



Parramatta Powerhouse Museum Early Works Construction Environmental Management Plan

Prepared by
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For
Infrastructure NSW



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NSW Manager

Specialist Deconstruction Services

- Industrial demolition contractors ■ Mine closure consulting ■ 3D Modelling
- Demolition consultants ■ Asbestos abatement

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1. BACKGROUND

1.1. INTRODUCTION

The purpose of this Construction Environmental Management Plan (CEMP) is to address Condition C35 for the Powerhouse Parramatta project SSD-10416.

1.2. BACKGROUND

The Powerhouse is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's *A Plan for Growing Sydney* as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the Greater Sydney Region Plan.

Powerhouse Parramatta will be the first State cultural institution to be located in Western Sydney - the geographical heart of Sydney. In December 2019, the Government announced the winning design, by Moreau Kusunoki and Genton, for the Powerhouse Parramatta from an international design competition.

1.3. SITE DESCRIPTION

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site boundary is identified in **Figures 1, 2 and 3**. The site excludes the GE Office Building at 32 Phillip Street. The site is currently occupied by a number of buildings and structures, including:

- Riverbank Car Park – a four-level public car park
- St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s
- Willow Grove – A two- storey Victorian Style Villa built in the 1870's.
- 36 Phillip Street – a two-storey building comprising retail and business premises

- 40 Phillip Street – a two-storey building comprising retail and business premises
- 42 Phillip Street – a building set back from the street
- Parramatta River Foreshore (Footpath and Pier)

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.



Figure 1 - Aerial photograph of the site and its context
Source: Mark Merton Photography



Figure 2 - Site boundary, key existing features, and immediate local context

Source: Ethos Urban

1.4. OVERVIEW OF PROPOSED EARLY WORKS

The construction of Powerhouse Parramatta will be undertaken in stages. The first stage of construction (the subject of this CEMP) is Early Works which comprises:

- Site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- Demolition of existing buildings including the existing Riverbank Car Park, part of 'St George's Terrace' and all other existing structures located on the site except Willow Grove;

1.5. CEMP ASSESSMENT REQUIREMENTS

The CEMP addresses Conditions of Consent C35:

Condition of Consent	Section Referenced
C35. Prior to the commencement of construction, the Applicant must submit a Construction Environmental Management Plan (CEMP) to the Certifier and provide a copy to the Planning Secretary. The CEMP must include, but not be limited to, the following:	
(a) Details of:	
(i) hours of work;	Section 3
(ii) 24-hour contact details of site manager;	Section 12 & 13
(iii) management of dust and odour to protect the amenity of the neighbourhood;	Sections 8.3 and 8.4
(iv) stormwater control and discharge;	Section 8.6
(v) measures to ensure that sediment and other materials are not tracked onto the roadway by vehicles leaving the Subject site;	Sections 8.3 and 8.6
(vi) groundwater management plan including measures to prevent groundwater contamination;	Section 8.6
(vii) external lighting in compliance with AS 4282-1997 Control of the obtrusive effects of outdoor lighting;	Section 8.9
(viii) community consultation and complaints handling;	Section 13
(ix) detail the quantities of each waste type generated during construction and the proposed reuse, recycling and disposal locations;	Section 10.2

(b) Construction Traffic and Pedestrian Management Sub-Plan; (c) Construction Noise and Vibration Management Sub-Plan; (d) Construction Soil and Water Management Sub-Plan; (e) Construction Flood Emergency Response;	See separate reports as noted.
(f) an unexpected finds protocol for contamination and associated communications procedure;	Appendix 1
(g) an unexpected finds protocol for contamination, Aboriginal and non-Aboriginal heritage and associated communications procedure; and	Appendix 2
(h) waste classification (for materials to be removed) and validation (for materials to remain) be undertaken to confirm the contamination status in these areas of the site.	Section 10.4

1.6. CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

This Construction Environmental Management Plan (CEMP) outlines the approach to construction management of the Early Works component of Powerhouse Parramatta. The CEMP will be updated periodically by the appointed Contractor, engaged for the works prior to works commencing and will be maintained during the entirety of the works.

All tasks undertaken in relation to the project whether they be physical construction activities, office duties or procedural tasks are to be undertaken in accordance with the following:

- Suppliers and Contractors shall provide assurance of the quality of all goods, materials and services to be provided; and
- All materials and works are to be undertaken to the manufacturer's specification or industry standards.

Liaison will be established with relevant authorities to co-ordinate the works.

This CEMP should be read in conjunction with other management plans prepared for the Early Works, including:

- Construction Noise and Vibration Impact Assessment: Arup
- Construction Pedestrian & Traffic Management Plan: JMT Consulting
- Construction Soil and Water Management Plan: Arup
- Construction Flood Risk Emergency Response Plan: Arup
- Early Works Consultation Strategy: Infrastructure NSW
- Remedial Action Plan: JBS&G

The Contractor will adhere to the *Protection of the Environment Operations Act 1997* (POEO Act). The principles that underpin the POEO Act are:

- To protect, restore and enhance the quality of the environment in New South Wales, having regard for the need to maintain ecologically sustainable development;
- To provide increased opportunities for public involvement and participation in environment protection;
- To ensure that the community has access to relevant and meaningful information about pollution;
- Pollution prevention and cleaner production;
- Reduction to harmless levels of the discharge of substances likely to cause harm to the environment;
- Reduction in the use of materials and the re-use or recycling of materials;
- Making progressive improvements including the reduction of pollution;
- To rationalise, simplify and strengthen the regulatory framework for environment protection;
- To improve the efficiency of administration of the environment protection legislation; and
- To assist in the achievement of the objectives of the Waste Avoidance and Resource Recovery Act 2001 (NSW).



Figure 3 -Site Boundary Plan

1.7. OVERVIEW OF EARLY WORKS

The site is currently occupied by a multi-storey carpark, at grade carparking, existing low-rise buildings including Willow Grove and the St Georges Terrace.

The site has two partial road frontages and is made up of a number of land parcels, forming an irregularly shaped site area. It is bound by Parramatta River to the north, Wilde Avenue to the east, Phillip Street to the south and residential apartments and a hotel with frontages along Church Street to the west.

The Early Works include site preparation and establishment, service relocations or terminations, tree removal, hazardous material removal, demolition of existing structures, remediation and archaeological investigations.

2. LEGISLATIVE REQUIREMENTS

The works will be undertaken in accordance with the conditions of consent for SSD-10416 and the following legislative requirements:

- Conditions of consent for SSD-10416- Powerhouse Parramatta
- Protection of the Environment Operations Act 1997 and Regulations.
- Environmentally Hazardous Chemicals Act 1985.
- Protection of the Environment Administration Act and Regulations.
- Work Health and Safety Act 2011 and relevant codes of practice and Standards.
- Work Health and Safety Regulation 2017 and relevant codes of practice and Standards.
- Australian Standard 2601-2001: Demolition of Structures.
- Code of Practice for the Safe Removal of Asbestos (NOHSC:2002 1998).
- Guide to the Control of Asbestos Hazards in Buildings and Structures (NOHSC:3002 1998).
- Resource and Recovery Act 2001.
- Environmental Planning and Assessment Act 1979 and Regulations.
- Heritage Act 1997.
- Local Government Act 1993.
- State Environmental Planning Policy (Infrastructure) 2007
- State Environmental Planning Policy (State and Regional Development) 2011
- State Environmental Planning Policy No. 55 – Remediation of Land
- Draft State Environmental Planning Policy (Environment) 2017;
- State Environmental Planning Policy No. 64 – Advertising and Signage;
- Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005; and
- Sydney Local Environmental Plan 2012

3. HOURS OF WORK

All work on site will only occur between:

- 7am to 6pm Monday to Friday and
- 8am to 1pm Saturday
- Unless otherwise approved in writing by Consent Authority due to extenuating circumstances

In some additional cases, after-hours permits may be sought from the relevant authorities where special requirements exist, for example oversized deliveries of construction materials.

4. SITE INVESTIGATION

4.1. INFRASTRUCTURE SERVICES

Removal, termination and/or relocation of site services will be required during the Early Works:

- Electricity (Decommissioning of existing Substation)
- Minor services
 - Potable Water
 - Telecommunications
 - Gas

In general terms the following principles will be adopted when disconnecting services:

- All Service authorities will be consulted prior to works commencing to ascertain lead times and correct termination locations.
- All termination works should be undertaken in accordance with design engineers' specifications and instructions.
- All termination works should be undertaken by suitably licensed Contractors.
- All relevant approvals will be obtained prior to undertaking and services works.

4.2 DEMOLITION

Demolition of structures will be undertaken in accordance with Australian Standards for Demolition of Structures, *AS2601 – 2001*, where relevant. Demolition work plans will be developed for relevant works and written confirmation that the safety requirements of the Standard will be met, will be provided to the Certifier in accordance with Condition C27.

Legend

- Chain Mesh (to be installed after tree removal work)
- A Class Hoarding (Post in ground)
- A Class Hoarding (Block)
- B Class Hoarding
- ↔ Gate
- Maintain existing ATF fencing until demolish west end of carpark
- ATF fencing during demolition work of west end of carpark. Hoarding post demolition TBC
- Future A class hoarding

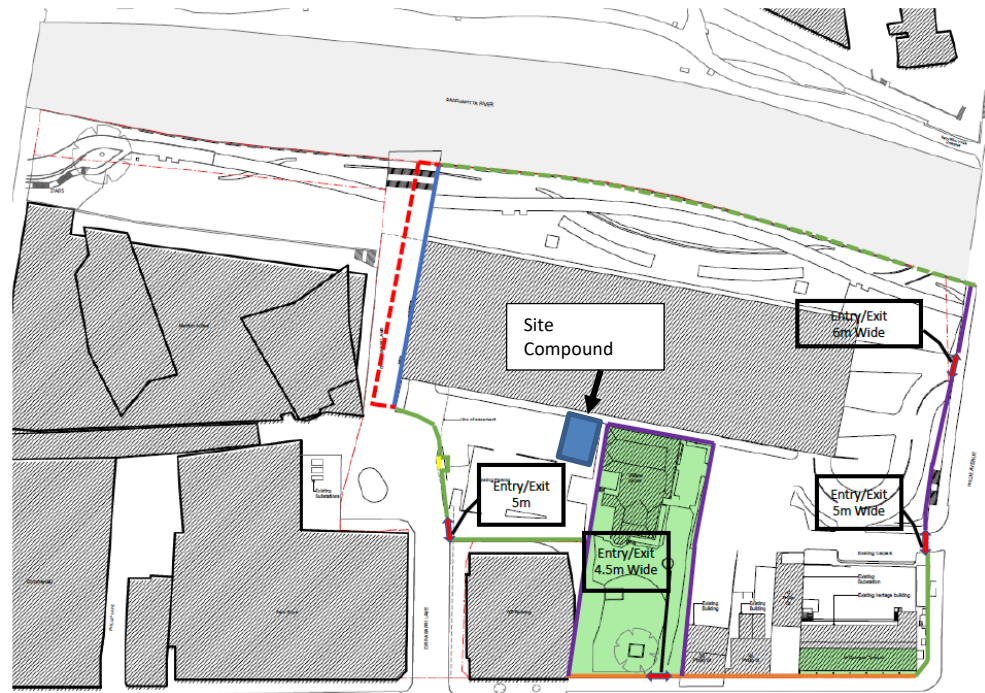


FIGURE 4 - PROPOSED SITE HOARDING ALIGNMENT FOR THE EARLY WORKS.

5. PUBLIC & PROPERTY PROTECTION

Prior to the commencement of works a dilapidation survey is to be undertaken involving all public and private roadways, adjoining and adjacent paving, structures, buildings and residences. Temporary hoarding and fencing will be installed to delineate the site boundary and protect the general public from activities occurring on the site/s. The building site/s will be kept neat and tidy to maintain public safety and local amenity.

Adequate protective perimeter signage will be installed as required. This signage will be required to identify construction contact points and ensure no unauthorized entry to site.

5.1. HOARDINGS, FENCING AND BARRIERS

Areas of the site where works will be undertaken will be securely fenced off using best practice methodology in order to protect the public. The following indicative issues will be considered with regard to site hoarding, fencing and barriers:

- Where possible maintain the existing perimeter fencing and attach shade cloth, or erect hoardings, to control views and manage dust;
- The site hoardings, perimeter fencing or other site barrier systems will be kept tidy throughout the programme of works;
- Before and during building work, all excavations below 1m in height will have safety barriers delineating potential fall areas;
- Hoardings, barriers and other perimeter fencing will be suitably lined to limit public viewing to designated viewing areas. This will ensure pedestrian flow is not impeded;
- The hoarding/fences may be adjusted to suite the phases of the development;

Vehicular access/egress gates are proposed through access points off Wilde Avenue, Dirrabarri Lane and George Khattar Lane. These gates will be attended by qualified traffic supervisors at the times of major vehicular access and egress to the Site. Roads, paths and kerbs likely to be damaged by construction or worker traffic are to be protected by temporary overlays and ramps.

All necessary permits for installation of hoardings on Council land will be sought through City of Parramatta Council prior to their installation.

5.2 WORKS IN THE PUBLIC DOMAIN

Works associated with the development/s may take place outside of the main site footprint such as road works and provision of site services. All necessary permits will be obtained from City of Parramatta Council prior to any works in the public domain being undertaken.

5.3 SIGNAGE

The following will be included within hoarding signage:

- Signs will be displayed in a number of areas around the site advising of the 24hr contact details for the site manager;
- All works related signage (including particularly safety-related signage) will comply with the relevant WorkCover NSW Codes of Practice.

6 PERMITS

The works will be undertaken under a strict permitting system controlled by the relevant Authorities and the Principal Contractors. During the works, a number of permits will be issued by relevant Authorities to facilitate the construction methodology. The following indicative permits and approvals may be applicable to the works:

- Permit to erect a gantry, overhead protective awning over the road or footpath (hoarding permit) especially on Philip St and Wilde Ave;
- Permit for a vehicular crossing (permanent or temporary);
- Permit to occupy space on Philip St and Council Footpath areas.
- Permit for a road opening;
- Permit for a road closure;
- Permit for a construction zone;
- Permit to use a mobile crane, travel tower or lift on or above a road;
- Permit for rubbish skips;
- Permit for works in adjoining Council reserves.
- Permit for afterhours works;
- WorkCover permit for demolition; and
- WorkCover permit for asbestos removal (if required).

7 CEMP IMPLEMENTATION

7.1 ROLES & RESPONSIBILITIES

Appropriate responsibilities are provided in table 2 below for all key personnel to ensure effective environmental management during the Early Works phase of the Project.

Role	Responsibilities
Project Director	▪ Be aware of responsibilities as detailed in management plans ▪ Actively ensure that subcontractors are complying with environmental requirements ▪ Liaise with INSW and other government authorities as required
Project Manager	▪ Plan Construction works in a manner which avoids impact to the environment ▪ Be accountable for environmental control measures and environmental compliance ▪ Be aware of the responsibilities as detailed in management plans
Environmental Site Representative (Also referred to as Responsible Person in Subplans)	▪ Advise on environmental matters of compliance, licenses, permits and authorisations ▪ Liaison with the Principal, personnel and relevant authorities in relation to environmental matters ▪ Ensure that CEMP is established, implemented and maintained ▪ Overall responsibility for the establishment, management, monitoring (see monitoring and inspection section) and maintenance of environmental controls within the site ▪ Facilitate induction and toolbox talks for all site personnel (where applicable) ▪ Specific authority to stop work to prevent environmental non-conformities ▪ Notification to relevant parties of environmental incidents ▪ Manage and close out complaints with assistance from Community consultation representative ▪ Co-ordinate action in emergency situations and allocate resources
All Personnel	▪ Ensure procedures in the CEMP and associated procedures, permits and approvals are followed in conjunction with the latest drawings issued for construction; ▪ Exercise due care, skill and foresight when carrying out tasks; ▪ Identify and notify and environmental incidents/non-conformances to the Environmental Site Representative and; ▪ Ensure and verify that corrective actions are implemented where required

7.2 ENVIRONMENTAL INDUCTION TRAINING AND AWARENESS

Inductions

Prior to commencement of construction all working and other project permanent and temporary site staff including subcontractors will be required to complete a site induction which includes an environmental component. The induction and site-specific training (environmental toolbox talks/alerts, specific targeted training workshops for sediment/erosion controls and asbestos awareness) will identify any sensitive receivers, environmental areas and cover risks and mitigation measures used to minimise potential impacts. It should also include:

- are aware of the key environmental aspects, impacts and risks, the conditions of consent and approved CEMP
- direction on the proper implementation and maintenance of environmental controls where required
- procedures and escalation for environmental incidents and unexpected finds
- are aware of relevant legislative responsibilities, including any penalties for failing to meet these responsibilities

Training

Targeted environmental training will be provided to individuals or groups with a specific responsibility for environmental management or those undertaking activities with high risk of impact. The training schedule/ requirements are outlined in table 3 below.

Training	Project Manager	Environmental Officer	Labourers	Community Engagement Staff
Project Induction	✓	✓	✓	✓
Erosion & Sediment Control	✓	✓	✓	
Spill/incident Response	✓	✓	✓	
Noise Management	✓	✓	✓	✓
Asbestos Awareness	✓	✓	✓	✓

Training	Project Manager	Environmental Officer	Labourers	Community Engagement Staff
Complaints Escalation	✓	✓	✓	✓

Training Records

A Register of Personnel who have attended site inductions will be maintained by the Site Manager.

7.3 TOOLBOX TALKS

Toolbox talk will be carried out as one method of raising awareness and will be tailored to the specific issues associated with the Early Works phase. Relevant issues may include (but are not limited to):

- Hours of work (including out of hours works)
- Emergency and spill response
- Review of SWMS
- Erosion and sedimentation control
- Vegetation Clearing protocols
- Unexpected finds protocols
- Air Quality and Dust Control
- Noise Management
- Heritage management

7.4 DAILY PRESTART MEETINGS

Conducted by the Environmental Site Representative or other delegate the prestart meeting is a tool for informing the working group of daily activities, coordination, restrictions or other hazards or information relevant to that day. All attendees are required to sign on to the prestart sheet acknowledging their understanding of issues explained.

8 ENVIRONMENTAL MANAGEMENT PLAN

Environmental and safety controls shall be installed by the Contractor prior to the commencement of any onsite works. An environmental risk assessment process was undertaken as part of the Environmental Impact Assessment for the Parramatta Powerhouse Project (Appendix 3). Measures have been developed to mitigate these risks as outlined in Section 6.0 of the EIA and in Response to Submissions. The following section outlines the practical construction management measures to be implemented during Early Works to comply with the measures where required in this phase of the project and all applicable conditions of consent.

These will include but not be limited to:

- Security measures (fencing and gate access);
- Work health and safety measures (personal protective equipment, first aid supplies, signage and barriers where required; and
- Environmental management measures (spill kits, booms, storm water control, dust control, silt control).

The above controls will be implemented as a minimum in accordance with the following plans:

- Construction Noise and Vibration Impact Assessment;
- Construction Soil and Water Management Plan.

8.1 NOISE AND VIBRATION

The noise and vibration control measures that apply to the Early Works are outlined in the Construction Noise and Vibration Management Plan prepared by Arup. This plan will remain in place for the duration of the Early Works and outlines all necessary management measures in respect of noise and vibration.

8.2 HAZARDOUS MATERIAL

A preliminary hazardous materials survey has been undertaken which has identified the location and type of hazardous materials on the site.

The following controls and safeguards are to be implemented for hazardous materials removal:

- All demolition works involving the removal and disposal of asbestos (of an area more than 10 square metres) must only be undertaken by a licensed asbestos removalist who is licensed to carry out the work.
- Transporters of asbestos waste (of any load over 100kg of asbestos waste or 10 square metres or more of asbestos sheeting) must provide information to the

NSW EPA regarding the movement of waste using their WasteLocate online reporting tool www.wastelocate.epa.nsw.gov.au.

- Asbestos removal must be carried out in accordance with the WorkCover, Environment Protection Authority and Office of Environment and Heritage requirements.
- Asbestos to be disposed of must only be transported to waste facilities licensed to accept asbestos.
- No asbestos products are to be reused on the site.
- If unidentified asbestos is encountered during the Works, work will stop in that area immediately and the applicant must immediately notify the certifying authority and Council. A suitably qualified Contractor will seal the area and make safe as appropriate.
- If required, the necessary sampling and identification of the suspect material will take place and the appropriate method of removal implemented.

A final clearance report will be provided by the hygienist which will include the provision of tip dockets from waste centers.

An Unexpected Finds Protocol for contamination and hazardous materials is included in Appendix 1. This protocol will guide actions to be undertaken in the event of any finds of hazardous or potential hazardous materials outside of that identified within the hazardous materials surveys.

8.3 DUST AND AIR CONTROL MEASURES

Dust control measures for site preparation which will remain in place for the duration of the Works will include:

- Erection of site fencing to provide appropriate barriers at the site boundary
- Erection of effective screens and barriers around dusty activities. Cleaning of the screens and barriers should be completed as necessary.
- Communication with stakeholders and neighbouring properties prior to undertaking works in proximity to their premises.
- Establishment of a complaints management system to record details of any reason for air quality-based complaints or incidents.
- Avoidance of dry sweeping in large areas
- Use of effective water suppression where necessary especially when utilising equipment and plant
- Limit demolition activities that will create dust during times of adverse wind

- Covering of stockpiles
- Trucks to have payload covered
- Wheel washing system for trucks if necessary
- Limiting plant and equipment idling
- Implement speed limits on site.

Should these measures be undertaken it is expected that dust impacts can be kept at acceptable levels throughout the Works.

Monitoring of air quality will include daily and weekly visual surveillance of dust emissions, dust controls and plant emissions. Undertaking and maintaining regular inspection logs will enable transparent monitoring of air quality throughout the works. Weather and physical parameters such as wind speed, rain, temperature and humidity will be utilised to assist in programming works (impact of rain and wind conditions on site) and recorded. Works will not be conducted during periods of rainfall where there is the potential to generate runoff, or where heavy rain is forecast.

Weather data (such as wind direction) will also be used where complaints are received in relation to dust or noise.

8.4 ODOUR CONTROL

In terms of the Early Works, it is not anticipated that any odour nuisance will occur. All plant and machinery involved in the Works will be regularly serviced and checked for exhaust emissions.

8.5 STORAGE OF DANGEROUS GOODS

The Works may involve the use of flammable fuels such as petrol, diesel, Oxy-acetylene, oils, etc.

If required, such items will be stored in a lockable compound, within an appropriately bunded area, and with sufficient ventilation in accordance with relevant codes of practice and Standards.

Material safety data sheets (MSDS) on all flammable and potentially harmful liquids will be maintained by the Contractor undertaking the Works. Copies of MSDS will be kept in the site office and easily accessible to all construction personnel.

8.6 EROSION AND SEDIMENT CONTROL, FLOODING AND GROUND WATER

A Construction Soil and Water Management Plan and a Construction Flood Risk Emergency Response Plan have been prepared by Arup. These plans outline the required erosion and sediment control measures to be implemented prior to commencement of any works that could cause issues in relation to erosion or sedimentation.

8.7 FLORA AND FAUNA MANAGEMENT

Only trees that have been nominated and approved for removal will be cleared from site. All trees that are to remain on site will be protected accordingly and inspected by an Arborist throughout the project when required.

Works near trees to be retained will be conducted as follows:

- A minimum 1.8m high chain-wire fence is to be erected at least three (3 meters) from the base of each tree and kept in place prior to Works commencing to restrict the following occurring:
 - Stockpiling of materials within the root protection zone;
 - Placement of fill within the root protection zone;
 - Parking of vehicles within the root protection zone;
 - Compaction of soil within the root protection zone.
- All required tree protection measures are to be maintained in good condition for the duration of the construction period.
- All areas within the root protection zone are to be mulched with composted leaf mulch to a depth of no less than 100mm.
- A sign is to be erected indicating the trees to be protected.

8.8 TRAFFIC MANAGEMENT

A Construction Traffic and Pedestrian Management Plan (CTPMP) has been completed by JMT Consulting. This plan outlines the controls for management of construction traffic, including access and egress arrangements for the site and pedestrian and cycle diversions.

8.9 LIGHTING

All lighting within the site will be installed to comply with *AS 4282-1997 Control of the obtrusive effects of outdoor lighting*. Relevant information confirming compliance with the standard will be provided to the Certifier once lighting is installed.

9 ARCHAEOLOGICAL

The Early Works have potential to uncover archaeological resources as identified in:

- Archaeological Research Design, Curio Projects, April 2020.
- Addendum Historical Archaeological Impact Assessment Report, Curio Projects, 15 September 2020
- Aboriginal Cultural Heritage Assessment Report, Curio Projects, 21 January 2021

All works that will potentially uncover archaeological resources will be undertaken under supervision of Curio Projects who will act as Excavation Directors for the project.

In the event that works uncover archaeological resources or potential archaeological resources in areas that are not expected to contain such resources, an Unexpected Finds Protocol for archaeological resources will apply. A copy of this protocol is contained at Appendix 2.

10 WASTE MINIMISATION AND MANAGEMENT PLAN

10.1 WASTE MINIMISATION AND MANAGEMENT PLAN

The following section describes the principles and procedures that will be carried out to manage waste generated by Early Works activities and minimise landfill whilst maximising waste material avoidance, reuse and recycling.

Early Works will exceed landfill diversion target of 75% and a recycling rate of at least 70% for construction and demolition, as required by the NSW Waste avoidance and Resource Recovery Strategy 2014-21. The key activities within the early works period which will generate the majority of waste include demolition of Riverbank Carpark, commercial buildings, intrusive structures of St Georges Terrace and at-grade carparks and hardstand areas.

10.2 WASTE QUANTITIES, TYPES, DISPOSAL AND RE-USE/RECYCLING

Details of demolition and construction waste materials types, estimated quantities and proposed methods of disposal or recycling/reuse are provided in Table 2 below. The general principles of waste avoidance whereby reuse is considered first, recycling second and then disposal where the other methods cannot be used will be adopted.

Figures from Table 2 are estimates used as a guide for designing the waste management systems on site. It is anticipated at least 90% of the waste streams will be recyclable. Further validation on the quantities from the waste streams will be confirmed by via the use of waste dockets and recording of truck loads.

MATERIALS ON-SITE		DESTINATION		
		Re-Use and Recycling		Disposal
Type of Materials	Estimated Approximate Quantity	ON-SITE	OFF-SITE	
Structural & Reinforcement Steel	1,150	N/A	Off-site recycling facility	N/A
Concrete	17,000	N/A	Off-site recycling facility	N/A
Asphalt	<550	N/A	Off-site recycling facility	N/A
Glass	600	N/A	Off-site recycling facility	N/A
Cabling	<10	N/A	Off-site recycling facility	N/A
Fluorescent Light Tubes	<10	N/A	Off-site recycling facility	N/A
Asbestos	<200	N/A	N/A	EPA approved asbestos disposal facility

Fitout Strip Out (including plasterboard, ceilings, services and joinery)	800	N/A	Off-site recycling facility	N/A
Green Waste	1,150	Potential reuse within landscaped areas	Off-site recycling facility	N/A

Table 2 - Estimated Waste Generation and Destination

In addition to quantities within Table 2 areas throughout the site require remediation due to impacts of legacy PAHs/benzo(a)pyrene, lead, PCBs and asbestos. The quantity of soils requiring remediation are estimated as 300m³ in the central portion of the site, 150m³ in the eastern portion and 750m³ of soil in the south-eastern portion. The preferred option of remediation is removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill. *Refer to JBS&G Remedial Action Plan – October 2020.*

Waste Reuse

The Contractor will identify materials for reuse for waste generated from demolition activities or surplus materials used in Early Works activities. In order to allow maximum reuse waste shall be segregated into individual stockpiles where space is available and as determined by the Contractor. There is likely to be opportunity for stockpiling within the work area and sufficient space must be provided to allow stockpiling of soil and material from activities.

Waste Recycling

It is estimated that the majority of waste material generated from demolition activities of surrounding structures will be able to be recycled. Waste should be sorted and segregated into recyclable and non-recyclable waste streams as part of the demolition process and stockpiling where practical before being transferred to the appropriate off-site recycling facility.

Waste Disposal

Residual waste identified as unsuitable for re-use or recycling due to its category, class or material will be directed to the appointed waste management center for disposal. Waste materials are to be handled in a manner which causes the least amount of harm to the environment. Removal, transportation and disposal will be undertaken in accordance with legislative requirements and guidelines.

General waste produced during Early Works activities shall be handled as per Council requirements. It is recommended that existing local waste management facilities are utilised.

Disposal locations include (not limited to):

- Sydney Recycling Park – Wanless Waste Management
- MET Recycling Facility – MET Recycling Pty Ltd
- Boral Recycling
- Homebush Bay Liquid Treatment Plant – Cleanaway Operations Pty Ltd
- Horsley Park Waste Management Facility – Veolia Environmental Services Pty Ltd
- Horsley Park Resource Recovery Facility – Veolia Environmental Services Pty Ltd
- Brandown Recycling Yard – Brandown Pty Limited
- Genesis Facility – Dial-a-dump Pty Ltd
- Sell & Parker Pty Ltd
- Concrete Recyclers
- Bingo Bins Pty Ltd
- Suez Recycling & Recovery Pty Ltd
- Eco Cycle Materials Pty Ltd

The following procedures will be implemented in order to facilitate waste management of the above materials identified:

- Contractors shall ensure removal, transportation and disposal of all waste is carried out by appropriately qualified and licensed persons in accordance with current legislative requirements.
- In order to allow maximum chance for re-use, waste shall be segregated into individual stockpiles where practical for each material type in designated locations onsite.
- All waste generated during construction must be secured and maintained within designated waste storage areas at all times and must not leave the site onto neighbouring public or private properties.
- The Contractor will supply transportation dockets, disposal points and other relevant documentation which verifies the type, quantity and disposal/recycle location of all materials removed from site
- The Contractor is to develop on site waste recording for all waste streams and volumes arising throughout the demolition phase. This information will be used to show the type, volume and rate of waste being generated, re-used and recycled.

- General waste produced on site shall be handled as per Council requirements. It is recommended that existing local waste management facilities are utilised.

10.3 ACM MANAGEMENT DURING EARLY WORKS

Only appropriately licenced and qualified persons will undertake Asbestos removal works. The contractor must:

- Ensure that removal of hazardous materials, particularly the method of containment and control of emission of fibres to the air, and disposal is undertaken at an approved waste disposal facility is in accordance with the requirements of the relevant legislation, codes, standards and guidelines.
- Comply with requirements of the Protection of the Environment Operations (Waste) Regulation 2014 with particular reference to Part 7 – ‘Transportation and management of asbestos waste’ to ensure risks associated with asbestos works are minimised.
- Ensure that notification and consultation with SafeWork NSW is carried out in accordance with SafeWork requirements concerning the handling of asbestos that may be encountered (five calendar days before undertaking any licenced asbestos removal work).

Contaminated Excavated material

Any excavated material to be removed from the site is to be assessed, classified, transported and disposed of in accordance with the Department of Environment and Climate Change’s (DECC) ‘Waste Classification Guidelines Part 1: Classifying Waste’.

Unexpected finds

The Unexpected Finds protocol (Appendix 1 - Flowchart 7.1 of Remedial Action Plan) is to be followed in the event of any additional unforeseen finds of hazardous waste materials that are uncovered during the Early Works activities.

10.4 WASTE CLASSIFICATION AND VALIDATION

All waste generated will be stockpiled onsite where practical with the final location being determined following classification from the contractor. Materials requiring disposal from site shall be classified in accordance with Waste Classification Guidelines Part 1: Classifying Waste, November 2014, NSW EPA (EPA 2014a) or an appropriate exemption or general immobilisation will be sort under the Protection of the Environment Operations (Waste) Regulation 2014.

Validation for materials remaining on site will be conducted by the environmental consultant to demonstrate the remediation requirements have been achieved.

10.5 MONITORING & REPORTING

Ongoing Monitoring and reporting will be conducted with the tables below.

Monitoring Required	Staff Responsible	Timing
Waste management will be monitored daily through observations.	Site Manager	Daily
Weekly waste management inspections for the Environmental Inspection Checklist.	Site Manager	Weekly
Waste storage locations are to be inspected to ensure safety from unplanned movement of waste from water, wind or other means around the site.	Project Engineer	Prior to commencement and during works
All waste vehicles entering and leaving site must have adequate truck GPS monitoring systems.	Project Engineer	Prior to commencement
Reporting Required	Staff Responsible	Timing
A list of contamination incidents including the masses of contaminated bins.	Project Engineer	Ad hoc
A list quantifying the amount and types of waste generated during the works.	Project Engineer	Throughout Early Works
A list of arrangements for the disposal waste from the site.	Site Manager	Throughout Early Works

11 ENVIRONMENTAL MONITORING & REPORTING

11.1 MONITORING

Regular presence of Environmental officers and use of site inspections will be incorporated to monitor construction activities and ensure compliance to controls outlined within the management plans. Environmental inspections provide an opportunity to investigate whether the controls implemented on site could be altered to improve outcomes beyond compliance.

11.2 INSPECTIONS & REPORTING

In addition to specific monitoring described in the NVMP and SWMP, regular inspections and observations are to be conducted by suitably qualified and competent personnel usually the ESR. Any inspections conducted need to be consistent with the CEMP and sub-plan. The ESR or other suitably qualified persons in their absence will determine the details of the inspection.

As a minimum the following conditions are to be inspected and assessed:

- Date/Time
- Weather
- Site activities and approvals
- General site conditions
- Stockpile management (See RAP)
- Erosion and Sediment controls (See SWMP)
- Storage of Hazardous substances and Spill kit currency
- Noise and vibration (see NVMP)
- Waste Management (See 10.3)

11.3 RECORDS REPORTING

Project specific records will be maintained to ensure adequate environmental management information is captured. Management documents to be maintained include:

- Environmental site inspection checklist
- Corrective and Preventative Action Report
- Environmental Incident report form
- Environmental training register
- Waste register
- Monitoring and discharge checklist

11.4 OTHER COMPLIANCE, MONITORING AND AUDITING

This construction project is required to monitor compliance with conditions of consent in accordance with The Department of Planning Industry & Environments Compliance Reporting Post Approval Requirements (PAR). The Early Works phase is also subject to be audited in accordance with the Department's Independent Audit Post Approval Requirements (PAR).

11.5 CORRECTIVE AND PREVENTATIVE ACTIONS

This process should be initiated following the identification of a non-conformance and/or non-compliance. Non-conformance is defined in this guideline to be a failure to comply with an environmental requirement, standard, or procedure. Non-compliance is defined as an occurrence and/or set of circumstances that breach the conditions of consent and/or any other legal requirement

- The ESR to conduct the review of any non-conformance/non-compliance
- The ESR should develop a clear corrective and preventative action plan to address the finding.
- The ESR is to determine timeframes for implementation, checking following correction and tracking to prevent reoccurrence
- This process should be documented and recorded using the Corrective and Preventative Action Report.
- The ESR will then determine and distribute to the Department or other authorities where required.

12 INCIDENT NOTIFICATION

The Health Safety and Environment Management System reference of Contractor's emergency/incident notification process should be adhered to when reporting environmental incidents. This section outlines personnel responsible for managing incidents and emergencies and escalation of notification to INSW from events and incidents, outlined in the table below.

Those responsible for determining whether and event is or is not an incident are listed below. The details of contacts should be readily available on-site.

- Environmental Site Representative
- Project Manager/Site Manager

The flowchart below should be use in case of an event:

NOTE: Regardless of the rating below, if emergency services, Fire, Ambulance or Police are called to the project, notification to the INSW Project Director via phone will be made immediately and followed up via documented notification process as soon as possible (within 24 hours)

LOW	MODERATE	HIGH	EXTREME
Site response As per the contractor's HSE management plan	Site response As per the contractor's HSE management plan	Site response As per the contractor's HSE management plan	Site response As per the contractor's HSE management plan
Notification protocol The contractor's site manager reports incident via monthly HSE performance report to INSW Project Director	Notification protocol The contractor's site manager reports incident via monthly HSE performance report and if incident reported to ComCare to INSW Project Director via documented notification process with within 24 hours	Notification protocol The contractor's site manager reports via monthly HSE performance report incident and if incident reported to ComCare to INSW Project Director via phone immediately and via documented notification process as soon as possible (within 24 hours)	Notification protocol The contractor's site manager reports incident via monthly HSE performance report and if incident reported to ComCare to INSW Project Director via phone immediately and via documented notification process as soon as possible (within 24 hours)
INSW Project Director reviews report and requests further information where required.	INSW Project Director reviews report and requests further information where required.	INSW Project Director alerts Head of Projects NSW immediately via phone Head of Projects NSW notifies INSW Crisis Team immediately via phone to determine possible further action INSW Director Comms and Engagement to notify Minister Lee's office	INSW Project Director alerts Head of Projects NSW immediately via phone Head of Projects NSW notifies INSW Crisis Team immediately via phone INSW CFOO to establish incident room within INSW offices

13 COMMUNITY ENGAGEMENT AND CONSULTATION MANAGEMENT

An Early Works Consultation Strategy has been prepared by Infrastructure NSW. This Strategy outlines the consultation processes that will be employed throughout the Early Works and coordinates the various consultation requirements outlined in the conditions of consent.

The Strategy includes details for complaints management and community liaison as well as 24-hour contact details for the site manager and the nominated community liaison representative.

14 OTHER SPECIFIC MANAGEMENT PLAN PRINCIPLES

14.1 WORK OCCUPATIONAL HEALTH & SAFETY MANAGEMENT PRINCIPLES

A site-specific Plan will be developed and will be tailored to meet the project requirements.

The Plan will look to cover induction and training, safe work method statements (SWMS), risk management, injury management, incident management, training, inspections, audits and performance reporting.

The WHS management system shall, as a minimum, demonstrate compliance with all duties of an employer specified in the *Work Health and Safety Act 2017*.

The site-specific Safety Management Plan shall consider and respond to the specific WHS hazards and issues relevant to the Works and shall document the systems and methods to be implemented for the term of the Contract.

The general outcomes for the project are:

- That the construction work complies with all relevant legislation;
- That the Works be undertaken such that all environmental and construction objectives are achieved; and
- Compliance with the criteria and safeguards as specified in the various planning and approval documents; and
- The environmental parameters set in the Developments Conditions of Approval and regulatory agencies requirements are adhered to.

14.2 QUALITY MANAGEMENT PRINCIPLES

The plan will be developed to focus not only on product/service quality, but also the means to which it is achieved.

Planning for quality management can reduce the risk of project failure attributable to inadequate project management processes that result in outputs failing to meet defined and agreed standards.

15 REVIEW AND REVISION OF THIS CEMP

The Project Manager/Site Manager will be responsible for coordinating a review of this CEMP and related documents as a result of:

- Changed to procedures or process
- Changes to key personnel or resources
- Changes in legal obligations
- Where instructed by the Department of Planning, Industry and Environment

This CEMP will be reviewed within one month of any of the following occurrences:

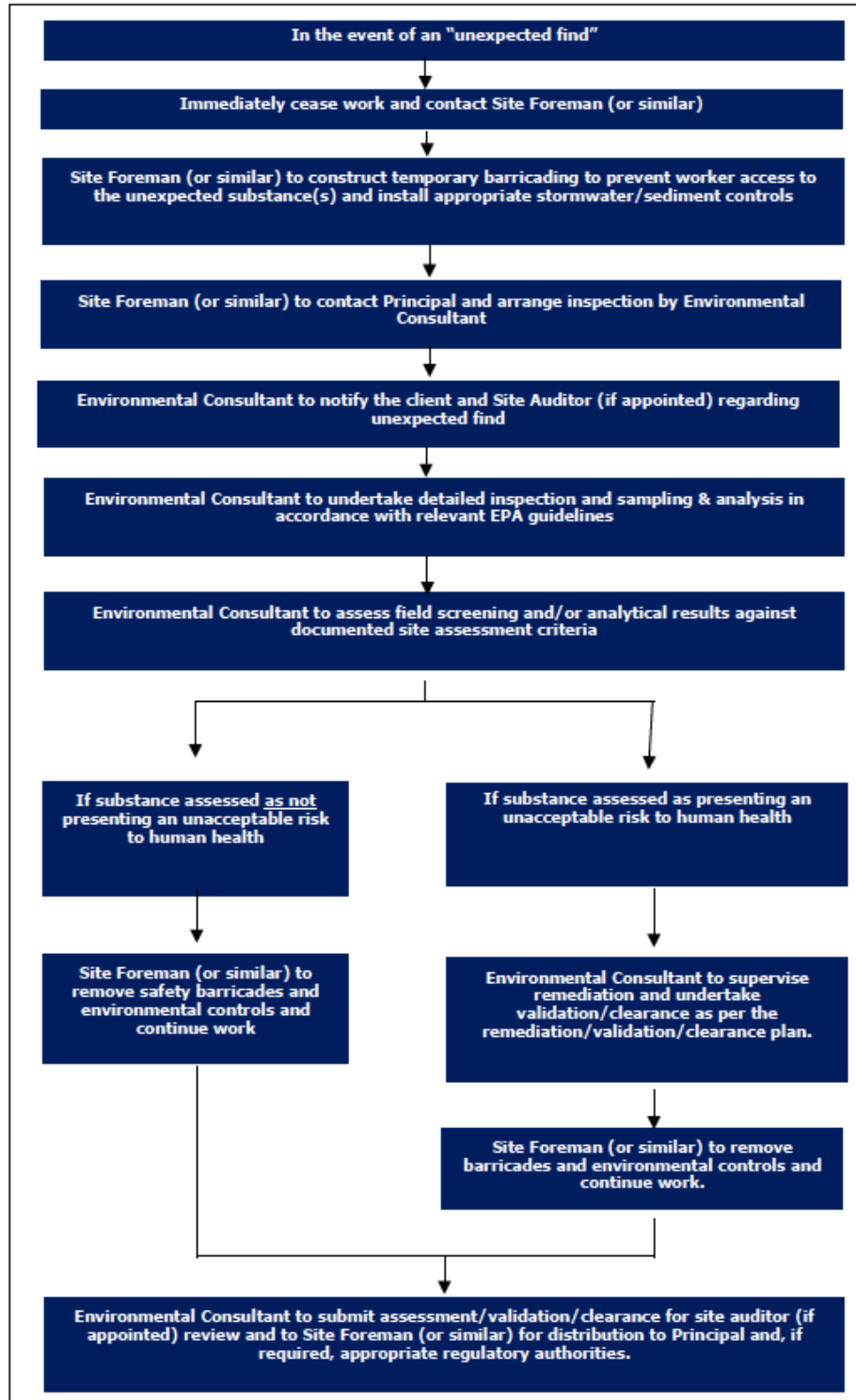
- Identification of matters that require attention following an environmental audit
- A reportable environmental incident or near miss
- Significant changes to site conditions and/or work methods
- Identification of new risks, including risks identified during risk register updates
- Identification of non-compliances

Should the review process identify any issues or items within the environmental documentation that are in need of updating, the Environmental Site Representative will update the CEMP.

APPENDIX 1- UNEXPECTED CONTAMINATION FINDS



Flowchart 7.1 – Unexpected Finds Protocol



APPENDIX 2- UNEXPECTED ARCHAEOLOGICAL FINDS



1. Unexpected Finds Protocol and Unexpected Aboriginal Finds Policy

1.1. Introduction

It is possible that types of archaeological features other than those identified in the *Archaeological Research Design* and *Aboriginal Cultural Heritage Assessment Report* prepared by Curio Projects, are exposed during the project works. If any unexpected structures, relics or potential relics works are to stop and the site supervisor is to be notified who will contact the project archaeologist. A Curio Projects archaeologist will be 'on-call' to advise and if required visit the site for further inspection.

If any Aboriginal objects, including stone tools, shell middens and/or other objects likely to be associated with Aboriginal occupation of the site are found, works shall cease immediately and Curio Projects should be contacted for further investigation. If any potential human skeletal remains are identified, works shall cease completely and responsible authorities should be notified as well as Curio Projects. All potential archaeological sites are to be safely barricaded and isolated from the rest of the site until further advice from the project archaeologist has been obtained.

If State or locally significant relics are found during works, the Heritage Council of NSW is to be notified in accordance with s.146 of the Heritage Act 1977. If suspected Aboriginal objects are found during works then the National Parks and Wildlife Service should be notified under s89 of the NPW Act.

In either event professional archaeological advice should be sought to investigate and assess any unexpected find suspected of being a 'relic' or Aboriginal cultural material.

DO NOT REMOVE OR DISTURB ANY SUSPECTED ARCHAEOLOGY OR HERITAGE ITEMS FROM THE LOCATION WHERE EXPOSED BEFORE AN ARCHAEOLOGIST HAS INSPECTED THEM.

Photographs and survey information should be taken of any unexpected items identified in the location they were found. They can be forwarded to the archaeologist, to determine if the items or features need to be further inspected and recorded. There may be a brief, localised halt to the works so the archaeologist can attend site, inspect the items in the ground, photograph and record them, and advise on the best way to proceed with works.

During works, the following practices should be maintained:

- Keep a sharp eye out for changes in the colour or compaction of the soil, or a large or unusual number of artefacts and notify the archaeologists.
- If any fragile artefacts such as shell, bone or leather, stop work and get the archaeologist to inspect the area, as sometimes these items must be handled in a special way.

1.2. Construction That May Affect Archaeology

Proposed construction works which may affect archaeology within the site include:

- Demolition of existing buildings;
- Cuts for grading;
- Service trenches;
- Piling;
- Bulk excavation;
- Most work that requires excavation below existing ground levels.

APPENDIX 3 – ENVIRONMENTAL RISK ASSESSMENT

7.0 Environmental Risk Assessment

The Environmental Risk Assessment (ERA) establishes a residual risk by reviewing the significance of environmental impacts and the ability to manage those impacts. The ERA for Powerhouse Parramatta has been adapted from Australian Standard AS4369.1999 Risk Management and Environmental Risk Tools.

In accordance with the SEARs, the ERA addresses the following significant risk issues:

- the adequacy of baseline data;
- the potential cumulative impacts arising from other developments in the vicinity of the Site; and
- measures to avoid, minimise, offset the predicted impacts where necessary involving the preparation of detailed contingency plans for managing any significant risk to the environment.

Figure 83 indicates the significance of environmental impacts and assigns a value between 1 and 10 based on:

- the receiving environment;
- the level of understanding of the type and extent of impacts; and
- the likely community response to the environmental consequence of the project;

The manageability of environmental impact is assigned a value between 1 and 5 based on:

- the complexity of mitigation measures;
- the known level of performance of the safeguards proposed; and
- the opportunity for adaptive management.

The sum of the values assigned provides an indicative ranking of potential residual impacts after the mitigation measures are implemented.

Significance of impact	Manageability of impact				
	5 Complex	4 Substantial	3 Elementary	2 Standard	1 Simple
1 – Low	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)	2 (Low)
2 – Minor	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)	3 (Low)
3 – Moderate	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)	4 (Low/Medium)
4 – High	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)	5 (Low/Medium)
5 – Extreme	10 (High)	9 (High)	8 (High/Medium)	7 (High/Medium)	6 (Medium)

Figure 83 Risk Assessment Matrix

Table 16 Environmental risk assessment

				Risk Assessment		
Item	Phase	Potential Environmental Impact	Proposed Mitigation Measures and / or Comment	Significance of Impact	Manageability of Impact	Residual Impact
Aboriginal Heritage	C / O	- potential impacts on archaeology - impact on cultural values	- An Aboriginal Cultural Heritage Assessment Report has been prepared, detailing the sites social and cultural values, as well as potential for archaeological resource value. - The Archaeological Research Design has been prepared to guide test trenches to investigate the nature and extent of any archaeological remains. - A framework of supervised and unexpected finds will also be prepared to manage approaches to excavation and construction activity to ensure that adverse impacts to archaeology, if present, does not occur. - Opportunities to provide education and interpretation of the social and cultural significance of the site to the Aboriginal community, including historic use of the area will be pursued through the Heritage Interpretation Plan.	3	3	6 Medium
Post-settlement Heritage	C / O	- demolition of heritage items - potential impacts on surrounding heritage items - potential impacts on archaeology	- The redevelopment of the site will necessitate the demolition of Willow Grove and St George's Terrace, being local heritage items. Alternative options were considered as part of the competitive design process, and it was concluded these items could not be retained on the site. - The cumulative impact is identified as being minimal, and strategies are developed to recognise and celebrate the history of the site including programmatic heritage interpretation, archiving, and salvaging. - The development is not identified as impacting Old Government House and appropriate construction management will ensure there is no physical impact on the Lennox Bridge. - A Archaeological Research Design has been prepared to guide test trenches to investigate the nature and extent of any archaeological remains. - A framework of supervised and unexpected finds will also be prepared to manage approaches to excavation and construction activity to ensure that adverse impacts to archaeology, if present, does not occur.	4	3	7 High / medium
Water Management and Flooding	C / O	- Flooding - Stormwater - Water quality	The proposed development has been designed to provide passive flood protection and achieves approximately the same flood storage and flow conveyance as the pre-development scenario when the river is in flood. Arup confirm that the design of the proposed development does not present increased risk to public safety for people within the building.	2	2	4 Low/Medium

Risk Assessment						
			- A flood emergency plan will be developed prior to the commencement of operations, including the installation of any physical, visual and/or audible warning mechanisms. - The proposed stormwater network will be superior to the existing predevelopment configuration meaning more floodwater will be captured and conveyed in the proposed pits and pipes, resulting in less water flowing overland. - MUSIC modelling has been undertaken to confirm that the development will achieve the identified water quality improvement targets for the project.			
Visual and view impacts	C / O	- Impact on public views. - Impact on private views.	- View Impact Assessment confirms that whilst the proposed building will be visible within the landscape from some locations, impacts would be low or medium in nature and are reasonable within the CBD context of the site and the applicable planning framework for the land. - Site hoarding is already erected around the site and will be maintained throughout the construction phase to screen views to the site from the public domain.	3	2	5 Low/Medium
Overshadowing	O	- Potential for overshadowing of adjoining land. - Potential for overshadowing of new public domain.	- There is some additional overshadowing as a result of the proposed development, however, this does not impact any surrounding residential development and is limited in time duration. - The public open space areas along the Parramatta River foreshore will have excellent solar access.	2	1	3 Low
Wind	O	Potential wind impacts on safety and comfort	An Environmental Wind Assessment has been undertaken which considers the effect of the proposed building on wind conditions within the public domain. At all measures locations wind speeds will comply with the criterion for safety, and the comfort criteria ensures the spaces are acceptable based on the nature and intended usage of these locations.	2	2	4 Low/Medium
Reflectivity	O	potential impacts to the safety of drivers, pedestrians, and ferries	An Reflectivity Assessment has been undertaken by Arup which confirms that the proposed development is result in unacceptable glare for drivers, ferries, pedestrians or surrounding buildings that cannot be managed.	2	2	4 Low/Medium
Transport and Accessibility	C / O	- Construction traffic on local roads - Congestion associated with the operation of Powerhouse Parramatta	- A preliminary Construction Traffic, Transport and Pedestrian Management Plan has been prepared to ensure that demolition and construction activities do not adversely impact upon the amenity or safety of the locality. - The proposed development can be accommodated within the existing transport network, without the requirement for upgrades or additional services.	3	2	5 Low/Medium

Risk Assessment						
			A range of transport measures can also be implemented by the Powerhouse to encourage the use of sustainable and access transport when travelling to and from the site for staff, residents, and visitors. These initiatives will be confirmed prior to the commencement of operations and will be monitored and developed over time to meet the target mode share			
Noise and vibration	C / O	- Construction noise. - Operational noise.	- A Noise and Vibration Impact Assessment has been prepared by Arup which considers potential demolition noise and vibration impacts on nearby receivers and sets out mitigation measures to reduce impacts during the demolition phase. - The operation of Powerhouse Parramatta confirms that typical noise emissions from traffic, services and plant, loading and deliveries, and patrons leaving the site will be minimal and can be mitigated. - The operation of the Powerhouse Program on the site, including crowd noises and amplified music from the use of space, has been assessed as not exceeding the relevant criteria for nearby residences or tourist and visitor accommodation during the day, evening or night. Events that exceed these typical activities in terms of typical hours or where the patron and music levels exceed those modelled, will be managed in accordance with the strategies developed by Arup and confirmed in an Operational Noise Management Plan.	3	3	6 Medium
Biodiversity	C / O	Impacts on flora and fauna.	The BDAR waiver confirms there are not any significant native flora or fauna within the subject site.	1	2	3 Low
Contamination	C / O	Remediation of contaminated soils	An assessment of the conditions of the site has been completed by JBS&G, which confirms that the site can be made suitable for its intended use provided that the recommendations of the Remedial Action Plan are enacted and any unexpected finds are managed during the construction phase of the project.	3	2	5 Low/Medium
Safety and security	C / O	Potential for crime and perception of crime within future public domain areas surrounding Powerhouse Parramatta	A Crime Prevention through Environmental Design (CPTED) assessment has been undertaken that considers the potential for crime to occur within the public domain surrounding Powerhouse Parramatta and outlines how this risk will be minimised through detailed design and operational mitigation measures.	2	2	4 Low
Utilities and Infrastructure	C / O	Capacity to service the new development	An Infrastructure Management Plan has been prepared which confirms that the site is capable of being serviced via either existing or augmented utility services, with the final detail of utility servicing to be determined via the relevant utility service approval pathways.	2	2	4 Low/Medium
Air Quality	C	Dust impacts during construction activities.	An Air Quality Impact Assessment has been prepared that identifies potential dust-generating construction activities and standard mitigation	2	2	4 Low/Medium

Risk Assessment						
			measures that can be implemented to reduce and avoid adverse air quality impacts.			
Communications and Community	C / O	- Information about DA - Construction impacts and complaints - Operational information	- Section 3.0 of this EIS and the Consultation Outcomes Report identify consultation activities that have been undertaken to date to inform the scope of the project and provide information to the community regarding the proposal and planning process. - This EIS will be publicly exhibited by DPIE and Infrastructure NSW will undertake further engagement during this period. - Subject to planning approval, regular communications will be provided to local residents throughout the construction phase to advise of the progress of works, likely impacts and special activities.	3	2	5 Low/Medium

APPENDIX 4- CONSTRUCTION TRAFFIC AND PEDESTRIAN MANAGEMENT PLAN



Powerhouse Parramatta (Early Works)

Construction Traffic and Pedestrian Management Plan

Prepared for:

Infrastructure NSW

29 March 2021

JMT
Consulting

PROJECT INFORMATION

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1 Introduction

1.1 Introduction

The Powerhouse Parramatta project (SSD-10416) has been approved by the Minister for Planning and Public Spaces.

In accordance with the conditions of approval, a Construction Traffic and Pedestrian Management Plan (CTPMP) must be prepared to achieve the objective of ensuring safety and efficiency of the road network. The plan is to be developed in consultation with, and endorsed by, Transport for NSW (TfNSW) prior to commencement of any works.

1.2 Project background

The Powerhouse is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill. The Powerhouse has occupied the Ultimo site since 1988.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's A Plan for Growing Sydney as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the Greater Sydney Region Plan.

Powerhouse Parramatta will be the first State cultural institution to be located in Western Sydney – the geographical heart of Sydney. In December 2019, the Government announced the winning design, by Moreau Kusunoki and Genton, for the Powerhouse Parramatta from an international design competition.

Powerhouse Parramatta will establish a new paradigm for museums through the creation of an institution that is innately flexible. It will become a national and international destination renowned for its distinctive programs driven by original research and inspired by its expansive collections. It will be a place of collaboration, a mirror of its communities forever embedded in the contemporary identity of Greater Sydney and NSW.

1.3 Site description

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site boundary is identified in Figure 1 and Figure 2. The site excludes the GE Office Building at 32 Phillip Street.

The site is currently occupied by a number of buildings and structures, including:

- Riverbank Car Park – a four-level public car park
- Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s, which is a locally-listed heritage item (I737)
- St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s
- 36 Phillip Street – a two-storey building comprising retail and business premises
- 40 Phillip Street – a two-storey building comprising retail and business premises
- 42 Philips Street – a two-storey substation building set back from the street comprising retail premises

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.



Figure 1 Aerial photograph of the site and its context

Source: Mark Merton Photography

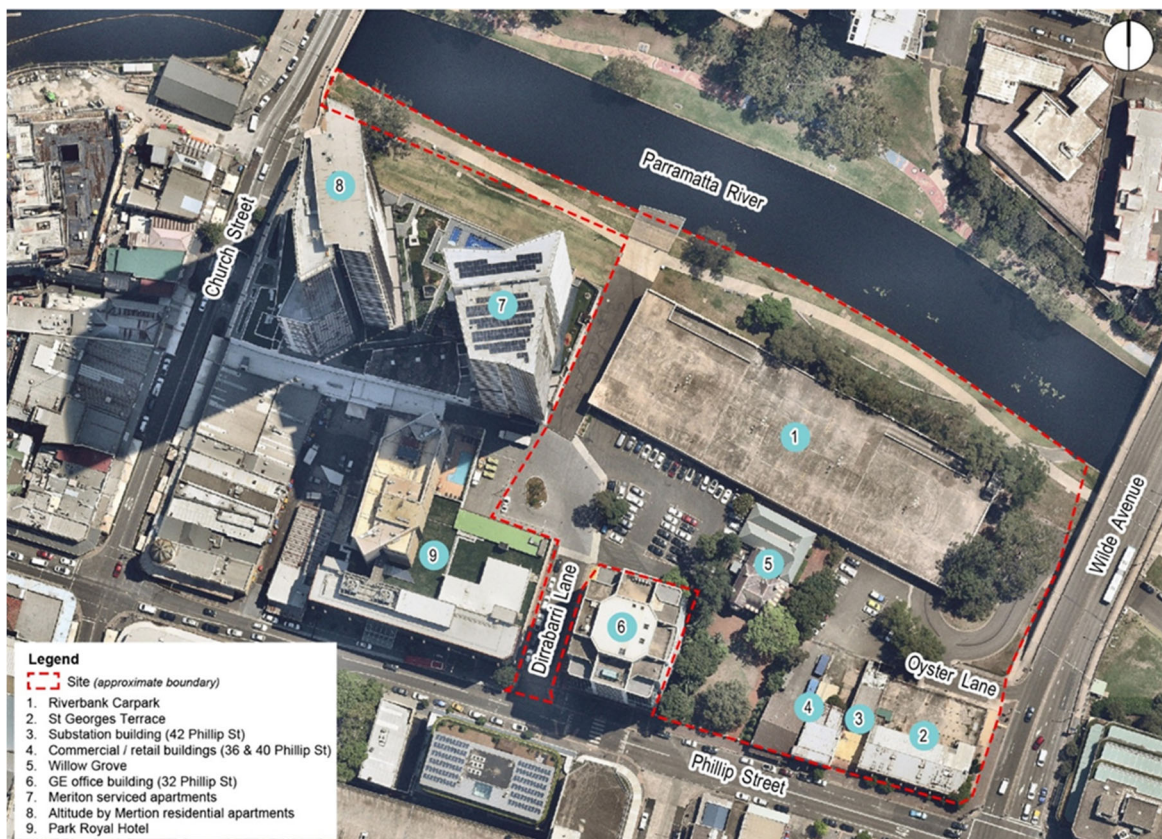


Figure 2 Project site boundary, key existing features, and immediate local context

Source: Ethos Urban

1.4 Document purpose

The purpose of the CTPMP is to assess the proposed access and operation of construction traffic associated with the Early Works for the proposed development with respect to safety and capacity. The Early Works include:

- decommissioning of existing services;
- demolition of nominated buildings, structures and footings (including the Riverbank car park, commercial buildings along Phillip Street, non-heritage components of St George's Terrace and hard stand throughout the site.
- services diversions and installations.

The document addresses the requirements listed in relevant condition of approval as summarised in Table 1 below.

Table 1 Requirements for CTPMP

Requirements of project approval for SSD-10416	Section Discussed
<i>The Construction Traffic and Pedestrian Management Sub-Plan (CTPMSP) must be prepared to achieve the objective of ensuring safety and efficiency of the road network. The CTPMSP shall be prepared in consultation with, and endorsed by, TfNSW and shall specify, but not be limited to, the following:</i>	
a description of the development;	2
location of any proposed work zone(s);	3.7
details of crane arrangements, including location of any crane(s) and crane movement plan;	N/A- no fixed cranes will be utilised for Early Works
haulage routes;	3.9
proposed construction hours;	3.2
predicted number of construction vehicle movements, detail of vehicle types and demonstrate that proposed construction vehicle movements can work within the context of road changes in the surrounding area, noting that construction vehicle movements are to be minimised during peak periods;	3.4 and 3.10
construction vehicle access arrangements;	3.10
construction program and construction methodology, including any construction staging;	Refer to CEMP
a detailed plan of any proposed hoarding and/or scaffolding;	3.6
consultation strategy for liaison with surrounding stakeholders, including other developments under construction and Parramatta Light Rail Builder;	4.12

Requirements of project approval for SSD-10416	Section Discussed
identify any potential impacts to general traffic, cyclists, pedestrians, bus services and any light rail within the vicinity of the site from construction vehicles during the construction of the proposed works. Proposed mitigation measures should be clearly identified and included in the CTPMSP; and	4
identify the cumulative construction activities of the development and other projects within or around the development site, including the Parramatta Light Rail Project, Sydney Metro West Project and private development. Proposed measures to minimise the cumulative impacts on the surrounding road network should be clearly identified and included in the CTPMP.	4.9
Note: The Applicant shall provide the builder's direct contact number to small businesses adjoining or impacted by the construction work and TfNSW to resolve issues relating to traffic, public transport, freight, servicing and pedestrian access during construction in real time. The applicant is responsible for ensuring the builder's direct contact number is current during any stage of construction.	This is to be provided separately to TfNSW

2 Development Description

The Powerhouse Parramatta as approved under SSD 10416 provides consent for the following works:

- site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- demolition of existing buildings including the existing Riverbank Car Park, 'Willow Grove', 'St George's Terrace' and all other existing structures located on the site (with Willow Grove to be relocated to another site);
- construction of the Powerhouse Parramatta, including:
 - seven major public presentation spaces for the exhibition of Powerhouse Collection;
 - front and back-of-house spaces;
 - studio, co-working and collaboration spaces comprising the 'Powerlab', supported by 30 residences (serviced apartments) for scientists, researchers, students and artists;
 - education and community spaces for staff, researchers and the Powerlab residents, the community, and education / commercial hirers;
 - commercial kitchen comprising the 'Powerlab Kitchen' used for cultural food programs, research, education and events;
 - film, photography, and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
 - public facing research library and archive for community, industry, students and researchers to access materials; and
 - a mix of retail spaces including food and drink tenancies with outdoor dining.
- operation and use of the Powerhouse Parramatta including use of the public domain provided on the site to support programs and functions;
- maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Lane and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;
- public domain within the site including new public open space areas, landscaping and tree planting across the site; and
- building identification signage.

The scope of this CTPMP covers the Early Works only.

3 Overview of Early Works

3.1 Construction program

It is currently envisaged the Early Works will commence in early 2021 and take approximately five months to complete.

3.2 Working hours

Work associated with the proposal will be carried out between the following hours of construction:

- Monday to Friday: 7am – 6pm
- Saturday: 8am – 1pm
- Sunday / public holiday: No work

The appointed contractor will be responsible for instructing and controlling all subcontractors regarding the hours of work. Any work outside the approved construction hours would be subject to specific prior approval.

3.3 Worker parking

It is anticipated that there will be on average up to 20 workers on-site at any given time during the early works.

It is not expected on-site parking will be provided for workers. Workers will not be permitted to park on the surrounding roads. Given the site's proximity to high frequency and wide-ranging public transport services, workers will be encouraged to use public transport to access the site where practical. During site induction, workers will be informed of the existing bus and train network servicing the site. Appropriate arrangements will be made for any equipment/ tool storage and drop-off requirements.

3.4 Size and type of vehicles

The site will have various types of construction vehicles accessing the site, including:

- 19m Truck and Dog Trailers;
- 12.5m Heavy Rigid Vehicles (HRVs)
- 8.8m Medium Rigid Vehicles (MRVs)
- 6.5m Small Rigid Vehicles (SRVs);
- Utes/vans

The largest construction vehicles accessing the site on a typical day will include 19m Truck and Dog Trailers. These vehicle types are consistent with those stated in the EIS and have consequently been approved as part of the Project.

3.5 Construction site boundary

The proposed site boundary for the Early Works is illustrated in Figure 3 below, and largely encompasses the perimeter of the site.

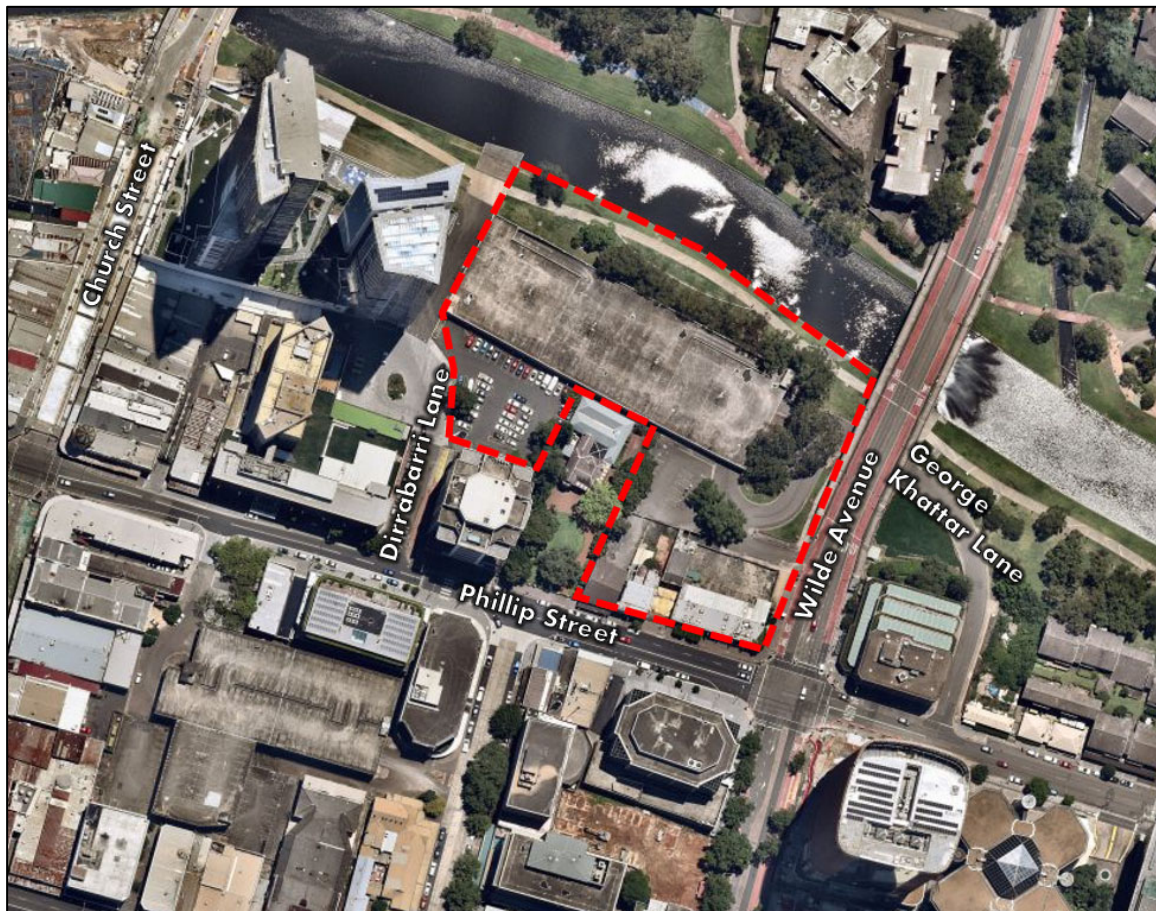


Figure 3 Proposed site boundary

3.6 Site hoarding

Site hoardings will be installed by the contractor as indicated in Figure 4. Chain mesh and A Class hoardings will be erected along the majority of the perimeter of the site to prevent unauthorised access by the general public. B Class hoarding is to be installed along Phillip Street (between the GE building and Wilde Avenue) so as to facilitate the introduction of a works zone at this location.

Parramatta Light Rail (PLR) works and associated access from Dirrabarri Lane are not to be impeded by the early works. Hoarding placement and design along Parramatta River and at the portal for Lennox Bridge and access to this work area are to be maintained. Consultation with PLR and its contractors will be undertaken by the early works contractor.



Figure 4 Proposed site hoarding

3.7 Work zones

To facilitate the project, a work zone is proposed to be established on the northern side of Phillip Street, as shown in Figure 5. The work zone would require the removal of approximately 5 existing on-street parking spaces, which are proposed to be removed regardless following the opening of the Powerhouse Parramatta to facilitate a bus pick up / drop off area. The work zone would be approximately 25m in length.

A B-Class hoarding will be installed adjacent to the work zone to provide protection to pedestrians walking along Phillip Street. The Phillip Street footpath will remain open at all times during the construction period.

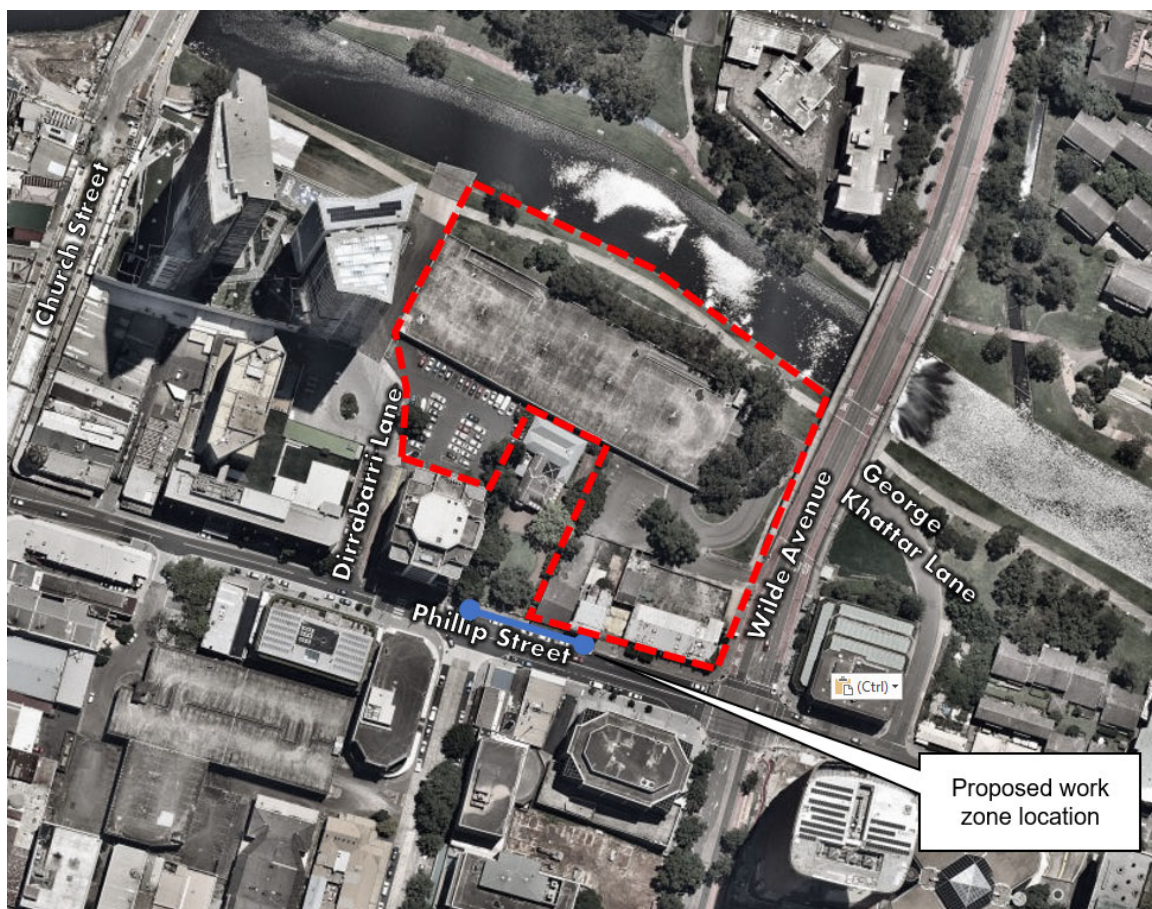


Figure 5 Proposed Phillip Street work zone

3.8 Road closures

No road closures are expected to be necessary to facilitate the early works, ensuring people driving in the streets around Parramatta are not impacted by the proposed works.

3.9 Heavy vehicle routes

The main heavy vehicle access routes will be via the state road network including the M4 Motorway, James Ruse Drive, Pennant Hills Road and Victoria Road. These routes have been selected to avoid trucks travelling through the Parramatta CBD and impacting adjacent construction projects – particularly Parramatta Light Rail (Stage 1). Church Street is not proposed to be used as a construction access route given the concurrent construction activity that will be occurring for the PLR project. Vehicles using the Oyster Lane access point will travel along Hassall Street and Parkes Street before turning right onto Smith Street. These heavy vehicle routes from the broader road network are shown in Figure 6.

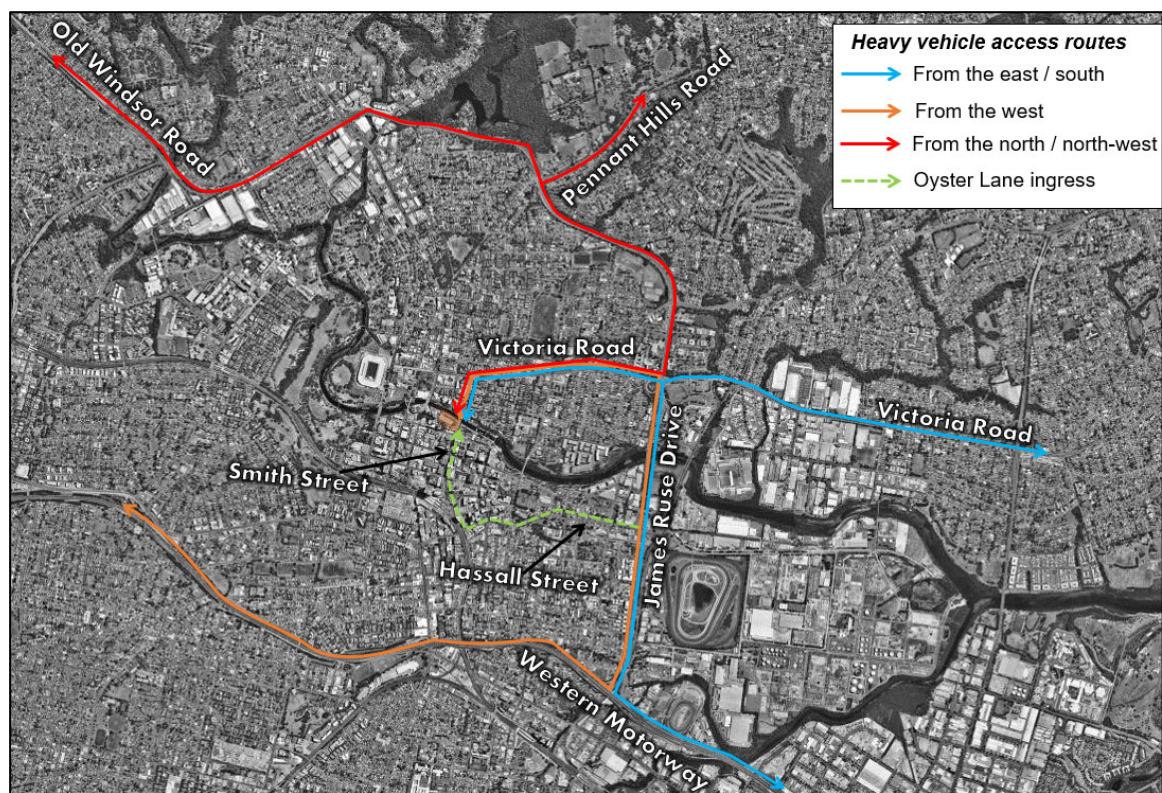


Figure 6 Heavy vehicle access routes from broader road network

Closer to the Parramatta CBD, construction vehicles (MRVs or smaller) will access the site via the Wilde Avenue bridge and turn right onto Phillip Street. Vehicles will then turn right into Dirrabarri Lane from Phillip Street. Wilde Avenue will form the egress route for vehicles using Dirrabarri Lane via a left turn onto Phillip Street. Larger vehicles including truck and dogs utilising the access point via George Khattar Lane will travel left from Wilde Avenue onto Phillip Street before entering George Khattar Lane. The existing Oyster Lane vehicle access will also be retained so vehicles can turn left into the site on entry and then exit the site directly onto Wilde Avenue. Approximately three months into the early works an access point will become available along Phillip Street east of Dirrabarri Lane.

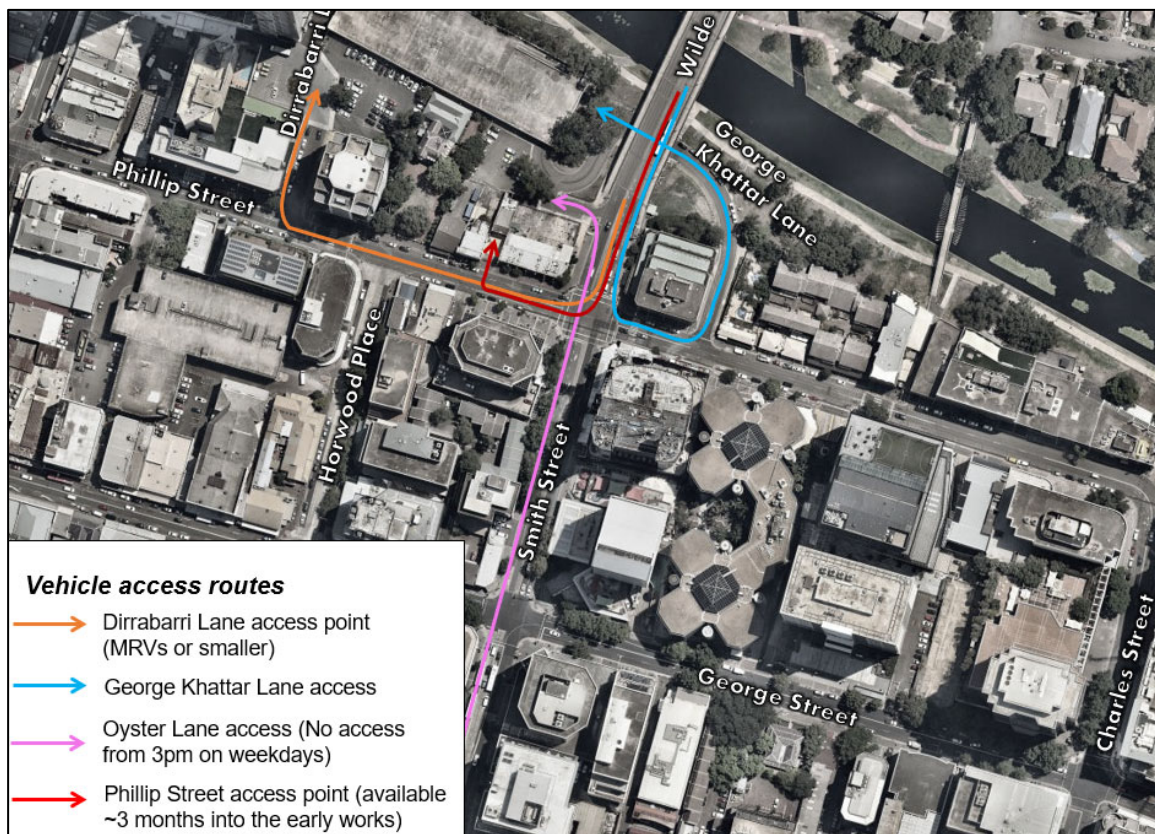


Figure 7 Heavy vehicle access routes in Parramatta CBD

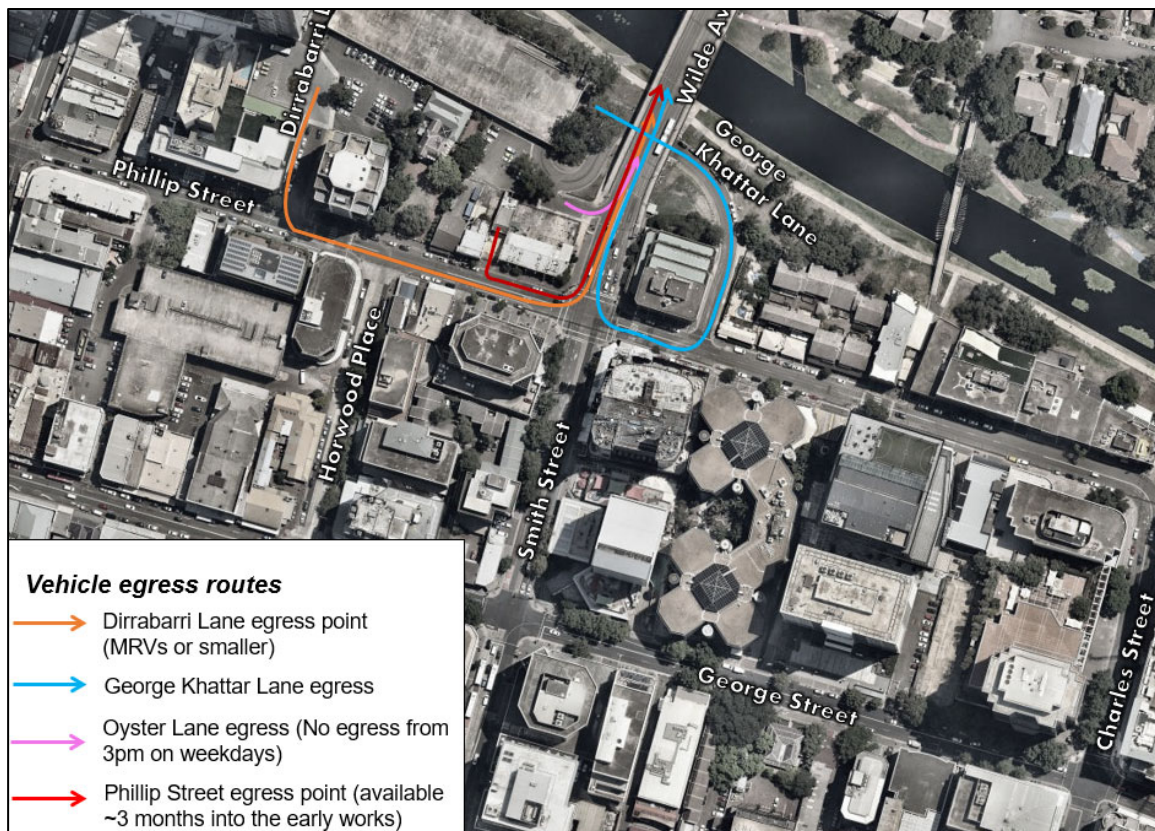


Figure 8 Heavy vehicle egress routes in Parramatta CBD

Given the existing bus corridor along Wilde Avenue and Smith Street, no vehicle access or egress via Oyster Lane will be permitted after 3pm onwards on weekdays. There is to be a maximum of 5 construction vehicle movements (5 in and 5 out) per hour from the Oyster Lane access in the AM Peak period (7am-10am). Access into and out of the site by construction vehicles is to be shared by the other access points to the site and not only via Oyster Lane, namely Dirrabarri Lane and George Khattar Lane. Ingress in the AM Peak period is only approved until the secondary access/egress location on Phillip Street becomes available or for the first three months of the early works from the start of construction activities - whichever of the two events occurs first.

Minor civil works to the existing footpath along Wilde Avenue will need to be undertaken to widen the Oyster Lane access point to accommodate the swept path of a truck and dog vehicle into and out of the site.

For vehicles accessing the works zone on Phillip Street they will be required to enter the site via Dirrabarri Lane and turn around within the site before entering back onto Phillip Street. Egress from the works zone will be along Phillip Street and then left into Wilde Avenue as shown in Figure 9 below.



Figure 9 Access to Phillip Street works zone

Vehicle swept paths for 19m truck and dog vehicles entering and exiting the site are provided in Appendix A of this document.

3.10 Construction traffic volumes

The number of daily heavy vehicles accessing the site is forecast to be approximately 40 vehicles per day, with up to eight trucks per hour expected during peak times. The expected profile of truck numbers accessing the site over the course of a weekday is illustrated in Figure 10.

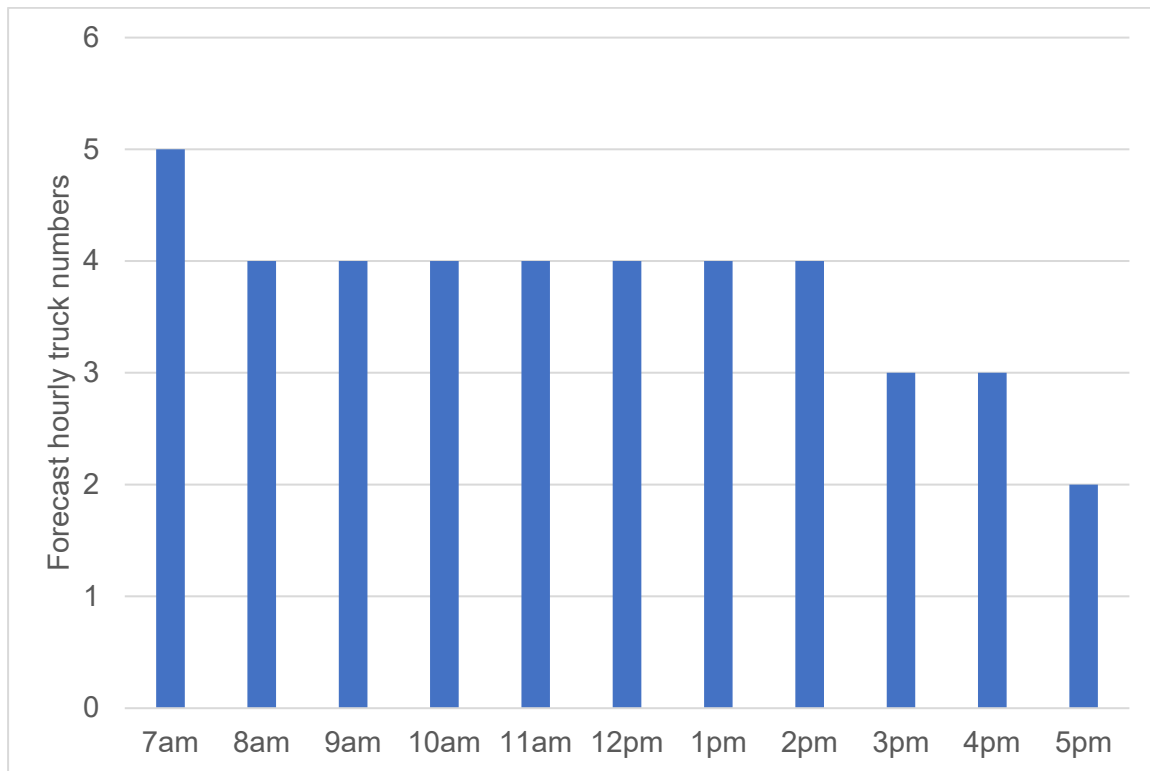


Figure 10 Typical daily profile of truck activity (weekday)

It is important to note that the numbers indicated are indicative only and subject to change on a daily basis.

4 Impacts and Management of Works

4.1 Pedestrians and cyclists

At this stage it is not envisaged that any footpath closures will be required to facilitate the construction project. Temporary B Class hoardings will be installed along the site frontage on Phillip Street to maintain east-west pedestrian movements and ensure the safety of pedestrians walking adjacent to the construction site.

The primary impact to pedestrians and cyclists associated with the works will be along the Parramatta Valley Cycleway, with the existing section between Wilde Avenue and Church Street to be closed during the works. During the closure of this section of path detour signage will be in place underneath the Barry Wilde Bridge to direct pedestrians and cyclists to the pathway on the northern bank of the Parramatta River where they can continue their journey. Signage will also be in place adjacent to the Parramatta ferry wharf noting the closure of the pathway at the Barry Wilde Bridge.

The impacts of the closure during the works are considered minor given that:

- The existing pathway on the southern bank of the Parramatta River ends at Church Street, only 270m west of the closure point; and
- There is an existing crossing point of the Parramatta River for pedestrians and cyclists underneath the Barry Wilde Bridge which will allow for pedestrians and cyclists to continue their journeys on the northern bank of the Parramatta River.

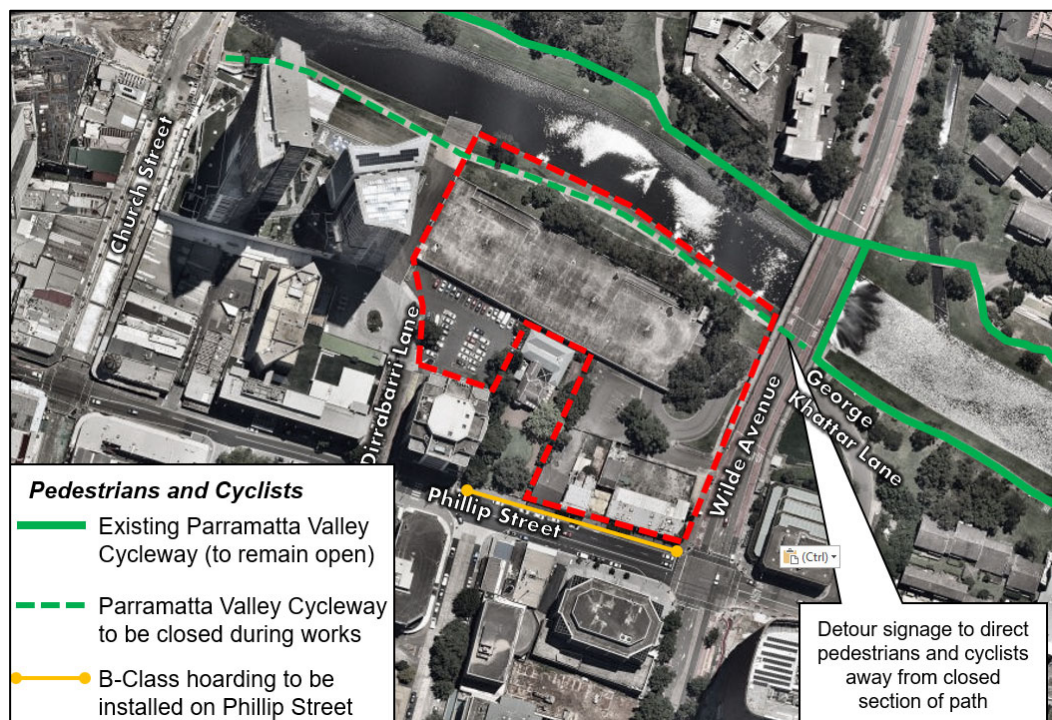


Figure 11 Pedestrian and cyclist impacts along Parramatta Valley Cycleway

4.2 Traffic control

Traffic controllers will be positioned at vehicle site access and egress points to manage interactions between vehicles and pedestrians on adjoining footpaths. When large vehicles longer than 8.8m enter George Khattar Lane from Phillip Street a traffic controller will be in place to stop traffic travelling in the opposite direction on George Khattar Lane. This is required as the swept path of the vehicle (see Appendix A) crosses onto the opposing side of the road when turning left from Phillip Street into George Khattar Lane.

Traffic control plans (TCPs) for the site access points have been prepared and are presented in Appendix B of this document.

4.3 Public transport

It is not expected that public transport services would be affected by the works. The small number of additional vehicles using public transport corridors such as Wilde Avenue and Victoria Road would not impact the operation of the public transport network in the vicinity of the site. The number of daily vehicles associated with the works will be less than that currently using the Riverbank car park. Heavy vehicle arrival and departure routes have been selected in order to avoid interactions with the Parramatta Light Rail (Stage 1) works – therefore not impacting this construction project.

No access to the site via Wilde Avenue at Oyster Lane from 3pm onwards on weekdays is proposed so as to not impact the operation of the Wilde Avenue bus corridor during the AM and PM peak periods.

The only bus route that operates on Phillip Street is the 900 loop service. This service is not expected to be impacted by the works given the relatively small vehicle numbers as well as the distribution of site access points. Traffic controllers will be in place at the Dirrabarri Lane access on Phillip Street to ensure that traffic, including buses, continues to move efficiently during the early works.

The close proximity of public transport servicing the site via heavy rail and the adjacent bus network will enable construction personnel to easily access the site via public transport, minimising the road traffic impact around the site.

4.4 Dirrabarri Lane access

Dirrabarri Lane will remain open at all times to maintain vehicle access to the adjacent GE Building and Meriton apartments. Traffic controllers will manage construction movements on Dirrabarri Lane so that these vehicles do not impact the movement or safety of other users.

4.5 Emergency vehicles

Emergency vehicle access will be maintained into the precinct at all times via Dirrabarri Lane.

4.6 Road network impacts

Workers will generate some additional traffic to the site. The early works will have a workforce of only 20 people on a standard working day. Typically workers have a high vehicle occupancy of between 2-3 people per vehicle, however a conservative vehicle occupancy of 1.5 people / car has been assumed for this project. Further, given the site's proximity to nearby public transport services it is expected at least half of workers will arrive by non-car modes, which is considered a conservative assumption.

This would generate approximately 7 vehicles arriving to the Parramatta CBD during the early works phase of the project. This level of activity is significantly lower than that currently generated by the Riverbank car park, and is not expected to result in any undue impacts on the surrounding road network. Further, workers will need to arrive to the site prior to 7am, therefore not coinciding the morning commuter peak hour.

4.7 Car parking

It is not expected on-site parking will be provided for workers, with public transport to be promoted as the primary form of access to the site. For workers that choose to drive, they will be afforded with a number of car parking options within the Parramatta CBD. A maximum parking demand of 7 cars is expected during the construction period, which in the context of the current supply within Parramatta is considered negligible.

To support workers in utilising public transport and reduce dependency on private vehicle as a mode of access to the site, appropriate arrangements will be made for any equipment/ tool storage and drop-off requirements.

To facilitate the proposed work zone on the northern side of Phillip Street, approximately 5 existing on-street car parking spaces will require removal during working hours.

4.8 Site induction

All staff employed on the site by the head contractor (including sub-contractors) are required to undergo a site induction. Delivery driver inductions will take place to ensure truck drivers are aware of this document, and any changes that may occur on a case by case basis.

The induction would include permitted access routes to and from the site for site staff and delivery vehicles, limited parking arrangements, as well as standard

environmental, workplace health and safety, driver protocols and emergency procedures. The approved work hours must be included as part of this induction.

4.9 Cumulative construction activities

The key concurrent construction project in the vicinity of the Powerhouse Parramatta site will be the PLR Stage 1 works. The primary construction vehicle routes in place for the PLR Stage 1 project (as per those identified in the Environmental Impact Statement) are shown in Figure 12 below. This indicates that the primary construction vehicle routes for the PLR project do not overlap with that proposed for the Powerhouse Parramatta site, that being the route via Victoria Road and Wilde Avenue. Although Victoria Road will be used by both construction projects, the number of vehicle movements on this corridor will be relatively low in the context of existing traffic volumes. Therefore the cumulative impacts associated with the PLR Stage 1 project are expected to be minor.

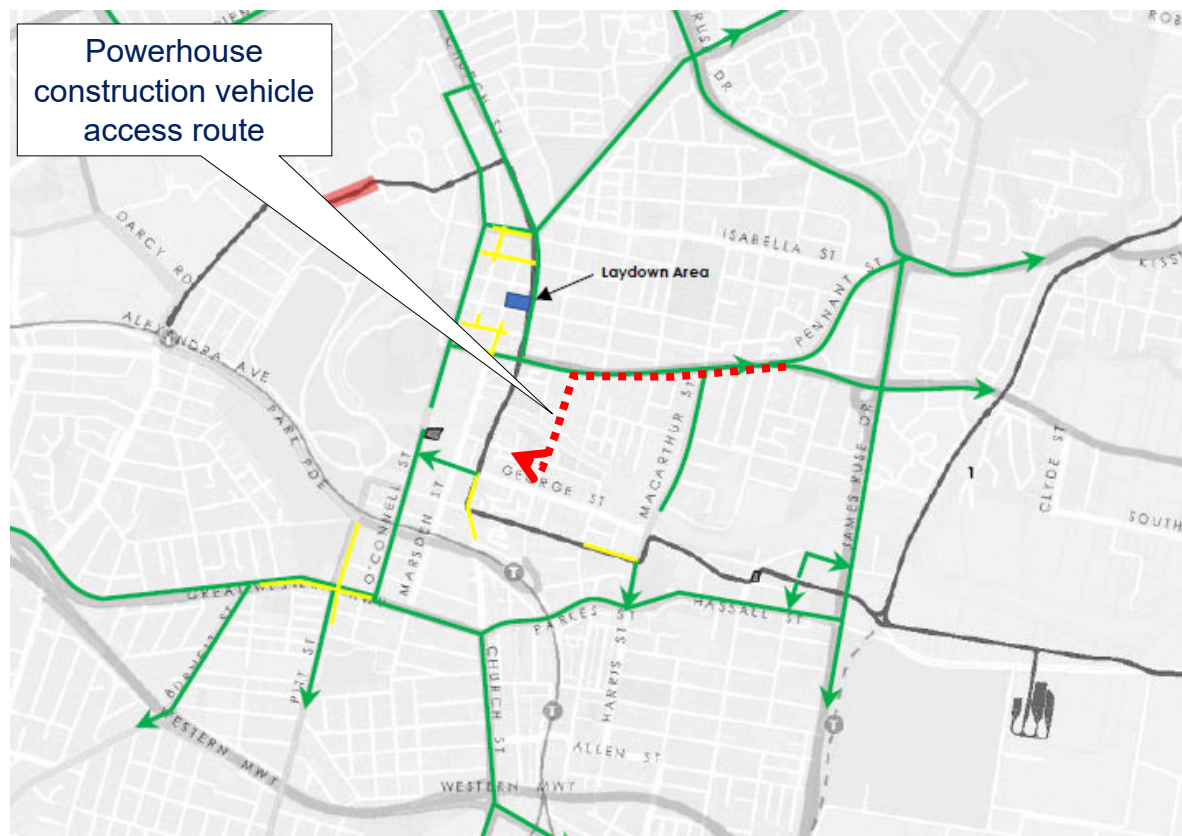


Figure 12 PLR Stage 1 construction traffic routes

Source: Transport for NSW, 2017

The appointed contractor will need to engage in ongoing consultation with key agencies including City of Parramatta Council and Transport for NSW during the construction period to ensure any cumulative impacts with other projects are managed appropriately.

Transport for NSW has an access licence through the Powerhouse construction site for works associated with Parramatta Light Rail near Lennox Street Bridge. Under the terms of this licence access is to be provided by the landowners of the Powerhouse site for Transport. Following discussions with Transport for NSW, it has been agreed that arrangements will be made for access through any hoardings placed on the Powerhouse site.

It is noted that Transport for NSW anticipate completion of works within the Powerhouse site by end March 2021. In this case it is anticipated that arrangements for access through the Powerhouse site would only be for a duration of less than 1 month and can easily be managed through ongoing consultation with the Powerhouse contractor.

Future access licenses through the site may be granted and the appointed contractor for the Powerhouse Parramatta will work with any future contractors in order to come to an agreement to grant an access license to safely manage access through the site.

4.10 Mitigation measures

Mitigation measures will be adopted during construction to ensure traffic movements have minimal impact on surrounding land uses and the community in general, and would include the following:

- Trucks to not use any local streets for access to the construction site other than local streets that have been designated as heavy vehicles routes (as per Section 3.9 of this document);
- Trucks to enter and exit the site in a forward direction;
- Pedestrians near the ingress/egress points will not be held unnecessarily;
- At construction vehicle access/egress points, priority is to be given to trucks accessing the site over trucks egressing the site so as to have no impact to traffic flow on surrounding roads;
- Trucks to not circulate on the road network to wait to enter the site;
- Restrict construction vehicle activity to designated routes which minimise the use of local roads;
- Truck drivers will be advised of the designated truck routes to/ from the site;
- Construction access from the external road network to mainly occur at signalised intersection;
- Pedestrian movements adjacent the construction site will be managed and controlled by site personnel where required;
- Pedestrian warning signs and construction safety signs/devices to be utilised in the vicinity of the site and to be provided in accordance with WorkCover requirements;

- Construction activity to be carried out in accordance with approved hours of work;
- Truck loads would be covered during transportation off-site;
- Establishment and enforcement of appropriate on-site vehicle speed limits which would be reviewed depending on weather conditions or safety requirements;
- Activities related to the Early Works would not impede traffic flow along adjacent roads;
- Materials would be delivered and spoil removed during standard construction hours;
- Construction vehicles not to queue on adjacent streets;
- During site induction, workers will be informed of the existing public transport network servicing the site;
- To support workers in utilising public transport, appropriate arrangements will be made for any equipment/ tool storage and drop-off requirements; and
- Development and enforcement of driver charter.

4.11 Driver code of conduct

The contractor will include the following in all subcontract procurement packages:

- a copy of the approved truck routes as previously detailed in this document.
- the approved maximum truck size
- any other entry restrictions, or site access restrictions as agreed to by the authorities.

The contractor will be responsible for managing all site access points and monitoring subcontractor behaviour and subcontractor truck access arrangements to ensure compliance with conditions of contract. They will be responsible for managing for all the site gate access to ensure there is no access to or from the site before or after approved construction hours. Within the site, a speed limit of 10km/hr will apply. Vehicles entering, exiting and driving around the site will be required to give way to pedestrians. Vehicles are not to queue on the road network and must enter and exit the site in a forward direction. All deliveries are to check in at the site office on arrival.

4.12 Consultation strategy

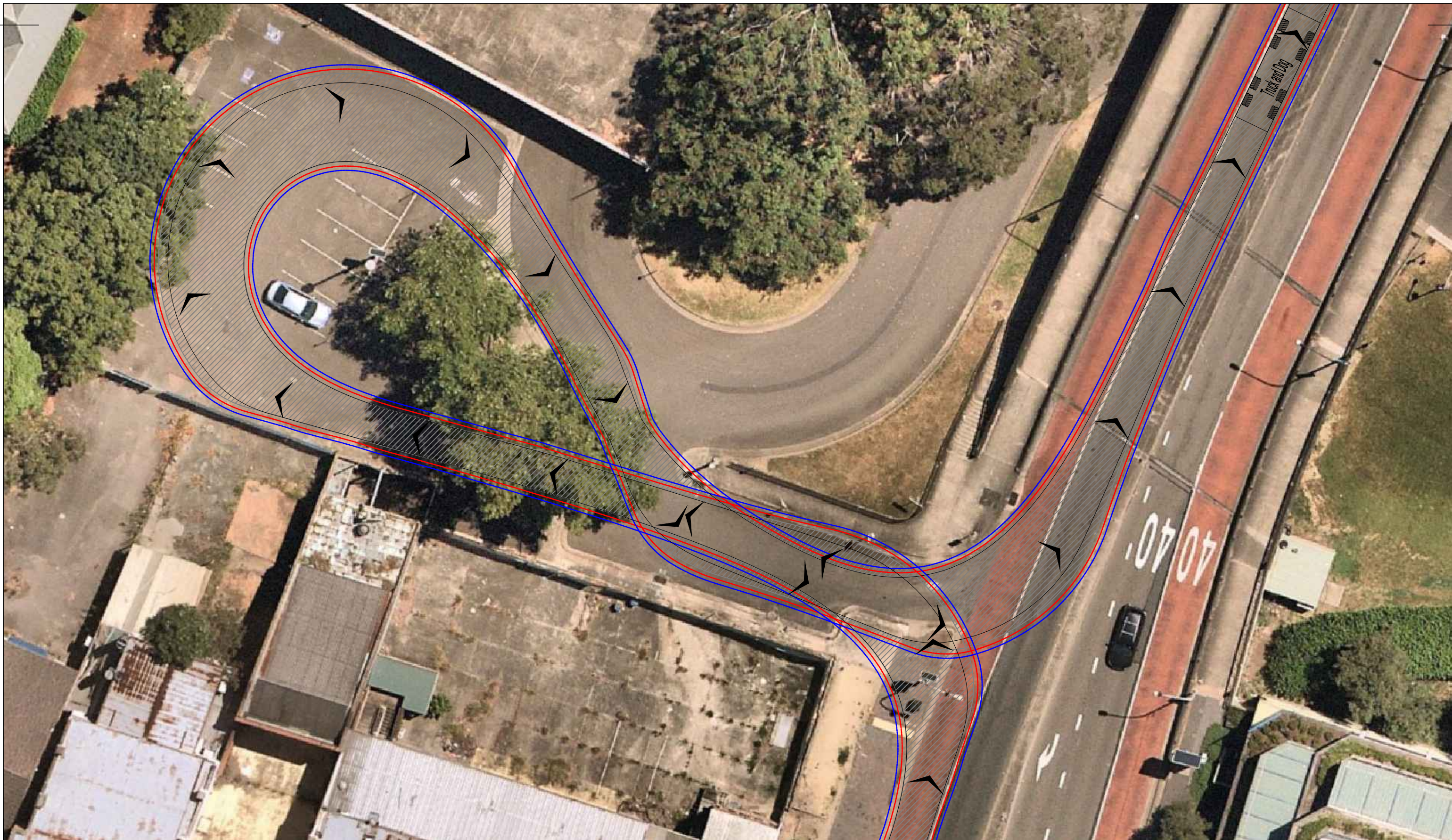
A consultation strategy for the Early Works is appended to the Construction Environmental Management Plan (CEMP) and this meets all requirements for construction traffic and pedestrian management as required by the condition.

5 Summary

This Construction Traffic and Pedestrian Management Plan has been prepared to support the Early Works on the Powerhouse Parramatta site. The works are programmed to begin in early 2021 and take approximately 5 months to complete.

The assessment describes the arrangements that the appointed contractor will follow such that the works can be carried out safely, with impacts to pedestrians and other road users appropriately managed through the measures described in this report. Overall, the impacts of the Early Works are considered to be low with the provision of appropriate safety and mitigation measures.

Appendix A: Vehicle Swept Paths



Client
Infrastructure NSW

Date
23.02.21

Job Title
Powerhouse Parramatta

Job No
2006

Drawing Title
Turning Paths
Truck and Dog turning around
within the site

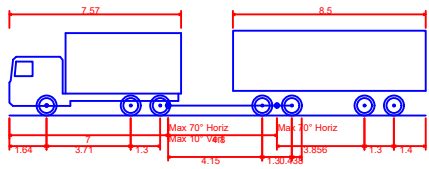
Drawing No
SKT19

Drawing Status
For Information

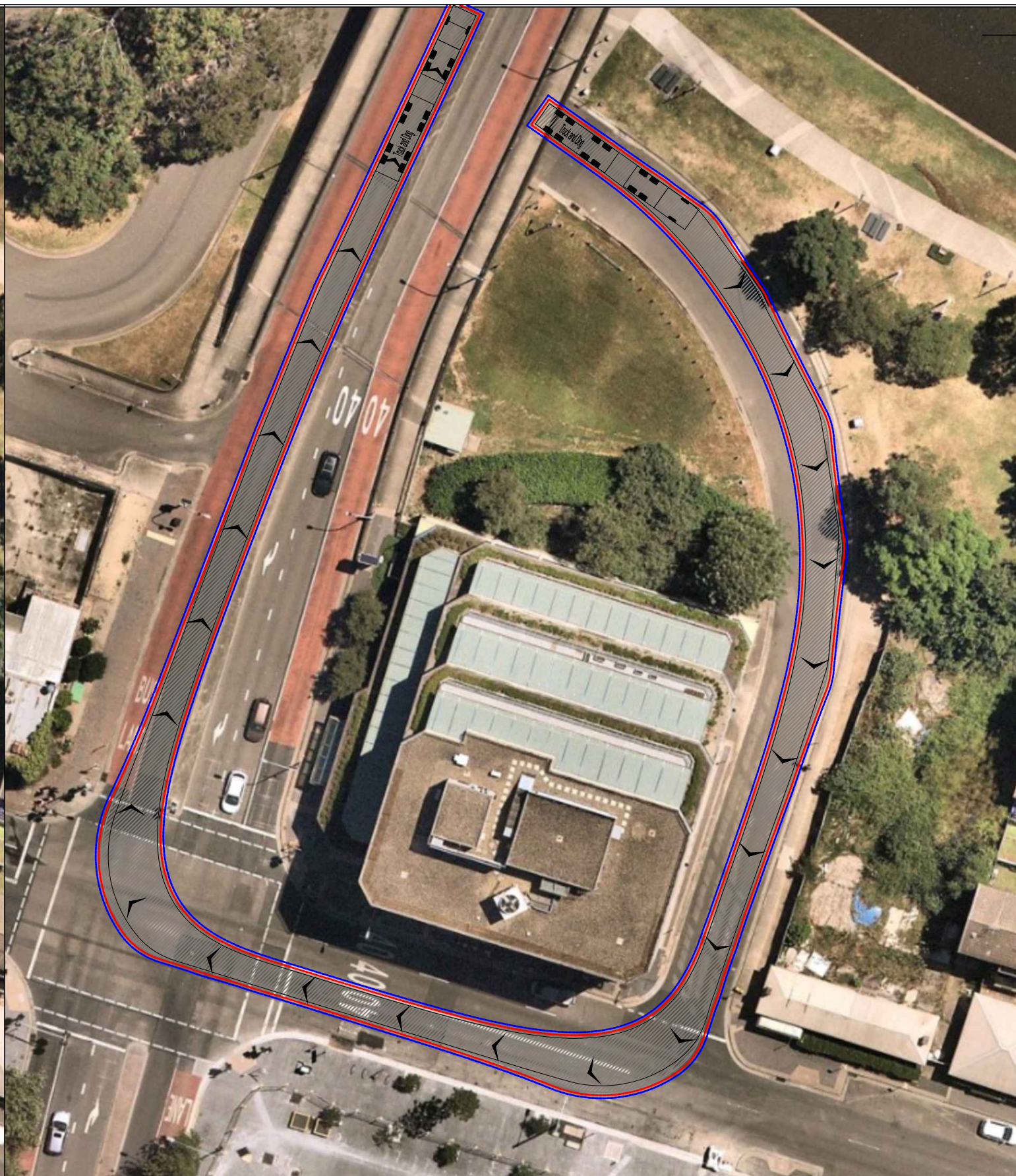
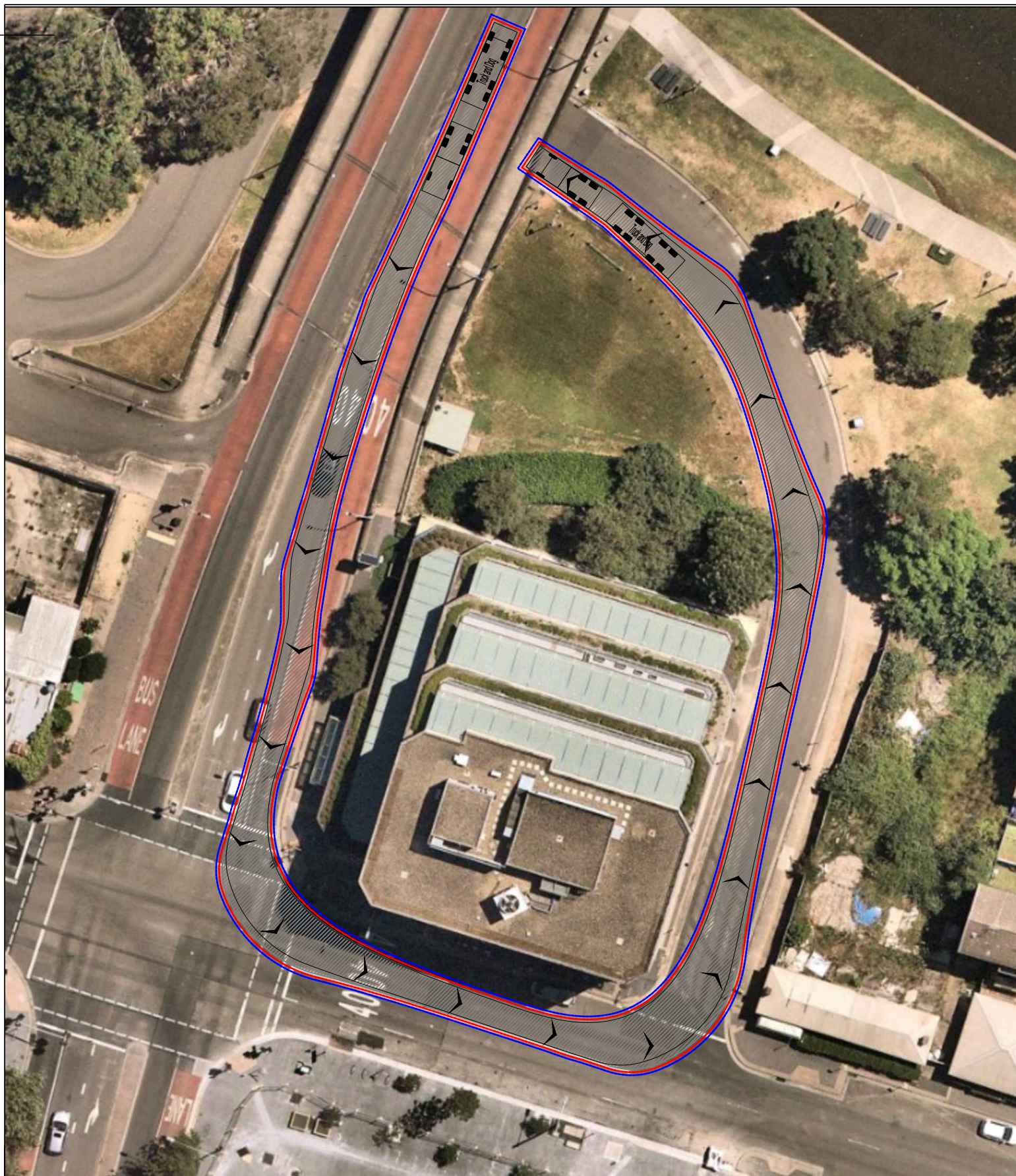
- Legend**
- Body Envelope
 - 300mm Envelope
 - 600mm Envelope
 - Wheel Envelope

Scale at A3
1:250

Vehicle type(s)



Truck and Dog
Overall Length 18.356m
Overall Width 2.500m
Overall Body Height 3.738m
Min Body Ground Clearance 0.427m
Track Width 2.500m
Lock to Lock Time 6.00 sec
Curb to Curb Turning Radius 12.500m



Client
Infrastructure NSW

Date
23.02.21

Job Title
Powerhouse Parramatta

Job No
2006

Drawing Title
Turning Paths
George Khattar Lane access

Drawing No
SKT20

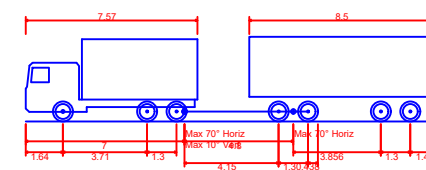
Drawing Status
For Information

Legend

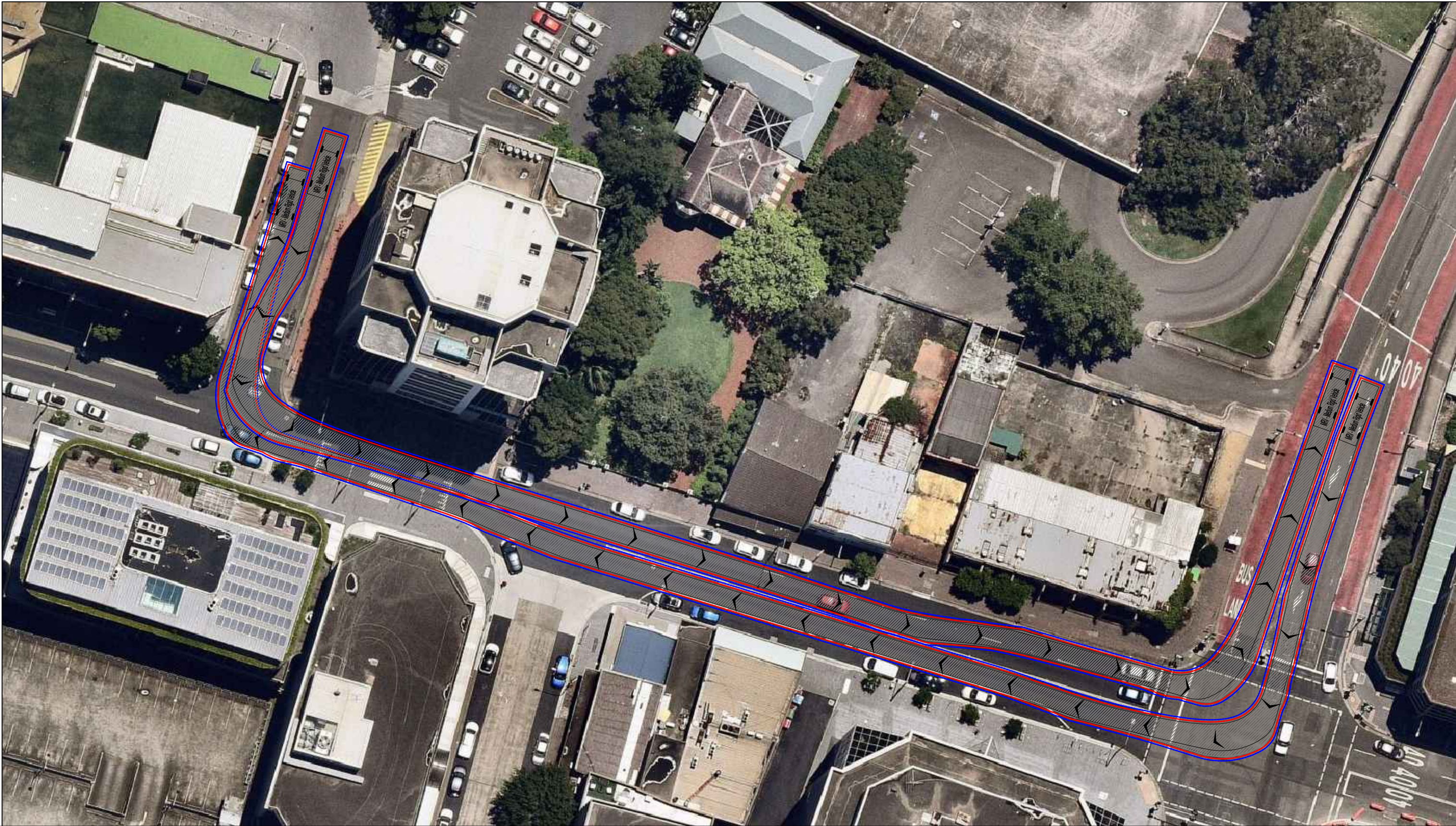
- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Scale at A3
1:250

Vehicle type(s)



Truck and Dog
Overall Length 18.356m
Overall Width 2.500m
Overall Body Height 3.738m
Min Body Ground Clearance 0.427m
Track Width 2.500m
Lock to Lock Time 6.00 sec
Curb to Curb Turning Radius 12.500m



Client
Infrastructure NSW

Date
24.03.21

Job Title
Powerhouse Parramatta

Job No
2006

Drawing Title
Turning Paths
MRV in Dirrabarri Lane

Drawing No
SKT22

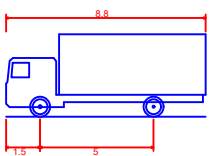
Drawing Status
For Information

Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

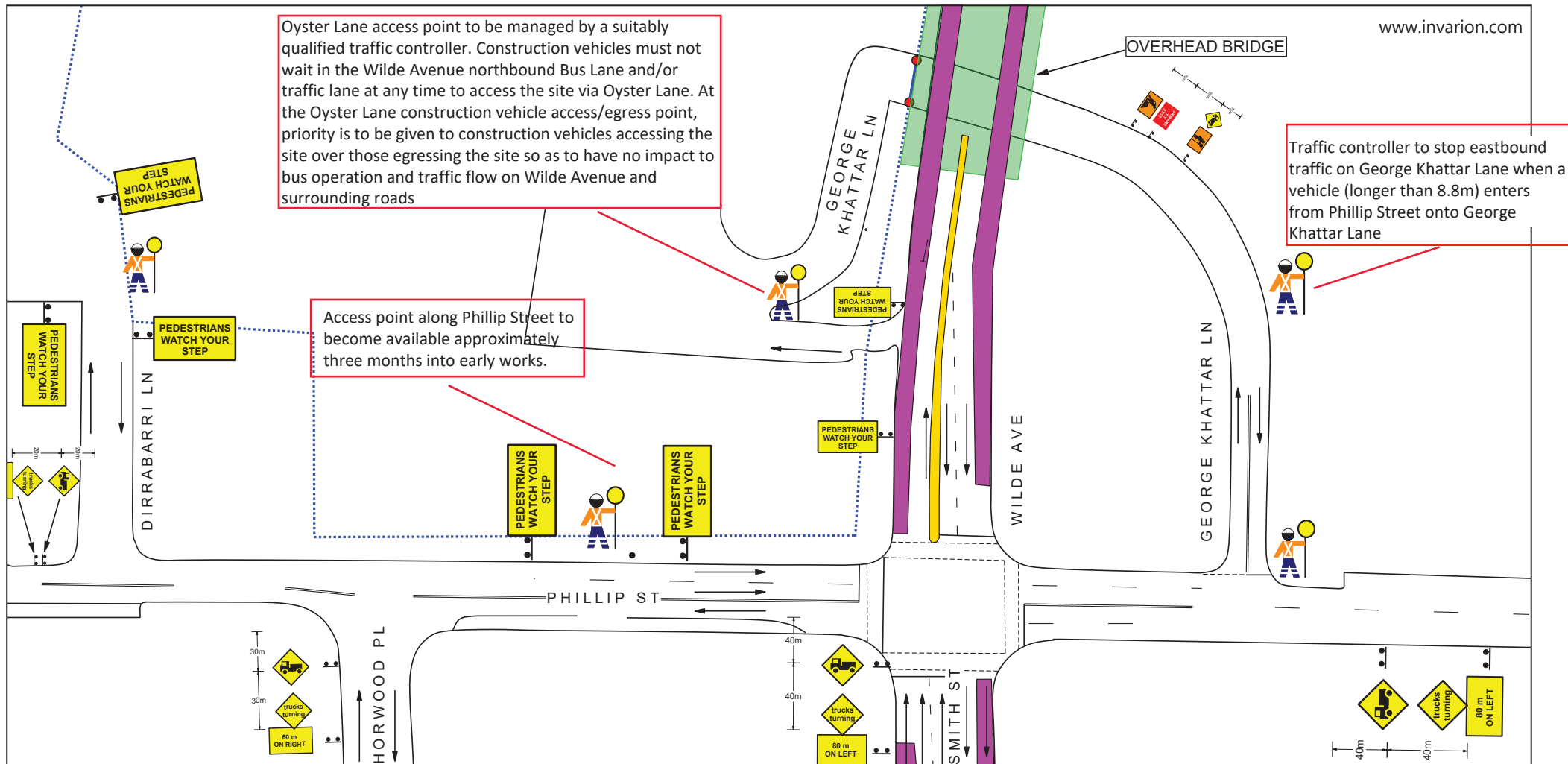
Scale at A3
1:500

Vehicle type(s)



MRV - Medium Rigid Vehicle
Overall Length 8.800m
Overall Width 2.500m
Overall Height 3.63m
Min Body Ground Clearance 0.428m
Track Width 2.500m
Lock to Lock Time 4.00 sec
Curb to Curb Turning Radius 10.000m

Appendix B: Traffic Control Plans



PH: 02 9675 7731 F: 02 9675 7744
10 Coventry Place
Mount Druitt NSW 2770
www.aaatraficcontrol.com.au
info@aaatraficcontrol.com.au
A.B.N. 78 105 021 869

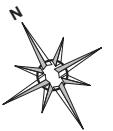
NOTES:

1. All Traffic Control works; signs and devices to comply with Australian Standard AS 1742.3.
2. Adjustments to TCP may be only made by persons holding an RMS "Prepare a Work Zone TMP" certification.
3. All traffic control devices may only be set out by persons holding an RMS "Implement Traffic Control Plans" ticket or higher.
4. Traffic control personnel must hold an RMS "Traffic Controller" ticket or higher.
5. Signs to be erected so they are visible to motorists and not a hazard to pedestrians.
6. Traffic controllers to escort pedestrians past the work area.
7. Traffic Controllers who are on constant Stop-Go, must be relieved for a minimum period of 15 minutes every two hours. As per the Australian Standards and the WH&S Act.
8. Site ganger is to conduct a 'tool box talk' and complete the adequate paperwork to support the discussion.
9. A 'risk assessment' to be conducted on site, prior setup to determine the queue length and site distance to the active TCP.
10. If an incident occurs on site, an 'Incident report form' MUST be completed immediately. Upon completion of the incident report form, site Ganger is to notify AAA head office.

This TCP has been prepared as a guide for Traffic Management purposes only and is not to scale.

The positions of the signs, traffic controllers and equipment are only suggested locations. Amendments to the locations may be required on site.

AAA Traffic Control Pty Ltd accepts no liability for the implementation or execution of this TCP unless undertaken by authorized AAA Traffic Control personnel.



CLIENT: J MILSTON TRANSPORT CONSULTING PTY LTD

CONTACT: JOSH PH: 0415 563 177

PROJECT: TRUCK EXIT/ENTRY

LOCATION: POWERHOUSE MEUSEUM, PARRAMATTA

UBD: 24/J6

PO:

MANAGEMENT

- EXIT/ENTRY
- LANE MERGE
- CONTRA FLOW
- DETOUR
- ROAD CLOSURE
- SHOULDER WORKS

- PEDESTRIAN MGMT.
- INTERMITTENT

ROAD CLASSIFICATION

- STATE (RTA/RMS)
- REGIONAL (COUNCIL & RTA/RMS)
- LOCAL (COUNCIL)

JOB NO. 9190

PLAN NO: SA3417

AUTHOR: THIOLAN NAIDOO

CERT: 0051984642

DATE: 24.03.2021

SIGN:

REV DATE

SCALE N.T.S

RECOMMENDED MAXIMUM SPACING OF CONES AND BOLLARDS

PURPOSE OF USAGE	APPROACH SPEED (km/h)	MAX SPACING (m)
All purposes on residential or commercial streets	<= 50	4
Center-line on approach to Traffic Controller position	All cases	4
Outer edge of traffic line - i.e. working on shoulder	51-70 / >70	18 / 24
Separating opposing traffic on 2 lane 2 way road	51-70 / >70	12 / 18
Separating opposing traffic on multilane undivided road	51-70 / >70	16 / 24
Adjacent to a closed lane on a multilane road	51-70 / >70	9 / 12
Merge tapers	51-70 / >70	12 / 18
Lateral shift tapers	51-70 / >70	24 / 60
Protecting freshly painted lines	51-70 / >70	24 / 60

RECOMMENDED TAPER LENGTHS

APPROACH SPEED (km/h)	TRAFFIC CONTROL AT START	LATERAL SHIFT TAPER	MERGE TAPER
< 45	15	0	15
46 - 55	15	15	30
56 - 65	30	30	60
66 - 75	N/A	70	115
76 - 85	N/A	80	130
86 - 95	N/A	90	145
96 - 105	N/A	100	160
> 105	N/A	110	180

FIGURES EXTRACTED FROM RTA TCWS MANUAL v4.0 (TABLES 5.1 & 5.2). REFER TO MANUAL FOR FURTHER INFO.

APPENDIX 5- CONSTRUCTION NOISE AND VIBRATION MANAGEMENT PLAN

Infrastructure New South Wales **Powerhouse Precinct Parramatta** Construction Noise and Vibration Management Plan

REP 0002

Issue 2 | 8 February 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 273467

Arup
Arup Pty Ltd ABN 18 000 966 165



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ARUP

Document Verification

ARUP

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		Signature			
Issue Document Verification with Document ☒					

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References

- [1] Arup, “PHM-ARP-REP-AC-0001 v4 NVIA Powerhouse Parramatta Noise and Vibration Impact Assessment,” Arup, Sydney, 2020.
- [2] NSW Environment Protection Authority, “NSW Noise Policy for Industry,” NSW Environment Protection Authority, Sydney, 2017.
- [3] Standards Australia, “AS 2436-2010 - Guide to noise and vibration control on construction, demolition and maintenance sites,” Standards Australia, 2010.
- [4] Department for Environment Food and Rural Affairs, “Update of noise database for prediction of noise on construction and open sites,” Department for Environment Food and Rural Affairs, 2006.
- [5] Department of Environment and Conservation (NSW), “Assessing Vibration: A technical guideline,” Department of Environment and Conservation (NSW), Sydney, 2006.

1 Introduction

This Construction Noise and Vibration Management Plan (CNVMP) has been prepared for early works construction activities associated with the Powerhouse Parramatta.

The report outlines the relevant assessment criteria, assessment of impacts and the management techniques that should be used to manage noise and vibration impacts from the early works, of which the most significant noise and vibration generating activities are demolition of the existing structures.

A Noise and Vibration Impact Assessment Report (NVIA) [1] was prepared by Arup on 22 April 2020 for the project application, which presented preliminary assessments of construction noise and vibration impacts along with establishment of background noise levels utilised in this CNVMP.

1.1 Scope of this document

This CNVMP has been developed in accordance with Condition of Consent of Application SSD-10416, Powerhouse Parramatta.

Individual requirements which have been addressed in this CNVMP are outlined in Section 4, along with the corresponding CNVMP section.

1.2 Responsibilities

The Contractor will be responsible for adhering to the construction noise and vibration mitigation measures outlined in the NVIA.

1.3 Qualification

This CNVMP was prepared and reviewed by suitably qualified and experienced acousticians from the Arup Acoustics team, who hold good working knowledge of the relevant standards, specifications and conditions applicable to this project.

2 Project Description

Powerhouse Parramatta will be an active working precinct and include the Powerlab, which will enable researchers, scientists, artists and students from across regional NSW, Australia and around the world to collaborate and participate in Powerhouse programs.

Powerhouse Parramatta building shall include:

- seven major public presentation spaces for the exhibition of Powerhouse Collection;
- front and back-of-house spaces;
- studio, co-working and collaboration spaces comprising the ‘Powerlab’, supported by 30 residences (serviced apartments) for scientists, researchers, students and artists, and 60 dormitory beds for school students;
- education and community spaces for staff, researchers and the Powerlab residents, the community, and education and commercial hirers;
- commercial kitchen comprising the ‘Powerlab Kitchen’ used for cultural food programs, research, education and events;
- film, photography, and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
- public facing research library and archive for community, industry, students and researchers to access materials; and
- a mix of retail spaces including food and drink tenancies with outdoor dining.

2.1 Site vicinity and nearby noise-sensitive premises

The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street.

The site boundary is identified in Figure 1 and Figure 2. The site excludes the GE Office Building at 32 Phillip Street.



Figure 1: Aerial photograph of the site and its context Source: Mark Merton Photography



Figure 2: Site boundary, key existing features, and immediate local context Source: Ethos Urban

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.

2.2 Noise sensitive receivers

In accordance with the Noise Policy for Industry (NPfI) [2] the reasonably most-affected receivers have been identified. Table 1 presents the most-potentially affected residential receivers and mixed-use receivers, while Table 2 presents the non-residential noise sensitive receivers within the study area. Mixed-use receivers are defined as residences located in the same building as a commercial premise.

Figure 3 shows the receivers where noise and vibration impacts were assessed within this report.

Table 1: Reasonably most-affected residential receivers

Receiver ID	Address	No. of floors
R1	14 Lamont Street, Parramatta	6
R2	3 Sorrell Street, Parramatta (Solace apartments)	16
R3	330 Church Street, Parramatta (Meriton suites)	49
R4	12 Phillip Street, Parramatta (Coronation – Under construction)	41
R5	5 Elizabeth Street, Parramatta	4
R6	1 Robertson Street, Parramatta	3
M1	66 Phillip Street, Parramatta	4
M2	302 Church Street, Parramatta	2
M3	295 Church Street, Parramatta	2

Table 2: Non-residential receivers

Receiver ID	Name	Address	No. of floors
Commercial			
C1	Meriton Suites	330 Church Street, Parramatta	32
C2	Parkroyal (Hotel tower)	30 Phillip Street, Parramatta	10
C3	Parkroyal (Lobby/Entrance/Hotel)	30 Phillip Street, Parramatta	8
C4	GE Building	32 Phillip Street, Parramatta	14
C5	Himalayan Fusion	81 Phillip Street, Parramatta	3
C6	Rotary South Pacific & Philippines Office	60 Phillip Street, Parramatta	5
Child Care Centre			
CC1	MindChamps Early Learning Centre	330 Church Street, Parramatta	1
CC2	Reggio Emilia Early Learning Centre	100 George Street, Parramatta	2
Theatre			
CU1	Riverside Theatres	353-353 Church Street, Parramatta	5
Education			
E1	Apex Institute of Education	2 Sorrell Street, Parramatta	3
E2	Parramatta Marist High (Middle of Grounds)	3 Marist Place, Parramatta	4

Receiver ID	Name	Address	No. of floors
E3	University of New England	211 Church Street, Parramatta	3
Passive Recreation Area			
P1	Prince Alfred Square	Prince Alfred Square	0
Place of Worship			
W1	Parramatta Mosque	150 Marsden Street, Parramatta	8
W2	All Saints Anglican Church	27 Elizabeth Street, Parramatta	2

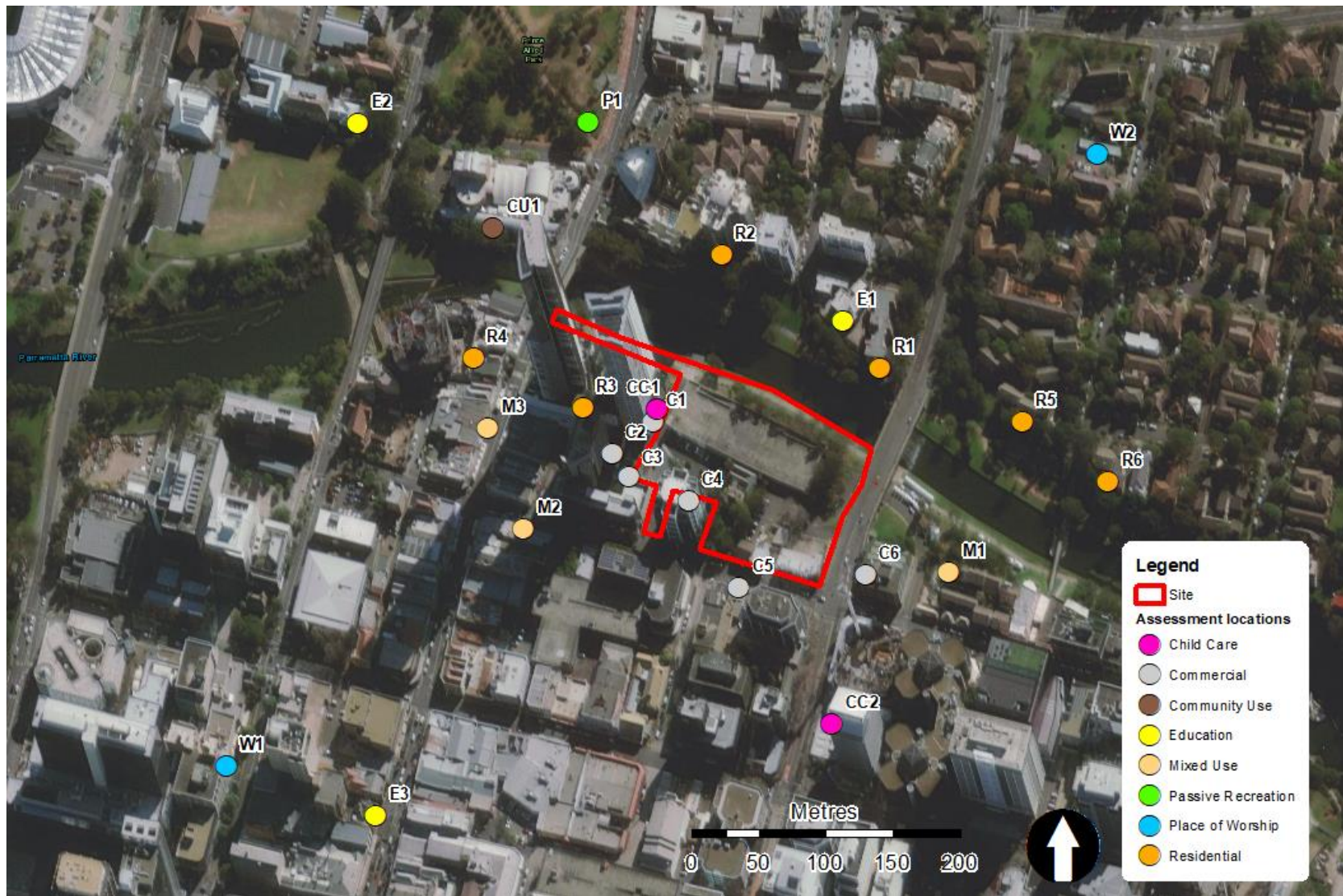


Figure 3: Assessment location

3 Assessment

3.1 Construction noise management levels

Noise Management Levels (NMLs) have been established based on measured Rating Background Levels, detailed in the NVIA [1].

Project NMLs have been reproduced in Table 3 and Table 4 for residential and non-residential premises respectively.

Table 3: Residential Noise Management Levels during intended working hours

Rec. ID	Name	Assess. location	External NML, dBL _{Aeq} 15minute		
			Standard hours	Out of standard hours	Highly noise affected
Residential					
R1	14 Lamont St	External	61	56	75
R2	Solace Apartments, 3 Sorrell St	External	61	56	75
R3	Meriton Suites (Apartment)	External	61	56	75
R4	Coronation (Under Construction)	External	61	56	75
R5	5 Elizabeth St (Apartment)	External	61	56	75
R6	1 Robertson St (Apartment)	External	61	56	75
M1	66 Phillip St	External	61	56	75
M2	Coco Cubano	External	61	56	75
M3	Mad Mex	External	61	56	75

Table 4: Non-residential Noise Management Levels during intended working hours

Rec. ID	Name	Time period	Assess. location	External NML, dBL _{Aeq} 15minute
Commercial				
C1	Meriton Suites	When in use	External	70
C2	Parkroyal (Hotel tower)	When in use	External	70
C3	Parkroyal (Lobby/Entrance/Hotel)	When in use	External	70
C4	GE Building	When in use	External	70
C5	Himalayan Fusion	When in use	External	70
C6	Rotary South Pacific & Philippines Office	When in use	External	70
Child Care				
CC1	MindChamps Early Learning Center	When in use	External	65 ²
CC2	Reggio Emilia	When in use	External	55 ¹

Rec. ID	Name	Time period	Assess. location	External NML, dBL _{Aeq} 15minute
Educational institution				
E1	Apex Institute of Education	When in use	Internal	55 ¹
E2	Parramatta Marist High (Middle of Grounds)	When in use	Internal	55 ¹
E3	University of New England	When in use	Internal	55 ¹
Passive recreation area				
P1	Prince Alfred Square	When in use	External	60
Community Use				
CU1	Riverside Theatres	When in use	External	60 ³
Place of worship				
W1	Parramatta Mosque	When in use	Internal	55 ¹
W2	All Saints Anglican Church	When in use	Internal	55 ¹

Note:

1. External noise levels have been determined by assuming a 10dB reduction through an open window.
2. MindChamps Early Learning Center does have doors on the eastern façade facing the construction area, however these doors are only used to access the outdoor play area. During sensitive times, such as rest times, these doors are closed. A 20dB reduction has been assumed through a closed door.
3. AS2107 recommends an internal noise level for a drama theatre of 25-30 dBA. A loss of 30dB through the building fabric into the theatre has been applied, based on the assumption a theatre building would require reasonably high performing building envelope.

3.2 Activities

The Early Works to be delivered by the Contractor is for the Site establishment (including temporary services), decommissioning of existing services, demolition of nominated buildings, structures and footings, services diversions and installations for the Powerhouse Parramatta Site.

Early works are anticipated to occur for up to 5 months. Assumed construction equipment to be used for redevelopment works are provided in Table 5.

Equipment sound power levels have been determined by reference to AS2436 [3], BS5228 [4], and Arup's measurement database. The equipment below has been assumed to operate concurrently however equipment sound power levels have been adjusted according to its usage in a worst case 15-minute period, and penalty corrections for impulsive noise characteristics.

The locations of equipment have been based on the locations of the construction works around the precinct.

Table 5: Construction equipment usage and associated sound power levels (L_w)

Plant Item	Sound power level per item - L_w , dB(A)	Penalty ¹ , dB	% of use in worst case 15 mins	Number of plant items
				Early works
Rock Breaker	118	5	100	1
Excavator mounted pulveriser	108	-	100	1
Jack Hammer	121	5	100	1
Hand Tools (Electric)	110	-	100	1

Note:

1. 5dB penalty applied for impulsive nature of noise.

3.3 Assessment methodology

Noise emissions from construction activities associated with the Powerhouse Parramatta have been assessed to criteria outlined in Section 3.1.

Noise emissions have been modelled using SoundPlan 8 in accordance with ISO9613-2 algorithms. The model included:

- Construction noise sources listed in Section 3.2;
- Surrounding buildings;
- Receivers listed in Section 2.2; and
- Ground terrain and absorption.

Noise emissions have been modelled on the following assumptions:

- Equipment, staging and durations are based on information provided by Aver
- The location of equipment will be spread evenly across the site.

3.4 Noise prediction results

Predicted construction noise levels at surrounding residential receivers along with the relevant NML for the intended working hours are presented in Table 6.

Table 6: Predicted construction noise levels – Residential receivers, $dB L_{Aeq}$ (15 min)

Receiver	NML	Early Works
Residential receivers (including mixed use developments)		
R1 - 14 Lamont Street	61	78
R2 - 3 Sorrell Street	61	75
R3(Upper) - 330 Church Street	61	69
R3(Lower) - 330 Church Street	61	70
R4(Upper) - 12 Phillip Street	61	55
R4(Lower) - 12 Phillip Street	61	58
R5 - 5 Elizabeth Street	61	71

Receiver	NML	Early Works
R6 - 1 Robertson Street	61	69
M1 - 66 Phillip Street	61	73
M2 - 302 Church Street	61	60
M3 - 295 Church Street	61	52

Notes:

- Levels shaded in grey indicate a notional exceedance of NMLs based on the worst-case assumptions noted above.
- Levels in **BOLD RED** represent 'highly affected' noise levels of 75dBA or above.

Results indicate that the largest exceedances are predicted at the residences along the north of the Parramatta River, opposite the site (R1 – 14 Lamont Street, R2 – 3 Sorrell Street), with exceedances of up to 17 dB predicted.

Noise levels at R1 - 14 Lamont Street and R2 – 3 Sorrell Street are predicted to reach 'highly affected' levels of 75 dBL_{Aeq(15minute)} or above which applies to residential receivers.

The residential Meriton Suites on Church Street (R1 - 330 Church Street) are located to the west of the Meriton serviced apartments (C1 - 330 Church Street, assessed in Table 7), therefore are shielded from the highest construction noise impacts.

Highest predicted noise levels are attributed to high noise equipment including the hammer mounted excavator and the jackhammer.

Predicted noise levels at non-residential receivers are presented in Table 7.

Table 7: Predicted construction noise levels – Non-residential receivers, dBL_{Aeq (15 min)}

Receiver	NML	Early works
Commercial and Hotel receivers		
C1(Lower) – Meriton Suites, 330 Church Street, Parramatta	70	83
C1(Upper) - Meriton Suites, 330 Church Street, Parramatta	70	80
C2 – Park Royal Lobby 30 Phillip Street, Parramatta	70	78
C3 - Park Royal Tower 30 Phillip Street, Parramatta	70	79
C4 - 32 Phillip Street, Parramatta	70	83
C5 - 81 Phillip Street, Parramatta	70	83
C6 - 60 Phillip Street, Parramatta	70	81
Places Of Worship		
W1 - 150 Marsden Street, Parramatta	55	50
W2 - 27 Elizabeth Street, Parramatta	55	50
Childcare Facilities		
CC1 - 330 Church Street, Parramatta	55	83
CC2 - 100 George Street, Parramatta	55	60
Educational Facilities		

E1 - 2 Sorrell Street, Parramatta	55	75
E2 - 3 Marist Place, Parramatta	55	52
E3 - 211 Church Street, Parramatta	55	47
Passive Recreation		
P1 - Prince Alfred Square	60	55
Community Use		
CU1 - 353-353 Church Street, Parramatta	60	66

Notes:

Levels shaded in grey indicate a notional exceedance of NMLs based on the worst-case assumptions noted above.

Results indicate that the largest exceedances are predicted at receivers immediately adjacent to the site (CC1 - 330 Church Street), west to the site and across Parramatta River (E1 - 2 Sorrell Street), with exceedances up to 28 dB predicted.

Exceedances of up to 13 dB are predicted at surrounding commercial premises, which are located immediately adjacent to the proposed site.

4 CNVMP requirements

The specifications outlined in this CNVMP have been based on the requirements outlined in the Consent.

These requirements, along with the corresponding section of this CNVMP where the requirements are addressed, are detailed in Table 8.

Table 8: CNVMP requirements

Condition	Addressed in CNVMP Section
C34. Management plans required under this consent must be prepared having regard to relevant guidelines, including but not limited to the Environmental Management Plan Guideline: Guideline for Infrastructure Projects (DPIE April 2020). Note: The Environmental Management Plan Guideline is available on the Planning Portal at: https://www.planningportal.nsw.gov.au/majorprojects/assessment/post-approval Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans	This document
C37. The Construction Noise and Vibration Management Sub-Plan (CNVMSP) must address, but not be limited to, the following:	
(a) be prepared by a suitably qualified and experienced noise expert;	Section 1.3
(b) incorporate recommendations of the noise report titled 'Noise and Vibration Impact Assessment' Issue 02, prepared by ARUP and dated 22 April 2020– as amended by letter 'Powerhouse Parramatta SSDA Acoustic Response Submissions' prepared by ARUP and dated 26 August 2020;	Throughout
(c) describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009);	Throughout
(d) hours of construction in accordance with Conditions <u>D5</u> to <u>D8</u> ;	Section 9.1
(e) outline how noise and vibration impacts would be monitored during construction	Section 6 and 7
(f) describe the community consultation undertaken to develop the strategies;	Community Consultation Strategy, Appendix A
(g) describe the measures to be implemented to manage high noise generating works, in close proximity to sensitive receivers;	Section 6, 9.2 and 9.4
(h) include a complaints management system that would be implemented for the duration of the construction; and	Community Consultation Strategy, Appendix A
(i) include a program to monitor and report on the impacts and environmental performance of the development and the effectiveness of the management measures in accordance with condition <u>C34</u> .	Section 6 and 7

Condition	Addressed in CNVMP Section
D5. Construction, including the delivery of materials to and from the site, may only be carried out between the following hours: (a) between 7am and 6pm, Mondays to Fridays inclusive; and (b) between 8am and 1pm, Saturdays. (c) No work may be carried out on Sundays or public holidays. D6. Construction activities may be undertaken outside of the hours in condition E4 if required: (a) by the Police or a public authority for the delivery of vehicles, plant or materials; or (b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or (c) where the works are inaudible at the nearest sensitive receivers. D7. Notification of such construction activities as referenced in condition E5 must be given to affected residents before undertaking the activities or as soon as is practical afterwards. D8. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours: (a) 9am to 12pm, Monday to Friday; (b) 2pm to 5pm Monday to Friday; and (c) 9am to 12pm, Saturday.	Section 9
D15. The development must be constructed to achieve the construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed in accordance with the management and mitigation measures identified in the approved CNVMSP.	Throughout
D16. The Applicant must ensure construction vehicles (including concrete agitator trucks) do not arrive at the site or surrounding residential precincts outside of the construction hours of work outlined under Conditions E4 to E7.	Section 9.1
D17. The Applicant must implement, where practicable and without compromising the safety of construction staff or members of the public, the use audible movement alarms of a type that would minimise noise impacts on surrounding noise sensitive receivers.	Section 8.2
D18. The Applicant must ensure that any work generating high noise impact (i.e. work exceeding a NML of LAeq 75dBA) as measured at the sensitive receiver must only be undertaken in continuous blocks of no more than 3 hours, with at least a 1 hour respite between each block of work generating high noise impact, where the location of the work is likely to impact the same receivers. For the purposes of this condition 'continuous' includes any period during which there is less than one hour respite between ceasing and recommencing any of the work the subject of this condition.	Section 9

Condition	Addressed in CNVMP Section
D19. Any noise generated during construction of the development must not be offensive noise within the meaning of the Protection of the Environment Operations Act 1997 or exceed approved noise limits for the site.	'Offensive noise' is considered addressed by the correction for annoying characteristics in accordance with Fact Sheet C of the NPfI [2], applied in Section 3
D20. Vibration caused by construction at any residence or structure outside the site must be limited to: (a) for structural damage, the latest version of DIN 4150-3 (1992-02) Structural vibration - Effects of vibration on structures (German Institute for Standardisation, 1999); and (b) for human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline (DEC, 2006) (as may be updated or replaced from time to time).	Section 7
D21. Vibratory compactors must not be used closer than 30 metres from residential buildings unless vibration monitoring confirms compliance with the vibration criteria specified in condition D20.	
D22. The limits in Conditions D20 and D21 apply unless otherwise outlined in a Construction Noise and Vibration Management Plan, approved as part of the CEMP required by Condition (a) of this consent.	
D23. The Applicant shall refer to the minimum working distances in Table 25 of the document titled 'Noise and Vibration Impact Assessment' Issue 02, prepared by ARUP and dated 22 April 2020, and undertake vibration monitoring at the nearest potential affected building where vibration intensive works are required within these minimum distances. Vibration monitoring should be capable of real-time alerts where measured vibrations exceed criteria.	

5 Site personnel – Responsible Person

A member of the site staff will act as the Responsible Person with respect to noise and vibration.

Identification of all reasonable and feasible noise mitigation methods will be conducted by the Responsible Person on a daily basis during noisy works. The Responsible Person will have the authority to modify work practices in response to complaints, where this is considered appropriate

They will be responsible for implementing the measures within this CNVMP.

Specifically, the Responsible Person is to:

- Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise, including discussion of noise and vibration mitigation, monitoring and assessment. These topics will also be covered under induction processes;
- Ensuring good work practices are adopted to avoid issues such as noise from dropped items and noise from communication radios is kept as low as is practicable;
- Ensure the use of radios or stereos outdoors is avoided;
- Ensure the use of two way radios at the minimum effective volume, and avoid shouting or whistling at the site; and
- Ensure shouting, talking loudly and slamming vehicle doors is avoided.

6 Noise monitoring

This Section outlines a noise and vibration monitoring programme to monitor construction noise and vibration levels at critical locations around the site.

Short term attended noise monitoring (15 minutes duration) is to be conducted at the following nearest residential and non-residential premises:

- 14 Lamont Street, Parramatta
- Meriton Suites, 330 Church Street, Parramatta

This monitoring shall be conducted at the commencement of a new stage of works which involve 'High Noise Impact Works', which are defined as:

- jack hammering, rock breaking or hammering, pile driving, vibratory rolling, cutting of pavement, concrete or steel or other work occurring on the surface that generates noise with impulsive, intermittent, tonal or low frequency characteristics that exceed the NML; or
- continuous noisy activities where 'continuous' includes any period during which there is less than a 1-hour respite between ceasing and recommencing any of the work that is the subject of this condition.

6.1 Reporting

Monitoring results shall be recorded in a monitoring report which includes:

- Time and date of monitoring
- Monitored levels
- Activities taking place during monitoring
- Identification of any exceedances and likely equipment attributed to exceedances.

6.2 Equipment specifications

All monitoring equipment must comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated as Class 1 for attended monitors.

6.3 Maintenance

All equipment to monitor the performance of the development must be:

- a) maintained in a proper and efficient condition;
- b) maintained and checked by a suitably qualified acoustician; and
- c) operated in a proper and efficient manner.

7 Vibration management

The minimum working distances in Table 9 are based on international standards and guidance. They pertain to cosmetic damage of typical buildings under typical geotechnical conditions, considered to represent the structural nature of the stands.

Table 9: Recommended minimum working distances for vibration intensive plant

Plant Item	Rating / Description	Minimum working distance
		Cosmetic damage (BS 7385)
Small rock breaker	(300 kg - 5 to 12t excavator)	2 m
Medium rock breaker	(900 kg – 12 to 18t excavator)	7 m
Large rock breaker	(1600 kg – 18 to 34t excavator)	22 m
Jackhammer	Hand held	1 m (nominal)
Vibratory compactors		30 m from residential building

Vibration monitoring locations are shown in Figure 3.

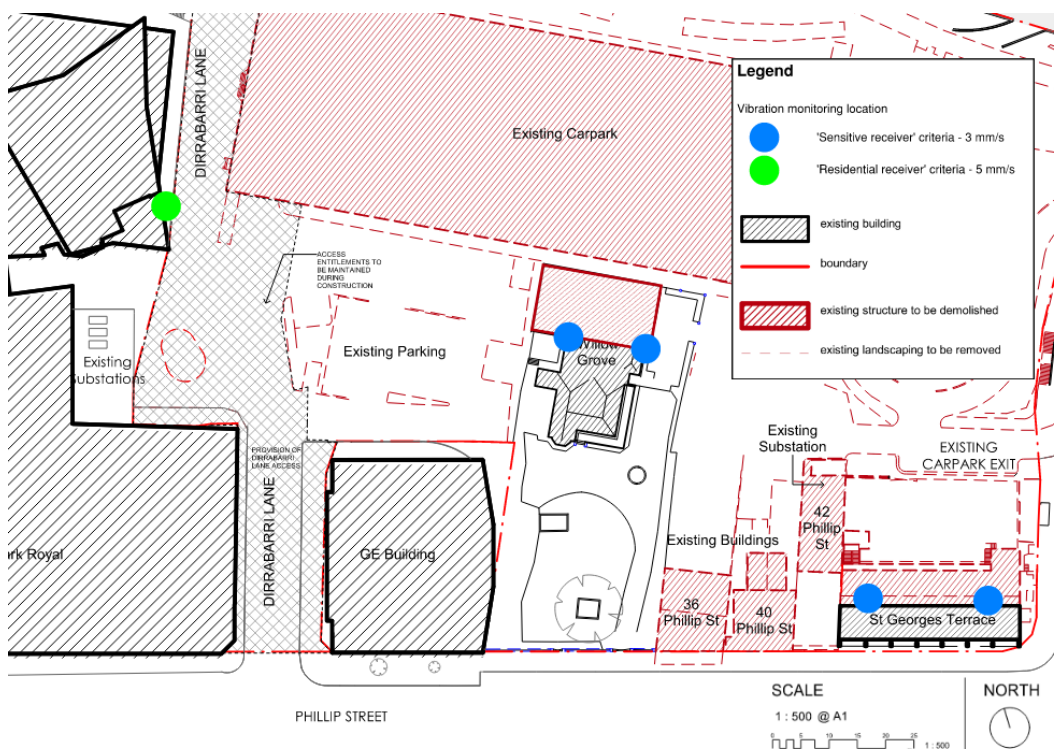


Figure 3: Vibration monitoring locations

Structural damage criterion in DIN 4150 – Part 3 [5] for ‘sensitive structures’ (3mm/sec) will be applied for heritage listed structures and criterion for ‘residential buildings and buildings of similar design and / occupancy’ (5mm/s) for the Meriton Suites. For human exposure, the acceptable vibration values set out in the Environmental Noise Management Assessing Vibration: a technical guideline [6] shall be applied.

The vibration monitors shall be calibrated to generate real-time alerts (SMS messages and/or flashing lights) when vibration criterion is exceeded.

If the vibration criterion is exceeded by works on site, an alert will be sent to the Site Manager who shall issue 'Stop Work' order.

An exceedance of the vibration criterion will necessitate a change in demolition and/or construction management and methodology. This could include:

- Re-evaluation of the vibration criterion based on results of the initial condition investigation and inspections of the structure following the commencement of works.
- Maintain vibration monitoring throughout works.
- Reduce the size of demolition and construction equipment and develop alternative methodologies to minimise vibration.
- Use less vibration emitting demolition methods such as concrete pulverisers and smaller percussive hammers.
- Use rubber tracked excavators and machinery.
- Balance variable speed vibrating plant and operate at speeds that do not produce resonance.
- Ensure all fixed plant at the site are appropriately selected (on a risk assessment approach), and where necessary, fitted with vibration attenuation measures.
- Position vibrating plant and equipment as far apart as it practicable from each other and consider whether orientation and location of the plant can reduce vibration impacts at the nearest receivers.
- Use non-percussive piling techniques for all piles where practicable.
- Maintain machinery and equipment.

8 Demolition activities and equipment

The following site-specific treatments are proposed; however, these will be updated as details about construction planning are available.

8.1 Equipment selection

Hammering should only be undertaken where non-percussive method is not feasible or reasonable.

Where hammering is undertaken it should be performed according to the following:

- Using the smallest equipment as is practical
- Using hammers with low-noise heads or wrapping the head to minimise radiated noise.

8.2 Movement alarms

Audible movement alarms that would minimise noise impacts by reducing annoying characteristics such as ‘tonal’ alarms, must be implemented. These may include ‘quacker’ style reversing alarms in lieu of tonal beeping alarms.

These shall be used where practicable and without compromising the safety of construction staff or members of the public.

8.3 Equipment condition

All plant and equipment used on site must be:

- a) maintained in a proper and efficient condition; and
- b) operated in a proper and efficient manner.

The Responsible Person is to ensure that the condition of the powered equipment used on site is checked daily to ensure plant is properly maintained and that noise is kept as low as practicable.

8.4 Equipment use and handling

All vehicles, plant and equipment should be turned off when not in use.

Consider using electric / hydraulic equipment where possible, such as hydraulic pulverisers for demolition

Avoid dropping equipment/materials from a height or into trucks.

Where practicable, use sound dampening material to cover the surfaces on to which any materials must be dropped.

8.5 Stationary equipment location

Stationary equipment should be located to the south of the site as far from receivers as possible.

Where possible, stationary equipment should be located behind structures such as demountable buildings or stockpiles to maximise shielding to receivers.

Locate loud, stationary plant as far from noise sensitive receivers as possible.

8.6 Deliveries and access roads

Site access roads and site compounds shall be located as far away as possible from noise sensitive receptors.

Truck movements shall avoid residential streets where possible.

9 Hours of work

9.1 Permitted hours of work

Construction works, including the delivery of materials to and from the site, may only be carried out between the following hours:

- a) between 7 am and 6 pm, Mondays to Fridays inclusive;
- b) between 8 am and 1pm, Saturdays; and

No construction work may be carried out on Sundays or public holidays.

Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

- a) 9am to 12pm, Monday to Friday;
- b) 2pm to 5pm Monday to Friday; and
- c) 9am to 12pm, Saturday.

9.2 Scheduling

High noise activities shall be programmed to occur during the middle of the day, considered to be the least sensitive period, wherever possible and will be scheduled with due consideration to the nearest sensitive receivers.

9.3 Activities outside of permitted hours

Activities may be undertaken outside of the permitted hours in Section 9.1 if required:

- a) by the Police or a public authority for the delivery of vehicles, plant or materials; or
- b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm; or
- c) where the works are inaudible at the nearest sensitive receivers; or
- d) where a variation is approved in advance in writing by the Planning Secretary or her nominee if appropriate justification is provided for the works.

Notification of such activities must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

9.4 Respite periods

The following respite periods shall be maintained for works predicted to exceed 75 dBL_{Aeq(15 mins)}, unless otherwise agreed with the identified sensitive receivers

and evidence of the agreement provided to the Planning Secretary, prior to the commencement of the works:

- in continuous blocks not exceeding 3 hours each with one hour of respite every three hours block;
- scheduling of works outside of the examination time for educational establishments; and
- noise intrusive works commencing after 8am and be undertaken within the approved standard construction hours.

For the purposes of this condition 'continuous' includes any period during which there is less than one hour respite between ceasing and recommencing any of the work the subject of this condition.

Respite periods shall be developed following consultation with the community as part of the Consultation Strategy prepared by Infrastructure NSW.

APPENDIX 6- CONSTRUCTION SOIL AND WATER MANAGEMENT PLAN AND CONSTRUCTION FLOOD EMERGENCY RESPONSE PLAN

Infrastructure NSW

Powerhouse Parramatta

Construction Soil and Water
Management Plan

PHM-ARP-REP-CE-0010

Rev 0 | 9 February 2021

This report takes into account the particular instructions and requirements of our client.

It is not intended for and should not be relied upon by any third party and no responsibility is undertaken to any third party.

Job number 273467

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Appendices

Appendix A

Construction Soil and Water Management Plan

Appendix B

Inspection Test Plan Examples

Appendix C

Acid Sulphate Soils Management Plan (JBS&G)

1 Introduction

The purpose of this report is to describe the Construction Soil and Water Management Plan (CSWMP) and Construction Flood Emergency Response Sub-Plan (FERSP) for the early works for the proposed Parramatta Powerhouse Development. This plan focuses solely on the Early Works phase of the development.

1.1 Background

Erosion and sediment control measures are a specific consideration of the broader construction management plan (CMP) that are designed to minimise the risk of scour, erosion, and sedimentation. These risks are increased during necessary construction activities including demolition, land disturbance, cutting and filling.

Likewise, these risks are also increased when developing a site that is prone to overland flows and flooding. The Arup Powerhouse Parramatta Flood Risk and Stormwater Management Addendum report (reference: PHM-ARP-CIV-REP-0003) provides an assessment of the existing site conditions and identifies regions of the development site at risk from overland flows and flooding.

The CSWMP addresses the following:

- Outlines existing site conditions;
- Provides clear soil and management objectives specifically related to the project;
- Provides erosion and sediment control techniques that will be implemented during the demolition phase of the development; and
- Informs the construction management plan including the site establishment, access and egress and material management to reduce the risk of disruption and damage to the development.
 - Inspection and Test Plans (Examples in Appendix B, Landcom 2004).

1.2 Qualification

This CSWMP and the FERSP were prepared and reviewed by suitably qualified and experienced engineers from the Arup Civil team, who hold good working knowledge of the relevant standards, specifications and conditions applicable to this project.

2 Environmental Requirements

This plan has been developed in accordance with the following guidelines:

- Landcom “Managing Urban Stormwater – Soils and Construction” Volume 1; 4th edition; dated March 2004.
- NSW Government “Protection of the Environment Operations Act 1997 No 156”; dated December 2020.
- NSW Government Department of Land and Water Conservation “Guidelines for Erosion and Sediment Control on Building Sites”; dated January 2000.
- City of Parramatta “Development Control Plan (DCP)”; dated October 2011.
- ANZECC & ARMICANZ “Australian and New Zealand Guidelines for Fresh and Marine Water Quality”, October 2000.
- AS/NZS “3500.3 2018 Plumbing and drainage, Part 3: Stormwater drainage”; dated June 2018.
- Commonwealth of Australia (Geoscience Australia) “Australian Rainfall and Runoff: Guide to Flood Estimation”; dated 2019.

2.1 Conditions of Consent

This CSWMP has been developed to meet the relevant conditions of consent for the Powerhouse Parramatta project as follows:

Condition	Where Addressed
<i>C38. The Construction Soil and Water Management Plan (CSWMP) must address, but not be limited to the following:</i>	
(a) be prepared by a suitably qualified expert, in consultation with Council;	1.2
(b) describe all erosion and sediment controls to be implemented during construction as a minimum, in accordance with the publication Managing Urban Stormwater: Soils & Construction (4th edition, Landcom 2004) commonly referred to as the ‘Blue Book’;	4.2
(c) include an Acid Sulfate Soils Management Plan including measures for the management, handling, treatment and disposal of acid sulfate soils, including monitoring of water quality at acid sulfate soils treatment areas;	Appendix C
(d) provide a plan of how all construction works will be managed in wet weather events (i.e. storage of equipment, stabilisation of the Site);	4.3.4
(e) detail all off-Site flows from the Site;	3.2
(f) describe the measures that must be implemented to manage stormwater and flood flows for small and large sized events, including, but not limited to 1 in 1 year ARI, 1 in 5 year ARI and 1 in 100 year ARI.	4.3.1

<i>C39. The Construction Flood Emergency Response Sub-Plan (FERSP) must address, but not be limited to, the following:</i>	
(a) be prepared by a suitably qualified and experienced person(s);	1.2
(b) address the provisions of the Floodplain Risk Management Guidelines (EESG);	5
(c) include details of: (i) the flood emergency responses for the construction phase of the development; (ii) predicted flood levels; (iii) flood warning time and flood notification; (iv) assembly points and evacuation routes; (v) evacuation and refuge protocols; and (vi) awareness training for employees, contractors and any other relevant persons associated with the site.	5.1 - 5.4

3 Existing Site

The site location and boundaries are described and illustrated in Figure 1 (Site Access Schedule). The northern frontage of the development site connects to the Parramatta River which flows from north east to south west in the immediate vicinity of the site. The site is positioned between two existing bridge structures, Lennox Bridge at the upstream end of the site and Barry Wilde Bridge (together with a timber pedestrian bridge below the vehicular bridge deck just above the river wall level) at the downstream end of the site. The distance between these structures is approximately 270 m. The Willow Grove Area (shaded green) is not within the works boundary.



Figure 1 Existing site and boundaries (Part A, Site Access Schedule. Drawing by Moreau Kusunoki- Genton November 2020 with Arup markup).

3.1 Topography and ground surface conditions

In existing pre-development conditions, the highest site elevations are in the car park to the east of the Willow Grove building in the order of 7.8 mAHD. Ground south of the Willow Grove falls in a southerly direction towards Phillip Street. Existing hardstand east and west of the Willow Grove falls north towards the Riverside carpark and ultimately to the Parramatta River.

The southern wall of the existing Riverbank car park is a concrete retaining wall. This effectively creates a step in the site levels, separating the southern half of the site typically at higher elevations (above 6 mAHD), from the northern half, which includes the lower ground floor level of the Riverbank car park, typically at lower elevations (below 4 mAHD).

Dirrabarri Lane, situated between the Riverside car park and the 330 Church Street (the Meriton development), slopes from RL 7.0 mAHd down to RL 3.7 mAHd and provides road access to the riverside.

Elevations are lowest along the northern edge of the site at approximately 2.0 mAHd – 2.5 mAHd.

The site is predominantly paved with impervious surfaces. These surfaces comprise parking areas, roads, and footpaths near Dirrabarri and George Khattar Lane. A portion of the northern frontage of the site between the existing car park and the Parramatta River is grassed and is generally pervious. Key features at the site are shown in the aerial photograph in Figure 2.

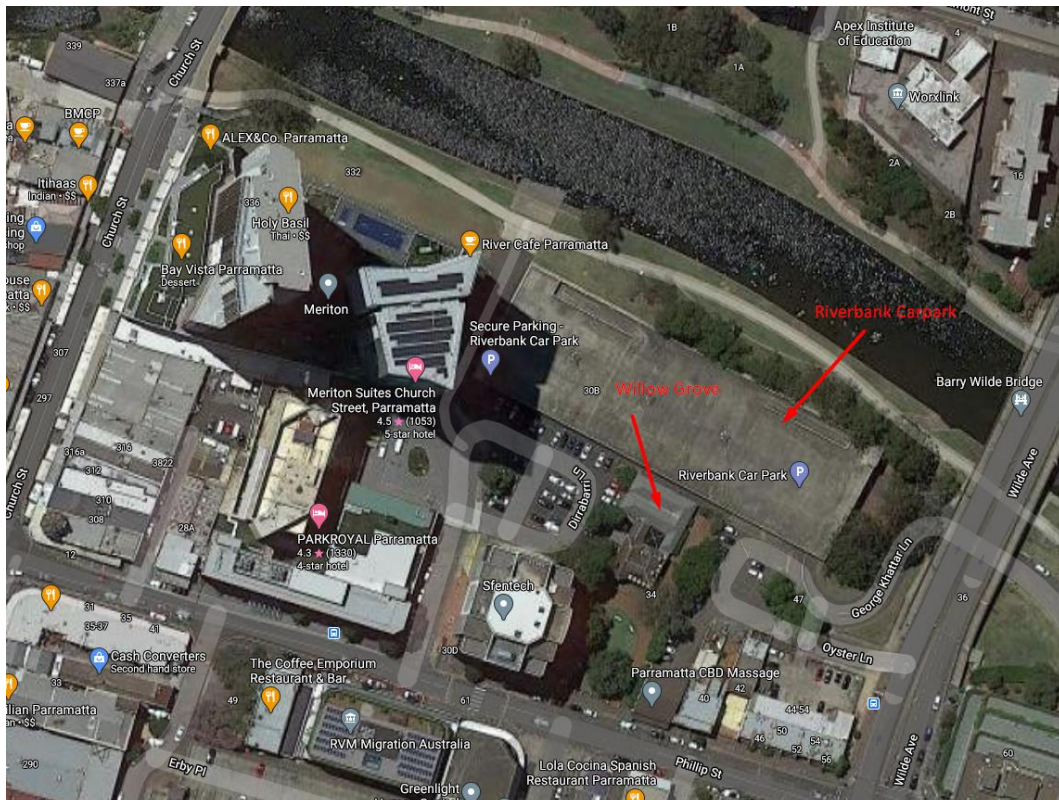


Figure 2 Aerial image of the existing site (Google Maps, 2020).

3.2 Surface water and Flooding

Existing flood studies for the Parramatta River have been reviewed in detail to understand the historic patterns and records of former flooding events. Appendix O – Flood Risk and Stormwater Management Report of the EIS includes detailed discussions of this review and further summary is provided in the Flood Risk and Stormwater Management addendum. It is recognised that flooding risk to the development site is a function of two separate mechanisms: riverine flooding of the Parramatta River, and overland flow flooding from Phillip Street. The latter results from runoff that exceeds the capacity of the local stormwater infrastructure. The Powerhouse Museum Flood Model was used to simulate a range of flood events to define the existing flood behaviour of the area

surrounding the Powerhouse Museum site. The results are outlined in the following sections.

3.2.1 Riverine Flood Behaviour

Flood modelling indicates that existing car park basement would be significantly inundated by floodwaters from Parramatta River in major riverine flood events, with more than 1m of flood depth expected for the 5% AEP event. In a 1% AEP flood, these depths are more than 2m in the eastern part of the car park.

Peak flood levels on the site in the 1% AEP river flood are estimated to range from 5.9mAHD to 6.1mAHD.

Most of the floodplain, including the development site, is shown to be flooded by more than 2m of floodwaters in the PMF event.

3.2.2 Overland Flood Behaviour

Flood modelling indicates that in local overland flow flood events, overland flow paths would converge near the intersection of Phillip Street and Horwood Place. These flows would then diverge into two flow paths, running north on the eastern and western sides of 32 Phillip Street. In these events flood depth at the site and surrounding area are shallow, with 1% AEP overland flow flood depths of up to 0.3m on Dirrabarri Lane, between 30 and 32 Phillip Street Parramatta.

Modelling also indicates that during local overland flow flood events, the capacity of the underground drainage system would be exceeded, resulting in floodwaters pooling around the low point at the open car park located adjacent to the southern wall of the multi-storey Riverbank car park.

For larger, rarer overland flow flood events, the flood levels increase such that the floodwaters start to flow around the south-west corner of the multi-storey car park, down the ramp at the end of Dirrabarri Lane and discharge towards Parramatta River.

3.3 Rainfall

Data collected from the Bureau of Meteorology for Parramatta North give the following mean rainfall (Table 1). The data suggests that the wettest months are January to March.

Table 1 Mean Rainfall for Parramatta North (BOM 2020)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
mm	101.5	126.4	112.5	88.5	66.4	91.7	46.1	55.5	49.8	68.5	82.8	72.8	966
%	11	13	12	9	7	9	5	6	5	7	9	8	100

3.4 Site Geology

Reference is made to the following available geotechnical reports for a description of the site history, geology, and ground conditions:

- JK Geotechnics (JK) for Parramatta City Council, Preliminary Geotechnical Investigation for Mixed Use Development at Riverbank Square, 30B Phillip Street, Parramatta dated 5 November 2013;
- Pells, Sullivan Meynink for Johnstaff, New Museum of Applied Arts and Sciences Parramatta Geotechnical Investigation dated 2 September 2016; and
- J&K Geotechnics (JK) for Meriton Apartments Pty Ltd, Preliminary Geotechnical Investigation for Proposed Residential Development at 330 Church Street, Parramatta dated 13 June 2011;
- J&K Geotechnics (JK) report 33090ANrpt for Infrastructure NSW, Geotechnical Desktop Study for Proposed Powerhouse Museum at 30B Phillip Street, Parramatta dated 21 April 2020; and
- J&K Geotechnics (JK) report 33090AN2rpt for Infrastructure NSW, Draft Geotechnical Investigation for Proposed Powerhouse Museum at 30B Phillip Street, Parramatta dated 25 August 2020.

Reference is made to the following available environmental assessment reports for the site:

- JBS&G Australia for Infrastructure NSW, Detailed Site Investigation for Contamination of Museum of Applied Arts and Science-Draft 1, Phillips Street Paramatta NSW dated 29 March 2020;
- JBS&G Australia for Infrastructure NSW, Acid Sulphate Management Plan for Museum of Applied Arts and Science-Draft 1, Phillips Street Paramatta NSW dated 29 March 2020;
- JBS&G Australia for Infrastructure NSW, Remedial Action Plan for Museum of Applied Arts and Science-Draft 1, Phillips Street Paramatta NSW dated 27 March 2020; and
- EIS for Parramatta City Council, Preliminary Environmental Site Assessment for Mixed Use Development at Riverbank Square, 30B Phillip Street, Parramatta dated 28 October 2013.

The site is described as follows:

- Reference to the 1:100 000 Series Geological Sheet for Sydney and to adjacent site investigations indicates the site is generally underlain by Ashfield Shale of the Wianammatta Group. Preliminary borehole information describes the subsurface to comprise of fill, alluvial soils overlaying sandstone bedrock at moderate depth;
- A majority of the site is occupied by an at-grade carpark with asphaltic concrete surface between 30mm to 130mm thick overlaying fill of between 0.3 to 3.05m deep;

- Below this fill a varying layer of alluvial soil consisting of clays, sands and gravels to depth of between 3.3m and 9.8m was encountered;
- Sandstone of increasing quality was encountered and depths of between 3.3m and 9.8m. Class IV increasing in quality to Class III; and
- Boreholes BH1, BH3 and BH4 of the J&K investigation dated 13 June 2011, BH301, BH302, BH303, BH304, BH305 and BH306 from J&K investigation dated 28 August 2020 are the most applicable to the development.

Table 2. Summary of general site stratum.

Stratum	Thickness
Fill	0.3m – 3.3m
Alluvial clays sands and gravels	3.3m – 9.8m
Low to medium strength Laminite	3.3m/9.8m - depth

3.5 Groundwater

Measured groundwater levels from J&K June 2011, J&K November 2013 and J&K August 2020 indicate shallow ground water levels ranging between 1.6m and 5.9m below ground at the site.

Standing water levels recorded during and up to 3 weeks after completion of the drilling by J&K in the August 2020 investigation is tabulated in their report.

Additional groundwater monitoring will be required in the subsequent design stages.

3.6 Erosion Hazard

The Revised Universal Soil Loss Equation (RUSLE) was used to determine the soil erosion hazard of the site (1).

$$A = R K L S P C \quad (1)$$

where, A = computed soil loss (tonnes/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length/gradient factor

P = erosion control practice factor

C = ground cover and management factor.

The soil erosion hazard was calculated at 228 tonnes/ha/yr, which signifies a Soil Class of 3 and a low to moderate erosion hazard (Landcom 2004). However, according to JBS&G's *Acid Sulphate Soil Management Plan* (2020), the site is considered to have a high soil erosion hazard due to localised flooding.

4 Proposed Soil and Water Management Measures

4.1 Erosion and Sediment Control Objectives

The purpose of this project specific CSWMP is to:

- Reduce the risk of land degradation associated with vegetation removal, regrading and related construction activities;
- Control and reduce the risk of erosion of soil material;
- Control and contain sediment and other particulate materials together with soil nutrients near their source;
- Provide temporary drainage measures that will remain stable and operational in a significant storm event;
- Reduce the risk of sediment, construction materials and associated pollutants from being washed into downstream areas and receiving water courses thereby offering protection to these environments; and
- Inform the construction management plan including the site establishment, access and egress, material management to reduce the risk of disruption and damage to the development.

4.2 Erosion and Sediment Controls Descriptions

Each of the following erosion and sediment control measures are proposed to be implemented at the site. This section includes a brief description of each of these measures.

Temporary Construction Access

Ensures controlled movement of construction vehicles. Entry/exit points are constructed such that soil materials from wheels/construction vehicles do not leave the site. All vehicle site access entries/exits should adhere to NSW Government guidelines.

Straw Bales

Act as a barrier to surface water, restricting or diverting flow. Must be noted that when bales cannot be properly embedded into the ground, alternative controls need to be taken to prevent polluted water passing underneath (Landcom 2004). At least four bales are to be utilised to act as an adequate barrier to water at each control point (NSW Govt DLWC 2000).

Sediment Fence

Geotextile fencing set up downstream of land disturbance to capture sediment from overland flow and form a temporary barrier. Suspended solids can be removed once settled. Fences must be constructed with trenches to avoid undermining.

Diversion Bank and Channel

Intercepts and diverts concentrated flow around site. Constructed at upper edges of slope to ensure water is diverted away from cuts and then back to natural overland flow routes.

Inlet sediment trap/ Fabric stocking sediment trap

Prevents flows from entering the existing stormwater drainage system at pit locations. Geosynthetic material separates the sediment from the water.

Stockpile

Area for storing construction materials. It is recommended that stockpiles are located at least 5m from waterways and roads. Diversion banks/channels should be constructed at the upstream of the stockpile, and sediment fences downstream. Covering is recommended to reduce stockpile loss.

Sediment Basin

Houses stormwater that is sediment laden. Suspended solids are removed through a filtration system.

4.3 Soil and Water Management Implementation

During the demolition phase, the predominant activity will be demolition of existing structures and the sorting of materials arising from demolition. Demolition activities are likely to be undertaken at both the lower elevation, near to the Parramatta River and at the higher elevation closer to Phillip Street. The main land disturbances will be the removal or partial removal of existing pavements/slabs and vegetated areas as part of the demolition scope.

4.3.1 Surface Water Management

The CSWMP described in the appended drawings (Appendix A) sets out the temporary stormwater management proposals for this phase. These measures include temporary sediment fences, channels and in-ground drainage that aim to manage surface runoff whilst minimising erosion. These measures are designed to convey flows up to 10-year ARI (in accordance with Landcom 2004).

Surface water and overland flow together with any sediment that is transported across the site will be directed to three sediment basins: one at the south-western end of the site and two located near the Parramatta River. The basins are designed to contain the 10-year ARI storm event (in accordance with Landcom 2004) and will allow settlement and containment of sediment with filtered, cleaner water pumped into the river. They were sized considering the construction footprint catchment area, and do not consider either the Willow Grove catchment or the shared access for emergency and council vehicles that extends west along the river (blue hatching in Figure 1). Basin 3 has an additional area that can be added once the carpark to the south has been demolished. The contractor is required to ensure that the sediment basins have sufficient area to accommodate for the total disturbed land area.

The two proposed basins adjacent the Parramatta River have a Sydney Water owned sewer main running beside them that is to be retained. Minimum cover to this main will need to be achieved. The exact dimensions and position are to be confirmed on site. Basin 3 is also above an existing stormwater pit and pipe. The pit will need to be demolished and a pit in the existing footpath to be constructed to enable access to the pipe. Basin 1 is also above an existing stormwater pipe.

Assuming Type D soils for the site, it is recommended that flocculation/coagulation is carried out to remove fine particles from the water before discharge can occur into the Parramatta River. Jar testing will need to be conducted to determine the appropriate levels of settling agent required depending on the soil type. This must be done at a NATA (National Association of Testing Authorities) accredited laboratory.

For discharge into the river, the criteria outlined in Table 3 must be met.

Table 3 Water discharge criteria

Discharge parameter	Units	Target	Comment
pH	pH	6.5-8.5	To be tested weekly and < 1hr prior to discharge. To be neutralised and re-tested if outside this range.
Total suspended solids	TSS	<50	If not able to be achieved by natural settling, flocculation to be carried out with gypsum (rate to be determined in NATA-accredited laboratory). To be completed < 1hr prior to discharge. If level not achieved, solids to be removed/further settlement to occur prior to re-testing.
Grease/oil	N/A	No visible oil or grease	Visible inspection to be completed < 1hr prior to discharge. If grease/oil are present, then water to be disposed at licensed disposal facility/treated.

Discharged water should also comply with City of Parramatta Council guidelines and comply with trigger values in the ANZECC 2000 Guidelines. Under no circumstances should contaminated/untreated water enter the existing stormwater drainage system or the Parramatta River.

4.3.1.1 1 in 1-year ARI

The approach outlined above in Section 4.3.1 is appropriate for smaller storm events including the 1 in 1- year ARI. Wet weather procedures outlined in Section 4.3.4 are to be followed both before and after a rainfall event of this magnitude.

4.3.1.2 1 in 5-year ARI

Similarly, the approach outlined in Section 4.3.1 should be largely successful for smaller storm events including the 1 in 5-year ARI. Wet weather procedures outlined in Section 4.3.4 are to be followed both before and after a rainfall event of this magnitude.

4.3.1.3 1 in 100-year ARI

Whilst the approach outlined in Section 4.3.1 should be largely successful for smaller rainfall events and overland flow, one residual risk is the occurrence of a significant flood event that would cause the Parramatta River to burst its banks. Flood maps suggest that the basins are outside of the 5% AEP flood extent for the 25-minute duration storm, but within the 1% AEP flood extent (ARUP flood maps- Figure E1.0-5D-OF). However, both basins are within the extents for the longer duration (9-hour) storms for both events. If these events or greater were to occur, the sediment basins would become filled with floodwater from the river and there is a risk of sediment in the basins being washed into the river itself.

For this reason, weekly inspection, maintenance and cleaning/emptying of the basins will be necessary to minimise risk and inspection following a significant rainfall event will also be necessary (> 20 mm in 24hrs). An alternative solution is to use proprietary silt-busters or sediment tanks which may allow for a reduction in the size of the basins. It is necessary that the site supervisor be aware of weather forecasts and ensure that basins are clean/emptied before large rainfall events occur.

The demolition Contractor must demonstrate their works will be properly managed in order to mitigate flood risks and protect the environment, the workforce, and the site works in the event of a flood. When flooding is likely to occur, the measures outlined in Section 4.3.4 are to be employed. As noted, the stormwater runoff will be managed on site and subsequently discharged into Parramatta River. The site works does not include modifications to the existing Parramatta River (i.e. channel bed, channel walls and outlet structures) as these elements are to be retained and protected during the duration of the site development works.

4.3.2 Acid Sulphate Soil Management

As outlined in JBS&G's *Acid Sulphate Soil Management Plan* (Appendix C, 2020), acid sulphate soils may be present in deeper soils throughout the site. Reference to this report should be made for management of these soils during the demolition phase of development.

4.3.3 Dust Management

Fences will be erected around the project boundary, with additional screens and barriers set up for dusty works. Dry sweeping of materials will be avoided, and water suppression used where necessary to keep surfaces moist. Water from the sedimentation basins should be reused where possible. For this to occur, approval from the Project's Environmental Representative (PER) must be sought. To allow water to be reused on site the following criteria are to be met:

- pH-6.5-8.5;
- no visible oil or grease;
- water to remain within the site/not enter Parramatta River; and
- no surface runoff to be produced.

The site supervisor needs to monitor weather conditions to ensure that demolition is ceased when windy conditions arise. Unprotected areas are to be kept moist in windy conditions (Landcom 2004).

4.3.4 Wet weather management

It is necessary that the site supervisor be aware of weather forecasts and ensure that basins are clean/emptied before rainfall events occur. It is advised that the Contractor sign up to *FloodSmart Parramatta*. This is a service that assists with understanding the flood risk of the area and provides warnings via SMS.

Maintenance of sediment and erosion control measures is paramount to limit unwanted sediment runoff during wet weather. The following measures should be carried out before rain:

- Stockpiles are to be covered and any trapped sediment to be removed prior to rainfall events;
- Construction equipment/plant to be removed from flood prone areas and relocated to higher ground;
- Checking sediment and control measures are in place;
- Emptying basins; and
- Clearing site of debris.

Additionally, the following rainfall, the sediment and control measures should all be checked and repaired as required.

The site accommodation/cabins etc are to be located above RL of 6.0m (effectively in the southern part of the site). Where practical, stockpiles should also be located above the 5% AEP event.

4.4 Development and Adaptation

It is the responsibility of the demolition team to take all steps necessary to protect the environment during the contract works and implement the necessary measures for the control of erosion and sedimentation.

5 Construction Flood Emergency Response Sub-Plan (FERSP)

This FERSP has been developed to guide the early works. The contractor will progressively update the FERSP including evacuation routes, assembly points and refuge protocols as works commence throughout the site.

5.1 Predicted flood levels

The Powerhouse Museum Flood Model was used to simulate a range of flood events to define the existing flood behaviour of the area surrounding the Powerhouse Museum site. Section 3.2 outlines both the riverine and overland flood behaviour in the existing conditions.

Predicted peak flood levels for the site range between 5.9mAHD and 6.1mAHD for riverine flooding for the 1% AEP event. This peak flood levels are slightly higher for overland flooding and range between 6.72mAHD and 7.20mAHD for the 1% AEP event, depending on adopted blockage (Arup 2020).

5.2 Flood warning time and flood notification

The Parramatta Local Disaster Plan (DISPLAN) does not list a relevant flood sub-plan. However, the draft Update of Parramatta Floodplain Risk Management Plans, prepared by Molino Stewart on behalf of City of Parramatta Council, does include recommendations with respect to emergency management (2019).

An extract of the flood emergency response classification of communities across the CBD is contained in Figure 3 which shows that the site of the Powerhouse Museum is classified as a “Low Flood Island”.

This island effect can occur for short durations (less than one hour), and to shallow depths (~0.4m) due to flash overland flooding. It can also occur during rare riverine flood events where Parramatta River breaks its banks upstream of the proposed development and floods the majority of roads within Parramatta CBD.

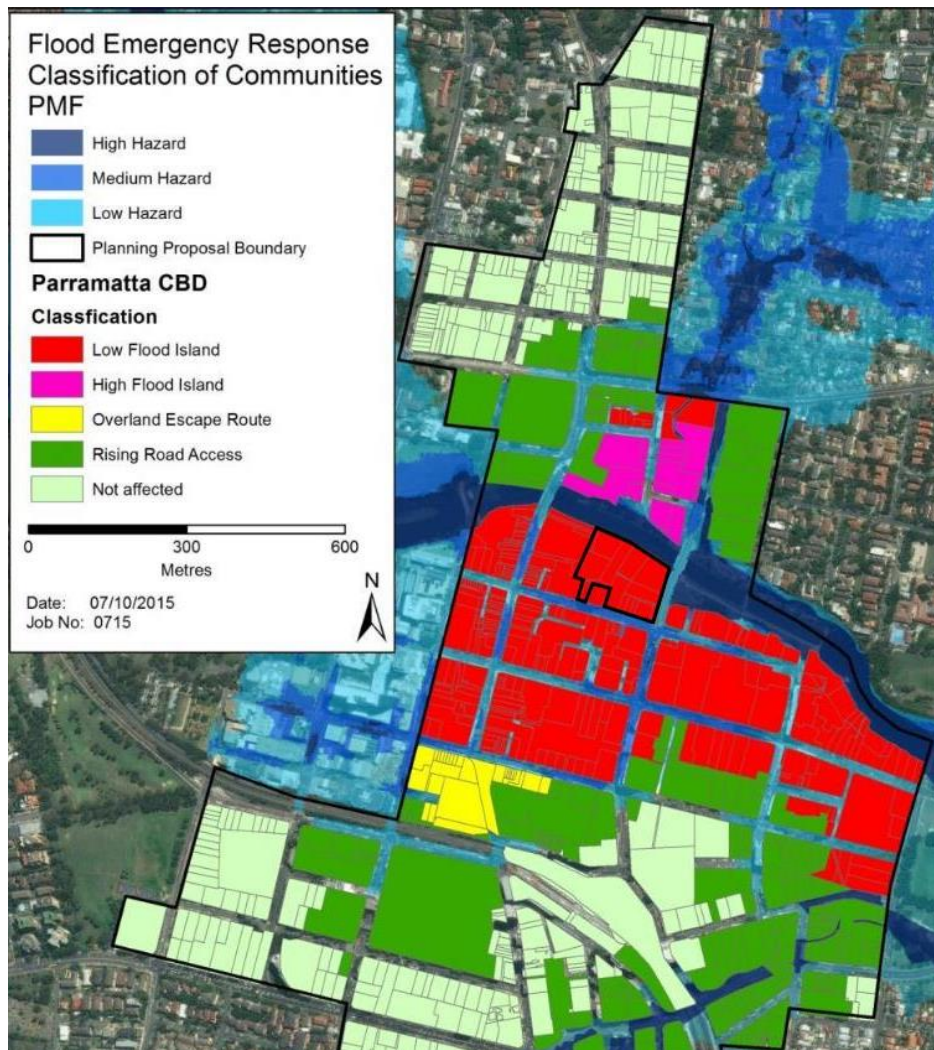


Figure 3 Extract of Flood Emergency Response Classification of Communities Across the CBD (Source: draft Update of Parramatta Flood Risk Management Plans, Molino Stewart 2019)

The Contractor will sign up to *FloodSmart Parramatta*. This is a service that assists with understanding the flood risk of the area and provides warnings via SMS. As well as monitoring the information published by *FloodSmart Parramatta*, the Contractor will also monitor BoM and SES to ensure that any flood warnings are responded to promptly.

5.3 Evacuation protocols

The most flood prone parts of the site are near the riverbank, however, Figure 1 shows that the whole site and surrounding areas are considered “Low Flood Island” zones (Figure 3). According to the draft Update of Parramatta Floodplain Risk Management Plans, prepared by Molino Stewart on behalf of City of Parramatta Council, there are two forms of evacuation response:

1. Evacuation outside of the floodplain; and
2. Shelter in place.

Both methods have drawbacks and the adopted method will be dependent on factors present at the time of flooding. However, considering the nature of the site, it would be recommended to shelter in place should a significant flooding event occur up to the 1% AEP. Personnel on site could take shelter in the site compound located at the south of the site until floodwaters have subsided (Figure 4). Existing levels at the suggested compound site are between 7.1-7.9 mAHD. It is suggested that the compound FFLs are above the 1% AEP. For events greater than the 1% AEP, site evacuation is recommended.

Where early notification is given of a weather warning, the Contractor may decide to close down the site, undertaken appropriate preparation works and evacuate.

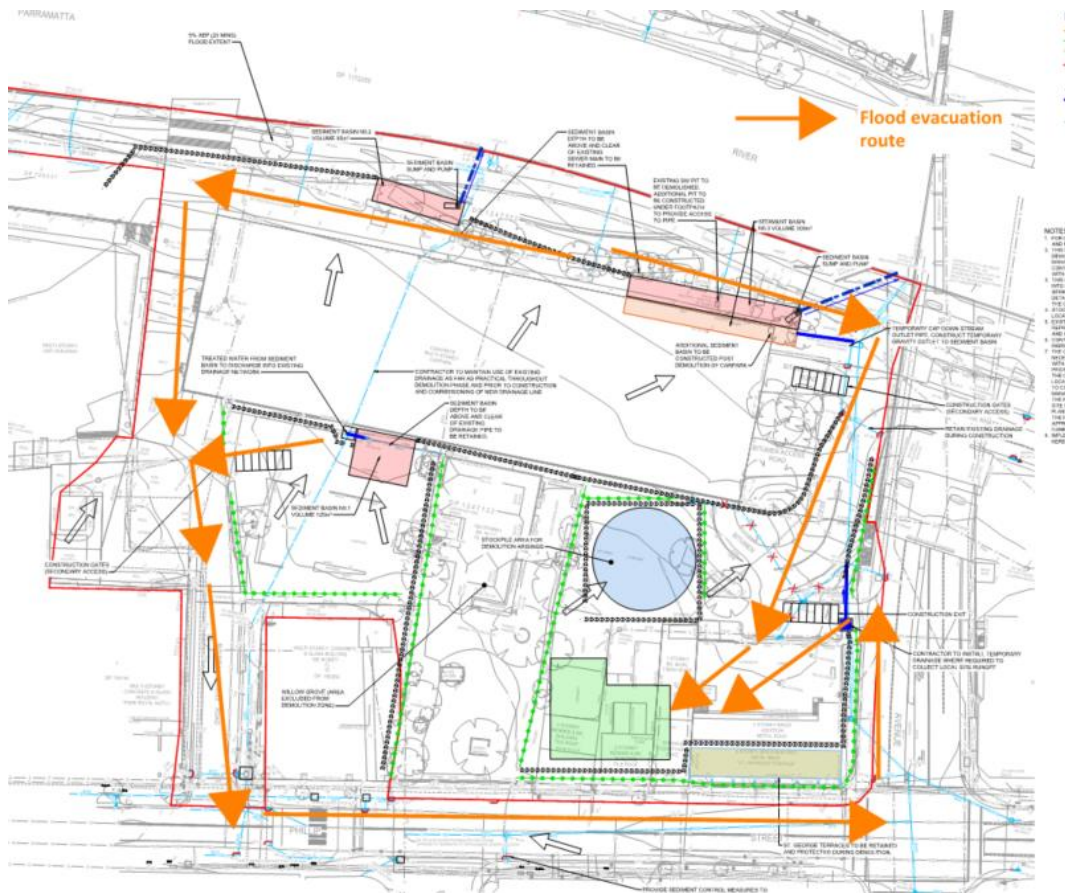


Figure 4 Potential flood evacuation route for the site

Potential assembly points, evacuation routes and refuge protocols should be determined by the contractor on site depending on the works being undertaken, with Figure 4 providing only one option. These assembly points and evacuation routes will be developed in accordance with the NSW Floodplain Risk Management Guidelines and NSW SES guidelines. Important points to consider are:

- Considering key levels throughout the site and surrounding roads that are affected by floodwaters;
- Identifying triggers for action (e.g. weather forecasts, FloodSafe notification, observed rain or flooding);

- Identifying routes to reach safe places (including alternative routes); and
- Reviewing the plan regularly (including after significant rainfall).

5.4 Training

Awareness training is mandatory for all employees, contractors and other relevant persons associated with the site. Prior to entering the construction site, the contractor must ensure that all personnel attend induction training covering emergency procedures relating to flooding, including evacuation responses and refuge protocols.

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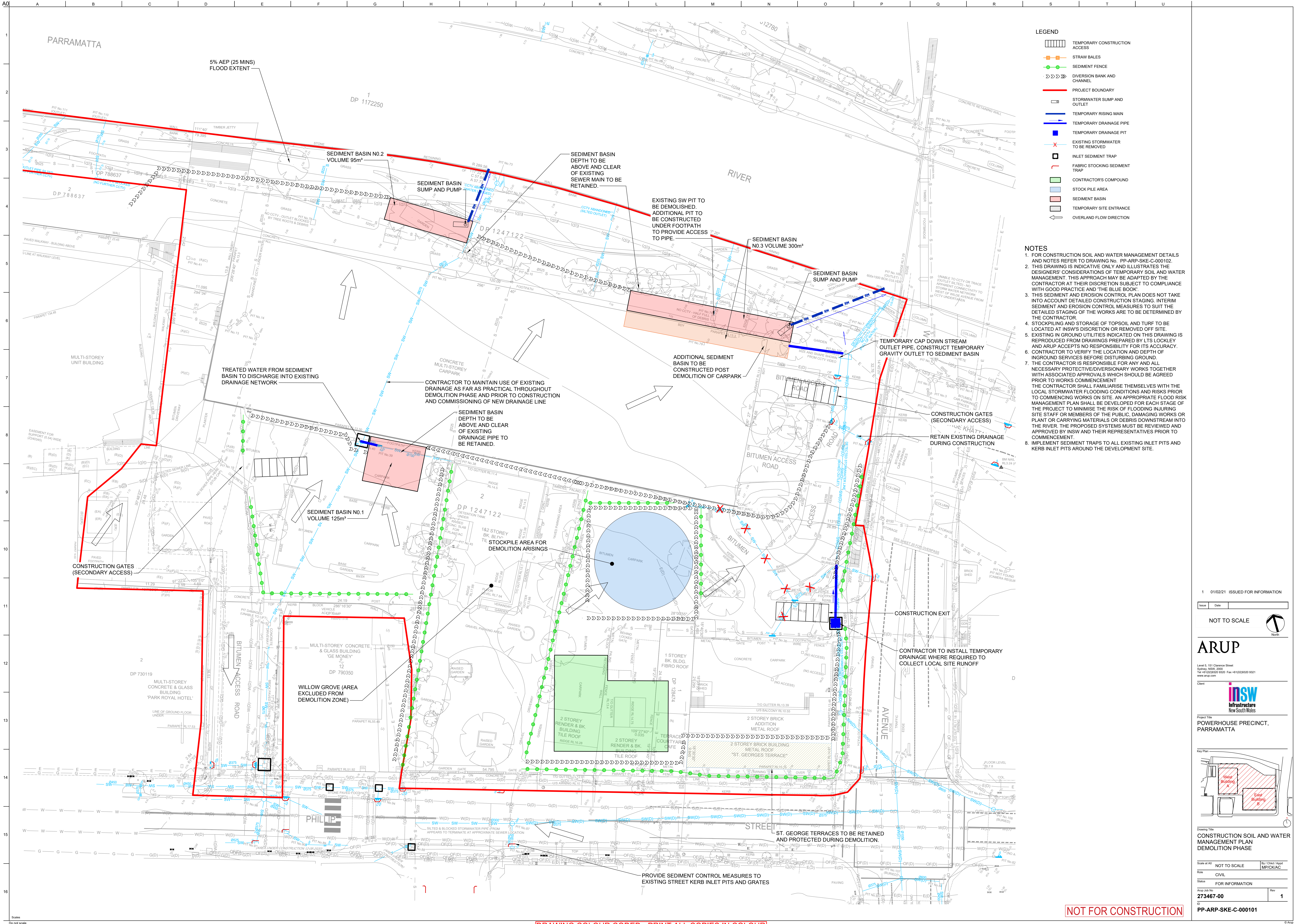
NSW Government “Protection of the Environment Operations Act 1997 No 156”; dated December 2020.

NSW Government Department of Land and Water Conservation “Guidelines for Erosion and Sediment Control on Building Sites”; dated January 2000.

NSW State Emergency Services, viewed 4th February 2021,
<https://www.ses.nsw.gov.au/disaster-tabs-header/flood/>

Appendix A

Construction Soil and Water Management Plan



- LEGEND**
- TEMPORARY CONSTRUCTION ACCESS
 - STRAW BALES
 - SEDIMENT FENCE
 - DIVERSION BANK AND CHANNEL
 - PROJECT BOUNDARY
 - STORMWATER SUMP AND OUTLET
 - TEMPORARY RISING MAIN
 - TEMPORARY DRAINAGE PIPE
 - TEMPORARY DRAINAGE PIT
 - EXISTING STORMWATER TO BE REMOVED
 - INLET SEDIMENT TRAP
 - FABRIC STOCKING SEDIMENT TRAP
 - CONTRACTOR'S COMPOUND
 - STOCK PILE AREA
 - SEDIMENT BASIN
 - TEMPORARY SITE ENTRANCE
 - OVERLAND FLOW DIRECTION

- NOTES**
- FOR CONSTRUCTION SOIL AND WATER MANAGEMENT DETAILS AND NOTES REFER TO DRAWING No. PP-ARP-SKE-C-000102.
 - THIS DRAWING IS INDICATIVE ONLY AND ILLUSTRATES THE DESIGNERS' CONSIDERATIONS OF TEMPORARY SOIL AND WATER MANAGEMENT. THIS APPROACH MAY BE ADAPTED BY THE CONTRACTOR AT THEIR DISCRETION SUBJECT TO COMPLIANCE WITH GOOD PRACTICE AND THE BLUE BOOK.
 - THIS SEDIMENT AND EROSION CONTROL PLAN DOES NOT TAKE INTO ACCOUNT DETAILED CONSTRUCTION STAGING. INTERIM SEDIMENT AND EROSION CONTROL MEASURES TO SUIT THE DETAILED STAGING OF THE WORKS ARE TO BE DETERMINED BY THE CONTRACTOR.
 - STOCKPILING AND STORAGE OF TOPSOIL AND TURF TO BE LOCATED AT INSW'S DISCRETION OR REMOVED OFF SITE.
 - EXISTING IN GROUND UTILITIES INDICATED ON THIS DRAWING IS REPRODUCED FROM DRAWINGS PREPARED BY LTS LOCKLEY AND ARUP ACCEPTS NO RESPONSIBILITY FOR ITS ACCURACY.
 - CONTRACTOR TO VERIFY THE LOCATION AND DEPTH OF INGROUND SERVICES BEFORE DISTURBING GROUND.
 - THE CONTRACTOR IS RESPONSIBLE FOR ANY AND ALL NECESSARY PROTECTIVE/DIVERSIONARY WORKS TOGETHER WITH ASSOCIATED APPROVALS WHICH SHOULD BE AGREED PRIOR TO WORKS COMMENCEMENT.
 - THE CONTRACTOR SHALL FAMILIARISE THEMSELVES WITH THE LOCAL STORMWATER FLOODING CONDITIONS AND RISKS PRIOR TO COMMENCING WORKS ON SITE. AN APPROPRIATE FLOOD RISK MANAGEMENT PLAN SHALL BE DEVELOPED FOR EACH STAGE OF THE PROJECT TO MINIMISE THE RISK OF FLOODING INJURING SITE STAFF OR MEMBERS OF THE PUBLIC. DAMAGING WORKS OR PLANT OR CARRYING MATERIALS OR DEBRIS DOWNSTREAM INTO THE RIVER. THE PROPOSED SYSTEMS MUST BE REVIEWED AND APPROVED BY INSW AND THEIR REPRESENTATIVES PRIOR TO COMMENCEMENT.
 - IMPLEMENT SEDIMENT TRAPS TO ALL EXISTING INLET PITS AND KERB INLET PITS AROUND THE DEVELOPMENT SITE.

1 01/02/21 ISSUED FOR INFORMATION

Issue Date

NOT TO SCALE

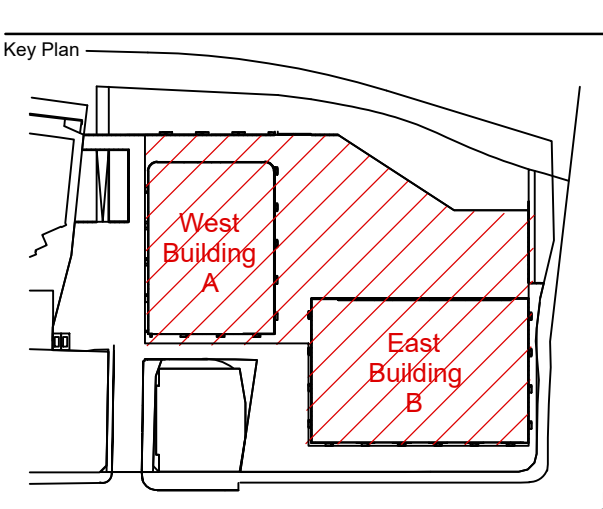
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Client

insw
Infrastructure
New South Wales

Project Title
**POWERHOUSE PRECINCT,
PARRAMATTA**



Drawing Title
**CONSTRUCTION SOIL AND WATER
MANAGEMENT PLAN
DEMOLITION PHASE**

Scale at A0: NOT TO SCALE By: CHU/Agd MP/CK/AC

Role: CIVIL

Status: FOR INFORMATION

Project No: 273467-00
Rev: 1
PP-ARP-SKE-C-000101

DRAWING COLOUR CODED - PRINT ALL COPIES IN COLOUR

NOT FOR CONSTRUCTION

ES1 ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE IN ACCORDANCE WITH LANDCOM "SOILS AND CONSTRUCTION MANUAL VOLUME 1, MARCH 2004"

ES2 WORKS SHALL BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:

- (A) INSTALL AIR MONITORING EQUIPMENT, COMMENCE WITH PITS TO BE RETAINED.
- (B) INSTALL EROSION AND SEDIMENT CONTROLS.
- (C) STRIP AND STOCKPILE TOPSOIL AND CARRY OUT ALL BULK EARTHWORKS.
- (D) UNDERTAKE REMAINING SITE WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS.
- (E) REMOVE SOIL AND WATER MANAGEMENT WORKS NOT REQUIRED FOR OTHER STAGES OF CONSTRUCTION ONCE UPSTREAM SURFACES ARE STABILISED TO THE SATISFACTION OF THE PROJECT MANAGER.

EC1	CONTROLS AFFECTED BY WORKS ARE TO BE RE-ESTABLISHED PRIOR TO THE COMPLETION OF EACH DAYS WORK.
EC2	DUST CONTROL MEASURES SHALL BE IMPLEMENTED CONTINUOUSLY DURING CONSTRUCTION WORKS TO THE SATISFACTION OF THE PROJECT MANAGER.

SC1 DURING EARTHWORKS, CAR PARK WORKS, ROADWORKS, TEMPORARY DIVERSION BANKS SHOULD BE CONSTRUCTED TO LIMIT SLOPE LENGTH, WHERE POSSIBLE, IN ACCORDANCE WITH THE FOLLOWING:

SC2 ALL STORMWATER PITS TO BE COVERED OR DROP INLET SEDIMENT TRAPS PROVIDED IN ACCORDANCE WITH DRAWING No. PP-ARP-DRG-C-000101 & PP-ARP-DRG-C-000102. KERB INLET SEDIMENT TRAPS ARE TO BE INSTALLED AFTER COMPLETION OF PAVING.

(B) MATERIALS ARE REPLACED OR REPAIRED AS REQUIRED TO ENSURE SERVICEABILITY OF BOTH THE ELEMENT AND THE TRAP.

SC5 FOLLOWING COMPLETION AND RESTORATION OF SITE, REMOVE ALL MATERIALS AND FILL DIVERSION DRAINS, WATERWAYS AND SEDIMENT TRAPS TO MATCH LEVELS OF THE PREVIOUSLY COMPLETED WORKS.

SC7 AN ACCESS POINT TO ALLOW MACHINE ENTRY / EXIT ARE TO INCLUDE A ROUNDED EARTH MOUND 0.3m HIGH WITH 10H:1V BATTERS.

SC9 THE CONTRACTOR SHALL MAINTAIN A LOG BOOK DETAILING
- RECORDS OF ALL RAINFALL
- CONDITION OF SOIL AND WATER MANAGEMENT STRUCTURES
- ANY ADDITIONAL REMEDIAL WORKS REQUIRED
THE LOG BOOK SHALL BE MAINTAINED ON A DAILY BASIS AND BE MADE
AVAILABLE TO ANY AUTHORISED PERSON UPON REQUEST. THE ORIGINAL
LOG BOOK SHALL BE ISSUED TO THE PROJECT MANAGER AT THE
COMPLETION OF THE WORKS.

SC11 THE CONTRACTOR SHALL PROVIDE CATCH DRAINS AT THE BOTTOM OF ALL BATTERS AND DIVERT THE CATCH DRAINS AND ANY TAIL OUT DRAINS TO DRAIN TO THE NEAREST STORMWATER PIT.



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Drawing Title
CONSTRUCTION SOIL AND WA
MANAGEMENT PLAN
NOTES AND DETAILS

Arup Job No	Rev
273467-00	

PP-ARP-SKE-C-000102

NOT FOR CONSTRUCTION

Appendix B

Inspection Test Plan Examples

Appendix C

Acid Sulphate Soils Management Plan (JBS&G)

Figure 2.1a

INSPECTION AND TEST PLAN

PROJECT:										INSPECTION TEST PLAN NO: QAIT001		PAGE 1 OF 2			
PROCESS: DWELLING CONSTRUCTION EROSION AND SEDIMENT CONTROL (LOTS LESS THAN 2,500M ²)										CONTROLLED COPY NO:		REV: 0			
STEP	INSPECTION ACTIVITY	APPLICABLE STANDARD	ACCEPTANCE CRITERIA	TEST		INSPECTORATE			RECORDS/REMARKS	AREA					
				METHOD	FREQ.	SUB	CON	SUP							
1	Review Erosion and Sedimentation Control Plan (ESCP)	Chapter 2.0 Chapter 3.0	Plan to minimum scale of 1:2000, locality, contours (initial and final), land slope gradients, critical natural areas (eg. streams and cliffs), catchment boundaries, location of roads and impervious surfaces, existing vegetation and site drainage shown. Limit of clearing, grading and filling defined, location of topsoil stockpiles shown, erosion control practices and sediment control practices Details of site revegetation programme and outline of programme for maintenance of erosion and sediment controls included.	Review	Before start		X		File note of ESCP review						
2	Review construction program	Chapter 3.0	Construction of control measures shown completed prior to commencement of work on site. Clearing and grading integrated with design layout, limited to areas of work in progress and staged to immediately precede construction activities. Permanent stormwater drainage works installed as first stage of land development. Installation of utilities co-ordinated.	Review	Before start		X		File note of construction program review						
3	Confirm all approvals received	Contract documents	Superintendent approval of ESCP, construction program and subcontractors received. Relevant Authority approvals received.	Review	Before start			H	File note of document review. Superintendent's letter of release from Hold Point						
4	Confirm site erosion and sediment control measures in place	Chapter 5.0 Chapter 6.0 Chapter 9.0	Stabilised access, stormwater filters, sediment filter fences, channels, earth banks and level spreader properly located and constructed. Surface flows directed over areas with vegetation to sediment fences.	Visual	Before excavation			H	Site diary note of inspection. Superintendent's letter of release from Hold Point						

DEVELOP EROSION AND SEDIMENTATION CONTROL PLAN IF NOT PROVIDED IN THE CONTRACT DOCUMENTS

INCLUDE EROSION AND SEDIMENTATION CONTROL MEASURES IN CONSTRUCTION PROGRAM

OBTAIN APPROVALS FROM SUPERINTENDENT AND RELEVANT AUTHORITIES

ALLOCATE ROLES AND RESPONSIBILITIES FOR PROJECT PERSONNEL AND SUBCONTRACTORS

DEFINE THE WORKS AREA WITH TEMPORARY FENCING

INSTALL SEDIMENT FENCE ON DOWNSLOPE SIDES OF WORK AREA

DIVERT UPSLOPE STORMWATER AWAY FROM CONSTRUCTION AREA

PROTECT STORMWATER INLETS

CONSTRUCT STABILISED ACCESS TO SITE AND DIVERT STORMWATER TO SEDIMENT FENCE

CONTINUE TO PAGE 2

Figure 2.1b

INSPECTION AND TEST PLAN

PROJECT:											INSPECTION TEST PLAN NO: QAIT001		PAGE 2 OF 2			
PROCESS: DWELLING CONSTRUCTION EROSION AND SEDIMENT CONTROL (LOTS LESS THAN 2,500M ²)											CONTROLLED COPY NO:		REV: 0			
STEP	INSPECTION ACTIVITY	APPLICABLE STANDARD	ACCEPTANCE CRITERIA	TEST		INSPECTORATE			RECORDS/REMARKS	AREA						
				METHOD	FREQ.	SUB	CON	SUP								
	COMMENCE ROUTINE INSPECTION OF CONTROL MEASURES MAINTAIN VEGETATED AREAS STRIP, STOCKPILE AND STABILISE TOPSOIL CONSTRUCT SEDIMENT FENCE AROUND TOPSOIL STOCKPILE CARRY OUT SITE EXCAVATION ESTABLISH GROUND LEVELS TO DRAIN WATER TO PERIMETER OF SITE DRAIN SITE PERIMETER TO SINGLE OUTLET AND DISPERSE WATER THROUGH SEDIMENT FENCE INSTALL SERVICES															
5	Check condition of erosion and sediment control measures	Chapter 8.0	Inspection of erosion and sediment control measures carried out weekly, whenever storms are forecast, during storms and after storms have subsided. Damaged control measures repaired and accumulated sediment removed to non-erodible locations.	Visual	Weekly Storms		X			Site diary note of inspections						
6	Confirm building area erosion and sediment control measures in place	Chapter 4.0 Chapter 6.0 Chapter 9.0	Topsoil stockpile, sediment filter fence, channels and earth banks properly located and constructed. Surface flows directed to single outlet and dispersed through sediment fence. Topsoil stockpile stabilised.	Visual	Before start			W		Site diary note of inspection						
7	Inspect trench restoration	Chapter 9.0	Trenches backfilled and compacted on completion. Restoration carried out to pre-existing condition.	Visual	At finish	X		S		Site diary note of inspections Service installation Inspection and Test Plan						
8	Check storage of materials	Chapter 9.0	All materials stored within site sediment fence.	Visual	Weekly		X			Site diary note						
9	Inspect site restoration	Chapter 4.0 Chapter 7.0 Contract Documents	Ground prepared, treated and topsoil applied to specified depth. Plants, turf and seeding placed in accordance with landscape plan.	Visual	At finish	X		S		Site diary note of inspections Landscape Inspection and Test Plan						
10	Final inspection	Contract documents	Disturbed areas reinstated, landscaping in accordance with plan, vegetation healthy and temporary sediment control structures removed.	Visual	At finish		X	W		Site diary note						
LEGEND: SUB - SUBCONTRACTOR CON - CONTRACTOR SUP - SUPERINTENDENT X - WORK ACTIVITY S - SURVEILLANCE W - WITNESS POINT H - HOLD POINT											Boxes to be initialised and dated when activity for each area has been satisfactorily completed					
REFERENCE DOCUMENTS:				PREPARED BY:		ISSUED TO:		REVISION:								
MANAGING URBAN STORMWATER: CONSTRUCTION MANUAL				AUTHORISED BY:		DATE:		DATE:								
MAINTAIN VEGETATION CONSTRUCT DWELLING SPREAD TOPSOIL REVEGETATE SITE AND LANDSCAPE																



Infrastructure NSW
Acid Sulfate Soil Management Plan

Museum of Applied Arts and Sciences
Philip Street
Parramatta, NSW

29 March 2020
58352/128531 (Rev No. A)
JBS&G Australia Pty Ltd

Infrastructure NSW
Acid Sulfate Soil Management Plan

Museum of Applied Arts and Sciences
Philip Street
Parramatta, NSW

29 March 2020
58352/128531 (Rev A)
JBS&G

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Appendices

Appendix A: Site Figures

Abbreviations

Term	Definition
AASS	Actual Acid Sulfate Soil
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
ASSMP	Acid Sulfate Soil Management Plan
BGS	Below Ground Surface
CC	Construction Certificate
DA	Development Application/Approval
DCP	Development Control Plan
EPA	NSW Environment Protection Authority
ha	Hectare
LEP	Local Environmental Plan
LOR	Limit of Reporting
NoW	NSW Office of Water
PASS	Potential Acid Sulfate Soil
SAC	Site Action Criteria
S _{Cr} %	Chromium Reducible Sulfur (%)
sPOCAS	Suspended Potential Oxidation Combined Acidity and Sulfur (test method)
S _{pos} %	Potential Oxidisable Sulfur
SWL	Standing Water Level
TAA	Total Actual Acidity
TPA	Total Potential Acidity
TSA	Total Sulfidic Acidity

1. Introduction

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Infrastructure NSW (the client) to conduct a Detailed Site Investigation (DSI) of potential contamination at the proposed future location of the Museum of Applied Arts and Sciences (also referred to as the future Powerhouse Museum) at Philip Street, Parramatta NSW (the site). The total site is legally identified as Lot 1 DP788637, Lot 1 DP128474, Lots 1-3 in DP1247122 and occupies an area of approximately 2.5 hectares (ha). The site location and layout are shown on **Figures 1** and **2**, respectively.

The DSI has been prepared and issued as *Detailed Site Investigation Infrastructure NSW Museum of Applied Arts and Sciences, Philip Street Parramatta NSW*, 27 March 2020, JBS&G Australia Pty Ltd (JBS&G 2020). A potential for actual and/or potential acid sulphate soils (ASS and/or PASS) to occur at depth have been identified in JBS&G (2020). There is a likelihood that deep excavation works as anticipated with the proposed development, more than likely restricted to ‘piling’ activities, will encounter soils as classified as acid sulfate soils / potential acid sulfate soils (ASS or PASS).

This ASSMP has been prepared with consideration to the requirements of *Acid Sulfate Soil Manual* (ASSMAC, 1998) and the specific deep inground disturbance works anticipated for the site. Given the proposed works will include the generation of excess material, consideration has also been given to a future classification for off-site disposal of the natural material under the NSW EPA *Waste Classification Guidelines* (EPA 2014a¹ and 2014b²).

This report further supports a State Significant Development (SSD) Development Application (DA) for the development of the Powerhouse Parramatta at 34-54 & 30B Phillip Street and 338 Church Street, Parramatta. The Powerhouse Parramatta is a museum (information and education facility) that has a capital investment value in excess of \$30 million and as such the DA is submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Infrastructure NSW is the proponent of the DA.

The Department of Planning, Industry and Environment have issued Secretary’s Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development. This report has been prepared having regard to the SEARs as issued for the management of site contamination issues, interpreted as inclusive of ASS and/or PASS.

¹ *Waste Classification Guidelines Part 1: Classifying Waste*. NSW EPA 2014 (EPA 2014b)

² *Waste Classification Guidelines, Part 4: Acid Sulfate Soils*. NSW EPA (EPA 2014b)

1.2 Aims and Objectives

The aim of this assessment is to first assess the extent of potential ASS/PASS within the areas of proposed ground disturbance. In addition, it is a further objective to outline management techniques to mitigate the potential environmental impacts associated with the anticipated disturbance of ASS/PASS during the proposed site excavation works associated with deep piling as will potentially be undertaken to facilitate the proposed development of the site. Specifically, the objectives of this ASSMP are to document:

- The known site sub-surface characteristics that will be encountered during future excavation works to support design and implementation of future investigative and management activities;
- A monitoring and sampling strategy to be implemented prior to and during the proposed deep ground disturbance activities such that ASS/PASS may be appropriately identified and managed during the excavation works;
- Evaluation of potential ASS/PASS management opportunities and constraints resulting in the identification of a preferred management strategy;
- Procedures for the management and validation of ASS/PASS treatment during the future site excavation works so as to minimise the potential for adverse environmental impacts as a result of the ASS/PASS disturbance activities; and
- Outline the necessary off-site disposal requirements for potential ASS/PASS spoil generated from the proposed works.

1.3 Overview of Proposed Development

The Powerhouse was established in 1879, and Powerhouse Parramatta will radically return to its origins through the creation of seven presentation spaces of extraordinary scale that will enable the delivery of an ambitious, dynamic constantly changing program that provides new levels of access to Powerhouse Collection. The Powerhouse will set a new international benchmark in experiential learning through the creation of an immensely scaled 360-degree digital space, unique to Australia.

Powerhouse Parramatta will reflect the communities and cultures of one of Australia's fastest growing regions. It will hold First Nations culture at its core and set a new national benchmark in culturally diverse programming. The Powerhouse will be highly connected through multiple transport links, and integrate into the fine grain of the city.

Powerhouse Parramatta will be an active working precinct and include the Powerlab, which will enable researchers, scientists, artists and students from across regional NSW, Australia and around the world to collaborate and participate in Powerhouse programs. The Powerlab will feature digital studios to support music and screen industries alongside co-working spaces, life-long learning and community spaces. Integrated into the Powerlab will be a research kitchen and library that will support a NSW industry development program including archives and oral histories.

This application will deliver an iconic cultural institution for Parramatta in the heart of Sydney's Central City. The SSD DA seeks consent for the delivery of the Powerhouse Parramatta as a single stage, comprising:

- Site preparation works, including the termination or relocation of site services and infrastructure, tree removal and the erection of site protection hoardings and fencing;
- Demolition of existing buildings including the existing Riverbank Car Park, 'Willow Grove', 'St George's Terrace' and all other existing structures located on the site;
- Construction of the Powerhouse Parramatta, including:

- Seven major public presentation spaces for the exhibition of Powerhouse Collection;
- Front and back-of-house spaces;
- Studio, co-working and collaboration spaces comprising the 'Powerlab', supported by 40 residences (serviced apartments) for scientists, researchers, students and artists, students, researchers and scientists, and 60 dormitory beds for school students;
- Education and community spaces for staff, researchers and the Powerlab residents, the community, and education and commercial hirers;
- Commercial kitchen comprising the 'Powerlab Kitchen' used for cultural food programs, research, education and events and product development, and as a destination, education and event space;
- Film, photography, and postproduction studios that will connect communities with industry and content that will interpret the Powerhouse Collection;
- Public facing research library and archive for community, industry, students and researchers to access materials; and
- A mix of retail spaces including food and drink tenancies with outdoor dining.
- Operation and use of the Powerhouse Parramatta including use of the public domain provided on the site to support programs and functions;
- Maintenance of the existing vehicular access easement via Dirrabarri Lane, the removal of Oyster Lane and termination of George Khattar Lane, and the provision of a new vehicular access point to Wilde Avenue for loading;
- Public domain within the site including new public open space areas, landscaping and tree planting across the site; and
- Building identification signage.

The project does not seek consent for the carrying out of works outside of the site boundary, and in particular does not involve any alterations to the existing edge of the formed concrete edge of the Parramatta River or to the waterway itself.

1.4 Application

This document applies to the excavation of soils below a depth of 2 m. This is consistent with guidance in Parramatta City Council records for the site, and the potential occurrence of ASS/PASS.

2. Site Conditions

2.1 Site Identification

The site location and the assessment area are shown in **Figures 1** and **Figure 2**, respectively. The site is located at the northern edge of the Parramatta CBD on the southern bank of the Parramatta River. It occupies an area of approximately 2.5 hectares and has extensive frontages to Phillip Street, Wilde Avenue and the Parramatta River. A small portion of the site extends along the foreshore of the Parramatta River to the west, close to the Lennox Street Bridge on Church Street. The site excludes the GE Office Building at 32 Phillip Street.

Assessment area details are summarised in **Table 2.1** and described in detail in the following sections.

Table 2.1: Summary of Assessment Area Details

Lot/DP	Lot 12 DP790350, Lot 1 DP788637, Lot 203 DP1237698, Lot 1 DP128474, Lot 2 DP730119, Lot 3 DP1225807, Lot 2 DP1247122, Lot 3 DP1247122, and Lot 1 DP1247122
Address	Phillip Street, Parramatta
Local Government Authority	Parramatta City Council
Approximate Area size	2.5 ha
Current Zoning	B4 Mixed Use, RE1 Public Recreation
Current Land Use	Carpark, commercial properties including restaurants and open space
Previous Land Use	Carpark since 1960s
Proposed Land Use	Open Space / Recreational – Museum of Applied Arts and Sciences

2.2 Site Description

A detailed inspection of the assessment area was conducted on 28 February 2020 by one of JBS&G's trained and experienced environmental scientists. Observations of the current site configuration and potential areas of concern are discussed below.

The site is currently occupied by a number of buildings and structures, including:

- Riverbank Car Park – a four-level public car park;
- Willow Grove – a two-storey villa of Victorian Italianate style constructed in the 1870s;
- St George's Terrace – a two-storey terrace of seven houses fronting Phillip Street constructed in the 1880s;
- 36 Phillip Street – a two-storey building comprising retail and business premises;
- 40 Phillip Street – a two-storey building comprising retail and business premises; and
- 42 Philip Street – a substation building set back from the street.

The immediate context of the site comprises a range of land uses including office premises, retail premises, hotel, serviced apartments and residential apartments. To the north is the Parramatta River and open space corridor, beyond which are predominately residential uses. The Riverside Theatre is located to the north-west across the Parramatta River.

Two ground-level asphalt carparks situated to the south of the Riverbank Car Park and were divided by an open-space, private parkland and Willow Grove and St George's Terrace. Small landscaped areas consisting of vegetation and patchy grass/exposed soils were also situated at various locations throughout both carparks. A number of private carparks were also situated at the rear of the commercial properties along Phillip Street, with surface compositions comprising patchy asphalt and gravelled exposed soils.

Directly to the north of the commercial properties, Oyster Lane and George Khattar Lane merge and slope downwards in a northerly direction towards Parramatta River and to the east of the Riverbank

Car Park. A landscaped area comprising large trees and grass also exists between George Khattar Lane and Riverbank Car Park.

2.3 Discussion of Geology and Acid Sulfate Soil Conditions

Review of the 1:100 000 scale Sydney Geological Sheet Series 9130 (NSW DMR 1983³) indicates that the site is located on the Wianamatta Group Shale, consisting mostly of shale, carbonaceous claystone, laminate, fine to medium grade lithic sandstone. Previous investigations (see **Section 3.8**) reported fill over natural soils as silty sand/silty clay overlying sandstone.

Review of the NSW Department of Environment and Heritage online resource eSPADE⁴, indicated the site overlies the Birrong Soil Group which comprises deep (>250 cm) *Yellow Podzolic Soils* on older alluvial terraces, deep (>250 cm) Solodic Soils and Yellow Solonetz on the current floodplain. The soil landscape is prone to localised flooding and presents a high soil erosion hazard. Furthermore, the Birrong Soil Group can be characterised as saline subsoil with very low soil fertility and seasonal waterlogging.

Review of the Acid Sulfate Soil Risk Map (NSW DLWC)⁵ indicates that the site is located within an area of Disturbed Terrain which includes areas historically impacted by reclamation of low-lying wetlands, dredging, mining or urban development. The nearby Parramatta River comprises an area of high probability of acid sulfate soil occurrence in bottom sediments. Acid Sulphate Soils are anticipated to be present underlying the site at depth.

Previous environmental assessments completed for the site have reported that ASS/PASS conditions are generally not present in fill materials / near surface soils, however may be present in deeper soils. On this basis, and in consideration of the proposed development, guidance in PCC records for the site, and the likely extent of minor excavations and deep excavations as may be required for piling, the provisions of the plan are intended to apply to any excavation proposed to a depth of 2 m below the existing ground surface.

2.3.1 Potential Acid Sulfate Soil Assessment Conclusions

Based on the proposed site plans and with consideration to the proposed development details, the following has been identified with regard to the requirements for management of ASS / PASS risks at the site:

- Disturbed natural soils below the water table that are disturbed or otherwise exposed to the atmosphere during any construction phase, or otherwise soils below a depth of 2 m (as consistent with shallowest depth of groundwater in areas of proposed development) may require treatment for ASS/PASS if kept on-site to prevent production of acid sulfate soils with the potential to impact on the surrounding environment;
- The proposed development works will include the disturbance of only minor volumes of natural alluvial soils currently present underlying fill materials and beneath the water table as likely to be restricted to spoils as generated by piling works;
- Where soils below this depth are proposed to be disturbed, then advance sampling will require to be undertaken to assess the soils for a sPOCAS analysis to determine an initial liming rate. Mixing of the ASS/PASS soils with lime (if present) will cause a neutralisation of the acidity as otherwise generated by the ASS/PASS on disturbance;

³ Sydney 1:100,000 Geological Sheet 1930, 1st Edition. NSW Department of Mineral Resources 1983 (NSW DMR 1983)

⁴ eSPADE <https://www.environment.nsw.gov.au/eSpade2WebApp#> NSW Department of Environment and Heritage. Accessed 5 March 2020

⁵ 'Acid Sulphate Soil Risk Map – Prospect-Parramatta, 1997 1:25 000 (NSW DLWC)

- Following successful completion of the neutralisation process, the treated soils will no longer be considered ASS/PASS materials and so may potentially be reused on site as engineered fill material;
- Any identified neutralised ASS/PASS in excess of site requirements will require classification by reference to EPA (2014) Waste Classification Guidelines prior to offsite disposal; and
- It is anticipated that the ASS/PASS management requirements, will be limited to the natural soils underlying fill materials across the site, as present at depth.

3. Acid Sulfate Soil General Information

3.1 Acid Sulfate Soil Background

Acid sulfate soils (ASS) is a common name given to naturally occurring sediments and soils containing iron sulfides (generally as iron sulfide or iron disulfide). These soil profiles are typically located in coastal, low-lying alluvial or estuarine areas such as mangroves, salt marshes, coastal rivers and creeks, estuaries, tidal lakes and coastal floodplains where historical iron rich sediment deposition in the presence of a sulfate source (commonly salt water), organic matter and microbial action over time has resulted in the formation of particular environmental conditions. Acid sulfate soils are predominantly encountered in areas with an elevation of less than 5 m AHD and may be found close to the ground level or at depth in the soil profile where continued deposition has resulted in raising of the ground levels.

Changes in environmental conditions which result in the exposure of these materials to air, via excavation or drainage of subsurface soils, can lead to the reaction of the iron sulfides with oxygen, causing the generation of sulfuric acid. This may result in significant environmental and infrastructure damage if the produced acid is spread by groundwater or surface water.

Acid Sulfate Soils (ASS) consist of two major categories:

- Actual Acid Sulfate Soils (AASS) are soils that have been exposed to oxygen which has caused the oxidation of iron sulfides to form sulfuric acid. Some of this acid is commonly neutralised by other soil particles in a process known as buffering, however the excess acid is spread by water movement through the soil; and
- Potential Acid Sulfate Soils (PASS) are soils which contain iron sulfides, but which have not been oxidised. These soils are generally kept from contact with air by permanent waterlogging or the density of the soil profile and so are relatively stable, or in equilibrium. In this state the soils are generally non-acidic and are considered harmless to the environment. However, oxidation of such soils through disturbance has the potential to generate acidic conditions.

Commonly, an acid sulfate soil profile will consist of a combination of both AASS and PASS material as a result of ongoing chemical reactions in response to environmental changes including groundwater fluctuations and seasonal soil moisture changes.

In NSW, development of land subject to ASS occurrence is managed at a planning level in accordance with the *Acid Sulfate Soil Manual* (1998) prepared by the Acid Sulfate Soil Management Advisory Committee (ASSMAC). Local Environmental Plans (LEP) provide a regulatory regime for the sustainable management of acid sulfate soils in the coastal zone. The ASS Manual provides guidance on the assessment of acid sulfate soil conditions and appropriate management strategies for development of ASS identified land.

3.2 Laboratory Assessment Guidelines

The assessment of site soil conditions with respect to ASS occurrence is completed in accordance with the guidance provided in ASSMAC (1998). The requirement to manage soils for ASS is evaluated by comparison of laboratory analysis results with Site Action Criteria developed based on three broad soil texture categories. The SAC are based on the percentage of oxidisable sulfur or equivalent acid trail (i.e. titratable actual acidity-TAA or titratable potential acidity-TPA) results. There are two categories based on the scale of the proposed disturbance, with the SAC for small scale (i.e. less than 1000 tonnes) works based upon the texture of the soil material and the SAC for large scale works adopting the most sensitive SAC being the SAC for coarse textured soils in small scale works.

Table 3.1 ASSMAC Site Action Criteria based on General Soil Texture Categories

Type of material		Action Criteria 1-1000 tonnes disturbed		Action Criteria if more than 1000 tonnes disturbed	
Texture Range. McDonald at al. (1990)	Approx. clay content (%<0.002 mm)	Sulfur trail % S oxidisable (oven- dry basis) e.g. S _{Cr} or S _{pos}	Acid trail Mol H ⁺ /tonne (oven- dry basis) e.g., TPA or TSA	Sulfur Trail % S oxidisable (oven- dry basis) e.g. S _{Cr} or S _{pos}	Acid trail Mol H ⁺ /tonne (oven-dry basis) e.g., TPA or TSA
Coarse Texture Sands to loamy sands	≤5	0.03	18	0.03	18
Medium texture Sandy loams to light clay	5-40	0.06	36	0.03	18
Fine texture Medium to Heavy clays and silty clays	≥40	0.1	62	0.03	18

Exceedance of the SAC attributable to ASS material generally triggers the need to prepare a management plan and is based on the percentage of oxidisable sulfur (or equivalent TPA, TAA) for broad categories of soil. However, it is noted that other soil properties and constituents may cause acidic conditions in soils that are not related to acid sulfate soil conditions. This may include sources of organic acidity where the soils have a pH of less than 5 and positive titratable actual acidity (TAA) or titratable potential acidity (TPA) but have no detectable sulfur source (i.e. no S%). In this case, exceedance of the Acid Trail SAC does not trigger treatment of these soils.

Given the nature of the works to be undertaken at the subject site (i.e. minimal volumes to be disturbed) and with consideration to the variability of the soils types noted in previous investigations, the SAC adopted for assessment and management of ASS at this site are:

- Sulfur Trail Criteria (S_{pos} or S_{Cr} %) > 0.03 %;
- Acid Trail Criteria (TSA, TPA) > 18 mol H⁺ / tonne soil.

3.3 Other Regulatory Guidance

Section 105 of the *Contaminated Land Management Act 1997* (CLM Act) allows the Environment Protection Authority (EPA) to “make or approve” guidelines for any purpose related to the objects of the Act. In addition to ASSMAC (1998), this management plan has been prepared with reference to the following:

- *Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014a)
- *Waste Classification Guidelines Part 4: Acid Sulfate Soils* (EPA 2014b)
- *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*, 3rd Edition, October 2017 (EPA 2017)
- *Protection of the Environment Operations Act 1997* (POEO Act) and associated regulations.

4. Extent of ASS/PASS within Proposed Area of Disturbance

Previous investigations have identified a potential for ASS/PASS to be present in deep soils at the site. This is consistent with the proximity of the site to the Parramatta River and the potential for sulfidic material to be present in deep soils. It is likely that future deep excavation works, most likely restricted to piling, will cause the disturbance of these ASS/PASS soils.

At the outset of these works, an indication will be required of the potential depth that ASS/PASS materials are present (if present at all) and the levels of sulfidic materials present in the soils. At the stage of the ASSMP preparation, this information is not yet available for the site.

These works will be required to be undertaken where a plan of proposed deep excavations has been prepared, and the extent of deep excavations is known. This would likely occur with detailed geotechnical assessments prior to construction of buildings, and with detailed building designs.

At the time that these detailed plans are available, representative investigation locations shall be undertaken through the area of proposed deep excavation and samples of soils from below a depth of 2 m collected at regular intervals. These samples shall be assessed for a sPOCAS analysis and compared to criteria nominated in **Table 3.1**. The distribution of ASS/PASS shall be determined from these analysis results, and the appropriate provisions of this ASSMP applied to soils where appropriate.

Initial liming rates to achieve the neutralisation of the disturbed soils can further be determined from the analysis rates. These liming rates shall be used in the first instance to implement the neutralisation works as described in further detail in **Section 5**.

5. Management Procedures

The aim of the following management procedures is to identify ASS/PASS material and implement appropriate mitigation measures such that the potential environmental impacts associated with disturbance of ASS/PASS during the proposed site construction works may be appropriately managed. Specifically, the objectives are to provide:

- A methodology for the identification of materials requiring management;
- Protocols for the on-site treatment and management of ASS/PASS materials and associated leachate water (as required) during the proposed works;
- Excavation inspection and validation assessment protocols to be implemented during the proposed works such that the extent of ASS/PASS material may be delineated from non-PASS material to provide for off-site disposal of the balance of the natural soils as virgin excavated natural material (VENM);
- Water and soil quality targets for the excavation, treatment and removal of material encountered during the proposed works; and
- A contingency framework in the event that additional ASS/PASS conditions are encountered during the site works; monitoring indicates disturbance of off-site ASS/PASS materials; or the proposed treatment strategy fails.

5.1 Scope of Soil Disturbance Activities

Of relevance to the scope of the ASSMP, as being restricted to soils below a depth of 2 m across the extent of the site, potential soil disturbance activities that will disturb deep soils will most likely be restricted to piling to support the construction of future structures on the site. Sub-surface structures are not proposed with the development, and no basements have been included in the site building.

The proposed development works are mainly above ground with limited soil disturbances, excepting the likely piling works. The precise extent of the piling works will not be able to be determined the project design is further advanced and detailed building plans / construction specifications are available.

5.2 Evaluation of Potential Management Strategies

Where the presence of ASS/PASS has been identified, evaluation of options to minimise the level of disturbance and to mitigate the potential impact of disturbance (if necessary) of the materials is required. As per ASSMP (1998), potential mitigation approaches have been identified:

- Avoid ASS/PASS materials being encountered during works by not undertaking bulk excavation works into natural alluvial soils, i.e. removing excavation and/or dewatering requirements;
- Where encountering ASS/PASS during works cannot be avoided, manage the potential for acid generation by neutralising disturbed materials, preventing movement of acid impacted water, and the use of suitable construction materials;
- If PASS materials have previously been disturbed, undertake works to mitigate the existing conditions, minimise the production of further acid during the proposed works and rehabilitate impacted areas;
- Treat soil by allowing full oxidation of the sulfide component under controlled conditions followed by flushing the acid from the soil with water and neutralisation of the subsequent leachate;

- Avoid using untreated ASS/PASS materials as fill material in non-ASS areas by either leaving material on-site, or managing the potential for acid generation prior to material being transported from the site of origin; and/or
- Reburial of ASS materials beneath the permanent water table or beneath a dense soil profile which excludes oxygen exposure such as an engineered clay cap. This may be undertaken on-site if there are low lying areas where reburial and consequential flooding of the soil profile or construction of a suitable capping layer can be undertaken as part of development works, or at an alternative off-site location provided that sufficient stabilisation of material is undertaken to minimise acid generation during transportation and handling.

The potential suitability of the various options is further discussed in the following sections.

5.2.1 Avoidance Strategies

Avoidance of ASS/PASS disturbance is generally considered to be the preferred means of ASS/PASS risk management where such actions can be achieved.

Given the proposed works to be excavations (i.e. boreholes) of likely significant depths and into horizons where ASS/PASS are present, and will most likely generate excess spoil due to the installation of the pier within the created boreholes, avoiding ASS/PASS disturbance is not considered a viable option.

5.2.2 Management by Neutralisation

Neutralisation techniques can be used to treat ASS/PASS by the addition of chemicals that react with the produced acid to ensure that acid is not released from the treated material. The neutralisation activities should result in the pH of the disturbed materials (water and/or soil) being between 5.5 to 7.5 and requires that ASS/PASS material disturbed during site activities be treated with the preferred neutralising agent.

Laboratory analysis is used to assess the levels of existing and/or actual acidity and indicates the level of neutralising capacity required to react with all potential acidity that may be generated during/following disturbance of the ASS/PASS material. Due to the small volumes of ASS/PASS potentially being generated however, laboratory confirmation of treated materials will only be required where material is to be disposed of offsite or used at the ground surface. Field testing is considered adequate to validate materials to be placed back within the excavations at depth within a short timeframe.

The potential uncertainty associated with the quantity of neutralising capacity to be added is commonly managed by the use of a factor of safety of 1.2 or 2 depending upon the level of uncertainty.

Sufficient capacity in terms of a suitable treatment area, machinery, budget to purchase the neutralising agent and time is necessary to successfully implement ASS/PASS neutralisation. Implementation of environmental controls is also necessary to ensure that all potentially acidic leachate produced during the treatment process is captured and appropriately managed. This can be done with sand bags or silt fencing placed around the excavated materials to ensure water can be treated and neutralised prior to either evaporation, use as dust suppression or placement back into the excavation.

For the purposes of this plan, the neutralising chemical is assumed to be high quality agricultural lime (aglime). The aglime should be fine ground (<1mm) calcium carbonate (CaCO_3) or calcite (limestone or marble powder). In the event that neutralising products other than high quality aglime are selected for use in this project, there are several issues that should be considered:

- Is there any potential environmental risk associated with use of the compounds (i.e. other components that may contaminate water, result in a much higher pH value (i.e. hydrated lime), stain treatment areas, etc); and/or
- Will the neutralising agent be of comparable effectiveness or will properties including: neutralising value, effective neutralising capacity, solubility, pH, chemical components, moisture content, impurities and particle size; require the quantity of agent addition to be varied by a consistent factor.

During works which are known to disturb materials from below the fill material or beneath the water table, a sufficient supply of agricultural lime (aglime), being the volume required to address the total project requirement, should be acquired prior to commencement of excavation works.

The quantity is based on requirements for the treatment of acid sulfate soils to be neutralised within the treatment area. Receipts, dockets and other field records showing the storage locations of all chemicals and location of all applications of neutralising agents must be kept.

ASS/PASS management by neutralisation is considered to be a suitable option for management of the identified ASS/PASS soils generated during the proposed deep excavations works as:

- Excavation of small volumes of natural material are required to be completed for drilling of boreholes to install piles;
- There is sufficient space that can be made available within the site (directly adjacent the piling area) to set aside a treatment area(s) close to the identified ASS/PASS disturbance which can be hydraulically isolated from the remainder of the site;
- Appropriate machinery to mix the soil and neutralisation chemicals can be supplied by the civil works contractors completing works on site; and
- Following successful completion of the neutralisation process, the treated soils are no longer considered to be ASS materials, and so may either be reused on site as engineered fill material, or alternatively, may be removed off-site as waste.

5.2.3 Full Oxidation and Leachate Collection

Although not a preferred option, in the event that the acid production potential is relatively low, or there is a relatively low quantity of material to be treated, consideration may be given to the excavation and exposure of the soils to promote full oxidation. This option requires the implementation of environmental controls to ensure that all acid produced is flushed from the soil as leachate. Similar to management by neutralisation, a suitable treatment area is necessary where material can be spread and reworked to allow oxygen to react with the sulfides in the soil and where all leachate produced can be captured and treated by neutralisation.

This method is considered not to be a viable option for the proposed works as the process of soil oxidation may take extended periods (weeks to months) to reach completion. There is also a significant level of uncertainty in the volumes of leachate that would require neutralisation and disposal due to climatic variation, including rainfall events. Given the low anticipated volume of material requiring treatment and the requirement to maintain environmental controls for a long period, this option is considered undesirable when compared to the relatively low cost of neutralisation chemicals as discussed in **Section 5.2.2** above.

5.2.4 Reburial of PASS Material

Strategic reburial or interment techniques can be used to manage PASS material by prevention of oxidation through permanent storage in an anoxic environment. These techniques are often adopted where areas are available for reburial and cost savings can be achieved by avoiding soil handling labour and neutralisation chemical costs. As the concrete and steel construction of the pile will be placed within the excavations, the placement of ASS/PASS materials back into the excavations are not considered a viable option and therefore this technique would not be recommended.

An alternative method of achieving reburial is over excavation of non-acid sulfate soil materials in an area that would not be anticipated to be disturbed in the future followed by reinstatement of the excavation with potential PASS material. Potential reburial sites must have a permanent groundwater table level above the proposed top of the reburial cell or alternatively measures to minimise oxygen exposure to ensure that the material is returned to an anoxic environment. These areas may be applicable in the northern portion of the site, which is present at a lower elevation to the remainder of the site.

Reburial may occur within the Site or alternatively, where appropriate licences are obtained, at a site lawfully able to accept this material in accordance with the requirements of EPA (2014).

Excavation of PASS and creation of re-interment voids must be staged to ensure that adequate space is available for all PASS materials to be adequately reburied below a permanent water table and that the PASS will not be buried in conditions that may cause the formation of acidic conditions. A maximum period of time between the commencement of disturbance and completion of interment works of approximately 48 hours should be adopted in all instances. If the material is to remain exposed for longer the 24 hours the pH levels should be monitored every 12 hours to ensure acid conditions are not developing.

On this site, given the required depth of excavation to expose the PASS material and the proposed development works consisting of mainly above-ground works, strategic reburial of PASS without neutralisation is considered unlikely to be a practicable management option.

5.2.5 Separation Techniques

Separation techniques are increasingly being implemented to reduce the quantity of ASS/PASS material requiring treatment in areas where works include the disturbance of large quantities of PASS. These activities include the removal of fine ASS particles including pyrite and monosulfides from coarser grained soil particles. This results in two material streams, concentrated 'ASS fines' and non-ASS material which can be removed from the management process. Management of ASS fines would then involve implementation of other ASS/PASS management techniques such as reburial, neutralisation, etc.

Separation is typically implemented by creating a soil slurry where fine particles can be suspended in solution away from heavier soil particles using methods such as sluicing or cycloning. Typically, such methods require suitably grained soils such as sand or non-consolidated sediments and a significant water source to implement the separation.

Environmental controls are required during the separation processes to ensure that the ASS fines do not undergo oxidation prior to the implementation of other management measures and validation of the non-ASS stream would then be necessary to confirm that the ASS fines have been adequately removed.

On this site, separation techniques are considered not to be a viable management option as these techniques cannot be used as a standalone management option and as such the ASS fines once separated would still require further treatment. Further, as there is only a small quantity of material requiring treatment, the establishment of infrastructure required is not economical.

5.2.6 Selection of Preferred Management Strategies

Evaluation of potential management strategies has identified that the use of neutralisation techniques where disturbance cannot be avoided is considered the most appropriate technique for this site. As the excavations will not allow for generated soil spoil to be used as backfill material due to the installation of piers within the piled boreholes, reburial of PASS/ASS materials within the excavation is not an option.

Management measures for identified ASS/PASS material will include the application of neutralisation chemicals to excavated ASS/PASS material, neutralisation of exposed excavation faces during works and neutralisation of any groundwater seepage and drainage leachate produced during the excavation and treatment works. Following validation to confirm the acid generation potential of the material has been appropriately neutralised, the material will either be set aside for use as engineered fill material within the development site, or alternatively, will require off-site disposal as per the requirements of EPA (2014).

5.3 General Site Management Strategy

The site management strategy to be implemented during works which may disturb ASS/PASS materials will ensure the following:

- Adequate treatment of ASS/PASS material such that there is sufficient acid neutralizing capacity and no net acidity following stabilization (as measured through appropriate field testing);
- Water discharged from the treatment areas (including run-off, water from dewatering and leachate) is neutral and discharged to stormwater once it has been shown to meet with the criteria specified in this plan or alternatively, shall be reused on site for dust suppression, or tankered off site as liquid waste; and
- Implementation of additional assessment procedures during earthworks operations for the effective treatment and management of any drained, disturbed or excavated acid sulfate soils.

5.3.1 Pre-disturbance Works

Subsequent to the additional investigation activities as identified in **Section 4**, and prior to the commencement of excavation works which may disturb ASS/PASS materials at the site, including activities with the potential to generate spoil, the following preparations should be considered:

- The sequencing of proposed deep excavation/ deep piling works and other associated activities should be planned in detail taking into account the time and space necessary to complete the ASS/PASS management activities outlined in this document. The planning should provide a contingency for treatment of additional quantities of materials in the event that the proposed works require additional excavation extents to those currently identified and/or the quantity of ASS/PASS material generated is greater than anticipated during implementation of the site works, or heavy rainfall events result in significant additional quantities of collected impacted water; and
- The actual areas of ASS/PASS occurrence where disturbance/excavation will occur during the proposed works as part of the site activities should be identified and suitable location(s) for treatment areas and/or storage of treatment bins close to the areas of disturbance identified (e.g. adjacent the excavation). Based on the proposed works, it is anticipated that there is sufficient space to complete the required excavation / piling works for each location in a single stage. To minimise the potential volume of water requiring management/ treatment, installation of appropriate bunding should occur around proposed areas of ground disturbance (i.e. around the piling rig) and the

treatment area. These measures should prevent the release of acidic water across the site and also the mixing of surface/stormwater with ASS/PASS material exposed within the excavated and/or undergoing treatment.

5.3.2 Neutralisation Chemicals

For the purposes of this plan, the neutralising chemical is assumed to be high quality agricultural lime (aglime). The aglime should be fine ground (<1 mm) calcium carbonate (CaCO_3) or calcite (limestone or marble powder). In the event that neutralising products other than high quality aglime are selected for use in this project, there are several issues that should be considered:

- Is there any potential environmental risk associated with use of the compounds (i.e. other components that may contaminate water, result in a much higher pH value (i.e. hydrated lime), stain treatment areas, etc); and
- Will the neutralising agent be of comparable effectiveness or will properties including: neutralising value, effective neutralising capacity, solubility, pH, chemical components, moisture content, impurities and particle size; require the quantity of agent addition to be varied by a consistent factor.

5.3.3 Treatment Area Design

As noted above, the treatment area should be situated in an appropriate location(s) with respect to site disturbance activities. In addition, consideration should also be given to the ease with which environmental controls can be implemented and potential requirement for off-site disposal of the material once stabilised and validated.

As the proposed works are expected to be small scale disturbance activities, it is anticipated that a large lined skip bin or suitable structure could be used as a 'treatment cell' to minimise the potential for release of acidic leachate or partially treated soil. This will enable the effective containment of excavated material prior to, during and following treatment of the material.

As a stormwater management contingency measure in addition to the general works stormwater/sediment erosion plans for the works, a temporary bund may be constructed surrounding the storage bin location for the duration of the on-site storage/treatment of ASS material. The bund surrounding each treatment pad may be constructed of concrete, compacted non-ASS clay, sand and lime filled sandbags or other suitable materials that are relatively impervious and can be coated with a guard layer of lime to neutralise acidic leachate that may contact the bund.

Alternatively, placement of the material adjacent the excavation area on a limed pad with appropriate bunding as described below would also be appropriate.

Should quantities of material disturbed during excavation works exceed that able to be managed adjacent to the excavation or in a large skip bin, a treatment area should be established with consideration of the following:

- The treatment area should be established separate to the area of disturbance but able to be accessed from the area of disturbance by plant/vehicles transporting the material to be treated and material to be removed from the treatment area at the completion of stabilisation activities. Adjacent to the excavation would be appropriate as long as enough space to contain any water leaching from the material was maintained;
- The treatment areas should be established on a solid ground surface with a thin layer of lime spread across the area prior to placement of the ASS/PASS materials. The area must include water/ sediment collection and treatment measures, and a nearby lime storage area;

- The treatment pad should be of a size that would allow treatment of material by a single machine over a reasonable timeframe to minimise the oxidation of material during spreading and treatment;
- The bund surrounding each treatment pad may be constructed as outlined above;
- Once well mixed with a suitable quantity of neutralisation agent field validation testing will be completed and the material will remain until validation of the material by an Environmental Consultant is given. The material will then be cleared for beneficial reuse within the site, or alternatively for off-site disposal to landfill;
- Surface water flows will be diverted around the treatment area where possible. Water falling within the various portions of the treatment area will be contained and neutralised with lime if required prior to either evaporation or use as dust suppression across the site. Water discharges from the site must not have a significant impact on pH, buffering capacity, colour or ionic composition of the receiving water body (stormwater, groundwater, sewer, etc);
- A sufficient supply of aglime should be kept on site at all times for the treatment of ASS/PASS to be neutralised within the treatment area; and for wet weather events where existing applications will require replacement and/or treatment of acidic water is necessary. Receipts, dockets and other field records showing the storage locations of all chemicals and location of all applications of neutralising agents must be kept; and
- The supply shall be stored in a covered and bunded area to prevent accidental exposure to water and deterioration of the inherent neutralizing capacity. ASS/PASS treatment materials should be stored in a manner that minimise the exposure of the materials to wet or humid conditions. Such conditions may result in the clumping or surface crusting of particulate lime which can reduce the level of effectiveness in neutralising water or soil.

5.3.4 General Site Management

All natural soils within the deep excavation zones must be treated as ASS/PASS material until such a time as the material is demonstrated to be non-PASS material or treatment effectively reduces the risk associated with the material and validation results meet the relevant specifications.

ASS/PASS materials that have been disturbed or excavated should be placed separately to non ASS/PASS fill materials and immediately treated as soon as practicable to minimise the quantity of soil, sediment and/or groundwater requiring treatment and the risk of environmental harm to the site and/or down-gradient receptors. It is expected that ASS/PASS material will be placed directly into bins, whilst the non-PASS fill material may be stockpiled on the ground surface, beyond the excavation / piling area bund.

Bunding, diversion drains, contaminated water treatment/containment etc may be used to contain surface water run-off from ASS/PASS disturbance zones and subsequent storage and treatment areas. However, ASS/PASS materials must not be used in the construction of bunds and other diversion devices.

Equipment used in the treatment of ASS/PASS shall be washed with an alkaline solution at the completion of each work period to minimize corrosion of equipment.

5.3.5 Treatment of Excavated ASS/PASS Material

Treatment of ASS/PASS soils will comprise the addition of sufficient quantities of finely ground neutralising agent to treat all oxidisable S% and actual acidity and provide a factor of safety to compensate for potential impurities in the neutralising agent, non-homogenous mixing and limitations to the solubility of the neutralising agent.

The excavated ASS/PASS material should be treated as soon as practicable and within one day of excavation.

If stockpiled, the material should be formed into a conical stockpile to minimise the exposure of the material to air. In the event of significant wet weather periods, the stockpiles should be covered with builder's plastic or similar to limit the infiltration of rainfall into the stockpiles.

Although not anticipated, if site conditions require the stockpiling of material for longer than 24 hours, the stockpiles should be treated with a guard layer of aglime of 5 kg lime/ m² per vertical metre of soil in the stockpile. The stockpile should then be covered with an impervious surface (i.e. builder's plastic) that covers the top and sides of the stockpile to minimise drying by wind and sun and to prevent rainfall entering the stockpile.

Irrespective of whether the material is placed within a skip bin or a treatment pad it used, mixing of the lime and soil mixture may be undertaken by harrowing, rotary hoeing, using an excavator shaker bucket to blend the material, the use of a pug mill or similar equipment. Care shall be taken to ensure that mixing occurs throughout the depth of the layer/throughout the binned material. The soil must be managed to achieve a consistency that will allow for thorough mixing of the soil and neutralising agent to ensure that the effective neutralisation occurs.

This may require mechanical turning of material and breaking up of soil to provide for adequate mixing of soil particles and lime. In some instances, drying of the disturbed material (with associated management of any acidic leachate and other resulting contaminants) may be required for the material to be workable. Drying should not be undertaken during foreseeable wet weather events due to the increased risk of runoff flushing acid from the material and into uncontrolled areas. It is noted that given the material does not comprise marine clay soils and dewatering will be required during excavation, additional drying of the material is not expected to be necessary during the works.

On completion of mixing the soil and lime, field testing can be undertaken immediately and if neutralisation has occurred and been confirmed, soil can be approved for re-use within the site if proposed within a deep excavation placed for this purpose.

Otherwise if soils are proposed to be removed off-site as waste or used at the ground surface, confirmation laboratory results will be required prior to approval.

5.3.6 Water Management During Treatment

Surface drainage and groundwater that comes into contact with ASS/PASS materials has the potential to become acidic and contaminated with heavy metals leached from the acidified soil. Sources of water may include ground surface drainage associated with rainfall, dewatering product produced during the excavation works, leachate produced during treatment of excavated soils, and groundwater inflow into open excavations.

Water from within the treatment area will be required to be collected, assessed and if necessary treated prior to discharge from the site. Once pH and contaminant concentrations are considered suitable for discharge from the site, the water may be used for dust suppression at the site and/or released to the site stormwater system.

Water will be neutralised, where required, by the addition of lime within either the bunded area, a dedicated treatment tank or lined detention basin. Lime shall be added incrementally and thoroughly mixed. Approximate lime application rates based on initial pH are provided in **Table 5.1** below.

Table 5.1 Treatment of Acidic Dewater

Water pH	Agricultural Lime / 1000L Water
0.5	11.7kg
1.0	3.7kg
1.5	1.2kg
2.0	0.37kg
2.5	0.12kg
3.0	37g
3.5	12g
4.0	4g
4.5	1.2g
5.0	0.37g
5.5	0.12g

Lime addition and mixing shall continue until the pH of the water is within the range of 6.5 – 8.5.

In the event water volumes greater than the capacity of the water treatment holding capacity are produced during the acid sulfate soil management activities, consideration should be given to off-site disposal of water via a licensed contractor or treatment of water using neutralisation chemical dosing within holding tanks prior to re-irrigation of open excavations once the pH of the water has been demonstrated to be suitable.

5.3.7 Validation of Treated ASS/PASS Material

Following the application and mixing of lime to the ASS/PASS, the material can be immediately sampled for field testing. The soil would be assessed to establish post neutralisation conditions and establish whether the following performance criteria have been achieved:

- Post neutralisation, the soil pH is greater than pH 5.5 (and preferably less than 9);
- The neutralising capacity of the treated soil must exceed the sum of the TAA and TPA of the soil, i.e. there is no net acidity in the soil as measured by sPOCAS / SCr < 0.03%; and
- Excess neutralising potential should remain in the soil as all acid generation reactions may not be complete and so the soil may still have further capacity to generate acidity.

Validation testing using field tests to measure the soil/water pH shall be undertaken at a rate of ten samples per treatment batch (to a maximum quantity of 100 m³, or a rate of 1 sample per 20 m³). Field testing will include pH_f and post treatment peroxide pH_{fox}, with both required to meet the post neutralisation criteria noted above for all samples per treatment batch.

Confirmatory laboratory analysis (pH and sPOCAS / SCr) will be undertaken on materials to establish that the field test data generated is reliable and accurate. Additionally, laboratory confirmation data will also be required if material is to be removed offsite as waste or placed at the ground surface. If required, laboratory samples will be submitted at a rate of two samples per treatment batch (or a rate of 1 sample per 50 m³). The samples obtained for laboratory analysis may be obtained by compositing three subsamples obtained from the treatment material to provide a broader indication of net acidity levels.

Following receipt and logging of the successful laboratory validation results, the stockpile may then be released for beneficial reuse of material at the site, or alternatively, for off-site disposal. In the event that the laboratory results indicate that the stockpile requires further treatment, the material should be returned to the treatment pad as a unique treatment batch and treated as required prior to re-sampling.

In the presence of positive field validation tests, laboratory analysis of validation samples may be employed to determine the level of net acidity and confirm that the treatment has been successful, or provide an indication of the quantity of further aglime application necessary to neutralise the soil.

If negative field tests occur but the confirmatory laboratory analysis results indicate that there is still net acidity, a further application of aglime will be mixed with material to ensure additional neutralisation capacity, prior to further confirmatory analysis.

Following receipt and logging of the successful laboratory validation results, the material may then be released for beneficial reuse of material at the site, or alternatively, for off-site disposal. In the event that the laboratory results indicate that the stockpile requires further treatment, the material should be treated as required prior to re-sampling.

5.3.8 Site Condition Monitoring

It is anticipated that monitoring of conditions will be undertaken by both the site contractors and an appropriately qualified consultant to ensure that the appropriate environmental controls are in place and the treatment strategy is minimising the environmental risk associated with the ASS materials.

The following inspection/monitoring regime will be implemented during the site works period and documented as appropriate to demonstrate compliance with this ASSMP:

- Stockpiles of material will be inspected daily by the site contractors with pH measurements of any retained leachate taken and recorded where required. In the event that leachate is significantly acidic ($\text{pH} < 5.0$), the stockpiled material may require further treatment; and
- Although not anticipated, all treated excavation faces to be retained for more than three days will be inspected on the third morning and lime reapplied as necessary each following morning.

Regular inspection of all excavation and treatment areas will be undertaken to identify potential indications of PASS oxidation. These inspections should note:

- Unexplained scalding, corrosion or degradation of onsite steel equipment and concrete paved surfaces;
- Formation of the mineral jarosite or other acidic salts in exposed or excavated soils;
- Areas of surface water blue-green, blue-white in colour or extremely clarified indicating high concentrations of aluminium; and
- Rust coloured deposits on excavation faces, in drainage paths, on bunds, channels, etc indicating iron precipitates.
- Such inspections should also identify the presence of unusual odours, including strong organic or sulfurous smells (i.e. rotten egg gas).

5.3.9 Removal of Neutralised ASS/PASS from the Site

Only material confirmed to be below the criteria listed in **Table 3.1** will be considered as stabilised ASS material for potential reuse within or removal from site. A final round of field pH testing should be undertaken prior to loading of the trucks to ensure that pH levels remain above 6. Material to be removed from the site will be classified in accordance with current EPA (2014) requirements and disposed of to a licensed facility permitted to accept the material.

6. Responsibilities

The selection of samples for environmental analysis shall be undertaken by a suitably qualified and experienced environmental or geotechnical consultant. Results of analysis shall be assessed and evaluated by a suitably qualified and experienced consultant.

Implementation of the physical treatment, material management and environmental controls portions of this ASSMP will be the responsibility of the site contractor engaged to complete civil works within the site, inclusive of deep excavation works. The monitoring of conditions, unless otherwise specified in the monitoring sections will be the responsibility of a suitable qualified environmental consultant who will regularly inspect the site, the treatment area and treatment activities and implement the validation assessments to document compliance with this ASSMP.

The contractor should appoint a foreman or other responsible employee to undertake the appropriate monitoring activities as designated in this ASSMP. This person should be appropriately trained by the environmental consultant in all actions to be completed by the contractor. Where doubt arises concerning the results of the inspections or of field test validity, the environmental consultant should be contacted for verification of appropriate actions.

The contractor is not authorised to make any changes to this ASSMP or implement unapproved variations to the treatment and/or monitoring protocols outlined in this document unless explicit written approval is obtained from the environmental consultant prior to implementation of the changes.

Where ambiguity or conflicts in procedures arise, it is the contractor's responsibility to seek clarification on appropriate actions from the environmental consultant.

ASS/PASS mitigation measures should be documented as they apply to all individual works activities to be undertaken at the site. All persons responsible for the works activities should be made aware of their responsibilities in writing and suitable ASS management training should be provided to those persons to ensure that the responsibilities can be achieved.

Where contingency actions are necessary, or in the event that non-compliance with the ASSMP is identified by the contractor, the environmental consultant should be immediately informed in writing. The environmental consultant will then be obliged to provide a timely response documenting the necessary corrective actions.

7. Contingencies

In the event of unexpected events, including the identification of additional ASS/PASS zones at the site, or the failure of management measures as described in this ASSMP, the associated environmental risk will be managed by the evaluation and implementation of the contingency procedures and mitigation strategies.

7.1.1 Additional Acid Sulfate Soil Identification

In the event that site excavation works encounter the potential for additional acid sulfate soil areas at the site, identified by visual cues, field testing or laboratory analysis, the additional areas will be treated as per the ASS/PASS material treatment protocols. If the material is to be excavated as part of the development works, the excavation will be undertaken in stages with suitable volumes to allow for the completion of the neutralisation treatment process prior to excavation of the next stage.

If the proposed works do not require excavation of the identified material, exposed surfaces will be treated with a guard layer of lime upon exposure. Groundwater seepage will be monitored and neutralising agents added as necessary to manage the potentially acidic leachate produced.

7.1.2 Failure of Initial Acid Neutralisation Treatment

As described in **Section 5.3.7** following the treatment of materials within the treatment area, validation sampling will be completed to assess the success of the neutralisation process prior to removal of the material from the holding area. In the event that the validation testing indicates that neutralisation of the material is incomplete (i.e. $\text{pH} < 6$), a further application of lime and repeat of the treatment procedure will be undertaken prior to further validation assessment. If the proposed techniques fail, further consideration may be given to alternative management strategies as outlined in **Section 5.2**.

8. Conclusions

Site characterisation assessment data available for subsurface conditions across the site has identified the occurrence of potential ASS/PASS material at depth, primarily situated within natural alluvial soils, present beneath the water table. It has been adopted in the application of this ASSMP that ASS/PASS is potentially present below a depth of 2m on the site, and requires considerations for all potential excavations below 2.0 m. Given the depth of potential occurrence, there is currently limited available data as to the lateral extent of occurrence.

Where existing and future assessment data identifies the presence of ASS/PASS materials within or areas these materials may be disturbed, the measures as identified in this Acid Sulfate Soil Management Plan (ASSMP) provide appropriate procedures to manage the risks associated with the proposed activities. If successfully implemented, these measures will minimise the environmental risks associated with disturbance of the ASS/PASS materials.

9. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

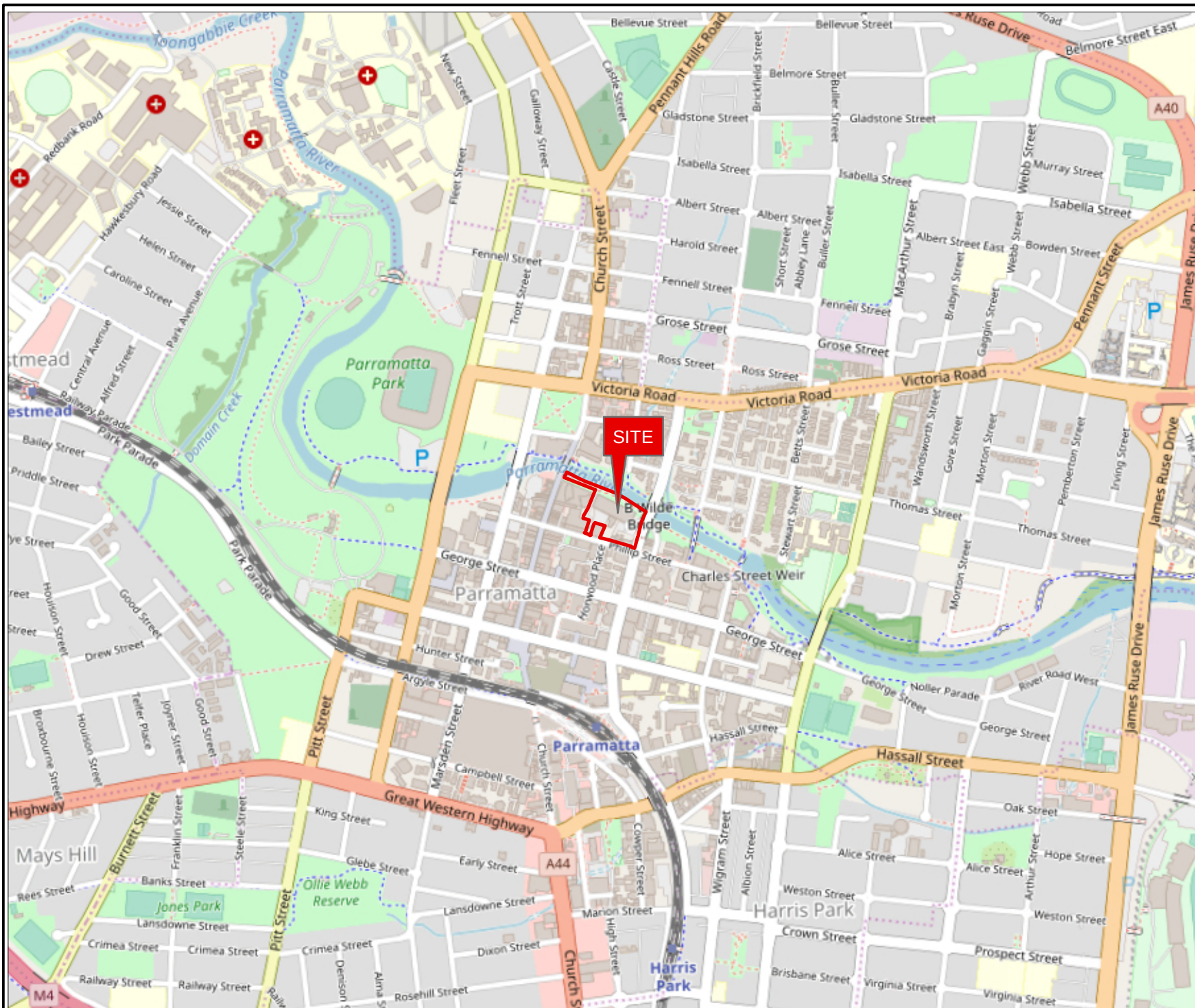
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Appendix A Figures



Legend:

Approximate Site Boundary



Job No: 58352

Client: Infrastructure NSW

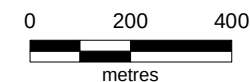
Version: R02 Rev A

Date 26/03/2020

Drawn By: AS/RF

Checked By: MP

Scale 1:15,000



Coord. Sys. GDA 1994 MGA Zone 56

**Phillip Street,
Parramatta, NSW**

SITE LOCATION

FIGURE 1



Legend:

- Approximate Site Boundary
- Cadastre (NSW DCS, 2020)



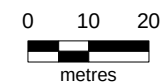
Job No: 58352

Client: Infrastructure NSW

Version: R02 Rev A Date 26/03/2020

Drawn By: AS/RF Checked By: MP

Scale 1:1,250



Coord. Sys. GDA 1994 MGA Zone 56

Phillip Street,
Parramatta, NSW

CURRENT SITE LAYOUT

FIGURE 2

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		Name	Name	Signature	Date
A	Jessica Staehli / Matthew Parkinson	Matthew Parkinson	Draft for client review		29/03/2020



APPENDIX 7- CONSULTATION STRATEGY

POWERHOUSE PARRAMATTA

EARLY WORKS CONSULTATION STRATEGY

Prepared by Infrastructure NSW

March 2021

Revision 1

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Revisions

Rev	Date	Prepared By	Reviewed By	Approved By	Remarks
0	19/01/2021	T Woods	K Neasy	K Neasy	
1	16/03/2021	T Woods	K Neasy	K Neasy	

1. Introduction

Powerhouse Museum is Australia's contemporary museum for excellence and innovation in applied arts and sciences. The museum was established in 1879 in the Garden Palace which emerged from a history of 19th Century grand exhibition halls, including the Grand Palais. It currently encompasses the Powerhouse in Ultimo, Sydney Observatory in The Rocks and the Museums Discovery Centre in Castle Hill. The Powerhouse has occupied the Ultimo site since 1988.

Parramatta, in the heart of Western Sydney, is entering a period of rapid growth. It was identified in 2014's *A Plan for Growing Sydney* as the metropolis' emerging second Central Business District, with the provision of supporting social and cultural infrastructure regarded as integral to its success. The strategic importance of Parramatta as an economic and social capital for Sydney has been subsequently reinforced and further emphasised through its designation as the metropolitan centre of the Central City under the *Greater Sydney Region Plan*.

Powerhouse Parramatta will be the first State cultural institution located in Western Sydney – the geographical heart of Sydney. It will establish a new paradigm for museums through the creation of an institution that is innately flexible. It will become a national and international destination renowned for its distinctive programs, driven by original research and inspired by its expansive Collection. It will be a place of collaboration. It will be a mirror of its communities, forever embedded in the contemporary identity of Greater Sydney and NSW.

Infrastructure NSW is responsible for the development and delivery of the Powerhouse Parramatta project, including preparation of staged development applications. The state significant development application for Powerhouse Parramatta was approved by the Minister for Planning in February 2021.

This strategy outlines the communication and engagement approach to be carried out during the early works stage of the development. The approval contains conditions of consent which require consultation activities to be undertaken during construction. The requirements for consultation and where they are addressed within this strategy are as follows:

Requirement	Where Addressed
C35(a) (ii) 24 hour contact details of site manager	Section 4.2
C35(a)(viii) community consultation and complaints handling	Section 4.3
C36(k) consultation strategy for liaison with surrounding stakeholders, including other developments under construction and Parramatta Light Rail Builder	Section 2
C37(h) include a complaints management system that would be implemented for the duration of the construction	Section 4.5

1.1. Communication and engagement objectives

The following objectives have been developed to guide communication and engagement for the development of Powerhouse Parramatta:

- Promote informed dialogue with stakeholders and the community
- Proactively identify and manage project issues in a transparent way
- Enhance stakeholder relationships, particularly among neighbours and relevant authorities
- Manage stakeholder and community expectations
- Ensure that communication is distributed broadly and on time to keep the wide range of stakeholders well informed
- Meet the requirements of the development consent conditions relating to a Community Communication Strategy and a system to manage complaints, feedback and inquiries including dispute resolution.

1.2. Community communication strategy and key project milestones

The Early Works Consultation Strategy has been developed to meet the conditions of consent prescribed by SSD 10416. It will be implemented for the duration of the early works construction of the development. This Strategy will be updated if required at relevant project milestones to respond to compliance outcomes or in response to a written request from the Secretary.

1.3. Roles and responsibilities

Infrastructure NSW has been charged by the NSW Government with development and delivery of Powerhouse Parramatta. The Museum of Applied Arts and Science (MAAS) will become the operator of the new museum. Infrastructure NSW has appointed a contractor to undertake Early Works for Powerhouse Parramatta, which comprise:

- decommissioning of existing services;
- demolition of nominated buildings, structures and footings (including the Riverbank car park, commercial buildings along Phillip Street, non-heritage components of St George's Terrace and hard stand throughout the site.
- services diversions and installations.

2. Stakeholder Analysis

This section outlines the stakeholders to be consulted during the Early Works phase. To best understand the stakeholders who are affected or have an interest in the project and determine the most effective way to engage and communicate these groups, the following categories have been developed:

- Federal and State government and agencies
- Local government
- Business groups and local businesses
- Local residents
- Other developments under construction in the local area
- Emergency services

This categorisation will ensure that communication and engagement activities are targeted and guided by a strong purpose. This section provides a break-down of each stakeholder group, including relationship owner, interests and proposed engagement approach.

2.1. Federal and State government

Responsibility	Infrastructure NSW
Description	• The Hon Gladys Berejiklian, MP – NSW Premier • The Hon Julie Owen, MP – Federal Member for Parramatta • The Hon Dr Geoff Lee, NSW Member for Parramatta • The Hon Don Harwin, MP – NSW Minister for the Public Service and Employee Relations, Aboriginal Affairs, and the Arts • Relevant NSW Government departments and agencies (including Department of Planning, Industry and Environment, Transport for NSW, Environmental Protection Authority and DPIE's Environment, Energy and Science Group)

Issues and interests	• Alignment with Federal and State objectives and plans • Delivering a world-class Museum on time, within budget and to the community's expectations • Ensuring all necessary regulations and conditions are met • Minimising disruption to the local community during construction and operation • Commitment to community consultation
Communication tools	• Meetings • Briefings

2.2. Government departments and agencies

Responsibility	Infrastructure NSW
Description	Government agencies include: • Government Architect NSW • Greater Sydney Commission • Greater Sydney Commission Youth Panel • Heritage Council NSW • Heritage Office NSW • Parramatta Heritage and Visitor Information Centre • Parramatta Park Trust • The National Trust • Transport for NSW • Western Sydney Parklands Trust • Destination NSW • Event NSW • NSW Department of Education • Western Sydney Local Health Network
Issues and interests	• Minimising disruption to the local community during construction and operation • Handling of Aboriginal and colonial heritage • Construction fatigue • Access to the river foreshore and CBD • Employment opportunities • Impacts on the liveability of the local government area

	• Commitment to community consultation
Communication tool	• Meetings • Briefings

2.3. Local government

Responsibility	Infrastructure NSW
Description	Powerhouse Parramatta is in the City of Parramatta local government area.
Issues and interests	• Minimising disruption to the local community during construction and operation • Handling of Aboriginal and colonial heritage • Construction fatigue • Access to the river foreshore and CBD • Employment opportunities • Impacts on the liveability of the LGA • Commitment to community consultation
Communication tool	• Meetings • Briefings

2.4. Business groups

Responsibility	Infrastructure NSW
Description	Business groups that have an interest and have engaged with the project include: • Chamber Alliance of Western Sydney • Committee for Sydney • NSW Business Chamber • Sydney Business Chamber • Sydney Hills Business Chamber • Western Sydney Business Chamber • Western Sydney Business Connection Parramatta Business Chamber • Western Sydney Leadership Dialogue • Western Sydney Women
Issues and interests	• Impacts on local business • Project delays • Impact on other projects • Construction impacts • Traffic and access impacts • Social sustainability and investment • Employment opportunities • Engagement and education opportunities • Community engagement and consultation
Communication tool	• Meetings • Briefings • Collateral e.g. factsheets and flyers

2.5. Local business neighbours

Responsibility	Infrastructure NSW, in collaboration with early works contractor
Description	Surrounding the museum site, there is a high density of businesses varying in size and covering a range of sectors such as commerce, business, education, retail and food and beverage.

Issues and interests	• Visual amenity of high rise museum building • Potential noise, dust and vibration disruptions and any impacts on traffic and parking due to road closures and construction vehicles • Operation of the new museum, particularly parking, noise and light pollution • Construction fatigue • Impacts on local business • Access to the river foreshore and CBD during construction
Communication tools	• Briefings • Meetings • Phone/email • Doorknock • Letterbox drop • Phone/email • Website • Signage • Collateral e.g. factsheets and flyers

2.6. Local residential neighbours

Responsibility	Infrastructure NSW in collaboration with early works contractor
Description	The Powerhouse Parramatta site is surrounded by a combination of medium and high density residential areas. The map at Appendix A shows the residents and non-residents defined as project neighbours and noise sensitive receivers.
Issues and interests	• Visual amenity of high rise museum building • Potential noise, dust and vibration disruptions and any impacts on traffic and parking due to road closures and construction vehicles • Operation of the new museum, particularly parking, noise and light pollution • Construction fatigue • Access to the river foreshore and CBD during construction • Active and public transport links • Handling of Aboriginal and colonial heritage • Impacts to Ultimo Museum

Communication tools	• Doorknock • Letterbox drop • Phone/email • Website • Signage • Collateral e.g. factsheets and flyers • Community pop-up stalls and drop-in information sessions
----------------------------	---

2.7. Other developments under construction

Responsibility	Infrastructure NSW
Description	Parramatta Light Rail builder and other developments under construction in the local area
Issues and interests	• Design compliance • Delivery timeline • Traffic impacts • Access impacts
Communication tools	• Briefings • Meetings • Phone/email

2.8. Emergency services

Responsibility	Infrastructure NSW
Description	• State Emergency Services • NSW Ambulance • Fire & Rescue NSW • NSW police
Issues and interests	• Delivery timeline • Traffic impacts • Access impacts
Communication tools	• Phone/email • Collateral e.g. factsheets and flyers

3. Communication tools

This section addresses the procedures and mechanisms (or communication tools) available for the regular distribution of accessible information about or relevant to the development.

This section describes the communication tools to support the objectives and aims of this Strategy.

3.1. INSW Powerhouse Parramatta webpage

What	The Infrastructure NSW Powerhouse Parramatta webpage provides a comprehensive source of project information. The website will be promoted in all communication activities. Regular updates to the website will ensure currency of information. Other communication material such as community updates will be stored on the webpage. http://www.insw.com/projects-nsw/powerhouse-parramatta/ MAAS also hosts a page dedicated to the Powerhouse Parramatta development. Content is in line with that of Infrastructure NSW. https://maas.museum/new-powerhouse/
When	Ongoing
Why	To inform

3.2. Project 1800-line and email

What	The dedicated project 1800-line and email address are key access points for the community to receive project information. Protocols for managing enquiries and complaints through the project phone line and email are set out in this Strategy. P: 1800 679 121 E: powerhouse.parramatta@infrastructure.nsw.gov.au
When	Ongoing
Why	To inform, provide feedback and raise concerns

3.3. Collateral

What	Engagement activities are supported by a series of collateral, including fact sheets and project updates. Some pieces have been produced to provide overarching information on the project, while others relate to a specific milestone or elements of the project. Collateral will be updated and developed as the project progresses and distributed via email or by letterbox drop to those properties identified within the yellow line shown on the map in Appendix A. All collateral will also be made available on the INSW Powerhouse Parramatta webpage at: http://www.insw.com/projects-nsw/powerhouse-parramatta/
When	As required with a minimum of quarterly project updates.
Why	To inform

3.4. Key stakeholder meetings and briefings

What	Project briefings will continue to be provided to relevant stakeholders at key milestones. This will assist in ensuring these stakeholders are informed and consulted on the project, providing factual and up-to-date information for distribution to their networks and in media. The level and form of stakeholder briefing will vary to meet the needs of individual stakeholders, for example local government stakeholders will be briefed at each milestone, while other stakeholder groups may receive one-off presentations as required. Condition B19(c) requires the CCS to address the formation of community based forums if required that focus on key environmental issues for the development. Specific community groups are not considered necessary on the basis that: – there is an established Community Reference Group (CRG) which is proposed to continue as set out in Section 4.5 below; and – there are multiple conditions that require agency consultation and engagement to address technical environmental issues; agencies are considered best placed to deal with environmental issues and would operate in the community's interests.
When	As required – dependent on stakeholder needs and feedback
Why	Inform, consult and resolve disputes

3.5. Community information centre

What	The Powerhouse Community Space has been established for the community to drop in and ask questions, clarify mistruths and provide feedback on the project.
When	The Powerhouse Community Space is open during the week. It has been open since December 2020.
Why	To inform, raise awareness, provide feedback

3.6. Good neighbour activities

What	Door-knocks, letterbox drops, local visual messaging signage and site signage will be used to provide specific project information to project neighbours and others who may be impacted by site works as they travel through the area. These will clearly detail upcoming works (what, who, when) and where to go for further information.
When	As required
Why	To inform and build positive relationships

4. Procedures for managing enquiries and feedback

This Section of the Strategy outlines the procedures and mechanisms to receive and respond to enquiries, feedback and complaints.

Infrastructure NSW maintains a nominated person who will be responsible for receiving and responding to enquiries, feedback and complaints. The following protocols and procedures will be in place during the Early Works, to effectively manage enquiries and complaints received from the community and other stakeholders. The nominated person will be supported by the Early Works contractor.

4.1. Contacts protocol

The nominated person will have primary responsibility for maintaining a record and actioning all project related contacts (complaints or enquiries). Input from the wider project team will also be sought to help respond to complaints and enquiries.

4.2. Contact points

There will be three main points of public contact:

- Direct phone number: 1800 679 121
- Email address: powerhouse.parramatta@infrastructure.nsw.gov.au
- Postal address: Powerhouse Parramatta
PO Box R220
Royal Exchange NSW 1225

The telephone line will operate during work hours with all calls logged and immediately forwarded to the nominated person for response and action. Outside of standard working hours, calls will be answered for actioning the next working day; or in the case of an emergency, the nominated 24 hour site contact will be contacted.

The project email address will be checked at minimum on a daily basis on weekdays.

Face to face contact is likely to occur through doorknocks and walk-arounds as required. Any queries direct to the project team while working in and around the site are to be referred on to the project information line or the nominated person.

In addition the contact details for the 24 hour site manager are:

Andrew Wall
Project Engineer, Liberty Industrial
M 0437 245 628
awall@libertyindustrial.com.au

4.3. Responding to and recording contacts received

Some contacts will be resolved on the spot, while others will require acknowledgement and further investigation in order to action and complete. Details of the response times for different types of contact are outlined below.

Contact type	Method	Acknowledge	Resolve	Note
Enquiry	Face to face	Acknowledge within 24 hours of receipt (Mon-Fri)	Within two working days	Enter in INSW Consultation Manager within 24 hours of receipt
	Telephone			
	Email			
	Letter			
Complaint	Face to face	Acknowledge within 2 hours of receipt	Endeavour to resolve within one working day	Advise INSW immediately upon receipt
	Telephone			
	Email			
	Letter			

4.4. Enquiries handling procedure

Enquiries or feedback received by the nominated person via post, the phone line or email will be answered on the spot using pre-approved key messages or responses to FAQs. If the enquiry cannot be answered using key messages, the nominated person will liaise with the project team to provide an answer. The enquiry or feedback will be logged into the Stakeholder Consultation database.

4.5. Complaints handling procedure

Complaints may include any interaction with a community member of stakeholder who expresses dissatisfaction with the project, policies, contractor's services, staff members, actions or proposed actions during the project.

Complaints received by the nominated person via post, the phone line or email will be referred directly to the project team and simultaneously logged with Infrastructure NSW and entered into the Stakeholder Consultation database.

The project team is to advise the nominated person as soon as practicable after investigation as to the nature and cause of the complaint to enable the nominated person to report back and close out the issue. Where a complaint is made directly to workers onsite, they are to immediately advise the nominated person of the complaint for logging and actioning. The nominated person will maintain ongoing contact with the caller/emailer until the issue is resolved satisfactorily.

The Stakeholder Contact database will track the status of enquiries and complaints and delegate actions to the appropriate project team members. The nominated person will have responsibility for ensuring all contacts are actioned in a timely manner.

4.6. Dispute resolution

A complaint that cannot be resolved by the nominated person will then be considered a dispute. It will be escalated as follows:

1. Construction contractor Project Manager, if not resolved then –
2. Construction contractor Project Director, if not resolved then –
3. Infrastructure NSW Project Director, if not resolved then –
4. Construction contractor and Infrastructure NSW discussion. The construction contractor Project Director and Infrastructure NSW Project Director to determine if the complaint is to be forwarded to mediation.

A complaint is deemed to be resolved when it reaches a conclusion, not necessarily resolved to the satisfaction of the complainant.

If mediation is required, Infrastructure NSW and the State will comply with the recommendations of a specialist mediator, who will be independent of Infrastructure NSW.

4.7. Recording contacts

A record will be kept of all contact, including telephone and face-to-face communication. Details will be entered either directly into a contact database maintained by the nominated person or documented on a Record of Contact Form and subsequently entered into the contact database. The nominated person, Infrastructure NSW Project Team and contractors will have access to Record of Contact Forms. The contact database for contacts received will note the following:

- Type of contact (enquiry/complaint and telephone/email/letter/face-to-face)
- Date and time of contact
- Team member receiving contact
- Name of stakeholder and contact details (if consent to record personal details is not provided the contact will be recorded but will not include personal details)
- The tone of the contact, particularly if angry or upset
- The team member to whom the contact was referred (if needed) and the referral date
- For contact requiring action, record of the action taken, response provided and the completion date
- For contact where no further action will be taken record the reason(s) why no action was taken
- For contact where further action is required, record required actions, contact the person to confirm/clarify:

- The nature of the issue
 - Reasons (if any) for its occurrence
 - The criteria upon which the issue was assessed
 - How the issue has been addressed
 - Steps undertaken to prevent re-occurrence of either the issue or the contact if based on a complaint.
- Record the resolution reached and the completion date.

Appendix A – Project neighbours

The following map shows sensitive receivers which are those people likely to work, occupy or reside. This is the area identified to receive ongoing project updates via letterbox drop. Other project neighbours will be captured via email.

