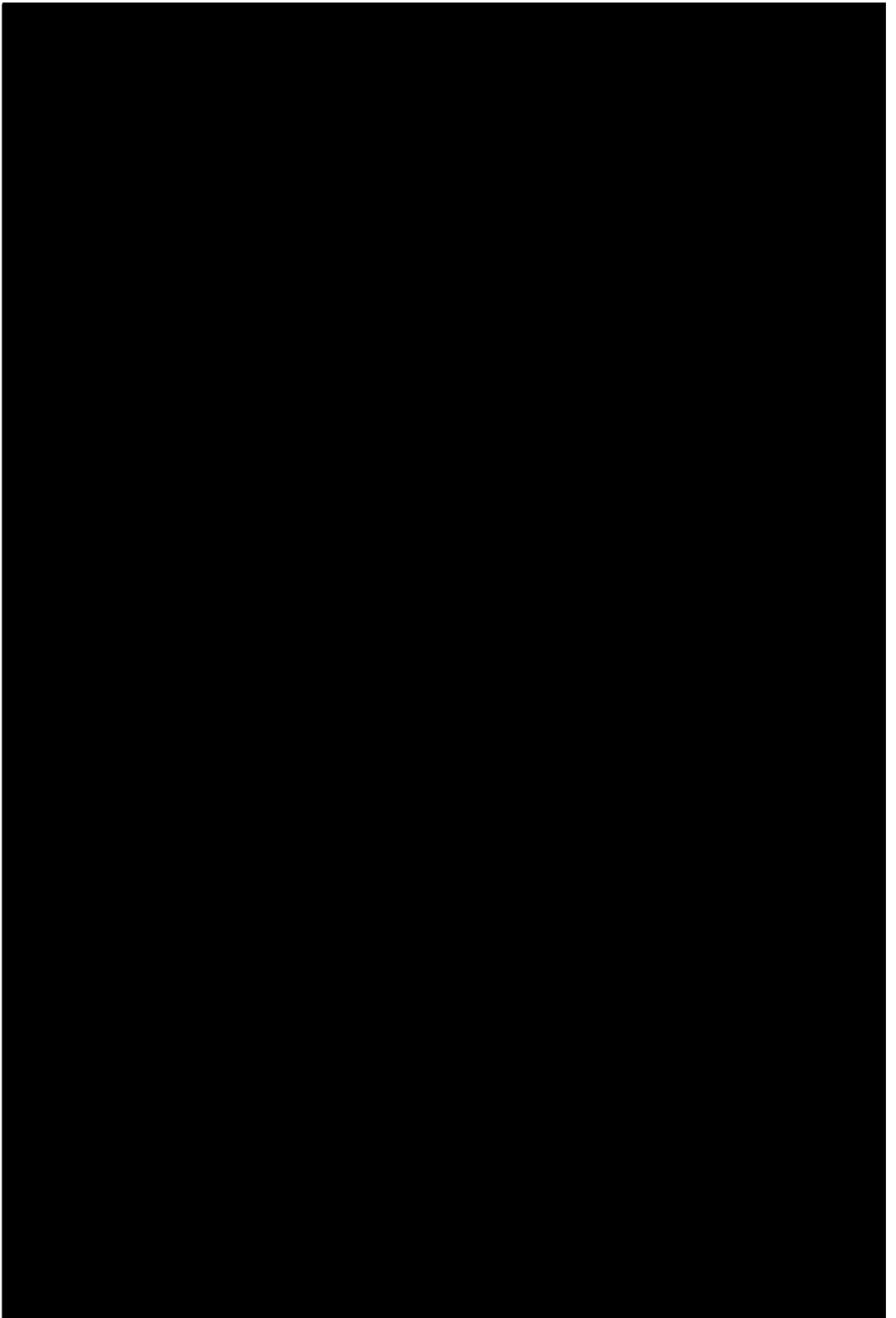


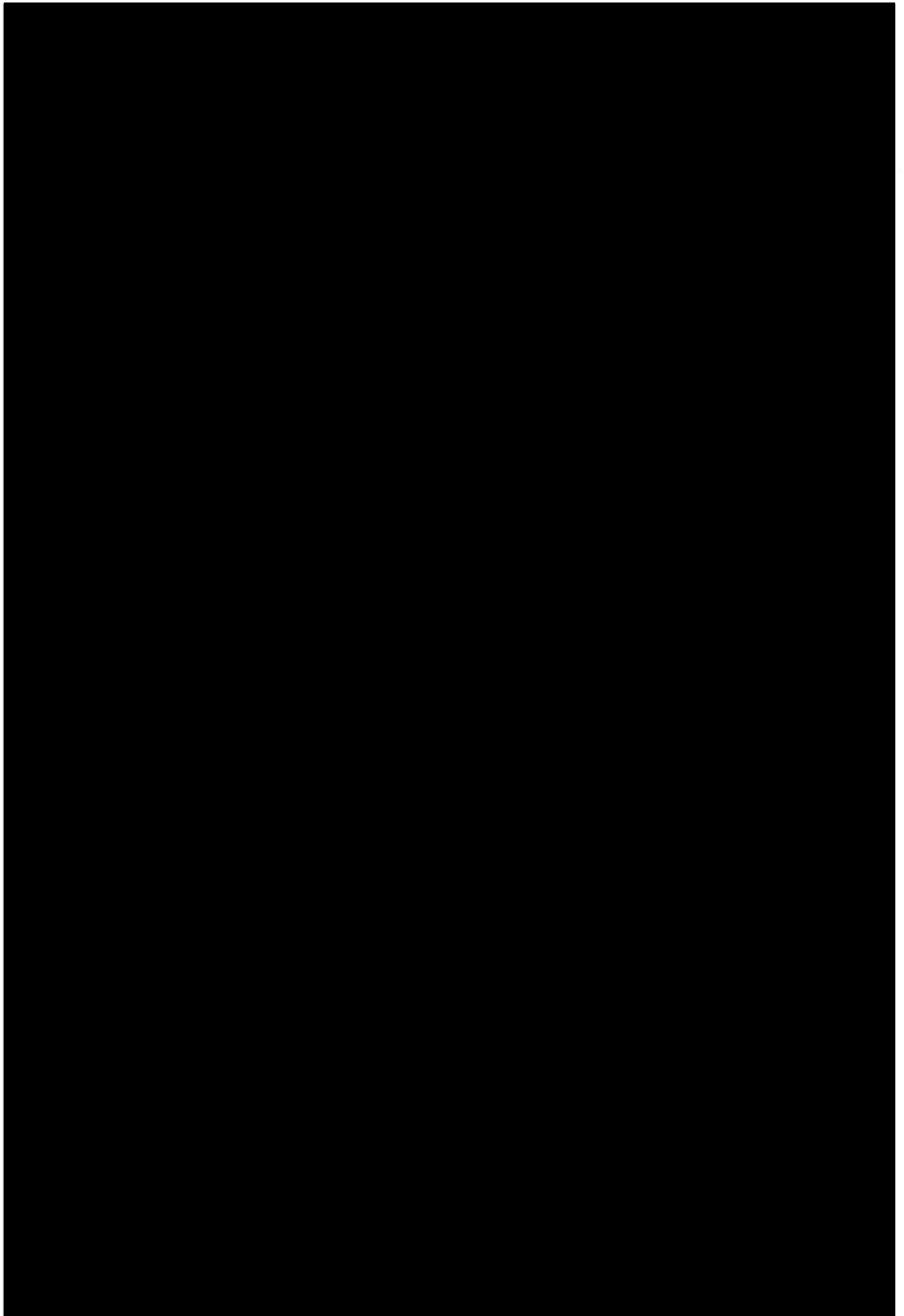


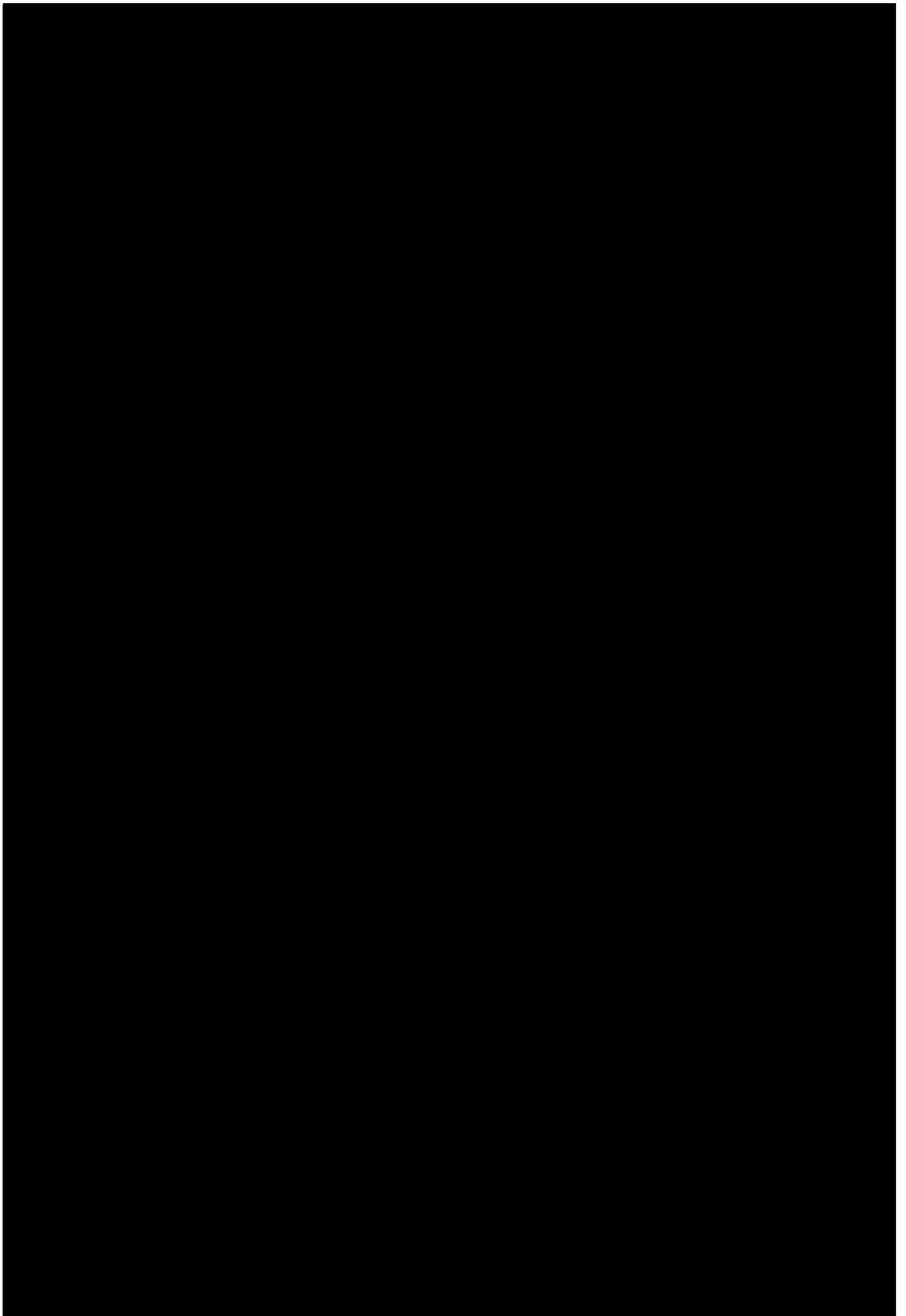


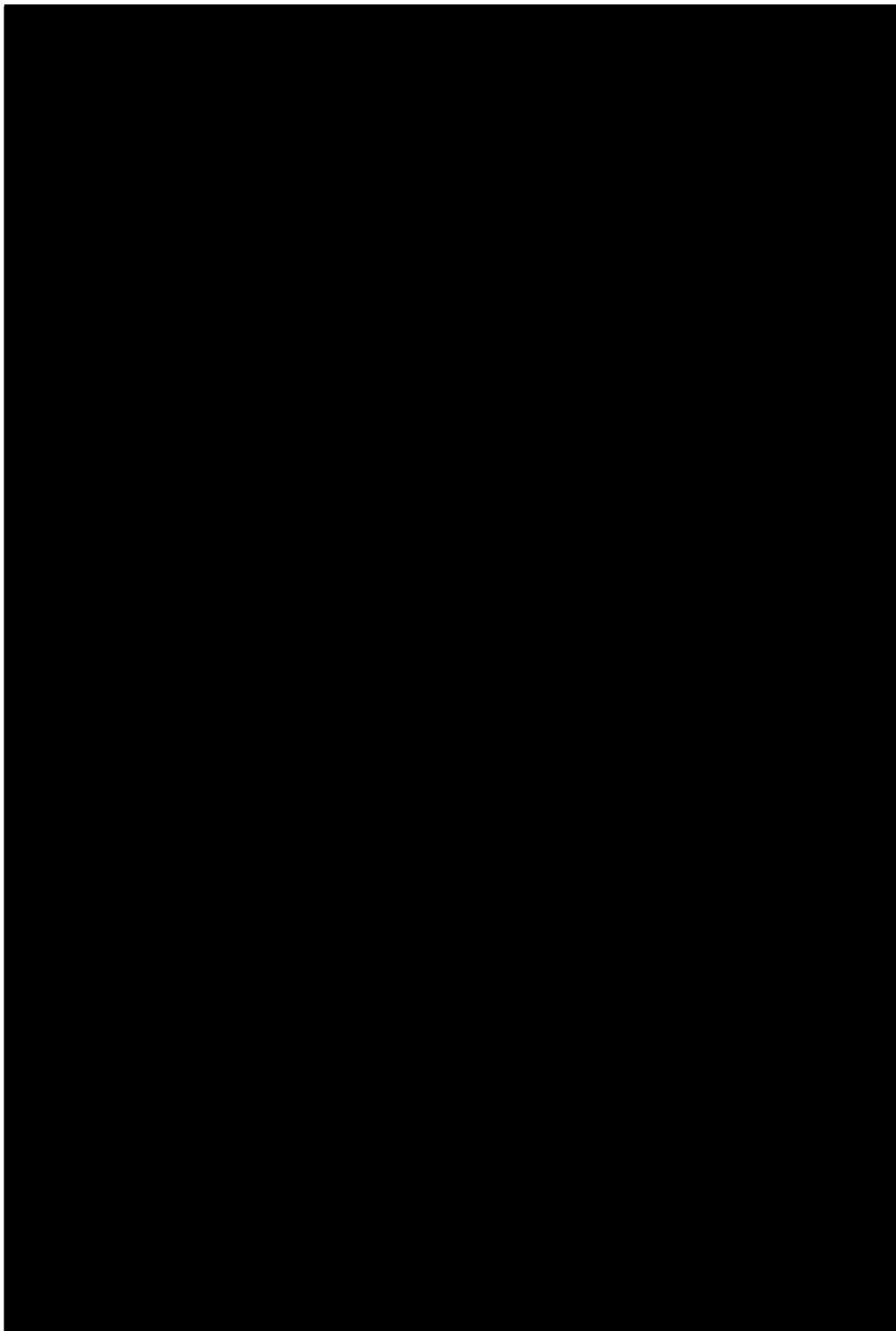




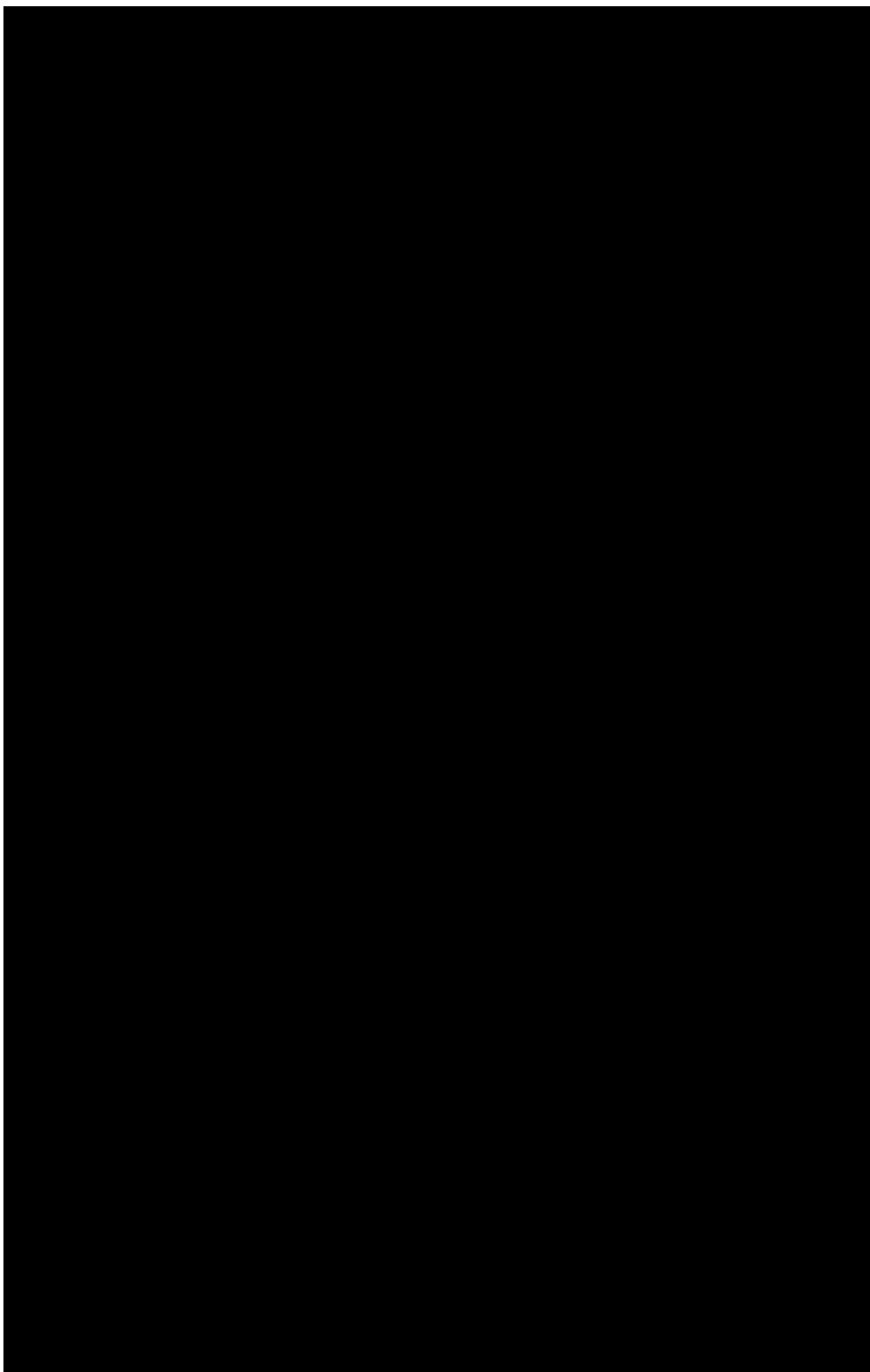














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Schedule E1 Scope and Performance Requirements

Appendix 50 – Legacy Ticketing System

Document Number: 3370830_6
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1. Overview and Scope

1.1. General

- (a) This Appendix describes the scope and performance requirements of the Legacy Ticketing System.
- (b) Legacy tickets are provided by thermal printed paper tickets from a manually operated hand held (Casio) ticketing machine. Legacy tickets include tickets previously issued that are within the validity period. The nature of the terms and conditions of these legacy tickets will be as directed by TfNSW from time to time. Customer Service Officers sell legacy tickets and customers pay by cash.
- (c) The LTS will operate in parallel with the ETS from the Date of Revenue Service until the LTS End Date.

1.2. Scope

- (a) In relation to the LTS, OpCo must co-operate and work with TfNSW, and will be responsible for:
 - i. operation and maintenance of the LTS until the LTS End Date;
 - ii. supply of all consumables and rotables;
 - iii. the training of Staff involved in operating and maintaining the LTS;
 - iv. cash servicing, reporting and accounting of LTS; and
 - v. phasing out the LTS in accordance with the requirements of TfNSW at section 2.3 and 3 of this Appendix.

2. LTS responsibilities

2.1. LTS operations

- (a) OpCo will operate the LTS in accordance with this Appendix until the LTS End Date. OpCo must:
 - i. accept the LTS Equipment on commencement of the IWLR Operations Phase;
 - ii. provide CSOs to continue to operate the LTS;
 - iii. sell legacy tickets and collect fares from customers on the IWLRV and, where necessary, at key Stops;
 - iv. provide and replenish a float to be able to give cash change to customers who have made purchases;
 - v. carry out ticket validation of legacy tickets, My Zone tickets and Opal cards presented by customers;
 - vi. account for and reconcile LTS sales and revenue collected;
 - vii. report monthly on the number of legacy tickets issued by ticket type and revenue collected;

- viii. bank all cash revenue OpCo receives in respect of the LTS and note Schedule D1 Clauses 2.1 and 17;
 - ix. ensure an auditable trail for the issue of LTS tickets and cash collection;
 - x. notify TfNSW of all faults with LTS Equipment; and
 - xi. ensure LTS Equipment is reconfigured for changes to fares from time to time as advised by TfNSW.
- (b) TfNSW will:
- i. specify the terms of use for the LTS; and
 - ii. grant to OpCo a non-exclusive and non-transferable licence to use the LTS Equipment for the sole purpose of undertaking the responsibilities outlined in this Appendix.

2.2. LTS maintenance

- (a) OpCo must carry out all maintenance for LTS Equipment to ensure all LTS Equipment is at all times operational.
- (b) OpCo must distribute and replenish all consumables and expendables for LTS Equipment as required including:
 - i. source, securely store, install and dispose LTS rotables, (where necessary swap out of defective rotables);
 - ii. source other consumables, including cash bags, coin dispensers and security seals; and
 - iii. provide inventory management of stored consumable stock.

2.3. LTS customer experience

- (a) The success of the transition from LTS to ETS is reliant on co-ordinated marketing and communications by OpCo and TfNSW.
- (b) OpCo must at all times deliver high quality service to support ticketing and make all reasonable endeavours to:
 - i. make travel by public transport easier and simpler;
 - ii. support and positively represent the transition from the LTS to the ETS;
 - iii. implement a customer education program for the transition from the LTS to the ETS;
 - iv. ensure information and posters supplied by TfNSW regarding tickets are installed and clearly visible to customers; and
 - v. respond pro-actively and positively to customer requests for assistance or information in relation to the ticketing systems.
- (c) TfNSW will develop the overall marketing and communication strategy, including plans, protocols and a calendar of activities for the transition from the LTS to the ETS.

3. Deployment: Phase 2 of the ETS Program

3.1. LTS phase out

- (a) TfNSW will:
- i. develop and communicate 'Deployment: Phase 2' of the ETS Program (as defined in Schedule B1 (*Electronic Ticketing System and Interface*), which includes the timescales for removal of all LTS;
 - ii. plan for the transition from the LTS to the ETS in conjunction with OpCo; and
 - iii. specify future ticketing requirements.
- (b) OpCo will support the transition from the LTS to the ETS and must:
- i. comply with processes supporting outcomes developed by TfNSW and as directed by TfNSW;
 - ii. cease use of the LTS and any associated legacy fare payment system by the LTS End Date;
 - iii. return all LTS Equipment and consumables to TfNSW on the LTS End Date; and
 - iv. secure the IWLRV as a paid area from the LTS End Date.





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Schedules Part E (Volume 4 of 4) (Appendix 45)

December 2014







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Sydney Light Rail
Public Private Partnership
Project Deed
Schedule E1 Scope and Performance Requirements
Appendix 45 – Concept Design

Document Number: 3126341_14
Execution Version

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1. Concept Design

1.1 Introduction

- (a) This Appendix 45 contains the Concept Design, which consists of the Concept Design drawings and documents listed in Table 1 below and contained in the Attachments to this Appendix 45, as amended in accordance with section 2 of this SPR Appendix 45.

Table 1 Concept Design drawings and documents

Drawing number	Rev	Drawing / Document Title	Attachment
ABD9001319648	A	Sydney Roof Arrangements – Sheet 1 of 1	Attachment 1 - CSELRV Drawings
ABD9001340824	B	305 2650 - Sydney X05 Layout – Sheet 1 of 1	
ABD9001341180	A	Mobilite UFR - Sydney WCU Mobility – Sheet 1 of 1	
ABD9001341218	B	Sydney X05 Areas – Sheet 1 of 1	
ABD9001341230	B	Sydney Multi Unit Tram – Sheet 1 of 1	
ABD9001330614	A	Sydney Gauge Study In – Sag and Summit 500m - Sheet 1 of 2	
ABD9001330614	A	Sydney Gauge Study In – Sag and Summit 500m – Sheet 2 of 2	
ABD9001340824	C	Diagramme Sydney X05 Layout	
ABD9001312256	C	Longitudinal Cross Section	
ABD09001225155	C	Transversal Cross Section – 1 / 2	
ABD09001225155	C	Transversal Cross Section – 2 / 2	
ABD9000913331	C	Prehension Gamme X02NG – 3 / 4	
ABD9000913331	C	Prehension Gamme X02NG – 4 / 4	
ABD9001226723	C	Video Surveillance 305 Range X05	

Drawing number	Rev	Drawing / Document Title	Attachment
N/A	N/A	CSELRVs Product Description Part A	Attachment 2 - CSELRVs Product Description
N/A	N/A	CSELRVs Product Description Part B	
N/A	N/A	CSELRVs Performance Characteristics Part A	Attachment 3 - CSELRVs Performance Characteristics
N/A	N/A	CSELRVs Performance Characteristics Part B	
SLR-CSY-DWG-CI-0100	A	Alignment Plan and Long Section – Route A – Sheet 1 of 18	Attachment 4 - Corridor Alignment
SLR-CSY-DWG-CI-0101	B	Alignment Plan and Long Section – Route A – Sheet 2 of 18	
SLR-CSY-DWG-CI-0102	C	Alignment Plan and Long Section – Route A – Sheet 3 of 18	
SLR-CSY-DWG-CI-0103	C	Alignment Plan and Long Section – Route A – Sheet 4 of 18	
SLR-CSY-DWG-CI-0104	B	Alignment Plan and Long Section – Route A – Sheet 5 of 18	
SLR-CSY-DWG-CI-0105	A	Alignment Plan and Long Section – Route I2 – Sheet 6 of 18	
SLR-CSY-DWG-CI-0106	A	Alignment Plan and Long Section – Route I2 – Sheet 7 of 18	
SLR-CSY-DWG-CI-0107	A	Alignment Plan and Long Section – Route I2 – Sheet 8 of 18	
SLR-CSY-DWG-CI-0108	A	Alignment Plan and Long Section – Route I2 – Sheet 9 of 18	
SLR-CSY-DWG-CI-0109	C	Alignment Plan and Long Section – Route 02 – Sheet 10 of 18	
SLR-CSY-DWG-CI-0110	C	Alignment Plan and Long Section – Route 02 – Sheet 11 of 18	
SLR-CSY-DWG-CI-	C	Alignment Plan and Long Section	

Drawing number	Rev	Drawing / Document Title	Attachment
0111		– Route 02 – Sheet 12 of 18	
SLR-CSY-DWG-CI-0112	C	Alignment Plan and Long Section – Route 02 – Sheet 13 of 18	
SLR-CSY-DWG-CI-0113	B	Alignment Plan and Long Section – Route 02 – Sheet 14 of 18	
SLR-CSY-DWG-CI-0114	A	Alignment Plan and Long Section – Route M – Sheet 15 of 18	
SLR-CSY-DWG-CI-0115	A	Alignment Plan and Long Section – Route M – Sheet 16 of 18	
SLR-CSY-DWG-CI-0116	A	Alignment Plan and Long Section – Route M – Sheet 17 of 18	
SLR-CSY-DWG-CI-0117	A	Alignment Plan and Long Section – Route M – Sheet 18 of 18	
SLR-CSY-DWG-CI-0130	B	Junction Layouts – Route A	
SLR-CSY-DWG-CI-0131	A	Junction Layouts – Route I2	
SLR-CSY-DWG-CI-0132	B	Junction Layouts – Route 02	
SLR-CSY-DWG-CI-0133	A	Junction Layouts – Route M	
SLR-CSY-DWG-CI-0140	A	Typical Sections - Sheet 1	
SLR-CSY-DWG-CI-0141	B	Typical Sections - Sheet 2	
SLR-CSY-DWG-CI-0142	A	Typical Sections - Sheet 3	
SLR-CSY-DWG-CI-0143	C	Typical Sections - Sheet 4	
SLR-CSY-DWG-CI-0144	A	Typical Sections - Sheet 5	
SLR-CSY-DWG-CI-0150	A	Vehicle Specific Developed Kinematic Envelope – Gauge	

Drawing number	Rev	Drawing / Document Title	Attachment
		Study in Straight Track – Sheet 1	
SLR-CSY-DWG-CI-0151	A	Vehicle Specific Developed Kinematic Envelope – Gauge Study in Straight Track – Sheet 2	
SLR-CSY-DWG-CI-0152	A	Vehicle Specific Developed Kinematic Envelope – Gauge Study in Straight Track – Sheet 3	
SLR-CSY-DWG-CI-0153	A	Vehicle Specific Developed Kinematic Envelope – Gauge Study in 25M Radius Curve – Sheet 1	
SLR-CSY-DWG-CI-0154	A	Vehicle Specific Developed Kinematic Envelope – Gauge Study in 25M Radius Curve – Sheet 2	
SLR-CSY-DWG-CI-0155	A	Vehicle Specific Developed Kinematic Envelope – Gauge Study in 25M Radius Curve – Sheet 3	
SLR-CSY-DWG-LA-0100	A	Materials and Finishes Legend	Attachment 5 - Public Domain and Landscape Plans and Sections
SLR-CSY-DWG-LA-0200	A	Public Domain Plan – Circular Quay	
SLR-CSY-DWG-LA-0201	A	Public Domain Section – Circular Quay	
SLR-CSY-DWG-LA-0300	A	Public Domain Plan – Rawson Place	
SLR-CSY-DWG-LA-0301	A	Public Domain Section – Rawson Place	
SLR-CSY-DWG-LA-0400	A	Public Domain Plan – Town Hall	
SLR-CSY-DWG-LA-0401	A	Public Domain Section – Town Hall	
SLR-CSY-DWG-LA-0500	A	Public Domain Plan – Moore Park	

Drawing number	Rev	Drawing / Document Title	Attachment	
SLR-CSY-DWG-LA-0502	A	Public Domain Section – Moore Park		
SLR-CSY-DWG-LA-0503	B	Moore Park Portal Plan		
SLR-CSY-DWG-LA-0600	A	Public Domain Plan – UNSW Anzac Parade		
SLR-CSY-DWG-LA-0601	A	Public Domain Section – UNSW Anzac Parade		
SLR-CSY-DWG-LA-0700	A	Public Domain Plan – Kingsford		
SLR-CSY-DWG-LA-0701	A	Public Domain Section – Kingsford		
SLR-CSY-DWG-LA-0800	A	Public Domain Plan - Todman Avenue		
SLR-CSY-DWG-LA-0801	A	Public Domain Section – Todman Avenue		
SLR-CSY-DWG-LA-0900	B	Public Domain Plan – Randwick		
SLR-CSY-DWG-LA-0901	B	Public Domain Section – Randwick		
SLR-CSY-DWG-LA-1000	A	Public Domain Plan – Queen Victoria Building		
SLR-CSY-DWG-AR-0250	A	Circular Quay Stop - Part Plan and Elevations - Sheet 1		Attachment 6 - Stops General Arrangement
SLR-CSY-DWG-AR-0251	A	Circular Quay Stop - Part Plan and Elevations - Sheet 2		
SLR-CSY-DWG-AR-0255	A	Circular Quay Stop - Cross Section		
SLR-CSY-DWG-AR-0350	A	Rawson Place Stop - Part Plan and Elevations - Sheet 1		
SLR-CSY-DWG-AR-0351	A	Rawson Place Stop - Part Plan and Elevations - Sheet 2		
SLR-CSY-DWG-AR-	A	Rawson Place Stop - Cross		

Drawing number	Rev	Drawing / Document Title	Attachment
0355		Section	
SLR-CSY-DWG-AR-0450	A	Town Hall Stop - Part Plan and Elevations - Sheet 1	
SLR-CSY-DWG-AR-0451	A	Town Hall Stop - Part Plan and Elevations - Sheet 2	
SLR-CSY-DWG-AR-0455	A	Town Hall Stop - Cross Section	
SLR-CSY-DWG-AR-0550	A	Moore Park Stop - Part Plan and Elevations	
SLR-CSY-DWG-AR-0551	A	Moore Park Stop - Part Plan and Elevations	
SLR-CSY-DWG-AR-0555	A	Moore Park Stop - Cross Sections	
SLR-CSY-DWG-AR-0556	A	Moore Park Stop - Cross Sections - Sheet 2	
SLR-CSY-DWG-AR-0650	A	UNSW Anzac Parade Stop - Part Plan and Elevations	
SLR-CSY-DWG-AR-0651	A	UNSW Anzac Parade Stop - Part Plan and Elevations - Sheet 2	
SLR-CSY-DWG-AR-0655	A	UNSW Anzac Parade Stop - Cross Section	
SLR-CSY-DWG-AR-0750	A	Kingsford Stop - Part Plan - Sheet 1	
SLR-CSY-DWG-AR-0751	A	Kingsford Stop – Elevations - Sheet 1	
SLR-CSY-DWG-AR-0755	A	Kingsford Stop - Cross Section	
SLR-CSY-DWG-AR-0850	A	Todman Avenue Stop - Part Plan and Elevations	
SLR-CSY-DWG-AR-0851	A	Todman Avenue Stop - Part Plan and Elevations - Sheet 2	
SLR-CSY-DWG-AR-0855	A	Todman Avenue Stop - Cross Section	

Drawing number	Rev	Drawing / Document Title	Attachment	
SLR-CSY-DWG-AR-0950	B	Randwick Stop - Part Plan and Elevations - Sheet 1		
SLR-CSY-DWG-AR-0951	B	Randwick Stop - Part Plan and Elevations - Sheet 2		
SLR-CSY-DWG-AR-0955	B	Randwick Stop - Cross Section		
SLR-CSY-DWG-AR-0021	A	Stop Details - Kit of Parts - Sheet 1	Attachment 7 - Modular Canopies - Typical Platform Canopy Sections	
SLR-CSY-DWG-AR-0022	A	Stop Details - Kit of Parts - Sheet 2		
SLR-CSY-DWG-AR-0031	A	Stop Details - Kit of Parts - Sheet 3		
SLR-CSY-DWG-AR-0032	A	Stop Details - Kit of Parts - Sheet 4		
SLR-CSY-DWG-AR-0041	A	Stop Details - Kit of Parts - Totems		
SLR-CSY-DWG-AR-0042	A	Stop Details - Kit of Parts - Stop Furniture		
SLR-CSY-DWG-AR-1000	A	Substations Plan and Section		
SLR-CSY-DWG-AR-1001	A	Substations Elevations		
SLR-CSY-DWG-BR-0520	A	Bridge Over the Eastern Distributor – Elevation and Section		Attachment 8 - Bridge Over Eastern Distributor and Moore Park Tunnel
SLR-CSY-DWG-AR-0530	B	Moore Park Tunnel Portal - West - Section and Plan		
SLR-CSY-DWG-AR-0535	A	Moore Park Tunnel Portal - East - Section and Plan		
SLR-CSY-DWG-ST-0061	A	Track Form Types - Sheet 1	Attachment 9 - Track Form Types	
SLR-CSY-DWG-ST-0062	A	Track Form Types - Sheet 2		
SLR-CSY-DWG-ST-	A	Track Form Types - Sheet 3		

Drawing number	Rev	Drawing / Document Title	Attachment
0063			
SLR-CSY-DWG-AR-1210	D	Randwick Stabling Yard	Attachment 10 - Rail Maintenance and Stabling Facilities
SLR-CSY-DWG-AR-1215	A	Randwick Stabling Yard - Administration and Control Centre Building Plans	
SLR-CSY-DWG-AR-1220	A	Rozelle Depot	
SLR-CSY-DWG-HV-0911	B	Traction Electrical System Diagram – Randwick – HESOP 2x1.2MW	
SLR-CSY-DWG-HV-0912	C	Traction Electrical System Diagram – Rozelle – HESOP 2x1.2MW	
N/A	N/A	Schedule of Materials, Fittings, Fixtures and Finishes	
N/A	N/A	EMC Plan	Attachment 12 - EMC Plan
N/A	N/A	Earthing Bonding and Stray Current Management Plan	Attachment 13 – Earthing, Bonding and Stray Current Management Plan

- (b) In relation to the Concept Design drawings and documents listed in Table 1 above and contained in the Attachments to this Appendix 45, the parties agree that:
- (i) any references to 'Connecting Sydney' or 'CSY' are to be taken as meaning 'ALTRAC Light Rail' or 'ALR' respectively; and
 - (ii) in further versions of those drawings and documents developed as part of the Design Documentation, in accordance with this deed (including clause 13.4 of the Operative Provisions and SPR Appendix 47 (*Design Documentation Requirements*)), the references to 'Connecting Sydney' or 'CSY' shall be amended to 'ALTRAC Light Rail' or 'ALR' respectively.

2. Amendments to the Concept Design Drawings and Documents

- (a) The Concept Design drawings and documents are amended by the amendments and requirements identified in table 2 of this SPR Appendix 45.
- (b) The amendments and requirements are not exhaustive and TfNSW does not warrant that:
 - a. it has checked the relevant documents for compliance with the requirements of the deed including the SPR; or
 - b. compliance with the requirements of this section 2 of this SPR Appendix 45, including Table 2, will ensure OpCo fulfils all the requirements of the deed including the SPR.
- (c) OpCo is required to adopt and make the amendments referred to below and such adoption and amendments will not in any way limit the warranty given by OpCo under clause 13.1 of the Operative Provisions, including that the Concept Design included in this SPR Appendix 45 has been prepared by the OpCo and will be fit for its intended purpose.

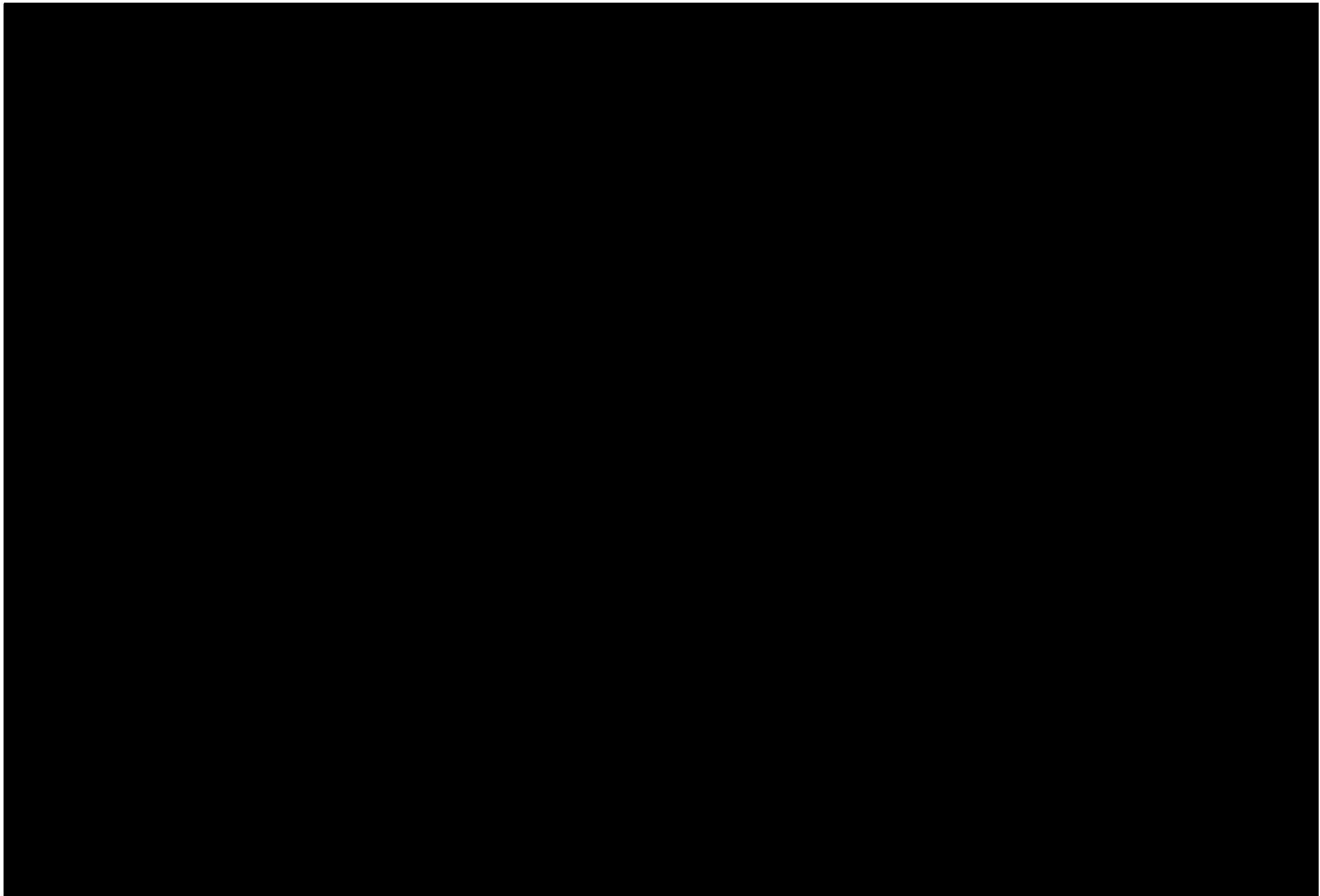
Table 2 Amendments to the Concept Design Drawings and Documents

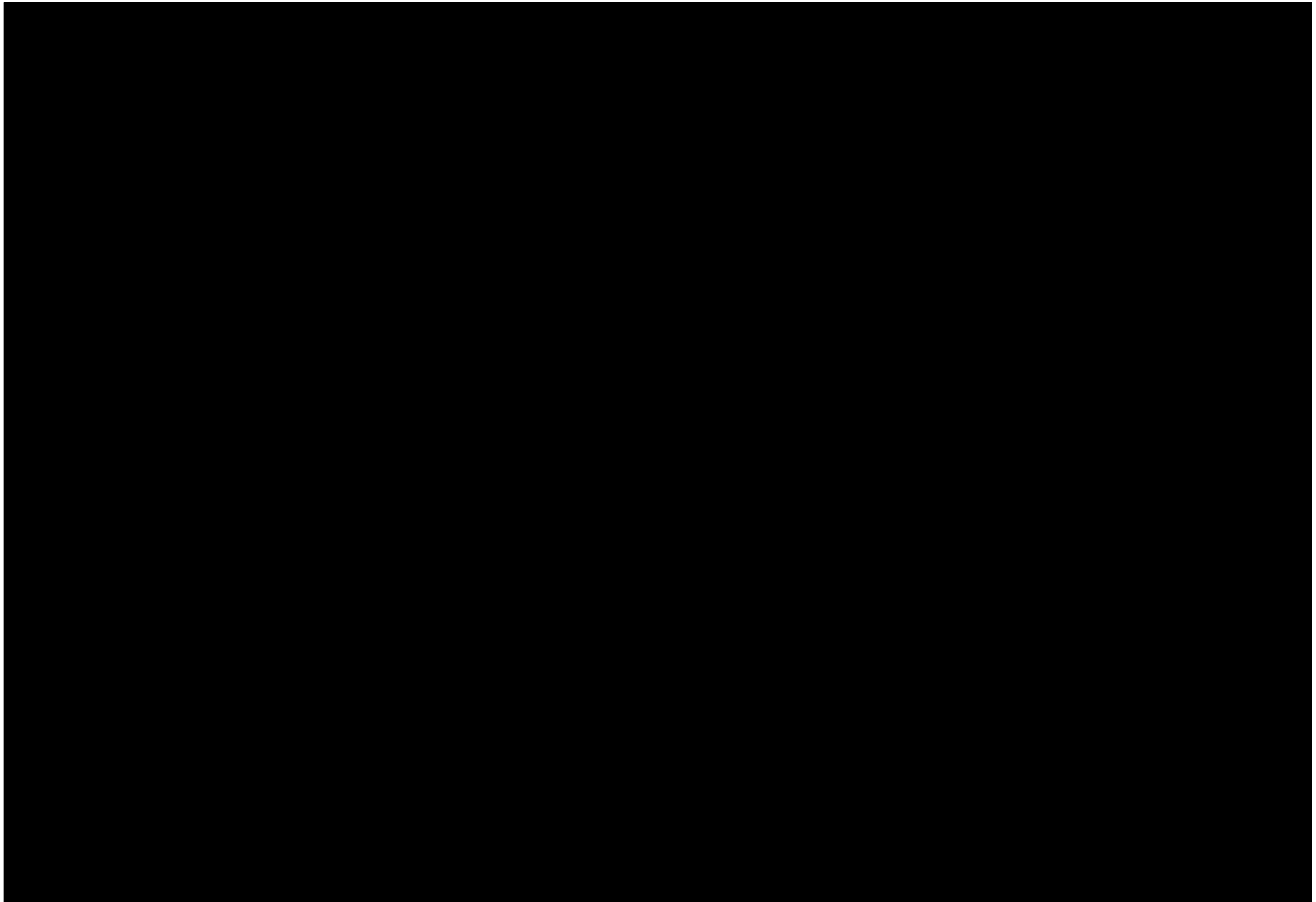
Item	Amendment to the Concept Design Drawings and Documents
1	Details of road intersection layouts and function are to be as shown in SPR Appendix 16, not as shown in the corridor alignment drawings in Attachment 4.
2	The following drawings are amended in accordance with SPR Appendix 48, Item 38: <ul style="list-style-type: none"> - SLR-CSY-DWG-LA-0400 - SLR-CSY-DWG-LA-0400 - SLR-CSY-DWG-AR-0450 - SLR-CSY-DWG-AR-0451 - SLR-CSY-DWG-AR-0455.
3	In relation to drawing SLR-CSY-DWG-AR-0041, it is noted that wayfinding elements must be in accordance with TfNSW Wayfinding Guidelines.
4	In relation to drawings SLR-CSY-DWG-CI-0106 and SLR-CSY-DWG-AR- 0530, it is noted that the Moore Park West substation is to be located on the opposite side of the tracks to the location shown on these drawings.
5	Drawing SLR-CSY-DWG-AR-0551 is amended in accordance with the design commitment in SPR Appendix 48, item 11 and Attachment 11 (Schedule of Materials, Fittings, Fixtures and Finishes).

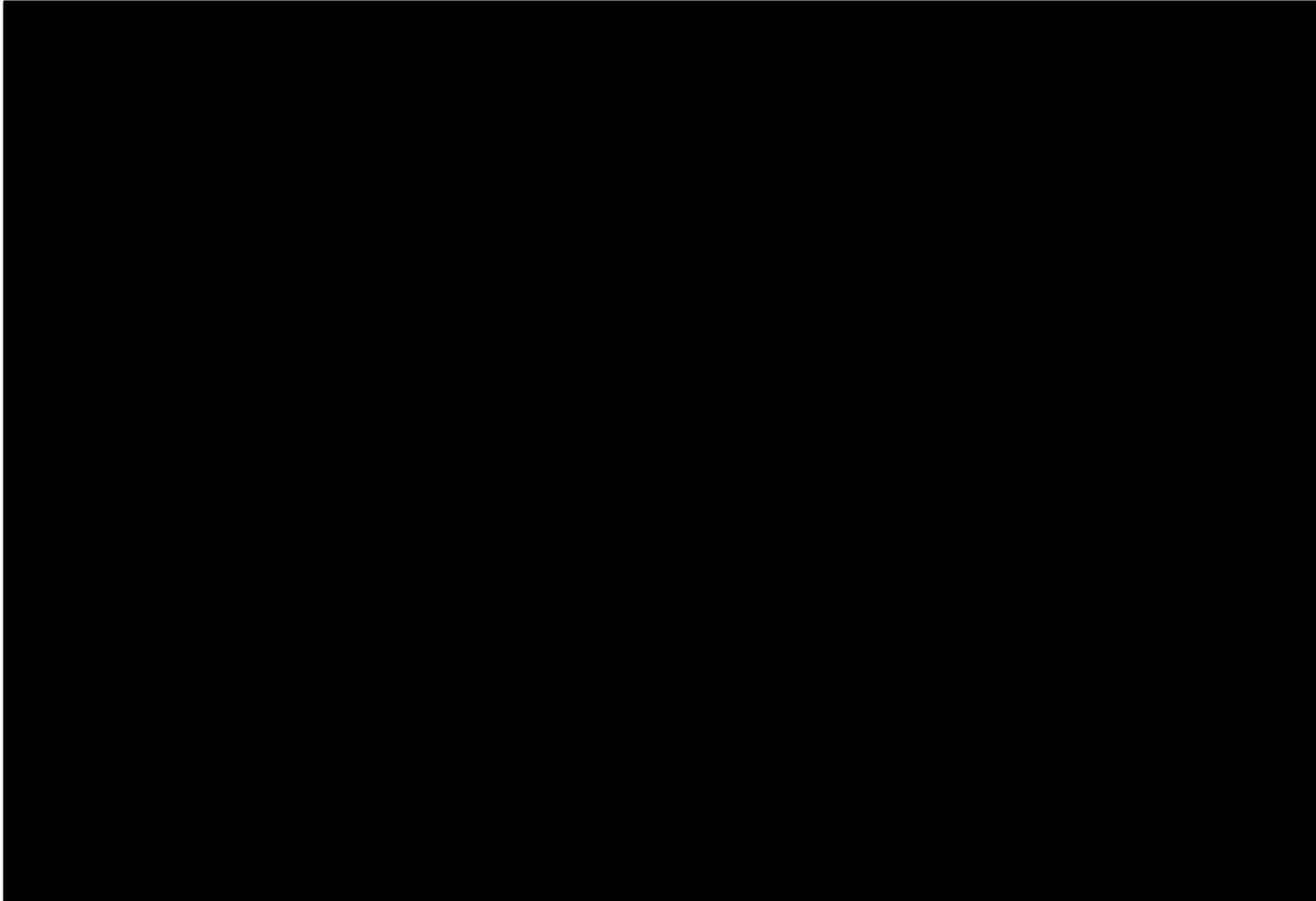
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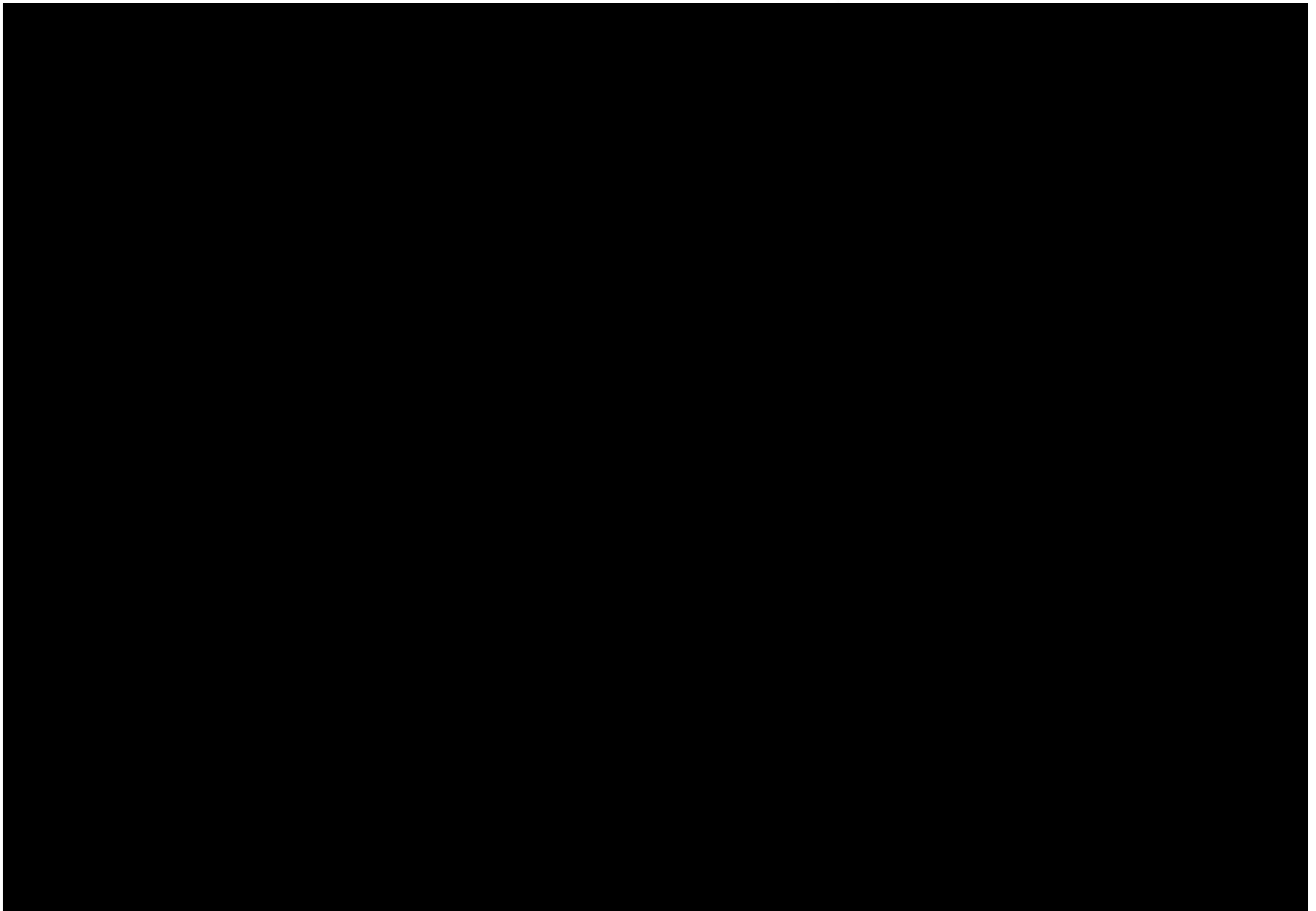
ATTACHMENT 1 – CSELRV Drawings

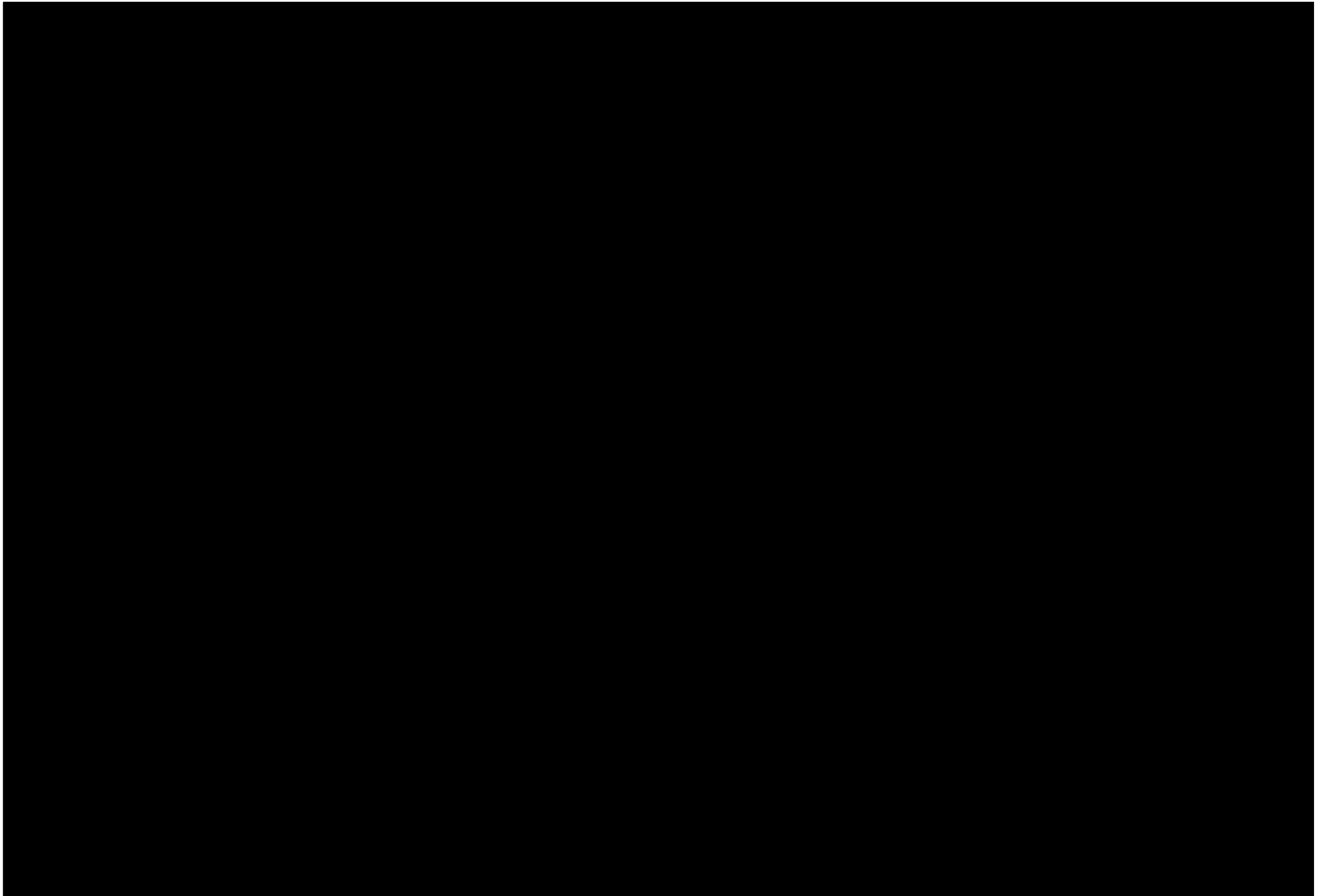
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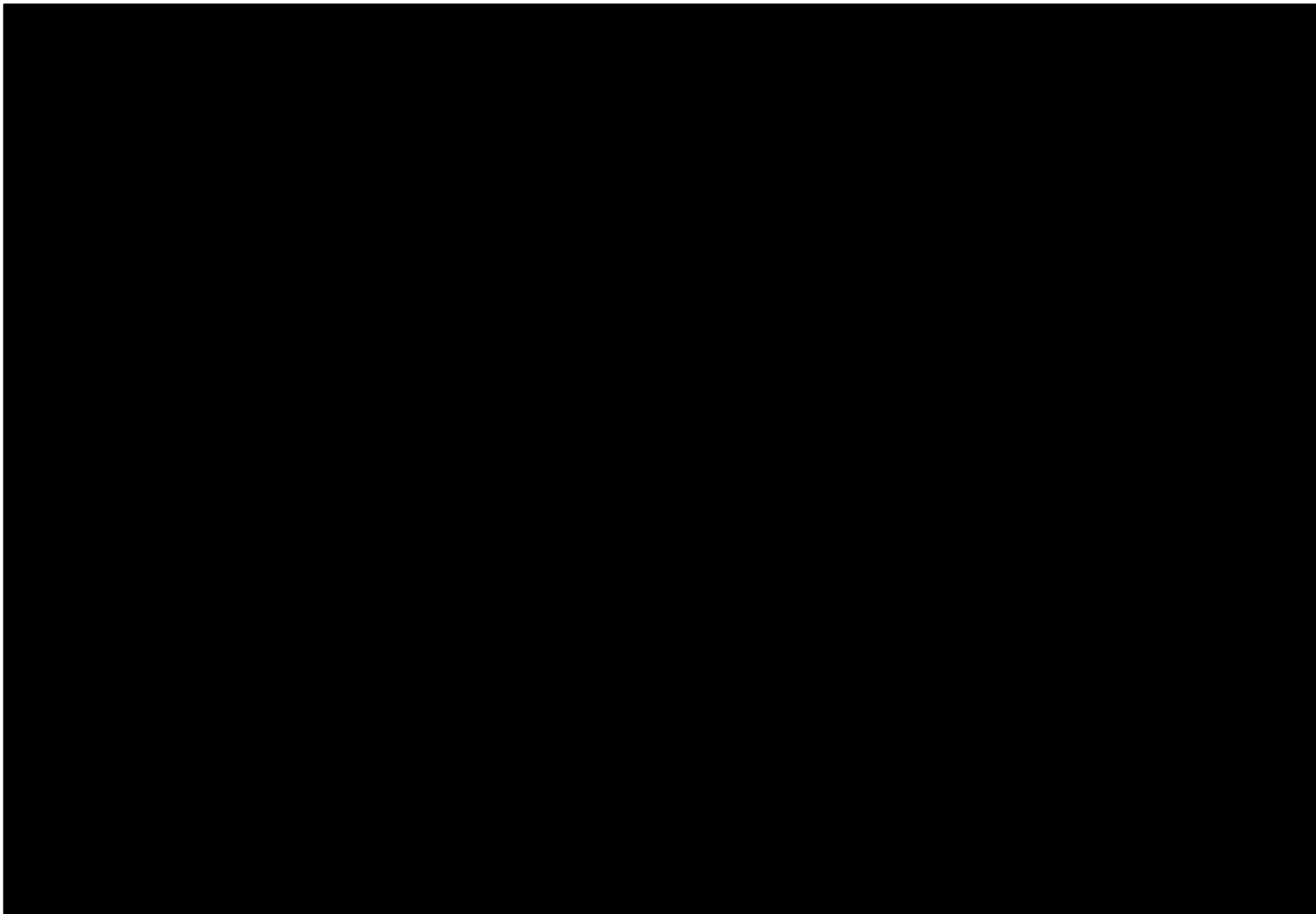




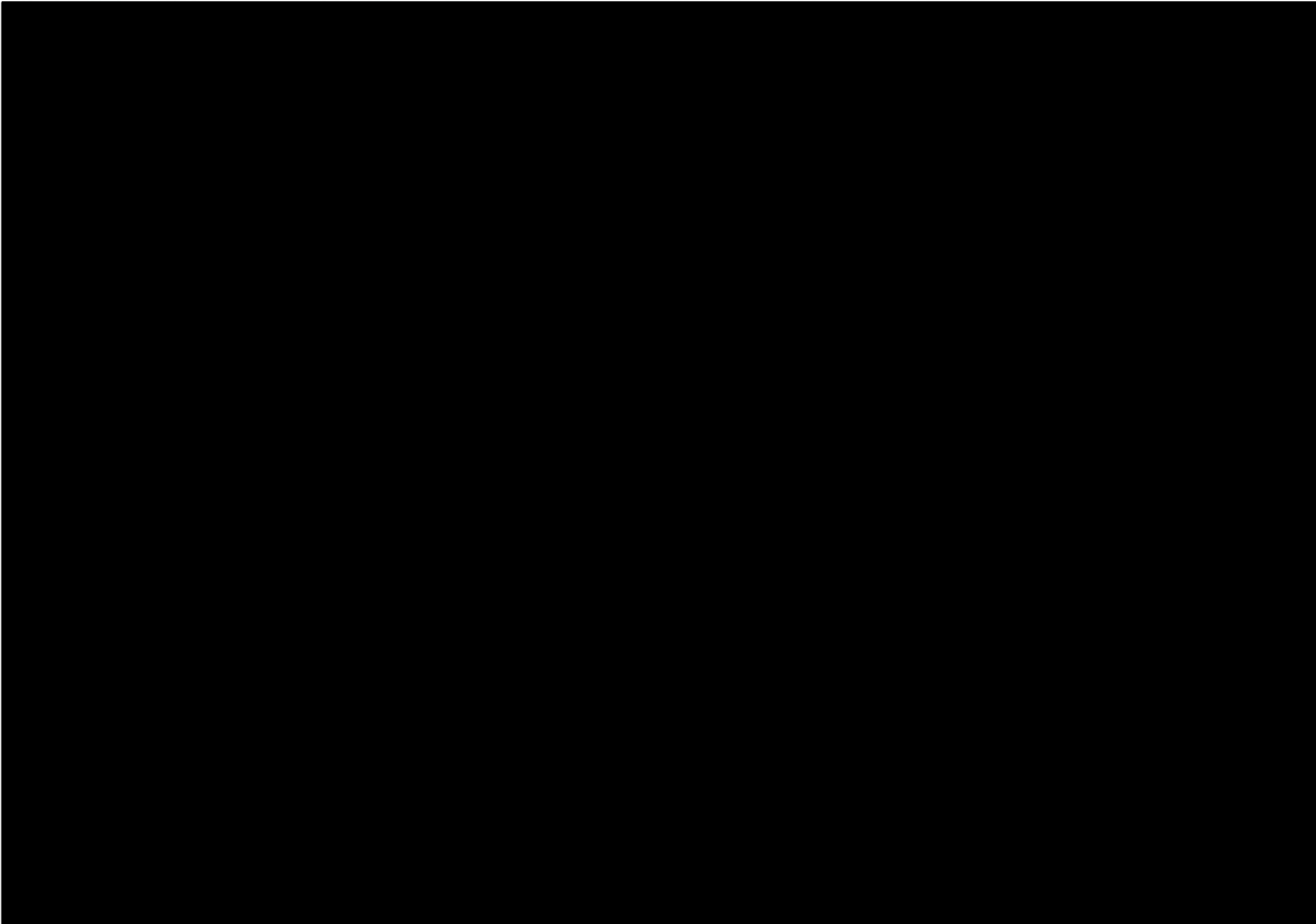


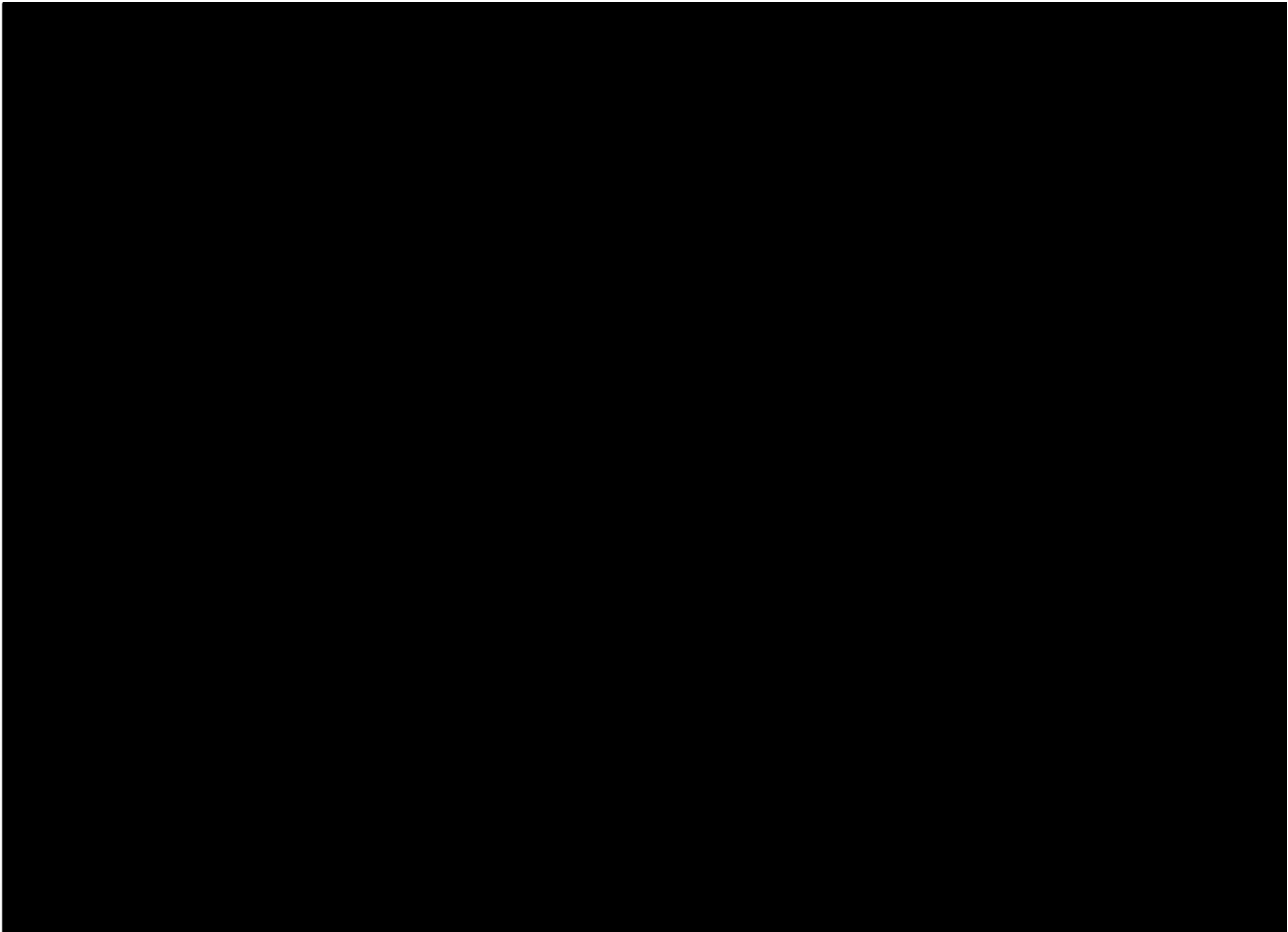


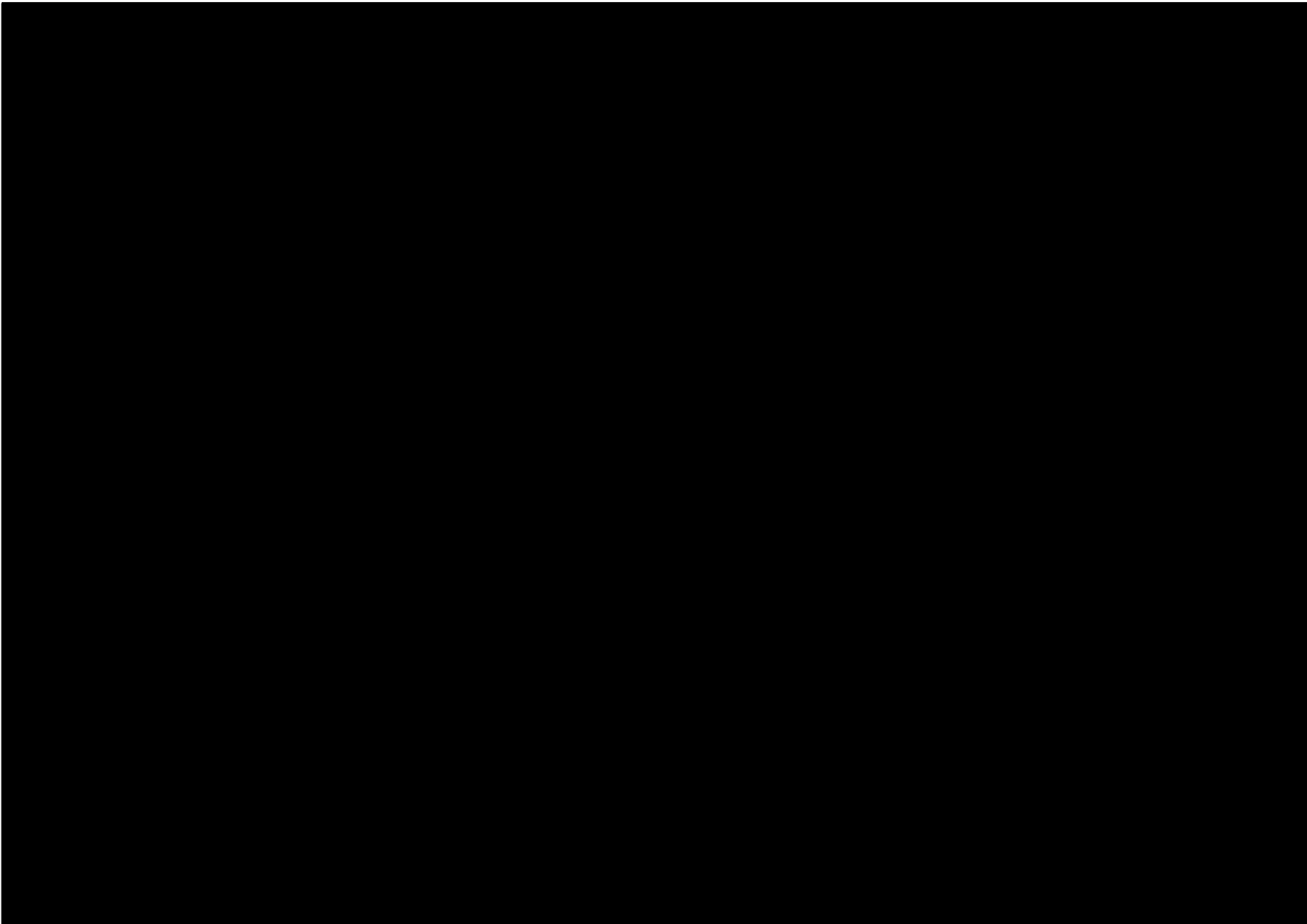


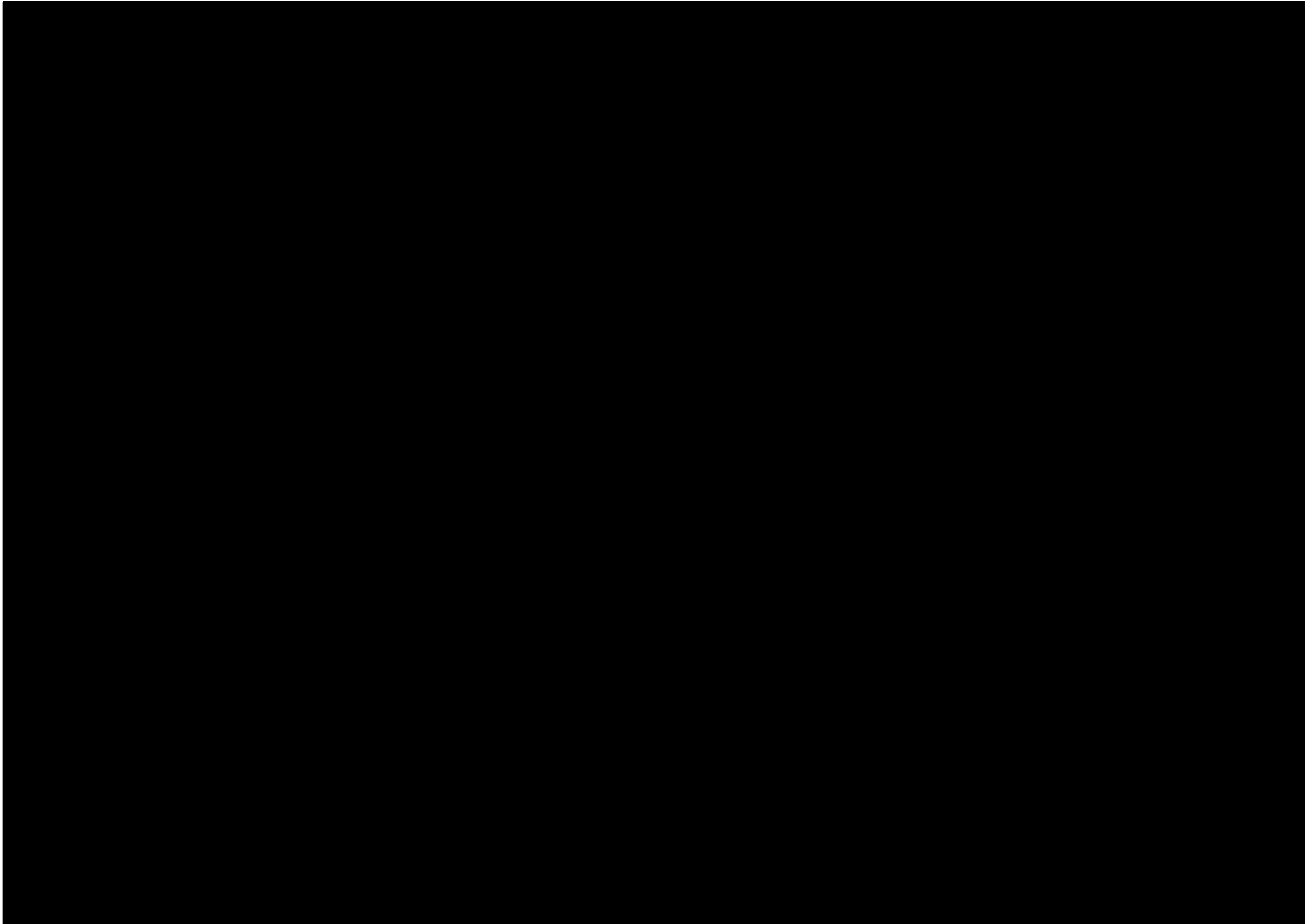


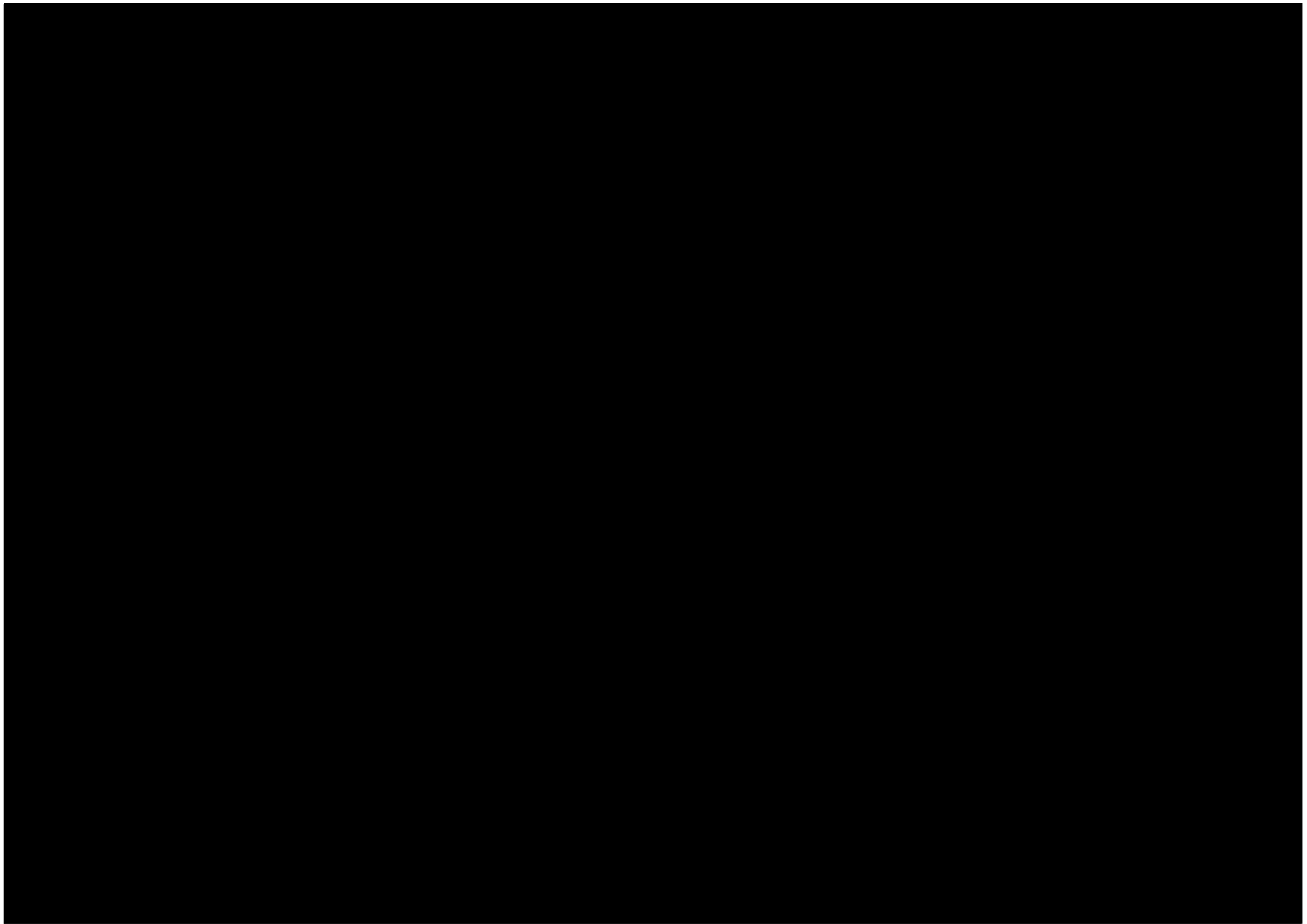


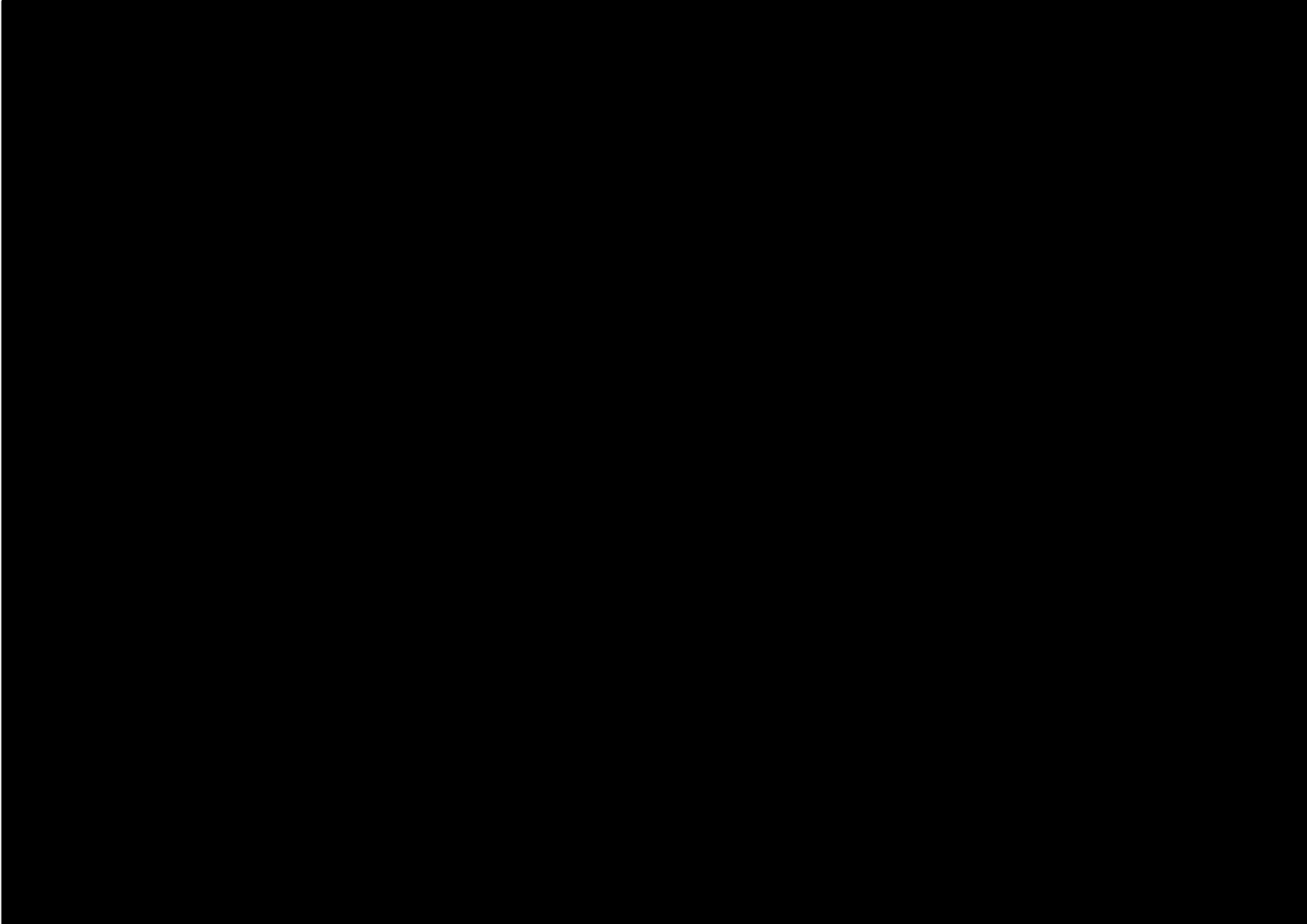


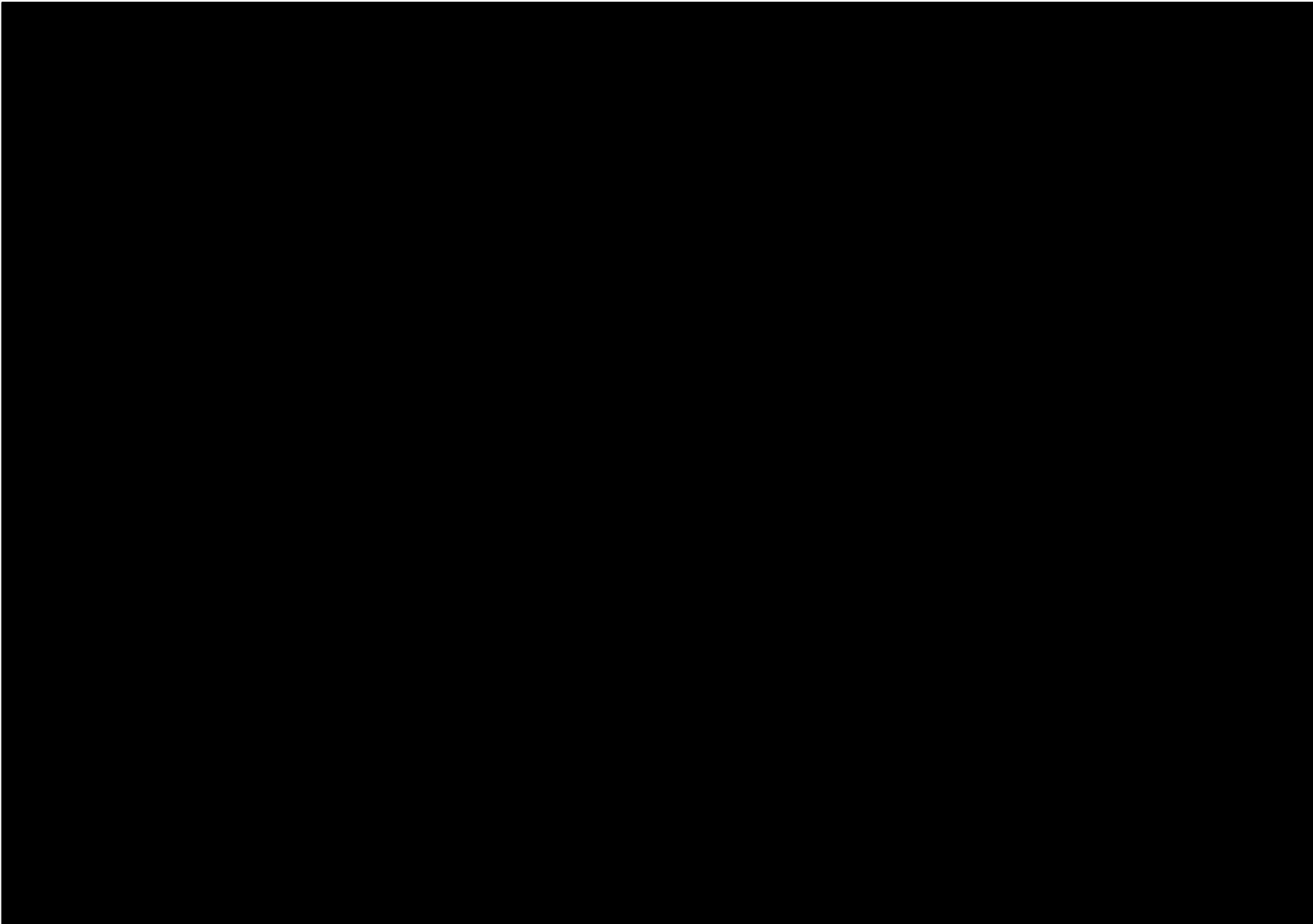












ATTACHMENT 2 – CSELRVs Product Description

This Attachment consists of the following documents:

1. CSELRVs Product Description – Part A; and
2. CSELRVs Product Description – Part B.

Attachment 2 – CSELRVs Product Description – Part A

CONSOLIDATED CLARIFICATION

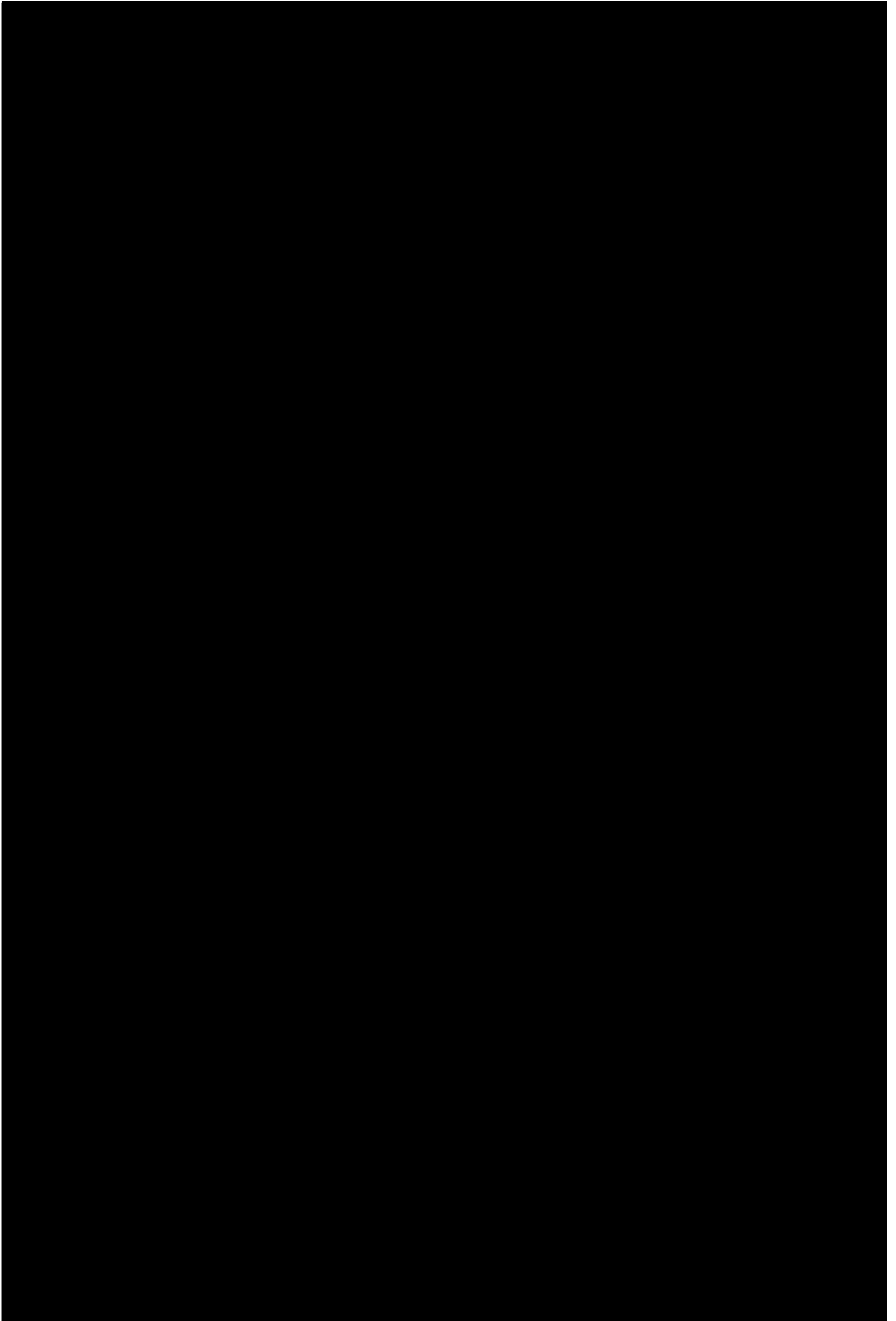
RETURNABLE 3 | CSELRVs

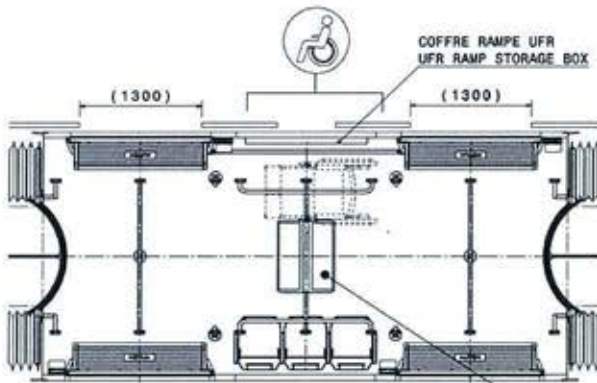
3.2 PRODUCT DESCRIPTION
(SPR Appendix 37 and Appendix 45)



CONNECTING
SYDNEY

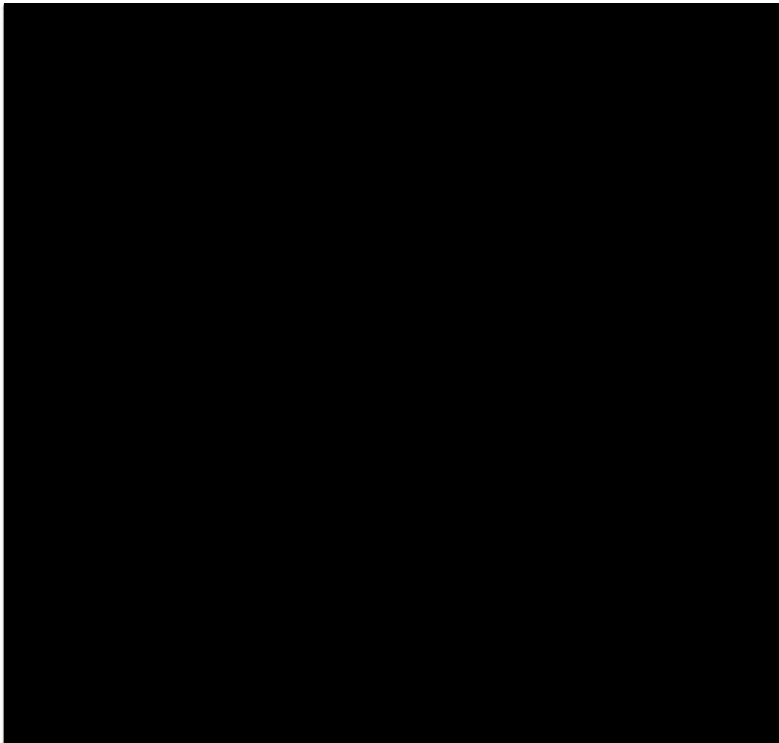






Mobility within the LRV

Mobility within the LRV unit is facilitated for all passengers by wide aisles and maximum slopes of around 6%.



Attachment 2 – CSELRVs Product Description – Part B

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RETURNABLE 3 | CSELRVs

3.2 PRODUCT DESCRIPTION
(SPR Appendix 37 and Appendix 45)

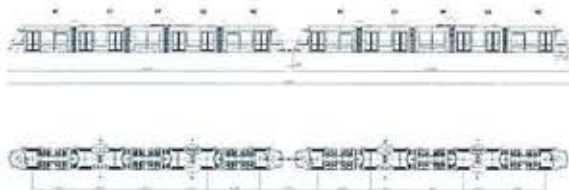


CONNECTING
SYDNEY





Figure 3: Coupled LRVs



The coupled unit Citadis already operates in Paris, Tunis, Casablanca and Jerusalem.

Our CSELRVs will benefit from several features of the Citadis family:

- the Ixège bogie, developed specifically for combined city and suburban operation. Its strong and simple design allows for comfort, easy maintenance operation and energy saving;
- a double-leaf door behind the driver cabins increasing Customer fluidity and accessibility; and
- permanent magnet motors for finer motor control and efficiency, delivering smoother tractive and braking efforts and improving energy efficiency.

3.2 (a) Key requirements

CSELRVs are designed to meet the key requirements of Table 1.

Table 1 - Main requirements

Characteristic	Citadis
Track gauge	1,435mm
Floor configuration	100% low floor
Percentage of seated capacity at AW3 load	~23.2%
Power supply	750V DC
Vehicle configuration	Driver cabs both ends

Our CSELRVs are also able travel on the IWLR track to the Rozelle Maintenance and Stabling Facility, using the existing systems in service.

3.2 (b) General requirements of the LRV

The main specifications of our Rolling Stock include:

- dimensions;
- passenger-transportation capacity;
- land take of the network;
- safety devices and arrangements; and
- traction and braking equipment, etc.

This document addresses the performance of the LRV in traction and braking mode, as well as its dynamic and acoustic characteristics.

3.2 (b) (i) A functional, flexible and progressive LRV concept

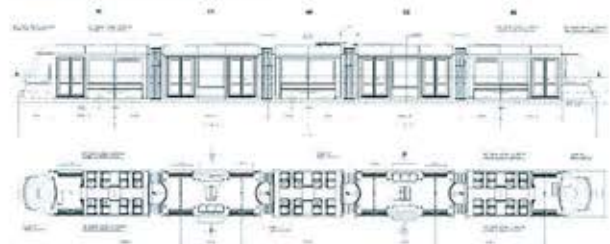
3.2 (b) (i) 1 General Architecture

The CSELRVs include the following modules:

- two motor cars with drivers' cabs (M1 and M2) each one resting on one bogie;
- one trailer car (NP) resting on one bogie; and
- two suspended car modules (C1 and C2).

The proposed diagram (refer to the drawings ABD9001340824 and ABD9001341230 in [Appendix A3.2](#)) and interior layouts are shown in Figure 4.

Figure 4: Interior layouts



A single unit is approximately 33.4m. Multiple units (consisting of two vehicles coupled together) measure 67.7m.

The side section of the vehicle curves towards a slim narrow roof line. This balances any constraints arising from the vehicles' kinetic envelope and creates space around the seats for passenger comfort.

Access to the seats in the motor and trailer cars is improved through the lightly sloped low floor.

The height is designed for passenger movement between 364mm and 521mm from the rail top. The low floor level at 364mm gently transitions to 521mm above the bogies. Extra height improves passenger comfort due to the double suspension of the bogie design. Transition is achieved by a gentle slope of 6%. At each door, a short slope of 8% decreases the height to around 325mm in front of the thresholds. This facilitates access to the vehicle from the LRV Stop platform (the motor car door access height is 336mm from top of rail in AW0 load).

We will achieve visual amenity through large glazed areas on the side of the LRV, allowing a clear view from inside and outside the vehicle.

The five modules of the vehicle are connected by wide intercommunication gangways, allowing fluid passenger movement onboard.

Auxiliary equipment items, including air conditioning units, are roof-mounted and hidden from view by lateral roof fairings. Fairings protect



the equipment during operations, and provide LRVs with a uniform appearance.

The main LRV equipment is attached below the underframe. The layout facilitates easy access to the running gear, concealed by the lower fairing skirts.

The LRV systems are integrated with the overall SLR systems. This includes timing, provided by the master clock functions within the OCC.

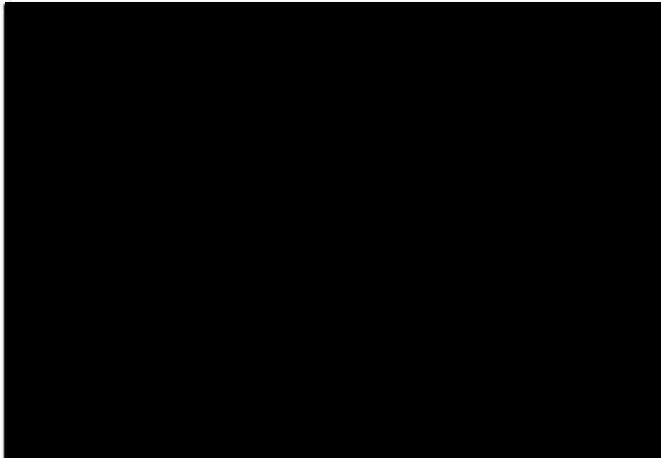


Figure 5: Easily accessible special needs space (for illustration purpose)



Table 2 presents the passenger capacity of the vehicles under (AW3) and (AW4) loads.

Dimensions

The dimensions of the LRVs are:

- length: 33.4m;
- overall width: 2.650m;
- overall height, pantograph folded down: 3450mm;
- current-collection amplitude : 3610mm/6420mm;
- floor height in area for people with reduce mobility: 0.364m;
- clear height of access doors: 2.065m; and
- clear width of double doors: 1.300m.

Figure 6: LRV layout





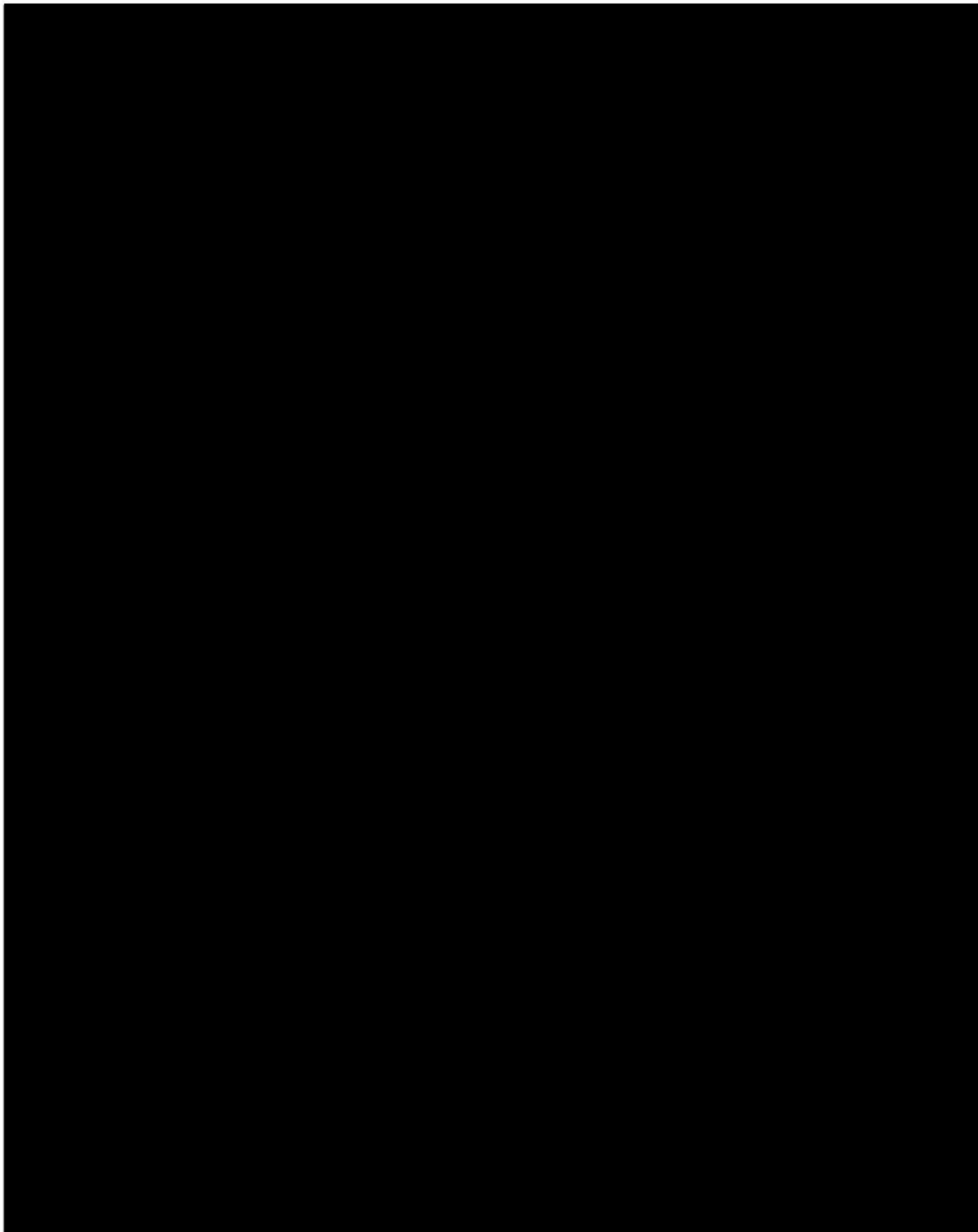
3.2 (c) Load conditions

LRV weight

The load cases are considered following the definition supplied in Table 3.

Table 3: Loaded cases

Load Condition	Definition
AW0	An empty LRV with no passengers onboard and in a serviceable condition (Tare).
AW1	An LRV with all seats (including tip-up seats) occupied.
AW2	An LRV with all seats (excluding tip-up seats) occupied and standing passengers at two passengers per m ² .
AW3	An LRV with all seats (excluding tip-up seats) occupied and standing passengers at four passengers per m ² .
AW4	An LRV with all seats (excluding tip-up seats) occupied and standing passengers at six passengers per m ² .





3.2 (g) Noise

3.2 (g) (i) Optimal HVAC settings for minimal noise level

A specific output of the LRV's auxiliary converter is to produce the three-phase voltage (360 to 480 V) for the air-conditioning unit. The HVAC unit requires the appropriate frequency of the vehicle's auxiliary converter depending on the load demand. This function enhances the regulation in cooling mode by adjusting the cooling capacity to the needs and reduces the operating noise when the vehicle is at a standstill.

When the LRV is at a standstill, the converter frequency is reduced in order to limit the interior and exterior noise.

A control button is located on the driver's desk to turn the air-conditioning unit on and off in addition to the tactile controls on the driver display unit.

3.2 (h) Rolling stock performance

3.2 (h) (i) Emergency push/pull operation

When one of the two vehicles of the double unit fails, the two vehicles need not be decoupled. There are two possibilities for repatriating the failed LRV in forward running direction and normal driving mode: pull and push operation.

The LRV (in 'prepared' status) including the driver's cab in service is called the 'rescuing' LRV; the 'deprepared' or isolated LRV is the 'rescued' LRV.

3.2 (h) (ii) Recommendations

During push/pull operations, certain recommendations or restrictions relative to safety must be taken into account:

- the rescuing LRV must be fully operational;
- at least two authorised operators must be present during the operation (this is a mandatory condition);
- in emergency situations, only the safety braking mode must be used (via the dedicated push button on the driver's control desk); and
- depending on the LRV unit configuration, other recommendations and procedures may be required.

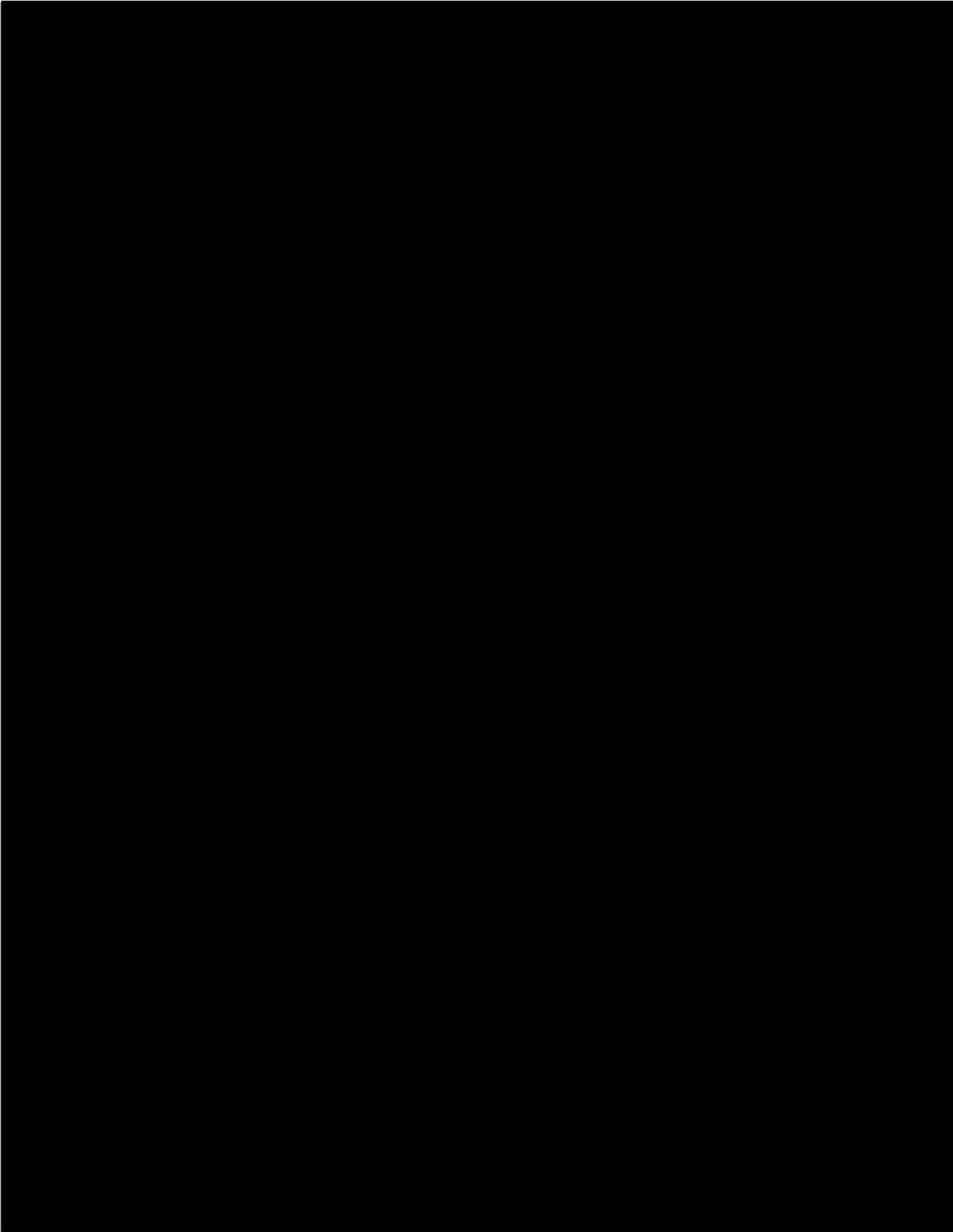
3.2 (h) (iii) Functions ensured in push/pull mode

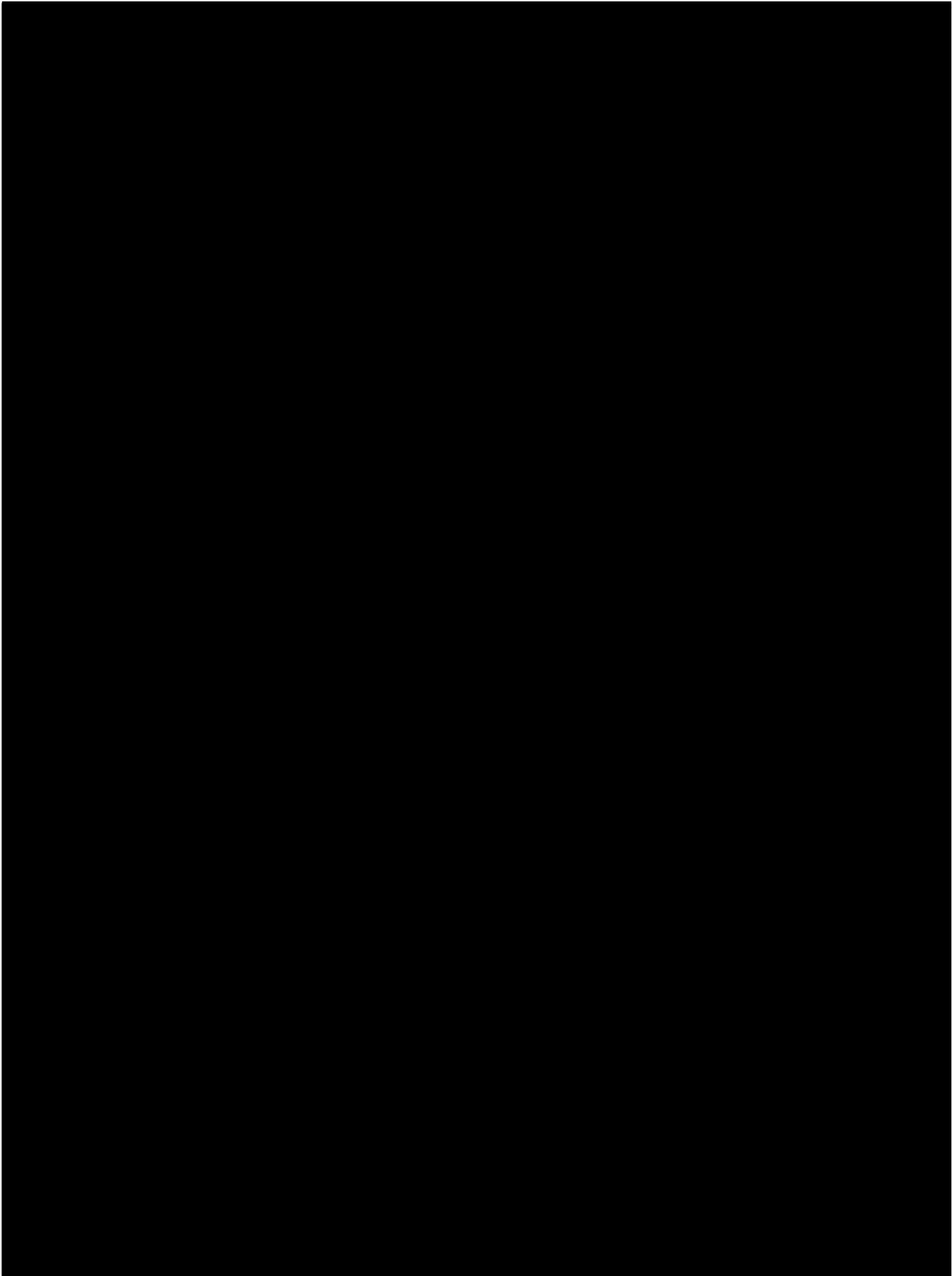
Table 8 details the functions that are ensured in push/pull mode:

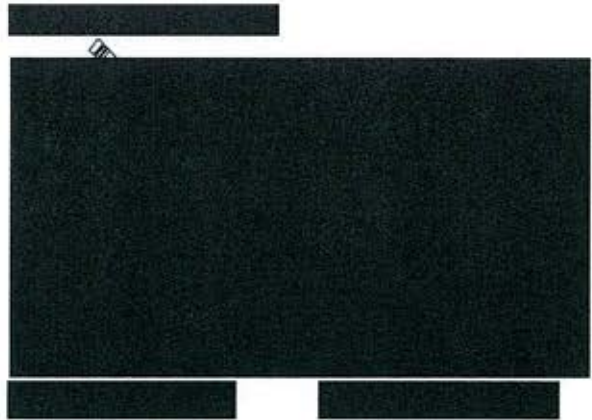
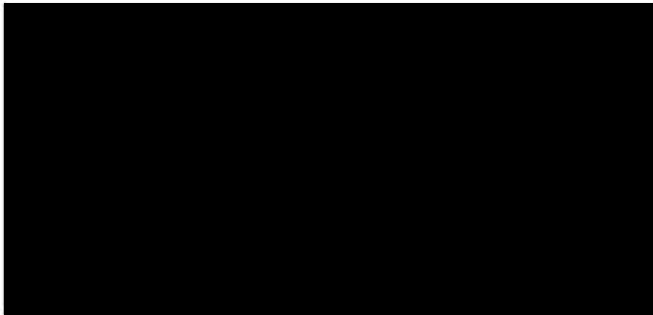


Table 8:-Push Pull Functions

Function	Function ensured on the rescued LRV	
	With battery in operation	With battery out of operation (Distribution of backup permanent LV supply from the rescuing LRV)
Cab-to-cab intercom	Yes	Yes
Emergency ringtones between the cabs	Yes	Yes
Electrical release of brakes from the rescuing LRV	Yes, by operating the push buttons installed on each of the release units on the rescued LRV	
SB Control given from the rescued LRV during EB control from the rescuing LRV	Yes, with reactivation of isolated brakes on motor bogies	
Standstill in case of rupture of coupling	Yes, if the brakes (parking ones) were release electrically as per the brakes electrical isolation procedure	
Front light signalling on rescued LRV	Yes (except high beam), upon control from the rescuing LRV. The following are concerned: low beam, marker lights, tall lights and stop lights	
Control of signal warning lights	Yes	Yes, upon control from the rescuing LRV
Control	Yes(with normal operation speed only)	
Control of bell from all cabs	Yes	Yes
Control of horn from all cabs	Yes	Yes
Reduced lighting in the passenger compartment	Yes	Yes
Driver's cab lighting	Yes	Yes
Remote track point switching	Yes	Yes







3.2 (i) (ix) Lighting and signalling equipment

The LRV is fitted at both ends with devices for exterior signalling and lighting. These devices are of sufficient quantity to indicate the vehicle position (at standstill or while running) and will conform to Australian Design Rules.

Our proposal includes two white head lights of the standard road type, diameter 90 or 120mm; and two red lamps with LEDs, including the rear side of the LRV signalling, and the brake activation signalling. The white lights can be operated in high beam/low beam. Low beams are activated as soon as the LRV is prepared, i.e. ready for operation.



Figure 14: LRV Lights



External left and right indicator signal lights are installed which are capable of performing as hazard lamps if required.

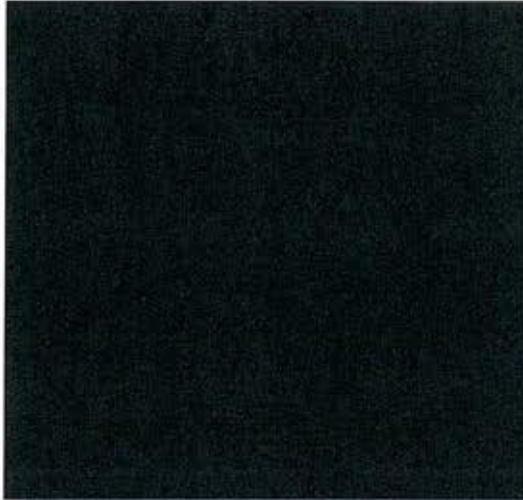
All information signs and controls will be in English.

3.2 (j) Couplers



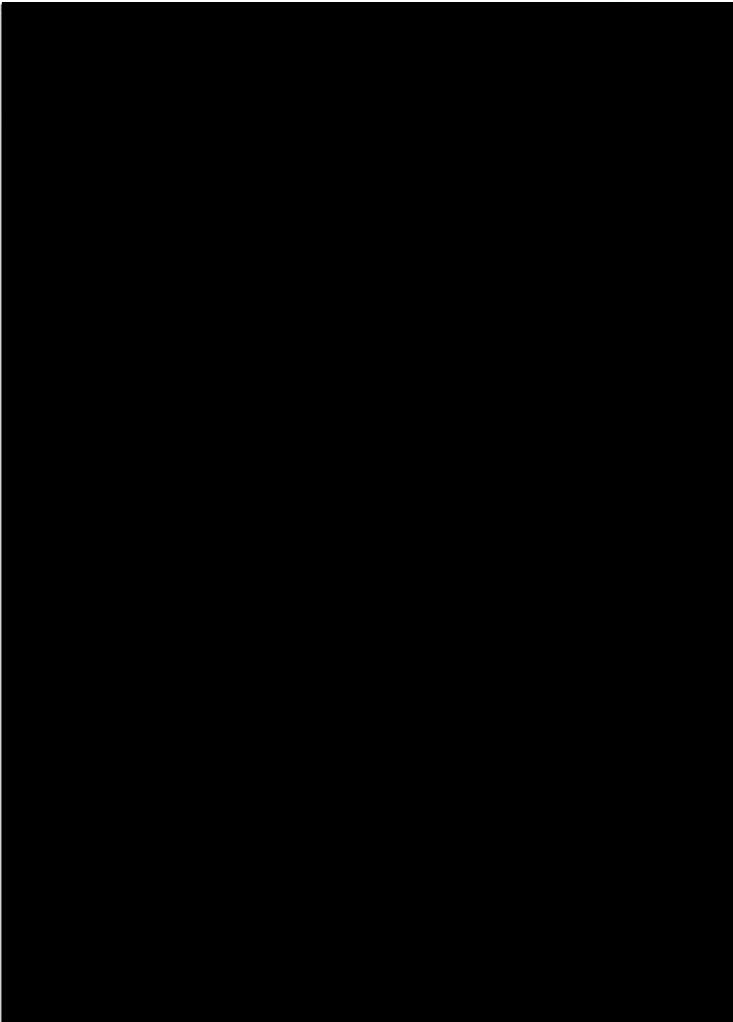
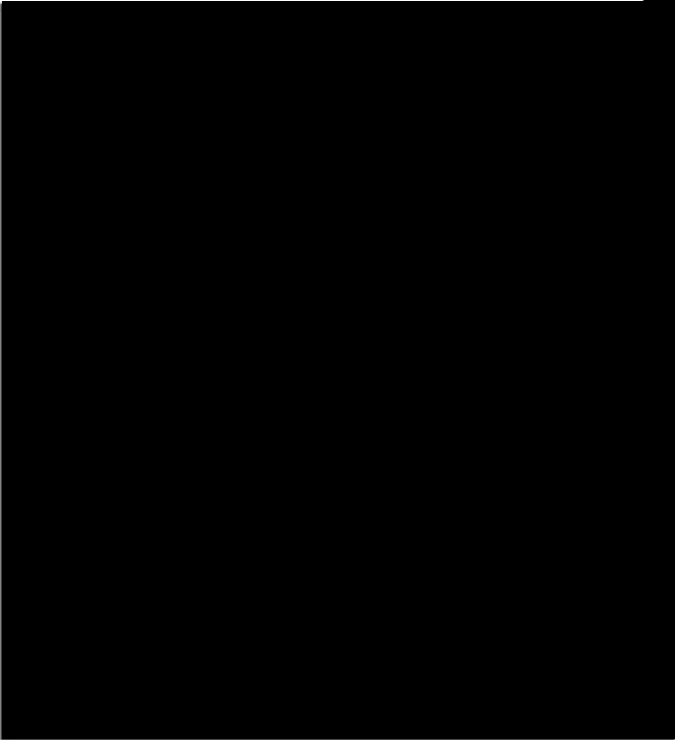


When the coupling system is not used, it is



3.2 (j) (i) Intercommunication gangways between modules

The intercommunication gangway areas between modules are designed to improve passenger comfort, stability and internal flow with:

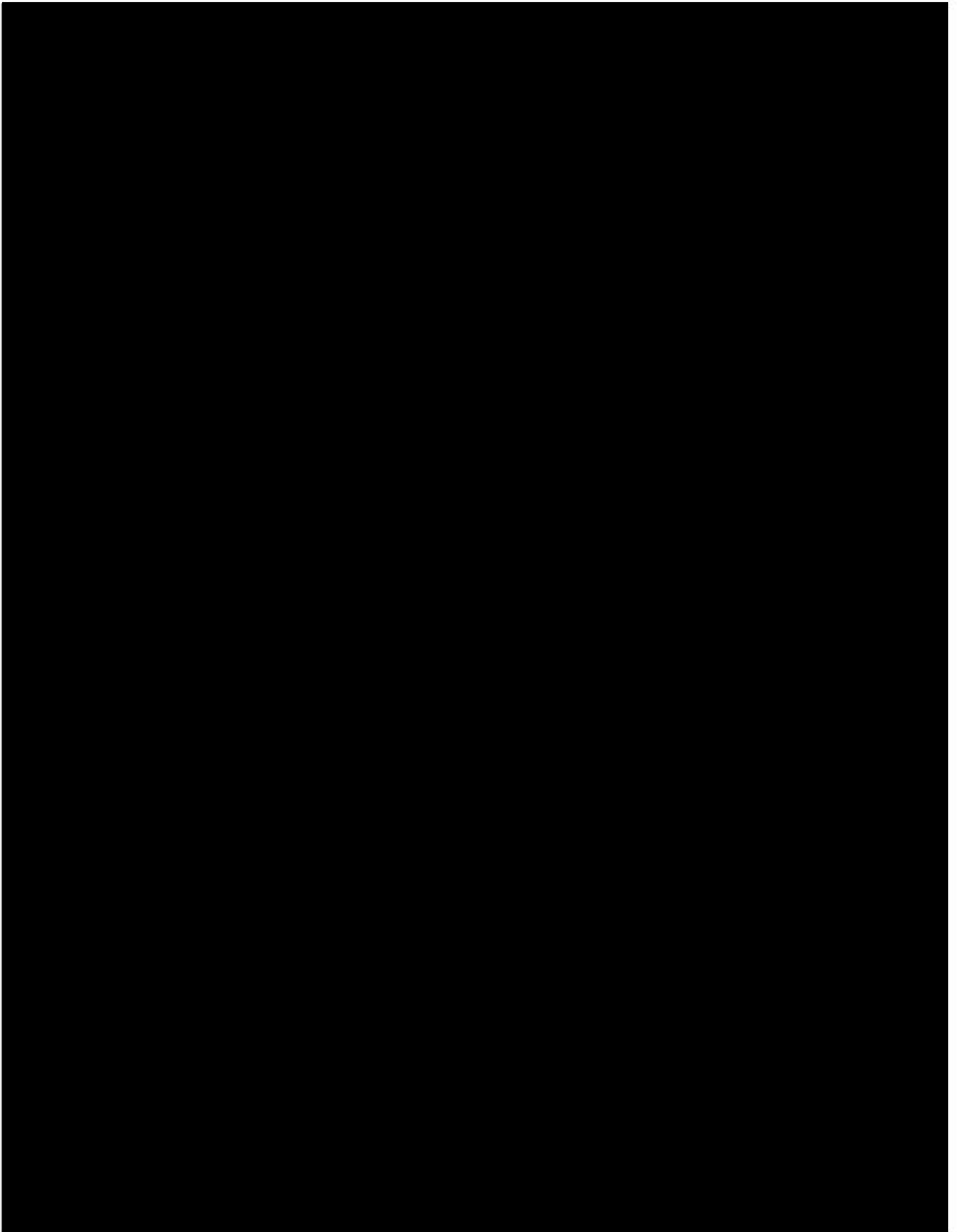


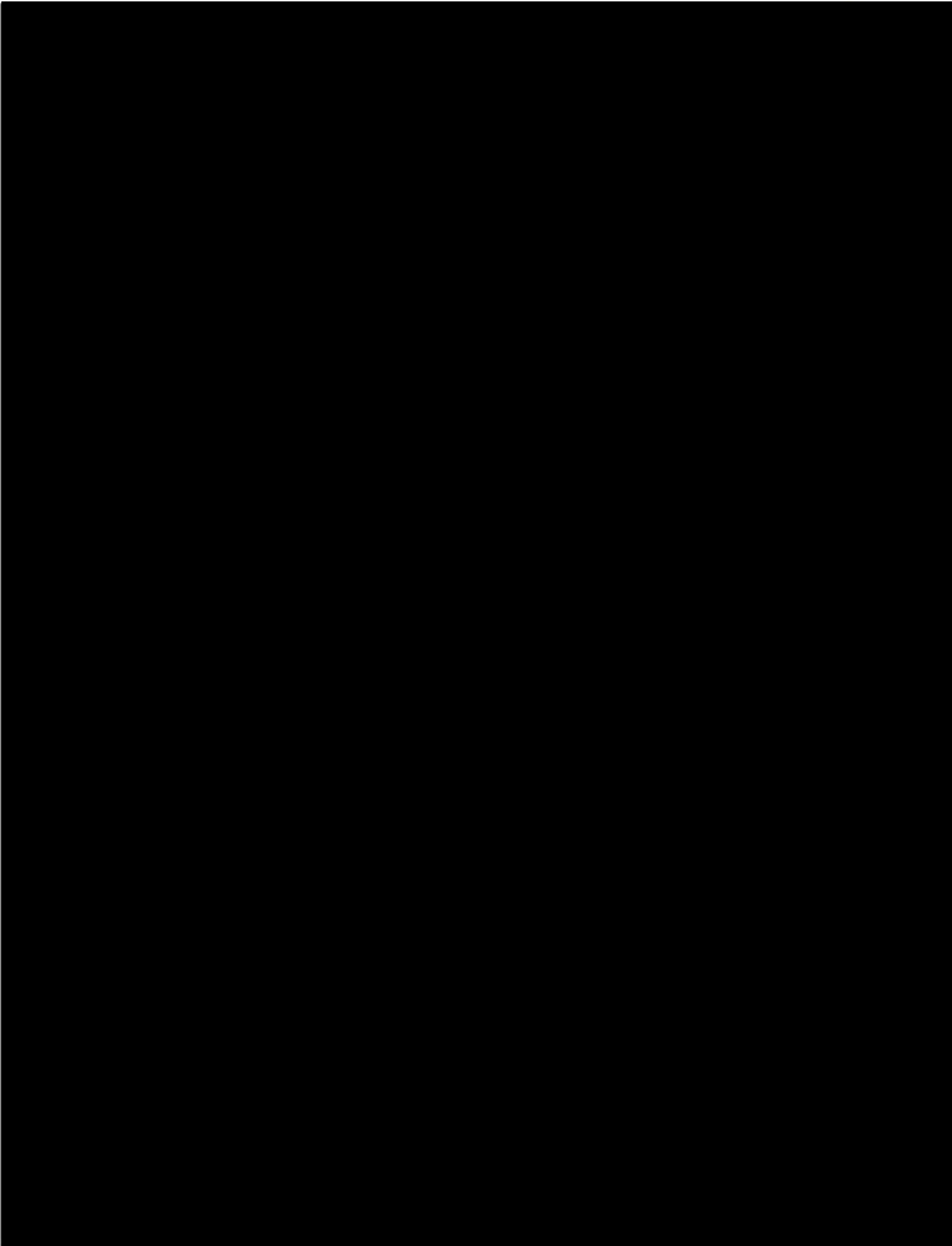
3.2 (k) LRV monitoring system

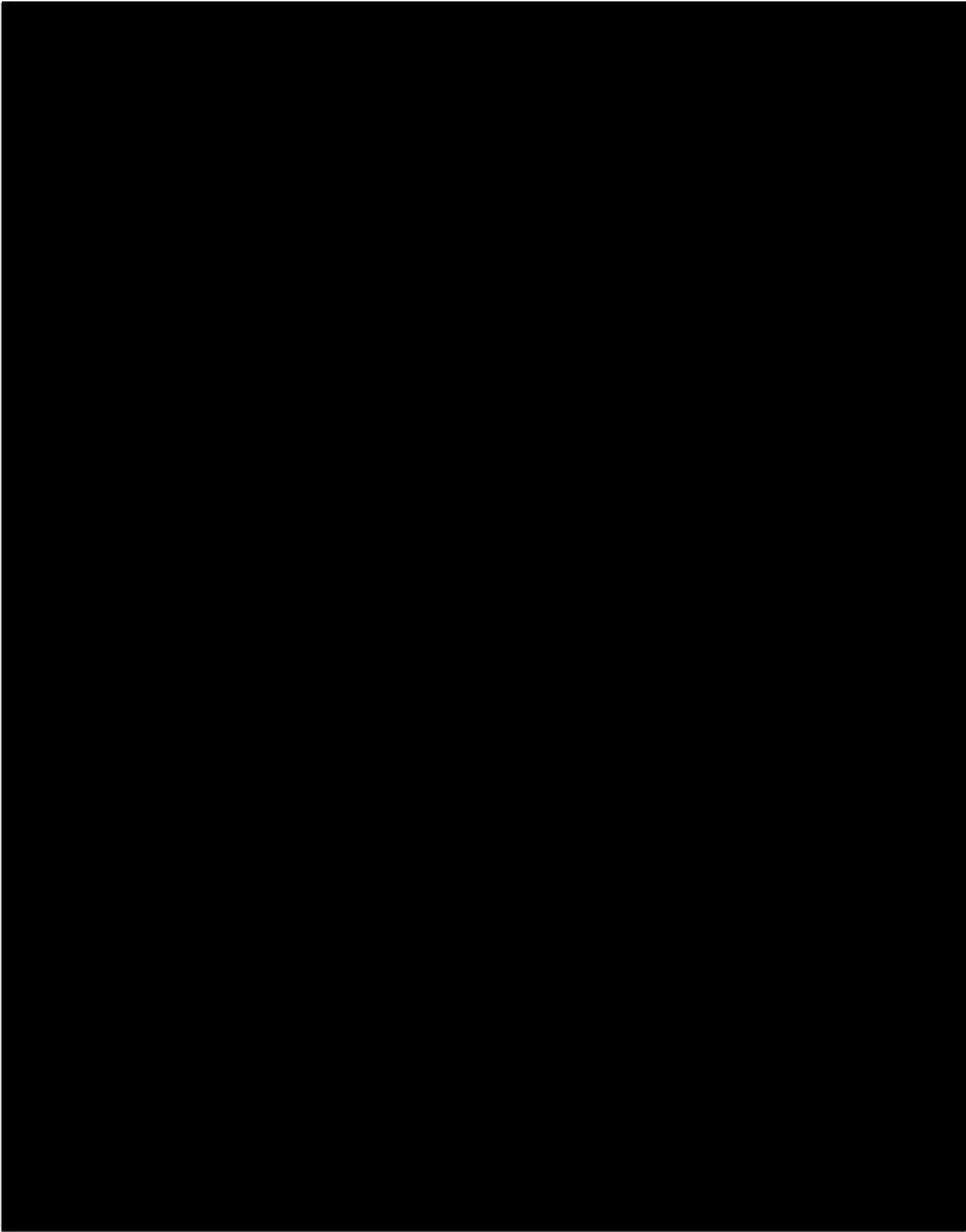
The (LRV) LRV Control Monitoring System (TCMS) manages all LRV functions control and monitoring. The Citadis LRV relies on latest-generation Alstom electronic systems and equipment of the TCMS Platform.

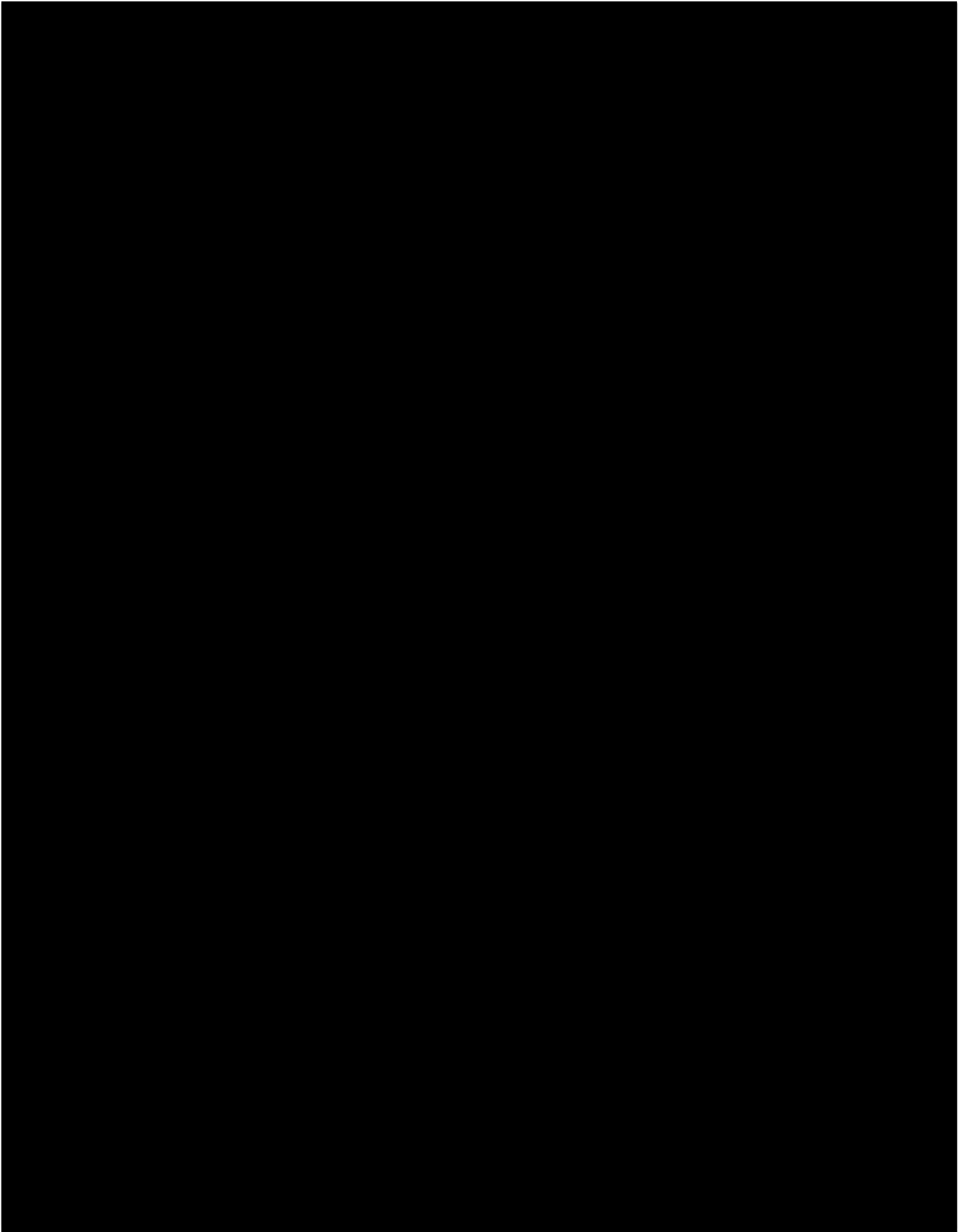
The Citadis benefits from a large return of experience from LRVs already in commercial operation.













3.2 (n) Rollback prevention

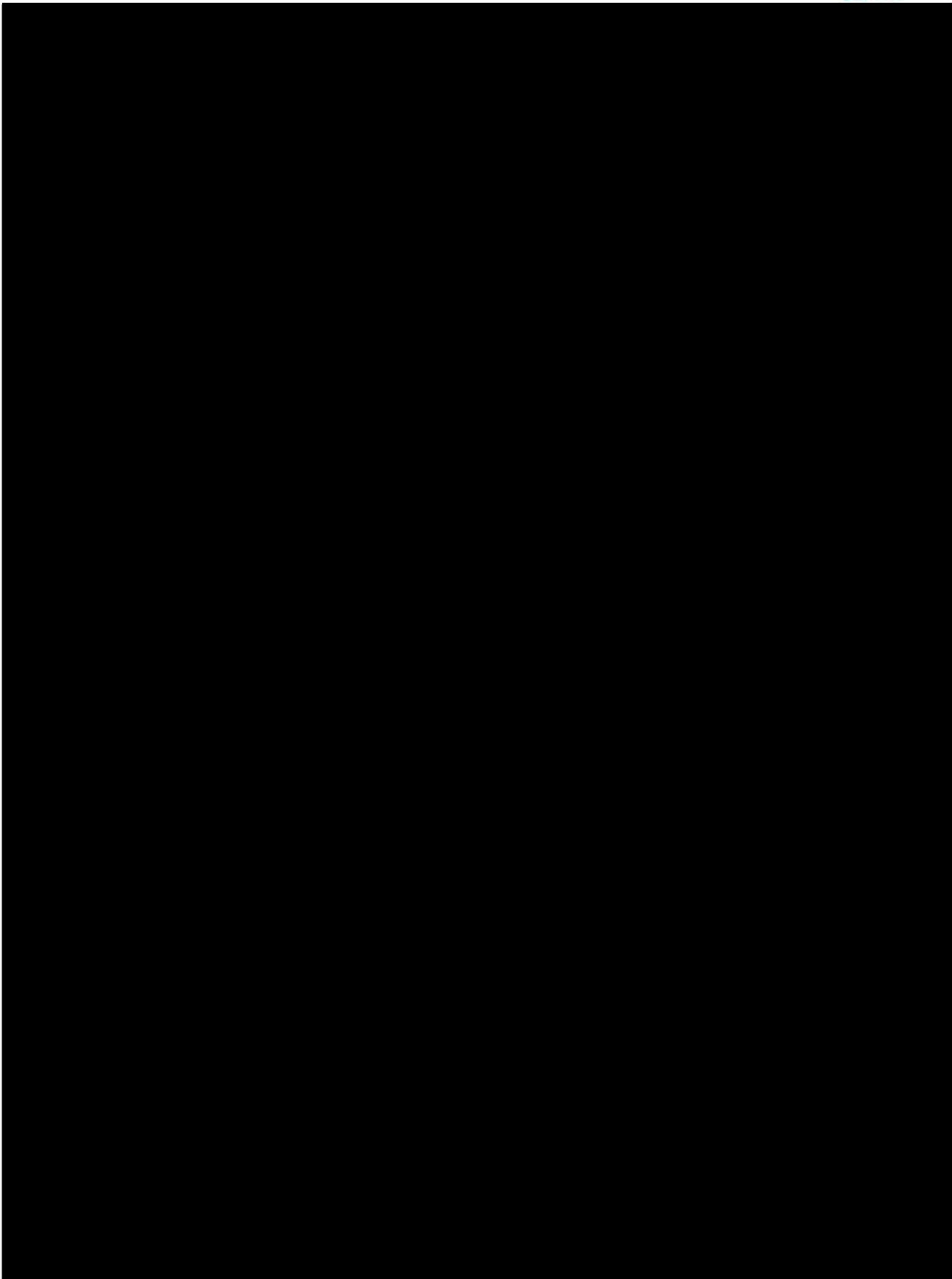
The traction equipment in motor cars M1 and M2 monitors the running direction of the vehicle. In case of a disparity between the selected running direction and the actual vehicle direction, the emergency braking loop is ready to activate, and an alert is sent to the driver via the Train Control Monitoring System.

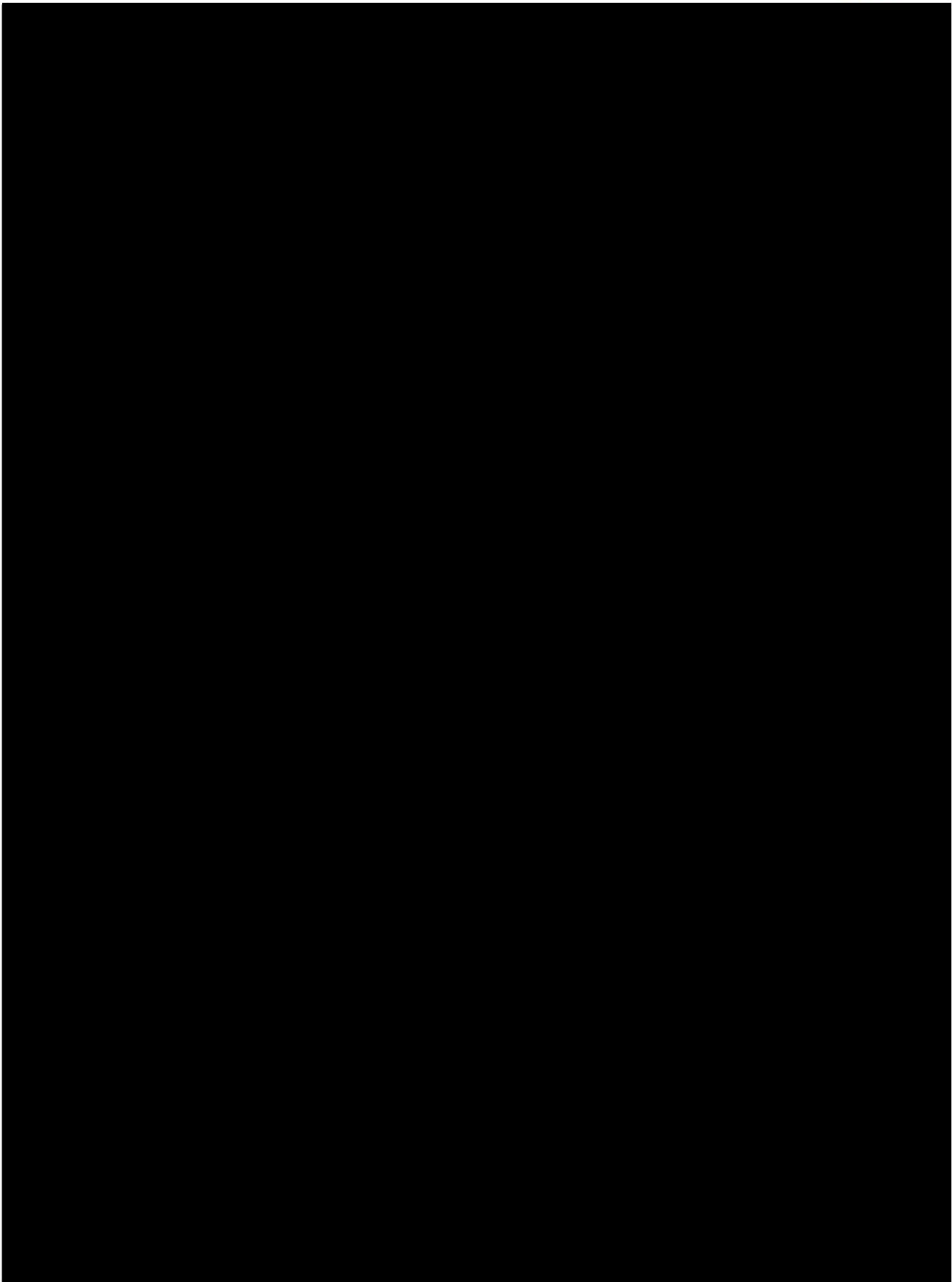
When the vehicle rolls backwards (i.e. the selected running direction is different from the actual direction), over a distance above a given threshold (information provided by the speed sensors on motor bogies), 'rollback' information is generated and indicated by the Traction/Braking Control Unit of M1 and M2.

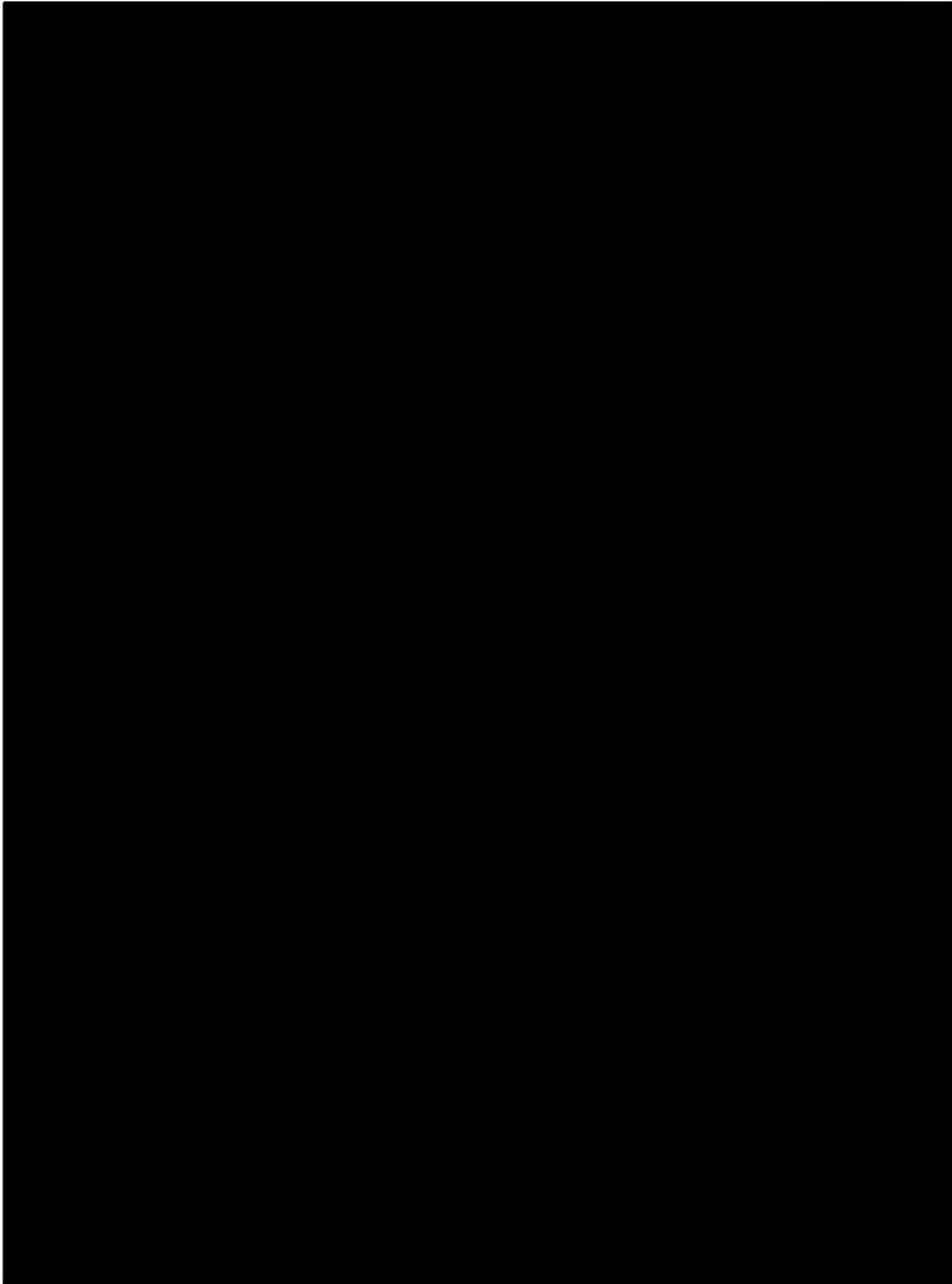
A running direction request is emitted via a vehicle communications line (sent to TBCU) while the actual vehicle direction is determined by the AGATE control system. Rollback of a single axle on M1 or M2 is sufficient to activate the rollback-protection system and apply the emergency brake.

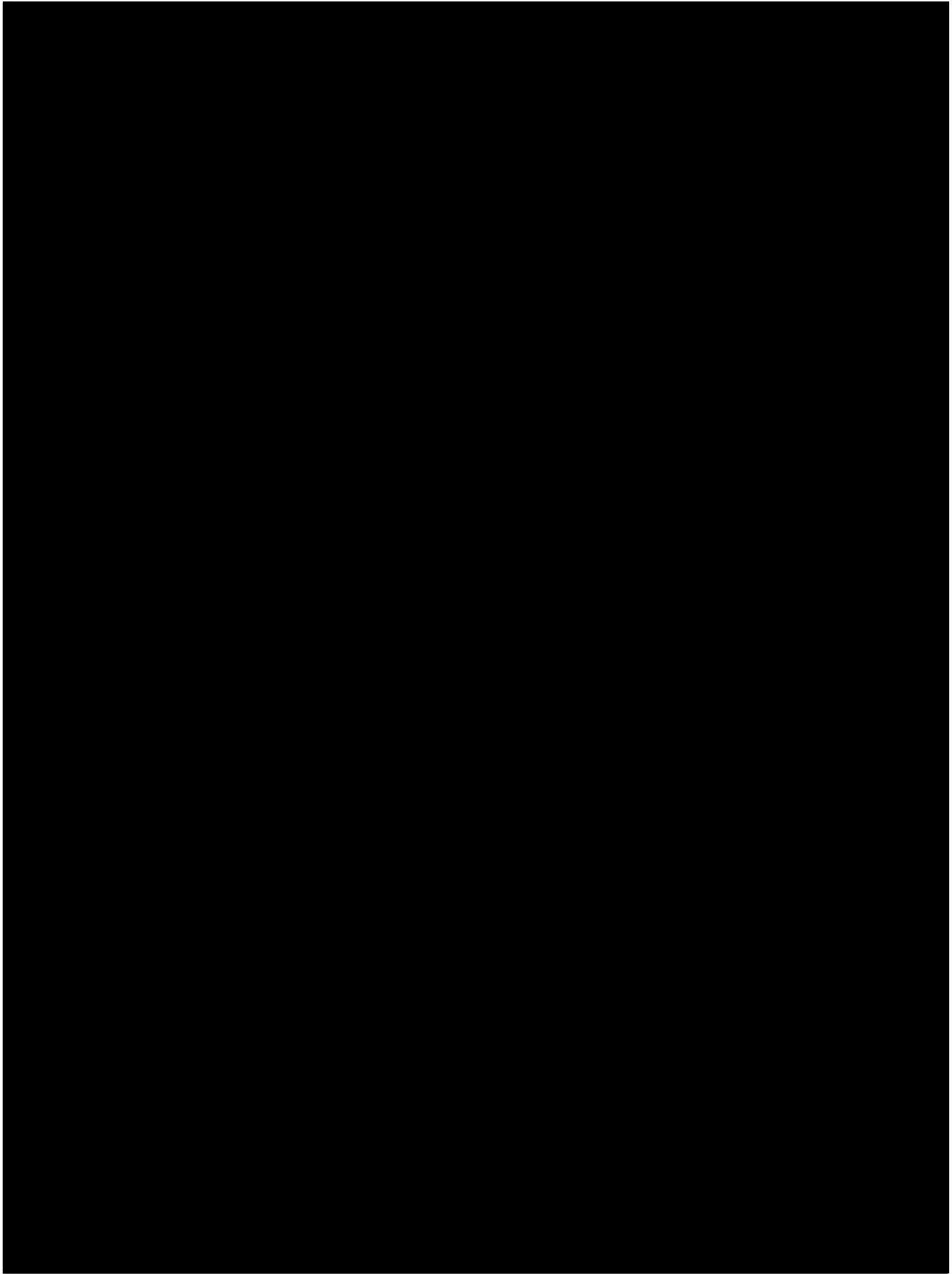
In 'normal driving' mode, if rollback is detected, the emergency loop is automatically opened and an Emergency Brake application (FU1) is requested. However, as speed is too low for the electrodynamic brakes, only mechanical and electromagnetic brakes will be applied. Traction authorisation is then cancelled.

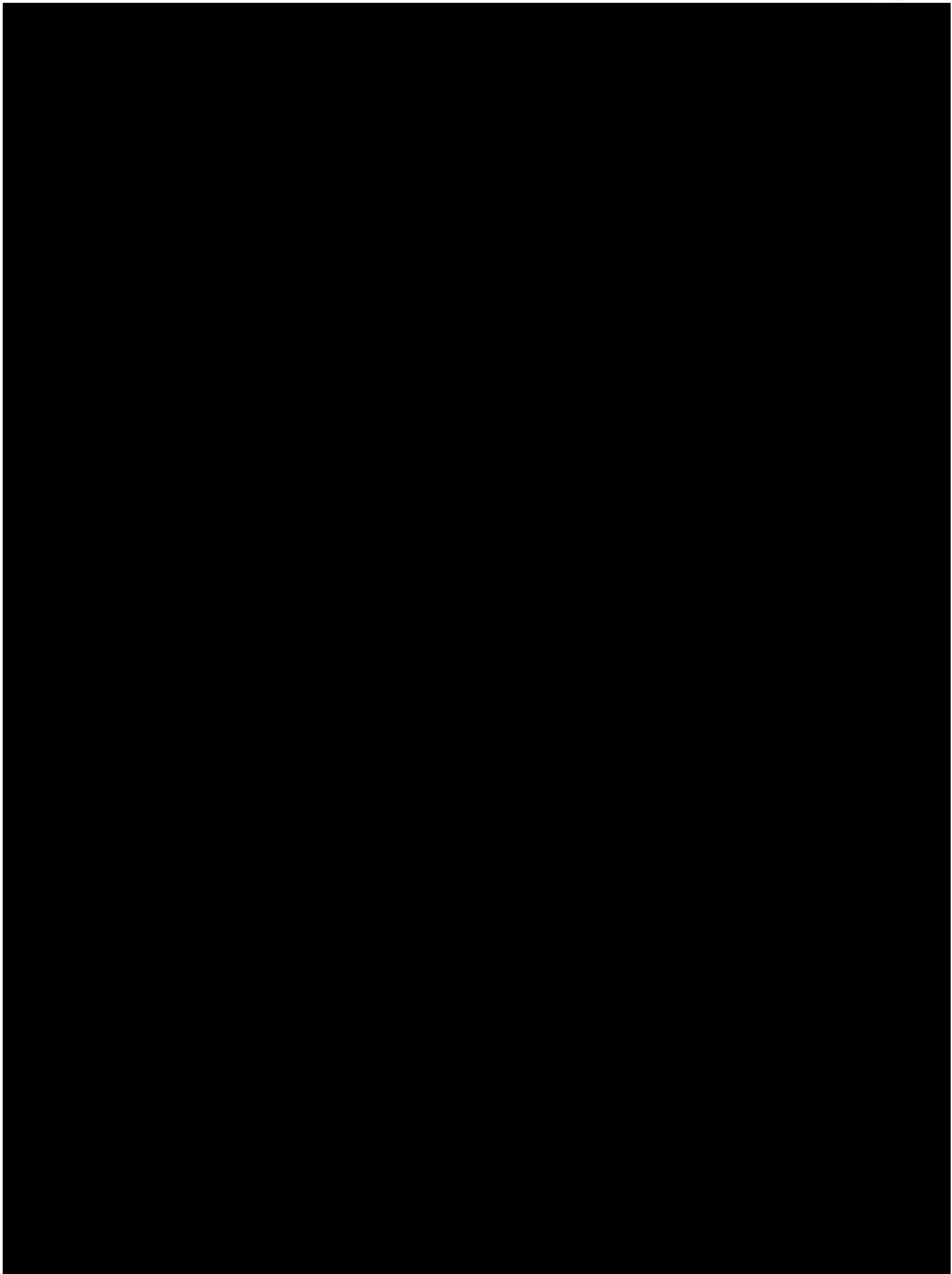
After a rollback prevention event, once the vehicle's speed returns to zero, the rollback-protection system will cancel the emergency-braking control after three seconds.

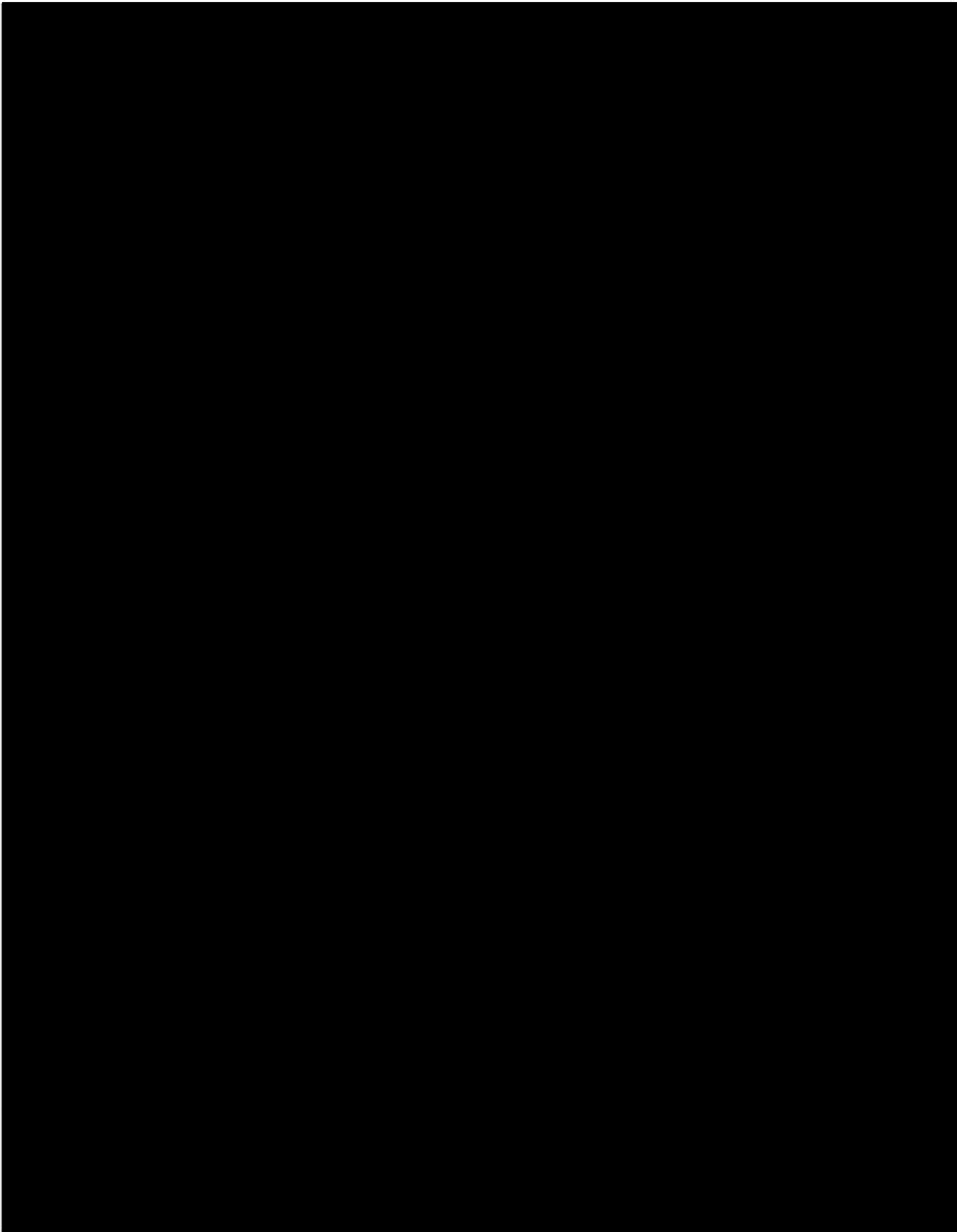














3.2 (q) Passenger interior

This document presents the passenger-transportation functions by focusing on the following topics:

- accessibility;
- interior layout;
- passenger comfort (thermal, acoustic, visual, dynamic comfort; passenger information); and
- safety (doors, video surveillance, call buttons, etc.)

3.2 (q) (i) Accessibility

3.2 (q) (i) 1 Passenger access doors

Citadis vehicles are equipped with double-leaf sliding plug doors.

Available passage ways comprise:

- clear width: 1300 mm; and
- clear height: 2065 mm.

The access doors are compliant with all requirements of European standard NF EN 14752 and feature large glazed areas.

The door leaves comprise:

- a structure based on aluminium profiles. The horizontal bar at mid-height ensures the anti-defenestration function required in standard NF EN 14752; and
- toughened, 5-mm thick Parsol Vert glass is circumferentially bonded to the aluminium structure.

The glazing is compliant with standard NF F 31-129. Black screen printing around the full periphery allows:

- aesthetics to be enhanced; and
- for the adhesive bonding to be protected against U.V. radiation; and
- glass to be supported and retained in the event of breakage to prevent it from falling out.

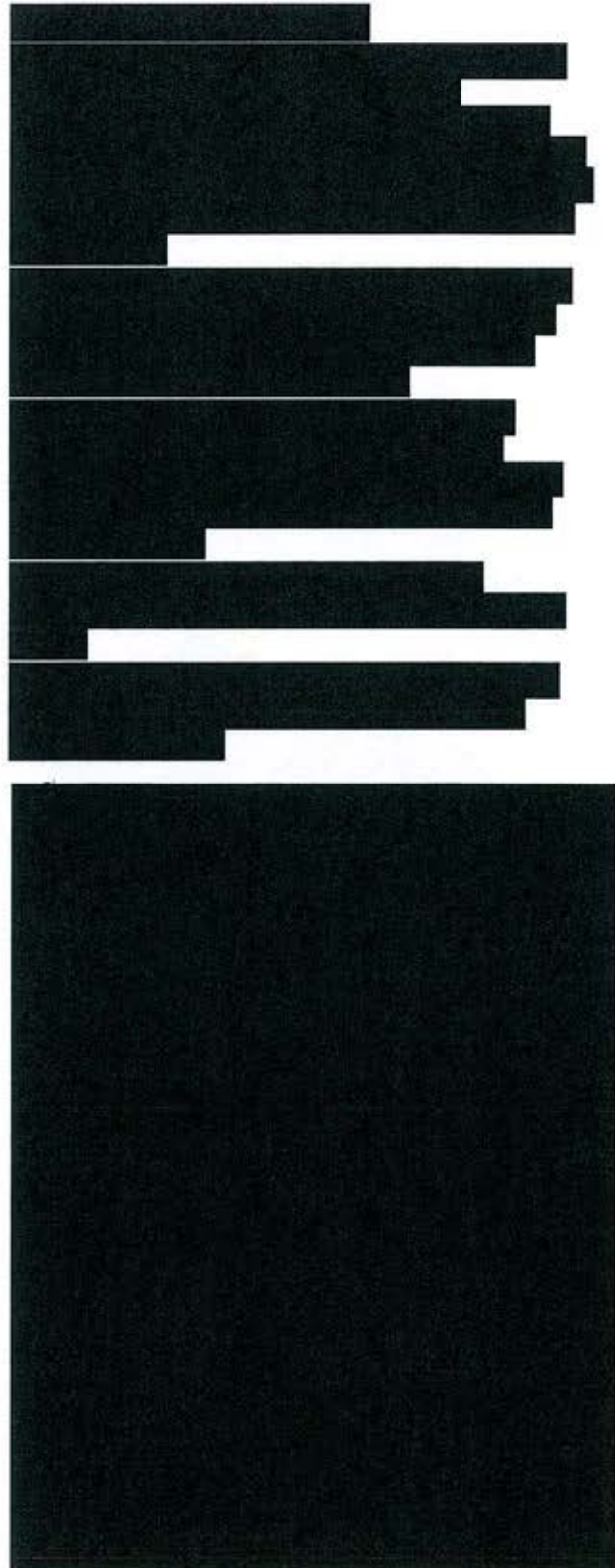
The leading edge of the door-leaf is equipped with elastomer sealing joints, which ensure both safety and sealing of the door closure. Obstacle detection upon closure is guaranteed by controlling the motor current at door-control unit level at each door.

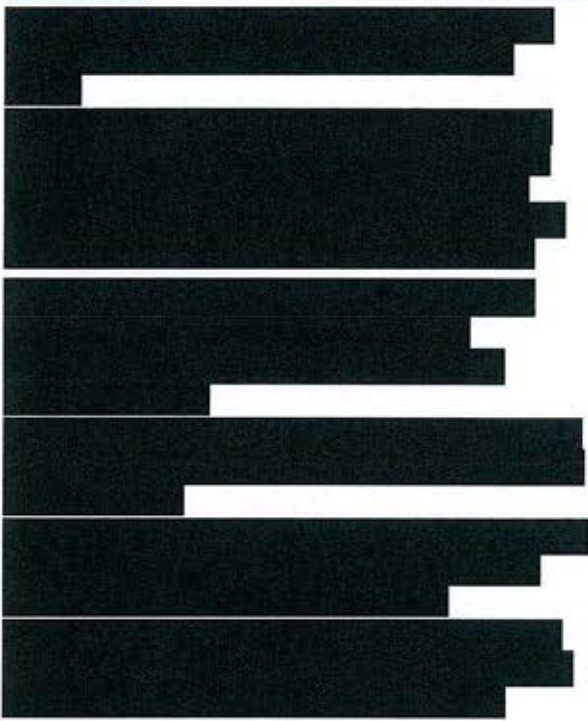
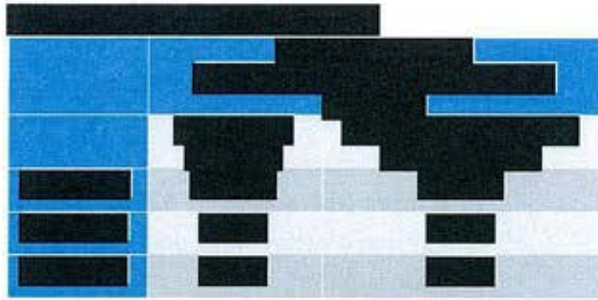
The door mechanism is located at the ceiling, behind the mobile roof-arch-area flap. It is made up of a single structure that ensures door leaf support, guidance, motorisation and monitoring.

The doors are driven by a 24V DC motor.

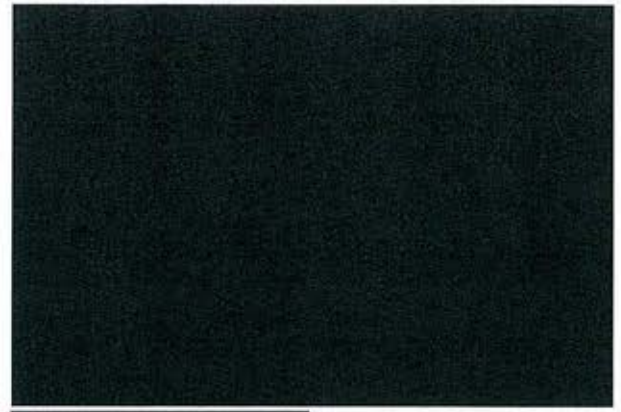
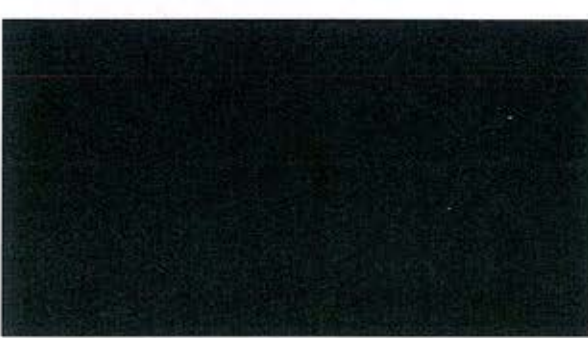
Door opening and closing times are in the vicinity of 3.5 seconds each.

3.2 (q) (i) 2 Access to the LRV





DETAIL W/F



3.2 (q) (ii) Interior layout

With regard to interior arrangements, the following is proposed:

- Motor Car/Trailer car (16 seats); and
- Suspended Carbody Module: three fixed seats and one lumbar seat.

3.2 (q) (ii) 1 Motor Car Module

Figure 31: Motor Car module



3.2 (q) (ii) 2 Suspended Carbody Module Interior

The Suspended Carbody Module arrangements include:

- 1 group of three fixed seats
- 1 lumbar seat allowing one wheelchair area

Figure 32: Suspended Carbody Module interior



The doors at the Module ends of the suspended car enable wheelchair-bound passengers to easily board or alight.

The dimensions of clear passageway between modules is more than 1000 mm, allowing for wheelchair access.

The interior, including the seats, floors and other panels are vandal resistant. They are made from robust materials and covered in materials which are resistant to stain. The seats are cushioned and covered in a polyester fire retardant material. Inside panels are painted in hard coat paint which makes it easier to clean; the floors are a tough material which is smooth but offers a gripping surface.

3.2 (q) (ii) 3 Windows

The windows are made of toughened, 5-mm thick Parsol Vert glass, as per standard NF F 31 129. The colour is the same as that of the driver's cab windows and the access doors and has similar structural and retention properties.

For optimal maintainability, the glazing is bonded to a frame, which in turn is fixed to the carbody structure by means of screws. This assembly was specifically designed to enable quick replacement of a window, reducing the vehicle downtime in case of glass breakage, compared to windows that are directly bonded to the carbody structure. A passenger compartment sidewall window can be replaced by a new one in less than 15 minutes.

The frame is made of aluminium, painted with polyester powder (interior finishing). An elastomer joint ensures sealing between the windows and the carbody structure.

Black screen printing around the full window periphery allows the aesthetic appearance to be enhanced and the adhesive material to be protected against U.V. radiation.

Windows are fitted with solar film in order to limit UV radiation impact.

The characteristic features for energy and light transmission of the windows are as follows:

- light transmission: 76%;
- solar factor (with solar film): 42%;
- energy transmission: 48%; and
- K-factor: 5.8W/m².

3.2 (q) (ii) 4 Floor

The LRV floor is made of thick plywood panels, bonded to rubber mounts which are in turn bonded to the carbody structure, separating the floor from the structure and preventing the transmission of vibrations.

The floor panels are jointed in the transverse direction by continuous splints, ensuring there is no movement between the floor panels.

The floor and the bottom of the sidewall are covered with a smooth, 2mm thick lining material guaranteeing good durability and slip resistance over time as well as resistance to fire.

The floor covering complies with:

- NF F 31-812 – Railway rolling stock. Rubber floor coverings; and
- NF EN 1817 – Resilient floor coverings - Specification for homogeneous and heterogeneous smooth rubber floor coverings.

The colour of the floor covering will be chosen from the product-specific colour chart during the project design phase.

3.2 (q) (ii) 5 Grab bars and handles

The LRV has horizontal and vertical grab bars and handles as follows:

- horizontal bars are in three locations -next to the lumbar support structure; on the ceiling in the centre of the Suspended Carbody Module; and in the centre of the access vestibules; and
- vertical - in the interconnecting gangways; next to the doors and in the access vestibules.

The grab bars and handles are designed to comply with the following mechanical strength requirements:

- 100 daN, applied horizontally and evenly distributed over the whole height of the bar;
- 150 daN, applied vertically and evenly distributed over the whole (horizontal) length of the bar; and
- 100 daN applied vertically, then horizontally to the centre of the horizontal part of the bar.



3.2 (q) (ii) 6 Characteristic features of materials and trimmings

Flat elements that make up the linings are made of sheet metal and aluminium profiles, painted with polyester powder to guarantee resistance of the paint over time. The colours will be chosen from the colour chart of the product range during the design phase.

Elements with complex shapes are manufactured in glass fibre/polyester resin and plastic mouldings. The elements are then finished with lacquer paint which will support repetitive application and removal of temporary signage.

The installation principles and the fastening methods allow for easy and quick maintenance whilst also ensuring that the unplanned loosening of any individual screws and fasteners will not be the cause any item detaching from the vehicle during operations.

The design for interior arrangements complies with all requirements regarding passenger safety, and in particular:

- type of materials: linings, glazing;
- shapes: no sharp edges, no finger-pinching traps; and
- arrangements: enable passengers to move freely and

Linings and interior arrangements are of modular design and are easily disassembled by the maintenance operators.

Materials and shapes of the linings and interior arrangements are chosen to facilitate cleaning and to prevent dirt from collecting.

The floor covering extends up the lower part of the sidewalls and allows for easy, efficient cleaning of the floor and sealing between the interior and the vehicle structure.

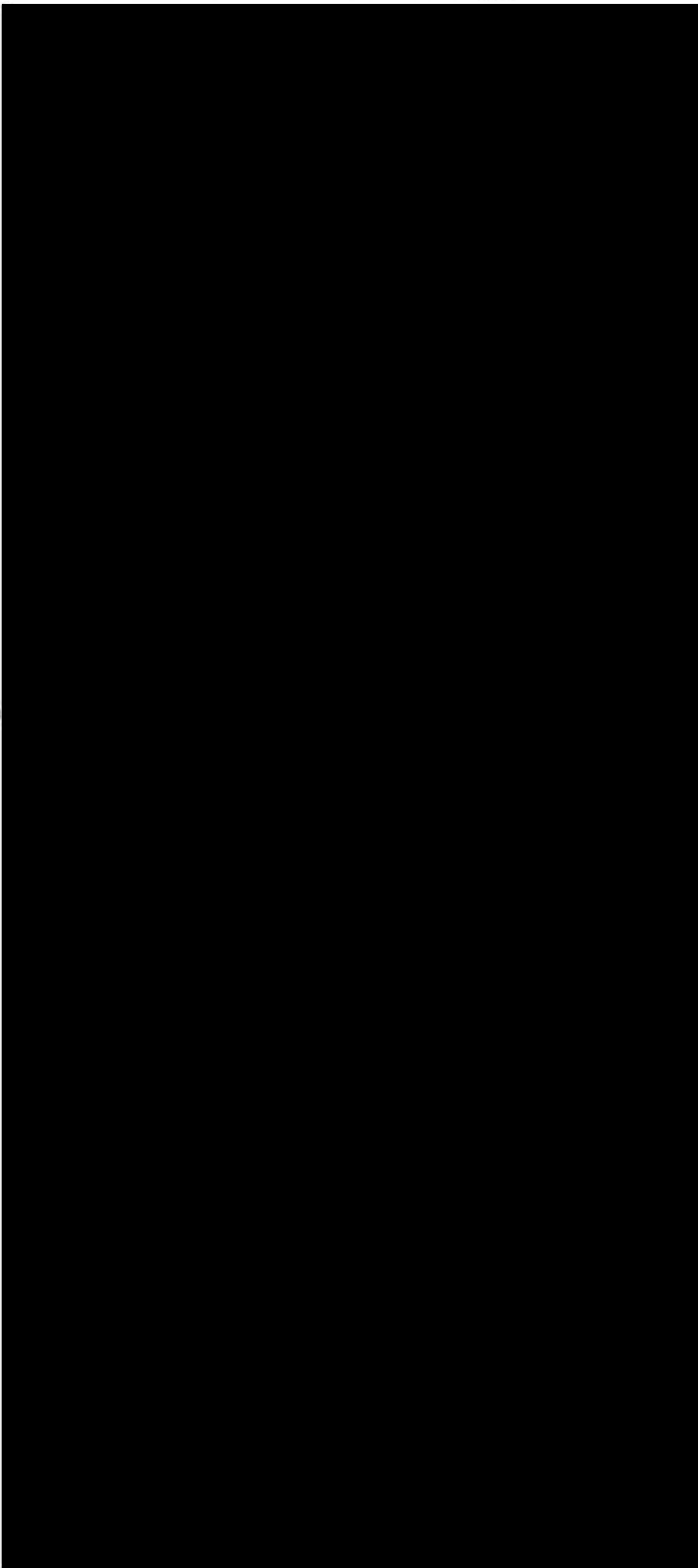
3.2 (r) Heating, ventilation and air conditioning system

Alstom has extensive experience with air conditioning in many varied climates around the world. The products proposed for Sydney will be manufactured by equipment suppliers with extensive knowledge of HVAC for LRVs.

Heating, venting and cooling functions are achieved thanks to roof mounted Heating Venting Air-Conditioning (HVAC) units. Each driver's cab has one separated, independent air-conditioning unit so that the driver may set his or her own individual comfort level.

The HVAC layout is summarised in Figure 33.

Figure 33: HVAC layout





3.2 (s) Door system

3.2 (s) (i) Door status display on driver's desk tactile display and control unit

The status of each door is displayed on the driver's desk tactile display and control unit.

3.2 (s) (ii) Service-side selection

The service side is selected by pressing one of the two illuminated latching push buttons for 'service side selection'. The driver may select no side, one side, or both sides of the LRV.

3.2 (s) (iii) Door opening

Door opening is subjected to the presence of an opening authorisation and an opening control.

The door opening authorisation depends on following three conditions:

- driver has selected a service side (or both sides);
- driver has controlled door unlocking by pressing the 'Unlocking' latching push button; and
- LRV speed lies below 2km/h.

Door opening may be controlled:

- generally, by the driver pressing the 'general door opening' latching push button,
- individually, by passengers pressing a door-opening push button as located on all door leaves inside and outside the LRV in a 'self-service' mode; and
- locally with regard to doors located in the PMR areas, by the driver pressing a key on the driver's desk tactile display and control unit (after having received an opening request via the push button dedicated to mobility-impaired passengers).

The opening of a door is shown in the driver's cab by a 'Door open' indicator light coming on and on the driver's desk tactile display and control unit 'door open' pictogram.

The driver operating the 'door closure inhibition' tactile key prevents the open doors from closing again.

3.2 (s) (iv) Mobility impaired passengers

Wheelchair and mobility impaired passengers may ask the driver to open the doors in the suspended car body module at the next stop by pressing one of the help point buttons provided for this purpose. This operation produces the following sequence:



- the onboard push buttons designed for passengers requiring assistance flashes, and an opening request is displayed on the driver's desk tactile display and control unit;
- the driver acknowledges the opening request on the driver's desk tactile display and control unit ;
- the two push buttons designed for wheelchair-bound passengers stop flashing and come on in fixed mode; and
- at the next stop, the doors for wheelchair-bound passengers open automatically.

The driver may also control for opening of these doors by using the same tactile key on the desk tactile display and control unit when a wheelchair-bound Customer is waiting on the stop platform, even without a previous request being made by a passenger.

3.2 (s) (v) Door-opening push buttons

To open the passenger doors, the driver activates the door-side selection and door unlocking controls for the Stop service side of the LRV. This authorises the Door Control Units located on the side selected for service to activate the interior and exterior indicator lights on the doors and causes them to flash. This informs the passengers that the doors are ready to be opened.

Once a passenger presses the flashing button and activates a particular door, the button becomes a fixed illuminated display while open. The door button indicator lights return to flashing during the door closing phase.

Figure 35 - Door opening push button



Door-opening push button

3.2 (s) (vi) Passenger safety

3.2 (s) (vi) 1 Passage- detection

A photoelectric detection device impedes the door closure as long as a passenger is detected between the posts.

The device is active when the door is closed in self-service mode.

3.2 (s) (vi) 2 Obstacle detection

The obstacle detection system ensures the safety of boarding and alighting passengers. It is made up of a device that detects motor-overcurrent when the door encounters an obstacle during the closing sequence. The safety device causes the door to reopen for approximately one second, and then the door closing sequence recommences.

After five successive reopening cycles, the door opens and remains open. However, the driver may override the door open scenario and force it to close.

The safety device is also active during the door opening sequence. In this case it stops the door leaf movement for two seconds before resuming the normal opening cycle. Upon the third attempt, the door is immobilised at its blocking point until a closing control signal is sent.



3.2 (s) (vii) Door closure

Door closure is achieved either by the obstacle detection being active or by the obstacle detection being inhibited in case of forced closure.

3.2 (s) (vii) 1 Door closure in self-service mode

Door closure in self-service mode occurs automatically three seconds after complete opening or three seconds after the latest detection of passage (photoelectric cells). This closing mode operates with the obstacle detection and passage detection systems.

A visual signal at each door warns when door closure is imminent.

3.2 (s) (vii) 2 Door closure through cancellation of door-unlocking control

Door closure through cancellation of the door-unlocking control by the driver results in the door-opening authorisation disappearing.

The closing sequence in this case is:

- audible and visual (i.e. luminous) signalling in the passenger compartment;
- closure with obstacle detection of active doors in the course of being closed;
- door locking confirmed by the indicator lights on the door push buttons going off;
- doors that are open or in the course of being opened are maintained for three seconds, then closed with obstacle detection being active, then locked.

The audio message for normal door closure is broadcast via all loud speakers of the PA system, in form of a pre-recorded warning announcement.

3.2 (s) (vii) 3 Forced door closure

If at least one door remains open, then the driver may force the door closure using a specific push button control which needs to be sustained by the driver for more than three seconds in order to force the doors to close.

This closing mode is achieved without the passage detection and obstacle detection safety devices described above. The driver will have CCTV footage of the door. The impending closure of the door is signalled to passengers by audible and luminous signals during the first three seconds of the control push button being maintained by the driver.

This push button must remain depressed until the complete closure of all doors on board the LRV.

The forced door-closure sound signal is broadcast via all loud speakers of the Public Address System, in form of a pre-recorded warning announcement.



3.2 (s) (vii) 4 Door customized parameters

Table 17 summarises a list of parameters which can be customised by the maintainer.

Table 17: Customised Door Parameters

No	Description	Default	Range
1	Time delay till closing after switching off 'door enable' (unit 0,5 sec.) 0 = no delay	3 sec.	0-10 sec.
2	Time delay till closing after switching off 'open all doors' or 'MIP open' (unit 0,5 sec.) 0 = no delay	3 sec.	0-10 sec.
3	Time delay for automatic closing ('self service mode') (unit 0,5 sec.) 0 = no delay	3 sec.	0-20sec.
4	Light barrier active during automatic closing cycle (0 = not active / 1 = active)	1	0/1
5	Min. time delay till unlocking during emergency operation (unit 1 sec.) 0 = no delay	15 sec.	0-30 sec.
6	Max. time delay till unlocking during emergency operation (unit 1 sec.) 0 = no delay	60 sec.	0-180 sec.
7	Reopen time after detection of an obstacle during closing (unit 0,5 sec.) 0 = no delay	1 sec	0-10 sec.
8	Number of closing attempts with obstruction detection (0 = infinite attempts)	5 att.	0-10
9	Number of opening attempts with obstruction detection (0 = infinite attempts)	3 att.	0-10
10	Stop time after detection of an obstacle during opening (unit 0,5 sec.) 0 = no delay	2 sec.	0-5 sec.
11	Change of illumination of door open push button during closing sequence 0 = push button steady illuminated / 1 = illumination flashing with 2 Hz	0	0/1
12	Change time delay defined at offset No.6 to time delay defined at offset No.5 for condition: standstill not active and side selection not active (1 = No.6 is changed to No.5)	0	0/1
13	Time delay before start of self service closure warning (buzzer and warning light) (unit 0,5 sec)	1 sec	0-8 sec.
14	Self service closure warning time (unit 0,5 sec)	2 sec.	2-90 sec.
15	Alternating signal interval of warning light during self service closure warning (0,1 Hz)	2 Hz	0,1-25,5 Hz
16	Alternating signal interval of warning buzzer before self service closure (0 = steady signal; 1 Hz steps)	0	0-10 Hz
17	Self service closure warning buzzer activated (ON = 1/ OFF =0)	1	0/1
18	Self service closure warning light activated (ON = 1/ OFF =0)	1	0/1
19	Alternating signal interval of warning buzzer during self service closure (0 = steady signal; 1 Hz steps)	0	0-10 Hz



3.2 (s) (vii) 5 Door-Closure Monitoring

The 'All doors closed' status is monitored by a safety loop. Opening of a door above the 3-km/h speed threshold will immediately trigger Emergency Braking.

As soon as all doors are closed and locked, a sound signal is broadcast in the driver's cab in service, informing the driver that he or she may start, and the 'door open' indicator light goes off.

3.2 (s) (vii) 6 Driver's cab change

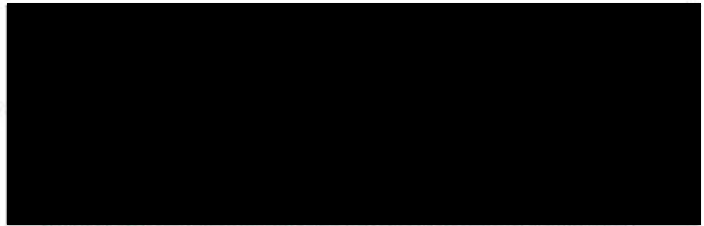
The door control device at the driver's disposal is activated from:

- the driver's cab in service (if any); and
- the driver's cab that was last in service (if no driver's cab is in service).

In this way, when a driver's cab change takes place, the status of door-control devices is maintained until the other driver's cab is set into service.

3.2 (s) (vii) 7 Isolation of a door

When a door is out of order, the driver can lock it out-of-use in order to continue commercial service. The relevant door is then electrically and mechanically isolated.



3.2 (t) Passenger information and communication system

3.2 (t) (i) Display units

The LRV visual display system includes interior and exterior display units. The display units' dimensions allow for easy reading from any place within the LRV and do not hinder passenger movement.

Each vehicle is equipped with six LCD extra-wide screens allowing displaying network and operation information as well as advertisements. One LCD display unit is located in each of the motor cars and two in each of the suspended cars as identified in red in Figure 36.

Figure 36: LCD display layouts



Each LCD is a twenty-nine inch wide profile screen suited to the LRV installation.

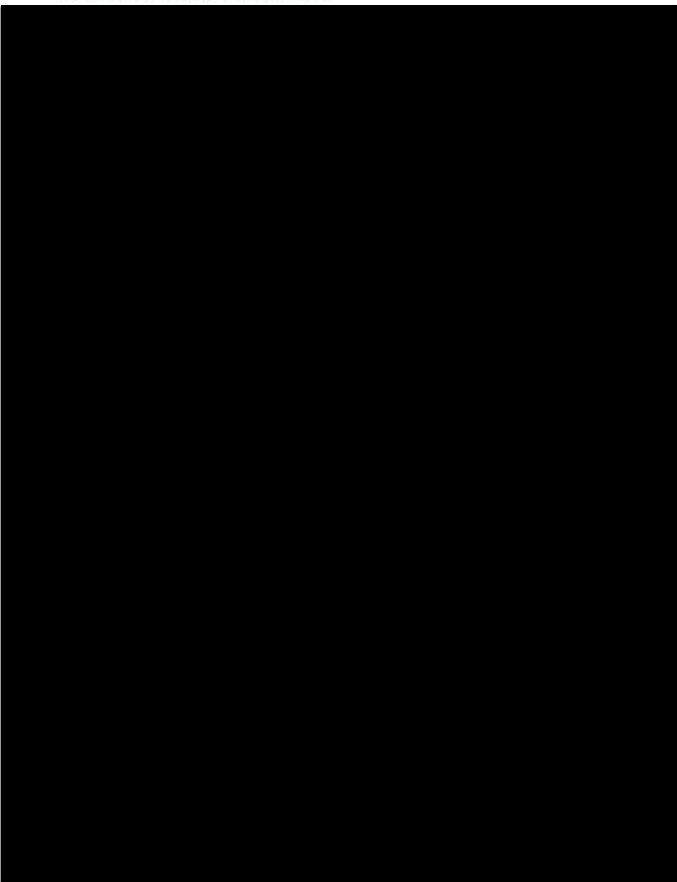
Figure 37 - Wide profile LCD screen



One external facing LED front display is fitted in each driver's cab at the top of the vehicle.

These units display the destination, line number and possibly the code of mission, for public display outside the LRV.

The side external display units mainly communicate the destination to Customers standing outside the LRV. There are two display





units per Motor Car (four per vehicle) – which are integrated into the roof arch areas.

The proposed external display units are equipped with monochrome amber-coloured LEDs and comply with the French Decree dated 13 July 2009 relative to urban public transport vehicles' accessibility for wheelchair-bound and Mobility-Impaired Passengers.

3.2 (t) (ii) Audio announcement system for passengers

Announcement for passengers are broadcast via loud speakers distributed throughout the LRV. The various means of announcement communication to passengers are described hereafter.

3.2 (t) (iii) Broadcast of the OCC/Passenger announcements

Broadcast of the OCC for the attention of the LRV passengers is requested by the OCC via radiotelephone. An audio link is then opened between the OCC and the loudspeakers.

3.2 (t) (iv) Broadcast of Driver/Passenger announcements

On board broadcast by the driver is initiated by pressing the driver/passengers announcement control push button in the driver's cab in service. An audio link is then opened between the driver and the passenger compartment loudspeakers.

3.2 (t) (v) Broadcast of pre-recorded automatic announcements to passengers

Broadcast of pre-recorded announcements via the passenger-compartment loudspeakers is initiated by the Operating Aid Service. Broadcast of such announcements may be enabled by the driver using the 'Pre-recorded automatic announcement broadcast inhibition' push button.

3.2 (t) (vi) Passenger communication system

The following sound signals relative to the doors' function are over-modulated on the basic signal described above, in descending order of priority:

3.2 (t) (vi) 1 Forced door closure warning signal
When the driver sends out a 'Forced door closure' control, a warning signal is broadcast via the passenger-announcement loud speakers. The signal is of 340 Hz, emitted at 1 second per cycle.

3.2 (t) (vi) 2 Door closing signal

When the driver controls the doors to re-lock, a signal is broadcast via the passenger-announcement loud speakers. This signal is a 340 Hz signal, emitted on a continuous basis.

3.2 (t) (vi) 3 Adjustment of interior sound level

The chosen sound level and number of loud speakers ensure announcements are clear at any location in the LRV.

The sound level is automatically adjusted according to the LRV running speed and load. There are six sound levels, of which five depend on the LRV speed, and one on the LRV load conditions.

A table will be developed and validated during the Project phase to enable each LRV running-speed stage to correlate to a specific sound amplification level.

3.2 (t) (vi) 4 Management of pre-recorded messages

Pre-recorded announcements are stored in the Multimedia Central Unit; they come in the form of files that can be modified with the help of a specific message-creating station. Information may be updated from a PC connected to the Central Unit or from the Ethernet port in the driver's cab.

Storage capacity for pre-recorded messages is 800 messages of five seconds each.

3.2 (t) (vi) 5 Devices for hearing-impaired people

For hearing-impaired people, the suspended cars (C1 & C2) are fitted with magnetic induction loops which amplify signals from internal sound system and passenger/driver communication system.

The magnetic induction loops enable sounds to be transmitted in the form of electromagnetic signals, to augment the sound delivered to passengers wearing hearing aids.

The hearing augmentation loop enables Customers to have improved accessibility to the Public Address and Passenger Intercom systems.

3.2 (t) (vi) 6 Intercom on board the LRV

The various functions fulfilled by the Public Address System and equipment related to it are as follows (numbered in order of priority):

3.2 (t) (vii) Passenger/driver Intercom – Help Point

Passengers can make a Passenger/Driver Intercom request by pressing the Help Point push button located next to the doors that are fitted with a Help Point Unit in each allocated space. Intercommunication is then authorised and established when the driver acknowledges the communication request. Operating the Help Point push button allows the driver to authorise as well as to interrupt the connection established in both



communication directions between the passenger and the Passenger Intercom Unit. This bi-directional channel is called Full-Duplex communication.

The Passenger/driver intercom is also enabled by operating an emergency door-unlocking handle.

3.2 (t) (viii) Passengers/Ground Control Station Intercom

In case the driver does not answer to a Passenger/Driver Intercom request, the communication is transferred to the Operations Control Centre after a fixed time delay which will be specified at the Project design stage). The connection between the OCC operator and the passenger via the Passenger-Intercom Unit is in Full Duplex mode.

3.2 (t) (ix) Cab-to-cab intercom

Cab-to-cab intercom is requested by pressing the cab/cab intercom push button, in any one of the driver's cabs. The Intercom is then authorised using the same push button in another driver's cab. Communication between the two driver's cabs is established in Full Duplex mode and is ended by again operating the cab/cab intercom push button from which conversation was requested or authorised.

3.2 (t) (x) Distress call

A distress call push button on the driver's desk allows the driver to inform the OCC in circumstances of distress (such as an attack or the occurrence of a major adverse event).

3.2 (t) (xi) Degraded mode

A degraded mode communication system is provided and may be activated through a manual switch. The system uses ring tones activated in the driver's cabs, allowing the drivers to communicate using a code in case of breakdown of the cab/cab intercom.

Note: The OCC/Driver link is managed by the radio, over an independent link. Priorities with regard to other operation modes must be managed at that level.

There is no automatic priority between broadcast of an announcement by the driver and a request for intercom made by a passenger. In any case, the driver can stop an announcement in progress to change over to intercom communication, or vice versa.

3.2 (t) (xii) Visual information System (Passenger-Information System)

The information shown on the exterior (front and side) display units is stored in the Multimedia Central Unit, which controls all display units and is initiated by the Operating Aid System.

In nominal mode, the Operating Aid System is in charge of initiating the audible and visual messages on the LRV.

The 'message-creating station' allows the message data base to be implemented and target(s), type and characteristics to be related to each individual message.

If the Operating Aid System fails or is unavailable, the display units can be controlled manually by the driver, from the driver's desk by selecting a service message from a list. The driver can select the destination which will then be displayed on all display units.

This information can be updated from a laptop connected to the Central Unit or the Ethernet socket in the driver's cab.

3.2 (u) Passenger counting system

This system is composed of the following components:

- one UCD (unit of data concentration) per vehicle;
- one sensor above each door (stereoscopic video type); and
- one DPF (closing door detection) captor per door.

The stereoscopic sensor uses two cameras which create a 3D model of the counting zone. The sensor starts to count as soon as the door is open, and continues until the doors are completely closed again, detected by the DPF captor.

Figure 38 - Passenger Counting System



The UCD records and stores the data files which are kept for several months. They are categorised by LRV location on the line, date and LRV direction. The data can be transmitted via the Ethernet network by the board/ground link in the maintenance facilities.

Using the following formula, the passenger counting system achieves 95% accuracy:



$\frac{[(\text{Number of passenger counted}) - (\text{real number of passenger})]}{(\text{passenger capacity of the vehicle})}$

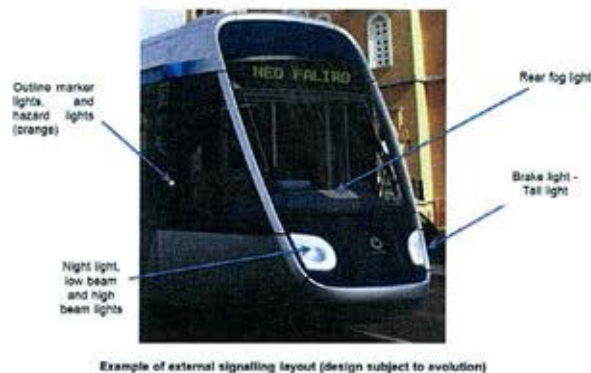
3.2 (v) Signalling and vehicle control

3.2 (v) (i) 1 Exterior signalling

Exterior signalling (both visual and acoustic) comprises:

- on the LRV front ends:
 - two lighting units on the driver's cab front, integrating the low-beam and high-beam functions;
 - two lighting units on the driver's cab front, integrating the tail light (red tail lights) and brake lights; and
 - one rectangular fog light.
- On the LRV side walls:
 - 12 orange volume lights (six per sidewall: outline marker lights and signal warning lights).
- In the underframe area of each LRV:
 - one electrically controlled horn signal; and
 - one sound warning system of the electronic bell type.

Figure 39: Example of external signalling layout (design subject to evolution)



Example of external signalling layout (design subject to evolution)

Tail light operation

When the LRV is un-prepared, and provided the battery is not isolated, the red LED tail lights are supplied on both ends of the LRV. In this case, the signal warning lights, electric bell and horn can be operated from any of the driver's cabs.

When the battery is fully charged, the LRV can be maintained in this state for at least two days with tail lights on.

When a driver's cab is set into service, the red tail lights of the cab at the front end switch off in forward running, and the red tail lights on the rear end cab remain on.

Brake lights

During braking, the two red brake lights switch on. The brake lights also operate at zero speed if braking control is maintained by the driver through the Master Controller, if the magnetic track brakes control push button is pressed and in case of emergency braking or safety braking.

Low beam and high beam

The low beam/high beam are controlled from the driver's cab during services by means of a two-position switch on the driver's desk. Lights are operated according to the running direction of the LRV.

As soon as the headlights switch in the driver's cab in service is switched to the low-beam position, low beam is displayed in the driver's cab in forward running mode. In high beam position, the high beams come on in the driver's cab in forward running mode.

A high-beam flash signal push button is also at the driver's disposal as soon as night lights, low-beam or high-beam lights are activated from the driver's cab in service.

Fog lights

The fog lights are controlled in reverse running mode by the driver using a fog light push button in the driver's cab in service. This control will be effective provided that the night lights, low beam or high beam are activated.

The rear fog light also comes on when the magnetic track brakes are controlled manually or in case of a braking control being underway.

Selecting the reverse running mode causes the fog light of the driver's cab in service to come on.

Marker lights and signal warning lights

The orange lights denoting that signal warning lights are functioning are operated from a central unit:

- either by the driver, using a push button located in the driver's cab; or
- automatically, when LRV speed is less than 3km/h and an emergency door-unlocking handle is activated.

The orange lights (ensuring marker light functions are all on in fixed mode as soon as the night lights, low beam or high beam are engaged) are controlled from the driver's cab during service.

Horn

The horn and electric bell in each driver's cab may be operated locally, from the driver's desks, by



pressing the electric bell or the horn impulse push button.

3.2 (v) (i) 2Rear vision cameras

An exterior surveillance system is installed onboard the LRVs; designed for observation of the vehicle sides. The driver may choose between observing both sides at the same time or monitoring the two ends of one side.

The system is includes the following equipment, installed in each LRV:

- two colour video cameras, located on either side of the driver's cab; and
- two colour video monitors (brightness able to be adjusted) per driver's cab.

The device allows the driver to visualise the chosen service side at the station and within the platform clearance areas:

- if the selected service side is the right hand side, the front right and rear right cameras are connected to the monitors;
- if the selected service side is the left-hand side, the front left and rear left cameras are connected to the monitors; and
- if no side is selected, or both sides are selected, the front left and front right cameras are connected to the monitors.

When the LRV runs outside the platform clearance area, the monitor in the driver's cab in service is, by default, in standby. The driver can choose to visualise the images of the cameras, on the driver's cab in service between the stations: the front-left and front-right cameras are connected to the monitor.

Rear vision camera footage is recorded by the CCTV recorder.

3.2 (v) (i) 3LRV standstill and un-preparation

The LRVs are 'un-prepared' by pressing the dedicated push button in the driver's cab in service, or from any cab if none is in service. Un-preparation is possible regardless of the selected driving mode.

A new preparation operation will be possible only when the LRV is in neutral status (i.e. no driving mode selected, no preparation control from one or the other driver's cab underway).

LRV un-preparation results in application of the parking brake.

After LRV un-preparation, the following systems remain supplied with power for 30 minutes on a time delay:

- operating aid system;

- radio telephone drawer; and
- equipment designed to maintain the Ethernet in operation.

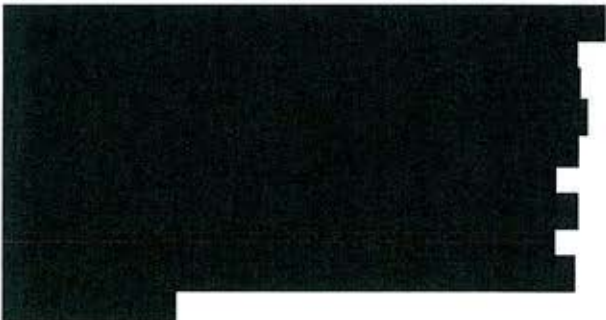
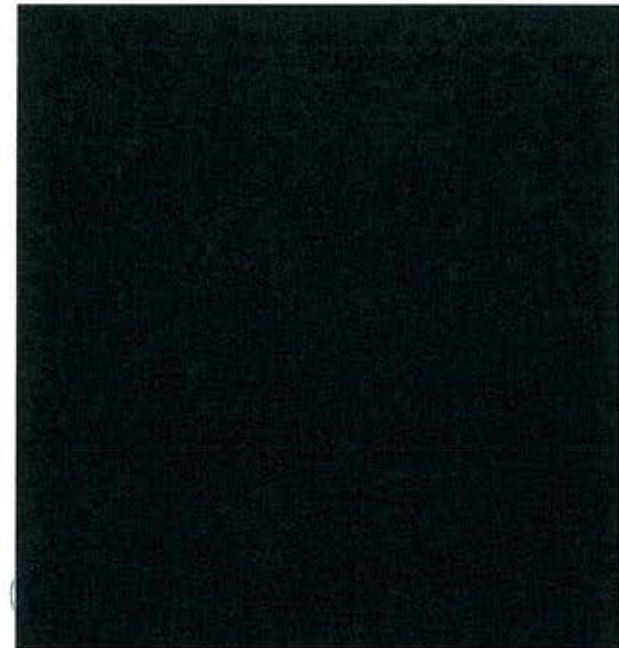
Note: alarms and events of the LRV supervision system can only be downloaded after un-preparation of the LRV.

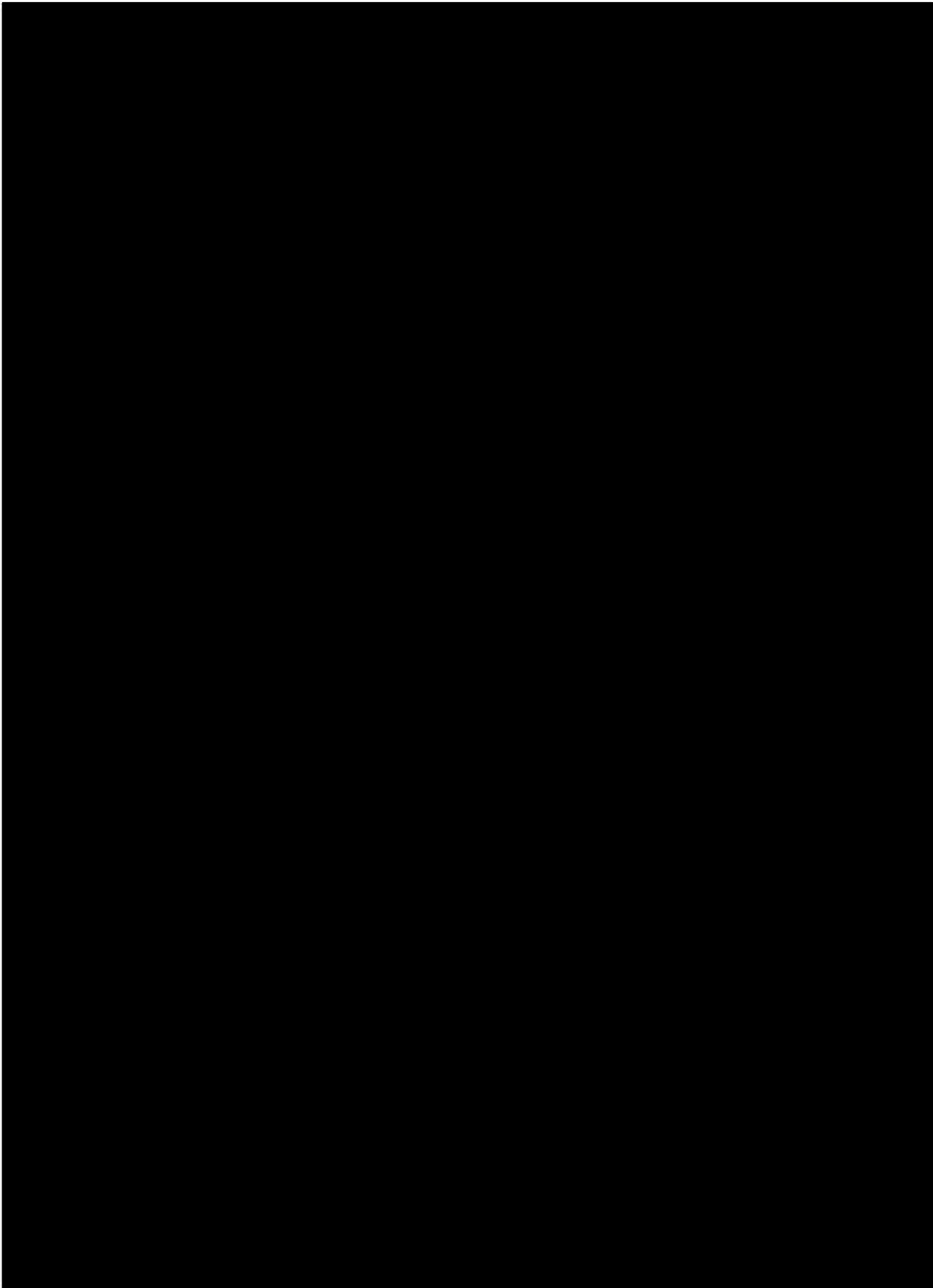
The video-surveillance recorder is stopped as soon as the LRV is un-prepared.

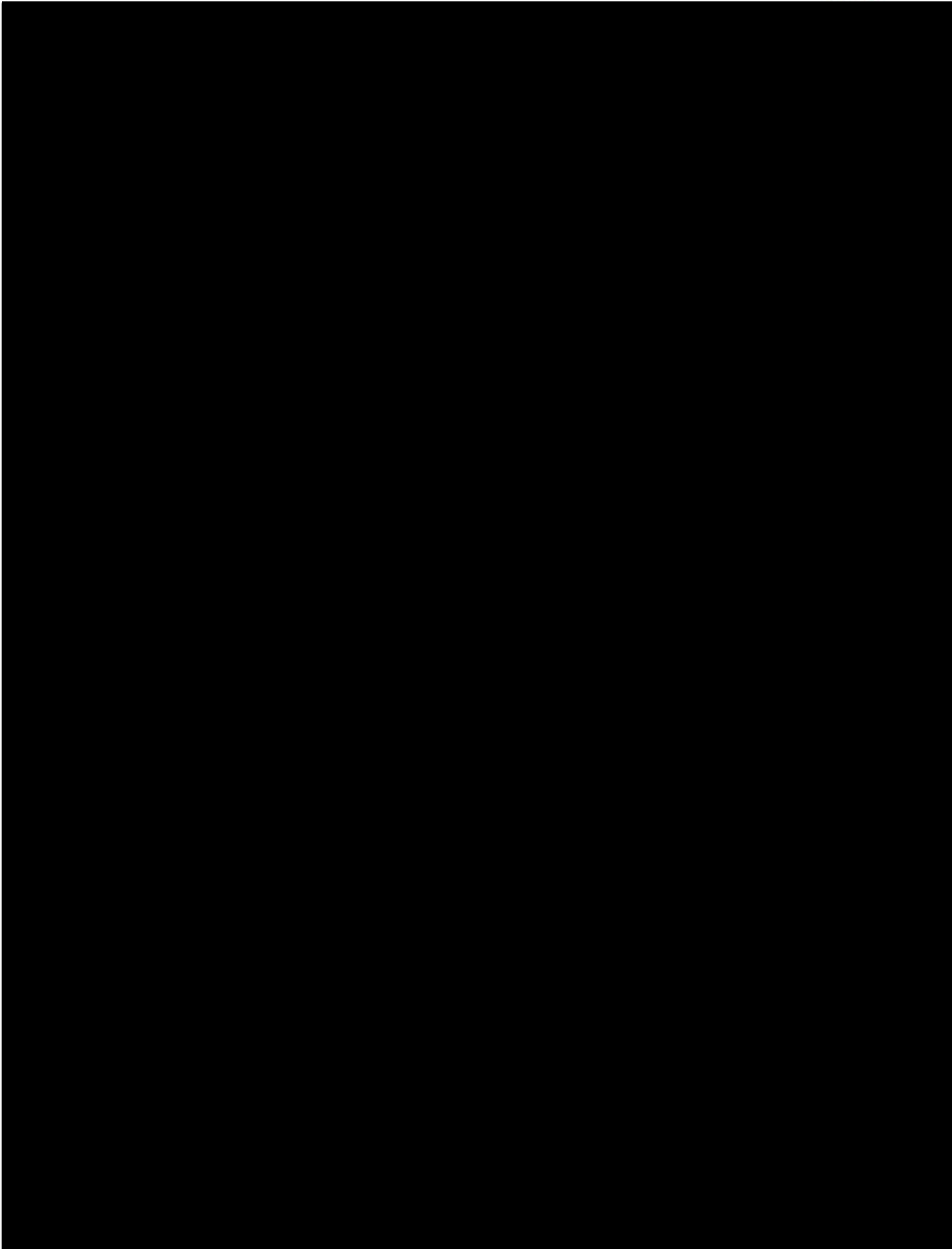
3.2 (v) (ii) Vehicle control

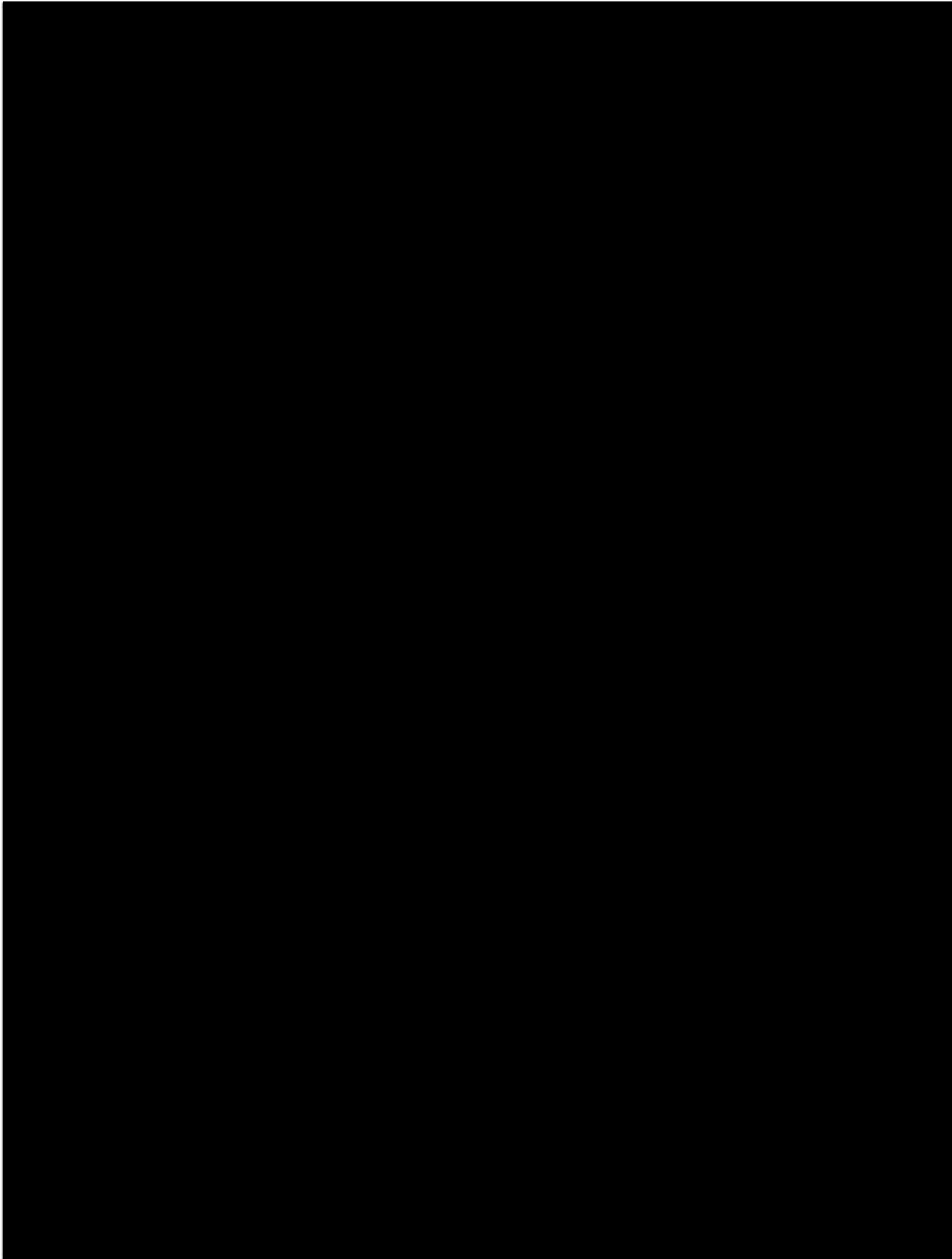
The LRV driving and commercial operation functions are presented according to the chronology of their utilisation onboard the LRV.

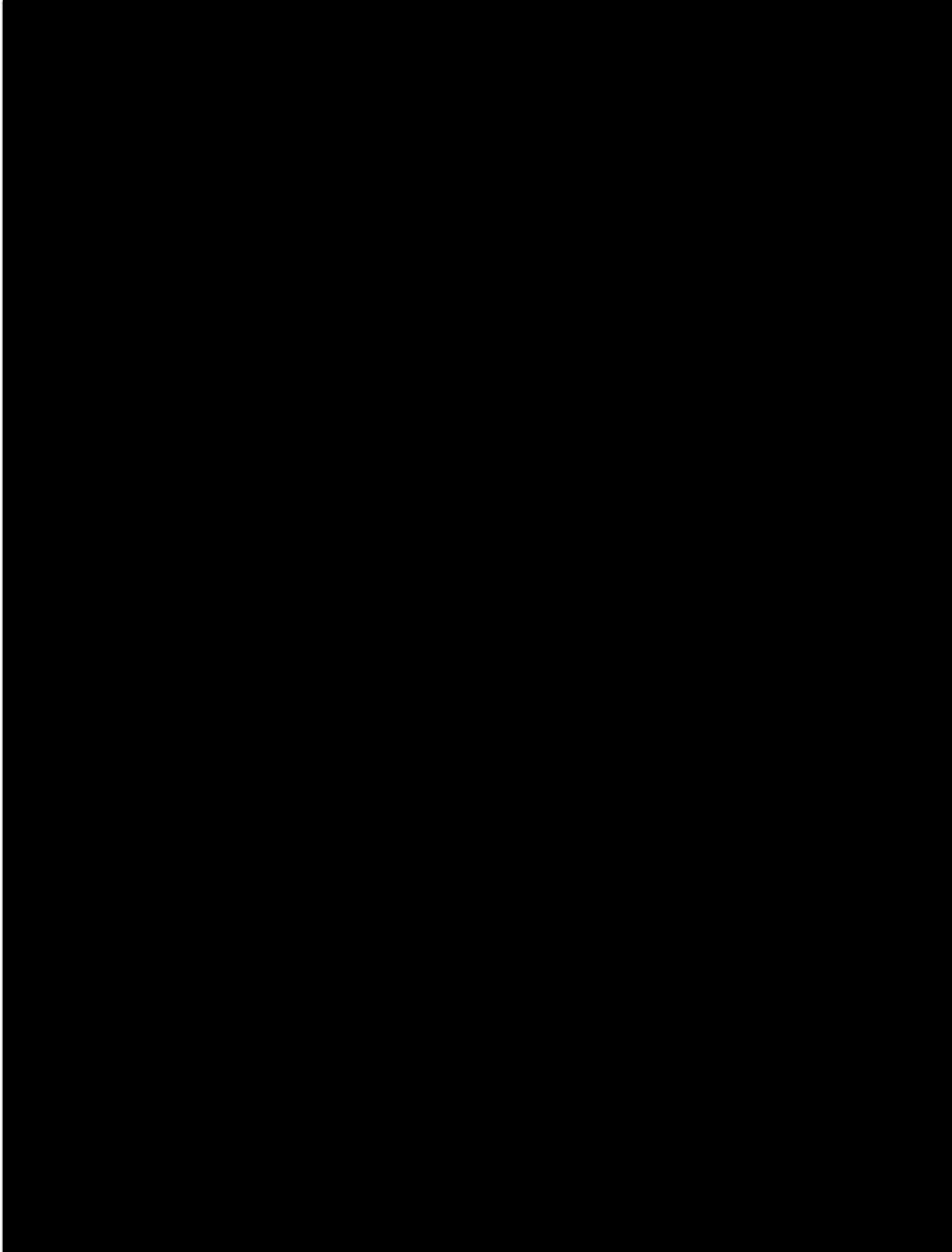
3.2 (v) (ii) 1 Access to the LRV

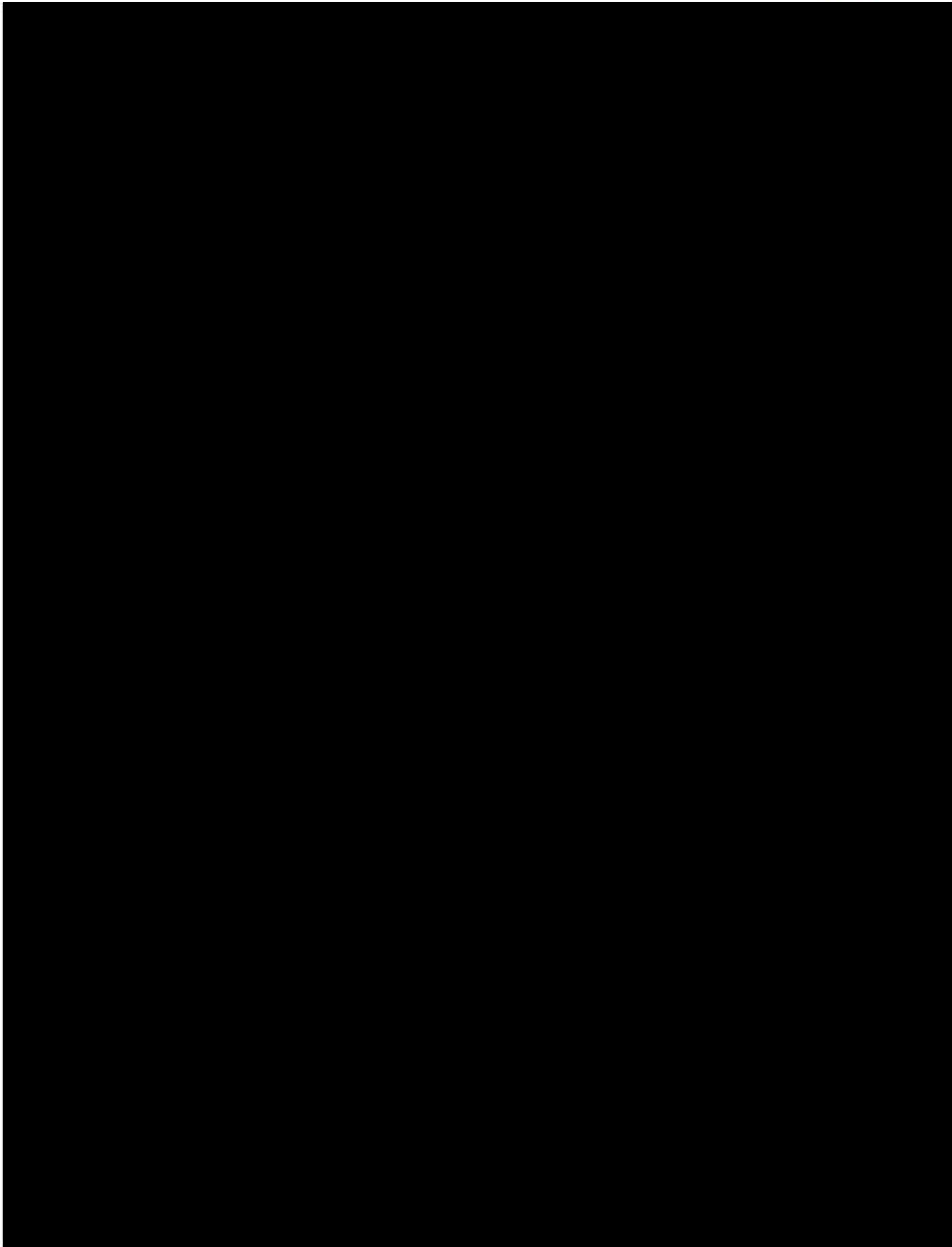


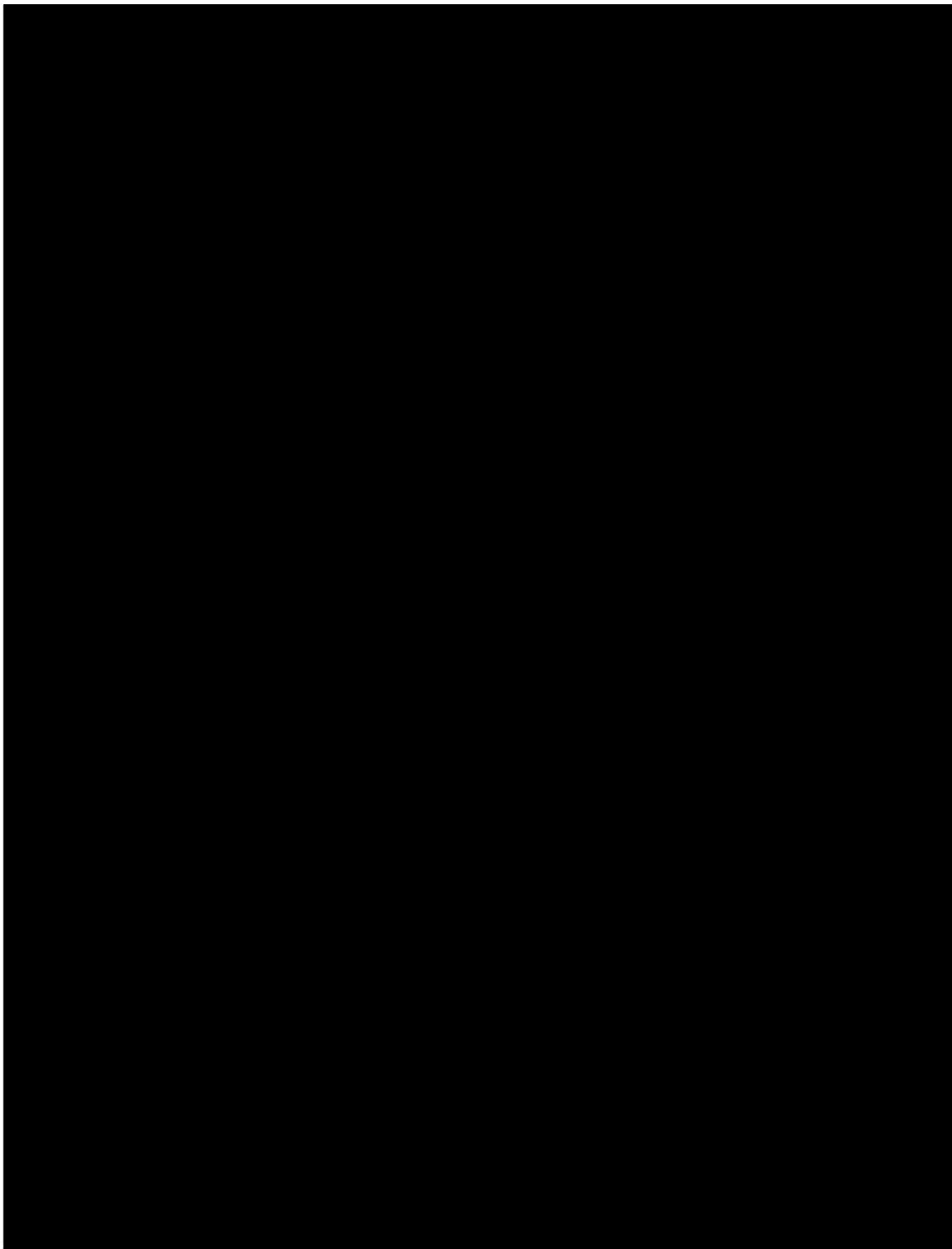


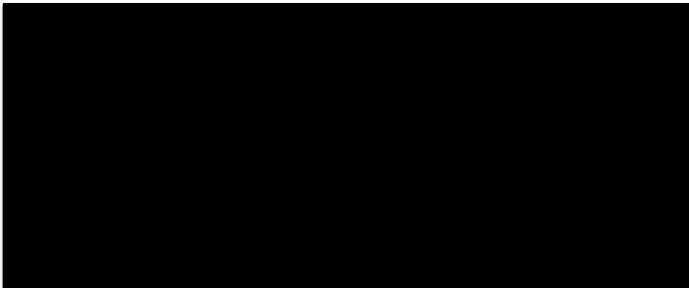












Thermal comfort

The ventilation, heating and cooling functions are provided by means of one air conditioning set per cab installed in the ceiling of the driving cab. It is independent from the air conditioning system of the passenger compartment.

This air conditioning set comprises:

- a cooling circuit, using a homologated cooling fluid compliant with current applicable European standards and the Montreal protocol concerning substances detrimental to the ozone layer; and
- an air conditioning circuit

Main characteristics

Cooling capacity is 4.5 kW.

Maintenance

The air conditioning set is equipped with a programmable card for updating the software to ensure the following maintenance activities:

- fault analysis by connecting the cab maintenance socket;
- initiation of the automatic test cycle for the air conditioning/high voltage heating/ventilation ;
- reading the temperature of each sensor; and
- updating the air conditioning set software.

All HVAC components are accessible from the roof by removing the polyester cover above the driving cab. The air conditioning unit is a one-piece installation which can be quickly removed by an overhead crane or hoist.

Air ventilation circuit

The air in the driving cab is constantly refreshed, irrespective of the active automatic mode. The rate of fresh air inflow varies from 30m³/h to 50 m³/h.

The processed air flow is filtered and air-conditioned in ranges between 350 m³/h at the low rate and 500 m³/h in the assisted ventilation mode.

The cab is maintained at a constant temperature throughout, to assist with de-misting the windscreen and side windows.

The air intake is through the roof of the driving cab.

Air conditioning control system

The temperature and air flow inside the cabs is adjusted by manual control. Selection options include halted/ at low speed/ at normal speed

The maintenance teams can set the mean operating temperature at 21°C or 24°C. The driver can modulate this temperature.

Operation of the cab air conditioning system is monitored. Any defect that occurs in the set is sent to the Train Control Monitoring System (TCMS) and displayed on the driver's console.

3.2 (y) (iv) Maximum visibility of the environment outside the cab – the best guarantee for safety

3.2 (y) (iv) 1 A windscreen offering a field of view of 180°

The large glazed area and slim pillar design of the cab provide to the driver with optimum visibility to oversee the safe operation of the LRV and the external environment.

The cab windscreen is 9 mm thick laminated safety glass about as follows:

- one sheet of PARSOL tinted annealed glass on the outside;
- one intermediate sheet containing a heating network; and
- one annealed glass sheet on the inside.

The cab windscreen complies with standard NF F 15 818. The impact strength of the windscreen is has been assessed by the UIC projectile shock test.

The cab side windows are in 8mm thick safety glass about and consist of:

- a tinted annealed glass sheet on the outside;
- an intermediate PCB sheet' and
- an annealed glass sheet on the inside.

The side windows comply with standard NF F 31 250

The shade of the PARSOL VERT glass matches that of the glazing of the windows and access doors of the passenger compartment. A silk screen print is applied around the perimeter of these glazed sections to protect the bonding agents from attack by ultraviolet radiation and to improve the appearance. These windows are bonded onto a polyester cell. This mounting system is a proven industrial process which has been in use for more than 15 years but which also allows for quick and easy glass replacement.



3.2 (y) (iv) 2 De-icing and de-misting

The central section of the windscreen is fitted with a heating network of approximately 1.5m² in area and supplied with 24 volts. Its filaments are directed vertically and the specific power of the network is approximately 3.5W / dm². In addition, the incoming air from the cab air conditioning helps to de-mist the side windows and increase the windscreen mist and ice-free area.

3.2 (y) (iv) 3 Windscreen wiper and washer

The windscreen is equipped with a single blade wiper that returns to the vertical position when not in use. It also comprises a washing fluid tank with a capacity of about 6 litres which is accessible from the outside.

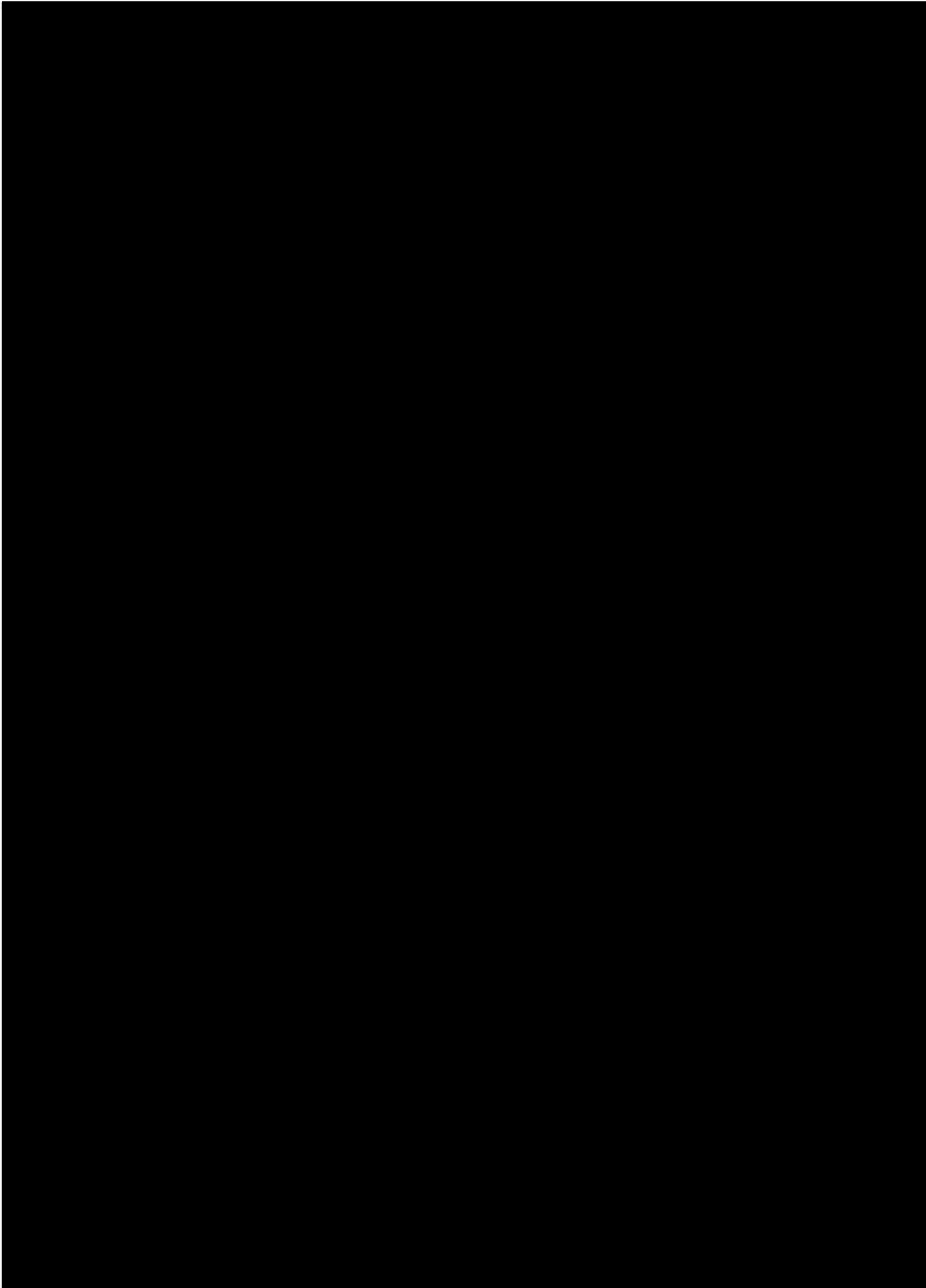
Figure 47: Windscreen wipers

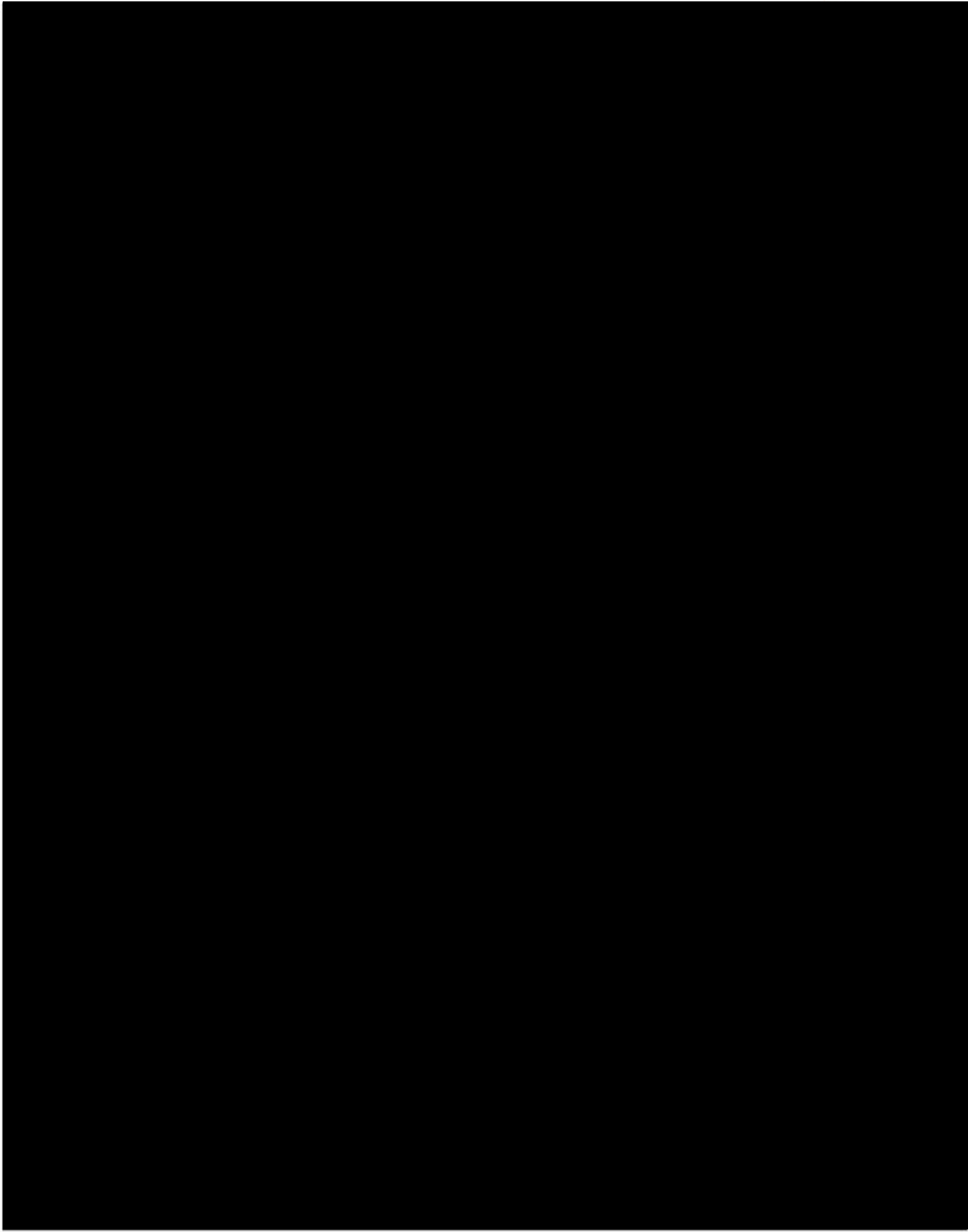


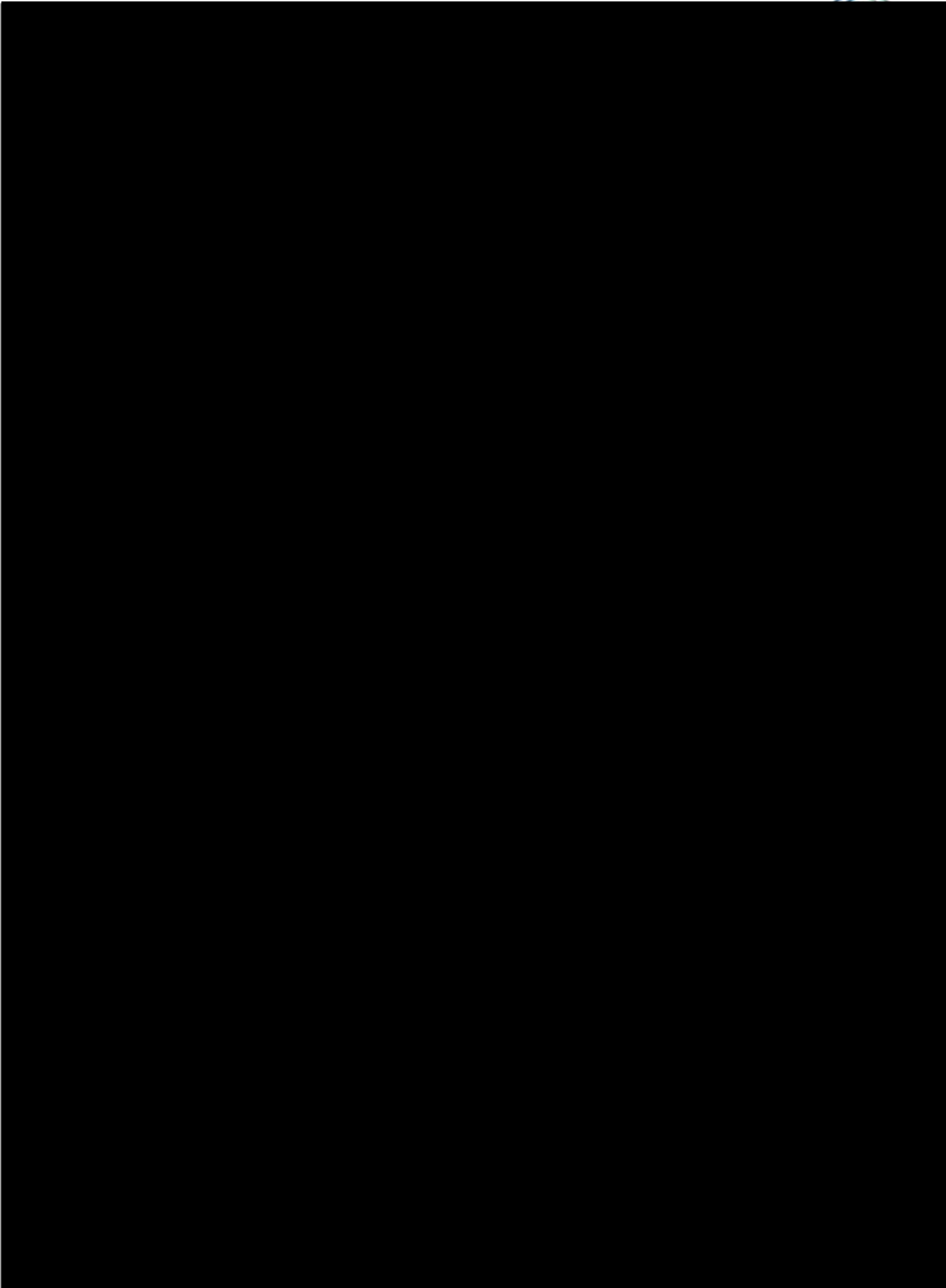
3.2 (y) (iv) 4 Protection against solar radiation by blinds and films

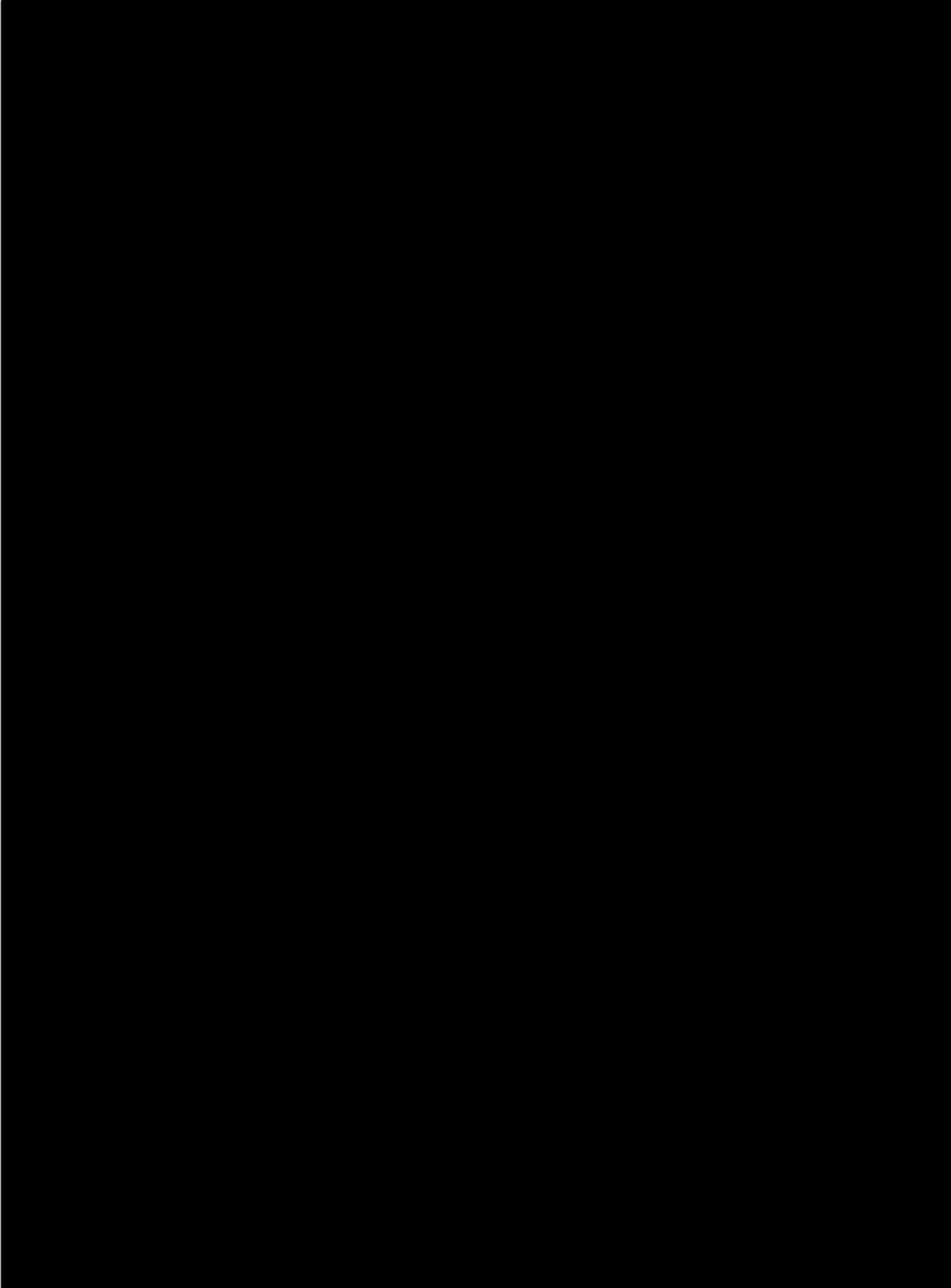
Regardless of the position of the sun, the driver is protected from glare. The front section of the windscreen is equipped with a sun blind in fabric that winds up onto a cylinder equipped with a pawl and return spring. The sun blind is raised and lowered by moving its bar which is maintained in position by the natural weight of the bar. The fabric is kept stretched on this bar, the ends of which are guided by two side cables.

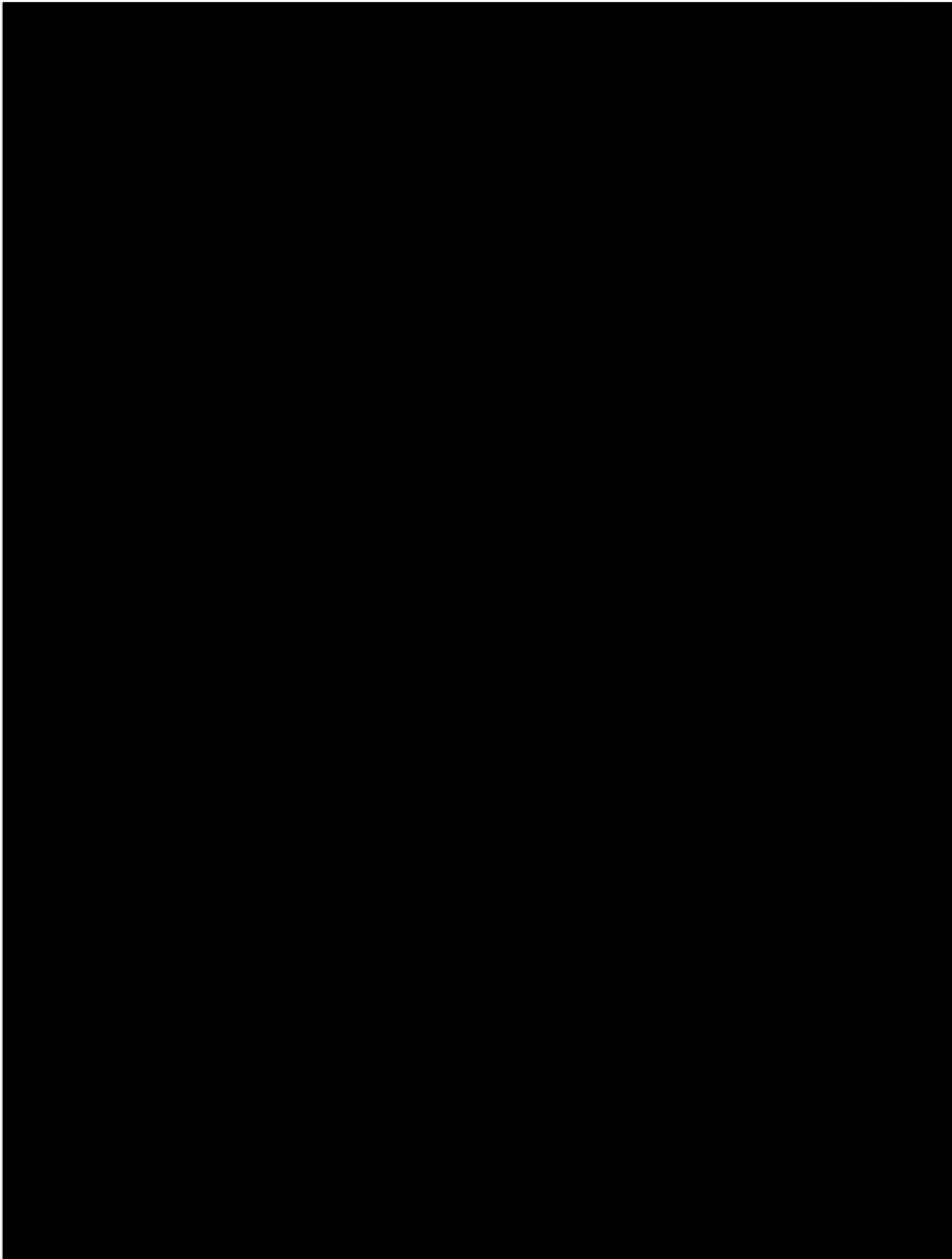
The sun blind can be actuated manually by the driver in a standing position.













3.3 Requirements of SLR PPP Volume 2, (b) – (g)

3.2 (gg) List of Internationally Recognised Standards

The Citadis LRV complies with the standards outlined in Table 19.

Table 19: International rolling stock standards

Reference	Title
UIC 651	Composition of driving cabs of railcars and pilot vehicles.
ISO 3095	Railway applications. Acoustics. Measurement of noise generated by vehicles running on rails.
ISO 3381	Railway applications. Acoustics. Measurement of noise generated inside vehicles running on rails.
DIN 51130	Tests on floor coverings – determination of grip factor.
CEI 60085	Assessment of electrical insulation heat-resistance class.
CEI 60571	Electronic equipment used for railway applications.
ISO 2631-1	Vibrations and mechanical impacts. Assessment of exposure of personnel to vibrations.
ISO3744	Acoustics – determination of acoustic power levels generated by noise sources from pressure. Method of estimation under condition approaching those in a free field impacting a reflecting plane.
ISO9614	Acoustics – determination by noise level meter of the acoustic power levels released by noise sources.
ISO 7626-5	Shock and vibrations – experimental determination of mechanical mobility – Part 5: Measurements using impact excitation with an exciter which is not attached to the structure
EN 15595	Braking equipment – anti-seizure.
UIC 564-2	Rules governing protection and fire fighting in railway vehicles in international service; carriage of passengers or assimilated vehicles.
UIC 565-3	Rules governing fitting-out of vehicles, also suitable for carriage of disabled persons in wheelchairs.
CEI 60077-1	Railway applications – rolling stock electrical equipment – Part1: General service conditions and rules of good practice.
CEI 60077-2	Railway applications – Rolling stock electrical equipment – Part 2: Electrotechnical components – General rules applicable.
CEI 61287-1	Railway applications. Power converters installed aboard rolling stock. Part 1: characteristics and testing methods.
"Arrêté du 13 Juillet 2009"	Accessibility of urban guided transport vehicles for handicapped or disabled persons.
"Guide Technique"	STRMTG: Ergonomics of driving positions of LRV – Specification of loads.



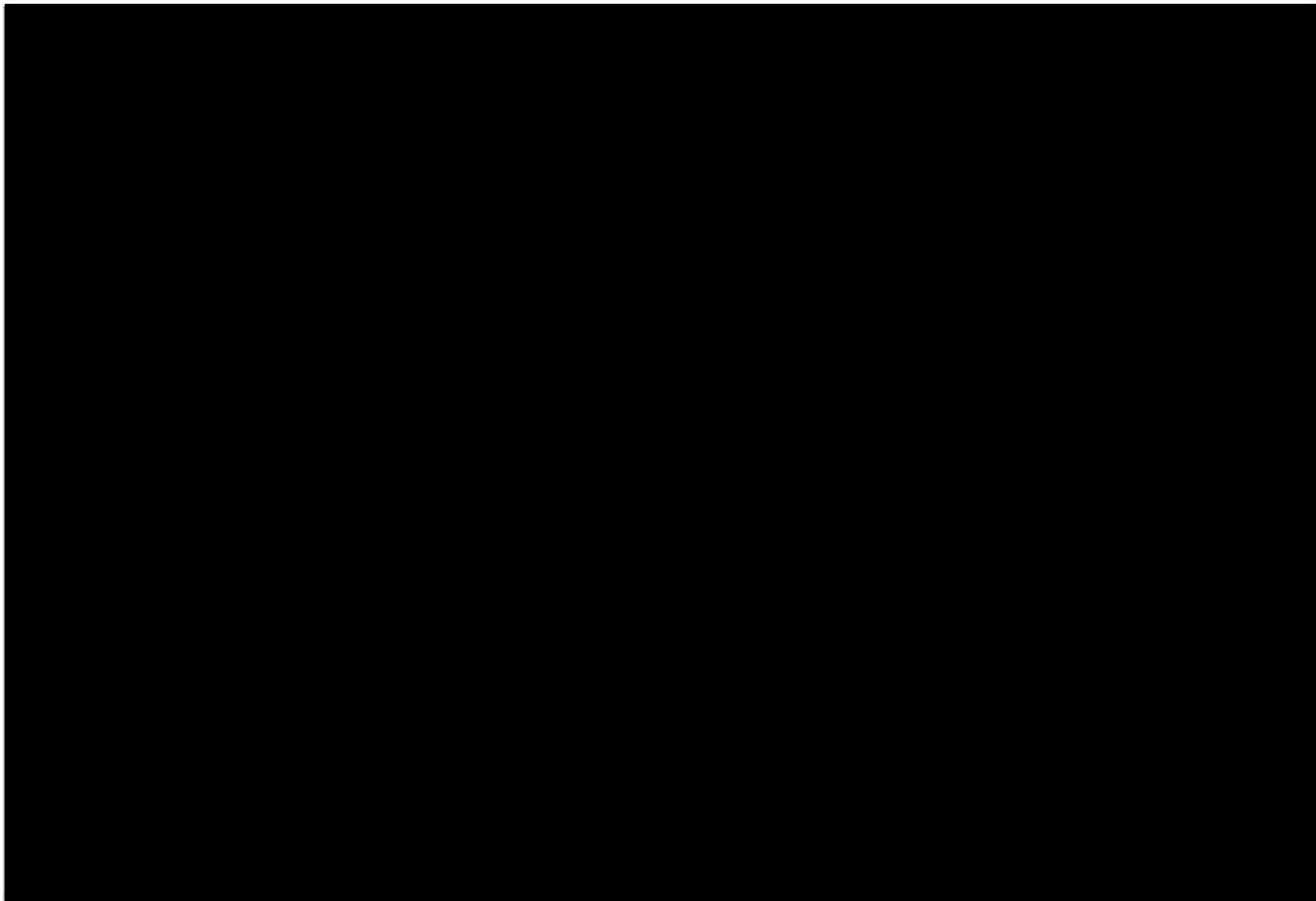
Reference	Title
EN 12-663	Railway applications – strength of railway vehicle structures.
EN 13272	Railway applications. Electrical lighting facilities for rolling stock of public transport systems.
EN 13306	Maintenance terminology.
EN 13452-1	Railway applications. Braking – braking systems of urban and suburban transport facilities. Part 1: Performance requirements.
EN 13452-2	Railway applications. Braking systems of urban and suburban transport facilities. Part 2: Testing methods.
EN 13749	Railway applications – axles mounted and bogies – methodology for specifying the strength of the bogie frame structures.
EN 14363	Railway applications – testing for the acceptance of running characteristics of railway vehicles.
EN 14738	Safety of machines – anthropological requirements governing the design of driving positions on machines.
EN 14750-1	Railway applications. Air conditioning for rolling stock for urban and suburban equipment. Part 1: Comfort parameters.
EN 14750-2	Railway applications – air conditioning for rolling stock for urban and suburban equipment - Part 2: Type tests.
EN 14752	Railway applications – rolling stock access door systems.
EN 14813-1	Railway applications – air conditioning driving cabs – Part 1: Comfort parameters.
EN 14813-2	Railway applications – air conditioning driving cabs – Part 2: Type tests.
EN 15227	Railway applications – passive safety requirements with regard to collision for their structures of railway vehicles.
EN 50124-1	Railway applications. Coordination insulation parameters. Part 1: fundamental requirements – Insulation distances in air and leakage lines for all electrical and electronic equipment.
EN 50124-2	Railway applications – coordination of insulation - Part 2: Overvoltage and the relevant protection systems.
EN 50125-1	Railway applications – hardware environment requirements – Part 1: Equipment mounted aboard rolling stock.
EN 50126-1	Railway applications – specification and demonstration of reliability, maintainability and safety – Part 1: Basic requirements and generic procedures.
EN 50128	Railway applications – Signalling telecommunication and processing systems – Railway control and protection software programs.
EN 50129	Railway applications – signalling telecommunication and processing systems. Electronic safety systems for signalling.
EN 50153	Railway applications – rolling stock – measures for protecting electrical danger sources.

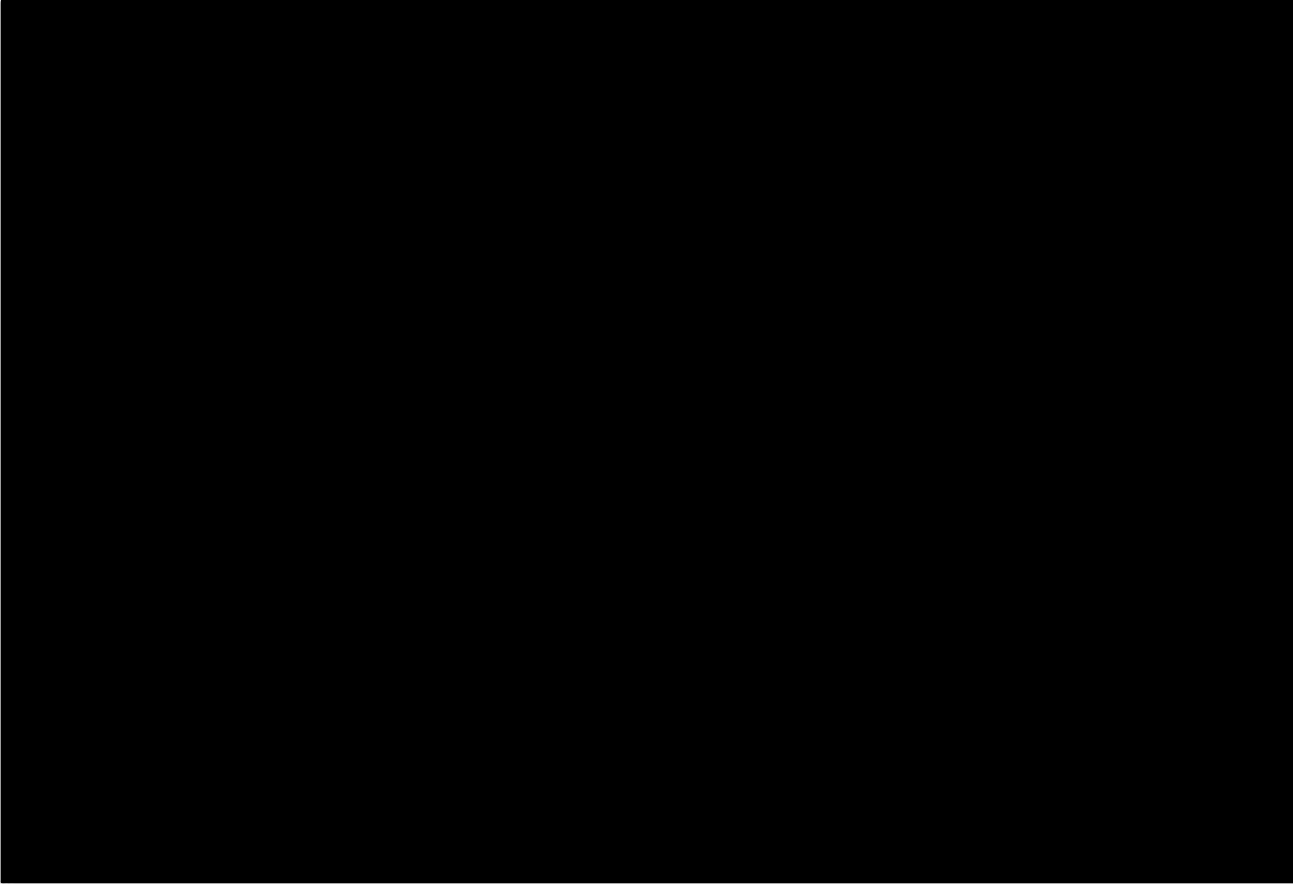


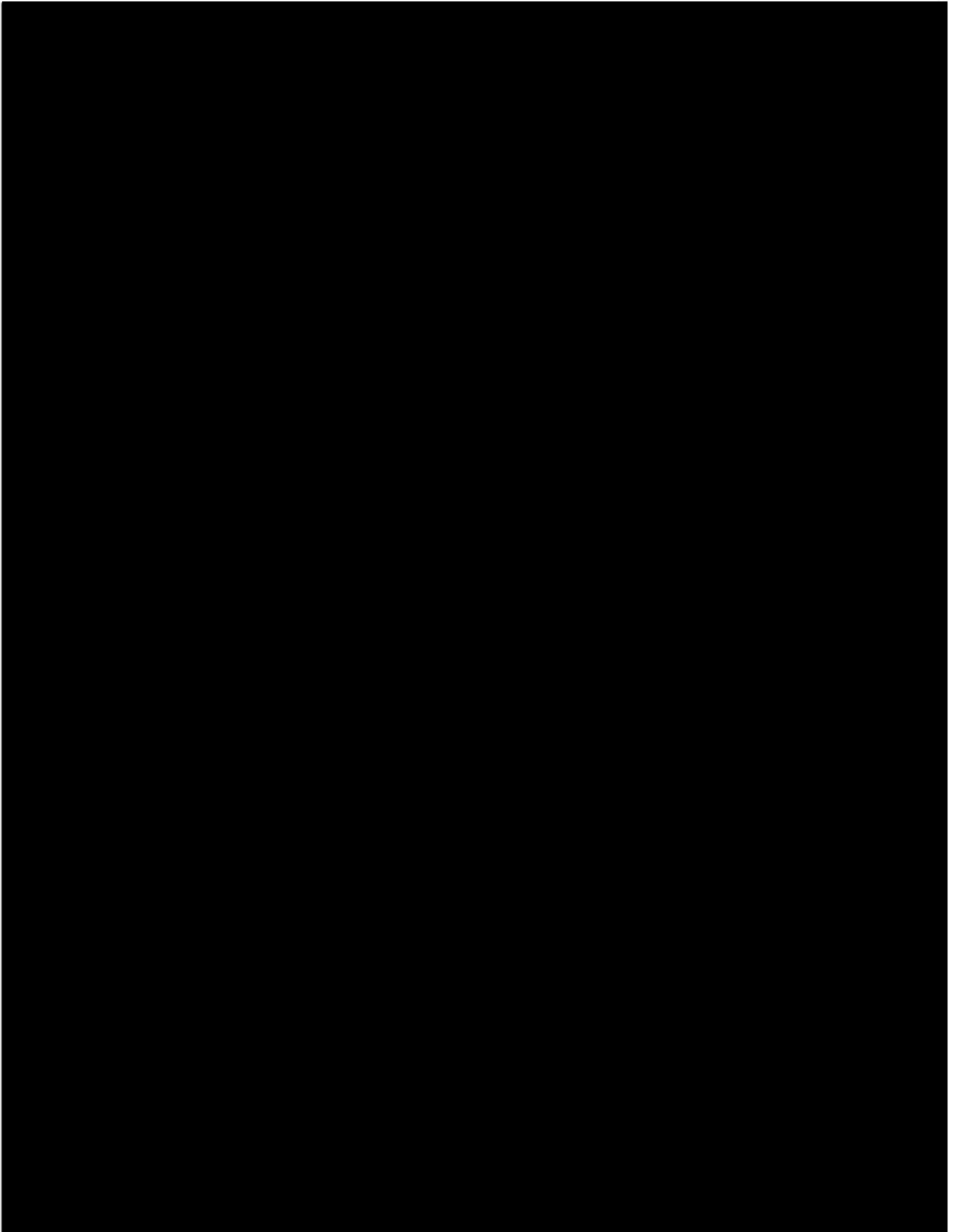
Reference	Title
EN 50155	Railway applications – electronic equipment used of rolling stock.
EN 50163	Railway applications – traction networks supply voltage.
EN 50206-2	Railway applications – pantographs
EN 50215	Railway applications – tests on rolling stock after completion and introduction into service.
EN 50264 parts 1 to 3	Railway applications – railway rolling stock power and control cables having special fire performances
EN 50306 parties 1 à 4	Rolling stock equipment – cables for railway rolling stock with special fire behaviour parameters – thin insulation.
EN 50343	Railway applications – rolling stock – wiring installation rules.
EN 50643	Railway applications – energy measurement on board train.
EN 60349-2	Railway applications – spinning machines of railway and road haulage vehicles – Part 2: AC Motors supplied by power converters.
EN 61373	Railway applications – vibration resistance of electrical and electronic equipment – shock and vibration tests.
EN 894-1	Safety of machines. Ergonomic specific actions for the design of signalling devices and service equipment. Part 1: general principles.
NAS 1638	Aerospace industries association of America, Inc – cleanliness requirements of parts used in hydraulic systems
NF EN 50-121-3-2	Railway applications – electromagnetic compatibility.
EN 50121-1 (IEC 62236-1)	Railway applications – electromagnetic compatibility Part 1: General.
EN 50121-3-1 (IEC 62236-3-1)	Railway applications – railway applications – electromagnetic compatibility Part 3-1 : rolling stock – trains and complete vehicles
EN 50500	Railway applications – procedures for measuring magnetic field intensities with regard to exposure of passengers and personnel.
NF F 01-301	Rolling stock equipment – weights and loads of power vehicles and passenger trailer vehicles.
NF F 01-303	Rolling stock – pictograms to identify attachment/lifting points for holding and lifting operations.
NF F 01-305	Rolling stock – reliability; concepts of availability and maintainability
NF F 15-818	Rolling stock – front glazing
EN 45545	Rolling stock – fire behaviour / protection and fire-fighting - choice of materials.
EN 50553	Rolling stock – Rolling capability requirements in the event of outbreak of fire aboard railway vehicles.
NF F 19-141 parts 1 and 2	Rolling stock – Protection and decoration by paint of the structure of vehicles and their constituents
NF F 31 118	seats

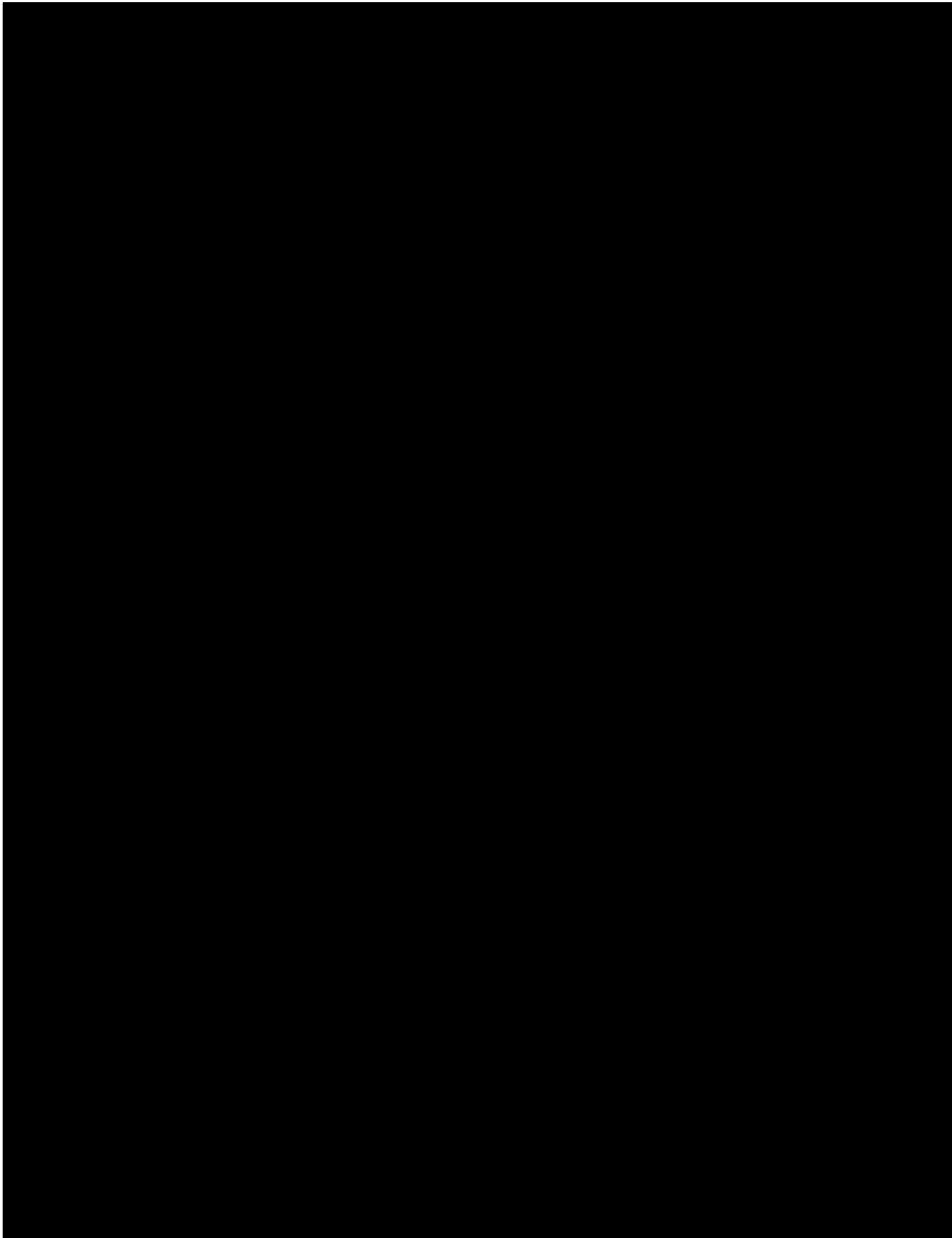


Reference	Title
NF F 31-119	Rolling stock – behaviour of seats in the presence of static loads, fatigue stresses, vibration and shock.
NF F 31-129	Rolling stock – hardened safety glazing
NF F 31-250	Rolling stock – laminated safety glazing
EN50343	Railway applications. Rolling stock. Rules for installation of cabling
EN 50264	Railway applications. Railway rolling stock cables having special fire performance. Standard wall.
NF F 64-018	Electrical accumulators – Nickel – cadmium open rechargeable cells.
NF P 90-106	Floor surfacing for sports activities – measurement of slip of a surface by means of a friction pendulum.
EN 60529	Specification for degrees of protection provided by enclosures (IP code)
ISO 3864	International standards for safety symbols
ISO 9223	Corrosion of metals and alloys. Corrosiveness of atmospheres. Classification, determination and estimation.
X 35-002	Anthropometrical models of the female and male population.









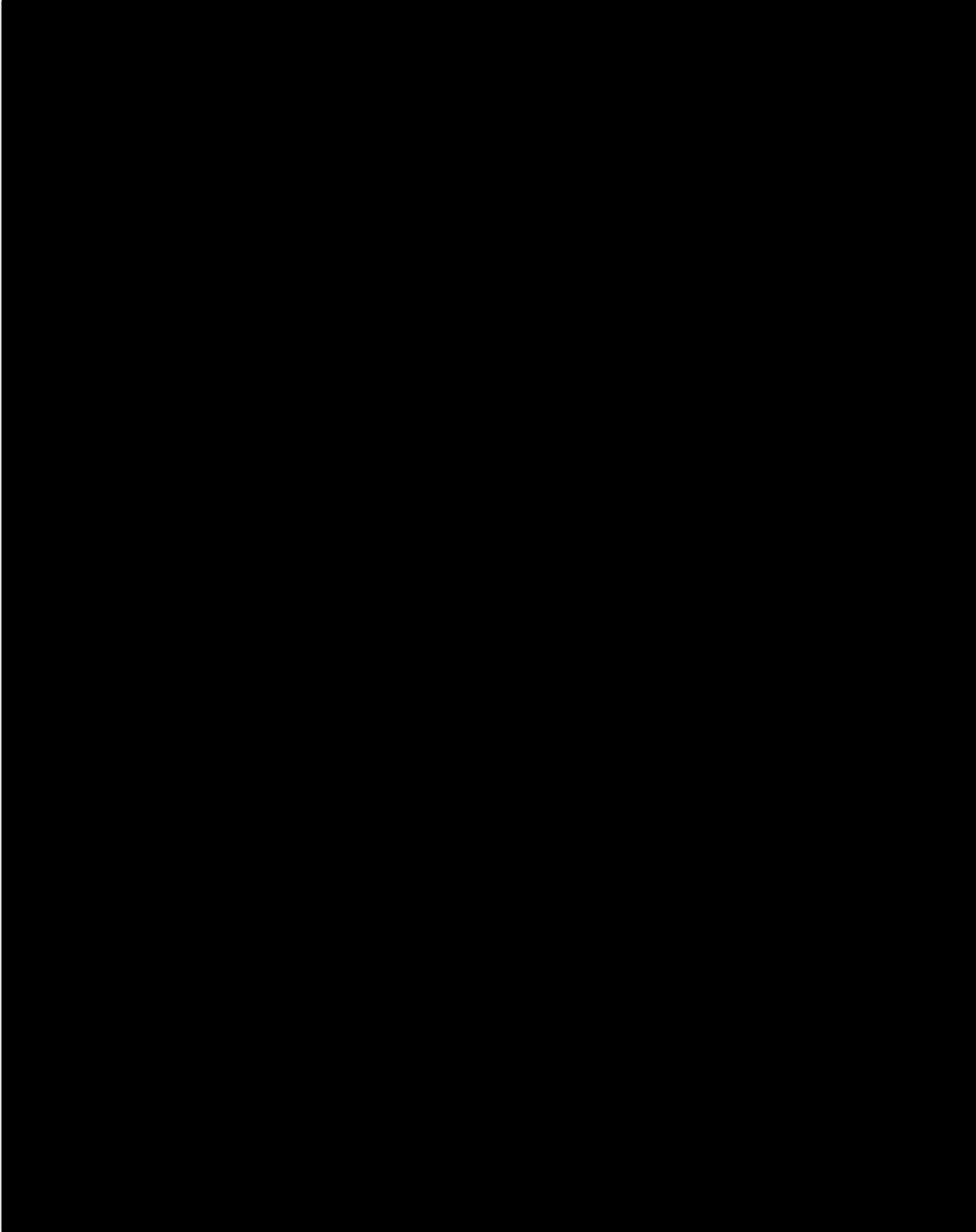
APPENDIX B | QUALITY GUIDE

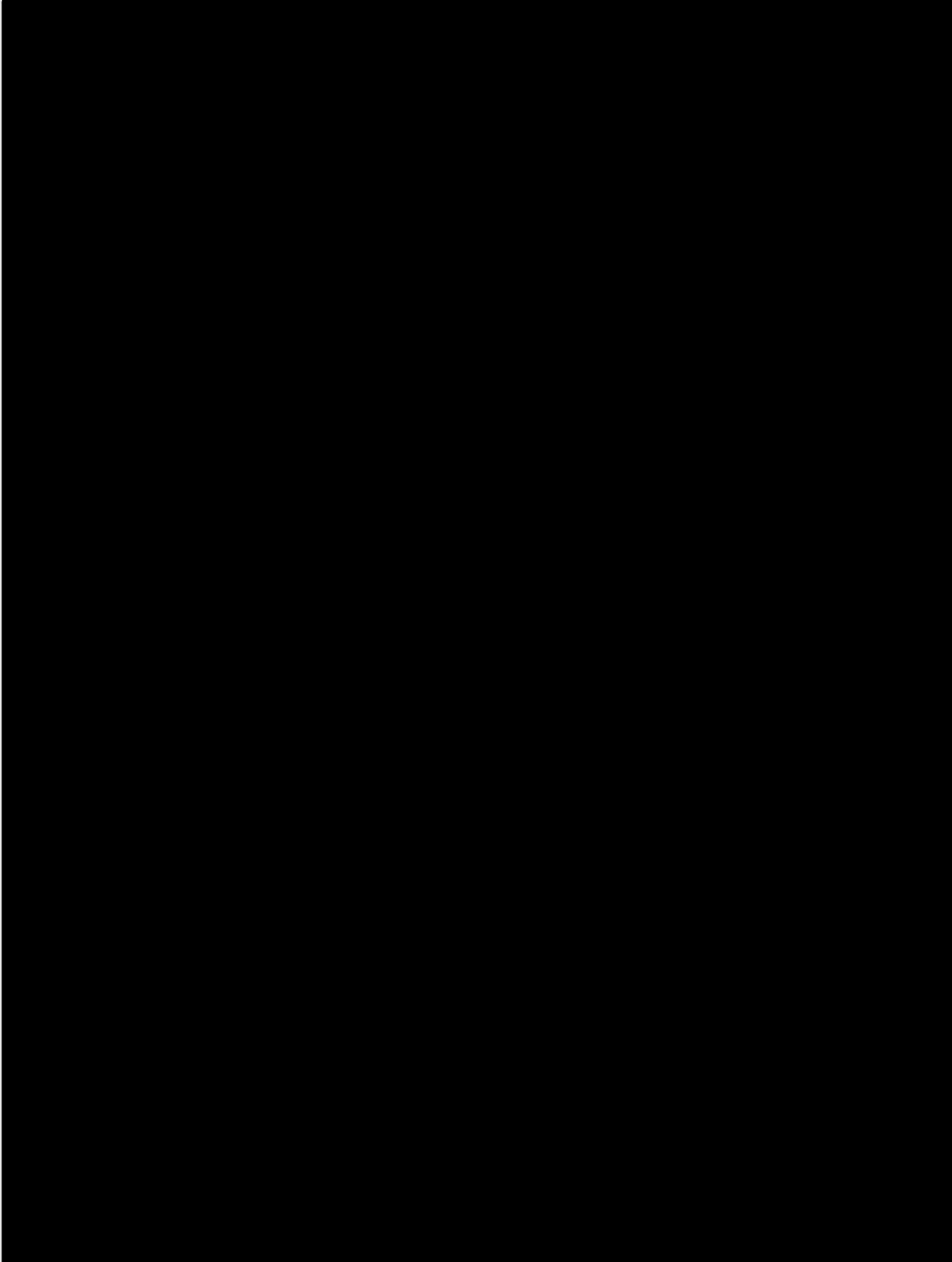
3.2 PRODUCT DESCRIPTION

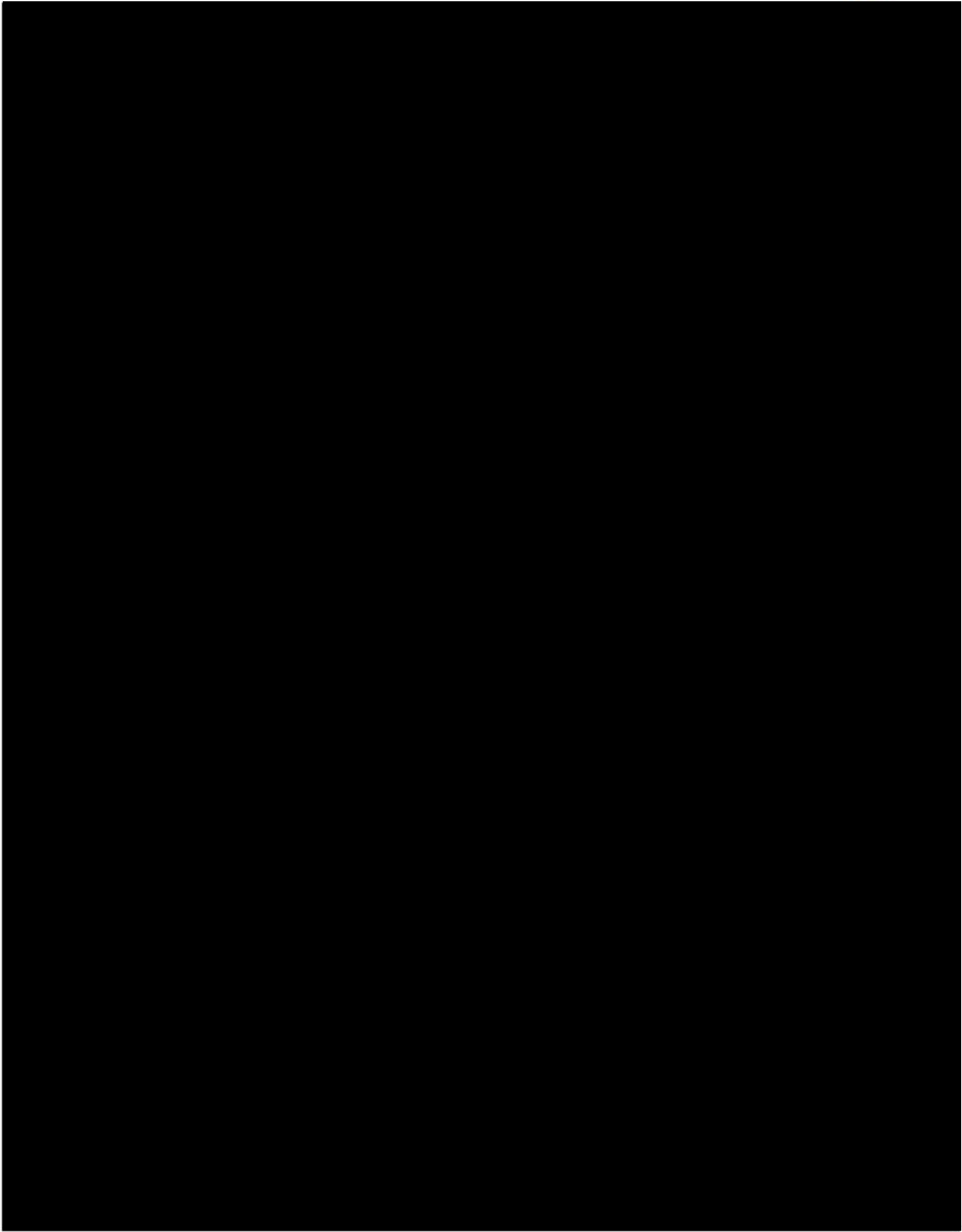


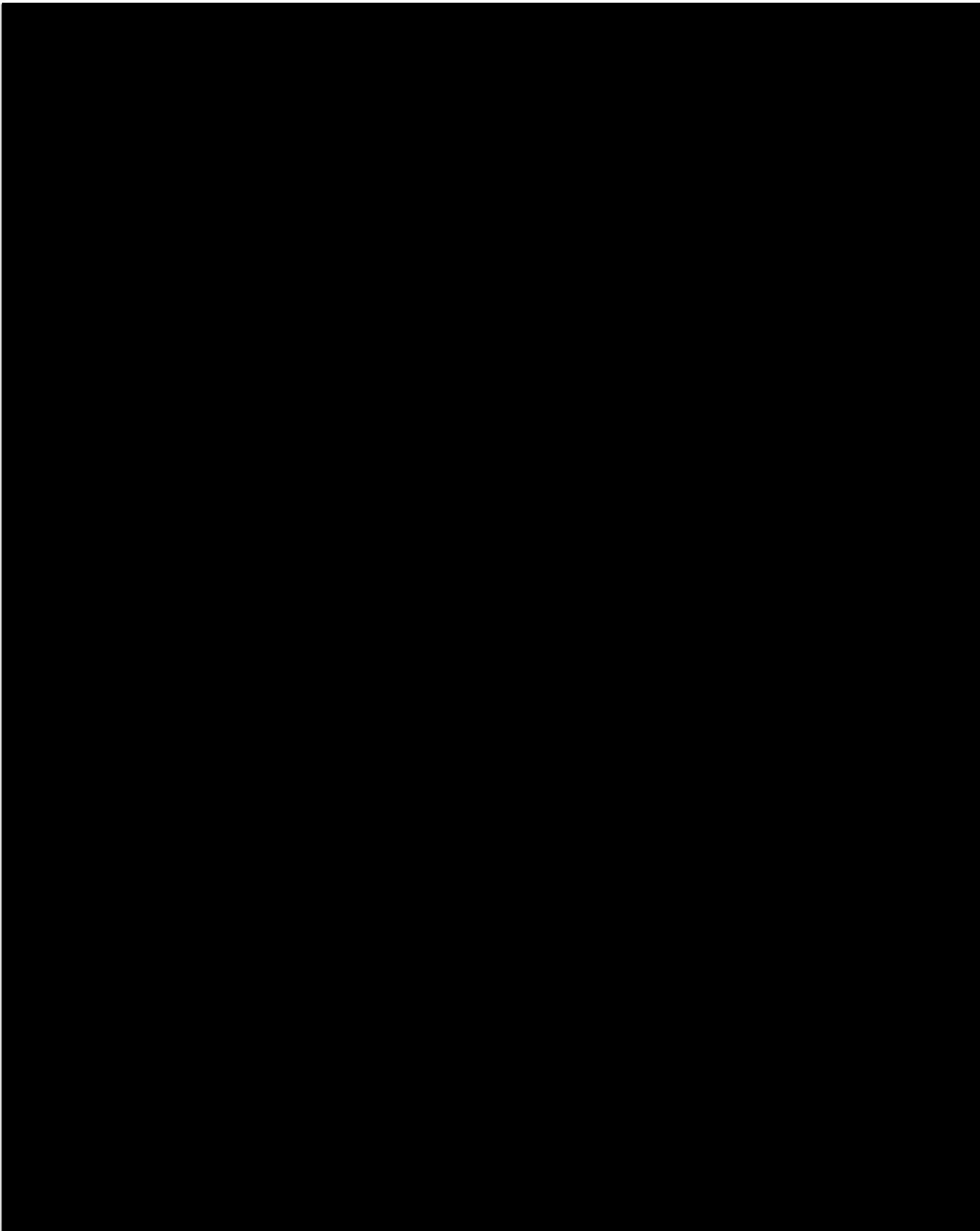
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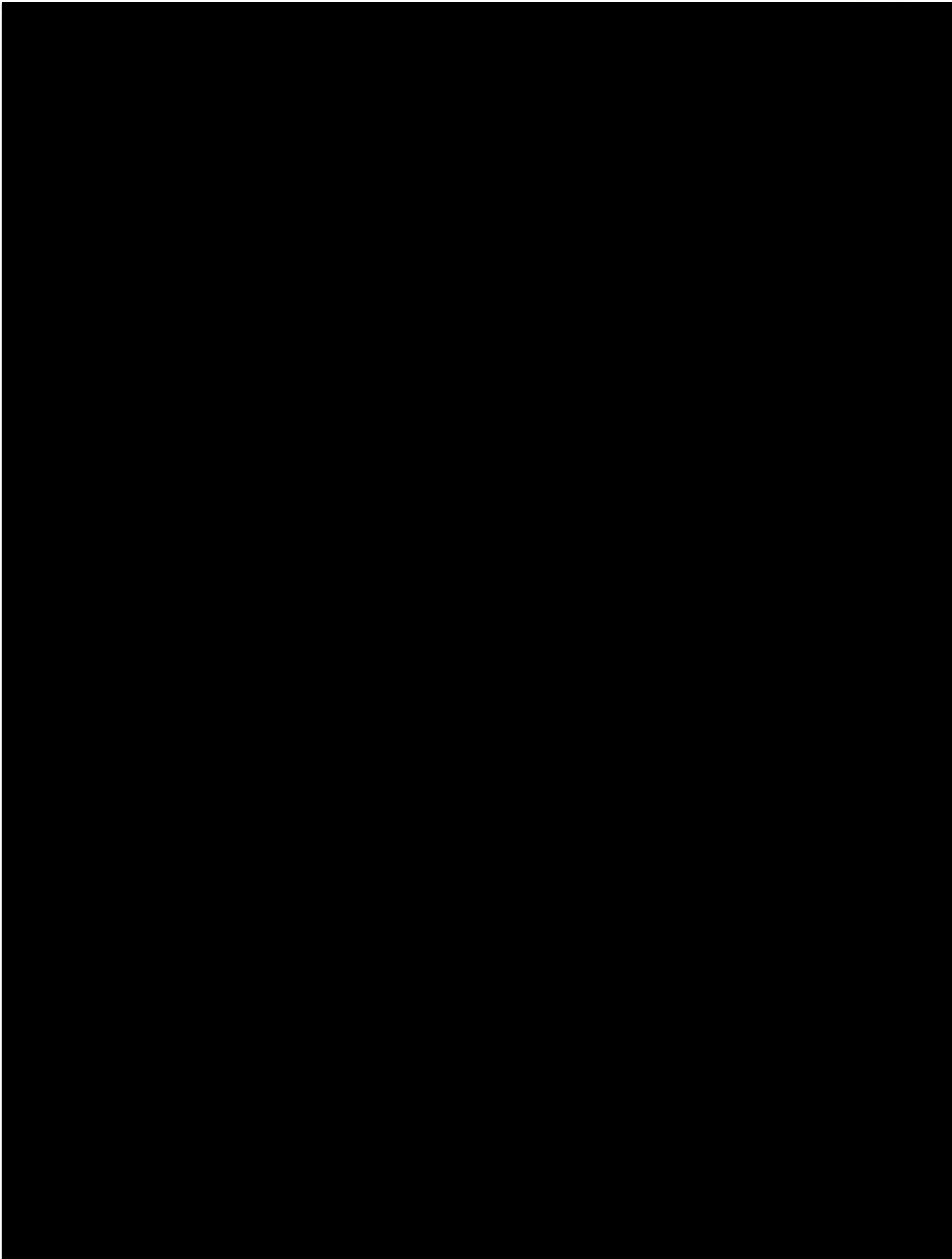


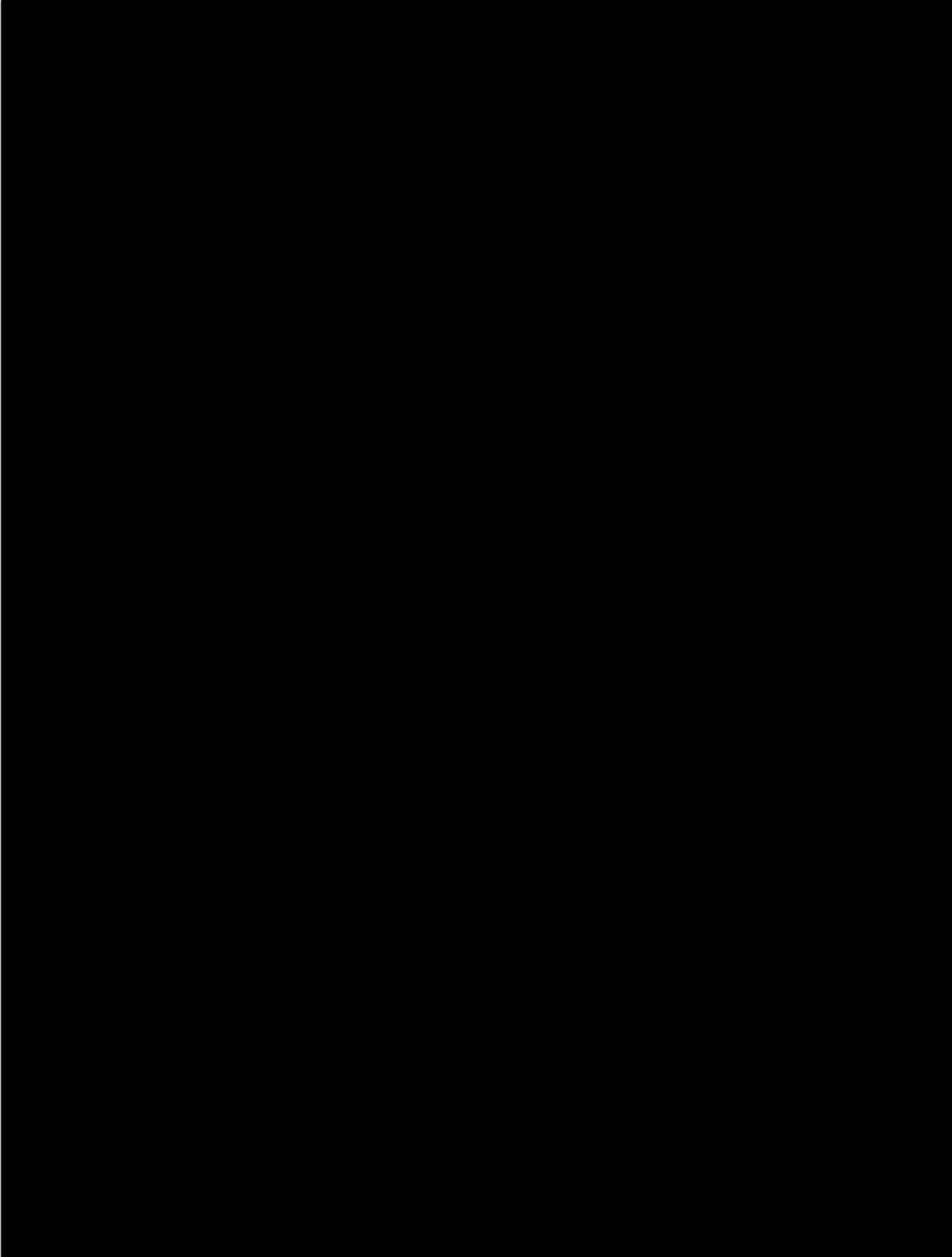


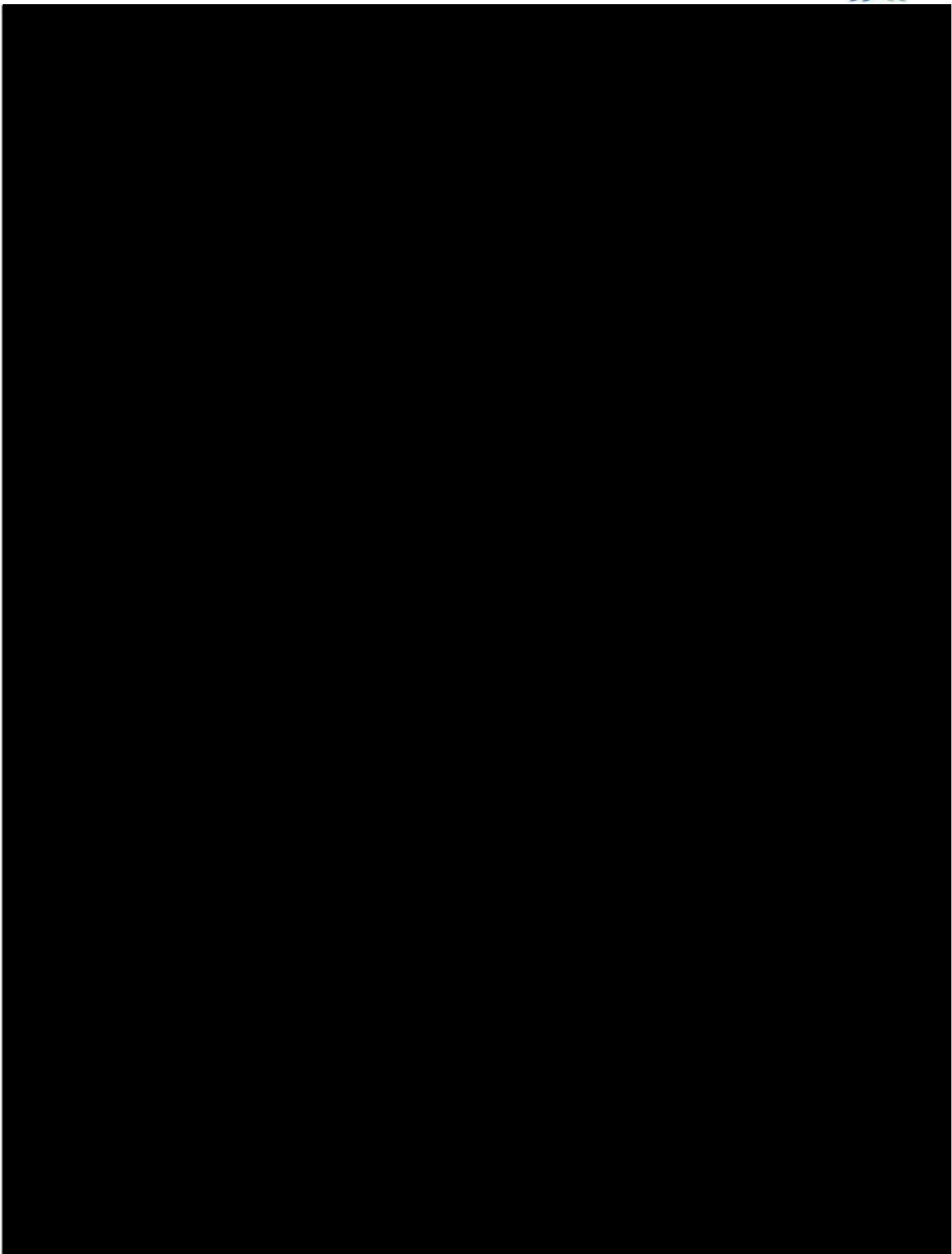


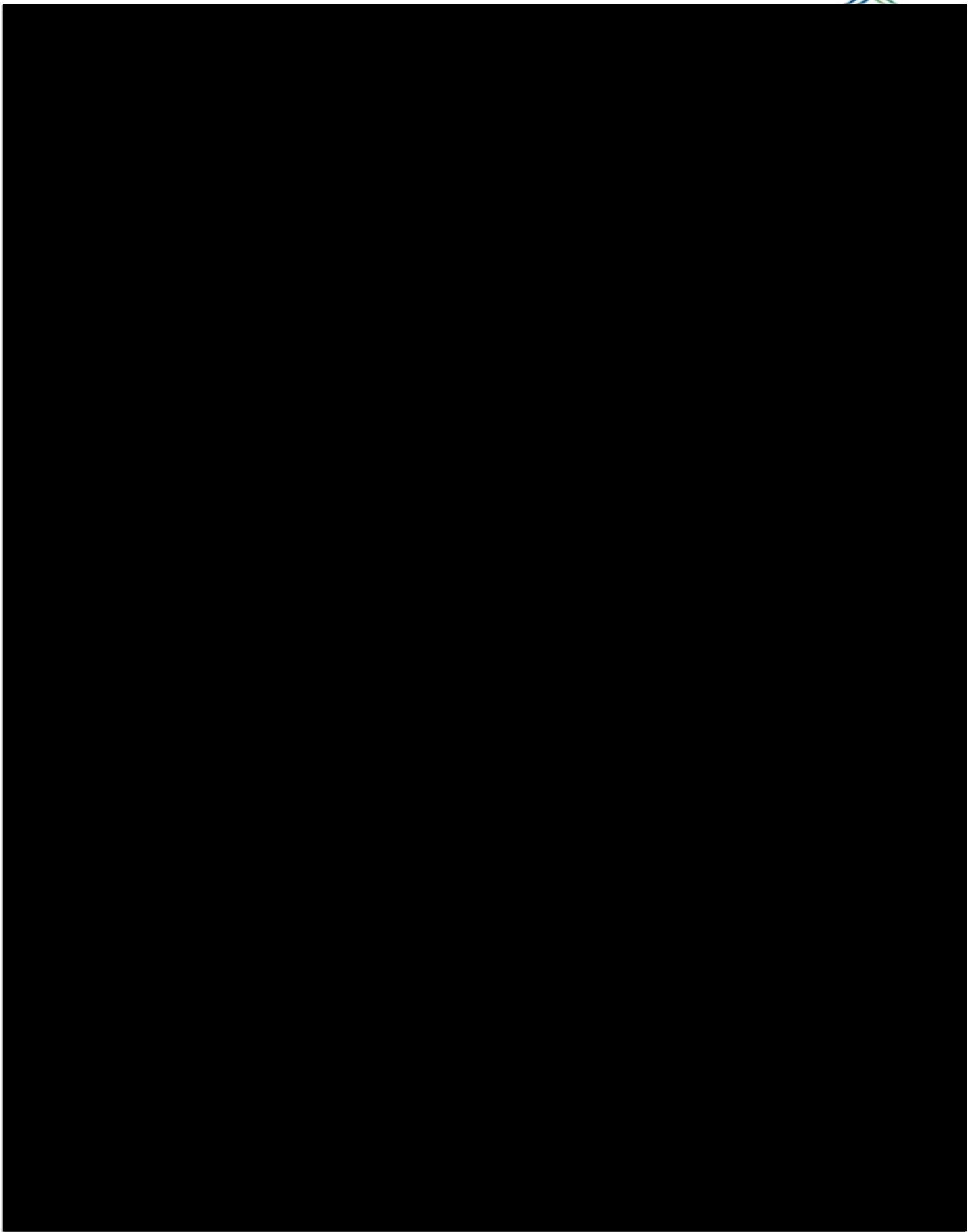


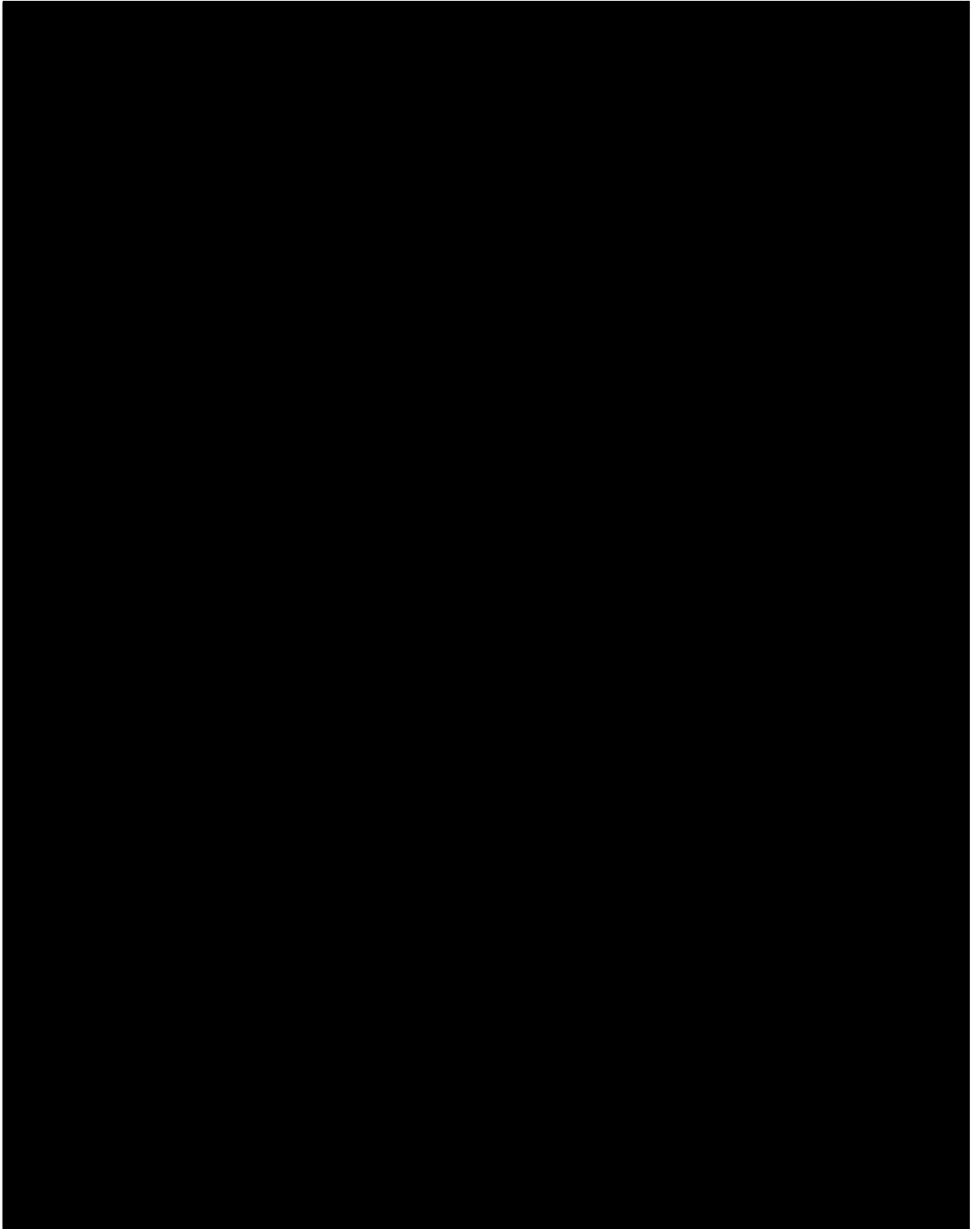












ATTACHMENT 3 – CSELRVs Performance Characteristics

This Attachment consists of the following documents:

CSELRVs Performance Characteristics – Part A; and

CSELRVs Performance Characteristics – Part B

Attachment 3 – CSELRVs Performance Characteristics – Part A

CONSOLIDATED CLARIFICATION

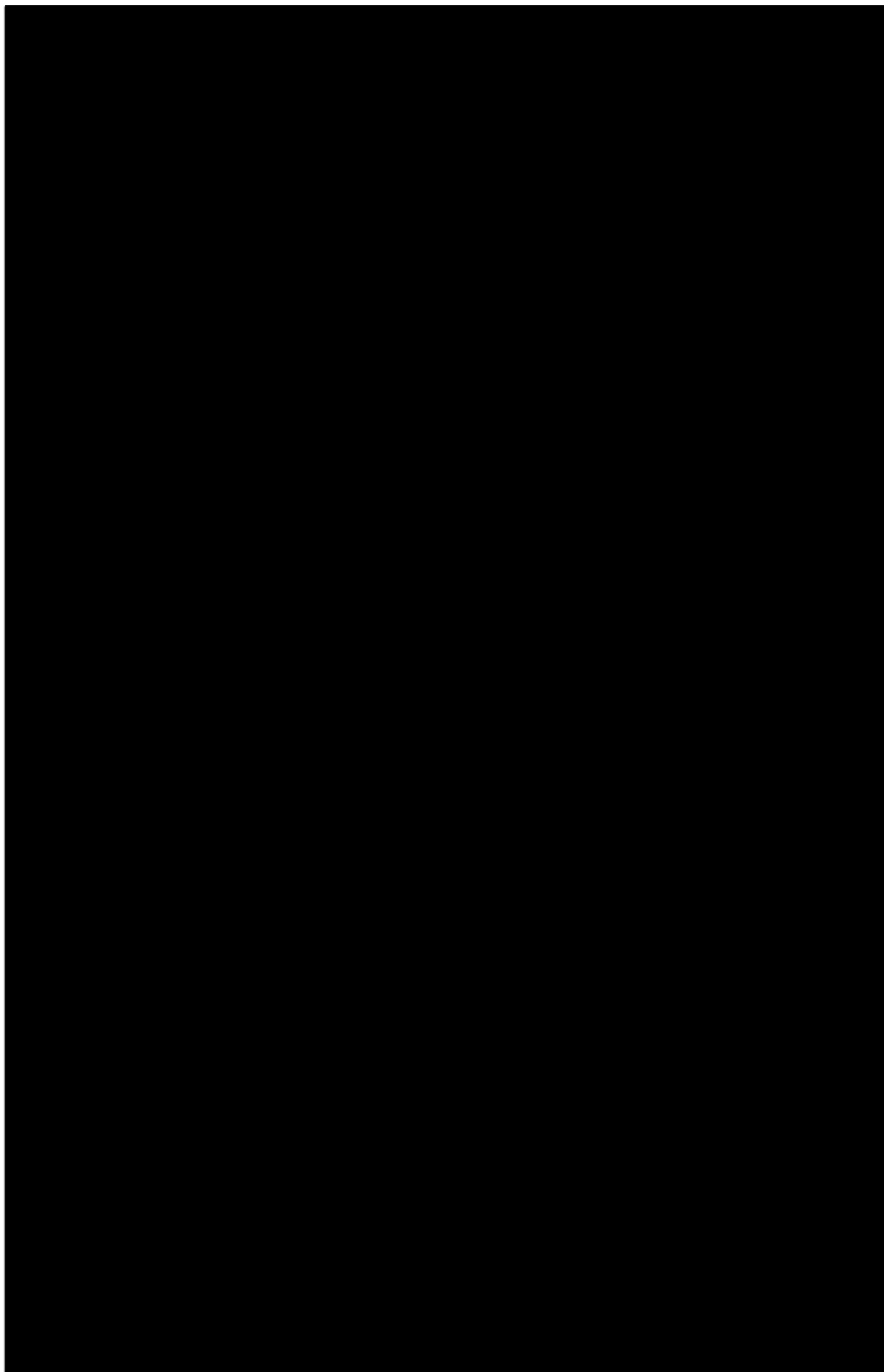
RETURNABLE 3 | CSELRVs

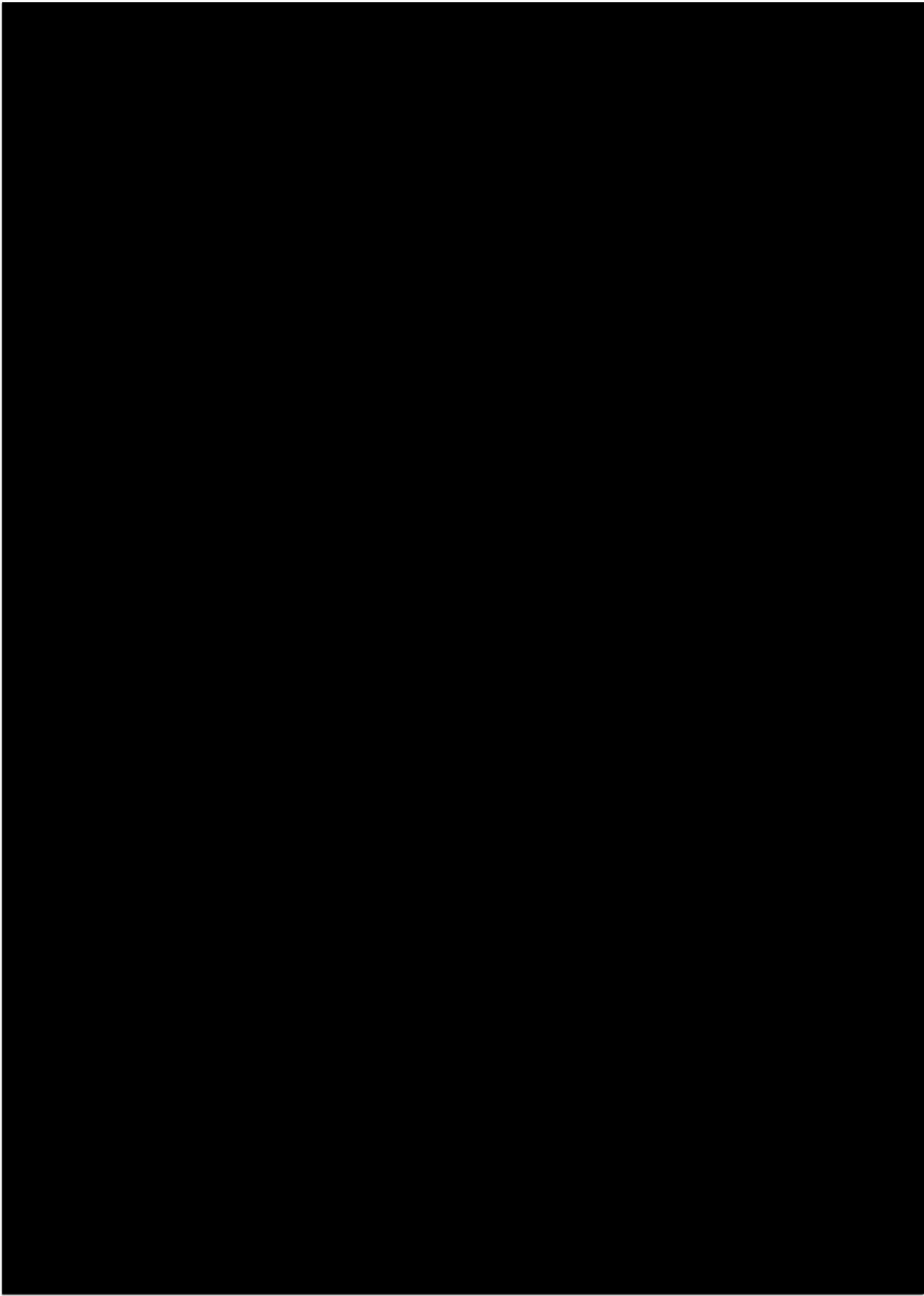
3.3 PERFORMANCE CHARACTERISTICS



CONNECTING
SYDNEY







Attachment 3 – CSELRVs Performance Characteristics – Part B

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RETURNABLE 3 | CSELRVs

3.3 PERFORMANCE CHARACTERISTICS



CONNECTING
SYDNEY





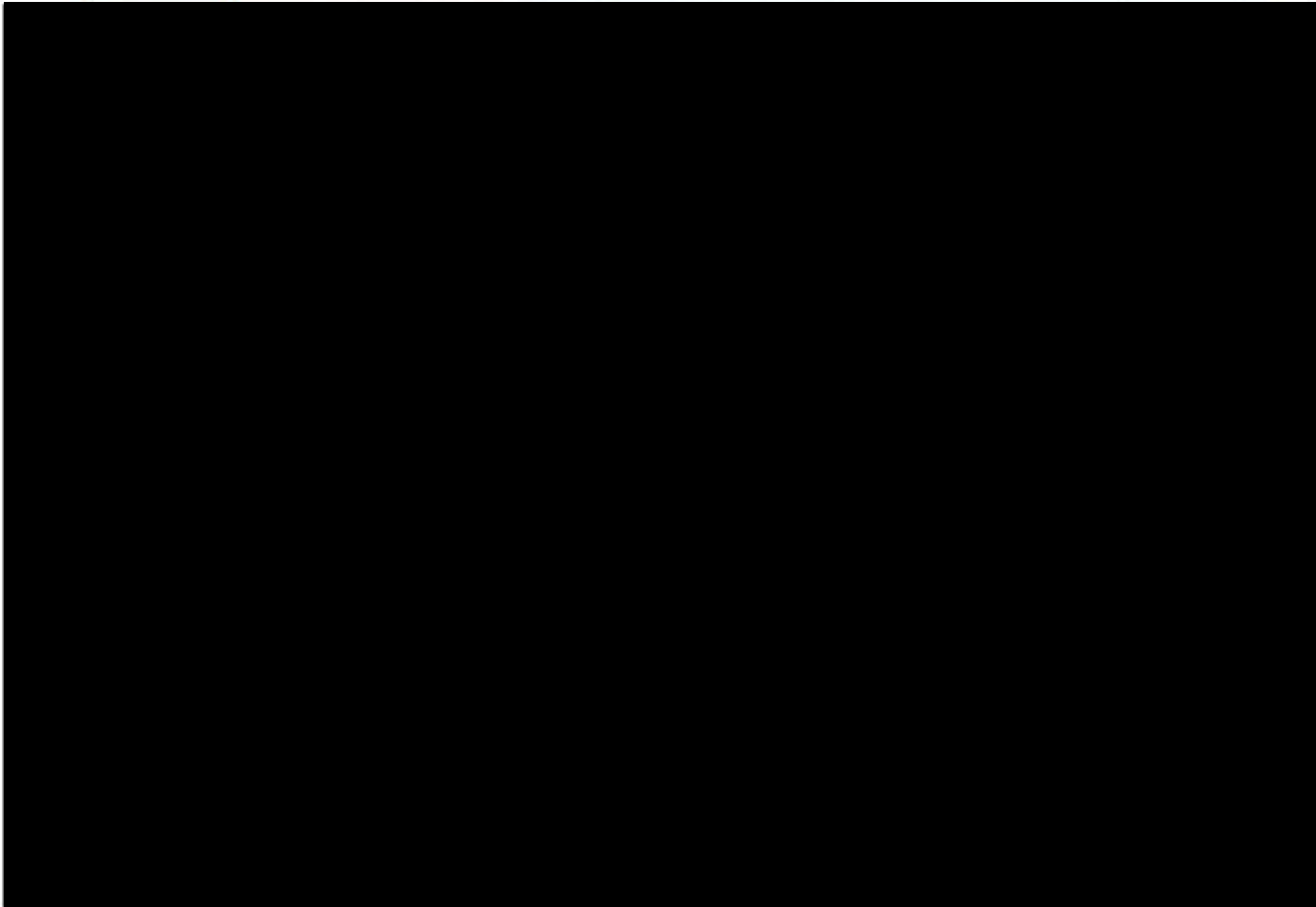
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[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
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[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]
[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]	[Redacted]

3.3.1 (b) Number of Passengers

The capacity of each single 33m LRV is shown in Table 2. The coupled 33m LRVs carry double the capacities shown.

Table 2: Capacity of LRV

Tram Type	AW1		Area m ²	AW3 - 4 pax/m ²		AW4 - 6 pax/m ²	
	Tram Width	Seat		Standing	Total	Standing	Total
305	2650	54	44.75	179	233	268	322





3.3.2 Ride characteristic

The dynamic envelope of the LRV is determined by the maximum volume swept by the rolling stock when running on the reference tracks, in alignment and through curves.

The dynamic envelope is calculated on the most unfavourable configurations:

- cumulation of tolerances, clearances and wear (tracks and wheels);
- cumulation of vehicle movements due to suspension flexibility, load cases and exceptional transversal accelerations;
- sideways movement of a bogie on the tracks; and
- sideways movement of a carbody on the bogie.

3.3.2 (a) Air gap

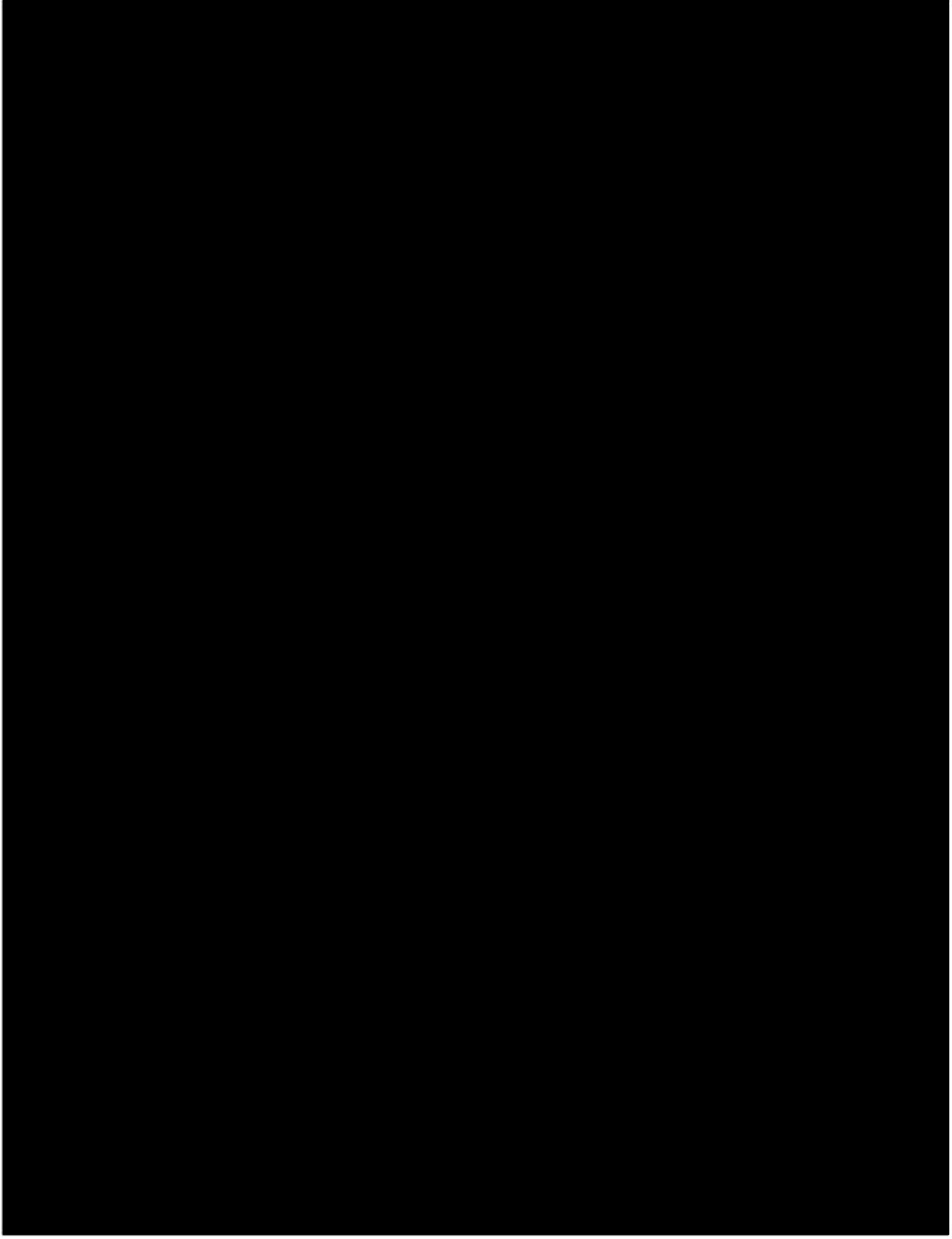
The air gap refers to the gap between the dynamic envelope and the vehicle gauge. It considers:

- track defects (for commercial operation);
- oscillations and dissymmetry ≤ 1 and induced displacements; and
- the margin specific to each railway network, designed to take account particular situations (over speed margins, effects of significant side winds).

3.3.2 (b) Clearance gauge

This is the inner limit into which no obstacle must penetrate, despite displacements (elastic or inelastic) of the tracks.

$$\text{Clearance gauge} = \text{air gap} + \text{dynamic envelope} + \text{air gap}$$





3.3.2 (b) (ii) Dip and Hill Gauge

LRV passage through vertical curves with radii of 500m (dip) and 500m (hill) does not result in the underside of the LRV or joints coming into contact with the ground. Please refer to drawing ABD9001319722 in Returnable 5.

[REDACTED]

3.3.3 Noise

Our Rolling Stock provider, Alstom, is aware of the importance given to acoustic comfort in urban transportation.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

3.3.3 (a) (i) Conditions for measurements
European Standards ISO 3095 and ISO 3381, November 2005 are applied when measuring speeds between 0 and 70 km/h.

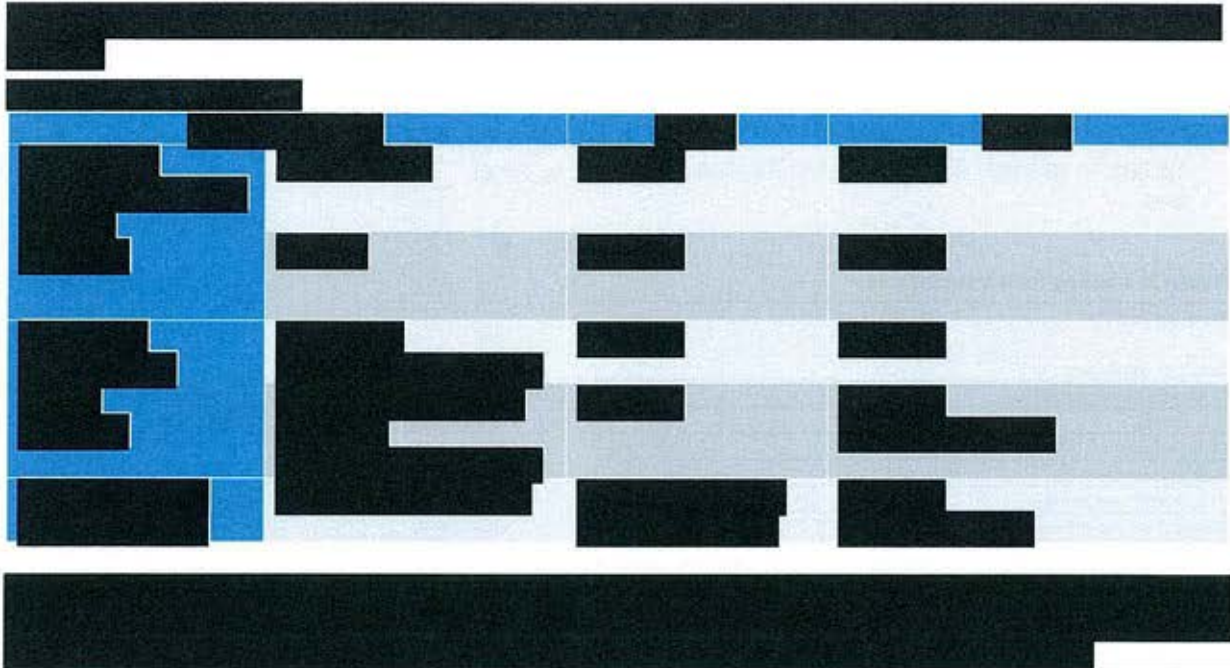
Noise results depend largely on the location where they were measured. The choice of site must therefore consider the following criteria while meeting the standards quoted above:

- site in an open field (with no obstacles, such as fences, rocks, trees, buildings etc., within a radius of 25m around the LRV);
- track portion with no slope, no trackside devices, tangent track;
- ballasted track;
- standard-track on wooden or concrete sleepers; and
- rail surface roughness in compliance with Appendix A of standard ISO 3095.

[REDACTED]



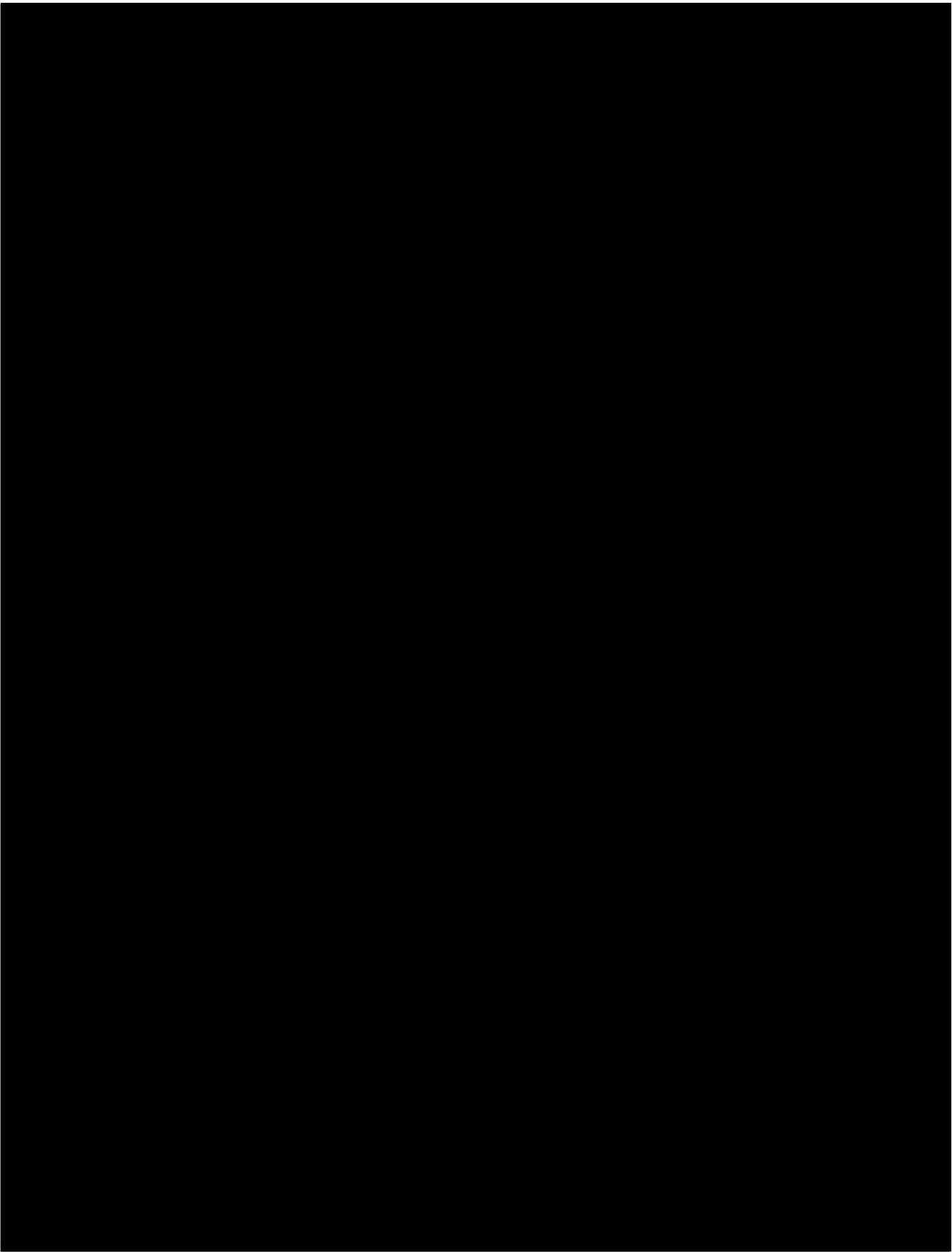
3.3.3 (a) (ii) Noise levels

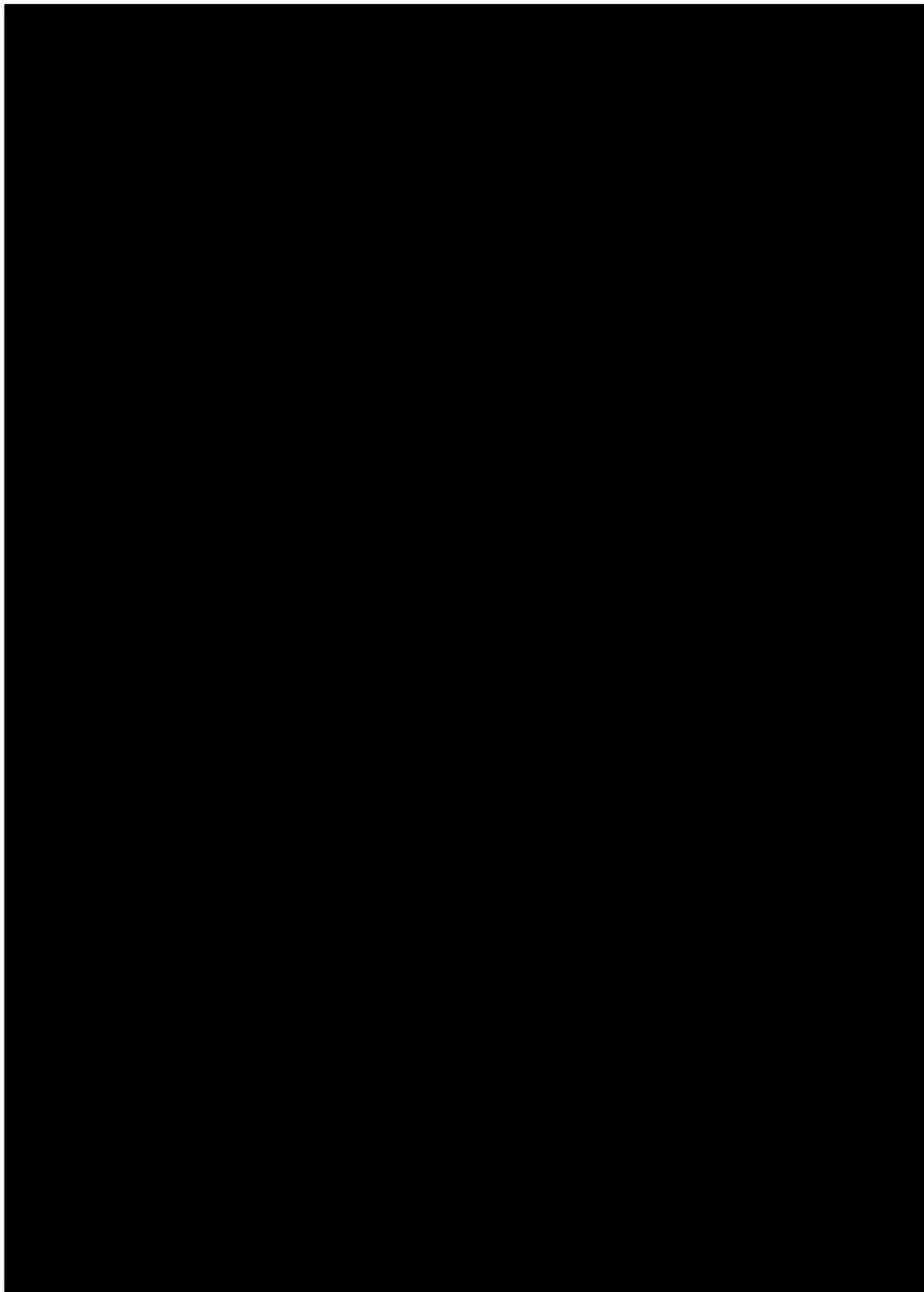


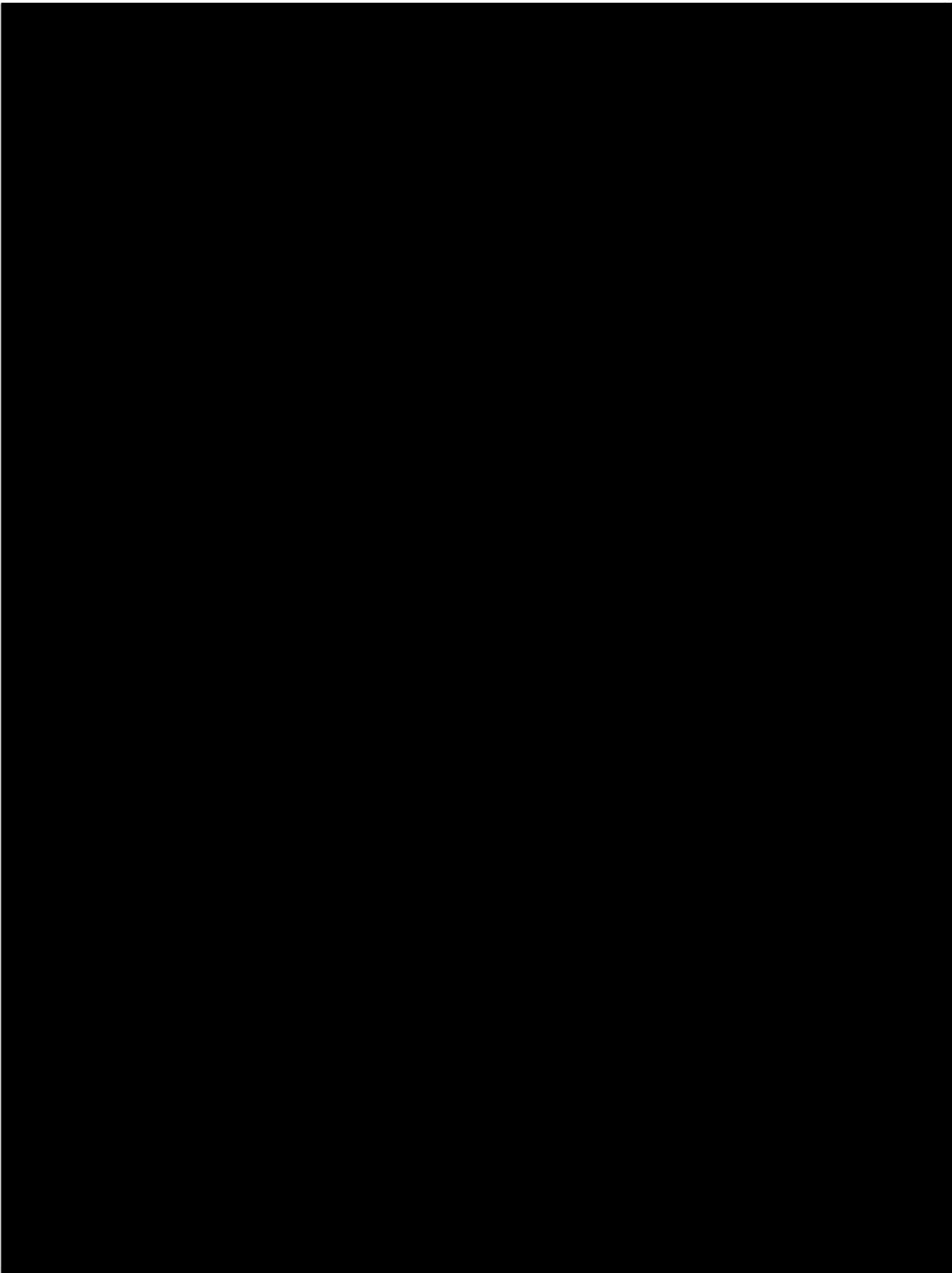
3.3.3 (b) Horn and Bell Noise Levels

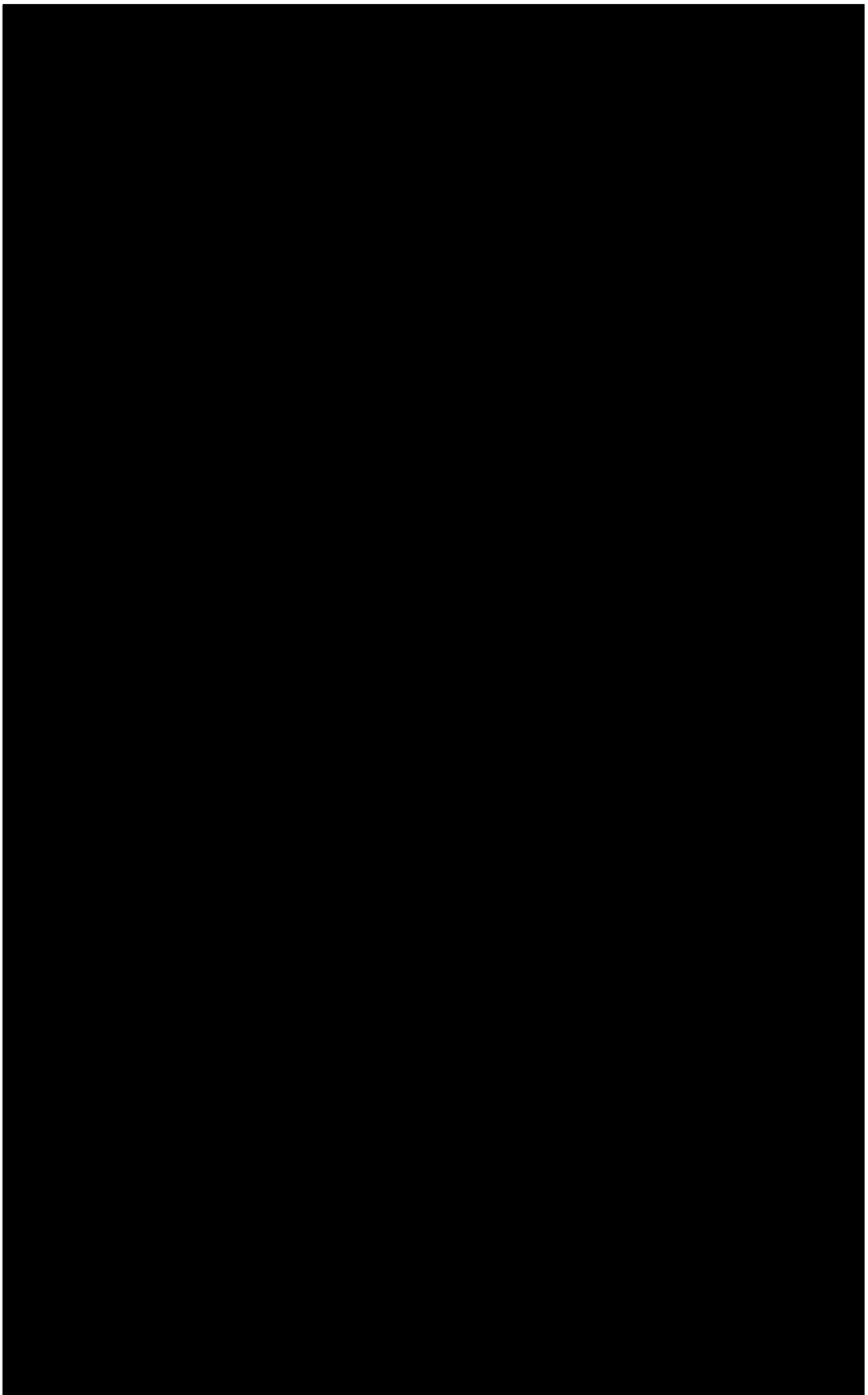
Table 7: Equipment and noise level

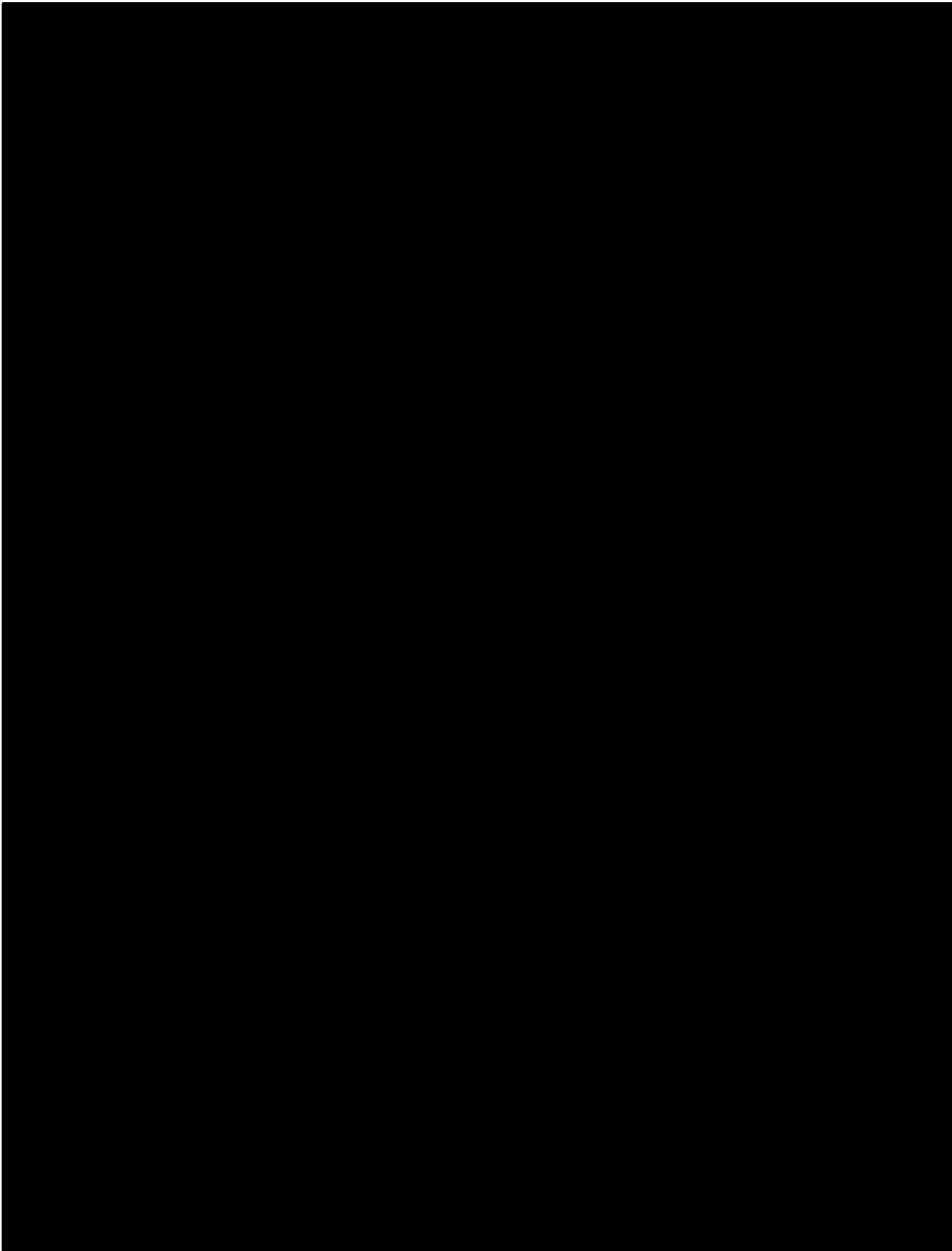
Equipment	Noise level
Bell: at 7.5m around the cab	From 76 to 81 dB(A)
Horn at 1.5m	107 dB(A)

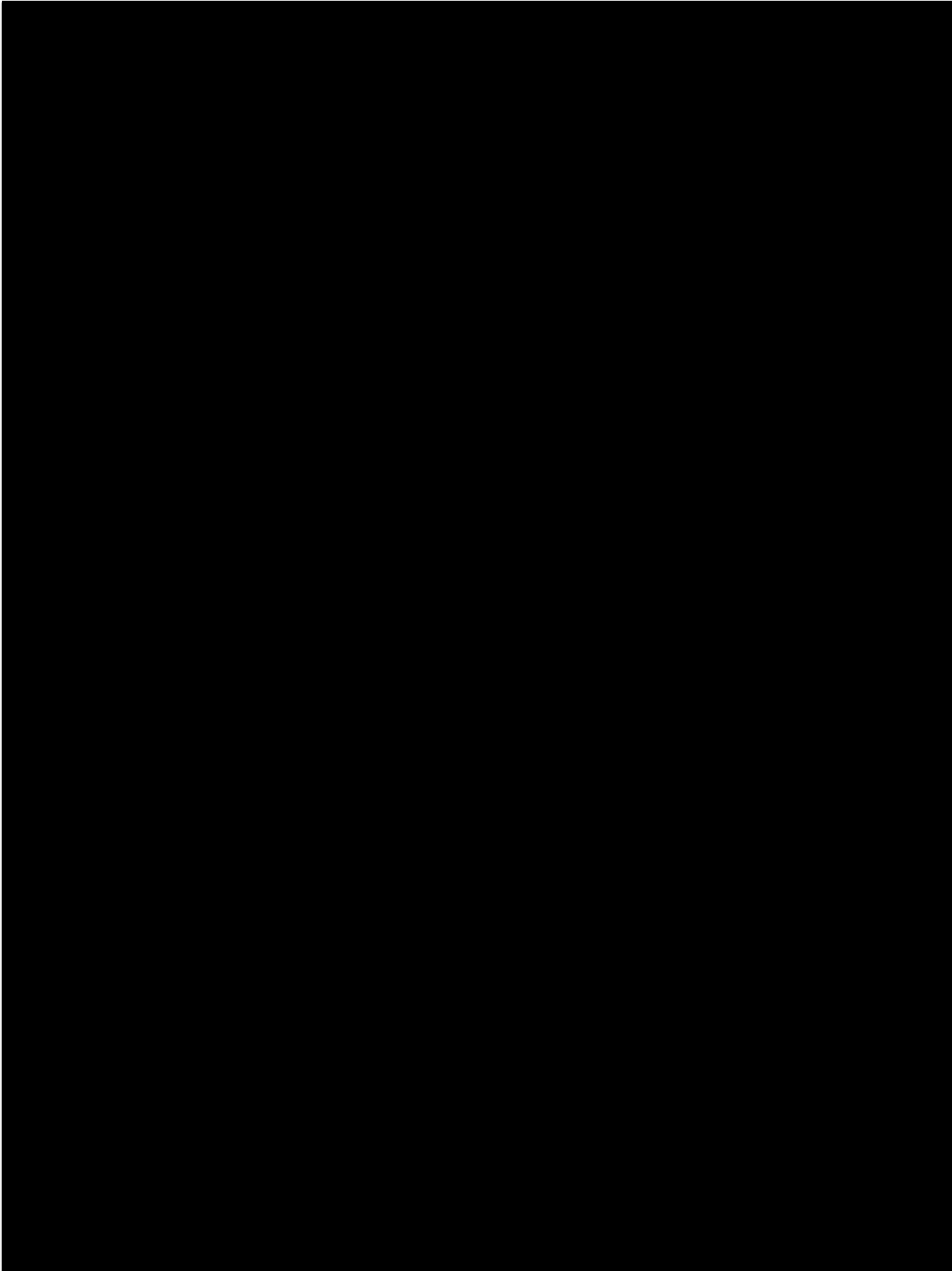












ATTACHMENT 4 – Corridor Alignment

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BRIDGE STREET

LOFTUS LANE

REFER DRG SLR-CSY-DWG-CI-0101 FOR CONTINUATION

MACQUARIE STREET

ALBERT STREET

CANILL EXPRESSWAY

PHILIP STREET

YOUNG STREET

CUSTOM HOUSE LANE

LOFTUS STREET

BALLET PLACE

PITT STREET

UNDERWOOD STREET

UNDEVELOPED STREET

ESSEX STREET

ESSEX STREET

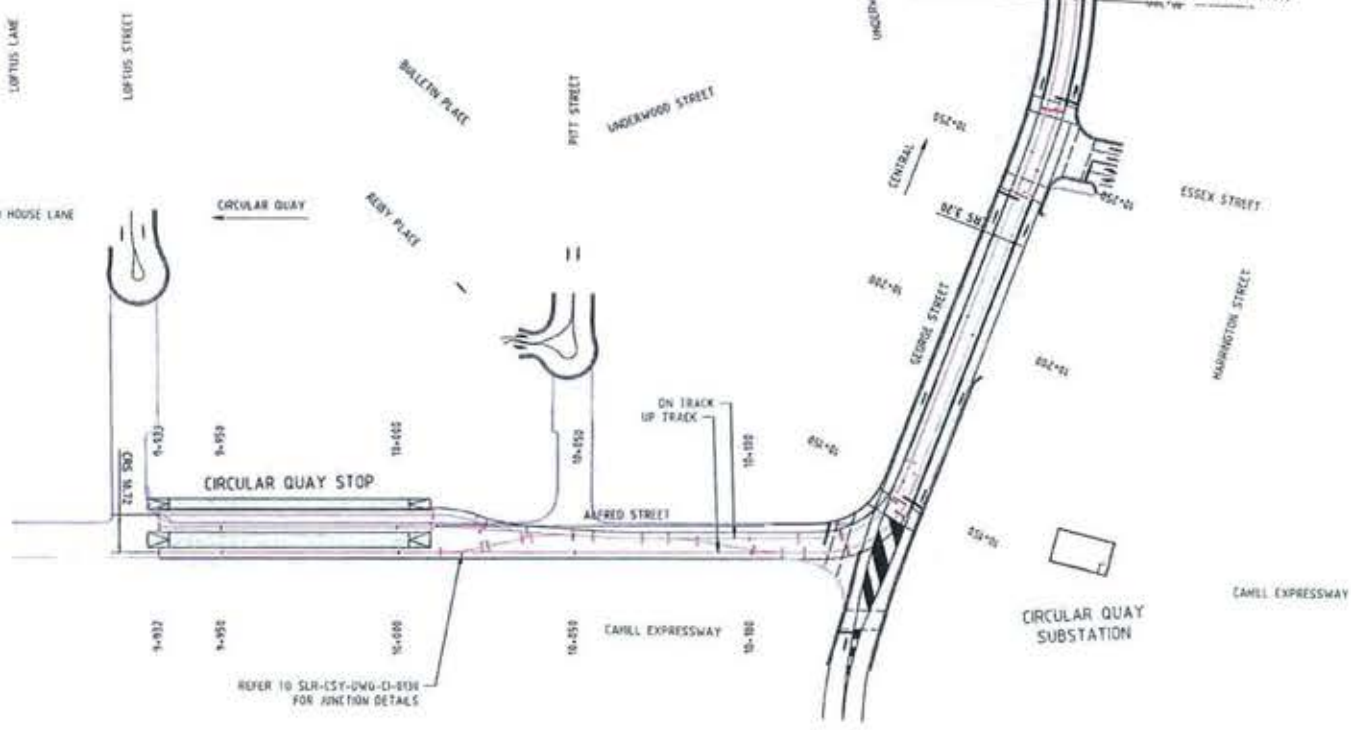
ROUNDELL STREET

CUMBERLAND STREET

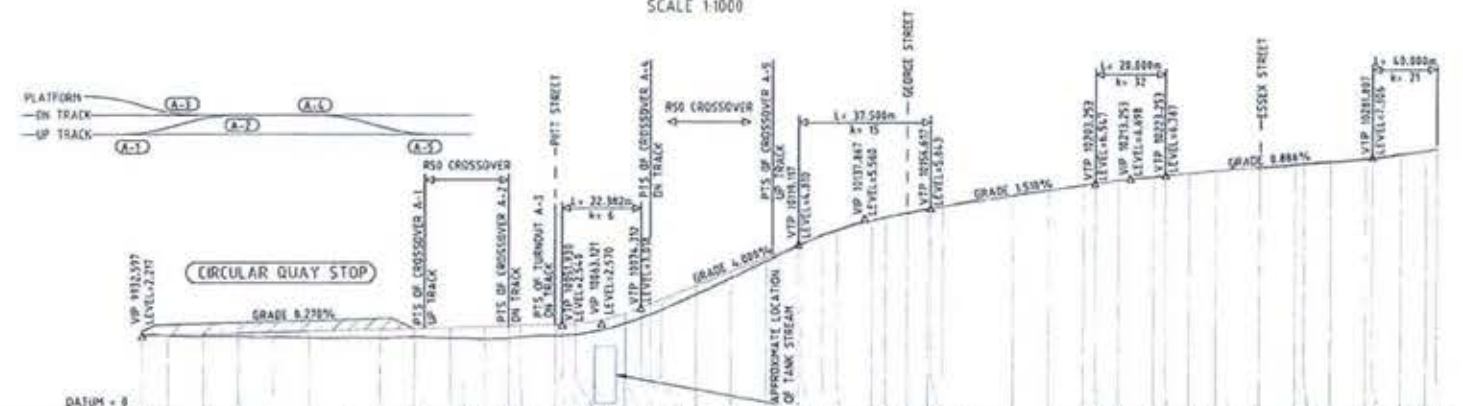
CUMBERLAND STREET

WESTERN DISTRIBUTOR

BRADFIELD HIGHWAY



PLAN SCALE 1:1000



KILOMETRAGE	9+932.517	9+943.000	9+953.500	9+964.000	9+974.500	9+985.000	9+995.500	10+006.000	10+016.500	10+027.000	10+037.500	10+048.000	10+058.500	10+069.000	10+079.500	10+090.000	10+100.500	10+111.000	10+121.500	10+132.000	10+142.500	10+153.000	10+163.500	10+174.000	10+184.500	10+195.000	10+205.500	10+216.000	10+226.500	10+237.000	10+247.500	10+258.000	10+268.500	10+279.000	10+289.500	10+300.000		
PROPOSED VERTICAL DESIGN	[Profile diagram showing vertical curves and grades]																																					
PROPOSED LOW RAIL LEVELS	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270	2.270
SPEED	30km/h																																					
CANT (mm)	[Cant diagram showing track cant values]																																					
HORIZONTAL ALIGNMENT	[Horizontal alignment diagram showing curve data]																																					

LONGITUDINAL SECTION SCALE 1:1000 (H) 1:100 (V)

- LEGEND**
- SURVEY AND CADASTRAL
 - EXISTING KERB TO BE REMOVED
 - LRV CLEARANCE ENVELOPE
 - PROPOSED ROAD & PAVEMENT
 - MARKING MODIFICATIONS
 - PROPOSED TRACK ALIGNMENT
 - PROPOSED OHW SPAN LINE AND SUPPORT
 - PROPOSED PLATFORM LOCATION
 - PROPOSED PEDESTRIAN & CYCLIST SHARED LANE
 - PROPOSED TRAM & BUS SHARED LANE
 - PROPOSED BUS LANE/BAY
 - PROPOSED SUBSTATION

CONCEPT DESIGN

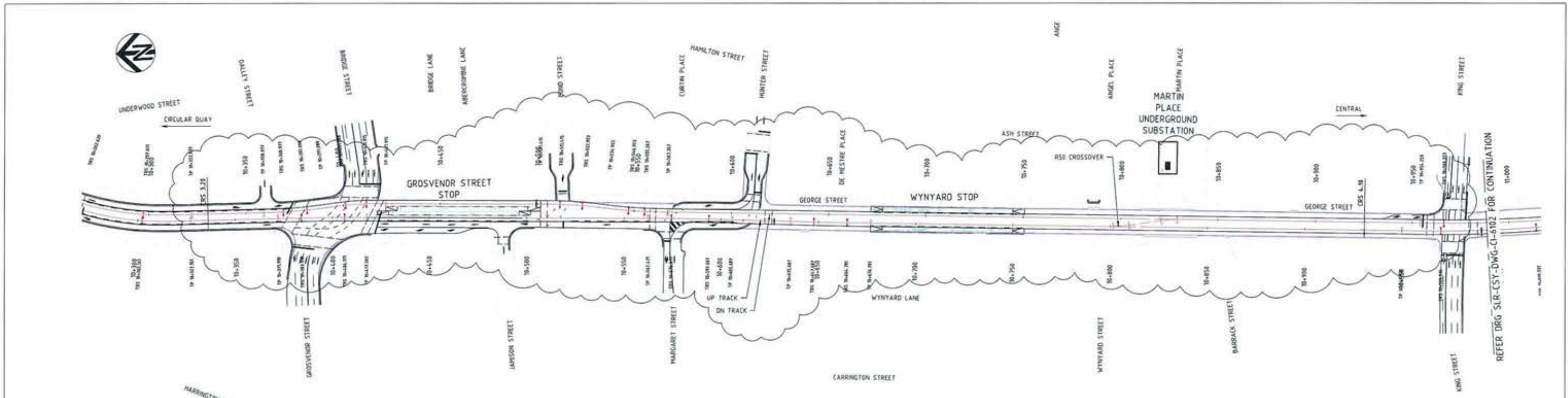
No.	Revision	Date	By	Checked
1	ISSUED FOR CONCEPT DESIGN	04/07/2014	D. SMITH	G. MORAN



Drawn	A. BIK	Designer	A. GIPAN
Drafting	D. SMITH	Design	G. MORAN
Check		Check	
Approved	A. COLLIS		
Date	04/07/2014		
Scale	1:1000		

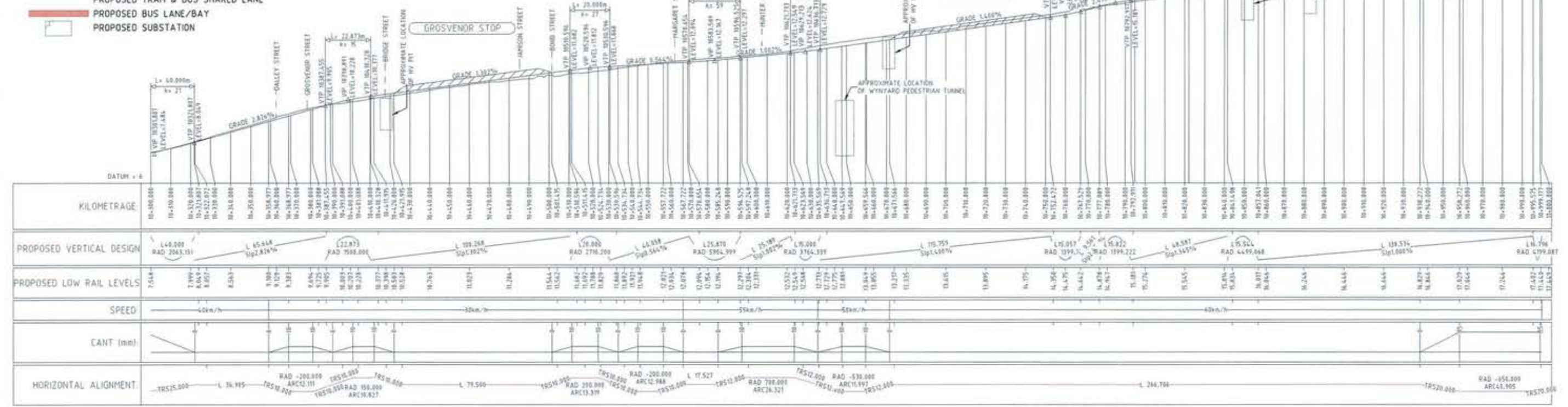
SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 ALIGNMENT PLAN AND LONG SECTION
 ROUTE A
 SHEET 1 OF 18

Drawing No: SLR-CSY-DWG-CI-0100 Rev: A



- LEGEND**
- SURVEY AND CADASTRAL
 - EXISTING KERB TO BE REMOVED
 - LRV CLEARANCE ENVELOPE
 - PROPOSED ROAD & PAVEMENT MARKING MODIFICATIONS
 - PROPOSED TRACK ALIGNMENT
 - PROPOSED DHW SPAN LINE AND SUPPORT
 - PROPOSED PLATFORM LOCATION
 - PROPOSED PEDESTRIAN & CYCLIST SHARED LANE
 - PROPOSED TRAM & BUS SHARED LANE
 - PROPOSED BUS LANE/BAY
 - PROPOSED SUBSTATION

NOTE: VERTICAL ALIGNMENT TO BE UPDATED IN DETAILED DESIGN



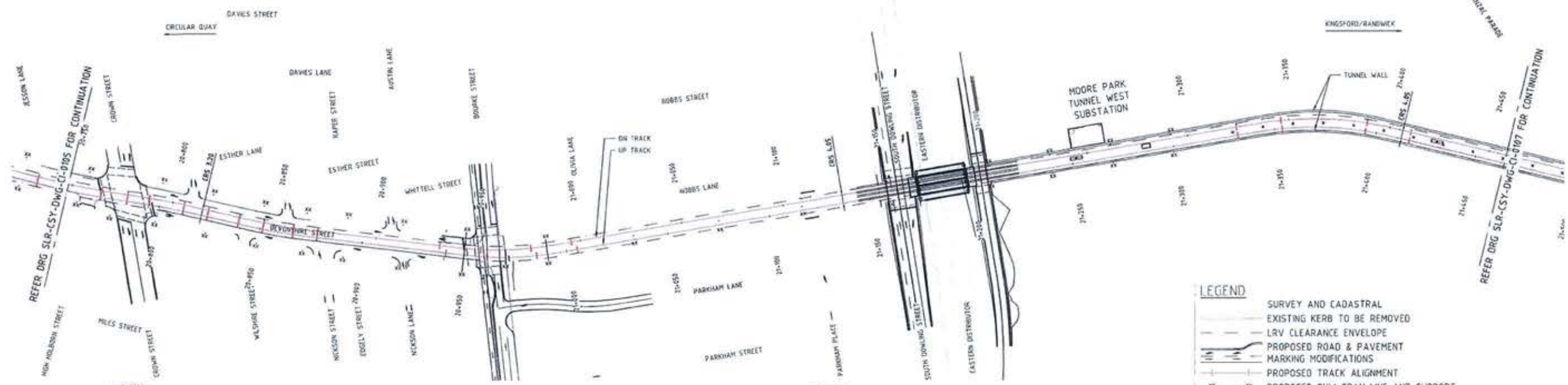
CONCEPT DESIGN

<p>Client: NSW GOVERNMENT Transport for NSW</p> <p>DO NOT SCALE</p> <p>CONNECTING SYDNEY</p>	<p>Drawn: A.BK Designer: A.KRPAV</p> <p>Drafting Check: D.SMITH Design Check: G.MORTON</p> <p>Approved: A.COLLIS</p> <p>Date: 04/07/2014</p> <p>Scale: 1:1000</p>	<p>SYDNEY LIGHT RAIL EASTERN EXTENSION</p> <p>CIRCULAR QUAY TO RAINWICK</p> <p>ALIGNMENT PLAN AND LONG SECTION</p> <p>ROUTE A</p> <p>SHEET 2 OF 18</p> <p>Original Size: A1 Drawing No: SLR-CSY-DWG-CI-0101 Rev: 8</p>
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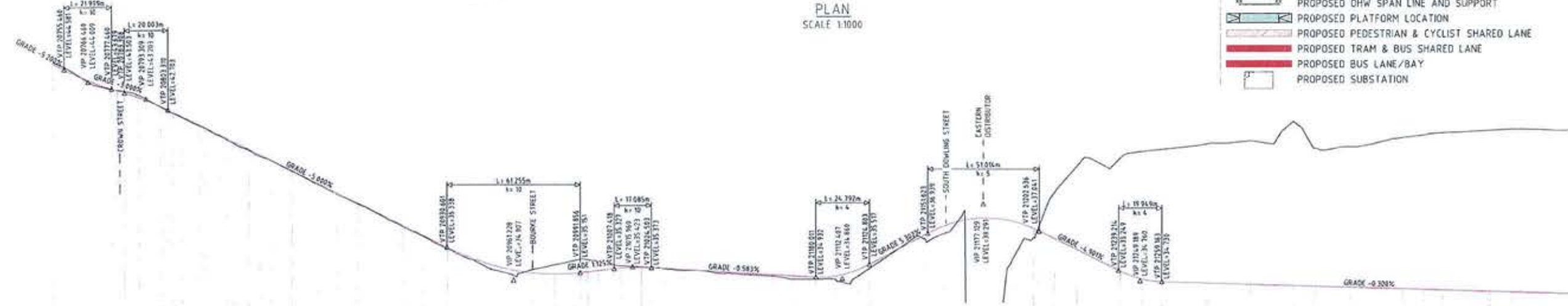
VERTICAL 1:100 AT ORIGINAL SIZE
HORIZONTAL 1:1000 AT ORIGINAL SIZE

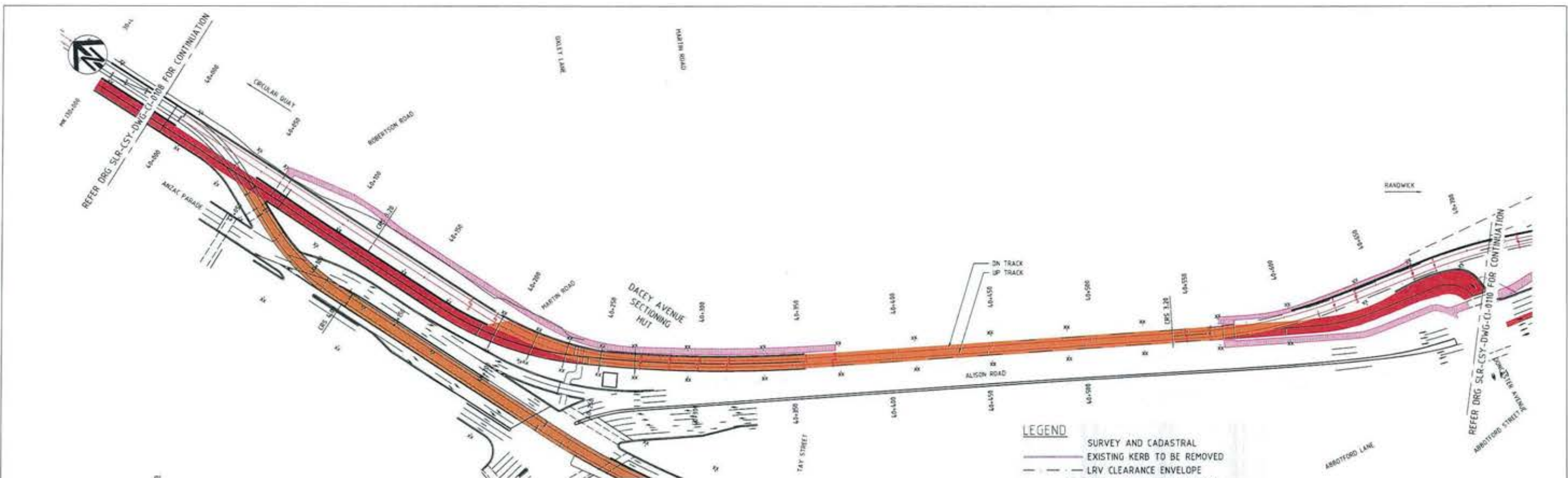
0 1 2 3 4 5m
0 10 20 30 40 50m

Plot Date: 5 September 2014 - 8:28 PM Printed by: David Smith

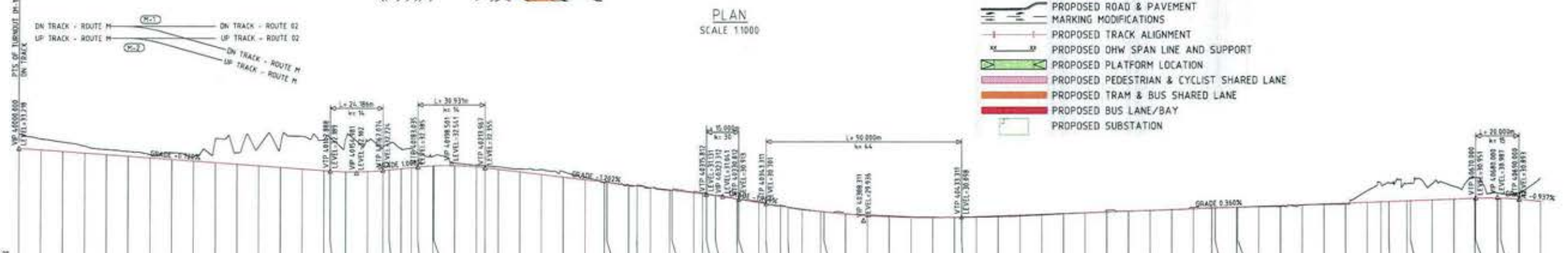


- LEGEND**
- EXISTING KERB TO BE REMOVED
 - LRV CLEARANCE ENVELOPE
 - PROPOSED ROAD & PAVEMENT
 - MARKING MODIFICATIONS
 - PROPOSED TRACK ALIGNMENT
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 - PROPOSED TRAM & BUS SHARED LANE
 - PROPOSED BUS LANE/BAY
 - PROPOSED SUBSTATION





- LEGEND**
- SURVEY AND CADASTRAL
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 - PROPOSED TRAM & BUS SHARED LANE
 - PROPOSED BUS LANE/BAY
 - PROPOSED SUBSTATION

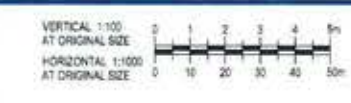


DATUM = 28	PTS. OF TURNOUT (H-3) ON TRACK	
KILOMETRAGE:	44+000.000	48+000.000
PROPOSED VERTICAL DESIGN:	[Vertical curve diagram showing grades and curve lengths]	
PROPOSED LOW RAIL LEVELS:	33.378	30.800
SPEED:	70km/h	45km/h
CANT ALIGNMENT(mm):	0	70
HORIZONTAL ALIGNMENT:	[Horizontal curve data including radii and arcs]	

LONGITUDINAL SECTION
SCALE 1:1000 (H) 1:100 (V)

CONCEPT DESIGN

No.	Revised	Notes	Drawn	Checked	Date
1					
2					
3					
4					

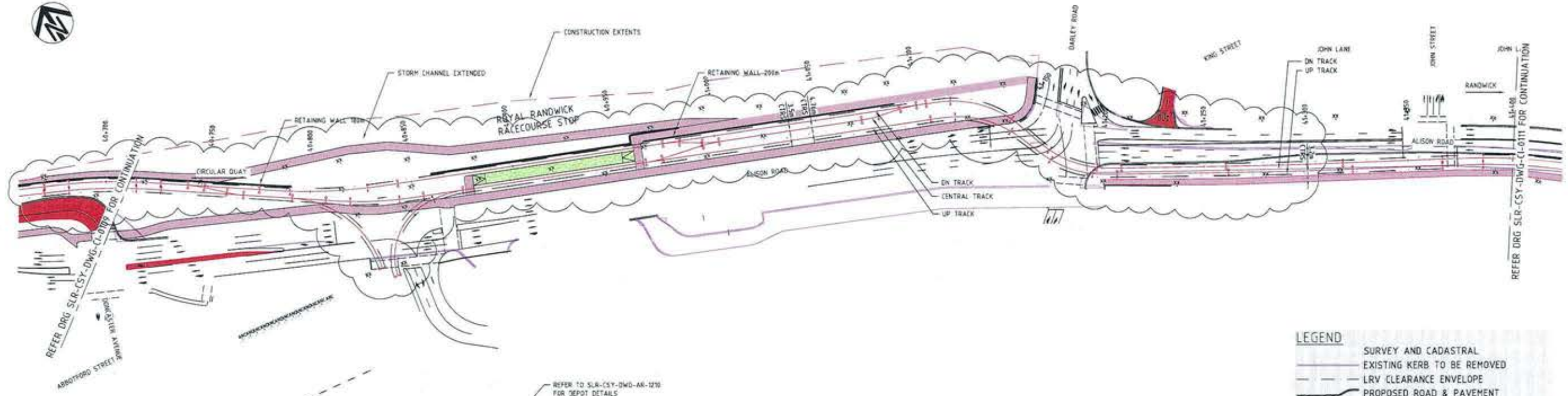


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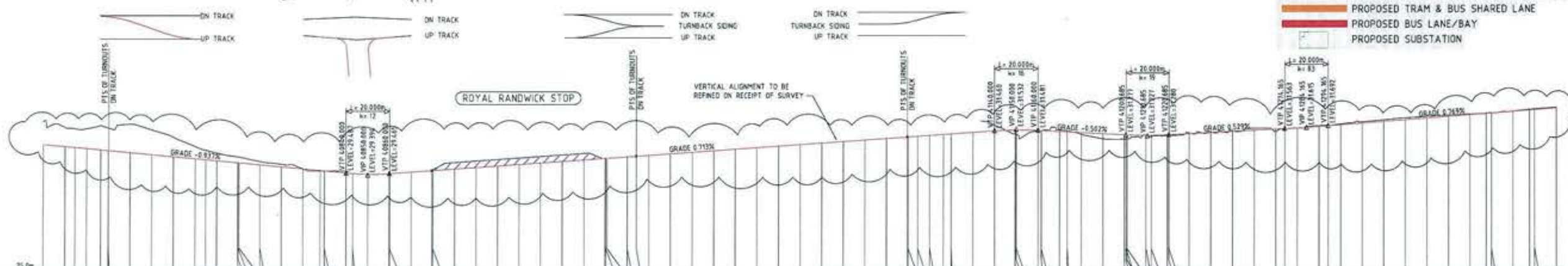
Drawn: S.SAIIBARI Designer: W.PERRAM
 Drafting Check: D.SMITH Design Check: G.MORTON
 Approved: A.COLLIS
 Date: 18/11/2014
 Scale: 1:1000

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 ALIGNMENT PLAN AND LONG SECTION
 ROUTE 02
 SHEET 10 OF 14

Original Size: **A1** Drawing No: SLR-CSY-DWG-CI-0109 Rev: C



PLAN
SCALE 1:1000

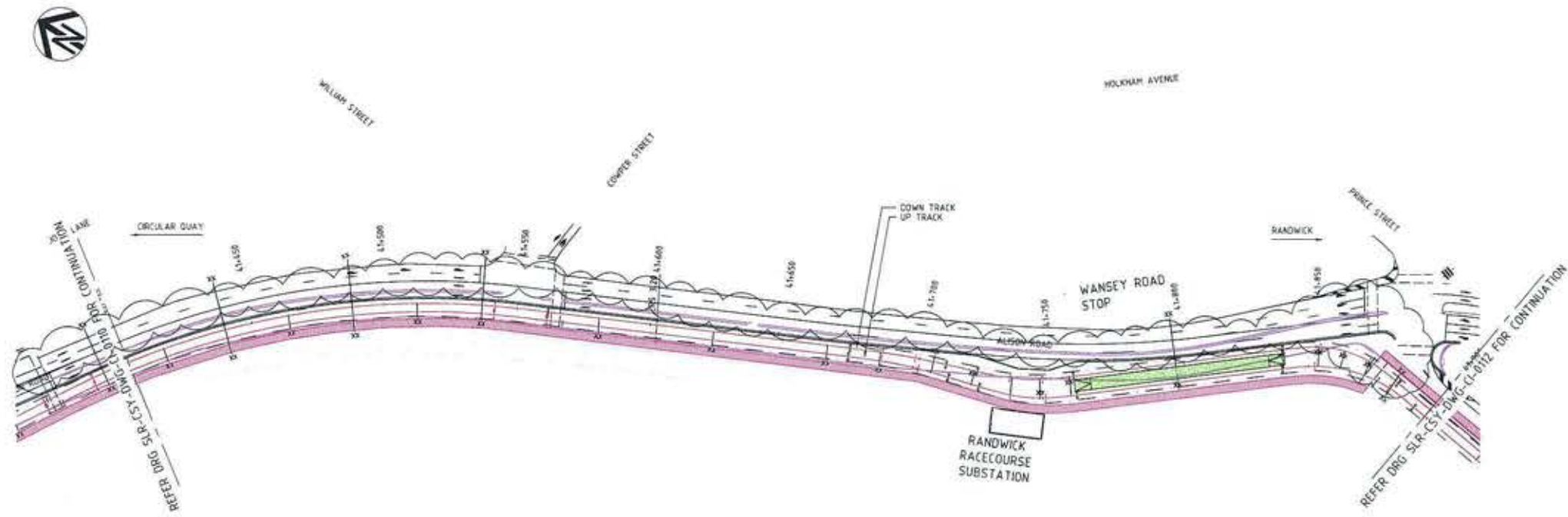


KILOMETRAGE	46+700 000	46+710 000	46+720 000	46+730 000	46+740 000	46+750 000	46+760 000	46+770 000	46+780 000	46+790 000	46+800 000	46+810 000	46+820 000	46+830 000	46+840 000	46+850 000	46+860 000	46+870 000	46+880 000	46+890 000	46+900 000	46+910 000	46+920 000	46+930 000	46+940 000	46+950 000	46+960 000	46+970 000	46+980 000	46+990 000	47+000 000			
PROPOSED VERTICAL DESIGN	L=20000 S ₁ =-0.1313% S ₂ =0.1133%																	L=20000 S ₁ =-0.5022% S ₂ =0.3220%																
PROPOSED LOW RAIL LEVELS	30.799	30.663	30.550	30.470	30.420	30.390	30.370	30.360	30.350	30.340	30.330	30.320	30.310	30.300	30.290	30.280	30.270	30.260	30.250	30.240	30.230	30.220	30.210	30.200	30.190	30.180	30.170	30.160	30.150	30.140	30.130	30.120		
SPEED	45km/h																	25km/h																
CANT ALIGNMENT (mm)	0																	0																
HORIZONTAL ALIGNMENT	RAD 210.000 ARC 32.103 L=148.288																	L=2014.445																

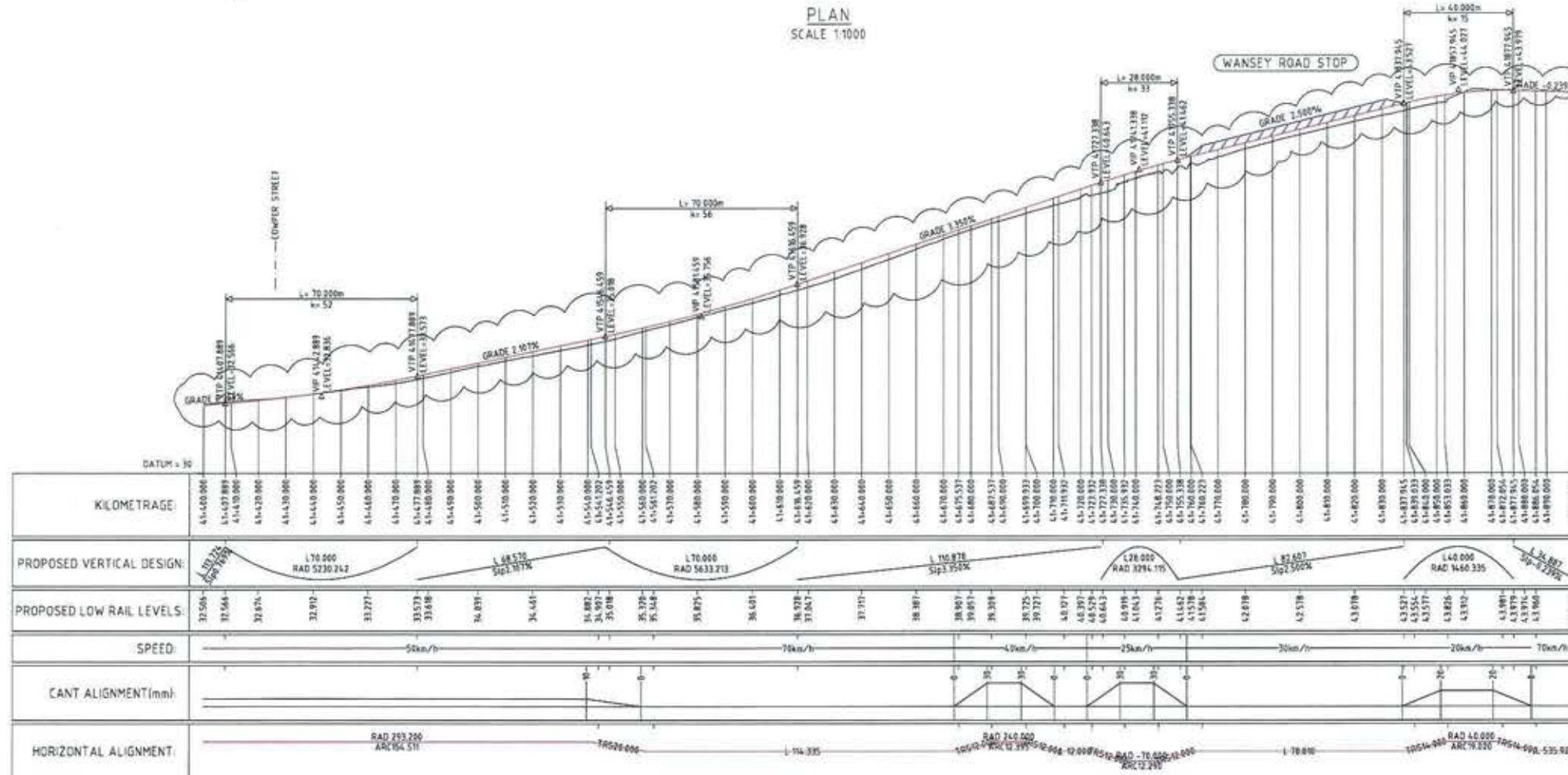
LONGITUDINAL SECTION
SCALE 1:1000 (H) 1:100 (V)

CONCEPT DESIGN

Client Transport for NSW	DO NOT SCALE 	Drawn: S.RAIBORN Designer: W.FERRAR	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK ALIGNMENT PLAN AND LONG SECTION ROUTE 02 SHEET 11 OF 18
		Drafting Check: D.SMITH Design Check: G.MORTON	
Approved: A.COLLIS Date: 04/07/2014	Scale: 1:1000	This Drawing must not be used for construction unless signed as Approved.	Drawing Size: A1 Drawing No: SLR-CSY-DWG-CI-0110 Rev: C



PLAN
SCALE 1:1000

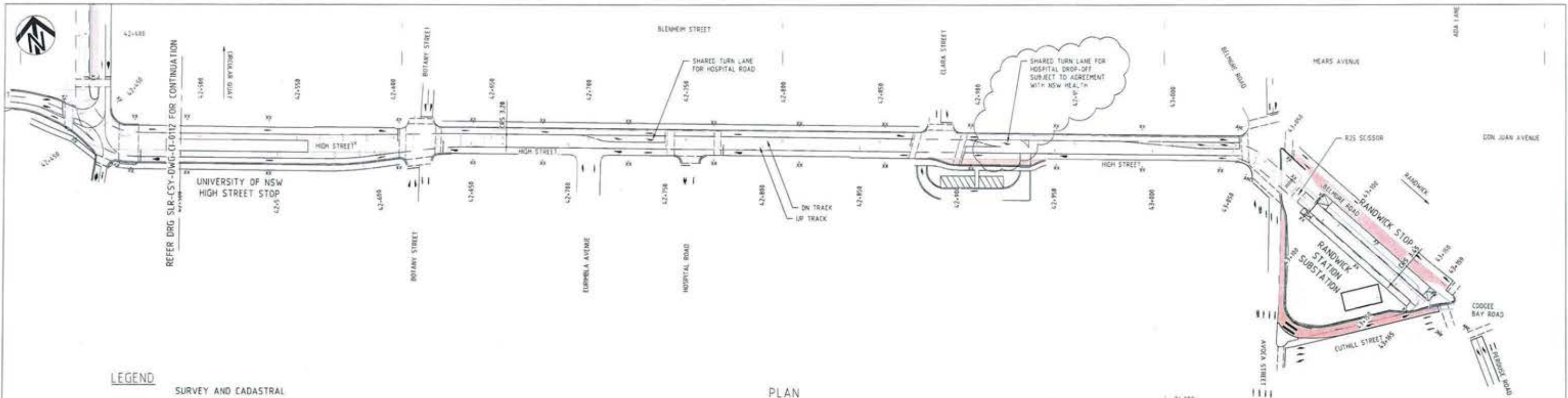


LONGITUDINAL SECTION
SCALE 1:1000 (H) 1:100 (V)

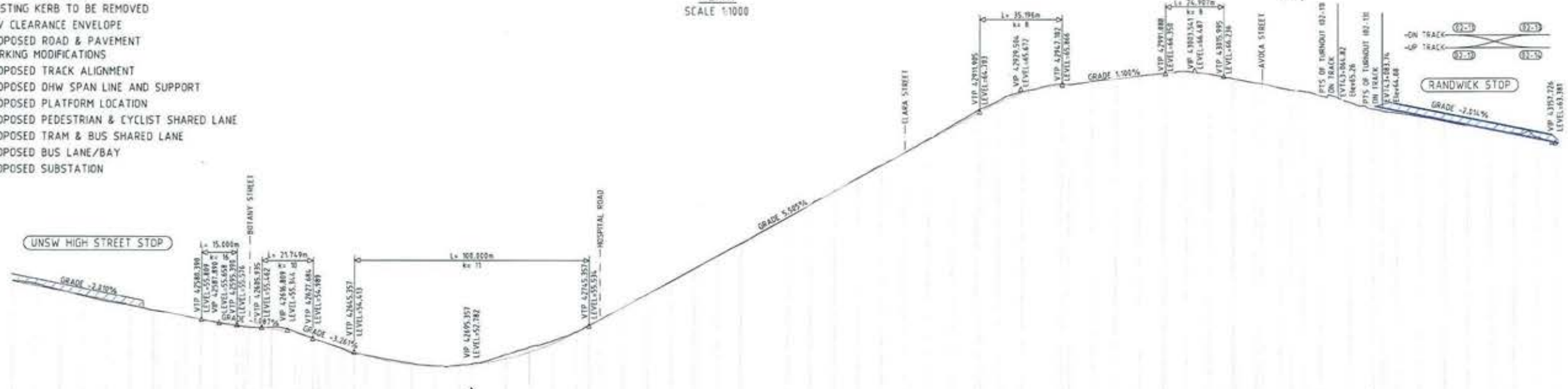
- LEGEND**
- SURVEY AND CADASTRAL
 - EXISTING KERB TO BE REMOVED
 - LRV CLEARANCE ENVELOPE
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 - PROPOSED TRAM & BUS SHARED LANE
 - PROPOSED BUS LANE/BAY
 - PROPOSED SUBSTATION

CONCEPT DESIGN

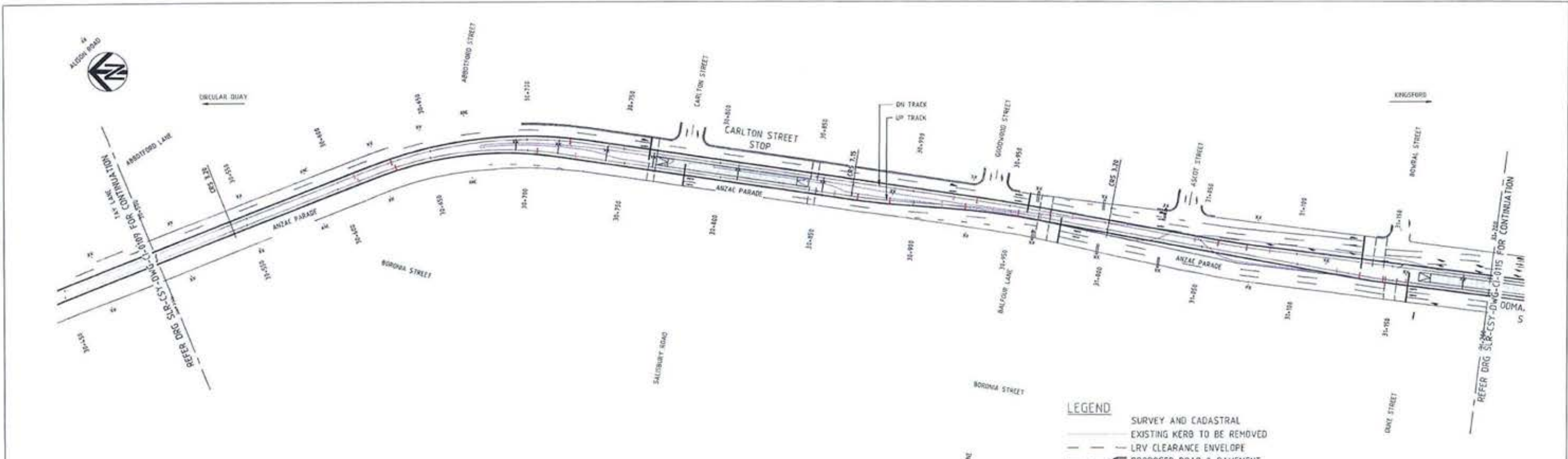
REVISIONS FOR CONTRACT SUBS REVISIONS FOR CONCEPT DESIGN REVISIONS FOR CONCEPT DESIGN	NO. REVISIONS DATE	APPROVED BY DATE	CLIENT Transport for NSW	DO NOT SCALE 	DRAWN: S.RAJAMAN DESIGNER: W.PERRAM DRAFTER: D.SMTI DESIGN CHECK: G.MORTON APPROVED: A.COLLIS DATE: 18/11/2014 SCALE: 1:1000	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK ALIGNMENT PLAN AND LONG SECTION ROUTE 02 SHEET 12 OF 18
	ORIGINAL SIZE HORIZONTAL 1:1000 AT ORIGINAL SIZE				This Drawing must not be used for construction unless signed as Approved.	Original Size A1 Drawing No: SLR-CSY-DWG-CI-0111 Rev: C
	Vertical 1:100 AT ORIGINAL SIZE		Horizontal 1:1000 AT ORIGINAL SIZE		Approved for Construction	Original Size
	Vertical 1:100 AT ORIGINAL SIZE		Horizontal 1:1000 AT ORIGINAL SIZE		Approved for Construction	Original Size



- LEGEND**
- SURVEY AND CADASTRAL
 - EXISTING KERB TO BE REMOVED
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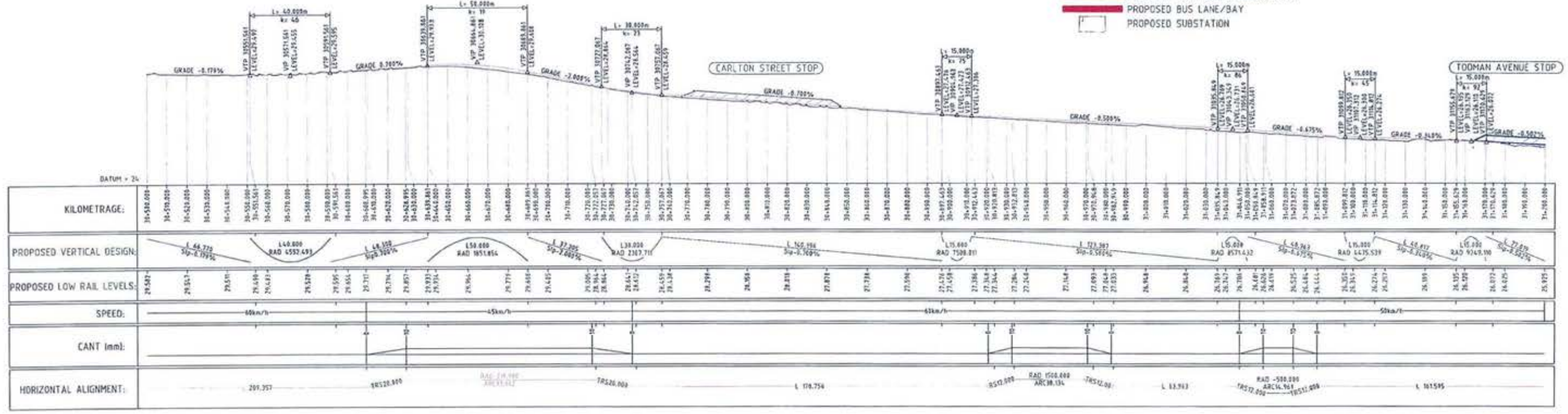


KILOMETRAGE:	PROPOSED VERTICAL DESIGN:	PROPOSED LOW RAIL LEVELS:	SPEED:	CANT (mm):	HORIZONTAL ALIGNMENT:
42+000.000	L 89.433 Sg -2.10%	57.424	70km/h	0	L 88.79%
42+500.000		57.422			
42+500.000	L 15.000 RAD 114.684	56.420	40km/h	0	RAD -875.000 ARC 12.136
42+548.000		56.218			
42+548.000	L 17.749 RAD 119.999	55.917	40km/h	0	L 12.000 RAD 12.000
42+580.000		55.806			
42+580.000	L 17.749 RAD 119.999	55.784	40km/h	0	RAD 875.000 ARC 12.136
42+600.000		55.518			
42+600.000	L 100.000 RAD 114.684	55.547	70km/h	0	L 49.21%
42+630.000		55.528			
42+630.000	L 135.196 RAD 798.964	55.482	70km/h	0	RAD 12000.000 ARC 24.302
42+700.000		55.422			
42+700.000	L 135.196 RAD 798.964	55.252	70km/h	0	L 300.857
42+730.000		55.514			
42+730.000	L 135.196 RAD 798.964	56.361	70km/h	0	RAD 12000.000 ARC 24.302
42+760.000		56.361			
42+760.000	L 135.196 RAD 798.964	57.442	70km/h	0	L 182.259
42+790.000		56.543			
42+790.000	L 135.196 RAD 798.964	56.844	70km/h	0	RAD 12000.000 ARC 24.302
42+820.000		56.844			
42+820.000	L 135.196 RAD 798.964	68.745	70km/h	0	L 182.259
42+850.000		68.745			
42+850.000	L 135.196 RAD 798.964	68.846	70km/h	0	RAD 12000.000 ARC 24.302
42+880.000		68.846			
42+880.000	L 135.196 RAD 798.964	62.967	70km/h	0	L 182.259
42+910.000		62.967			
42+910.000	L 135.196 RAD 798.964	64.018	70km/h	0	RAD 12000.000 ARC 24.302
42+940.000		64.018			
42+940.000	L 135.196 RAD 798.964	65.108	70km/h	0	L 182.259
42+970.000		65.108			
42+970.000	L 135.196 RAD 798.964	65.754	70km/h	0	RAD 12000.000 ARC 24.302
42+980.000		65.754			
42+980.000	L 135.196 RAD 798.964	65.886	70km/h	0	L 182.259
42+990.000		65.886			
42+990.000	L 135.196 RAD 798.964	66.208	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.208			
42+990.000	L 135.196 RAD 798.964	66.390	70km/h	0	L 182.259
42+990.000		66.390			
42+990.000	L 135.196 RAD 798.964	66.708	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.708			
42+990.000	L 135.196 RAD 798.964	66.754	70km/h	0	L 182.259
42+990.000		66.754			
42+990.000	L 135.196 RAD 798.964	66.846	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.846			
42+990.000	L 135.196 RAD 798.964	66.917	70km/h	0	L 182.259
42+990.000		66.917			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	RAD 12000.000 ARC 24.302
42+990.000		66.952			
42+990.000	L 135.196 RAD 798.964	66.952	70km/h	0	L 182.259



PLAN
SCALE 1:1000

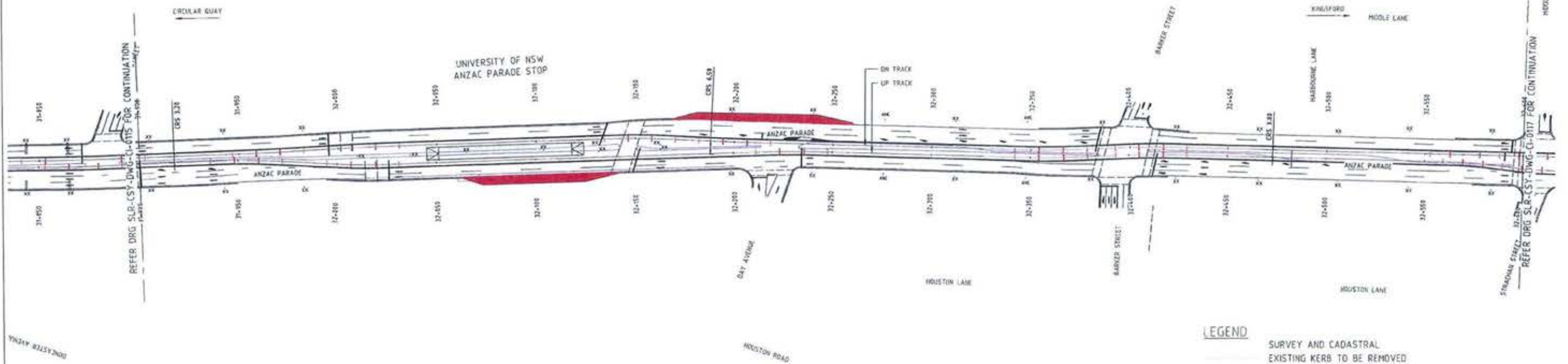
- LEGEND**
- SURVEY AND CADASTRAL
 - EXISTING KERB TO BE REMOVED
 - LRV CLEARANCE ENVELOPE
 - PROPOSED ROAD & PAVEMENT
 - MARKING MODIFICATIONS
 - PROPOSED TRACK ALIGNMENT
 - PROPOSED OHW SPAN LINE AND SUPPORT
 - PROPOSED PLATFORM LOCATION
 - PROPOSED PEDESTRIAN & CYCLIST SHARED LANE
 - PROPOSED TRAM & BUS SHARED LANE
 - PROPOSED BUS LANE/BAY
 - PROPOSED SUBSTATION



LONGITUDINAL SECTION
SCALE 1:1000 (H) 1:100 (V)

CONCEPT DESIGN

						DO NOT SCALE		Drawn: S THORNE Designer: D CALDWELL Drafting Check: D SMITH Design Check: G MORTON Approved: A COLLIS Date: 04/07/2014 Scale: 1:1000		SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK ALIGNMENT PLAN AND LONG SECTION ROUTE M SHEET 15 OF 18 Drawing No: SLR-CSY-DWG-CI-0114 Rev: A	
VERTICAL 1:100 AT ORIGINAL SIZE HORIZONTAL 1:1000 AT ORIGINAL SIZE				Client:		Date:		Title:		Author:	



PLAN
SCALE 1:1000

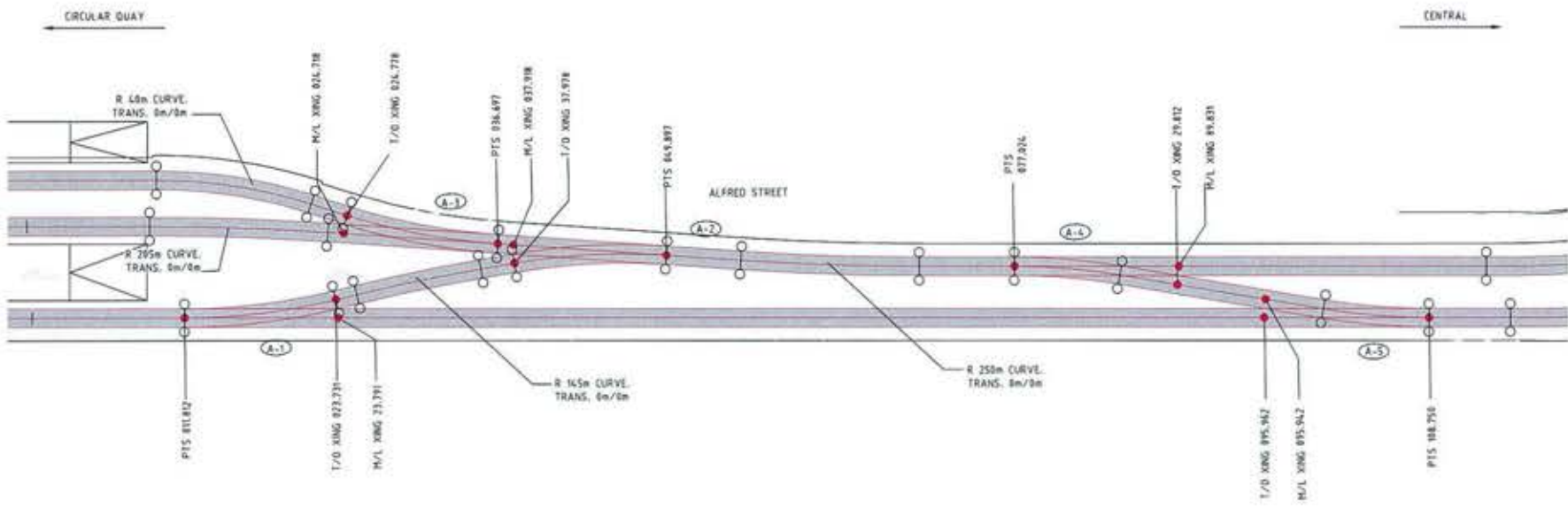
LEGEND

- SURVEY AND CADASTRAL
- EXISTING KERB TO BE REMOVED
- LRV CLEARANCE ENVELOPE
- PROPOSED ROAD & PAVEMENT
- MARKING MODIFICATIONS
- PROPOSED TRACK ALIGNMENT
- PROPOSED OHW SPAN LINE AND SUPPORT
- PROPOSED PLATFORM LOCATION
- PROPOSED PEDESTRIAN & CYCLIST SHARED LANE
- PROPOSED TRAM & BUS SHARED LANE
- PROPOSED BUS LANE/BAY
- PROPOSED SUBSTATION

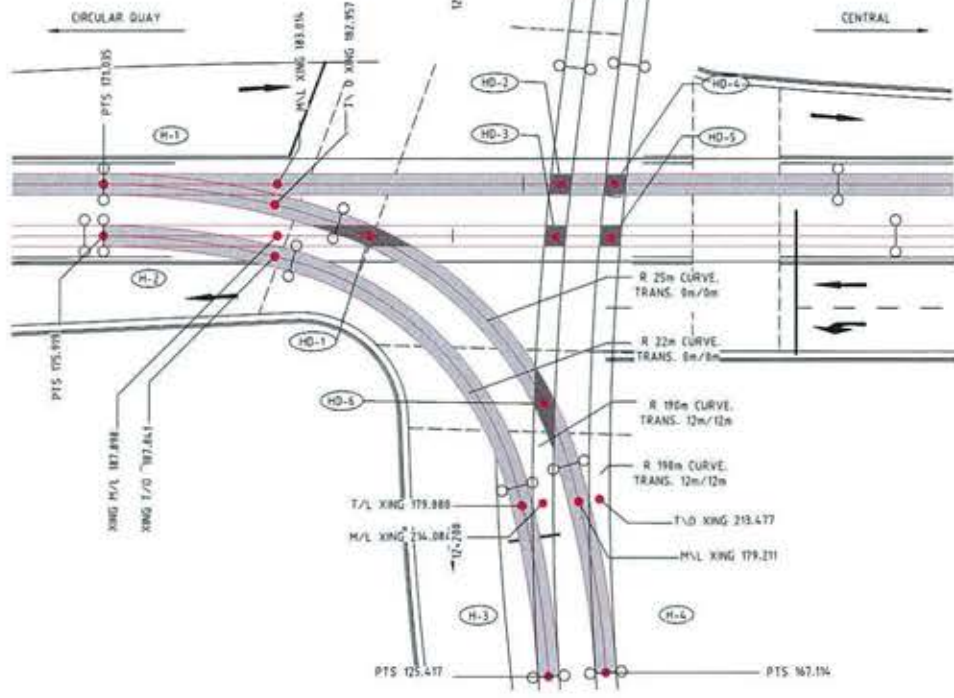


LONGITUDINAL SECTION
SCALE 1:1000 (H) 1:100 (V)

KILOMETRAGE:	PROPOSED VERTICAL DESIGN:	PROPOSED LOW RAIL LEVELS:	SPEED:	CANT (mm):	HORIZONTAL ALIGNMENT:
31+000.000	L 50.000m RAD 4330.391 SIP -2.5031%	27.207	40km/h	0	L 103.479
31+002.000		27.205			
31+004.000	L 50.000m RAD 4444.528 SIP -2.5031%	27.202	40km/h	0	L 123.491
31+006.000		27.200			
31+008.000	L 50.000m RAD 4558.665 SIP -2.5031%	27.197	40km/h	0	L 123.446
31+010.000		27.195			
31+012.000	L 50.000m RAD 4672.802 SIP -2.5031%	27.192	40km/h	0	L 123.401
31+014.000		27.190			
31+016.000	L 50.000m RAD 4786.939 SIP -2.5031%	27.189	40km/h	0	L 123.356
31+018.000		27.187			
31+020.000	L 50.000m RAD 4901.076 SIP -2.5031%	27.184	40km/h	0	L 123.311
31+022.000		27.182			
31+024.000	L 50.000m RAD 5015.213 SIP -2.5031%	27.179	40km/h	0	L 123.266
31+026.000		27.177			
31+028.000	L 50.000m RAD 5129.350 SIP -2.5031%	27.174	40km/h	0	L 123.221
31+030.000		27.172			
31+032.000	L 50.000m RAD 5243.487 SIP -2.5031%	27.169	40km/h	0	L 123.176
31+034.000		27.167			
31+036.000	L 50.000m RAD 5357.624 SIP -2.5031%	27.164	40km/h	0	L 123.131
31+038.000		27.162			
31+040.000	L 50.000m RAD 5471.761 SIP -2.5031%	27.159	40km/h	0	L 123.086
31+042.000		27.157			
31+044.000	L 50.000m RAD 5585.898 SIP -2.5031%	27.154	40km/h	0	L 123.041
31+046.000		27.152			
31+048.000	L 50.000m RAD 5700.035 SIP -2.5031%	27.149	40km/h	0	L 122.996
31+050.000		27.147			
31+052.000	L 50.000m RAD 5814.172 SIP -2.5031%	27.144	40km/h	0	L 122.951
31+054.000		27.142			
31+056.000	L 50.000m RAD 5928.309 SIP -2.5031%	27.139	40km/h	0	L 122.906
31+058.000		27.137			
31+060.000	L 50.000m RAD 6042.446 SIP -2.5031%	27.134	40km/h	0	L 122.861
31+062.000		27.132			
31+064.000	L 50.000m RAD 6156.583 SIP -2.5031%	27.129	40km/h	0	L 122.816
31+066.000		27.127			
31+068.000	L 50.000m RAD 6270.720 SIP -2.5031%	27.124	40km/h	0	L 122.771
31+070.000		27.122			
31+072.000	L 50.000m RAD 6384.857 SIP -2.5031%	27.119	40km/h	0	L 122.726
31+074.000		27.117			
31+076.000	L 50.000m RAD 6498.994 SIP -2.5031%	27.114	40km/h	0	L 122.681
31+078.000		27.112			
31+080.000	L 50.000m RAD 6613.131 SIP -2.5031%	27.109	40km/h	0	L 122.636
31+082.000		27.107			
31+084.000	L 50.000m RAD 6727.268 SIP -2.5031%	27.104	40km/h	0	L 122.591
31+086.000		27.102			
31+088.000	L 50.000m RAD 6841.405 SIP -2.5031%	27.099	40km/h	0	L 122.546
31+090.000		27.097			
31+092.000	L 50.000m RAD 6955.542 SIP -2.5031%	27.094	40km/h	0	L 122.501
31+094.000		27.092			
31+096.000	L 50.000m RAD 7069.679 SIP -2.5031%	27.089	40km/h	0	L 122.456
31+098.000		27.087			
31+100.000	L 50.000m RAD 7183.816 SIP -2.5031%	27.084	40km/h	0	L 122.411
31+102.000		27.082			
31+104.000	L 50.000m RAD 7297.953 SIP -2.5031%	27.079	40km/h	0	L 122.366
31+106.000		27.077			
31+108.000	L 50.000m RAD 7412.090 SIP -2.5031%	27.074	40km/h	0	L 122.321
31+110.000		27.072			
31+112.000	L 50.000m RAD 7526.227 SIP -2.5031%	27.069	40km/h	0	L 122.276
31+114.000		27.067			
31+116.000	L 50.000m RAD 7640.364 SIP -2.5031%	27.064	40km/h	0	L 122.231
31+118.000		27.062			
31+120.000	L 50.000m RAD 7754.501 SIP -2.5031%	27.059	40km/h	0	L 122.186
31+122.000		27.057			
31+124.000	L 50.000m RAD 7868.638 SIP -2.5031%	27.054	40km/h	0	L 122.141
31+126.000		27.052			
31+128.000	L 50.000m RAD 7982.775 SIP -2.5031%	27.049	40km/h	0	L 122.096
31+130.000		27.047			
31+132.000	L 50.000m RAD 8096.912 SIP -2.5031%	27.044	40km/h	0	L 122.051
31+134.000		27.042			
31+136.000	L 50.000m RAD 8211.049 SIP -2.5031%	27.039	40km/h	0	L 122.006
31+138.000		27.037			
31+140.000	L 50.000m RAD 8325.186 SIP -2.5031%	27.034	40km/h	0	L 121.961
31+142.000		27.032			
31+144.000	L 50.000m RAD 8439.323 SIP -2.5031%	27.029	40km/h	0	L 121.916
31+146.000		27.027			
31+148.000	L 50.000m RAD 8553.460 SIP -2.5031%	27.024	40km/h	0	L 121.871
31+150.000		27.022			
31+152.000	L 50.000m RAD 8667.597 SIP -2.5031%	27.019	40km/h	0	L 121.826
31+154.000		27.017			
31+156.000	L 50.000m RAD 8781.734 SIP -2.5031%	27.014	40km/h	0	L 121.781
31+158.000		27.012			
31+160.000	L 50.000m RAD 8895.871 SIP -2.5031%	27.009	40km/h	0	L 121.736
31+162.000		27.007			
31+164.000	L 50.000m RAD 9010.008 SIP -2.5031%	27.004	40km/h	0	L 121.691
31+166.000		27.002			
31+168.000	L 50.000m RAD 9124.145 SIP -2.5031%	27.000	40km/h	0	L 121.646
31+170.000		26.998			
31+172.000	L 50.000m RAD 9238.282 SIP -2.5031%	26.995	40km/h	0	L 121.601
31+174.000		26.993			
31+176.000	L 50.000m RAD 9352.419 SIP -2.5031%	26.990	40km/h	0	L 121.556
31+178.000		26.988			
31+180.000	L 50.000m RAD 9466.556 SIP -2.5031%	26.985	40km/h	0	L 121.511
31+182.000		26.983			
31+184.000	L 50.000m RAD 9580.693 SIP -2.5031%	26.980	40km/h	0	L 121.466
31+186.000		26.978			
31+188.000	L 50.000m RAD 9694.830 SIP -2.5031%	26.975	40km/h	0	L 121.421
31+190.000		26.973			
31+192.000	L 50.000m RAD 9808.967 SIP -2.5031%	26.970	40km/h	0	L 121.376
31+194.000		26.968			
31+196.000	L 50.000m RAD 9923.104 SIP -2.5031%	26.965	40km/h	0	L 121.331
31+198.000		26.963			
31+200.000	L 50.000m RAD 10037.241 SIP -2.5031%	26.960	40km/h	0	L 121.286
31+202.000		26.958			
31+204.000	L 50.000m RAD 10151.378 SIP -2.5031%	26.955	40km/h	0	L 121.241
31+206.000		26.953			
31+208.000	L 50.000m RAD 10265.515 SIP -2.5031%	26.950	40km/h	0	L 121.196
31+210.000		26.948			
31+212.000	L 50.000m RAD 10379.652 SIP -2.5031%	26.945	40km/h	0	L 121.151
31+214.000		26.943			
31+216.000	L 50.000m RAD 10493.789 SIP -2.5031%	26.940	40km/h	0	L 121.106
31+218.000		26.938			
31+220.000	L 50.000m RAD 10607.926 SIP -2.5031%	26.935	40km/h	0	L 121.061
31+222.000		26.933			
31+224.000	L 50.000m RAD 10722.063 SIP -2.5031%	26.930	40km/h	0	L 121.016
31+226.000		26.928			
31+228.000	L 50.000m RAD 10836.200 SIP -2.5031%	26.925	40km/h	0	L 120.971
31+230.000		26.923			
31+232.000	L 50.000m RAD 10950.337 SIP -2.5031%	26.920	40km/h	0	L 120.926
31+234.000		26.918			
31+236.000	L 50.000m RAD 11064.474 SIP -2.5031%	26.915	40km/h	0	L 120.881
31+238.000		26.913			
31+240.000	L 50.000m RAD 11178.611 SIP -2.5031%	26.910	40km/h	0	L 120.836
31+242.000		26.908			
31+244.000	L 50.000m RAD 11292.748 SIP -2.5031%	26.905	40km/h	0	L 120.791
31+246.000		26.903			
31+248.000	L 50.000m RAD 11406.885 SIP -2.5031%	26.900	40km/h	0	L 120.746
31+250.000		26.898			
31+252.000	L 50.000m RAD 11521.022 SIP -2.5031%	26.895	40km/h	0	L 120.701
31+254.000		26.893			
31+256.000	L 50.000m RAD 11635.159 SIP -2.5031%	26.890	40km/h	0	L 120.656
31+258.000		26.888			
31+260.000	L 50.000m RAD 11749.296 SIP -2.5031%	26.885	40km/h	0	L 120.611
31+262.000		26.883			
31+264.000	L 50.000m RAD 11863.433 SIP -2.5031%	26.880	40km/h	0	L 120.566
31+266.000		26.878			
31+268.000	L 50.000m RAD 11977.570 SIP -2.5031%	26.875	40km/h	0	L 120.521
31+270.000		26.873			
31+272.000	L 50.000m RAD 12091.707 SIP -2.5031%	26.870	40km/h	0	L 120.476
31+274.000		26.868			
31+276.000	L 50.000m RAD 12205.844 SIP -2.5031%	26.865	40km/h	0	L 120.431
31+278.000		26.863			
31+280.000	L 50.000m RAD 12319.981 SIP -2.5031%	26.860	40km/h	0	L 120.386
31+282.000		26.858			
31+284.000	L 50.000m RAD 12434.118 SIP -2.5031%	26.855	40km/h	0	L 120.341
31+286.000		26.853			
31+288.000	L 50.000m RAD 12548.255 SIP -2.5031%	26.850	40km/h	0	L 120.296
31+290.000		26.848			
31+292.000	L 50.000m RAD 12662.392 SIP -2.5031%	26.845	40km/h	0	L 120.251
31+294.000		26.843			
31+296.000	L 50.000m RAD 12776.529 SIP -2.5031%	26.840	40km/h	0	L 120.206
31+298.000		26.838			
31+300.000	L 50.000m RAD 12890				



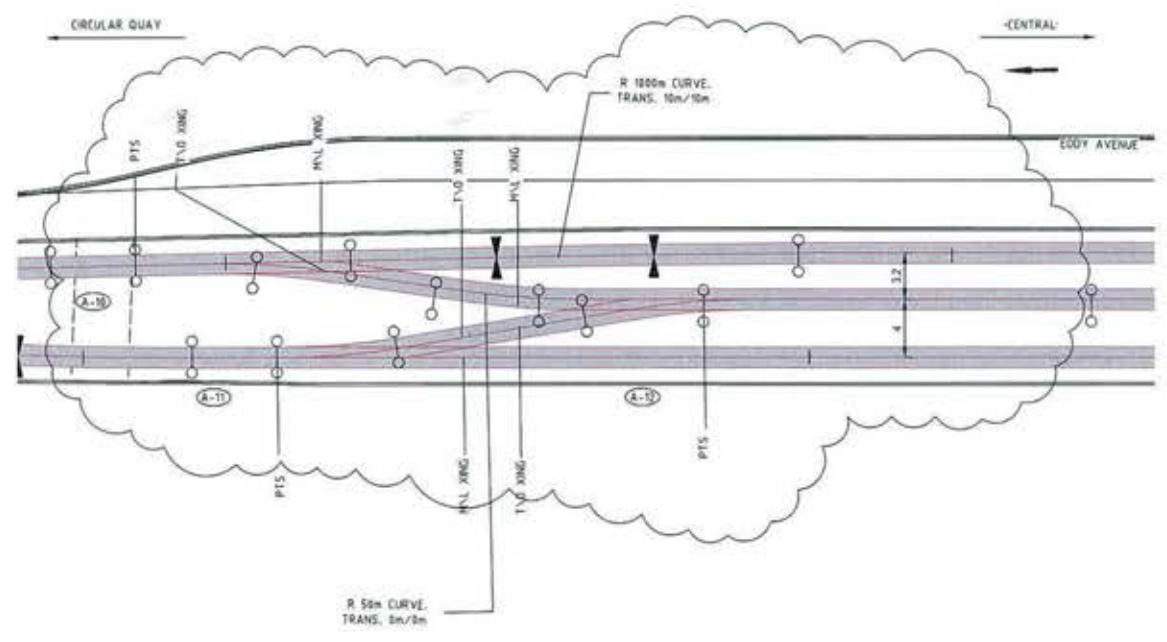
PLAN
SCALE 1:250



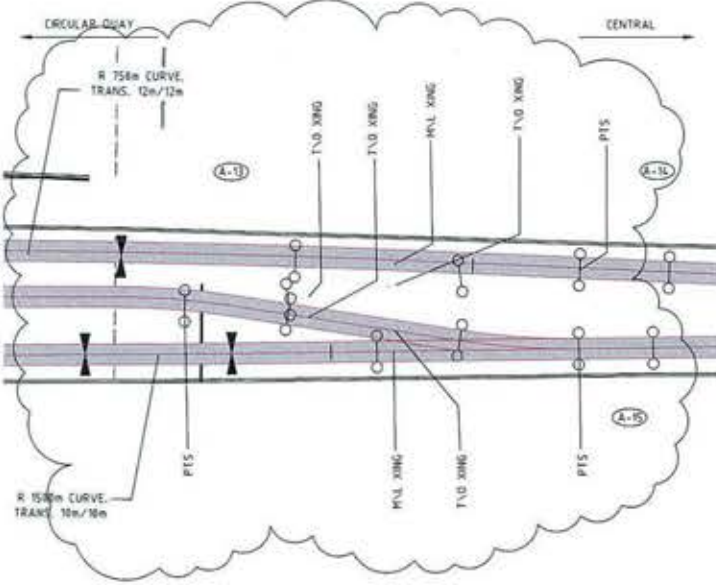
PLAN
SCALE 1:250

TURNOUT DETAILS					
POINTS	CROSSING ANGLE	SWITCH GEOMETRY RADIUS (m)	CROSSING GEOMETRY RADIUS IN (m)	M/L GEOMETRY IN (m)	DESCRIPTION
A-1	CURVED	50.00	50.000	STRAIGHT	SPECIAL LH
A-2	CURVED	50.00	50.000	STRAIGHT	SPECIAL RH
A-3	CURVED	50.00	50.000	STRAIGHT	SPECIAL RH
A-4	1.6	50.00	50.000	STRAIGHT	STANDARD RH
A-5	1.6	50.00	50.000	STRAIGHT	STANDARD RH
A-10	1.6	50.000	STRAIGHT	STRAIGHT	STANDARD RH
A-11	1.6	50.000	STRAIGHT	STRAIGHT	STANDARD LH
A-12	CURVED	50.000	STRAIGHT	STRAIGHT	SPECIAL LH
A-13	CURVED	50.000	50.000	STRAIGHT	SPECIAL WYE
A-14	1.6	50.000	STRAIGHT	STRAIGHT	STANDARD LH
A-15	1.6	50.000	STRAIGHT	STRAIGHT	STANDARD RH
H-1	CURVED	50.000	50.000	STRAIGHT	SPECIAL RH
H-2	CURVED	50.000	50.000	STRAIGHT	SPECIAL RH
H-3	CURVED	67.98	67.980	190m RADIUS CURVE	SPECIAL LH
H-4	CURVED	67.98	67.980	190m RADIUS CURVE	SPECIAL LH

DIAMOND DETAILS			
ID	XING TYPE	XING ANGLE	DESCRIPTION
HD-1	CURVED	CURVED	SPECIAL
HD-2	CURVED	CURVED	SPECIAL
HD-3	CURVED	CURVED	SPECIAL
HD-4	CURVED	CURVED	SPECIAL
HD-5	CURVED	CURVED	SPECIAL
HD-6	CURVED	CURVED	SPECIAL



PLAN
SCALE 1:250



PLAN
SCALE 1:250

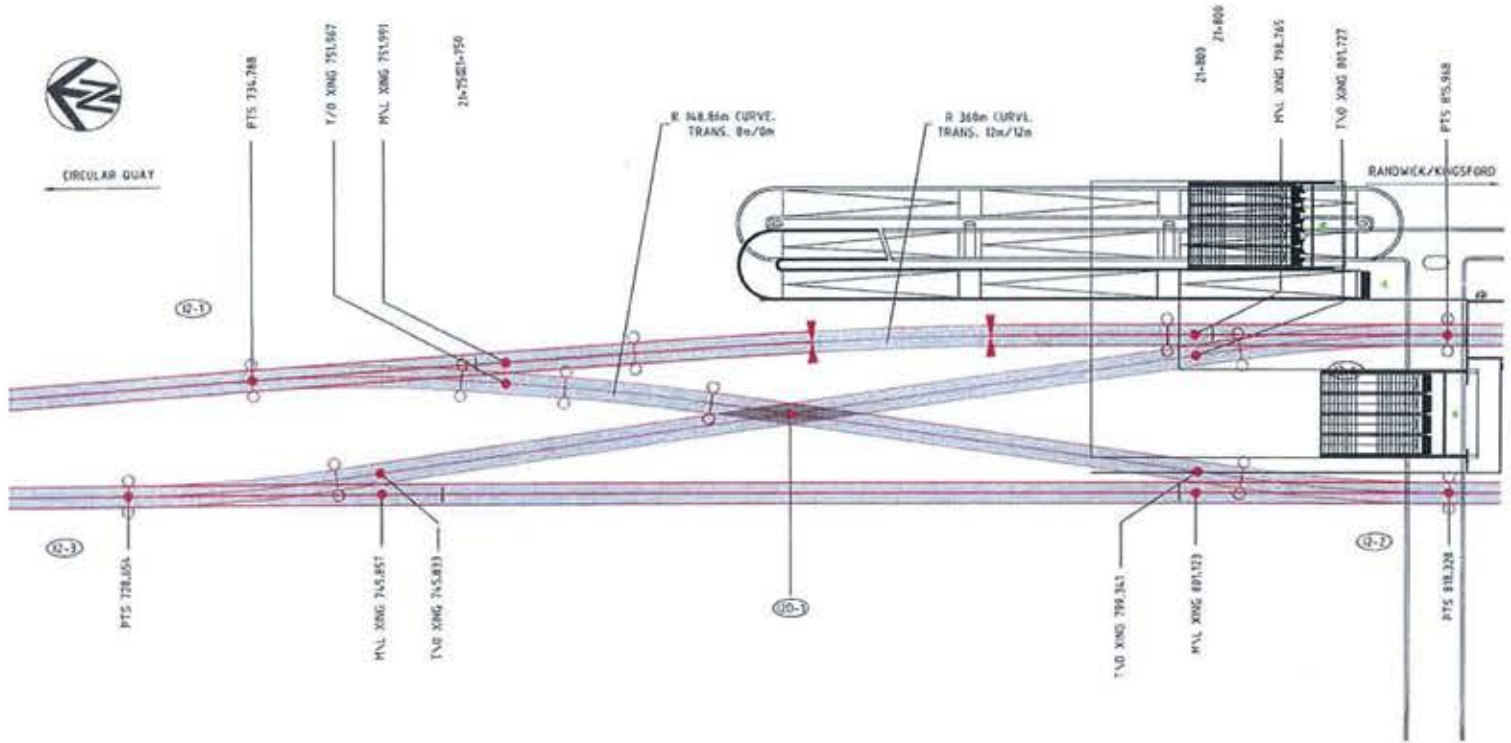
CONCEPT DESIGN

No.	Revision	Date	By	Checked	Date
1	ISSUED FOR CONSTRUCTION	04/07/2014	W. FERRAM	Q. MORTON	04/07/2014
2	ISSUED FOR CONCEPT DESIGN	04/07/2014	W. FERRAM	Q. MORTON	04/07/2014



Client	DO NOT SCALE	Drawn	W. FERRAM
Designer	Q. MORTON	Drafting Check	Q. SMITH
Design Check	Q. MORTON	Approved	A. COLLIS
Date	04/07/2014	Date	04/07/2014
Scale		Scale	

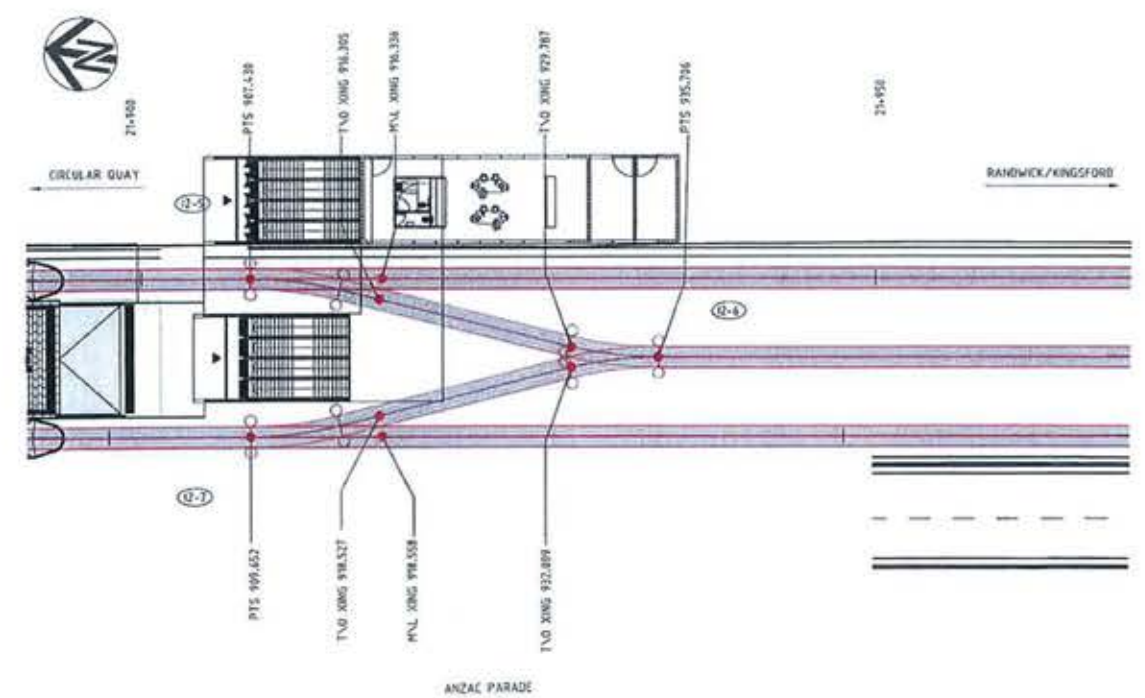
SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK JUNCTION LAYOUTS ROUTE A	
Original Size	A1
Drawing No:	SLR-CSY-DWG-CI-0130
Rev:	B



PLAN
SCALE 1:250

TURNOUT DETAILS				
POINTS	CROSSING RATE	M/L GEOMETRY IN (m)	T/O GEOMETRY RADIUS IN (m)	DESCRIPTION
12-1	1 : 7	STRAIGHT	100.000	STANDARD RH
12-2	1 : 7	STRAIGHT	100.000	STANDARD RH
12-3	1 : 7	STRAIGHT	100.000	STANDARD LH
12-4	1 : 7	STRAIGHT	100.000	STANDARD LH

DIAMOND DETAILS			
ID	XING TYPE	XING ANGLE	DESCRIPTION
MD-1	'V' XING	16.26 °	SPECIAL



PLAN
SCALE 1:250

TURNOUT DETAILS					
POINTS	CROSSING ANGLE	SWITCH GEOMETRY RADIUS (m)	CROSSING GEOMETRY RADIUS IN (m)	M/L GEOMETRY IN (m)	DESCRIPTION
12-5	1 : 4	25.000	STRAIGHT	STRAIGHT	STANDARD RH
12-6	1 : 4	25.000	STRAIGHT	STRAIGHT	SPECIAL WYE
12-7	1 : 4	25.000	STRAIGHT	STRAIGHT	STANDARD LH

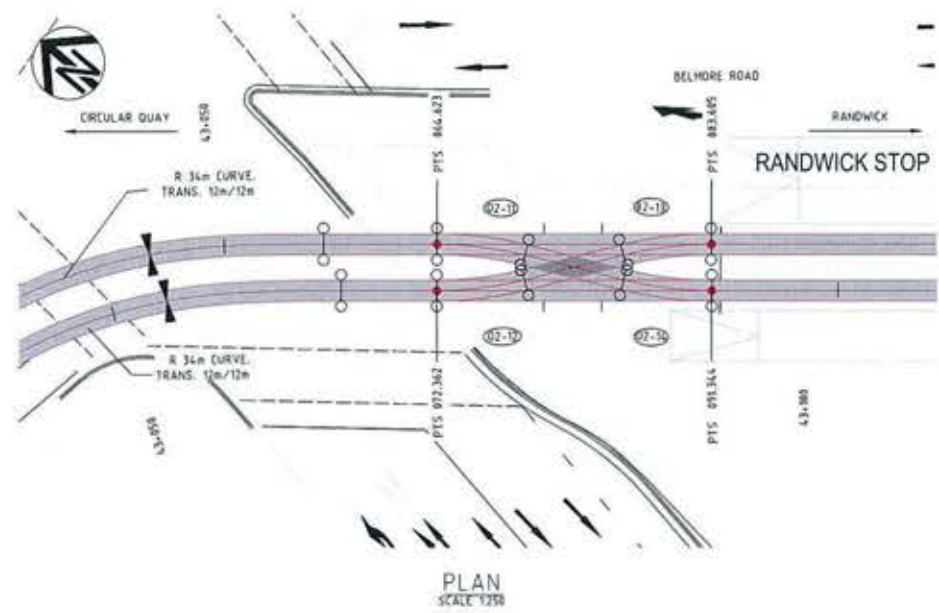
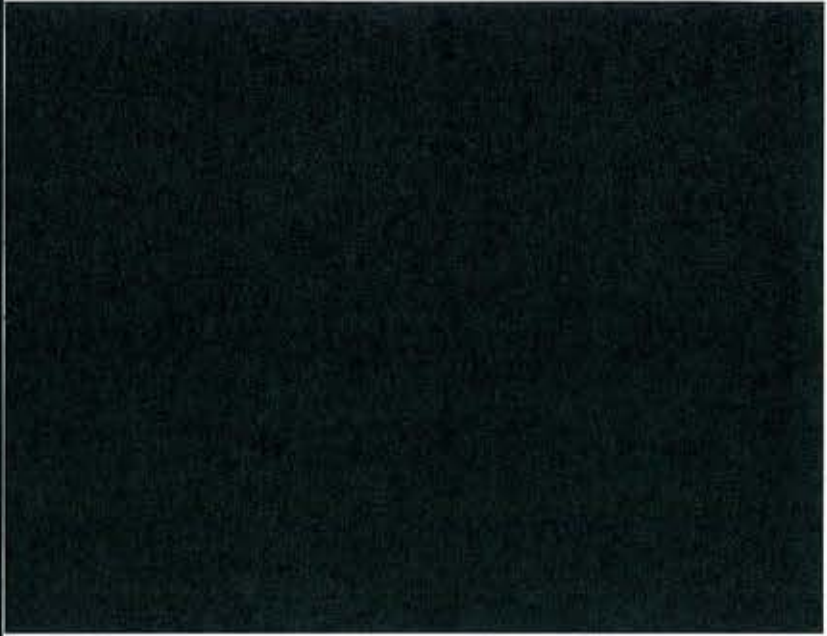
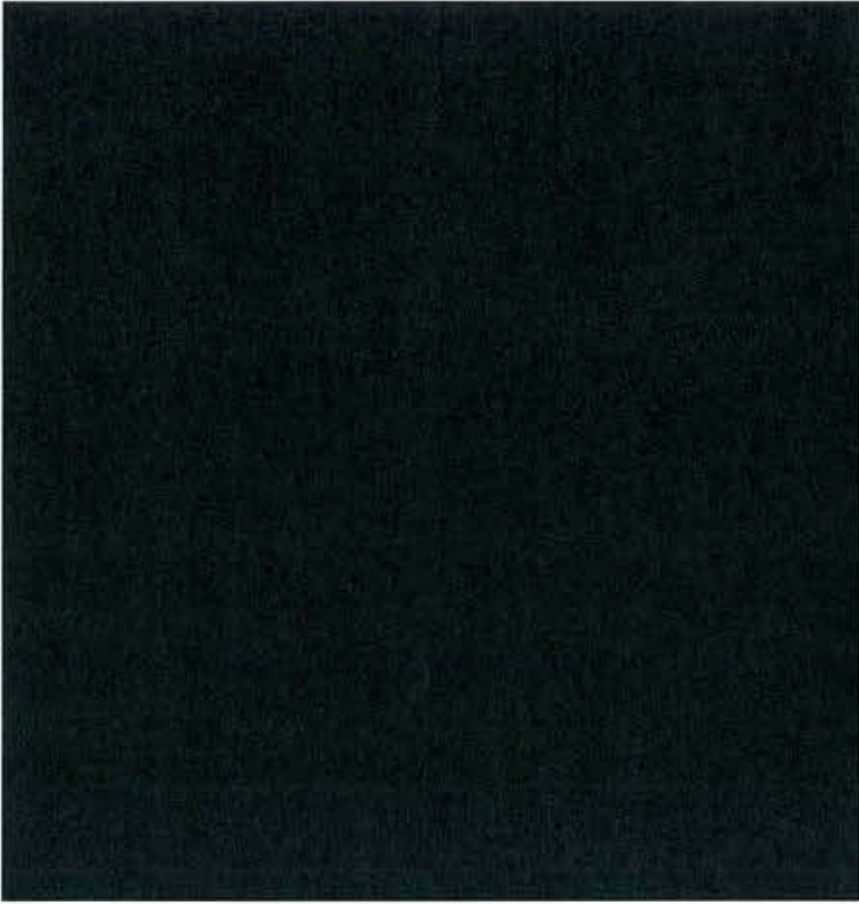
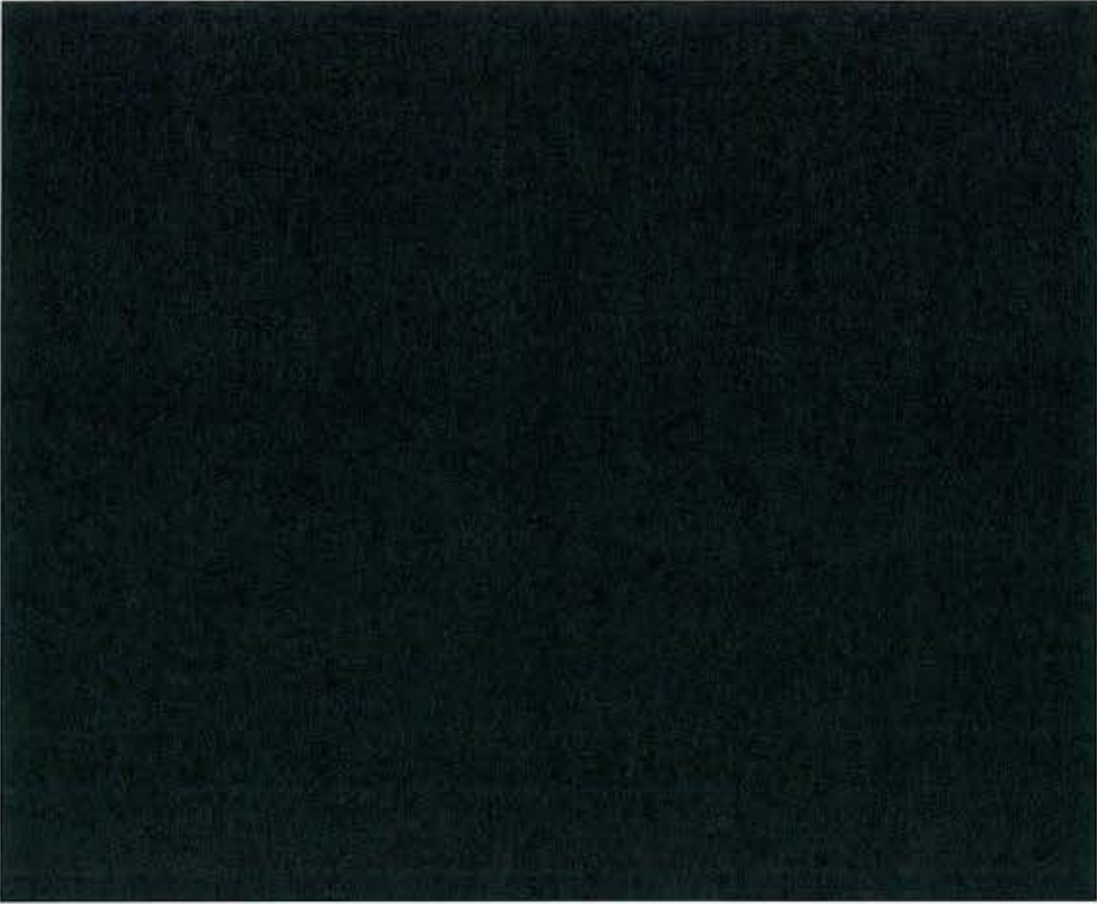
CONCEPT DESIGN

No	Revision	Date	By	Check	Appr
1	CONCEPT	04/07/2014	G.MORTON	G.MORTON	A.DRELLIS



Drawn	D.TAQIC	Designer	W.PERRAM
Drafting Check	D.SMITH	Design Check	G.MORTON
Approved	A.DRELLIS	Date	04/07/2014
Scale	This Drawing must not be used for Construction unless signed as Approved		

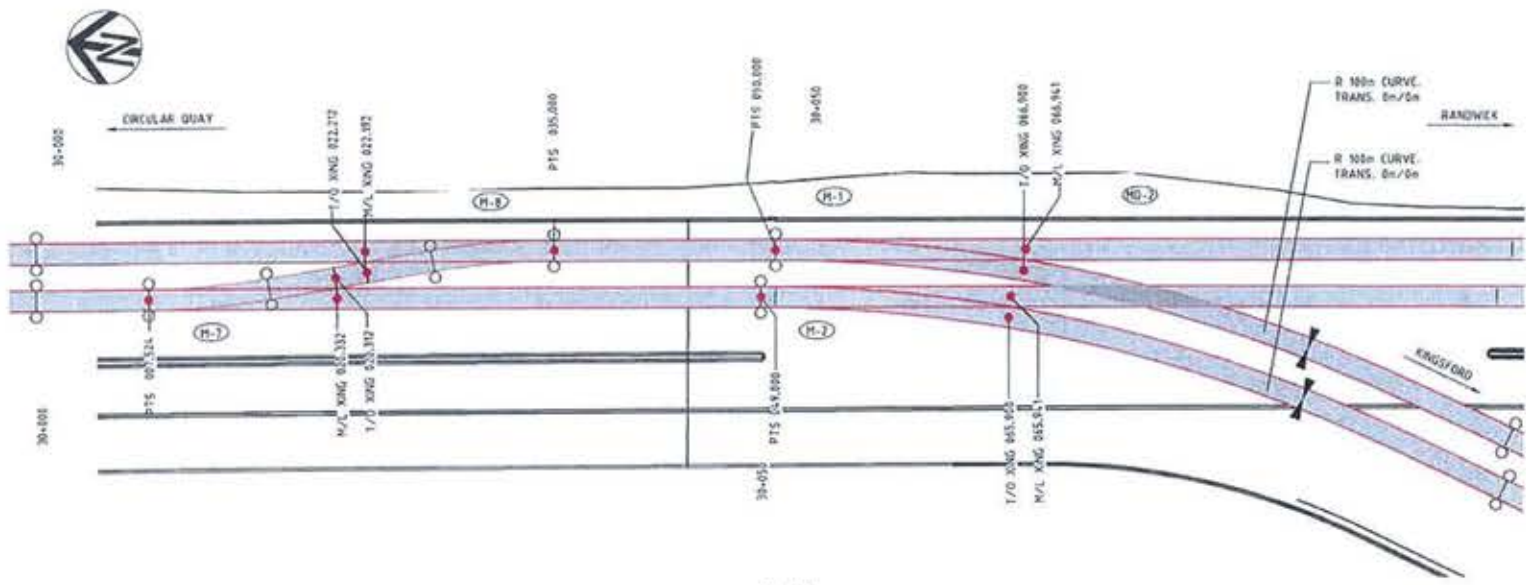
SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK/KINGSFORD JUNCTION LAYOUTS ROUTE 12	
Original Size	A1
Drawing No:	SLR-CSY-DWG-CI-0131
Rev:	A



TURNOUT DETAILS				
POINTS	CROSSING ANGLE	SWITCH GEOMETRY RADIUS (m)	M/L GEOMETRY IN (m)	DESCRIPTION
02-11	1.4	25.000	STRAIGHT	RH SCISSOR, 3.2m CTRS
02-12	1.4	25.000	STRAIGHT	LH SCISSOR, 3.2m CTRS
02-13	1.4	25.000	STRAIGHT	LH SCISSOR, 3.2m CTRS
02-14	1.4	25.000	STRAIGHT	RH SCISSOR, 3.2m CTRS

CONCEPT DESIGN

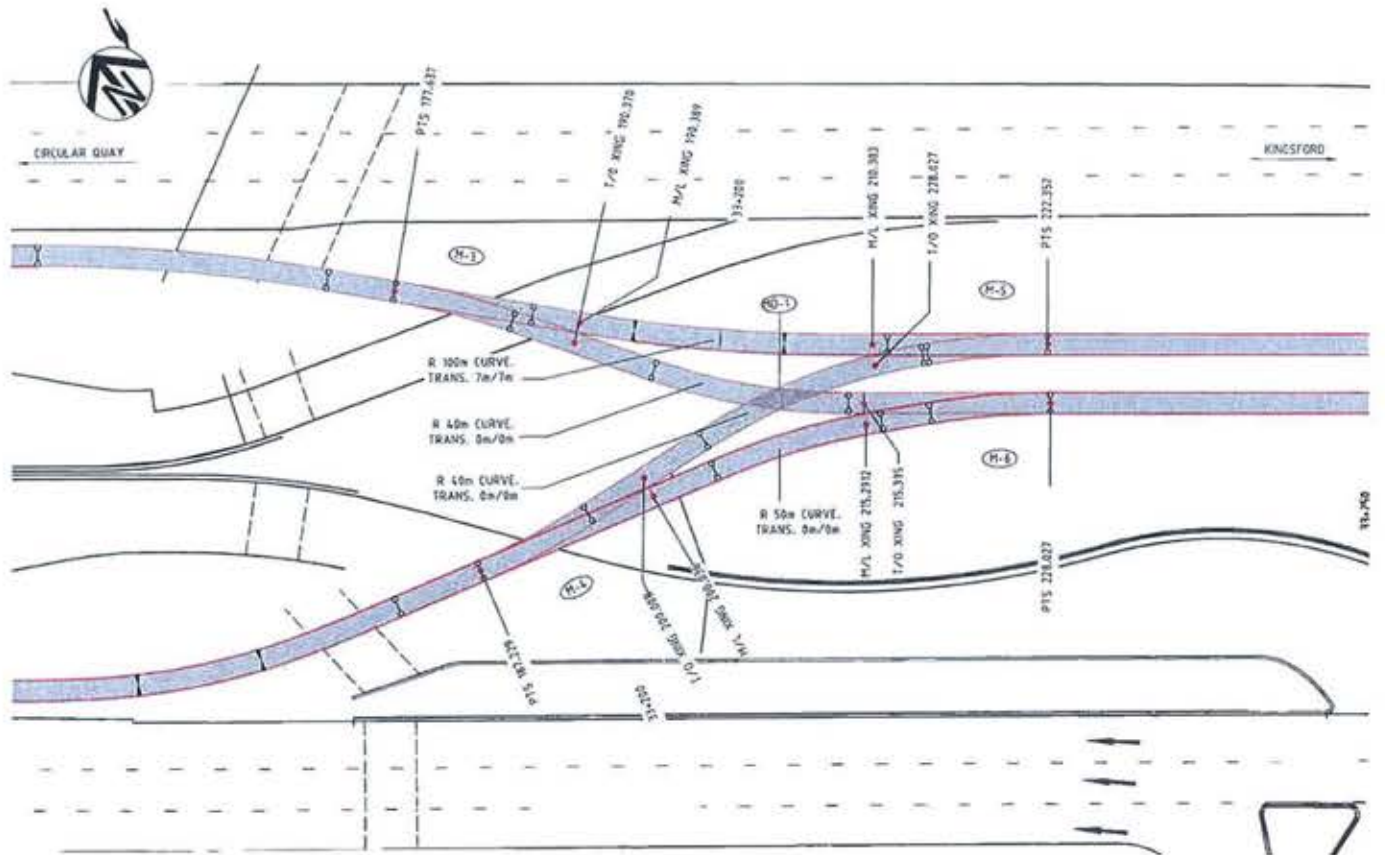
					Draft: 0.TADC Designer: W.PERRAM Drafting Check: D.SMITH Design Check: G.MORTON Approved: A.COLLIS Date: 04/07/2014 Scale:	This Drawing must not be used for Construction unless signed as Approved Original Size: A1 Drawing No: SLR-CSY-DWG-CI-0132	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK JUNCTION LAYOUTS ROUTE 02 Rev: B
3 ISSUED FOR CONSULTATION 4 ISSUED FOR CONCEPT REVIEW No. Revision: <i>Note: * indicates signatures in original issues of drawing or last revision of drawing.</i> Drawn: <i>Job Manager</i> Date:	20 25 26	S.MORTON S.MORTON S.MORTON	04/08/14 04/02/14 04/02/14	Client:	DO NOT SCALE	Scale:	Rev: B



PLAN SCALE 1:250

TURNOUT DETAILS					
POINTS	CROSSING ANGLE	SWITCH GEOMETRY RADIUS (m)	CROSSING GEOMETRY RADIUS IN (m)	M/L GEOMETRY IN (m)	DESCRIPTION
M-1	CURVED	100.000	100.000	STRAIGHT	SPECIAL RH
M-2	CURVED	100.000	100.000	STRAIGHT	SPECIAL RH
M-7	1.6	50.000	STRAIGHT	STRAIGHT	STANDARD LH
M-8	1.6	50.000	STRAIGHT	STRAIGHT	STANDARD LH

DIAMOND DETAILS			
ID	XING TYPE	XING ANGLE	DESCRIPTION
MD-2	CURVED	CURVED	SPECIAL



PLAN SCALE 1:250

TURNOUT DETAILS					
POINTS	CROSSING ANGLE	SWITCH GEOMETRY RADIUS (m)	CROSSING GEOMETRY RADIUS IN (m)	M/L GEOMETRY IN (m)	DESCRIPTION
M-3	1.6	50.00	50.000	TRANSITION	SPECIAL RH
M-4	1.6	50.00	50.000	STRAIGHT	STANDARD LH
M-5	1.6	50.00	50.000	TRANSITION	SPECIAL LH
M-6	1.6	50.00	50.000	STRAIGHT	STANDARD LH

DIAMOND DETAILS			
ID	XING TYPE	XING ANGLE	DESCRIPTION
MD-1	CURVED	CURVED	SPECIAL

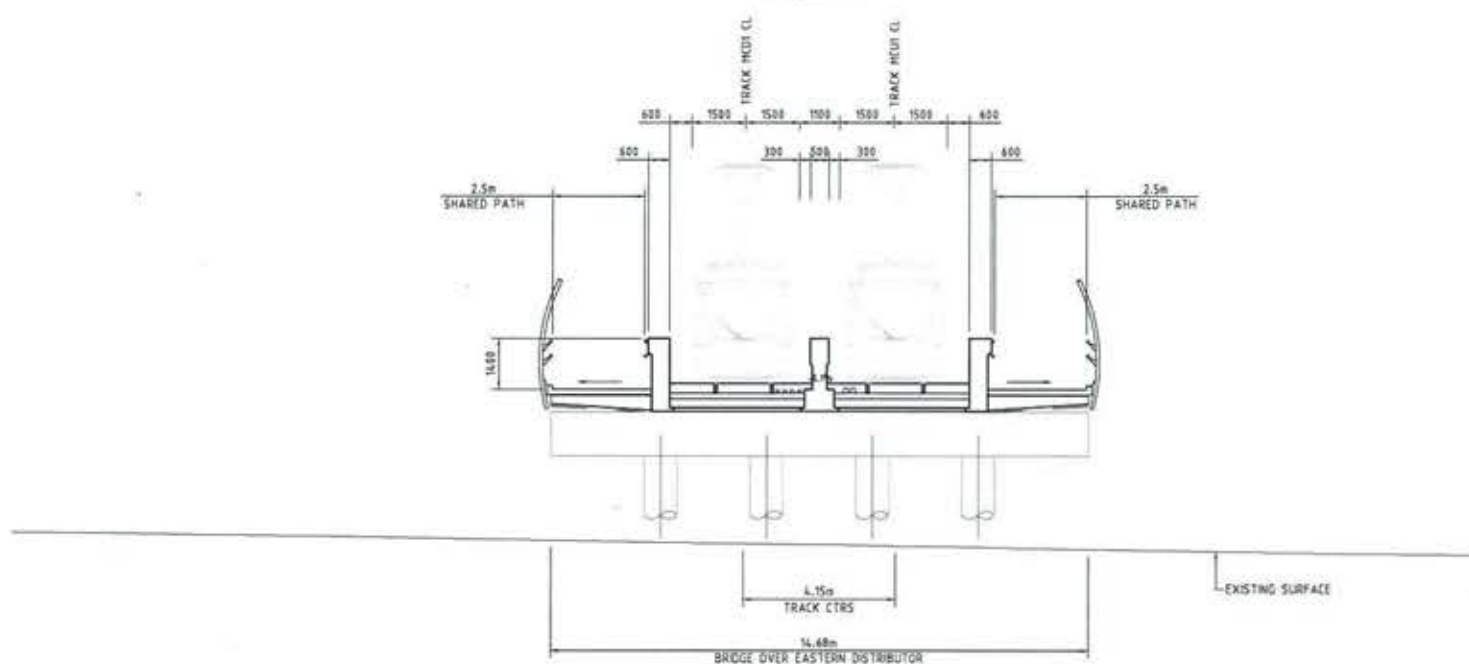
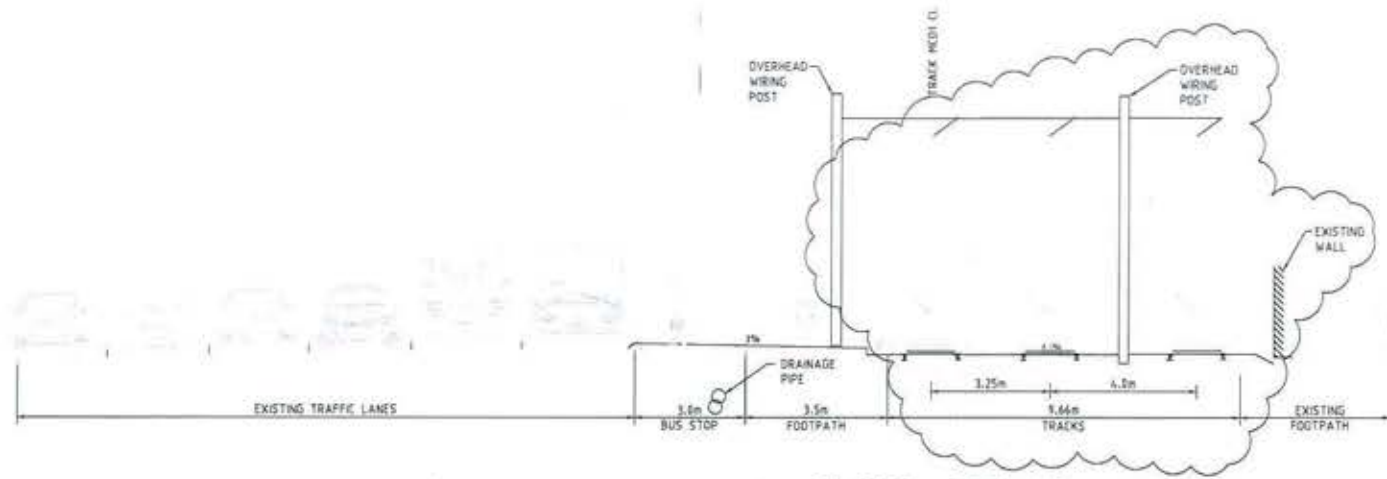
CONCEPT DESIGN

No.	Revision	Notes	Indicates signatures on original issue of drawing or last revision of drawing.
1	CONCEPT DESIGN		
Drawn	Checked	Designed	Approved



Drawn	D.TADIC	Designer	W.PERRAM
Drafting Check	D.SMETH	Design Check	G.MORTON
Approved	A.GOLLUS		
Date	04/07/2014		
Scale		This Drawing must not be used for Construction unless signed as Approved.	

SYDNEY LIGHT RAIL EASTERN EXTENSION			
CIRCULAR QUAY TO RANDWICK JUNCTION LAYOUTS ROUTE M			
Original Size	A1	Drawing No:	SLR-CSY-DWG-CI-0133
Rev:	A		



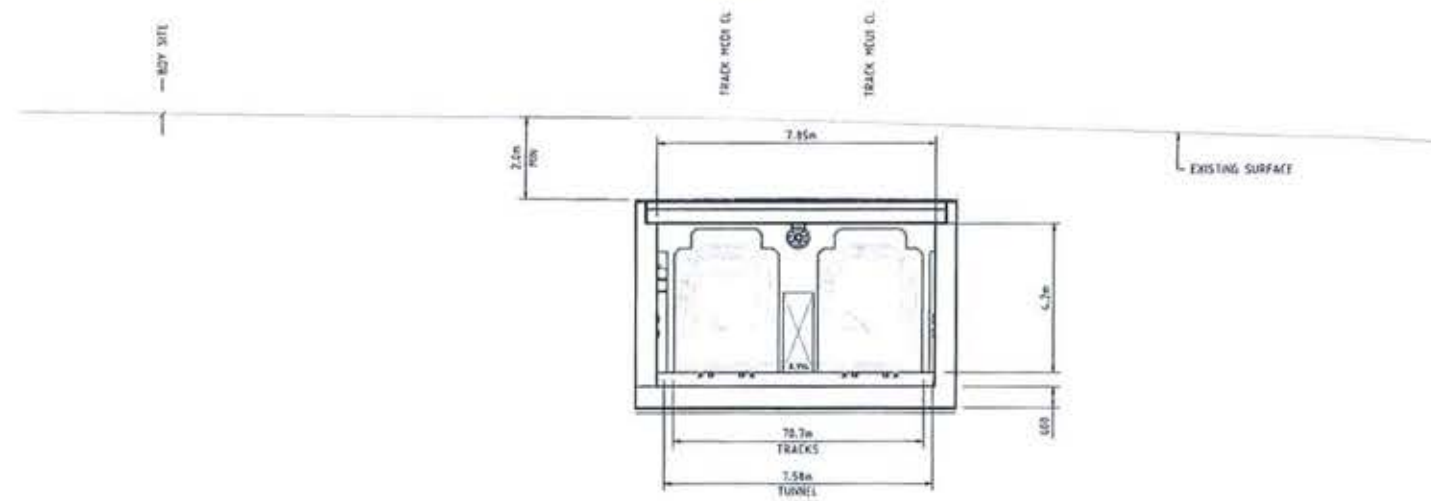
CONCEPT DESIGN

No	Revision	Notes	Drawn	JCD Manager	Date
4	ISSUED FOR CONSTRUCTION CLARIFICATION		SS	S.MORTON	28/06/2014
3	ISSUED FOR CONCEPT DESIGN		SS	S.MORTON	24/03/2014

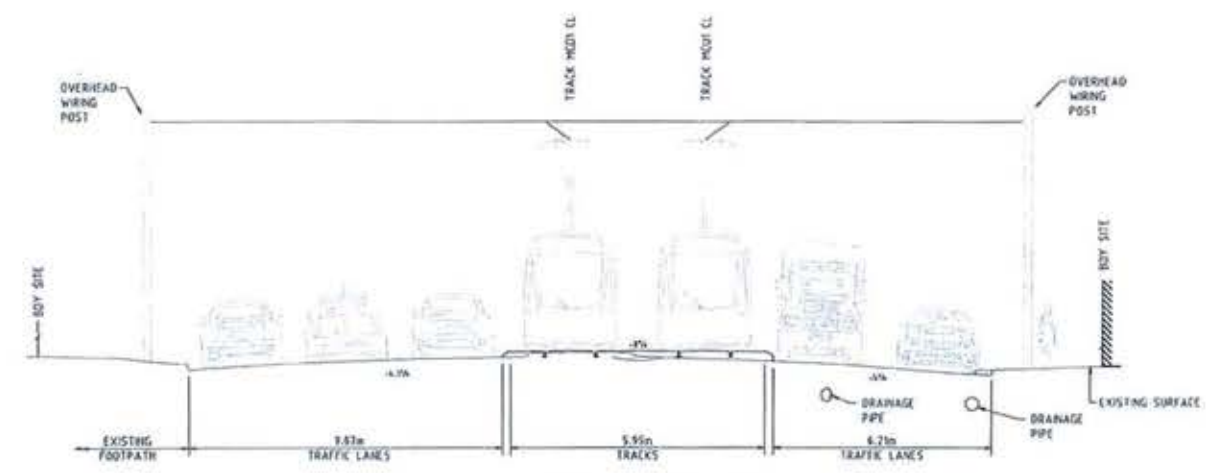


Drawn	S.THORNE	Designer	S.KOSTAKIS
Drafting Check	D.SMITH	Design Check	G.MORTON
Approved	A.COLLIIS	Date	04/07/2014
Scale	This Drawing must not be used for Construction unless signed as Approved		

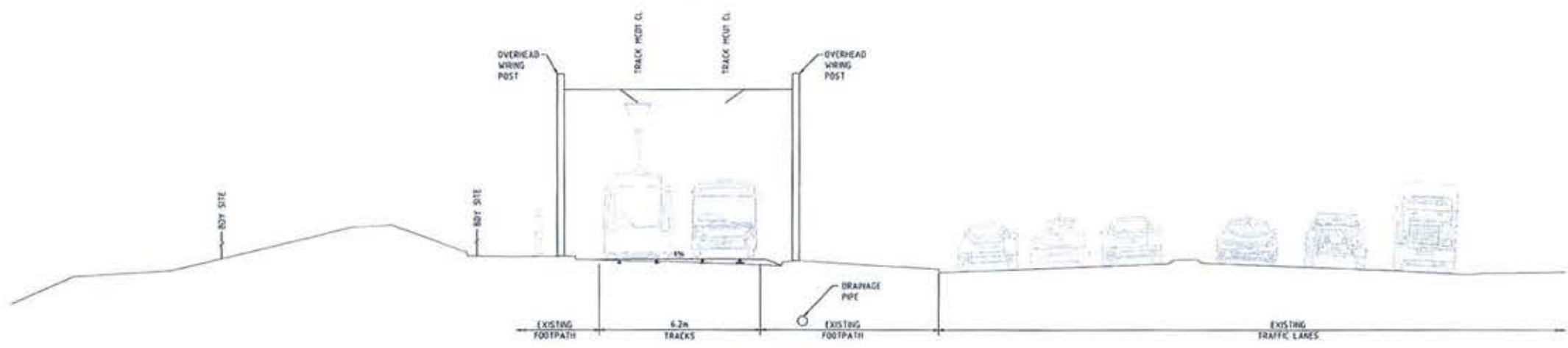
SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
TYPICAL SECTIONS	
SHEET 2	
Original Size	A1
Drawing No:	SLR-CSY-DWG-CI-0141
Rev:	B



CH 21300 - MOORE PARK TUNNEL
SCALE 1:100



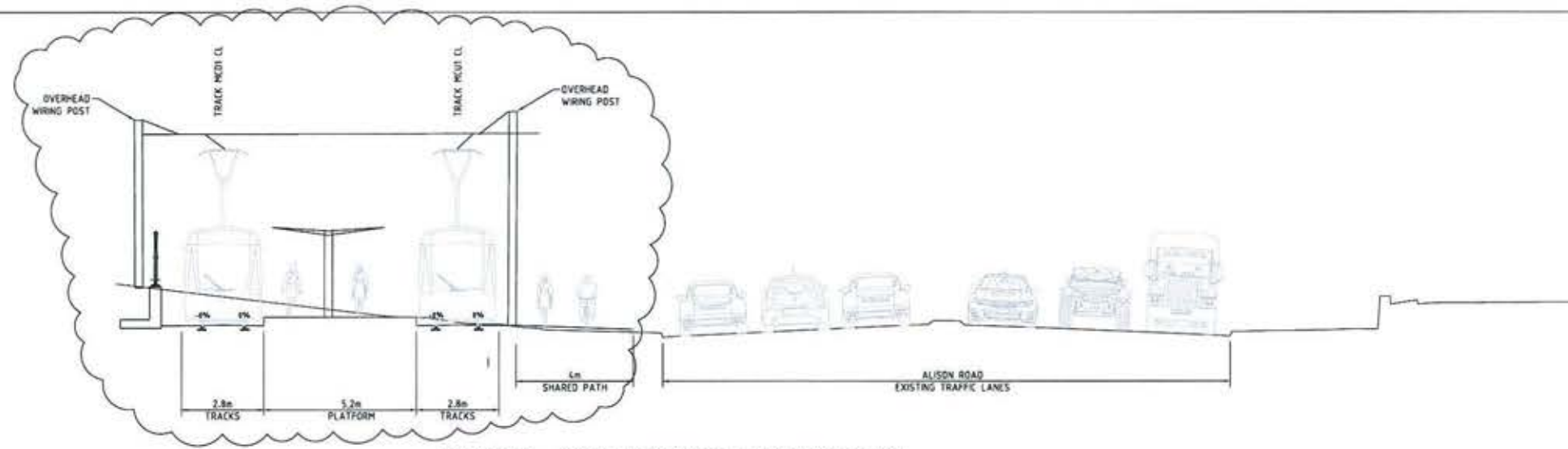
CH 32300 - ANZAC PDE
SCALE 1:100



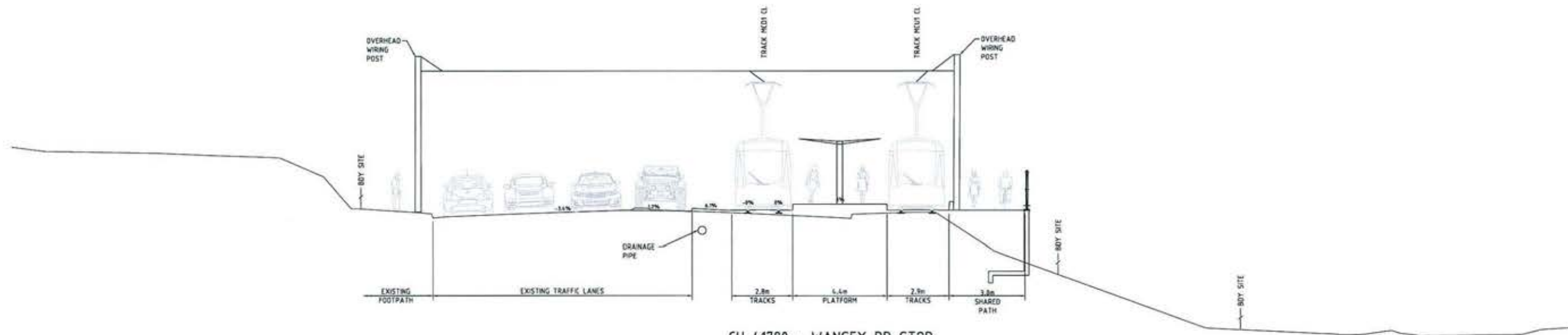
CH 40580 - ALISON RD SHARED CORRIDOR
SCALE 1:100

CONCEPT DESIGN

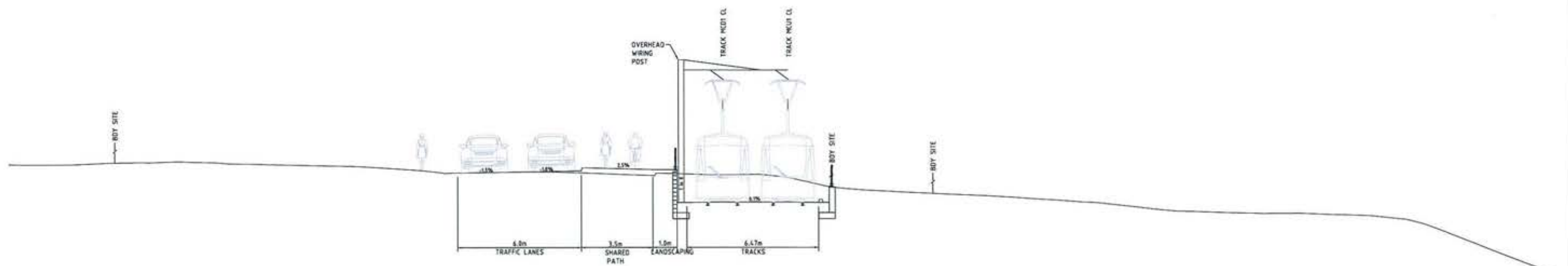
					Drawn: S.THEORGE Designer: S.KOSTAKIS Drafting Check: D.SARTER Design Check: G.SARTER Approved: A.COLLIS Date: 04/07/2014 Scale:	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK TYPICAL SECTIONS SHEET 3
1. CHECK FOR CONCEPT DESIGN 2. Revision: Note: * indicates signature on original issue of drawing or last revision of drawing Drawn: S.THEORGE Job Manager: S.THEORGE Date: 04/07/2014					This Drawing must not be used for Construction unless signed or Approved	Drawing No: SLR-CSY-DWG-CI-0142 Rev: A



CH 40900 - ROYAL RANDWICK RACECOURSE STOP
SCALE 1:100



CH 41780 - WANSEY RD STOP
SCALE 1:100



CH 42280 - WANSEY RD NEAR ARTHUR ST INTERSECTION
SCALE 1:100

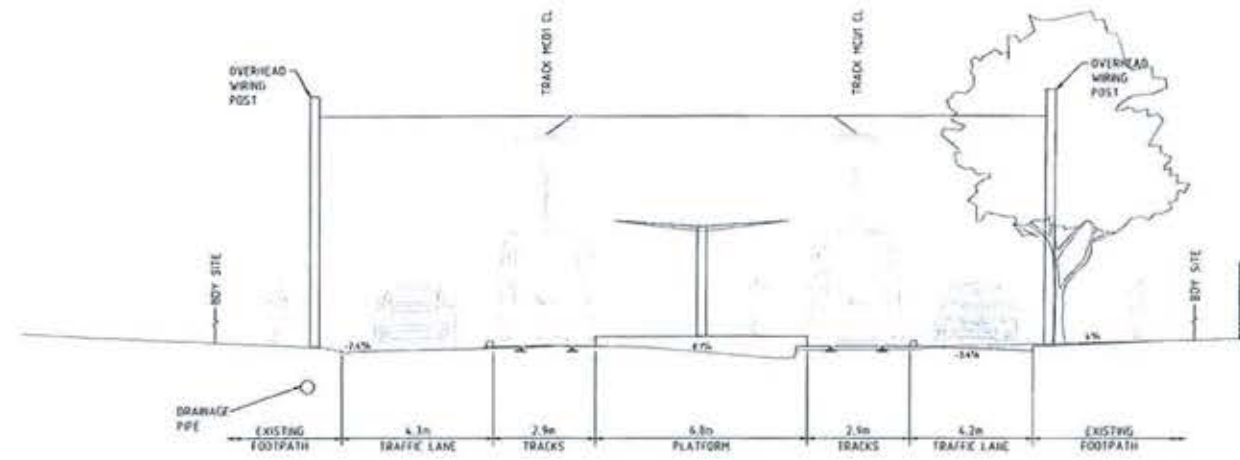
CONCEPT DESIGN

No	Revision	Note: * indicates alterations on original issue of drawing or last revision of drawing	Drawn	Job Manager	Date
E	ISSUED FOR CONTRACT CLOSE		SS	KL.MORTON	18/11/2014
D	ISSUED FOR CONTRACT CLOSE		SS	KL.MORTON	20/11/2014
A	ISSUED FOR CONCEPT DESIGN		SS	KL.MORTON	04/01/2014

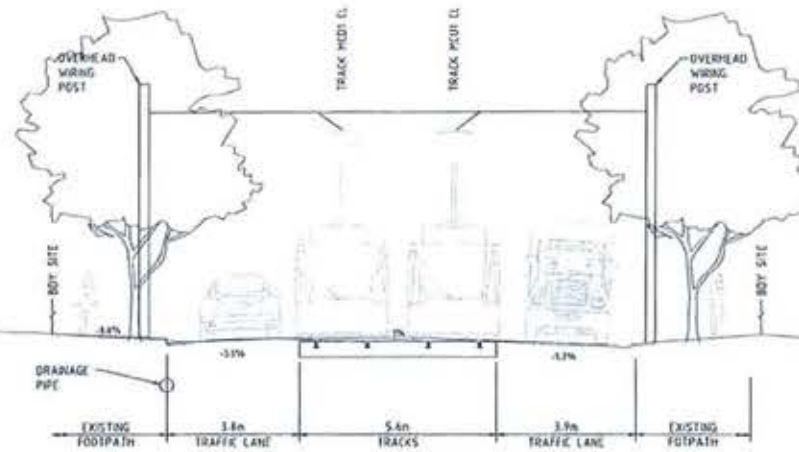


Drawn	S.THORNE	Designer	S.KOSTAKIS
Drafting Check	D.SMITH	Design Check	G.MORTON
Approved	A.COLLIS		
Date	04/01/2014		
Scale	This Drawing must not be used for Construction unless signed as Approved		

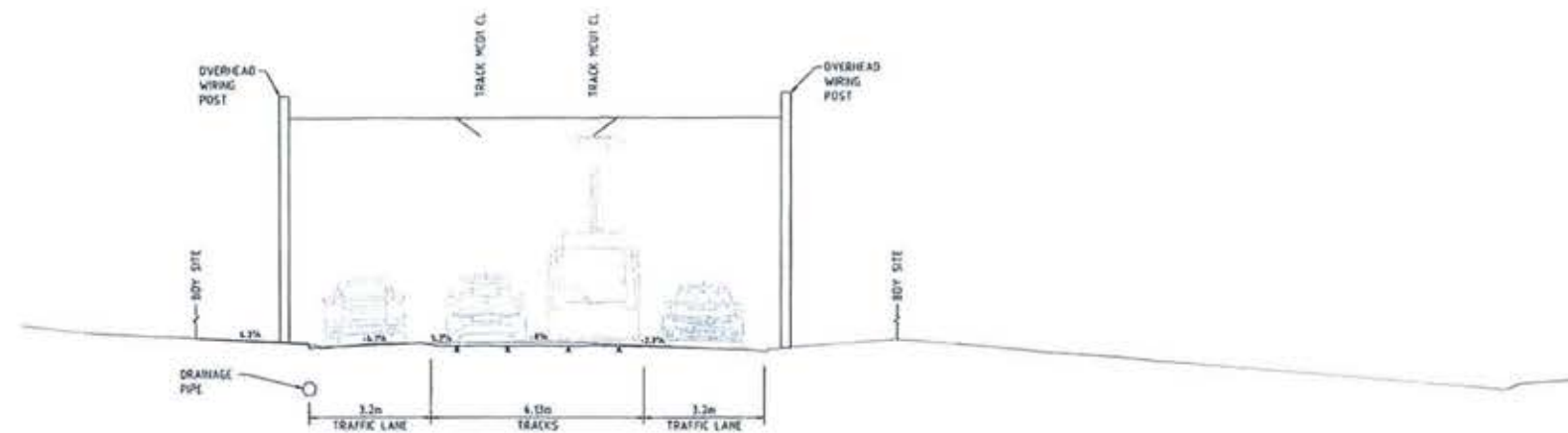
SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
TYPICAL SECTIONS SHEET 4	
Original Size	A1
Drawing No:	SLR-CSY-DWG-CI-0143
Rev:	C



CH 42520 - UNIVERSITY OF NSW HIGH ST STOP
SCALE 1:100



CH 42800 - HIGH ST
SCALE 1:100



CH 42900 - HIGH ST - NEAR HOSPITAL ACCESS
SCALE 1:100

CONCEPT DESIGN

NO	REVISION	DATE	BY	APP'D
1	ISSUED FOR CONCEPT DESIGN	24/04/2014	DAVID SMITH	DAVID SMITH
2	REVISION			
3				
4				

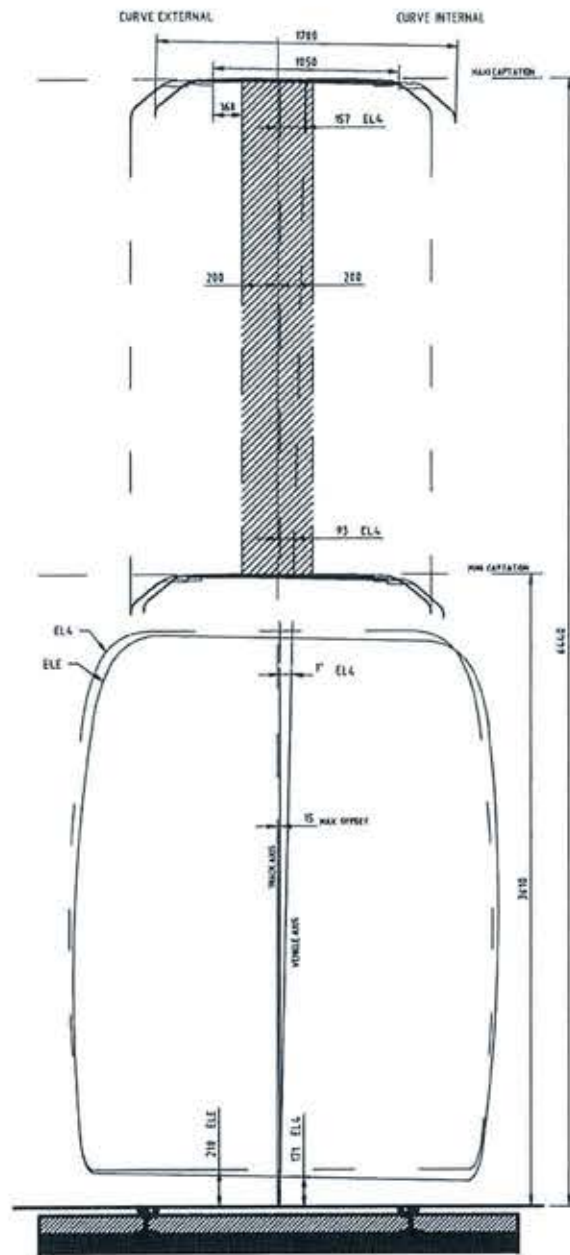


Drawn	S. THORNE	Designer	S. KOSTAKOS
Drafting Check	D. SMITH	Design Check	G. MORFON
Approved	A. COLLIS		
Date	04/07/2014		
Scale			

SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANWICK
TYPICAL SECTIONS
SHEET 5

Original Size: A1 Drawing No: SLR-CSY-DWG-CI-0144

Rev: A



SECTION C-C
SCALE 1:20

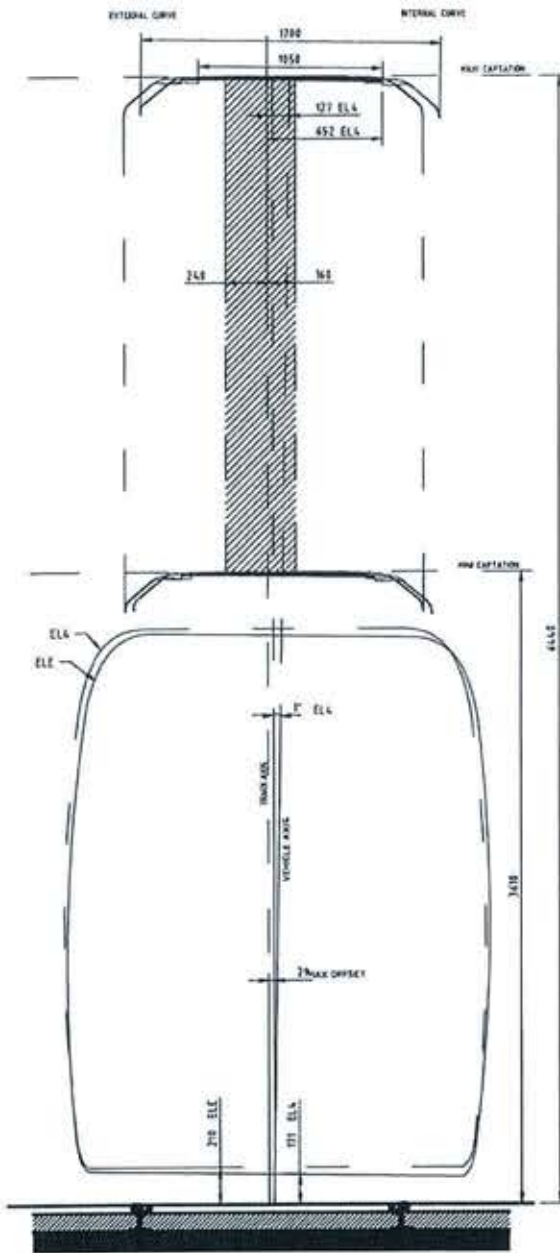
GAUGE STUDY IN STRAIGHT TRACK WITH PANTOGRAPH

NOTE: THE MAXIMUM LOADING CONDITION (EL4) IS SHOWN ON THE DRAWING.

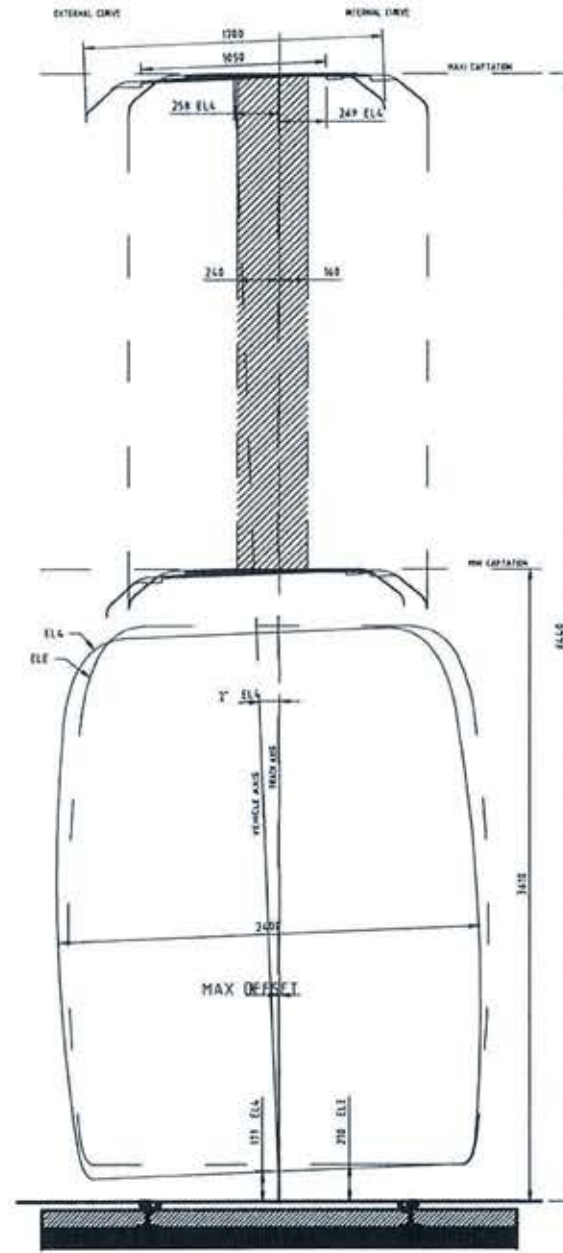
ASSUMPTIONS EL4:
 - SUSPENSIONS COMPRESSION : 29mm
 - VERTICAL WHEEL WEAR : 10mm
 - ACCELERATION: 1m/s²
 ELE: NO LOAD CONDITION.
 EL4: MAX LOAD CONDITION.

CONCEPT DESIGN

		<p>SCALE 1:20 AT ORIGINAL SIZE</p>		<p>NSW GOVERNMENT</p>		<p>Transport for NSW</p>		<p>CONNECTING SYDNEY</p>		<p>DO NOT SCALE</p>		<p>Drawn: D.J. MARTIN Designer: D.J. MARTIN Drafting Check: Y. PALAU Design Check: N. YAKONKARN Approved: TREVOST Date: 04/02/2014 Scale:</p>		<p>SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANOWICK VEHICLE SPECIFIC DEVELOPED KINEMATIC ENVELOPE GAUGE STUDY IN STRAIGHT TRACK SHEET 3</p>		<p>Drawing Size: A1 Drawing No: SLR-CSY-DWG-CI-0152 Rev: A</p>	
<p>1. 100% FOR CONSTRUCTION</p>		<p>2. 100% FOR CONSTRUCTION</p>		<p>3. 100% FOR CONSTRUCTION</p>		<p>4. 100% FOR CONSTRUCTION</p>		<p>5. 100% FOR CONSTRUCTION</p>		<p>6. 100% FOR CONSTRUCTION</p>		<p>7. 100% FOR CONSTRUCTION</p>		<p>8. 100% FOR CONSTRUCTION</p>			
<p>No. Revision</p>		<p>Date</p>		<p>Drawn</p>		<p>Checked</p>		<p>Approved</p>		<p>Date</p>		<p>Scale</p>		<p>Drawing Size</p>			



SECTION C-C
SCALE 1:20



SECTION D-D
SCALE 1:20

**GAUGE STUDY IN CURVE 25m RADIUS
CURVE WITH PANTOGRAPH**

NOTE: THE MAXIMUM LOADING CONDITION (EL4) IS SHOWN ON THE DRAWING.

- ASSUMPTIONS EL4:**
- SUSPENSIONS COMPRESSION : 29mm
 - VERTICAL WHEEL WEAR : 10mm
 - EXTERNAL CURVE ACCELERATION: $2m/s^2$
 - INTERNAL CURVE ACCELERATION: $1m/s^2$

EL: NO LOAD CONDITION.
EL4: MAX LOAD CONDITION.

CONCEPT DESIGN

No.	Revision	Make	Indicates a change in original issue of drawing or last revision of drawing	Drawn	Job Manager	Date
1						



DO NOT SCALE	
Drawn	D J MARTIN
Designer	D J MARTIN
Drafting Check	Y PINAUD
Design Check	N YAKOWSKA
Approved	DPREVOST
Date	04/07/2014
Scale	

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
VEHICLE SPECIFIC DEVELOPED KINEMATIC ENVELOPE	
GAUGE STUDY IN 25M RADIUS CURVE	
SHEET 3	
Sheet Size	A1
Drawing No:	SLR-CSY-DWG-CI-0155
Rev:	A

ATTACHMENT 5 – Public Domain and Landscape Plans and Sections

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MATERIALS + FINISHES LEGEND

SITE PLANNING

- EXTENT OF EARLY WORKS
- EXISTING GROUND LINE (AS REPRESENTED IN SECTION LINES)

GRADING & LEVELS

- +EX EXISTING LEVELS
- +RL 141.23 PROPOSED LEVELS
- +TOW PROPOSED TOP OF WALL HEIGHT

SOFTSCAPE ELEMENTS

- TR (circle with dot) PROPOSED TREE
- TR (circle with dot and cross) EXISTING TREE TO BE RETAINED
- TR (circle with dot and X) EXISTING TREE TO BE REMOVED
- TR (circle with dot and triangle) EXISTING TREE TO BE RELOCATED (SUBJECT TO ARBORIST ADVICE)

- MP1 MASS PLANTING TYPE 1
- MP2 MEDIAN PLANTING TYPE 1
- MP3 MASS PLANTING ON BANK
- TRF 1 TURF
- TRF 2 TURF OVER STRUCTURE

PAVING + SURFACES

- G1 PEDESTRIAN GRANITE PAVERS
- G2 TRAFFICABLE GRANITE PAVERS
- G3 TRAFFICABLE GRANITE SETT GEORGE STREET PEDESTRIAN ZONE
- C1 PEDESTRIAN CONCRETE UNIT PAVERS
- C2 IN-SITU CONCRETE
- C3 EXPOSED AGGREGATE CONCRETE
- C4 CONCRETE UNIT PAVERS INTERLOCKING
- C5 CONCRETE UNIT PAVERS INTERLOCKING (MOORE PARK)
- ASH ASPHALTIC CONCRETE
- TG1 TACTILE GROUND SURFACE INDICATOR
- TG2 TACTILE GROUND SURFACE INDICATOR TILES
- K1 GRANITE KERB
- PV15 BLUESTONE KERB
- K3 CONCRETE KERB
- ET1 EDGE TYPE 1 80MM FAVED GRANITE CONTRAST BAND
- E2 EDGE TYPE 2 GRANITE FLUSH KERB
- W1 INSITU CONE WALL
- W2 INSITU CONE WALL
- W3 MASONRY BLOCK WALL
- ST1 STAIR TYPE 1
- ST2 STAIR TYPE 2

FURNITURE + FIXTURES

- S1 BENCH SEAT (CBD AREAS)
- S2 BENCH SEAT COS LGA BEYOND CBD
- S3 BENCH SEAT (RANDWICK LGA)
- EB EXISTING BENCH (CIRCULAR QUAY)
- ELT EXISTING LIGHT POLE
- LP1 LIGHT POLE (CIRCULAR QUAY)
- LP2 LIGHT POLE (GEORGE STREET PEDESTRIANISED AREA)
- LP3 LIGHT POLE (CBD)
- LP4 LIGHT POLE (ROUTES M & O2)
- CP1 CATENARY POLE (MOORE PARK)
- CP2 CATENARY POLE (ANZAC PARADE)
- CLP1 CATENARY LIGHT POLE (MOORE PARK)
- CLP2 CATENARY LIGHT POLE (TOWNHALL & DEVONSHIRE STREET)
- CLP3 CATENARY LIGHT POLE (GEORGE STREET TRAFFIC ZONE)
- CLP4 CATENARY LIGHT POLE (ROUTES M & O2)
- CLP5 CATENARY LIGHT POLE (KINGSFORD)
- BU1 DRINKING FOUNTAIN
- BN1 RUBBISH BIN COS LGA
- BN2 RUBBISH BIN RCG LGA
- BS1 BICYCLE HOOP
- BS2 COVERED BICYCLE STORAGE
- B1 REMOVEABLE BOLLARD
- B2 FIXED BOLLARD
- B3 OMNI-STOP BOLLARDS 150 DIA S/STEEL
- DR INDICATIVE STRIP DRAIN (200MM) GEORGE STREET PEDESTRIAN ZONE TO BE COORDINATED WITH HYDRAULICS ENGINEERS

FENCE, WALLS, EDGES AND TREE BASES

- FE1 SECURITY FENCE
- FE2 SAFETY FENCE
- TP1 TREE SURROUND (CBD) (1350 x 1500)
- TP2 TREE GRATE (DEVONSHIRE STREET) (1300 X1300)
- TP3 TREE SURROUND
- SP SHARED PATH & CYCLE WAY LINE MARKING

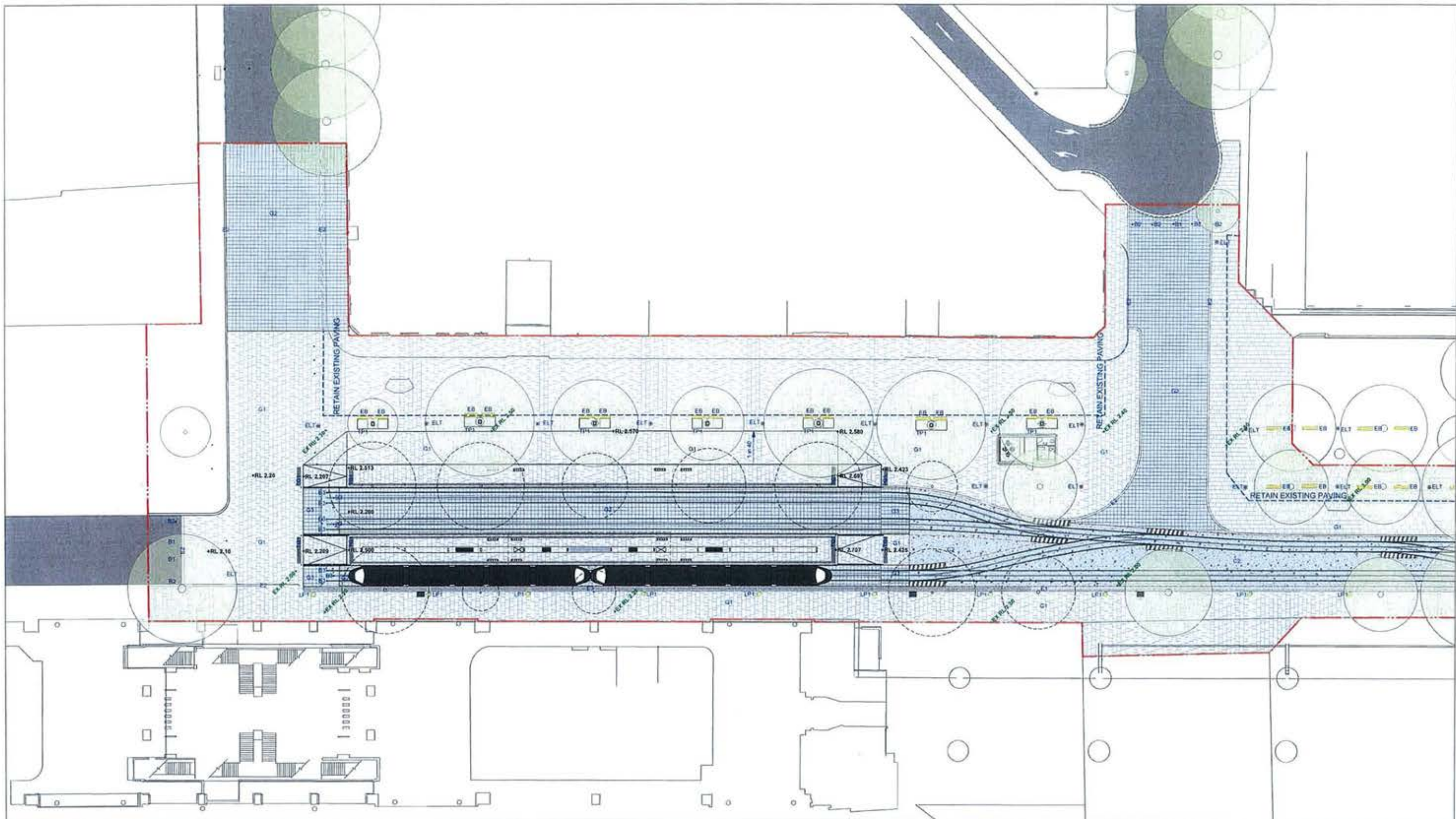
CONCEPT DESIGN


No	Revision	Note	Drawn	Job Manager	Date
A	01	FOR CONCEPT DESIGN	DWAF	KL	04/07/14



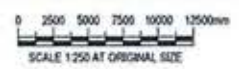
Drawn	ASPECT STUDIOS	Designer	DWAF
Drafting Check	KL	Design Check	KL
Approved	KL		
Date	04/07/2014		
Scale	NA	This Drawing must not be used for construction unless signed as Approved	

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK MATERIALS AND FINISHES LEGEND	
Original Size	A1
Drawing No:	SLR-CSY-DWG-LA-0100
Rev:	A



TO RANDWICK → 
 CONCEPT DESIGN

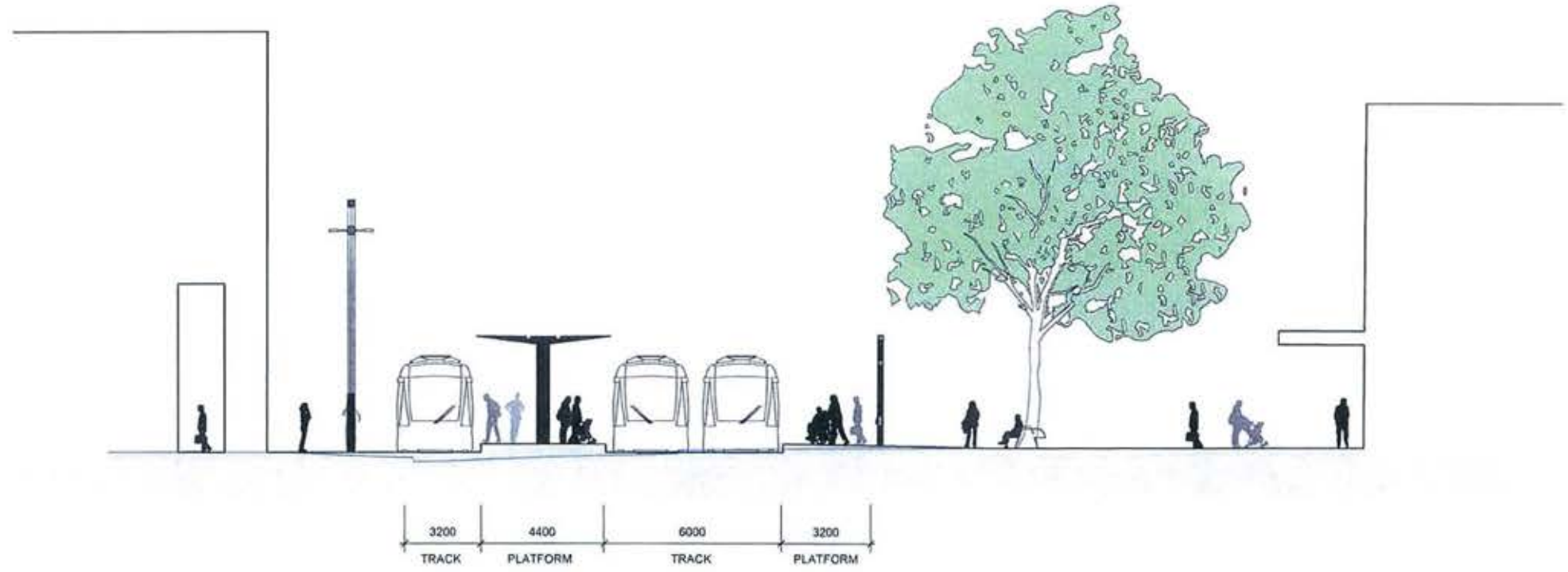
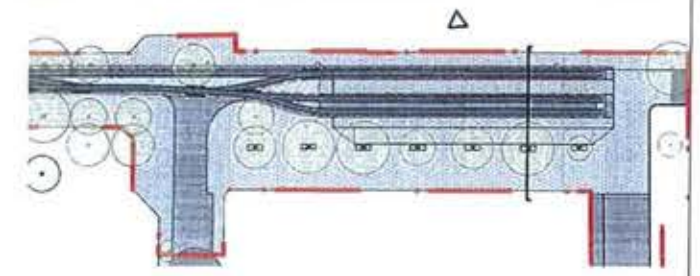
No	Revision	Note	Drawn	Checked	Date
A		CONCEPT DESIGN			04/02/2014



Client	ASPECT STUDIOS	Designer	OM/CM
DO NOT SCALE	Drafting Check	Design Check	XL
	Approved		XL
	Date		04/02/2014
	Scale		1:250 @ A1 1:500 @ A3

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 PUBLIC DOMAIN PLAN
 CIRCULAR QUAY

Original file: **A1**
 Drawing No: SLR-CSY-DWG-LA-0200
 Rev: A



CONCEPT DESIGN

No	Revision	Date	Drawn	Job Manager	Date
1			MF	KL	04/07/2014



Transport for NSW

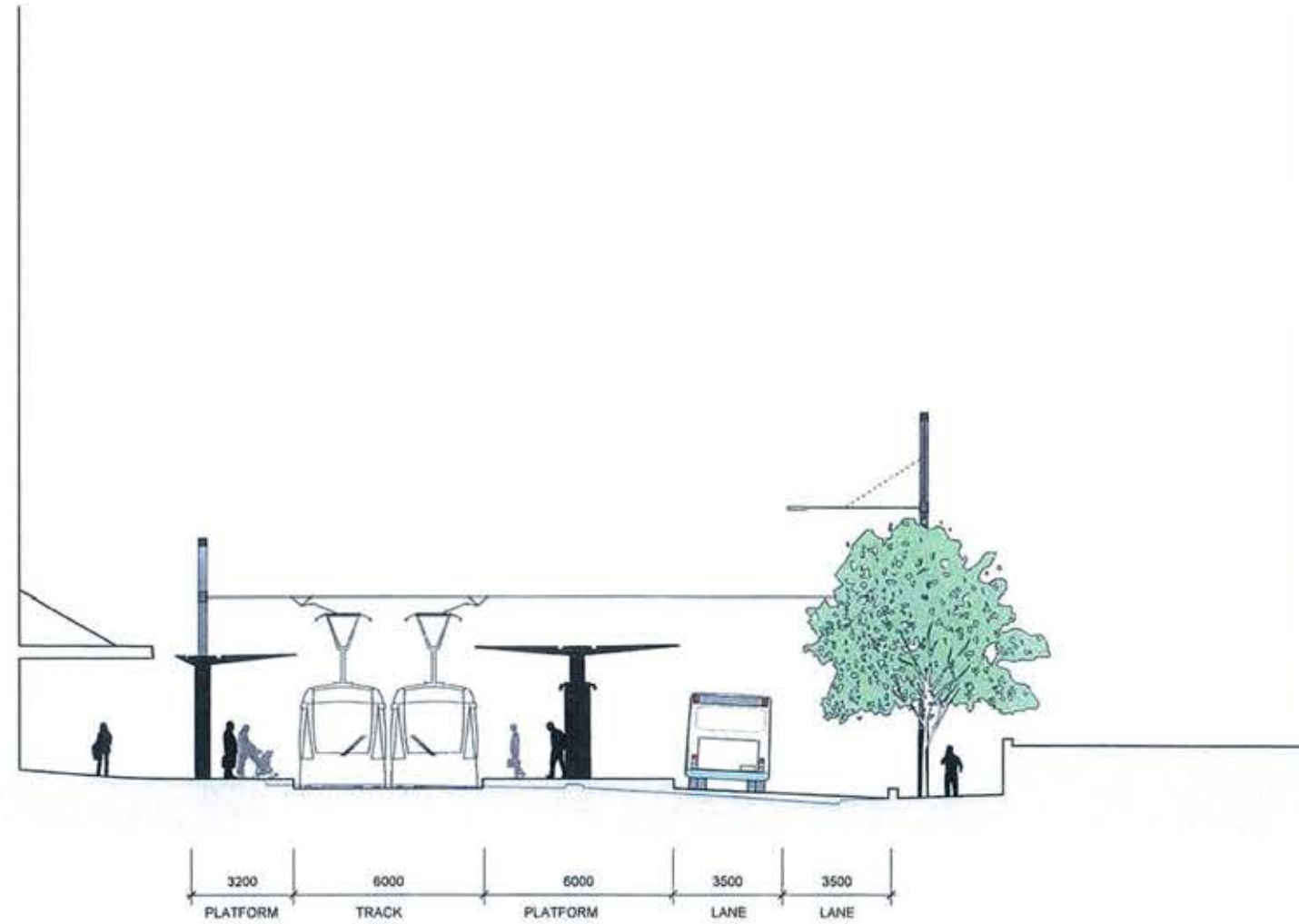
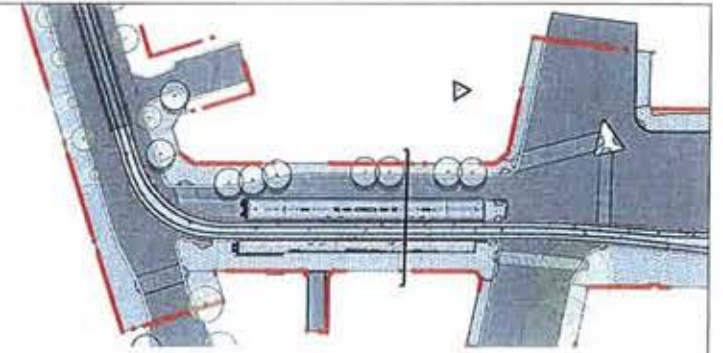


DO NOT SCALE

Drawn	ASPECT STUDIOS	Designer	MF
Drafting Check	KL	Design Check	KL
Approved	KL		
Date	04/07/2014		
Scale	1:100 @ A1 1:200 @ A3		

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO FRAMEWORK	
PUBLIC DOMAIN SECTION	
CIRCULAR QUAY	
Original File:	A1
Drawing No:	SLR-CSY-DWG-LA-0201
Rev:	A

This Drawing must not be used for Construction unless signed as Approved



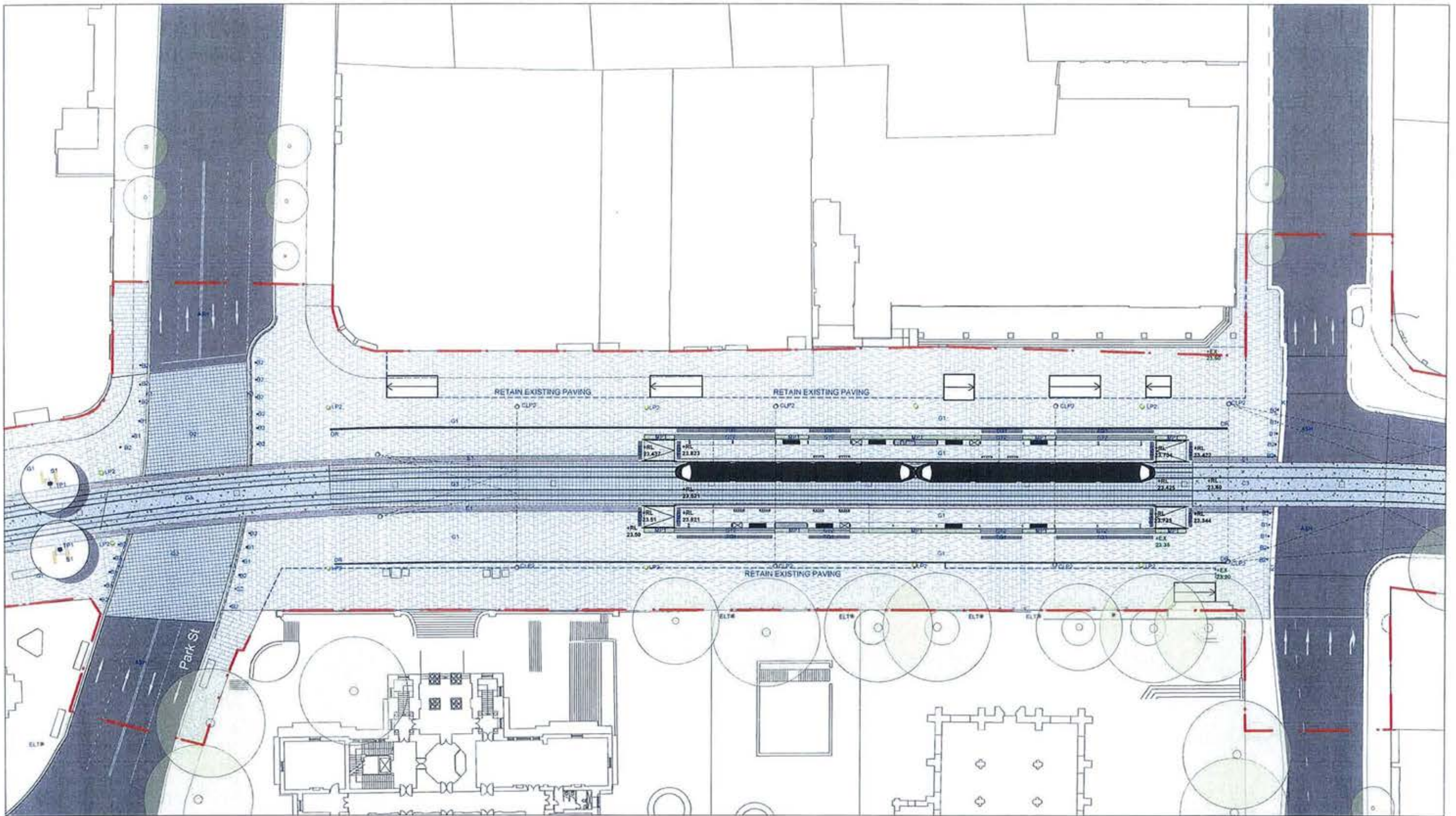
CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
1		ISSUED FOR CONCEPT DESIGN	MF	KL	04/07/14



DO NOT SCALE	
Drawn: ASPECT STUDIOS	Designer: MF
Drafting Check: KL	Design Check: KL
Approved: KL	
Date: 04/07/2014	
Scale: 1:100 @ A1 1:200 @ A3	This Drawing must not be used for Construction unless signed as Approved

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANGMOOR	
PUBLIC DOMAIN SECTION	
RAWSON PLACE	
Original Size: A1	Drawing No: SLR-CSY-DWG-LA-0301
	Rev: A

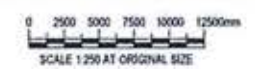


TO RANDWICK →



CONCEPT DESIGN

No	Revision	Date	Drawn	Job Manager	Date
1	REVISED FOR CONCEPT DESIGN				




Client



Transport for NSW

DO NOT SCALE

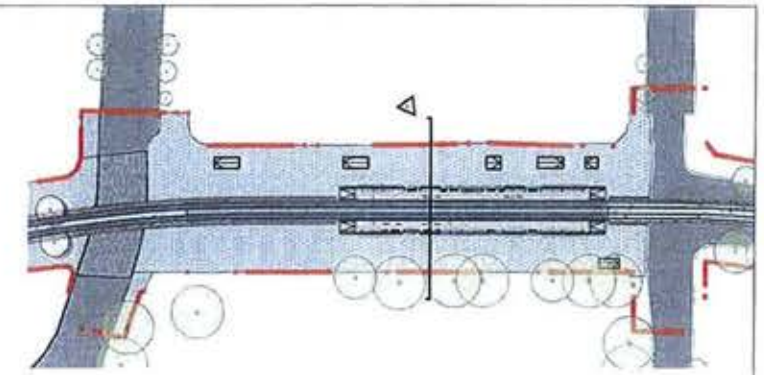


Drawn: ASPECT STUDIOS
 Designer: DM/CM
 Drafting Check: KL
 Design Check: KL
 Approved: KL
 Date: 04/07/2014
 Scale: 1:250 @ A1 1:500 @ A3

This Drawing must not be used for Construction unless signed as Approved

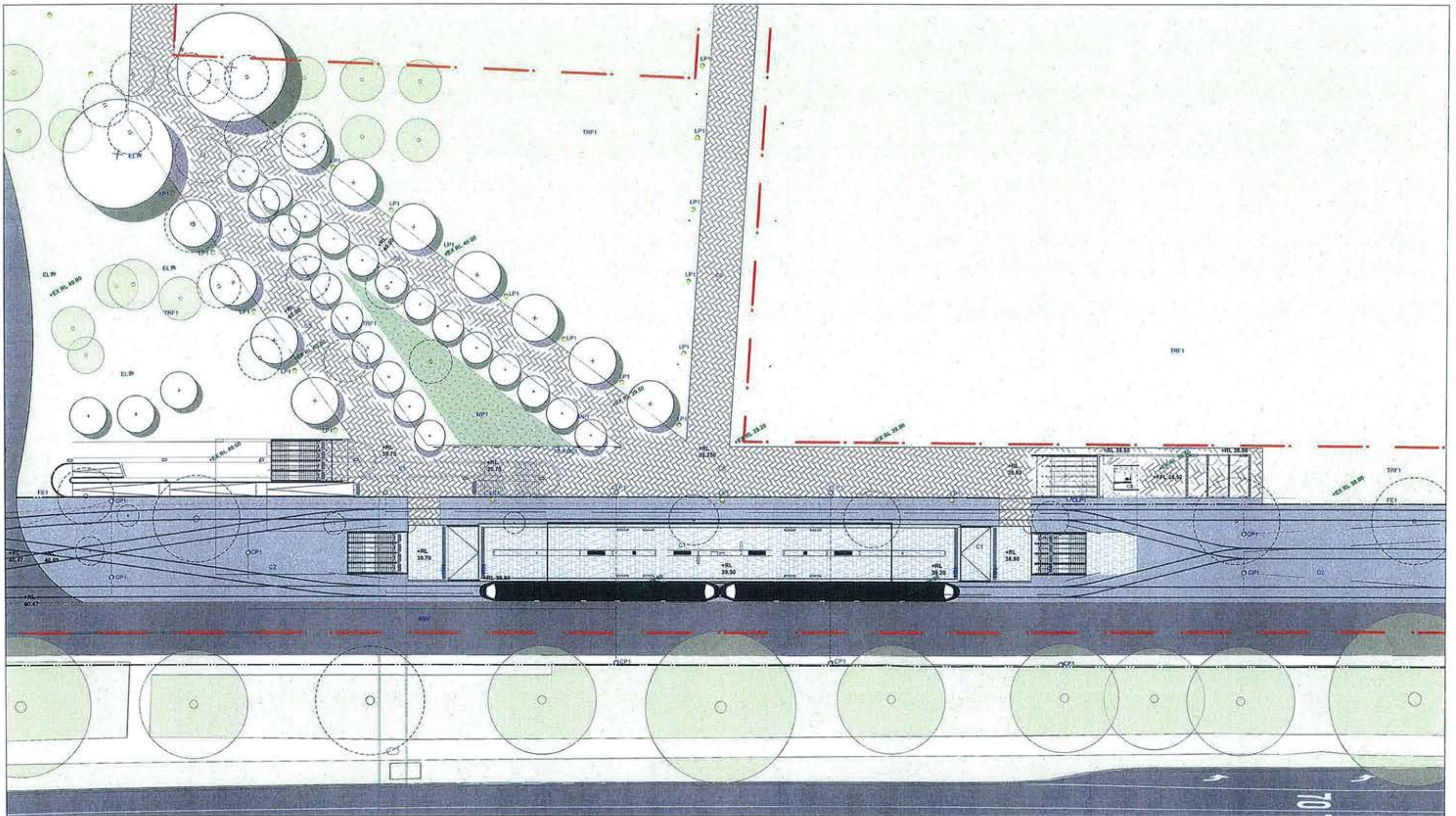
SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 PUBLIC DOMAIN PLAN
 TOWN HALL

Original Size: **A1**
 Drawing No: SLR-CSY-DWG-LA-0400
 Rev: A



CONCEPT DESIGN

		<p>SCALE 1:100 AT ORIGINAL SIZE</p>		<p>Client</p> <p>Transport for NSW</p>		<p>DO NOT SCALE</p>		<p>Drawn ASPECT STUDIOS Designer MF</p> <p>Drafting Check XL Design Check HL</p> <p>Approved XL</p> <p>Date 04/07/2014</p> <p>Scale 1:100 @ A1 1:200 @ A3</p> <p><small>This Drawing shall not be used for Construction unless signed as Approved</small></p>		<p>SYDNEY LIGHT RAIL EASTERN EXTENSION</p> <p><small>CIRCULAR ONLY TO TOWNHALL</small></p> <p>PUBLIC DOMAIN SECTION TOWN HALL</p> <p>Original No: A1 Drawing No: SLR-CSY-DWG-LA-0401 Rev: A</p>	
<p>A MARKED FOR CONCEPT DESIGN</p>		MF	HL	<p>Job Manager</p>		<p>Date</p>					
No	Revision	<p>Note: * Indicates signature on original issue of drawing or last revision of drawing</p>		Drawn	Job Manager	Date					



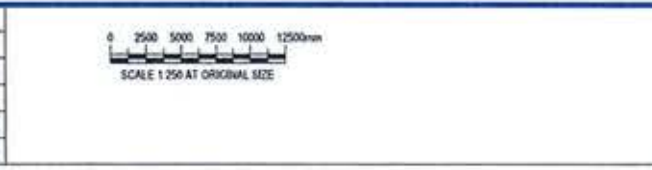
← TO CIRCULAR QUAY

TO RANDWICK →



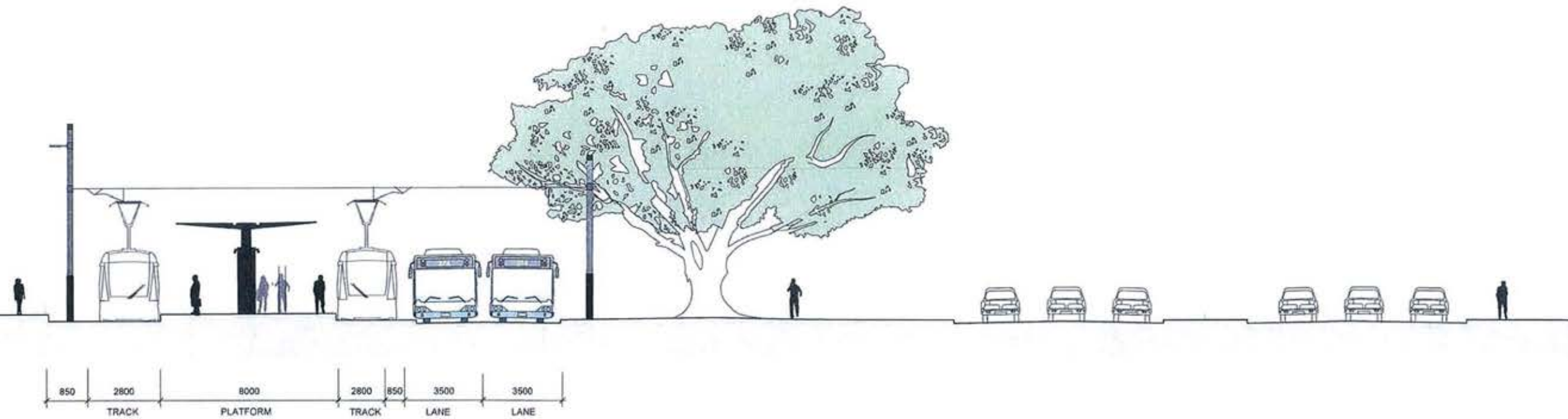
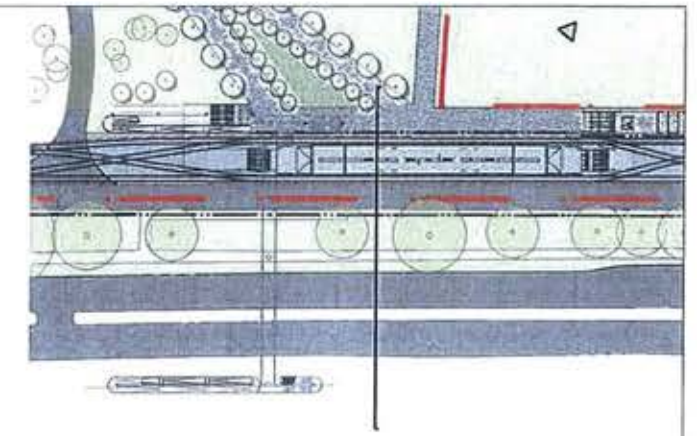
CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
1		ISSUED FOR CONCEPT DESIGN			



DO NOT SCALE	
Drawn: ASPECT STUDIOS	Designer: DMCM
Drafting Check: X	Design Check: X
Approved: X	
Date: 04/07/2014	
Scale: 1:250 @ A1 1:500 @ A3	This Drawing must not be used for Construction unless signed as Approved

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
PUBLIC DOMAIN PLAN	
MOORE PARK	
Original No: A1	Drawing No: SLR-CSY-DWG-LA-0500
	Rev: A



CONCEPT DESIGN

No	Revision	Note	Date



Client

Transport for NSW

DO NOT SCALE

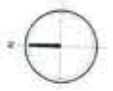
CONNECTING SYDNEY

Drawn	ASPECT STUDIOS	Designer	MP
Drafting Check	KL	Design Check	KL
Approved	KL	Date	04/07/2014
Scale	1:100 @ A1 1:200 @ A3		

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO BUNGAROCK
 PUBLIC DOMAIN SECTION
 MOORE PARK

Signature: **A1** Drawing No: SLR-CSY-DWG-LA-0502 Rev: A

This Drawing must not be used for Construction unless signed as Approved



CONCEPT DESIGN

8	ISSUED FOR CONSULTATION CLARIFICATIONS	04/08/14	KL	05/08/14
A	RESPONSE TO RFI 188 & RFI 191	04/08/14	KL	06/08/14
No	Revision	Note: * indicates signature on original issue of drawing or last revision of drawing	Drawn	Job Manager

SCALE 1:1000 AT ORIGINAL SIZE



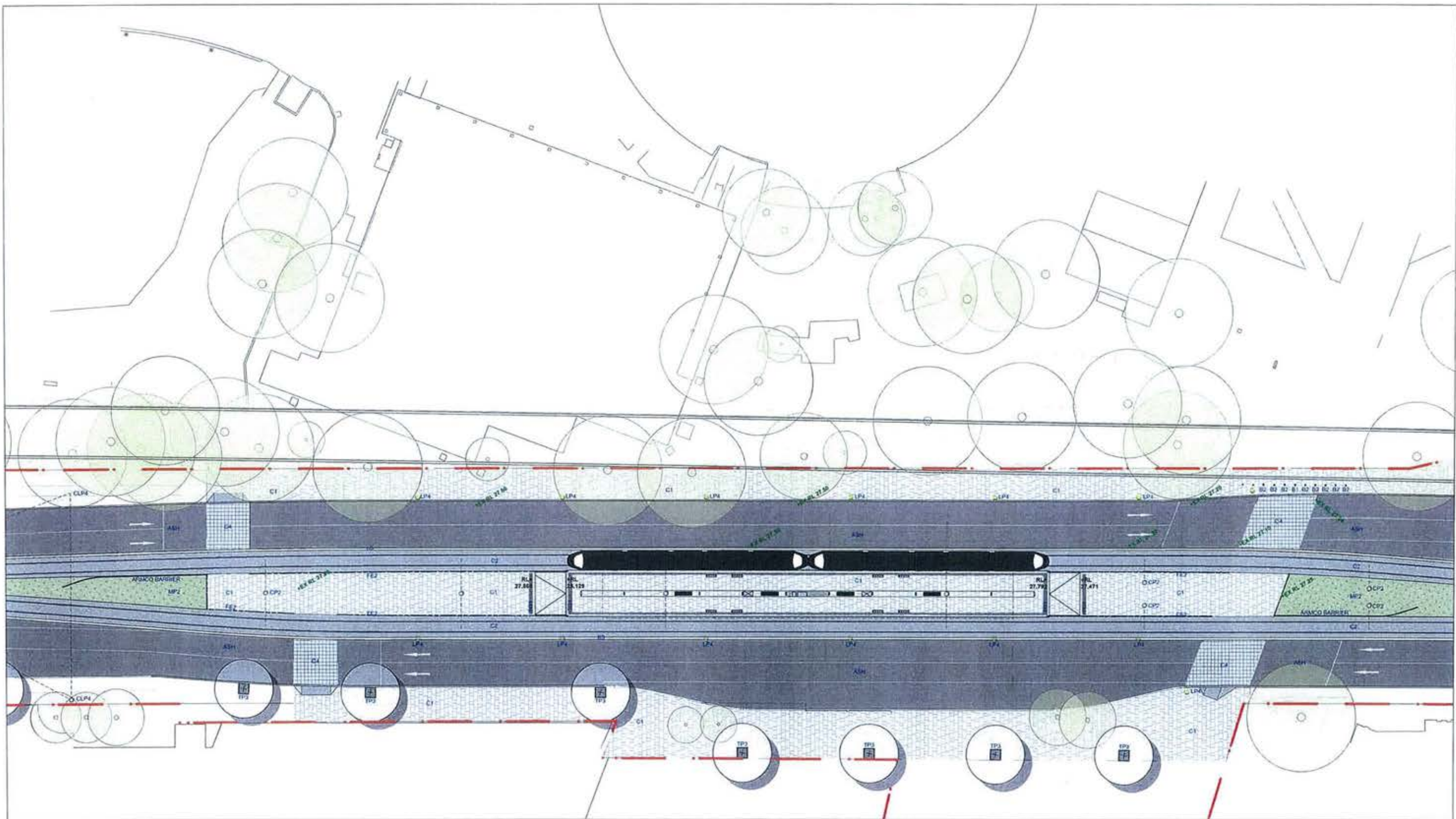
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Drawn	KL	Design Check	KL
Drafting Check	KL		
Approved	KL		
Date	06/08/2014		
Scale	1:1000 @ A1 1:2000 @ A3		

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 MOORE PARK PORTAL PLAN

Original Size
A1 Drawing No: SLR-CSY-DWG-LA-0503

Rev: 8

This Drawing must not be used for Construction unless signed as Approved



← TO CIRCULAR QUAY

TO KINGSFORD →



CONCEPT DESIGN

No	Revised	Notes	Drawn	Sub Manager	Date
A		ISSUED FOR CONCEPT DESIGN			



Client



Transport for NSW

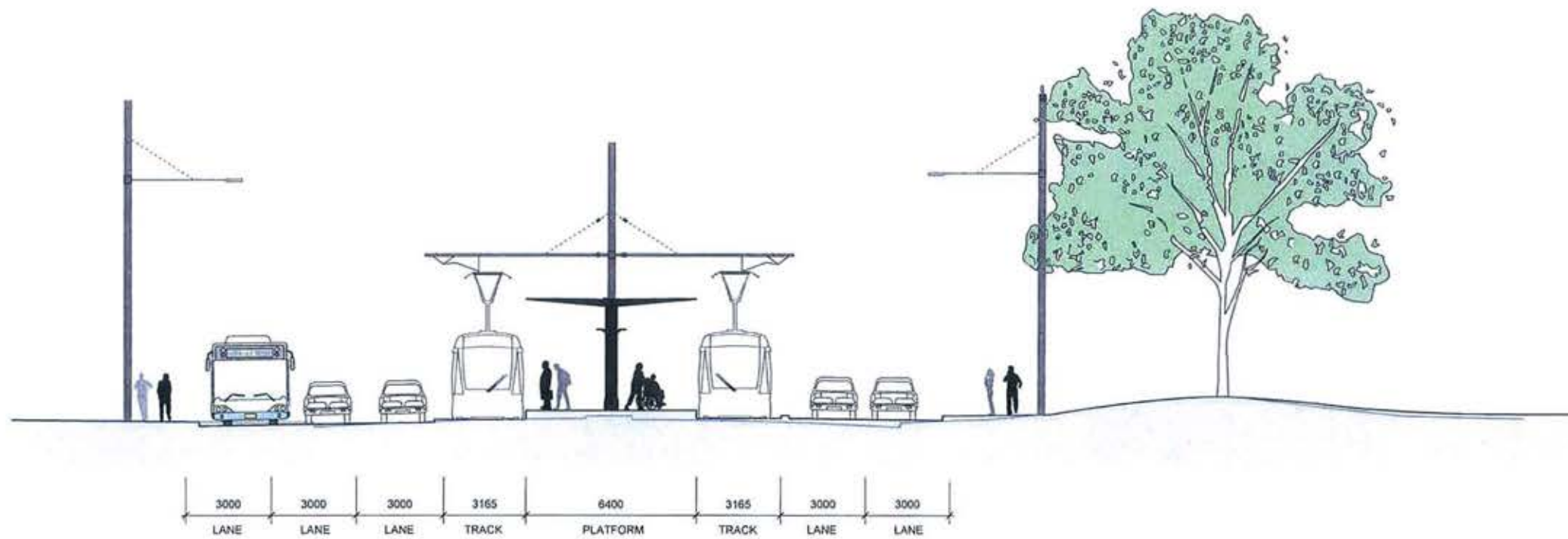
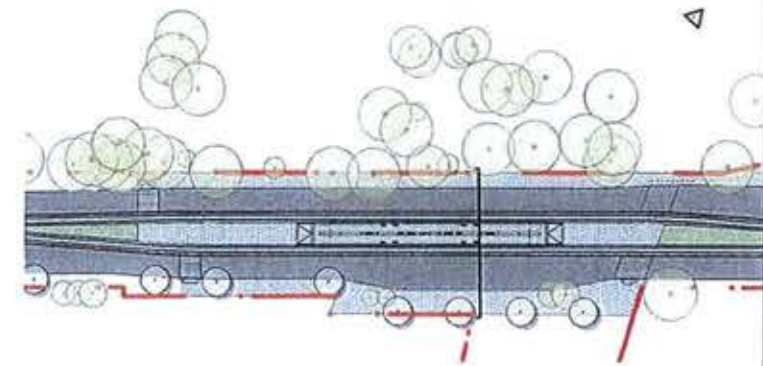
DO NOT SCALE



Drawn	ASPECT STUDIOS	Designer	DM/CM
Drafting Check	KL	Design Check	KL
Approved	KL		
Date	04/07/2014		
Scale	1:250 @ A1 1:500 @ A3		

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO KINGSFORD
 PUBLIC DOMAIN PLAN
 UNSW ANZAC PARADE

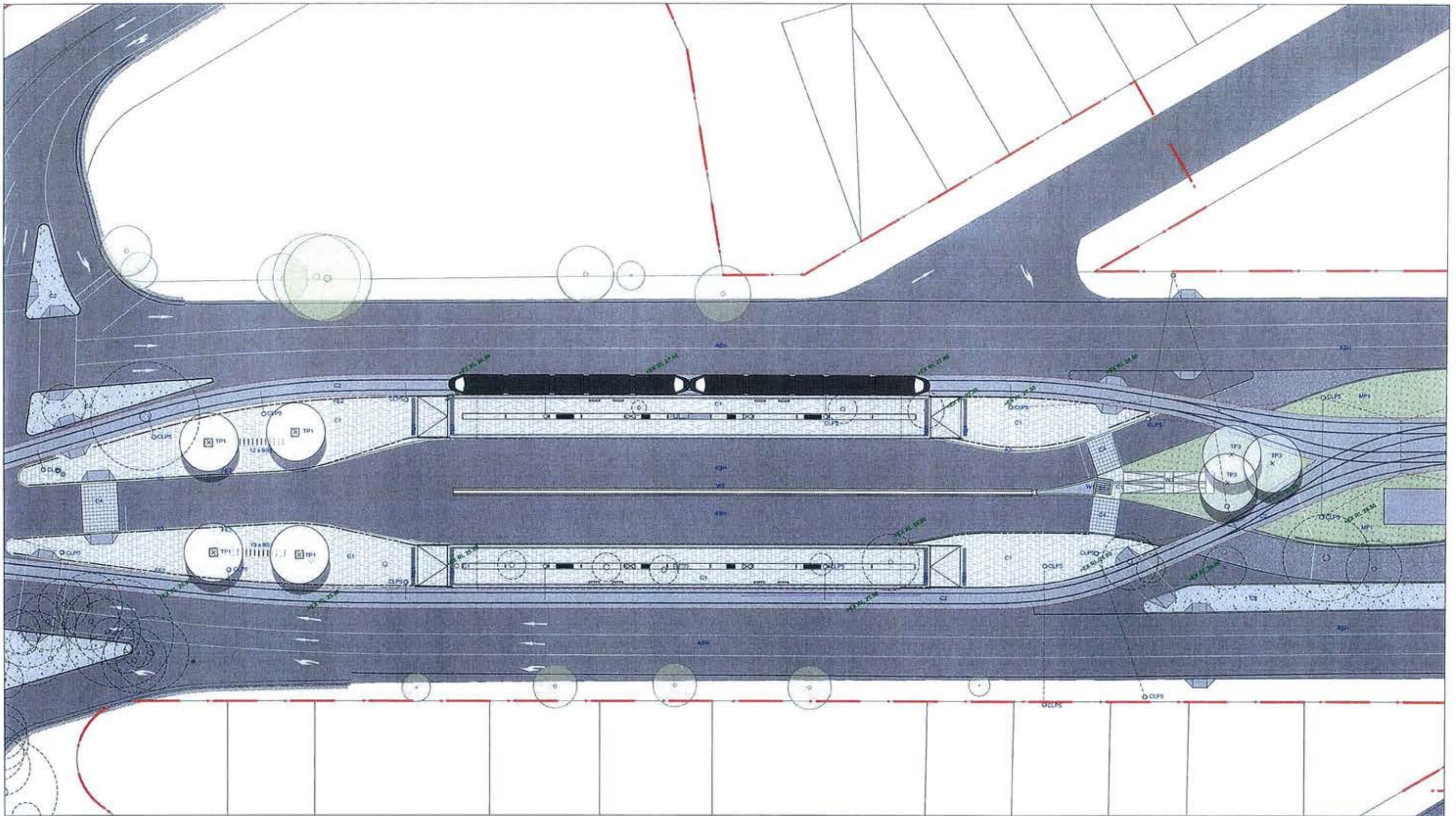
Original No: **A1** Drawing No: **SLR-CSY-DWG-LA-0600** Rev: **A**



CONCEPT DESIGN

		 SCALE 1:100 AT ORIGINAL SIZE		Client Transport for NSW		DO NOT SCALE 		Drawn ASPECT STUDIOS Designer MF Drafting Check KL Design Check KL Approved KL Date 04/07/2014 Scale 1:100 @ A1 1:200 @ A3		SYDNEY LIGHT RAIL EASTERN EXTENSION PUBLIC DOMAIN SECTION UNSW ANZAC PARADE Original File: A1 Drawing No: SLR-CSY-DWG-LA-0601	
* MARKED FOR CONCEPT DESIGN		MF	KL	04/07/14							
No.	Revision	Note	* Indicates signature on original issue of drawing or last revision of drawing		Drawn	JPM Manager	Date				

Rev: A



← TO CIRCULAR QUAY



CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
1		ISSUED FOR CONCEPT DESIGN			04/07/2014



Client



Transport for NSW

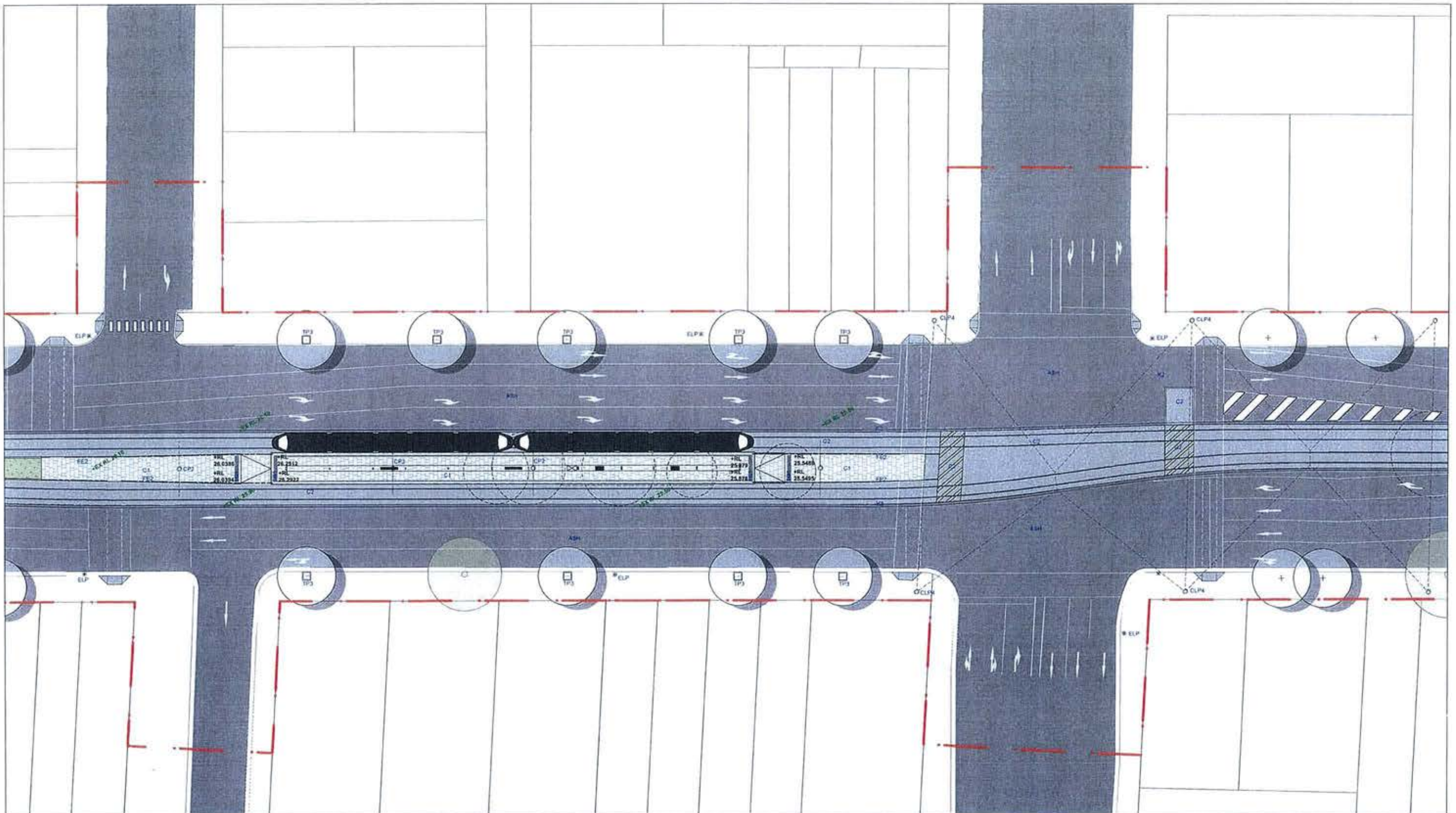
DO NOT SCALE



Drawn	ASPECT STUDIOS	Designer	DMSCM
Drafting Check	KL	Design Check	KL
Approved	KL		
Date	04/07/2014		
Scale	1:250 @ A1 1:500 @ A3		

SYDNEY LIGHT RAIL EASTERN EXTENSION
CLICK AND DRAG TO ENLARGE
PUBLIC DOMAIN PLAN
KINGSFORD

Original No: **A1** Drawing No: **SLR-CSY-DWG-LA-0700** Rev: **A**



← TO CIRCULAR QUAY

TO KINGSFORD →



CONCEPT DESIGN

No.	Revision	Note	Drawn	Job Manager	Date
A		ISSUED FOR CONCEPT DESIGN			



Client



Transport for NSW

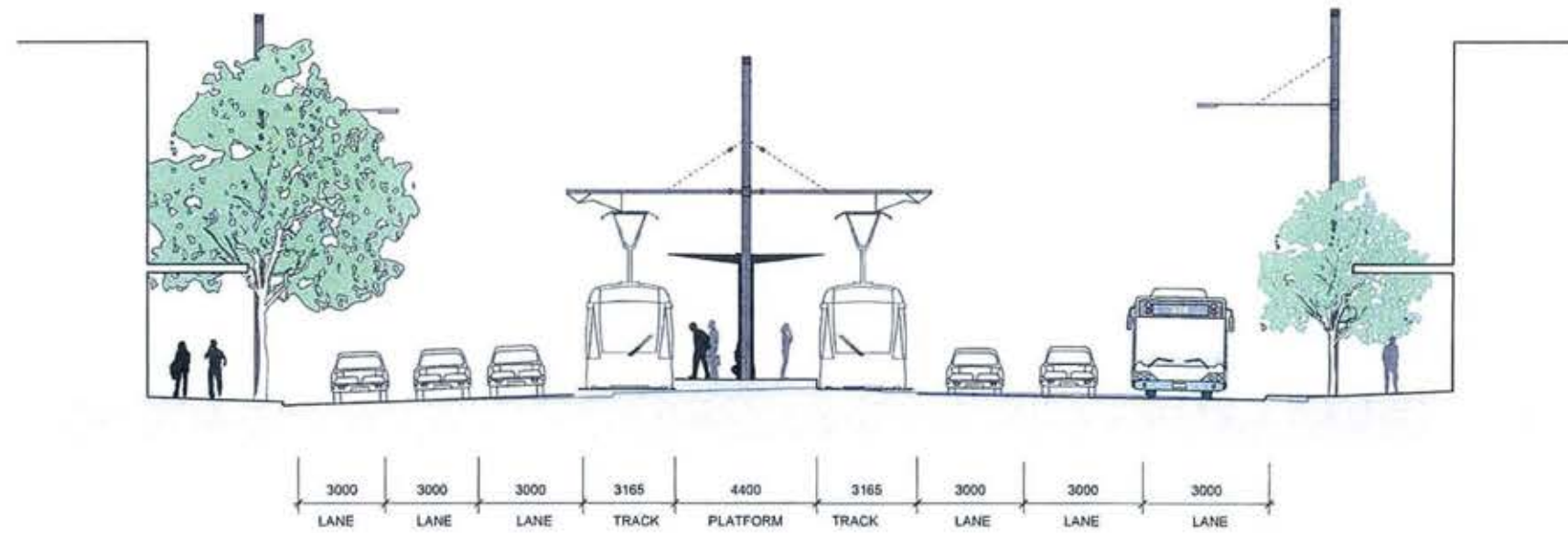
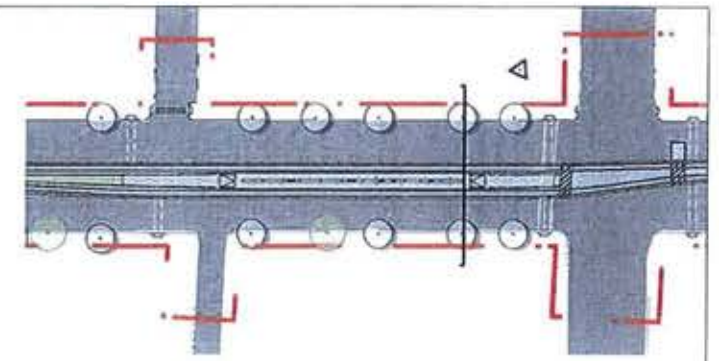
DO NOT SCALE



Drawn	ASPECT STUDIOS	Designer	DM/CM
Drafting Check	XL	Design Check	KL
Approved	KL		
Date	04/07/2014		
Scale	1:250 @ A1 1:500 @ A3		

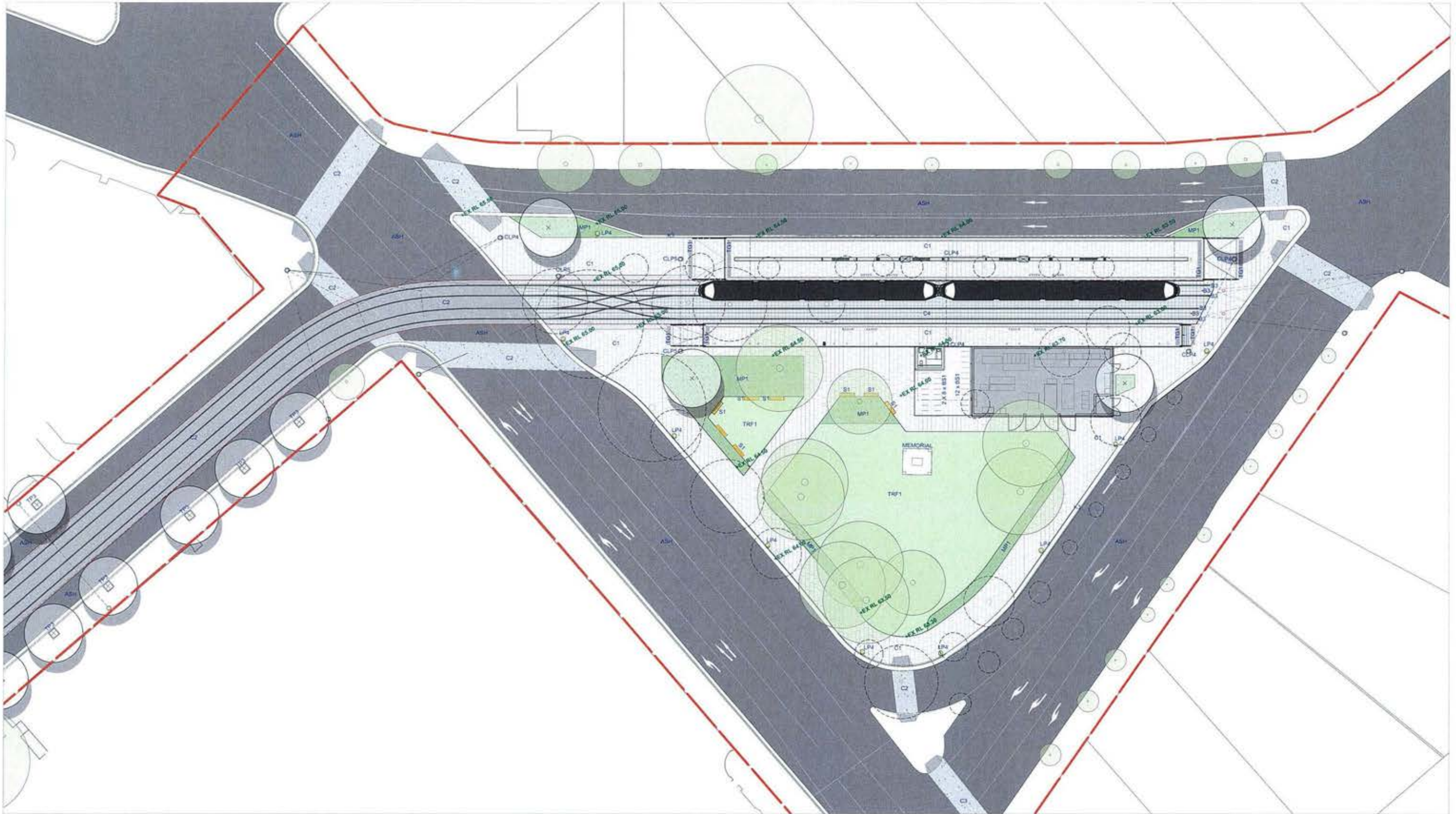
SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO KINGSFORD
 PUBLIC DOMAIN PLAN
 TOOMAN AVENUE

Original Size
A1 Drawing No: SLR-CSY-DWG-LA-0800 Rev: A



CONCEPT DESIGN

				Client 		DO NOT SCALE 		Drawn ASPECT STUDIOS Designer MF Drafting Check KL Design Check KL Approved KL Date 04/07/2014 Scale 1:100 @ A1 1:200 @ A3		SYDNEY LIGHT RAIL EASTERN EXTENSION CROOKER QUAY TO KINGSGROVE PUBLIC DOMAIN SECTION TODMAN AVENUE Original No: A1 Drawing No: SLR-CSY-DWG-LA-0801 Rev: A	
* ISSUED FOR CONSTRUCTION		Drawn: KL Job Manager: KL Date: 04/07/14						This Drawing must not be used for Construction unless signed as Approved		Original No: A1 Drawing No: SLR-CSY-DWG-LA-0801 Rev: A	
Revision Note: * indicates signature on original issue of drawing or last revision of drawing		Drawn: KL Job Manager: KL Date: 04/07/14						This Drawing must not be used for Construction unless signed as Approved		Original No: A1 Drawing No: SLR-CSY-DWG-LA-0801 Rev: A	

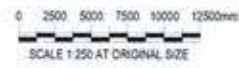


TO CIRCULAR QUAY



CONCEPT DESIGN

No	Revision	Note	Author	Job Manager	Date
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2	ISSUED FOR CONCEPT DESIGN		09/09	KL	05/09/14



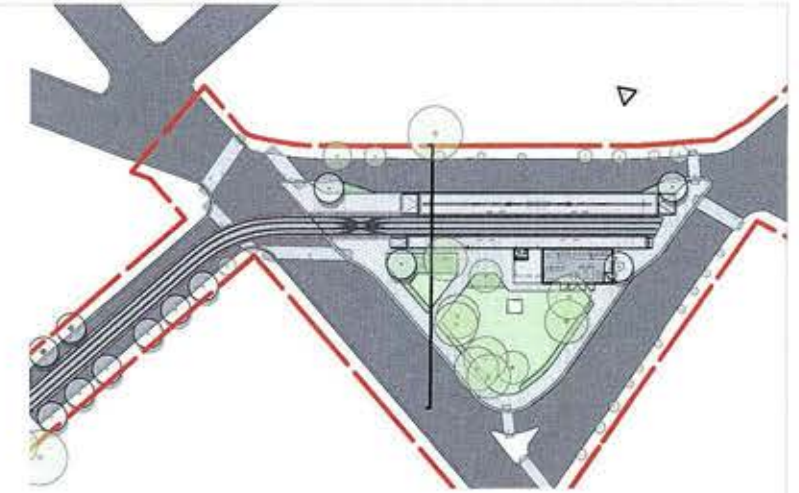
DO NOT SCALE

Drawn	ASPECT STUDIOS	Designer	DM/CM
Drafting Check	KL	Design Check	KL
Approved	KL		
Date	04/07/2014		
Scale	1:250 @ A1 1:500 @ A3		

This Drawing must not be used for Construction unless signed as Approved

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 PUBLIC DOMAIN PLAN
 RANDWICK

Original Size: **A1** Drawing No: SLR-CSY-DWG-LA-0900 Rev: B



CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
1		ISSUED FOR CONSOLIDATED CLARIFICATIONS	MF	KL	03/03/14
4		ISSUED FOR CONCEPT DESIGN	MF	KL	04/07/14

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SCALE 1:100 AT ORIGINAL SIZE

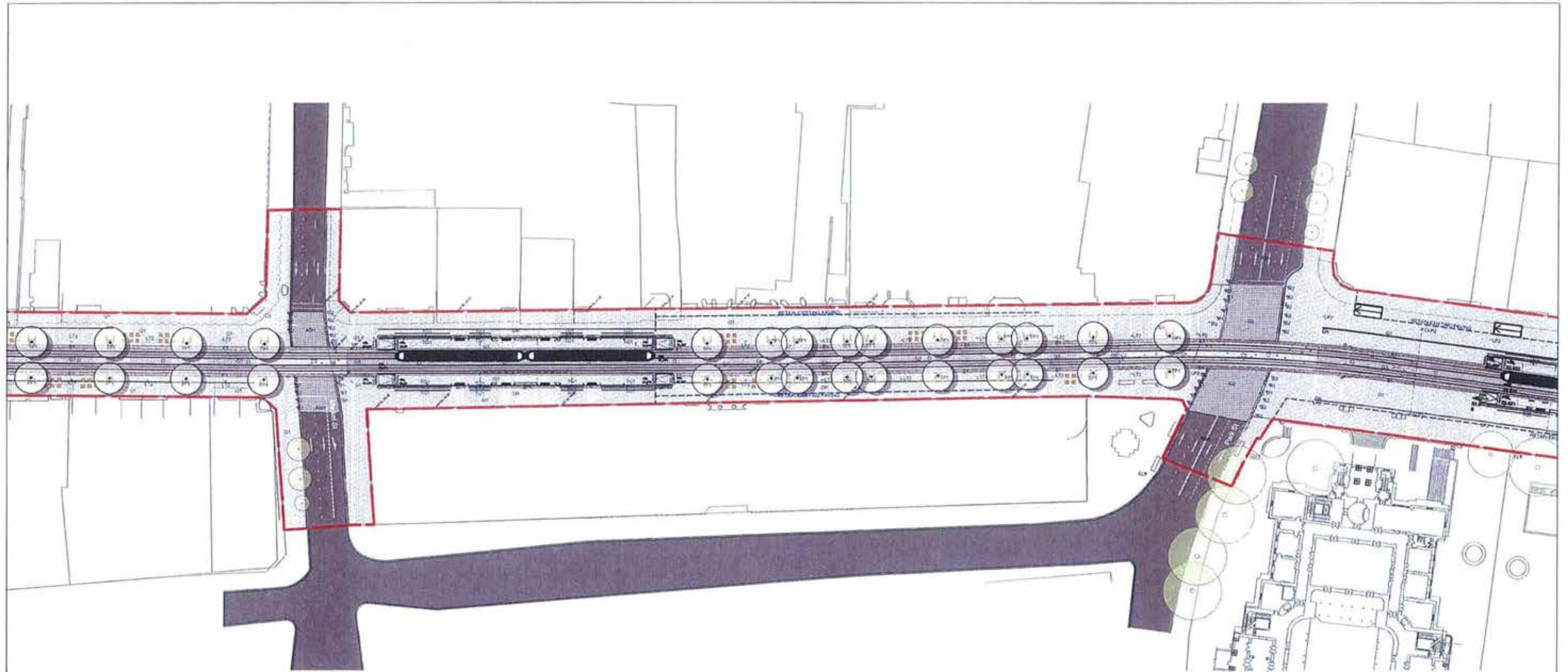


DO NOT SCALE
 Drawn ASPECT STUDIOS Designer MF
 Drafting Check KL Design Check KL
 Approved KL
 Date 04/07/2014
 Scale 1:100 @ A1 1:200 @ A3

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
 PUBLIC DOMAIN SECTION
 RANDWICK

Original Size **A1** Drawing No: SLR-CSY-DWG-LA-0901

Rev: 6



← TO CIRCULAR QUAY

TO RANDWICK →



CONCEPT DESIGN

No.	Revision	Notes	Drawn	Job Manager	Date
A	RESPONSE TO REQUEST		DWCM	KL	04/08/2014



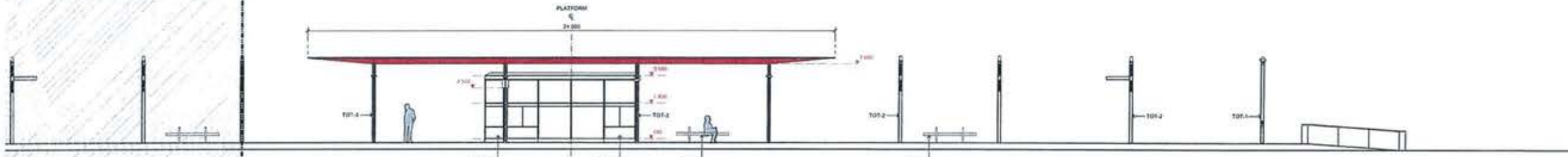
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Drafting Check	KL	Design Check	KL
Approved	KL		
Date	04/08/2014		
Scale	1:500 @ A1 1:1000 @ A3	This Drawing must not be used for Construction unless signed as Approved	

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
PUBLIC DOMAIN PLAN	
QUEEN VICTORIA BUILDING	
Drawing No:	SLR-CSY-DWG-LA-1000
Rev:	A

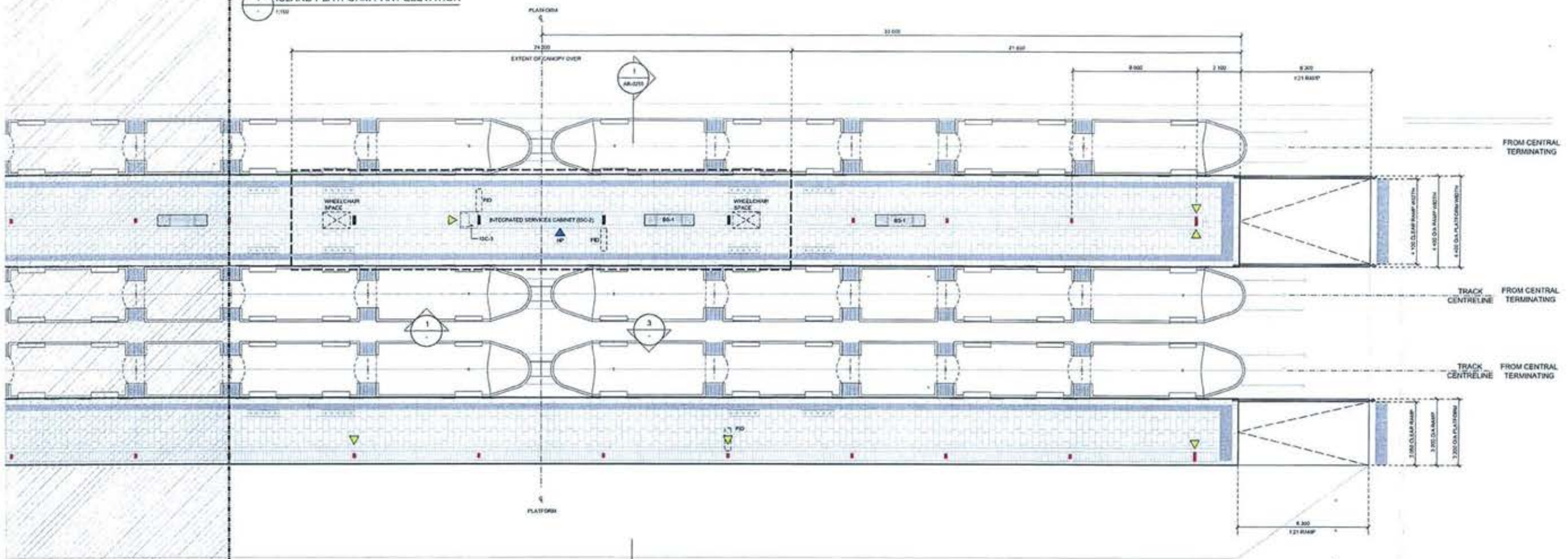
ATTACHMENT 6 – Stops General Arrangement

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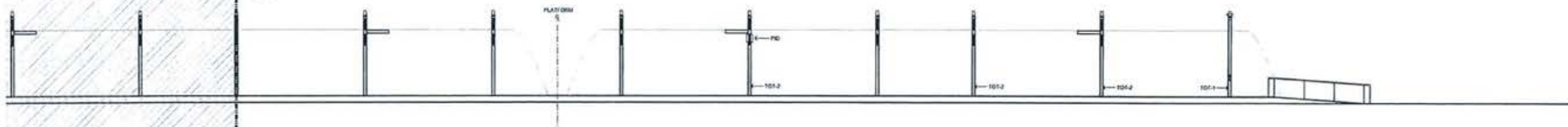
FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0251



1 ISLAND PLATFORM PART ELEVATION
1/100



2 CIRCULAR QUAY PART PLAN
1/100



KEY

	FUR
	HELP POINT
	PG PLAN
	ACCESSIBLE DOORS



CONCEPT DESIGN

No.	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager	Date
1					

Client	NSW GOVERNMENT
Project	Transport for NSW
Drawn	L.SARVIS
Checked	K.JURKIEWICZ
Approved	A.CORRIESE
Date	04/07/2014
Scale	1:100@A1

NSW GOVERNMENT
Transport for NSW

DO NOT SCALE

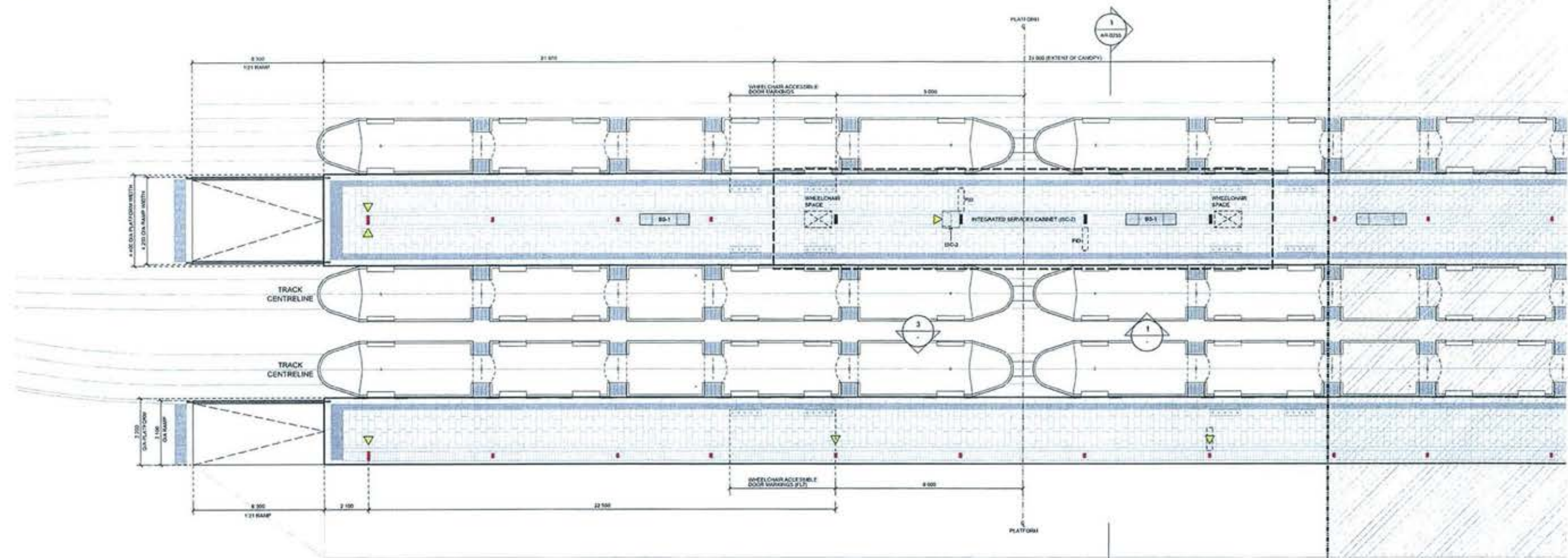
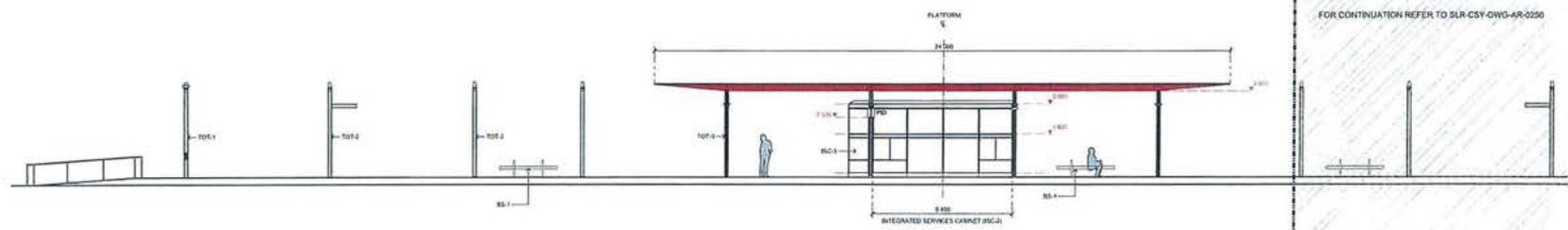
CONNECTING SYDNEY

SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
CIRCULAR QUAY STOP
PART PLAN AND ELEVATIONS - SHEET 1
ROUTE A

Original Size: A1
Drawing No: SLR-CSY-DWG-AR-0250
Rev: A

FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0250

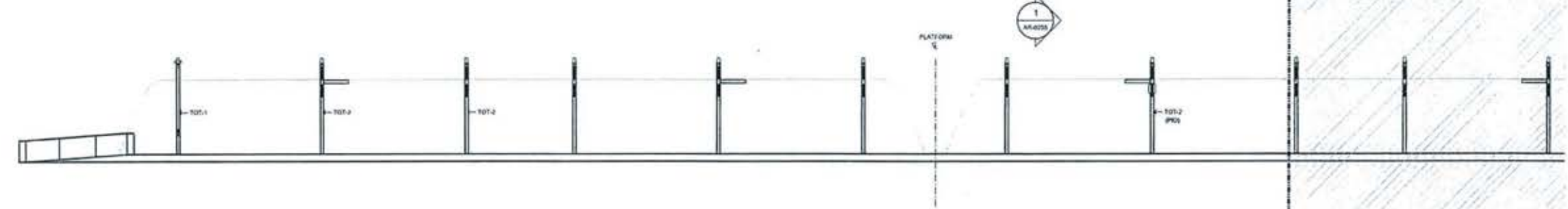
1 SIDE PLATFORM PART ELEVATION



2 CIRCULAR QUAY STOP PART PLAN

KEY

	FLR
	HELP POINT
	PD (PLAN)
	ACCESSIBLE DOORS

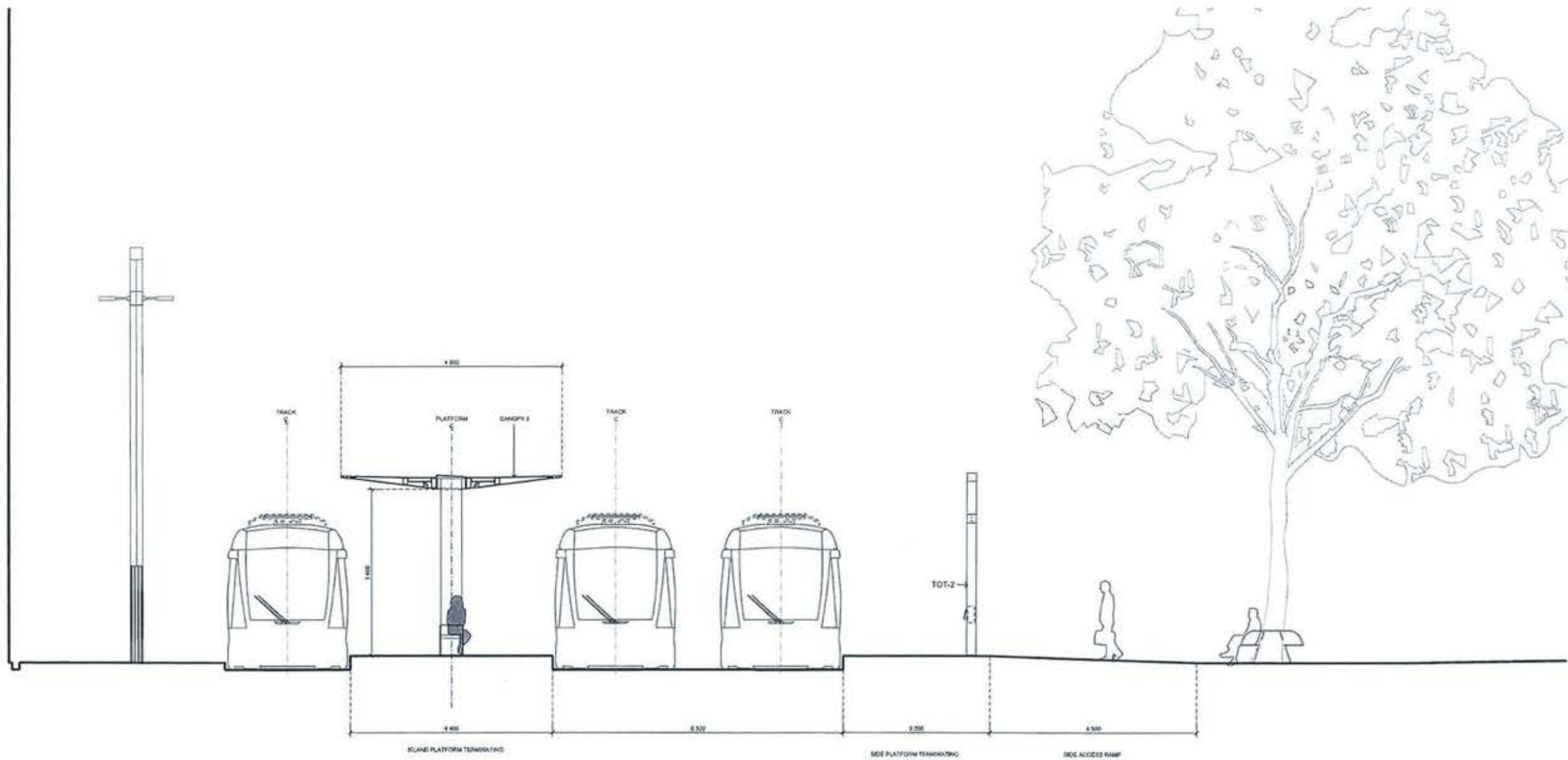


3 SIDE PLATFORM PART ELEVATION



CONCEPT DESIGN

				 	<p>DO NOT SCALE</p>	Drawn: L.JARVIS Designer: K.JURNEWICZ Drafting Check: K.JURNEWICZ Design Check: A.K. THOMPSON Approved: A.CORTESE Date: 04/07/2014 Scale: 1:100 @ A1	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK CIRCULAR QUAY STOP PART PLAN AND ELEVATIONS - SHEET 2 ROUTE A
No. Revision Note: * indicates signatures on original issue of drawing or last revision of drawing Drawn: JCS Date:						Original Size: A1 Drawing No: SLR-CSY-DWG-AR-0251 Rev: A	



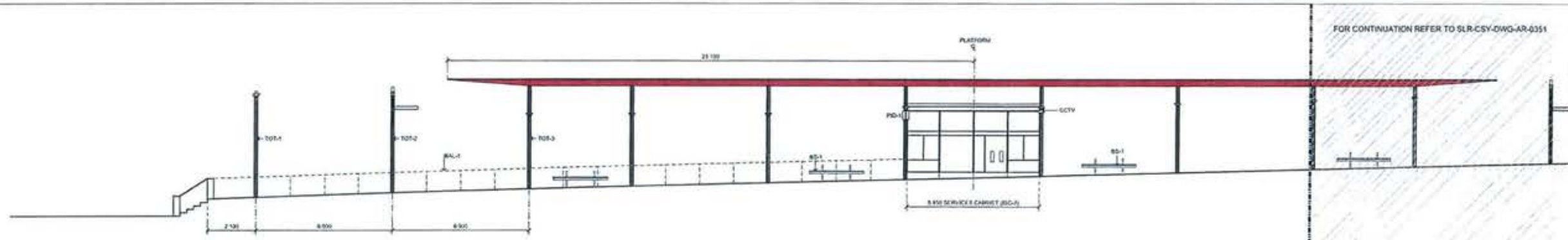
1 CIRCULAR QUAY STOP SECTION
1:50

CONCEPT DESIGN

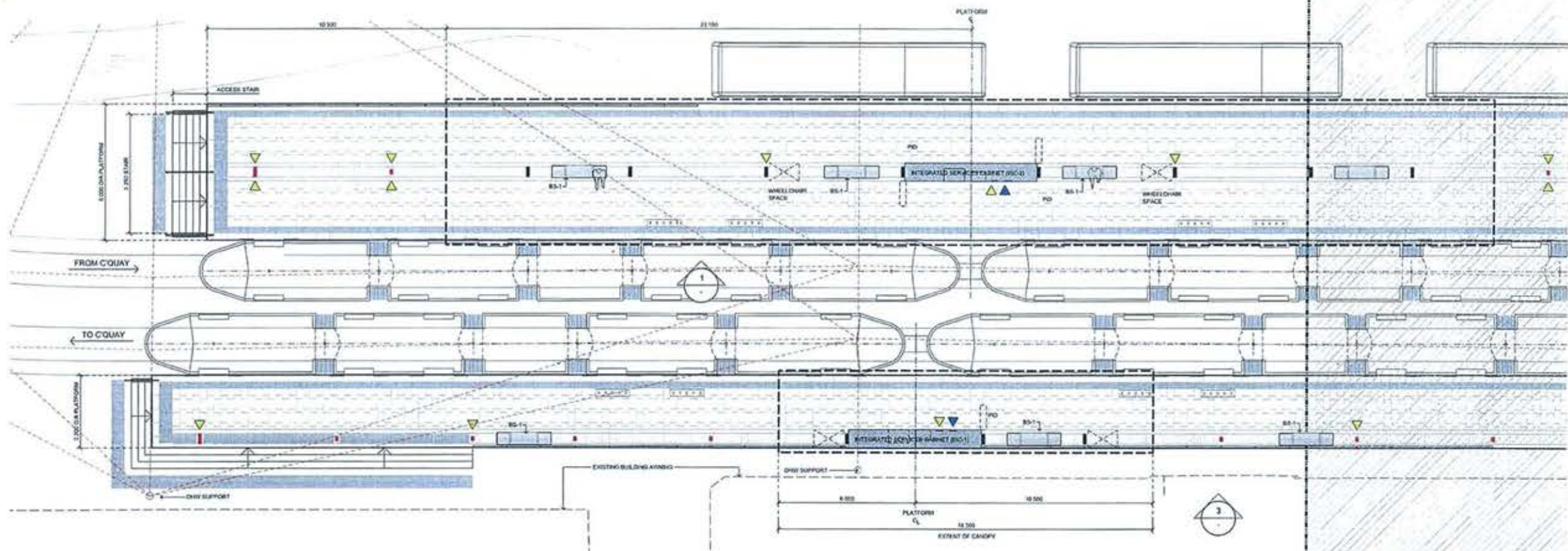
				 Transport for NSW	DO NOT SCALE 	Drawn: L.JARVIS	Designer: K.AJIKIEWICZ	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK CIRCULAR QUAY STOP CROSS SECTION ROUTE A				
						Drafting Check: K.AJIKIEWICZ	Design Check: A.K.THOMPSON					
				Approved: A.CORTESE	Date: 04/07/2014	Scale: 1:50 @ A1	This Drawing must not be used for Construction unless signed as Approved					
				No.:	Revision:	State: * indicates signatures on original issue of drawing or last revision of drawing	Drawn:		Job Manager:	Date:	Original Size: A1	Drawing No: SLR-CSY-DWG-AR-0255

FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0351

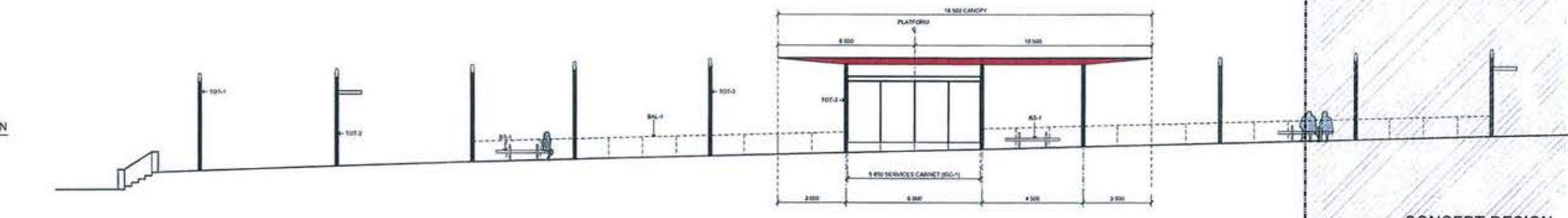
1 ISLAND PLATFORM ELEVATION
1:100



2 RAWSON PLACE STOP PLAN
1:100



3 SIDE PLATFORM ELEVATION
1:500



FLA
 HELP POINT
 PD



CONCEPT DESIGN

1	ISSUED FOR CONCEPT DESIGN	LI	MT	04/07/2014
No.	Revision	Note: * Indicates signatures on original issue of drawing or last revision of drawing	Drawn	Job Manager
			Date	

Client

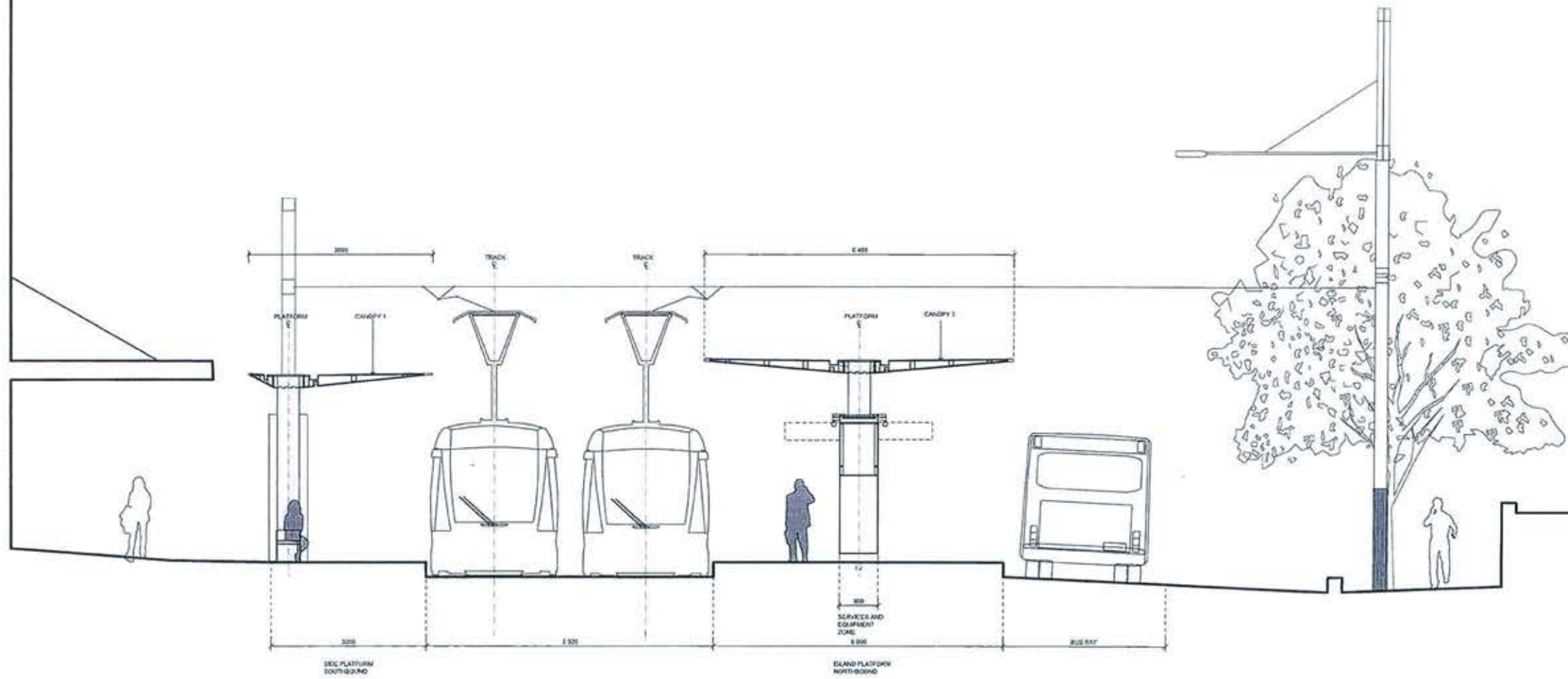
Transport for NSW

DO NOT SCALE

Drawn: L.JARVIS
 Designer: K.JURKIEWICZ
 Drafting Check: K.JURKIEWICZ
 Design Check: A.K.THOMPSON
 Approved: A.CORRISE
 Date: 04/07/2014
 Scale: 1:100 @ A1

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RAWSON
 RAWSON PLACE STOP
 PART PLAN AND ELEVATIONS - SHEET 1
 ROUTE A

This Drawing must not be used for Construction unless signed as Approved
 Drawing No: SLR-CSY-DWG-AR-0350
 Rev: A

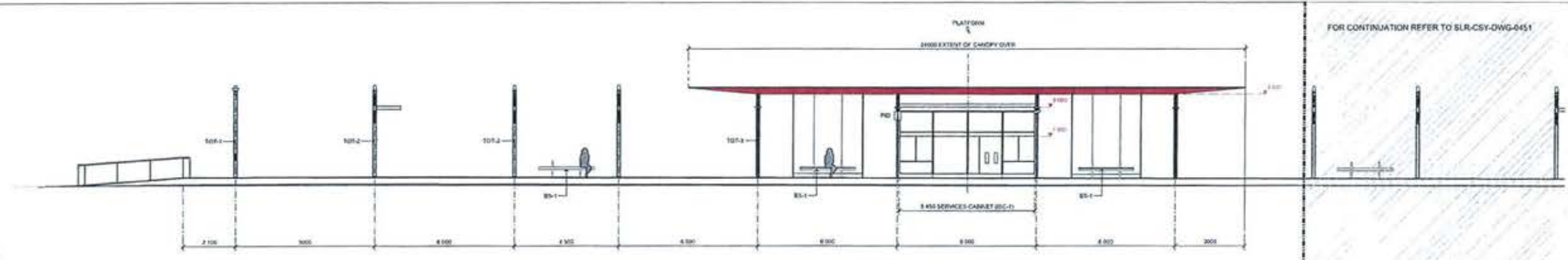


1 RAWSON PLACE STOP CROSS SECTION
1/04

CONCEPT DESIGN

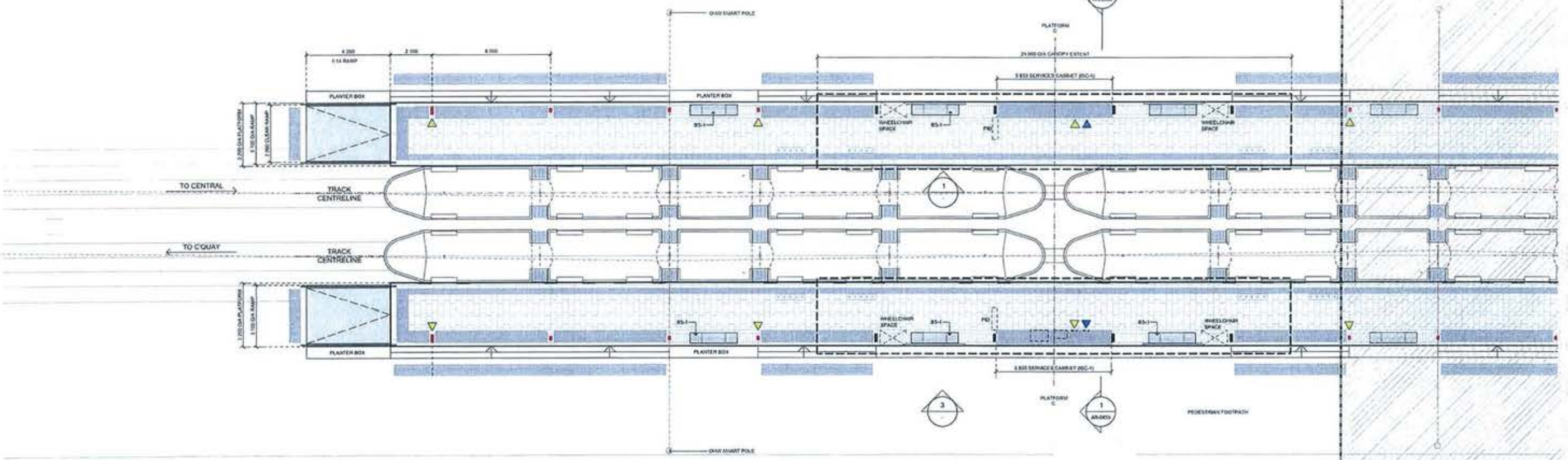
										DO NOT SCALE		Drawn: L.JARVIS Designer: K.JURKIEWICZ Drafting Check: K.JURKIEWICZ Design Check: A.X.THOMPSON Approved: A.CORFESI Date: 04/07/2014 Scale: 1:50 @ A1	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR CUEV TO SANDRICK RAWSON PLACE STOP CROSS SECTION ROUTE A This Drawing must not be used for Construction unless signed as Approved Alpha Size A1	Drawing No: SLR-CSY-DWG-AR-0355 Rev: A
No. Revision Note: * indicates signature on original issue of drawing or best revision of drawing Drawn Job Manager Date														

1 SOUTHBOUND PLATFORM ELEVATION
1:100



FOR CONTINUATION REFER TO SLR-CSY-DWG-0451

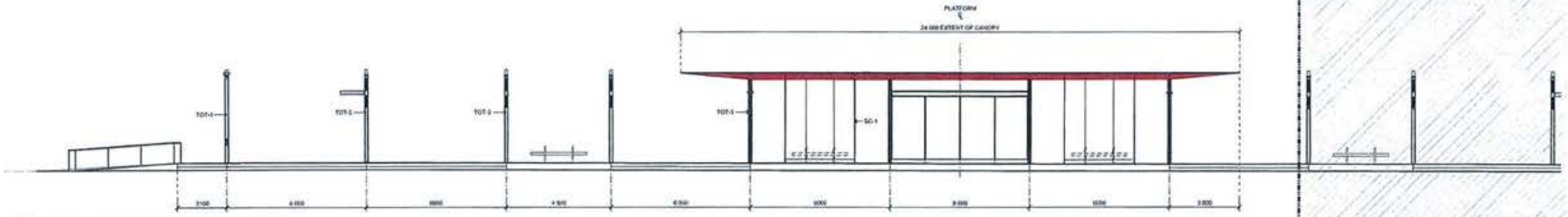
2 TOWN HALL STOP PART PLAN
1:100



KEY

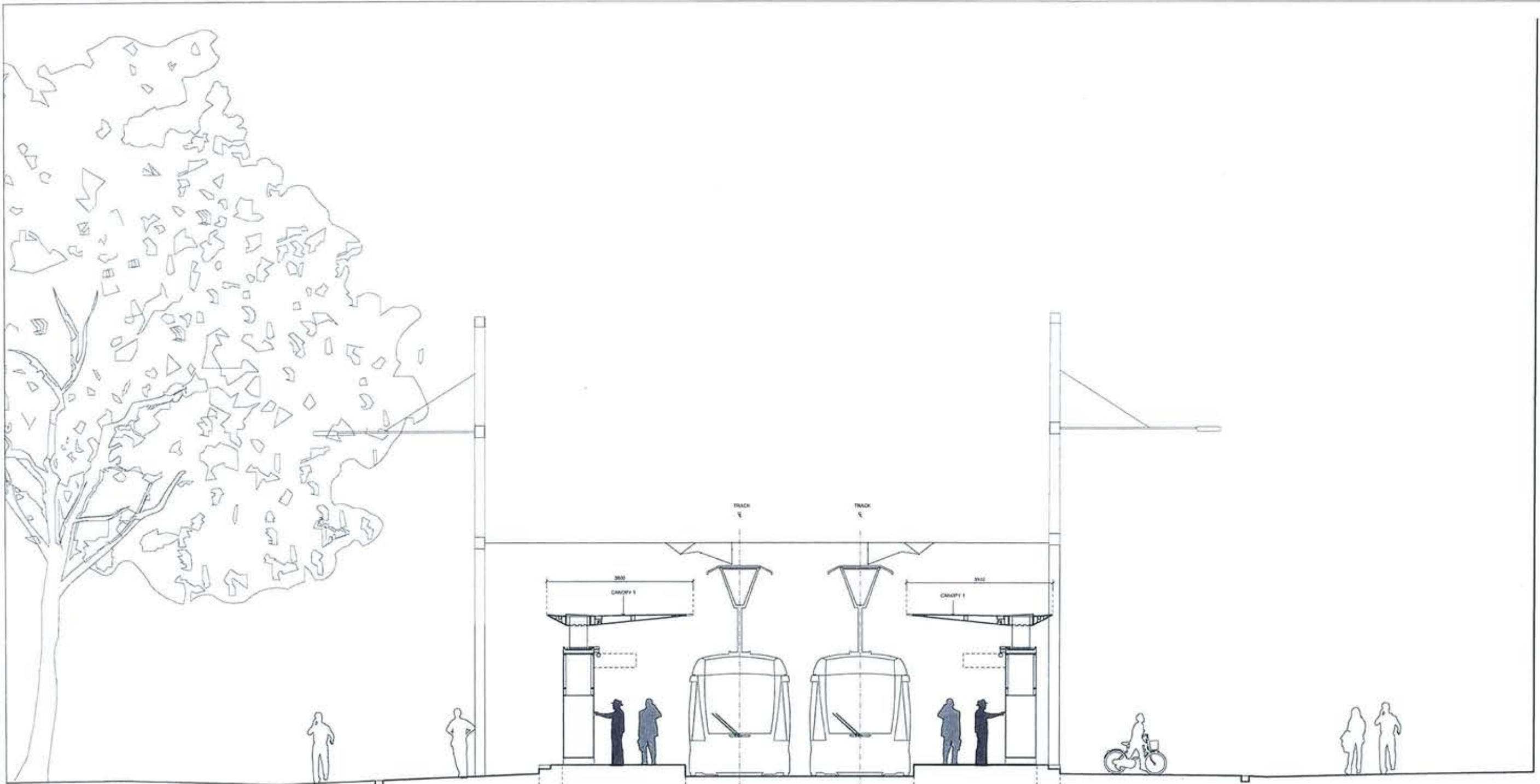
	FLX
	HELP POINT
	NO PLANT
	ACCESSIBLE DOORS

3 NORTHBOUND PLATFORM PART ELEVATION
1:100



CONCEPT DESIGN

				DO NOT SCALE Drawn: L.JARVIS Designer: K.JURKIEWICZ Drafting Check: K.JURKIEWICZ Design Check: A.K.THOMPSON Approved: A.CORTESE Date: 04/07/2014 Scale: 1:100 @ A1	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK TOWN HALL STOP PART PLAN AND ELEVATIONS - SHEET 1 ROUTE A Original Size: A1 Drawing No: SLR-CSY-DWG-AR-0450 Rev: A
No Revision. Note: * Indicates alterations on original issue of drawing or last revision of drawing. Drawn: J.S. Manager Date: 06/07/2014		Client: NSW GOVERNMENT Project: H3/Projects - Assets/3168_Sydney Light Rail REP/CAD/PLOT/EA-CSY-DWG-AR-0450.dwg		This Drawing must not be used for construction unless signed as Approved.	



1 TOWN HALL STOP CROSS SECTION
1:50

CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
4	01/07/2014	04/07/2014	LA	JAT	04/07/2014

Client



Transport for NSW

DO NOT SCALE

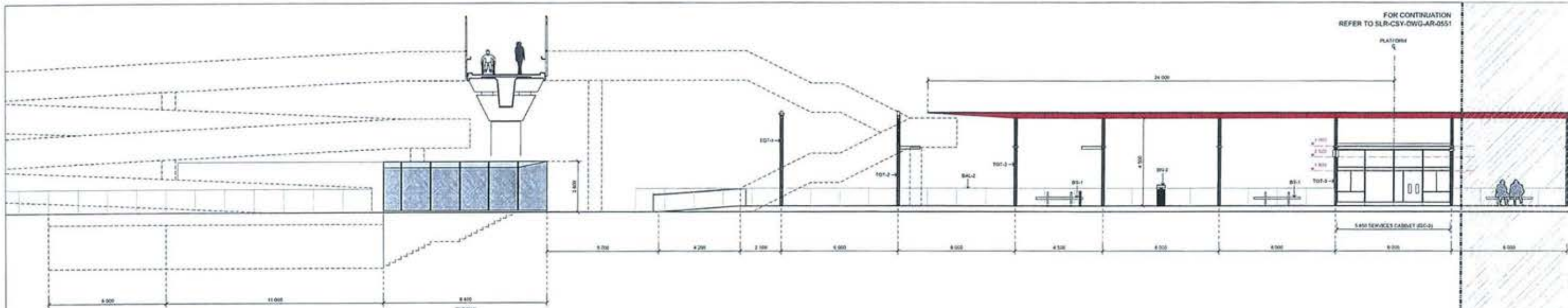


CONNECTING SYDNEY

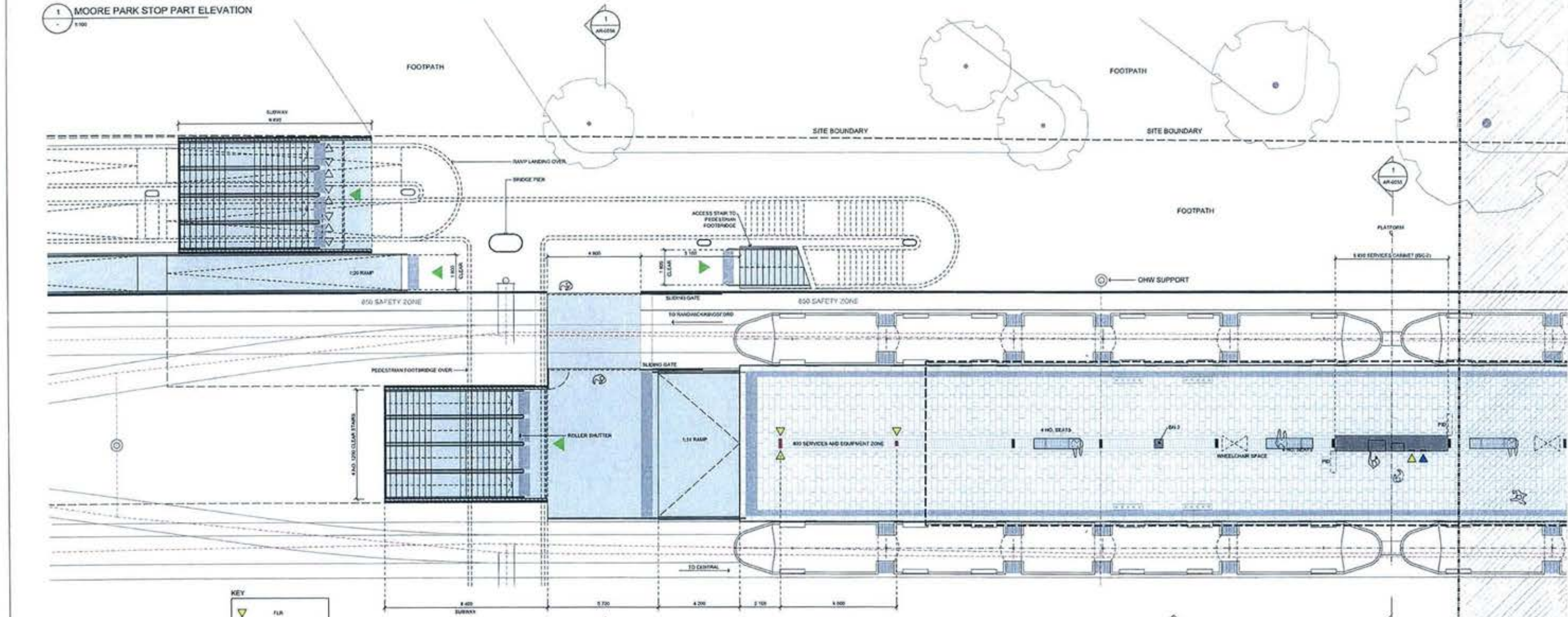
Drawn	L.JARVIS	Designer	K.JURKIEWICZ
Drafting Check	K.JURKIEWICZ	Design Check	A.K.THOMPSON
Approved	A.CORRIESE		
Date	04/07/2014		
Scale	1:50 @ A1		

SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
TOWN HALL STOP
CROSS SECTION
ROUTE A

Original Size
A1 Drawing No: SLR-CSY-DWG-AR-0455 Rev: A



1 MOORE PARK STOP PART ELEVATION
1:100



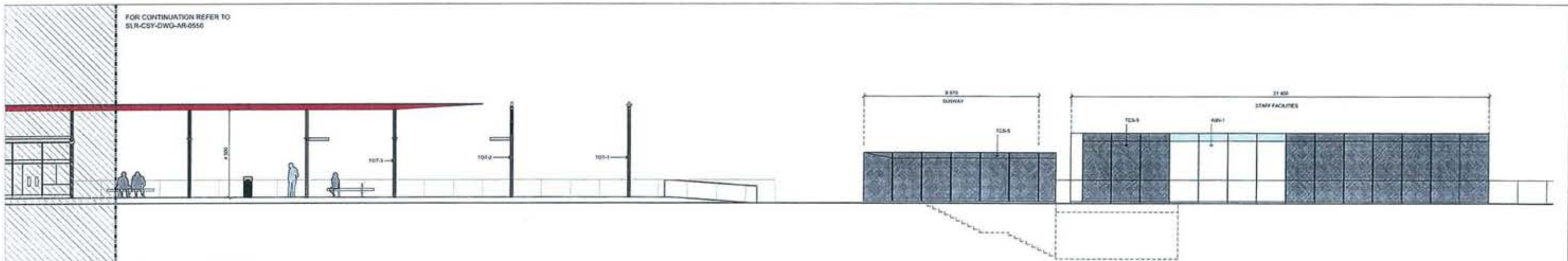
2 MOORE PARK STOP PART PLAN
1:100

KEY

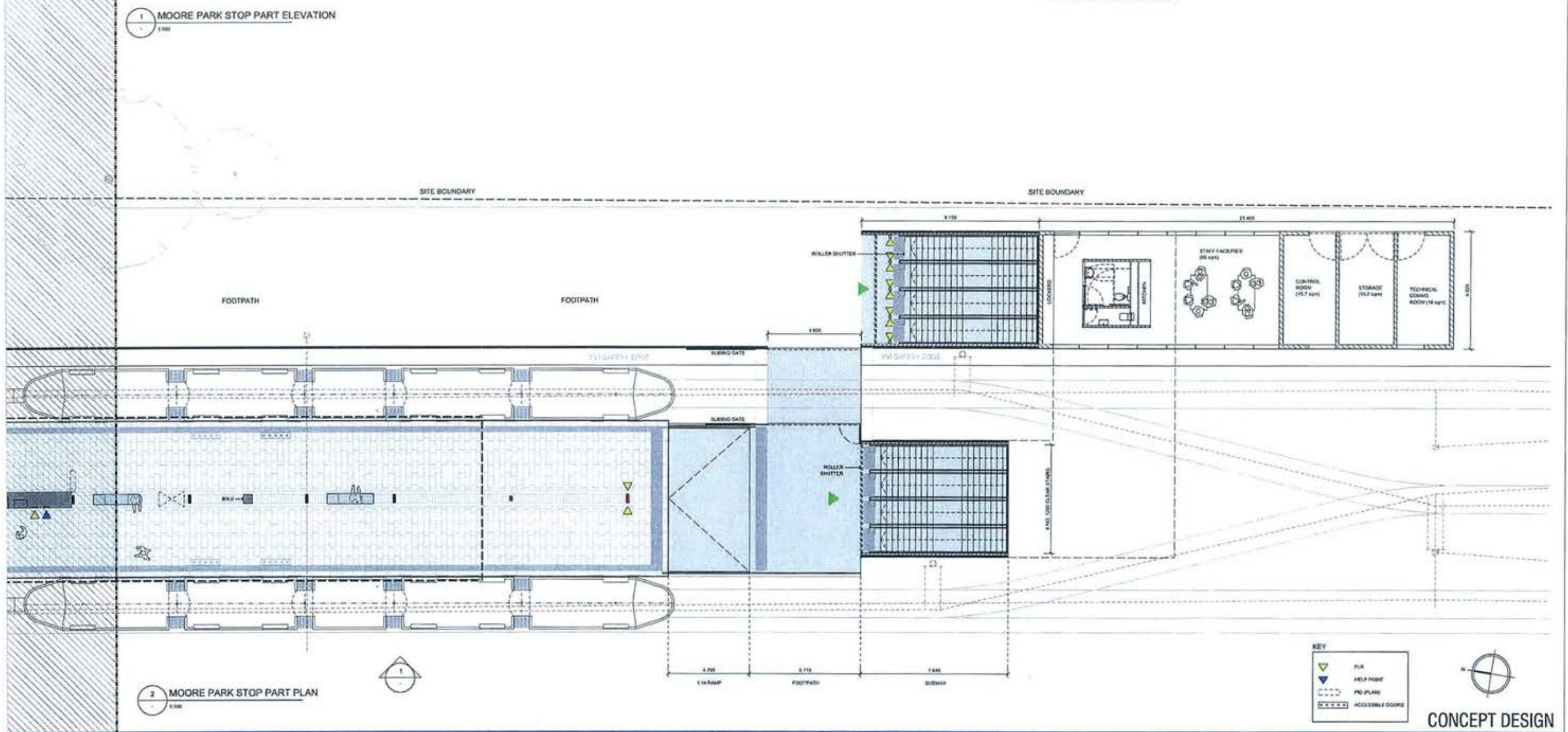
	FLR
	HELP POINT
	FO-PLAN
	ACCESSIBLE DOORS

CONCEPT DESIGN

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	NO.	REVISION	DATE	BY	APP'D									
	Client: NSW GOVERNMENT	Drawn: L.JARVIS	Designer: K.JURKIEWICZ											
Drawn: L.JARVIS	Designer: K.JURKIEWICZ	Design Check: A.K.THOMPSON												
Approved: A.CORTISET	Date: 04/07/2014	Scale: 1:100 @ A1												



1 MOORE PARK STOP PART ELEVATION
1:100



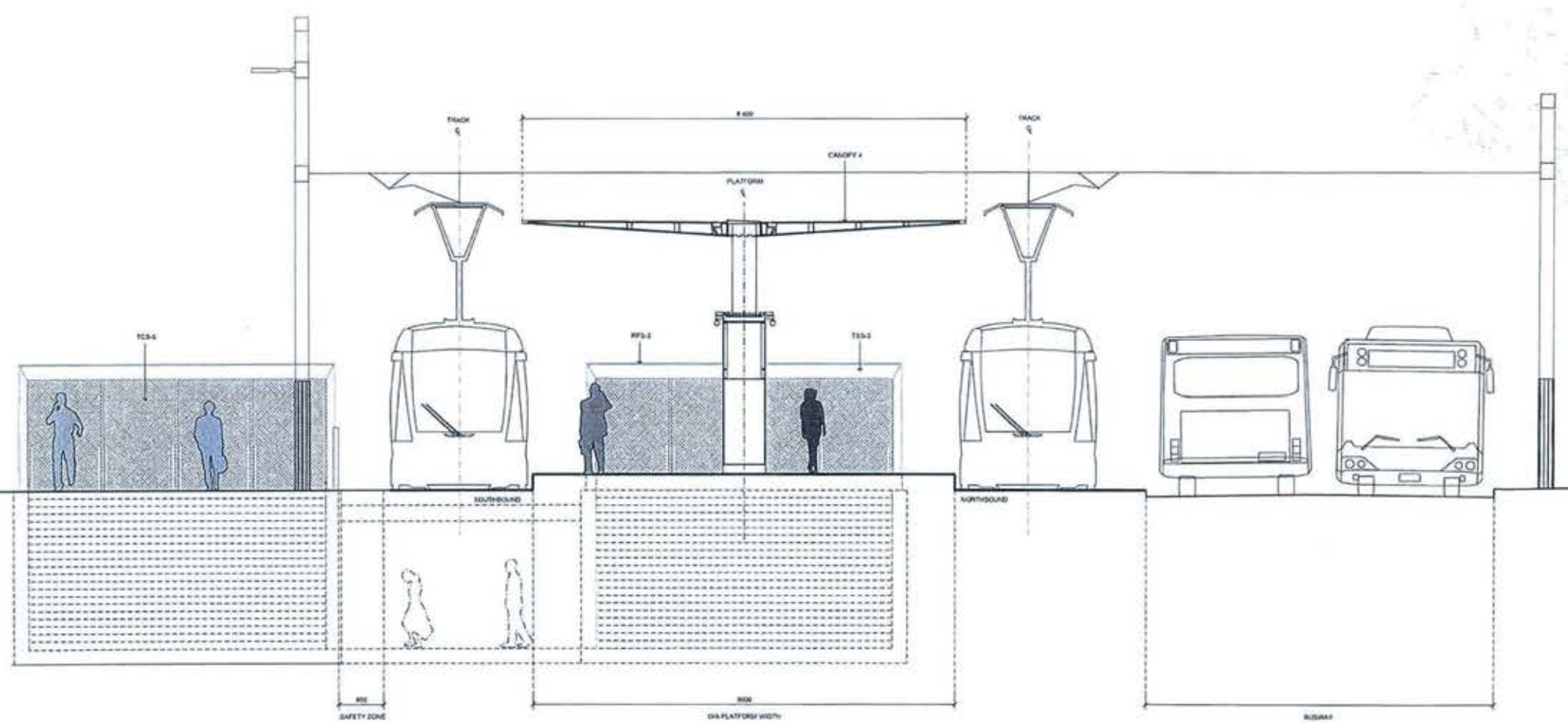
2 MOORE PARK STOP PART PLAN
1:100

KEY

- FIRE
- HELP POINT
- PD PANEL
- ACCESSIBLE DOORS

CONCEPT DESIGN

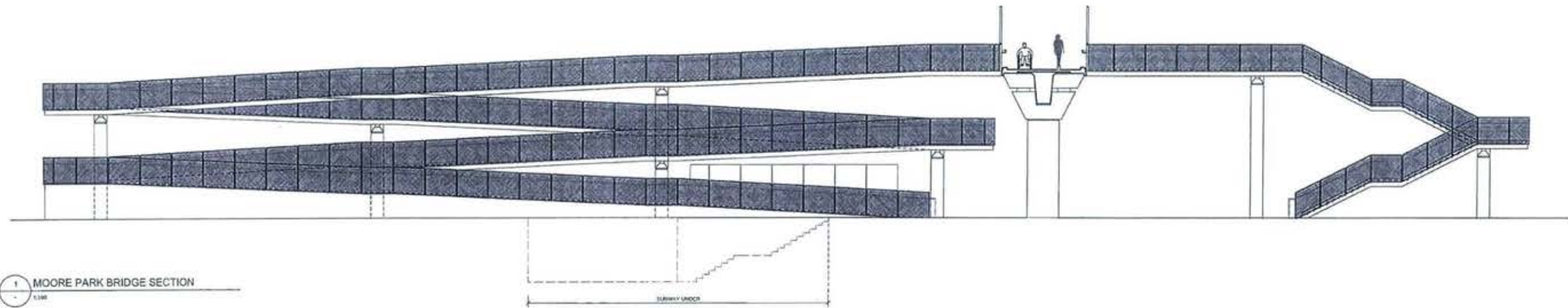
						DO NOT SCALE		Drawn: L.JARVIS Designer: K.JURKIEWICZ Drafting Check: K.JURKIEWICZ Design Check: A.THOMPSON Approved: A.CORRISE Date: 04/07/2014 Scale: 1:100 @ A1	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK MOORE PARK STOP PART PLAN AND ELEVATIONS ROUTE Q		Drawing No: SLR-CSY-DWG-AR-0551 Rev: A
Client: NSW Government Project: Sydney Light Rail Eastern Extension Drawing Title: Moore Park Stop Part Plan and Elevations Date: 04/07/2014 Scale: 1:100 @ A1 This Drawing must not be used for Construction unless signed as Approved.											



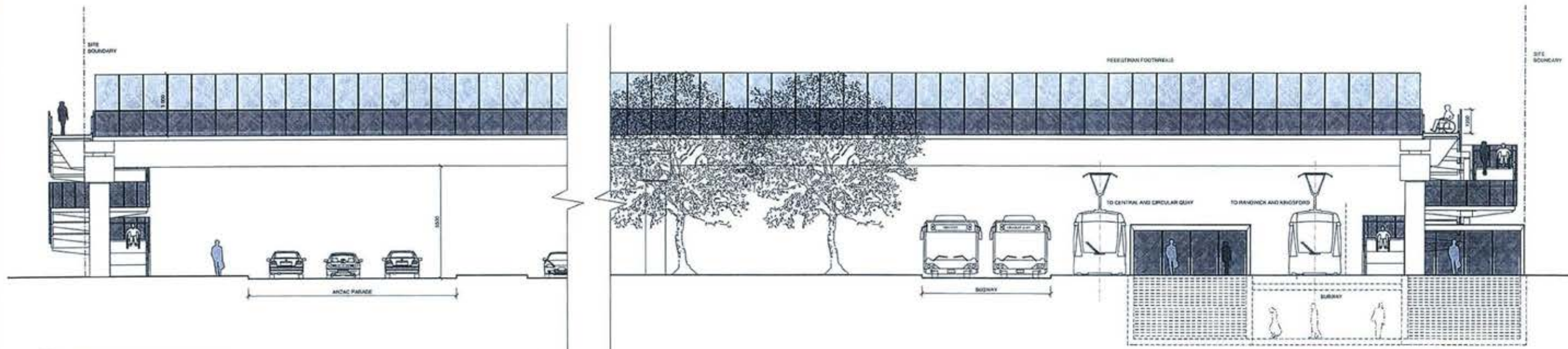
01 MOORE PARK STOP CROSS SECTION

CONCEPT DESIGN

				 Transport for NSW		DO NOT SCALE 		Drawn: L.JARVIS Designer: K.JURKIEWICZ Drafting Check: K.JURKIEWICZ Design Check: A.K. THOMPSON Approved: A.CORTESE Date: 04/01/2014	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK MOORE PARK STOP CROSS SECTION ROUTE 02	
Client: NSW GOVERNMENT				Scale: 1:50 @ A1		This Drawing must not be used for Construction unless signed as Approved		Original Size: A1 Drawing No: SLR-CSY-DWG-AR-0555 Rev: A		



1 MOORE PARK BRIDGE SECTION
1:100



2 MOORE PARK BRIDGE ELEVATION
1:100

CONCEPT DESIGN

No.	Revision	Note	Drawn	QC Manager	Date
1		ISSUED FOR CONCEPT DESIGN	LJ	MT	04/07/2014

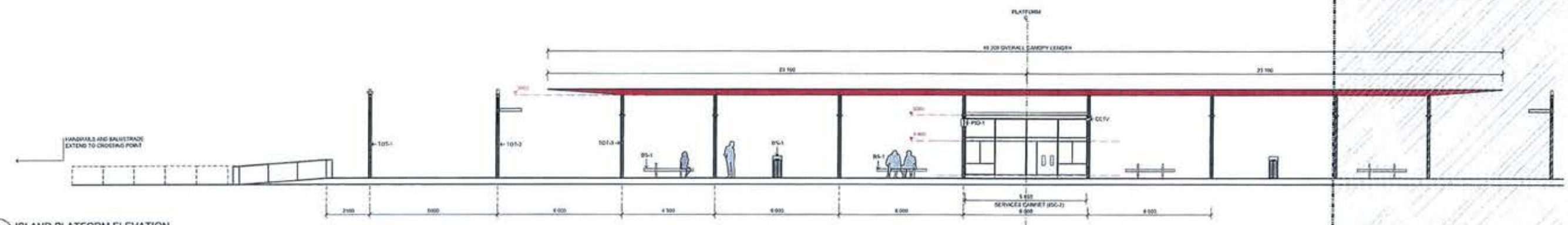


Client	DO NOT SCALE	Drawn	L.JARVIS	Designer	K.JURNEWICZ
		Drafting Check	K.JURNEWICZ	Design Check	A.K.THOMPSON
		Approved	A.COMTESE		
		Date	04/07/2014		
		Scale	1:50 @ A1		

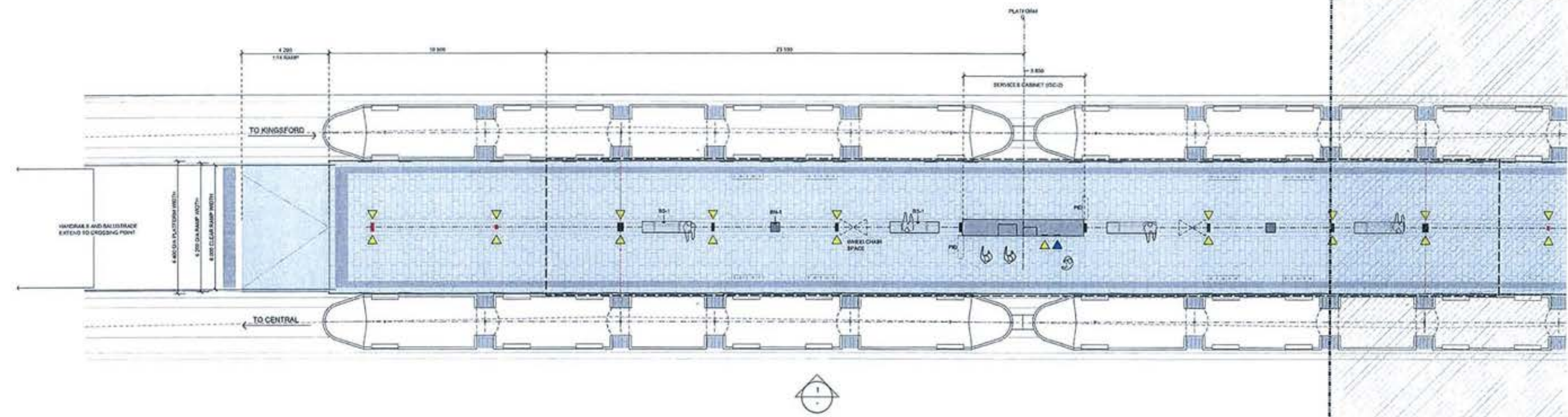
SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
MOORE PARK SECTIONS	
SHEET 2	
ROUTE 02	
Original Title	A1
Drawing No:	SLR-CSY-DWG-AR-0556
Rev:	A

FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0651

1 ISLAND PLATFORM ELEVATION
1:100



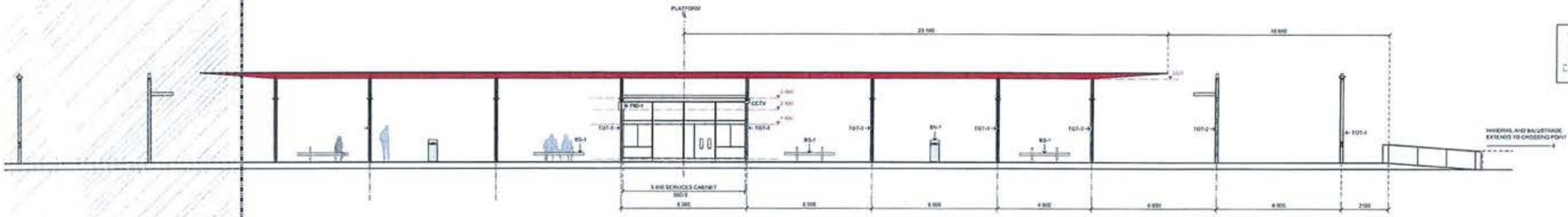
2 UNSW STOP PART PLAN
1:100



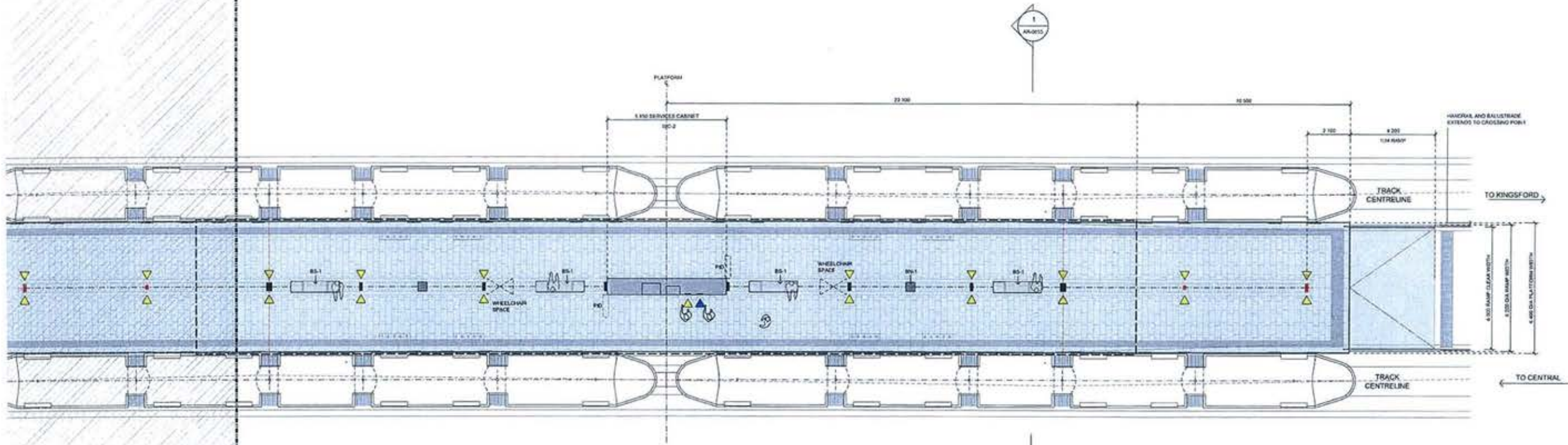
CONCEPT DESIGN

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Drafting Check: K.JURKEWICZ Approved: A.CORTESE Date: 04/07/2014		Design Check: A.X.THOMPSON		Scale: 1:100 @ A1		This Drawing must not be used for Construction unless signed as Approved		Original Size A1 Drawing No: SLR-CSY-DWG-AR-0650		Rev: A	

FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0650



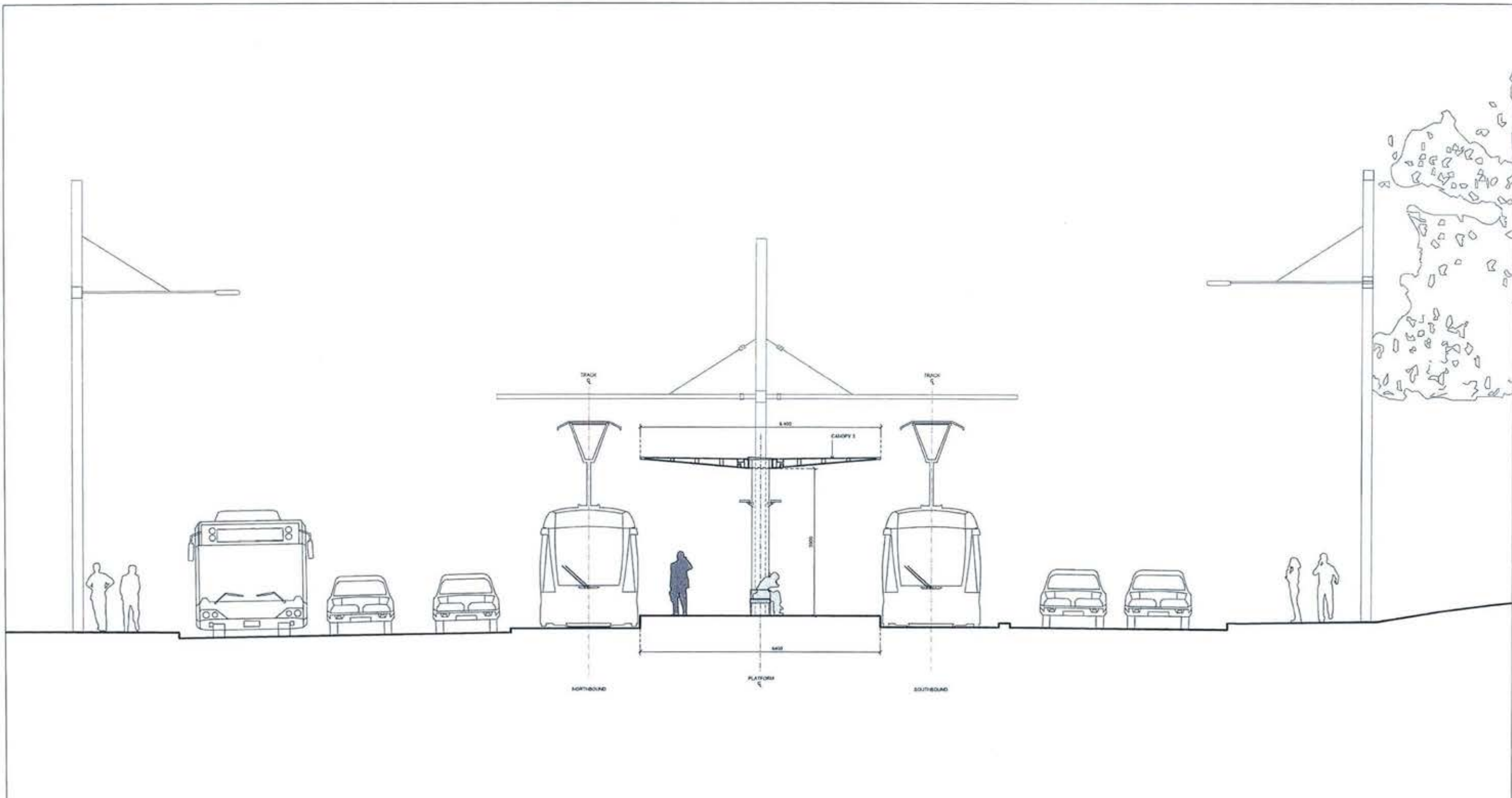
1 ISLAND PLATFORM ELEVATION
1:100



2 UNSW STOP PART PLAN
1:100

CONCEPT DESIGN

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No	Revision	Date	Drawn	Manager	Date														
A	CONCEPT DESIGN	04/07/2014	LA	MT	04/07/2014														



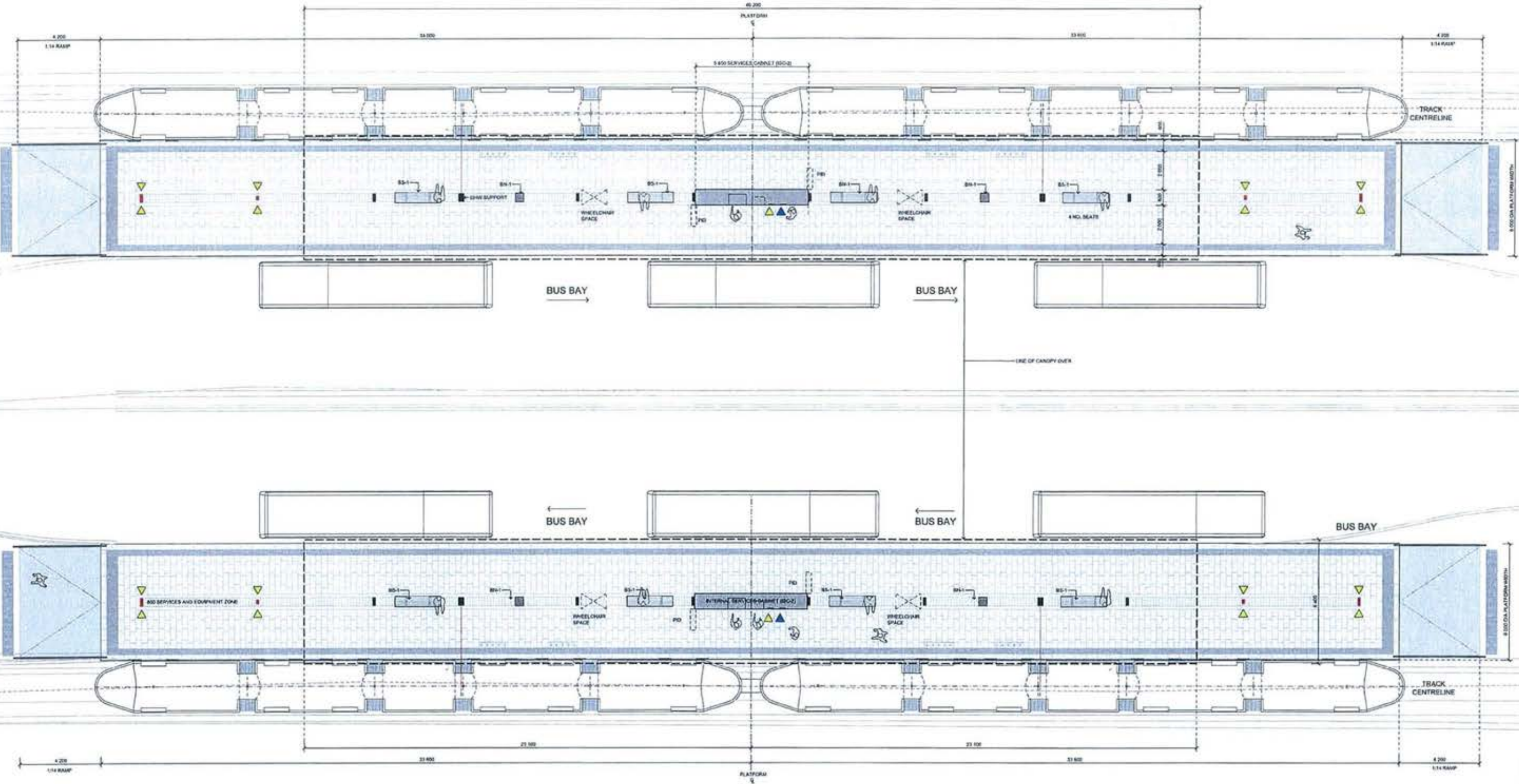
2 UNSW STOP CROSS SECTION
1:50

CONCEPT DESIGN

										DO NOT SCALE		Drawn: L.JARVIS Drafting Check: K.JURKIEWICZ Approved: A.CORFEE Date: 04/07/2014 Scale: 1:50 @ A1	Designer: K.JURKIEWICZ Design Check: A.K.THOMPSON	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR DUNY TO RANDWICK UNSW ANZAC PARADE STOP CROSS SECTION ROUTE M	Original Size: A1 Drawing No: SLR-CSY-DWG-AR-0655 Rev: A
Revision table with columns: No, Revision, Note, Drawn, Date				Client		NSW GOVERNMENT		TRANSPORT FOR NSW		CONNECTING SYDNEY		This Drawing must not be used for Construction unless signed as Approved		Drawing No: SLR-CSY-DWG-AR-0655	



	FLK
	HELPPOINT
	FD



1 KINGSFORD STOP PART PLAN
1:100

CONCEPT DESIGN

No.	Revision	Date	By	Check	Date
1	ISSUED FOR CONCEPT DESIGN	04/07/2014	LJ	WT	04/07/2014

Client

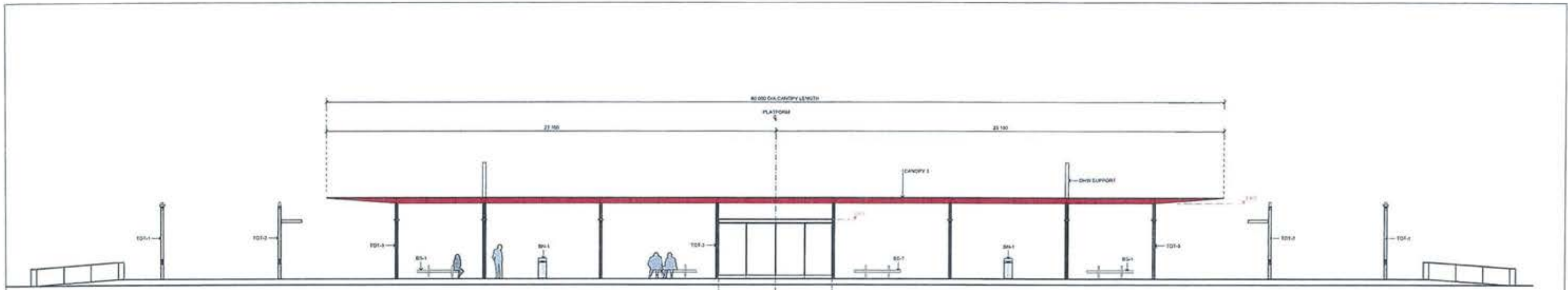
Transport for NSW

DO NOT SCALE

Drawn	L.JARVIS	Designer	K.ARKIEWICZ
Drafting Check	K.ARKIEWICZ	Design Check	A.K.THESSPSON
Approved	A.CORTESE		
Date	04/07/2014		
Scale	1:100 @ A1		

SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
KINGSFORD STOP
PART PLAN - SHEET 1
ROUTE M

Original Size
A1 Drawing No: SLR-CSY-DWG-AR-0750 Rev: A



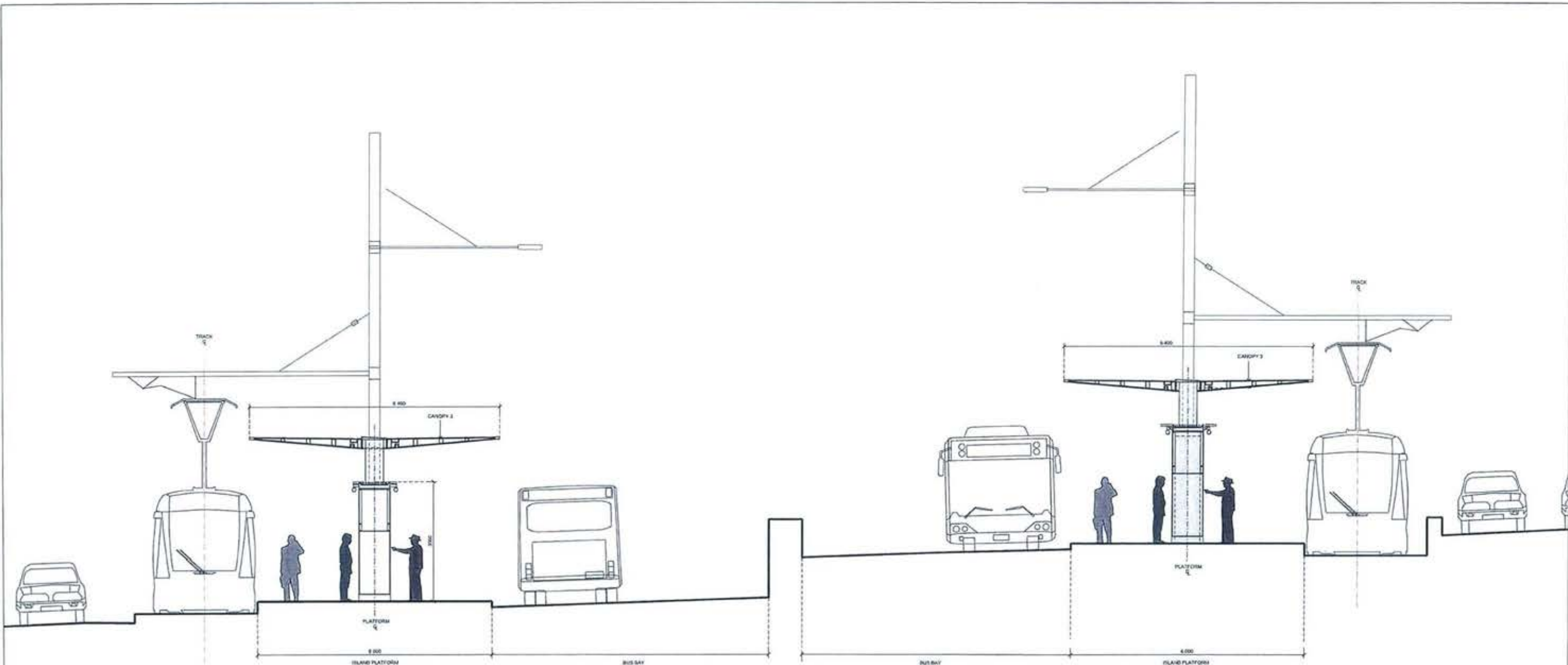
1 KINGSFORD STOP ELEVATION
1:100



2 KINGSFORD STOP PLAN
1:100

CONCEPT DESIGN

						DO NOT SCALE		Drawn: L.JARVIS Drafting Check: K.JURKIEWICZ Approved: A.CORTESE Date: 04/07/2014 Scale: 1:100 @ A1	Designer: K.JURKIEWICZ Design Check: A.K.THOMPSON	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO SANDWICK KINGSFORD STOP ELEVATIONS - SHEET 1 PROJECT WIDE	Original Size: A1 Drawing No: SLR-CSY-DWG-AR-0751 Rev: A
No. Revision Date		Drawn Date		Job Manager Date		Client		This Drawing must not be used for Construction unless signed as Approved		Original Size: A1	



1 KINGSFORD STOP CROSS SECTION
1:100

CONCEPT DESIGN

No.	Revision	Note: *Indicates alterations on original issue of drawing or last revision of drawing	Drawn	Job Manager	Date
1		ISSUED FOR CONCEPT DESIGN	LJ	MT	04/07/2014

Client



Transport for NSW

DO NOT SCALE

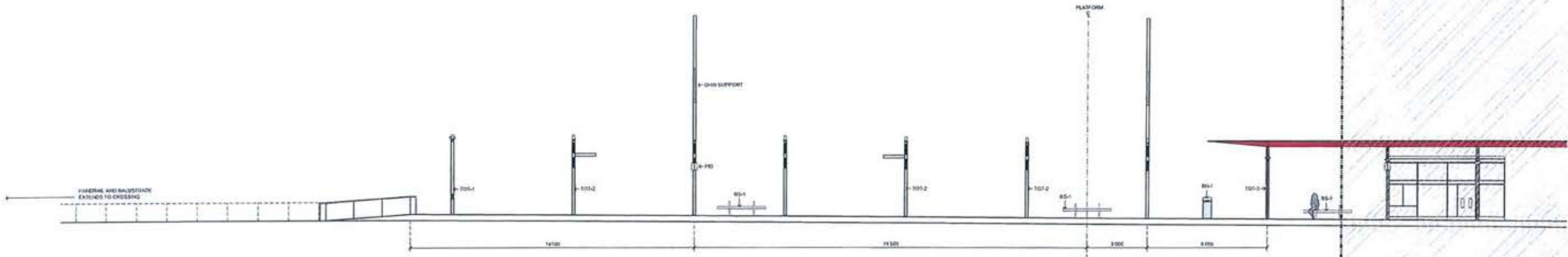


Drawn	L.JARVIS	Designer	K.JURKIEWICZ
Drafting Check	K.JURKIEWICZ	Design Check	A.K.THOMPSON
Approved	A.CORRIE		
Date	04/07/2014		
Scale	1:50 @ A1		

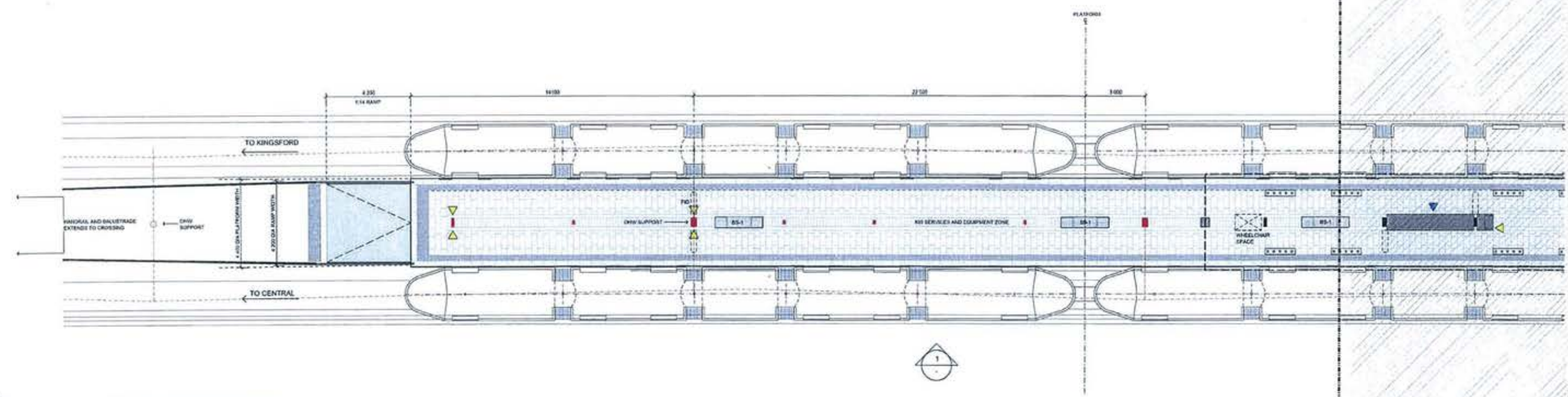
SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANWICK
KINGSFORD STOP
CROSS SECTION
ROUTE M

Original Size
A1 Drawing No: SLR-CSY-DWG-AR-0755 Rev: A

FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0851



1 ISLAND PLATFORM PART ELEVATION
1/100



2 TOOMAN AVENUE PART PLAN
1/100

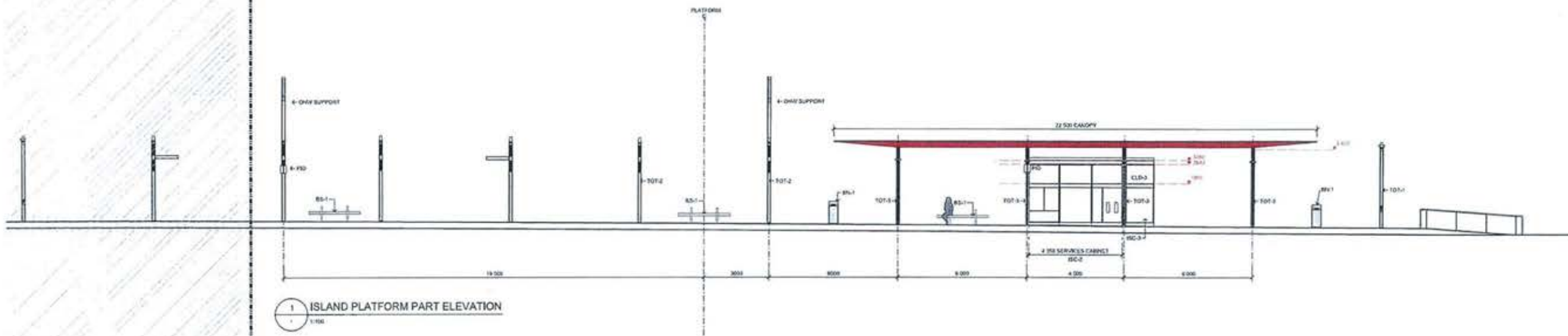


	FLR
	HELP POINT
	DHW

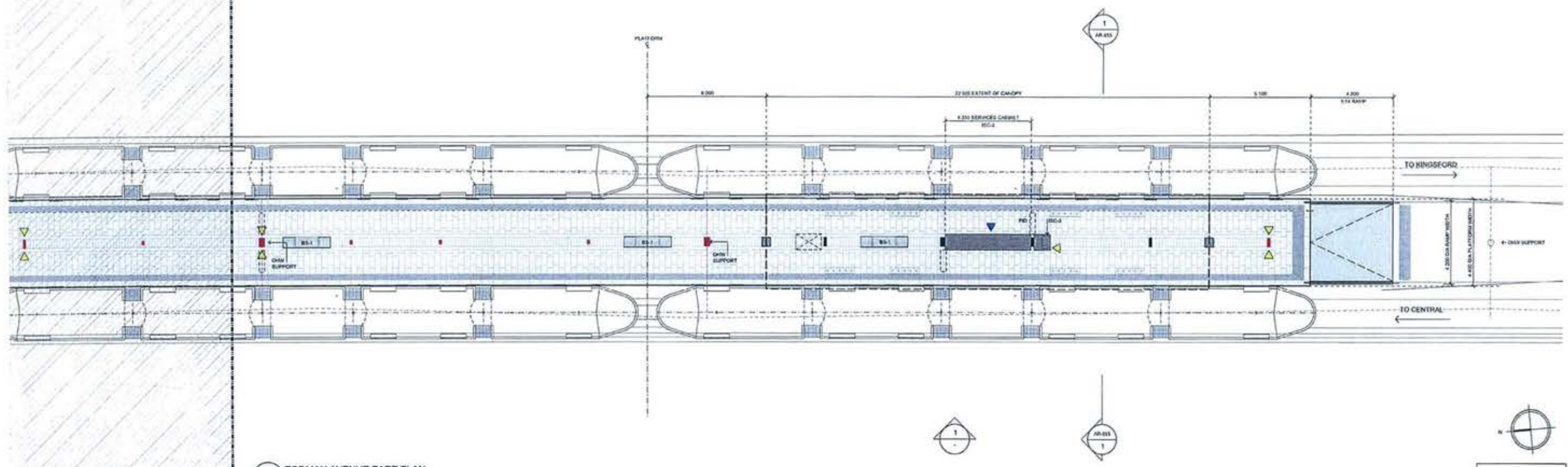
CONCEPT DESIGN

			DO NOT SCALE Drawn: L.JARVIS Designer: K.JARKEWICZ Drafting Check: K.JARKEWICZ Design Check: A.K.THOMPSON Approved: A.CORRESE Date: 04/05/2014 Scale: 1:100 @ A1	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK TOOMAN AVENUE STOP PART PLAN AND ELEVATIONS ROUTE M Drawing No: SLR-CSY-DWG-AR-0850 Rev: A
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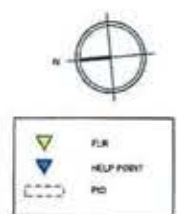
FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0850



1 ISLAND PLATFORM PART ELEVATION
1:100



2 TODMAN AVENUE PART PLAN
1:100



CONCEPT DESIGN

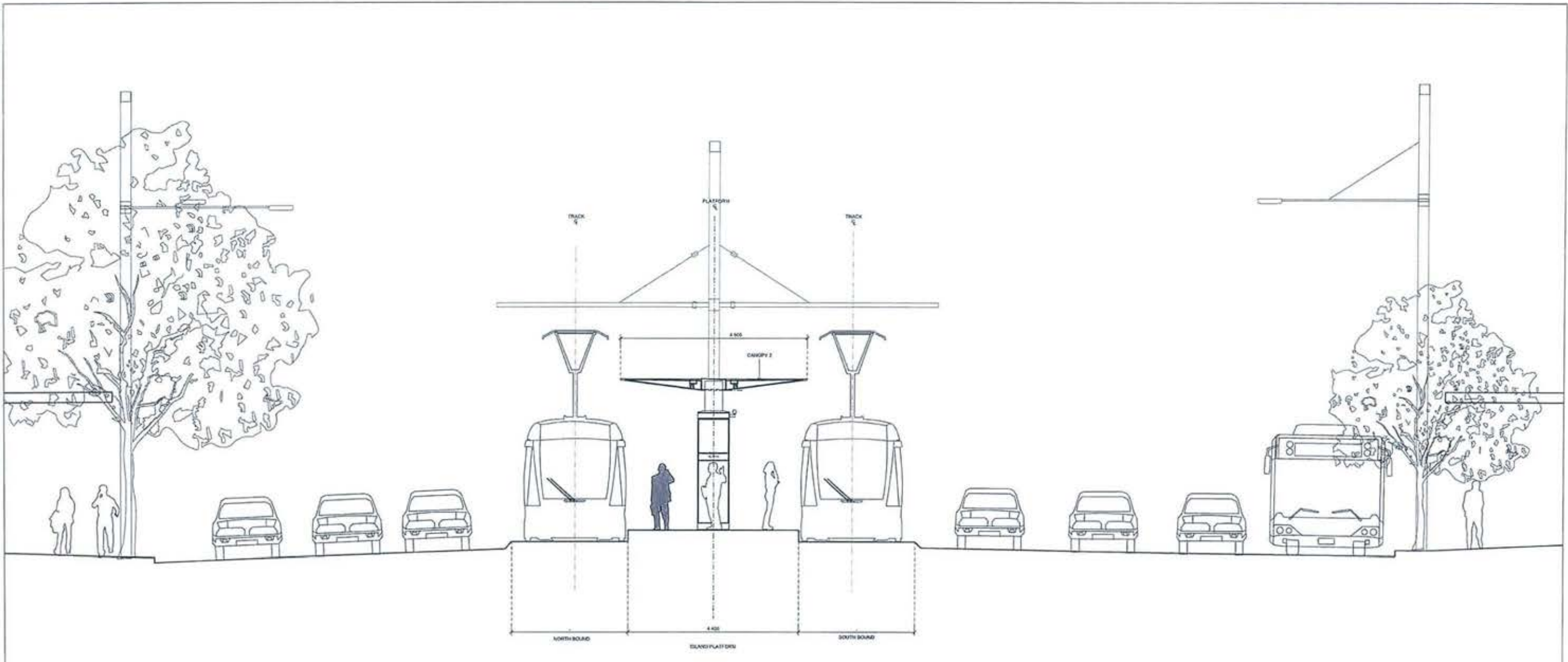
No.	Revision	Date	Drawn	Checked	Date
1	AS PER CONCEPT DESIGN	04/07/2014	MT	MT	04/07/2014



DO NOT SCALE
CONNECTING SYDNEY

Drawn	L.JARVIS	Designer	K.JURKIEWICZ
Drafting Check	K.JURKIEWICZ	Design Check	A.X.THOMPSON
Approved	A.CORRISE	Date	04/07/2014
Scale	1:100 @ A1	This Drawing must not be used for construction unless signed as Approved	

SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
TODMAN AVENUE STOP
PART PLAN AND ELEVATIONS - SHEET 2
ROUTE M
Original Size
A1 Drawing No: SLR-CSY-DWG-AR-0851 Rev: A

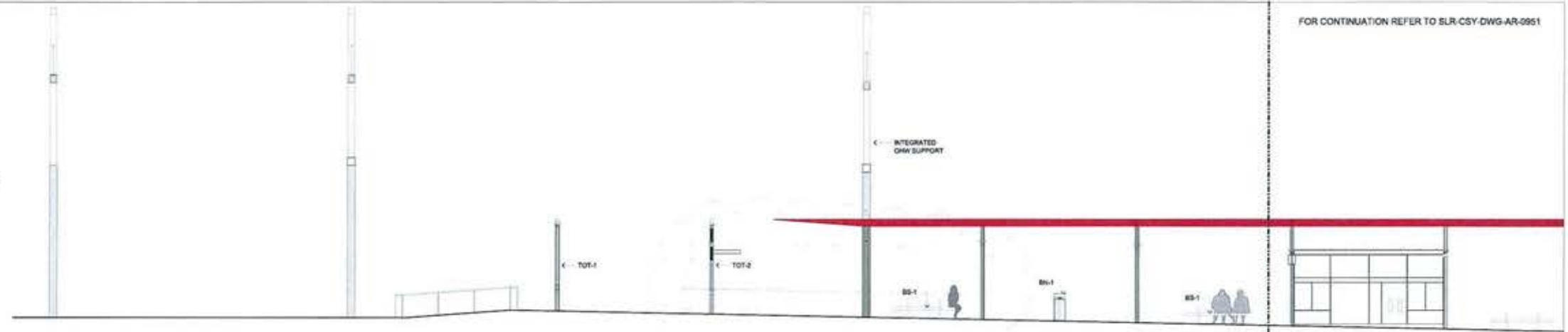


1 TODMAN AVENUE STOP CROSS SECTION
1:50

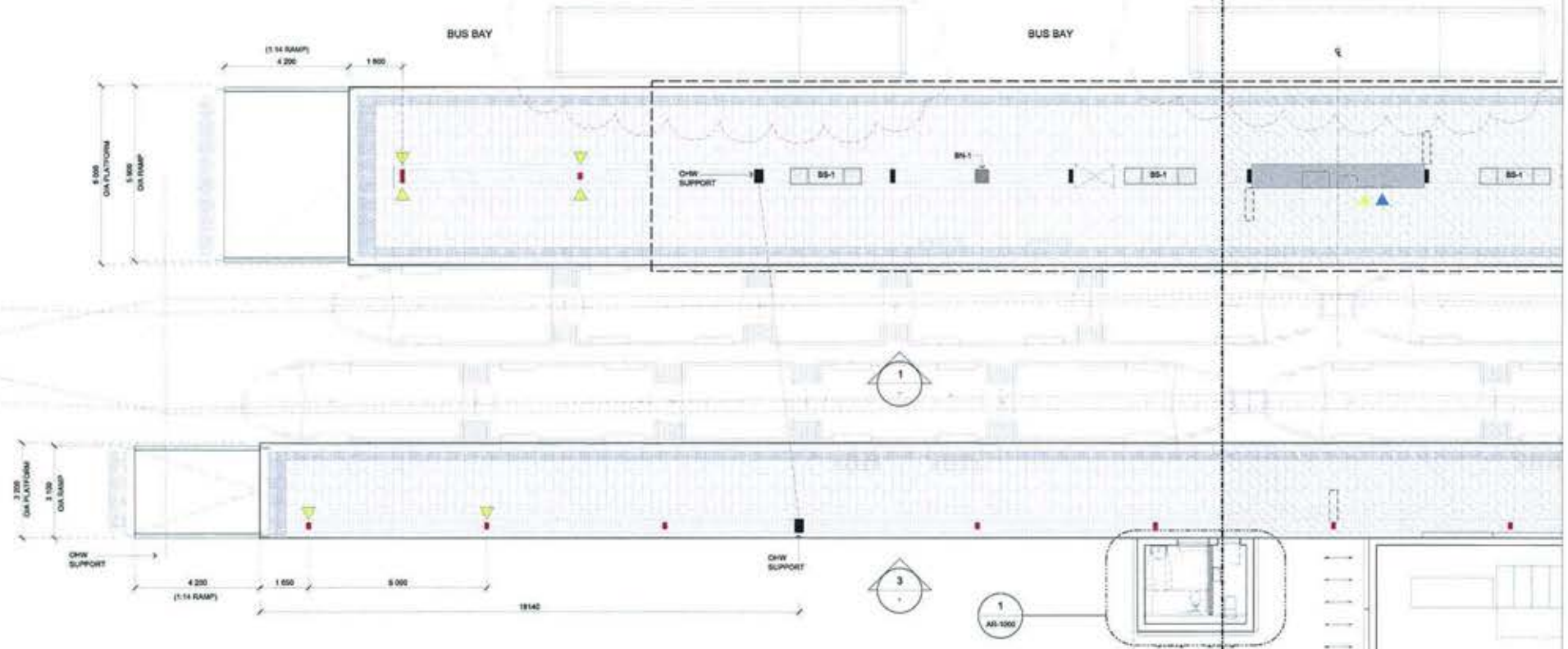
CONCEPT DESIGN

										Drawn: K.JURKEWICZ Designer: K.JURKEWICZ Drafting Check: K.JURKEWICZ Design Check: A.K.THOMPSON Approved: A.CORTESE Date: 04/07/2014 Scale: 1:50 @ A1		SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK TODMAN AVENUE STOP CROSS SECTION ROUTE M	
No. Revision Note: * Indicates signatures on original issue of drawing or last revision of drawing		Drawn:	Job Manager:	Date:	This Drawing must not be used for Construction unless signed as Approved		Original Size: A1		Drawing No: SLR-CSY-DWG-AR-0855		Rev: A		

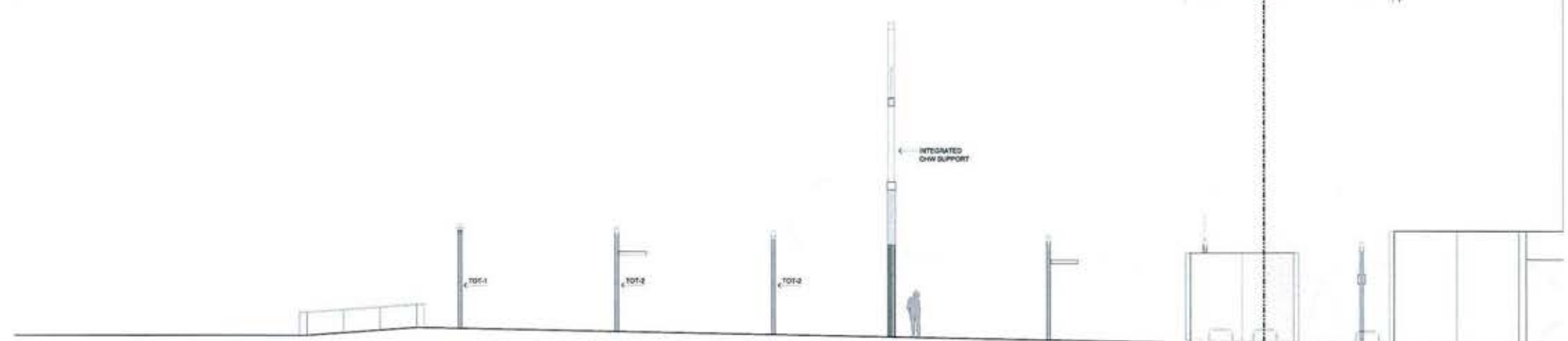
1 ISLAND PLATFORM ELEVATION
1:100



2 RANDWICK PART PLAN
850 1:100



3 RANDWICK PART ELEVATION
850 1:100



KEY

- FLR
- HELP POINT
- PD (PLAN)
- ACCESSIBLE DOOR

CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
B	ISSUED FOR CONSOLIDATED CLARIFICATION		LJ	AKT	03/09/2014
A	ISSUED FOR CONCEPT DESIGN		LJ	AKT	04/07/2014

Client

Transport for NSW

DO NOT SCALE

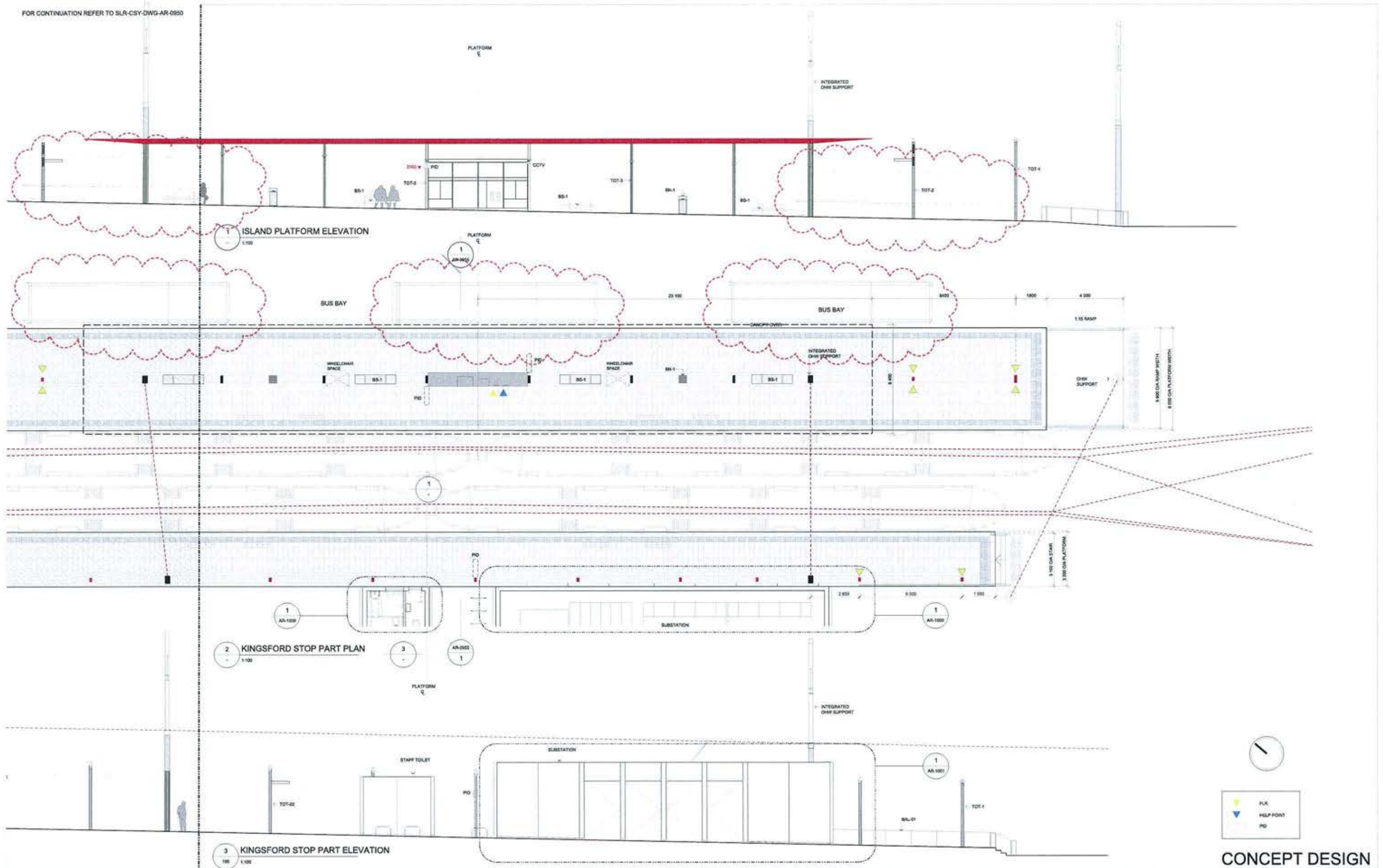
CONNECTING SYDNEY

Drawn	L.JARVIS	Designer	K.JURKIEWICZ
Drafting Check	K.JURKIEWICZ	Design Check	A.K.THOMPSON
Approved	A.CORTESE		
Date	04/07/2014		
Scale	1:100 @ A1		

SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
RANDWICK STOP
PART PLAN AND ELEVATIONS - SHEET 1
ROUTE 02

Original Size A1 Drawing No: SLR-CSY-DWG-AR-0950 Rev: B

FOR CONTINUATION REFER TO SLR-CSY-DWG-AR-0950



CONCEPT DESIGN

ISSUED FOR CONSOLIDATED CLARIFICATION	LJ	AKT	03/09/2014
ISSUED FOR CONCEPT DESIGN	LJ	AKT	04/07/2014
No. Revision	Note	Drawn	Date
		Job Manager	

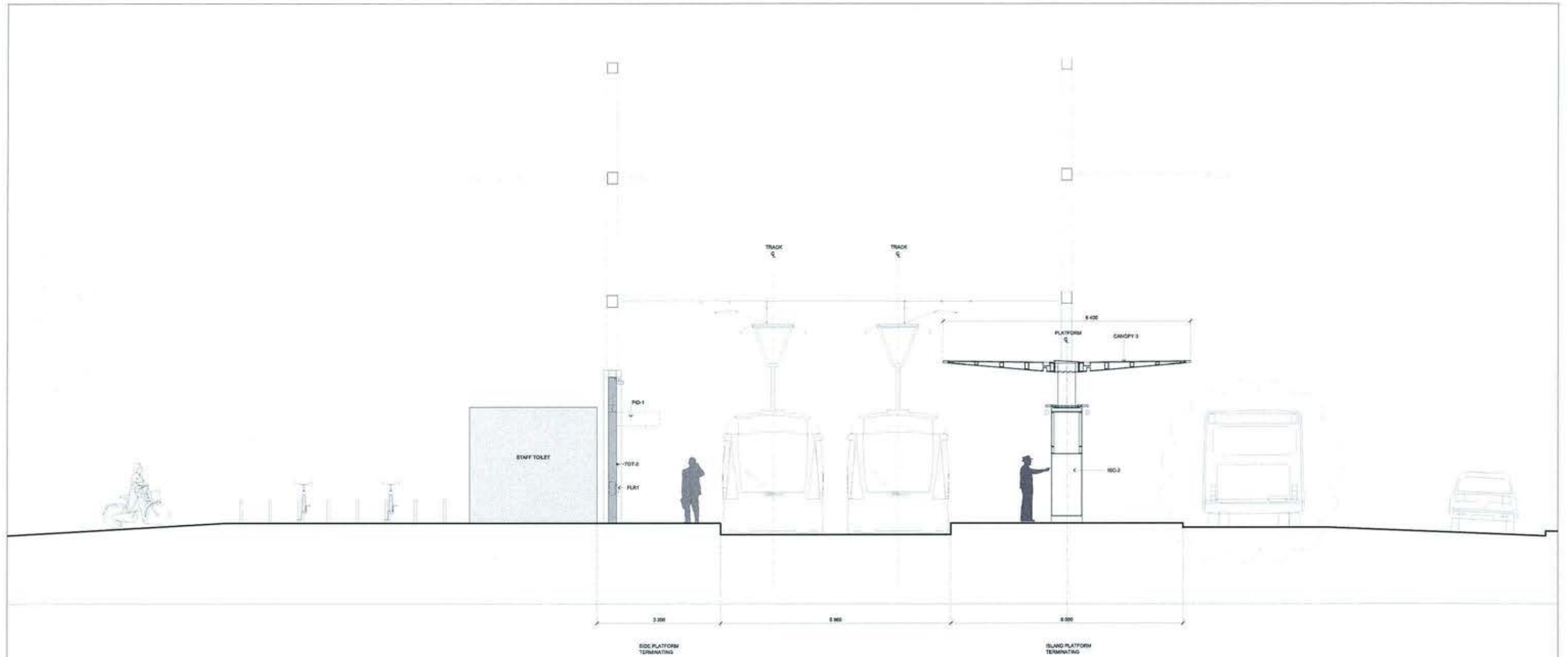


DO NOT SCALE

Drawn	L.JARVIS	Designer	K.JURKIEWICZ
Drafting Check	K.JURKIEWICZ	Design Check	A.K.THOMPSON
Approved	A.CORTESE		
Date	04/07/2014		
Scale	1:100 @ A1		

SYDNEY LIGHT RAIL EASTERN EXTENSION
 CIRCULAR QUAY TO RANDWICK
RANDWICK STOP
 PART PLAN AND ELEVATIONS - SHEET 2
 ROUTE 02

Original Size: **A1**
 Drawing No: **SLR-CSY-DWG-AR-0951** Rev: **B**



1 RANDWICK STOP CROSS SECTION
1:50

CONCEPT DESIGN

No.	Revision	Note	Drawn	Manager	Date
B	ISSUED FOR CONSOLIDATED CLARIFICATION		LJ	AKT	03/06/2014
A	ISSUED FOR CONCEPT DESIGN		LJ	AKT	04/07/2014

Client



Transport for NSW

DO NOT SCALE



Drawn: L.JARVIS
Designer: K.JURKIEWICZ
Drafting Check: K.JURKIEWICZ
Design Check: A.K.THOMPSON
Approved: A.CORTESE
Date: 04/07/2014
Scale: 1:50 @ A1

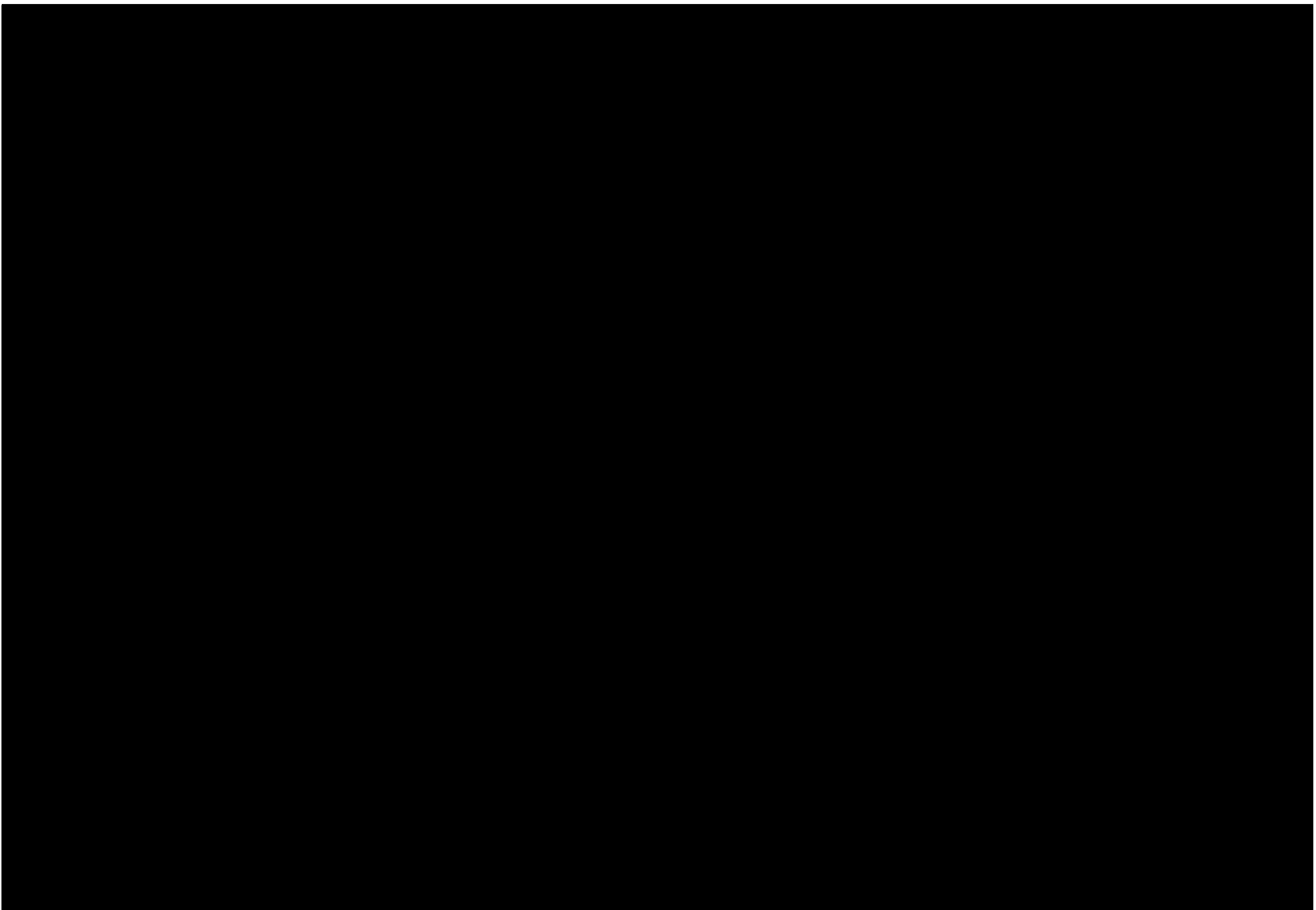
SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
RANDWICK STOP
CROSS SECTION
ROUTE 02

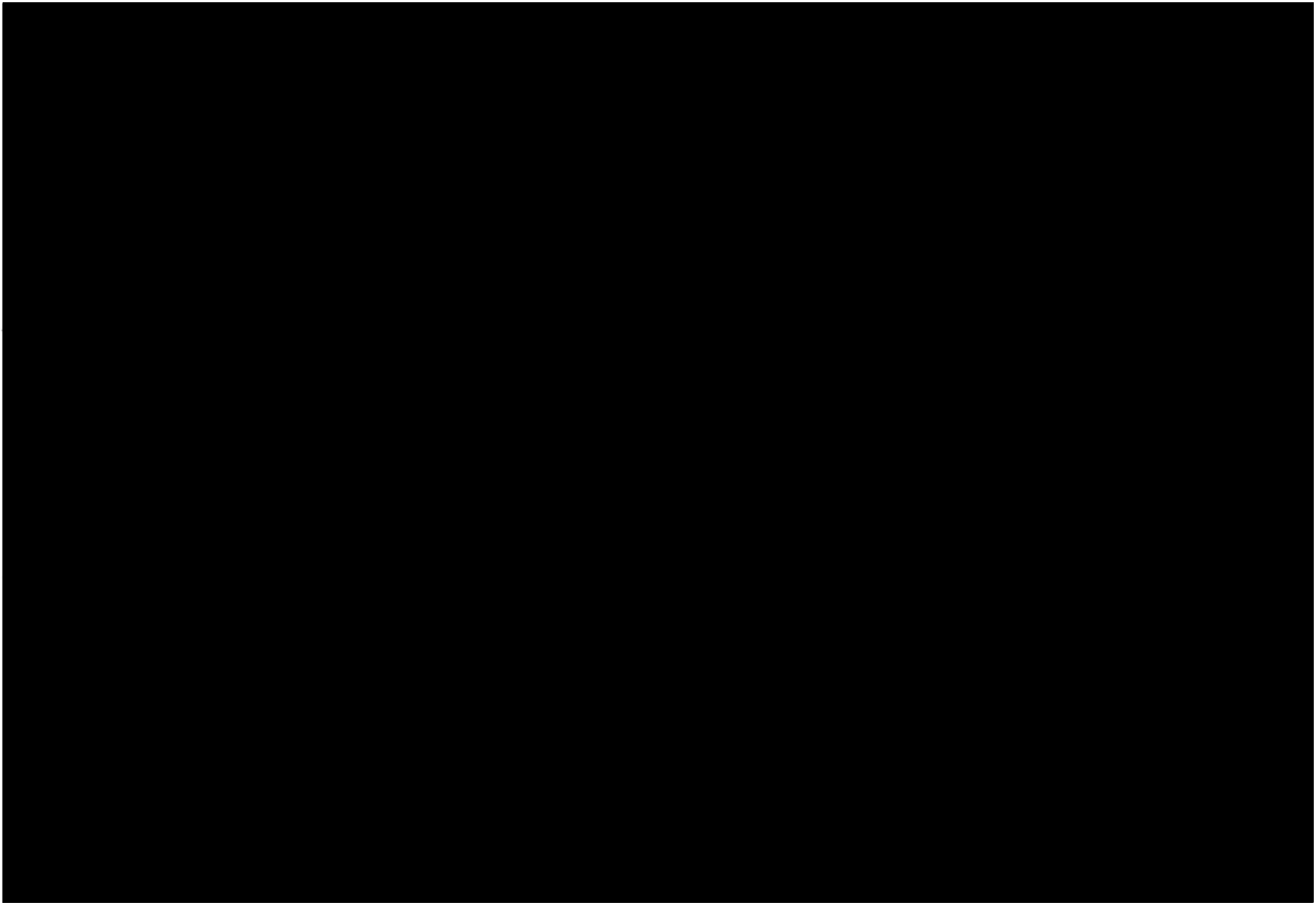
This Drawing must not be used for Construction unless signed as Approved

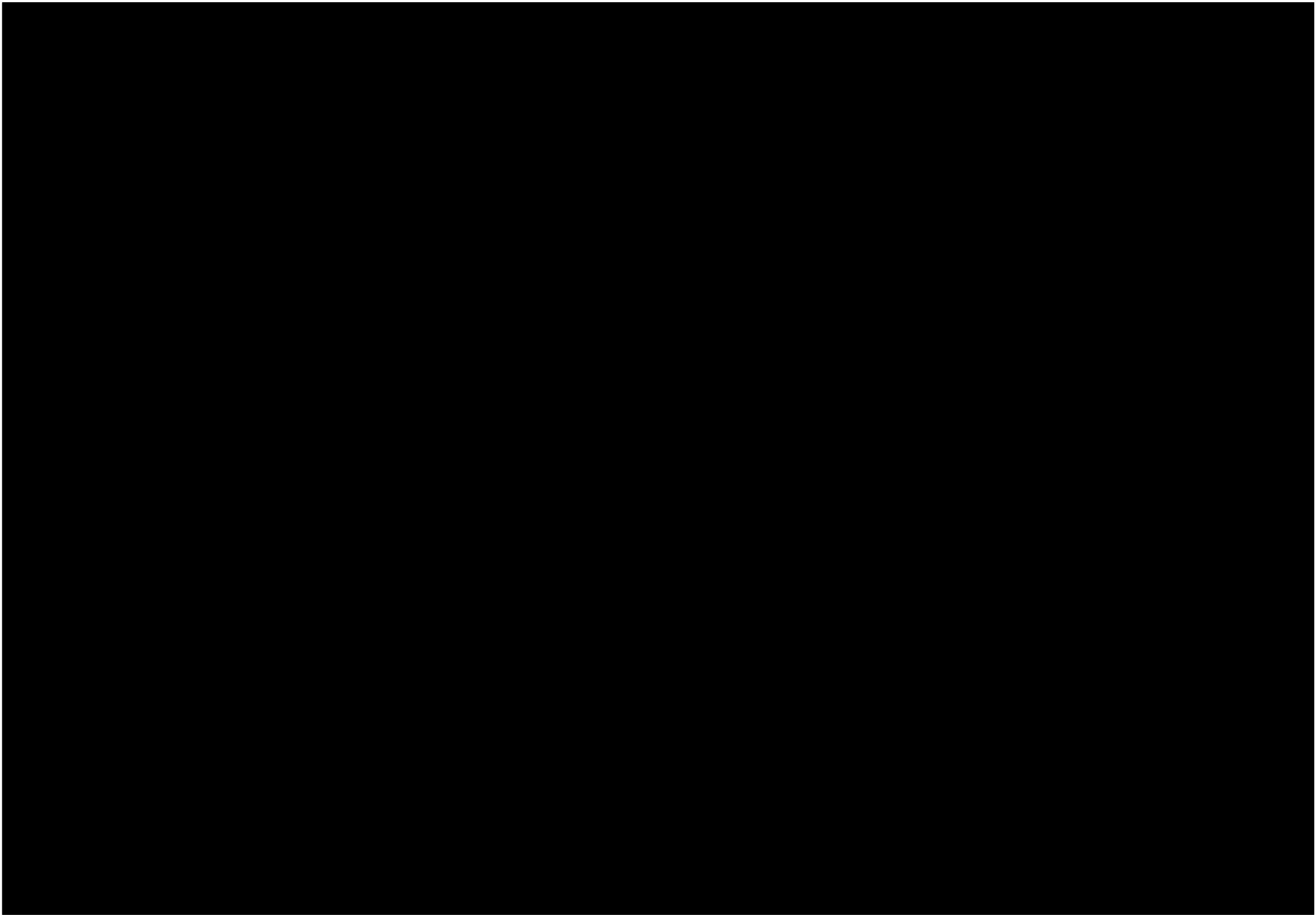
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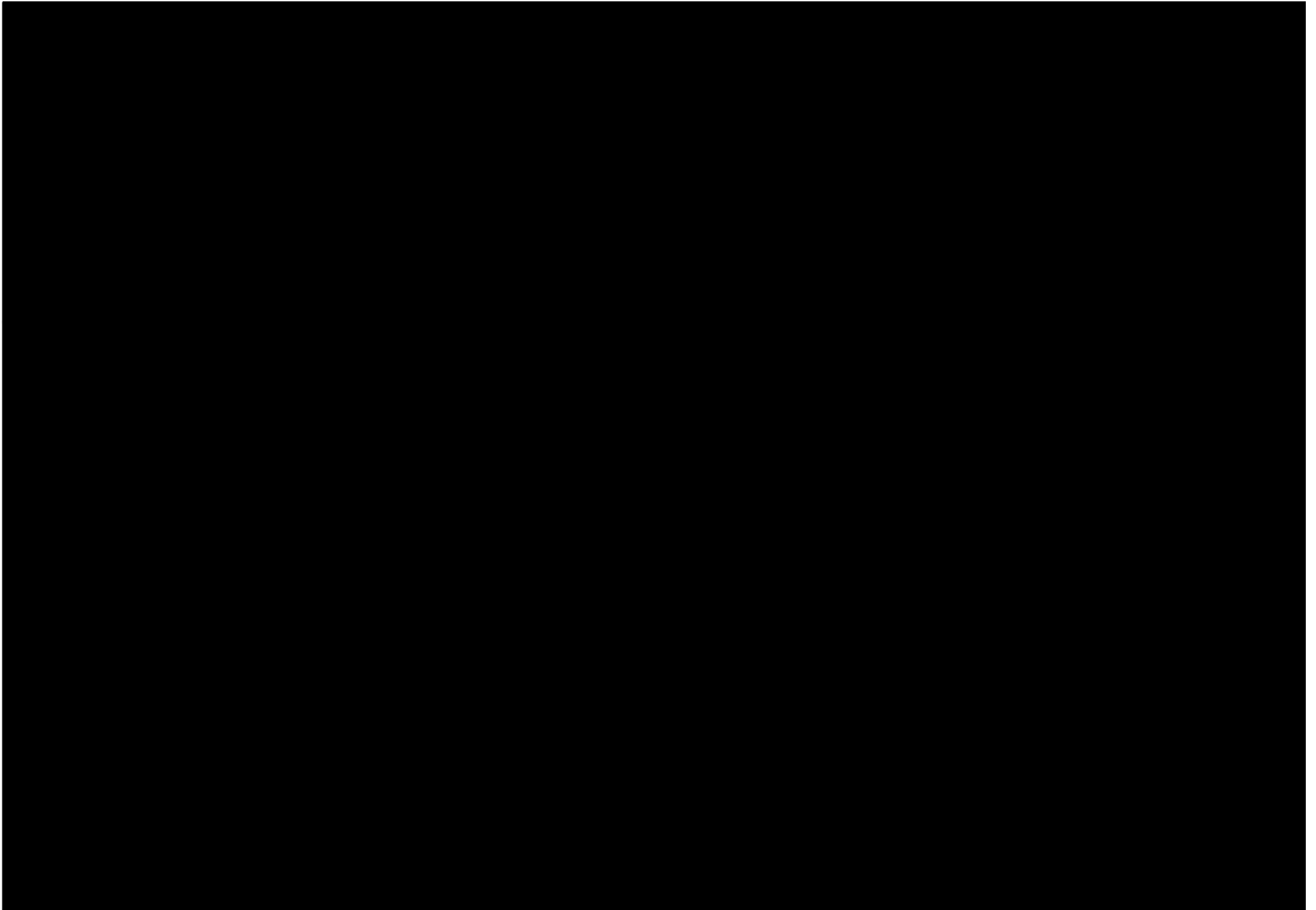
ATTACHMENT 7 – Modular Canopies - Typical Platform Canopy Sections

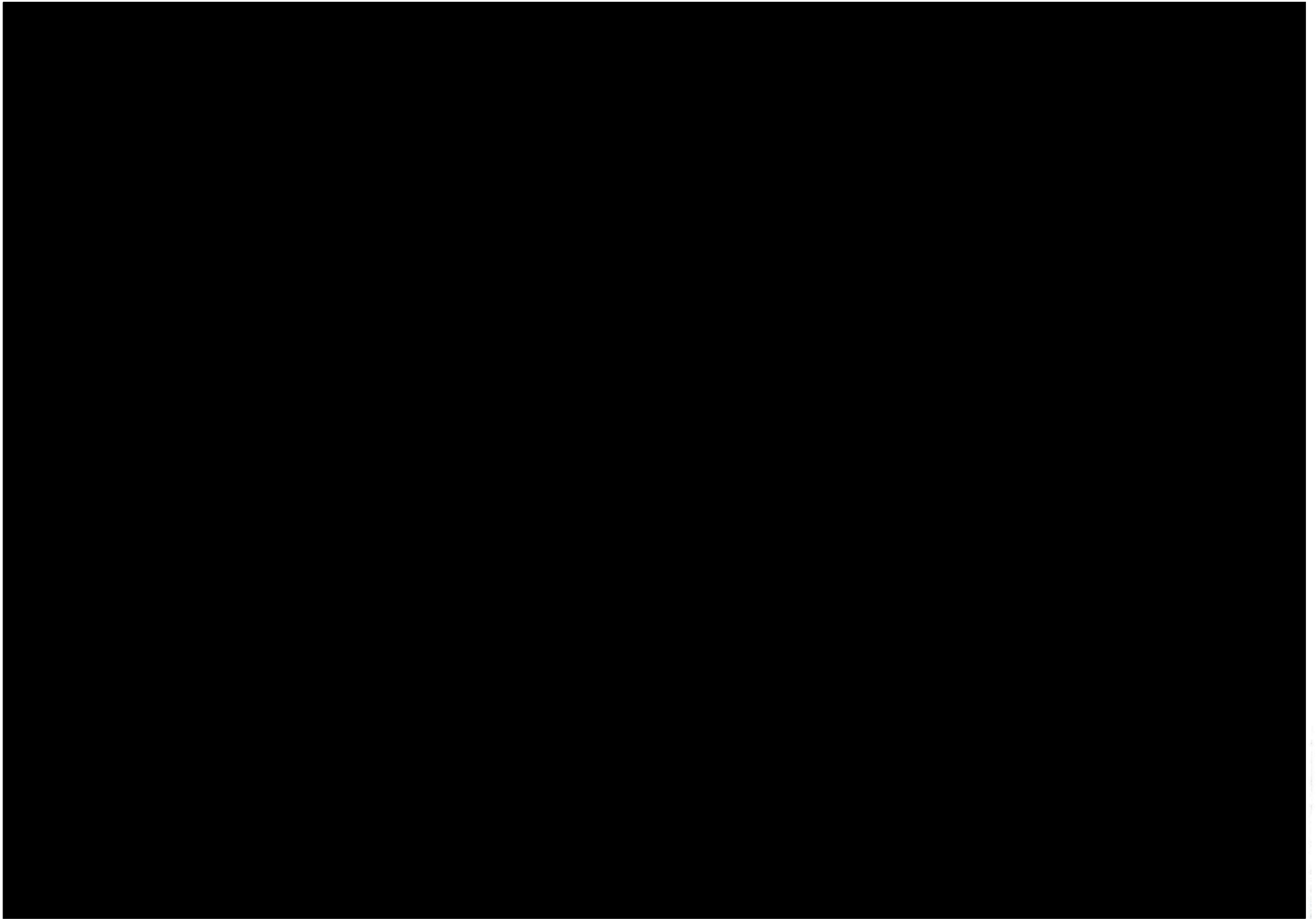
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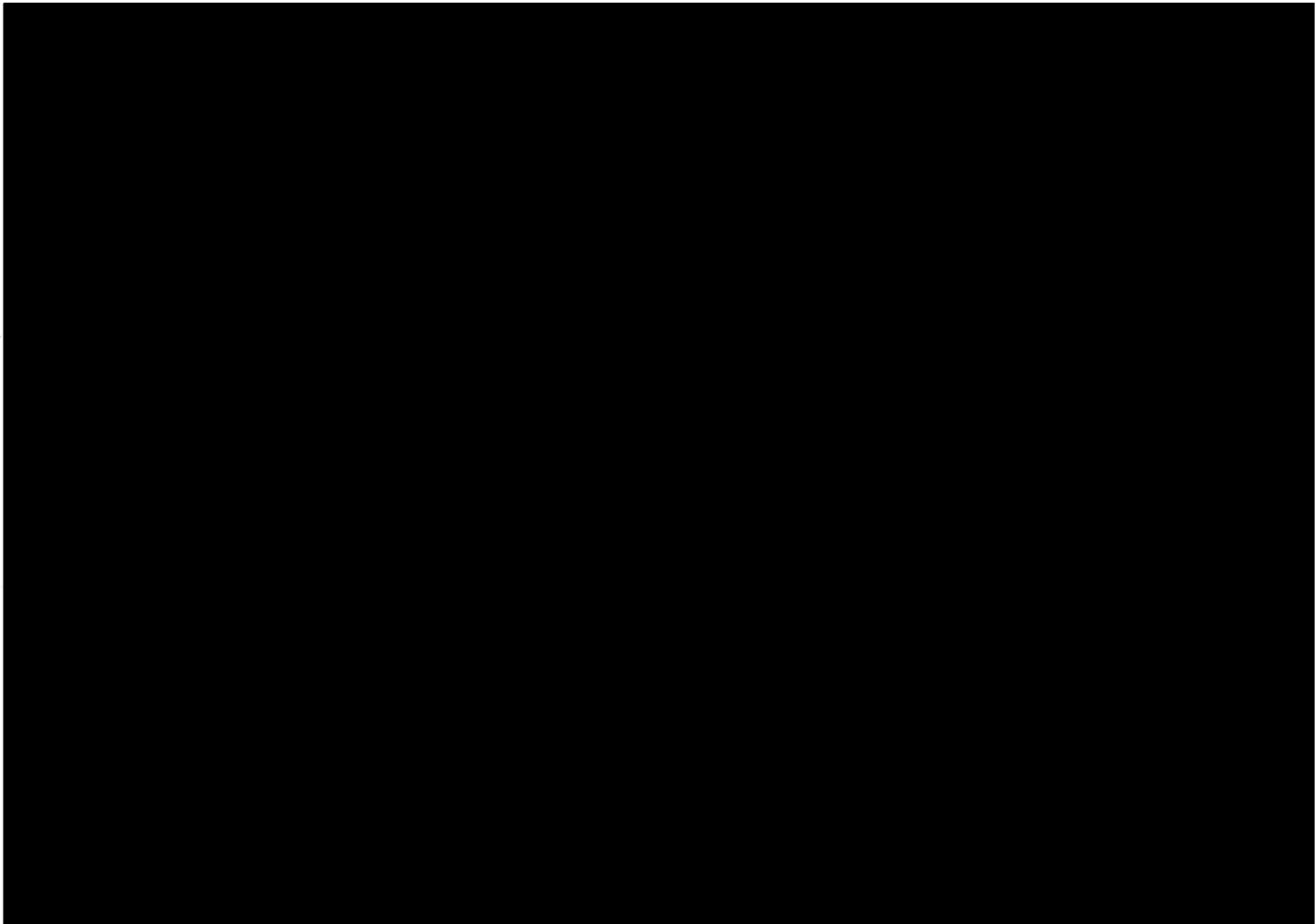


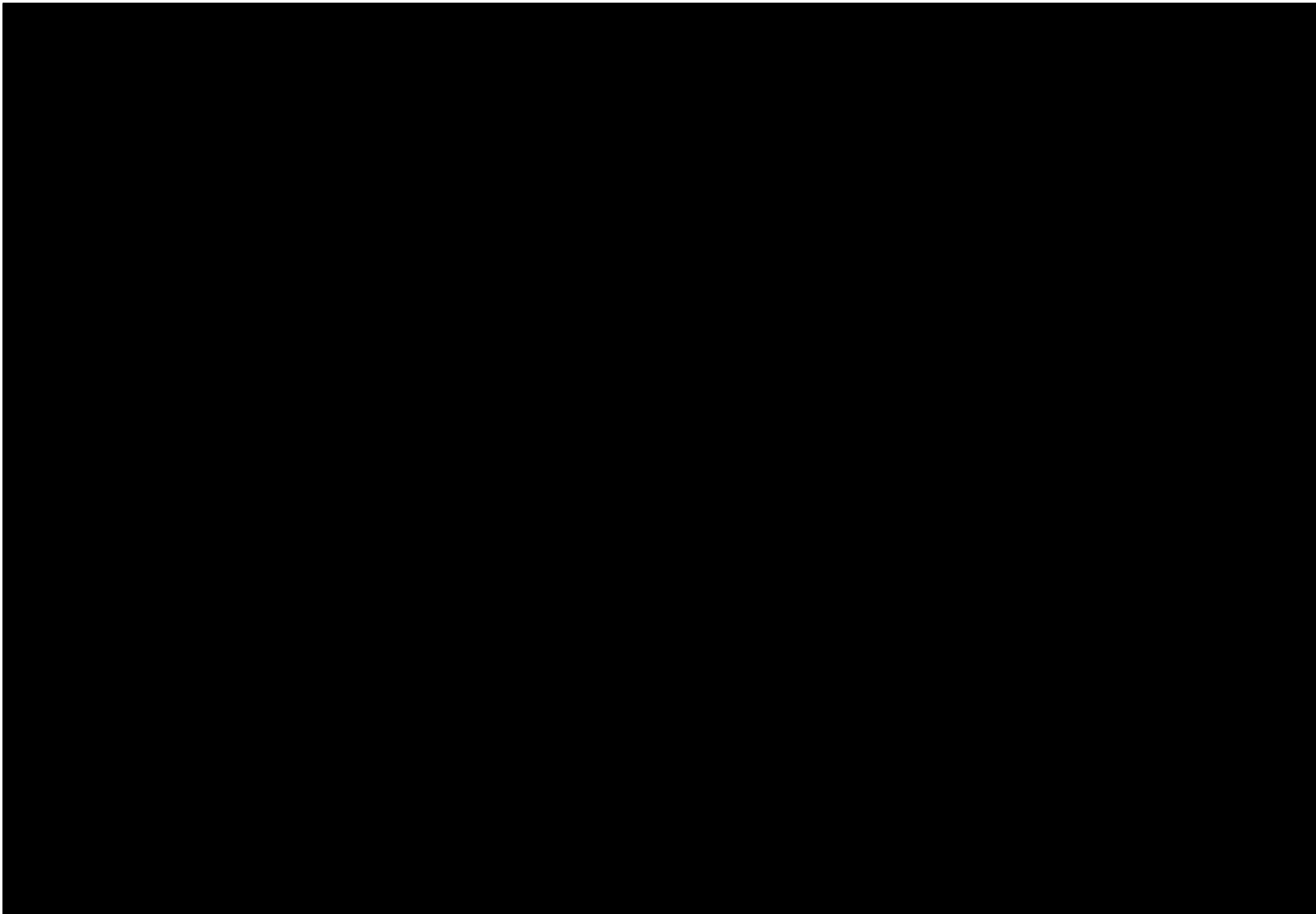


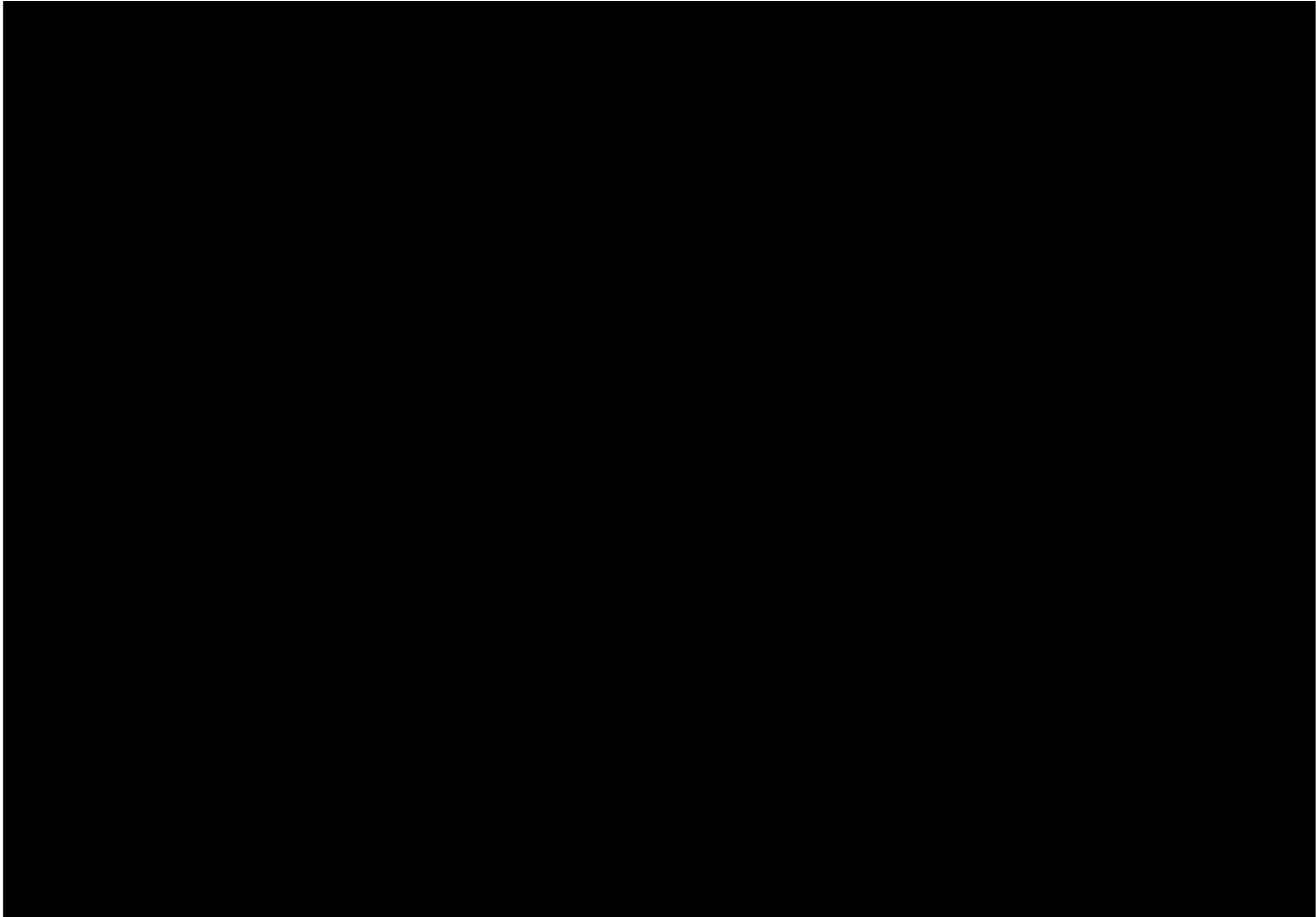






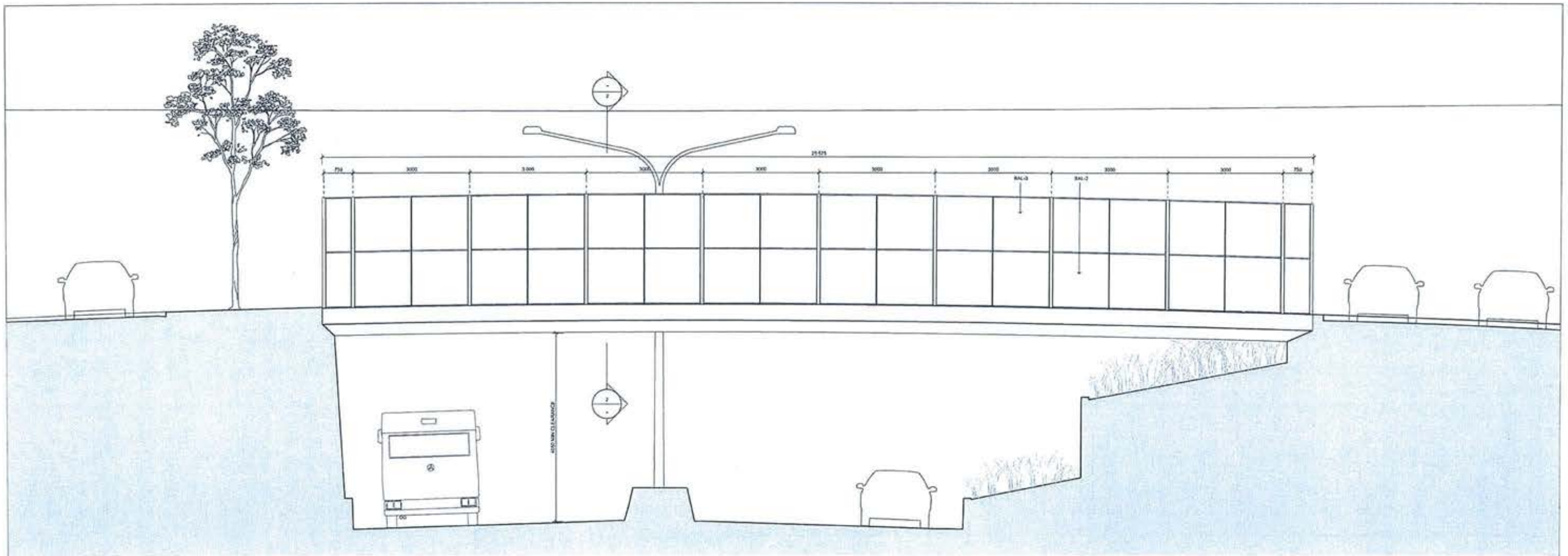




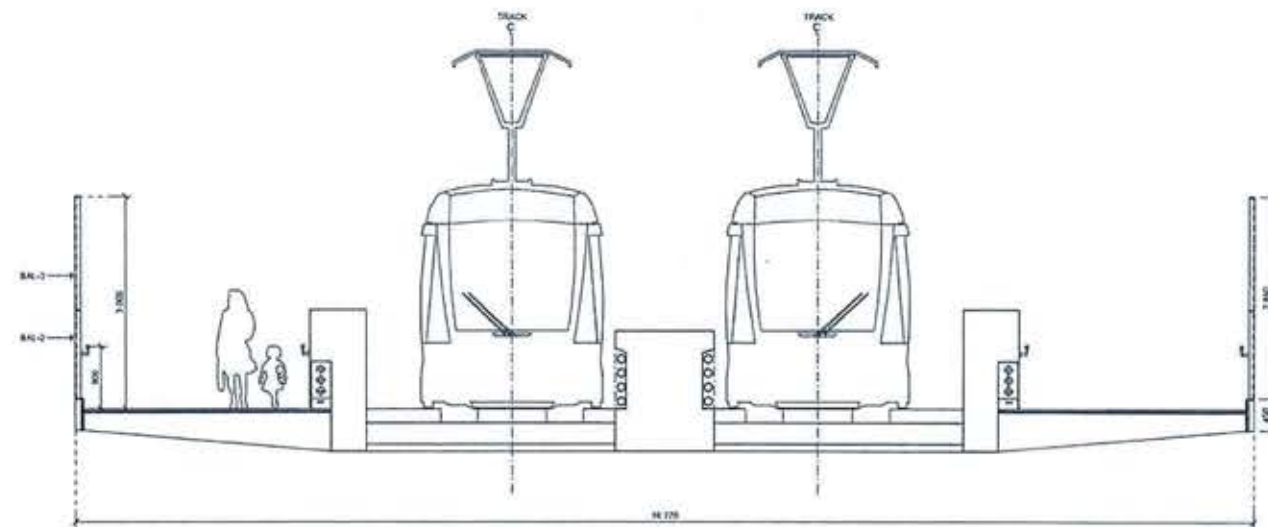


ATTACHMENT 8 – Bridge Over Eastern Distributor and Moore Park Tunnel

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1 EASTERN DISTRUBUTOR BRIDGE ELEVATION
SCALE 1:1500A1



2 EASTERN DISTRUBUTOR BRIDGE SECTION
SCALE 1:1500A1

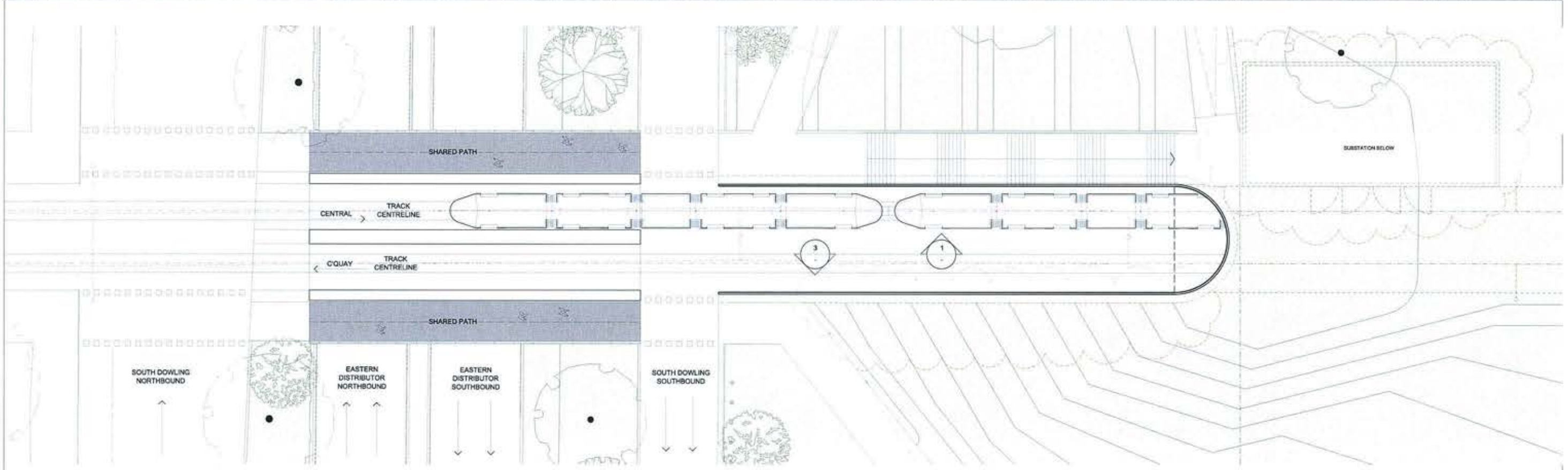
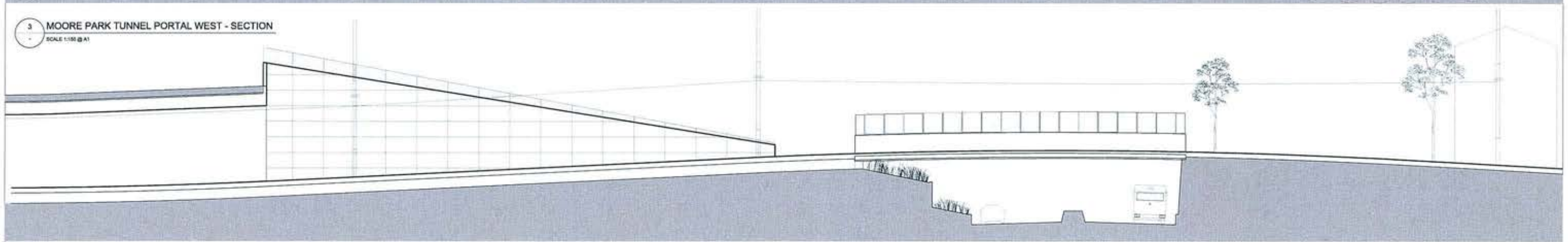
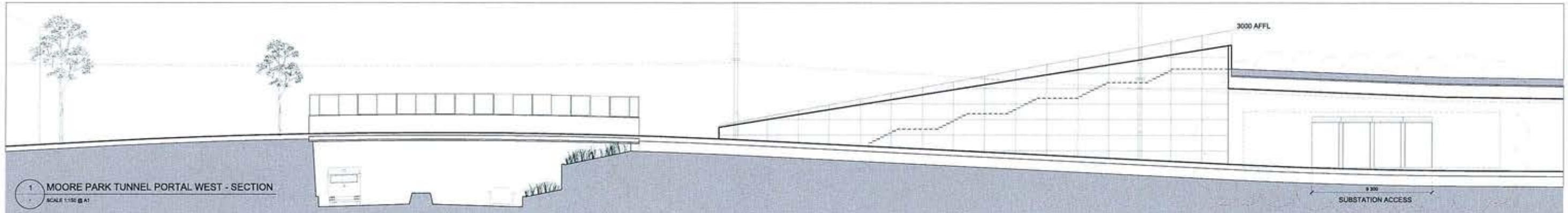
CONCEPT DESIGN

No	Revision	Note	Drawn	Job Manager	Date
1					



Drawn	A.K. THOMPSON	Designer	K. JURKIEWICZ
Drafting Check	K. JURKIEWICZ	Design Check	A.K. THOMPSON
Approved	A. CORTESE		
Date	04/07/2014		
Scale	1:50		

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANGWICK	
BRIDGE OVER EASTERN DISTRIBUTOR	
ELEVATION & SECTION	
ROUTE 12	
Output Size	A1
Drawing No:	SLR-CSY-DWG-BR-0520
Rev:	A



CONCEPT DESIGN

No	Revision	Note: * indicates signature on original issue of drawing or last revision of drawing	Drawn	Job Manager	Date
B	ISSUED FOR CONSOLIDATED CLARIFICATION		KJ	AKT	03/08/2014
A	ISSUED FOR CONCEPT DESIGN		LJ	AKT	04/07/2014

Client	NSW GOVERNMENT
Designer	K.JURKIEWICZ
Design Check	A.K.THOMPSON
Drafting Check	K.JURKIEWICZ
Approved	A.CORTESE
Date	04/07/2014
Scale	1:150 @ A1

Client

Transport for NSW

DO NOT SCALE

Drawn	L.JARVIS	Designer	K.JURKIEWICZ
Drafting Check	K.JURKIEWICZ	Design Check	A.K.THOMPSON
Approved	A.CORTESE		
Date	04/07/2014		
Scale	1:150 @ A1		

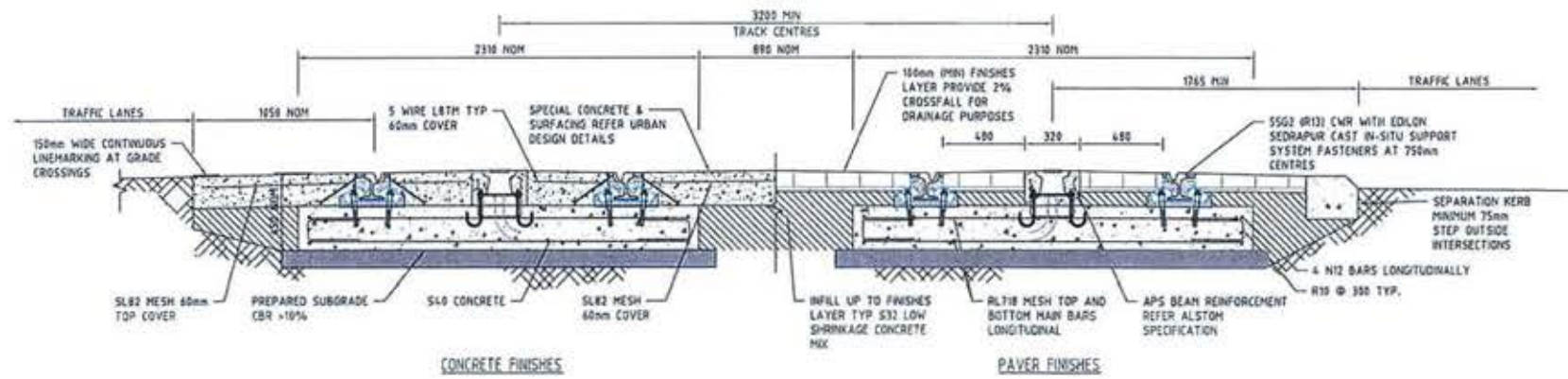
SYDNEY LIGHT RAIL EASTERN EXTENSION
CIRCULAR QUAY TO RANDWICK
MOORE PARK TUNNEL PORTAL - WEST
SECTION AND PLAN
ROUTE I2

Original Size
A1

Drawing No: SLR-CSY-DWG-AR-0530 Rev: B

ATTACHMENT 9 – Track Form Types

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TYPICAL SECTION - APS TRACK REINFORCED
EDILON SEDRAPUR WITH 55G2 RAIL
SCALE 1:20

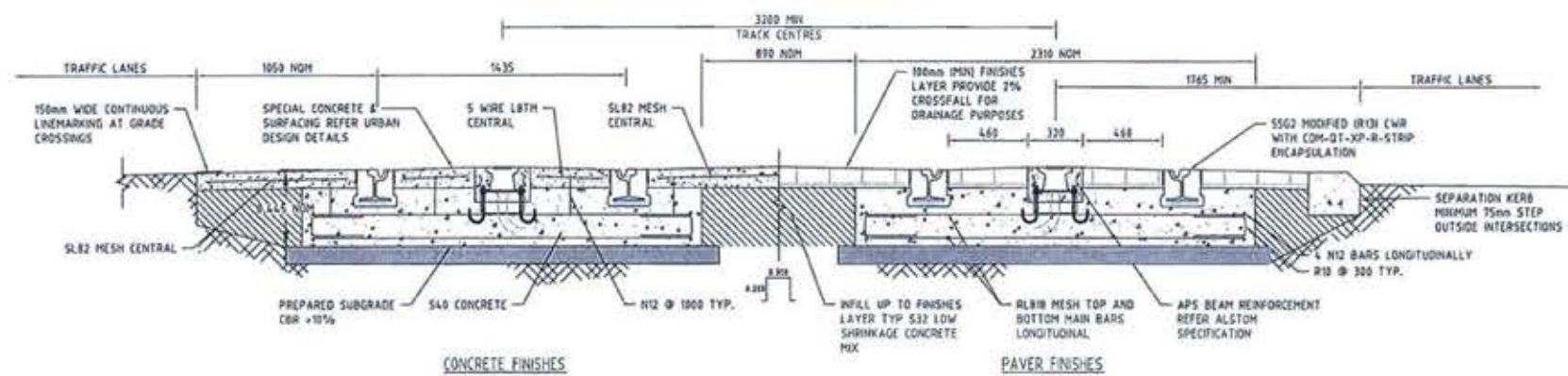
CONCEPT DESIGN

4	SLR/ST/ST/CONCEPT DESIGN	02	LMORTON	04/07/2014	
Rev	Revision	Note: * indicates signatures on original issue of drawing or last revision of drawing	Drawn	JOB Manager	Date



DO NOT SCALE	Drawn	A.BK	Designer	D.TASC
	Drafting Check	O.SMITH	Design Check	G.MORTON
	Approved	A.COLLIS	Date	04/07/2014
	Scale		This Drawing must not be used for Construction unless signed as Approved	

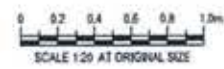
SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK	
TRACK FORM TYPES	
SHEET 1	
Original Size	A1
Drawing No:	SLR-CSY-DWG-ST-0061
Rev:	A



TYPICAL SECTION - APS TRACK REINFORCED
 PANDROL-CDM WITH 55G2 MODIFIED RAIL
 SCALE 1:20

CONCEPT DESIGN

No.	Revision	Note: * indicates signature on original issue of drawing or last revision of drawing	Drawn	JOB Manager	Date
1			AL	S WOOD	04/07/2014



Client



Transport for NSW

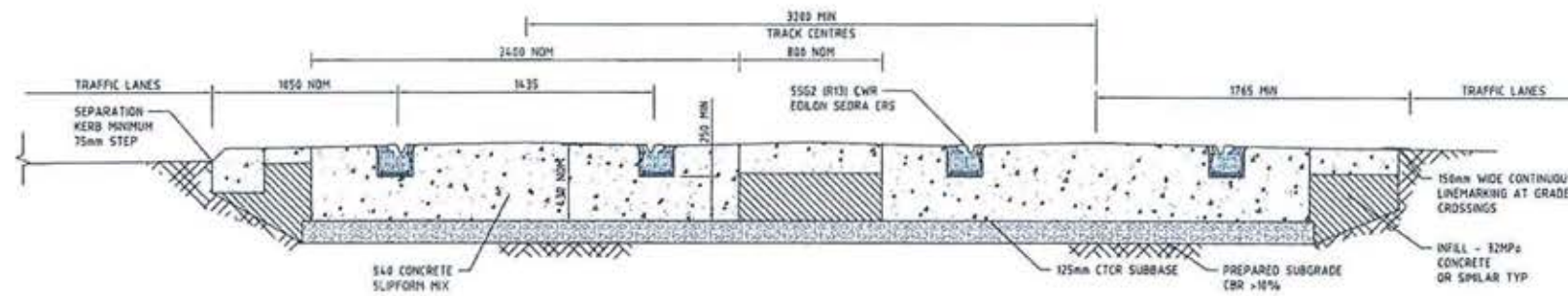
DO NOT SCALE



CONNECTING SYDNEY

Drawn	ALB	Designer	D.TADIC
Drafting Check	D.SMITH	Design Check	G.MORTON
Approved	A.DOLLIS		
Date	04/07/2014		
Scale		This Drawing must not be used for Construction unless signed as Approved	

SYDNEY LIGHT RAIL EASTERN EXTENSION	
CIRCULAR QUAY TO RANDWICK TRACK FORM TYPES SHEET 2	
Sheet Size	A1
Drawing No:	SLR-CSY-DWG-ST-0062
Rev:	A



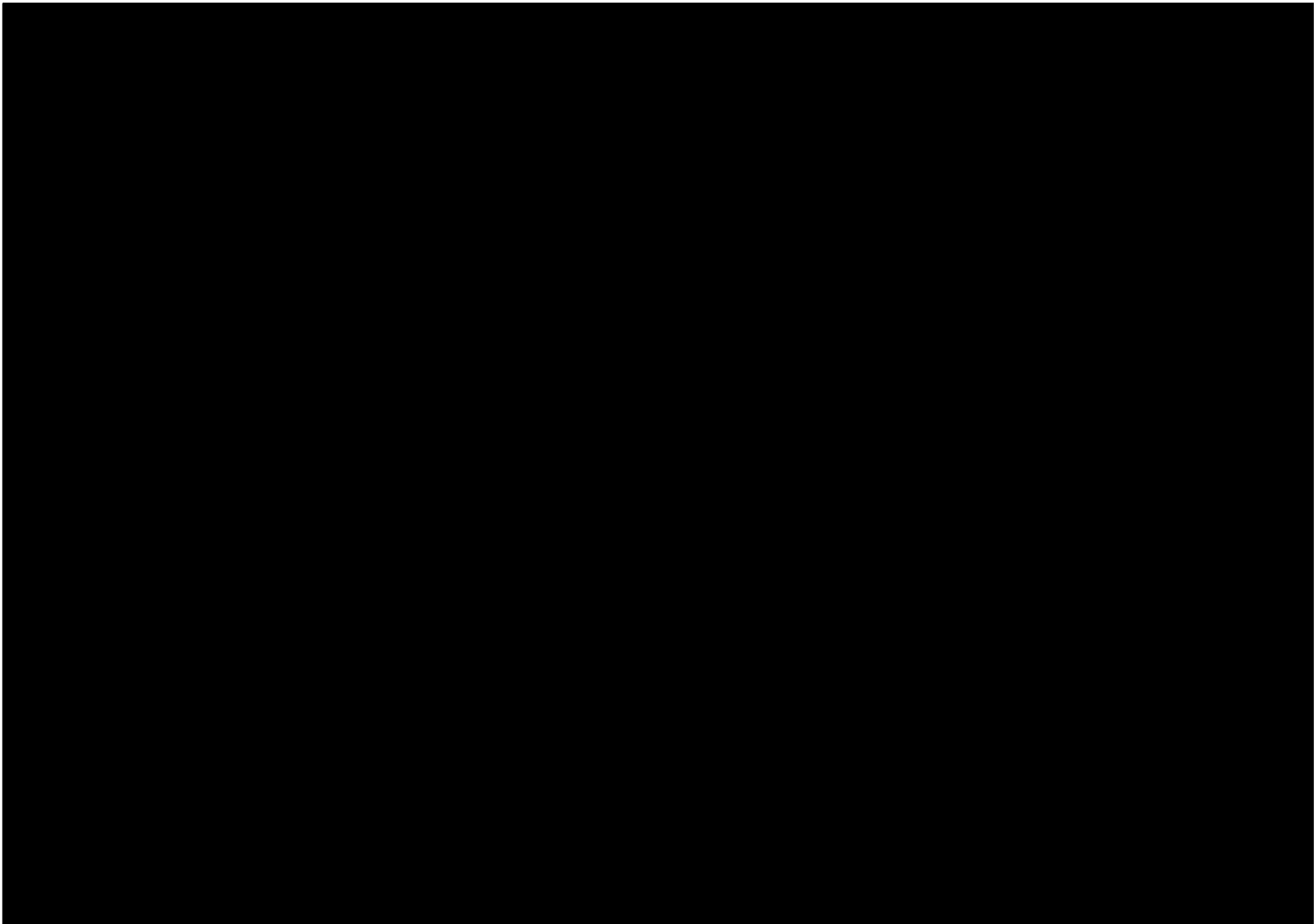
TYPICAL SECTION - EDILON SEDRA ERS
SLIPFORM WITH 55G2 RAIL
SCALE 1:20

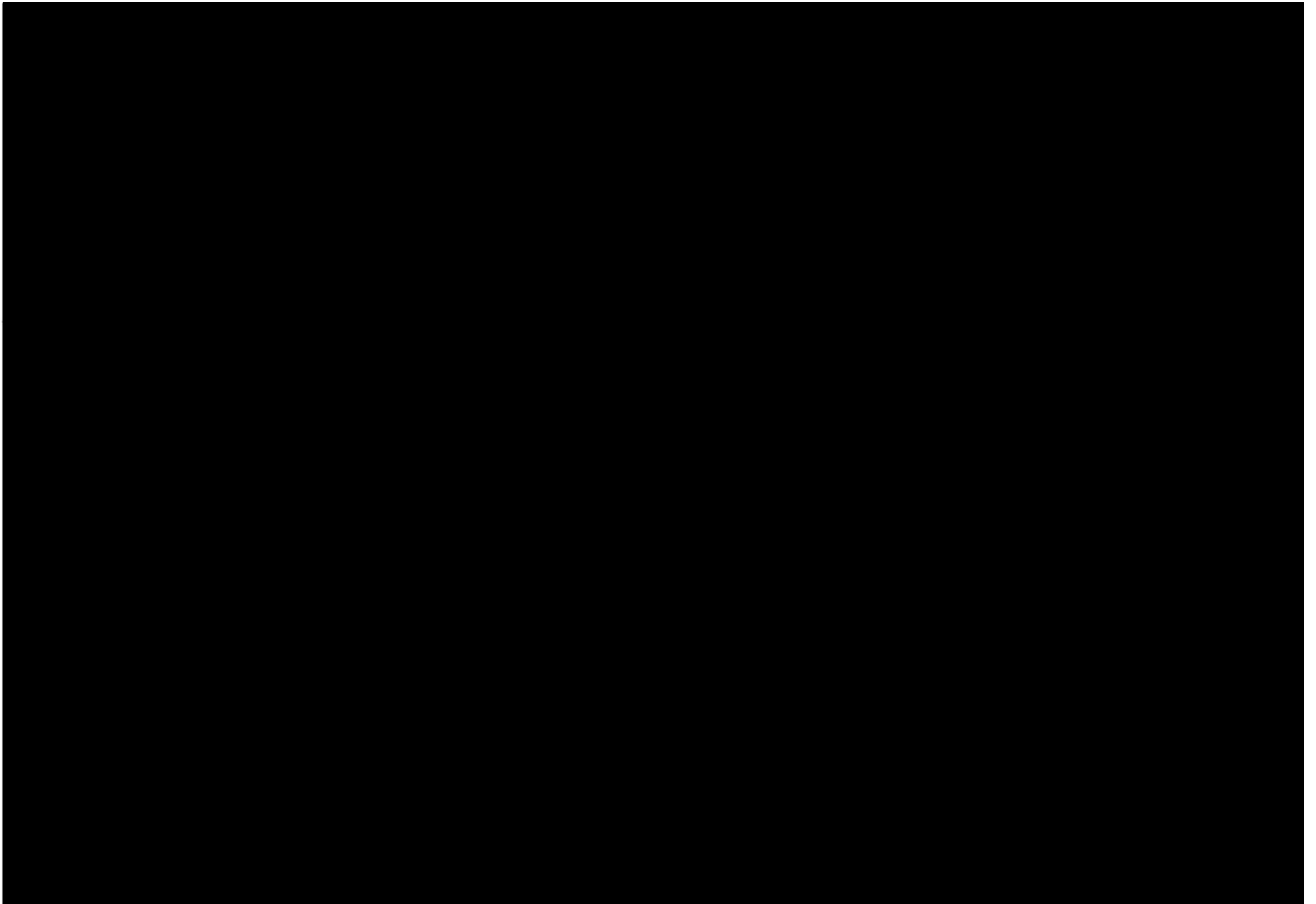
CONCEPT DESIGN

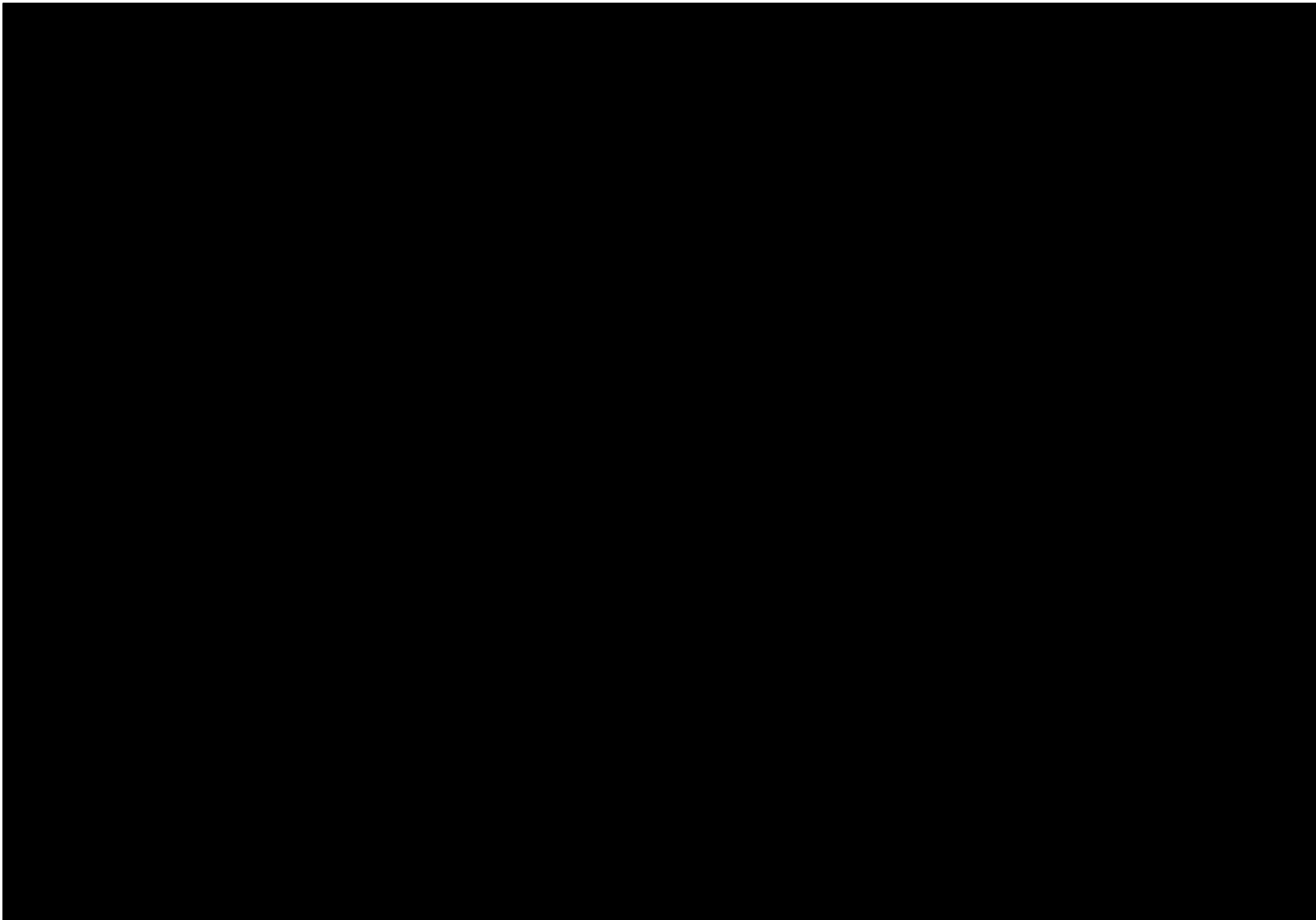
								DO NOT SCALE		Drawn: A.BK Drafting Check: D.SMITH Approved: A.COLLIS Date: 04/07/2014 Scale:	Designer: D.TADG Design Check: G.MORTON	SYDNEY LIGHT RAIL EASTERN EXTENSION CIRCULAR QUAY TO RANDWICK TRACK FORM TYPES SHEET 3	Original Size: A1 Drawing No: SLR-CSY-DWG-ST-0063 Rev: A
Note: * indicates signatures on original issue of drawing or last revision of drawing				Client:		Connecting Sydney		This Drawing must not be used for construction unless signed as Approved		Drawing No: SLR-CSY-DWG-ST-0063			

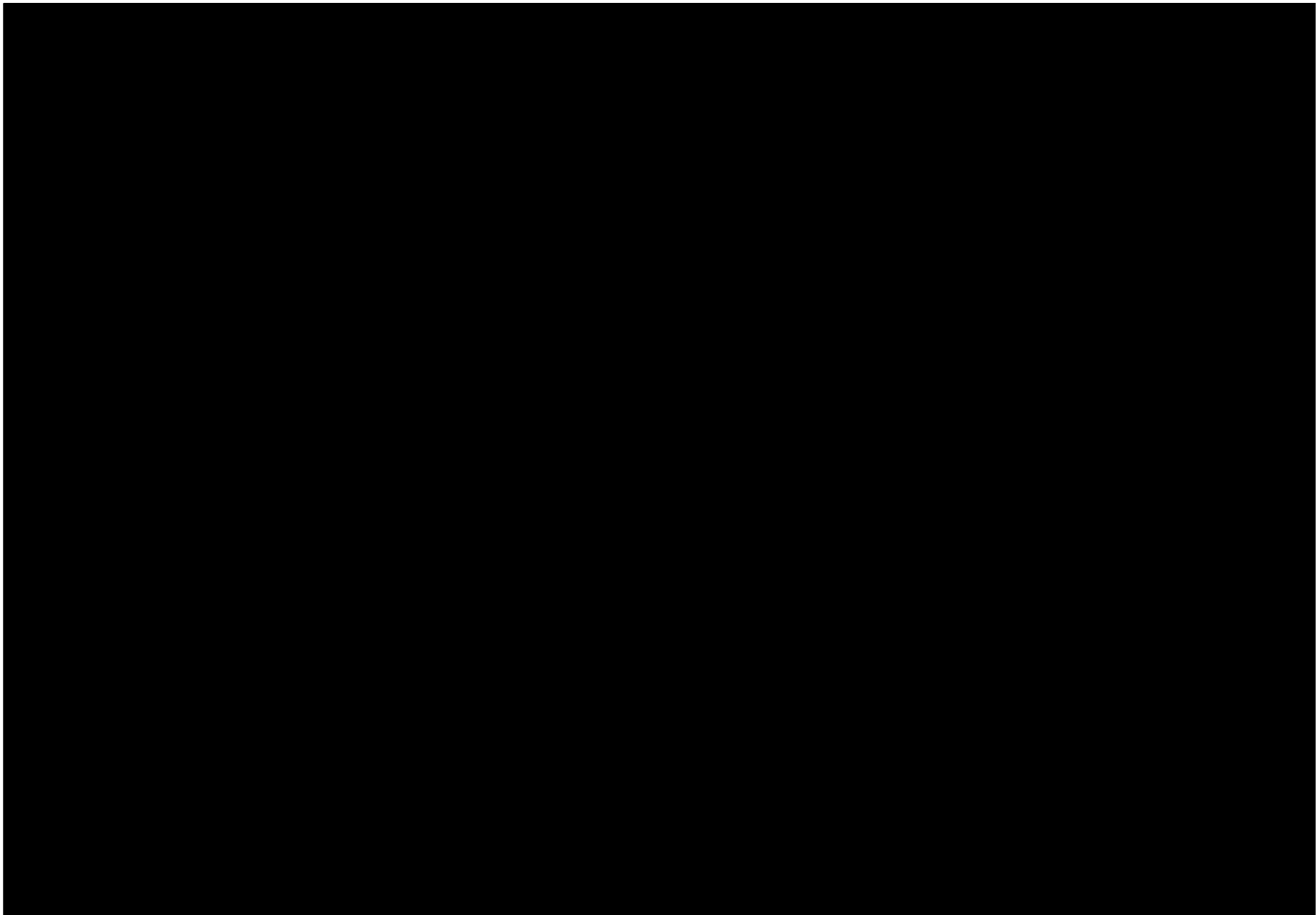
ATTACHMENT 10 – Rail Maintenance and Stabling Facilities

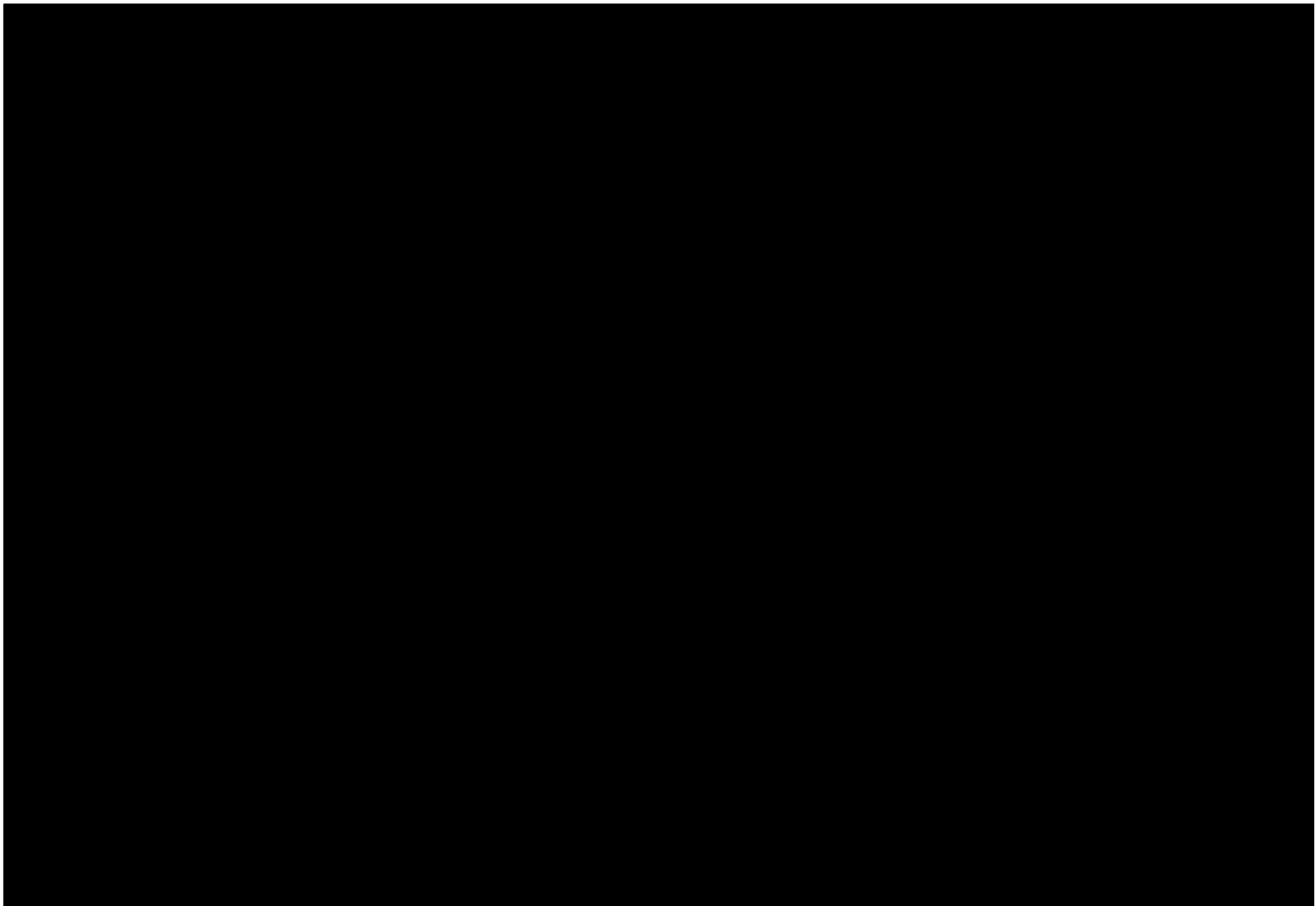
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ATTACHMENT 11 – Schedule of Materials, Fittings, Fixtures and Finishes

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Returnable 5

March 2014
Version 01

Version Control box

Date	Version Number	Reviewer	Comments
	V01	Crisanthe Hatzantonis	Template
5.5.14	V02	Emily	Dot Points
11.6.14	V03	Aspect/Grimshaw/Emily	Review after 80% complete
11.6.14	V04	Mint	Review after 80% complete

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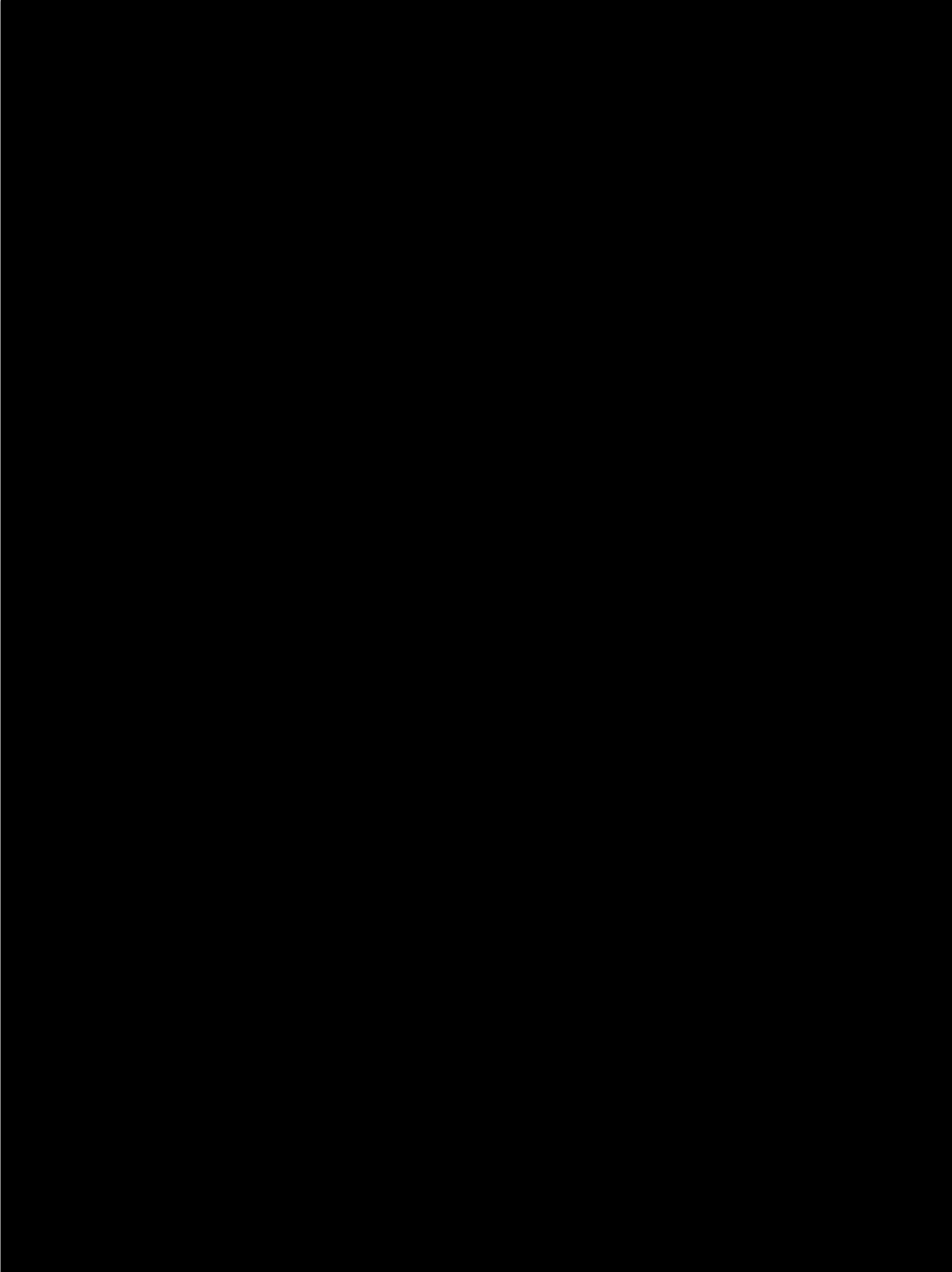
5. ENGINEERING ARCHITECTURAL AND URBAN DESIGN

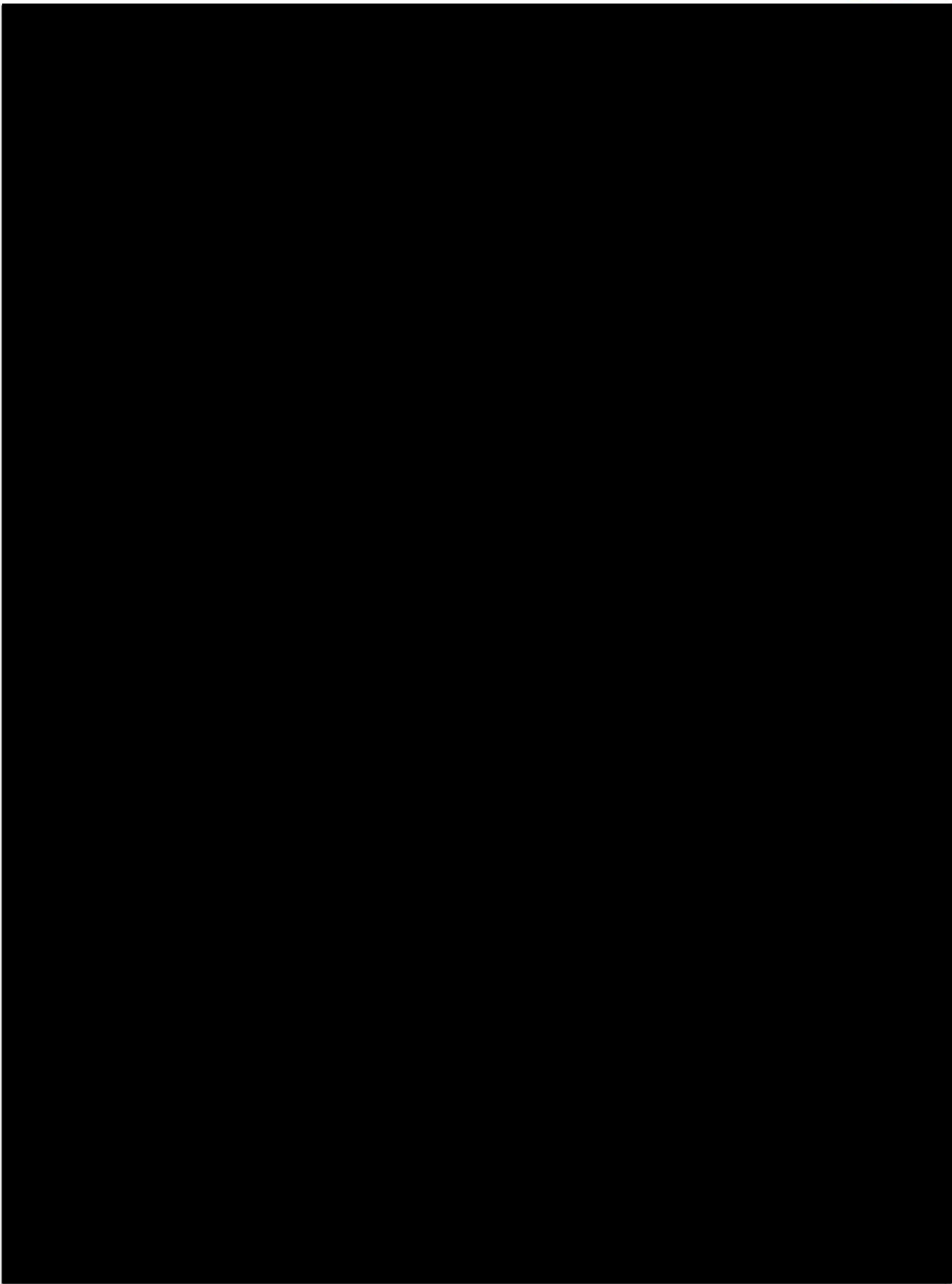
5.3 Materials Fittings, Fixtures and Finishes (SPR Appendix 45)

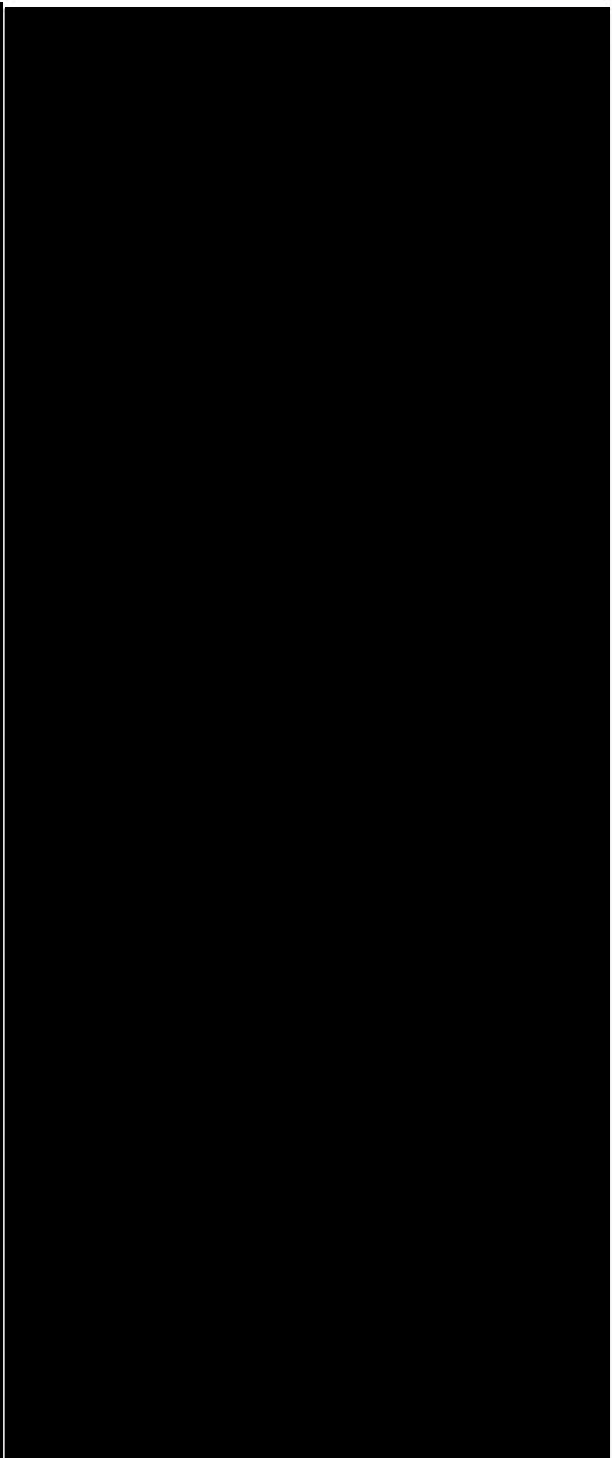
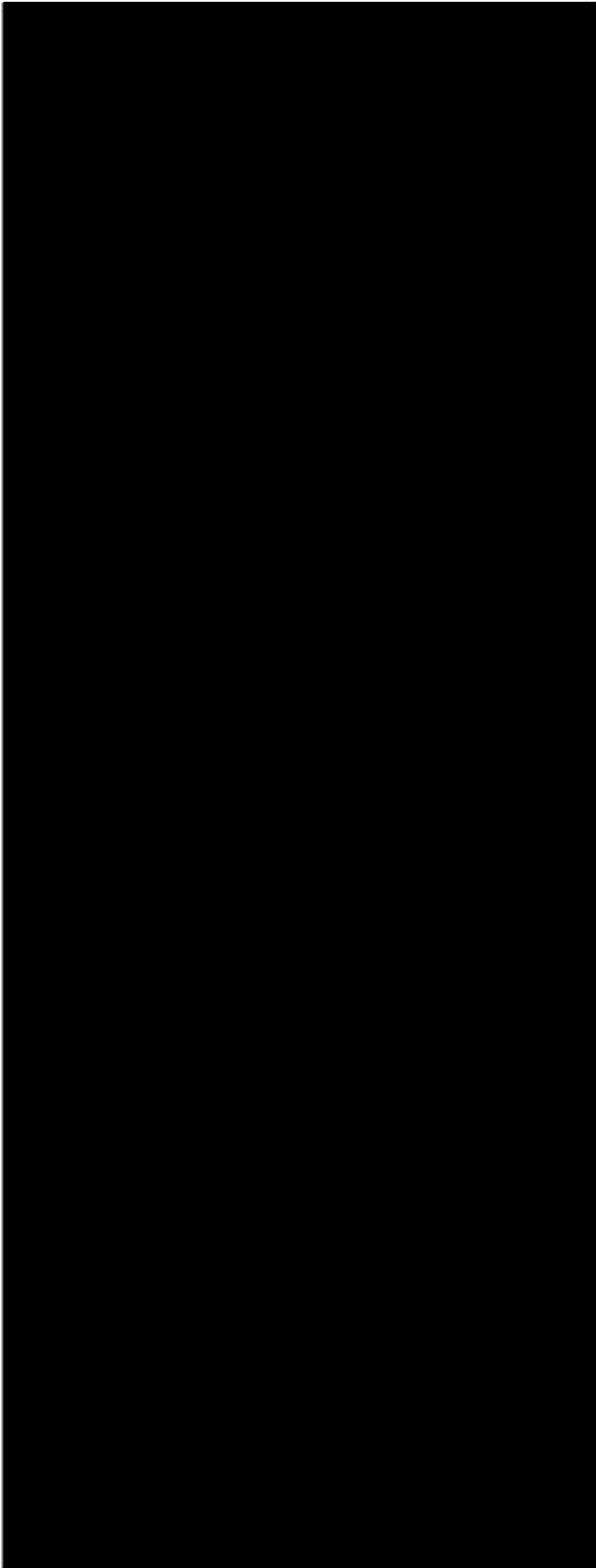
Note to Proponents: As a guide, the response to Returnable 5.3 should not be more than 5 A3 page.

5.3 (a) Description

The Proponent is to provide a description of typical materials, fittings, fixtures and finishes for the Concept Design for:

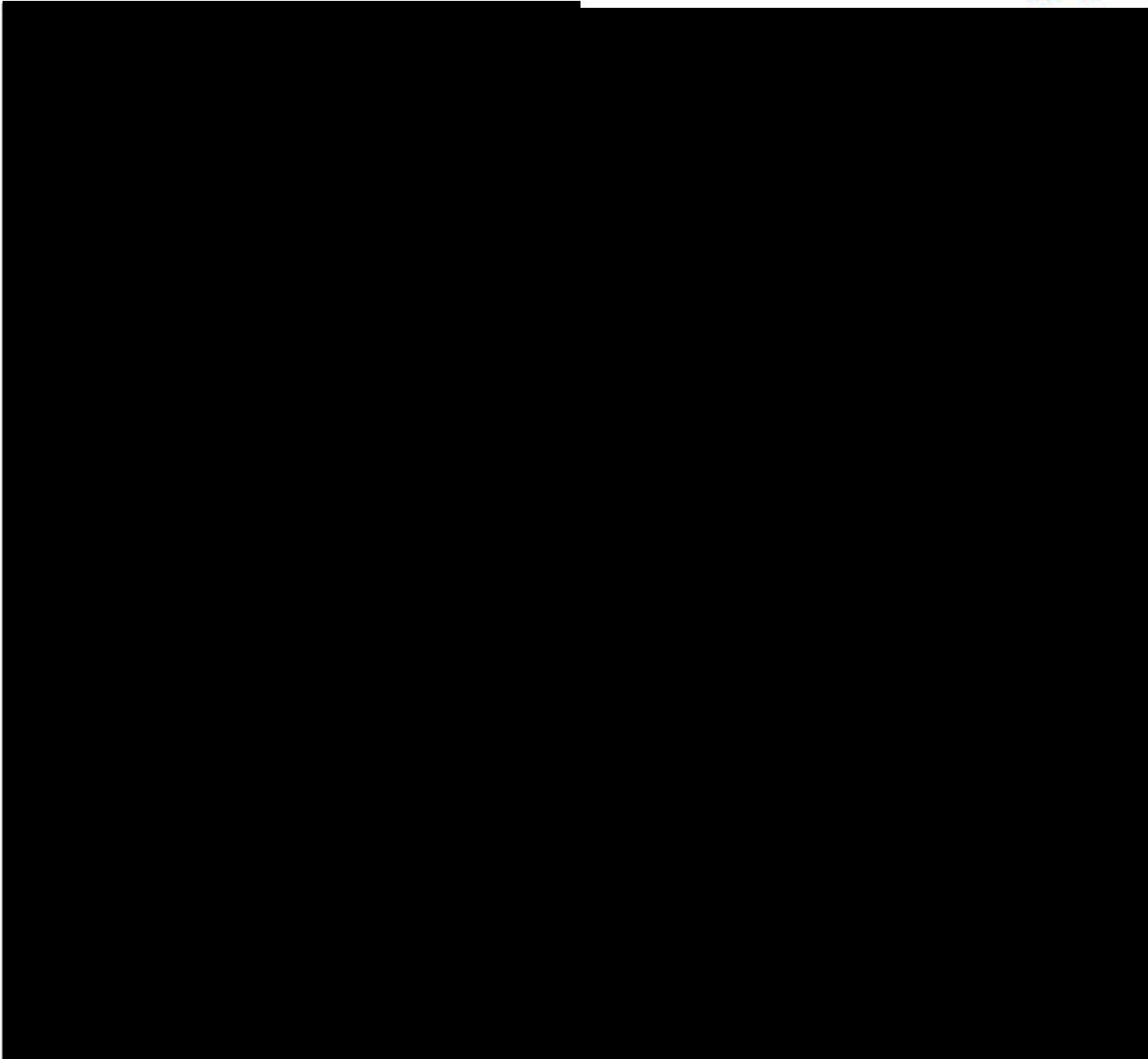




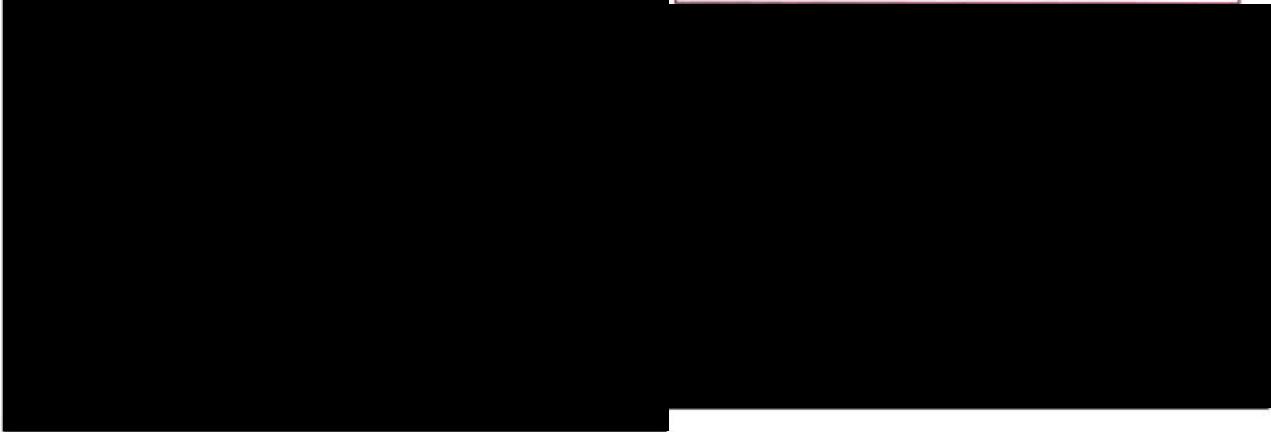


The description is to, in relation to key materials, finishes, fixtures and fittings:





describe the key advantages and the rationale for the choice including Customer outcome and whole-of-life considerations;



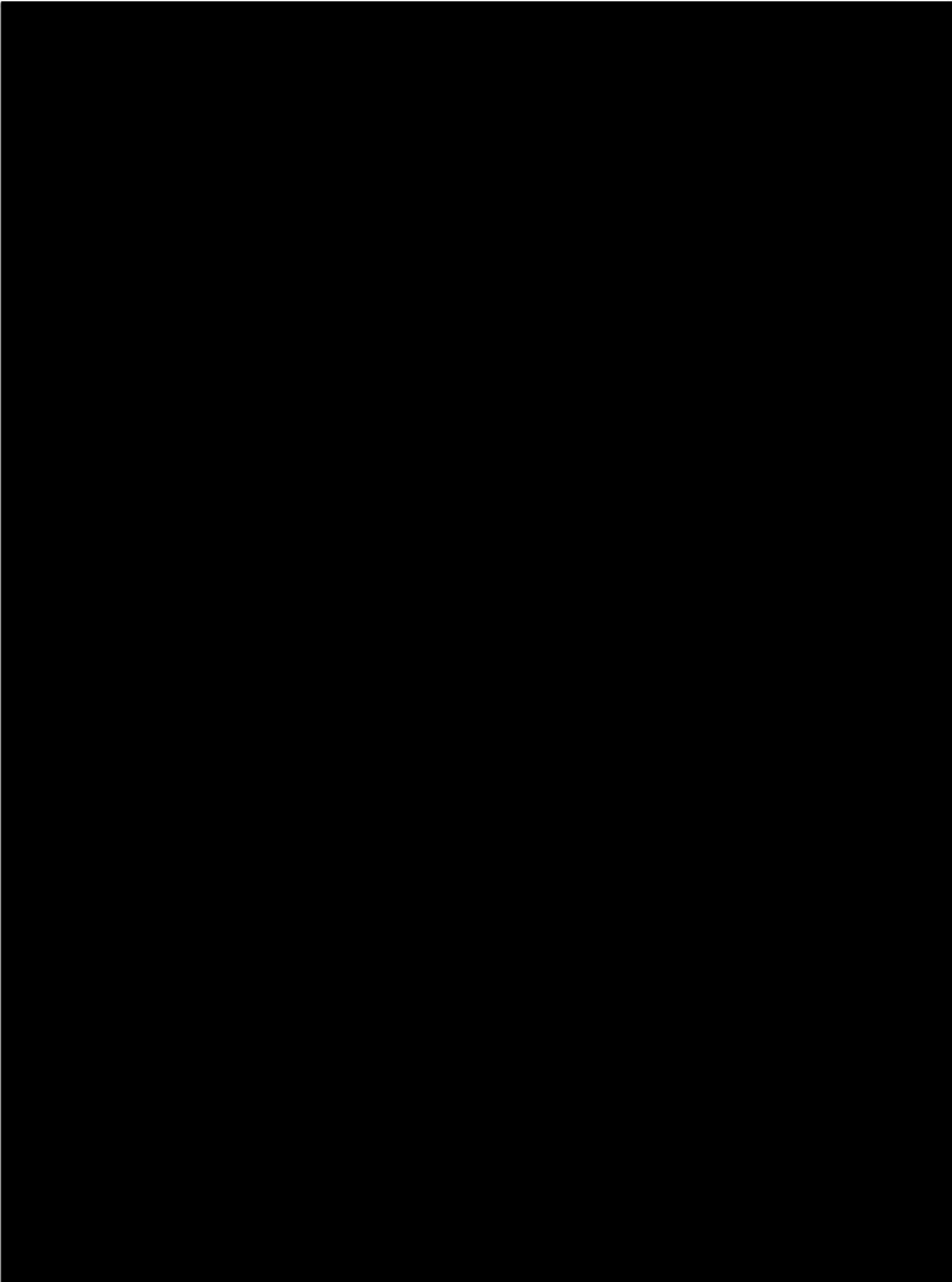


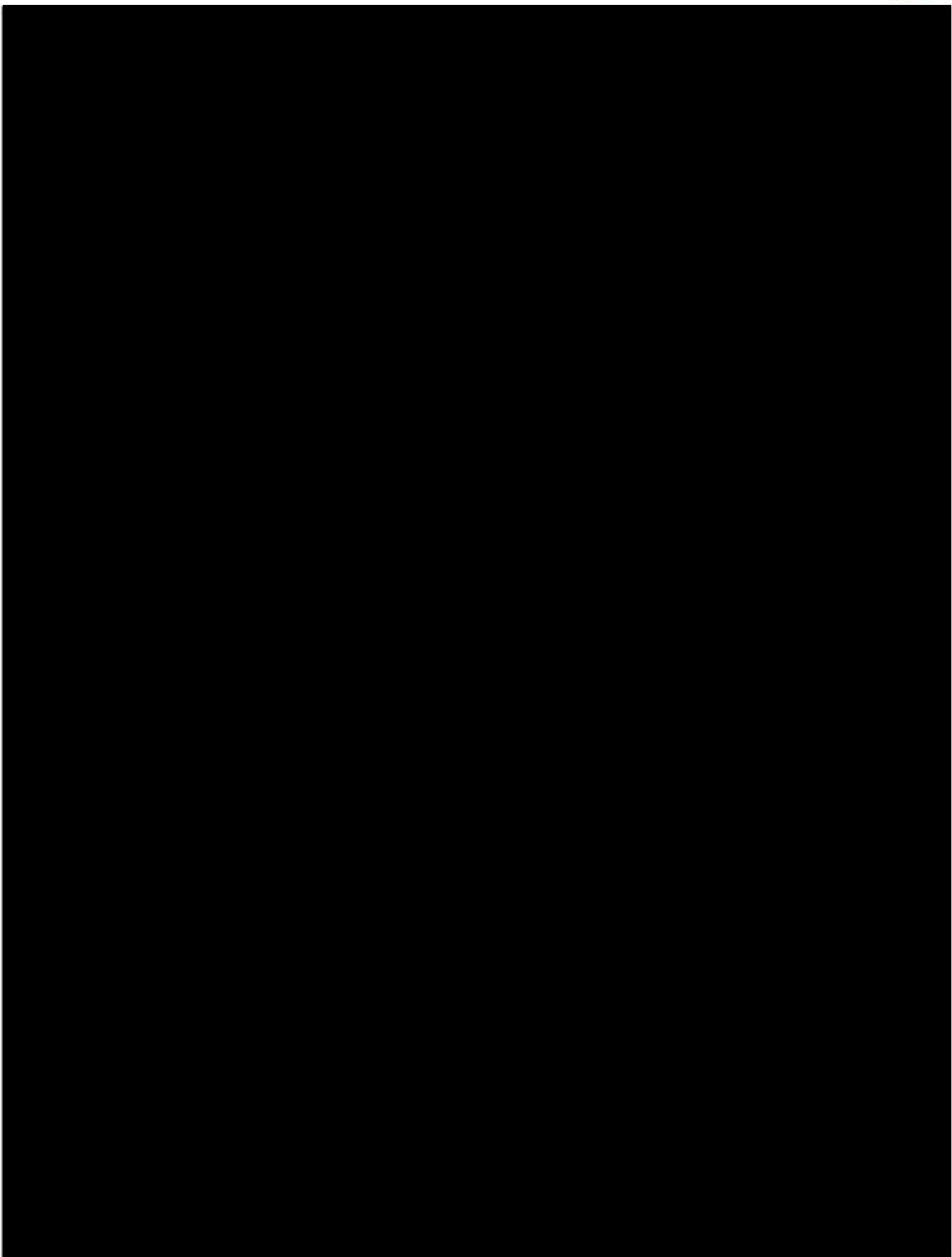
5.3 (b) (ii) Schedule

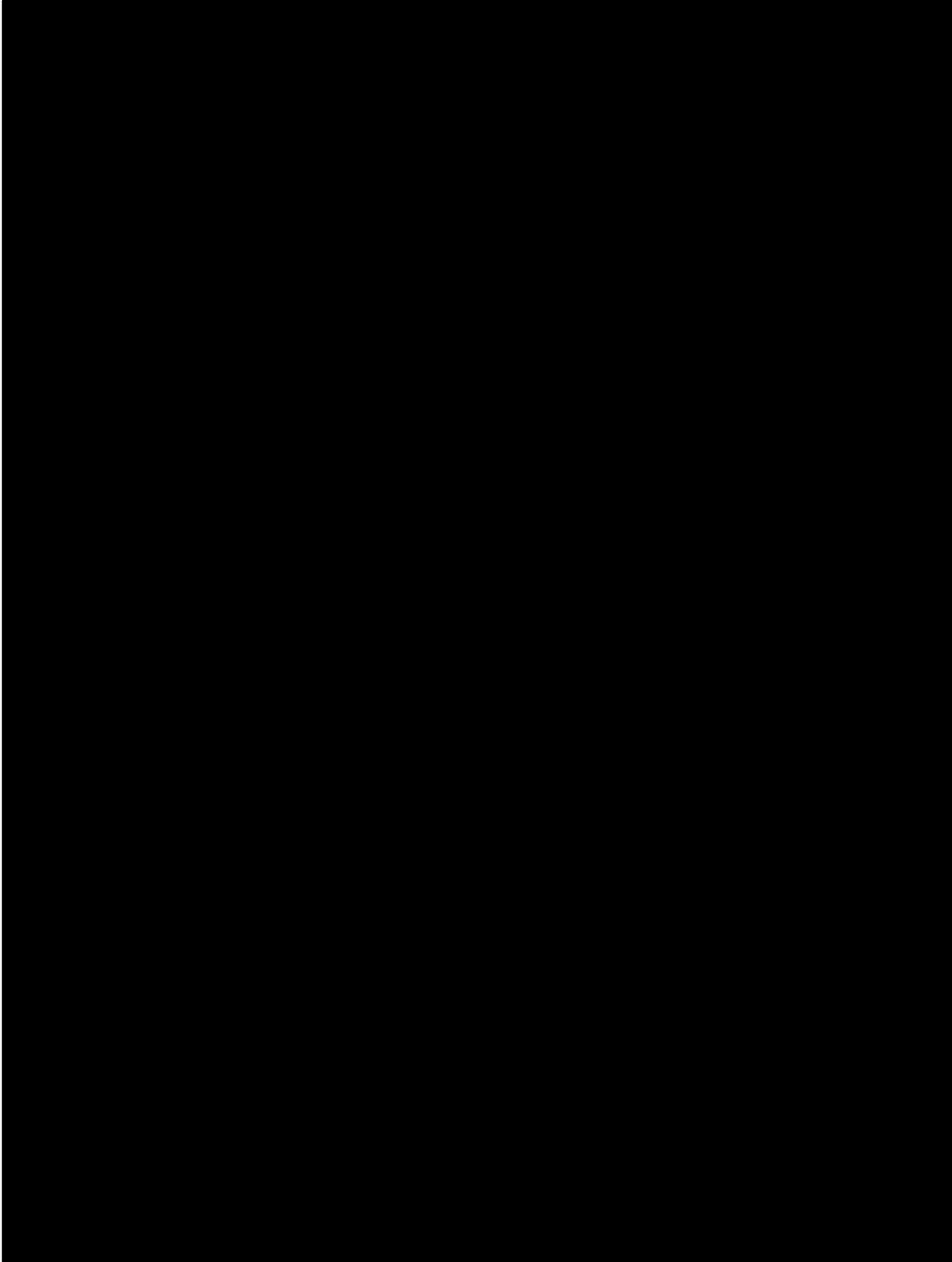
include a schedule of individual materials, finishes, fixtures and fittings which should be tabulated with text (in the format of Table R5.2 below);

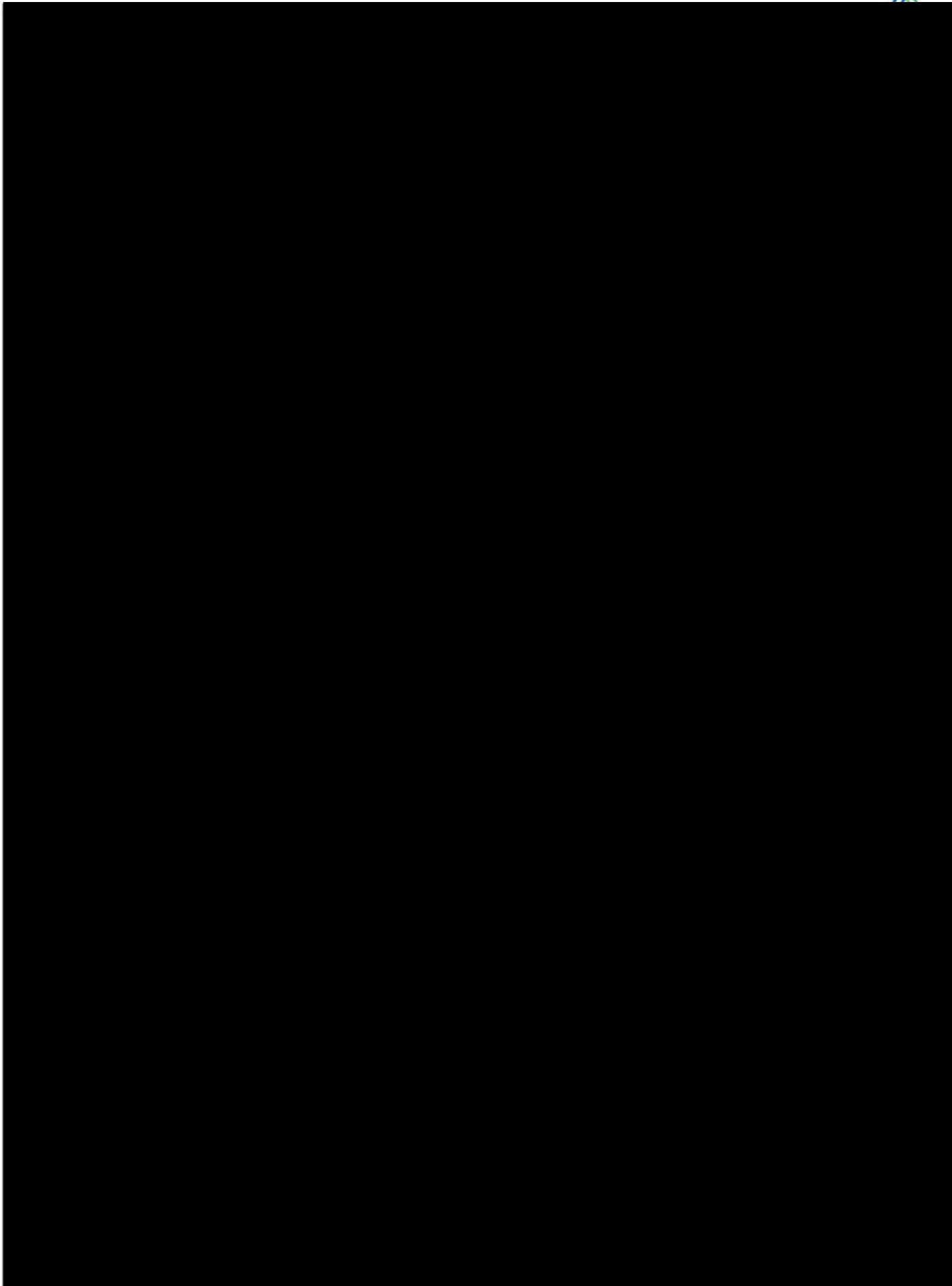
Refer Table 5.2 Proponents Initial Materials, Finishes, Fixtures and Fittings

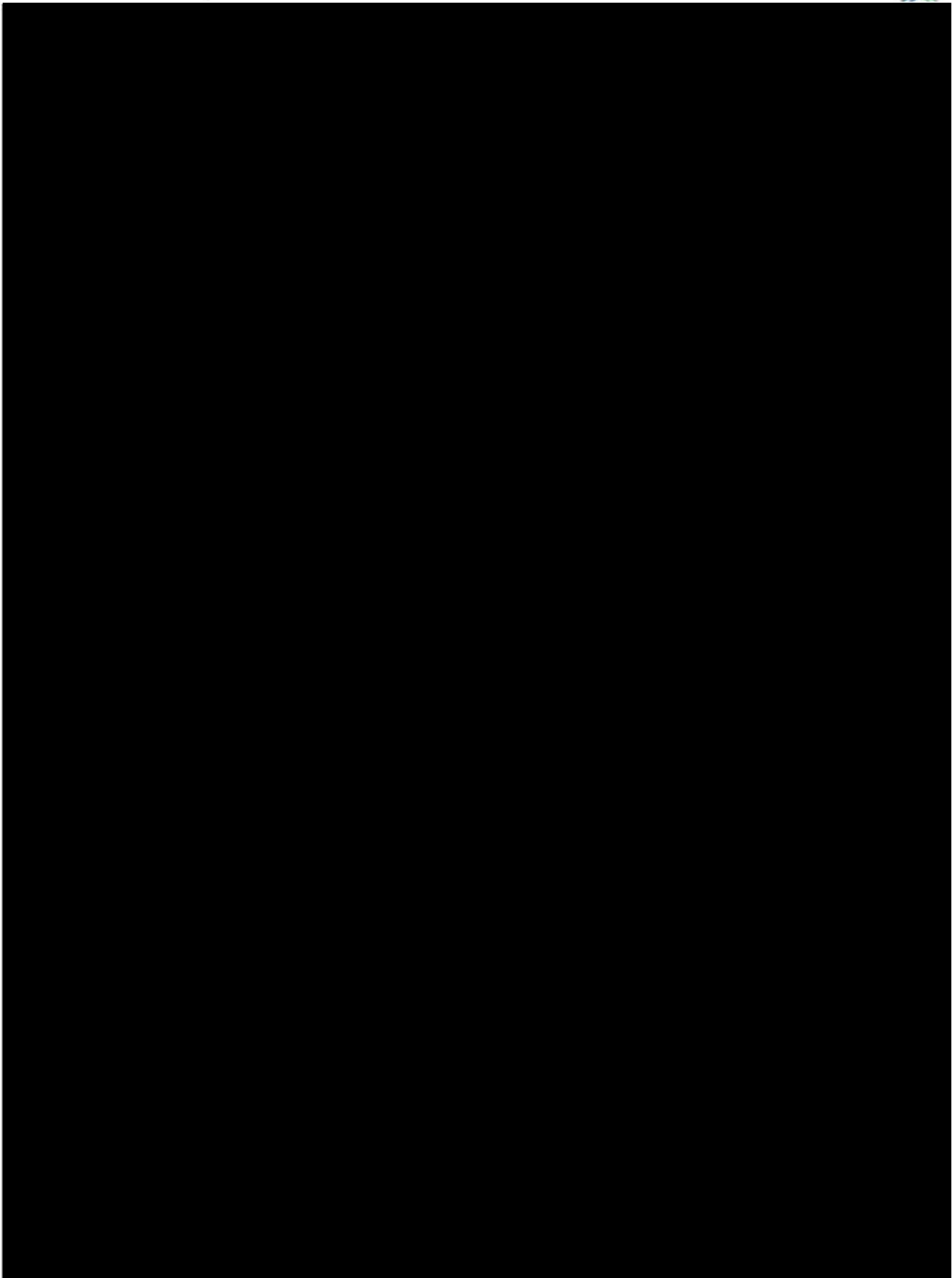
Connecting Sydney's Table R5.2: Proponents Initial Materials, Finishes, Fixtures and Fittings is illustrated in [Appendix 5.3 of Returnable 5](#).

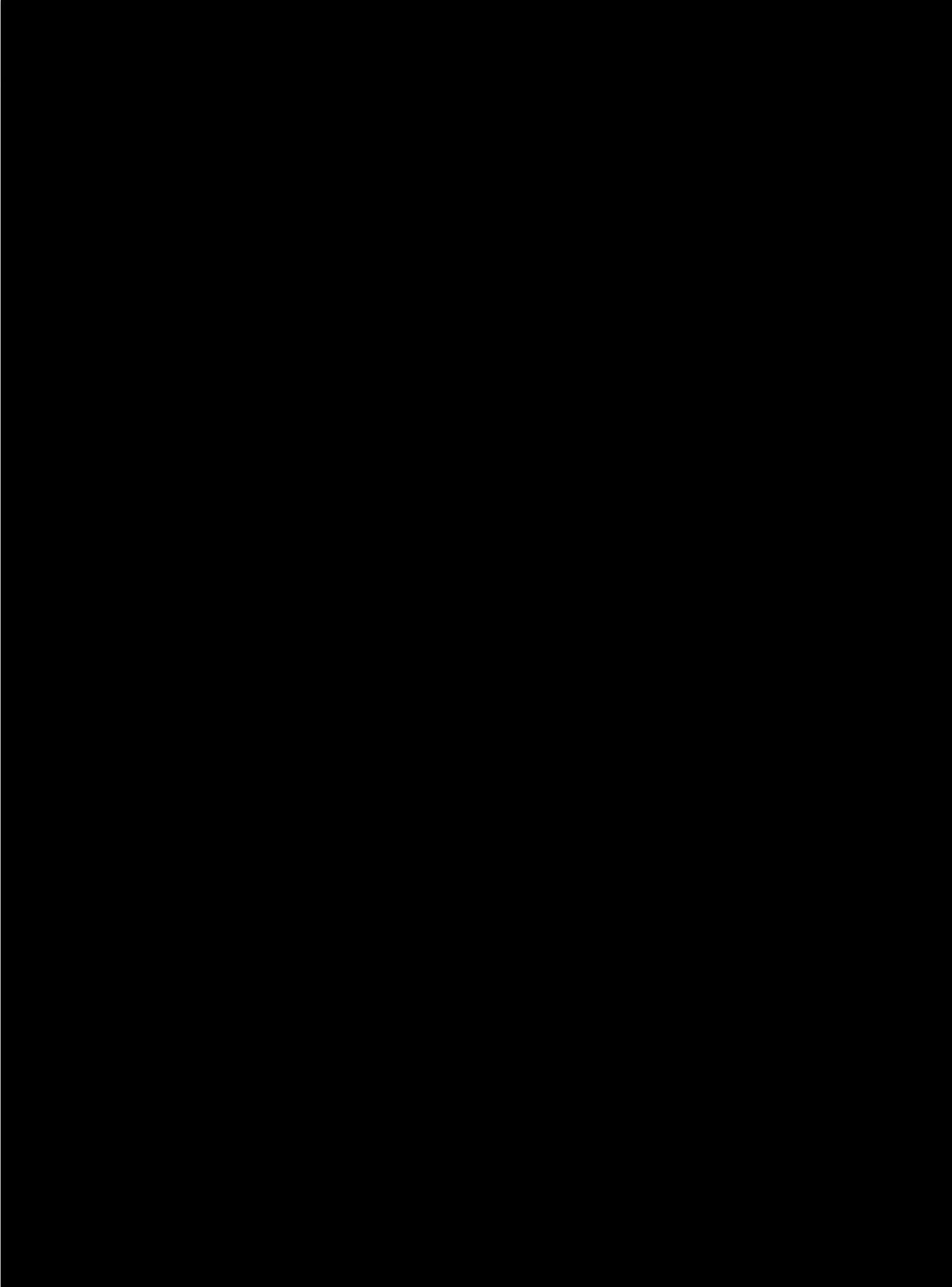


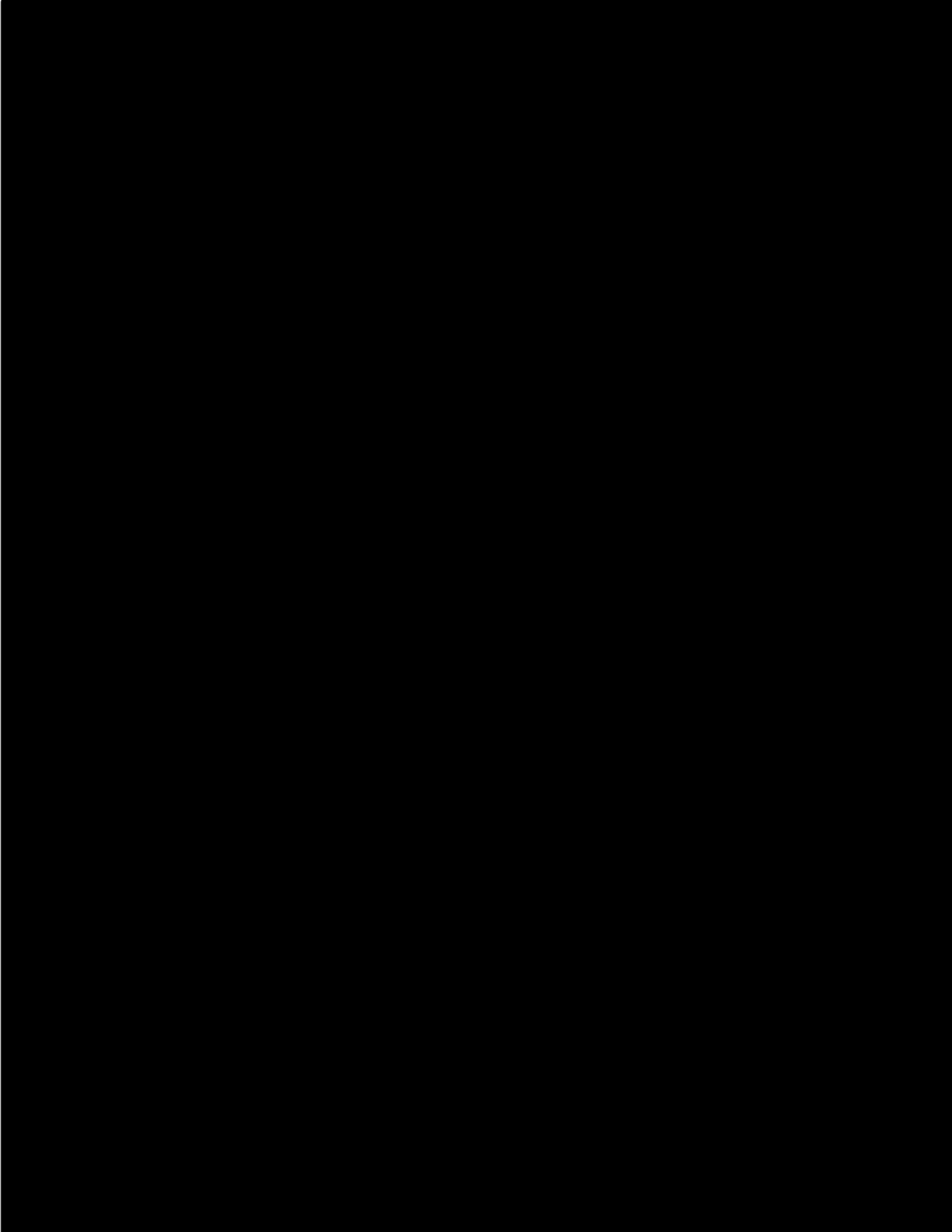


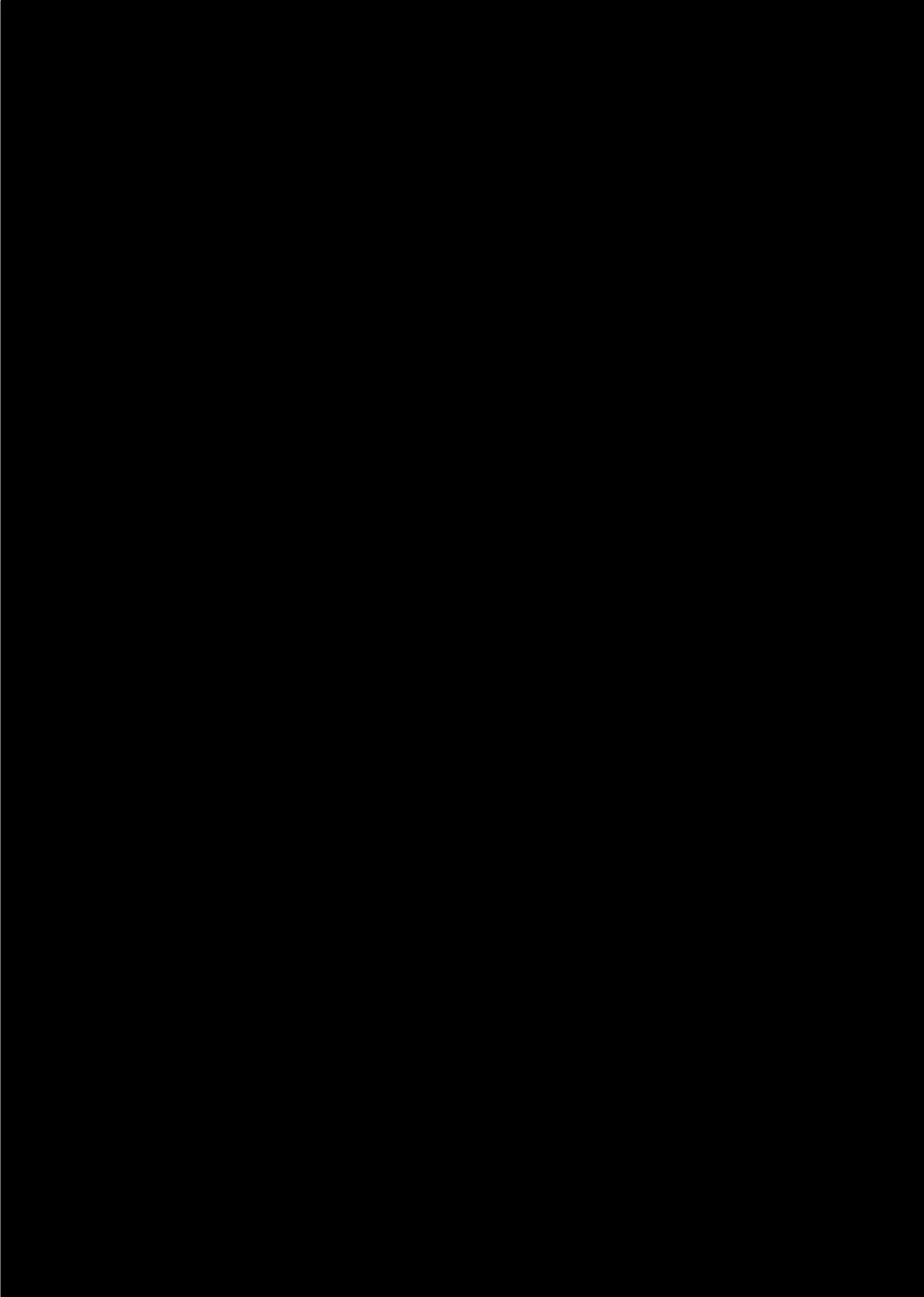


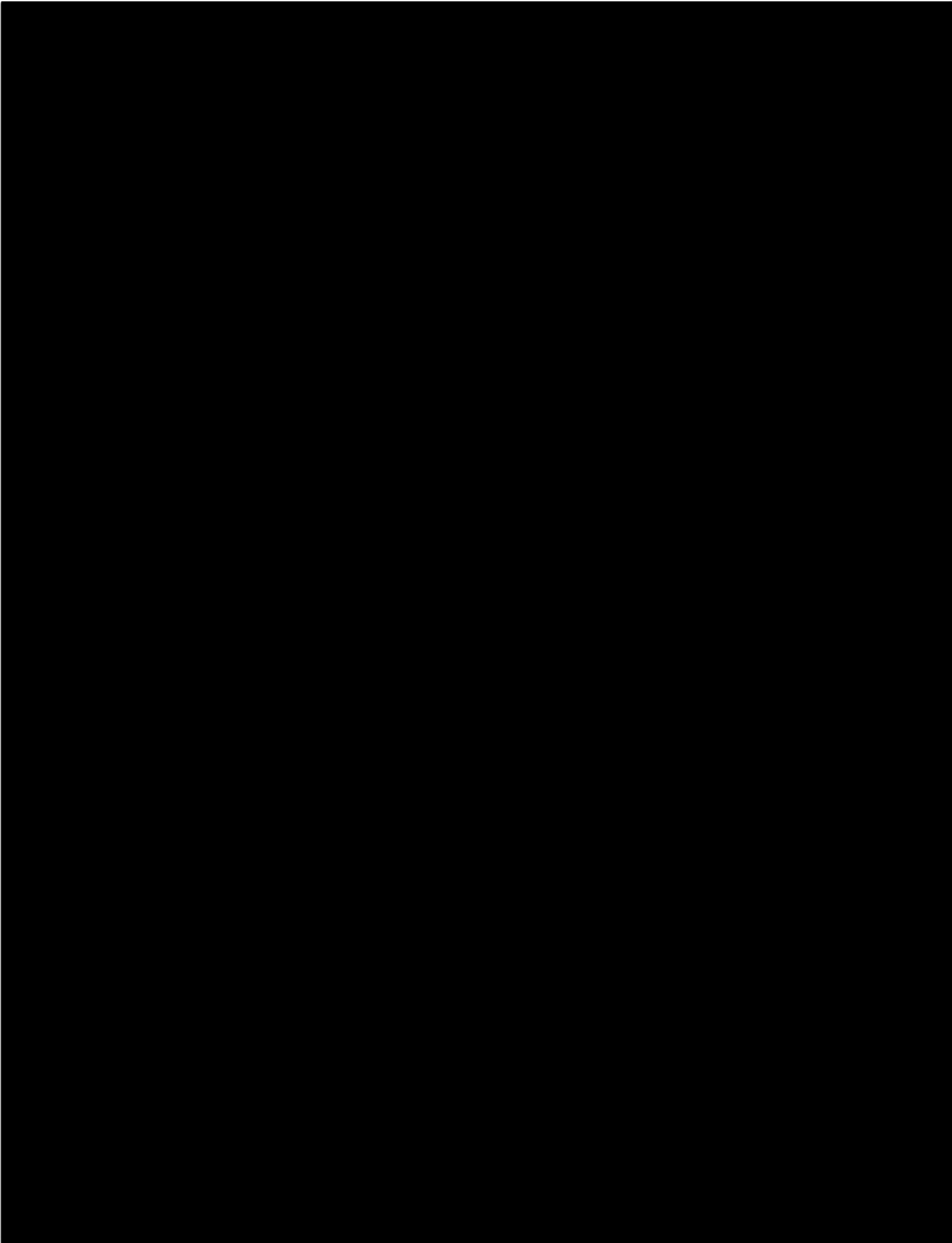


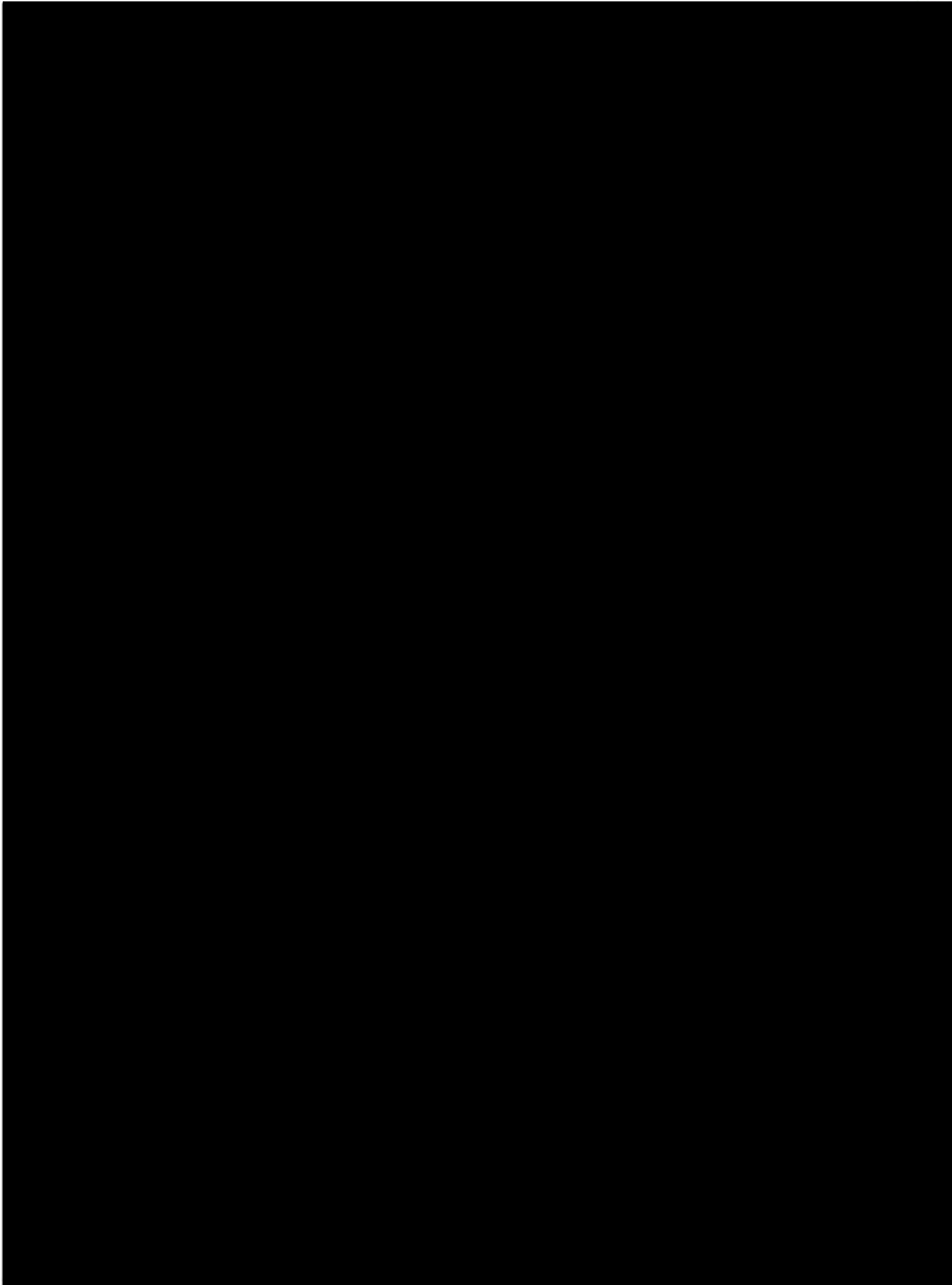


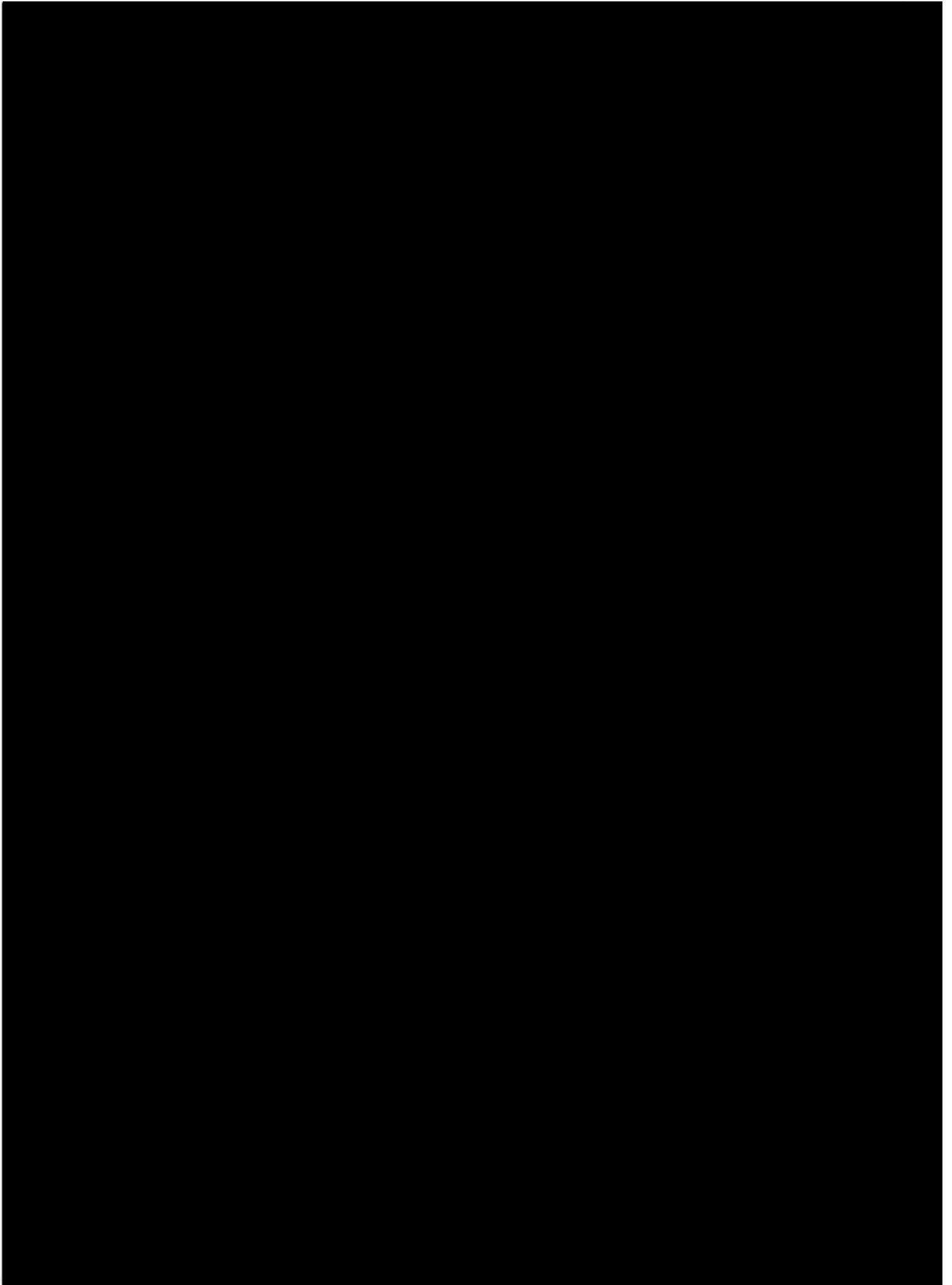


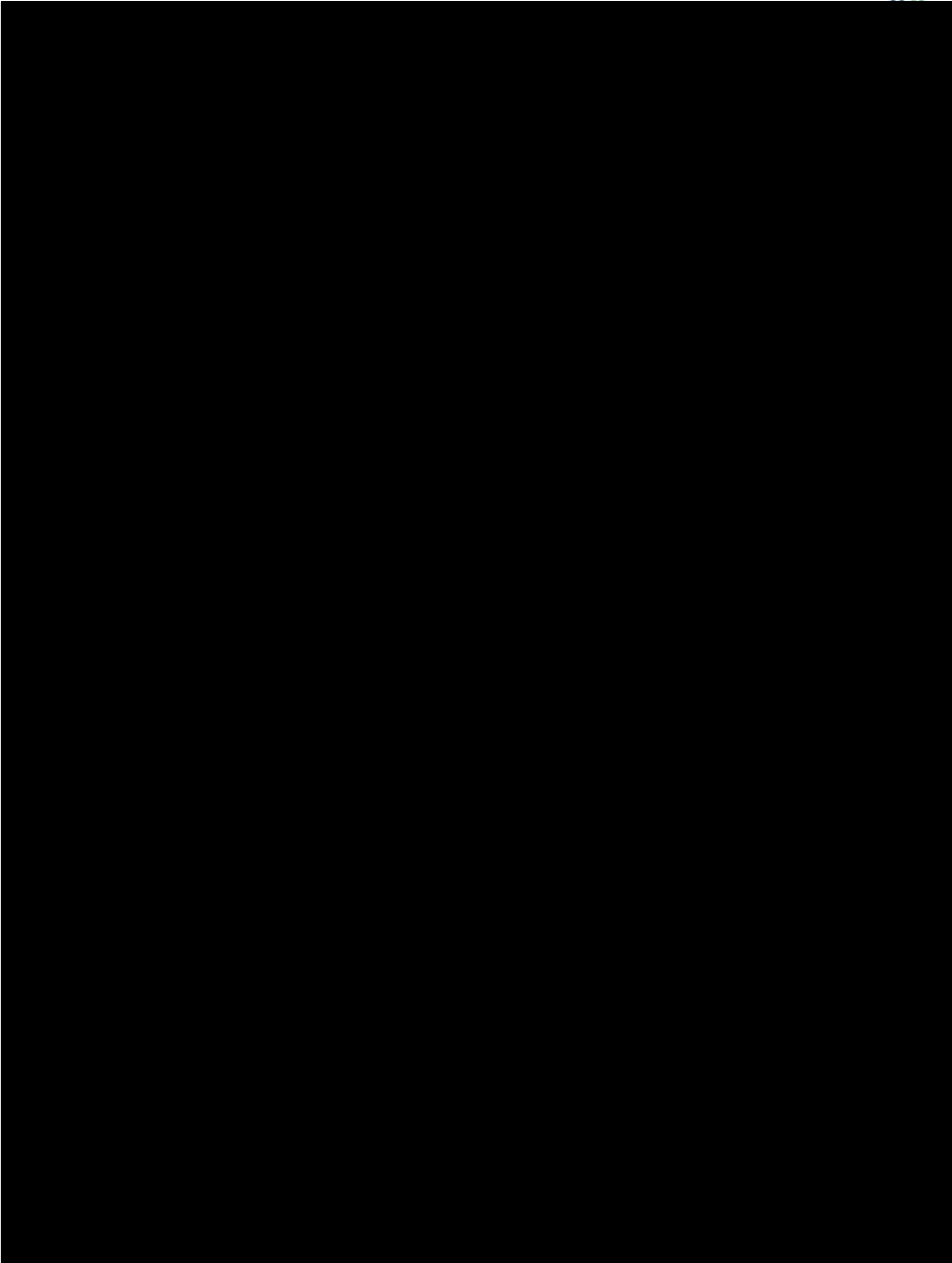


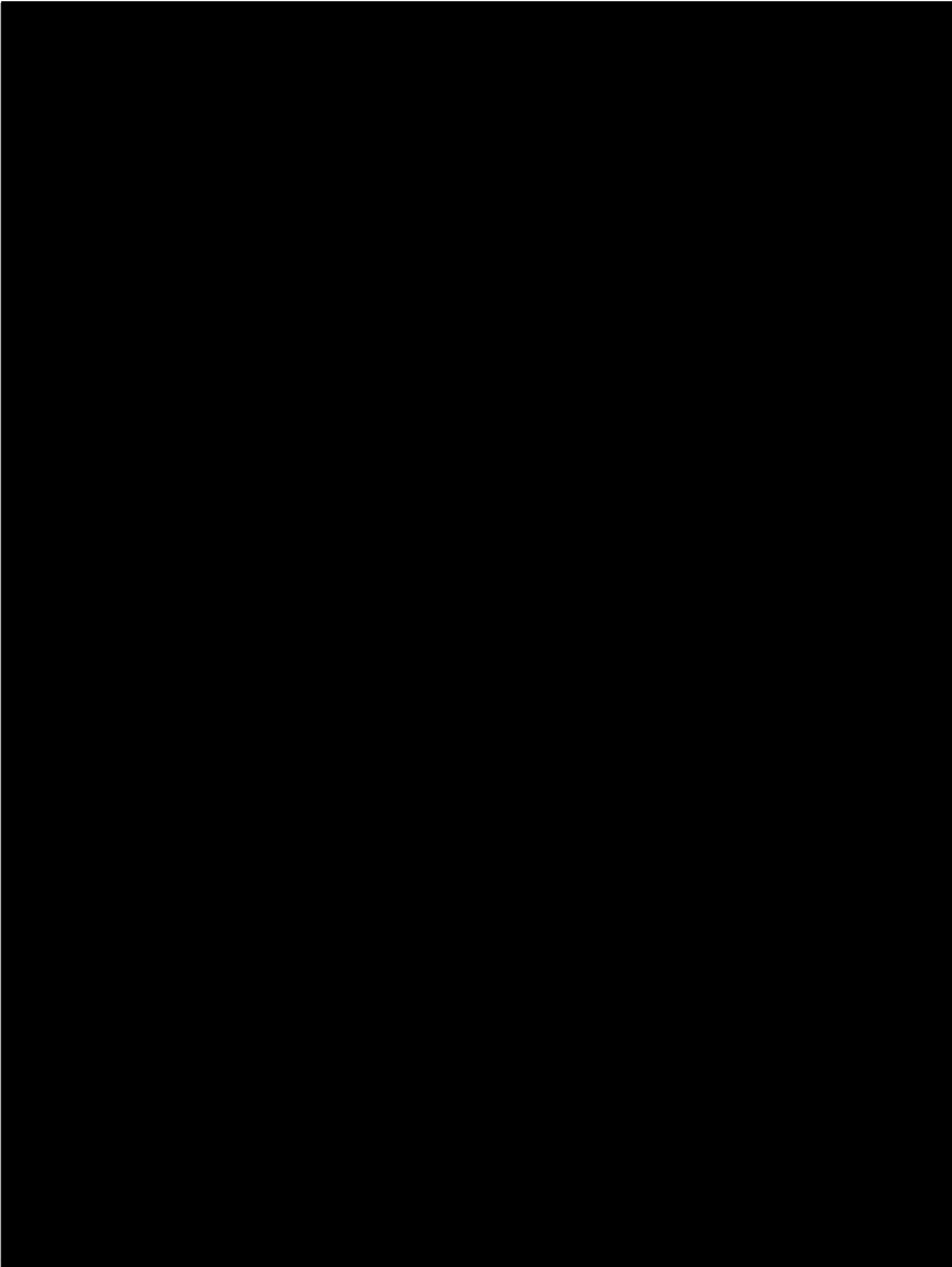


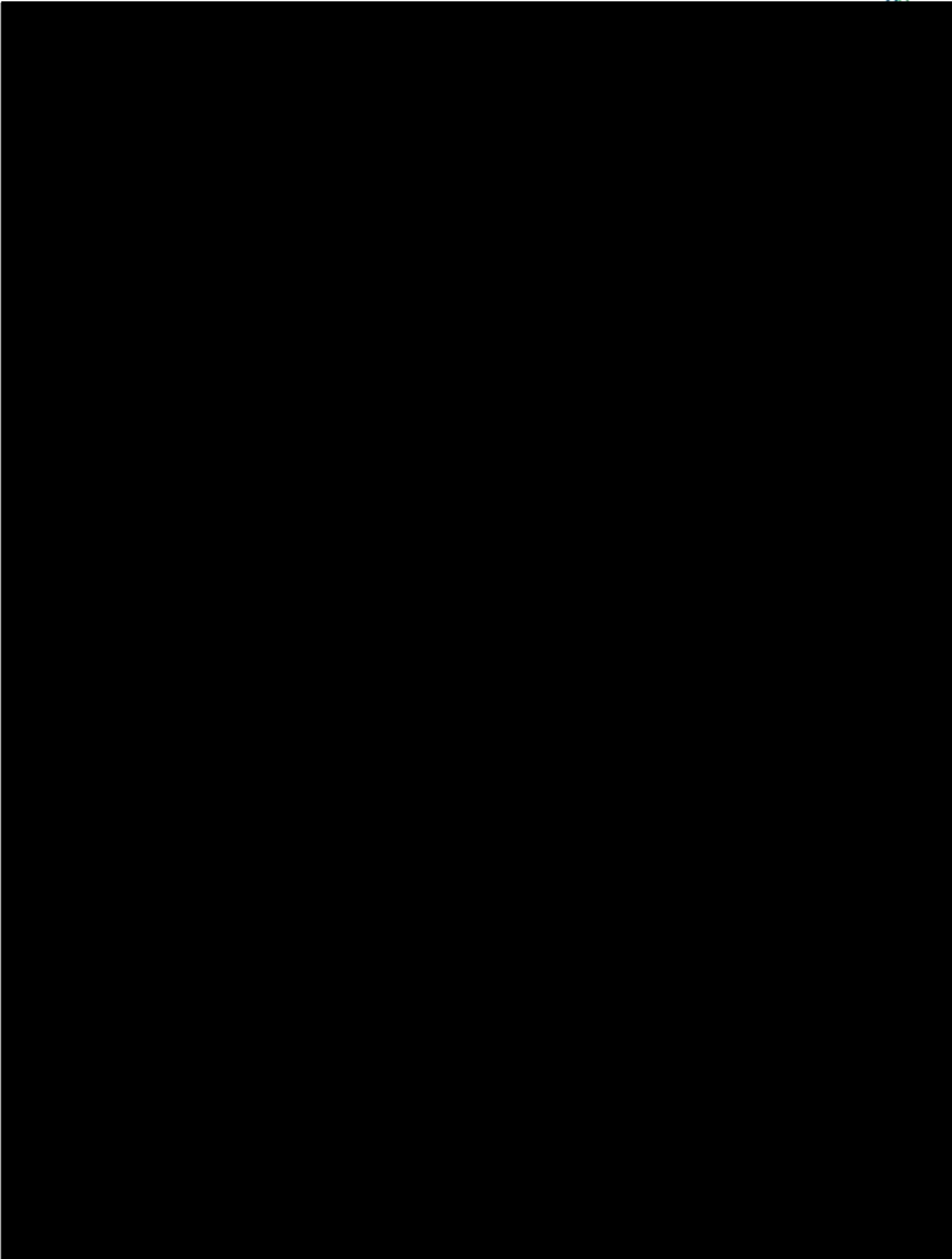


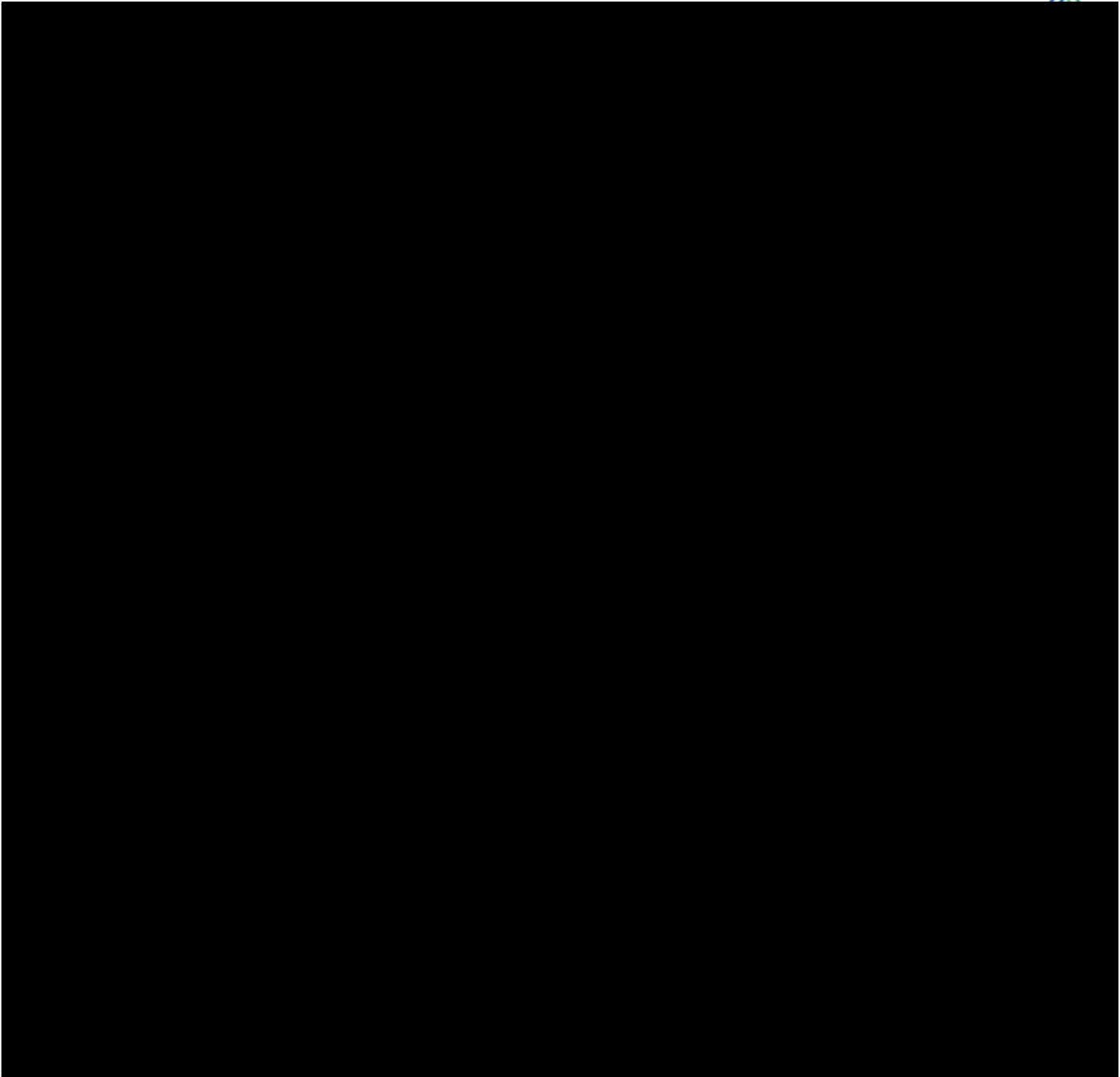


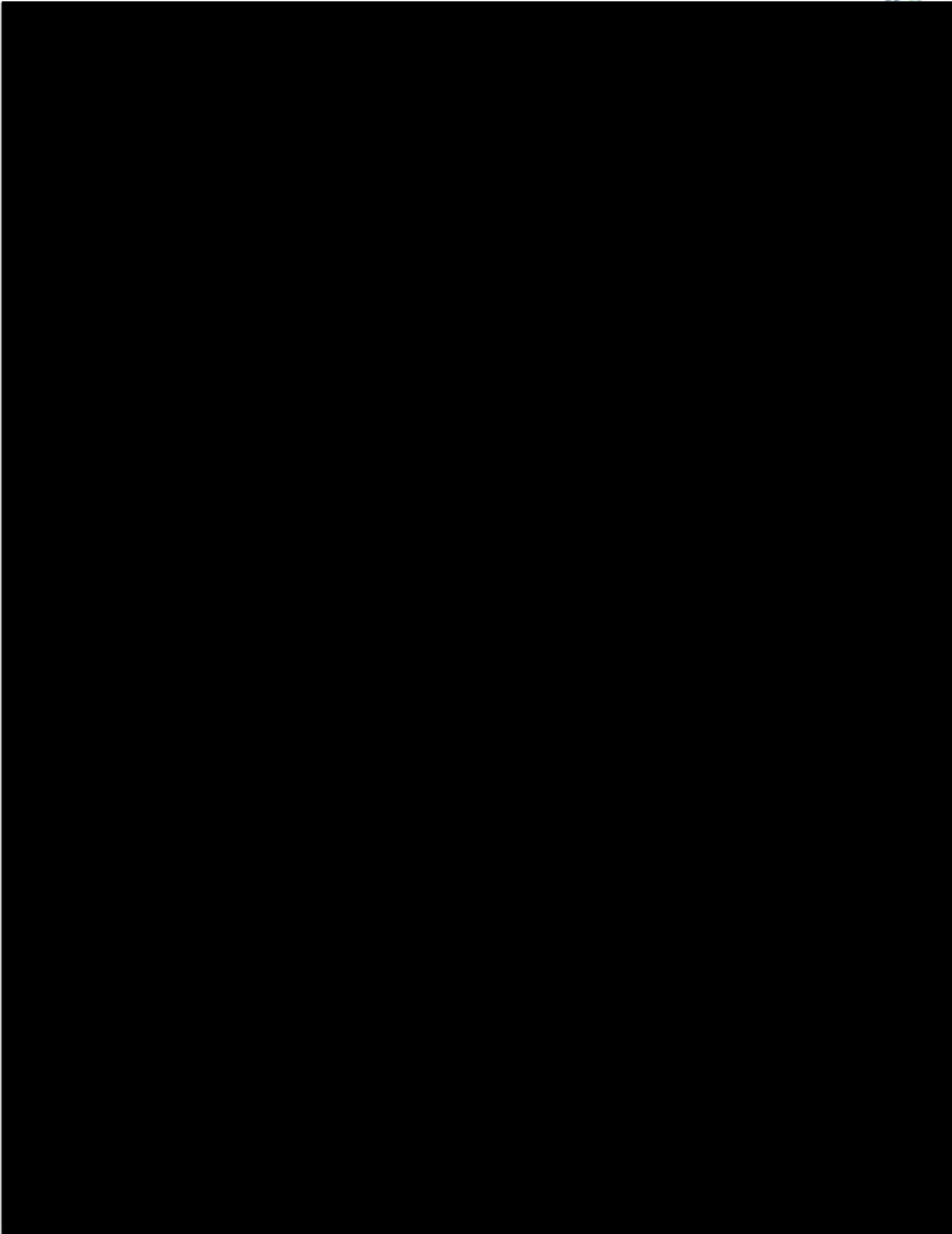


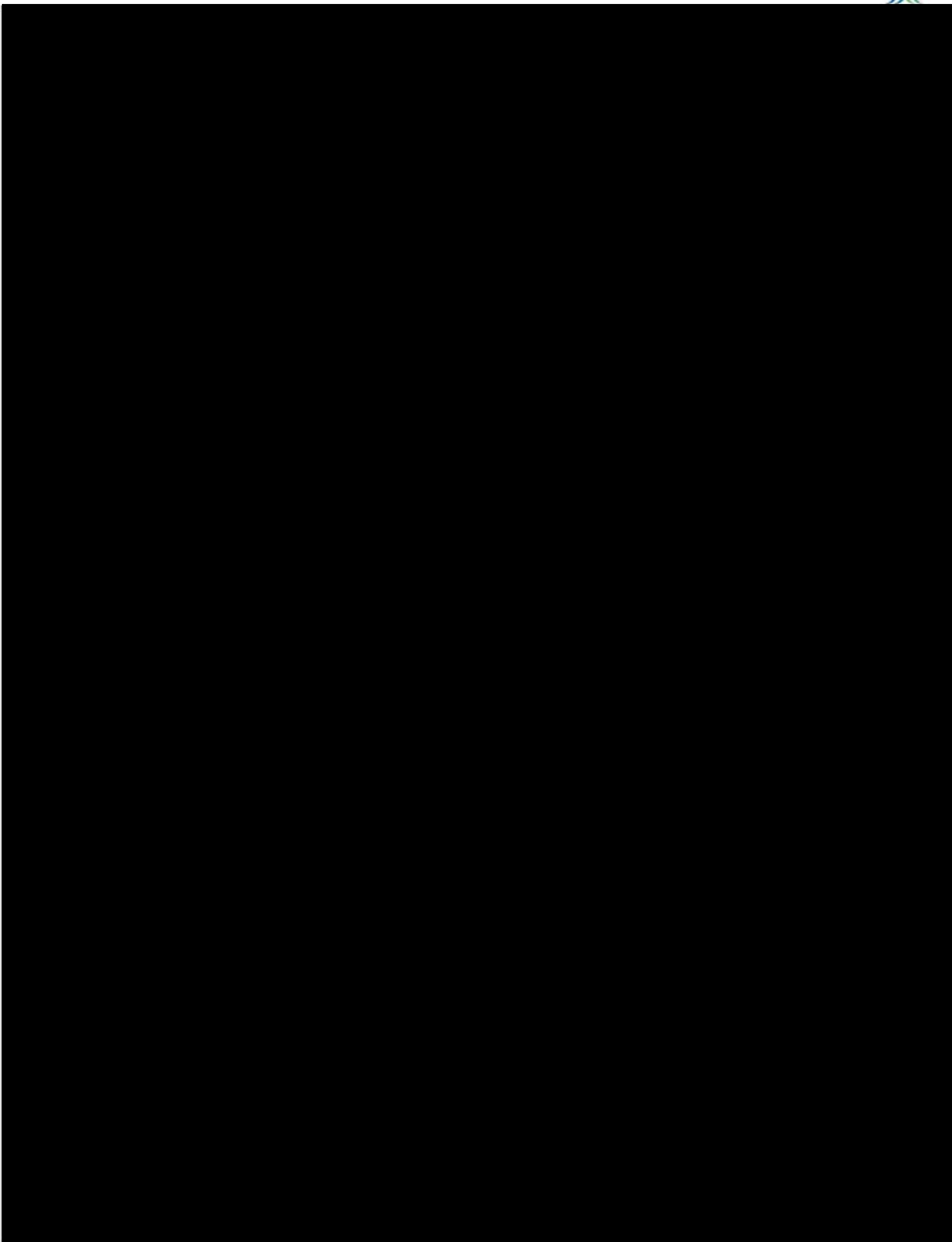


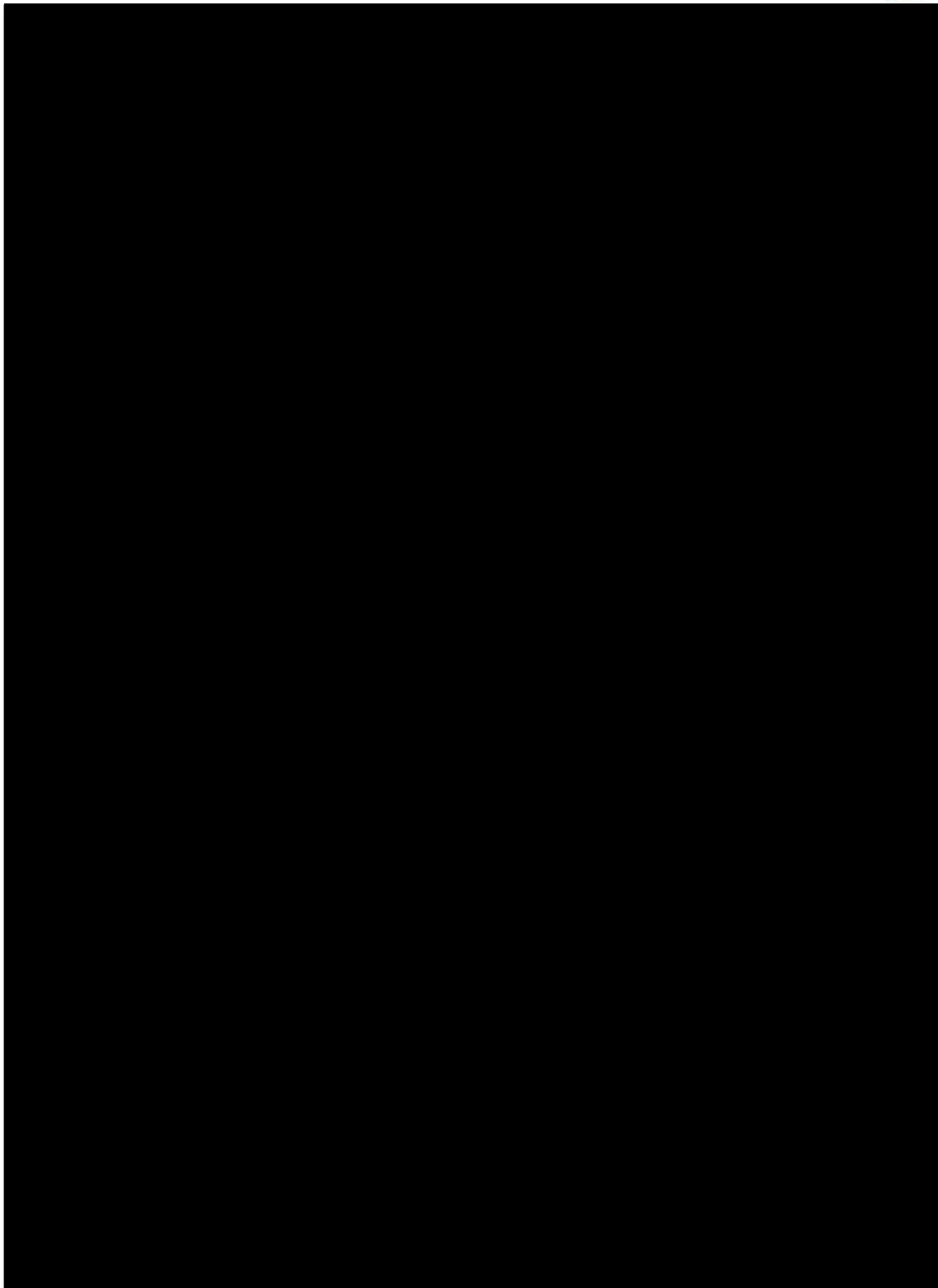


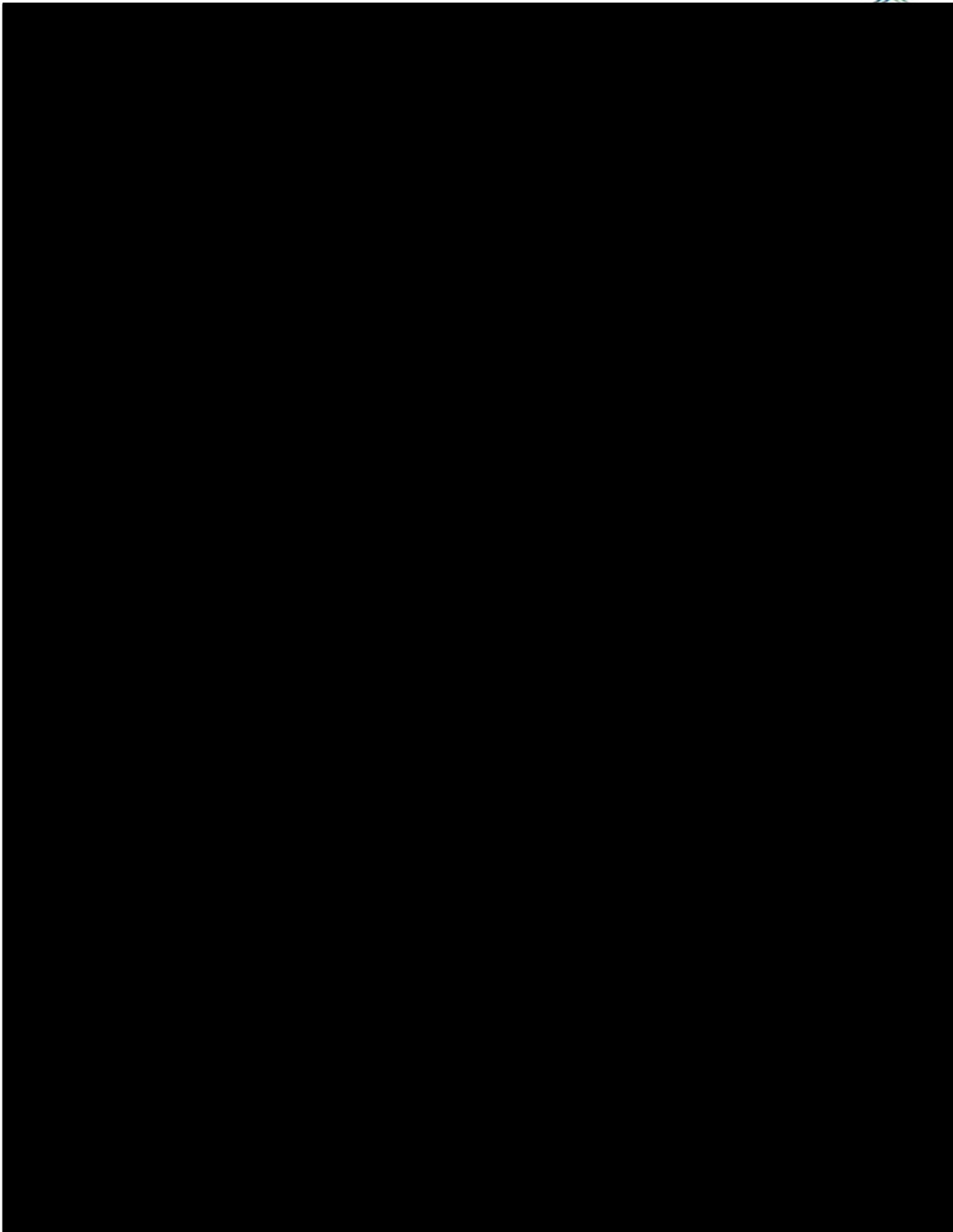


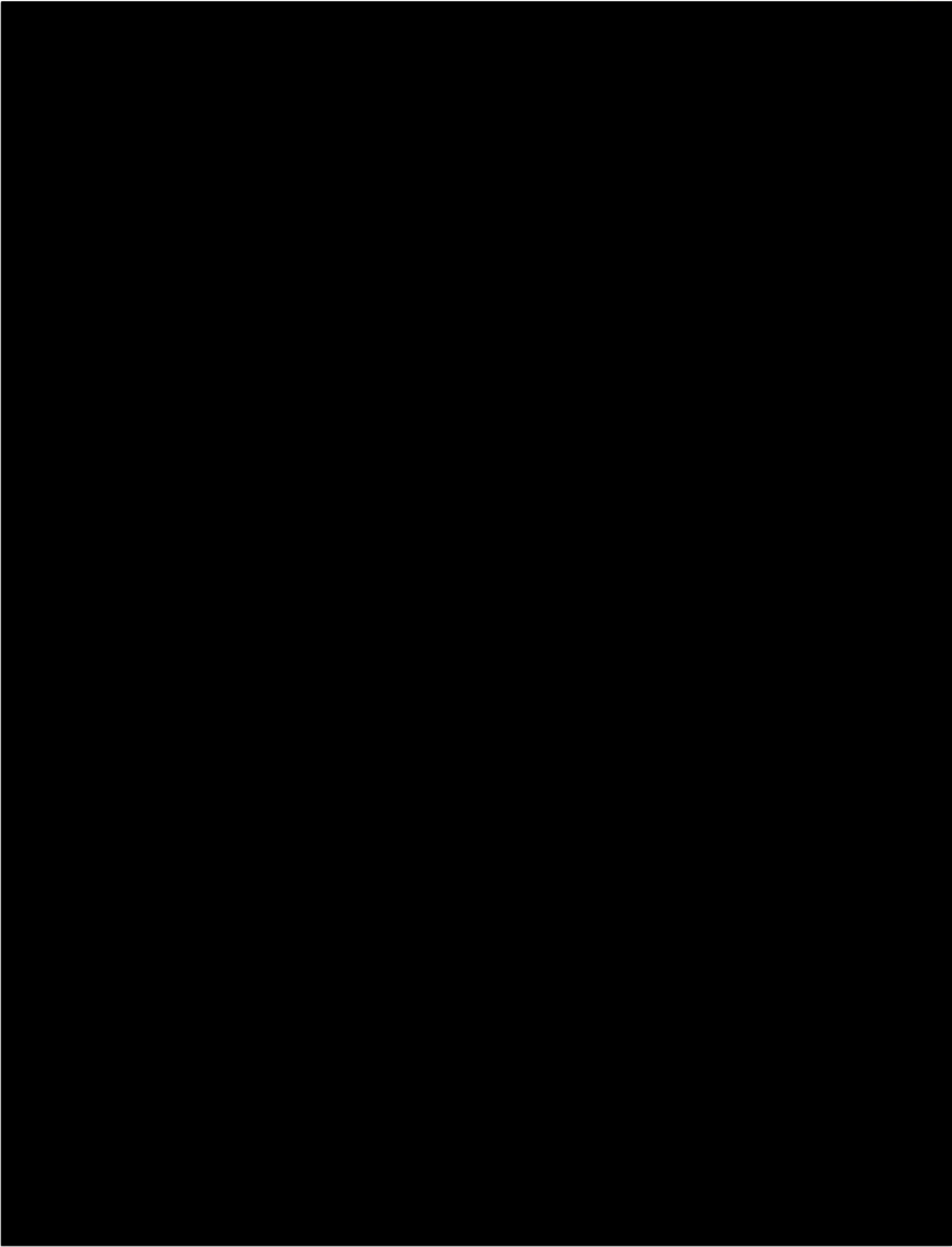


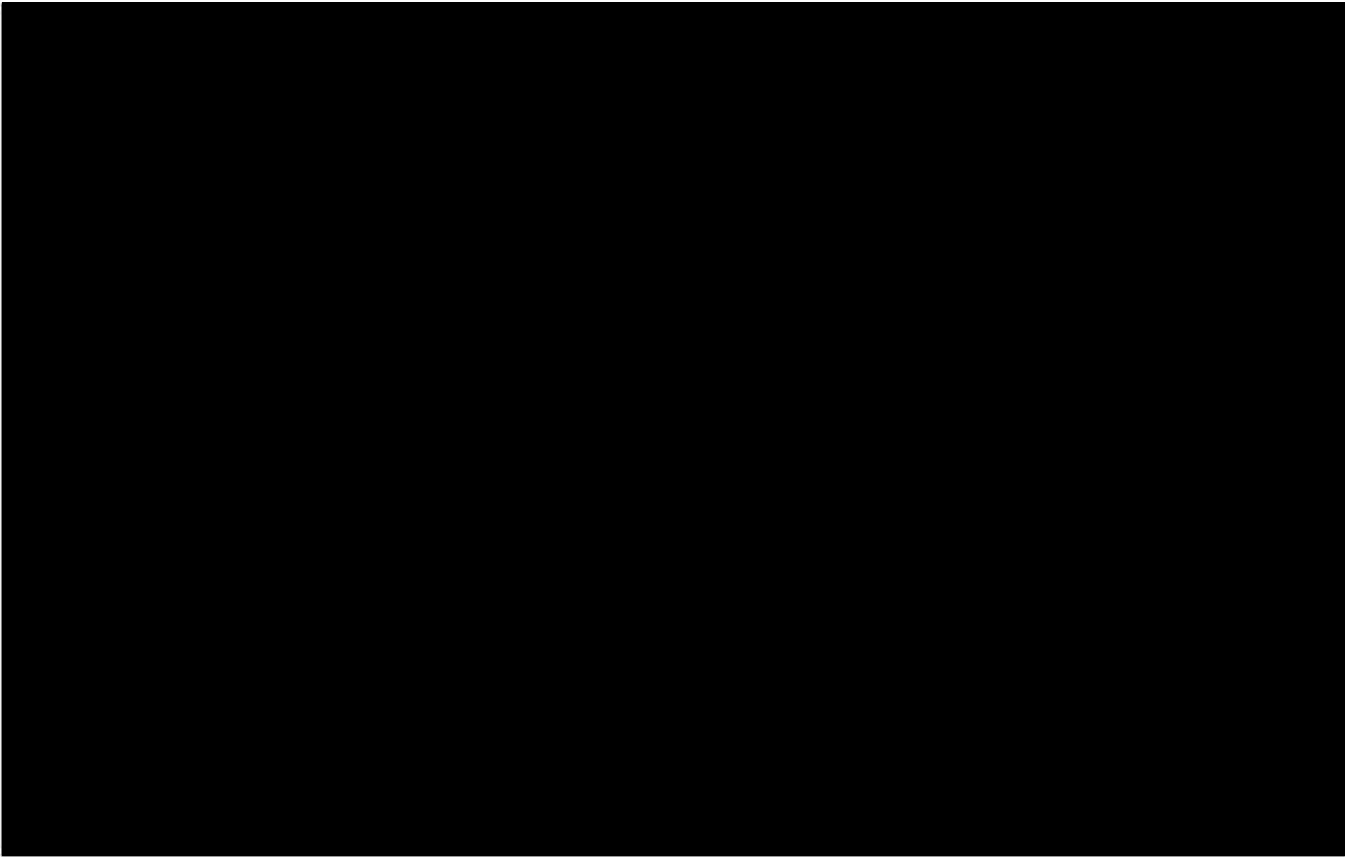














ATTACHMENT 12 – EMC Plan

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APPENDIX B | EMC PLAN

4.3 ELECTRICAL SYSTEMS



CONNECTING
SYDNEY





APPENDIX - EMC PLAN

4 FOREWORD

4.1 Object of this Appendix

The object of this appendix is to describe Connecting Sydney engineering process to be conducted throughout all the phases of the Sydney Light Rail Project in order to achieve the system Electromagnetic Compatibility level set out by TfNSW in the SLR PPP RFP (refer to §5.1.1).



Our LRT system encompasses the following subsystems which will be fully integrated on site:

- Rolling Stock (RST);
- Signalling (SIG);
- Communication (COM);
- Power Supply (POW);
- Aesthetic Power Supply (APS);
- Depot Equipment (DEQ);
- Automatic Fare Collection (AFC);
- Civil Work (CW) E&M;
- Track (TRK);
- Road Signalling (RSG);
- Overhead Wiring (OHW).

Among the previously listed subsystems, a particular attention will be paid to the EMC-key LRT subsystems which are directly identified by a part of the EMC railway standard EN 50121. Those subsystems are:

- Rolling Stock (RST);
- Signalling (SIG);
- Communication (COM);
- Power Supply (POW).

Each EMC-key subsystem must comply with the EMC requirements of the Sydney Light Rail Project, to prevent functional anomaly during their commercial operation, due to:

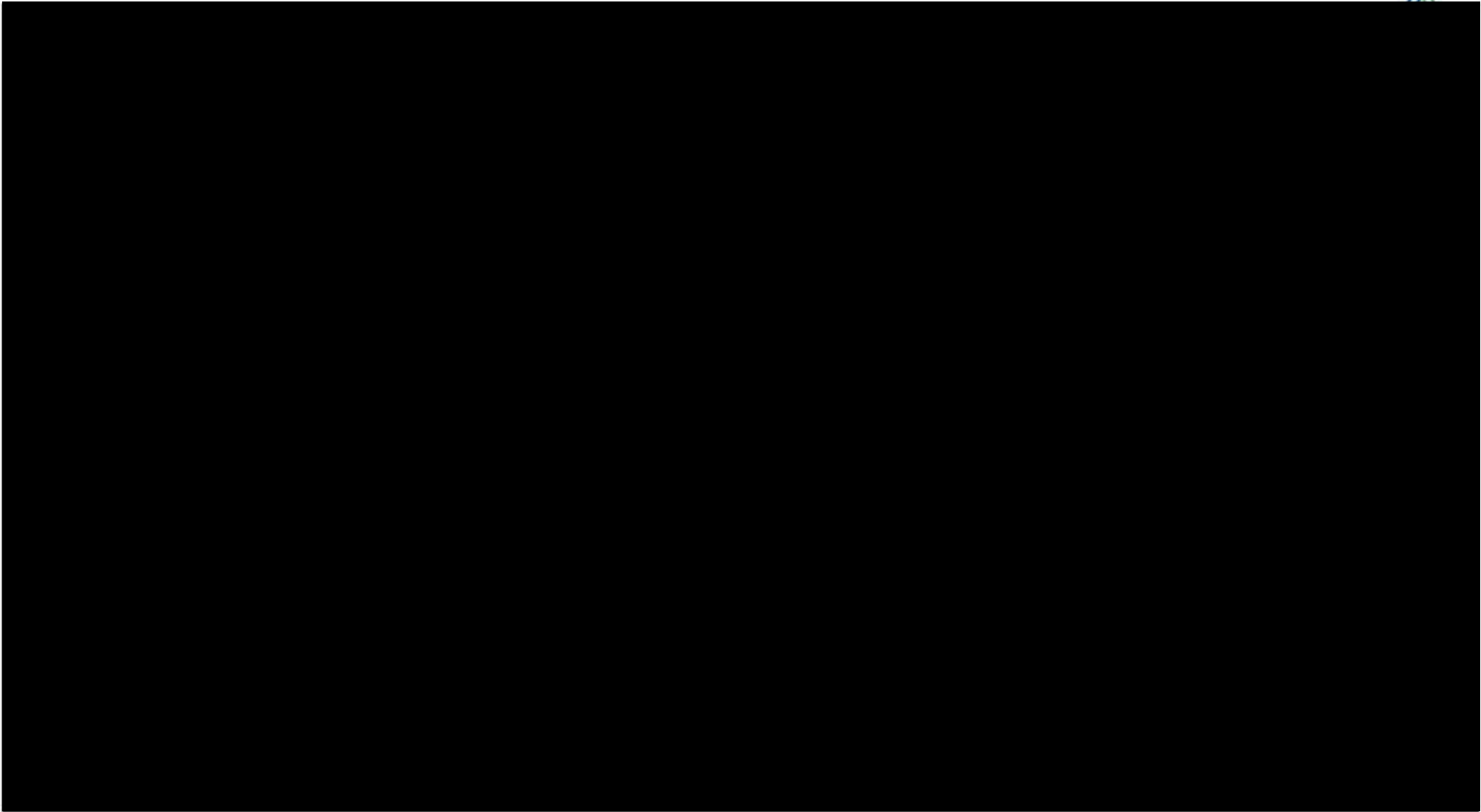
- its own self-generated EMC environment;
- the EM environment (Intrasystem EMC) generated by the other LRT EMC-key subsystems within Connecting Sydney scope of supply;
- the external EM environment (Intersystem EMC) in the operating site generated by systems external to the LRT systems.

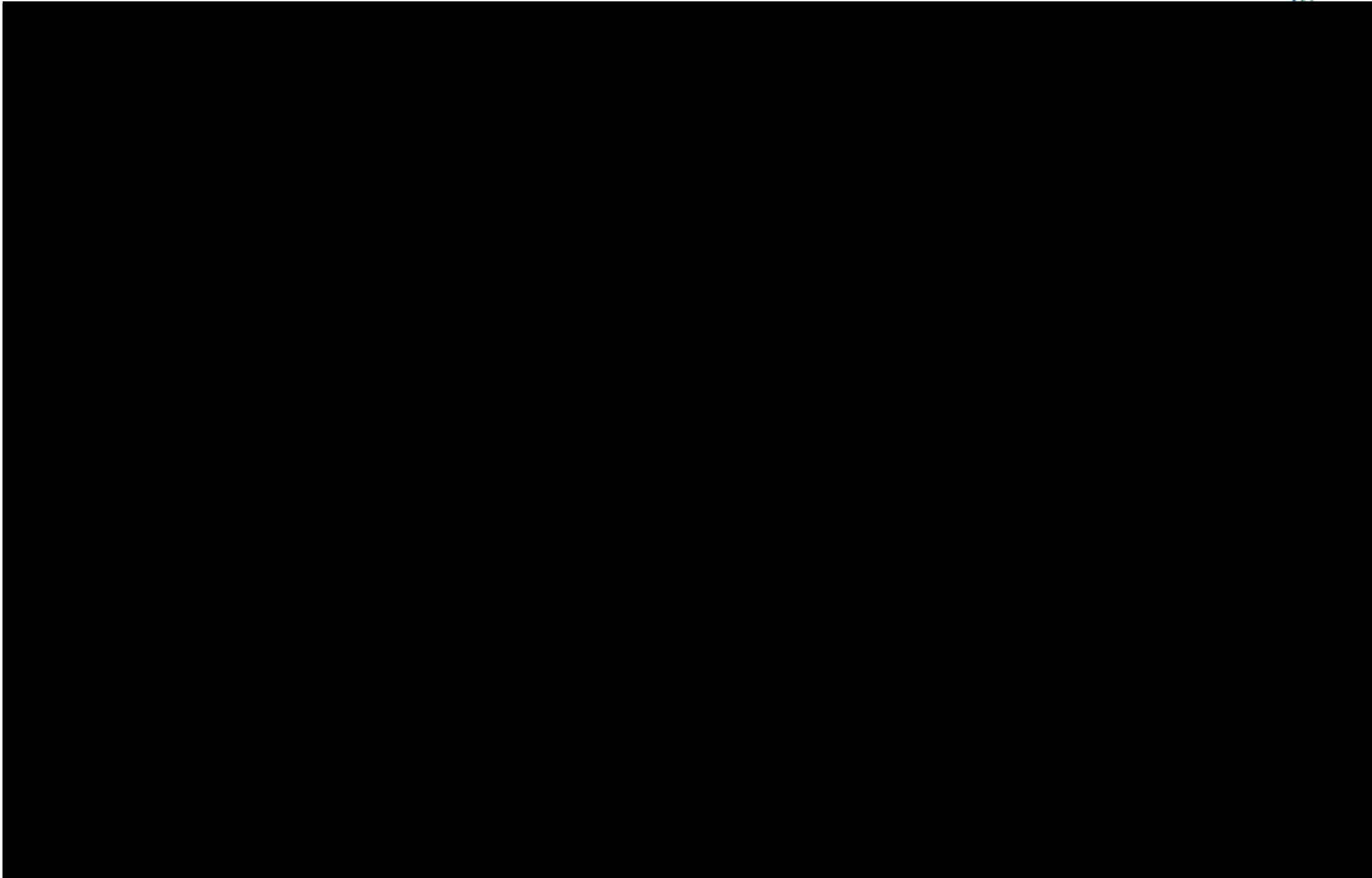
6 INTRODUCTION

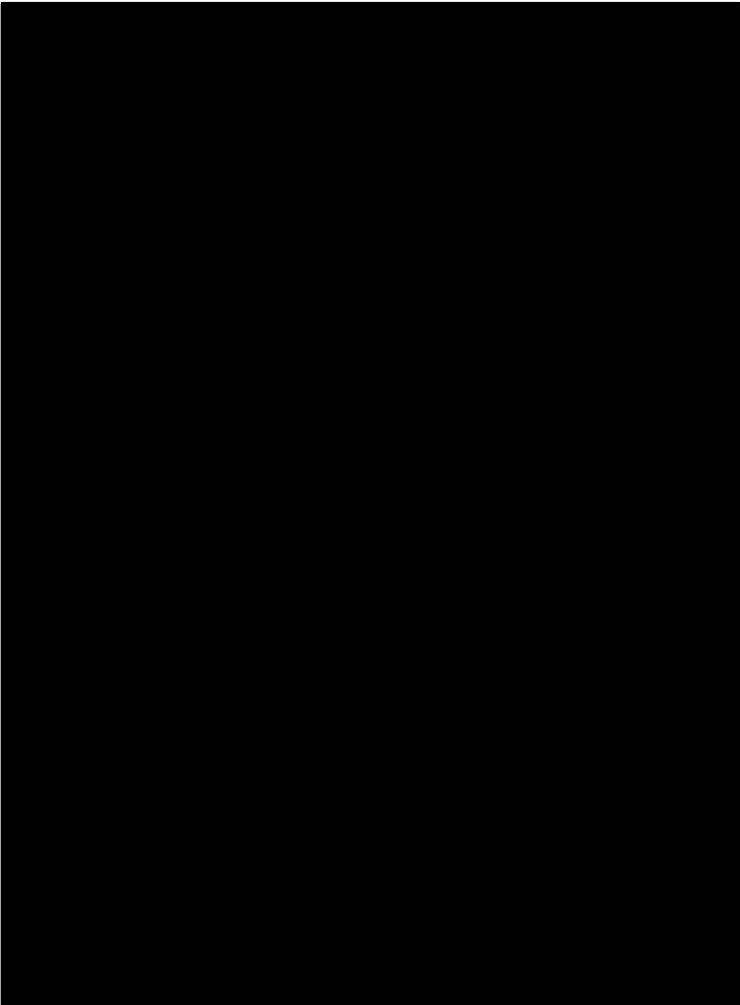
The SLR PPP project will operate both the existing IWLR, and the CSELR network extension. This 25 km long network will be operated by a fleet of 2 different types of LRV (CAF Urbos 3 for the IWLR and Alstom Citadis for the CSELR). A total of 43 stations (23 on IWLR and 20 on CSELR) will be operated. The whole network will be fed by 750 V OHW traction power. About 1600 m of CSELR will be wire free, thanks to Our APS solution.

Connecting Sydney systems will integrate E&M subsystems, which equipment are emitters of EM energy (both conducted and radiated), as well as equipment that are susceptible to EM conducted and radiated interference (EMI).

All these subsystems equipment must correctly operate, both internally, between themselves, and externally, with external systems in the surrounding environment, especially with sensitive receptors located at (but not limited to) the UNSW and the Prince of Wales hospital.







ATTACHMENT 13 – Earthing, Bonding and Stray Current Management Plan

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CONSOLIDATED CLARIFICATION

APPENDIX D | EARTHING BONDING AND
STRAY CURRENT MANAGEMENT PLAN

4.4 TRACTION POWER SUPPLY AND
ELECTRIFICATION SYSTEM



CONNECTING
SYDNEY





APPENDIX S: EARTHING AND BONDING AND STRAY CURRENT MANAGEMENT PLAN

4 INTRODUCTION

4.1 Object of the Document

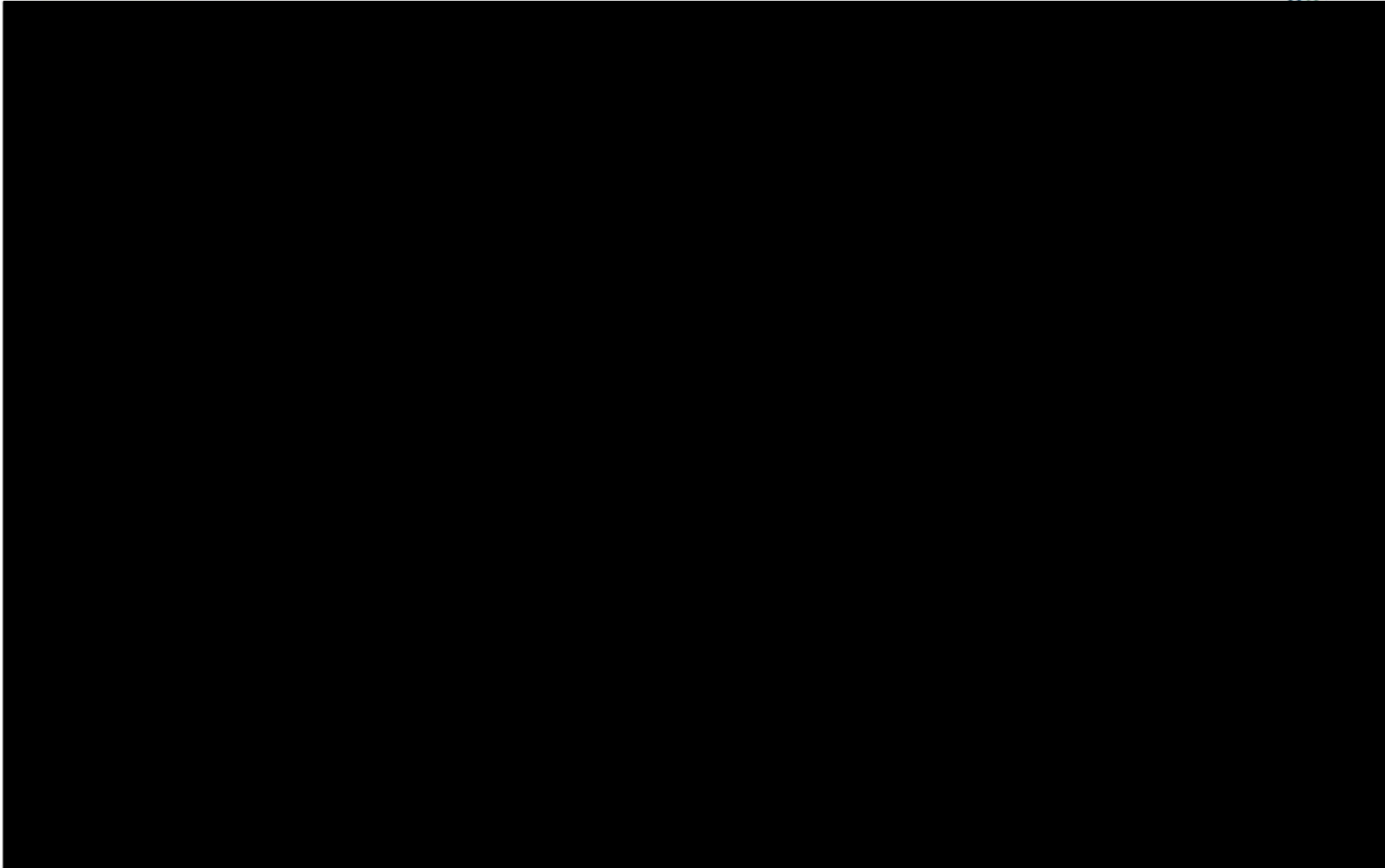
This document describes the principles of earthing and bonding and stray currents installations for SYDNEY Tramway project. It addresses protective provisions for electrical safety as well as protective provisions against the effects of stray currents caused by the D.C. traction system.

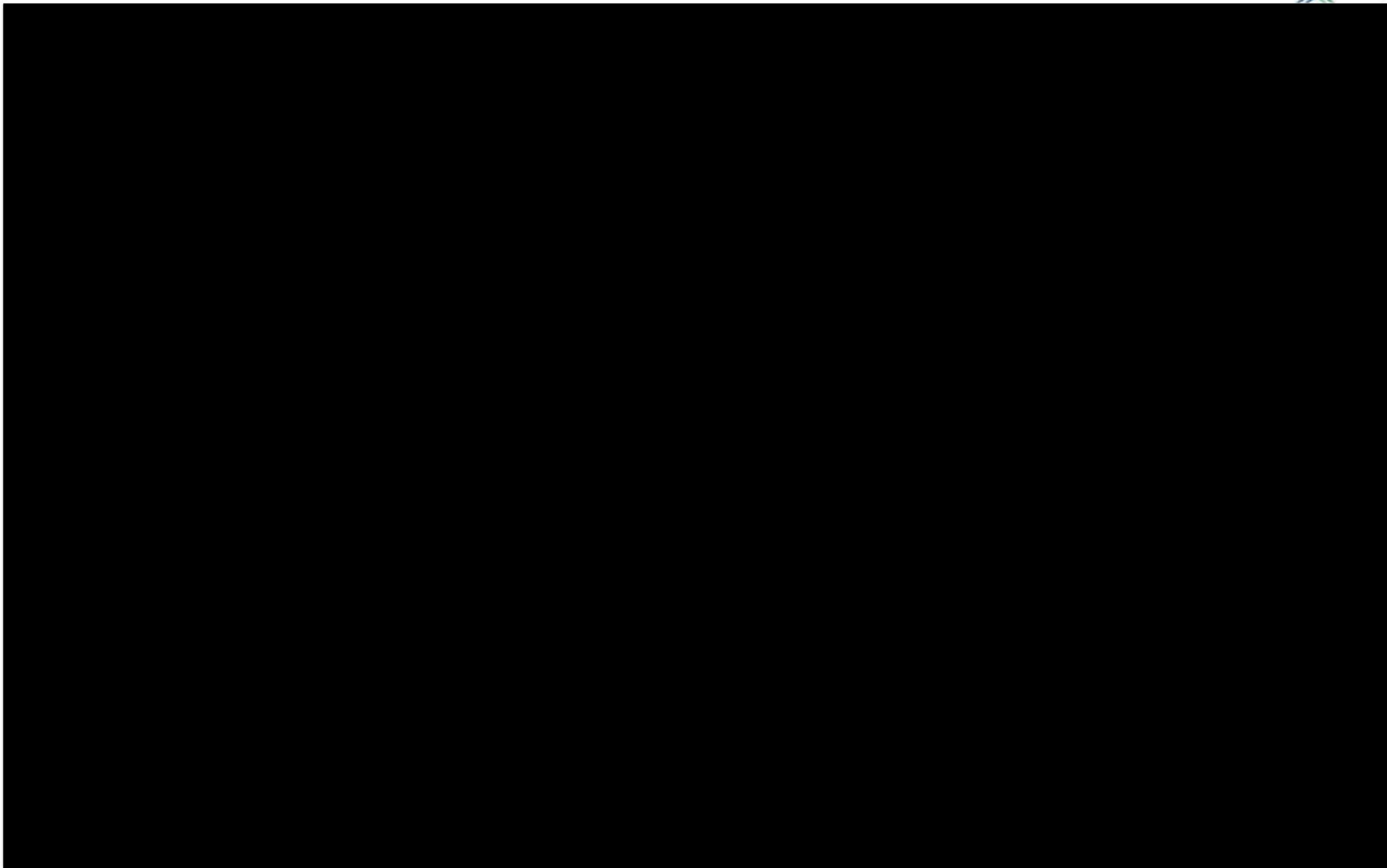
4.2 Scope

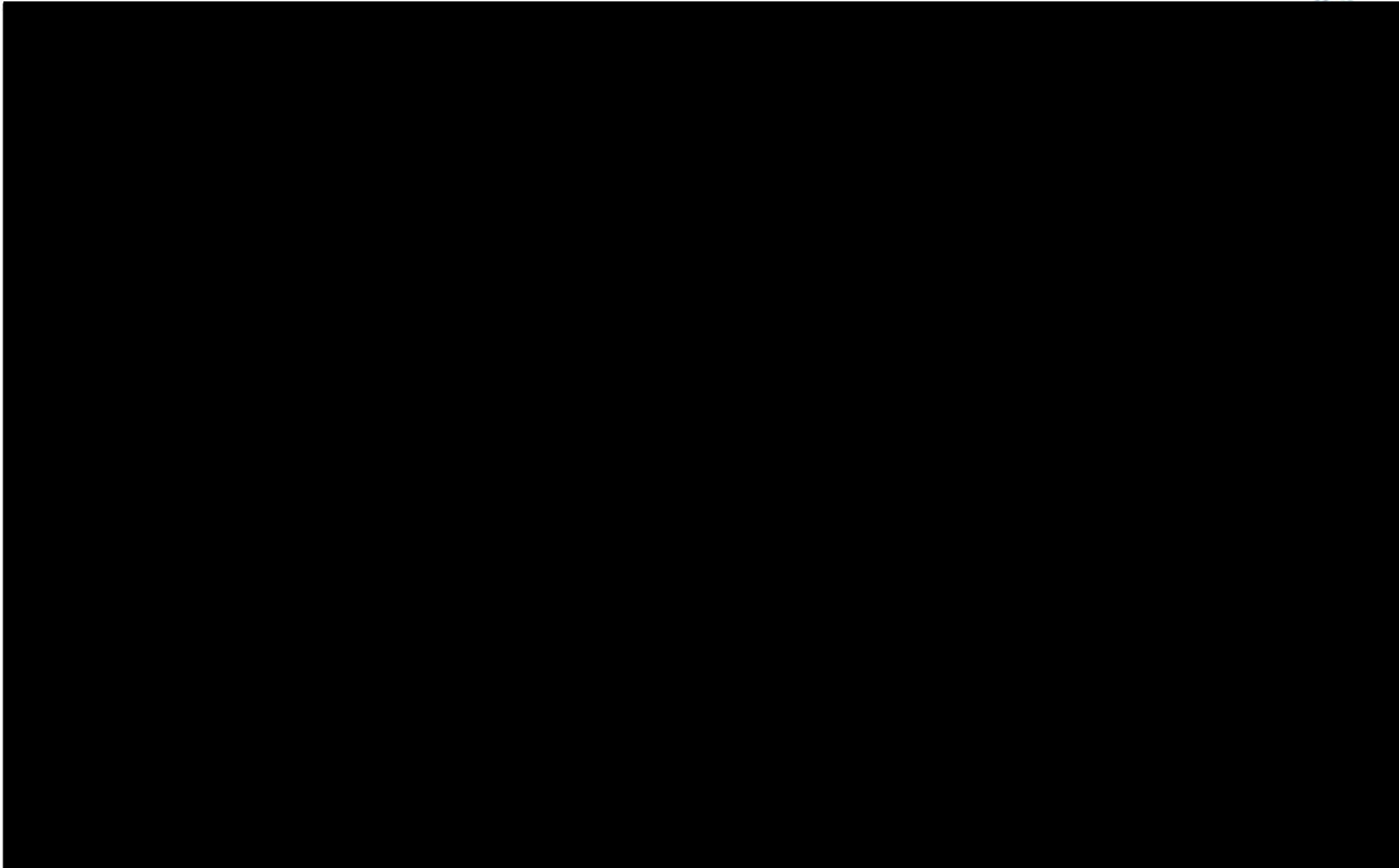
The document is applicable to Track system, Power supply system, Signalling, Civil and all other entities involved in structures and electrical equipment as well as in structures potentially affected by stray currents.

4.3 Usage Responsibility

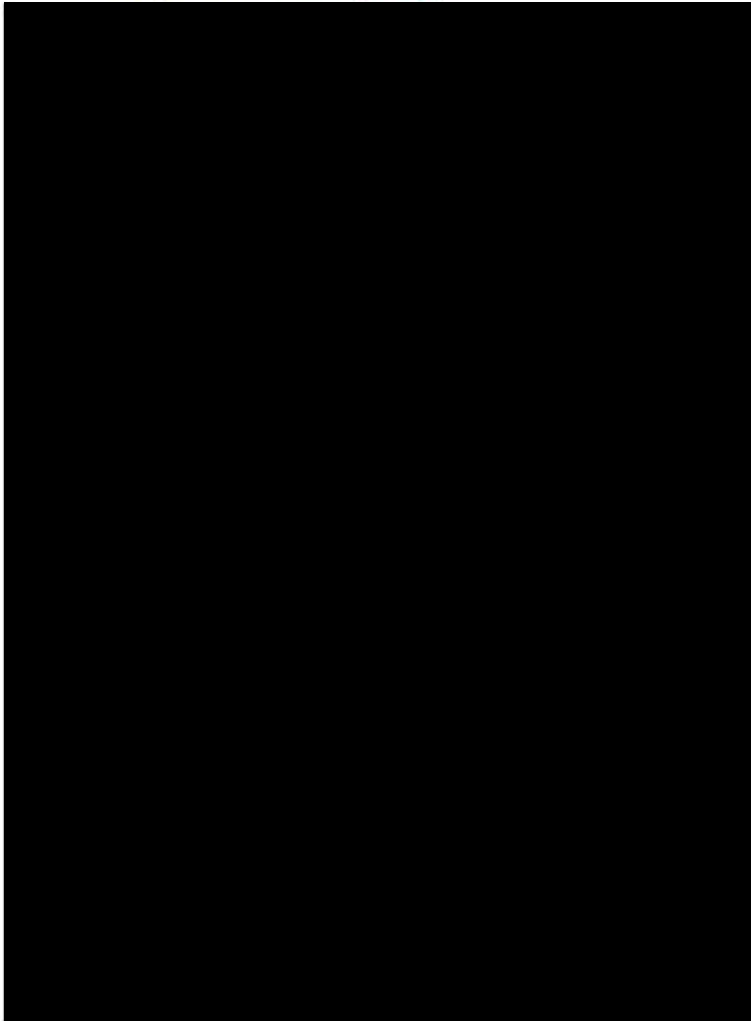
Every entity involved in the SYDNEY Tramway project– including subcontractors - shall take into consideration and respect the rules described in this plan.







the experience is everything





Transport
for NSW