

CHATSWOOD TO SYDENHAM
**SYDENHAM STATION
AND SYDNEY METRO
TRAINS FACILITY SOUTH
MODIFICATION REPORT**

APPENDICES

CONTENTS

APPENDICES



Contents

A	Secretary's environmental assessment requirements
B	Chatswood to Sydenham Design Guidelines
C	Traffic and transport technical appendix
D	Noise and vibration technical information
E	Non-Aboriginal heritage technical information
F	Landscape character and visual amenity technical information

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SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

APPENDIX A



Secretary's environmental assessment requirements

Desired Performance Outcome	Requirement	Where addressed
1. Environmental Impact Assessment Process The process for assessment of the proposal is transparent, balanced, well focussed and legal.	1. The Environmental Impact Statement must be prepared in accordance with Part 3 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> (the Regulation).	Not applicable
	2. It is the Proponent's responsibility to determine whether the project needs to be referred to the Commonwealth Department of the Environment for an approval under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act). The Proponent must contact the Commonwealth Department of the Environment immediately if it is determined that an approval is required under the EPBC Act, as supplementary environmental assessment requirements may need to be issued to ensure a streamlined assessment under the Bilateral agreement can be achieved. 3. Where the project requires approval under the EPBC Act and is being assessed under the Bilateral Agreement the EIS should address: a. Consideration of any Protected Matters that may be impacted by the development where the Commonwealth Minister has determined that the proposal is a Controlled Action. b. Identification and assessment of those Protected Matters that are likely to be significantly impacted. c. Details of how significant impacts to Protected Matters have been avoided, mitigated and, if necessary, offset. d. Consideration of, and reference to, any relevant conservation advices, recovery plans and threat abatement plans. 4. The onus is on the Proponent to ensure legislative requirements relevant to the project are met.	Chapter 4

Desired Performance Outcome	Requirement	Where addressed
2. Environmental Impact Statement The project is described in sufficient detail to enable clear understanding that the project has been developed through an iterative process of impact identification and assessment and project refinement to avoid, minimise or offset impacts so that the project, on balance, has the least adverse environmental, social and economic impact, including its cumulative impacts.	1. The EIS must include, but not necessarily be limited to, the following: a. executive summary; b. a description of the project, including all components and activities (including ancillary components and activities) required to construct and operate it; c. a statement of the objective(s) of the project; d. a summary of the strategic need for the project with regard to its critical State significance and relevant State Government policy; e. an analysis of any feasible alternatives to the project; f. a description of feasible options within the project; g. a description of how alternatives to and options within the project were analysed to inform the selection of the preferred alternative / option. The description must contain sufficient detail to enable an understanding of why the preferred alternative to and options(s) within the project were selected; h. potential opportunities for further network expansion and consideration of relationship to other Government public transport initiatives; a concise description of the general biophysical and socioeconomic environment that is likely to be impacted by the project (including offsite impacts). Elements of the environment that are not likely to be affected by the project do not need to be described; i. a demonstration of how the project design has been developed to avoid or minimise likely adverse impacts; j. the identification and assessment of key issues as provided in the ‘Assessment of Key Issues’ performance outcome; k. a statement of the outcome(s) the proponent will achieve for each key issue; l. measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact; m. an assessment of the cumulative impacts of the project taking into account other projects that have been approved but where construction has not commenced, projects that have commenced construction, and projects that have recently been completed (for example WestConnex, Barangaroo, any approved construction in the relevant precincts);	Not applicable, however the following is noted: • Description of the modification is provided in Chapters 6 and 7 • Need and justification for the modification is provided in Chapter 2 • Options analysis for the elements of the modification is provided in Chapter 3

Desired Performance Outcome	Requirement	Where addressed
	n. statutory context of the project as a whole, including: – how the project meets the provisions of the EP&A Act and EP&A Regulation; – a list of any approvals that must be obtained under any other Act or law before the project may lawfully be carried out; o. a chapter that synthesises the environmental impact assessment and provides: – a succinct but full description of the project for which approval is sought; – a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project; – a compilation of the impacts of the project that have not been avoided; – a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts; – a compilation of the outcome(s) the proponent will achieve; and – the reasons justifying carrying out the project as proposed, having regard to the biophysical, economic and social considerations, including ecologically sustainable development and cumulative impacts. p. relevant project plans, drawings, diagrams in an electronic format that enables integration with mapping and other technical software. 2. The EIS must only include data and analysis that is reasonably needed to make a decision on the proposal. Relevant information must be succinctly summarised in the EIS and included in full in appendices. Irrelevant, conflicting or duplicated information must be avoided.	

Desired Performance Outcome	Requirement	Where addressed
3. Assessment of Key Issues* Key issue impacts are assessed objectively and thoroughly to provide confidence that the project will be constructed and operated within acceptable levels of impact. * Key issues are nominated by the Proponent in the CSSI project application and by the Department in the SEARs. Key issues need to be reviewed throughout the preparation of the EIS to ensure any new key issues that emerge are captured. The key issues identified in this document are not exhaustive but are key issues common to most CSSI projects.	1. 1. The level of assessment of likely impacts must be proportionate to the significance of, or degree of impact on, the issue, within the context of the proposal location and the surrounding environment. The level of assessment must be commensurate to the degree of impact and sufficient to ensure that the Department and other government agencies are able to understand and assess impacts.	Chapters 9 to 20
	2. For each key issue the Proponent must: a. describe the biophysical and socio-economic environment, as far as it is relevant to that issue; b. describe the legislative and policy context, as far as it is relevant to the issue; c. identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts; d. demonstrate how potential impacts have been avoided (through design, or construction or operation methodologies); e. detail how likely impacts that have not been avoided through design will be minimised, and the predicted effectiveness of these measures (against performance criteria where relevant).	Chapters 9 to 20
	3. Where multiple reasonable and feasible options to avoid or minimise impacts are available, they must be identified and considered and the proposed measure justified taking into account the public interest.	Chapter 3
4. Consultation The project is developed with meaningful and effective engagement during project design and delivery.	1. The project must be informed by consultation, including with relevant government agencies, infrastructure and service providers, special interest groups, affected landowners, businesses and the community. The consultation process must be undertaken in accordance with the current guidelines. 2. The Proponent must document the consultation process, and demonstrate how the project has responded to the inputs received. 3. The Proponent must describe the timing and type of community consultation proposed during the design and delivery of the project, the mechanisms for community feedback, the mechanisms for keeping the community informed, and procedures for complaints handling and resolution.	Chapter 5

Desired Performance Outcome	Requirement	Where addressed
5. Biodiversity The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any remaining impacts of project construction and operation.	1. The Proponent must assess biodiversity impacts in accordance with the current guidelines including the Framework for Biodiversity Assessment (FBA). 2. The Proponent must assess any impacts on biodiversity values not covered by the FBA as specified in s2.3. 3. The Proponent must assess impacts on the following [EECs, threatened species and/or populations] and provide the information specified in s9.2 of the FBA. 4. The Proponent must identify whether the project as a whole, or any component of the project, would be classified as a Key Threatening Process (KTP) in accordance with the listings in the <i>Threatened Species Conservation Act 1997</i> (TSC Act), <i>Fisheries Management Act 1994</i> (FM Act) and <i>Environmental Protection and Biodiversity Conservation Act 2000</i> (EPBC Act).	Chapter 19
6. Flooding The project minimises adverse impacts on existing flooding characteristics. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards, or dam failure.	1. The Proponent must assess and model (where required), taking into account any relevant Council-adopted flood model or latest flood data available from Councils, the impacts on flood behaviour during construction and operation for a full range of flood events up to the probable maximum flood (taking into account sea level rise and storm intensity due to climate change) including: a. any detrimental increases in the potential flood affectation of other properties, assets and infrastructure; b. consistency (or inconsistency) with applicable Council floodplain risk management plans; c. compatibility with the flood hazard of the land; d. compatibility with the hydraulic functions of flow conveyance in flood ways and storage areas of the land; e. downstream velocity and scour potential; f. impacts the development may have upon existing community emergency management arrangements for flooding. These matters must be discussed with the State Emergency Services and Council; and g. any impacts the development may have on the social and economic costs to the community as consequence of flooding.	Chapter 17

Desired Performance Outcome	Requirement	Where addressed
7. Heritage The design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places. The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places.	1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:	Chapter 14 Chapter 15 Chapter 20
	a. Aboriginal places and objects, as defined under the <i>National Parks and Wildlife Act 1974</i> and in accordance with the principles and methods of assessment identified in the current guidelines;	Chapter 15
	b. Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	Chapter 15
	c. environmental heritage, as defined under the <i>Heritage Act 1977</i> ; and d. items listed on the National and World Heritage lists.	Chapter 14
	2. Where impacts to State or locally significant heritage items are identified, the assessment must:	
	a. include a statement of heritage impact for all heritage items (including significance assessment); b. consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant);	
	c. outline measures to avoid and minimise those impacts in accordance with the current guidelines; and	Chapter 14 Chapter 15
	d. be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council’s Excavation Director criteria).	Chapter 14 Chapter 15
	3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the <i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010).	Chapter 15
	4. Where impacts to Aboriginal objects and/or places are proposed, consultation must be undertaken with Aboriginal people in accordance with the current guidelines.	Chapter 15

Desired Performance Outcome	Requirement	Where addressed
8. Noise and Vibration – Amenity Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity. Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community.	1. The Proponent must assess construction and operational noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to sensitive receivers including commercial premises, and include consideration of sleep disturbance and, as relevant, the characteristics of noise and vibration (for example, low frequency noise).	Chapter 11
	2. If blasting is required, the relevant requirements of <i>Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration</i> (ANZEC 1990) are to be assessed.	Chapter 11
9. Noise and Vibration – Structural Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage. Increases in noise emissions and vibration affecting environmental heritage as defined in the <i>Heritage Act 1977</i> during operation of the project are effectively managed.	1. The Proponent must assess construction and operation noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage).	Chapter 11 Chapter 14
	2. The Proponent must demonstrate that blast impacts are capable of complying with the current guidelines, if blasting is required.	Chapter 11
10. Socio-economic, Land Use and Property The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities. The project minimises impacts to property and business and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.	1. The Proponent must assess social and economic impacts in accordance with the current guidelines.	Chapter 12
	2. The Proponent must assess impacts from construction and operation on potentially affected properties, approved development applications, businesses, public open space, recreational users and land and water users (for example, recreational and commercial fishers, oyster farmers), including property acquisitions/adjustments, access, amenity and relevant statutory rights.	Chapter 9 Chapter 12 Chapter 13 Chapter 20
	3. Assess the likely risks of the project to public safety, paying particular attention to subsidence risks, bushfire risks and the handling and use of dangerous goods.	Not applicable

Desired Performance Outcome	Requirement	Where addressed
11. Soils The environmental values of land, including soils, subsoils and landforms, are protected. Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.	1. The Proponent must verify the risk of acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Risk Map) within, and in the area likely to be impacted by, the project.	Chapter 18
	2. The Proponent must assess the impact of the project on acid sulfate soils (including impacts of acidic runoff offsite) in accordance with the current guidelines.	Chapter 18
	3. The Proponent must assess whether the land is likely to be contaminated and identify if remediation of the land is required, having regard to the ecological and human health risks posed by the contamination in the context of past, existing and future land uses. Where assessment and/or remediation is required, the Proponent must document how the assessment and/or remediation would be undertaken in accordance with current guidelines.	Chapter 18
	4. The Proponent must assess whether salinity is likely to be an issue and if so, determine the presence, extent and severity of soil salinity within the project area.	Not applicable
	5. The Proponent must assess the impacts of the project on soil salinity and how it may affect groundwater resources and hydrology.	Not applicable
	6. The Proponent must assess the impacts on soil and land resources (including erosion risk or hazard). Particular attention must be given to soil erosion and sediment transport consistent with the practices and principles in the current guidelines.	Not applicable
12. Sustainability The project reduces the NSW Government’s operating costs and ensures the effective and efficient use of resources. Conservation of natural resources is maximised.	1. The Proponent must assess the project against the current guidelines including targets and strategies to improve Government efficiency in use of water, energy and transport.	Not applicable

Desired Performance Outcome	Requirement	Where addressed
13. Transport and Traffic Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained. Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.	1. The Proponent must assess construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to:	
	a. a considered approach to route identification and scheduling of transport movements;	Chapter 9
	b. the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements);	Chapter 9
	c. the capacity of or need to upgrade roads proposed as construction vehicle routes including Bedwin Road;	Chapter 9
	d. changes to existing local and regional road networks including access to and around the proposed Chatswood tunnelling site;	Chapter 9
	e. construction worker parking;	Chapter 9
	f. the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements), including access to the Overseas Passenger Terminal for deliveries and passenger coaches;	Chapter 9
	g. details of how construction and scheduling of works are to be coordinated in regard to public events; cumulative traffic impacts resulting from concurrent work on Westconnex, Barangaroo, Sydney Light Rail and other key construction projects in the Sydney CBD;	Chapter 20
	h. alternatives to road transport of construction spoil;	Chapter 9
	i. access constraints and impacts on public transport, pedestrian access and cyclists;	Chapter 9
	j. the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project;	Chapter 9
	k. assess the likely risks of the project to public safety, paying particular attention to pedestrian safety and users of Sydney Harbour; and	Chapter 9
	l. impacts to water based traffic and shipping channels on users of Sydney Harbour with particular reference to the channel between Blues Point and Millers Point for passage to and from White Bay, Glebe Island and Gore Cove.	Not applicable

Desired Performance Outcome	Requirement	Where addressed
	2. The Proponent must assess the operational transport impacts of the project, including: a. forecast travel demand and traffic volumes for the project and the surrounding road, cycle and public transport network; b. travel time analysis; c. performance of interchanges and intersections by undertaking a coordinated level of service analysis at locations affected by stations; d. wider transport interactions (local and regional roads, permanent loss of parking, the need for kiss and ride facilities, cycling, public and freight transport); e. induced traffic and operational implications for public transport (particularly with respect to strategic bus corridors and bus routes) and consideration of opportunities to improve public transport; f. impacts to pedestrian access in and around stations and connecting streets, capacity of streets at peak pedestrian times, including phasing of traffic lights, intersection crossing times and connectivity between stations g. assess the benefits to each station and the general vicinity of walking and cycling catchments and the provision of infrastructure to support sustainable transport options. h. impacts on cyclists and pedestrian access and safety; and i. opportunities to integrate cycling and pedestrian elements with surrounding networks and in the project.	Chapter 10
14. Urban design The project design complements the visual amenity, character and quality of the surrounding environment. The project contributes to the accessibility and connectivity of communities.	1. The Proponent must: a. identify the urban design and landscaping aspects of the project and its components; b. include consideration of urban design principles adopted by each council or within each station precinct; c. assess the impact of the project on the urban, rural and natural fabric; d. explore the use of Crime Prevention Through Environmental Design (CPTED) principles during the design development process, including natural surveillance, lighting, walkways, signage and landscape; and e. identify urban design strategies and opportunities to enhance healthy, cohesive and inclusive communities.	Chapter 6 Chapter 16

Desired Performance Outcome	Requirement	Where addressed
15. Visual Amenity The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.	1. The Proponent must assess the visual impact of the project and any ancillary infrastructure on: a. views and vistas; b. streetscapes, key sites and buildings; c. the local community. 2. The Proponent must provide artist impressions and perspective drawings of the project to illustrate how the project has responded to the visual impact through urban design and landscaping.	Chapter 16
16. Waste All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.	1. The Proponent must assess predicted waste generated from the project during construction and operation, including: a. classification of the waste in accordance with the current guidelines; b. estimates / details of the quantity of bulk earthworks and spoil balance to be generated during construction of the project; c. handling of waste including measures to facilitate segregation and prevent cross contamination; d. management of waste including indicative location and volume of stockpiles; e. waste minimisation and reuse; f. lawful disposal or recycling locations for each type of waste using a hierarchy which prioritises higher value end use; and g. contingencies for the above, including managing unexpected waste volumes. 2. The Proponent must assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste particularly with relation to sediment/leachate control, noise and dust.	Not applicable

Desired Performance Outcome	Requirement	Where addressed
17. Water – Hydrology Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.	1. The Proponent must describe (and map) the existing hydrological regime for any surface and groundwater resource (including reliance by users and for ecological purposes) likely to be impacted by the project, including stream orders, as per the FBA.	Chapter 17
	2. The Proponent must assess (and model if appropriate) the impact of the construction and operation of the project and any ancillary facilities (both built elements and discharges) on surface and groundwater hydrology in accordance with the current guidelines, including:	Chapter 17
	a. natural processes within rivers, wetlands, estuaries, marine waters and floodplains that affect the health of the fluvial, riparian, estuarine or marine system and landscape health (such as modified discharge volumes, durations and velocities), aquatic connectivity and access to habitat for spawning and refuge;	Chapter 17
	b. impacts from any permanent and temporary interruption of groundwater flow, including the extent of drawdown, barriers to flows, implications for groundwater dependent surface flows, ecosystems and species, groundwater users and the potential for settlement;	Chapter 17
	c. changes to environmental water availability and flows, both regulated/licensed and unregulated/rules-based sources;	Not applicable
	d. direct or indirect increases in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses;	Not applicable
	e. minimising the effects of proposed stormwater and wastewater management during construction and operation on natural hydrological attributes (such as volumes, flow rates, management methods and re-use options) and on the conveyance capacity of existing stormwater systems where discharges are proposed through such systems; and	Chapter 17
	f. water take (direct or passive) from all surface and groundwater sources with estimates of annual volumes during construction and operation.	Chapter 17
	3. The Proponent must identify any requirements for baseline monitoring of hydrological attributes.	Not applicable

Desired Performance Outcome	Requirement	Where addressed
18. Water – Quality The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable).	1. The Proponent must: - state the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the project, including the indicators and associated trigger values or criteria for the identified environmental values; - identify all pollutants that may be introduced into the water cycle and describe the nature and degree of impact that any discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment; - identify the rainfall event that the water quality protection measures will be designed to cope with; - assess the significance of any identified impacts including consideration of the relevant ambient water quality outcomes; - demonstrate how construction and operation of the project will, to the extent that the project can influence, ensure that: - where the NSW WQOs for receiving waters are currently being met they will continue to be protected; and - where the NSW WQOs are not currently being met, activities will work toward their achievement over time; - justify, if required, why the WQOs cannot be maintained or achieved over time; - demonstrate that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented; - identify sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments; and - identify proposed monitoring locations, monitoring frequency and indicators of surface and groundwater quality.	Not applicable
19. Utilities The project is designed, construction and operated to minimise impacts to utilities and provision of such to the public.	1. The Proponent must consider: - the impact of the project on the integrity of trunk assets and the need to augment or relocate; - opportunities to support initiatives adopted by Councils and utilities providers; and - how access to assets will be maintained during construction.	Chapter 7

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CHATSWOOD TO SYDENHAM DESIGN GUIDELINES

APPENDIX B



Sydney Metro City & Southwest

Chatswood to Sydenham Design Guidelines

June 2017

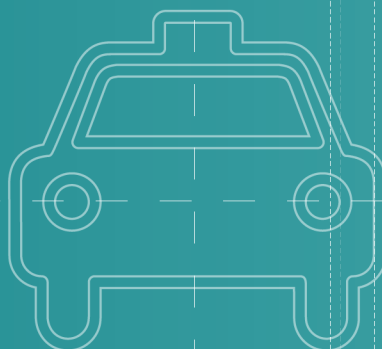
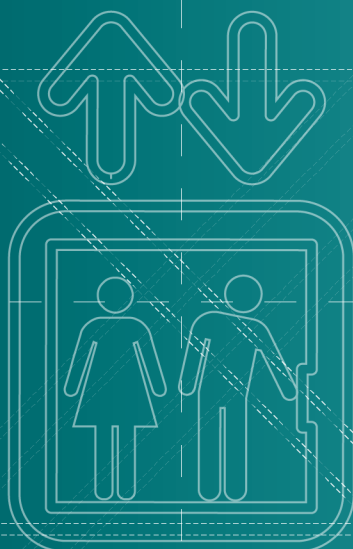
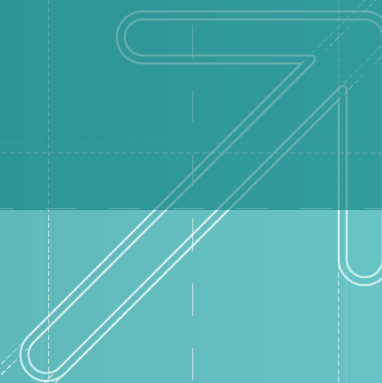




Table of Contents

1	Introduction	
1.1	Purpose of these Guidelines	2
1.2	Project Scope	3
1.3	Project Vision	4
1.4	Design Objectives	5
1.5	Understanding Customer Needs	6
1.6	A Commitment to Safety	8
1.7	A Commitment to Sustainability	9
1.8	Structure of the Guidelines	10
1.9	Application of the Guidelines	11
2	Stations	
	About this Section	14
2.1	Crows Nest	16
2.2	Victoria Cross	19
2.3	Barangaroo	22
2.4	Martin Place	25
2.5	Pitt Street	28
2.6	Central	31
2.7	Waterloo	33
2.8	Sydenham	36
3	Function & Experience	
	About this Section	40
3.1	An Easy Customer Experience	41
3.1.1	Customer Centred Design	42
3.1.2	Customer Circulation	43
3.1.3	Wayfinding and Legibility	44
3.1.4	Comfort and Amenity	45
3.1.5	Customer Safety	46
3.1.6	Accessibility	48
3.2	Identity	49
3.2.1	Network and Station Legibility	50
3.2.2	Place-making	51
3.2.3	Heritage and Archaeology	52
3.2.4	Environment and Sustainability	53
3.2.5	Art	54
3.2.6	Lighting	55
3.3	Connectivity	56
3.3.1	Interchange	57
3.3.2	Pedestrian Movement	58
3.3.3	Bicycle Movement	59
3.3.4	Vehicular Interface	60
4	Elements	
	About this Section	62
4.1	Stations	63
4.1.1	Station Typology	64
4.1.2	Station Entries	65
4.1.3	Platforms	66
4.1.4	Circulation Elements	67
4.1.5	Flooring	68
4.1.6	Internal Walls and Ceilings	69
4.2	Urban Realm	70
4.2.1	Landscaping	71
4.2.2	Accessible Pathways	72
4.2.3	Furniture	73
4.2.4	Walls and Fences	74
4.2.5	Earthworks and Engineered Structures	75
4.3	Operation and Services	76
4.3.1	Wayfinding and Signage	77
4.3.2	Ticketing Equipment	78
4.3.3	Engineering and Services Integration	79
4.3.4	Management and Maintenance	80
4.3.5	Security	81
4.3.6	Emergency Requirements	82
4.3.7	Service Vehicle Access	83
4.4	Specific Elements	84
4.4.1	Sydney Yard Access Bridge	85
4.4.2	Central Walk	86
4.4.3	Sydenham Aqueduct	87
4.4.4	Sydney Metro Trains Facility - South	88
	Image References	90

Introduction

1.1	Purpose of these Guidelines	2
1.2	Project Scope	3
1.3	Project Vision	4
1.4	Design Objectives	5
1.5	Understanding Customer Needs	6
1.6	A Commitment to Safety	8
1.7	A Commitment to Sustainability	9
1.8	Structure of the Guidelines	10
1.9	Application of the Guidelines	11

1.1 Purpose of these Guidelines

The Guidelines will support the development of healthy, cohesive and inclusive communities.

The Guidelines establish the design standards for the Sydney Metro Chatswood to Sydenham project (the project) by guiding the design of the interface between stations and their surrounding locality including:

- Station entries
 - Transport interchange facilities (bicycle facilities, bus stops, kiss and ride, taxi ranks and connections to existing rail, ferry and light rail transport)
 - Landscaping and other public domain elements.
- Rail corridor works including the tunnel drive structures, rail cuttings and embankments.
 - Station and service buildings, including underground stations

Any development above Metro stations would be subject to a separate planning approval.

The Guidelines have been developed to respond to the strategic directions and urban design strategies of the local Councils. The Guidelines will be used by Transport for NSW (TfNSW) to guide the design development process for the project.

The Sydney Metro Delivery Office, part of TfNSW, is managing the planning, procurement and delivery of the Sydney Metro Network.



Grand Concourse, Central Station, Sydney. Accommodating Sydney's growing population in a manner that protects Sydney's status as a global city.
Source: TfNSW.

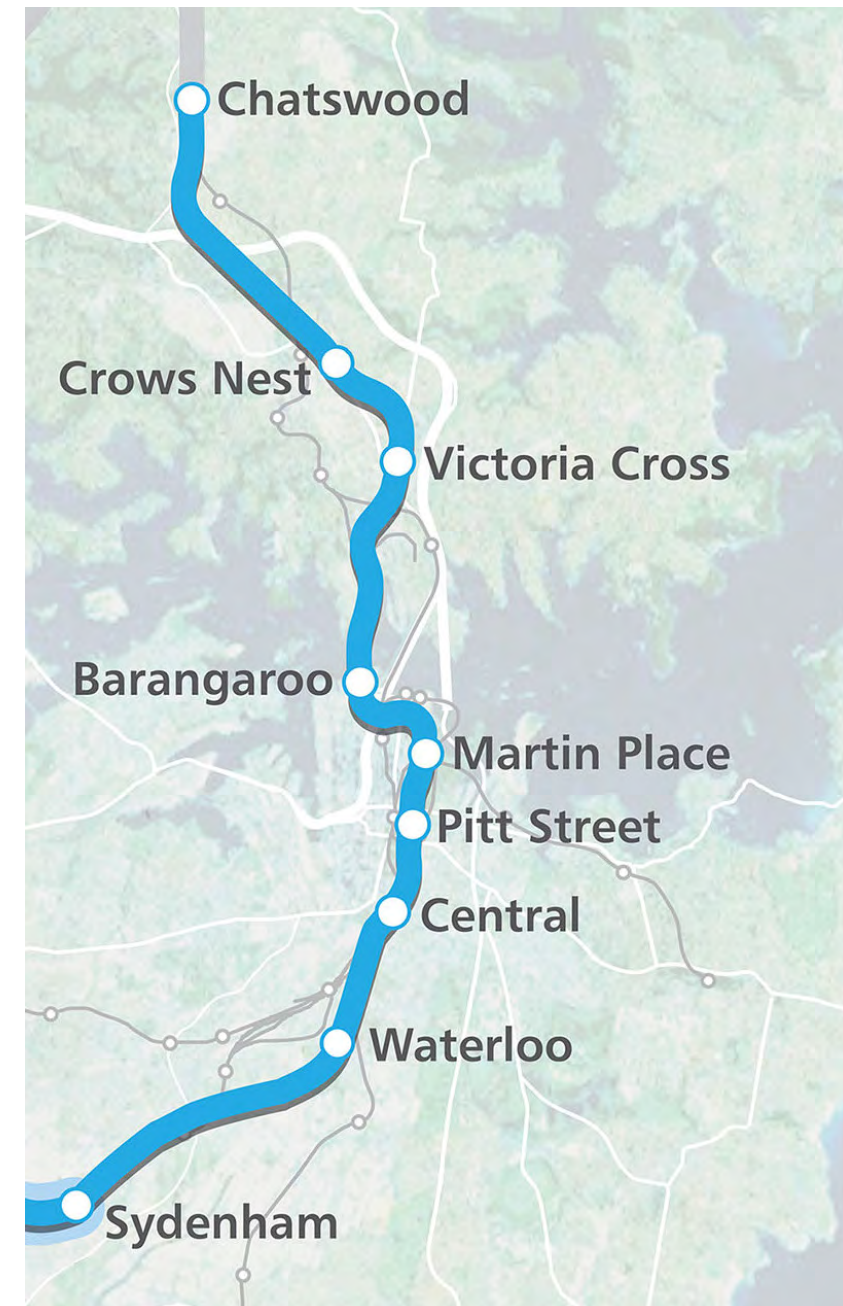
1.2 Project Scope

The Chatswood to Sydenham component of the Project includes the construction and operation of a new metro rail line from Chatswood under Sydney Harbour through Sydney's CBD to Sydenham. The project will deliver eight new metro stations at;

- Crows Nest
- Victoria Cross (North Sydney)
- Barangaroo
- Martin Place
- Pitt Street
- Central Station (new underground platforms)
- Waterloo
- Sydenham

Key Project features include:

- 16km of new metro line between Chatswood and Sydenham.
- 15km of new twin rail tunnels.
- Convenient interchanges with other forms of transport including Sydney Trains, NSW Trains, light rail, buses and ferries.
- All stations will meet the needs of pedestrians, cyclists, customers catching or getting off buses and taxis, and people being dropped off and picked up in cars.
- There will be platform screen doors and all stations will be fully accessible.
- New stations designed for passenger comfort including environmentally friendly features like natural ventilation and natural lighting.



Chatswood to Sydenham alignment map

1.3 Project Vision

Transport for NSW’s vision for Sydney Metro is:
“Transforming Sydney with a new world class metro”.

The Sydney Metro Delivery Office’s mission is to deliver a world class, connected metro, which will provide more choice to customers and opportunities for our communities now and in the future.

Sydney Metro is also a unique opportunity to demonstrate an exemplary approach to integrated transport and land use planning. Quality architecture, good urban design and a user friendly and inter-connected transport system are critical to ensuring that the Sydney Metro project meets customer needs and expectations and maximises its city shaping potential and broader urban benefits.



Sydney Metro alignment map

1.4 Design Objectives

To help meet the transformational vision and world class aspirations of the project, five **Design Objectives** for the project have been agreed to guide decision making and the design process for the City & Southwest project.

A **Design Principle** is prescribed under each design objective, describing the intention of the objective for the design of stations, station precincts and the wider Metro corridor:

Objective 1: Ensuring an easy customer experience.

Principle
Sydney Metro places the customer first. Stations are welcoming and intuitive with simple, uncluttered spaces that ensure a comfortable, enjoyable and safe experience for a diverse range of customers.

Objective 2: Being part of a fully integrated transport system.

Principle
Sydney Metro is a transit-oriented project that prioritises clear and legible connections with other public and active transport modes within the wider metropolitan travel network that intersect with this new spine.

Objective 3: Being a catalyst for positive change.

Principle
Sydney Metro is a landmark opportunity to regenerate and invigorate the city with new stations and associated development that engage with their precincts, raise the urban quality and enhance the overall experience of the city.

Objective 4: Being responsive to distinct contexts and communities.

Principle
Sydney Metro's identity is stronger for the unique conditions of centres and communities through which it passes. This local character is to be embraced through distinctive station architecture and public domain that is well integrated with the inherited urban fabric of existing places.

Objective 5: Delivering an enduring and sustainable legacy for Sydney.

Principle
Sydney Metro is a positive legacy for future generations. A high standard of design across the corridor, stations and station precincts, that sets a new benchmark, is vital to ensuring the longevity of the Metro system, its enduring contribution to civic life and an ability to adapt to a changing city over time.



Kings Cross Station, London UK. World class transport hub.
Architect: John McAslan + Partners
Source: Wikipedia

1.5 Understanding Customer Needs

Customer Centred Design

At Sydney Metro we aim to serve a diverse set of customers who will undertake a number of journeys throughout the day and week using our Metro. The design and delivery of service is centred around the customer – their needs, behaviours, and jobs to be done (tasks they want to achieve using the service).

Our commitment is to deliver a reliable “door-to-door-to-door” transport solution that is surprisingly easy for all our customers by the delivery of a thoughtfully designed, seamlessly integrated experience that moves customer’ around quickly and easily and is adaptive to change. Providing services centred around the customer is key to Sydney Metro’s ongoing success and building a solid customer base.

Our customer experience target



Sydney Metro customer experience pyramid
Source: TfNSW

At a very basic level our customers expect us to provide a service that is on time, clean, safe, comfortable, efficient, and convenient, has the right information, and has adequate customer service. These basics are key drivers of customer satisfaction.

Our goal is to deliver a level of service that goes beyond satisfaction and makes it easy for customers’ to use the Metro and encourages repeat use across the multiple types of journeys they may make. This will endeavour to support TfNSW’s goal of increasing the number of journeys taken on public transport by the public both in the peak and off peak.

Designing for an easy customer experience is an important part of engaging customers to use Sydney Metro as part of their journey. Customers will expect more from our service over time and ease of use is the foundation for design and development of all our products, services, systems and spaces going forward.

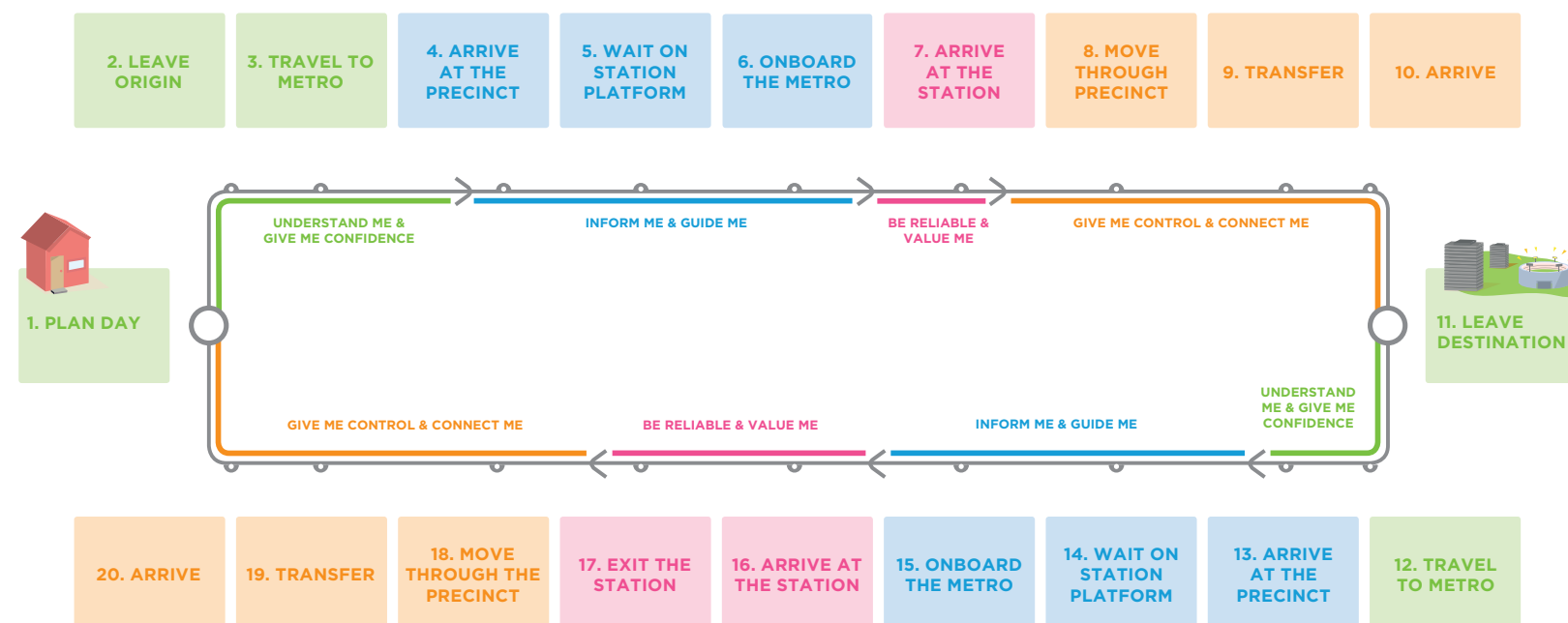
An integrated customer journey - ‘door-to-door-to-door’

Customers see their journey from door-to-door-to-door (from origin to destination and back again) and may plan and utilise multiple travel modes throughout their journey in order to achieve their job to be done. It is critical to customers’ that their journey is seamless and well integrated across all connecting modes and that there is easy access to connect to the Metro.

A customers’ ideal journey starts at their origin when they are planning their day. At this point they decide whether they travel with us or not. The information about all our modes and connection with Metro systems and services will be key in enabling customers to make a choice to use us. If a customer cannot easily see how they can leave their origin, get to their destination and then return or do another onward journey – they are less likely to engage with us as part of their journey.

At each stage of the journey there are a number of touchpoints where the customer will interact with a TfNSW product, service, system or is interacting in one of our spaces such as a precinct or an interchange or using one of our modes. At these touchpoints we aim to make it easy to interact as well as provide consistency in service delivery and information such that it is easy for a customer to have a seamless journey from door to door to door.

The customer journey map diagram captures the touchpoints in a customers’ ideal journey door (origin – planning the day) to door (destination) to door (return to origin). Key elements that are important to customers have been noted at each touchpoint. We need to make sure that these elements are well understood so we can deliver a product and service that matches customer needs



Sydney Metro customer journey map
Source: TfNSW

Sydney Metro Easy Customer Principles

The Sydney Metro Customer Principles are to be used to guide the design, development and operation of the services, products, systems and spaces to enable customers to have an easy customer experience. They outline:

What customers need:

- Understand Me – means demonstrating awareness and appreciation of my requirements for certainty, safety and value by providing me with easy and effective transport experiences that match my specific needs and wants.
- Give Me Confidence – means providing me with a clear appreciation for the integrated service offerings available through Sydney Metro. Assure me that throughout the journey that I can trust Sydney Metro to provide dependable, safe and secure solutions that will meet my particular needs whilst getting me to my destination in time and home again comfortably.

What the service must offer:

- Inform Me – means providing me with easy access to clear, accurate, relevant and up-to-date information at appropriate times and through convenient channels that enables me to plan my day, execute my plans and share details with others so I can easily achieve my goals with the least amount of effort, confusion and with minimal disruption.
- Guide Me – means showing me the best way to get to where I want to go, in order to get there in time, with the least amount of frustration, stress or uncertainty by directing, instructing and managing flow, crowding or impediments. It also means helping me resolve any problems or difficulties I might encounter that might negatively impact my overall experience.

How the organisation must deliver it:

- Be Reliable – means providing an effective frequency of integrated services that meet my specific needs, whilst dependably collecting and delivering me at scheduled times that enable me to successfully manage my commitments and run my life.
- Value Me – means providing effective transport solutions that I can access with the minimum amount of effort, at the right times and through convenient channels that truly respects my time. In addition, my safety, security, health and wellbeing are all considered and provided for in the way the services are delivered.

How customers want to feel:

- Give Me Control – means empowering me with the necessary knowledge and ability to make choices. It means reducing uncertainty and stress by allowing me to play an active role in managing my situation. Providing advance notice of problems with guidance and real-time updates that keep me informed gives me the freedom to update arrangements with others that may be impacted by the situation.
- Connect Me – means bringing customers closer to the people and things that are most important to them. A more effective transport solution provides a vital contribution to meeting customers’ interpersonal needs including a sense of belonging, self-esteem, friendship, love and security. Being connected is an integral enabler and a key component of the broader community experience.



Sydney Metro Customer Principles
Source: TfNSW

1.6 A Commitment to Safety

Transport for NSW is committed to ensuring Sydney Metro is designed, constructed and operated in a manner that facilitates safe working and customer passage. The project will provide facilities for customers, staff and contractors that meet or exceed any required safety standards. Sydney Metro will also comply with all relevant statutory and regulatory requirements in respect of safe system design, delivery and operation.

Safety will be considered at all stages of design across all aspects of corridor and station planning, construction, operation and maintenance. In particular, the design of Metro infrastructure in the city must provide safe interfaces between stations and the existing urban environment. The safe movement of customers, staff and contractors through station areas needs to be facilitated through many aspects of physical design, including provision of adequate platform capacity and circulation space, clear routes, adequate lighting and slip resistant flooring, as well as by minimising obstructions and eliminating crush zones.

Station and station realm design will identify and reflect current architectural and engineering best practice with respect to safety. Guidelines and protocols, such as CPTED, will also be important benchmarks in minimising the risks of personal harm, operational disruption and conflict.

Construction and operational safety will be managed through a rigorous safety in design process which will identify, develop and implement safety controls, and enhance the construction, operational and maintenance outcomes.

Maintenance and asset management strategies will be adopted that reduce risk through safety auditing and reporting. Sydney Metro will have a comprehensive framework to avoid or minimise risk, and to enhance safety, without unreasonably reducing amenity and functionality.

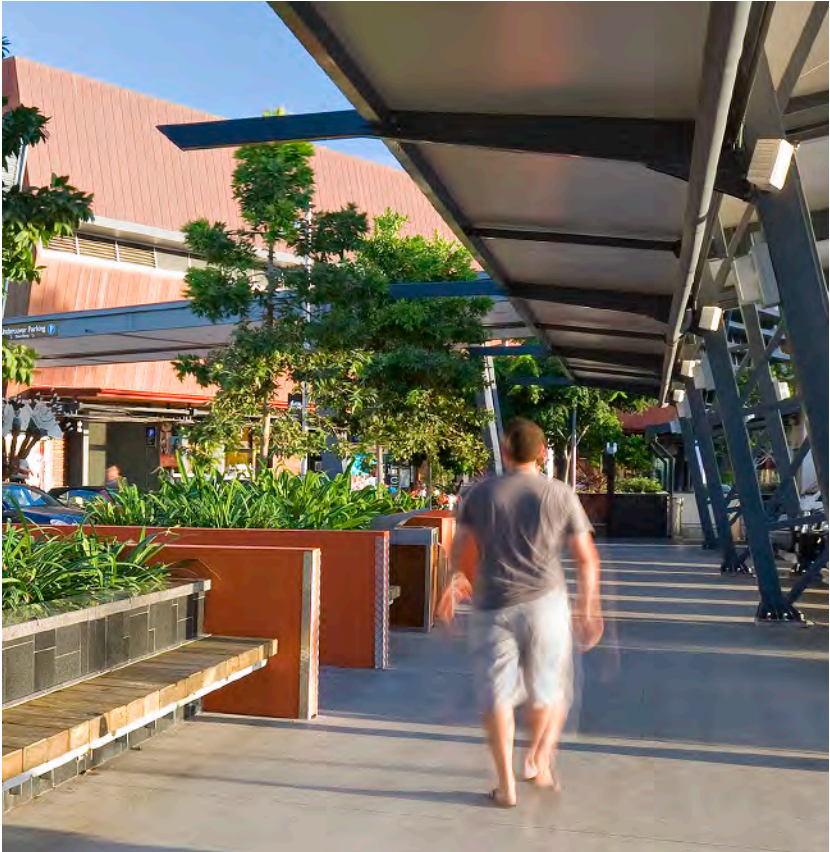


Construction of Sydney Metro Northwest.
Source: TfNSW

1.7 A Commitment to Sustainability

Transport for NSW has a clear vision for Sydney Metro to achieve new benchmarks in sustainable infrastructure delivery. This means demonstrating that Sydney Metro is at the forefront of best practice, delivering environmental, social and economic improvements throughout the delivery and operational phases of the project.

This commitment is articulated through a strategic Sydney Metro objective to deliver a sustainable metro product which contributes to environmental, social and economic sustainability and the project Environment and Sustainability Policy which contains specific sustainability objectives. Sustainability objectives relevant to these design guidelines are presented in the table below.



Microclimate and customer comfort can be improved through the use of landscaping and appropriate shading.
Source: AECOM.

Governance	Demonstrate leadership by embedding sustainability objectives into decision making
	Demonstrate a high level of performance against objectives and appropriate benchmarks
Carbon & Energy Management	Improve the shift toward lower carbon transport
	Reduce energy use and carbon emissions during operations
	Support innovative and cost effective approaches to energy efficiency, low-carbon / renewable energy sources and energy procurement
Pollution Control	Reduce sources of pollution and optimise control at source to avoid environmental harm
Climate Change Resilience	Infrastructure and operations will be resilient to the impacts of climate change
Resources - Water Efficiency	Minimise use of potable water
	Maximise opportunities for reuse of rainwater, stormwater, wastewater and groundwater
Resources - Waste & Materials	Minimise waste through the project lifecycle
	Reduce materials consumption
	Consider embodied impacts in materials selection
	Maximise beneficial reuse of spoil
Biodiversity Conservation	Protect and create biodiversity through appropriate planning, management
Heritage Conservation	Protect and promote heritage through appropriate design, planning, and management controls
Liveability	Promote improved public transport patronage by maximising connectivity and interchange capabilities
	Provide well designed stations and precincts that are comfortable, accessible, safe and attractive.
Community Benefit	Make a positive contribution to community health and well-being
	Ensure community and local stakeholder engagement and involvement in the development of the project
	Contribute to the delivery of legacy projects to benefit local communities
	Optimise community benefit of residual land development

1.8 Structure of the Guidelines

The Design Guidelines are structured into four sections:

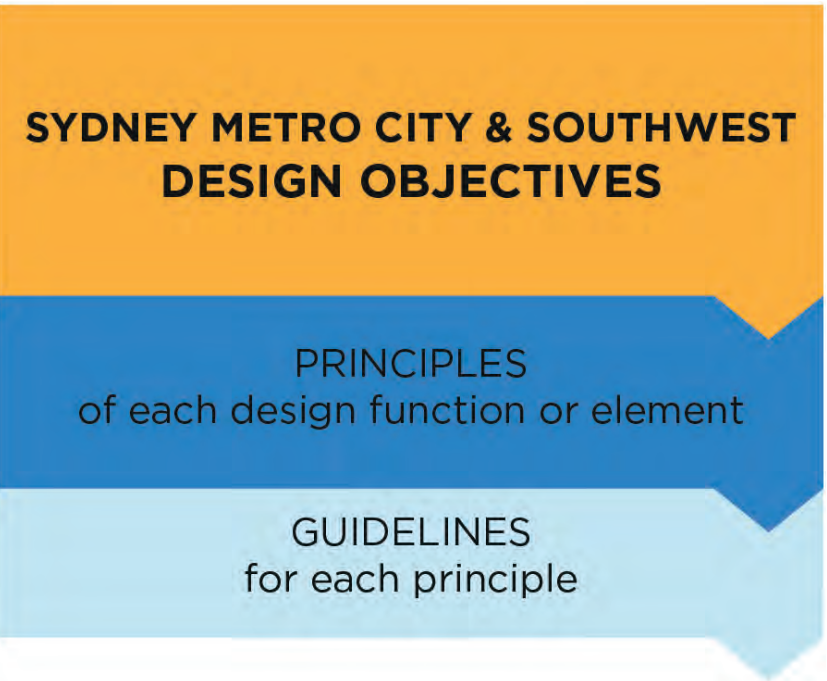
- 1. Introduction (this part)**
Provides an overview of the Sydney Metro City & Southwest, the project objectives, design principles, an understanding of our customers' needs and the importance of design in meeting those needs.
- 2. Stations**
Outlines the key contextual factors and design drivers that impact the design of the station and surrounding environment.
- 3. Function & Experience**
Outlines the principles and design guidelines to be applied to the design strategies for stations and their interface with adjoining areas.
- 4. Elements**
Outlines the principles and design guidelines to be applied to the elements of the new stations and their interface with adjoining areas.

Document Structure
Sections 3 and 4 are structured to include:

Relevant Design Objectives - how each design guideline relates to the project Design Objectives.

Principle - of each design element.

Guidelines - describes best practice design responses that address the objective.



1.9 Application of the Guidelines

Review of Design

The design of Sydney Metro is subject to ongoing internal review processes to ensure the designs are developed to respond to these Guidelines. This will ensure design quality meets the needs and expectations of Sydney Metro customers and the people of NSW. These Guidelines will be kept under review through subsequent detailed design and procurement stages to ensure that they remain up to date and relevant.

The design of Sydney Metro and implementation of these Guidelines is also subject to independent review by the Sydney Metro Design Review Panel. The objective of the Design Review Panel is to provide independent, high-level design review of the project to support the achievement of Sydney Metro project objectives and ensure quality design outcomes.

The Design Review Panel will be chaired by the NSW Government Architect and be supported by suitably qualified and appropriately skilled professionals from the fields of architecture, urban design, landscape design and heritage architecture. The Design Review Panel will be supported by specialist advisers in the fields of community integration, transport integration, sustainability and cultural heritage, as required.

These panel members will provide independent design review and advice periodically throughout the development of the design. They will maintain an ongoing review role in the design process for the project, ensuring that as the design of individual components develops, it delivers on the principles contained within this document.

Updating the Guidelines

These Guidelines have been reviewed and updated following exhibition of the Chatswood to Sydenham EIS, in response to public and agency submissions. The Guidelines may be updated from time to time through the project delivery stage, including application of the Guidelines in relevant contracts. It is envisaged that future updates would provide additional detail and guidance as design progresses. The objectives and principles contained in this version of the document would continue to apply in subsequent versions. Updated versions of the Guidelines would be subject to the review and endorsement of the Design Review Panel.

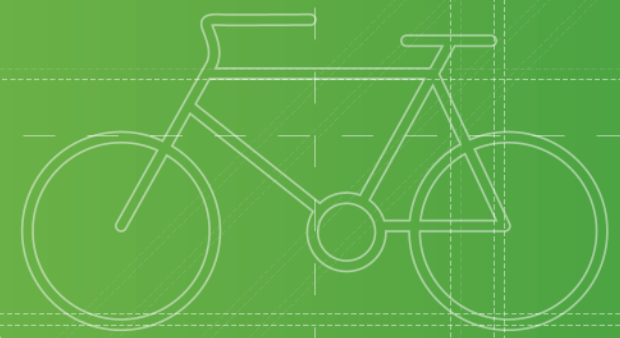
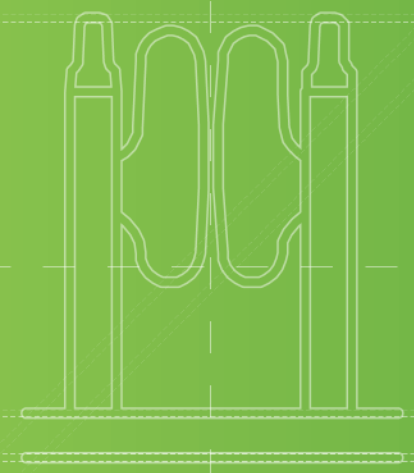


Artists rendering of Waterloo station.
Source: TfNSW



Stations

About this Section	14
2.1 Crows Nest	16
2.2 Victoria Cross	19
2.3 Barangaroo	22
2.4 Martin Place	25
2.5 Pitt Street	28
2.6 Central	31
2.7 Waterloo	33
2.8 Sydenham	36



About this Section

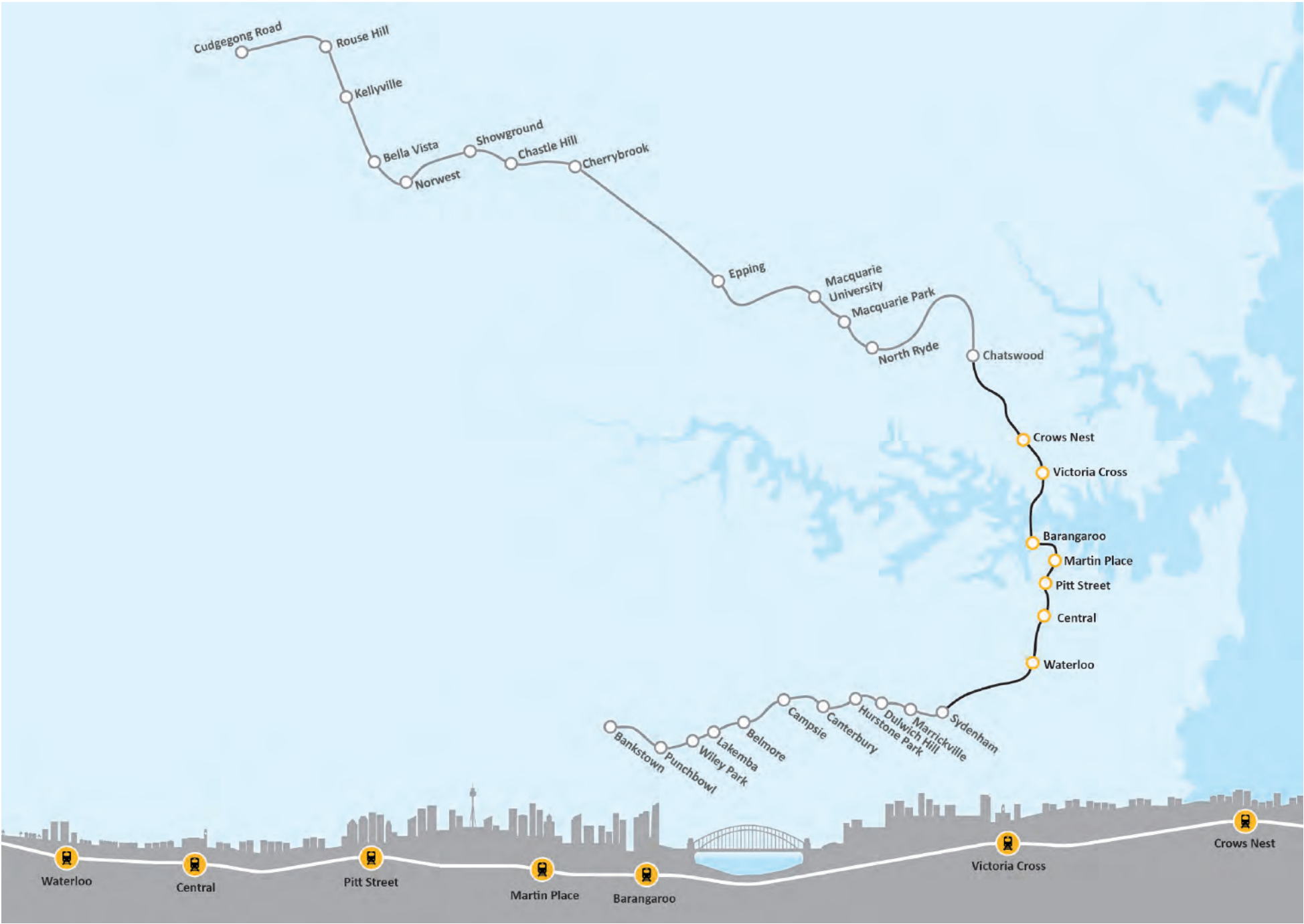
This section describes the context and functional character of the Metro stations. It acknowledges the existing conditions and urban interfaces of each station in order to inform the delivery of contextually responsive and integrated environmental outcomes.

The urban and public domain design must be developed with reference to the existing urban context and infrastructure (including built form and public domain conditions, landscape elements and existing and proposed services) as well as planned initiatives in the locality.

New metro stations are proposed at:

- Crows Nest
- Victoria Cross (North Sydney)
- Barangaroo
- Martin Place
- Pitt St
- Central Station (new underground platforms)
- Waterloo
- Sydenham.

Key descriptors for each station are noted in this section including; centre type, primary function (e.g. origin/destination), catchment type, and Local Government Area. An outline of the transport role and function and geographical catchment of each station, including the key design drivers for the station precinct, are also set out in the following pages.



Sydney Metro alignment map

2.1 Crows Nest

Centre type: Strategic centre

Primary Function: Origin and Destination

Catchment: Commercial, residential, leisure

Local Government Area: North Sydney

Context

Crows Nest Station would be located on the western fringe of the Crows Nest village. Access to the station would be from the corner of Clarke and Hume Streets and from the corner of Oxley Street and Pacific Highway.

Crows Nest Station would support the St Leonards strategic centre as a southern gateway to commercial and mixed use activities. The station would also improve access to the restaurants and specialist shops in the Crows Nest village.

Convenient and legible links to employment and mixed use developments around Atchison and Chandos Streets are important aspects of the station context. Oxley Street is important in the urban structure as a north-south link that is relatively level and has good sight lines.

The station would provide access to a new transport mode for the surrounding residential areas. This includes the lower scale Holtermann Estate to the east and medium density and multi-unit developments on the western side of the Pacific Highway.

A service building would be located above the station box on the Pacific Highway. The station design would enable development to be built above the station with frontage to the Pacific Highway.

Key design drivers:

- Create a new transport focus on the southern side of the St Leonards strategic centre.
- Maximise legibility and connectivity with the local urban structure.
- Integrate the station with local improvement plans and make a positive contribution to the sense of place.



Clarke/Hume Streets, Crows Nest.
Source: Cox Richardson



Clarke Street, Crows Nest
Source: Cox Richardson



Willoughby Road, Crows Nest
Source: Cox Richardson



Crows Nest Community Centre
Source: Cox Richardson



Crows Nest Station Design Drivers



Urban Design Strategies

Green Streets

Oxley and Hume Streets are important east-west links in the urban structure.

Crows Nest Station is an opportunity to enhance the amenity and green character of Oxley Street and Hume Street. This could include enhanced pedestrian space, paving upgrades and street trees.

Visible and integrated entries

The placement of entries on corners maximises their visibility from multiple vantage points.

There is an opportunity to create a seamless entry experience into the station through materiality and extending the character of the surrounding public domain into the station.

A Pacific Highway landmark

Sydney Metro provides an opportunity for a strong architectural presence along the Pacific Highway. The station entry on the corner of Pacific Highway and Oxley Street can anchor this presence.

The station and associated development above has the opportunity to create a consistent built edge along Pacific Highway, aligned with existing buildings and maximising activation at ground level.

Interchange with buses on the corner of Hume Street reinforces the importance of the metro station on this major transport spine.

Supporting the vision for Crows Nest Village

Sydney Metro will integrate with the vision for the Crows Nest Village including the planned upgrades to Hume Street Park, Clarke and Hume Streets by North Sydney Council, and connectivity to renewal areas to the north.

The Sydney Metro entry on the corner of Hume and Clarke Streets directly addresses cycle, kiss and ride and taxi access including improved pedestrian crossing of Clarke Street.

This station entry will be scaled to reflect the local fine grained character of the area and accommodate new and existing active transport links.

2.2 Victoria Cross

Centre type: Global Sydney (North Sydney CBD)

Primary Function: Destination

Catchment: Commercial, residential, education

Local Government Area: North Sydney

Context

Victoria Cross Station would be located in the northern section of the North Sydney CBD. Access to the station would be from the east side of Miller Street between Berry and Mount Streets.

The Victoria Cross Metro station would support the continued growth of the North Sydney CBD as an integral part of Global Sydney. The new station would improve customer experience at the existing North Sydney Station by relieving demand in peak times.

The North Sydney CBD is characterised by multi-storey commercial developments. A number of educational facilities including high schools and an Australian Catholic University campus are located on the north and western edges of the North Sydney CBD. The area north of Berry Street includes residential and mixed use developments.

The station design would enable development to be built above the station. The future development would have frontage to Miller and Berry Streets.

Key design drivers:

- Create a new transport focus in the North Sydney CBD.
- Contribute to the attractiveness of the North Sydney CBD by adding to and integrating with the public domain.
- Improve the permeability of the immediate station context.



Miller Street, North Sydney
Source: Cox Richardson



Miller Street, North Sydney
Source: Cox Richardson



Entrance to North Sydney station at Brett Whiteley Place
Source: Cox Richardson



Artist rendering of planned Brett Whiteley Place
Source: North Sydney Times



Victoria Cross Station Design Drivers



Urban Design Strategies

A Public Interchange Place

Miller Street is North Sydney’s civic street and an important thoroughfare. This new metro station reinforces the transport function of Miller Street, creating a generous “interchange place”.

This place allows for safe and equitable movement between different modes (especially Metro and rail, bus and taxi).

The Miller Street Green Avenue

The landscape character of Miller Street is extended (by new trees further south along this street) and expanded (into the new interchange place in front of the station).

This avenue will provide pedestrian amenity along the length of the block as well as within smaller pockets of activity, including areas for dining, sitting and relaxing. Miller Street will become the main civic space for North Sydney

Mid-Block Connectivity and Access

Metro provides an opportunity to break down the north-south oriented blocks of North Sydney with new east-west pedestrian connections.

This finer grain block structure opens up opportunities to upgrade laneways such as Denison Street to enable greater pedestrian connectivity.

A Focal Point for North Sydney

The Sydney Metro station creates a focus for development and renewal in North Sydney, creating a generous public space and major transport node, as well as the potential for a significant tower development over the station.

There is an opportunity to focus activity on the corner of Miller and Berry Streets, in addition to enhancing the character and pedestrian amenity of Denison Street.

2.3 Barangaroo

Centre type: Global Sydney (Sydney CBD)

Primary Function: Destination

Catchment: Commercial, visitor (recreation)

Planning Authority: Minister for Planning

Context

Barangaroo Station would be located on the western side of the Sydney CBD within the Barangaroo Central precinct. Access to the station would be from within the Barangaroo Central development and Barangaroo Reserve.

The Barangaroo station would improve accessibility to Barangaroo and to the Walsh Bay Arts and Culture precinct.

The Barangaroo precinct includes office, retail, residential uses and a new casino, hotel and apartment complex. Barangaroo Central will combine civic and cultural attractions with recreational, retail and commercial uses. At the north end Barangaroo Reserve includes Headland Park, a major new waterfront public open space and new cultural centre hosting events. Barangaroo South will be home to three significant new employment towers.

Key design drivers:

- Maximise connectivity and legibility to the primary uses within and near the Barangaroo precinct including the Walsh Bay Arts and Culture precinct.
- Ensure legible and direct access to Barangaroo Reserve and surrounding development.
- Integrate with the development plans for Barangaroo.



Barangaroo Master Plan
Source: Barangaroo South



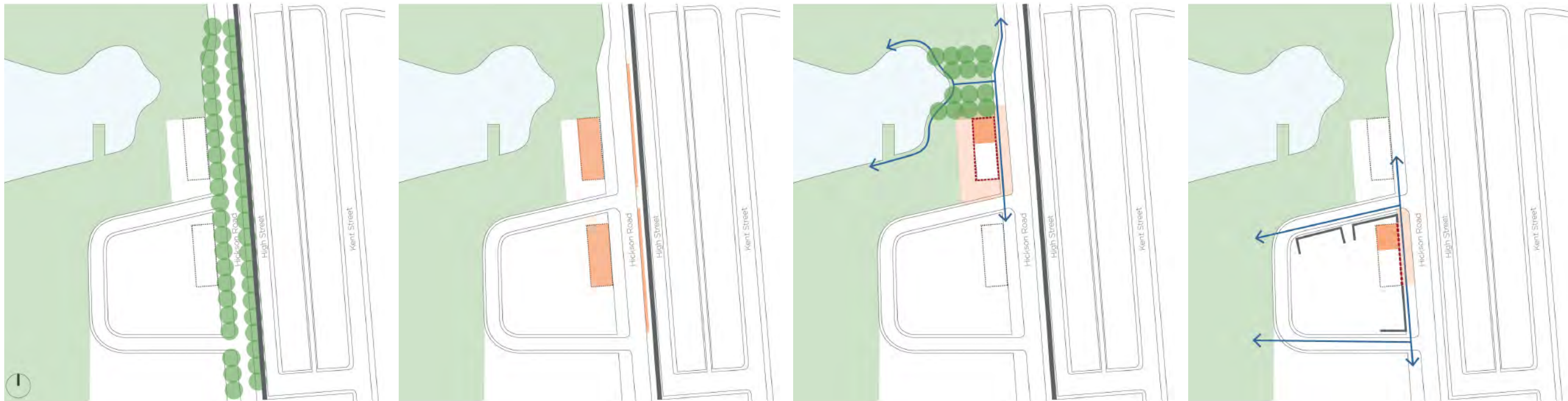
Barangaroo South under construction & Headland Park
Source: Cox Richardson



Walsh Bay Arts & Culture Precinct
Source: Timeout Sydney



Barangaroo Station Design Drivers



Urban Design Strategies

Hickson Road Heritage

The historic street of Hickson Road will become one of Sydney's premier boulevards, with street trees, landscaped median and generous footpaths. The entries to the Metro station will address Hickson Road.

The following principles apply to Hickson Road:

- Provide an exemplary streetscape design integrating station infrastructure, with heritage, street access and circulation, pedestrian amenity, safety and security
- Allow for high quality and safe pedestrian access along both sides of Hickson Road
- Integrate a contemporary urban art program and heritage interpretation strategy (including archaeology) as part of the station and streetscape improvement works
- Maximise consistency with the City of Sydney strategies

Infrastructure Integrated into Streetscape

Station infrastructure will be integrated into the eastern edge of Hickson Road. To minimise visual and physical obstruction, the following principles guide the design:

- Consolidate the number of station infrastructure and street elements to achieve a balance between efficiency and visual amenity
- Minimise the height, length and width of station infrastructure in the streetscape
- Locate station infrastructure away from view corridors (eg from the harbourside park between buildings) and from areas of open space (eg adjacent to the Northern Cove)
- Station infrastructure will not be above ground level whenever possible

Entry Pavilion on the Park

The northern entry to the Sydney Metro station will be located within the existing park adjacent to the Northern Cove of Barangaroo.

To ensure visual and physical connectivity between Hickson Road and the harbour, this entry will be minimally scaled and highly transparent.

Entry Embedded in New Development

The southern entry of the Sydney Metro station will be integrated into the future built form of Central Barangaroo, creating a consistent and activated street edge to Hickson Road and reducing the impact of any associated services.

2.4 Martin Place

Centre type: Global Sydney (Sydney CBD)

Primary Function: Destination and interchange (rail)

Catchment: Commercial, retail, civic

Local Government Area: City of Sydney

Context

Martin Place Station would be located between Elizabeth Street, Hunter Street, Castlereagh Street and Martin Place. Access to the station would be from Hunter, Castlereagh and Elizabeth Streets and from Martin Place.

The station would serve Sydney's high-end commercial and financial district, the Macquarie Street civic precinct and the Pitt Street retail zone. A key function of the Metro station would be to facilitate interchange with the existing Eastern Suburbs and Illawarra line platforms at Martin Place station.

Connection to Martin Place is an important aspect of the station's context. Martin Place is one of Sydney's most recognisable civic and public spaces and a primary east-west pedestrian corridor in the city centre.

The design would enable development to be built above the station at Hunter Street and on the south side of Martin Place.

Key design drivers:

- Reflect the significance of Martin Place and status of the station by designing clear, legible, iconic, integrated entries.
- Provide generous space for customers in a busy pedestrian environment by extending the public domain into the station entries.
- Efficient interchange in the centre of the Sydney CBD through convenient, direct connections to the existing Eastern Suburbs and Illawarra line train platforms.
- Integrate with public domain and transport access improvements.



Hunter Street
Source: Cox Richardson



9 Castlereagh St, Sydney. The public domain is extended within the building's site.
Source: Cox Richardson



Martin Place
Source: TfNSW



Martin Place Station Design Drivers



Urban Design Strategies

Supporting the City’s Public Domain Strategies
The City of Sydney’s master plan for the renewal of Martin Place sets a strategic framework for the works at Martin Place.

Sydney Metro can support this plan through the enhancement and activation of the public domain.

Entries as New Public Spaces
The new station entries are visually prominent and envisaged as generous “urban rooms”.

Extending the materiality and character of the public domain into the station creates the opportunity for a seamless experience.

Flagship Developments Over Stations
The entrances to the station provide an opportunity for renewal. Future development above these spaces should sensitively respond to the established built form and positively enhance the locality by providing high quality architecture and complementing the streetscape.

Direct and Legible Interchange
The new Metro station is integrated with the existing Martin Place rail station, allowing for direct subsurface interchange.

Bus stops are located on Castlereagh and Elizabeth Streets, as close as possible to station entries with Martin Place and Hunter Street acting as key connectors to these stops.

2.5 Pitt Street

Centre type: Global Sydney (Sydney CBD)

Primary Function: Destination

Catchment: Commercial, retail, residential, civic

Local Government Area: City of Sydney

Context

Pitt Street Station is located in the centre of Sydney CBD within the Town Hall civic precinct. Two entries are proposed - a northern entry on the north side of Park Street to the east of Pitt Street and a southern entry on the south side of Bathurst Street to the east of Pitt Street.

Pitt Street Station would serve the retail centre of the Sydney CBD on George and Pitt Streets north and west of the station, the civic and entertainment uses on George Street south and west and the emerging southern CBD residential developments between Park Street and Belmore Park.

The station would facilitate interchange with Light Rail on George Street and buses on the key corridors along Park, Elizabeth and Castlereagh Streets.

The station design would enable development to be built above the station entries.

Key design drivers:

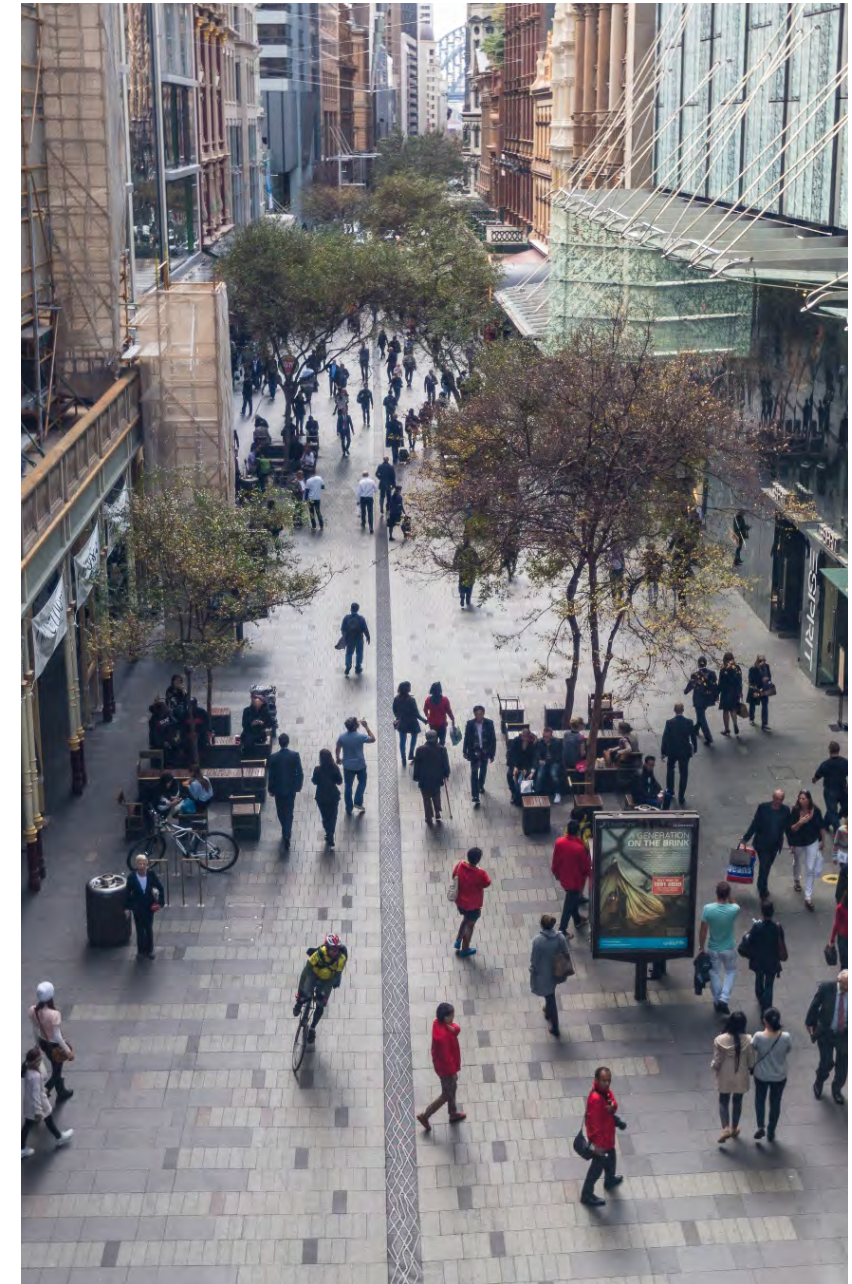
- Provide space for customers in a busy pedestrian environment by extending the public domain into the station entries.
- Integrate with the Sydney City Centre Access Strategy and other CBD planning.
- Anticipate connections to a future Town Hall Square and other nearby developments
- Extend the transport focus along Park Street, near Pitt Street.



Sydney Light Rail, George Street.
Source: TfNSW



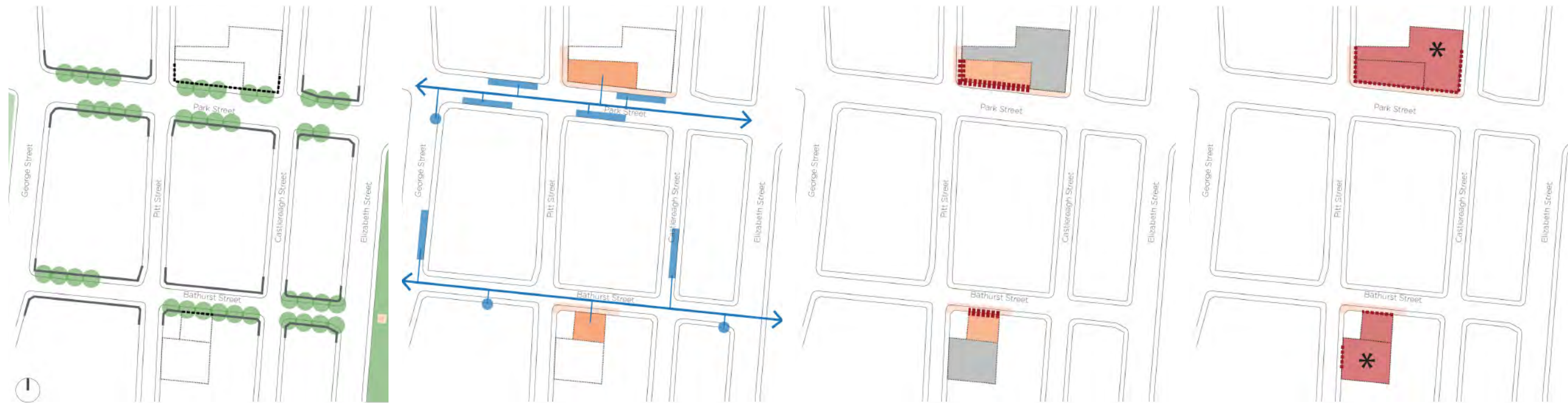
Park Street
Source: TfNSW



Pitt Street Mall
Source: TfNSW



Pitt Street Station Design Drivers



Urban Design Strategies

Linking Hyde Park to the Civic Precinct

Park and Bathurst Streets are key east-west connectors in the Sydney city centre, linking the harbour (at Darling Harbour) and green space (Hyde Park) on the edges of the city. These streets run through the heart of the city's civic precinct, which contains Sydney Town Hall, St Andrews Cathedral and the Queen Victoria Building (as well as the planned Town Hall Square).

As increasingly important pedestrian streets, Park Street and Bathurst Street will require public domain improvements.

A Street-grid of Interchange

The new Sydney Metro station will be located within a network of public transport services spread over several street blocks. These services include rail (Town Hall and Museum stations), bus (primarily along Park, Castlereagh and Elizabeth Streets) and future light rail along George Street.

The entrances to the new Metro station address Park and Bathurst Streets. These two streets will be key to interchange movements, especially to the bus and light rail services that run along the north-south streets of the city.

Frontages to east-west streets

The primary address of both Metro entries will be to the east-west connectors, reinforcing the importance of these streets and facilitating interchange between transport modes.

Extending the materiality and character of the surrounding public domain into the station entries creates the opportunity for a seamless experience.

Optimising development over stations

The entrances to the station provide an opportunity to facilitate renewal. Future development above these spaces should reflect the context of the locality and positively contribute to the built form and character of the area.

2.6 Central

Centre type: Global Sydney (Sydney CBD)

Primary Function: Destination and interchange (intercity and suburban rail/bus/light rail/coach services/taxis)

Catchment: Commercial, education

Local Government Area: City of Sydney

Context

The proposed Central Metro Station would be located within the existing Central Station precinct. Access would be from upgraded entries at Eddy Avenue, Chalmers Street and the western forecourt.

The station would have a major interchange role with suburban and intercity trains, light rail, buses and coaches.

Central Station would provide access to retail and mixed use precincts in the locality including Haymarket, Chinatown, Central Park and Surry Hills and to educational facilities including the University of Technology Sydney, the University of Notre Dame, Australia and Sydney Institute of Technology.

Key design drivers:

- Provide an efficient and high quality interchange for customers to connect to other public transport services.
- Respect the heritage significance of the Central Station precinct.
- Integrate with the Sydney City Centre Sydney Access Strategy and Central Station Precinct Plan.
- Support connectivity with major land uses and developments in the locality.



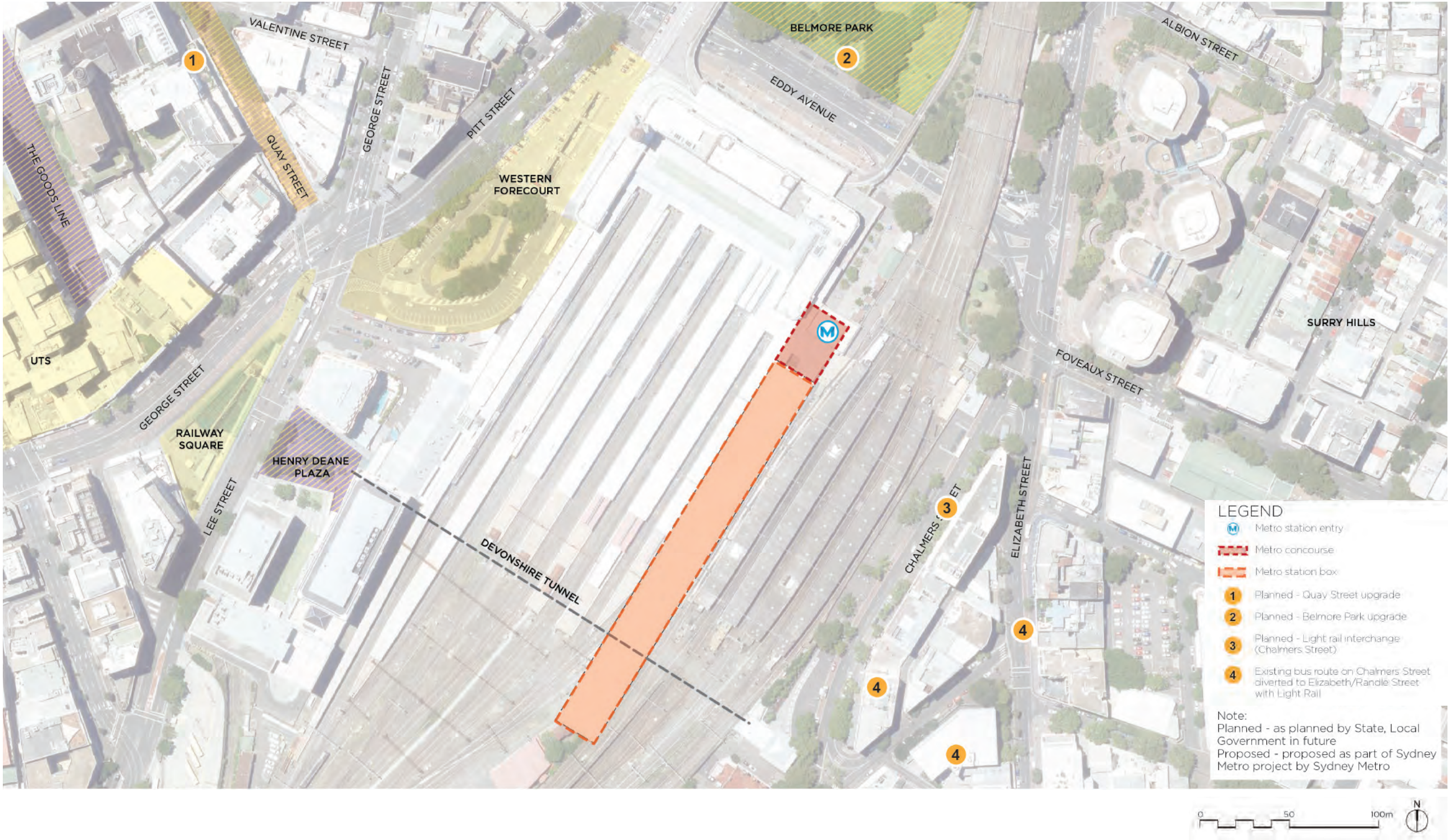
Central Station, view over suburban/city platforms
Source: TfNSW



Railway Square. Central Station is a major interchange place
Source: Cox Richardson



Central Station precinct. View over Railway Square looking south.
Source: TfNSW



Central Station Design Drivers

2.7 Waterloo

Centre type: Global Sydney (Sydney CBD)

Primary Function: Origin

Catchment: Residential

Local Government Area: City of Sydney

Context

The proposed Waterloo Station would be located between Botany Road and the Land and Housing Corporation landholdings in Waterloo.

A Waterloo Station would provide the opportunity to catalyse the development and urban renewal of the Land and Housing Corporation landholdings, connect the Australian Technology Park and the residents in the Waterloo/Redfern area with Sydney Metro.

The station design would enable development to be built above the station.

Key design drivers:

- Contribute to the sense of place and public domain.
- Create a new transport focus in Waterloo.
- Integrate the station with local improvement plans and make a positive contribution to the regeneration of this new urban community.



Botany Road, Waterloo
Source: Cox Richardson



Land and Housing Corporation site with Sydney CBD beyond.
Source: Cox Richardson



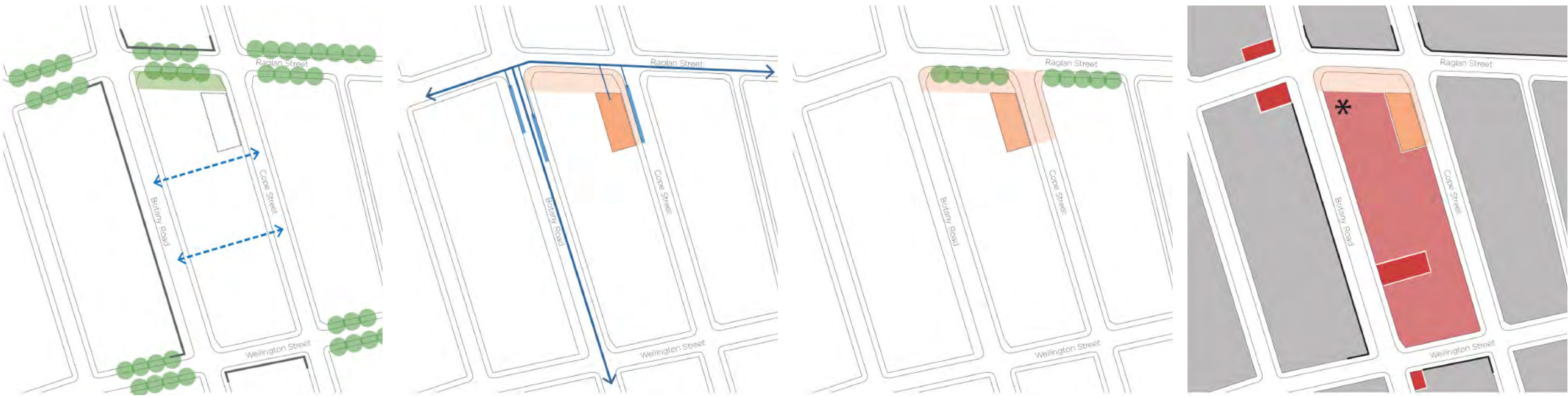
Raglan Street, Waterloo
Source: TfNSW



Artists Impression of Raglan Street, Waterloo
Source: UrbanGrowth NSW



Waterloo Station Design Drivers



Urban Design Strategies

Enhancing East-West Permeability

As the north-south streets of Waterloo (including Regent, Botany and Gibbons) Streets carry significant vehicular movement, east-west streets have greater potential for walking and cycling access. Raglan and Henderson Streets will become a key connector between the new Sydney Metro station, the Australian Technology Park and residential renewal areas to the east.

Opportunities for mid-block connections would enhance pedestrian connectivity and activity around the station site, breaking down the long street block bounded by Raglan and Wellington Streets.

Interchange Close to Station Entry

A number of bus routes run adjacent to the Sydney Metro station, with interchange (to stops on Botany Road, Henderson and Raglan Streets) on the southern side of Raglan Street. The location of bus stops on Botany Road may need to be reviewed to maximise connectivity with the station entry.

There are opportunities for safe and convenient access by cycles, taxi and drop-off to the station entrance from Cope Street.

Public Domain Defined and Activated

The new Metro station provides an opportunity to maximise connectivity, create activity and support growing residential populations through a network of high quality public spaces around the station. This would include spaces for customers to transfer between modes and upgrades to the pedestrian environment along major streets and any new laneway connections between Cope Street and Botany Road.

Support Renewal around the Station

The Metro station will support significant renewal in Waterloo and surrounding residential, commercial and industrial areas.

New buildings and spaces should contribute positively to the surrounding context by enhancing and integrating with existing heritage buildings, creating permeability through smaller development lots, delivering public spaces and public infrastructure, and considering issues of solar access, visual impact and acoustic privacy.

2.8 Sydenham

Centre type: Local Centre

Primary Function: Origin and Interchange

Catchment: Residential and light industrial

Local Government Area: Inner West Council

Context

Sydenham Station lies approximately 6km south of the Sydney CBD within the Inner West Council (formerly Marrickville) Local Government Area. The suburb is bounded by St Peters to the east, Marrickville to the west, Enmore to the north and Tempe to the south.

Land use around the station is mixed, with low density residential as well as commercial and industrial areas to the south that generally date from the late 19th century and early 20th century, and later industrial areas to the north.

Sydenham is only two kilometres from Kingsford-Smith Airport and lies directly under the flight path.

Railway Parade and Gleeson Avenue border the station and, with Sydenham and Marrickville Roads, form an important north-south connection for both general traffic and heavy vehicles. Burrows Avenue on the southern edge of the station is a busy local road. There are three high amenity recreational reserves within walking distance of the station: Fraser Park, Sydenham Green and Tillman Park.

Key design drivers:

- Additional station concourse at Sydenham that caters for the forecast patronage demand and facilitates interchange between Sydney Trains and Metro services
- Deliver an unpaid cross-corridor connection, creating a safe, local pedestrian link from the residential area in the south to the employment and retail areas of Marrickville to the north
- Provide accessible interchange currently missing at Sydenham Station with new entry plazas
- Improve connectivity across the railway corridor



Sydenham Station entry, Gleeson Avenue
Source: COX/HASELL



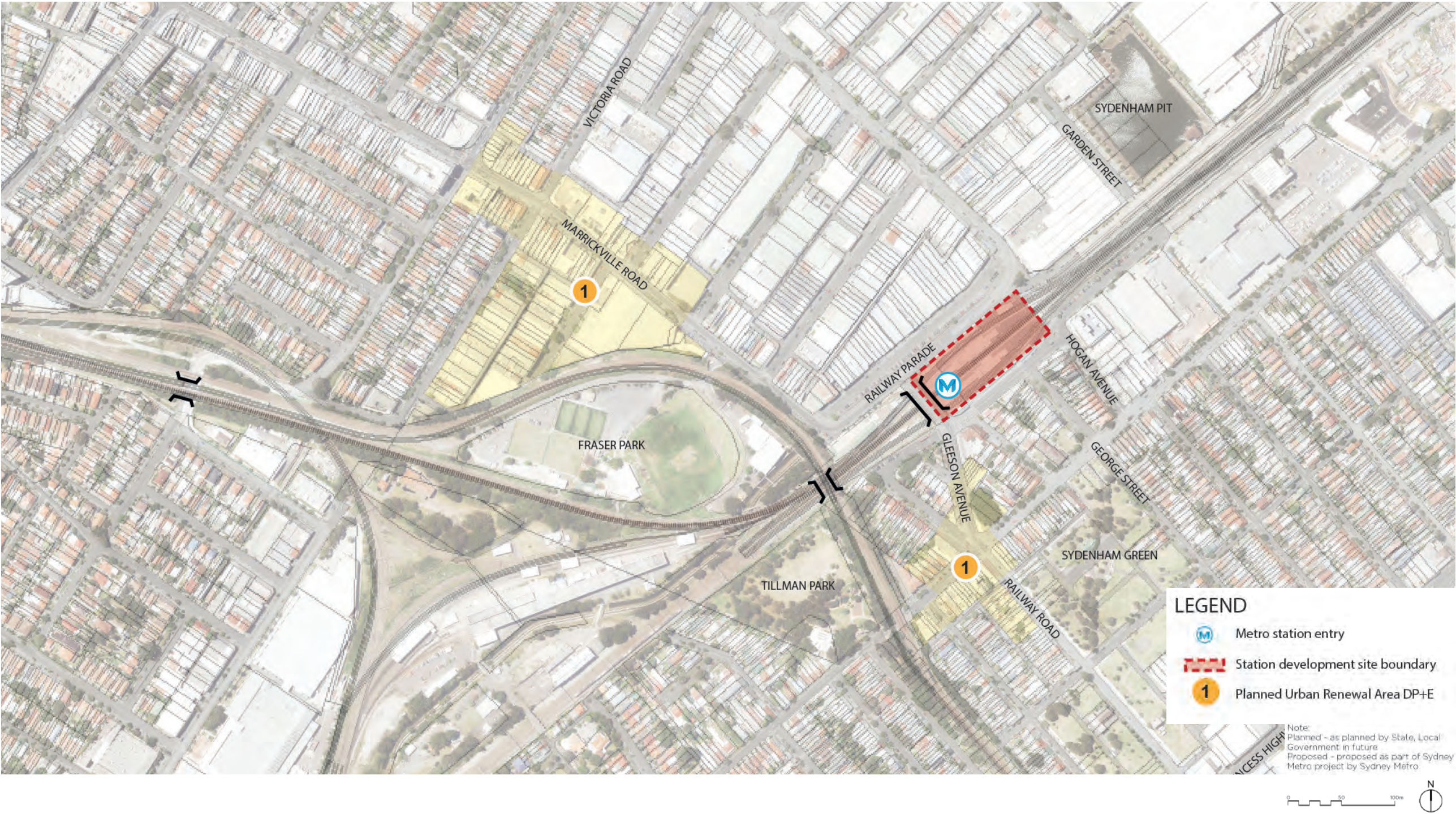
Street art on Marrickville Road, Sydenham
Source: COX/HASELL



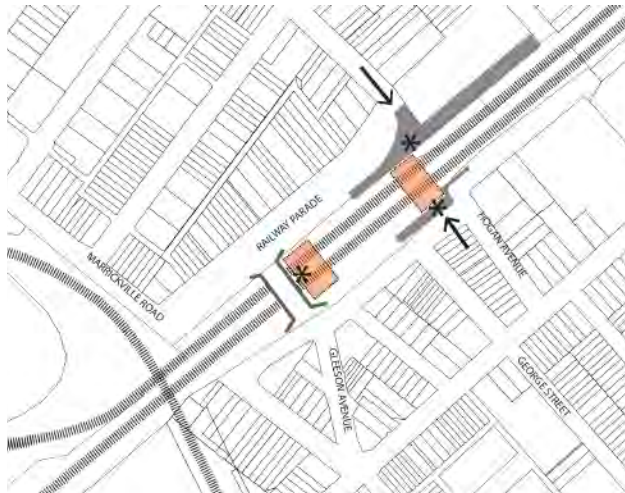
Sydenham Station platforms
Source: COX/HASELL



Sydenham Stormwater Storage Pit
Source: COX/HASELL



Sydenham Station Design Drivers



Urban Design Strategies

Address and Legibility

- Sydenham Station suffers from poor physical and visual connections to the north and south. Blank walls and facades and generally limited visibility restrict legibility of the station from adjacent areas.
- A second station entry and distinctive Metro canopy will open the station up and make it clearly visible from Sydenham Road in the north and local streets to the south.

Precinct Connectivity

- The station concourse at the eastern end of the station will provide an important cross-corridor link between Sydenham Road, and neighbourhood streets and Sydenham Green in the south.

Accessible Interchange

- Modifications to Railway Parade including a pedestrian crossing will provide a safe and accessible bus stop adjacent to the northern station entry for southbound bus services.
- An interchange zone on Burrows Avenue will serve northbound bus services and tax and kiss and ride requirements.
- Secure and sheltered bicycle parking will be located in north and south station plazas.

Public Space and Heritage

- Proposed plazas will widen the public domain at station entries and generally improve pedestrian amenity and safety.
- New street trees, interchange shelters and furniture will enhance the customer arrival and interchange experience.
- Improve public domain along the northern side of the station between Railway Parade and Garden Street, accommodating pedestrians, cyclists and facilitating retail opportunities
- Proposed aerial concourse will provide new views across the station platform buildings which have significant heritage value.

Function & Experience

About this Section	40
3.1 An Easy Customer Experience	41
3.1.1 Customer Centred Design	
3.1.2 Customer Circulation	
3.1.3 Wayfinding and Legibility	
3.1.4 Comfort and Amenity	
3.1.5 Customer Safety	
3.1.6 Accessibility	
3.2 Identity	49
3.2.1 Network and Station Legibility	
3.2.2 Place-making	
3.2.3 Heritage and Archaeology	
3.2.4 Environment and Sustainability	
3.2.5 Art	
3.2.6 Lighting	
3.3 Connectivity	56
3.3.1 Interchange	
3.3.2 Pedestrian Movement	
3.3.3 Bicycle Movement	
3.3.4 Vehicular Interface	

About this Section

This section provides guidelines for the spatial and functional design of the urban and public domain in each station precinct, as well as the urban form of associated project development. The guidelines are articulated according to a number of core design strategies that guide the planning and design of Metro stations and their precincts. The strategies are grouped under the following family headings:

- Designing for Customers
- Identity
- Connectivity
- Development Opportunities

More detailed design guidelines and key requirements for each of these strategies will be included in the scope and performance documents during the procurement stage.



Chatswood Transport Interchange. Interchange places should be active public spaces that support a range of amenities for all users.
Architect: CoxDesignInc.
Source: COX Richardson, Photographer: John Gollings

3.1 An Easy Customer Experience

An easy customer experience is central to all aspects of the Sydney Metro design. A high quality customer transport product across the whole 'door-to-door' customer journey is critical to the customer experience. Sydney Metro will be a fast, safe, reliable, easy service for all customers.

Sydney Metro will cater to all customers including daily commuters, people with disabilities, families, visitors to Sydney and infrequent users.

The key public transport customer service design principles which underpin customer focused design are provided below.

This part of the document provides guidelines for the following areas of the customer experience:

- Customer Centred Design
- Customer Circulation
- Wayfinding and Legibility
- Customer Safety
- Comfort and Amenity
- Accessibility

Public transport customer service design principles

Balanced: Functional performance is balanced with customer service to achieve high levels of customer satisfaction.

Efficient, assisted service: A self-service system that is designed for easy, intuitive use. Where assistance may be required, support is available and easy to get.

Universally accessible: Meet the needs of all members of the community, accommodate the distinct needs of key customer segments.

Flexible: Able to adapt to a range of typical usage patterns and services while delivering a consistent level of service outcomes.

Legible and consistent: Reflect a service style and tone that is easily understood and consistent with the experience of an integrated transport system.

Responsive: A service system open to feedback from customers, that adjusts over time as needs and preferences change, and continuously improves.



Provide an easy experience for a diverse range of customers.
Source: TfNSW

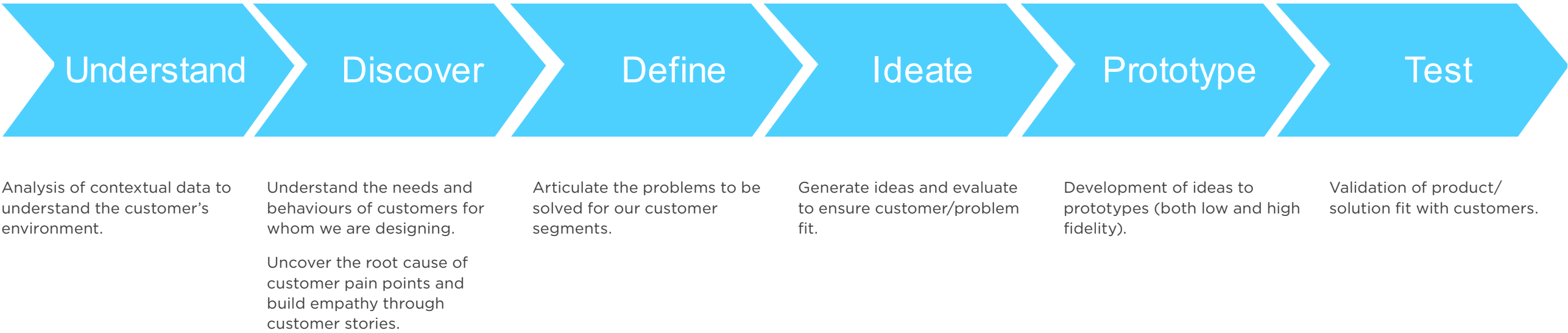
3.1.1 Customer Centred Design

Relevant Design Objectives

- 1 Ensuring an easy customer experience

Principle

Customer Centred Design (CCD) is the process that brings the 'customer to the centre of everything we do'.



3.1.2 Customer Circulation

Relevant Design Objectives

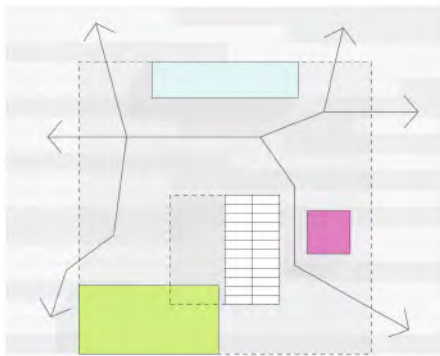
- 1 Ensuring an easy customer experience

Principle

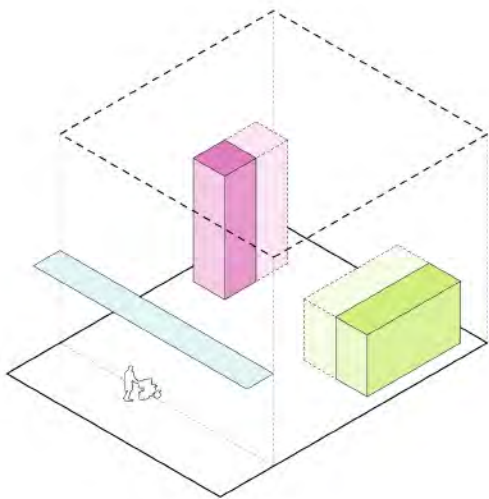
Provide adequate space to meet customer demands, including during peak periods and long-term patronage demands.

Guidelines

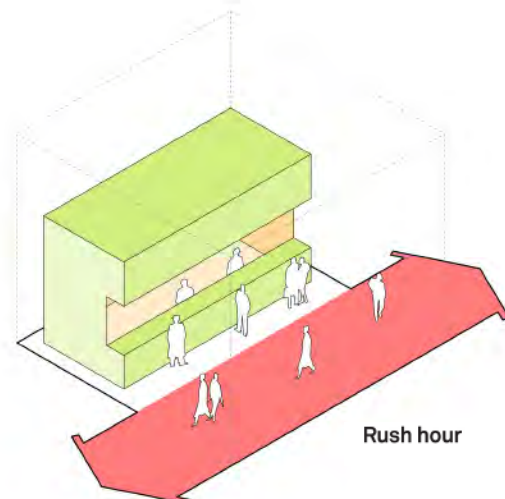
- Each part supports a different range of functions that must be addressed on station opening and in future scenarios.
- The movement capacity, configuration and spatial sequences of each of the Sydney Metro stations is to respond to patronage requirements as defined by a Level of Service (LOS) appropriate to the location and context.
- Pedestrian paths, crossings and spaces adjacent to Sydney Metro stations are to have sufficient capacity to meet potential demand with particular consideration of key decision points (gatelines, entrances, exits, customer queue zones) and information points. Where constrained, this may be met by extending the public domain into the station forecourt.
- The customer circulation paths within the station are to optimise timeliness for customers moving between concourse, platform, and station entries.
- Circulation paths are to be designed for convenience of connections into the station and from surrounding areas and other transport modes. These should reflect pedestrian desire lines as much as possible to enhance the convenience of circulation routes.
- Ancillary development and activities (retail, commercial or residential development, services areas and advertising structures) within Sydney Metro station sites are not to compromise efficient transport operations.
- All areas are to provide sufficient space for emergency access and movements in accordance with relevant design standards and legislation.



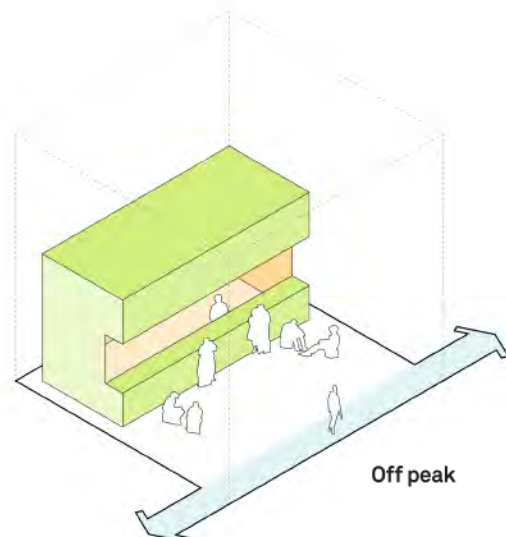
Station elements located to optimise permeability.



The effective space around each element can vary with the changing customer circulation requirements throughout the day.



Station design and capacity is to respond to primary customer flows and circulation during peak and off peak times.



3.1.3 Wayfinding and Legibility

Relevant Design Objectives

- | | |
|---|---|
| 1 | Ensuring an easy customer experience |
| 2 | Being part of a fully integrated transport system |

Principle

Provide intuitive, clear and consistent information and signage as well as legible, intuitive spaces to enhance customer journeys through efficient navigation and interchange. Wayfinding is to create a seamless and intuitive customer journey from origin to final destination to support an easy customer experience.

Guidelines

- Planning for wayfinding and legibility will support all customers to travel independently and easily on Sydney Metro. This is done by:
 - Anticipating the needs of customers
 - Providing the accurate information at the right time
 - Planning and creating predictable and intuitive environments
 - Applying consistent system of signs and information.
- Spaces are to be visually simple and intuitive to negotiate, to contribute to an easy customer experience. This is done by:
 - Providing visibility between station levels where possible
 - Using intuitive design to minimise wayfinding choices and the need for signage
 - Providing safe, legible, efficient, convenient, obstruction free, level, direct and attractive routes for customer access
- Wayfinding signage and information is to be provided in accordance with the TfNSW guidelines. Ensure consistency with TfNSW signage.
- Customers are to be provided with wayfinding and information when they are:
 - Interchanging between services or modes.
 - Connecting to and from public transport by walking, cycling, catching a taxi, being dropped off or picked up in private vehicle or parking in their car.



Town Hall Station. Wayfinding signage enables easy navigation and interchange.
Source: TfNSW



Macquarie Park Station design provides a high level of visibility between concourse and platform level to aid wayfinding and legibility.
Architect: Hassell
Source: TfNSW

3.1.4 Comfort and Amenity

Relevant Design Objectives

- 1 Ensuring an easy customer experience

Principle

Provide a comfortable customer environment that provides sufficient personal space and amenity and is well lit with effective and appropriate microclimate amenity for all users.

Guidelines

- Station entry orientation and design are to minimise adverse micro climate effects including wind tunnel impacts.
- Customer weather protection outside Sydney Metro stations is to be provided to ensure good levels of customer comfort are maintained and to provide useable spaces at ground level.
- A range of customer facilities and amenities is to be provided to grow patronage by making public transport a more attractive choice.
- A high level of amenity and security in customer waiting areas is to be provided to positively influence patronage and perceptions of the public transport system.
- Waiting areas, pedestrian walkways and cycle ways are to have adequate shade and day and night time lighting, while minimising energy consumption, providing an appropriate balance between sun access in winter and shade in summer.
- Minimise urban heat island effect through light coloured finishes, roofs and pavements, green walls, roofs, plantings and shade trees.



Chatswood Transport Interchange. Waiting and circulation areas outside the station entry are weather protected and have a high level of amenity and customer facilities.

Architect: CoxDesignInc.

Source: Cox Richardson, Photographer: John Gollings



9 Castlereagh Street, Sydney. Landscaped spaces provide shade in waiting areas.

Architect: Harry Seidler & Associates.

Source: Cox Richardson

3.1.5 Customer Safety

Relevant Design Objectives

- | | |
|---|--------------------------------------|
| 1 | Ensuring an easy customer experience |
|---|--------------------------------------|

Principle

Ensure stations and precincts provide a safe and secure environment for customers and also contribute to the overall public safety of urban places throughout the day and night.

Guidelines

General

- Safety issues are to be embedded in the design development process and optimised through the application of relevant Crime Prevention through Environmental Design (CPTED) principles and guidelines.
- Operators are to be consulted to advise on issues such as lighting, lines of sight and CCTV, based on their network experience.
- Integrated CCTV systems must be provided at entry and exits, stairways, ramps, bridges, tunnels, lifts, ticket office and vending machines, emergency help points, public telephones, waiting and seating areas in accordance with Australian Standards and Sydney Metro requirements.
- Vandal-resistant fittings and fixtures are to be used throughout.

Public Domain

- An initial CPTED review of station precincts is to assess activity generators, edge effects, movement predictors, conflicting user groups, crime hotspots, the ‘displacement phenomenon’ and building elements
- All public domain areas are to be planned with guidance from CPTED experts, adopt a risk prevention design approach and eliminate entrapment and concealed space opportunities.
- A Crime Risk Assessment audit must be applied to the precinct design to ensure that all precinct areas comply with CPTED guidelines.



Chatswood Transport Interchange, NSW. Design of the public domain enables passive surveillance with clear sight lines through the station areas.
Architect: CoxDesignInc.
Source: Cox Richardson

Stations

- The station design is to incorporate CPTED strategies:
 - Eliminating hidden spaces, recesses or voids that could provide a person with the ability to conceal themselves or others from general view.
 - Secured stations out of operating hours and during emergencies.
 - Ticket Vending Machines (TVMs) positioned to allow surveillance.
 - Minimising inadvertent or intentional access to hazardous or unauthorised areas of the station.
 - Physical barriers to minimise the risk of trespass or self-harm by station users.
 - Protective screening to elevated walkways and concourse areas particularly where persons traverse above or immediately adjacent to the rail corridor.
 - Glazed lift car and lift shaft enclosures to maximise visibility and safety.
- Station designs are to support visible staff presence as close as possible to customer movement and decision making zones to enhance customer safety.
- The stations are to be designed to minimise obstructions and projections, providing clear routes for customers.
- Station designs are to eliminate crush zones and provide equipment at safe and accessible locations.

Help Points

- Help points should be easily identifiable, accessible components integrated into station cladding systems
- Help point enclosures should be integrated with the surrounding wall or equipment cabinet.



Macquarie Park Station, NSW. Glass sided lifts enable passive surveillance and sight lines through to the concourse.
Architect: Hassell
Source: Cox Richardson

3.1.6 Accessibility

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system

Principle

Ensure the stations and associated spaces are safe, efficient, universally accessible, legible and easy for customers and pedestrians.

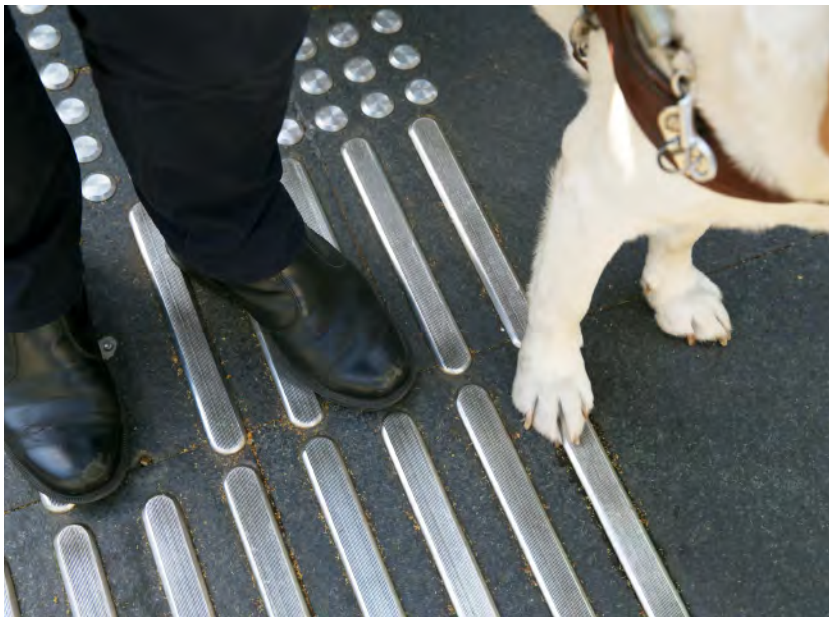
Guidelines

- Stations and precincts are to be easy, safe and accessible for all to use including the elderly, customers with disabilities, young children and those with prams and luggage.
- As far as possible, pedestrian pathways are to be obstacle and step free to maximise access for all customers. Where the use of stairs cannot be avoided, then they must be easy and safe to use.
- Where obstacles to universal access are unavoidable, clearly legible alternative routes must be provided as close as possible to the main travel path.
- Where the use of stairs is unavoidable, clearly legible, alternative accessible circulation routes are to be provided. These alternatives are to be as close as possible and not isolated from the primary circulation route.
- Where lifts and escalators are provided as an alternative to stair access they are not to result in a longer journey than the primary circulation route or compromise the safety of customers who need to use them.
- Ramps may provide opportunities for universal access; however, where possible, seek alternative means of effecting level changes, for example, by altering the path of travel.
- All facilities, furniture and fixings must be designed to be accessible to all customers. Accessible and ambulant toilets must be provided.
- Priority seats and adequate space should be provided in waiting areas and groups of seating to accommodate the elderly and customers with disabilities and prams.

- Information must be provided throughout the customer journey that considers user impairment, culture and language.
- Equivalent service and safety information must be provided for customers with disabilities in their preferred accessible format.
- Public transport information should be provided across a range of multimedia technologies including mobile phones, audio and visual and tactile signage, assisted listening for the hearing impaired and near field technologies to optimise accessibility for all users.
- The use of international icon protocols, colour coding and other graphic devices should also be considered to minimise the use of text-based signage and language difficulties.
- Comply with Disability Standards for Accessible Public Transport.
- All Metro service elements must comply with the Disability Discrimination Act 1992 and associated Public Transport and Premise Standards.



Universal access must be provided to all stations and precinct facilities.
Source: San Francisco Municipal Transportation Agency



Universal access must cater to customers with a wide range of disabilities.
Source: TfNSW

3.2 Identity

For a project of this importance it is imperative that the design delivers not just on the project objectives but provides an architectural and urban design experience that connects with the city and its diverse communities so that they embrace and identify with the project, the rail line and the opportunities it unlocks.

All of the public transport infrastructure is public space, so internal and external spaces of the stations are public realm. Having a consistent theme binds the internal and external areas integrating paid and unpaid areas and helps the station to integrate within its local context. The station entrances need to engage with their local context to create welcoming landmarks in the urban environment.

A major design objective is the achievement of a 'whole-of-corridor' identity for Sydney Metro. In this respect the design strategies in this section all contribute to the character, appearance, accessibility and function of the stations and their surrounding precincts. A unified approach can be fostered through adherence to common strategies for buildings and structures, finishes, accessibility and legibility that respond to local contexts while forming part of a 'whole-of-corridor' identity.

This part of the document provides guidelines for the following areas of creating a Sydney Metro identity:

- Network and Station Legibility
- Place Making
- Heritage & Archaeology
- Environment & Sustainability
- Art
- Lighting



Southwark Station, London. Station spaces are designed as distinctive, high quality public domain.
Architect: MPJ Architects
Source: MPJ Architects

3.2.1 Network and Station Legibility

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system
4	Being responsive to distinct contexts and communities

Principle

Create a line-wide identity for the Chatswood to Sydenham project that is recognisably part of the Sydney Metro network while enabling elements of station design to respond to context, character and environment to create locally distinctive sustainable outcomes.

Guidelines

- A line-wide identity is to be established through the architectural language and layout of the station types (cut and cover, single cavern, binocular cavern).
- The architectural language and elements of the transport infrastructure and stations are to form a line-wide design that reinforces the Sydney Metro identity within the broader transport network.
- The stations are to maintain a coherent identity with consideration of:
 - Network identity
 - Line-wide identity
 - Station-specific local identity.
- Station buildings, service facilities, public domain elements and component elements are all to form part of the identity and project an image which evokes a modern, contemporary and efficient transport system providing an attractive, comfortable, safe and inspiring customer environment, while also responding to the local context and environment.

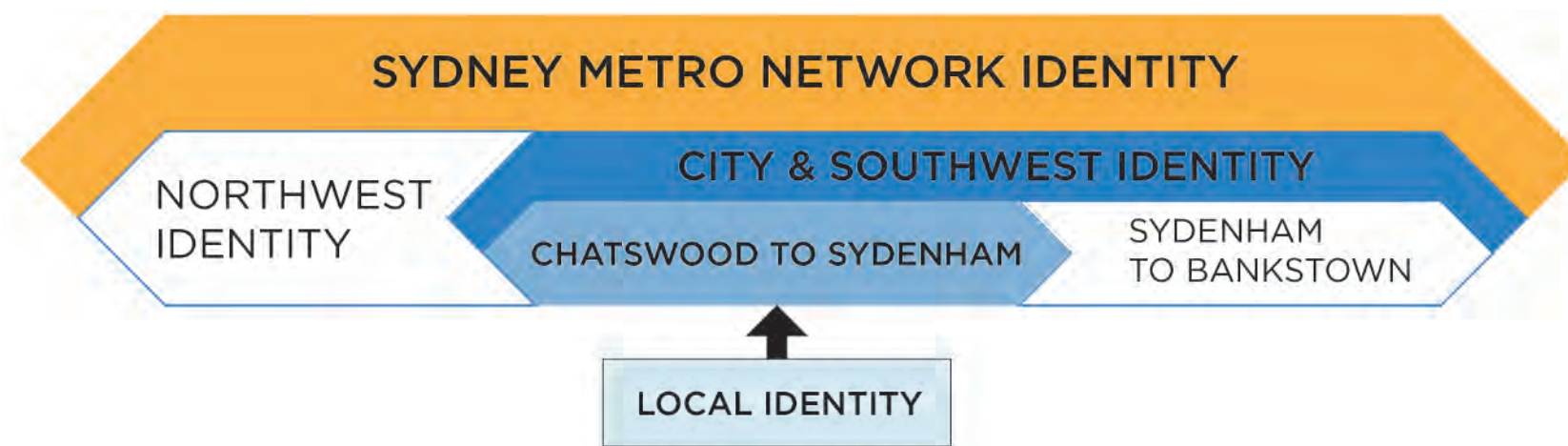


Diagram highlighting the various layers of identity that should be considered in the design.



Kings Cross Station, London. Clear signage contributes to network and station legibility. The architectural quality of the space creates an attractive place for customers with a local identity.
Architect: John McAslan + Partners
Source: Cox Richardson

3.2.2 Place-making

Relevant Design Objectives

- | | |
|---|--------------------------------------|
| 1 | Ensuring an easy customer experience |
| 3 | Being a catalyst for positive change |

Principle

Create welcoming, secure and well maintained public domain spaces and station buildings with an attractive ‘sense of place’.

Guidelines

- Stations and associated spaces are to promote a welcoming image or identity that reinforces a positive sense of place.
- Station plazas are to be designed as an extension of the internal station environment providing shelter, comfort, safety and security for customers, and contributing positively to customer journey experiences. These spaces are to reflect the local public realm context and character.
- The enhancement of station spaces can be achieved by introducing a range of uses, services and facilities such as retail, food and beverage, shade trees, landscaping and public art.
- Create public spaces which allow for spontaneous uses and activities by their occupants.
- Use opportunities to facilitate active uses and informal recreation.
- Consider opportunities for temporary event, pop ups, retail spaces and the night time economy.
- Station public spaces are to be designed with a consistent hierarchy of landscape treatments. The treatment of these spaces is to reflect local character and context, integrate within their settings, and provide attractive space and streetscapes.
- Fixtures, including furniture and lighting, are to enrich site context and sense of place and contribute to wayfinding.
- A coordinated lighting approach is to create aesthetic consistency across Sydney Metro by defining station address, public domain areas and attracting customer into station forecourts and plazas.
- A positive precinct image is to be developed around the particular heritage values of a place or by the qualities of the existing urban context.



‘Solar Tree’ St John’s Square, London
Artist: Ross Lovegrove
Source: Ross Lovegrove

3.2.3 Heritage and Archaeology

Relevant Design Objectives

4	Being responsive to distinct contexts and communities
5	Delivering an enduring and sustainable legacy for Sydney

Principle

Ensure elements and items of heritage significance are appropriately managed and respected. Identify opportunities for heritage conservation to contribute to the celebration of local identity in station design.

Guidelines

- Sydney Metro is to be fully integrated within, and sensitive to, its heritage context. This includes built and natural heritage, European and Indigenous archaeology and may include places, buildings, works, relics, moveable objects or precincts.
- Where Sydney Metro intervenes in or interfaces with heritage places (such as Central Station or Martin Place), design excellence is to be sought to support inventive, interpretive and contemporary responses to the heritage values of that place.
- Where appropriate, the design of the rail corridor and station precincts are to integrate and conserve existing heritage items and mitigate any negative impacts.
- Actively anticipate the research, site investigation, salvage and culturally appropriate safekeeping of Indigenous heritage uncovered by the Sydney Metro project.
- New work is to be based on an understanding of the heritage significance of heritage items, heritage conservation areas and places and is also to take into consideration:
 - Siting - including urban grain, streetscape rhythm, setbacks, orientation and address of buildings, location of boundary walls, key views, significant natural features and archaeological remains,
 - Scale - including wall and floor to floor heights, modulation and façade rhythms, massing, density, proportions, relationship to ground plane, wall modulation including openings and roof planes,

- Form - including proportion and number of openings, solid to void ratios, roof form, skyline and relationship between internal and external spaces,
 - Materials and colour - giving consideration to characteristic materials, textures, colours, light and shadow,
 - Details - creating complementary relationships between new and old elements to provide visual interest.
- Consideration is to be given to integrating heritage interpretation with Public Art.
 - Retaining or interpreting heritage fabric is to be viewed as a means of defining local identity.
 - For new underground stations, archaeological material, features and deposits may need to be considered.



Newtown Station, Sydney. Heritage interpretation.
Architect: NSW Government Architects Office/Caldis Cook Group.
Source: TfNSW



St Pancras Station, London. Heritage building has been enhanced to accommodate new rail requirements.
Architect: Alistair Lansley
Source: Visit London

3.2.4 Environment and Sustainability

Relevant Design Objectives

5 Delivering an enduring and sustainable legacy for Sydney

Principle

Ensure best practice sustainable design solutions are adopted for the public domain, stations and buildings, to minimise environmental impacts and benefit customers and local communities.

Guidelines

- Achieve a high level of performance using sustainable design rating systems.
- Adopt energy efficient and low carbon design solutions that minimise the carbon intensity of the project.
- Incorporate passive design solutions to optimise solar access, introduce daylight, and maximise natural ventilation.
- Harness both direct and indirect daylight to minimise energy consumption in lighting, while creating a light and airy ambience in stations and surface buildings.
- Utilise energy efficient lighting and lighting control systems.
- Ensure resilience to climate change, by incorporating climate change adaptation measures which respond to weather extremes, including flood risk, and temperature increases.
- Provide a positive journey experience in station precincts by protecting users from the potential negative impacts of extreme weather.
- Ensure designs respond to the local microclimate and incorporate opportunities to reduce heat island effects, including (as appropriate) light coloured finishes, roofs and pavements, green walls or roofs, plantings, and shade trees.
- Include integration of renewable energy sources at stations and in the public domain where feasible.
- Consider water efficiency in design, utilising water from recycled sources where appropriate.
- Opportunities for collection, treatment, storage and reuse of rainwater from station roofs, canopies and other surfaces are to be considered where practicable within the urban environment.
- Water Sensitive Urban Design (WSUD) initiatives are to include an integrated and site-responsive range of design solutions, influenced by urban design considerations and be adaptable into the future.
- Minimise materials consumption, and reduce embodied energy and impacts in materials selection.
- Prioritise reuse of materials, use of recycled materials, and selection of materials from sustainable sources.

- Use durable, climate resilient, long life, healthy, low maintenance materials.
- Maximise opportunities for beneficial reuse of spoil in landscape features and other uses.
- Provide noise control measures to ensure appropriate and comfortable acoustic conditions for users.
- Minimise waste through efficient design and material selections.



Central Park, Sydney. Landscaped facade treatment helps cool the microclimate.
Architect: Jean Nouvel
Source: Cox Richardson

3.2.5 Art

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities

Principle

Ensure public art is integrated within the design of stations and other corridor structures to aid place-making and to enhance local amenity and celebrate local character.

Guidelines

- Public art is to be a key feature of the customer experience, bringing joy to customers and adding value to the operation and success of Sydney Metro by contributing to station identity, beauty, amenity, wayfinding, safety, security, community values and the public domain.
- Public art is to be integrated into the station and building designs to enliven and enrich the public realm and contribute to a sense of place.
- Public art is to be integrated but separate from the architecture, budgeted and managed from the architectural scope.
- The design and location of art works is to be coordinated within the broader urban context of city stations and be reflective of the distinctive character of each place.
- Consider the re-installation of artworks present in existing buildings or streets to be changed as part of Sydney Metro works.
- Artworks are to contribute to the cultural identity of precincts and neighbourhoods and are to be developed in consultation with the local community and stakeholders.
- Maximise community involvement/representation/ownership in public art.
- Art works must be located to support the safe intermodal function of precincts around Metro stations.
- In station concourse and precinct areas, appropriate integration is required of permanent artworks with station wayfinding, information and other customer amenities.



Artwork may also be incorporated into the public realm as part of a building element.
Artist: Bronwyn Bancroft.
Source: TfNSW



Georg-Brauchle-Ring Station, Munich U-Bahn, Germany. Artwork on the trackside walls gives the station a distinctive identity and facilitates wayfinding.
Artist: Franz Ackermann
Source: Wikipedia

3.2.6 Lighting

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities

Principle

Ensure a coordinated approach to lighting that responds to the local context, addresses CPTED and operational requirements and provides feature lighting representative of the Sydney Metro image. Use light to enhance station built form and corridor landscape, whilst delivering functional lighting and creating a safe and high quality experience for all users.

Guidelines

General

- Lighting is to integrate with access, wayfinding and public art strategies.
- Lighting is to reinforce the visibility of station entries as safe and welcoming elements within the local context at night.
- Illumination levels are to be appropriate to the task, be it wayfinding, reading tasks and facial recognition, while creating visual interest within the stations.
- Glare and visual discomfort is to be eliminated through appropriate specification and positioning of luminaires.
- The number of luminaires is to be minimised to aid maintenance and sustainable aspirations.
- A coordinated lighting approach is to provide aesthetic consistency across Sydney Metro by defining station address, public domain areas and attracting customers into station precincts.
- Provide market leading energy efficient lighting and lighting control systems.

Public Domain

- Lighting at station precincts and facilities must provide a safe, secure, legible and comfortable environment for all operators and users.
- Provide public space lighting to facilitate diverse uses including night time use of public spaces.
- Station precincts are to be defined by the application of an iconic, consistent, multi-functional pole and luminaire system, as for example at Epping to Chatswood Rail Line stations in Sydney.
- To eliminate unnecessary clutter, lighting must be coordinated with all other public domain elements.
- Lighting within station precincts is to celebrate the station address and pedestrian links with lighting systems that are of an appropriate scale, different to that which defines the precinct streets and street frontages.

Stations

- Lighting is to complement the architectural design and seek to provide an appropriate balance of artificial and daylight.
- Natural light is to be maximised and artificial lighting is to support natural light levels.
- Protection from intense sun penetration is to be provided.



Britomart Transport Centre, Auckland. Lighting is designed to provide a safe, legible and comfortable environment for customers and users.
Architects: Mario Madaayag & Jasmax
Source: Opus



Westfriedhof Station, Munich. Coloured light in station platform
Lighting Designer: Ingo Maurer
Source: Unframed World

3.3 Connectivity

Safe and convenient connections to and from Sydney Metro stations are an important part of an easy customer experience. Connectivity between different transport modes including walking, cycling, rail, light rail, buses, taxis and kiss and ride, must be legible and easy, acknowledging that Sydney Metro is part of an integrated transport system.

A modal hierarchy that prioritises pedestrian connections has been established to guide the Sydney Metro design and ensure the safety and wellbeing of customers and users of the station environs.

The design of the Sydney Metro stations and station precincts must facilitate safe, welcoming intuitive and accessible connections between transport modes. This part provides guidelines for the following:

- Interchange
- Pedestrian Movement
- Bicycle Movement
- Vehicular Interface



Signage supports connectivity between different modes, and provides customer information to assist trip planning.
Source: TfNSW

3.3.1 Interchange

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system

Principle

Provide an efficient, safe transport service that is part of a fully integrated and accessible transport system.

Guidelines

- Station planning and design is to acknowledge Sydney Metro forms part of an integrated transport network that includes a hierarchy of movement modes:
 - Priority 1: Pedestrian, wheelchair and pram movement and access
 - Priority 2: Bicycle movement and access
 - Priority 3: Other primary Public Transport services (including Light Rail and Bus movement and access)
 - Priority 4: Taxi movement and access
 - Priority 5: Kiss and ride movement and access
- Station Precinct planning is to support good access to and between public transport modes for all customers, with connections designed to support efficient and timely interchange for customers.
- Integration of station precincts with the surrounding urban structure is to facilitate cross and through movements, enhancing precinct permeability and access to the transport interchange functions of the locality.
- The stations are to provide a safe, welcoming, intuitive and accessible environment for customers transferring between transport modes.
- Station design is to minimise movement conflicts for customers between key transport modes.
- Station forecourt areas to accommodate adequate customer access and waiting spaces (as relevant), while ensuring that customer confidence, sense of safety and wellbeing are not compromised.
- The varying spatial requirements of different transport modes, including third party operators, are to be accommodated to avoid user conflicts.
- Provide point of decision wayfinding signage to facilitate walking and cycling choices.
- Consider the Sydney City Centre Access Strategy when planning for transport and interchange functions around stations.



Station modal access hierarchy
Source: TfNSW

3.3.2 Pedestrian Movement

Relevant Design Objectives

- | | |
|---|---|
| 1 | Ensuring an easy customer experience |
| 2 | Being part of a fully integrated transport system |

Principles

Provide pedestrian connectivity between transport modes that is safe, efficient, accessible, legible and enjoyable.

Provide pedestrian movement systems that clearly connect the stations with their surrounding locality.

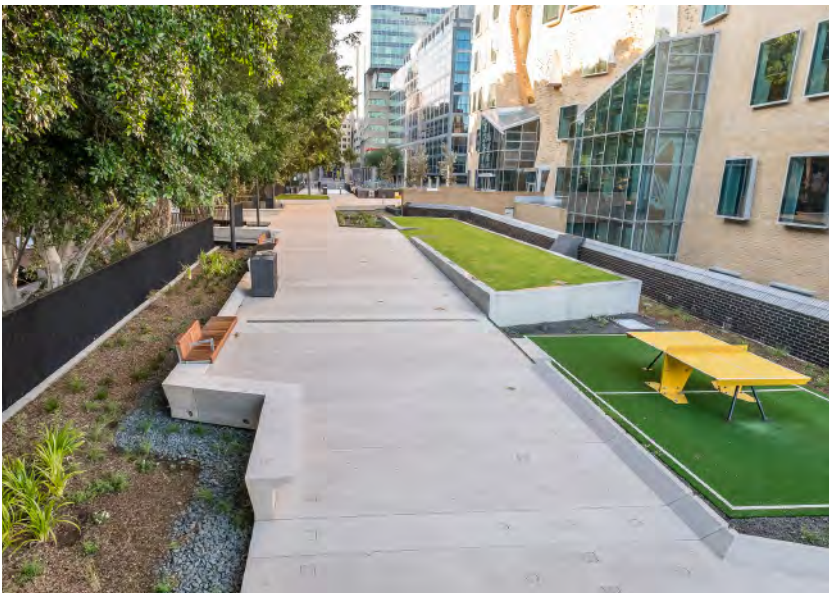
Ensure the vertical journey is a core element of the station architecture and provides step free access between the street and the platforms as it is integral to the station's design and has a major influence on the function and visual impact of the station environment.

Guidelines

- The station forecourt and associated areas are to adopt a clear hierarchy of movement functions that favour pedestrians ahead of vehicular circulation, thereby promoting opportunities for public transport patronage, walking and cycling.
- Station precincts are to provide pedestrian routes that connect people with places they want to go and provide clear sightlines through open, uncluttered spaces along pedestrian desire lines between key destinations.
- Pedestrian movements are to accommodate an appropriate level of service in all areas of the station. Precinct designs are to optimise the variety of movement functions in order to minimise potential conflicts.
- Circulation systems are to respond to context and reinforce the character of precincts so they are easy and efficient to navigate.
- Design decisions affecting movement planning are to consider varying customer usage patterns including commuters, customers with disabilities, station employees, tourist customers and non-travelling visitors.



Wide, clear footpaths enable people to stop and wait without obstructing pedestrian movement flow.
Source: TfNSW



The Goods Line, Sydney. Design walkable attractive places with high visual amenity. Circulation systems that respond to context and reinforce the character of precincts should be easier to navigate and therefore more efficient.
Architect & Landscape Architect: CHROFI & Aspect Studios
Source: TfNSW

3.3.3 Bicycle Movement

Relevant Design Objectives

- 2 Being part of a fully integrated transport system

Principle

Prioritise bicycle movement consistent with the modal access hierarchy by providing optimum connectivity and convenient, secure and accessible bicycle parking at stations to accommodate current and future demands.

Guidelines

- Bicycle paths to/from stations are to be connected with regional and local government bicycle networks, existing and future.
- Bicycle infrastructure is to be responsive to the specific characteristics of each station precinct, address the bicycle network and storage requirements, and integrate them into the broader precinct movement networks.
- The design of bicycle paths and routes connecting directly to/from stations is to be legible, with a distinct and identifiable character and be safe for cyclists and other users.
- Access to bicycle networks is to be easy, enabling the comfortable flow of bicycle traffic.
- Conflicts between pedestrians and cyclists at stations are to be designed out, particularly at high activity zones such as station entries and retail areas.
- Provide convenient, safe, secure bicycle storage facilities, with good natural surveillance and weather protection, connected to existing cycle ways.
- Sheltered and secure bicycle parking at stations is to be placed directly adjacent to movement paths to provide clear and legible access, without compromising safe, accessible paths of travel for customers with mobility and vision impairment.
- Design for bicycle facilities is to give priority to bicycle safety at road interfaces.
- Integrate with the directions established in Sydney's Cycling Future.



Attractive, secure, weather protected bicycle storage.
Source: Sydney Cycleways.



Provide for people with bicycles throughout the intermodal connections.
Source: TfNSW. Copyright: Glenn Duffus Photography

3.3.4 Vehicular Interface

Relevant Design Objectives

- 2
- Being part of a fully integrated transport system

Principle

Establish a legible hierarchy of safe vehicular streets that respond to the varying customer and operational requirements for vehicular, bicycle and pedestrian movements in accordance with the modal hierarchy.

Guidelines

- The design of stations and associated urban realm is to respond to the character of established streets and variations in carriageway width, on-street parking, existing and planned future cycle ways, street tree planting and pedestrian amenity.
- Modifications to existing roads are to consider:
 - Agreed adjustment of existing roads with relevant authority
 - Number of traffic lanes
 - Length and type of slip lanes
 - Intersection types and configurations Signalling requirements
 - Speed environments, traffic calming measures
 - Kerbside zones
 - Cycling
 - Footpaths
 - Crossings
- Changes to streets, footpaths and bicycle paths are to contribute to the quality and character of the urban area, and will heavily influence customer experience.
- Vehicular traffic planning is to be integrated with the built form and spatial planning of precincts.
- Consider the Sydney City Centre Access Strategy in planning for vehicular movement around stations.
- Provide for bus stops close to the station in accordance with the modal hierarchy, bus movements where buses operate on streets adjacent to station entries and safe and accessible paths to bus stops.
- Consider the need for secure electric bike/scooter and motorbike parking spaces. Consider locker provision at stations to cater for storage of electric scooters, electric bicycles, and batteries, and charging of personal electric transport.
- Taxi and kiss and ride spaces are to be located in accordance with the modal hierarchy.
- Service vehicle access for all precinct functions is to be addressed as part of the broader station precinct movement strategies.

Note - further guidelines on Service Vehicle Access are set out in Section 4.3.7



Sydney. Dedicated bicycle and bus lanes.
Source: TfNSW



Sydney City. Designated taxi pick up zones.
Source: AECOM.

4

Elements

About this Section 62

4.1 Stations 63

- 4.1.1 Station Typology
- 4.1.2 Station Entries
- 4.1.3 Platforms
- 4.1.4 Circulation Elements
- 4.1.5 Flooring
- 4.1.6 Internal Walls and Ceilings

4.2 Urban Realm 70

- 4.2.1 Landscaping
- 4.2.2 Accessible Pathways
- 4.2.3 Furniture
- 4.2.4 Walls and Fences
- 4.2.5 Earthworks and Engineered Structures

4.3 Operation and Services 76

- 4.3.1 Wayfinding and Signage
- 4.3.2 Ticketing Equipment
- 4.3.3 Engineering and Services Integration
- 4.3.4 Management and Maintenance
- 4.3.5 Security
- 4.3.6 Emergency Requirements
- 4.3.7 Service Vehicle Access

4.4 Specific Elements 84

- 4.4.1 Sydney Yard Access Bridge
- 4.4.2 Central Walk
- 4.4.3 Sydenham Aqueduct
- 4.4.4 Sydney Metro Trains Facility - South

Image References 90

About this Section

This section provides guidelines for developing the detailed elements of the urban and public domain around and within stations including connecting customer areas through station entries.

The guidelines for the design elements in this part of the document are arranged according to the following three topics:

- Stations
- Urban Realm
- Operational and Services

More detailed design guidelines and key requirements for each of these elements will be included in the scope and performance documents during the procurement stage.



Sculptural plant extraction vents at One Shelley Street, Sydney.
Artist: Anton James
Source: TfNSW

4.1 Stations

The Sydney Metro stations are part of a wider system requiring consistency between station planning, operations and architecture. Each station will take on a unique identity that relates to its locality, expressed through the station design. The interface between the station and surrounding context is critical in providing an integrated and legible transport system that is easy for the customer to use.

The design of each station must be framed around the benefits to or impacts upon the customer experience. Station entries, platforms and circulation elements must be designed to meet operational requirements while ensuring an easy customer experience. Stations are public buildings and all circulation elements, finishes and fittings must be of a robustness and quality associated with outdoor public spaces as well as suitability for the rail environment.

This part provides guidelines for the following station elements:

- Station Typology
- Station Entries
- Platforms
- Circulation Elements
- Flooring
- Internal Walls and Ceilings



Macquarie Park Station. Clear sightlines and uncluttered spaces provide a safe and welcoming customer environment.
Source: TfNSW

4.1.1 Station Typology

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system
5	Delivering an enduring and sustainable legacy for Sydney

Principle

The designs are to provide consistency between station planning, operations and architecture across the differing station typologies that will be adopted between Chatswood and Sydenham. There will be three principal typologies that relate to their construction type:

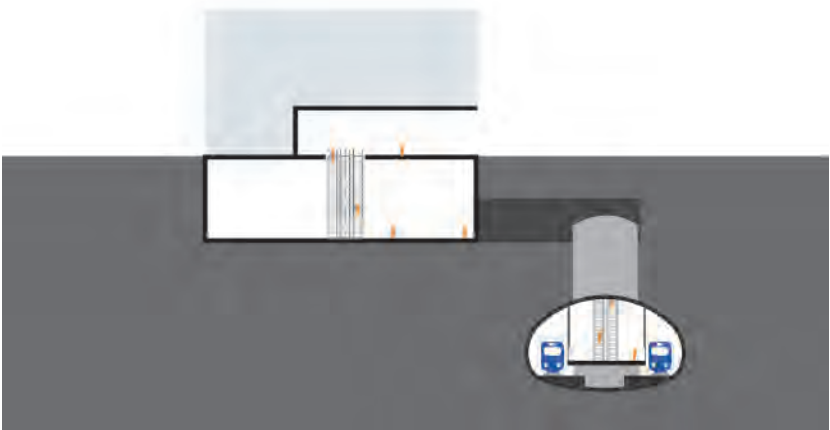
- **Cut and cover**
- **Single cavern**
- **Binocular cavern**

Guidelines

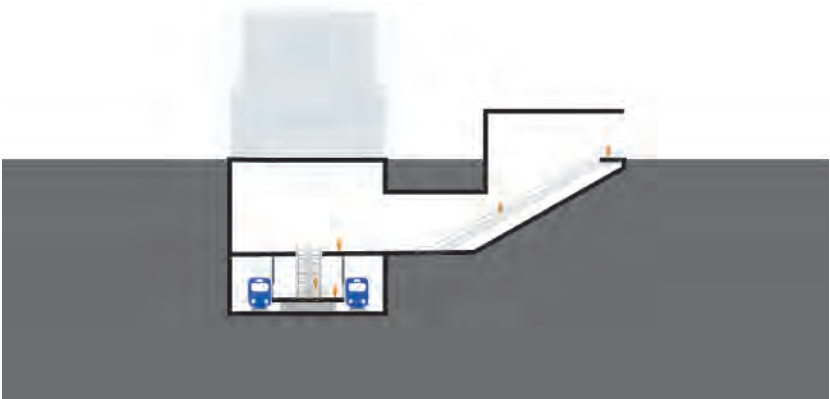
- The stations are to be integrated with the urban design of the adjoining precinct to provide direct and safe accessibility to the station entry.
- The station design is to enable integration with existing and future local development opportunities within adjacent sites as relevant.
- Designs are to provide a legible station entry integrated with public domain.
- Station designs are to provide a seamless transition between transport modes.
- The Sydney Metro stations should maximise consistency in the key functional elements of the architecture.
- Where there is sufficient space and where appropriate, station entries and gatelines are to be located at ground level to provide a line of security at street level.
- Integration of operational and customer facilities is to be consistent across the three typologies providing a high quality and consistent experience for all users.
- Design to minimise level changes between the street and station entries
- Maximise access to natural light and ventilation
- All entries and concourses are to be open and transparent, generous and inviting.
- Design for efficient customer circulation and intuitive wayfinding to and from station entries and platforms.
- Allow for affordable and flexible business premises including pop ups, start-ups, micro and small businesses.
- Consider role of station retail elements in supporting a night time economy, including retail areas, lighting, and use of public spaces by the community.



BINOCULAR CAVERN STATIONS
MARTIN PLACE
PITT STREET



SINGLE CAVERN STATIONS
VICTORIA CROSS



CUT AND COVER STATIONS
CROWS NEST
BARANGAROO
CENTRAL
WATERLOO

4.1.2 Station Entries

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities
5	Delivering an enduring and sustainable legacy for Sydney

Principle

Station entries including canopies and concourses are to create a strong and consistent line-wide visual identity to the station environments and be designed as intuitive interchange spaces for customers.

Guidelines

General

- Entrances to stations including canopies and concourses are to provide a consistent line-wide identity for Sydney Metro and are to be clearly visible from the immediate area.
- Canopies and entrances are to respond to the built form and character of the surrounding context in terms of scale, setbacks and character, as well as heritage context where relevant.
- Station entries are to be legible from the street and public domain and are to minimise long blank walls through articulation of the built form.
- Station entries are to provide active street frontages where possible, prioritising pedestrian activity and amenity at ground level.
- Station entries are to incorporate canopies/awnings as appropriate to provide weather protection for customers, community information, amenities, and ticketing equipment, gateline and appropriate queuing zones.
- Entry concourses should be clutter-free with clear and simple directional signage, simple volumes and flush continuous materials with components that support wayfinding.

- Entry spaces are to be well lit, bright and welcoming to enhance customer experience providing a safe, open environment that has good permeability and clear sight lines from inside and outside the station.
- Where possible, natural light areas should be provided over Vertical Transport (VT) and concourse areas to reinforce intuitive wayfinding.
- Adequate space should be provided to meet patronage demand and to provide clear zones for queuing at Ticket Vending Machines (TVMs) and gatelines, including during special events, separate to paths of travel.
- Columns are to be minimised and carefully positioned not to obstruct key sightlines or pedestrian movement, particularly for the mobility or visually impaired.
- Lighting, communication, wayfinding and information and security systems are to be well integrated with equipment and recessed where possible.
- Unobtrusive maintenance access is to be provided.
- The materials palette is to be of high quality and is to integrate with surrounding high quality public realm context.
- Permanent public art should be integrated within the station architecture. Art should act as a visual cue to enhance wayfinding.

Canopies and Awnings

- Canopy or awning features are to consider the adjacent character of buildings and should sit comfortably within their context.
- The entry canopy/awning design is to create a recognisable identity for stations along the Sydney Metro line but may not necessarily be common across all types of stations due to the diversity of the built form.
- Entry canopies should be clearly visible in the locality.
- The entry canopies should promote a sense of arrival and offer a weather protected threshold for customers.
- The entry canopy design should contribute positively to the built environment by enhancing the immediate public domain.
- Weather protection to station entry and concourse should be provided as a single integrated element.
- Roof lights should be integrated within the entry canopy and located directly over the customer's path of travel towards the vertical circulation zone to aid intuitive wayfinding.



Canary Wharf Station, London. Natural light over entries and VT enhances wayfinding and creates a welcoming station environment.
Architect: Foster + Partners
Source: Cox Richardson

4.1.3 Platforms

Relevant Design Objectives

- | | |
|---|--------------------------------------|
| 1 | Ensuring an easy customer experience |
|---|--------------------------------------|

Principle

Platform designs are to maximise efficiency and provide a high level of service and an easy customer experience.

Guidelines

- Platforms are to provide efficient and safe access to the Metro service through good sightlines, generous circulation and open and spacious planning.
- Vertical transport (VT) distribution and position on the platform is to be coordinated with the demand and movement patterns of customers.
- Platforms are to be free of recesses and indentations which could offer hiding places and litter traps, disrupt continuous paths of travel for the visually impaired and hinder CCTV coverage.
- Emergency egress must be provided.
- Platforms should establish a strong relationship with the vertical circulation zone through lighting and material palette selection.
- Platforms should minimise structures and columns to maximise sightlines and customer waiting and circulation space.

Note - design guidelines for platform screen doors are set out in Section 4.1.6.



Canary Wharf Station, London. Example of central columns and fixtures
Architect: Foster + Partners
Source: Cox Richardson



Macquarie Park Station. Example of transparent vertical circulation within an open platform that maximises sight lines.
Architect: Hassell
Source: Cox Richardson

4.1.4 Circulation Elements

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system

Principle

Enable step free access between the street and the platform via lifts and escalators that are integrated with station design.

Guidelines

- All Sydney Metro platforms are to be served by escalators and lifts. Lifts and escalators are to provide direct access from entry concourse to platform level.
- All circulation elements are to provide a means of safe movement of people in and around the stations.
- Stairs are to be avoided in stations as far as possible as they reduce opportunities for universal access. Where the use of stairs cannot be avoided or provide a secondary means of access, they must be easy and safe to use.
- Where ramps, lifts and escalators are provided as an alternative to stair access they must not result in a longer journey than the primary circulation route.
- Escalators are to enable a safe, fast and efficient method for vertical transportation for customers to and from station entrance level and platform levels.
- Where feasible, provide stairs adjacent to escalators to facilitate increased levels of activity and for when escalators are closed for maintenance.
- Lifts are to integrate into each different station design and be strong architectural elements in their own right to promote the inclusion of customers using step free circulation elements.
- All circulation elements are to incorporate high quality materials that contribute to the Sydney Metro identity.

Note - further design guidelines on accessible pathways are set out in Section 4.2.2.



Chatswood Transport Interchange, NSW. Good example of a glazed lift and shaft
Architect: CoxDesignInc.
Source: Cox Richardson

4.1.5 Flooring

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities
5	Delivering an enduring and sustainable legacy for Sydney

Principle

Ensure the safe, efficient movement of pedestrians, including people with disabilities, through high quality and robust flooring design suitable for the station environment.

Guidelines

- Flooring is to provide a safe and robust solution, suitable for the station environments. Types of flooring include those appropriate to public areas and others to areas of the station where special flooring is required.
- Flooring is to form a part of the Sydney Metro line-wide identity and maximise operational efficiencies.
- Flooring selection is to consider long term wear and tear, maintenance, sustainability objectives including dematerialisation and embodied energy, and future replacement as an important consideration in the design process.
- Flooring is to consider the urban realm context of the station, creating a seamless transition between the external and internal station environs.
- Flooring is to provide a clean, attractive and uniform appearance throughout the stations and is to be integrated with the broader internal materials palette to aid wayfinding.
- Flooring pattern and design is to accentuate movement.



Coordinate interior and exterior public domain pavements.
Source: AECOM.



North Sydney Station, NSW. Example of an open clutter free concourse with directional flooring.
Architect: Cox Richardson
Source: Cox Richardson

4.1.6 Internal Walls and Ceilings

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities
5	Delivering an enduring and sustainable legacy for Sydney

Principle

The vision for the design of wall and ceiling elements is the development of a system with inherent flexibility to adapt to the characteristics of individual stations while contributing to the Sydney Metro line-wide identity.

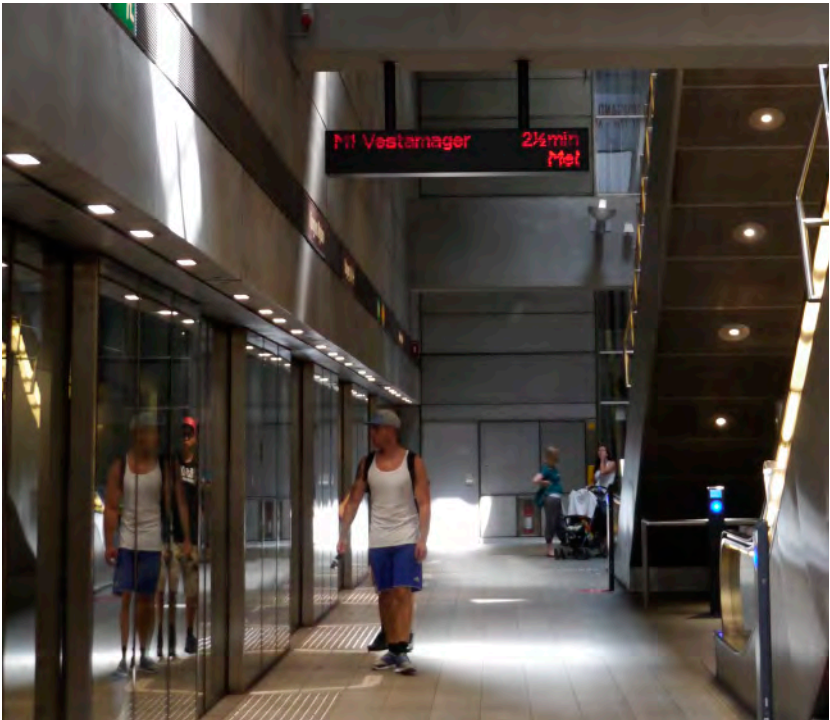
Guidelines

General

- The appearance and function of the walls is to be suitable for a rail environment and reinforce the Sydney Metro identity.
- Wall systems and details are to respond to their location, function and acoustic environment.
- Ease of access, maintenance and replacement of walls sections is to be considered.
- Robust cladding materials and finishes are to be selected in response to the local environment and conditions.
- Feature walls are to be an identifiable station element used in vertical circulation zones to accentuate the customer pathways and establish a strong architectural language.
- Walls and ceilings over tracks are to be calm and simple and contribute to the high quality station environment and customer experience.
- The materials palette should balance a calm and neutral quality with vibrant materials to aid wayfinding and accentuate movement.
- Use of colour/texture should assist in legibility and wayfinding.
- Wall and ceiling detailing should take into consideration the integration of station assets such as signage, fixtures and machines.

Platform Screen Doors

- Platform Screen Doors (PSDs) are to be minimal and elegant, seamlessly integrating customer information and supporting the station servicing requirements.
- Stations are to integrate the following PSD design considerations:
 - Be full height
 - Run full platform length
 - Integration of the end walls is to be well-considered.
 - Extent of glazing for customer experience is to be well-considered.
 - Security requirements
 - Modularity of units - constructability, repair and replacement.
 - Interface with other wall, floor and ceiling junctions



Copenhagen Metro, Denmark. Good example of full height PSD
Architect: KHRAS Architects
Source: Cox Richardson

4.2 Urban Realm

The public domain is a significant component of the door-to-door journey for Sydney Metro customers. The design quality of station precincts, forecourts and streetscapes outside station entries will therefore be of paramount importance to the overall public experience and perception of the new system. This has implications for the detailed design stages of the project with a range of architectural and engineering structures, landscaping elements and operational equipment that will need to be coordinated to ensure that coherent and distinctive station environs are delivered.

Each station will take on a unique identity that responds to its locality, expressed through the station design in both precinct urban realm and buildings. The interface between the station and surrounding streetscape needs to be well integrated and functional as part of the provision of robust and legible interchange precincts around Sydney Metro stations.

Key elements of the public realm around Metro stations and the alignment that are considered in this part of the document include:

- Landscaping
- Accessible pathways
- Furniture
- Walls and Fences
- Earthworks and Engineered Structures



The Goods Line, Sydney.
Architect & Landscape Architect: CHROFI & Aspect Studios
Source: TfNSW

4.2.1 Landscaping

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities
5	Delivering an enduring and sustainable legacy for Sydney

Principle

Provide hard and soft landscapes that establish a civic quality to the Sydney Metro project and an attractive customer public realm at stations located within the central city. Reflect the existing urban character along the corridor that is appropriate to local conditions.

Guidelines

General

- The landscape design is an important component of a positive, high quality and appealing urban realm identity for Metro stations and structures.
- Hard and soft landscaping design, species selection and material palettes are to relate and reflect the existing urban fabric of the city.
- Landscape treatments are to be appropriate to a functional station and related transport operations and address safety-in-design issues relevant to a transport customer environment and adjacent road and public realm networks.
- Landscape treatments are to be designed to provide appropriate scale and comfort to users throughout the seasons, with planting and materials palettes suited to the local microclimate and any surrounding development considerations.
- Integrate water sensitive urban design including permeable pavement.
- Consider reuse of materials from demolition e.g. in public space landscaping.
- Materials are to minimise slips, trips and falls.

Hard Landscaping

- The external materials palette is to be durable and establish a strong Sydney Metro identity, consistent with a CBD and inner-urban station environment.
- Materials and finishes are to be high quality, robust, durable and meet all functional requirements such as customer interface, component and services integration.
- A hierarchy of paving types should be provided that are appropriate to function and location.
- Use of colour/texture is to assist in legibility and wayfinding, within the context of the immediate station public realm.
- To optimise the legibility of precinct spaces, paving should consist of simple, linear patterns that relate to the main direction of travel.
- The paving palette is to be developed with reference to relevant local council public domain requirements and materials guidelines.
- Materials are to maximise economies of scale and be designed to ensure safe installation, low maintenance and long term durability to minimise the need for replacement.
- Paving is to be the same on each side of the station gateline and be of the highest quality consistent with the Sydney Metro image.
- As well as satisfying the relevant standards and design codes for visual and tactile contrast, products should be selected in order to complement the design of associated pavement materials.

Soft Planting

- Plant species are to be appropriate to local conditions and relate to the character of the urban context - both current and/or planned future context.
- The general planting arrangements and species are to suit the spatial scale of each public domain setting, without compromising pedestrian capacity and circulation outside stations.
- Where appropriate street trees are to provide strong, legible structure planting where appropriate at stations, either to reinforce spatial movement, connectivity with adjacent areas, civic quality, visual continuity or identity and character.
- Depending on orientation and urban enclosure, selected tree species are to provide shade during summer months and good solar access in winter months. Proposed species are to respond to existing council policies and guidelines and character drivers.
- Proposed plants are to be low maintenance and based on minimal water requirements beyond the establishment phase.
- Trees, shrubs and groundcover are to help reduce potential heat island effects and to provide valuable amenity for customers and the broader urban community.
- Screen planting is to be employed to help mitigate the visual impact of retaining structures, noise walls and service facilities as required.
- All planting must maintain clear setbacks and sight lines at road intersections and be offset from other transport infrastructure elements at suitable distances for the selected species.

4.2.2 Accessible Pathways

Relevant Design Objectives

- | | |
|---|---|
| 1 | Ensuring an easy customer experience |
| 2 | Being part of a fully integrated transport system |

Principle

Provide pathways to and from station entries and facilities that are accessible, safe and comfortable for all users.

Guidelines

- A system of appropriate pathway surfaces, widths and gradients is to provide safe and equitable pedestrian access throughout the public domain and to link transport modes.
- Station precincts must be easy and safe for all to use regardless of physical mobility; able bodied customers, wheelchair users, carers with strollers, the visually and cognitively impaired should all be provided with equal access.
- Stairs are to be avoided as far as possible as they reduce opportunities for universal access. Where the use of stairs cannot be avoided, then they must be short in length, easy and safe to use.
- Where the use of stairs is unavoidable, clearly legible alternative circulation routes should be provided. These alternatives should be as close as possible and not isolated from the primary circulation route.
- Ramps may provide opportunities for universal access; however, where possible, seek alternative means of effecting level changes, for example, by altering the path of travel.
- All alternative means of effecting level changes should be considered, for example by altering the path of travel.
- Selective use of colour, texture, lighting, finishes and customer information to further define paths of travel, circulation spaces and the location of key facilities.
- Tactile Ground Surface Indicators (TGSIs) should be used on paths of travel to warn customers with vision impairment of hazards and assist wayfinding where required.
- Where possible, provide a consistent, clear path of travel for customers with vision and mobility impairments by keeping one side of paths of travel clear of fittings and fixtures.



Design paths and ramps for access for all. All modal connections must be located in convenient, safe, well-lit areas with good natural surveillance.
Source: AECOM.



Martin Place, Sydney. Carefully locate all street furniture to minimise potential obstructions and maximise use of circulation spaces.
Source: AECOM.

4.2.3 Furniture

Relevant Design Objectives

- | | |
|---|---|
| 1 | Ensuring an easy customer experience |
| 2 | Being part of a fully integrated transport system |

Principle

Furniture and fixtures are to provide respite, safety, comfort, services and functionality to public spaces, as well as punctuating the station domain with items of interest.

Guidelines

General

- Furniture and fixings are to be robust, high quality and attractive, respond appropriately to context and be representative of the Sydney Metro identity.
- In addition to their functional and amenity value, furniture and fixings are to be used to delineate function zones and restrict or manage pedestrian access.
- Elements in common locations (bins/seating/drinking fountains/bollards) are to adopt a rational layout in order to minimise visual clutter within the public domain and maximise safe and accessible paths of travel.
- All components should be accessible and fully integrated with the station design.
- Modularity of components should retain ability for future enhancement or replacement.
- Robust materials should ensure durability within a rail environment.
- Street furniture should be selected with consideration to facilitating active uses and informal recreation.

Seating

- Seating placement should not impede customer flows and be located to provide resting points for the customer journey.
- Provide seating integrated with structures and landscape elements where it does not impede customer flows.
- Seating is to be located along main paths of travel adjacent to entrances, transit shelters, major crossover areas and no more than 60m apart.
- The location and grouping of seating and other elements is also an opportunity to help create meeting places and a sense of place.

Handrails and Balustrades

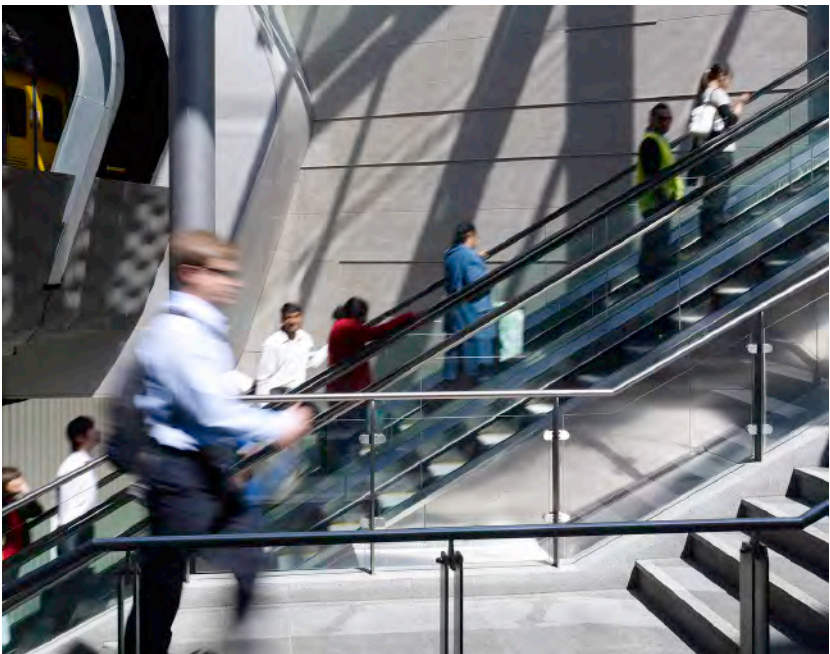
- Handrails and balustrades should guide safe customer movement and be consistent in material and quality line wide.

Waste Bins

- Bins should be consistent line-wide, including consideration of the locality and considerations below.
- The station design and management should ensure that, through the placement and maintenance of bins, cleanliness is maintained during operating hours.
- Bins are to be located to minimise the recurrence of litter, whilst considering the ambience and attractiveness of the station precinct.
- Facilitate waste separation and recycling.



Barangaroo, Sydney. The furniture and fixing colour palette should be coordinated with architectural elements, surface finishes and pavements.
Architect: Tzannes Associates
Source: TfNSW



Chatswood Station, Sydney, NSW. Example of handrail and stanchion
Architect: CoxDesignInc.
Source: Cox Richardson

4.2.4 Walls and Fences

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities
5	Delivering an enduring and sustainable legacy for Sydney

Principle

The vision for the design of wall and fencing elements is the development of a system which can be applied across the corridor and station sites with a high quality, robust and durable form that is representative of the Sydney Metro image and each station's context.

Guidelines

- The appearance and function of external walls and fencing is to be suitable for a rail environment and reinforce the Sydney Metro identity.
- Location, scale and articulation of external walls and fences are important elements of the public realm. Their design is to be an integral part of the urban design of station areas and corridor sites to minimise excessively long unarticulated lengths, inactive, bland and unappealing frontages.
- Wall and fencing systems and details are to respond to their location, function and acoustic environment.
- Ease of access, maintenance and replacement of walls and fencing sections is to be considered.
- Robust cladding materials and finishes are to be selected in response to the local environment and conditions, and sustainability objectives including dematerialisation and embodied energy.
- Feature walls are to be used to accentuate customer pathways and establish a strong architectural language at stations, employing artworks at appropriate sites.
- The materials palette should balance a calm and neutral quality with vibrant materials to aid wayfinding and accentuate movement.
- Use of colour/texture should assist in legibility and wayfinding.



Terracotta louvred facade provides a vibrant wall surface.
Source: AECOM.



Glazed facades enable transparency and legibility.
Architect: The Buchan Group
Source: Apple

4.2.5 Earthworks and Engineered Structures

Relevant Design Objectives

1	Ensuring an easy customer experience
4	Being responsive to distinct contexts and communities

Principle

Ensure earthworks and engineered structures such as noise walls, retaining walls and portals are visually integrated into their urban or landscape setting as much as possible, keeping engineered structures to a minimum.

Guidelines

Earthworks

- Dive structures at Marrickville and Chatswood may require cut embankments as a combination of engineered slopes and low retaining walls, to create an integrated, ‘sculpted’ landform, suited to the rail corridor setting.
- All earthworks are to sit lightly in their context, exhibiting a ‘natural fit’ within their landscape setting wherever possible.

Retaining Walls and Portals

- Retaining walls and related elements are to be designed as a unified composition and be integrated with the adjoining landscape (as appropriate) and other components such as fencing, guard rails, steps and other walls.
- The precautionary principle is to be adopted throughout so that retaining walls are only constructed where there is no other alternative.

Noise Walls

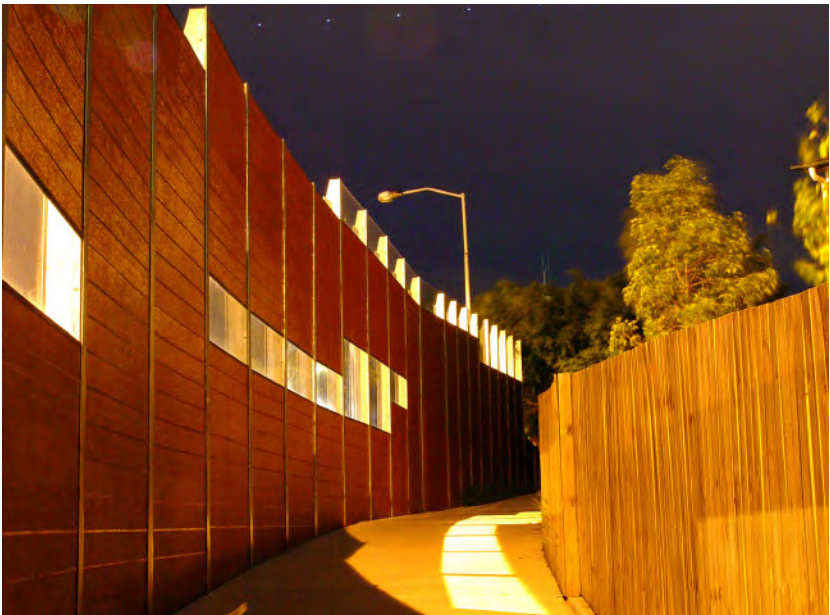
- Noise walls and retaining walls (where required) are to form a coordinated design system.
- Noise wall panels are to be comprised of robust, vandal-resistant materials and be resilient to damage by adjacent planting. Material and system selection to consider sustainability objectives including dematerialisation and embodied energy.
- Any noise walls are to be designed as part of a hierarchy of walls that includes retaining walls, abutments and parapet walls, such that each element appears to be visually coordinated.
- The apparent scale and visual impact of noise walls is to be reduced with careful planting, even when space is limited.

Bridges

- Design in accordance with the Bridge Aesthetics Design Guideline prepared by Roads and Maritime Services.



Gore Hill Freeway, Sydney. Provide retaining walls that are topped out by a consistent concrete capping beam.
Source: AECOM.



When designing noise walls consider their visual impacts from both inside and outside of the rail corridor.
Source: AECOM.

4.3 Operation and Services

The design of project infrastructure must be tailored to meet operational requirements and the transport function and integrity of the Metro system over the longer term. Design should also respond to the management and maintenance obligations that will be a critical part of the success of the Metro over successive generations as the greater Sydney region grows and demands on the transit services increase.

Stations, buildings, external areas and related corridor structures must be suitable for a high capacity passenger rail environment traversing a dense urban setting and a complexity of interfaces. The stations needs to have a consistent, reliable and bespoke series of facilities that assist both staff, servicing and security operations and meet the needs of the customers who will utilise the system on a daily or more infrequent basis.

This part of the guidelines relates to the following elements:

- Wayfinding and Signage
- Ticketing equipment and Fixtures
- Engineering and Services Integration
- Management and Maintenance
- Security
- Emergency Requirements
- Service Vehicle Access



Grand Concourse, Central Station. Transport Information with Passenger Information Display.
Source: TfNSW

4.3.1 Wayfinding and Signage

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system
4	Being responsive to distinct contexts and communities

Principle

Provide intuitive, clear and consistent information and signage to enhance customer journeys through efficient navigation and interchange, creating a seamless and intuitive customer journey from origin to final destination.

Guidelines

- All customer wayfinding and information signage must enable customers to navigate each station and precinct as part of a cohesive door-to-door journey.
- Information is to include, but not be limited to, information in trip planning; finding the right platform; making connections to another form of transport; destinations in the local precinct; ‘real time’ information for all public transport modes; wayfinding; facilities and amenities.
- A modern public address system is provided that is capable of projecting clear and audible information throughout the station.
- Advertising should not compromise wayfinding. The design and placement of customer information is prioritised as follows:
 - Wayfinding and customer information
 - Customer campaigns
 - Advertising



Circular Quay, Sydney. Signage and wayfinding enables clear sightlines of the interchange precinct.
Source: TfNSW

4.3.2 Ticketing Equipment

Relevant Design Objectives

1	Ensuring an easy customer experience
2	Being part of a fully integrated transport system

Principle

Provide ticketing equipment and fixtures that are integrated standard products across the Sydney Metro and Sydney Trains network and that contribute to quality and efficient service for customers.

Guidelines

General

- Common ticketing equipment and fixtures include:
 - Ticket Gates
 - Ticket Vending Machines (TVMs) and Opal Top-up Machines
- Equipment and fixtures are to be high quality, consistent throughout the Sydney Metro network and fully integrated with the station design.
- All components are to be robust and durable, suitable for the rail environment.
- Equipment and fixtures are to be located where they are visible and accessible to customers and station staff for wayfinding, security and maintenance
- Materials and installation must enable ease of access for maintenance and future repairs or replacement

Ticket Gates

- Ticket gates should be standard products used line-wide that contribute to quality and efficient service for customers.
- Opal ticket gates are to be used. Provision should be made for accessible gates and glazed manual wide aisle gates to allow for large equipment and prams.
- The number of ticket gates provided is to be sufficient for peak periods
- Ticket gates are to be located to enable sufficient space for comfortable and safe queuing without interfering with circulation routes.
- Wide aisle gates are to be clearly visible and located on accessible paths of travel.

Ticket Vending and Opal Top-up Machines

- TVMs and Opal Top-up Machines are to be clustered together to provide a legible ticket sales zone within the station entrance, and designed to integrate with interior components, materials and information systems.
- TVMs and Opal Top-up Machines must be publicly accessible and close to the station entrance without interfering with circulation routes.
- TVM and Opal Top-up Machine arrangement are to provide adequate space for queuing and manoeuvring by customers using mobility aids.
- TVMs and Opal Top-up Machines should be proprietary standard items and be DDA compliant.



Sydney Trains Opal Only Gates
Source: TfNSW

4.3.3 Engineering and Services Integration

Relevant Design Objectives

- | | |
|---|---|
| 1 | Ensuring an easy customer experience |
| 2 | Being part of a fully integrated transport system |
| 4 | Being responsive to distinct contexts and communities |

Principle

The rail engineering and service elements for the stations and service facilities should be integrated into the design holistically, whilst being able to be easily maintained.

Guidelines

General

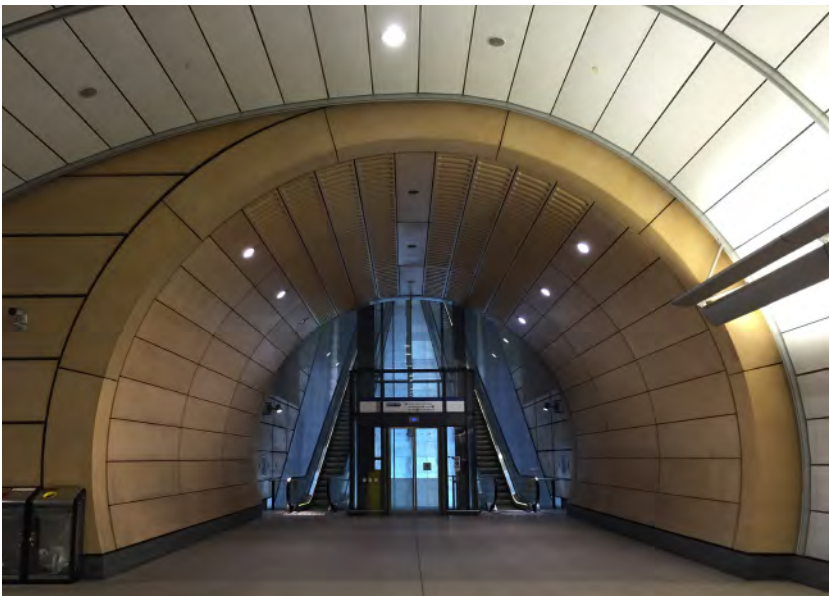
- The station structures and engineering elements are to be designed holistically, fusing architecture and engineering as one cohesive and compelling product.
- The station and station surrounds are to integrate all structural, civil, mechanical, electrical and rail systems to ensure efficient designs.
- Design integrity must be addressed through careful positioning of equipment.
- Minimise the visual impact of engineering components in public areas by concealing all services.
- Station and services design must allow for personnel access and regular maintenance of all engineering elements.
- Dedicated services zones should be integrated into the station designs allowing sufficient space proofing for future requirements.
- Expression of primary structural elements is to be considered.

Service Buildings

- Services buildings and facilities should form an integrated solution with the station architecture and precinct taking into account the scale, context and purpose of the structure.
- Similar materials and components as used in the station should be selected where appropriate to support the Sydney Metro identity.
- Opportunities to provide for active uses and frontages should take priority over service related structures.
- Elements in major urban settings need to consider impacts including visual, environmental and acoustic on the streetscape.
- Elements located in public areas of the station and surrounds are to be integrated with other functions such as public facilities, ticketing and information, fire stairs, community facilities or retail to minimise the impact of the services on the station precinct.
- Access for maintenance and replacement of plant and equipment should be considered including personnel access for regular maintenance tasks. Designs should allow for safe access and egress to all areas of services buildings.



King's Cross Square, London. Good example of a well designed vent structure integrated with other functions within an urban setting
Architect: Stanton Williams
Source: Getty



Macquarie Park Station. Services are concealed and integrated within the cavern structure, enabling the clean expression of the cavern form.
Architect: Hassell
Source: Cox Richardson

4.3.4 Management and Maintenance

Relevant Design Objectives

2	Being part of a fully integrated transport system
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Principle

Ensure the selection of cost effective, adaptable materials and assets that are durable and easily maintained and fit-for purpose for high traffic rail environments and customer interface.

Guidelines

- Adopt a consistent and coordinated palette of materials, furniture and fixtures within stations and their precincts to promote cost effectiveness and assist in the development of an efficient management and maintenance plan for Sydney Metro.
- Proposed hard and soft landscaping elements within the external urban realm of stations are to comply with the standards of each local council area to facilitate consistent future management and maintenance regimes.
- Public domain elements external to stations, such as pavement materials, wall types, furniture and fixtures are to be consistent with the existing urban context for ease of maintenance.
- Hard landscaped surfaces and structures in some locations may have to be more durable to withstand the larger loads of and vibrations from specialist installation or maintenance vehicles, notwithstanding vibrations from above or below ground trains.
- All signage, street furniture and operational equipment (e.g. Passenger Information Displays (PIDs) and CCTVs systems) in the public domain are to be designed to minimise vandalism and simplify cleaning.
- Placement and detailing of furniture, fixtures and equipment should consider impacts by birds, insects and mammals on operational assets and the customer environment.
- All assets, including paving, lighting, signage and street furniture, are to be of a standardised modular design as far as practical that is readily available and have readily replaceable components.
- Materials, furniture, fittings and fixtures are to be selected and sized in a manner that allows easy installation and repair. All components should meet the required life cycle objectives of Sydney Metro and consider sustainability objectives including dematerialisation and embodied energy.
- Materials and finishes will be able to be easily cleaned and maintained with consideration for graffiti resistance in customer interface areas.

- Furniture, fixtures and fittings are to be robust and durable, with consideration of detailing and placement to resist vandalism.
- The design for each station is to accommodate future maintenance access to all elements, including components that may require the use of heavy or large machinery or structures to be erected for installation of structures and equipment, regular cleaning or repair.
- Stations and station precincts should be designed to facilitate access in a safe environment for operational staff and customers alike. Maintenance considerations are to be integral to the design process from an early stage.



Temporary or ancillary equipment, vending machines or any other structures (i.e. temporary signage) are not be placed in the primary pedestrian paths.
Source: Grimshaw.

4.3.5 Security

Relevant Design Objectives

- 2
- Being part of a fully integrated transport system

Principle

Ensure adequate security for the rail corridor infrastructure, station assets and their users. Visually integrate security elements such as fencing, security screens CCTV and lighting into the rail corridor, precinct or station design as part of a coordinated whole-of-corridor design.

Guidelines

- Risks to the rail corridor and stations must be regularly assessed during the design phase to ensure adequate control measures can be put in place.
- A public address system is to be provided at emergency egress and risk points, controllable from Station Control Rooms and Operational Control Rooms.
- CCTV must be provided throughout the station.
- CCTV must be provided at all egress points and risk-sensitive areas.
- Security bollards may be provided where necessary but must not impede safe pedestrian movement. Where required, security bollards should adopt a rational layout in order to minimise visual clutter and maximise safe and accessible paths of travel.

Fencing and Gates

- Security fencing must be provided along the sections of the rail corridor not in tunnel and include permanent gated access at controlled locations. Fencing and gate locations are to be coordinated with strategic emergency access and egress points.
- The selection and detailing of fencing should be fully coordinated throughout the corridor and consist of modular components.
- Corridor fencing must not only respond to security considerations, but also respond to corridor context, including, for example, the provision for high quality fencing at station precincts.
- Security fencing types must be consistent throughout Sydney Metro and respond to the contextual environmental of the rail corridor, including provision for high quality fencing at station precincts where users experience the fencing close at hand and high security, more robust and utilitarian fencing at rail infrastructure/ facility locations.
- Fencing types must be robust, suitable to the rail environment and consider maintenance and future replacement.
- Fencing throughout the station precincts and public domain areas must avoid creating dead ends or sightline conflicts.

Lighting

- Lighting is to consider:
 - Natural daylight.
 - Emergency and exit lighting.
 - Interfaces with wall cladding, soffit systems and other visible services.
 - Consistency in design across all stations and precincts.
 - Ongoing access and maintenance - minimising the number of luminaire and lamp types and considering replacement processes.
 - Sustainability targets and energy usage.
 - Lighting levels sufficient for adequate operation of CCTV.



Homebush, Sydney. Rail corridor security fences should be robust, easily maintained, modular systems that are readily integrated with other urban design elements such as retaining walls.
Source: AECOM.

4.3.6 Emergency Requirements

Relevant Design Objectives

2	Being part of a fully integrated transport system
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Principle

Ensure that station precincts, facilities and rail corridors are provided with clearly identified zones for emergency access and egress, eliminating the potential for movement conflicts during emergencies.

Guidelines

- The precincts and rail corridor should provide access for emergency service vehicles and appropriate measures to safeguard all users.
- All station precincts and public domain areas must comply with statutory requirements and emergency procedures and relevant guidelines for fire and safety.
- Emergency requirements are to consider;
 - Effective and clearly signposted station emergency evacuation routes and assembly areas.
 - Adequate zoning and space at emergency assembly points to ensure they are free of clutter and remain accessible at all times.
 - Fire safe refuge areas with CCTV and accessible communication system in underground stations for people who are unable to self-evacuate.
 - Full integration within the relevant station and facilities evacuation plan.
 - Emergency lighting to the immediate station curtilage.
 - The appropriate location of firefighting equipment such as hydrants; all clearly identified and readily accessible.
 - The provision of emergency/security electronic help points.

Hydrant Enclosures

- Hydrant enclosures should be easily identifiable, easily accessed modular components integrated into station cladding systems.
- Hydrant enclosures should be integrated with the surrounding wall system to minimise their visual impact.



All station precincts must accommodate station evacuation and emergency procedures.
Source: AECOM.

4.3.7 Service Vehicle Access

Relevant Design Objectives

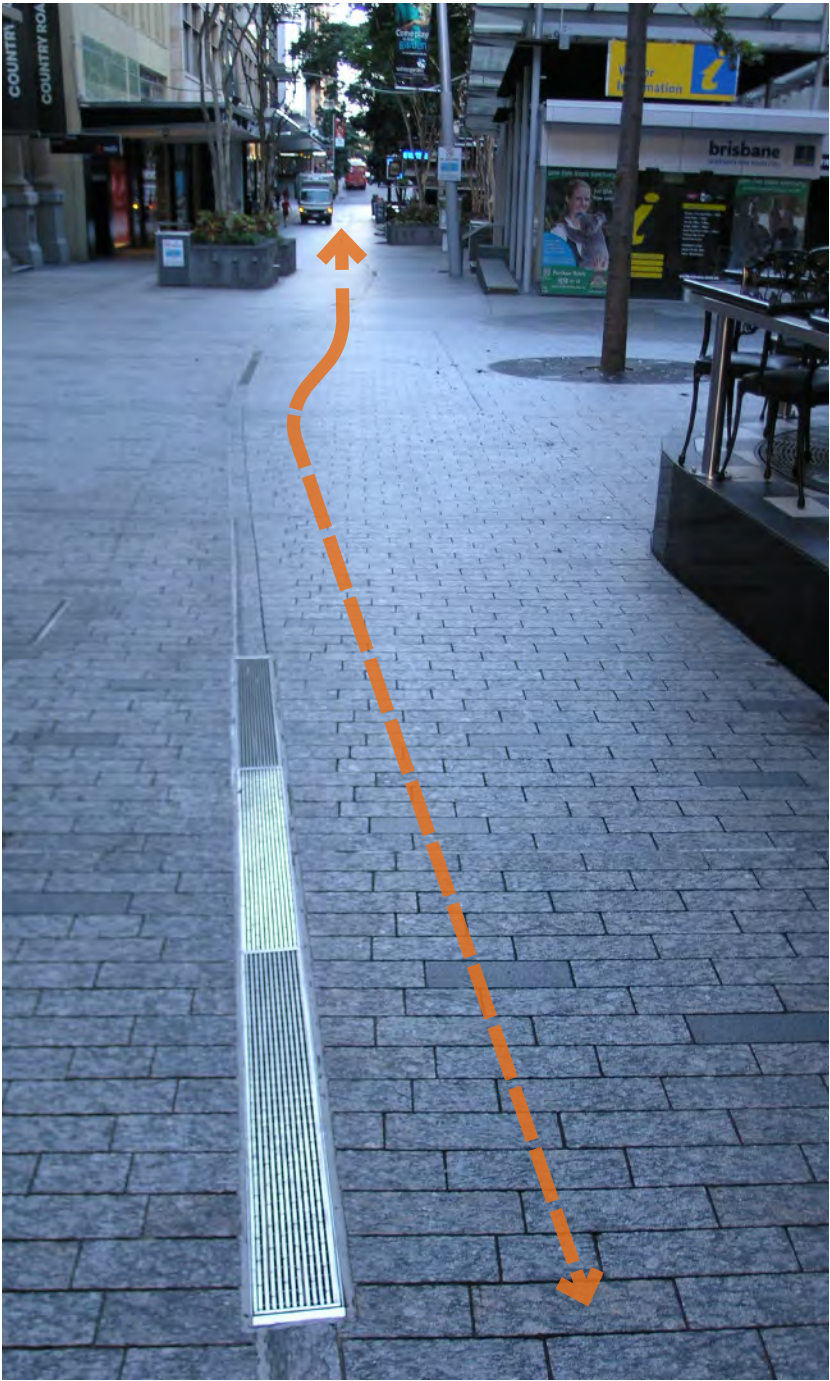
2	Being part of a fully integrated transport system
4	Being responsive to distinct contexts and communities

Principle

Ensure well defined and efficient coordination of service vehicle movements within precincts.

Guidelines

- The station design is to enable access for service vehicles. Service vehicle access is not to compromise the public domain areas of the station forecourt or interchange and connectivity functions.
- Service vehicle access for all precinct functions must be addressed as part of the broader station precinct movement strategies. These strategies must address both the project works requirements and increased movements over the life of the station precincts.
- The operational function and frequency of service vehicles should be considered to determine dedicated zones for daily or frequent access, or shared zones for occasional access within station precincts. Multi-use conflicts in shared zones should be eliminated.



Queen St Mall, Brisbane. Emergency vehicle and service vehicle access through the mall has been provided.
Source: AECOM.

4.4 Specific Elements

There are specific elements along the Sydney Metro corridor that are not adequately addressed in the general design guidelines due to their specialised or sensitive nature. To ensure they meet high quality design outcomes, these elements require additional unique design guidelines which are identified in this section.

A brief description of the context for specific elements is provided, followed by a series of specific guidelines for that element.

Specific elements in the Chatswood to Sydenham project considered in this part of the document include:

- Sydney Yard Access Bridge
- Central Walk
- Sydney Metro Trains Facility - South
- Sydenham Aqueduct



Central Station Clock Tower
Source: TfNSW

4.4.1 Sydney Yard Access Bridge

Context

The proposed bridge is located off Regent Street, Chippendale, south of Central Station, north of Cleveland Street and to the east of the Mortuary Station, in the southern sector of the Sydney Yard. The bridge will provide vehicular access to the Sydney Yard during the construction of the Sydney Metro station box and as a permanent access solution to Sydney Yard following the removal of the existing vehicular access from Eddy Avenue.

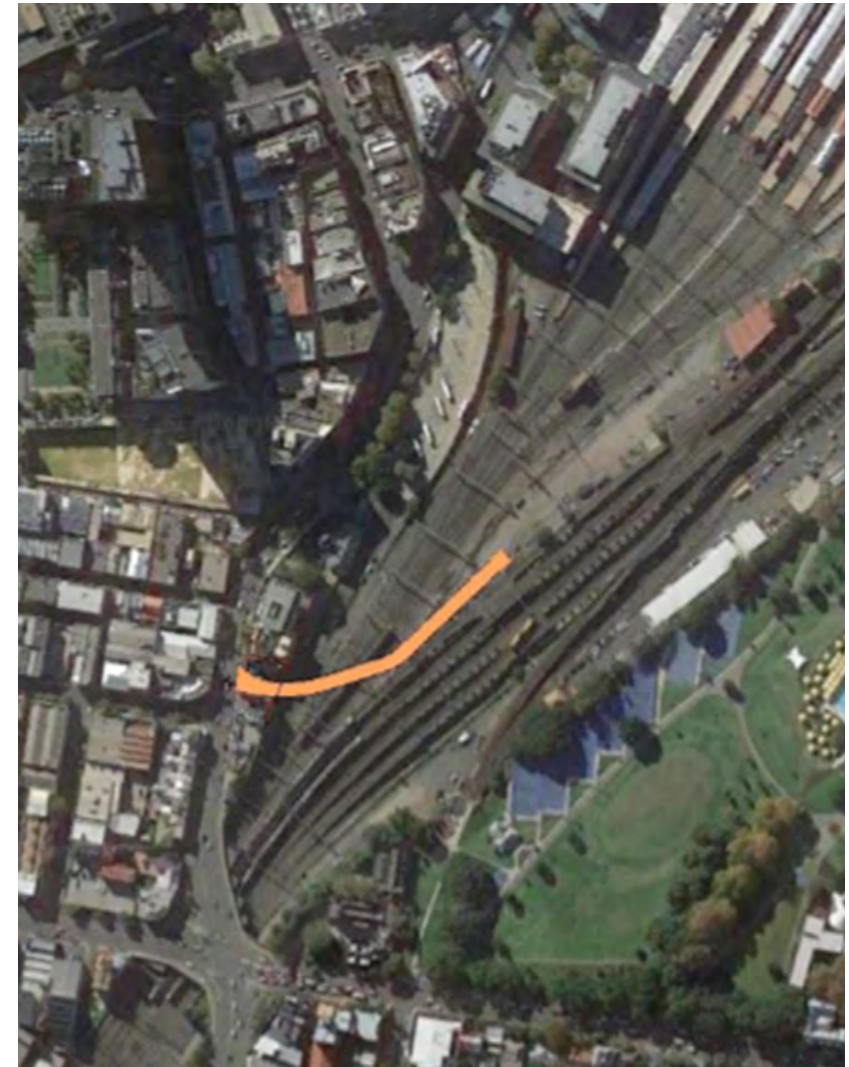
Principle

The bridge will be of a high architectural and urban design quality, utilising structures, forms and materials that respond to and respect the industrial rail context and aesthetic of the Sydney Yard and setting of Mortuary Station.

Guidelines

- The design shall be visually unobtrusive and minimise adverse impacts on existing views of significant heritage and provide wide and clear spans over the tracks.
- The bridge shall minimise impacts on the heritage values of Sydney Terminal and Central Railway Stations Group, the Chippendale Heritage Conservation Area (HCA), the Mortuary Station or the former Co-Masonic Temple.
- The bridge shall demonstrate best practice in integrated bridge engineering, architectural and urban design and construction.
- The bridge shall have a low profile form with shallow deck and low super-structure; with low profile parapet, edge beams, and traffic barriers.
- The bridge approach to Regent Street shall be designed to integrate with the surrounding context and minimise the visual intrusion onto the streetscape.

- The entry driveway and access site off Regent Street is to ensure pedestrian safety and good sightlines across the vehicular driveway; allowing for a pedestrian pavement that continues across the driveway without a kerb or step.
- Landscape screening of dense hedge planting and/or climbing plants shall be provided to adjacent buildings and vertical surfaces to deter graffiti.
- Low maintenance native landscaping together with medium-sized native trees shall be provided to the residual spaces between the approach ramp and the site boundaries to soften the appearance of the site from Regent Street.
- The abutments shall be sympathetic to the existing surrounding viaducts, with bridge piers incorporated within the envelope of the bridge.
- All screens, balustrades and fences shall be light weight and visually consistent in their aesthetic appearance.
- The bridge shall have no signage or advertising.
- Lighting of the bridge shall be inconspicuous and to minimise spill lighting into the adjacent public domain or Mortuary Station and must also not distract train drivers.



Sydney Yard Access Bridge - indicative location plan

4.4.2 Central Walk

Context

Central Station is a public landmark, heritage building and the largest transport interchange in NSW. Managing the complex heritage values of the place, while providing for the evolving needs of customers and seamless integration into the surrounding precincts, presents a unique challenge and once in a lifetime opportunity.

Central Walk represents a major intervention in Central Station and will fundamentally change the passenger circulation routes and how customers perceive their journey.

It brings major opportunities to improve the functionality of Central Station and to provide a sense of order and space throughout a constant level to better connect between transport modes and the surrounding areas.

Successful implementation of Central Walk will require design solutions that are sensitive to Central Station and its context, responsive to the changing environment and of a quality aligned with the importance of Central Station to Sydney.

Principle

Integrate Central Station with its surrounding context with seamless and intuitive connections that reinforce Central as a world class integrated transport interchange and gateway to the city.

Guidelines

General

- Wayfinding is to be seamless and intuitive, and support an effortless customer experience
- Customer circulation paths are to optimise timeliness for customers moving between concourse, platform, and other transport modes.
- Provide efficient and safe access through good sightlines, generous circulation and open and spacious planning
- Provide sufficient space for emergency access and movements in accordance with relevant design standards and legislation.

- Advertising is not to compromise wayfinding. The design and placement of customer information is to be prioritised as follows:
 - Wayfinding and customer information
 - Customer campaigns
 - Advertising
- All finishes are to be safe and robust, suitable for the station environment.

Concourse and entry

- Create a sense of place and belonging through welcoming and attractive spaces that enhance pedestrian connectivity and activity
- Be responsive to Central Station and surrounding urban context by respecting the scale and heritage character of existing buildings and structures
- Link the future Metro station with the existing Eastern Suburbs concourse with a contemporary below ground connection.
- Retain the eastern brick boundary wall on Chalmers Street.
- The eastern entry is to allow effective and timely interchange between pedestrians, bicycle users, light rail, suburban and Metro rail services, with pedestrian flow occurring without friction.
- The eastern entry must be clearly identifiable at street level and from approaching pedestrian routes.
- The east concourse design must support visible staff presence as close as possible to customer decision making zones
- The entry paths at street level are to enable safe crossing of the future Chalmers Street cycleway.

Suburban platforms

- Ensure platforms are free of recesses and indentations which could offer hiding places and litter traps, disrupt continuous paths of travel for the visually impaired and hinder CCTV coverage
- Minimise structures and columns on platforms to maximise sightlines and customer waiting and circulation space

- Design to enable easy, safe and accessible for all to use including the elderly, customers with disabilities, young children and those with prams and luggage
- Ensure the safety of customers by optimising the space between a barrier and the platform edge where new lifts or escalators are introduced
- Priority seats and adequate space are to be provided around groups of seating to accommodate the elderly, and customers with disabilities and prams



Central Walk - indicative plan

4.4.3 Sydenham Aqueduct

Context

The Sydenham Pit and Pumping Station are situated approximately 6km south of the Sydney CBD in the Inner West Council (formerly Marrickville) local government area. The pit lies immediately northeast of Sydenham Station and is bordered by the rail alignment on its southern boundary. North, east and west of the Pit land uses are typically industrial and commercial.

The pit infrastructure consists of the stormwater retention reservoir, the Eastern Drainage Channel and the Drainage Pumping Station. New track alignment between the station and the proposed Sydney Metro Stabling Facility clashes with the alignment of the existing Eastern Drainage Channel. It is proposed to replace the channel with a closed aqueduct spanning the southern side of the pit. The aqueduct and a new pumping station will significantly increase the capacity of the drainage system.

The Sydenham Pit and Pumping Station are listed on the State Heritage Register. A design response will be required that is highly sensitive to the heritage values of the Pit and Pumping Station.

Principle - Heritage

The design of new elements must only be undertaken with a full understanding of the heritage values of the site and with reference to the Sydenham Pit and Drainage Pumping Station No. 1 Draft Conservation Management Plan 2004.

Guidelines

- The design of the aqueduct structure should be of a minimalist form, using simple forms and restrained but well resolved detailing.
- The aqueduct balustrade and any necessary vehicle barriers must be as transparent as practicable.
- The location of the aqueduct structure must ensure adequate physical separation from the Drainage Pumping Station so the building and its supporting piers are legible as a discrete structure on the edge of the pit when viewed from the northern and western sides of the site.
- Any required modifications of the pit wall and floor should be sensitively reconstructed to minimise its visual interference with the existing pit.
- The new pumphouse must be designed and sited in such a way that does not diminish the primacy of the original pumping station.
- The new pumphouse must be a simple yet distinctive work of contemporary architecture.

Principle - Access and Circulation

The design of new infrastructure at the Sydenham Pit will safely and efficiently reconcile pit maintenance access and public access and connectivity in the precinct.

Guidelines

- Any maintenance access structures to the pit should be designed and constructed to minimise its visual presence within the surrounding context of the pit.
- The aqueduct design must provide the services required for its use for a range of potential public activities and gathering, such as markets and public performances.
- The design must ensure a safe, attractive and relatively seamless public/pedestrian connection between the aqueduct and the proposed northern Metro entry to Sydenham Station.
- The aqueduct design must ensure accessible pedestrian and cycling connection between Railway Parade and aqueduct (at the higher level) and Garden Street.

LEGEND

-  Metro station entry
-  Station development site boundary
-  Sydenham Aqueduct
-  Existing Pumping Station Building
-  Planned Pumping Station Building
-  Access ramp to pit/ top of culvert



Sydenham Aqueduct - indicative plan

4.4.4 Sydney Metro Trains Facility - South

Context

Sydney Metro Trains Facility - South lies approximately 6km south of the Sydney CBD and is located adjacent to the suburb of Marrickville, which falls within the Inner West Council (formerly Marrickville) Local Government Area. The suburb is bounded by Dulwich Hill to the west, St Peters and Sydenham to the east, Enmore to the north and Tempe to the south.

Land use around the proposed Sydney Metro Trains Facility - South is primarily made up of commercial and industrial areas that generally date from the late 19th century and early 20th century, and later industrial areas to the north.

The site is bound by Edinburgh Road and Sydney Steel Road to the north and west, the rail corridor to the west, and the state heritage listed Sydenham Pit to the south.

Principle

Provide a stabling facility and adjoining streetscapes that is sensitively integrated with the surrounding context, creating attractive shaded and pedestrian friendly streets, sustainable buildings, and functional staff facilities.

Guidelines

Landscape and Public Domain

- The areas of soft landscaping around the Administration building is maximised. The building and hard scape areas around the administration building and carpark must be consolidated as much as possible, maximise the opportunity for soft landscaping. These planted areas are intended to improve visual amenity, provide space for staff function and use, and allow areas for surface water run-off to be directed into.
- The areas of hard surfaces within the stabling facility is to be minimised. This is to reduce heat absorption and the general heat island effect, increase permeable surfaces and reduce water run-off, and improve general amenity within the facility.

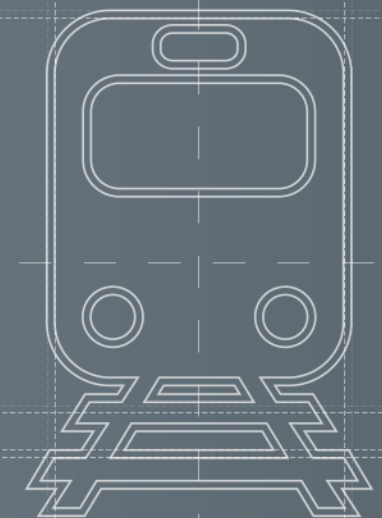
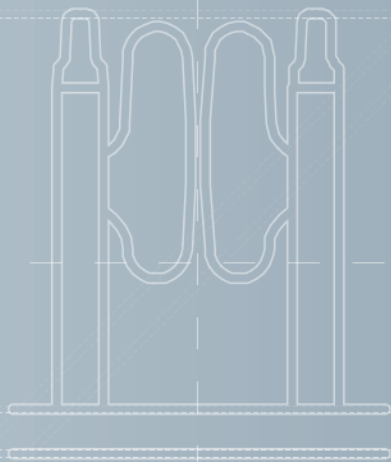
- Maximise street trees and landscape verge areas to Sydney Steel Road and Edinburgh Street. A high quality landscape treatment is required to the frontage of the facility to provide general amenity to the streetscape and visual screening of the facility. This is to be achieved through street tree planting, grass and understorey planting to verges areas, and high quality materials to footpaths and pavements.
- Enable pedestrian and cycle connection along the frontage of the stabling facility on Sydney Steel Road and Edinburgh Road, to provide connectivity and access to the wider precinct for pedestrians and cyclists commuting to and from Sydenham Station.

Administration Building

- The building must be oriented to maximise daylight into the building, as well as providing operational visibility over the facility. This is so to reduce lighting energy consumption, to enhance office staff enjoyment / comfort levels, and to shield to building from negative solar heat gain.
- Provide on-site low voltage power regeneration via roof mounted photovoltaic cells.
- Achieve water use reduction in the building through rain water harvesting and re-use, and use of water efficient fixtures.
- Mitigate the heat absorption through the inclusion of plantings, permeable or white reflective surfaces around the building.
- Consider the use of recycled materials including recycled concrete where possible.



Sydney Metro Trains Facility, South - indicative location plan



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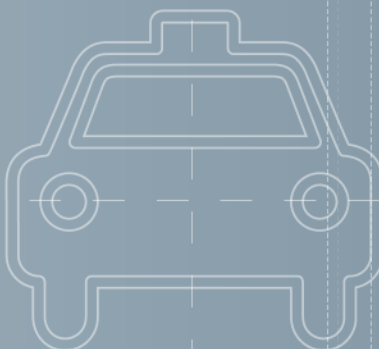
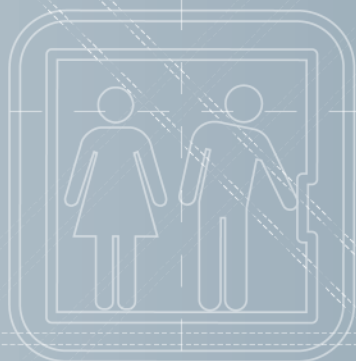
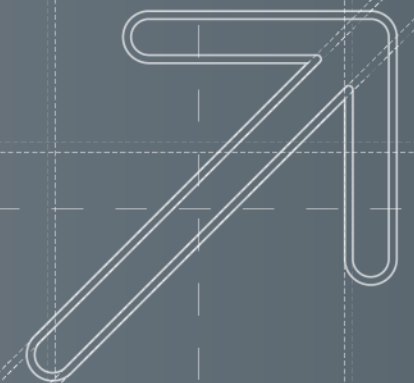
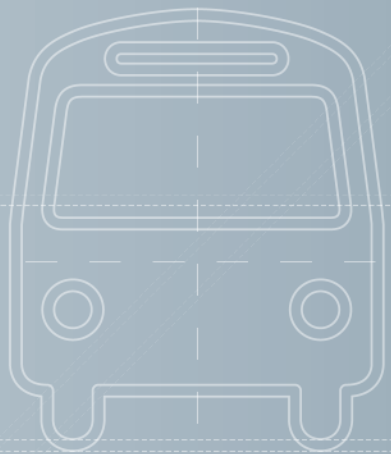


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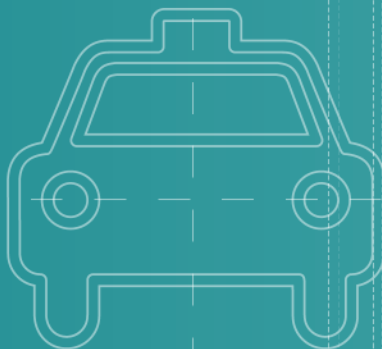
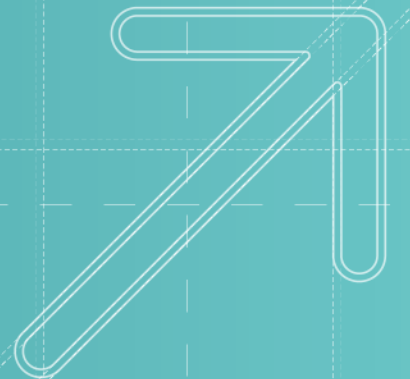
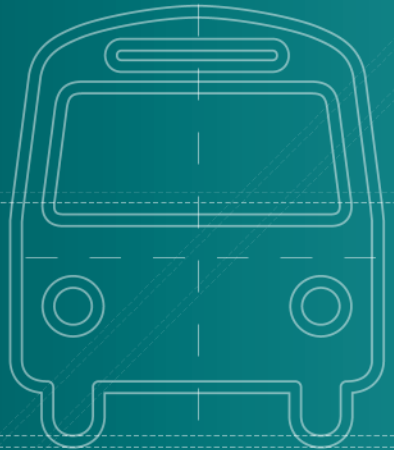
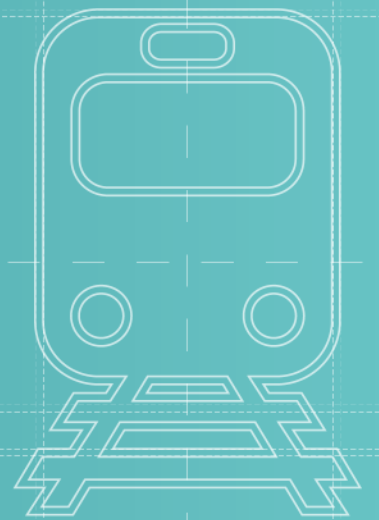
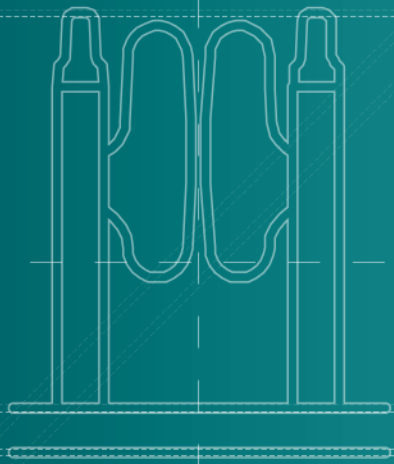
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TRAFFIC AND TRANSPORT TECHNICAL INFORMATION

APPENDIX C



Traffic and transport technical appendix

Modelled intersection performance

Peak period	Future conditions (2023) without construction				Proposed modification (2023 future conditions + construction traffic)				Proposed modification (2023 future conditions + construction traffic + TTS buses) ¹			
	Demand flow (PCUs per hour)	Average vehicle delay (seconds)	Level of service	Degree of saturation	Demand flow (PCUs per hour)	Average vehicle delay (seconds)	Level of service	Degree of saturation	Demand flow (PCUs per hour)	Average vehicle delay (seconds)	Level of service	Degree of saturation
Gleeson Avenue / Burrows Avenue (signals)												
Morning	2155	15	B	0.67	2177	16	B	0.68	2386	20	B	0.89
Evening	2605	29	C	0.66	2632	30	C	0.67	2838	36	C	0.86
Gleeson Avenue / Railway Parade (signals)												
Morning	2650	5	A	0.54	2675	6	A	0.68	2881	8	A	0.81
Evening	2940	4	A	0.50	2966	4	A	0.51	3174	4	A	0.58
Gleeson Avenue / Unwins Bridge Road (signals)												
Morning	2286	37	C	0.92	2313	41	C	0.97	2313	41	C	0.97
Evening	2688	33	C	0.79	2716	32	C	0.79	2716	32	C	0.79
Edinburgh Road / Murray Street (roundabout)												
Morning	887	7	A	0.60	887	7	A	0.60	N/A	N/A	N/A	N/A
Evening	1218	8	B	0.67	1218	8	B	0.67	N/A	N/A	N/A	N/A

Peak period	Future conditions (2023) without construction				Proposed modification (2023 future conditions + construction traffic)				Proposed modification (2023 future conditions + construction traffic + TTS buses) ¹			
	Demand flow (PCUs per hour)	Average vehicle delay (seconds)	Level of service	Degree of saturation	Demand flow (PCUs per hour)	Average vehicle delay (seconds)	Level of service	Degree of saturation	Demand flow (PCUs per hour)	Average vehicle delay (seconds)	Level of service	Degree of saturation
Edinburgh Road / Bedwin Road (signals)												
Morning	2168	13	A	0.59	2168	13	A	0.59	N/A	N/A	N/A	N/A
Evening	2480	11	A	0.58	2480	11	A	0.58	N/A	N/A	N/A	N/A
Bedwin Road / May Street												
Morning	2907	35	C	1.08	2907	35	C	1.08	N/A	N/A	N/A	N/A
Evening	3376	68	E	1.01	3376	68	E	1.01	N/A	N/A	N/A	N/A

Note 1: This scenario includes buses to support the temporary transport strategy required during the T3 Bankstown Line possessions and rail closedowns associated with the construction of the Sydenham to Bankstown project. Buses for the temporary transport strategy would not travel through the intersections surrounding the Sydney Metro Trains Facility South and therefore there would be no additional impact on construction traffic at these relevant intersections, shown as N/A.

NOISE AND VIBRATION TECHNICAL INFORMATION

APPENDIX D



Noise and vibration technical information

Results from attended noise monitoring

Train passby noise and / or vibration measurements were undertaken on 24 November 2015 for the T4 Illawarra Line and during June to July 2016 for the Good Lines within the study area. The results of this attended monitoring are presented in Table 1.

Table 1 Summary of attended measured noise levels

Location	Track	Distance from track centre (m)	Average speed (km/hr) ¹	Average L _{AE} (dBA) ²	Average L _{Amax} (dBA)	95 th percentile L _{Amax} (dBA)
OP01.N1 (corridor access gate at the end of Murray Street, Marrickville)	Local Up	15	63	82	76	77
	Local Down	19	63	78	70	71
	Main Up	23	67	76	69	73
	Main Down	27	66	75	66	71
OP02.N1 (corridor access road boundary between Goods Line and T3 Bankstown Line)	Goods Up	19	-	92	80	89
	Goods Down	15	-	100	90	103

1: Passenger train speeds presented for attended monitoring locations

2: Logarithmic average

Inputs and assumptions for operational noise modelling

Inputs into the operational airborne noise modelling for the proposed modification are provided below. This includes information relating to:

- Rolling stock noise levels
- Locations of track turnouts
- Correction factors for curves and bridges
- Sydney Trains and Sydney Metro train speed profiles
- Trains numbers on the metro line and existing rail lines.

Rolling stock noise levels

The reference noise levels used for the noise modelling are shown in Table 2. The input data used in the noise modelling for the proposed modification has been chosen so that the calculated noise levels for the future Metro operations reflect the likely future Metro train fleet of new single-deck trains. The calculated noise levels for the Sydney Trains operations are based on modern Sydney Trains electric double-deck suburban passenger trains as defined in the NSW rail noise database. The calculated noise levels for freight operations are based on reference noise levels for diesel-electric locomotives and general freight wagon arrangements presented in the NSW rail noise database.

Freight operations are present within the shared rail corridor in the southern half of the proposed modification study area. The future track form consists of ballast track on concrete sleepers. The source noise levels used in the noise modelling are typical of noise levels in the NSW rail noise database for existing double-deck Sydney trains. This approach is consistent with previous assessment stages of Sydney Metro and is considered conservative. In the event that the new Sydney Metro rolling stock has lower noise emissions than assumed here, the impacts of the proposed modification would be reduced (both the overall wayside noise levels, and the increase due to the proposed modification).

Table 2 Rolling stock reference noise levels

Train types	Reference conditions	L _{Amax} , 95%	L _{AE}
Double-deck Sydney Trains	15 m, 80 km/h	85 dBA	88 dBA
Single-deck Sydney Metro Trains	15 m, 80 km/h	85 dBA	88 dBA
Freight Locomotives	15 m, 80 km/h	94 dBA	88 dBA
Freight Wagons	15 m, 80 km/h	90 dBA	100 dBA

Additionally, the passby noise levels used in the noise modelling assume the track is in good condition and that the running surface of the rail head is free of significant defects such as wheel burns and squat defects. Wheel tread condition is also assumed to be in good to fair condition.

Locations of track turnouts

Impact noise from rail discontinuities such as turnouts, crossovers, expansion joints or rail defects increase the level of wheel-rail noise as each wheel of the train passes over the discontinuity. Table 3 identifies the locations of the turnouts in the future alignment designs.

The proposed modification would result in the removal of some turnouts on the existing T3 Bankstown Line tracks, and the installation of new turnouts on the Metro tracks. Where turnouts are removed from the existing T3 Bankstown Line tracks and not replaced as part of the proposed modification, the noise generated by the existing turnout would be eliminated from the with-project operations. Conversely, turnouts associated with the proposed modification that are installed in locations where the T3 Bankstown Line tracks did not have turnouts would result in the introduction of a new turnout noise source at that location.

Table 3 Rail track turnouts

Line	Track	Chainage
Goods Line (Port Botany to Enfield)	Goods Up	4.940 km
		5.050 km
		6.220 km
		6.500 km
		6.570 km
		6.600 km
	Goods Down	4.970 km
		5.030 km
		6.250 km
		6.480 km
		6.600 km
Goods Line (Illawarra Line)	Goods Up	5.590 km
		5.620 km
		5.820 km
		5.850 km
		6.050 km
		6.080 km
		6.590 km
	Goods Down	5.660 km
		5.750 km
		5.830 km
		6.020 km
		6.050 km
		6.100 km
		6.570 km
		6.600 km
T3 Bankstown Line	Main Up	5.450 km
	Main Down	5.480 km
		5.530 km
		5.590 km
		5.690 km

Line	Track	Chainage
Metro	Main Up	5.580 km
		5.620 km
		5.670 km
		5.710 km
		6.300 km
	Main Down	5.670 km
		5.710 km
		6.100 km
		6.300 km
		6.380 km
T4 Illawarra Line	Local Up	5.010 km
		5.120 km
		5.160 km
		5.550 km
		5.640 km
		5.760 km
	Local Down	4.990 km
		5.020 km
		5.140 km
		5.670 km
		5.730 km
		5.760 km
	Main Up	4.960 km
		4.990 km
		5.690 km
		5.720 km
	Main Down	4.960 km
		5.690 km

Additionally, the modelling included allowances for localised increases in noise emission from turnouts. A correction of +6 dB for turnouts has been applied in the noise model over a 20 metre track distance.

Correction factors for curves and bridges

Curves

In areas where there are tight radius curves, flanging noise or curve squeal may increase the levels of noise emission. The increased noise emissions generated from trains operating on curves is generally referred to as 'curve gain'. Many of the rail lines within the study area include curve radii that have the potential to result in curve gain under general operating conditions. Table 4 lists the curve gain corrections adopted in the noise modelling for the proposed modification.

Passenger train curve gain values presented in Table 4 are derived from curving noise studies performed on Australian electric passenger trains.

Freight train curve gain values presented in Table 4 are based on the typical best case modern freight wagon steering performance and rail track maintenance practices, which is considered conservative for this assessment.

Table 4 Curve gain corrections

Radius	Passenger train adjustment ¹		Freight train adjustment	
	L _{Aeq}	L _{Amax}	L _{Aeq}	L _{Amax}
Greater than 500m	0	0	0	0
400m to 500m	3	3	3	3
300m to 400m	8	16	5	5
200m to 300m	8	17	8	8
Less than 200m	8	17	8	8

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Bridges

Structure-radiated noise from some types of rail bridges (particularly open-transom steel bridges) may also increase the overall levels of track noise. Corrections applied to rail bridges within the proposed modification study area are listed in Table 5.

Table 5 Rail bridge corrections

Bridge	Approx. chainage (km) ¹	Rail line	Bridge	
			Construction description	Correction
Unwins Bridge Road	5.300 – 5.340	Goods Line	Ballasted, concrete span, no side screens	0 dB
Illawarra Line Overpass	5.470 – 5.520	Goods Line	Open transom, fabricated steel web, no side screens	+10 dB
Frasier Park Bridge	5.680 – 5.700	Goods Line	Ballasted, concrete span, no side screens	0 dB
Victoria Road Bridge	6.310 – 6.340	Goods Line T3 Bankstown Line Metro Line	Open transom, fabricated web forming side screens	+8 dB

1: Chainage refers to T3 Bankstown Line

Sydney Trains and Sydney Metro train speed profiles

The speed profile for noise and vibration assessment purposes for Sydney Trains services on the T3 Bankstown Line and T4 Illawarra Line are shown in Figure 1. These speed profiles are used for the 'existing', 'future without Sydney Metro' and 'future with Sydney Metro' scenarios, noting that the T3 Bankstown Line would not operate under the 'future with Sydney Metro' scenario.

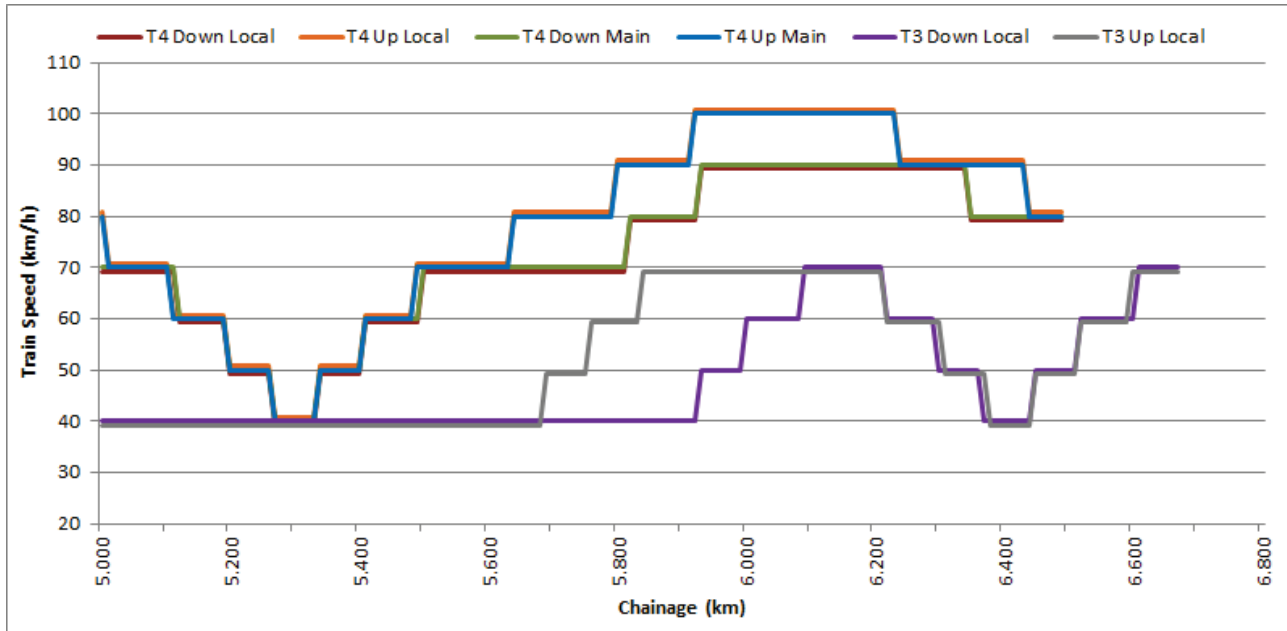


Figure 1 Sydney Trains Speed Profile for Noise and Vibration Assessment

The speed profile for noise and vibration assessment purposes for the proposed Metro track is shown in Figure 2. The maximum Metro train speeds are up to 100 km/h. These speed profiles are applicable to both the 'opening' and '10 years after opening' scenarios.

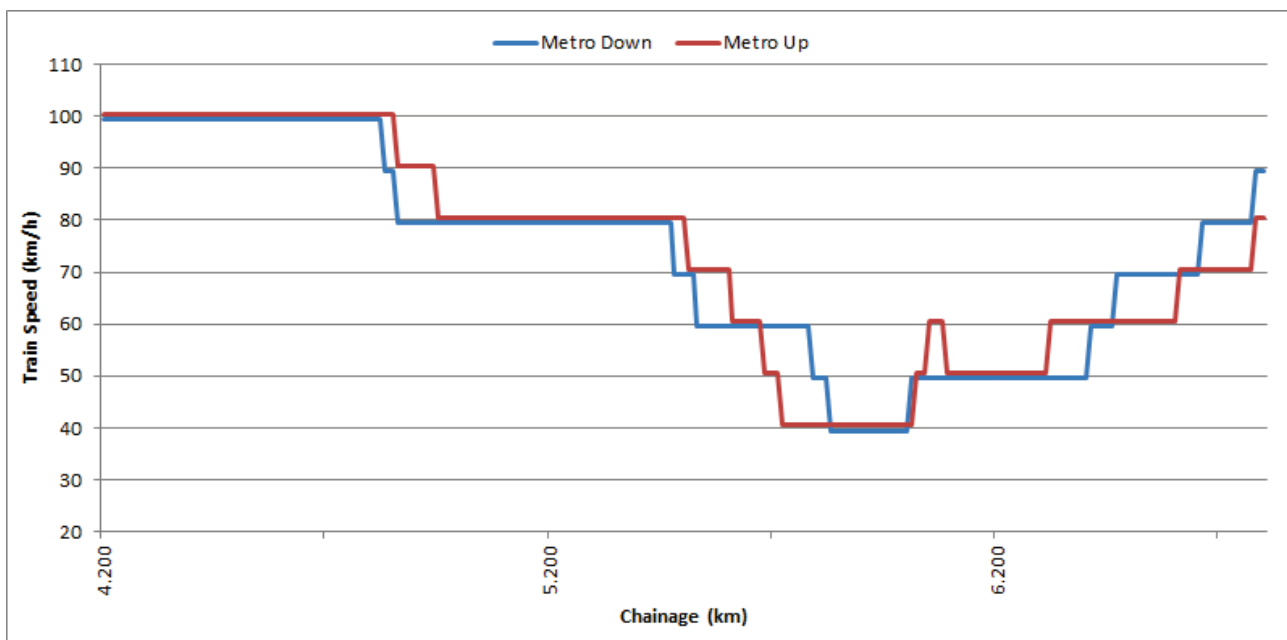


Figure 2 Metro Speed Profile for Noise and Vibration Assessment

As shown in Figure 1 and Figure 2, the minimum modelled train speed through stations for all passenger services is 40 km/h.

It is noted that the speed profile adopted for the noise and vibration assessment would be reviewed as part of the detailed design and may be subject to change. Further assessment would be undertaken if required.

Train numbers on the metro line and existing rail lines

The Rail Infrastructure Noise Guidelines (RING) specifies that the noise trigger levels apply both at the year of opening and for projected traffic volumes at an indicative period into the future to represent the expected typical maximum level of train usage. In order to support the noise modelling predictions, estimated train numbers for the 'at year of opening' (2024) and 'ten years after opening' (2034) operating scenarios have been provided.

The rail traffic estimates used in the modelling scenarios are summarised in Table 6. The train numbers in Table 6 are indicative only, with consideration given to the estimated passenger demand, minimum service levels and the upper design limit of Sydney Metro service frequencies for future peak times.

Table 6 Rail traffic scenarios for noise assessment purposes

Rail line	Scenario	Train type	Trains per weekday period			
			Day 7:00 am to 10:00 pm		Night 10:00 pm to 7:00 am	
			Up	Down	Up	Down
T2 Airport Line	Existing 2017	Double-deck Sydney Trains	6	8	0	1
	Prior to Sydney Metro Opening 2024	Double-deck Sydney Trains	26	23	6	6
	After Opening 2024 (with Sydney Metro)	Double-deck Sydney Trains	26	23	6	6
	Future 2034 (with Sydney Metro)	Double-deck Sydney Trains	26	23	6	6
	Future 2034 Without Project ('no build option')	Double-deck Sydney Trains	26	23	6	6
T3 Bankstown Line including future Metro Services	Existing 2017	Double-deck Sydney Trains	78	84	17	20
	Prior to Sydney Metro Opening 2024	Double-deck Sydney Trains	96	94	21	23

Rail line	Scenario	Train type	Trains per weekday period			
			Day 7:00 am to 10:00 pm		Night 10:00 pm to 7:00 am	
			Up	Down	Up	Down
	After Opening 2024 (with Sydney Metro)	Single-deck Metro Trains	184	184	27	27
	Future 2034 (with Sydney Metro)	Single-deck Metro Trains	202	202	30	30
	Future 2034 Without Project ('no build option')	Double-deck Sydney Trains	96	94	21	23
T4 Eastern Suburbs and Illawarra Line	Existing 2017	Double-deck Sydney Trains	96	85	26	23
	Prior to Sydney Metro Opening 2024	Double-deck Sydney Trains	111	101	28	26
	After Opening 2024 (with Sydney Metro)	Double-deck Sydney Trains	111	101	28	26
	Future 2034 (with Sydney Metro)	Double-deck Sydney Trains	111	101	28	26
	Future 2034 Without Project ('no build option')	Double-deck Sydney Trains	111	101	28	26
Goods Line	Existing 2017	Freight Trains	27	27	9	9
	Prior to Sydney Metro Opening 2024	Freight Trains	44	44	15	15
	After Opening 2024 (with Sydney Metro)	Freight Trains	44	44	15	15

Rail line	Scenario	Train type	Trains per weekday period			
			Day 7:00 am to 10:00 pm		Night 10:00 pm to 7:00 am	
			Up	Down	Up	Down
	Future 2034 (with Sydney Metro)	Freight Trains	63	63	21	21
	Future 2034 Without Project ('no build option')	Freight Trains	63	63	21	21

At opening, six car metro trains would operate at least every four minutes during the peak periods (between 15 and 20 trains per hour) and at least every ten minutes in the off peak periods.

Service frequencies in Table 7 represent the combination of both Up and Down rail traffic per line.

It is noted that the passenger train services on rail lines presented in Table 6 and Table 7 do not include continuous operations during the entire night-time period.

Table 7 Maximum service frequencies - trains per hour

Line	2024 maximum trains per hour		2034 maximum trains per hour	
	Day	Night	Day	Night
T2 Airport Line	17	9	17	9
T4 Illawarra Line Local	4	3	4	3
T4 Illawarra Line Main	14	11	14	11
Sydney Metro	40	12	44	13
Goods Line	12	7	16	9

Results for additional operational airborne noise modelling

A summary of the predicted worst-case noise levels from airborne noise resulting from rail operations for the at-opening 2024 scenario for residential receivers and other sensitive receivers are provided in Table 8 and Table 9.

Table 8 Predicted 2024 airborne noise levels – residential receivers surface track works south

NCA	Side	Worst-case predicted noise level (dBA)									
		Without project			With project			Increase			RING triggers
		L _{Aeq} Day	L _{Aeq} Night	L _{Amax}	L _{Aeq} Day	L _{Aeq} Night	L _{Amax}	L _{Aeq} Day	L _{Aeq} Night	L _{Amax}	
01	Up	49	45	69	51	46	69	1.5	0.9	0.0	0
	Down	54	50	73	55	51	73	1.5	0.8	0.0	0
02	Up	-	-	-	-	-	-	-	-	-	0
	Down	67	72	87	70	72	90	2.8	0.2	3.6	9

Note 1 Bold indicates exceedance of criteria

Note 2 For reference the trigger levels are:

development increases existing $L_{Aeq(periode)}$ rail noise levels by 2 dB or more, or existing L_{Amax} rail noise levels by 3 dB or more and

predicted rail noise levels exceed: daytime 65 $L_{Aeq(15hour)}$ or 85 L_{Amax} , night-time 60 $L_{Aeq(9hour)}$ or 85 L_{Amax}

Table 9 Predicted 2024 airborne noise levels – other sensitive receivers surface track works south

NCA	Side	Worst-case predicted noise level (dBA)							
		Without project		With project		Increase		RING triggers	
		L _{Aeq} Day	L _{Aeq} Night	L _{Aeq} Day	L _{Aeq} Night	L _{Aeq} Day	L _{Aeq} Night		
01	Up	-	-	-	-	-	-	-	-
	Down	-	-	-	-	-	-	-	-
02	Up	68	69	73	69	5.5	0.1	1	1
	Down	69	67	70	67	1.1	0.3	0	0

Discussion on operational airborne noise mitigation options

The noise modelling results (for the future scenario) for airborne noise (rail operations) indicate at some locations the RING noise trigger levels are exceeded at existing receivers. Further assessment of feasible and reasonable noise mitigation measures has therefore been undertaken.

Appendix 6 of the RING provides the following guidance in relation to determining feasible and reasonable mitigation measures:

“A feasible mitigation measure is a noise-abatement measure that can be engineered and is practical to build, given proposal constraints such as safety, maintenance and reliability requirements. It may also include options such as amending operational practices (e.g. changing timetable schedules) to achieve noise reduction.

Selecting reasonable measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the abatement measure. To make such a judgement, consider the following.

- Noise impacts
- Noise mitigation benefits
- Cost effectiveness of noise mitigation
- Community views”.

A summary of airborne operational noise mitigation options considered for existing receivers along the proposed modification corridor is provided in Table 10, along with comments on their feasibility and reasonableness.

Source control measures are typically more cost effective to implement in terms of the resulting noise benefit compared with path and receivers controls respectively. On this basis, the hierarchy of noise control is to give preference to source control measures, then to path control measures and finally receiver controls.

Table 10 Summary of additional operational noise mitigation options

Description	Estimated noise reduction	Comments on feasibility and reasonableness
Source control measures		
Reduce speeds	A 20% reduction in maximum speed would reduce L_{Amax} noise levels by 2.5 dB and L_{Aeq} noise levels by 1.5 dB.	▪ The speeds as proposed are required to meet service frequency demands during peak periods ▪ Potentially feasible and reasonable outside of peak periods, for example at night however, daytime is the critical period for RING triggers so a reduction in night-time speeds would not reduce the controlling daytime triggers.
Reduce overall number of train passbys	▪ No change in L_{Amax} ▪ 1 dB in L_{Aeq} for 20% reduction ▪ 2 dB in L_{Aeq} for 35% reduction.	Not feasible as train numbers are required to meet service frequency demands.
Reduce train lengths	▪ Negligible change in L_{Amax} ▪ 1.3 dB reduction in L_{Aeq} for 25% reduction in train length ▪ 3 dB reduction in L_{Aeq} for 50% reduction in train length.	Not feasible as train lengths are required to meet capacity demand.
Minimise wheel and rail roughness	Limited by whether rail roughness or wheel roughness dominates the combined system.	The specifications for the Sydney Metro operations already include requirements for maintaining the rail surface (via rail grinding) and train wheel condition (via wheel lathe) in accordance with defined acceptance standards.
Minimise train source noise levels via specifications	N/A.	Trains types are locked in with those specified for the Sydney Metro Northwest.
Track design measures – rail dampers	No significant benefit on typical ballast track.	Rail dampers are most suited to resiliently mounted track such as slab-track. No significant noise benefit is achievable for ballast track on concrete sleepers.

Description	Estimated noise reduction	Comments on feasibility and reasonableness
Exclude “noisy” individual trains from Sydney Metro	Negligible.	The base case operation of the Sydney Metro already proposes to use the quietest available train types, and would include a maintenance strategy to identify and repair noisy trains.
Path control measures		
Conventional noise barriers – near rail corridor boundary	Significant noise reduction possible (ie >5 dB) where source to receiver line-of-sight is broken by barrier.	▪ New noise barriers and increase in height of existing noise barriers where appropriate ▪ Conventional noise barriers can potentially mitigate noise emissions originating from all sources within the rail corridor ▪ Conventional noise barriers are typically well suited to mitigating the mid to high frequency noise emissions of wheel rail dominant train noise ▪ Maximise the rail noise mitigation benefits to all residents in the area, including those that have noise impacts below the RING noise trigger levels ▪ Improve external amenity due to rail corridor noise for both residential and other sensitive receivers such as backyards, parks and playing fields ▪ Conventional barriers can be constructed to greater heights than low barriers close to the tracks ▪ Residents may also possibly be affected by negative aspects of conventional barriers such as: ▪ Loss of open aspect and breezes ▪ Potential for vandalism and need for graffiti removal ▪ Reduction in visual amenity of urban landscape and potential for overshadowing ▪ Loss of views and vistas ▪ Removal of vegetation ▪ Requirement to break line of sight between the noise source and receiver, which can result in an overall unfeasible barrier height if there is a multi-storey receiver.

Description	Estimated noise reduction	Comments on feasibility and reasonableness
Noise barriers – low profile “platform barriers”	Up to 8 dB reduction in L_{Aeq} and L_{Amax} over unmitigated case. Benefit depends on the gap remaining between the low barrier and the train.	▪ Could result in high noise reduction with low visual impact ▪ Design would need to consider rollingstock loading gauge and track maintenance requirements ▪ Low profile noise barriers would likely be effective in significantly reducing noise from metro services at adjacent receivers by approximately 8 dB to 10 dB if correctly implemented ▪ Low profile barriers installed to target noise from the metro tracks are unlikely to effectively address noise from the neighbouring Goods Line tracks as they only mitigate noise from directly adjacent rail track sources. As such this mitigation option targets noise from the new Metro tracks only and does not address the total noise from all rail noise services in the corridor and for this reason is not considered a reasonable mitigation option in areas with significant rail noise from non-metro tracks ▪ Safety and maintenance risks determine the feasibility of low profile noise barriers and can be considered in greater detail during the detailed design stage when specific details regarding safety and maintenance requirements are better determined.
Receiver control options		
Ventilation in accordance with Building Code requirements to allow windows to be closed (if desired)	10 dB to 15 dB reduction in internal noise levels compared with windows open for standard glazing. Higher noise reductions possible for laminated and double glazing with acoustic seals. No benefit for outdoor areas or if windows are opened.	▪ This option could be applicable as a final measure for existing residences predicted to exceed the trigger levels ▪ The scope and suitability of property facade treatments would depend on the existing conditions at each property and consultation with the affected receivers ▪ Several receivers triggered for mitigation are modern constructions which likely include facades with high acoustic performance in line with the requirements of the SEPP and therefore further improving façade acoustic performance would be very limited.

Of the additional noise mitigation options listed in Table 10, conventional noise barriers are considered to be the most feasible and reasonable option for reducing the impact of operational noise at existing receivers with identified exceedances of the trigger levels.

Details and assumptions of stabling facility scenarios

A range of operating scenarios at the Sydney Metro Trains Facility South have been modelled to assess the potential airborne noise emissions for both the at-opening and future operations during the early morning, daytime, evening and night-time periods, under both neutral weather conditions and adverse weather conditions. The Sydney Metro Trains Facility South would operate differently from existing Sydney Trains stabling yards. The noise sources and scenarios have been developed appropriately for the Sydney Metro operating environment.

The scenarios that have been modelled are summarised in Table 11.

Table 11 Noise modelling scenarios

Scenario	Parameter	Time period	Noise sources
1	L _{Aeq} (15minute)	Opening Early Morning Train Departures	- Two trains undergoing preparation with air compressors, air-conditioners, pneumatic air release and static inverters operating - Substation
2	L _{Aeq} (15minute)	Opening Daytime Train Departures	- Two trains undergoing preparation with air compressors, air-conditioners, pneumatic air release and static inverters operating - Substation
3	L _{Aeq} (15minute)	Opening Daytime Train Arrivals	- Six trains undergoing cleaning with air-conditioners and static inverters operating - Substation
4	L _{Aeq} (15minute)	Opening Evening Train Arrivals	- Six trains undergoing cleaning with air-conditioners and static inverters operating - Substation
5	L _{Aeq} (15minute)	Opening Night-time Train Departures	- Two trains undergoing preparation with air compressors, air-conditioners, pneumatic air release and static inverters operating - Substation
6	L _{Aeq} (15minute)	Opening Night-time Train Arrivals	- Six trains undergoing cleaning with air-conditioners and static inverters operating - Substation
7	L _{Aeq} (15minute)	Future Early Morning Train Departures	- Eight trains undergoing preparation with air compressors, air-conditioners, pneumatic air release and static inverters operating - Train wash facility - Substation
8	L _{Aeq} (15minute)	Future Daytime Train Departures	- Eight trains undergoing preparation with air compressors, air-conditioners, pneumatic air release and static inverters operating - Train wash facility - Substation

Scenario	Parameter	Time period	Noise sources
9	L _{Aeq} (15minute)	Future Daytime Train Arrivals	- Fourteen trains undergoing cleaning with air-conditioners and static inverters operating - Train wash facility - Substation
10	L _{Aeq} (15minute)	Future Evening Train Arrivals	- Fourteen trains undergoing cleaning with air-conditioners and static inverters operating - Train wash facility - Substation
11	L _{Aeq} (15minute)	Future Night-time Train Departures	- Two trains undergoing preparation with air compressors, air-conditioners, pneumatic air release and static inverters operating - Train wash facility - Substation
12	L _{Aeq} (15minute)	Future Night-time Train Arrivals	- Fourteen trains undergoing cleaning with air-conditioners and static inverters operating - Train wash facility - Substation
13	L _{Amax}	Opening All periods	Pneumatic air release
14	L _{Amax}	Future All periods	Pneumatic air release

Meteorological conditions

The Industrial Noise Policy (INP) requires adverse meteorological conditions to be considered in some situations, where temperature inversions or prevailing winds may increase noise levels by focusing sound wave propagation paths at a single point.

At this stage a detailed analysis of seasonal weather data (wind and atmospheric stability) has not been undertaken. Instead default inversion parameters for a non-arid area are assumed during the night-time and early morning periods:

- Temperature inversion strength 3°C / 100 metres
- Source to receiver drainage flow wind speed of 2 m/s.

The online Application Notes to the INP state that in all cases, the noise impacts should be predicted (or measured) under neutral (calm) conditions as well as any significant weather conditions to allow for a better understanding of potential noise impacts from the development."

The approach to the assessment for the proposed modification has been to assess the impacts for all periods under neutral weather conditions, as well as daytime and evening winds of 3 m/s source to receiver and night-time and early morning temperature inversion conditions described above.

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BACKGROUND NOISE MONITORING RESULTS



INDEX

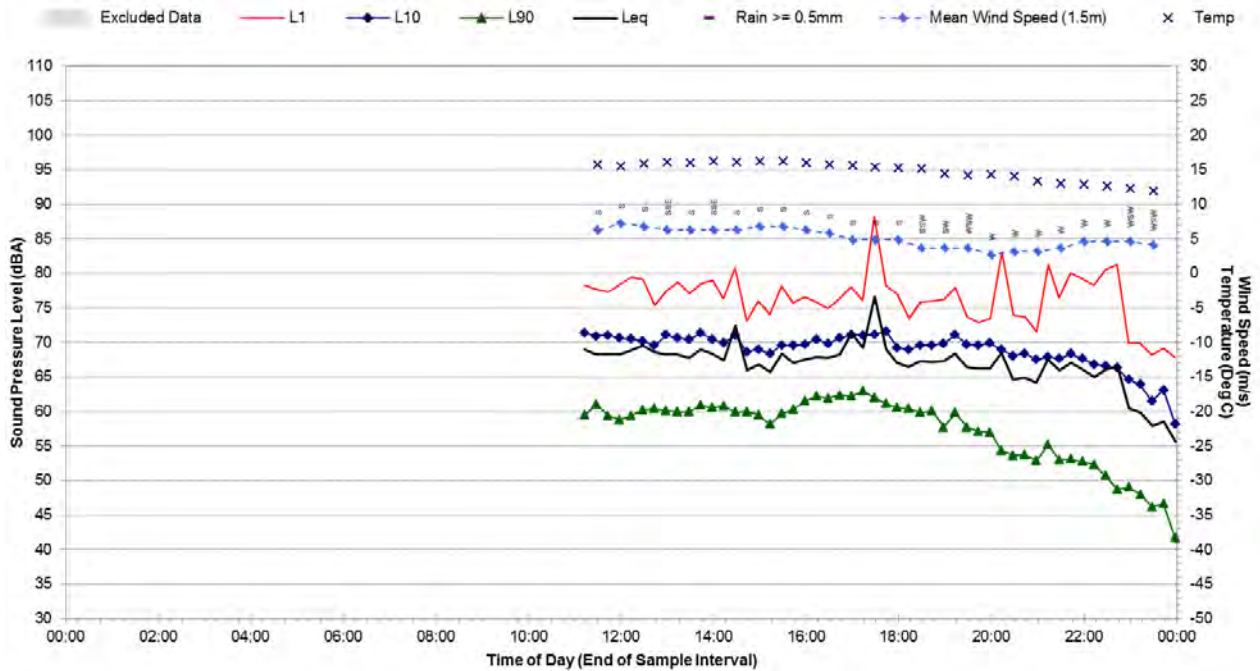
B.01	2
B.02	11
B.03	19
B.04	27

Background Noise Monitoring Results – B.01

Noise Monitoring Location:	B.01			
Noise Monitoring Address:	322 Edgeware Road, Newtown 2065			
Logger Device Type: Svantek 957 Logger Serial No: 23816				
Ambient noise logger deployed at residential address 322 Edgeware Road, Newtown. Logger located on the front balcony of the property.				
Attended noise measurements indicate that the ambient noise environment at this location is dominated by road traffic noise from Edgeware Road to the west during the daytime. Constant tyre-pavement/engine noise from light-vehicle traffic on Edgeware Road can be heard at this location along with noise from vehicles breaking into the right hand bend. Discrete traffic noise level peaks from heavy vehicle movements often occur several times per minute.				
				
Map of Noise Monitoring Location				
				
Photo of Noise Monitoring Location				
Ambient Noise Logging Results – INP Defined Time Periods				
Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	58	69	71	79
Evening	52	66	68	75
Night-time	38	62	63	69
Attended Noise Measurement Results				
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAm _{ax}
31/08/2015	11:02:07	61	68	84

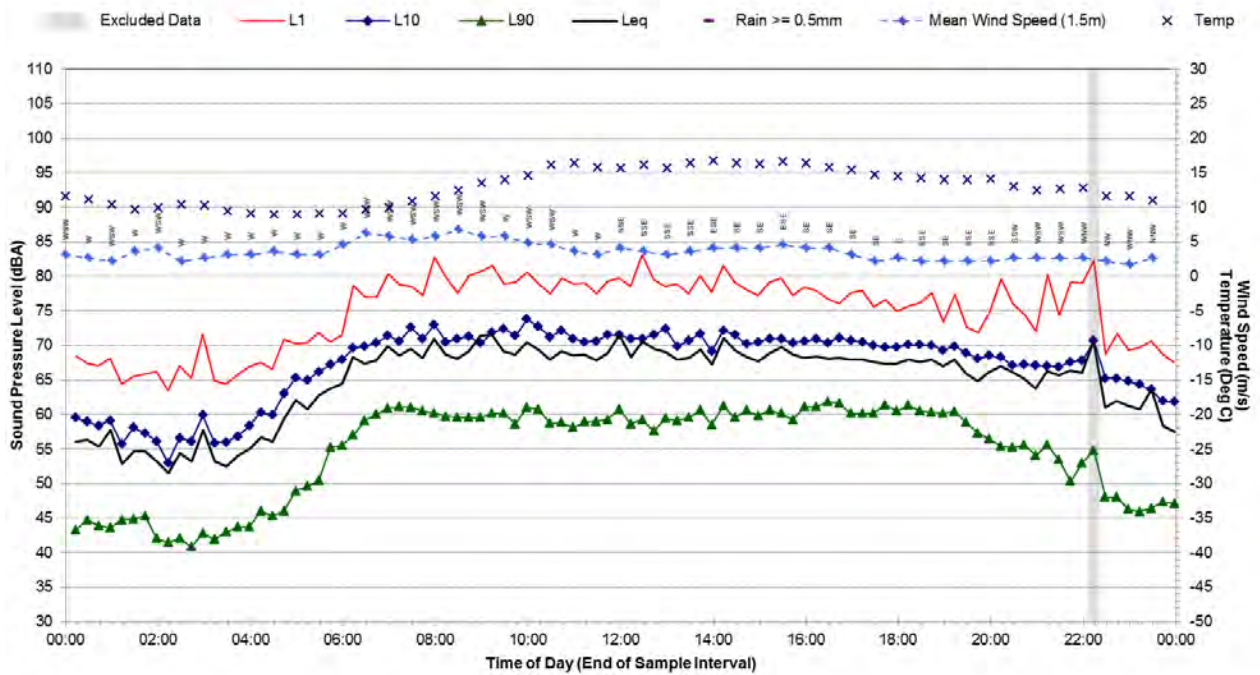
Statistical Ambient Noise Levels

B.01 - Monday, 31 August 2015



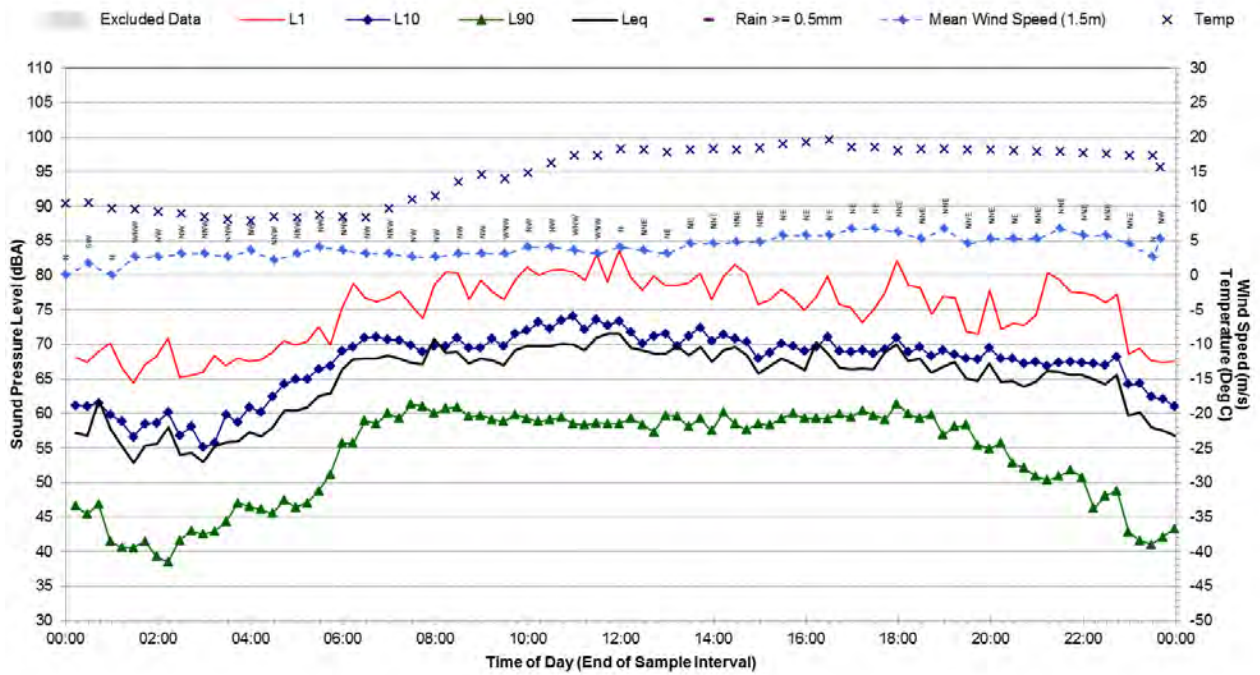
Statistical Ambient Noise Levels

B.01 - Tuesday, 1 September 2015



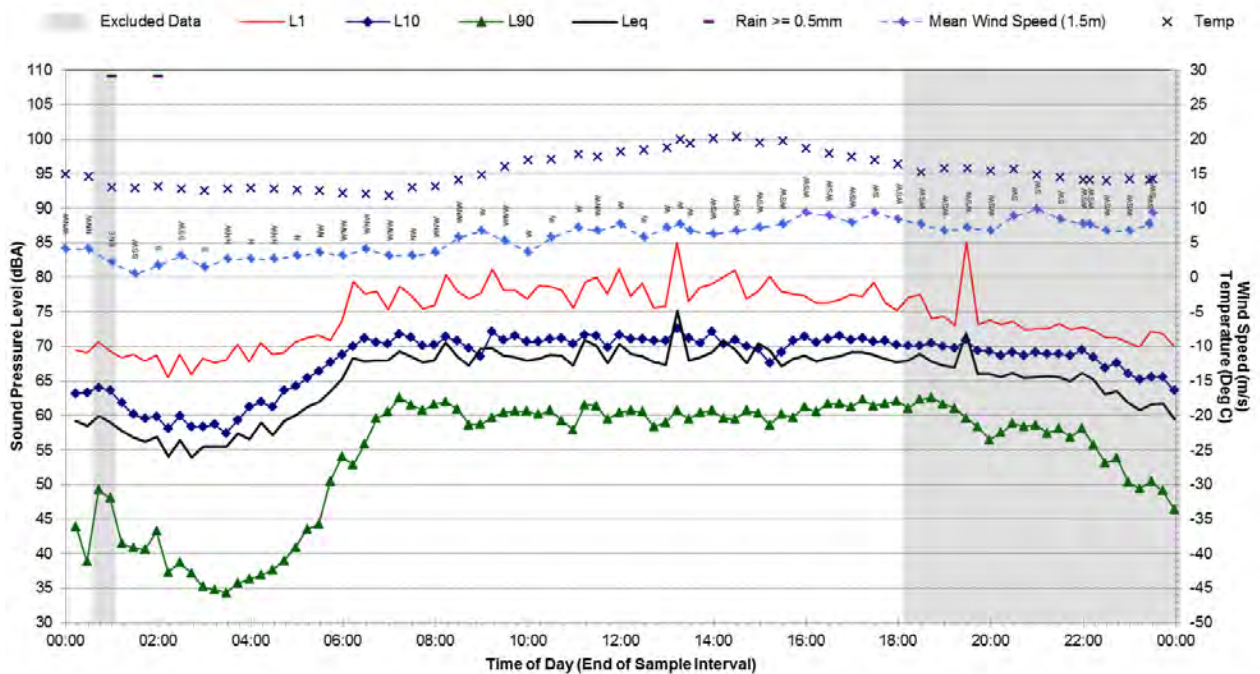
Statistical Ambient Noise Levels

B.01 - Wednesday, 2 September 2015



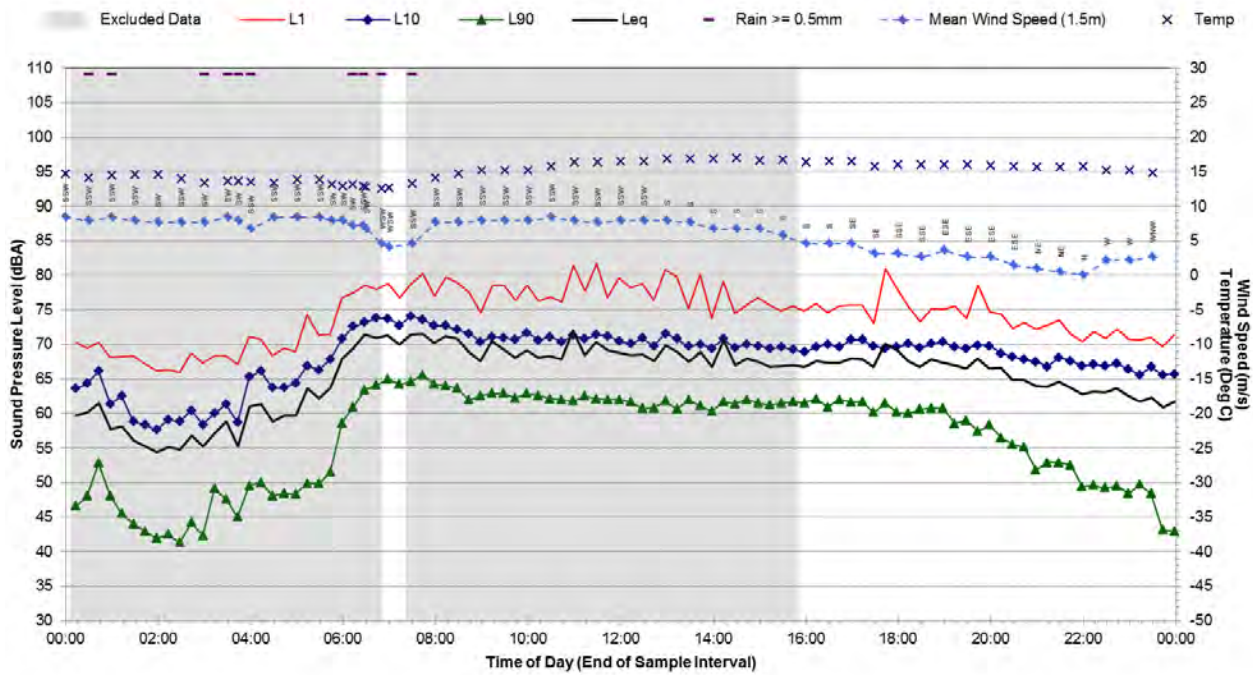
Statistical Ambient Noise Levels

B.01 - Thursday, 3 September 2015



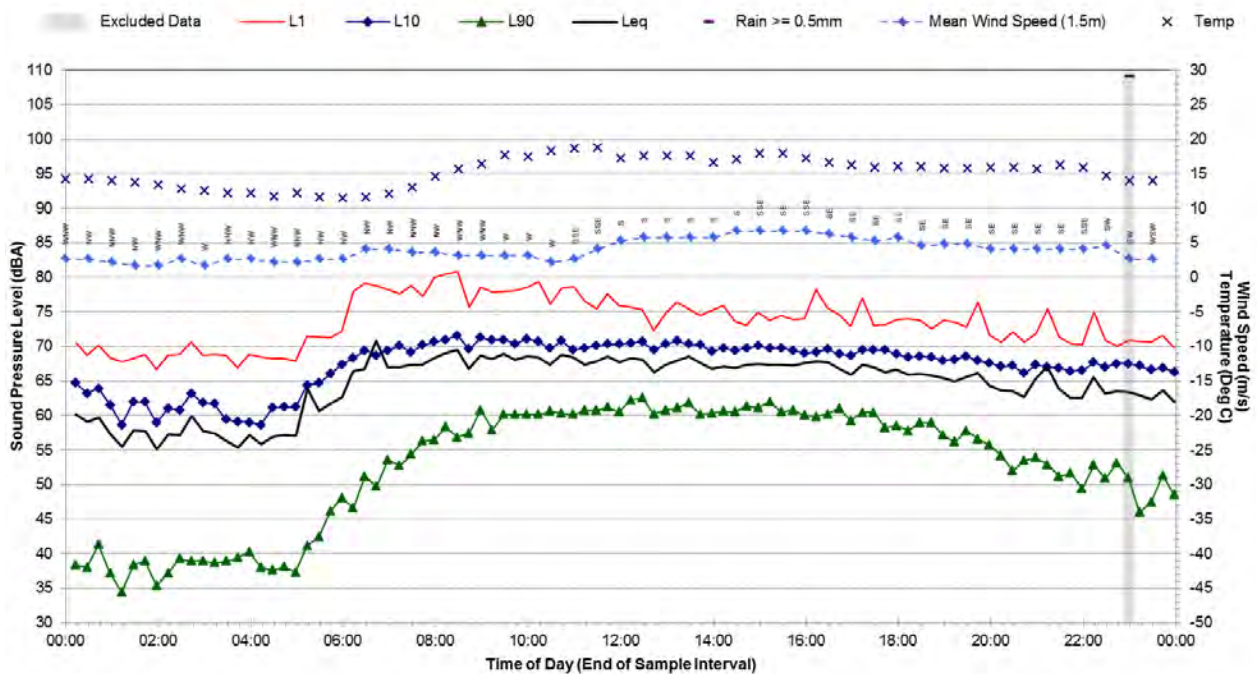
Statistical Ambient Noise Levels

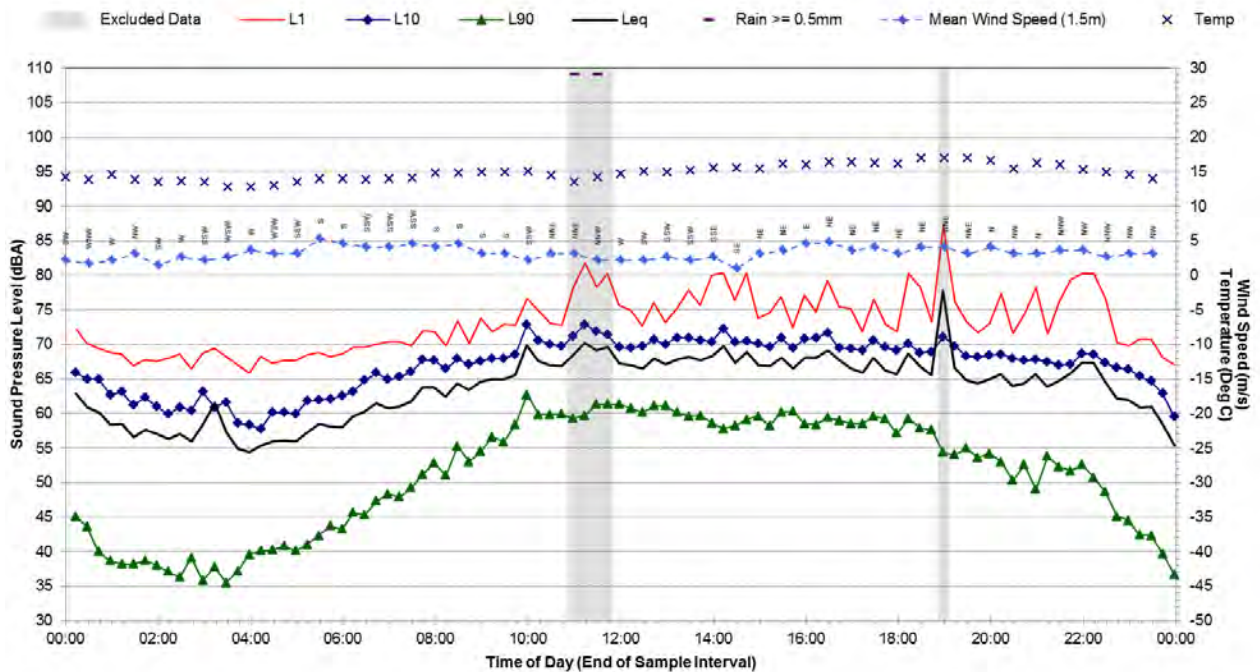
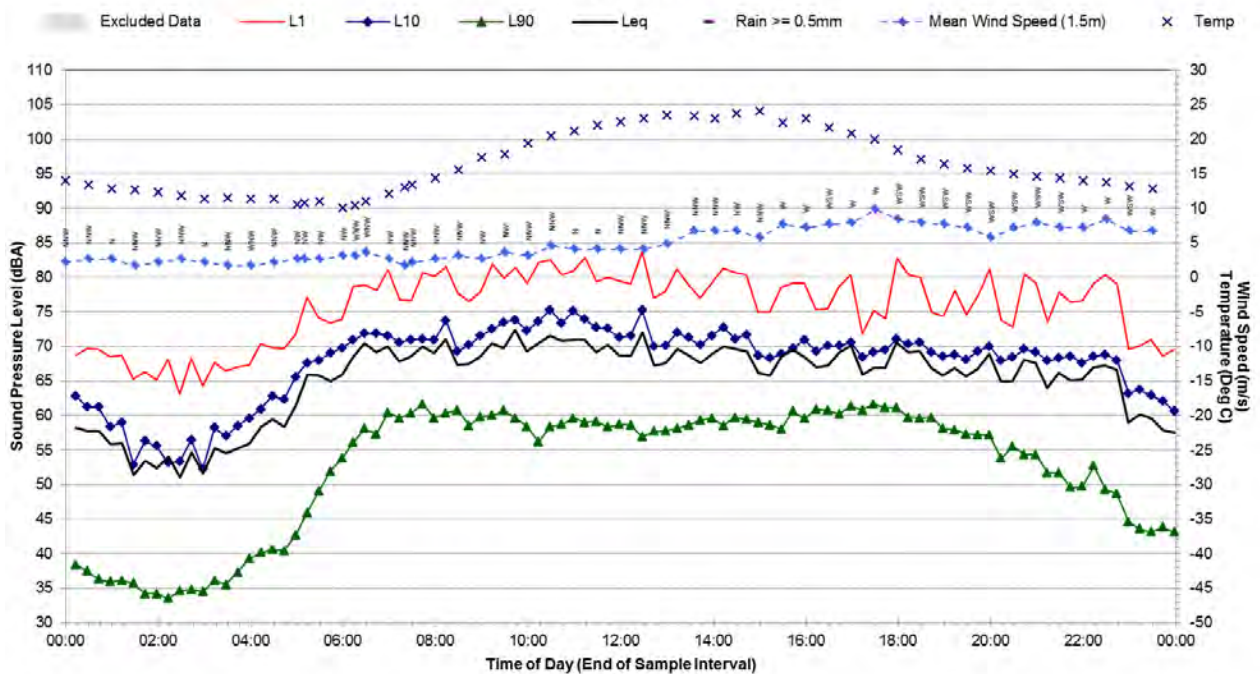
B.01 - Friday, 4 September 2015



Statistical Ambient Noise Levels

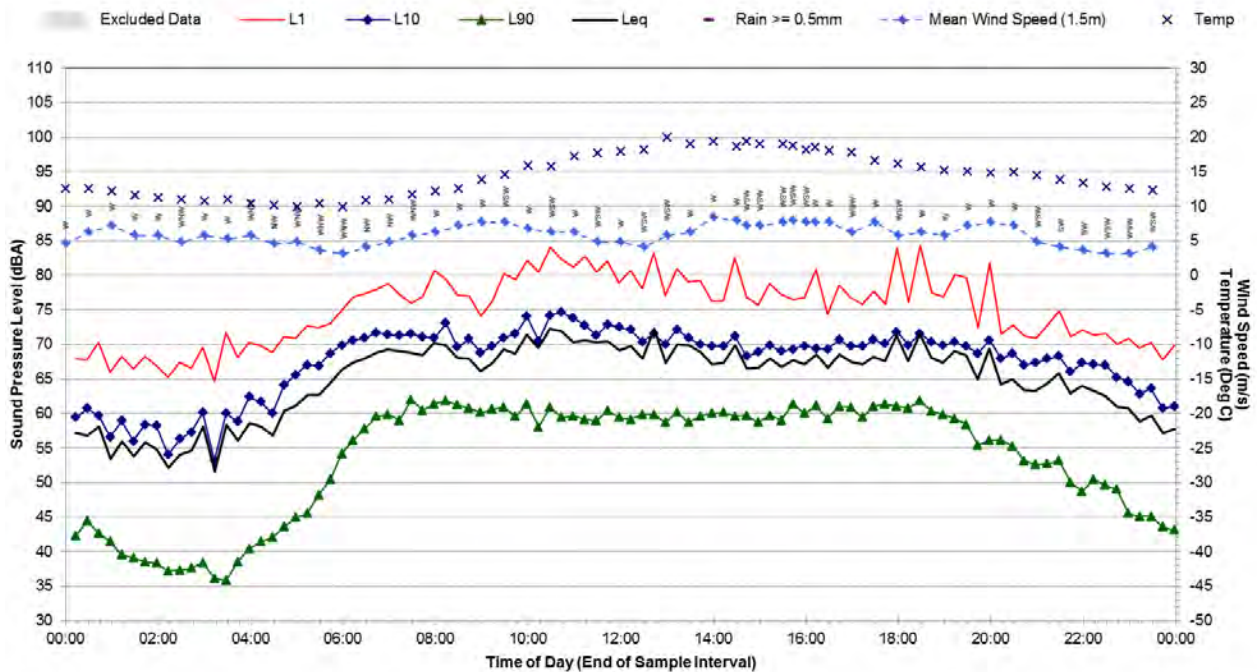
B.01 - Saturday, 5 September 2015



Statistical Ambient Noise Levels**B.01 - Sunday, 6 September 2015****Statistical Ambient Noise Levels****B.01 - Monday, 7 September 2015**

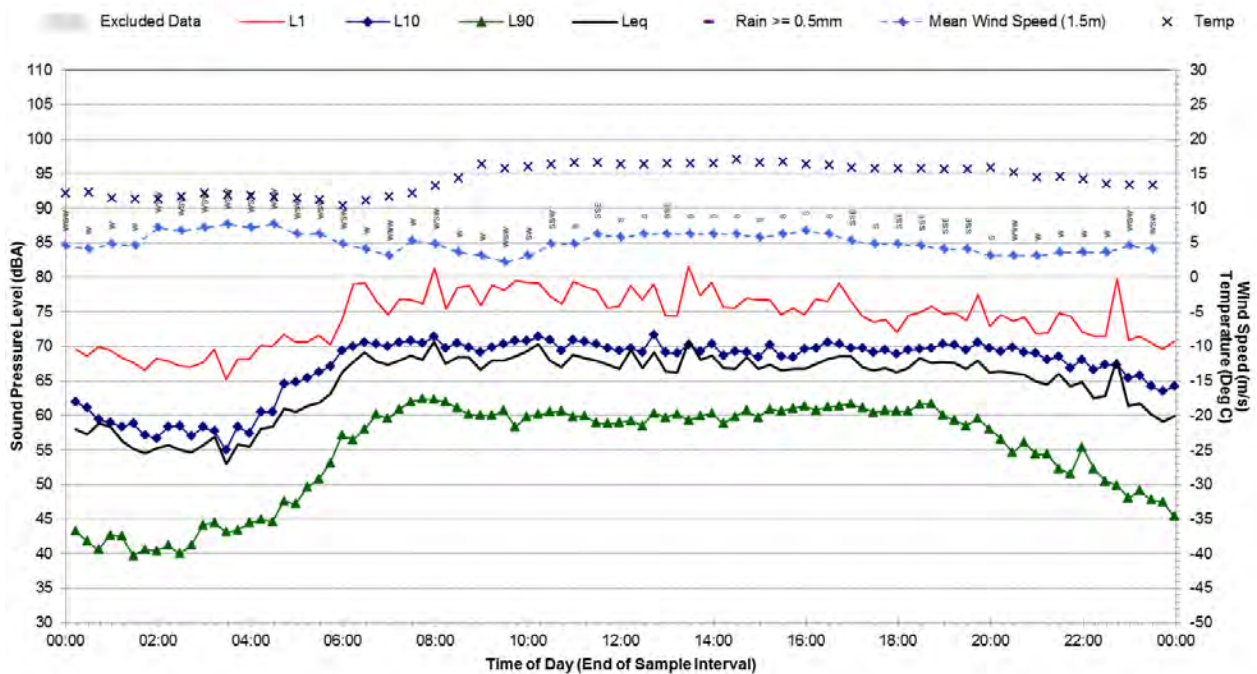
Statistical Ambient Noise Levels

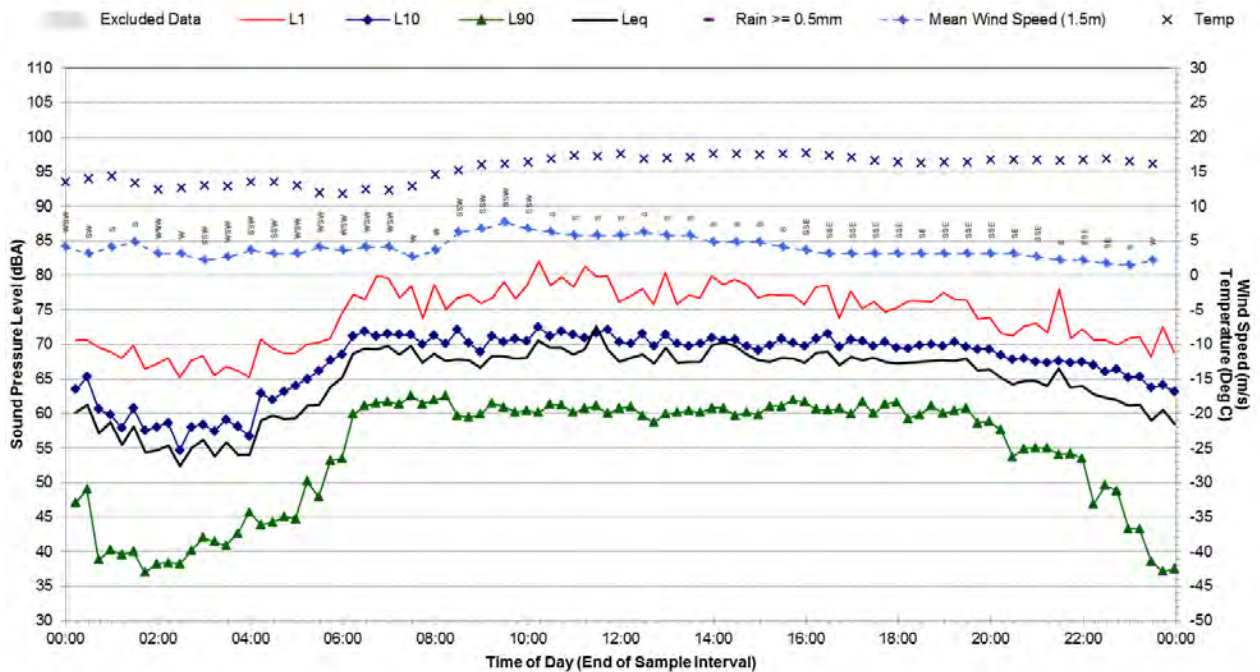
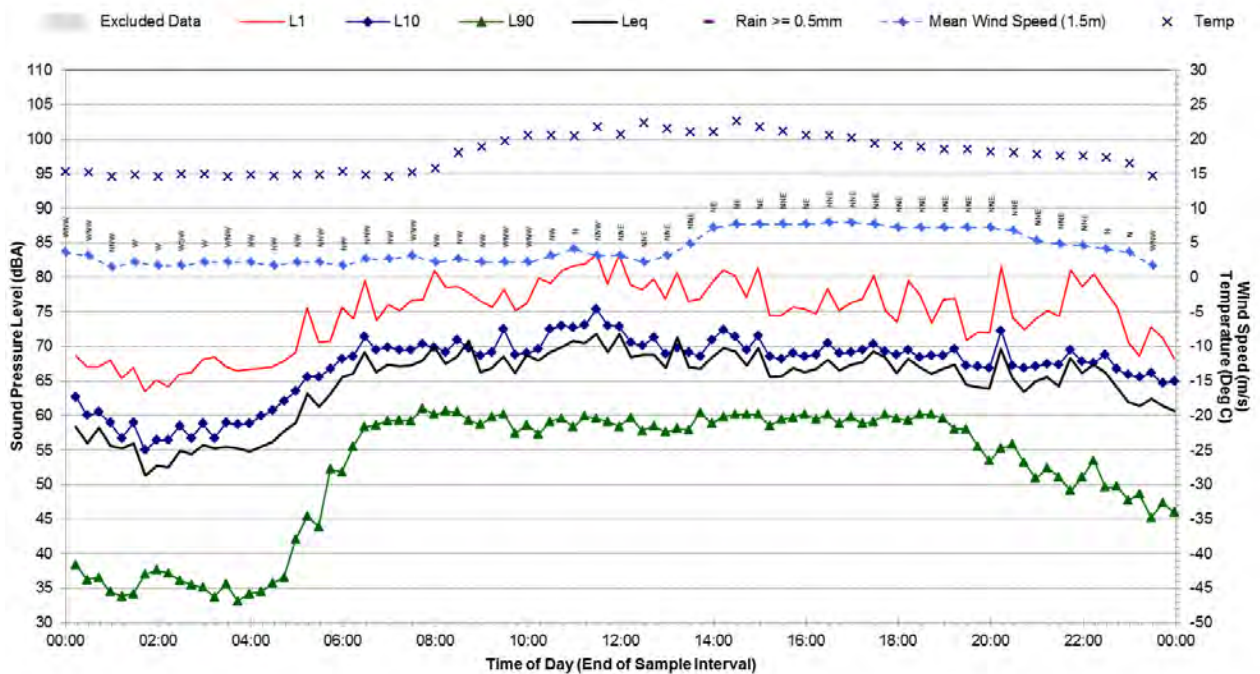
B.01 - Tuesday, 8 September 2015



Statistical Ambient Noise Levels

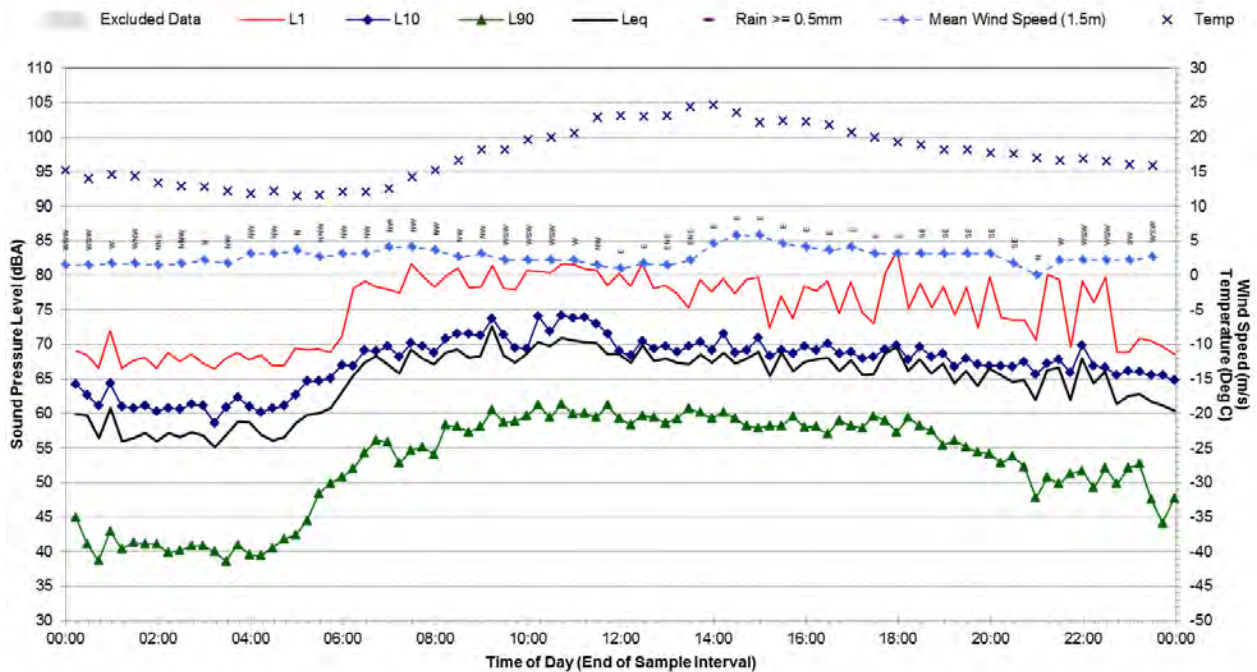
B.01 - Wednesday, 9 September 2015



Statistical Ambient Noise Levels**B.01 - Thursday, 10 September 2015****Statistical Ambient Noise Levels****B.01 - Friday, 11 September 2015**

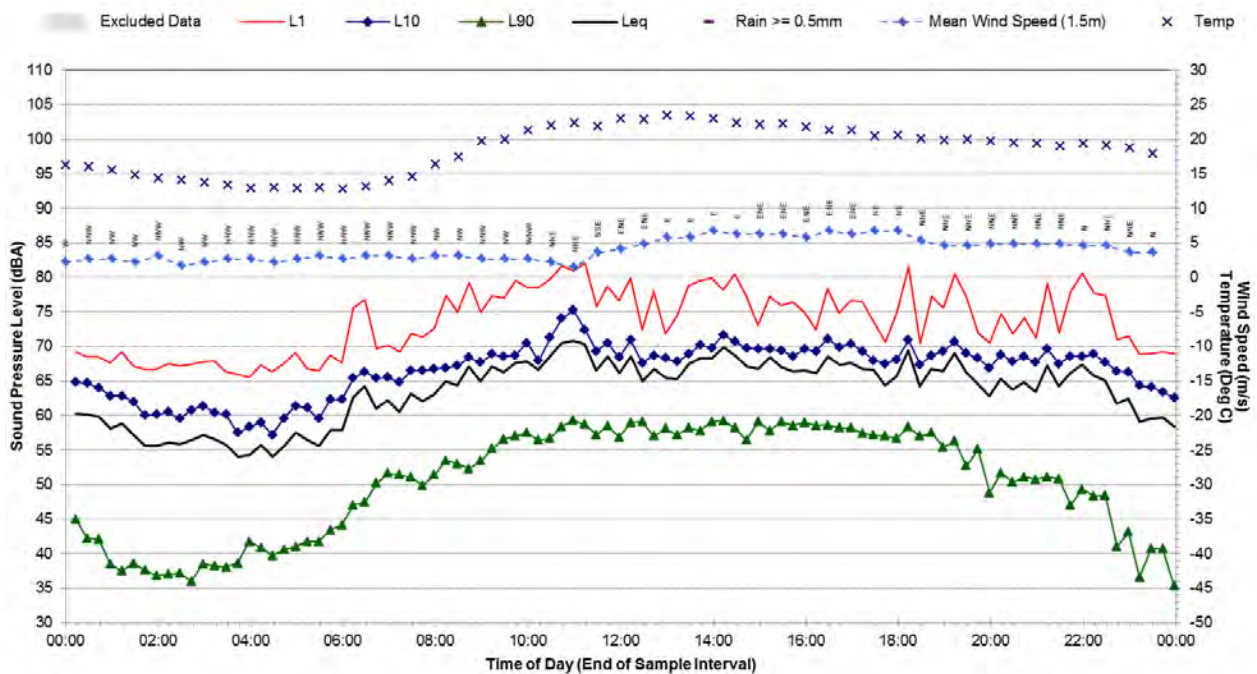
Statistical Ambient Noise Levels

B.01 - Saturday, 12 September 2015



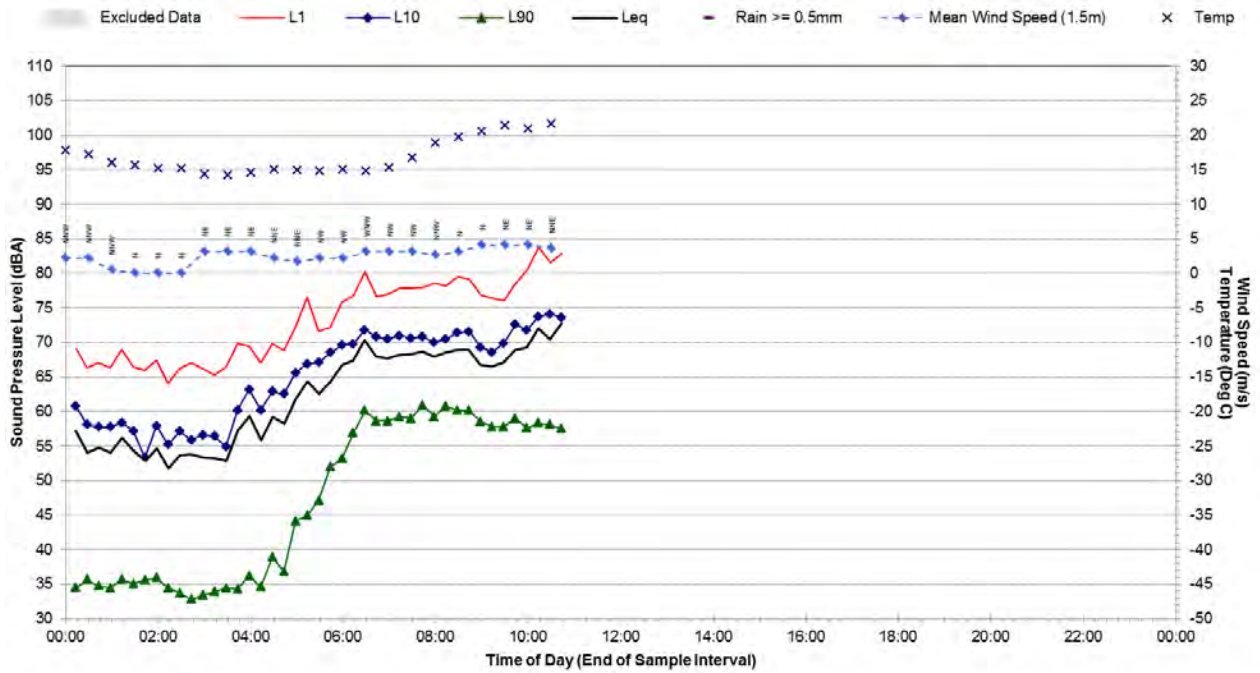
Statistical Ambient Noise Levels

B.01 - Sunday, 13 September 2015

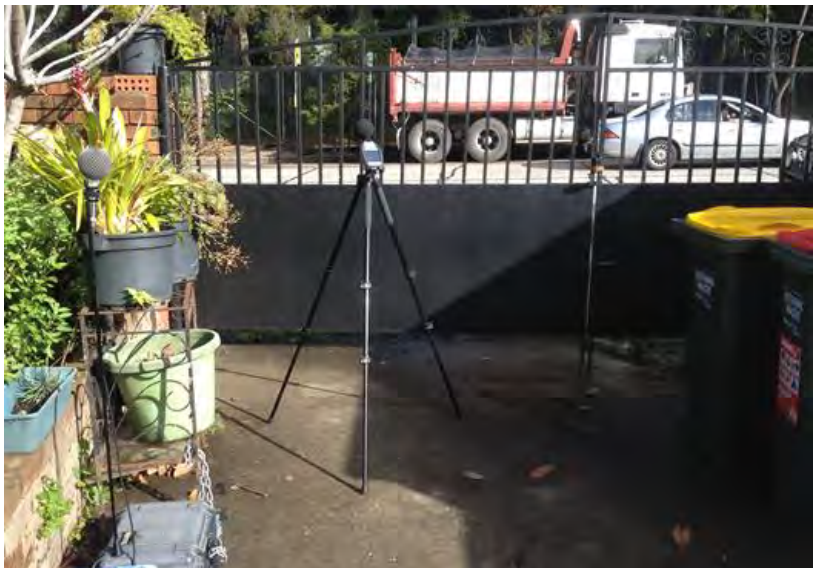


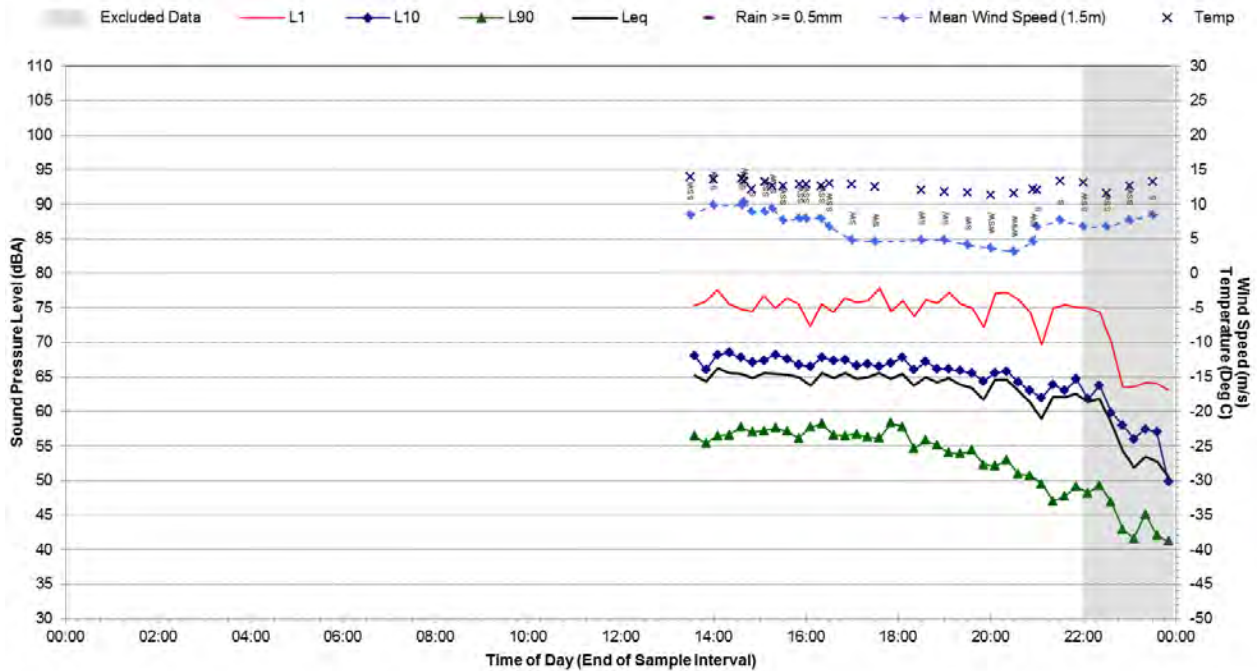
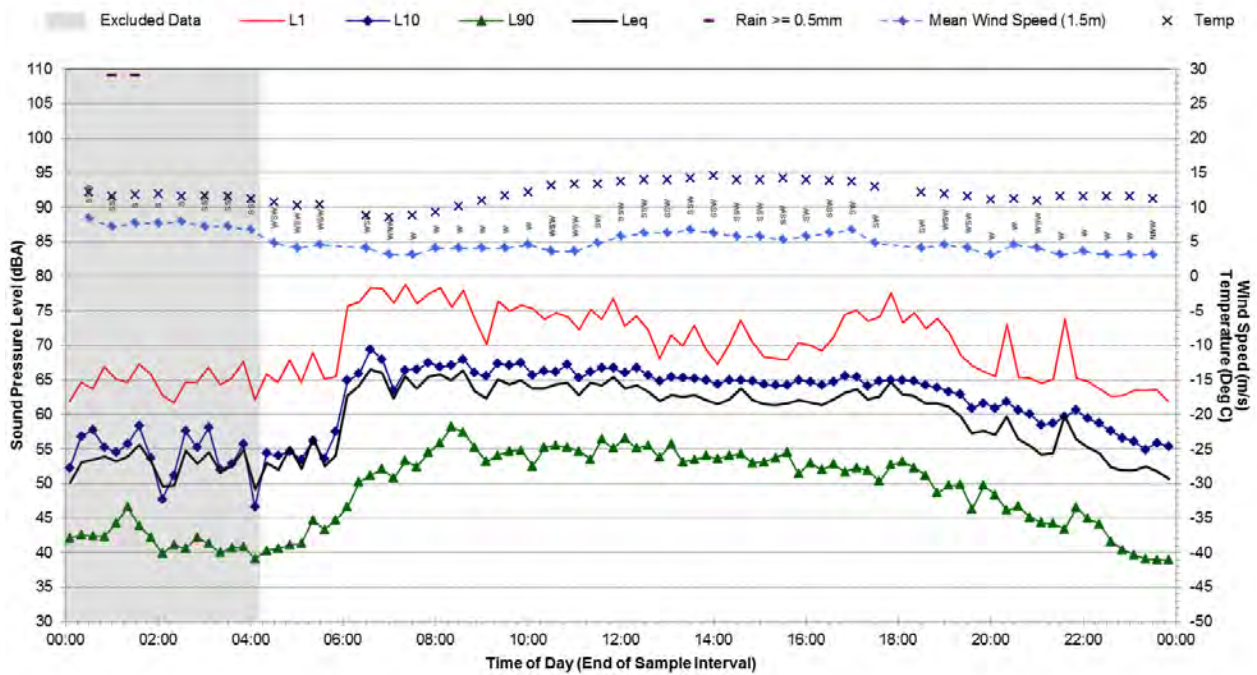
Statistical Ambient Noise Levels

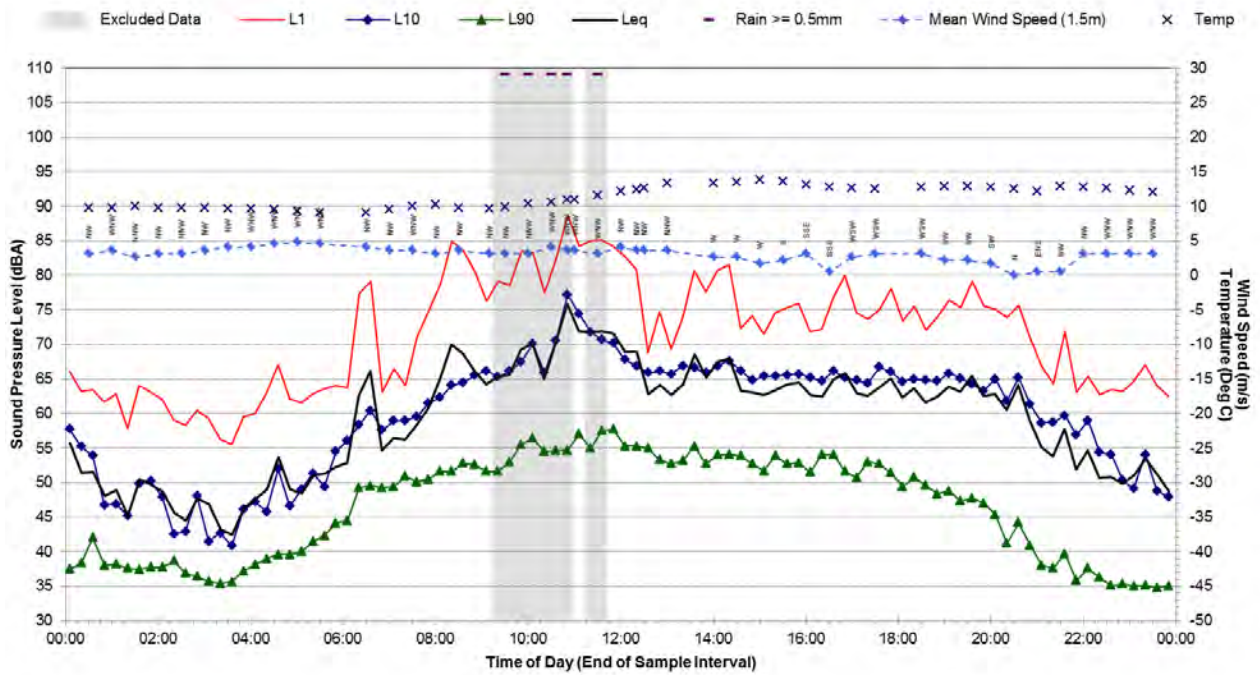
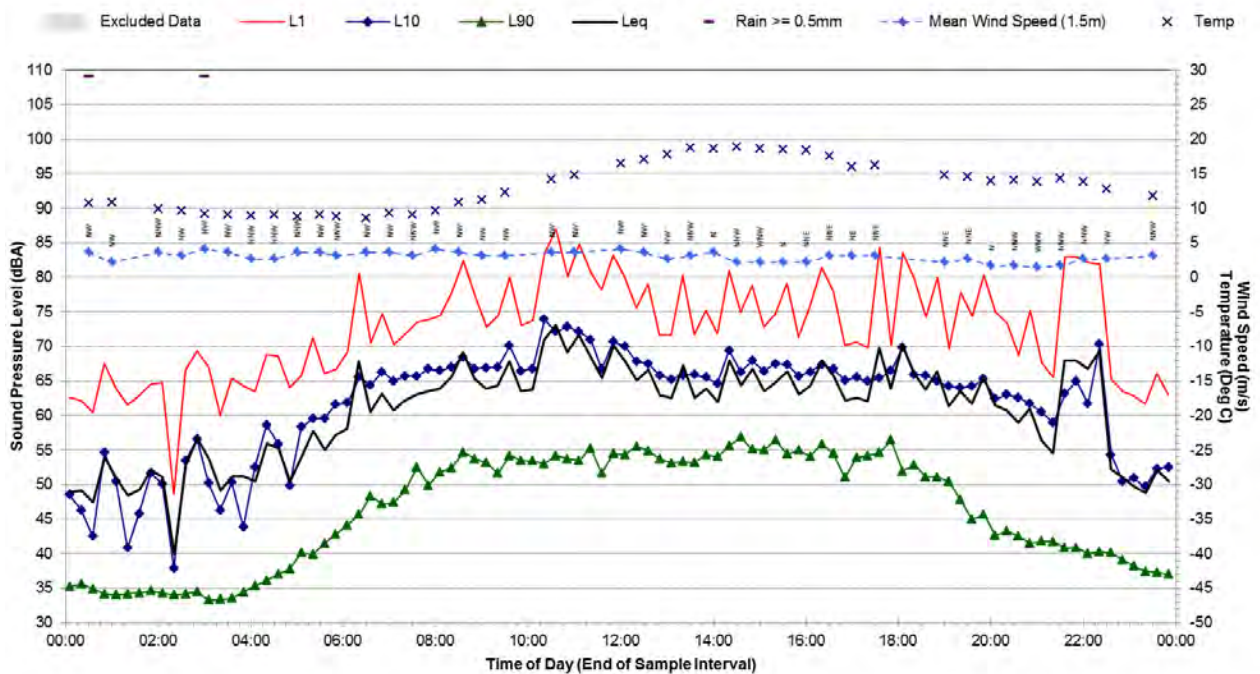
B.01 - Monday, 14 September 2015



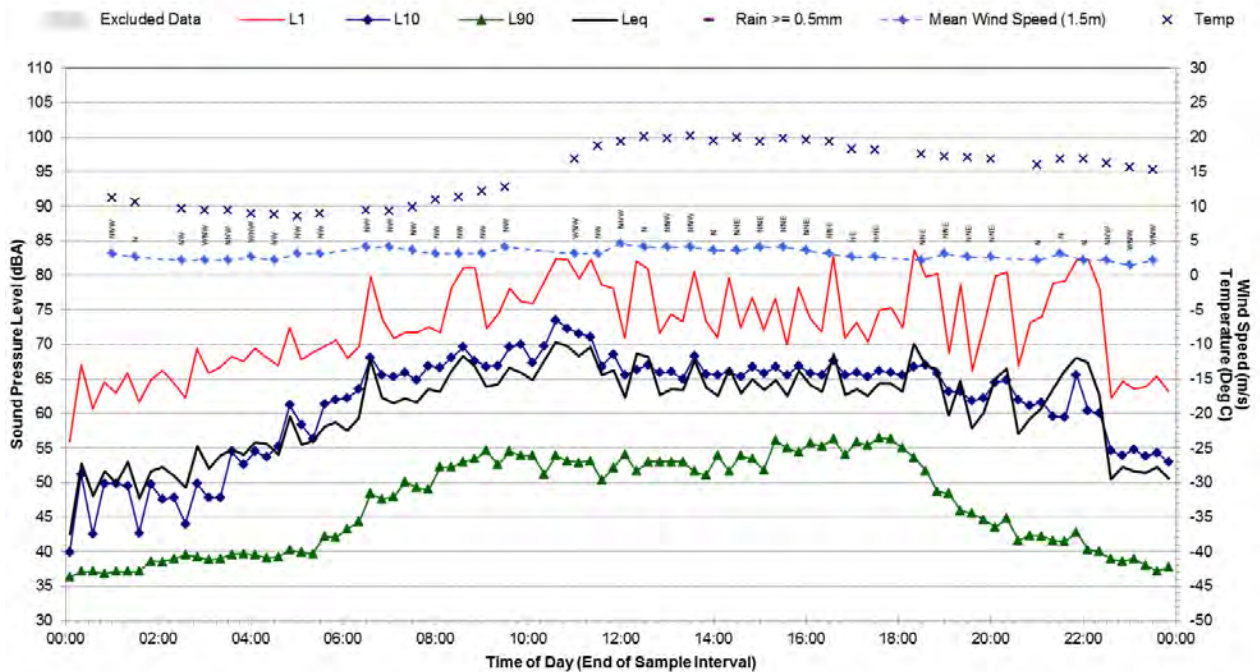
Background Noise Monitoring Results – B.02

Noise Monitoring Location: B.02		Map of Noise Monitoring Location		
Noise Monitoring Address: 1B Leicester Street, Marrickville 2204				
Logger Device Type: Svantek 957 Logger Serial No: 27580				
Ambient noise logger deployed at the front of residential address 1B Leicester Street, Marrickville. Logger located on the driveway in the south eastern corner of the property.				
Attended noise measurements indicate that the ambient noise environment at this location is dominated by road traffic noise from Edgeware Road, located to the south during the daytime.				
Ambient Noise Logging Results – INP Defined Time Periods				
Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	52	66	67	76
Evening	43	64	64	75
Night-time	38	58	55	66
Attended Noise Measurement Results				
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmx
19/06/2015	13:07:41	58	66	81

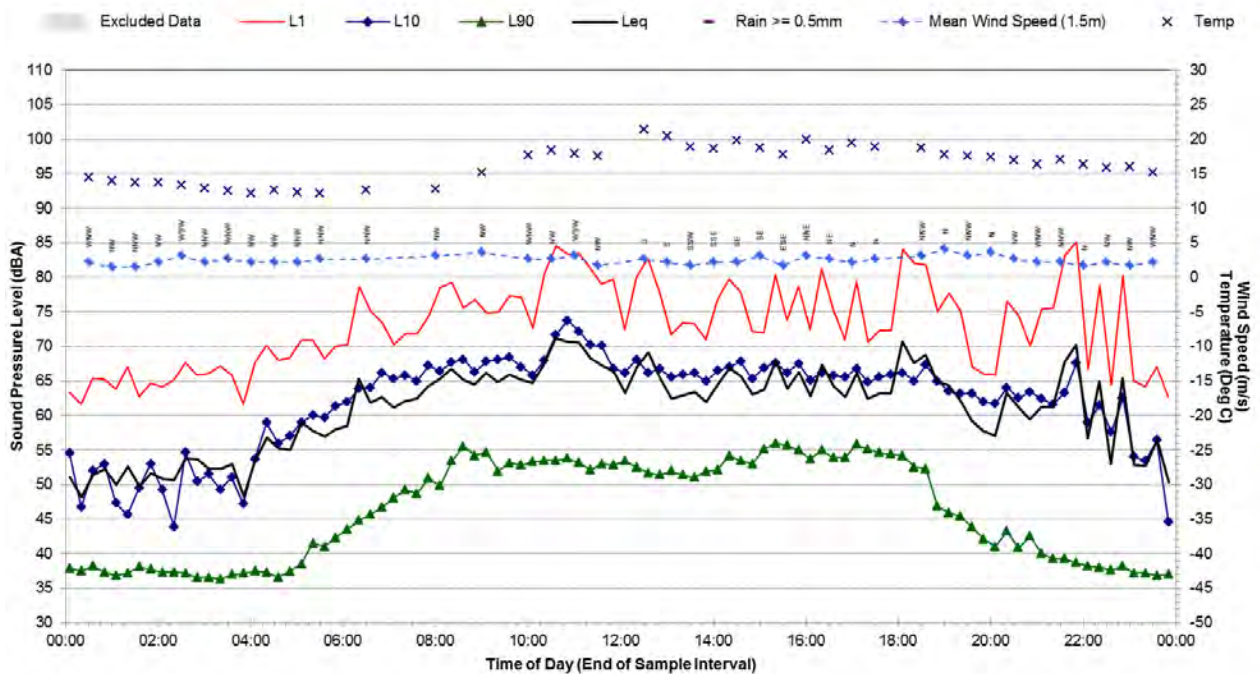
Statistical Ambient Noise Levels**B.02 - Friday, 19 June 2015****Statistical Ambient Noise Levels****B.02 - Saturday, 20 June 2015**

Statistical Ambient Noise Levels**B.02 - Sunday, 21 June 2015****Statistical Ambient Noise Levels****B.02 - Monday, 22 June 2015**

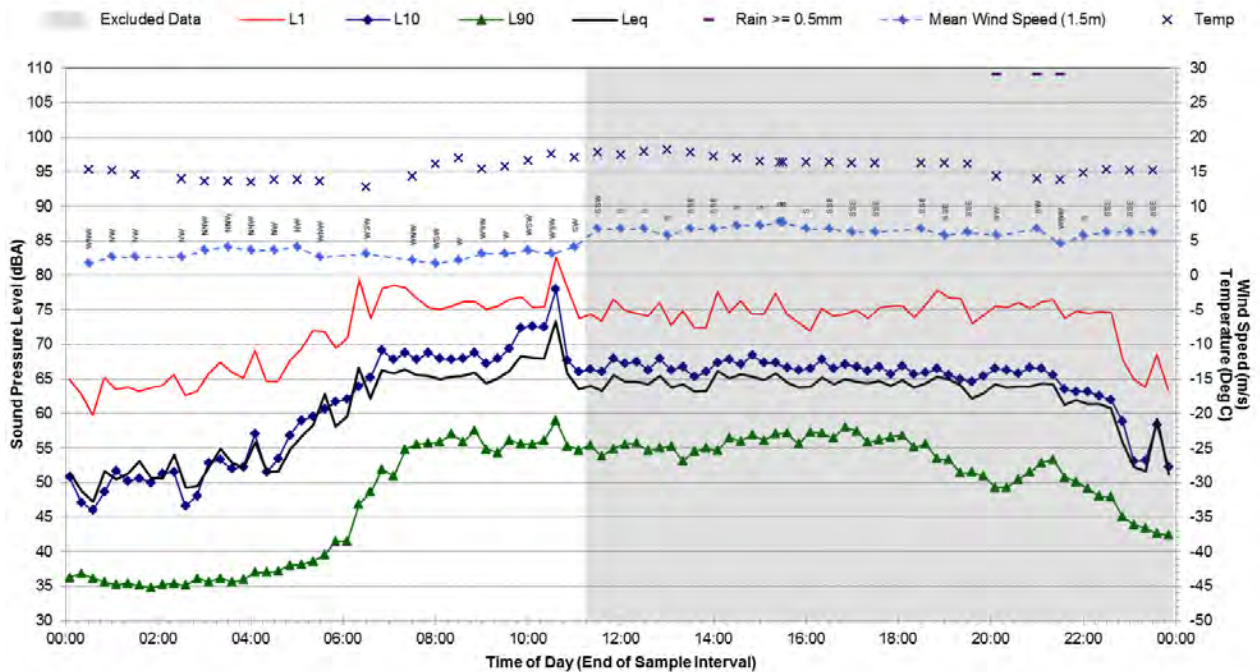
Statistical Ambient Noise Levels B.02 - Tuesday, 23 June 2015



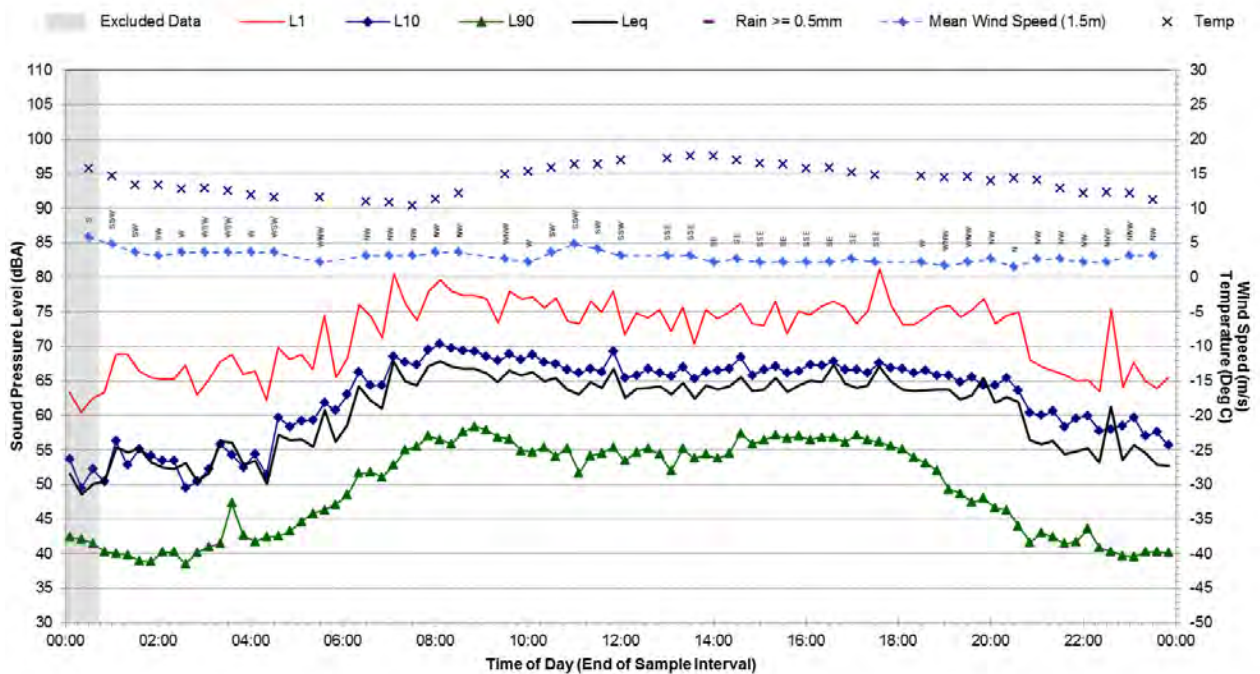
Statistical Ambient Noise Levels B.02 - Wednesday, 24 June 2015



Statistical Ambient Noise Levels B.02 - Thursday, 25 June 2015

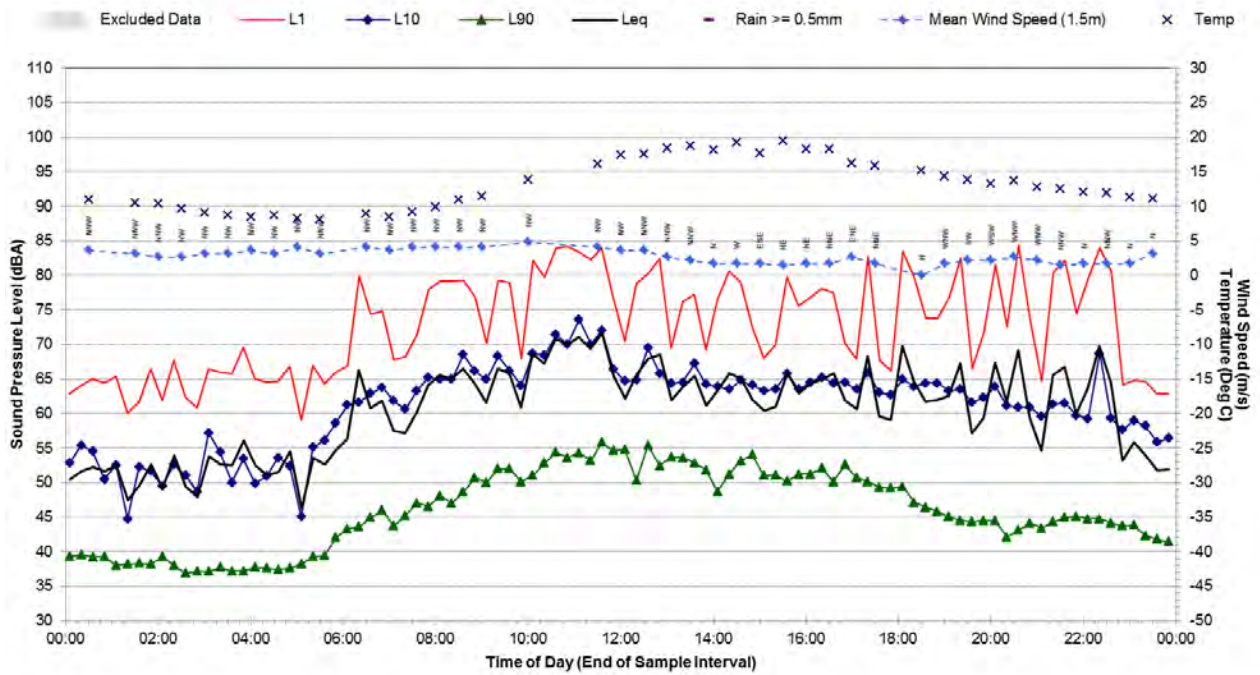


Statistical Ambient Noise Levels B.02 - Friday, 26 June 2015



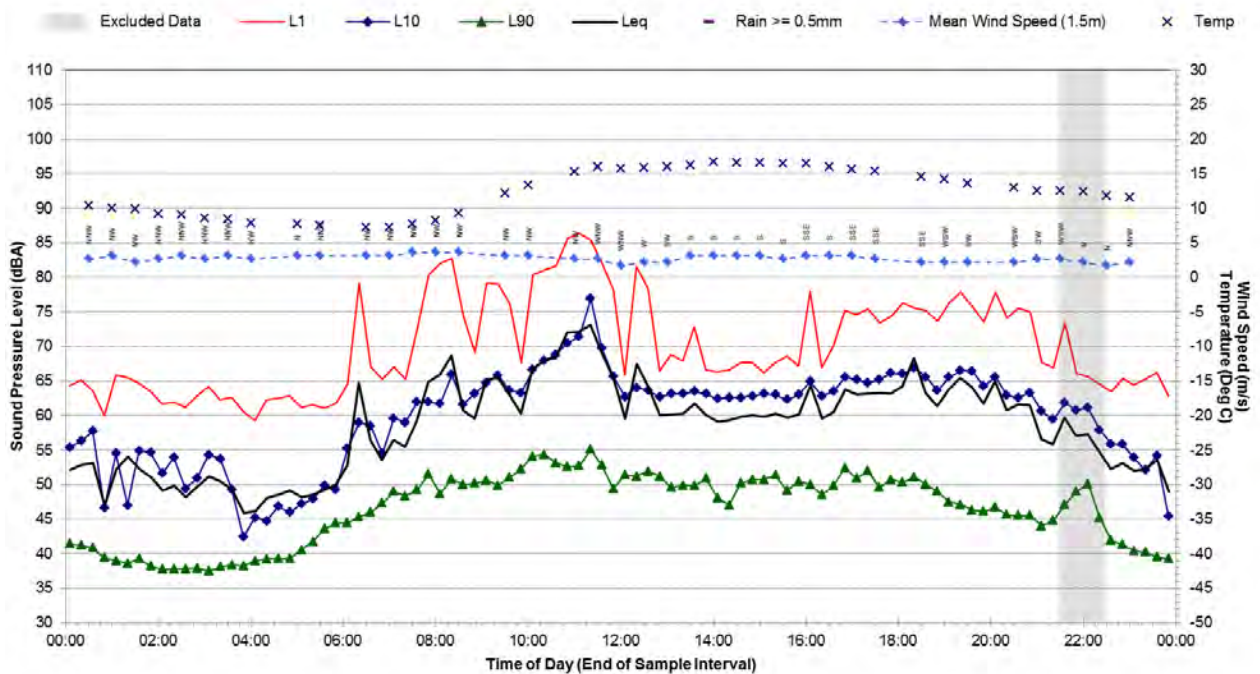
Statistical Ambient Noise Levels

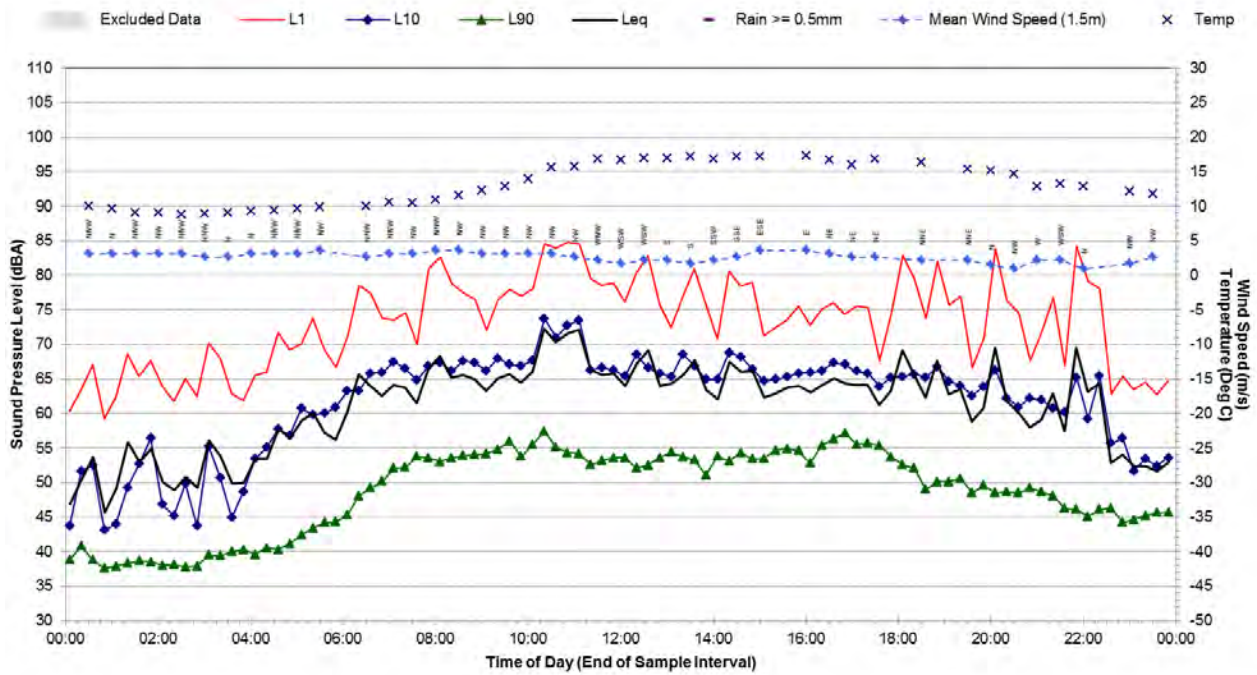
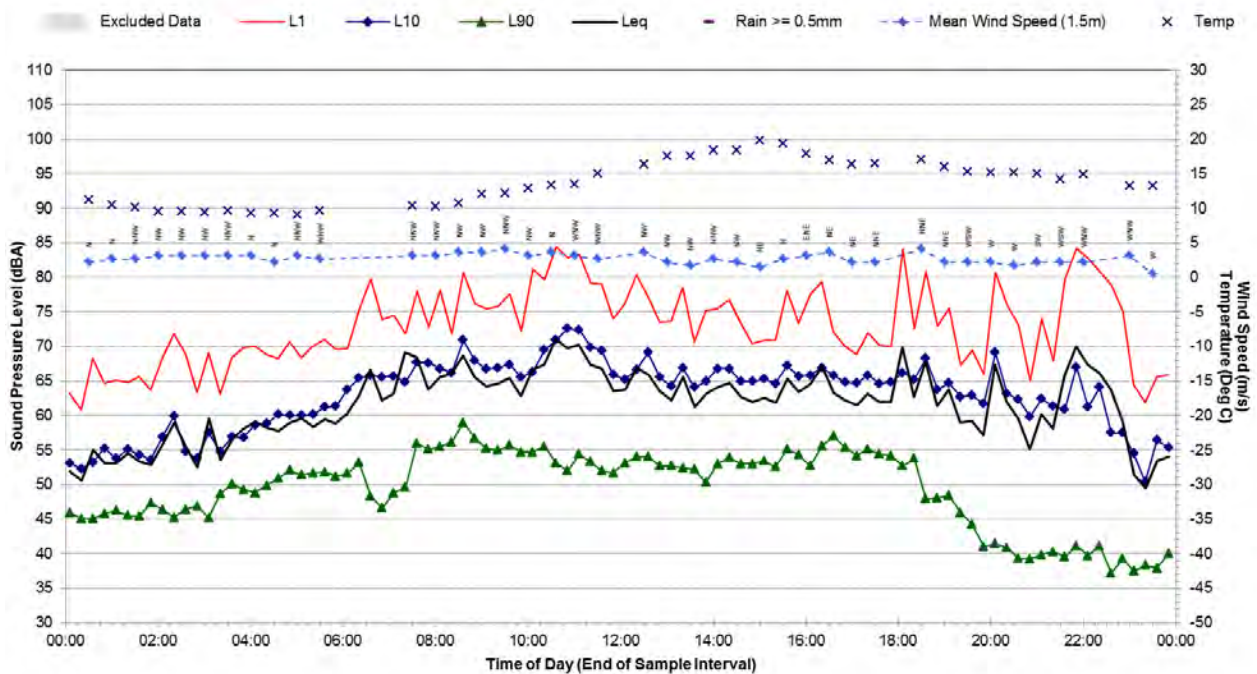
B.02 - Saturday, 27 June 2015



Statistical Ambient Noise Levels

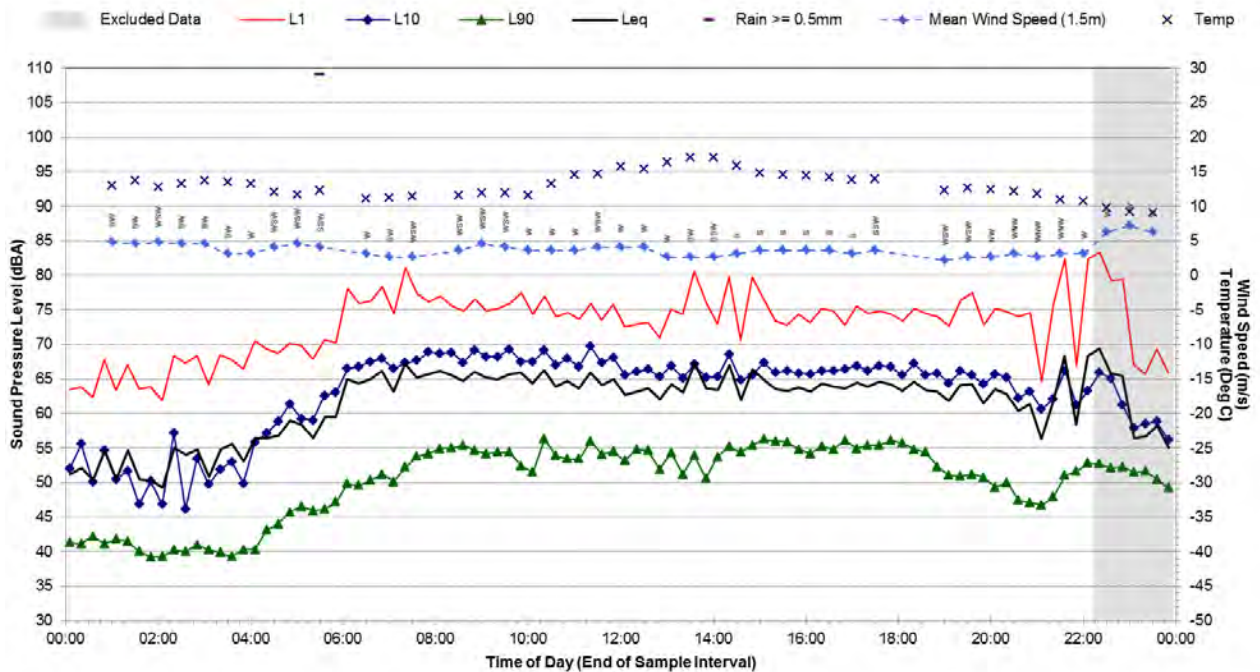
B.02 - Sunday, 28 June 2015



Statistical Ambient Noise Levels**B.02 - Monday, 29 June 2015****Statistical Ambient Noise Levels****B.02 - Tuesday, 30 June 2015**

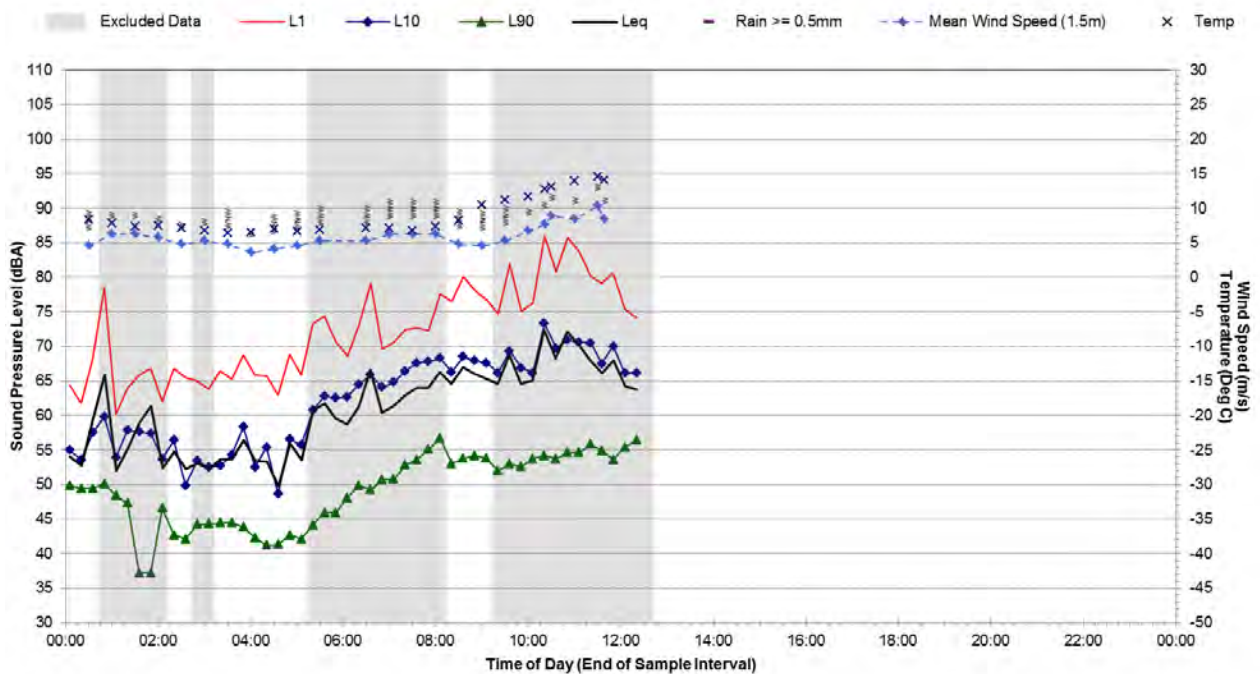
Statistical Ambient Noise Levels

B.02 - Wednesday, 1 July 2015



Statistical Ambient Noise Levels

B.02 - Thursday, 2 July 2015



Background Noise Monitoring Results – B.03

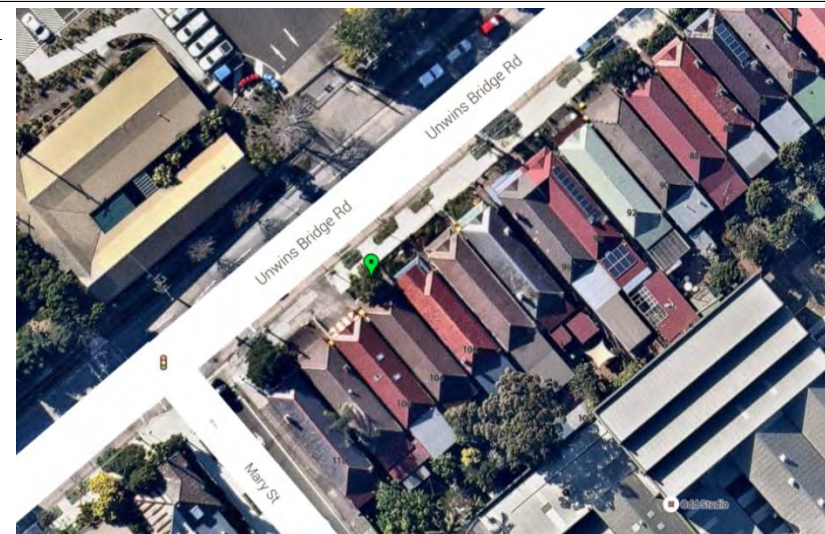
Noise Monitoring Location: B.03
Noise Monitoring Address: 104 Unwins Bridge Road, St Peters 2044

Logger Device Type: ARL-EL316
 Logger Serial No: 16-207-046

Ambient noise logger deployed on the front garden of residential address 104 Unwins Bridge Road, St Peters. Logger located next to a tree on the north western boundary of the property.

Attended noise measurements indicate that the ambient noise environment at this location is dominated by road traffic noise from Unwins Bridge Road and general traffic noise in the area in the daytime. Medium to high traffic noise events from Unwins Bridge Road occur several times per minute at this location, with continuous traffic noise levels from distant vehicle movements. Aircraft noise also influences the ambient noise environment.

Map of Noise Monitoring Location



Ambient Noise Logging Results – INP Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	59	71	74	79
Evening	53	69	73	78
Night-time	41	65	66	75

Attended Noise Measurement Results

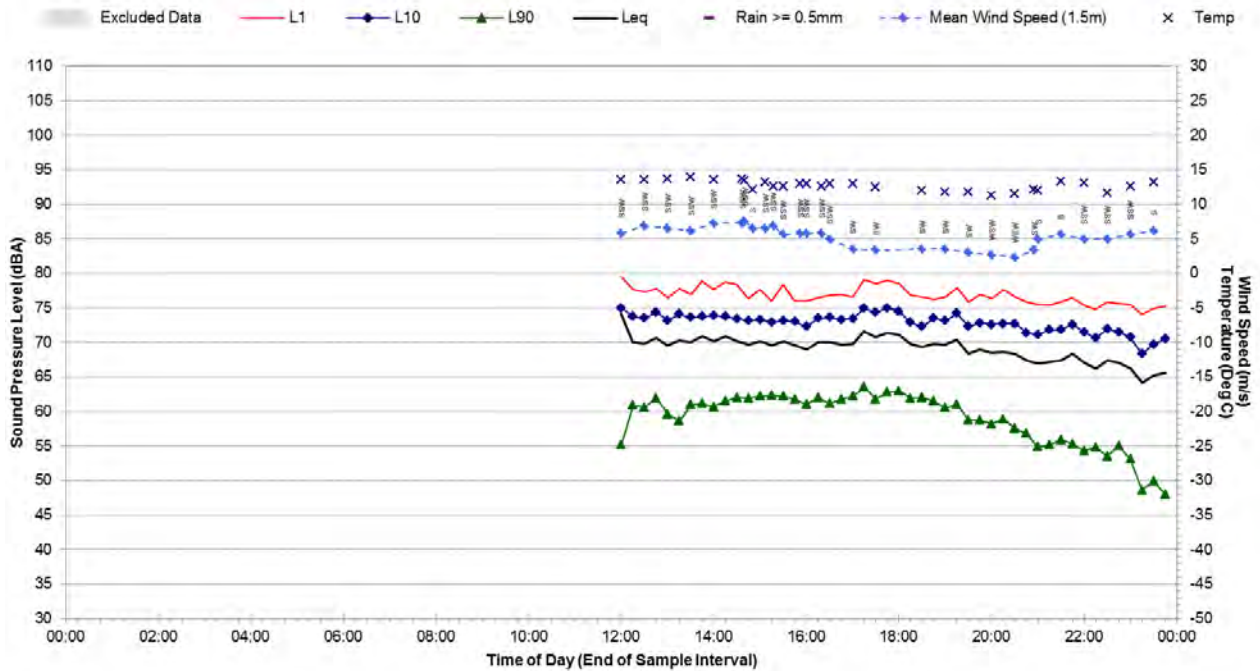
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmx
19/06/2015	11:59:53	61	71	82

Photo of Noise Monitoring Location



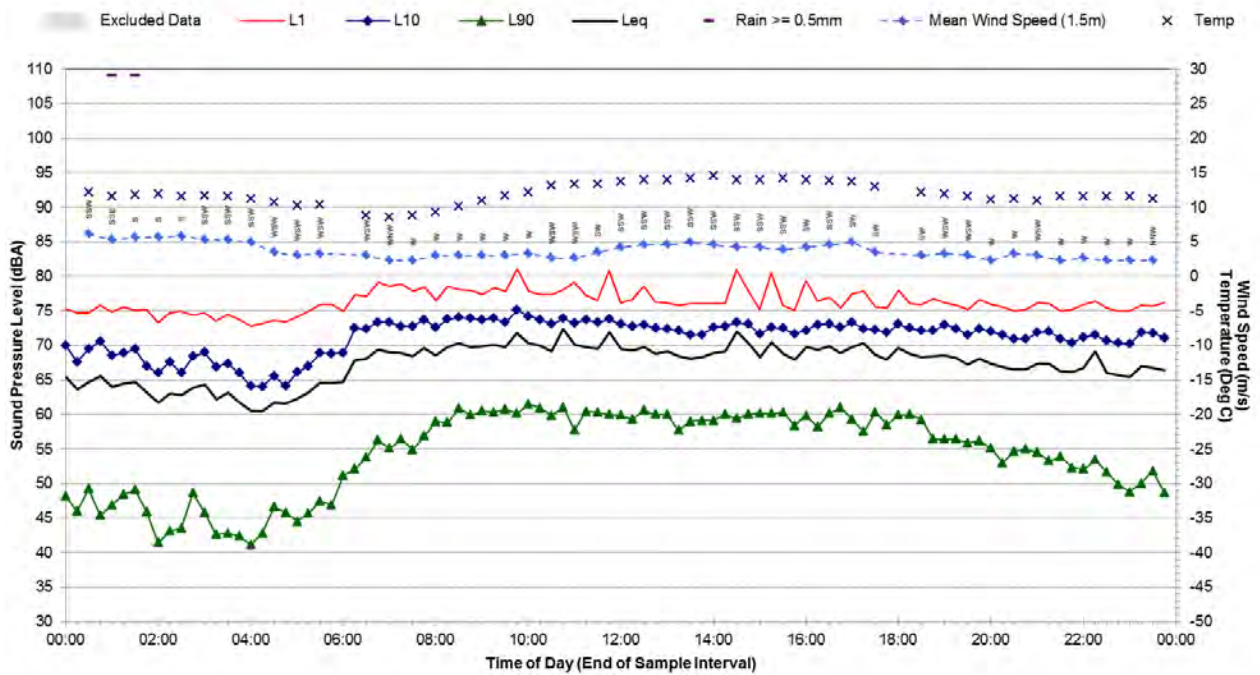
Statistical Ambient Noise Levels

B.03 - Friday, 19 June 2015



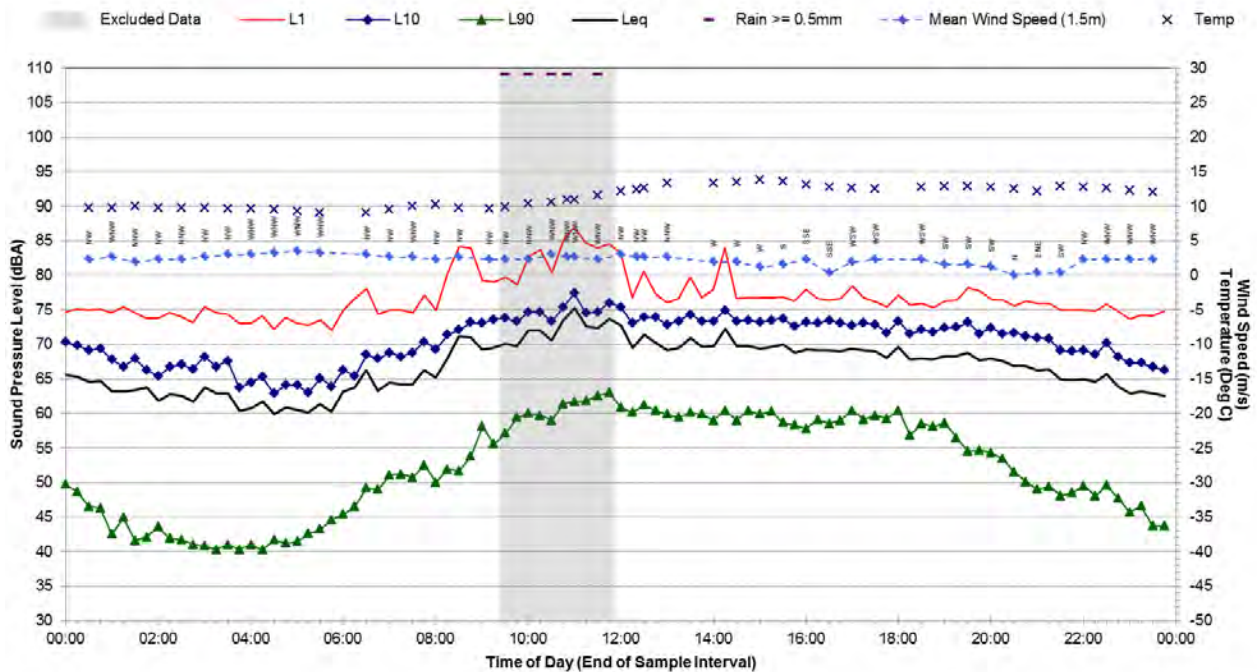
Statistical Ambient Noise Levels

B.03 - Saturday, 20 June 2015



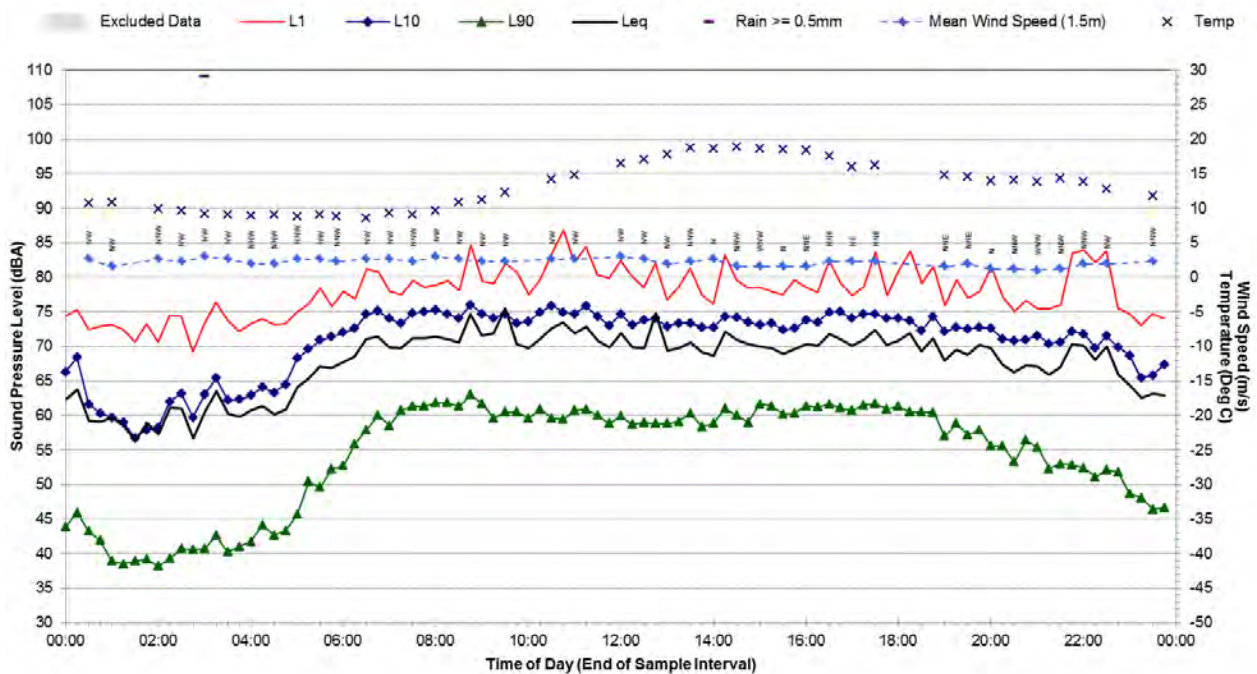
Statistical Ambient Noise Levels

B.03 - Sunday, 21 June 2015



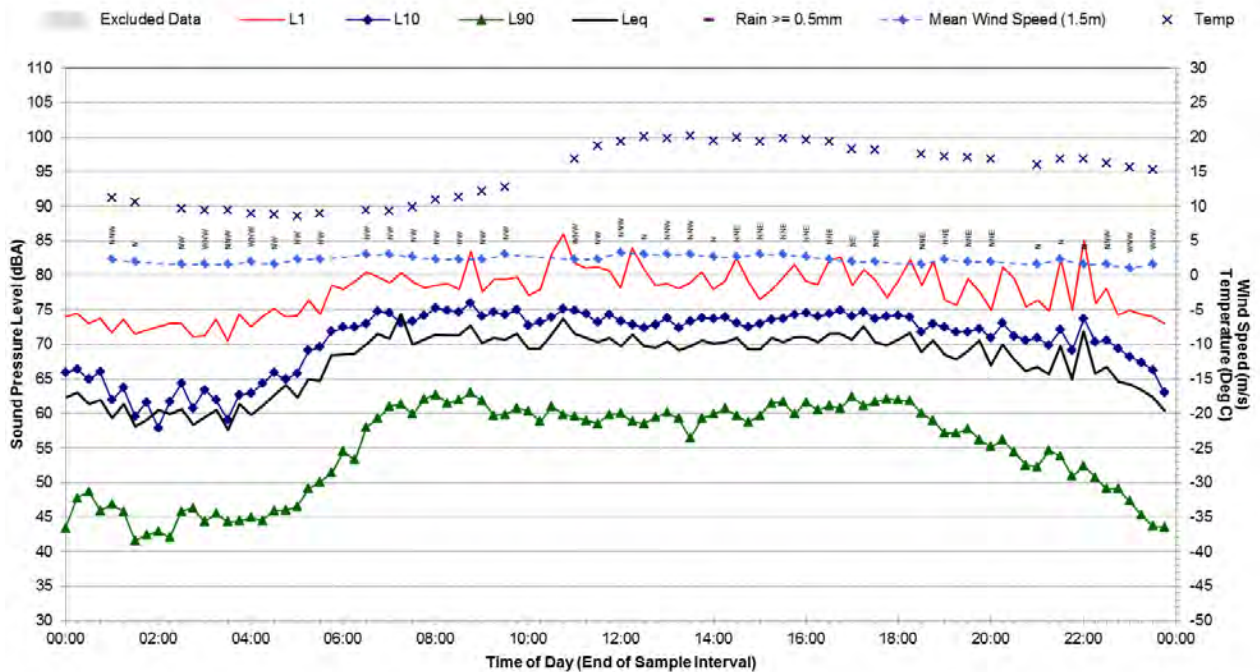
Statistical Ambient Noise Levels

B.03 - Monday, 22 June 2015



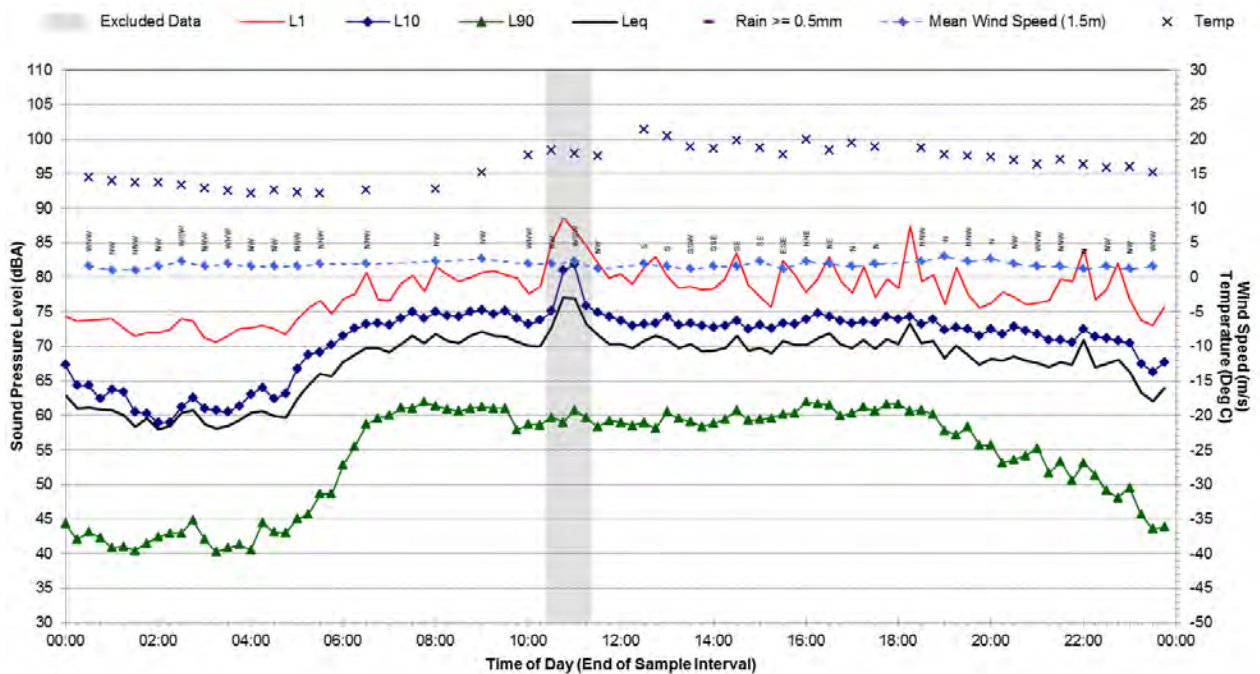
Statistical Ambient Noise Levels

B.03 - Tuesday, 23 June 2015



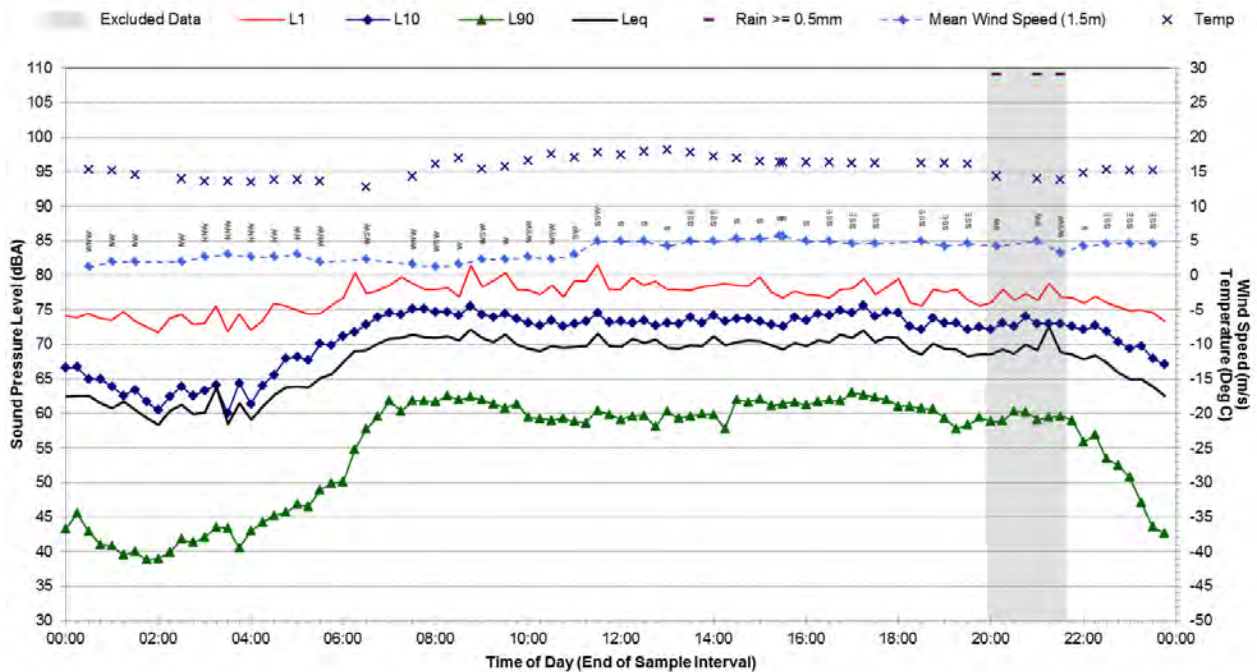
Statistical Ambient Noise Levels

B.03 - Wednesday, 24 June 2015



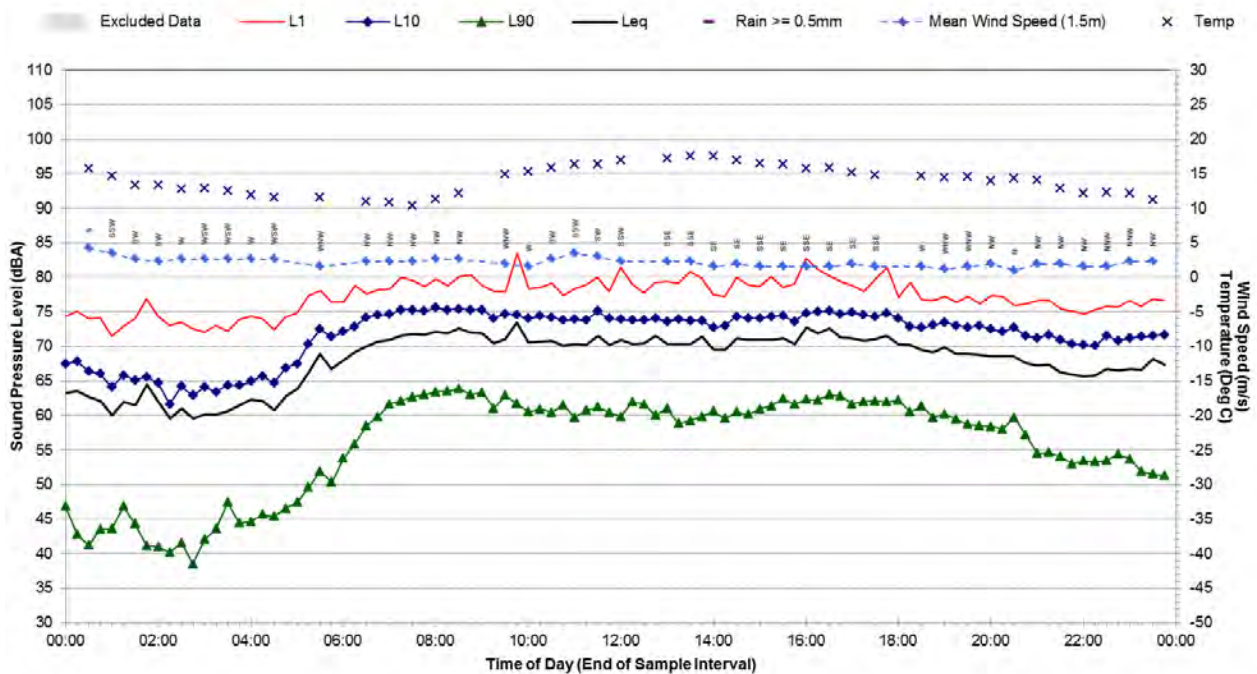
Statistical Ambient Noise Levels

B.03 - Thursday, 25 June 2015



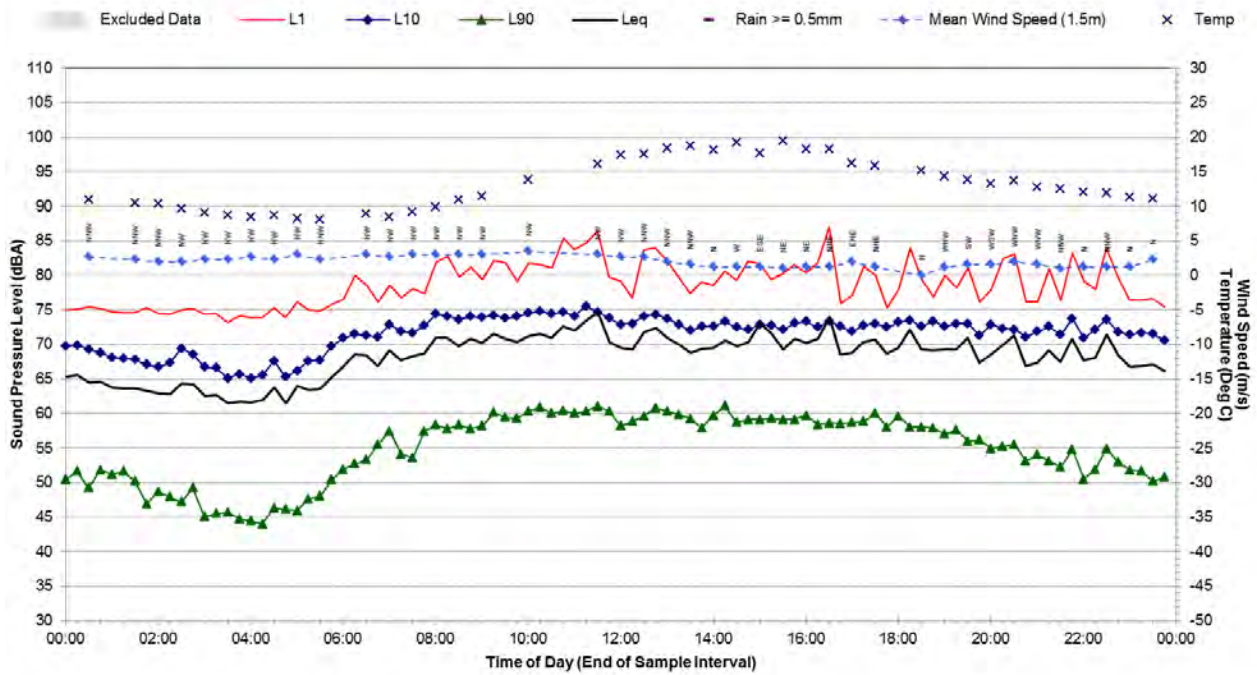
Statistical Ambient Noise Levels

B.03 - Friday, 26 June 2015



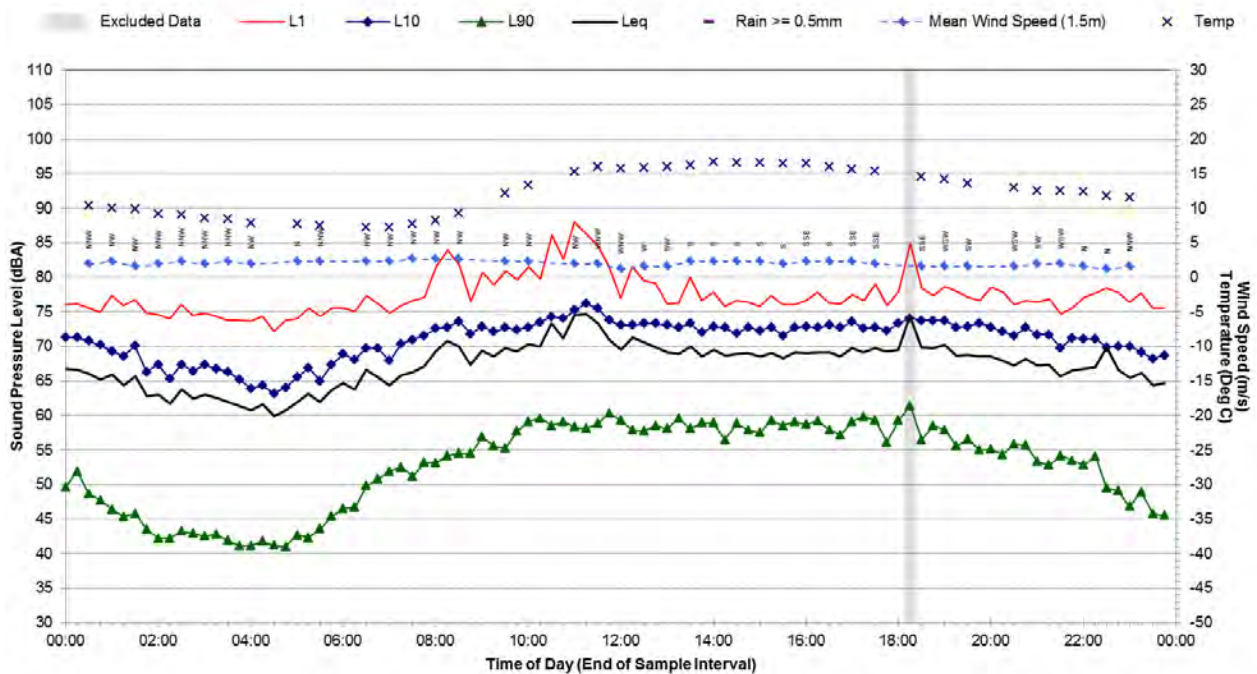
Statistical Ambient Noise Levels

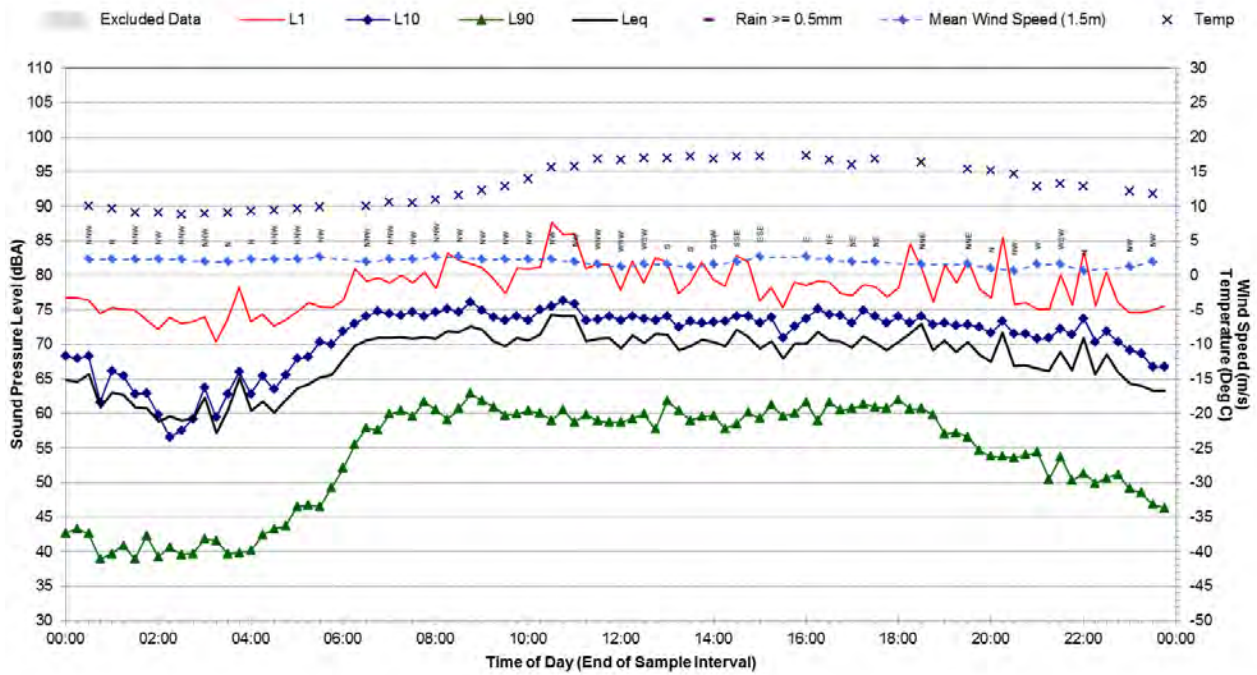
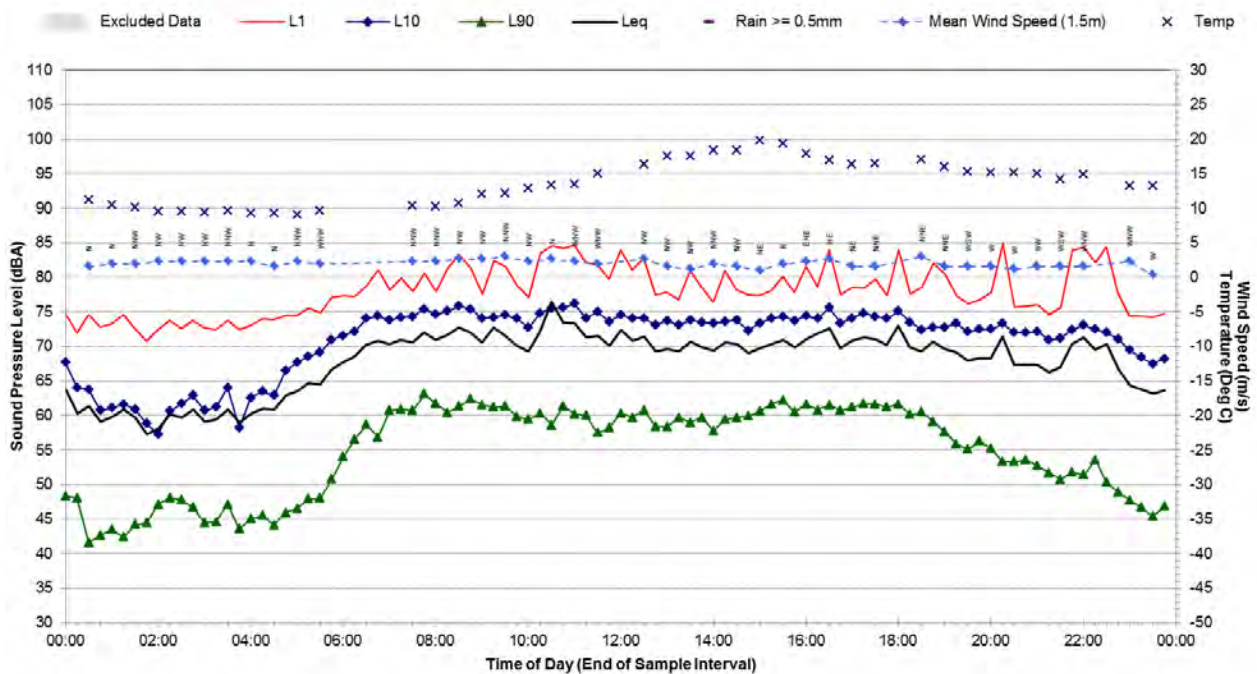
B.03 - Saturday, 27 June 2015



Statistical Ambient Noise Levels

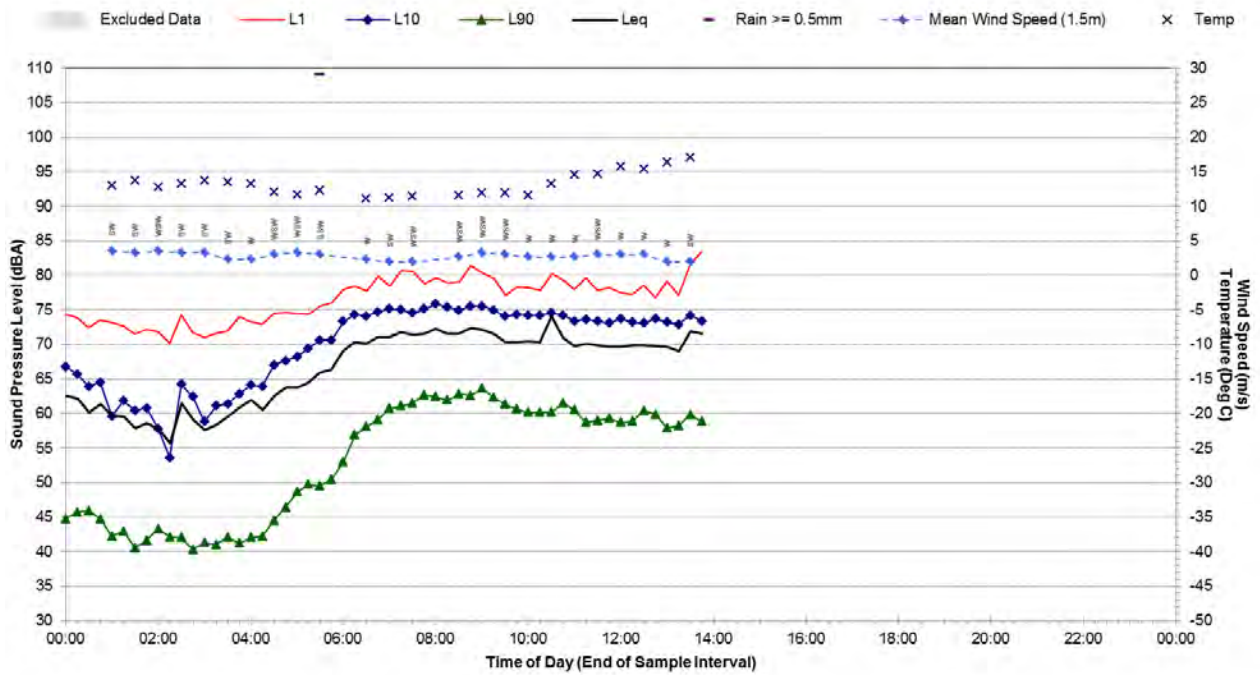
B.03 - Sunday, 28 June 2015



Statistical Ambient Noise Levels**B.03 - Monday, 29 June 2015****Statistical Ambient Noise Levels****B.03 - Tuesday, 30 June 2015**

Statistical Ambient Noise Levels

B.03 - Wednesday, 1 July 2015



Background Noise Monitoring Results – B.04

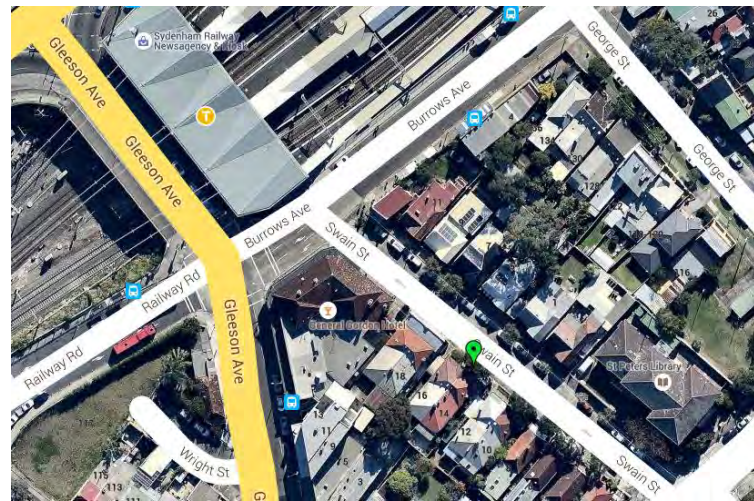
Noise Monitoring Location: B.04
Noise Monitoring Address: 16 Swain Street, Sydenham 2044

Logger Device Type: ARL-EL316
 Logger Serial No: 16-207-044

Ambient noise logger deployed at north east of residential address 16 Swain Street, Sydenham. Logger located beside a tree in the front garden of the premises, and adjacent to Swain Street.

Attended noise measurements indicate that the ambient noise environment at this location is dominated by local road traffic noise. Attended LAeq noise levels were influenced by a delivery truck, aircraft and rail noise. This is to be expected as the property lies very close to ANEF contour 35 and approximately 75m south of Sydenham station.

Map of Noise Monitoring Location



Ambient Noise Logging Results – INP Defined Time Periods

Monitoring Period	Noise Level (dBA)			
	RBL	LAeq	L10	L1
Daytime	47	69	61	81
Evening	47	68	59	78
Night-time	39	60	51	58

Attended Noise Measurement Results

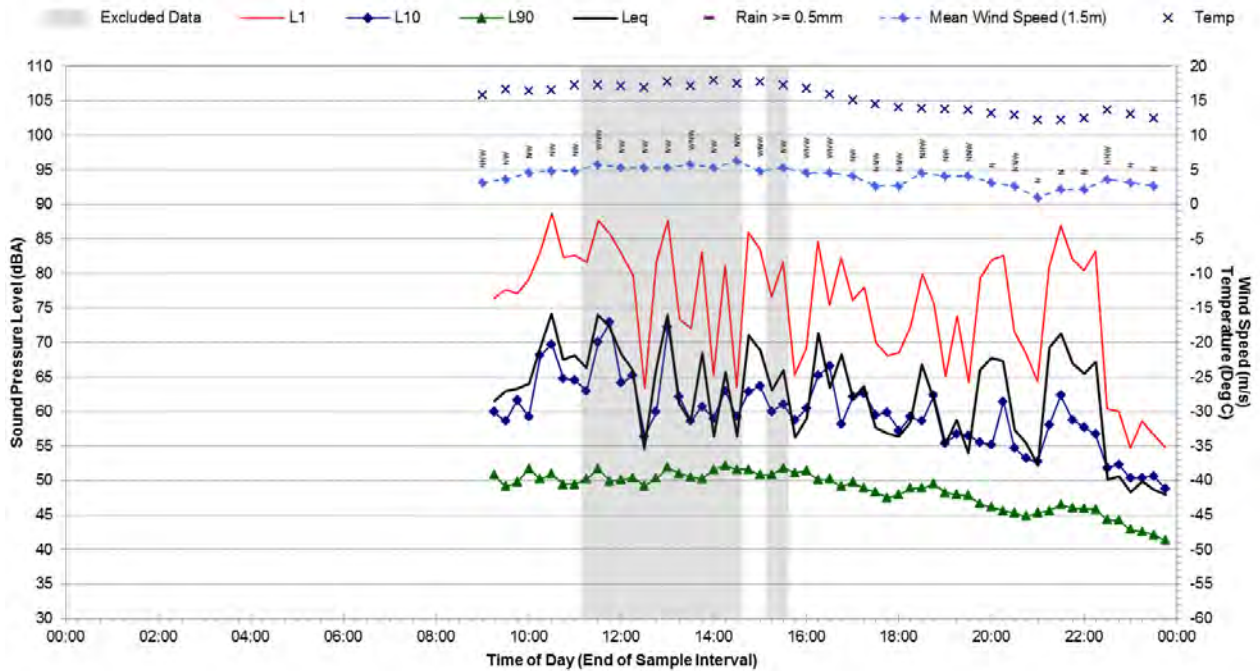
Date	Start Time	Measured Noise Level (dBA)		
		LA90	LAeq	LAmix
21/06/2016	09:05	50	55	73

Photo of Noise Monitoring Location



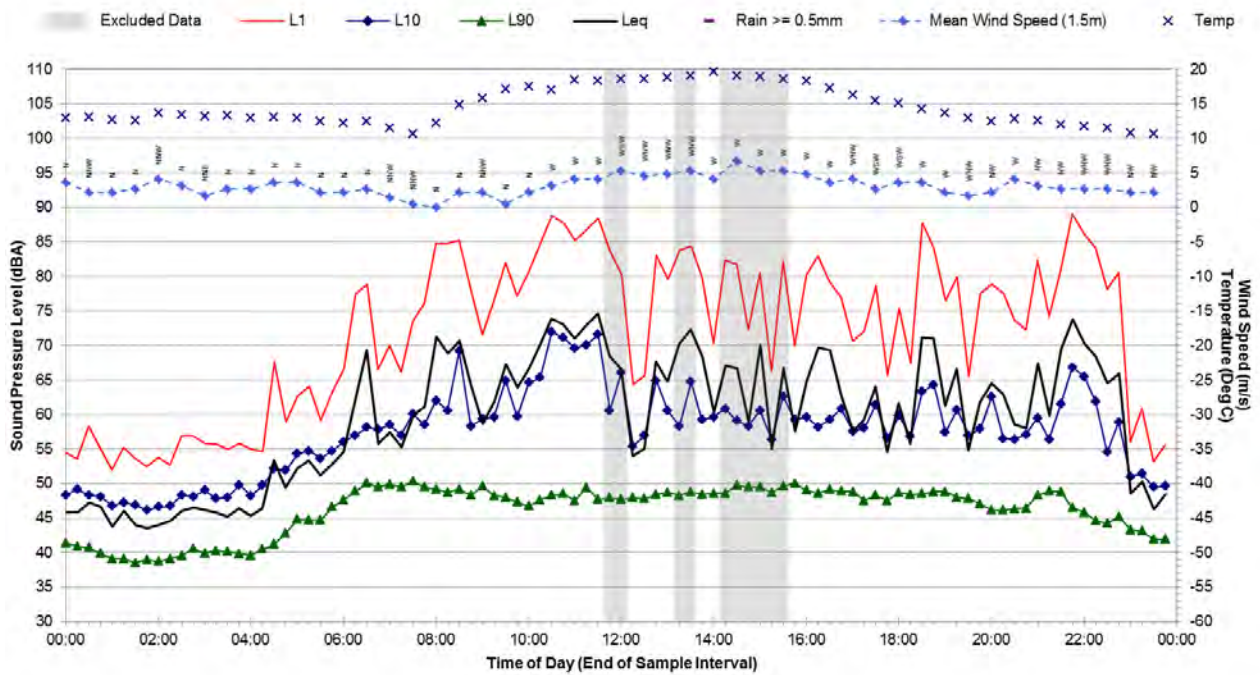
Statistical Ambient Noise Levels

B.04 - Tuesday, 21 June 2016



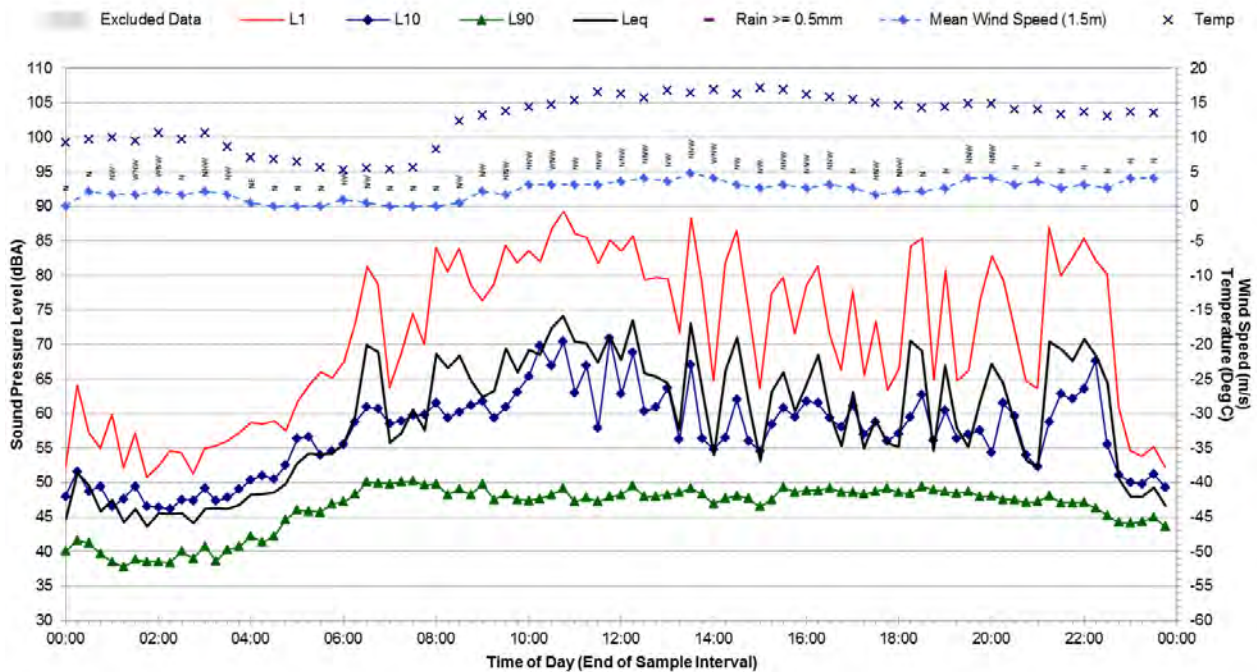
Statistical Ambient Noise Levels

B.04 - Wednesday, 22 June 2016



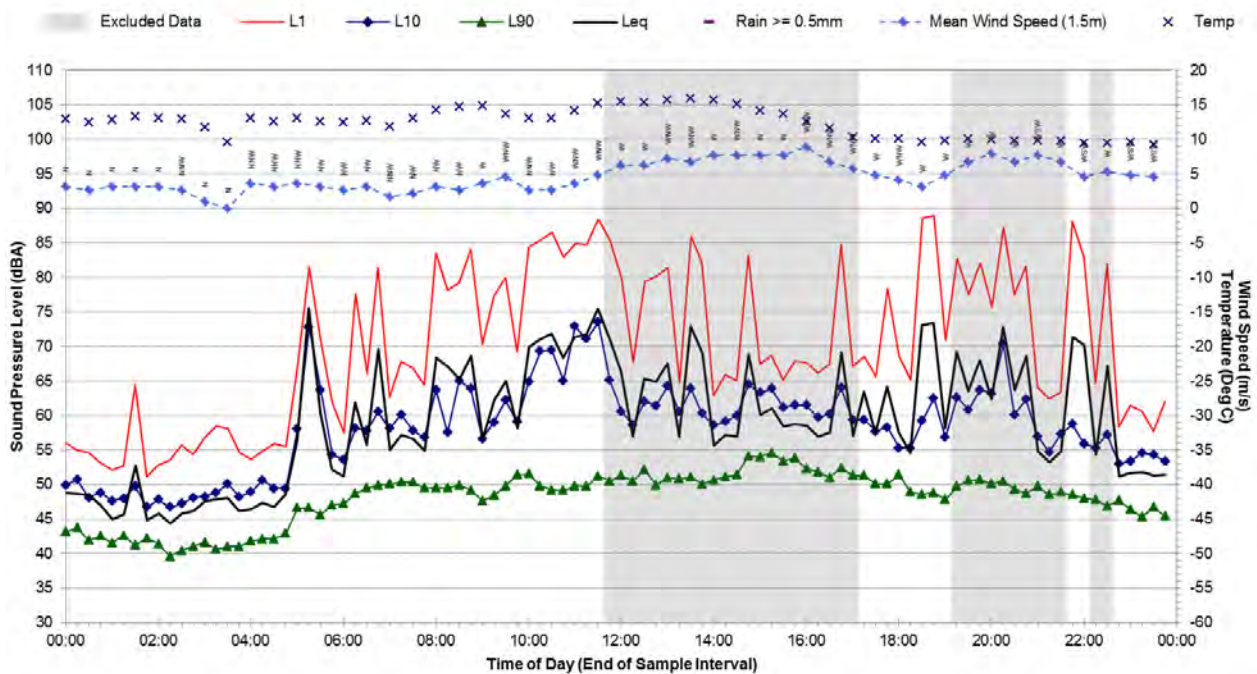
Statistical Ambient Noise Levels

B.04 - Thursday, 23 June 2016



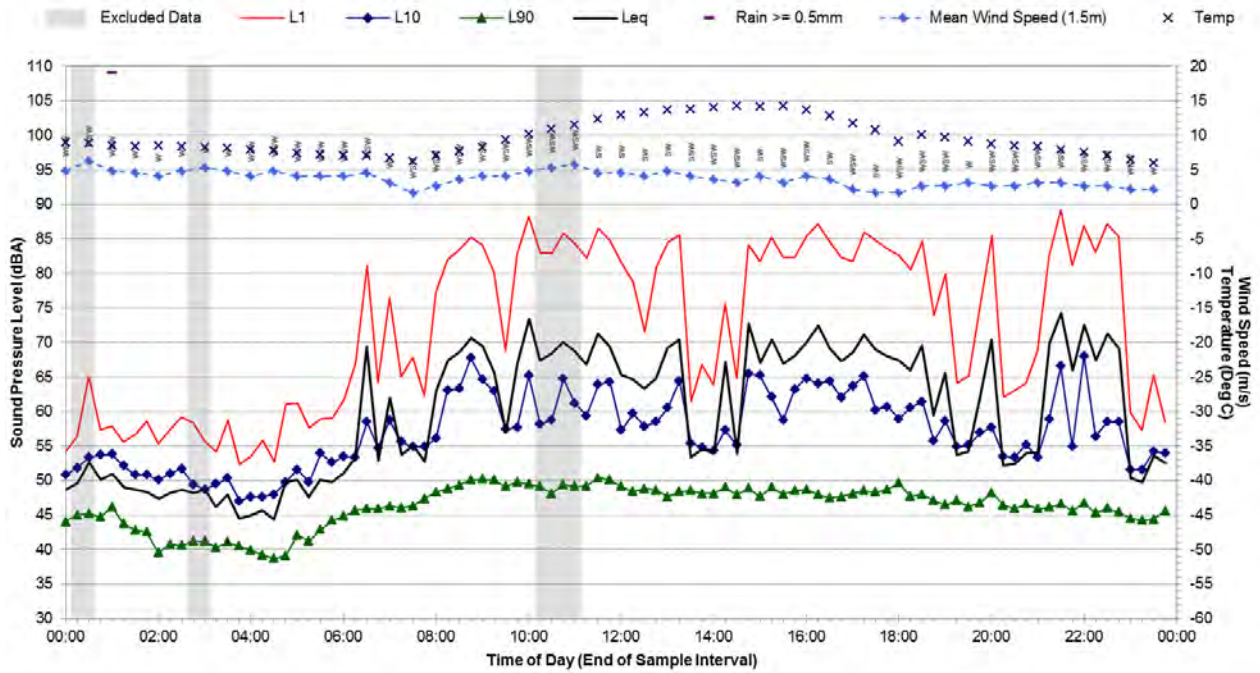
Statistical Ambient Noise Levels

B.04 - Friday, 24 June 2016



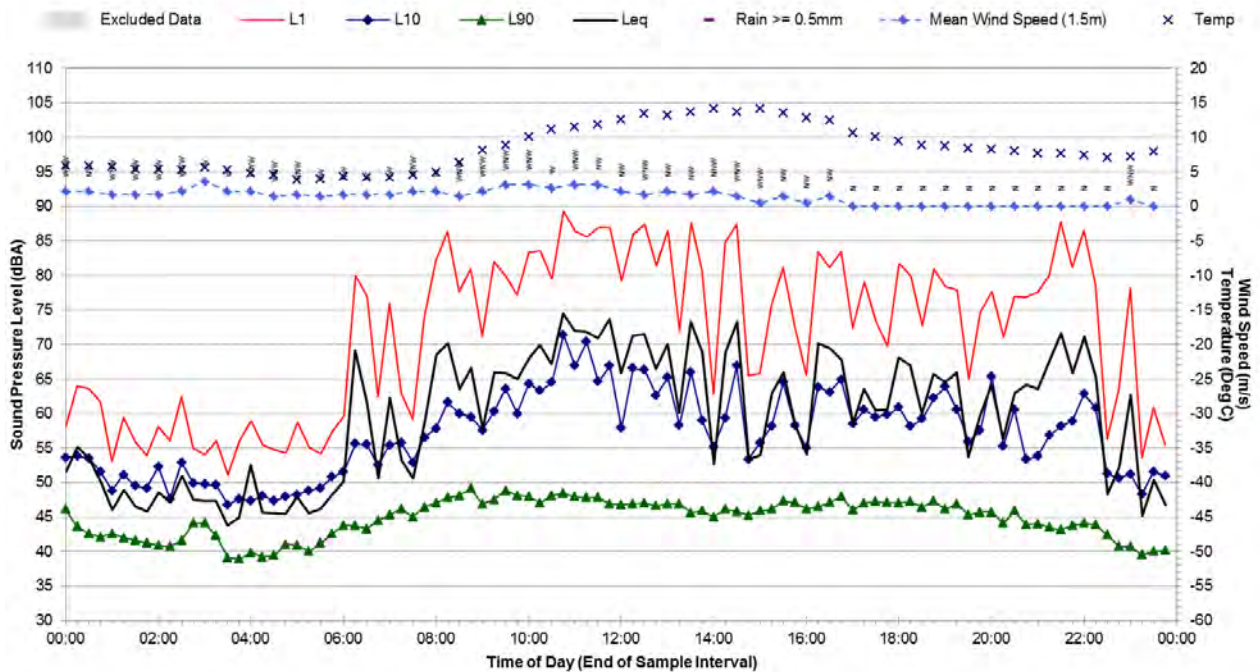
Statistical Ambient Noise Levels

B.04 - Saturday, 25 June 2016



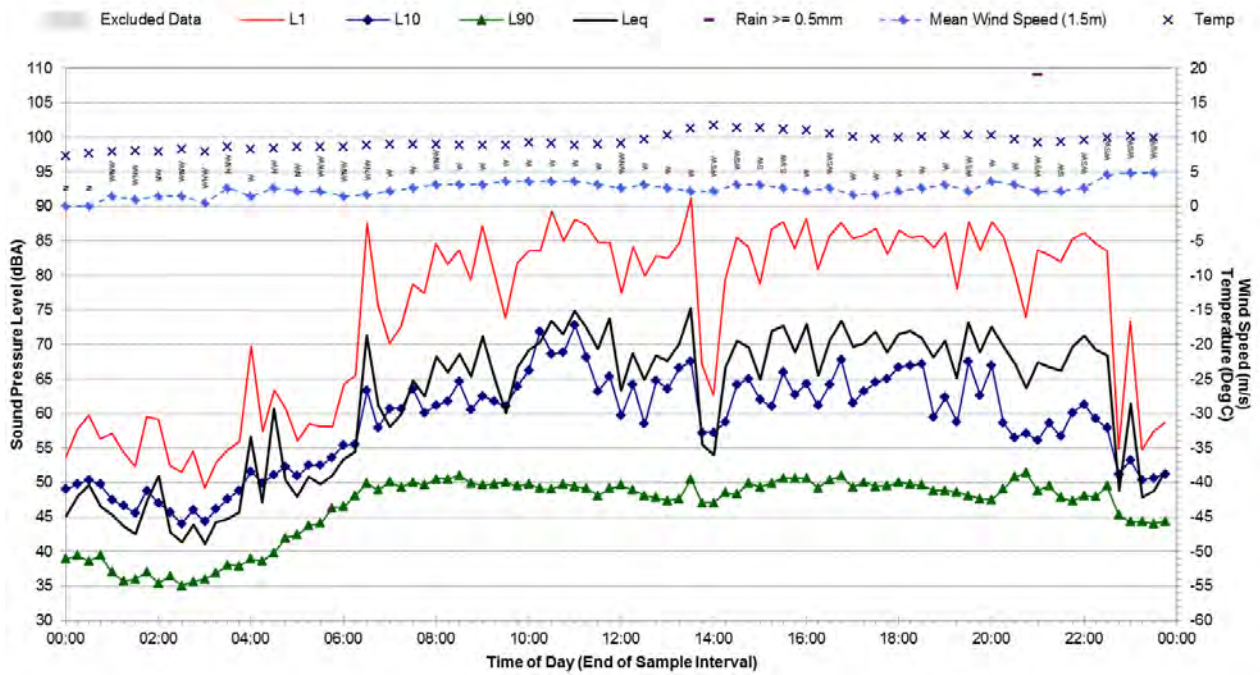
Statistical Ambient Noise Levels

B.04 - Sunday, 26 June 2016



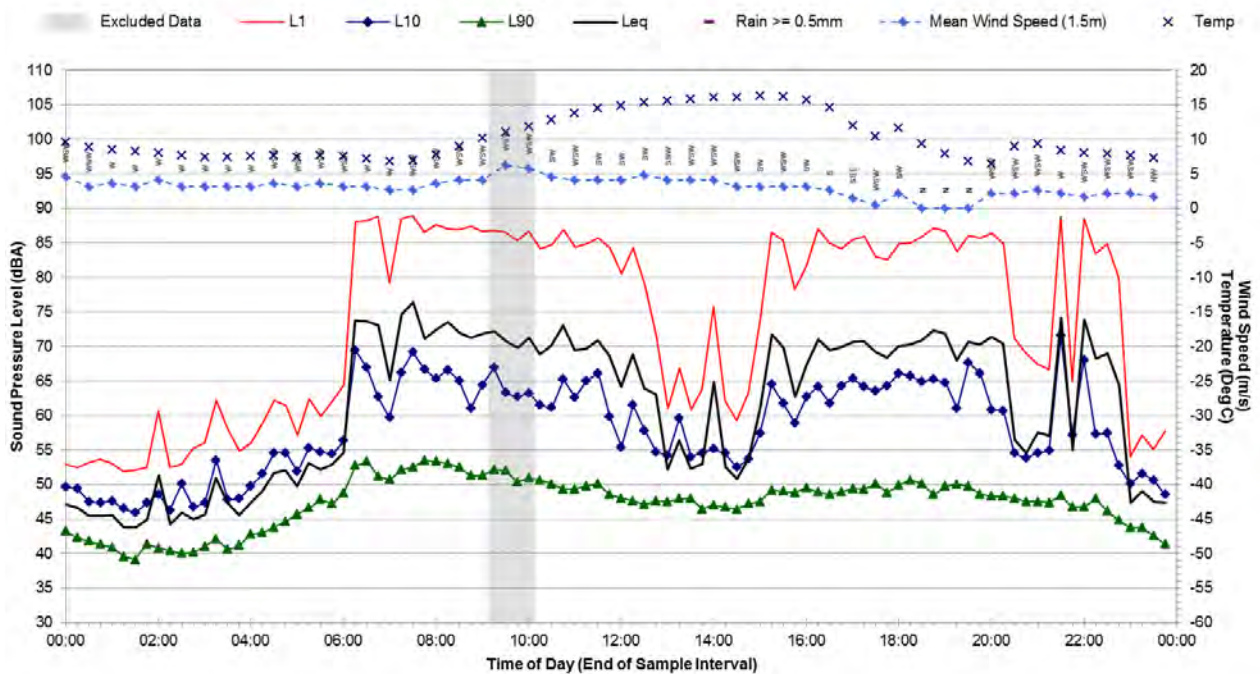
Statistical Ambient Noise Levels

B.04 - Monday, 27 June 2016



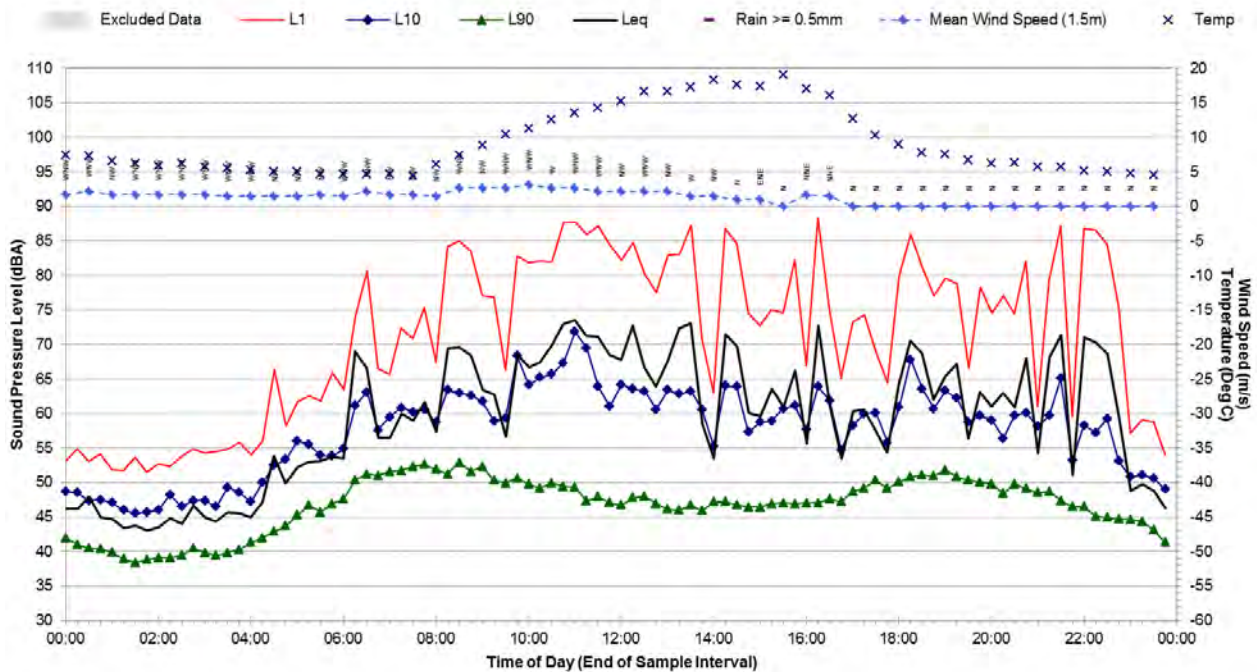
Statistical Ambient Noise Levels

B.04 - Tuesday, 28 June 2016



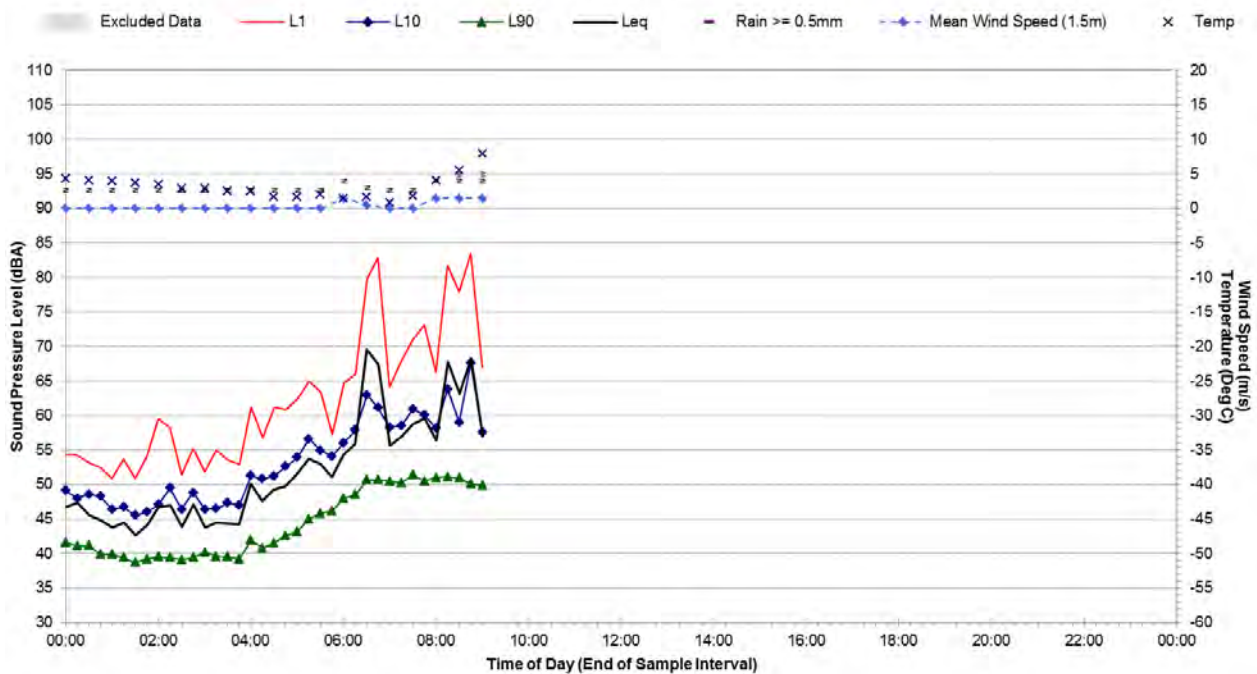
Statistical Ambient Noise Levels

B.04 - Wednesday, 29 June 2016



Statistical Ambient Noise Levels

B.04 - Thursday, 30 June 2016



CONSTRUCTION AIRBORNE NOISE CONTOURS



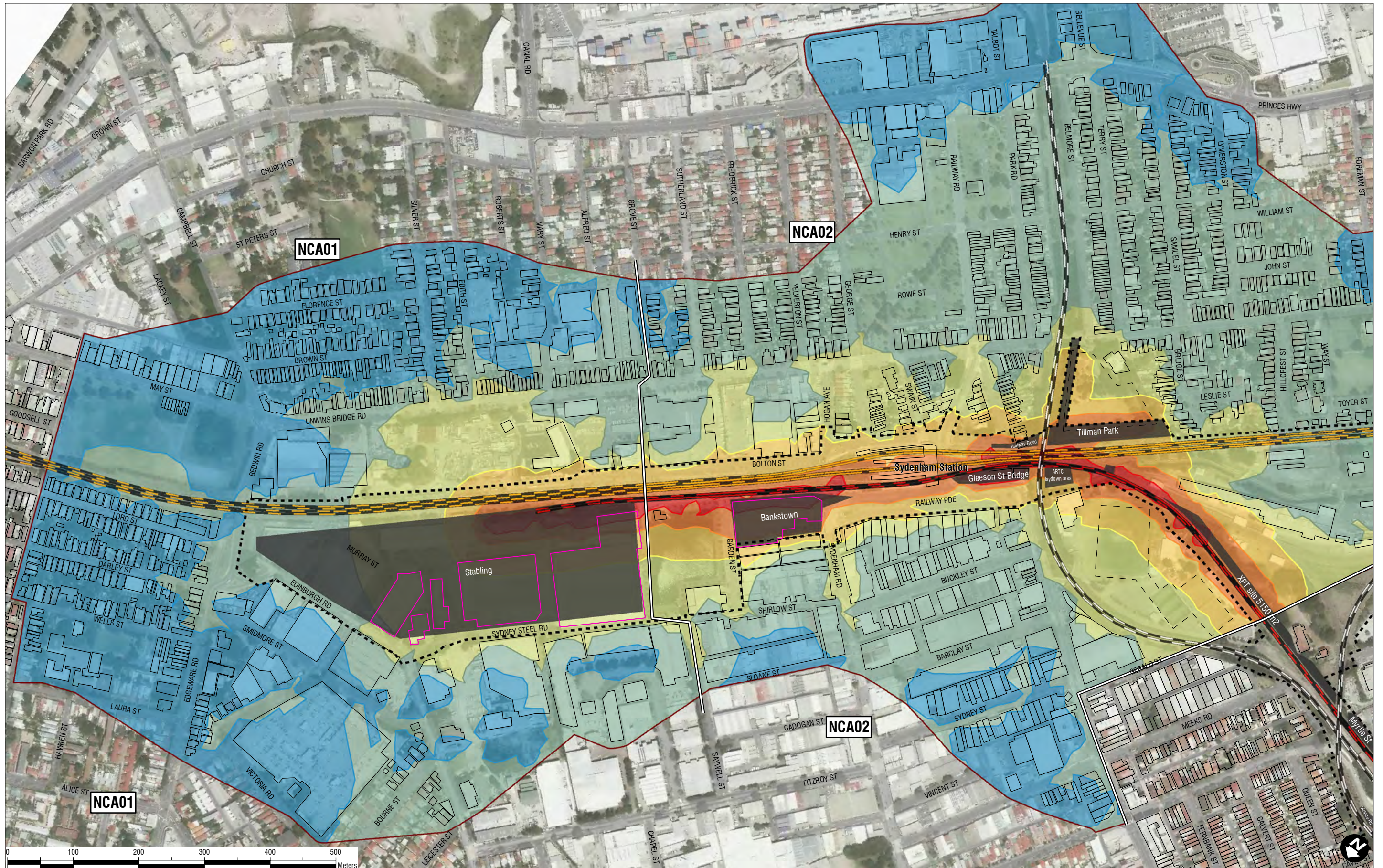
INDEX

E1 - Worst-Case Daytime LAeq(15hr) Construction Noise Predictions

E2 - Worst-Case Night-time LAeq(9hr) Construction Noise Predictions

E3 - Worst-Case Night-time LAeq(9hr) (No Intensive Plant) Construction Noise Predictions

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- Noise Catchment Areas
- Freight Rail Tracks
- Light Rail Tracks
- Metro Rail Tracks
- Sydney Trains Rail Tracks
- Noise Contour Calculation Boundary

Worst Case Night-time Construction Noise

Blue	< 40 dBA
Light Blue	40 - 50 dBA
Yellow	50 - 60 dBA
Orange	60 - 70 dBA
Red	70 - 80 dBA
Dark Red	> 80 dBA

- Worksites
- Project Area

- Assessed Receivers**
- Buildings
 - Outdoor
 - Acquisitions

Note:
*Noise contours are indicative and represent the worst-case noise levels predicted for all scenarios operating in the period

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham Station Junction Modification
Construction Airborne Noise Contours Worst-case Night-time (No Intensive Plant) Construction Noise Predictions
SLR61014718_AB3_CAN_RD01

**COSMETIC DAMAGE
VIBRATION ASSESSMENT
EXCEEDANCE OF
SCREENING CRITERIA**



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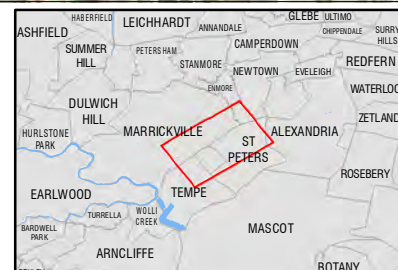


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— Noise Catchment Areas	Assessed Receivers	Works Location (Vibration)
Buildings	Outdoor	Vibration Cosmetic Damage Safe Working Distance
Acquisitions	Exceedance of Cosmetic Vibration Criteria (7.5mm/s)	
Heritage Listed Buildings		

Note:
*Construction mitigation areas are indicative
*The two most stringent mitigation categories have been shown only

Transport for NSW

Sydney Metro City & Southwest Chatswood to Sydenham Sydenham Station Junction Modification Cosmetic Damage Vibration Assessment Exceedance of Screening Criteria

SLR61014718_AD_CDVA_RD01

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OPERATIONAL AIRBORNE RAIL NOISE CONTOURS



INDEX

H1 - 2024 Daytime LAeq(15hr) With Project Noise Contours

H2 - 2024 Night-time LAeq(9hr) With Project Noise Contours

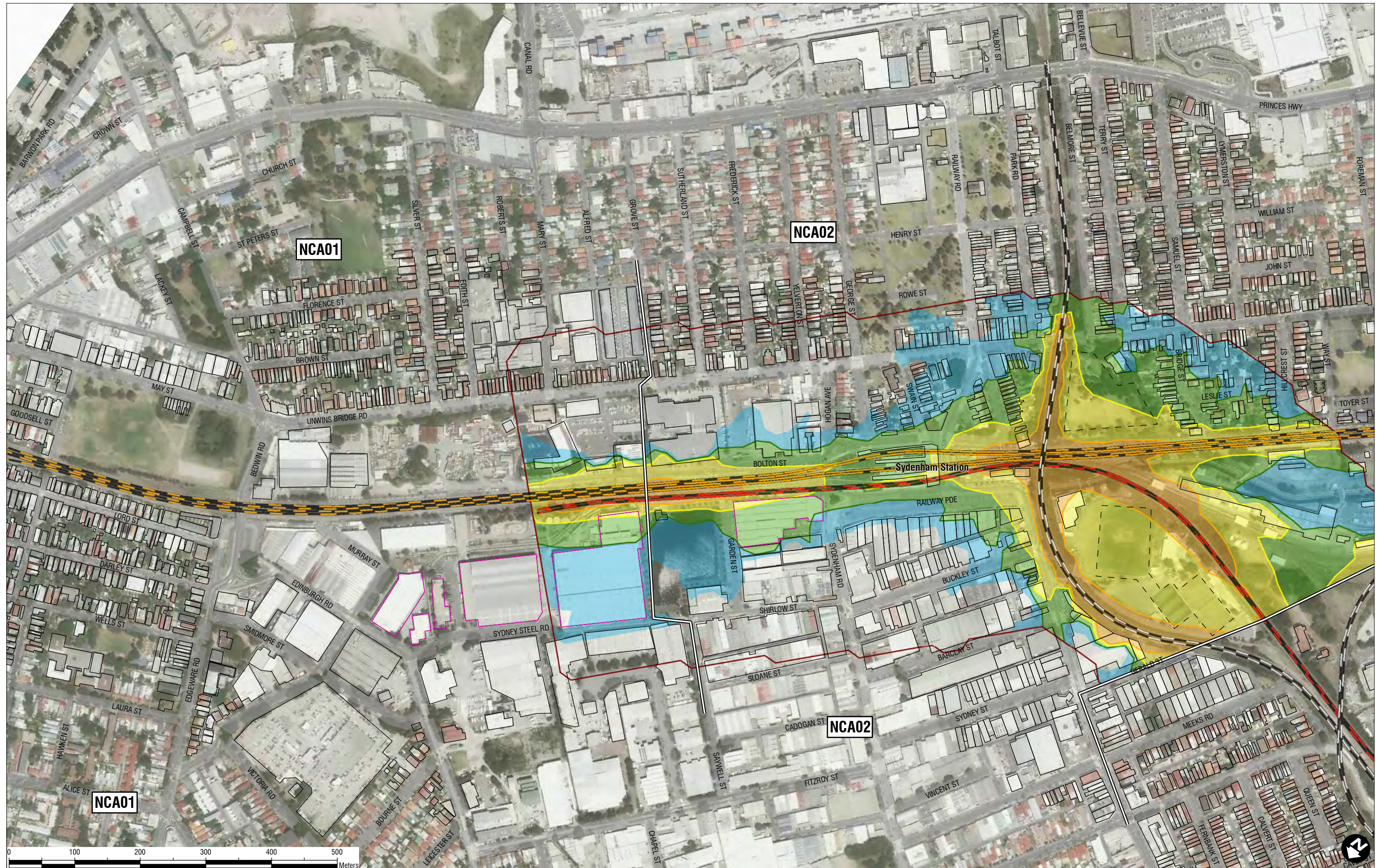
H3 - 2024 Maximum LAmax With Project Noise Contours

H4 - 2034 Daytime LAeq(15hr) With Project Noise Contours

H5 - 2034 Night-time LAeq(9hr) With Project Noise Contours

H6 - 2034 Maximum LAmax With Project Noise Contours

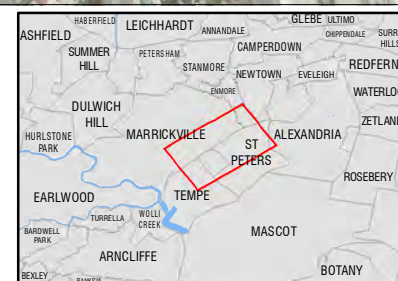
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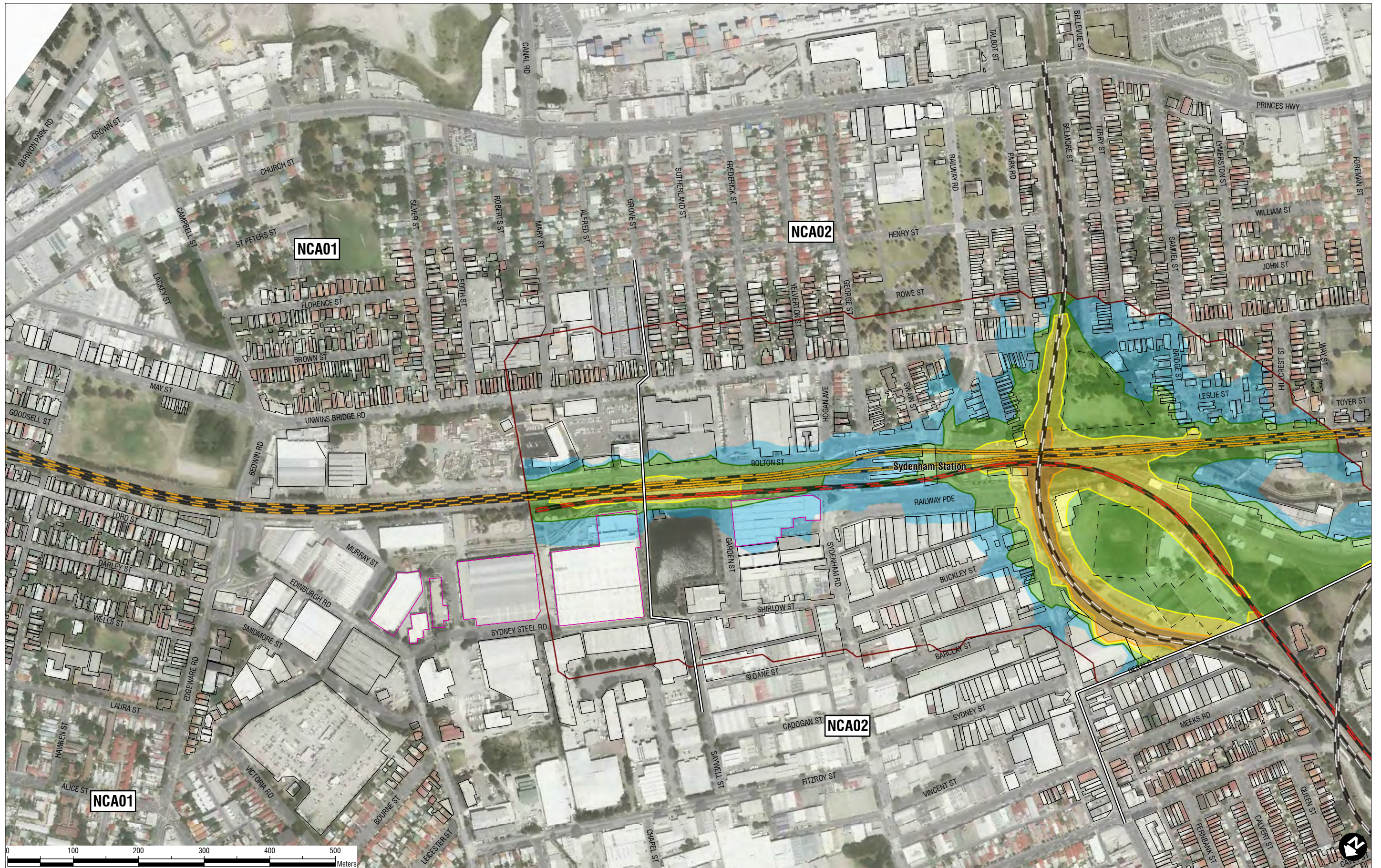


	2024 Daytime LAeq(15hr) Noise Contours	Assessed Receivers
— Noise Catchment Areas	55 dBA LAeq(15hr)	Buildings
— Freight Rail Tracks	60 dBA LAeq(15hr)	Outdoor
— Light Rail Tracks	65 dBA LAeq(15hr)	Acquisitions
— Metro Rail Tracks	70 dBA LAeq(15hr)	
— Sydney Trains Rail Tracks	Noise Contour Calculation Boundary	

Note:
* Noise contour grid spacing: 20m
* Noise contour height above ground: 4.5m

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham Sydenham Station Junction Modification
Operational Airborne Noise Contours 2024 Daytime LAeq(15hr) With Project
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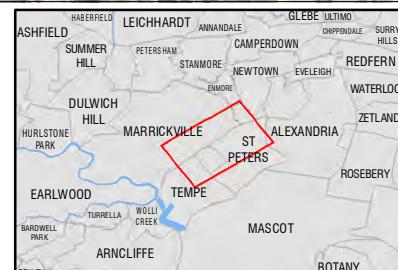
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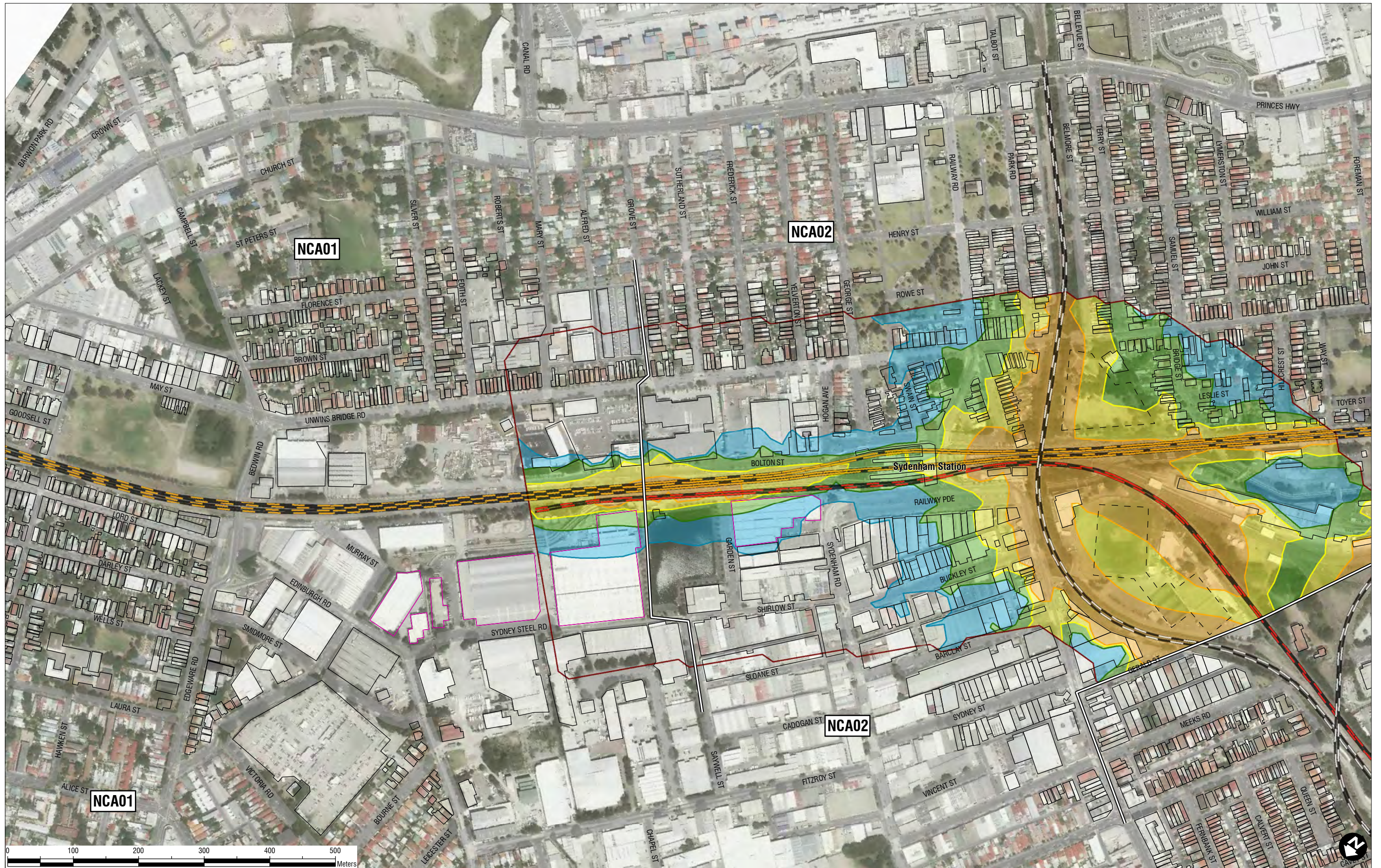


	2024 Night-time LAeq(9hr) Noise Contours	Assessed Receivers
— Noise Catchment Areas	55 dBA LAeq(15hr)	Buildings
— Freight Rail Tracks	60 dBA LAeq(15hr)	Outdoor
— Light Rail Tracks	65 dBA LAeq(15hr)	Acquisitions
— Metro Rail Tracks	70 dBA LAeq(15hr)	
— Sydney Trains Rail Tracks	Noise Contour Calculation Boundary	

Note:
* Noise contour grid spacing: 20m
* Noise contour height above ground: 4.5m

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham Sydenham Station Junction Modification
Operational Airborne Noise Contours 2024 Night-time LAeq(9hr)
With Project
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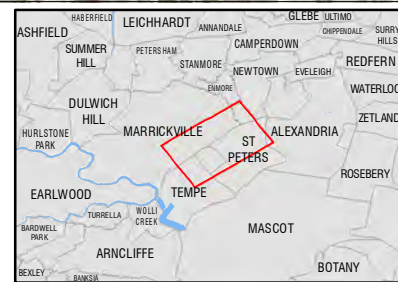
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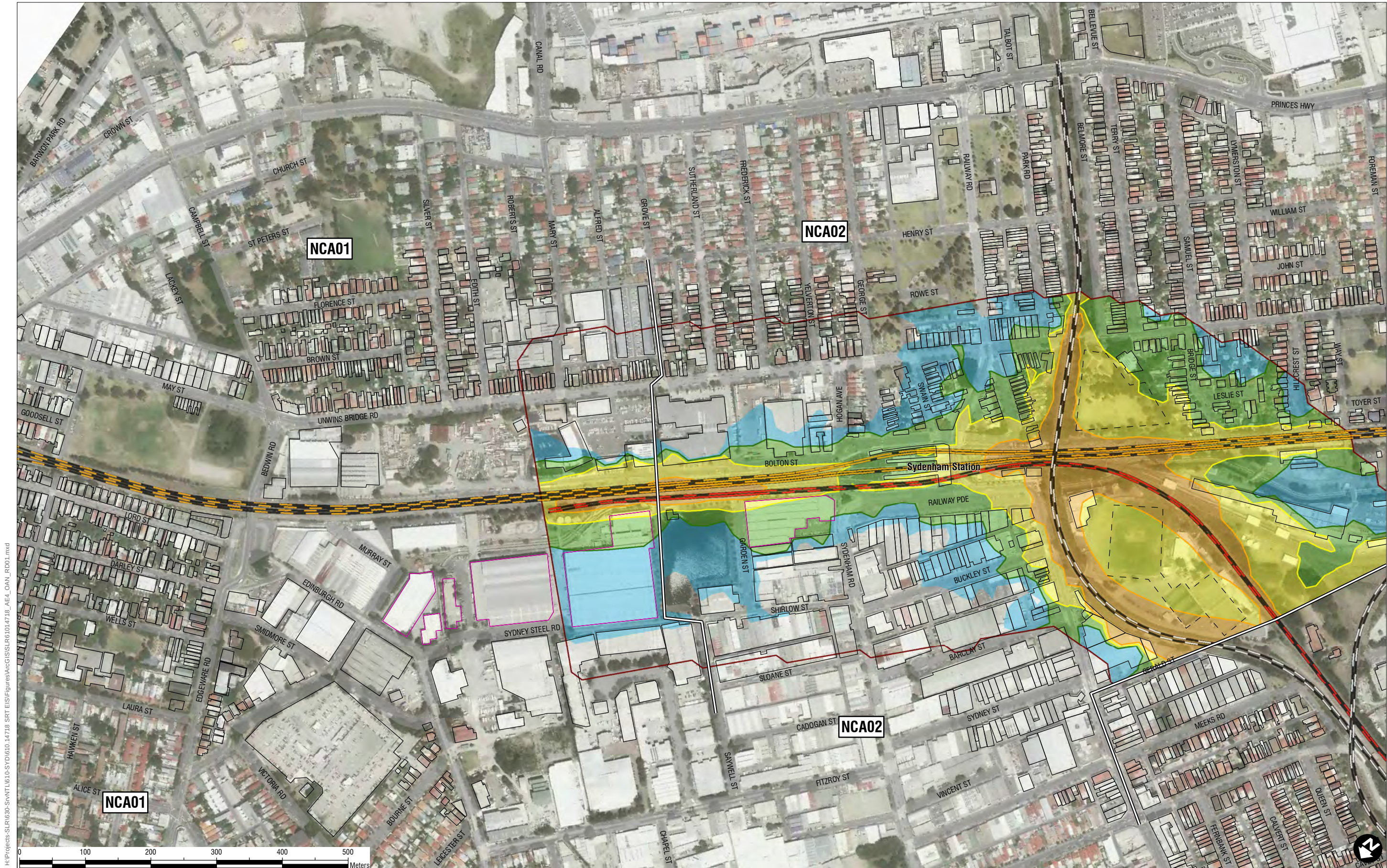
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— Noise Catchment Areas	2024 Maximum L _{max} Noise Contours	Assessed Receivers
— Freight Rail Tracks	75 dBA L _{max}	Buildings
— Light Rail Tracks	80 dBA L _{max}	Outdoor
— Metro Rail Tracks	85 dBA L _{max}	Acquisitions
— Sydney Trains Rail Tracks	90 dBA L _{max}	
	Noise Contour Calculation Boundary	

Note:
* Noise contour grid spacing: 20m
* Noise contour height above ground: 4.5m

Transport for NSW
**Sydney Metro City &
Southwest Chatswood to Sydenham
Sydenham Station Junction Modification**
**Operational Airborne Noise Contours
2024 Maximum L_{max}**
With Project
SLR61014718_AE3_OAN_RD01



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	Noise Catchment Areas		2034 Daytime LAeq(15hr) Noise Contours		Assessed Receivers
	Freight Rail Tracks		55 dBA LAeq(15hr)		Buildings
	Light Rail Tracks		60 dBA LAeq(15hr)		Outdoor
	Metro Rail Tracks		65 dBA LAeq(15hr)		Acquisitions
	Sydney Trains Rail Tracks		70 dBA LAeq(15hr)		
	Noise Contour Calculation Boundary				

Note:
* Noise contour grid spacing: 20m
* Noise contour height above ground: 4.5m

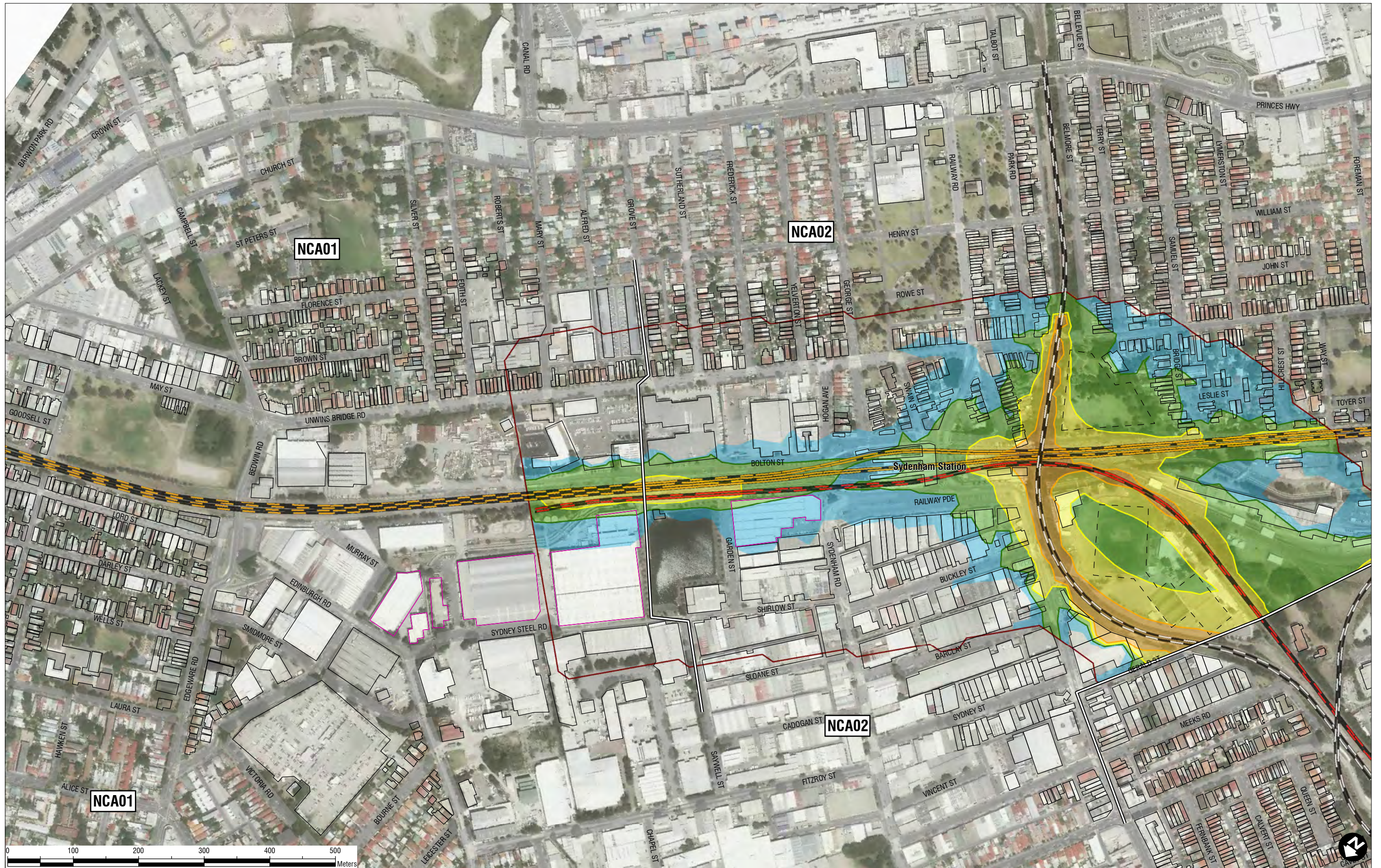
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**Sydney Metro City &
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Sydenham Station Junction Modification**

**Operational Airborne Noise Contours
2034 Daytime LAeq(15hr)
With Project**

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— Noise Catchment Areas	2034 Night-time LAeq(9hr) Noise Contours	Assessed Receivers
— Freight Rail Tracks	55 dBA LAeq(15hr)	Buildings
— Light Rail Tracks	60 dBA LAeq(15hr)	Outdoor
— Metro Rail Tracks	65 dBA LAeq(15hr)	Acquisitions
— Sydney Trains Rail Tracks	70 dBA LAeq(15hr)	
	Noise Contour Calculation Boundary	
	Note:	
	* Noise contour grid spacing: 20m	
	* Noise contour height above ground: 4.5m	

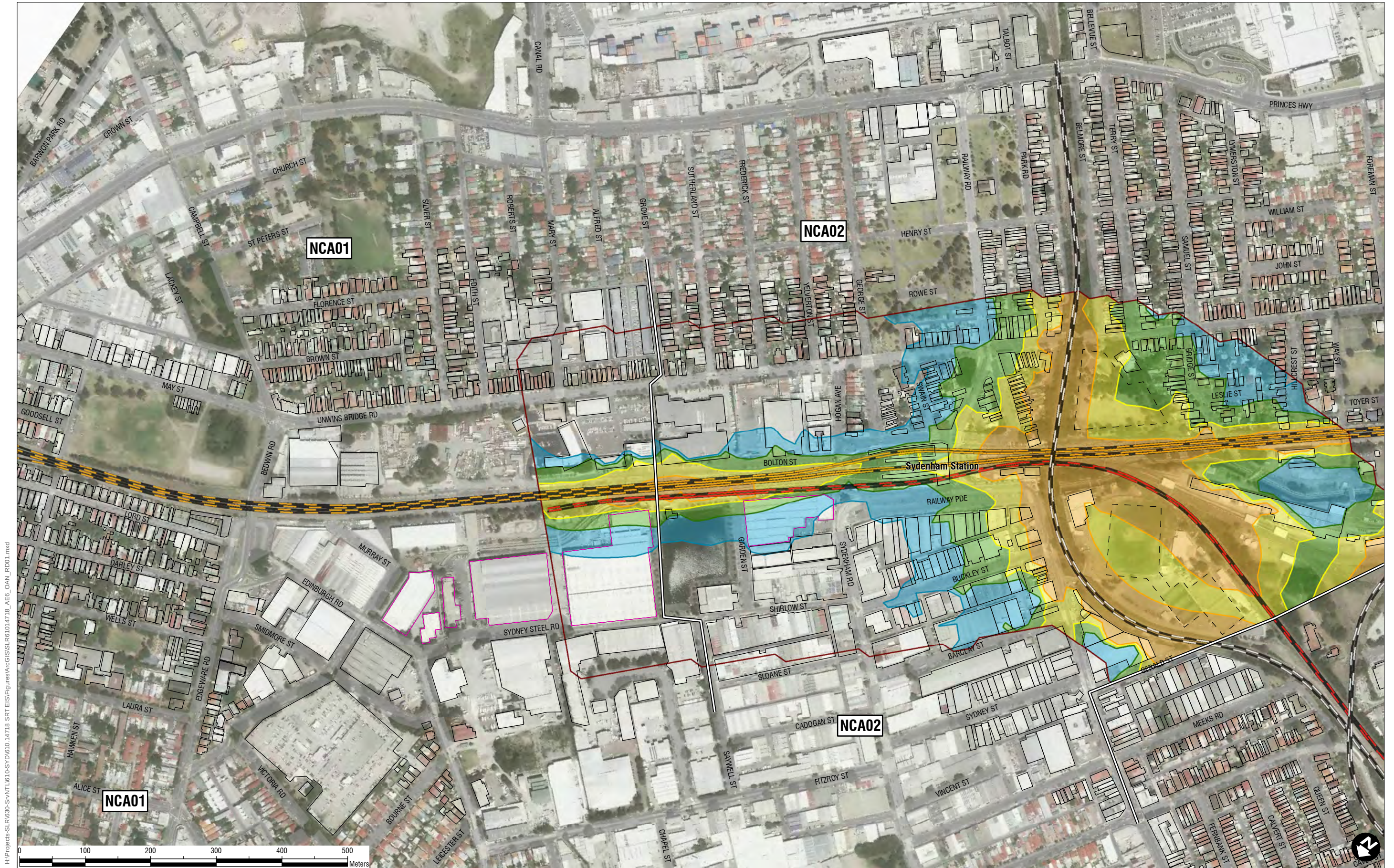
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Sydney Metro City & Southwest Chatswood to Sydenham Sydenham Station Junction Modification

Operational Airborne Noise Contours 2034 Night-time LAeq(9hr)

With Project

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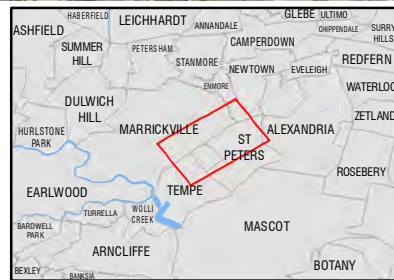


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- Noise Catchment Areas
 - Freight Rail Tracks
 - Light Rail Tracks
 - Metro Rail Tracks
 - Sydney Trains Rail Tracks
- 2034 Maximum LAmax Noise Contours**
- 75 dBA LAmax
 - 80 dBA LAmax
 - 85 dBA LAmax
 - 90 dBA LAmax
 - Noise Contour Calculation Boundary

- Assessed Receivers**
- Buildings
 - Outdoor
 - Acquisitions

Note:
* Noise contour grid spacing: 20m
* Noise contour height above ground: 4.5m

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham Station Junction Modification
Operational Airborne Noise Contours 2034 Maximum LAmax
With Project
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**SYDNEY METRO TRAINS
FACILITY SOUTH -
OPERATIONAL NOISE
EXCEEDANCES**



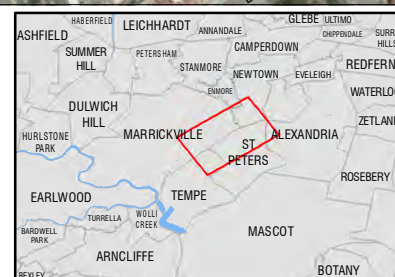
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- Noise Catchment Areas
- Metro Rail Tracks
- Sydney Trains Rail Tracks
- Stabling Layout
- Operational Noise Exceedances LAeq(15minute)**
- Assessed Building
- Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham
Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Early Morning LAeq(15minute)
Neutral Weather
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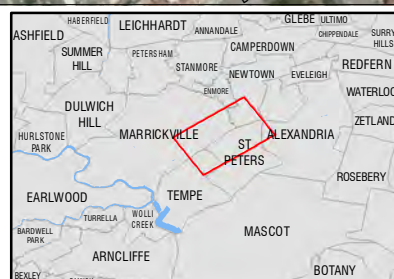
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- Noise Catchment Areas

Metro Rail Tracks

Sydney Trains Rail Tracks

Stabling Layout
- Operational Noise Exceedances LAeq(15minute)

Assessed Building

Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City &
Southwest Chatswood to Sydenham
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Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Daytime LAeq(15minute)
Neutral Weather

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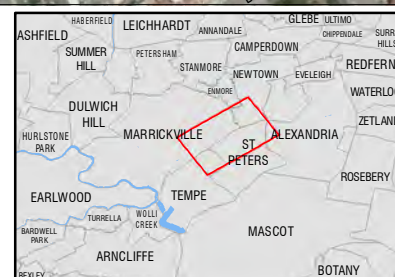


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Sydenham Station Junction Modification**
Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Evening LAeq(15minute)
Neutral Weather
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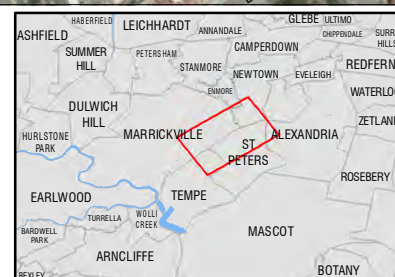


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- Exceedance of Noise Criteria

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**Sydney Metro City &
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Sydenham Station Junction Modification**

Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Night-time LAeq(15minute)
Neutral Weather

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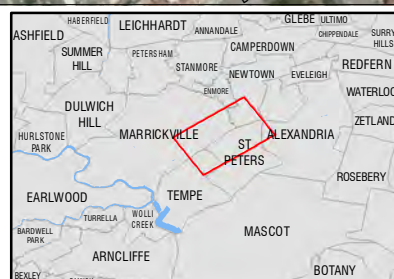
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- Noise Catchment Areas

Metro Rail Tracks

Sydney Trains Rail Tracks

Stabling Layout
- Operational Noise Exceedances LAeq(15minute)

Assessed Building

Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City &
Southwest Chatswood to Sydenham
Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
Future Operations - Early Morning
LAeq(15minute) Neutral Weather
SLR61014718_AF6_ONE_RD01

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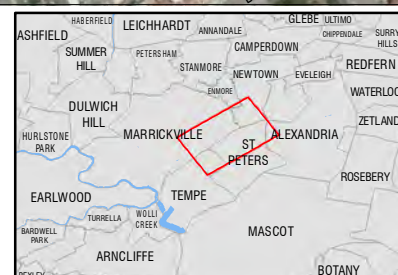


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Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
Future Operations - Daytime
LAeq(15minute) Neutral Weather
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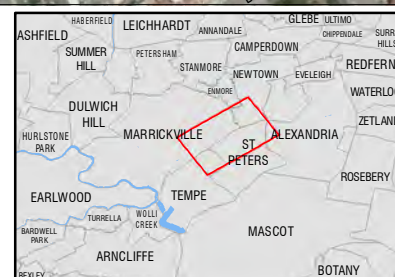
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Sydenham Stabling Yard
Operational Noise Exceedances
Future Operations - Evening
LAeq(15minute) Neutral Weather
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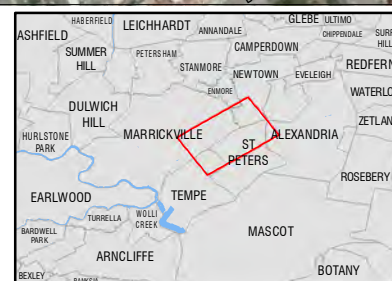
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- Noise Catchment Areas
- Metro Rail Tracks
- Sydney Trains Rail Tracks
- Stabling Layout

Operational Noise Exceedances LAeq(15minute)

- Assessed Building
- Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City &
Southwest Chatswood to Sydenham
Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
Future Operations - Night-time
LAeq(15minute) Neutral Weather
SLR61014718_AF9_ONE_RD01

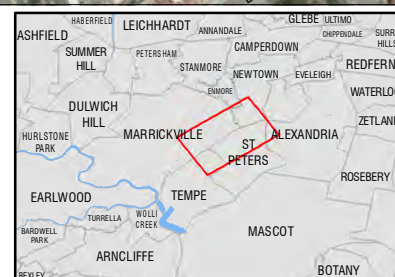
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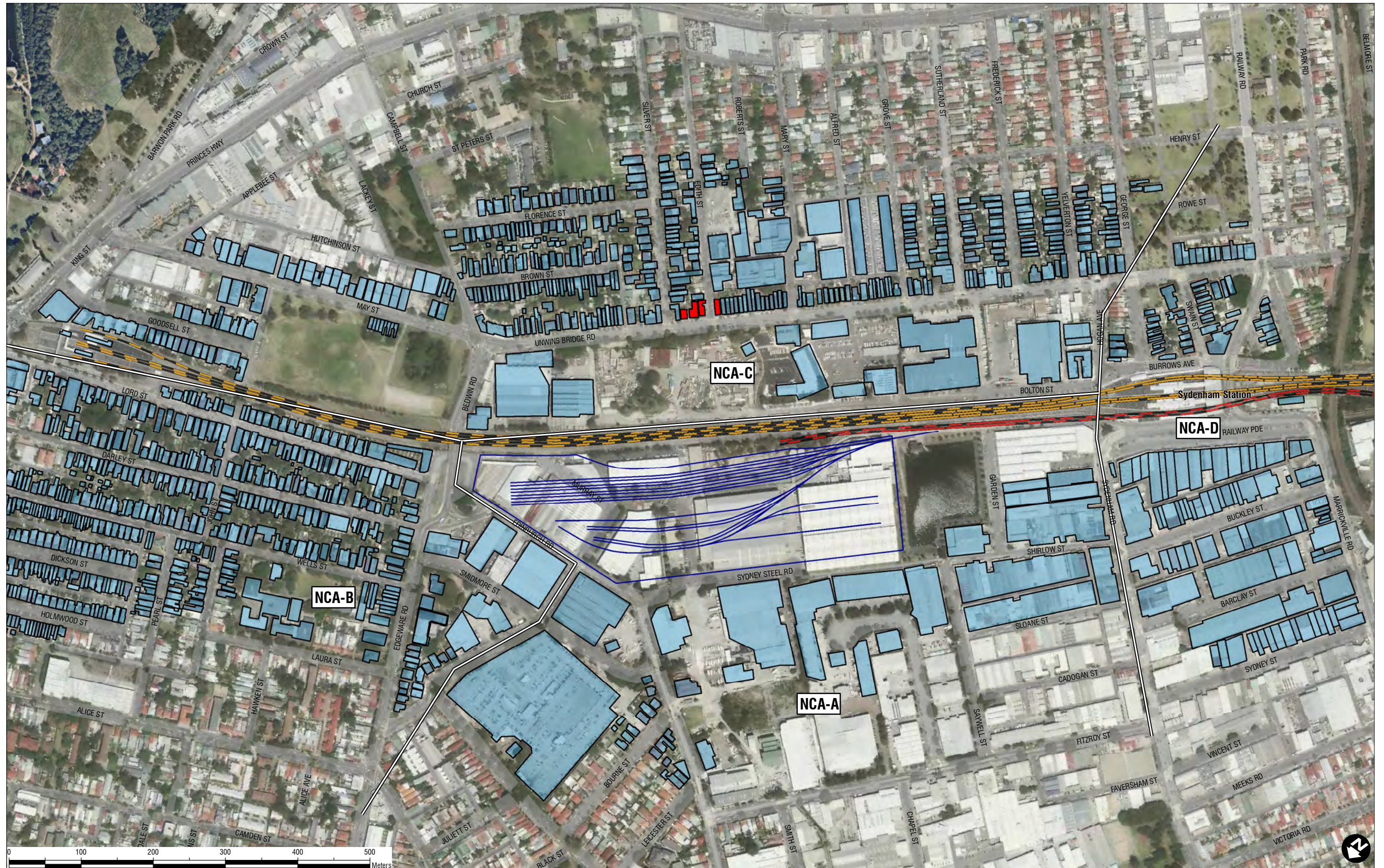
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- Noise Catchment Areas
- Metro Rail Tracks
- Sydney Trains Rail Tracks
- Stabling Layout
- Operational Noise Exceedances L_{max}**
- Assessed Building
- Exceedance of Noise Criteria

Transport for NSW
**Sydney Metro City &
Southwest Chatswood to Sydenham
Sydenham Station Junction Modification**
Sydenham Stabling Yard
**Operational Noise Exceedances
Future Operations - All Periods
L_{max} Neutral Weather**
SLR61014718_AF10_ONE_RD01

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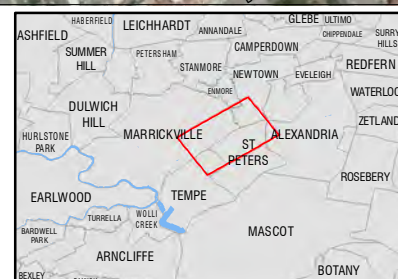


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- Assessed Building
- Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham
Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Early Morning LAeq(15minute)
Adverse Weather

SLR61014718_AF11_ONE_RD01

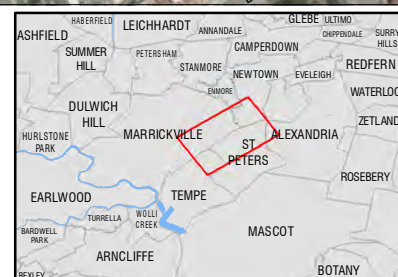
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- Sydney Trains Rail Tracks
- Stabling Layout
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- Assessed Building
- Exceedance of Noise Criteria

Transport for NSW
**Sydney Metro City &
Southwest Chatswood to Sydenham
Sydenham Station Junction Modification**
Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Daytime LAeq(15minute)
Adverse Weather
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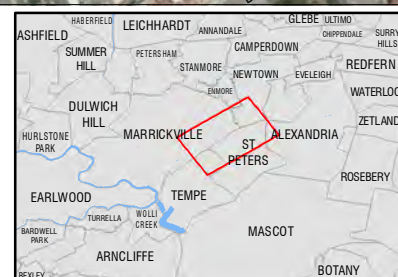
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Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Evening LAeq(15minute)
Adverse Weather
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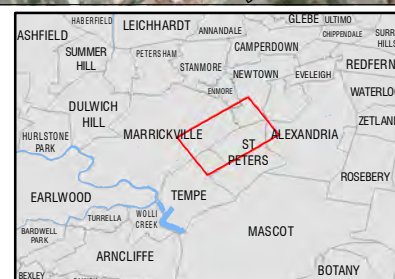
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- Stabling Layout
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- Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham
Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
At-opening - Night-time LAeq(15minute)
Adverse Weather
SLR61014718_AF14_ONE_RD01



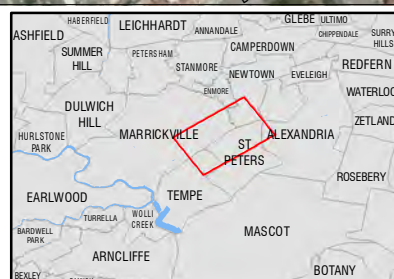
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- Noise Catchment Areas
— Metro Rail Tracks
— Sydney Trains Rail Tracks
— Stabling Layout
- Operational Noise Exceedances L_{max}**
Assessed Building
Exceedance of Noise Criteria

Transport for NSW
**Sydney Metro City &
Southwest Chatswood to Sydenham
Sydenham Station Junction Modification**
**Sydenham Stabling Yard
Operational Noise Exceedances
At-opening – All Periods L_{max}
Adverse Weather**
SLR61014718_AF15_ONE_RD01



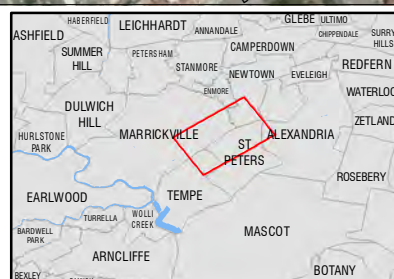
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- Noise Catchment Areas

Metro Rail Tracks

Sydney Trains Rail Tracks

Stabling Layout
- Operational Noise Exceedances LAeq(15minute)

Assessed Building

Exceedance of Noise Criteria

Transport for NSW
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Sydenham Stabling Yard
**Operational Noise Exceedances
Future Operations - Early Morning
LAeq(15minute) Adverse Weather**

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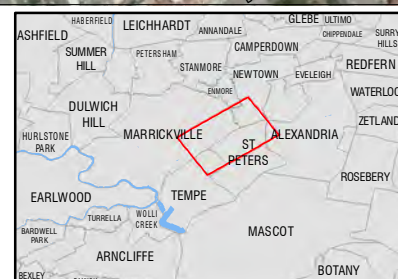


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- Operational Noise Exceedances LAeq(15minute)**
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- Exceedance of Noise Criteria

Transport for NSW
Sydney Metro City & Southwest Chatswood to Sydenham
Sydenham Station Junction Modification
Sydenham Stabling Yard
Operational Noise Exceedances
Future Operations - Daytime
LAeq(15minute) Adverse Weather
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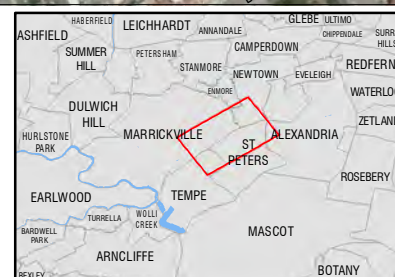
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Transport for NSW
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Operational Noise Exceedances
Future Operations - Evening
LAeq(15minute) Adverse Weather
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NON-ABORIGINAL HERITAGE TECHNICAL INFORMATION

APPENDIX E



Non-Aboriginal heritage technical information

Sydenham Railway Station Group

Sydenham Railway Station Group	
Image	View of Platform 2/3 building, south-west aspect 
Significance	State
Description	As described in the SHR listing, Sydenham Station was constructed between 1884 and 1962 by C. & E. Miller and William Robinson (Figure 132, Figure 133). It was originally built on a duplicated line from Illawarra Junction to Hurstville. The station opened as Marrickville Station but it was given its present name in 1895 with the opening of the Belmore branch line. In 1907 the platforms were extended. In 1907 the line from Edgeware Road to Sydenham was quadruplicated to serve the Belmore to Bankstown extension when it opened in 1909. This resulted in confining both buildings on island platforms so that passengers had to reach the platforms by an extended footbridge. A new timber overhead booking office on a steel support frame was built between Platforms 3 and 4 and steel footbridges were eventually extended to all platforms around 1914. The overhead footbridge at Sydenham is a haunched beam design which consists of tapered cantilevers resting on platform trestles and supporting shallow beams over the railway tracks where headroom over rolling stock can be critical. The footbridge was manufactured by Dorman Long & Co. Ltd. Middlesbrough England (stamped on posts), which also engineered the Sydney Harbour Bridge. To provide for the proposed Eastern Suburbs Railway, two additional tracks were constructed so that in 1925 the standard brick building on Platform 6 was built (Figure 134, Figure 135). In 1926 the lines were electrified at Sydenham. Soon after, in 1927 the refreshment room was opened for factory workers in the area. As the additional tracks were never utilised for the Eastern Suburbs Railway they have been mainly used for the Bankstown Line trains. In 1962 a brick parcels office building was constructed on Platform 1 but closed in the late 1980s (Figure 136, Figure 137 and Figure 138). The weatherboard ticket office on the overhead footbridge burnt down in the mid-1980s. In the late 1980s a new brick overhead booking office and a new metal-clad shop were built on the existing c. 1914 footbridge structure, and new canopies built over the stairs and connected to platform

Sydenham Railway Station Group	
	buildings. A TAP upgrade of the station was completed in 2013 with the removal of the 1980s overhead booking office and footbridge and the construction of a new concourse, four lift shafts, access stairs, new canopy structure and a new station building at overbridge level (Figure 139).¹¹⁰ The original station master's residence was demolished in 2014. It is not clear what date the northern platform, waiting sheds and northern boundary wall were constructed. What is known is that these elements were not present in 1943 (Figure 13). As platform 1 would have been required to be constructed prior to the 1962 Parcels Office, it would have been built between 1943 and 1962. The brick boundary wall located along the northern side of the station appears to be constructed of an identical brick and bonding to the parcels office and may also be dated 1962. The waiting sheds on platform 1, partly made of the brick boundary wall and new brick work, appear to post-date these structures. The south-western portion of the brick boundary wall is likely to have been built circa 1920-25 at time of construction of the overbridge and Platform 6, its curved form also associating with Inter-War architecture. Today the station consists of the 1884 platforms and platform buildings, the 1920s Gleeson Avenue overbridge, the 1925 platform and platform building, the 1962 parcels office (closed in the 1980s), waiting sheds, brick boundary walls and a new concourse and stairs.
Statement of significance	The following statement of significance has been extracted from the State Heritage Register listing for the Sydenham Railway Station Group: <i>Sydenham Railway Station – inclusive of all platform buildings and awnings, parcels office, waiting shed, brick faced platforms, steel footbridge structure and stairs, Gleeson Avenue overbridge and brick perimeter walls – is of State heritage significance. Sydenham Railway Station is of historical significance as a major junction station developed from 1884 to present, with two 1884 platform buildings, 1914 steel footbridge and stairs, 1925 platform building and waiting shed, 1962 parcels office, and 1920s Gleeson Avenue overbridge demonstrating its development over time, including the adaptation of the 1884 wayside platform buildings for island platform use.</i> <i>Of aesthetic and historical significance, the platform building awnings demonstrate the range of awnings used on railway buildings from the small original awning of two bays on the platform2/3 building (the original minor platform) to the addition of cantilevered awnings in 1925. All platform buildings are of aesthetic significance as good representative examples of their types and periods. The 1914 footbridge structure and stairs are of aesthetic and historical associational significance as a representative haunched beam structure and stair manufactured by Dorman Long & Co. engineers. The surviving interior and exterior detailing of the 1884 platform buildings and awnings is considered rare on the Illawarra Line, with other examples at St. Peters, Tempe and Rockdale. The station group is of state heritage significance.</i> It is noted that the statement of significance on the SHR listing has not been updated since the TAP project in 2012. The reference to the 1914 footbridge and its significance is no longer valid since its removal in 2012.
Approved project impact	No impact
Additional impact of the proposed modification	Direct impacts – major (platform removal and realignment, platform building demolition, retrofitting of buildings for metro use, addition of a new paid concourse and access facilities) Potential direct impacts – minor (vibration) Indirect impacts – moderate (views and vistas)

Elements within Sydenham Railway Station Group

Overview of elements and potential impacts of the proposed modification

Element	Grading	Condition	Impact of proposed modification	Assessment of impact
Platform 1	High	Fair	The removal of Platform 1 would result in a major impact on the fabric of the platform including the loss of the original brick face. Platform 1 was designed in a curvilinear form to stand in near-symmetry with Platform 6 located along the southern boundary of the site. The removal of the platform and the construction of the straight platform required for the Metro trains would result in a major impact on Platform 1 and disrupt the current symmetry with Platform 6. The new paid concourse, access stairs, lifts, overhead canopy structure, platform buildings and protective barriers would be located on the new platform and would not further impact significant fabric. This aspect of the proposed modification would result in a major impact on the station group overall.	Major
Platform 1 – Parcels Office	High	Fair-good	The Parcels Office would be removed to allow for the construction of a new paid concourse and overhead canopies. There would be a major direct impact on the fabric of the Parcels Office as a result of its demolition. Overall, the impact of its removal on the station group would be major.	Major
Platform 1 – Waiting sheds	Moderate	Good	The waiting sheds are proposed to be retained. This would result in a neutral impact on the sheds and station.	Neutral

Element	Grading	Condition	Impact of proposed modification	Assessment of impact
Platform 2/3	High	Fair	The realignment of Platform 2 would involve demolition of Platform 2/3 on the north and east sides of the platform building. This would have a major impact on the platform including the loss of the original brick face on the majority of the platform. The platform would be reconstructed to include an extension of Platform 2 in the north-eastern end to accommodate the straight rail lines required for the Metro trains. This would result in the loss of the historic curved platform end and of the original near-symmetry of the station platforms. This would have a major impact on the original platform layout. The addition of a new paid concourse and access stairs/lifts to the east of the reconstructed platform and installation of protective barriers along the platform to meet the requirements of Metro trains would be anchored to the fabric of the new platform and would not further impact significant fabric. The almost complete demolition of Platform 2/3 to be reconstructed in straight lines would result in a major impact on the station group as a whole.	Major
Platform 2/3 building (Type 4)	Exceptional	Good	The retention of the platform building is a positive heritage outcome in the context of the proposed modification. The building would be protected during platform reconstruction works. Retrofitting for new accommodation should be designed to minimise impacts to original fabric. Original layout should be preserved where possible. The opportunity could be taken to remove any intrusive modifications to the structure. Any additions to the building and platform should be designed to be sympathetic to the heritage context and minimise fabric and visual impacts. The proposed modification would have a minor impact on the heritage values of the building and station overall.	Minor
Platform 4/5	High	Fair	The addition of a new paid concourse and access stairs and lifts would have a moderate impact on the platform fabric where pylons and struts are anchored within the existing platform. The existing alignment of the platform would be retained. Impacts on the station group as whole as a result of changes to the platform would be moderate.	Moderate

Element	Grading	Condition	Impact of proposed modification	Assessment of impact
Platform 4/5 building (Type 3)	Exceptional	Good	The retention of the platform building is a positive heritage outcome in the context of the proposed modification. Retrofitting for new accommodation should be designed to minimise impacts to original fabric. Original layout should be preserved where possible. The opportunity could be taken to remove any intrusive modifications to the structure. Any additions to the building and platform should be designed to be sympathetic to the heritage context and minimise fabric and visual impacts. The proposed modification would have a minor impact on the heritage values of the building and station overall.	Minor
Gleeson Avenue overbridge	High	Fair	The structure is proposed to be retained and regraded for ongoing use. It is expected this aspect of the proposed modification would result in a minor impact on the heritage values of the overbridge and station overall.	Minor
Platform 6	High	Fair	Platform 6 is associated with the second layer of development of Sydenham Station. It is proposed to retain Platform 6. The removal of the Platform 6 building would result in a moderate impact to the fabric of the platform where the building's structure would be removed. The addition of part of a new concourse and access stairs/lifts would result in a moderate impact to its fabric where pylons and struts are anchored. The proposed bike parking structure would abut against the platform to the south-east and would have a negligible impact on the fabric of the platform. Impacts of the proposed works to Platform 6 and Sydenham Station as a whole would be moderate overall.	Moderate
Platform 6 building (Type 11)	High	Good	The Platform 6 building would be removed to allow for the construction of a new paid concourse and overhead canopies. Its removal would result in a major impact on the fabric of the building and on Sydenham Station as a whole.	Major

Element	Grading	Condition	Impact of proposed modification	Assessment of impact
Brick perimeter walls	High-moderate	Fair	The curvilinear perimeter wall in the corner of Burrows and Gleeson Avenues is proposed to be retained. This would result in a neutral impact on the walls and station. The high brick perimeter walls along Railway Parade are proposed to be removed and rebuilt at a different location in similar form. This would result in a minor impact on the walls and station.	Minor
Platform canopies and footbridge canopy	Little	Good	No works are proposed to the platform canopies and footbridge canopies as a result of the proposed modification. This would result in a neutral impact on Sydenham Station.	Neutral
Overhead booking office and shop	Little	Very good	No works are proposed to the overhead booking office, concourse and shop as a result of the proposed modification. This would result in a neutral impact on Sydenham Station.	Neutral
Footbridge and stairs	Little	Good	No works are proposed to the footbridge and stairs as a result of the proposed modification. This would result in a neutral impact on Sydenham Station.	Neutral
Landscape/natural features	Little	Fair	Existing landscape elements within the site are later additions which are of little significance. Although they complement the site, major direct impact on these features would have a negligible heritage impact on the significance of the station group as a whole.	Negligible

Overview of revised heritage impact – Sydenham Railway Station Group

All elements of exceptional significance and most elements of high significance would be retained and retrofitted with potential for positive impact. However, analysis of a range of options to enable effective operation of the station identified that the removal of the Platform 6 building and Parcels Office would be required. These are two of four significant buildings within the precinct, and with the removal of two of four original platforms, results in a major direct impact. The visual impact of the new development on the setting of the station and on significant views would be moderate. Potential direct impacts as a result of vibration would be minor provided that mitigation measures are implemented.

The removal of the 1925 Platform 6 building, 1962 platform and its associated Parcels Office would remove two layers of development of Sydenham Railway Station apart from Platform 1 (1925). This would impact the ability of the station to demonstrate its development over time. The integrity of the station has been previously impacted by the removal of the 1914 footbridge, stairs and timber overhead booking office and would be further impacted by the removal of the 1925 and 1962 structures. The retention of the Platforms 2/3 and 4/5 buildings dated 1884 would retain the historical significance of Sydenham Station as a major junction station. The two platform buildings are good examples of their respective types on the Bankstown Line and would conserve the aesthetic significance of the station and its rarity values at a State level. The retention of Platform 4/5 would retain a representative example of the original 1894 platforms as a brick face platform that was later converted into an island platform.

Overall, the level of heritage impact of the proposed modification on Sydenham Railway Station Group would be major. The heritage item would however continue to meet the threshold for State significance for its rarity, representativeness, and historical and aesthetic significance, particularly in relation to the retained elements and its continuing use as a major transport hub.

Sydenham (Illawarra Line) Underbridge

Sydenham (Illawarra Line) Underbridge	
Image	View of underbridge, west aspect 
Significance	Local
Description	The Sydenham Underbridge was designed by the Way and Works Branch, NSW Government Railways and constructed with day labour. The bridge is a single span, single track, steel Pratt truss over the Illawarra Line, with 37.5 metre span between brick abutments (Figure 15, Figure 140, Figure 141, Figure 142, Figure 143). The bridge is in good condition with the following defects: mild corrosion of truss, stringers, cross girders and bracing members. The bridge carries the single-track Botany Line over the Illawarra Line. The Botany Line was opened on 11 October 1925.
Statement of significance	The following statement of significance has been extracted from the State Heritage Inventory listing for the Sydenham (Illawarra Line) Underbridge: <i>The Illawarra Line Flyover is of local significance as the largest item of original infrastructure on the Botany Line. The bridge is a good representative example of a riveted steel Pratt truss rail bridge.</i>
Approved project impact	No impact
Additional impact of the proposed modification	Direct impacts – minor (maintenance works for ongoing use) Potential direct impacts – negligible (vibration) Indirect impacts – minor (views and vistas)
Revised heritage impact statement	The direct impacts of the proposed modification on Sydenham (Illawarra Line) Underbridge would be minor. The proposed works at Sydenham Railway Station Group would result in a negligible visual impact on the underbridge. The proposed works to the Sydenham (Illawarra Line) Underbridge itself would result in a minor visual impact. Potential direct impacts as a result of vibration would be negligible. Overall, the level of heritage impact of the proposed modification on the Sydenham (Illawarra Line) Underbridge would be minor. The heritage item would continue to meet the threshold for local significance.

Brick retaining walls

Brick retaining walls	
Image	View of Railway Parade retaining wall, south aspect 
Significance	Local
Description	The brick retaining walls are tall and curve as they change height over their length. They are constructed with dark bricks with rounded red brick capping (Figure 144 to Figure 154). The walls have Colonial bond with four projecting courses, five courses below this below the capping. The walls are in fair to good condition. These brick retaining walls are associated with the Bankstown rail line which was opened in 1895. This line required a number of cuttings and embankments to be constructed within the study area.
Statement of significance	The following statement of significance has been extracted from the State Heritage Inventory listing for the brick retaining walls: <i>These walls are a type commonly erected along this railway line, but in this case the size, location and line of the two walls combine to form an important streetscape element.</i>
Approved project impact	No impact
Additional impact of the proposed modification	Potential direct impacts – minor (vibration) Indirect impacts – negligible to minor (views and vistas)
Revised heritage impact statement	The direct impacts of the proposed modification onto the Brick Retaining Walls would be neutral. The proposed works at Sydenham Railway Station Group and Sydenham (Illawarra Line) Underbridge would result in negligible to minor visual impacts overall. Potential direct impacts as a result of vibration would be minor. Overall, the level of heritage impact of the proposed modification on the Brick Retaining Walls would be negligible. The heritage item would continue to meet the threshold for local significance.

General Gordon Hotel

General Gordon Hotel	
Significance	Local
Description	The brick retaining walls are tall and curve as they change height over their length. They are constructed with dark bricks with rounded red brick capping (Figure 144 to Figure 154). The walls have Colonial bond with four projecting courses, five courses below this below the capping. The walls are in fair to good condition. These brick retaining walls are associated with the Bankstown rail line which was opened in 1895. This line required a number of cuttings and embankments to be constructed within the study area.
Approved project impact	No impact
Additional impact of the proposed modification	Potential direct impacts – minor (vibration) Indirect impacts – minor (views and vistas)
Revised heritage impact statement	The direct impacts of the proposed modification onto the General Gordon Hotel would be neutral. The proposed works at Sydenham Station Precinct would result a minor visual impact overall. Potential direct impacts as a result of vibrational work would be minor. Overall, the level of heritage impact of the proposed modification on the General Gordon Hotel would be minor. The heritage item would continue to meet the threshold for local significance.

Sydenham Pit and Drainage Pumping Station 1

Sydenham Pit and Drainage Pumping Station 1	
Image	View south across Sydenham Pit and Drainage Pumping Station 
Significance	State
Description	The Sydenham Storage Pit and Pumping Station was designed and built by the New South Wales Public Works Department between 1935 and 1941. Sydenham Storage Pit and Pumping Station consists of two distinct parts: the pit and pumping station. The pit consists of a nine-metre deep basin with the sides formed into batters. The batters are faced with sandstone blocks laid horizontally in courses of about 300mm. The width of the blocks ranges from square to over one metre in length. The blocks are dressed on four sides with the face sparrow picked. Along the top of the stone facing wall, earth batters and an open concrete drain were formed. An access ramp to the base of the pit is located along the northern wall with entry from Railway Parade. The stone walls are penetrated by channel outlets in the southeast corner and in the centre of the western edge. The boundary of the site is planted with Oleanders. The pumping station is constructed of reinforced concrete and consists of a series of fins that rise 12 metres from the base of the pit to support the pump house that has its floor level about 1.8 metres above Railway Parade. Five concrete fins interspaced with four cylindrical concrete water shafts are incorporated, with the southern facade supported by three concrete piers joined by a horizontal cross-beam in the centre. The floor of the pumphouse overhangs the end concrete fin by about a metre and is supported by four concrete brackets. The pumphouse has the approximate internal dimensions of 7.2 m wide x 17 m long and 5.6 m ceiling height. A switch room adjoins the eastern facade of the main pump room and has the approximate internal dimensions of 4.8 m x 0.9 m. The pumphouse has a tiled gable roof which continues down at the same pitch over the switch room. The southern and northern facades have three closely spaced vertical steel framed windows that form a square in the centre of the wall. The tops of the windows are overhung by a concrete lintel. Along the western facade of the pumphouse are five vertical windows centred on the void between the concrete fins. The building was designed in a version of the Inter-War Mediterranean domestic style.

Sydenham Pit and Drainage Pumping Station 1	
Statement of significance	The following statement of significance has been extracted from the State Heritage Register listing for the Sydenham Pit and Drainage Pumping Station 1: <i>The Sydenham Pit and Pumping Station is of historic, aesthetic and technical significance. Historically, it is the first such infrastructure built in the SWC system and is an intact and major component of the Marrickville low level stormwater drainage infrastructure that was built in response to increasing urban expansion since the 1870s in an area prone to flooding. Its large scale and labour intensive construction method of excavating the pit reflects the abundance of labour during the Great Depression and the type of public works undertaken to provide relief work for the unemployed. Aesthetically, the use of pitched dry packed ashlar sandstone walls to line the sides of the pit provides a pleasantly textured and coloured finish to the pit. It is a major landmark and dramatic component of the industrial landscape of Sydenham particularly as viewed from the railway. The pumping station is a very good example of a utilitarian building displaying Inter-War Mediterranean style architectural details. Technically, the pumping plant contains good working examples of 1930s pumps, particularly three Metropolitan Vickers pumps, and its original electrical mains equipment has been preserved insitu during upgrading in c. 1992.</i>
Approved project impact	Potential direct impacts – neutral (vibration). This items would not experience vibration above the screening criteria for cosmetic damage Indirect impacts – minor (views and vistas). The establishment of the construction site in the adjacent property would result in minor temporary visual impact to the setting of the item. The southern services facility would be about 50 metres to the north-east of the heritage item and would have negligible long term visual impacts to the setting of the item.
Additional impact of the proposed modification	Direct impacts – moderate (installation of aqueduct and viaduct, maintenance vehicle ramp) Potential direct impacts – minor (vibration) Indirect impacts – major (views and vistas)
Revised heritage impact statement	The proposed aqueduct to be anchored in Sydenham Pit and Drainage Pumping Station in proximity of the drainage pumping station would result in impacts to the heritage item. Provided that the aqueduct and pylons are sensitively designed to minimise such impacts, it is anticipated that the proposed modification would result in moderate direct and major visual impacts on the heritage item overall. Elements of exceptional significance of the heritage item including the pit sandstone walls and the pumping station would be retained for continued use in their original function. Direct and visual impacts of drainage works located on the boundaries of the curtilage of the heritage item would result in negligible impacts. Visual impacts of the stabling facility to the east of the heritage item would be minor overall as they are in keeping with the industrial nature of the surrounding area. Visual impacts as a result of the aqueduct would be major as they would change the symmetry of the item and introduce a new visual element. Potential direct impacts as a result of vibration would be minor provided that mitigation measures are implemented. Overall, the level of heritage impact on Sydenham Pit and Drainage Pumping Station 1 would be major. The statement of significance indicates that Sydenham Pit and Drainage Pumping Station is historically, aesthetically and technically significant at a State level for being the first purpose built stormwater and drainage pumping station in the Sydney region. The site is also locally significant for having been built in response to increasing urban expansion from the 1870s, easing the impact of floodwaters and enabling the Marrickville township to expand. The item is also rare and representative of its type. Although the proposed aqueduct would result in a major impact on the

Sydenham Pit and Drainage Pumping Station 1	
	item, elements of exceptional significance would be retained and used for their original purpose. The landmark quality of the site, and the industrial character of the item would be retained within the urban landscape of the area and would continue to reflect the industrial context of the area. The item would remain rare and representative at a State level as it would still demonstrate its historic function and retain significant elements. Sydenham Pit and Drainage Pumping Station 1 would continue to meet the threshold for State significance.

Conservation Management Plan policies

The following table considered the applicability of the proposed modification to the relevant Conservation Management Plan policies.

Recommendation	Applicability of the proposed modification
7.1 Retention of Significance	
Sydenham Pit and Drainage Pumping Station should be conserved as an operating element of the Sydney stormwater system, continuing its historic function. The surviving historic fabric of Exceptional and High significance should be retained and conserved. This includes maintenance, repair and reconstruction where appropriate. Conservation should be undertaken in the context where the original primary function of the item is retained, and that Sydenham Pit and Drainage Pumping Station is fully operational.	Elements of exceptional significance of the heritage item including the pit sandstone walls and the pumping station would be retained for continued use in their original function. The item would maintain its original function within the context developing drainage needs.
7.2.1 Conservation of Significant Built Fabric	
The significant fabric is testament to the skill of past trades people. Repair work should be based on the principle of doing as little as possible and as much as necessary to conserve the item, retaining original material and detailing. All surviving elements of the historic built fabric shall be retained and repaired rather than replaced. It should be conserved in accordance with the levels of significance identified in Section 4.5 –Schedule of Conservation Works of this Conservation Plan. The priority of works is to be allocated in accordance with the condition of the elements affected.	The Conservation Management Plan would be considered during the detailed design process. Impacts to original fabric would be limited to impacts to stone and brickwork as a result of installation of the new pumping station, pylons, aqueduct and access road. The original pump house is expected to be reused and retrofitted. Impacts to original fabric would be undertaken in accordance with the project mitigation measures such as the salvage strategy and moveable heritage strategy.

Recommendation	Applicability of the proposed modification
7.2.2 New Services and Upgrading to Suit Contemporary Use	
Any eventual repairs or upgrading of the site elements of High and Exceptional level of significance should be based on respect for the historic fabric. Any upgrading of the Pump House, machinery or Pit, or any other site elements and installation of new services must respect the item's significance and the general integrity of the item's significant historic fabric. The removal of machinery or movable elements deteriorated beyond repair and their replacement with modern elements is generally considered acceptable, provided that the original elements are assessed for suitability to be included in the moveable heritage collection of the site.	The proposed new elements within the item such as the aqueduct and new pumping station would be designed to minimise direct and indirect impacts. A heritage architect would be consulted during the design process for the aqueduct.
7.5.2 European Archaeological Resources	
Any archaeological resources potentially encountered on the property should be conserved in accordance with the requirements of the NSW Heritage Act 1977 and their potential for interpretation considered.	Archaeological resources are not expected to be impacted by the proposed modification.

Waugh & Josephson Industrial Buildings

Waugh & Josephson Industrial Buildings	
Significance	Local
Description	The large main industrial administration building at 1-7 Unwins Bridge Road extends from the corner of Bedwin Street, southwest along the northern side of Unwins Bridge Road. The building is in the Inter-war Functionalist style, 1-2 storeys with a tower, constructed in buff brickwork with a parapeted roof. The building features curved corners, porthole windows, curved corner windows with horizontally emphasised glazing bars. It features a flat roof with a semi-circular end wall leading back to a narrow central tower block facing Unwins Bridge Road. The main entry to the curved wall features large, metal framed windows with a narrow, flat porch is followed back along the side walls by the head of the continuous windows. There are porthole windows to the tower, and to the southwestern end of the Unwins Bridge Road facade. Windows are multipaned, either timber framed double hung or steel framed, all with horizontally emphasised glazing bars. The main entry doors are recessed glazed timber framed doors with fixed fanlights and sidelights, with margin etching to the glazing. The site features an elaborate spiked wrought metal fence and gates extending along the Unwins Bridge Road frontage. The main double gates into the site, located near the corner with Bedwin Street, contain the initials "U" and "B" within the metalwork. At least two other simple saw-toothed roofed industrial buildings on the site, behind the main administration building, were built by 1943. These have been extended.
Approved project impact	No impact
Additional impact of the proposed modification	Potential direct impacts – minor (vibration) Indirect impacts – negligible (views and vistas)
Revised heritage impact statement	The direct impacts of the proposed modification on the Waugh & Josephson Industrial Buildings would be neutral. The proposed works for the Sydney Metro Train Facility South would result in a negligible visual impact overall. Potential direct impacts as a result of vibration would be minor. Overall, the level of heritage impact of the proposed modification on the Waugh & Josephson Industrial Buildings would be negligible. The heritage item would continue to meet the threshold for local significance.

Goodsell Estate Heritage Conservation Area

Goodsell Estate Heritage Conservation Area	
Significance	Local
Description	The Goodsell Heritage Conservation Area is named after the prominent Sydney brick maker Frederick Goodsell who owned and operated a major steam-operated brickworks on the site. This is thought to be Sydney's first steam operated brickworks and the source of the first shale plastic bricks in the 1870s. The main brick pit was on the part of the site now occupied by Camdenville Park. Small terraces were built around the edge of the pit and in Goodsell Street and John Street (now Council Street). Only the group of eight that survive at the western end of the park were intended as housing for brick makers, the remainder appeared to have been erected by a range of speculative builders. The northern side of the street at that time was occupied by a timber yard, but was subdivided for development between 1902 and 1910. Much of the Area is now occupied by Camdenville Park and Oval which were constructed on part of the former brick pit and manufacturing site. The formal entrance to the park is located at the end of Goodsell Street and terminates the local view along the street. A small shop located at the south-eastern corner of the park has been previously demolished. The terrace of eight dwellings stand alone on this edge of the park as they once did on the edge of the clay pit for the brickworks. The two-storey terrace overlooking the park at the southern end of Council Street is a good example of the most modest two-storey terrace form, one that was intended for basic workers housing. Built to the street alignment with a veranda cantilevered over the footpath, the group forms a strongly expressed and rhythmic streetscape and roofscape, enlivened by the prominent chimneys rising above the main roof form and their slight stepping to accommodate the fall of the land. The view over the rear elevation of the terraces (from Goodsell Street) is also a good one and highly contributory to the aesthetic value of the area as a three-dimensional urban space. The streetscape of Goodsell Street is a tight and cohesive one comprised of single and two-storey terraces from the late Victorian/Federation period, groups of which are notably narrower than is usual in the Marrickville area. The streetscape also includes modest single storey parapeted terraces and freestanding cottages. The streetscape demonstrates some subtle differences from other areas of terrace development: the facades are set well back from the street alignment, providing for an unusually generous amount of soft landscaping; yet the individual terrace houses are very narrow. The reason for this configuration is not known. Some front fences are the original iron palisade but many have been replaced by cast aluminium, timber picket or low brick walls. A substantial pair of Victorian terrace shops with overhanging balconies is situated at the eastern end of Goodsell Street. The street plantings are a notable element of this conservation area, with mature shade trees in an almost unbroken line on the southern side of Goodsell Street and more widely spaced on the northern side. Species include Brush Box, the range of Australian natives common in the Marrickville area and a paired planting of Port Jackson Figs towards the eastern end which dominate views into the streetscape. The quality of the views within the precinct are enhanced by their termination at the park entrance, marked by a formal set of gates. Few properties in this area demonstrated evidence of significant structural alterations or additions, although the painting and rendering of original face brickwork was found. The group of eight brick-worker's terraces at the edge of the park fronting May Street are listed as locally significant heritage items and also contribute to the heritage significance of the area. The major intrusions into the area are the recently constructed residential flat building at the

Goodsell Estate Heritage Conservation Area	
	northern corner of the area and the warehouse at 8-14 Goodsell Street, both of which introduce scale, bulk and detailing that do not respect those found in the remainder of the heritage conservation area. Kerbing and in places guttering is representative of that found throughout the Marrickville area, being mainly constructed from large sandstone blocks.
Approved project impact	No impact
Additional impact of the proposed modification	Potential direct impacts – negligible (vibration) Indirect impacts – negligible (views and vistas)
Revised heritage impact statement	The direct impacts of the proposed modification onto the Goodsell Estate HCA would be neutral. The proposed works for the Sydney Metro Trains Facility South would result in a negligible visual impact overall. Potential direct impacts as a result of vibration would be negligible. Overall, the level of heritage impact of the proposed modification on the Goodsell Estate Heritage Conservation Area would be negligible. The heritage item would continue to meet the threshold for local significance.

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LANDSCAPE CHARACTER AND VISUAL AMENITY TECHNICAL INFORMATION

APPENDIX F



Landscape character and visual amenity technical information

Landscape and visual sensitivity levels

The following summarises the landscape and visual sensitivity for locations within the Sydenham Station and Sydney Metro Trains Facility South study area which are relevant to the elements of the proposed modification.

Industrial areas of Sydenham and Marrickville

The predominantly industrial areas that surround the station precinct to the west, north and east provide a setting for workers and visitors to these businesses. Narrow footpaths and broad driveways create utilitarian, vehicle dominated streets. The landscape and views in these areas have a functional focus whereas a scattering of small open spaces are valued for respite from this intensely urban environment. The landscape and views in this area are of **neighbourhood sensitivity**.

Burrows Avenue to Unwins Bridge Road residential area

These streets are mostly used by residents and their visitors and include such local destinations as the St Peters library and Sydenham Green. The concentration of single and double storey terraces and detached houses with consistent setbacks and streetscape planting creates a cohesive public realm. The landscape and views in this area are of **neighbourhood sensitivity**.

Sydenham Station

Sydenham Station provides access to several lines on the suburban rail network and provides an important transport hub for the community. The station is a State heritage listed item, increasing its sensitivity as a visual feature and contributor to the character of the local area. The landscape and views in this area are of **local sensitivity**.

Gleeson Avenue commercial precinct

Gleeson Avenue is a key north-south route for traffic and pedestrians, linking Sydenham Road in the north with the Princes Highway in the south. Gleeson Avenue which functions as the Sydenham commercial centre, including the existing station entry, shops, restaurants, offices and some 'shop top' housing. This precinct is used by residents and people working locally. The landscape and views in this area are of **local sensitivity**.

Character and components of the proposed modification

Sydney Metro Trains Facility South

Construction

Construction of the Sydney Metro Trains Facility South would be located at the site of the approved project works at the Marrickville dive site. This site would be expanded to include an additional area between Murray Street, Edinburgh and Sydney Steel roads. The following section describes the additional works required for the construction phase of the proposed modification:

- Establishment of a construction site including demolition of industrial buildings at 102-112 Edinburgh Road
- Removal of vegetation within the proposed modification area including approximately:
 - 15 street trees on Murray Street
 - 15-20 street trees on Edinburgh Road
 - 15-20 street trees on Sydney Steel Road
 - 25-30 trees along the drainage corridor and within the site
- A construction site located between the Sydney Metro dive structure west to Edinburgh and Sydney Steel roads, incorporating Murray Street and southwest to include the Sydenham Pit and Drainage Pumping Station. The construction would include:
 - site amenities and site offices
 - on-site fabrication workshops, material handling and storage areas
- Construction vehicle access and movements via Murray Street, Edgeware, Bedwin, Edinburgh and Sydney Steel roads
- Bulk earthworks including import of fill.

Operation

The approved project includes a 400 metre dive structure and tunnel portal would be located to the south of Bedwin Road Bridge, with anti-throw structures and site exclusion fencing around the perimeter of the rail corridor.

The following section describes the proposed operational phase of the proposed modification:

- Stabling and maintenance area for Sydney Metro trains with the capacity to ultimately stable 20 eight-car trains
- The stabling area would consist of tracks fixed to concrete sleepers supported on ballast
- Three turnouts from the main operational line
- Stabling areas would be raised from existing ground levels and a series of retaining walls and structures would be required to address the difference in height between the raised stabling yard and the external existing ground level
- An administration building and car park

- Diversion of the drainage around the Sydenham Pit and Drainage Pumping Station including:
 - an aqueduct, aligned northeast to southwest over the Sydenham Pit and Drainage Pumping Station
 - operational vehicle access across the aqueduct
 - overflow weir to the Sydenham Pit and Drainage Pumping Station on the northern wall of the aqueduct
 - vehicle access ramp to the pit floor
 - new pumping station building
- Material storage and maintenance vehicle parking
- Perimeter security fencing
- Provision for stabling screening development along part of Edinburgh Road and Sydney Steel Road (civil works only)
- New trees around the administration building and along Edinburgh and Sydney Steel roads
- New open space on the corner of Edinburgh and Sydney Steel roads.

Sydenham Station

Construction

The following section describes the construction phase for the Sydenham Station site:

- Establishment of a construction including demolition of:
 - Brick walls along Railway Parade and Burrows Avenue (State heritage listed) within construction site area
 - building on platform 6 (State heritage listed)
 - Platform 1 and the Parcels Office (State heritage listed)
 - Parts of platform 2 (east of the State heritage listed platform building)
 - Permanent ways (railway lines, ballast, overhead lines) between platforms 1 and 2
 - Industrial buildings at 1-11 Sydenham Road
 - Brick-lined drainage channel between Sydenham Road and Garden Street.
- Removal of street trees impacted by this site including approximately:
 - 3 trees between Railway Parade and Sydenham Road
 - 15-20 trees along Railway Parade between Sydenham Road and Garden Street
- Establishment of a construction compound on the site of 11 Sydenham Road
- Construction vehicle movement along Railway Parade, Marrickville Road, Buckley Street, Sydenham Road, Gleeson Avenue, Unwins Bridge Road, Burrows and Hogan Avenue
- Temporary closure and retrofit of existing station buildings on platforms 1 and 2-3.

Operation

The following section describes the operational phase for the Sydenham Station site:

- New straight platforms approximately 170 metres long, extending east of the existing platforms
- Glazed platform barriers along the full length of the metro platforms
- New platform lighting, security and passenger interface infrastructure
- Emergency egress ramps and stairs between the eastern end of the platform and Garden Street
- New overhead footbridge between Railway Parade and Burrows Avenue with vertical transport connections to the platforms
- Overlapping canopies including tall 'pleated' concourse canopy, glazed station entry canopies and new platform canopies along metro platforms, excluding areas adjacent to the retained heritage platform buildings
- New northern station entry at the corner of Sydenham Road and Railway Parade and transport interchange on Railway Parade comprising:
 - consolidated bus interchange adjacent to the northern entry plaza
 - taxi parking
 - services, bicycle parking and storage building
 - plaza and accessible pedestrian connection to Garden Street
- New southern station entry on Burrows Avenue and transport interchange on Burrows Avenue comprising:
 - widened plaza
 - kiss-and-ride
 - bus stops
 - taxi parking
 - existing park and ride east of the station on Bolton Street would remain
- Retention of existing structures including overhead booking office and station entry on Gleeson Avenue, and heritage listed platform buildings on platforms 1, 2/3 and 4/5
- Realigned Railway Parade, including a signalised intersection at Sydenham Road, and a bus interchange
- Realigned stormwater drainage channel between Sydenham Road and Garden Street
- New kiss-and-ride zone, and taxi parking on the north side of Burrows Avenue
- New pedestrian crossing on Burrows Avenue at George Street.

Rail corridor

Construction

The following section describes the construction phase for the corridor and ancillary development:

- Establishment of a construction site along the corridor, with works including rail corridor widening works, including cuttings, embankments and retaining wall construction, earthworks and track formation
- Establishment of a construction site outside the rail corridor at Railway Parade, Sydenham
- A bus layover on Burrows Avenue and Railway Road west of Gleeson Avenue
- Removal of selected areas of vegetation within the Sydney Metro corridor and construction sites
- Demolition of the Sydenham Maintenance Centre access footbridge
- Upgrading of security fencing and gates along the rail corridor.

Operation

The following section describes the operational phase for the corridor and ancillary development:

- New Sydney Metro rail tracks realigned but generally replacing in the same location as the existing Sydney Trains lines, on a ballast formation
- A bus layover on Burrows Avenue and Railway Road west of Gleeson Avenue
- New overhead wiring and support structures
- Segregation fencing, side walls and associated operational infrastructure
- Telecommunications masts (radio antennae, CCTV cameras, telecommunications cabling and equipment enclosures) at approximately 250 metre intervals along the corridor, to an approximate height of seven metres above the rail line
- Combined services posts, varying in height between around 1.5 and 3.5 metres high and located at approximately 200 metre intervals along the corridor
- Services building to the west of Gleeson Avenue.

Assessment of landscape impact

Two landscape character areas were assessed for the approved project. The proposed modification would result in changed landscape character impacts to these areas and, as such, these have been reassessed. These landscape areas are:

- Marrickville flood storage reserve
- Industrial areas of Sydenham and Marrickville – Street Art precinct

The proposed modification would also introduce potential landscape character impacts in new areas. Two additional landscape areas were identified and assessed for further impacts from the proposed modification. The additional landscape areas are:

- Sydenham Station precinct
- Street trees and vegetation within the industrial areas of Sydenham and Marrickville.

Marrickville flood storage reserve

Landscape impact of the approved project during construction

There was a **minor adverse** landscape impact expected during construction of the approved project due to changes to the setting of the reserve.

Landscape impact of the proposed modification during construction

There would be a direct change to the storage reserve as a aqueduct and new pumping station building would be constructed within the pit. This would change the character of this important landscape feature and reduce visual access to it from adjacent streets and the rail corridor.

There would be a considerable reduction in the landscape quality and functioning of the Marrickville flood storage landscape area while construction works are undertaken. As this is an element of local sensitivity, this results in a **moderate adverse** landscape impact during construction. This is an increased impact when compared to the approved project.

Landscape impact of the approved project during operation

The functioning of this precinct would be restored as this site is returned to light industrial use, resulting in a **negligible** landscape impact during operation of the approved project.

Landscape impact of the proposed modification during operation

The character of the flood storage reserve would be substantially altered by the introduction of a large concrete aqueduct structure, extending across the southeastern portion of the Sydenham Pit and Drainage Pumping Station, northwest of the existing pumping station, and an access ramp would lead from Garden Street to the top of the aqueduct. These new elements, and works for the rail corridor widening to the south, would surround the pumping station. These new elements would also obstruct some views to the heritage pumping station building, brick-lined walls and open water of the pit. Its value as a landscape feature, adding vibrancy and interest to this corner of the industrial area, would be greatly reduced. Overall, this would result in a considerable reduction in the landscape quality and functionality of the Marrickville Flood Storage Reserve, which is of local sensitivity. This results in a **moderate adverse** landscape impact during operation. This is an increased impact when compared to the approved project.

Industrial areas of Sydenham and Marrickville – Street Art precinct

Landscape impact of the approved project during construction

There would be a direct impact on the walls available for street art with the removal of the buildings within the site, resulting in a **minor adverse** landscape impact during construction of the approved project.

Landscape impact of the proposed modification during construction

It is not expected that there would be an additional impact on the street art due to the proposed modification. The impact would remain as a **minor adverse** landscape impact during construction.

Landscape impact of the approved project during operation

It is likely that during operation of the approved project new opportunities for street art would emerge as the light industrial landuse is re-established in this area. It is therefore expected that there would not be a perceived change in the landscape quality of this precinct which is of local sensitivity, resulting in a **negligible** landscape impact during operation of the approved project.

Landscape impact of the proposed modification during operation

As there would be no additional impact on the street art due to the proposed modification there would continue to be a **negligible** landscape impact during operation.

Street trees and vegetation within the industrial areas of Sydenham and Marrickville

There were no impacts identified on the street trees and vegetation during construction and operation of the approved project. There would be new impacts associated with the proposed modification.

Landscape impact of the proposed modification during construction

There would be a direct impact on a substantial number of mature street trees across the Sydney Metro Trains Facility South site, including a mature avenue of *Lophostemon confertus* (Brush box) along Murray Street, and a mix of *Lophostemon*, *Cupaniopsis*, *Eucalyptus*, and *Melaleuca* species along Edinburgh Road, Sydney Steel Road and along the drainage corridor intersecting Sydney Steel Road. These trees are a mix of native and exotic species which form continuous lines of vegetation, along streets and drainage corridors, and provide shade and amenity within this largely industrial precinct. The removal of these trees would reduce the shade cover and amenity throughout the site and on adjacent streets. Overall, it is expected that there would be a considerable reduction in the landscape quality and functioning of this precinct, which is of neighbourhood sensitivity, resulting in a **minor adverse** landscape impact during construction.

Landscape impact of the proposed modification during operation

Due to the function and footprint of the Sydney Metro Trains Facility South, it is unlikely that there would be an opportunity for the planting of large trees within the site. However, new trees would be planted around the administration building, an avenue of street trees provided along part of Edinburgh Road, and along Sydney Steel Road. There would also be a new open space with trees and lawn provided at the corner of Edinburgh and Sydney Steel roads. This would result in an increase in the number of street trees around the perimeter of the site, and some planting within the site. Although the number of new trees would be greater, these would require time to mature and provide similar shade cover and amenity. Overall, this would balance to create a no perceived change in the landscape quality and functioning of the site and the adjacent streets. This vegetation is of neighbourhood sensitivity, which would result in a **negligible** landscape impact during operation.

Sydenham Station precinct

There were no impacts identified on the Sydenham Station precinct during construction and operation of the approved project. There would be new impacts associated with the proposed modification.

Existing conditions

Sydenham Station has one main entry on the overbridge at Gleeson Avenue to the west of the station. This entry has been recently upgraded as part of the Transport Access Program, and has a generous concourse area with lifts and stairs leading to the platforms.

Access and connectivity to and around the station is limited to this one entry. This entry provides direct access to the station from the commercial areas of Gleeson Avenue, but a less direct route from the surrounding industrial areas to the northeast of the station.

The wide rail corridor (passenger and freight) divides the industrial areas to the north from the residential and commercial centre to the south of the station, with Gleeson Avenue being the only north south connection.

The steepness of the Illawarra Road bridge and adjacent Station Street reduce the accessibility of the station entry somewhat. Bus stops for interchange are located on Railway Parade to the east of Gleeson Avenue, and on Burrows Avenue to the west of Gleeson Avenue.

A strong 'sense of place' exists within Sydenham Station due to the character of the heritage platform buildings, prominence of the new station architecture on Gleeson Avenue, and visual interest created by the curved, tiled wall 'Sydenham Station' sign.

Landscape impact of the proposed modification during construction

The proposed modification would require the demolition of existing buildings and establishment of a construction site at 11 Sydenham Road. Works would extend across the intersection of Sydenham Road and Railway Parade, and there would be work undertaken across much of the northern area of the station including platforms and track works. The works would involve the closure of Railway Parade, east of Sydenham Road, and footpaths on the northern side of Burrows Avenue and southern side of Railway Parade during some periods of construction. Diversion of pedestrians at times would adversely affect the connectivity and legibility of station access in this part of the station precinct. This is particularly the case for pedestrians moving between the commuter car parking on Bolton Street and the station entry on Gleeson Avenue. However, the footpaths and main station entrance on Gleeson Avenue would be unaffected, maintaining north-south connectivity over the rail corridor from Gleeson Avenue. Street trees on the corner of Railway Parade and Sydenham Road would be removed, reducing the shade cover and reducing pedestrian comfort levels in this area. Heritage listed platform shrub plantings and perimeter brick walls would be removed, resulting in a direct impact on these valued landscape elements.

The location of the construction works away from the existing main station entry would maintain the current levels of safety and legibility for customers using the Gleeson Avenue entry. However, the approach from the commuter car park, and other areas to the northeast may encounter some obstruction on the approach to the station. This would be countered somewhat by the increased lighting and activation of the construction sites, with the workforce providing some surveillance of the surrounding public realm during working hours.

Overall, it is expected that there would be a considerable reduction in the landscape quality and functionality of this precinct, which is of local sensitivity, resulting in a **moderate adverse** landscape impact during construction.

Landscape impact of the proposed modification during operation

The functioning of this precinct during operation would be improved when compared to the current situation. There would be two additional station entrances to the northeast and southeast of the station, one on Railway Parade and a second on Burrows Avenue, with legible station entry points and spacious plazas. In particular, the northeastern station entry would support urban renewal opportunities including the proposed Creative Hub.

Footpaths would be reinstated and street trees would provide shade, comfort and amenity to plaza areas. The provision and layout of transport interchanges would be improved, including a consolidated bus stop, taxi parking and bicycle storage building at the Railway Parade station entrance, and a kiss-and-ride, bus stop, and taxi parking at the Burrows Avenue station entrance, improving pedestrian safety and access.

Safety would be improved as the additional station entry would increase the permeability of the station, there would be increased surveillance and activation through the creation of an interchange, and increased lighting levels around the station precinct.

The removal of the heritage listed parcels office, brick-lined drainage channel between Sydenham Road and Garden Street, part of the brick walls along Railway Parade and Burrows Avenue, and platform planting would alter the 'sense of place' and heritage character of these streetscapes somewhat.

Overall, the station design would result in a noticeable improvement in the overall landscape functioning of this precinct. As this station is of local sensitivity, this results in a **minor beneficial** landscape impact during operation.

Rail corridor

There were no impacts identified on the Sydenham Station precinct during construction and operation of the approved project. There would be new impacts associated with the proposed modification.

Existing conditions

Features of this section of the corridor landscape include the Metropolitan Goods Line to Port Botany and pratt truss bridge, the T3 Bankstown Line to the north, the T4 Illawarra Line to the south, Sydenham Maintenance Centre, Fraser Park to the north, and Tillman Park, to the south. There is a wide corridor of mature trees, shrubs and native grasses along much of the corridor. The Sydney Water sewage pumping station 271 is also located within this area, on Carrington Road.

There are residential areas to the southeast of the corridor along Railway Road and Burrows Avenue, and northwest of the corridor at Meeks Road. A number of these properties have views over the corridor. There is no east-west pedestrian or cycle route along the corridor. North-south pedestrian movement is possible to the east at the Gleeson Avenue bridge and west at Victoria Road under the rail bridge.

Landscape impact of the proposed modification during construction

This section of the corridor would require earthworks to the north of the T3 Bankstown Line, and within Fraser Park for the construction works. Much of this work would be contained within the rail corridor. Some vegetation would be removed to accommodate the earthworks, and construction of corridor fencing and equipment, opening up views from surrounding parkland areas. The pratt truss bridge and Sydney Water sewage pumping station 271 would remain unchanged.

The introduction of a bus layover between Railway Road and Burrows Avenue, would have a direct impact on some street trees and a vacant lot on Railway Road and Burrows Avenue. This activity would be generally consistent in character with the adjacent existing rail corridor and bus stops and create a reduction in the amenity of views from a small number of adjacent residential properties.

North-south pedestrian connectivity would remain unchanged. Overall, it is expected that there would be a noticeable reduction in the landscape quality of the rail corridor between Sydenham and Marrickville, which is of local sensitivity. This would result in a **minor adverse** landscape impact during construction.

Landscape impact of the proposed modification during operation

There would be an intensification of rail corridor elements including new overhead wiring and support structures, new signalling equipment telecommunication masts, segregation fencing, and other operational infrastructure, to the north and south of the rail corridor. Vegetation would not be reinstated within the corridor which would result in a reduction in the number of trees and amenity of the corridor. Overall, there would be a noticeable reduction in the landscape quality of the corridor as the vegetation coverage would be reduced and fences and equipment would introduce additional visual barriers into the landscape. As this is a landscape of local sensitivity, this would result in a **minor adverse** landscape impact during operation.

Assessment of daytime visual impact

Sydney Metro Trains Facility South

Selection of representative viewpoints

In total 11 representative viewpoints were assessed for the approved project for the daytime visual impact assessment at the Marrickville dive site (southern) (one of these was not numbered). Of these, 10 are considered relevant to the proposed modification and have been re-assessed for the Sydney Metro Trains Facility South. These 10 viewpoints are:

- Viewpoint 1: View west from Edgeware Road
- Viewpoint 2: View west from the Bedwin Road Bridge
- Viewpoint 3: View west from Camdenville Park
- Viewpoint 4: View north-west from Unwins Bridge Road
- Viewpoint 5: View north from Bolton Street
- Viewpoint 6: View north-east along Railway Parade
- Viewpoint 7: View southeast from Sydney Steel Road to footpath connection with Shirlow Street
- Viewpoint 8: View south-west from Sydney Steel Road
- Viewpoint 9: View south-east from the corner of Murray Street and Edinburgh Road
- Viewpoint 10: Views from the rail corridor.

The remaining viewpoint assessed for the approved project would not have views to the proposed modification and there would be no change to the approved project impacts.

Two additional representative viewpoints were selected to inform the visual amenity assessment for the proposed modification. The two additional representative viewpoints are:

- Viewpoint 11: View from path between Shirlow Street and Sydney Steel Road
- Viewpoint 12: View south-east along Edinburgh Road.

The location of these viewpoints is provided in Chapter 16 of the modification report.

This assessment should be read in conjunction with the viewpoints assessed in the Environmental Impact Statement and the Preferred Infrastructure and Submissions Report.

Viewpoint 1: View west from Edgeware Road



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 1: View west from Edgeware Road

Existing view

This represents views from the ground floor level of adjacent 2-3 storey residential properties. The site is visible in the background of the view, seen across Edgeware Road and framed through the bridge underpass. The site is characterised by large warehouse buildings and includes graffiti on the warehouses and bridge abutments in the middle ground of the view. In the foreground is the two lane Edgeware Road and an informal area of parking. Some vegetation filters the edge of this view between the rail corridor and viewer.

Viewpoint 1: View west from Edgware Road	
View during approved project construction	It is expected that the approved project would create a noticeable reduction in the amenity of this view, due to the demolition of the existing warehouse and establishment of a 15 metre high acoustic enclosure. This is a view of neighbourhood visual sensitivity, and would result in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	From this location, it is not expected that there would be additional elements seen prominently in the view. The character of construction works for the modification would be generally consistent with the approved project. Overall, with the proposed modification works would not alter the visual impact and there would continue to be a negligible visual impact during construction. This impact is unchanged from the approved project.
View during approved project operation	The construction site would be replaced with the dive structure which would include a substation and industrial character landscape, with throw screens and security fencing on the site boundary which would be visually absorbed into the character of the surrounding industrial area and railway corridor and would result in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	From this location it is not expected that there would be additional elements seen prominently in the view. Overall, with the proposed modification works would not alter the visual impact and there would continue to be a negligible visual impact during operation. This impact is unchanged from the approved project.

Viewpoint 2: View west from the Bedwin Road Bridge



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 2: View west from the Bedwin Road Bridge	
Existing view	This view includes a predominantly industrial landscape with large warehouse buildings adjacent to a wide rail corridor. This view includes graffiti covered walls and some vegetation which softens the boundary between the rail and warehousing.
View during approved project construction	The existing warehousing would be replaced with the approved project construction site. Although the construction site is likely to be more visually prominent in this view, and varied in form, the character of construction works would be visually absorbed into the surrounding setting of light industrial development. It is therefore expected that the approved project would create no perceived change in the visual amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	In the background, the construction site would be visible. The establishment of this site would include the removal of buildings on the site and the street trees in Murray Street, which create the treed skyline in this view. This activity would be perceived as a continuation of the approved project construction works and would generally be absorbed into the character of the surrounding light industrial and railway corridor landscape. For this reason, there would not be a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction. This impact is unchanged from the approved project.

Viewpoint 2: View west from the Bedwin Road Bridge	
View during approved project operation	The construction site would be replaced with the dive structure and additional track, creating a wider rail corridor. Views would be opened up to the industrial development beyond the site, to the west of Edinburgh Road. Despite this change in use and form, it is expected that the approved project would be visually absorbed into the surrounding industrial and railway corridor landscape, and not create a perceived change in the amenity of this view. This would result in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	The construction site would be replaced with Sydney Metro Trains Facility South, expanding the character of the rail corridor. Due to the removal of vegetation, views to the rear of the proposed screening industrial development along Edinburgh Road would be revealed. Despite this change in use and form, it is expected that the proposed modification would be absorbed into the character of the surrounding industrial and railway corridor landscape, and not create a perceived change in the amenity of this view. This would result in a negligible visual impact during operation. This impact is unchanged from the approved project.

Viewpoint 3: View west from Camdenville Park



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 3: View west from Camdenville Park	
Existing view	This view is located within the Goodsell Estate Heritage Conservation Area (CA16, Marrickville LEP) and is characterised by open space with mature trees and wide open grassed fields. The project site is visible in the background of this view, glimpsed over the Bedwin Road Bridge, which forms the southern edge to the park and view.
View during approved project construction	A small portion of this view would change as the existing warehousing is replaced with the approved project construction site. There would also be construction related traffic using the Bedwin Road Bridge, seen in the background of this view. Despite these minor changes the approved project would not create a perceived change in the amenity of this view, which is of local visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	From this location, it is not expected that the proposed modification works would be seen, and would not alter the visual impact. The visual impact would therefore remain as a negligible visual impact during construction.
View during approved project operation	The construction site would be replaced with the dive structure, so that it would not rise above the Bedwin Road Bridge in views from this location. It is therefore expected that the approved project would not create a perceived change in the amenity of this view, resulting in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	From this location, it is not expected that the proposed modification works would be seen, and would not alter the visual impact. The visual impact would therefore remain as a negligible visual impact during operation.

Viewpoint 4: View north-west from Unwins Bridge Road



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 4: View north-west from Unwins Bridge Road	
Existing view	This view towards the site is representative of views from the residential area of St Peters to the southwest of Unwins Bridge Road. In this view existing site safety fencing with mesh screening obstructs views into the existing Sydney Trains Network System Base, which sits at a lower level than Unwins Bridge Road and the adjacent residential area are elevated above the rail corridor and site. The upper portion of warehouses on the site can be seen in the background of the view, over this fence, and filtered by an avenue of mature street trees.
View during approved project construction	The approved project construction site would be seen at a distance and the site works would be visually absorbed into the surrounding industrial landscape. Therefore, it is expected that the approved project would create no perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	The construction works for the proposed modification would be located in the background of the view. Tall equipment used on the site may be visible, seen at a distance and consistent in character with the approved project and surrounding industrial landscape. Overall, there would be no perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction. This impact is unchanged from the approved project.

Viewpoint 4: View north-west from Unwins Bridge Road**View during approved project operation**

The approved project assumed the site would be restored to its former use as light industry. Resulting in no perceived change in the amenity of this view, and a **negligible** visual impact during operation.

Visual impact with the proposed modification during operation

The Sydney Metro Trains Facility South would be raised and include a number of elevated elements, however, these elements are not likely to be prominent in this view, due to distance, and the elevated location of this viewpoint. There would be no perceived change in the amenity of this view, and a **negligible** visual impact during operation. This impact is unchanged from the approved project.

Viewpoint 5: View north from Bolton Street

The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 5: View north from Bolton Street**Existing view**

This view is from an area of light industrial development adjacent to the rail corridor to the north of Sydenham Station. This view is characterised by the surface commuter car park in the foreground and wide rail corridor with overhead lines and support structures. Beyond the rail is a landscape of industrial warehouses. The site can be seen and is currently characterised by industrial warehouses. Some trees can be seen on the site to the northwest of the rail corridor.

Viewpoint 5: View north from Bolton Street	
View during approved project construction	The warehousing and vegetation seen on the site would be removed and replaced with sheds of a similar scale and character to accommodate the precast concrete manufacture plant, as well as grout and concrete silos. There would also be views to construction of the dive structure, TBM launch and support works including acoustic enclosures. This construction activity would be seen in the context of existing light industrial warehousing and would be visually absorbed into this setting. Although the approved project would comprise a large area of the background of this view, there would not be a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	The proposed modification works would extend south to the Sydenham Pit and Drainage Pumping Station and would include works to construct the new pumping station and aqueduct. This construction activity would be seen in the context of the construction site for the approved project, in the background of this view. Due to the scale and extent of the works, the project including the proposed modification works, would result in a noticeable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction. Although there would be a reduction in the amenity of this view created by the proposed modification works, the impact level would remain unchanged from the approved project.
View during approved project operation	The construction site would be replaced with the dive structure, and additional track, creating a wider rail corridor in the background of the view. In the middle ground the construction site would be returned to light industrial landuses. This change would be visually absorbed into the character of the surrounding light industrial and railway corridor landscape. This change would not have a perceived effect on the amenity of this view, resulting in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	The construction site would be replaced with the additional rail permanent way and stabling at the Sydney Metro Trains Facility South creating the character of a wider rail corridor in the middle and background of the view. The aqueduct over the Sydenham Pit and Drainage Pumping Station would also be seen, rising above the pit in the background. This change would be largely consistent with the character of the surrounding light industrial and railway corridor landscape. This change would not have a perceived effect on the amenity of this view, resulting in a negligible visual impact during operation. This impact is unchanged from the approved project.

Viewpoint 6: View north-east along Railway Parade



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 6: View north-east along Railway Parade	
Existing view	This view, oriented along Railway Parade, is bound to the east (right of view) by the railway corridor with overhead lines and support structures. The heritage listed Sydenham Pit and Drainage Pumping Station is visible to the northwest (left of view), filtered through black palisade security fencing. The Sydney Water pumping station, decorated in street art, can be seen in the centre of the view. Vegetation and industrial warehouses on the site can be seen in the background of the view, extending west from the rail corridor. Although large scale buildings, there is a varied roofline, which creates interest in this view.
View during approved project construction	A large portion of the background of this view would change with the demolition of the visible warehousing and trees, and establishment of large sheds and silos. The approved project would create a noticeable reduction in the amenity of this view, which is of neighbourhood sensitivity and a negligible visual impact during construction.
Visual impact with the proposed modification during construction	During construction this viewpoint would not be accessible, as the construction site would extend across this area. For this reason there has been no re-assessment undertaken for this view.

Viewpoint 6: View north-east along Railway Parade	
View during approved project operation	The assessment of the approved project assumed the site would be returned to its former use for light industry which would not create a perceived change in the amenity of this view, resulting in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	This viewpoint would not be accessible, as the rail corridor would be widened in this areas and new tracks leading to the stabling yard would be established in this area. For this reason there has been no re-assessment undertaken for this view.

Viewpoint 7: View southeast from Sydney Steel Road to footpath connection with Shirlow Street



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 7: View southeast from Sydney Steel Road to footpath connection with Shirlow Street	
Existing view	In the centre and to the southeast (left of view) large warehouses, with a varied roofline and large doors, dominate this view. The street has a light industrial character with working vehicles, equipment, large skip bins and chainwire security fencing visible. To the south (right of view) these large warehouses frame a pedestrian footpath which is aligned away from the view. The warehouses create a canvas for both graffiti and the work of street artists. The street art is regularly changing and evolving, attracting the eye along this narrow and brightly coloured corridor.
View during approved project construction	The warehouses in the centre of this view, including the street art and graffiti, would be removed. The works would be generally consistent with the current character of the site and it is expected that the approved project would not create a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	Following the construction works required for the approved project, road works would be undertaken to extend Sydney Steel Road, and open up views to the Sydenham Pit and Drainage Pumping Station in the background. It is expected that the proposed modification would not create a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction. This impact is unchanged from the approved project.
View during approved project operation	The assessment of the approved project assumed that the construction site would be restored to its former use as light industry. Therefore the approved project would not create a perceived change in the amenity of this view, resulting in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	In the centre of this view, a new extension of Sydney Steel Road would be seen connecting to the northwestern corner of the Sydenham Pit and Drainage Pumping Station and opening up views to the open space adjacent to Shirlow Street. The future metro train stabling screening development zone would be seen to the east (left of view). Although the proposed modification works would comprise a large area of the view, the proposed modification would be visually absorbed into the surrounding light industrial character. This would not create a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction. This impact is unchanged from the approved project.

Viewpoint 8: View south-west from Sydney Steel Road



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 8: View south-west from Sydney Steel Road	
Existing view	This view is softened by trees to the west of Sydney Steel Road and a tree lined concrete drain, which can be seen in the middle ground of this view. Filtered by these trees, in the centre of the view, are large warehouses located within the project site. The street has a light industrial character with working vehicles, equipment and chainwire security fencing visible.
View during approved project construction	The warehouses in the centre, background of this view would be removed and replaced with temporary construction sheds of a similar scale and character. Trees within the street and along the drain would filter and visually soften these elements. The approved project would not create a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	The construction site would be expanded to include areas of the foreground and middle ground of this view. This would include the removal of all buildings and trees located to the east of Sydney Steel Road (left of view). Construction works would extend across the site. This would create a considerable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a minor adverse visual impact during construction. This impact is increased from the approved project.

Viewpoint 8: View south-west from Sydney Steel Road

View during approved project operation	The assessment of the approved project assumed the site would be restored to its former use as light industry. This would not create a perceived change in the amenity of this view, resulting in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	The future stabling facility screening development zone would be seen to the east (left of view), raised up above the streetscape. Sydney Steel Road would be seen, extending south towards the Sydenham Pit and Drainage Pumping Station in the background. Although the proposed modification works would comprise a large area of the view, the screening development would obstruct views to the stabling yard facilities, and be consistent in character with the surrounding light industrial development. Overall, this would not create a perceived change in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction. This impact is unchanged from the approved project.

Viewpoint 9: View south-east from the corner of Murray Street and Edinburgh Road

The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 9: View south-east from the corner of Murray Street and Edinburgh Road	
Existing view	This view includes a predominantly industrial landscape with large brick warehouse buildings. Although this view and the site do not include any heritage items, the age of this warehousing, brick construction and level of detail in the treatment of the facades give this view a historic character. The footprint of these buildings is large with wide roads, narrow footpaths and without street trees, resulting in a highly urbanised view.
View during approved project construction	The warehouse in the centre of the view would be demolished and replaced with the construction site. An acoustic enclosure would be seen in the background of the view, rising to 15 metres. Although this change would alter the character of the view, the character of construction works would be visually absorbed into the setting of light industrial and warehousing. This would result in a noticeable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during construction	There would be site filling to create a platform for the stabling facility that is elevated by approximately two metres above the streetscape. The preparation of the future screening development would also be seen in the centre of the view. This would result in a considerable reduction in the amenity of this view, which is of neighbourhood visual sensitivity, and a minor adverse visual impact during construction. This impact is increased from the approved project.
View during approved project operation	The assessment for the approved project assumed that the dive structure would be in the background of this view, and the project would be visually absorbed into the character of the surrounding industrial and railway corridor landscape. This would result in a noticeable reduction in the amenity of this view, which is of neighbourhood sensitivity, and a negligible visual impact during operation.
Visual impact with the proposed modification during operation	Future screening development would be seen in the centre of this view, obstructing views to the stabling facility beyond. This development would be raised up from street level by approximately two metres, and be filtered by new street trees. The character of this development would be contemporary, and have less visual interest than the adjacent historic character brickwork buildings opposite. This would result in there being no perceived change in the amenity of this view, which is of neighbourhood sensitivity, and a negligible visual impact during operation. This impact is unchanged from the approved project.

Viewpoint 10: Views from the rail corridor



The following is an update of the assessment of visual impact from the assessment for the approved project, incorporating an assessment of the proposed Sydenham Station and Sydney Metro Trains Facility South modification.

Viewpoint 10: Views from the rail corridor	
Existing view	Views north and southbound from the rail corridor include a largely industrial landscape, with some localised filtering through vegetation alongside the corridor.
View during approved project construction	The removal of vegetation alongside the rail corridor would open up views to the site. Within the site there would be unobstructed views to the construction site including TBM support works, spoil storage, acoustic enclosures, workshops, site offices, and silos. It is expected that due to the scale of these works the approved project would create a noticeable reduction in the visual amenity of views from trains using this corridor, which are of local visual sensitivity, resulting in a minor adverse visual impact during construction.
Visual impact with the proposed modification during construction	The relocation of open brick-lined drains, located adjacent to the site, and work within the Sydenham Pit and Drainage Pumping Station would be seen unobstructed from the rail corridor. In particular, the visibility of the Sydenham Pit and Drainage Pumping Station would be obstructed during this time and the existing pumping station building would remain but be seen surrounded by construction activity. In the middle and background of these views there would be considerable earthworks to create a level platform and the construction of lines and stabling (ballasted track on concrete sleepers), and associated buildings. It is expected that due to the scale of these works the proposed modification, and particularly the changes to the Sydenham Pit and Drainage Pumping Station, would create a considerable reduction in the amenity of views from trains using this corridor. As these views are of local visual sensitivity, this would result in a moderate adverse visual impact during construction. This impact is increased from the approved project.

Viewpoint 10: Views from the rail corridor	
View during approved project operation	There would be an intensification of rail activity seen on the corridor, including the new metro line and dive structure. It is expected that the approved project would not create a perceived change in the amenity of this view, resulting in a negligible visual impact during operation.
Visual impact with the proposed modification during operation	There would be an even greater intensification of rail activity seen on the corridor, including numerous tracks on ballast for stabling, maintenance vehicle storage and maintenance sheds seen beyond the new metro line and dive structure. Views to the Sydenham Pit and Drainage Pumping Station would be altered substantially with the introduction of an aqueduct which would obstruct the existing views of the pit walls and open water. The pumping station would remain, with street artwork, however it would be seen enclosed by expanded rail corridor and drainage infrastructure. Although much of this view would be generally consistent in character with the existing view of construction and industrial uses, the changes to the Sydenham Pit and Drainage Pumping Station would create a considerable reduction in the amenity of these views. It is expected that the proposed modification would be a considerable reduction in the amenity of this view, resulting in a moderate adverse visual impact during operation. This impact is increased from the approved project.

Viewpoint 11: View from path between Shirlow Street and Sydney Steel Road



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 11: View from path between Shirlow Street and Sydney Steel Road	
Existing view	This view from a well-used local route between the station and industrial areas to the northwest, offers views through perimeter security fencing to the Sydenham Pit and Drainage Pumping Station. The pit walls, open water and pumping station building can all be seen from this location. Street art on the pumping station building is oriented towards the rail corridor and cannot be seen. The industrial buildings to the north of the pit (left of view) would have been removed as a part of the approved project, and would have an existing construction character.
Visual impact with the proposed modification during construction	In the middle ground of this view, construction of the new aqueduct structure and new pumping station building would be seen extending across the much of the southern portion of the pit. This would obstruct some views to the existing pumping station building, walls and open water of the pit, and alter the character of the view with the introduction of a construction character across the pit, to the north (left of view) with works at the stabling site, and beyond (across the view) to the works between the pit and railway corridor. It is expected that there would be a considerable reduction in the visual amenity of the Sydenham Pit and Drainage Pumping Station while construction works are undertaken. As this is a view of local sensitivity, this results in a moderate adverse visual impact during construction.
Visual impact with the proposed modification during operation	In the middle ground of this view, the new viaduct structure would be seen aligned across the view, this would include a concrete structure on piers, with both open and enclosed channel sections above, a ramp structure leading to the base of the pit, and a new pumping building. This structure would obstruct views to the lower parts of the pumping station, southern brick walls, and reduce the overall area of water visible. To the north (left of view) a new road would be visible, aligned parallel to the pit. The stabling facility would be seen to the north, in the middle ground of the view. In the background, the aqueduct would diverge into two separate channels and ramps down to connect with existing channels downstream (out of view). This view is currently a predominantly industrial character with the Sydenham Pit and Drainage Pumping Station providing some visual respite and interest within this intensely developed view. Overall, it is expected that the proposed modification would create a considerable reduction in the amenity of this view due to the scale of the aqueduct and substantial change to the visibility of the Sydenham Pit and Drainage Pumping Station. This would result in a moderate adverse visual impact during operation.

Viewpoint 12: View south-east along Edinburgh Road



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 12: View south-east along Edinburgh Road	
Existing view	This view is from Edinburgh Road, a well-utilised route between Victoria and Edgeware roads in Sydenham's industrial precinct. A group of trees, including mature eucalypts, can be seen along the eastern side of Edinburgh Road, filtering views to the commercial office and industrial buildings (102-112 Edinburgh Road). Midrise heritage character brick industrial buildings flank the road to the west (left of view). In the background, midrise industrial buildings to the east of Edinburgh Road would have been removed by the approved project.
Visual impact with the proposed modification during construction	The trees along Edinburgh Road, and within the adjacent commercial office and industrial buildings, which comprise a substantial portion of this view, would be removed. The leafy character of this view would be replaced with the construction site and construction traffic would be seen using Edinburgh Road. It is therefore expected that there would be a considerable reduction in the amenity of this view, which is of neighbourhood visual sensitivity resulting in a minor adverse visual impact during construction.
Visual impact with the proposed modification during operation	Screening development would be seen in the centre of this view, obstructing views to the stabling facility beyond. There would be new street tree planting along Edinburgh Road. These elements would obstruct views to the stabling facility, and soften the view somewhat. There would be a contrast between the proposed screening development and historic brick character industrial buildings which have a texture and materiality that contribute to the amenity of this view. However, it is expected that the proposed modification would be consistent in character of the surrounding industrial areas, be filtered by new street tree planting, and not create a perceived change in the amenity of this view. This would result in a negligible visual impact during operation.

Sydenham Station

Selection of representative viewpoints

The proposed modification would introduce potential daytime visual impacts in new areas that were not assessed for the approved project. Five representative viewpoints were selected to inform the visual amenity assessment for the proposed modification. The five additional representative viewpoints (shown in Figure 16-7) are:

- Viewpoint 1: View north-east from Railway Parade
- Viewpoint 2: View south-east from Sydenham Road
- Viewpoint 3: View south-west from Railway Parade
- Viewpoint 4: View north-west from Hogan Avenue
- Viewpoint 5: View north-east along Burrows Avenue.

The location of these viewpoints is provided in Chapter 16 of the modification report.

Viewpoint 1: View north-east from Railway Parade



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 1: View north-east from Railway Parade	
Existing view	This view includes the heavily trafficked Railway Parade in the foreground, the Gleeson Avenue entrance to Sydenham Station in the middle ground, and the rail corridor in the background. From this elevated location, the view extends over the station's perimeter brick walls (heritage listed) to the heritage buildings on platforms 1, 2/3 and 4/5. The contemporary Gleeson Avenue Station entry has a folded roofline, which draws upon the pitched rooflines of the heritage platform buildings, and creates a complementary transition between heritage and contemporary architecture. Beyond the station, the wide rail corridor consists of overhead lines and support structures, passing through a landscape of light industrial warehouses. There are distant views of the city, including Sydney Tower. Vegetation at the intersection of Railway Parade and Sydenham Road partially filters views to the industrial areas of Marrickville and the proposed Sydney Metro Trains Facility South.
Visual impact with the proposed modification during construction	During construction, upper Railway Parade would remain open to traffic and the station entrance on Gleeson Avenue would be unchanged. A construction site would be seen to the northeast (left of view) at the corner of Sydenham Road and Railway Parade, replacing the heritage listed parcels office building on platform 1, group of street trees on the triangular island refuge, and adjacent footpath (on south side of Railway Parade). The removal of the industrial buildings at 1-11 Sydenham Road would also be visible in the background. Construction vehicles would access this site and compound at the corner of Railway Parade and Sydenham Road in the background of this view. Installation of the footbridge would be visible, beyond the heritage listed platform buildings. The character of construction works would generally be absorbed into the surrounding setting of industrial development, seen in the background of this view. It is expected that the proposed modification would create a noticeable reduction in the visual amenity of this view, which is of local visual sensitivity, resulting in a minor adverse visual impact during construction.
Visual impact with the proposed modification during operation	The new northern station entry would be visible at the corner of Sydenham Road and Railway Parade. An entry plaza with new paving, planning, bicycle parking, storage building, and bus interchange would be seen at street level. A footbridge would be seen above this entry at Sydenham Road and extending south over the station platforms, including a canopy structure, lift shafts and stairs. This structure would be a prominent skyline feature visible beyond the heritage station platform buildings. The introduction of this additional architectural element, with a layered horizontal roofline adjacent to the pitched rooflines of the heritage platform buildings, and folded roof structure of the Gleeson Avenue station entry building, would create a new focal point in this view, which contrasts with the character of the existing station architecture. The heritage platform buildings would be largely enveloped into the contemporary station architecture. The absence of trees at the corner of Sydenham Road and Railway Parade would reveal views to the realigned lower Railway Parade (including a signalised intersection at Sydenham Road), stormwater drainage channel and adjacent industrial buildings. A new services building would be seen on Railway Parade, beyond the station entrance. Despite the extent of change to this view, it is expected that the proposed modification would be visually compatible with the character of the surrounding industrial area, railway corridor, and station, resulting in no perceived change in the amenity this view. This view is of local sensitivity, resulting in a negligible visual impact during operation.

Viewpoint 2: View south-east from Sydenham Road



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 2: View south-east from Sydenham Road

Existing view

Views to the station precinct are framed by an industrial warehouse and a double storey heritage character terrace building at the corner of Railway Parade and Sydenham Road. Views into the station are largely obstructed by billboards and vegetation within the triangular island refuge. There are, however, glimpses through the rail corridor fencing and over the brick station perimeter walls (heritage listed), to the platform signage, overhead lines and support structures, and the rooftops of heritage buildings on platforms 2/3 and 4/5. Part of the brick Parcels Office building on platform 1 can be seen to the south of the view (right of view).

Viewpoint 2: View south-east from Sydenham Road	
Visual impact with the proposed modification during construction	Sydenham Road and Railway Parade would remain open to traffic during construction. The construction site and site access would extend outside of the rail corridor at the junction of these roads in the centre, middle ground of this view. The works would begin with the removal of the triangular island refuge and mature group of trees, billboards and fencing along the rail corridor boundary, as well as the heritage listed parcels office building on platform 1. The removal of the industrial buildings at 1-11 Sydenham Road would be seen in the foreground of this view and a construction compound would be established on this site. These elements comprise much of the centre of this view. Demolition of these buildings would open-up a view to the new services building construction site. The compound would be enclosed by hoarding, and construction sites enclosed by security fencing, partly obstructing views to the rail corridor and visually enclosing the street level activities within these sites. Installation of the footbridge would be visible in the centre of this view, rising above the platform level. Roadworks including works to construct the signalised intersection at the intersection of Railway Parade and Sydenham Road would also be seen, unobstructed, in the centre of this view. Despite the surrounding setting of predominantly industrial development, due to the scale and extent of these works, it is expected that the proposed modification would create a considerable reduction in the visual amenity of this view, which is of neighbourhood visual sensitivity, resulting in a minor adverse visual impact during construction.
Visual impact with the proposed modification during operation	The new northern station entry would be seen prominently on the axis of this view at the corner of Sydenham Road and Railway Parade. It would include an entry plaza with new paving, planting, bicycle parking and storage building and adjacent bus interchange at street level. The footbridge and canopy structures would rise higher than all the surrounding built form and be the foremost element in this view. The realigned lower Railway Parade and new signalised intersection at Sydenham Road would also be visible in the foreground. The earlier removal of buildings and trees at the corner of Sydenham Road and Railway Parade, would open-up a view to the rail corridor and adjacent new services building. The new station entrance would provide an architectural treatment that is compatible with the scale of the surrounding light industry, would clearly mark the station entry, and have a less visually cluttered plaza space including new trees. Although the heritage character of this view would have been diminished somewhat, these architectural qualities and public realm improvements would result in an improvement in the amenity of this view. Overall, there would be a considerable improvement in the amenity of this view, which is of neighbourhood sensitivity, resulting in a minor beneficial visual impact during operation.

Viewpoint 3: View south-west from Railway Parade

The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 3: View south-west from Railway Parade	
Existing view	This view is from Railway Parade east, a laneway primarily used by those working in Sydenham's industrial precinct. This view is positioned slightly below the track, allowing the rail corridor including trains, overhead lines and support structures, and black palisade perimeter fence to dominate the view. These structures filter views to the station buildings, including heritage listed platform buildings. Between the rail corridor and Railway Parade, an open brick-lined drainage channel (heritage listed), mostly covered in graffiti, is visible through the adjacent fencing. The industrial buildings to the south (left of view) are seen with some intervening vegetation.
Visual impact with the proposed modification during construction	This part of Railway Parade would be enclosed by construction activity so that this view would not be accessible. The drainage channel would be relocated; as would the adjacent black palisade fencing. The industrial buildings at 1-11 Sydenham Road would also be removed to enable construction of the new services building and adjacent realignment of lower Railway Parade. As this location would not be accessible during construction, the impact has not been assessed.

Viewpoint 3: View south-west from Railway Parade

Visual impact with the proposed modification during operation

The drainage channel, lower Railway Parade and the adjacent industrial buildings at 1-11 Sydenham Road would be replaced by a new services building and realigned lower Railway Parade. The foreground of this view would be flanked by the new services building to the south (left of view) and bus layover area to the north (right of view). The new metro platforms, segregation and boundary fencing would be visible to the south of the service building. The northern station entry on Railway Parade would be visible in the middle ground of the view, with canopy structure, footbridge (including lifts and stairs) rising above the surrounding built form and obstructing views to the heritage platform buildings and Gleeson Avenue overbridge beyond. At street level the view would include a new entry plaza with trees. Overall, there would be a noticeable improvement in the amenity of this view, which is of neighbourhood visual sensitivity, resulting in a **negligible** visual impact during operation.

Viewpoint 4: View north-west from Hogan Avenue



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 4: View north-west from Hogan Avenue	
Existing view	This location represents views from a small residential area to the south of the station. To the left of view, heritage character single and double storey terraces and detached houses with street tree plantings are visible in the middle and foreground. Beyond this, the rail corridor is defined by perimeter security fencing, filtering views to the station platforms and heritage platform buildings. The overhead lines and support structures are prominent features of this scene, visible above the rail corridor fencing. The Bolton Street commuter car park is also visible in the middle ground.
Visual impact with the proposed modification during construction	The construction site would extend across the station area, visible in the centre middle ground of this view. Construction of the new eastern station entrance, footbridge and bicycle storage building would be seen extending across the adjacent footpath, part of Burrows Avenue, including the triangular island refuge and adjacent on-street parking. The construction site would be visible through perimeter security fencing, and access to the site would be located at Burrows Avenue. This activity would create a considerable reduction in the amenity of this view, which is of neighbourhood visual sensitivity. This change would result in a minor adverse visual impact during construction.
Visual impact with the proposed modification during operation	The new footbridge (including lifts and stairs) would be visible in the centre middle ground of this view. The eastern station entrance, including the entry plaza with new paving, street tree planting, bicycle parking and bicycle storage building would be seen on Burrows Avenue, incorporating the former island refuge and slip lane on Burrows Avenue. These elements would create a setting for the footbridge and bring the station precinct closer to the adjacent residential properties. It is expected that the proposed modification would result in a noticeable improvement in the amenity of this view, resulting in a negligible visual impact during operation.

Viewpoint 5: View north-east along Burrows Avenue



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 5: View north-east along Burrows Avenue	
Existing view	This view, located adjacent to a double storey terrace building with shopfront café, offers elevated views over the station platforms, rail corridor and commuter car park. In the background of this view is the CBD skyline including the distinctive Sydney Tower. To the north (left of view), the platforms are in a cutting, so only the platform canopies, upper parts of the overhead wiring and support structures, and the rooftop of the heritage building on platform 4/5, can be seen. The heritage building and adjacent platform canopies on platform 6 can be seen along Burrows Avenue, and extending north and south from these buildings white palisade fencing defines the southern boundary of the rail corridor. To the east of the station, the rail corridor can be seen as it passes the Sydenham Pit and Drainage Pumping Station and adjacent industrial areas, in the background of this view. This part of the view includes track, trains, overhead wiring and support structures.
Visual impact with the proposed modification during construction	The construction site would extend across the centre middle ground of this view. It would include the site of the heritage listed building on platform 6, which would be demolished. The construction site would be surrounded by site security fencing, and above this the construction of the new eastern station entrance would be visible. This construction site would also extend across the adjacent parts of Burrows Avenue including the footpath, centre island refuge, on-street parking, palisade fencing and brick walls. Construction vehicle traffic would be visible along Burrows Avenue, with site access adjacent to the commuter car park on Bolton Street. This activity would create a noticeable reduction in the amenity of this view, which is of local visual sensitivity, resulting in a minor adverse visual impact during construction.

Viewpoint 5: View north-east along Burrows Avenue**Visual impact with the proposed modification during operation**

In this view the on-street parking along the north side of Burrows Avenue would be replaced with a new kiss-and-ride, and taxi parking zone. Beyond this, the eastern station entrance would be visually prominent and include the overhead footbridge with lifts and stairs, and an entry plaza with new paving, tree planting, bicycle parking and storage building. The new footbridge would make an architectural statement that marks the new station entry, and somewhat obstructs views to the rail corridor. It may also obstruct views to the Sydney CBD skyline beyond, and contrast with the scale of adjacent residential areas. Overall, the proposed modification would be absorbed into the character of the station precinct, with improved streetscape treatments providing a transition to the residential character opposite. This would result in no perceived change in the amenity of this view, which is of local sensitivity, and a **negligible** visual impact during operation.

Rail corridor

Selection of representative viewpoints

The proposed modification would introduce potential daytime visual impacts in new areas that were not assessed for the approved project. Two representative viewpoints were selected to inform the visual amenity assessment for the proposed modification. The two additional representative viewpoints (shown in Figure 16-7) are:

- Viewpoint 1: View north-west from Tillman Park, Tempe
- Viewpoint 2: View south from Fraser Park, Marrickville.

The location of these viewpoints is provided in Chapter 16 of the modification report.

Viewpoint 1: View north-west from Tillman Park, Tempe



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 1: View north-west from Tillman Park, Tempe	
Existing view	This view shows the northern boundary of Tillman Park, where it adjoins the rail corridor. The T4 Illawarra Line can be seen in this view, and is level with the park at this location. A wide corridor of mature trees, shrubs and grasses can be seen along the park and rail site boundary, filtering views to the overhead wiring and upper parts of the trains and support structures of the T4 Illawarra Line.
Visual impact with the proposed modification during construction	A construction site would be established in the background of this view but would not be visible due to intervening vegetation. Some construction may rise above the vegetation and be visible in the background of the view, including the installation of overhead lines and support structures, trackside services and segregation fencing and noise barriers within the corridor. This activity would not create a perceived change in the amenity of this view, which is of local visual sensitivity, resulting in a negligible visual impact during construction.
Visual impact with the proposed modification during operation	Similarly, during operations, there may be glimpses to the new overhead wiring and support structures, operational infrastructure, telecommunication masts, segregation fencing and noise barriers, filtered through the existing rail infrastructure and vegetation. The structures would be glimpsed through existing rail infrastructure and vegetation, and largely absorbed into the character of the existing rail corridor. There would be no perceived change in the amenity of this view, which is of local visual sensitivity, resulting in negligible visual impact during operation.

Viewpoint 2: View south from Fraser Park, Marrickville



The following is an assessment of an additional viewpoint to those assessed for the approved project, to assess the potential visible elements of Sydenham Station and Sydney Metro Trains Facility South.

Viewpoint 2: View south from Fraser Park, Marrickville	
Existing view	This view includes the main field and clubhouse at Fraser Park in the foreground, with the T3 Bankstown Line rail corridor visible in the background, to the west of the clubhouse. In this location, there is limited vegetation and chain mesh fencing along the northern side of the rail corridor, allowing clear views to the rail embankment, overhead wiring and support structures and passing trains. These elements are viewed against a mature backdrop of trees within the parkland beyond.
Visual impact with the proposed modification during construction	The construction activities would be seen along the corridor, in the background of this view, beyond the southern end the football field. Although this site would be enclosed by security fencing and shade cloth, some works would be visible including the demolition works (including removal of the track, overhead wiring and support structures and some vegetation south of the track), earthworks, relocation and installation of the trackside services, operational infrastructure and drainage, new track formation to access the Sydenham Maintenance Centre, and installation of two new metro lines, segregation fencing and noise barrier south of the track. Closure of the Sydenham Maintenance Centre access bridge and associated footpath would also be visible. This view would also include construction vehicle movement, and access to the construction site near the main car park. Overall, this activity would create a noticeable reduction in the amenity of this view, which is of local visual sensitivity, resulting in a minor adverse visual impact during construction.

Viewpoint 2: View south from Fraser Park, Marrickville	
Visual impact with the proposed modification during operation	Noise barriers along the northern boundary of the corridor would be seen in the middle ground of this view. Beyond this wall, the upper parts of metro trains, overhead wiring and support structures, operational infrastructure and telecommunication masts would be visible. Views to the T4 Illawarra Line trains would also be obscured by the noise barrier. Although there would be some vegetation loss along the southern rail corridor, the treed skyline of Tillman Park would remain. The noise barrier would enclose views within Fraser Park and obstruct views to the infrastructure and movement of trains within the rail corridor. On balance, there would not be a perceived change in the amenity of this view, which is of local visual sensitivity, resulting in negligible visual impact during operation.

Assessment of night-time visual impact

Sydney Metro Trains Facility South

Night-time visual impact	
Existing night-time setting	The setting of the Sydney Metro Train Facility South is an area of E3: Medium district brightness. This is due to the moderately lit industrial buildings and streets, and lit trains using the adjacent railway corridor.
Night-time setting during approved project construction	It is likely that there would be night works required at this location during construction, including 24 hour spoil haulage. Much of the night works would be contained within the acoustic enclosure and warehouses, however, remaining areas of the site would include security, vehicle and task lighting. This would result in the site, as well as adjacent areas being more brightly lit than the existing setting. It is not expected that this lighting would create a perceived change in the amenity of views, resulting in a negligible visual impact during evening hours.
Night-time impact with the proposed modification during construction	There would be lighting extending across a larger site area, including to the Sydenham Pit and Drainage Pumping Station in the south and to include areas south of Murray Street and to Edinburgh and Sydney Steel roads. At all times the site would include security lighting. It is also likely that there would be night works required at this location during construction, including 24-hour vehicle access. This work would create additional light sources and skyglow during these times, which would not be contained within the acoustic enclosures established at the dive site. However, as the site is located within a largely industrial landscape and adjacent to the active rail corridor, this additional lighting would be generally absorbed into the surrounding night scene. Overall, there would be no perceived change to the amenity of views within this area, resulting in a negligible visual impact at night. This impact is unchanged from the approved project.
Night-time setting during approved project operation	The dive structure would be moderately lit at night due to train headlights and security on associated services buildings. This lighting would be relatively contained by the walls of the dive structure as the trains approach the tunnel entrance in the vicinity of Edgeware Road. This lighting would be generally consistent with the surrounding medium district brightness environment and there would be a negligible visual impact during evening hours.

Night-time visual impact	
Night-time impact with the proposed modification during operation	The Sydney Metro Trains Facility South would be brightly lit at night as much of the maintenance and cleaning work is undertaken after hours. This would include lighting of the maintenance and inspection sidings, train stabling areas, internal roads, amenity buildings, parking and vehicle parking areas. It is likely that much of this light would be screened from adjacent industrial development on Edinburgh and Sydney Steel roads by screening development. There may be views to direct light sources from surrounding areas to the east and north, and from the rail corridor, however, and a general skyglow above the site. This lighting would be generally absorbed into the surrounding industrial landscape. Overall, this lighting would be generally consistent with the surrounding medium district brightness environment. It is expected that during operation the lighting of the proposed modification would not create a perceived change in visual amenity, resulting in a negligible visual impact at night. This impact is unchanged from the approved project.

Sydenham Station

The proposed modification would introduce potential night-time visual impacts around Sydenham Station that were not assessed for the approved project. As such, these would be additional impacts of the proposed modification.

Night-time visual impact	
Existing night-time setting	The setting of the Sydenham Station is an area of E3: Medium district. This is due to the brightly lit station buildings and platforms, moderately lit industrial buildings and streets, lit trains using the adjacent railway corridor, and surrounding densely urban areas.
Night-time impact with the proposed modification during construction	It is likely that there would be night works required at this location during construction, including 24-hour construction vehicle access. Much of the night works would occur within the station footprint and to the northeast at the compound on Sydenham Road and Railway Parade, set within a largely industrial landscape. Although additional light sources and skyglow would be seen in this area, this additional lighting would be absorbed into the surrounding night scene. There would, however, be works on Burrows Avenue which is located adjacent to the residential properties on George and Hogan streets. This may result in some additional light visible from these properties including views to both direct light sources and general skyglow above the southeastern area of the station. Overall, it is expected that this lighting would create a noticeable reduction in the amenity of views from residential properties on Burrows Avenue, resulting in a minor adverse visual impact at night.
Night-time impact with the proposed modification during operation	The station would be brightly lit at night including additional lighting around the new footbridge and along the platforms extending to the northeast of the station. There would also be headlights seen on the additional metro trains using platforms 1 and 2/3. This lighting would be generally consistent with the intensity of lighting seen at the existing station. At the northern entry to the station, on Railway Parade, the location of lighting on the elevated footbridge, and within the plaza and interchange areas would extend the lighting beyond the exiting station area. However, this lighting would be generally absorbed into the surrounding industrial landscape. On Burrows Avenue, the new station entry footbridge, plaza, and interchange areas would be brightly lit. This increased area of increased intensity of lighting would be near residential properties on Burrows Avenue, George and Hogan streets. It is expected that there would be a reduction in amenity in views at night from these locations. Overall, there would be a noticeable reduction in the amenity of views from adjacent residential streets, an area of medium district brightness. It is expected that during operation the lighting of the proposed modification would create a noticeable reduction in the amenity of views, resulting in a minor adverse visual impact at night.

Rail corridor

The proposed modification would introduce potential night-time visual impacts around the rail corridor between Sydenham Station and Marrickville that were not assessed for the approved project. There would be additional impacts of the proposed modification.

Night-time visual impact	
Existing night-time setting	The setting of the rail corridor and ancillary works is E3: Medium district brightness. This is due to the surrounding commercial and residential areas and lit trains using the rail corridor.
Night-time impact with the proposed modification during construction	There would be night works required along the rail corridor during construction, namely during rail possession periods, including 24-hour construction vehicle access via local streets. Much of the night works would occur within the rail corridor, however, adjacent areas that may also be affected by night works include the adjacent construction sites. It is expected that there would be a reduction in amenity for views at night from adjacent properties during these times, however any additional light sources and skyglow would be seen in the context of a high and moderately well-lit setting, and would generally be absorbed into the surrounding night scene. Overall, it is expected that this lighting would create a noticeable reduction in the amenity. This would result in a minor adverse visual impact in areas of E3: Medium district brightness during construction.
Night-time impact with the proposed modification during operation	The rail corridor would not be lit at night, however the headlights and internal lighting of a more frequent metro train service, would be seen along the alignment. The services building on Gleeson Avenue would require some lighting for security. However, this would be generally consistent with the surrounding areas of moderate district brightness. Overall, there would be a noticeable reduction in visual amenity at night from adjacent residential and commercial areas due primarily to the increase in train activity along the corridor. This would result in a minor adverse visual impact during operation.

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**SYDENHAM STATION AND SYDNEY METRO TRAINS FACILITY SOUTH
MODIFICATION REPORT**