

Barangaroo Station

Construction Environmental Management Plan

N217

BR COP

29 August 2022

Project overview

Project Site Address:

25 Hickson Road
Barangaroo
NSW 2000

BESIX Watpac State Division Address:

Level 24, 44 Market Street
SYDNEY
NSW 2000

Project Commencement Date:

12 March 2021

BESIX Watpac ABN:

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BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Mike Nevin	Author / Planning & Environment Manager		29/08/2022
Daniel Gooch	Reviewer / Construction Manager		29/08/2022
Luke Hunter	Reviewer / Senior Construction Manager		29/08/2022

Name	Role & Title	Signature	Date
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Note: A controlled copy of the Construction Environmental Management Plan (CEMP) will be distributed to the Sydney Metro Principal's Representative, Environmental Representative (ER) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

The CEMP associated sub-plans and procedures, when printed, will be uncontrolled and it will be the responsibility of each user to confirm the currency of the plan through the project document control system.

Acronym and Definitions

Acronym	Term and/or Definitions
AA	Acoustic Advisor
AIA	Arboricultural Impact Assessment
ASS	Acid Sulfate Soils
ASSMP	Acid Sulfate Soils Management Plan
ARI	Average Rainfall Intensity
BDA	Barangaroo Development Authority (known as Infrastructure NSW)
BR-CODD	Barangaroo 'Construct Only Delivery Deed'
BR-COP	Barangaroo 'Construct Only Package' (also various documents refer to: BZZ Contractor / STME)
BW	BESIX Watpac
CAR	Corrective Action Request
CEMP	Construction Environmental Management Plan
CMP	Contract Management Plan
CoA	Conditions of Approval
CSG	Construction Safety Group
CTR	Compliance Tracking Report
CWQMR	Construction Water Quality Monitoring Report
DITP	Detailed Inspection and Test Plan
DPE	Department of Planning and Environment (formerly DPIE)
DPIE	NSW Department of Planning Industry and Environment (now DPE)
EIS	The Sydney Metro City and Southwest Chatswood to Sydenham Environmental Impact Statement dated 3 May 2016 submitted to the Secretary seeking approval to carry out the CSSI and as revised if required by the Secretary under the EP&A Act.
EMS	The BESIX Watpac certified Environmental Management System
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
EPA	NSW Environmental Protection Authority
EPL	Environmental Protection License
GS	General Specification
HMP	Heritage Management Plan
ICNG	<i>Interim Construction Noise Guideline</i>
INSW	Infrastructure New South Wales
KPI	Key performance Indicator
CNVMP	Construction Noise & Vibration Management Plan
N/A	Not applicable
PS	Particular Specification
SFAIRP	So Far As Is Reasonably Practicable (in terms of the RSNL, NSW)
SM	Sydney Metro - Sydney Metro (https://www.sydneymetro.info)
SME	Subject Matter Expert, a person with expert knowledge and competency in a specified subject or topic matter area.
SMP	Sustainability Management Plan

Acronym	Term and/or Definitions
SMCSW	Sydney Metro City & Southwest (the overall program of works, which Barangaroo Station is part of)
SWMS	Safe Work Method Statement
SMPSAQP	Spoil Management Plan Sampling, Analysis & Quality Plan
Sydney Metro	Transport for New South Wales (https://www.transport.nsw.gov.au)
TSE	Tunnel and Station Excavation Contractor
TTS	Tree Transplantation Specification
UCLAFP	Unexpected Contaminated Land and Asbestos Finds Procedure
VAMP	Visual Amenity Management Plan
WDIA	Water Discharge Impact Assessment
WQMP	Water Quality Monitoring Program
WHS	Work Health and Safety
WTP	Water Treatment Plant

Terms and Definitions

Glossary	Definitions and Responsibilities
Aboriginal object	The same meaning as in the <i>National Parks and Wildlife Act 1974</i> (NSW)
Ancillary Facility	A facility established for construction of the project which will be decommissioned at the end of construction including and office and amenities compound, construction compound, materials crushing and screening plant, materials storage compound, maintenance workshop, testing laboratory and materials stockpile area.
Business Management Plan	the Business Management Plan required by the Project Planning Approval.
CEMP	Construction Environmental Management Plan
Contractor	Particular Specification (PS) must be read as a reference to the "BR Contractor" as defined in the BR-CODD
Contractors Activities	Particular Specification and General Specification must be read as a reference to the "BR Contractor's Activities" as defined in the BR-CODD
Construction	The same meaning as in the CSSI Sydney Metro City & Southwest Chatswood to Sydenham Conditions of Approval (SSI 7400)
Crisis Event	an event that may have an impact on the community, commuters, environment, personnel or subcontractors or has attracted or can reasonably be expected to attract the attention of the media, the Minister for Transport, a local Member of Parliament, local Authority or the local community. This includes emergencies, incidents or crises unrelated to the Contractor's Activities that may be deemed to be caused by the Contractor's Activities due to locality.
Design Documentation	Means the "Final Design Documentation" as defined in the BR-CODD.
Emergency Event	A situation in which there is an unacceptable risk, to the health and wellbeing of occupants, staff, or the general public, which needs intervention by staff or emergency services to control, limit escalation, suppress or address the risk and return to normal operations.
Environmental Aspect	Element of an organisation's activities, products or services that interacts or can interact with the environment (AS/NZS ISO 14001:2016)
Environmental Impact	Change to the environment whether adverse or beneficial, wholly or partly resulting from an organisation's environmental aspects
Environmental Policy	Statement by an organisation on its intention and principles for environmental performance
Incident	An occurrence or set of circumstances that causes, or threatens to cause, material harm to the environment, community or many member of the community, being actual or potential harm to the health and safety of human beings or to threatened species, endangered ecological communities or ecosystems that is not trivial
Inspection and Test Plan	Inspection and test plans prepared and implemented by the Contractor in accordance with the requirements in AS/NZS ISO 9001 Quality Management systems – Requirements.
Interface Contractors	Any contractor, consultant, artist, tradesperson or other person engaged by Sydney Metro that is carrying out, or that will carry out Interface Work including: <ul style="list-style-type: none"> • TSE Contractor • TSOM Contractors • The Operator • LW Contractor • ETS Contractor
Interface Work	Any activities undertaken by an Interface Contractor which interface with or affect, or are affected by, the Contractor's Activities, the Project Works or the Temporary Works.
Non-Compliance	Failure to comply with the requirements of the Project Approval or any applicable license, permit or legal requirements.
Non-Conformance	Failure to conform to the requirements of project system documentation including this CEMP or supporting documentation
POEO Act	<i>Protection of the Environment Operations Act 1997</i> (NSW)
Relevant Council	City of Sydney

Glossary	Definitions and Responsibilities
Secretary	Secretary of the NSW Department of Planning and Environment or nominee,
Sensitive receiver	<p>Includes residences, educational institutions (including preschools, school, universities, TAFE colleges), health care facilities (including nursing homes, hospitals), religious facilities (including churches), child care centres, passive recreation areas (including outdoor grounds used for teaching), active recreation area (including parks and sports grounds).</p> <p>Receivers that may be considered to be sensitive include commercial remises (including film and television studios, research facilities, entertainment spaces, temporary accommodation such as caravan parks and camping ground, restaurants, offices premises, and retail spaces and industrial premises, and others identified by the Secretary.</p>
Staging Report	Sydney Metro City & Southwest Chatswood to Sydenham – Staging Report V7
Unexpected heritage Finds	A potential heritage item discovered unexpectedly (usually during construction) having the same meaning as in the CSSI Sydney Metro City & Southwest Chatswood to Sydenham Conditions of Approval (SSI 7400)

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Appendix N Soil and Water Management Procedure

Appendix O Unexpected Contaminated Land & Asbestos Finds Procedure

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1.1 Introduction

BESIX Watpac have been engaged by Sydney Metro to build the Barangaroo Station Construct Only Package (COP), forming part of the broader Sydney Metro City & Southwest Chatswood to Sydenham project. Most of the station box primary structure has been completed by the Tunnel and Excavation Contractor (TSE), prior to Project commencement and BESIX Watpac will complete the station fit-out and associated civil and landscaping works.

This Construction Environmental Management Plan (CEMP) has been prepared to document the company's environmental commitments, objectives, and procedures for the project.

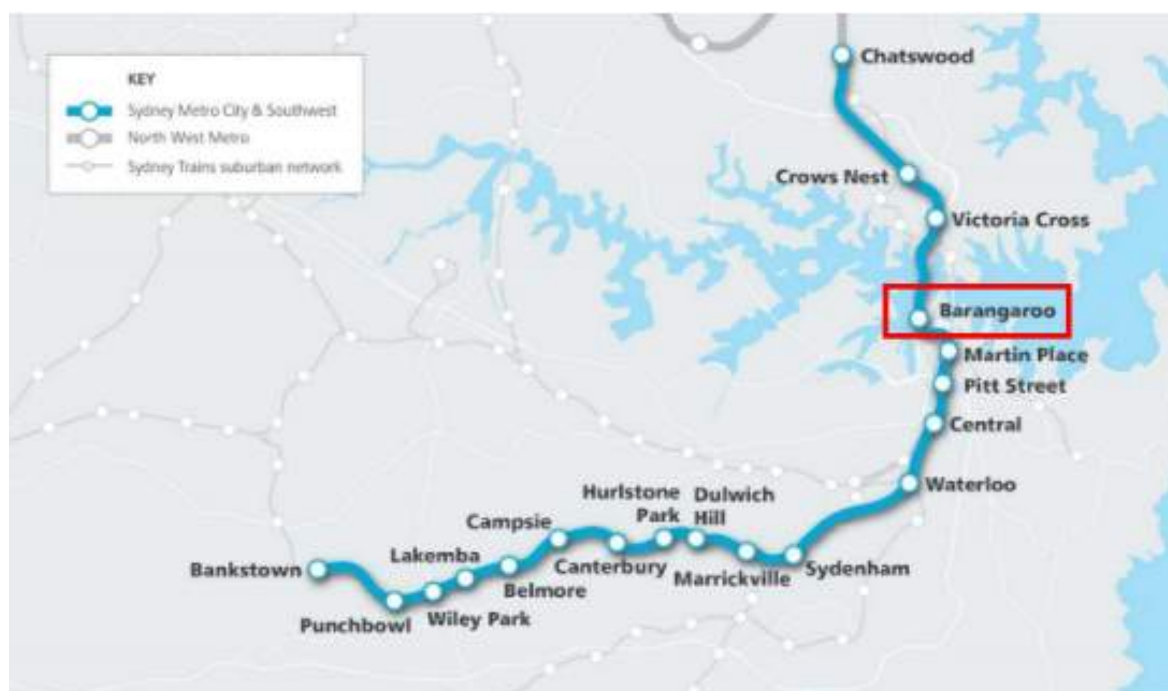
The CEMP is structured to provide and address the following:

- A description of the site and project scope
- Establishing the environmental legal framework and objectives that the project will be operating under
- A description of the standard approach of BESIX Watpac's environmental management system, including reporting and monitoring
- An outline of roles and responsibilities for the project, including site staff and BESIX Watpac's management support teams
- An outline of BESIX Watpac's Standard Operating Procedures (SOPs) address the standard controls against each of those environmental risks (Appendix F)
- A project specific risk assessment that analyses the risks under each aspect, presenting the logic/research behind the findings or recommendations and accompanying management strategies, recommendations, or controls

1.1.1 Site Location and Context

The Barangaroo Metro station is part of the Sydney Metro City & Southwest Chatswood to Sydenham project located between the future Victoria Cross and Martin Place stations as shown in Figure 1 below:

Figure 1 City & Southwest Project – Barangaroo Station Context



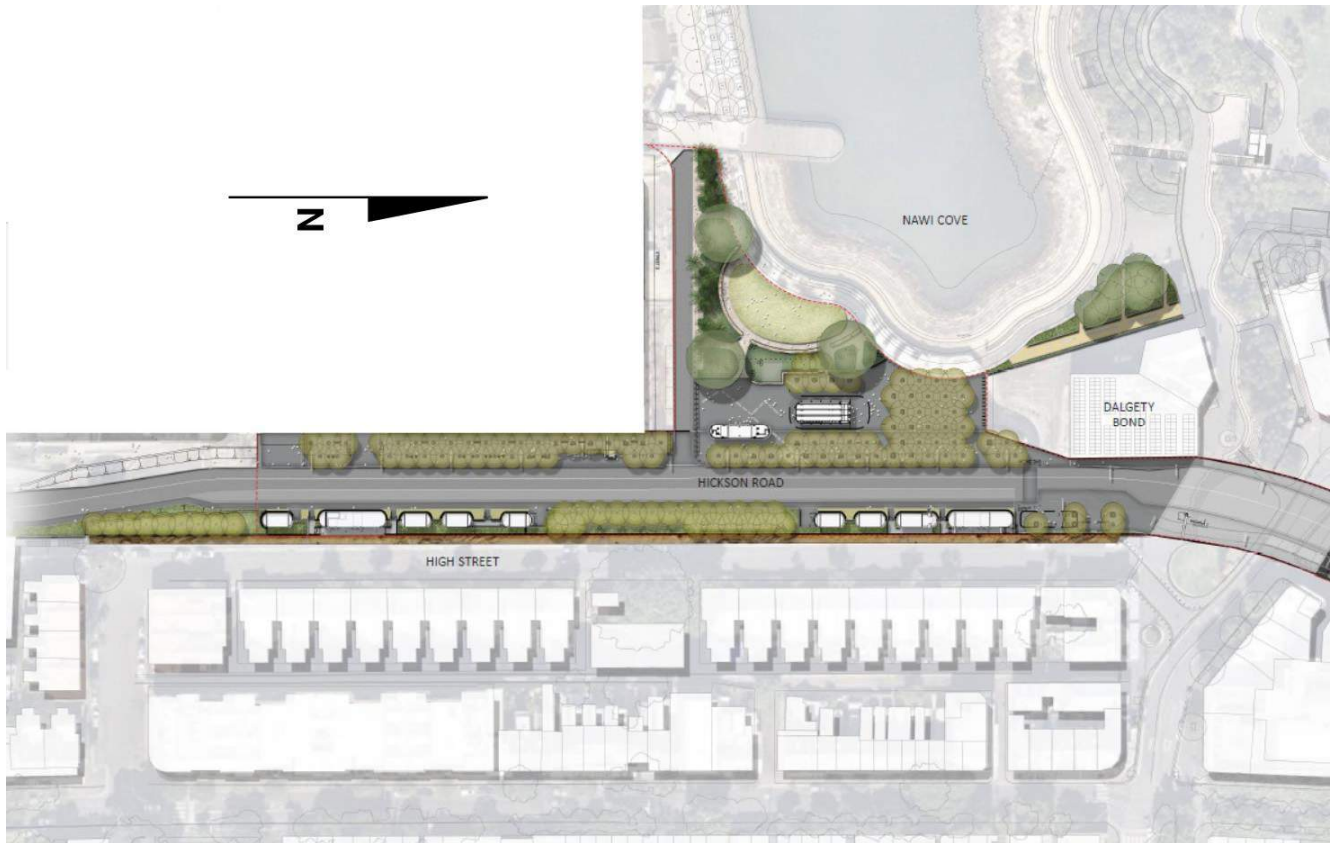
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The project site is located North of the Barangaroo precinct below Hickson Road on the North Western edge of the Sydney CBD and adjacent to Nawi Cove as per

Figure 2. The station is the most northerly of the CBD stations.

Figure 2 *Location of Barangaroo Station*



1.1.2 Project Scope

The Project consists of the following:

- Site establishment
- Structural and civil completion works to the station box
- Fit-out, testing and commissioning of the new metro station
- Stormwater trunk mains works from Hickson road precinct to the existing pit at western end of the site
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework including the connection of the system to an existing network of pipes in Sydney harbour. The operation of the cooling water system is not part of the scope of this CEMP
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers
- Waterproofing, backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft including removal of the acoustic shed, and
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

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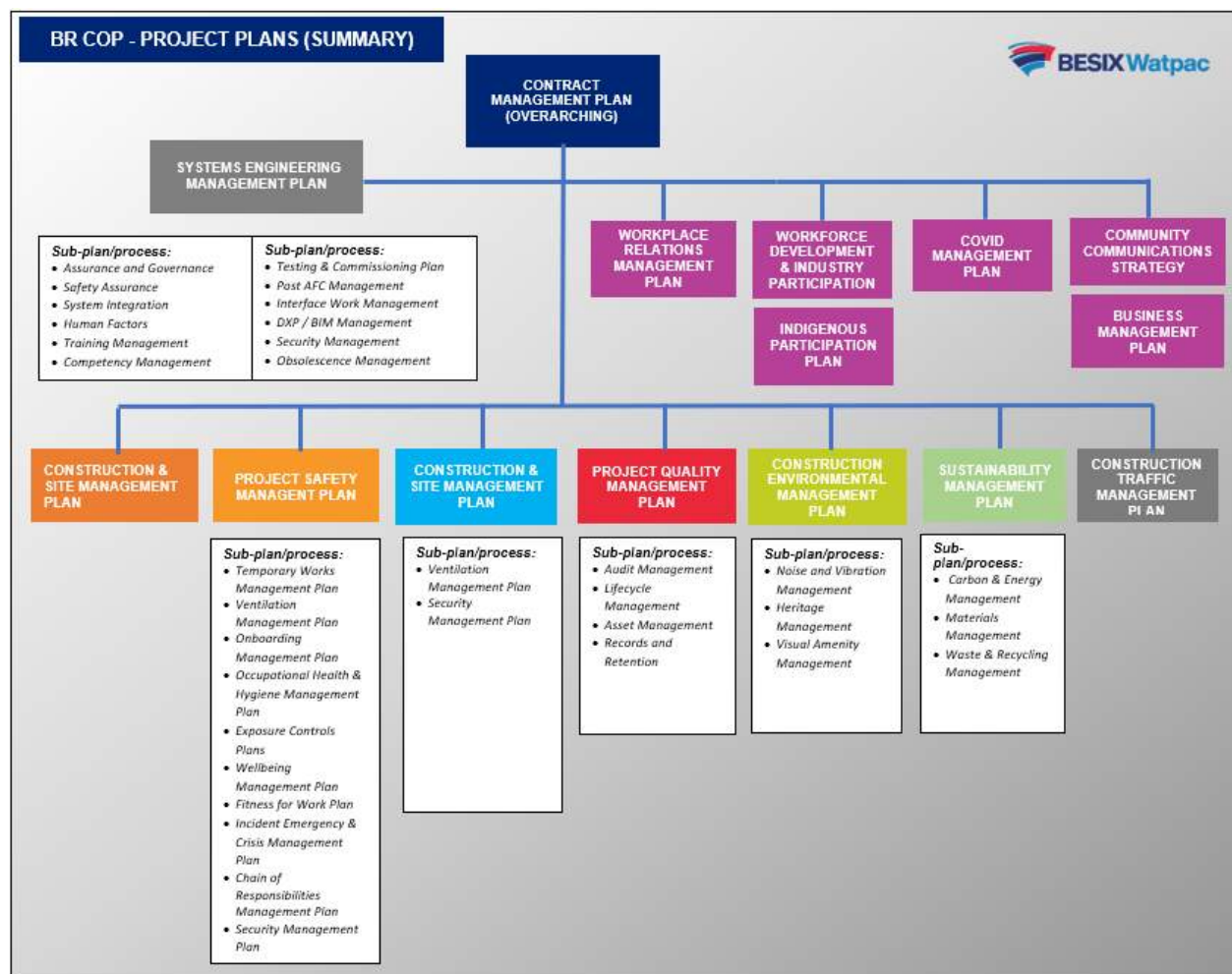
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Construction activities included within the scope of this CEMP are detailed in Section 1.2 - Construction Activities and Site Establishment Plans are located in Appendix G.

1.1.3 Project Plans

This CEMP and its sub plans operate under the overarching contract plan as per Figure 3 below.

Figure 3 Project Management Plans



Further detail on sub plans to this CEMP can be found in Section 9.2 and are included Appendices C, D and E.

Table 5 from the Staging Report, which determines those requirements from each of the CEMF topics that are applicable to Barangaroo Metro Station, has been used to determine the content and structure of the Project Management Plans, Sub-Plans and Procedures. The structure of each plan, and how they respond to each CEMF topic, is summarised in Table 1.

Table 1 Staging Report TABLE 5 applicability to Barangaroo Metro Station

CEMF Environmental Management Category	Staging report applicability to Barangaroo Metro Station and how addressed:
Spoil	Part of the CEMP
Groundwater	Part of this CEMP
Traffic (CTMP)	Stand alone Construction Traffic Management Plan (CTMP)
Noise and Vibration sub-plan (CNVMP)	Sub-plan to this CEMP

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CEMF Environmental Management Category	Staging report applicability to Barangaroo Metro Station and how addressed:
Heritage Management sub-plan (HMP)	Sub-plan to this CEMP
Fauna & Flora / Biodiversity	Procedure in this CEMP
Soil & Water	Procedure in this CEMP
Air Quality	Procedure in this CEMP
Visual Amenity sub-plan (VAMP)	Sub-plan to this CEMP
Sustainability Management Plan (SMP)	Management plan separate to this CEMP
Materials	Sub-plan to the SMP
Carbon & Energy	Sub-plan to the SMP
Waste (and Recycling)	Sub-plan to the SMP

In addition, the following Conditions of Approval (CoA) apply for the preparation of the CEMP and associated sub-plans:

- CEMP – CoA C1
- CNVMP – CoA C3
- CHMP – CoA C3
- VAMP – Section 3.4 of the CEMP
- CTMP – CoA E85 and Section 3.4 of the CEMP

1.2 Construction Activities

Works will be staged within a constrained site located relatively close to Sydney Harbour, other development works and nearby existing heritage structures.

Detailed work components are listed in Section 1.2.1 below.

Typical equipment on site is referred in Section 1.2.2.

1.2.1 Detail Construction Activities

The delivery of Barangaroo Station will involve the following detailed activities. As a generalisation, Civil works will have the greatest potential to impact the environment with the station fit-out and Interface contractors works posing less risk due to them taking place mostly underground within the existing concrete station shell. Nonetheless, all construction activities have been evaluated under the Environmental Risk Assessment – refer Section 3 and Appendix I.

There is expected to be a peak of 325 people on site and typically up to 50 No. x 19m truck movements and 50 No. delivery vehicle movements per day. Refer Construction Traffic Management Plan (CTMP) for details.

Table 2 Detailed Construction Activities

Component	Description of Work
Site Establishment	Establishment of a new site compound comprising temporary demountable site sheds, offices, toilets and showers, lunchrooms, change rooms, storage containers, rapid antigen testing and first aid sheds. Relocation of the existing TSE site compound for re-use by BESIX Watpac Establishment of site sheds, cranes, laydown areas, hoarding, refuelling areas and temp ventilation.

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Component	Description of Work
	Continual operation of the on-site Water Treatment Plant (WTP) which discharges to Sydney Harbour.
Civil	<p>Installation and maintenance of access routes within site</p> <p>Relocation of stormwater trunk drainage</p> <p>Demolition and reinstatement of Hickson Road</p> <p>Staged road, lane and footpath movements Hickson Road</p> <p>Civil works, trenching of in ground services</p> <p>Demolition of perimeter capping beam and removal of steel girders, temp ramp</p> <p>Installation of waterproofing to station roof</p> <p>Closure and backfilling of northern shaft and removal of the temporary acoustic shed</p> <p>Diving within the harbour, incl installation of stainless steel entry/exit cages and clearing of waterway entry/exits for the cooling water system</p> <p>Works to the existing main walkway, incl 2x chambers works, installation of pipe work connectors</p> <p>Headland Park – build and fit out of cooling water seawater heat exchanger room, install pipes/systems, LV feeder cables and building services (mech, fire, lights etc)</p> <p>Headland to BR COP install supply/return chiller lines, LV feeder and control cables</p> <p>Landscaping (hard and soft), public plaza and precinct activation works</p> <p>Bicycle parking facilities</p> <p>Provisions for advertising, and public art</p> <p>Operation of the WTP and discharge into Sydney Harbour, and</p> <p>Discharge into the harbour to de-water the western civil pit (bypassing the WTP).</p>
Station Works	<p>Construction of platform and over-track exhaust</p> <p>Temporary staging for installation of internal cladding and services fit out</p> <p>Internal equipment and lifting gantries</p> <p>All station fit-out, including cladding, façade and entrance canopy, lift canopy and stair and ventilation pods</p> <p>Fit out trades, building services, including long run escalators and lifts</p> <p>Fit out of existing plant and equipment rooms</p> <p>Construction of back of house cleaners and waste rooms</p> <p>Construction of public and staff toilets</p> <p>Installation of low-voltage electrical, earthing, fire, hydraulics, lighting and mechanical systems, including earthing and bonding as associated with works</p> <p>Installation of building management control system</p> <p>Provision of selected equipment and access provisions for Interface Contractors</p> <p>Installation of lifts and escalators</p> <p>Installation of signage and wayfinding, and</p> <p>Operation of the Basement 3 de-pressurisation pumps.</p>
Electrical & Coms (including Interface Contractors works in station)	<p>Provision of / installation of the following:</p> <ul style="list-style-type: none"> • Signalling and train control systems • Traction Power system • Track and tunnel services • Platform Screen Doors • Sydney Metro central control system • Sydney Metro communications system • Passenger information display systems • Public address systems • Audio frequency induction loop system • Sound system and intercom system for emergency purposes • Closed circuit television systems • Help Point systems • Electronic access control systems

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Component	Description of Work
	<ul style="list-style-type: none">• Local area networks• UHF radio systems• UHF distributed antenna system• Train radio communication systems• Precise clocks system• Electronic access system• Fibre and copper backbone• High voltage power supply and distribution system• Tunnel Ventilation System• Tunnel ventilation nozzles, and• Electronic ticketing system (ETS)

1.2.2 Plant & Equipment

Plant and equipment to be utilised to undertake the project activities include:

Station Construction Works:

- Tower crane (Luffing crane, Liebherr 160 HC)
- Mobile cranes; (various as required and up to 500t)
- 25t Franna cranes;
- 10t telehandlers;
- Northern Shaft gantry crane (existing)
- Elevated work platform (Scissor lifts and boom lifts)
- Concrete agitator trucks
- Concrete pump / placing boom;
- Handheld concrete vibrators;
- Delivery trucks - up to 19m articulated
- Waste removal – short wheel based trucks/skip bins
- Man and materials hoists (3 no.)
- Powered hand tools
- Circular saw
- Tile and brick saws
- Ventilation fans
- Generator
- Lighting towers;
- Water treatment plant (outlined in SWMP)
- Water sump pumps, and
- Plate compactor & Wacker packer.

Civil Works:

- 5t, 14t, 30t excavators
- Skid Steer
- 3t double drum vibratory roller
- 12t roller
- Grader
- Franna crane,
- 150t crawler crane (for demolition)

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- 60t crawler crane with vibrating hammer (for sheet piling)
- Bogie 10 wheeler
- Watercart
- Sucker trucks, and
- Concrete saws.

On site there is an existing water treatment plant (WTP), previously installed and operated by the Tunnel and Station Excavation (TSE) contractor that treats surface water and groundwater seepage into the station box. BESIX Watpac will continue the operation, maintenance, and water quality monitoring of the plant, including discharging water from the WTP into Sydney Harbour, until such time as it is decommissioned to enable construction activities in that location. Following this, either a new temporary WTP will be established to treat water on site, or water will be pumped to the WTP established for the project once operational. Approval from the EPA is not required for the WTP. The quality of water on site will be monitored in accordance with the Water Quality Monitoring Program (WQMP).

1.2.3 Site Compounds

The site compound and crib facilities that BESIX Watpac use for the purposes of carrying out construction, and to house the project work force, are the existing site compound and crib facilities that TSE established which have been supplemented with some additional temporary site accommodation that was delivered to the site. The location of the site compound is shown on the site establishment plans in Appendix G. As the establishment of the site compound was covered under *Sydney Metro C2S EIS Main Volume* section 7.10 (page 211 of Chapter 7), the compound is not considered to be an ancillary facility under the CoA. Any ancillary facilities that BESIX Watpac establish over and above the existing site compound will meet the requirements of CoA A16 to A20.

1.2.4 Summary Construction Activities with Key Environmental Risks

Key environmental risks, identified to satisfy CoA C2 (d), to be managed include:

- Minimisation of dust generated by demolition, stockpiling, construction of temporary access roads, minor civil works and backfilling to shafts
- Prevention of surface and site water discharge mixing with stockpiles of soil from trench excavations and backfilling material (including contaminated material)
- Managing the risk of the project's proximity to Sydney Harbour and the potential for surface runoff contaminated with civil or excavation material to be discharged into the Harbour without being controlled or treated
- Managing the dewatering of deep stormwater trenches (located below water table) and service trenches to the WTP for treatment and discharge to the harbour (in accordance with the Soil & Water Management Procedure)
- Managing the discharge of water from the western civil pit into the harbour, bypassing the WTP
- Managing surface water run off
- Ensuring that there are no legislative breaches or non-compliances
- Ensuring that the *NSW Water Quality Objectives* are met and there are no legislative breaches or non-compliances when discharging water from the WTP into Sydney Harbour
- Managing unexpected finds of contaminated material and heritage artefacts in excavations for services
- Managing noise and vibration, and especially out of hours noise, to meet regulatory limits and impact to sensitive receivers and the heritage listed Hickson Road wall.
- Ensuring that demolition and construction works adjacent to the Hickson Road heritage wall, and the rectification works of the wall itself, do not adversely impact or damage the heritage wall.

The construction activities associated with the environmental risks identified above pose the key environmental risk associated with the project. Following these activities, construction activities will mainly

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be associated with the station fit out, the construction of station entry canopy and other minor structures above ground and landscape works. The environmental focus on these activities will be on impacts due to logistics and material handling such as noise and vibration, and the generation of waste.

A risk assessment has been undertaken to assess the environmental impact of construction activities as required by CoA C2(d) and this is presented in Section 9 and Appendix I (Risk Assessment). The risk assessment will be revised at 6 monthly intervals throughout the course of the works or should there be a substantial change to the scope of the works being undertaken under the Barangaroo COP.

1.2.5 Timing and Scheduling

Site establishment commenced in Q3 2021, with staged construction of Portions 2, comprising station fit-out works and station utility works, and Portion 3, involving the finalisation of the external landscaping and public domain works with substantial completion scheduled for mid Q2 2023. The balance of the works consisting mostly of defects rectification and handover activities will be carried out until the end of Q3 2023.

Most activities associated with demolition and structural works are expected to be complete by end Q3 2022. Utilities services works will be carried out in Q1 to Q2 2022.

In accordance with CoA C2(a) an indicative construction schedule is shown Figure 4 in below:

Figure 4 Indicative Construction Schedule

Activity Description	2021				2022				2023			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Contract Award	★											
Site Establishment												
Procurement												
Demolition												
Station Works												
Civil Works												
Landscaping												
Station Testing and Commissioning												
Contract Completion												★

1.2.6 Construction Hours

Construction is generally proposed to be carried out during the standard construction hours of 7am to 6pm Monday to Friday and 8am to 6pm Saturdays in accordance with CoA E36.

In accordance with CoA E38 BESIX Watpac will implement the same respite periods as were agreed with the local community by the preceding TSE Contractor. Two noise respite periods will occur Monday to Friday between 09.30am - 10.30am and 12.30pm – 13.30pm. During these periods construction activities which generate significant noise will be ceased.

1.2.7 24 Hour Construction

In accordance with CoA E44, construction works may be undertaken outside of the standard working hours. Construction associated with the SSI may be undertaken outside standard construction hours where those works have been described in CoA E48. Relevant activities for the Barangaroo Station

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include station and tunnel fit out activities under CoA E48(d) and haulage and delivery of spoil and materials under CoA E48(e).

Some construction activities will occur outside of standard working hours, including works approved under CoA E48 which is subject to CoA E47, and must be consistent with the requirements of the Sydney Metro City & Southwest Out of Hours Strategy Protocol. These activities will be approved via a Sydney Metro Out of Hours Work Application Form (9TP-FT-079), with approval required from the ER and endorsement by the AA prior to the commencement of any out of hours works. Where work is deemed to be 'high risk', approval is required from the Secretary.

1.2.8 Interface Contractors

Interface Contractors will comply with this CEMP and associated sub-plans and procedures whilst carrying out construction activities within the boundaries of the site, when working underneath BESIX Watpac as the principal contractor. Any environmental management matters, non-conformances, monitoring, mitigation measures or the like, relating to Interface Contractor activities will be addressed using the framework as outlined in this CEMP and associated sub-plans and procedures.

Once BESIX Watpac have handed over principal contractor responsibility of areas of the station to the Interface Contractors, such as the up and down trackways and the northern shaft to the Linewide Contractor, the Interface Contractors will operate under their own management plans when working in these areas. Any environmental matters, non-conformances, monitoring, mitigation measures or the like will be the responsibility of the Interface Contractors once an area has been handed over to them as the principal contractor.

BESIX Watpac will provide crib facilities for 125 Interface Contractor personnel. BESIX Watpac will also provide the Interface Contractors with the following:

- Cranes and vertical movement of plant and equipment
- Storage points and laydown areas
- Hoisting for materials and personnel
- Treatment of construction water from within the station box by the WTP
- Drinking water and construction water
- A location for hazardous chemical storage, and
- Bins and off-site disposal of putrescible and construction waste.

Interface with the TSE contractor was limited to the handover of the site at the completion of their works at the commencement of BESIX Watpac's works. In addition, the TSE contractor will be provided with access to the site to complete the TSE contractors defects under the supervision of BESIX Watpac.

Taking possession of the site included taking possession of key plant and equipment required for the operation of the site known as 'Handover Items'. These handover items included the northern shaft acoustic shed crane, gantry crane, personnel hoist, the WTP and site dewatering pumps.

BESIX Watpac has engaged the existing supplier and operator of the WTP to continue with the management of the WTP. BESIX Watpac are not required to operate under an EPL, with water discharged from the WTP to the harbour in accordance with CoA E107 and the Water Discharge Impact Assessment (WDIA) detailed in the Soil and Water Management Procedure.

1.3 CEMP Purpose

This CEMP has been developed to meet the requirement of SSI 7400 Planning Approval CoA A1 (as modified) of the project approval and as specified in the Staging Report, and to:

- provide a single document (including required sub-plans) for managing environmental aspects of the project

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- identify measures to protect the environment, and ensure compliance with environmental legislation
- encourage best practice environmental management through planning, commitment, and continuous improvement
- identify and control potential environmental risks associated with the respective works activities
- identify the potential for, and respond to, environmental incidents, accidents and emergency situations and take corrective action
- define roles and responsibilities for personnel
- ensure employees and subcontractors implement the CEMP
- facilitate consultation and communication with external stakeholders such as the local community and government agencies
- identify the need for, and facilitate obtaining additional approvals
- define environmental reporting requirements and evaluation of performance
- describe all monitoring procedures required to identify impacts on the environment as a result of the works and activities
- implement complaint reporting procedures and maintain records of complaints and responses to complaints, and
- establish and maintain programs and procedures for periodic CEMP audits to be carried out.

1.4 CEMP Context

The CEMP sets out how BESIX Watpac in their role as Principal Contractor will manage their activities for the project to reduce impacts to the environment in accordance with company environmental policy, legislation and planning Conditions of Approval (CoA).

This CEMP was prepared in accordance with:

- The relevant planning approvals and CoAs for the project including Revised Environmental Mitigation Measures (REMMs) - refer Section 1.6 and Appendix B
- Applicable legislation and regulatory requirements - refer Section 2.1
- Sydney Metro Construction Environmental Management Framework – Chatswood to Sydenham (CEMF). Refer Section 1.5 and Appendix H
- Sydney Metro and BESIX Watpac's Environment and Sustainability Policies
- Guideline for the Preparation of Environmental Management Plans (Department of Infrastructure, Planning and Natural Resources, 2004), and
- Head Contract General & Particular Specifications – refer Appendix J (commercial in confidence).

This CEMP explains how BESIX Watpac will meet the environmental outcomes for the construction of the project. The CEMP comprises the main CEMP document, issue specific sub plans, activity specific standard operating procedures and site-based environmental control maps (ECMs).

In addition to the CEMP, the following sub-plans have been prepared, as set out in CoA C3, and as allocated in the Staging Report:

- Construction Noise and Vibration Management Plan (CNVMP)
- Construction Heritage Management Plan (CHMP)

The CEMP describes the relationship between other plans required by the contract and includes the requirements of the BESIX Watpac environmental management system (EMS) which is certified to ISO 14001:2015.

The CEMP must be endorsed by the ER as required by CoA C7 in advance of the submission of the Plan to the Secretary for approval under CoA C7. Construction will not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary, including any minor amendments approved by the ER, or the AA in the case of the CNVMP.

1.5 CEMF Application

This document has been prepared to demonstrate compliance with the Sydney Metro Construction Environmental Management Framework (CEMF) as outlined in Appendix H. Adherence to the CEMF will be to a degree that is appropriate to each applicable state of construction / operation as outlined in Table 5 of the Staging Report.

1.6 Planning Approvals

Sydney Metro City and Southwest is classified as Critical State Significant Infrastructure (CSSI) under Division 5.2 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and *State Environmental Planning Policy (State and Regional Development) 2011*.

This project falls under the construction and operation of the section between Chatswood and the Sydenham dive site known as “CSSI_7400”. Approval was granted on 9 January 2017 followed by eight approved modifications;

- MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017)
- MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017)
- MOD 2 – Central Walk (determined 21 December 2017)
- MOD 3 – Martin Place Metro Station (determined 22 March 2018)
- MOD 5 – Blues Point Acoustic Shed (determined 2 November 2018)
- MOD 6 – Administrative Changes (determined 21 February 2019)
- MOD 7 – Administrative Changes (determined 24 June 2020)
- MOD 8 – Blues Point Access Site (determined 25 November 2020)
- MOD 9 – Extension to standard construction hours (determined 30 June 2022)

BESIX Watpac is required to comply with CSSI_7400, including the modifications to this approval, to the extent required by Sydney Metro.

The environmental assessments relevant to the project, which have been referenced during the preparation of this CEMP are:

- Sydney Metro City & Southwest – Chatswood to Sydenham – Environmental Impact Statement (May 2016) - referred to as the (EIS)
- Sydney Metro City and Southwest – Submission and Preferred Infrastructure Report (SPIR). Dated October 2016.

EIS Technical Papers 1 to 9 reflect the assessment of environmental categories such as noise and vibration, contamination, groundwater, heritage and biodiversity. The EIS and SPIR informed the CoA and REMMs, with further compliance requirements outlined in Appendix B.

The BESIX Watpac Planning and Environmental Manager will review compliance with the CoAs and REMMs on a quarterly basis, or when modifications to the planning approval are approved. Likewise, the tracking of compliance will be managed by the BESIX Watpac Planning and Environmental Manager via the Approvals matrix (refer Appendix B) on a quarterly basis together with SM, and the ER to inform the Quarterly Compliance Tracking Report (CTR) and Compliance Report issued by the ER. Each requirement will be mapped to the relevant project plans and owners. Where evidence of the requirement is a referenced document, these will be managed in accordance with General Specification Clause 5.2.2.8 c), d), and e) respectively and maintained on the PDCS which is TeamBinder.

To avoid the risk of introducing changes that conflict with the project planning approval, BESIX Watpac will assess any construction methodology changes or proposed design changes to ensure there is no deviation from the approval.

1.6.1 Consistency Assessments

A consistency assessment is an assessment of whether a proposed activity, for the purpose of the CSSI, is consistent with the terms of the planning approval. Consistency assessments, if required will be prepared in accordance with 01.23.25 SM ES-PW-314_1.0 Sydney Metro Planning Approval Consistency Assessment .

BESIX Watpac and / or Sydney Metro will prepare consistency assessments in consultation with each other before submission to the ER and Sydney Metro for review. Following this the consistency assessment will be submitted to DPE. If required, this CEMP or other relevant project plans or sub-plans will be revised to incorporate additional commitments or mitigation measures and the ER will review and approve these minor amendments in accordance with project planning approval Condition A24 (j).

If a design change is found by Sydney Metro to be inconsistent with the planning approval, Sydney Metro will notify BESIX Watpac of this determination. BESIX Watpac will be required to comply with any Secretary's requirements in completing further environmental assessment of the design change. The consistency assessment will be uploaded to the website of either BESIX Watpac, or Sydney Metro, depending on who authored the document.

A register of all design changes approved for implementation on the project will be maintained by Sydney Metro with input from BESIX Watpac. Sydney Metro is responsible for assessing and obtaining any necessary approvals for changes it instigates unless otherwise specified.

1.6.2 Planning Modifications

For any new planning modification issued by DPE, BESIX Watpac will undertake a review to ascertain any new requirements or new activities, or environmental risks to be managed. A key objective of the review is to determine if the changes have a negative impact on any environmental aspect, and if so work to mitigate those impacts, and update the CEMP if necessary. Any amendment to the CEMP or sub-plans required due to a planning modification would be submitted to the ER for approval if considered a minor amendment under CoA A24(d) and (j).

1.7 Head Contract Specification compliance

The Head Contract General and Particular Specification compliance matrix for the CEMP is included in Appendix J. This compliance matrix is commercial in confidence for review by Sydney Metro only.

1.8 Environmental Policy

BESIX Watpac's Environmental Policy for this project is included in Appendix A.

This project specific environmental policy is aligned with both Sydney Metro's Environment and Sustainability Policy and BESIX Watpac corporate Health safety, Environment and Quality Policy.

The Environmental Policy will be displayed at the project office, and communicated to staff, sub-contractors and other interested parties via inductions and ongoing awareness programs.

1.9 Environmental Objectives

The environmental objectives presented in the EIS have been reviewed to assess relevance to this Project with the key objectives being as follows:

Table 3 *Environmental Objectives*

Category	Objective	Note
Dust - Air quality	Establishment of practical and robust site controls to minimise risk of dust generation in demolition, site roads, and structural works	This CEMP

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Category	Objective	Note
Water quality discharge	Establish stringent environmental monitoring and management for all site water sources including seepage, dewatering, stormwater runoff, and ingress station box	This CEMP
Contamination	Identify and minimise potential pollution from contamination when found on site	This CEMP
Heritage	Minimise impact to and record heritage finds	Heritage sub plan
Noise and Vibration	Minimise disturbance to sensitive receivers	Noise and Vibration sub plan
Sustainability, Biodiversity, Waste	Minimisation of construction waste	Sustainability Management plan
Traffic, Transport and Access	Ensure the safety of road users generally and manage the impact of construction traffic on the local environment	Traffic Management Plan

The environmental target for the Project is to achieve zero medium risk environmental pollution events and less than one complaint per month. The specific targets for noise and vibration are referred in the Construction Noise and Vibration Management Plan (CNVMP).

1.10 CEMP Objectives & Key Performance Targets

The objectives of this CEMP and key performance targets derived from the Environmental Policy core commitments will be used to measure health of the implementation of the CEMP, as follows:

Table 4 Key Performance Targets

Policy element	CEMP Objective	Measurement Basis	Target	Responsibility
Compliance with Legislation and regulations	Comply with all Statutory Requirements	Commonwealth, State and Local Council regulation	Zero Penalty Infringement Notices issued by Regulators Zero Prosecutions issued Regulators	Construction Managers/ Planning & Environmental Manager
Minimise & eliminating environmental risks	Minimise the impact of the site works to the receiving environment	Internal audits conducted by Management	No more than 5 environmental Corrective Action items issues to a single project from an internal audit Zero Non-Conformances issues as a result Project is audited within 6 months of being established on site.	Construction Managers/ Planning & Environmental Manager
Quality System Compliance	Implement an EMS that meets the requirements of AS/NZS ISO 14001 and is subject to continuous improvement	Audits, management reviews	Address non-conformances and corrective actions within specific timeframes.	Planning & Environmental Manager
Compliance with Approvals	Deliver the project in accordance with environmental approvals	Audits, construction compliance reporting, management review	Full compliance with statutory approvals.	Planning & Environmental Manager
Community	Minimise complaints and respond to any complaints within an agreed timeframe	Record number of, and response times to complaints	Less than 2 complaints per month total. Each complaint will be responded to in less than 24 hours.	Construction Managers/ Community Relations Manager

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Policy element	CEMP Objective	Measurement Basis	Target	Responsibility
Reporting	Ensure all environmental management measures are effectively implemented	Results of external and internal audits and site inspections	Nil non-conformances in relation to implementation of the CEMP.	Planning & Environmental Manager
Training	Ensure environmental leadership is empowered with right knowledge of issues	Provide environmental training to all key staff managing environmental issues	Training complete in first 12 months	Construction Managers

1.11 Distribution and Document Control

1.11.1 General

The CEMP will be held within the BESIX Watpac Barangaroo Station Project Document Collaboration System (PDCS), where it can be accessed by all project personnel and subcontractors, as necessary. A copy of the Plan will also be held on the Principal's PDCS (Teambinder) and on the Contractors website.

The BESIX Watpac Planning and Environment Manager is responsible for maintenance of the Plans and the BESIX Watpac Document Controller is responsible for the issuance of the Plans to both the PDCS and distribution parties as well as the Contractors website.

1.11.2 CEMP Reviews & Re-issue

A review of the CEMP will be undertaken every six months (or earlier if deemed necessary by the nature of circumstances or opportunity for improvement) by the BESIX Watpac Planning & Environment Manager and endorsed by the BESIX Watpac Senior Construction Manager.

The CEMP must be updated six monthly following the last approved revision. Draft changes can be reviewed, developed, and finalised in consultation with the ER, Sydney Metro and technical reviewers. Revisions must not reduce the scope or level of management control.

Criteria for changes may include:

- Any changes in environmental legislation or regulations
- Incorporating improvements resulting from internal and external audits
- To address any significant project change in scope
- Sydney Metro or SM feedback or non-conformance reports, and
- Lessons learnt or improvement initiatives from delivery team.

Draft changes in the CEMP will be submitted to Sydney Metro and the ER for review. If the changes are minor amendments, the ER will approve the Plan under CoA A24(j). Changes not considered to be minor in nature will be issued to DPE for approval. Once approved, the CEMP document number will be revised and issued by the document controller to the BESIX Watpac project team, consultants and subcontractors on the Contractors PDCS with a covering summary explanation of key changes needing to take immediate effect. The CEMP will also be uploaded to the Contractor's Project website by the Document Controller.

Initial updates to this Plan will be issued alphabetically for review. Once endorsed/approved by Sydney Metro, any subsequent Plan updates will be numbered consecutively and transmitted to holders of controlled copies.

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The draft initial revision of the CEMP will be issued for review and comment utilising an alphabetical revision, starting with revision A. Once the CEMP has been endorsed by the ER in accordance with CoA A24(d) and approved by DPIE, the revision was changed to numeric one, starting with Revision 00. Minor amendments will be approved by the ER in accordance with CoA A24(j) and the revision number ascended each time the Plan is re-issued.

2. Legislative and Other Requirements

2.1 Key Legislative and Regulatory Requirements

Table 5 *Key legislative Requirements*

Legislation	Requirement	How this Act relates to the project
Water Management Act 2000	<p>The NSW Aquifer Interference Policy (NSW Office of Water, 2012) documents the NSW Government's intention to implement the requirement for approval of 'aquifer interference activities' under the <i>Water Management Act 2000</i>.</p> <p>The Act stipulates not to cause water pollution (other than to a sewer) except in accordance with the conditions of an Environmental Protection Licence (EPL)</p>	<p>No change in groundwater is proposed by BR COP.</p> <p>Groundwater will be withdrawn from sumps within the station box where groundwater has naturally seeped in. This has been assessed under Part 5.1 of the EP&A Act, therefore approvals are not required under Section 89 for water use, Section 90 for water management work.</p> <p>In addition, activities generally requiring permits under the Act are exempt from aquifer interference approval under Section 91 as no proclamation under Section 88A had been made.</p>
Contaminated Land Management Act 1997	<p>This Act outlines the circumstances in which notification to the Environment Protection Authority (EPA) is required in relation to the contamination of land</p>	<p>If contaminated land is discovered it must be assessed in accordance with this Act. Areas on site with potential contamination subject to services trench excavation have been identified and will be assessed further by subject matter expert engaged by BESIX Watpac</p>
Heritage Act 1977 (Section 146)	<p>The Heritage Council must be notified if a relic is uncovered during construction and if it is reasonable to believe that the Heritage Council is unaware of the location of the relic.</p>	<p>Areas on site with potential heritage artefacts and subject to services trench excavations have been identified and will be assessed further by subject matter expert engaged by BESIX Watpac</p>
Dangerous Goods (Road & Rail Transport) Act 2008	<p>A license is required for the storage and/or transport of prescribed quantities of dangerous goods</p>	<p>Quantities are expected to be low. Where threshold for quantities exceeded, specific requirements include appropriate placards on the transport vehicle, emergency procedures, personal protective equipment, cargo documentation and placement of fire extinguishers.</p>
Protection of the Environment Operations Act 1997	<p>The relevant objective of the Act is to prevent environmental pollution. The Act contains provisions relating to:</p> <ul style="list-style-type: none"> • EPLs, including the calculation of administrative and load-based licence fees. EPLs are required when activities are above thresholds in Schedule 1 are identified.. • the definition of water pollution and exemptions from the offence of polluting waters under the Act, • compliance with the National Environment Protection (National Pollutant Inventory) Measure made under the National Environment Protection Council Act 1994 (Cth), 	<p>Construction works for the project are not listed as scheduled activities under the Act.</p>

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Legislation	Requirement	How this Act relates to the project
	<ul style="list-style-type: none"> the issuing of penalty notices under the Act and certain related environmental legislation, the appropriate regulatory authority for certain type of activities, fees for environmental protection notices, notification of pollution incidents. 	
National Environment Protection (Diesel Vehicle Emissions) Measure 2001	Ensure emissions from all internal combustion engines including diesel engines are not visible for a continuous period of 10 or more seconds. Otherwise the vehicle must not be used until serviced.	All diesel powered plant to be in good operation to minimise air pollution from diesel fumes
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Act protects fauna (threatened species, ecological community, or migratory species from any action that may result in their death, injury, keeping or moving. Obligation to notify Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) within 7 days of finding sensitive fauna on site	Very low likelihood given the lack of natural environment, but in the case a sensitive fauna establishes itself on site, BESIX Watpac are to ensure it is protected until it can be handled by a qualified ecologist
Environmental Planning & Assessment Act 1979	<p>The objects of the Act are as follows—</p> <ul style="list-style-type: none"> (a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources, (b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment, (c) to promote the orderly and economic use and development of land, (d) to promote the delivery and maintenance of affordable housing, (e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats, (f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage), (g) to promote good design and amenity of the built environment, (h) to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants, (i) to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State, (j) to provide increased opportunity for community participation in environmental planning and assessment. 	BESIX Watpac need to comply with the relevant Conditions of Approval for the Project
National Greenhouse and Energy Reporting Act 2007	The Act introduces a single national framework for reporting and disseminating company information about greenhouse	BESIX Watpac and subcontractors site greenhouse gas emissions associated with the project scope, must be collated reported.

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Legislation	Requirement	How this Act relates to the project
	gas emissions, energy production and energy consumption	
National Parks and Wildlife Act 1974	The Act aims at conserving the State's natural and cultural heritage, fostering public appreciation, understanding and enjoyment of the State's natural and cultural heritage.	Low Relevance. As the Project is Critical State Significant Infrastructure (CSSI), the requirements of the <i>National Parks and Wildlife Act 1974</i> are being assessed under Part 5.1 of the EP&A Act. This is addressed in the Project Planning Approval and no separate permits will be required.
Fisheries Management Act 1994	The Act governs the management of fish and their habitat in NSW including regulating activities that can impact on fish habitats.	Low Relevance Along with the POEO Act water discharging from the site must not pollute the adjacent streams or watercourses. Sydney Metro projects assessed under Part 5.1 of the EP&A Act are exempt from permits required under sections 201, 205 or 219.
Biosecurity Act 2015	The Act aims to provide for the prevention elimination, minimisation and management of biosecurity risks.	Under Part 3 of the Act there is a general biosecurity duty to prevent, eliminate or minimise risks posed by priority weeds
Ozone Protection Act 1989	The Act aims to protect the environment by reducing emission of ozone depleting substances and synthetic greenhouse gases.	The relevance of this Act will relate to the use of refrigerators and air conditioning units in site buildings and vehicles which still contain CFCs. Such items are unlikely to be found on site.
Sydney Water Act 1994	The Act establishes Sydney Water as a State-owned corporation for the supply of water, provision of sewerage and stormwater drainage systems.	Coordination is required with Sydney water during the works. Operational groundwater may be discharged to sewer under a Trade Waste Agreement managed by Sydney Metro.
Waste Avoidance and Resource Recovery Act 2001	The Act aims to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and reuse and recycling of waste.	The relevance of the Act to this project is to implement the strategies by adopting the hierarchy of: <ul style="list-style-type: none"> • avoidance of unnecessary resource consumption; • resource recovery (including reuse, reprocessing, • recycling and energy recovery), & disposal (as a last resort).

The BESIX Watpac Planning and Environment Manager will review legislative and other requirements at six monthly intervals during construction as part of the management review of this CEMP and update the document with any applicable changes. The Planning and Environment Manager will consult with internal legal advisors, SM and the ER to ensure new legislation is captured in the review. Any changes made to the legal and other requirements register will be communicated to the wider project team where necessary through toolbox talks, specific training and/or other methods detailed in Section 5.2.

2.2 Environment Protection Licences

The construction activities being undertaken as part of the Barangaroo Metro station described in this CEMP have no activities identified under Schedule 1 of the *Protection of Environmental Operation Act 1997* (POEO), and as such no Environment Protection License (EPL) is required, or will be sought.

2.3 Standards and Guidelines

2.3.1 Standards

The following Australian standards relating to environmental management apply to the project:

- ISO 14001:2015 Environmental Management Systems – Requirements with Guidance for Use
- AS4282:2019 Control of the Obtrusive Effect of Outdoor Lighting

Standards applicable to hazardous chemicals may be utilised where applicable:

- AS1940-2017 The Storage and Handling of Flammable & Combustible Liquids
- AS4326-2008 The Storage and Handling of Oxidising Agents
- AS 3780-2008 The Storage and Handling of Corrosive Substances (similar standards exist for other classes of dangerous goods)
- AS/NZS 3833:2007 The Storage and Handling of Mixed Classes of Dangerous Goods, in Packages and Intermediate Bulk Containers

Standards applicable to noise and vibration are included in the Construction Noise and Vibration Management Plan (CNVMP) which is a sub plan to the CEMP.

2.3.2 Guidelines

The following guidelines relating to environmental management apply to the project:

- ANZECC 2000: Australian Water Quality Guidelines for Fresh and Marine Water Quality.
- Department of Environment and Climate Change NSW 2009: Interim Construction Noise Guidelines.
- DPIE 2020: Environmental Management Plan Guideline, Guideline for Infrastructure Projects.
- EPA 2014: Waste Classification Guidelines.
- Landcom 2004: Managing Urban Stormwater - Soils and Construction (Blue Book), Version 4.
- SafeWork Australia 2018: Code of Practice for the Safe Removal of Asbestos.
- SafeWork Australia 2018: Code of Practice for the Management and Control of Asbestos in Workplaces.
- NSW EPA, 2014: Waste Locate Asbestos Waste Transporter User Guides.
- Sydney Metro Environment and Sustainability Policy.
- NSW EPA: Storing and Handling Liquids: trainers manual, including Review of Best Practice and Regulation

The following Sydney Metro guidelines relating to environmental management apply to the project:

- Sydney Metro Unexpected Heritage Finds Procedure.
- Sydney Metro Pre-construction Minor Works Approval.
- Sydney Metro City & Southwest Out of Hours Strategy Protocol (SM-ES-PW-317).
- Sydney Metro City & Southwest Construction Noise and Vibration Strategy (SM-ES-ST-210).
- Sydney Metro Water Discharge and Reuse Procedure (SM-17-00000098).
- Sydney Metro Risk Management Standard (SM-17-00000182)
- Compliance Monitoring/Tracking and Reporting Program Report
- Sydney Metro Overarching Community Communication Strategy

3. Environmental Risk Assessment

The environmental assessment prepared for the project identifies environmental risks and safeguards to be implemented to avoid or minimise those risks. Other risks have been identified through detailed understanding of proposed construction activities.

BESIX Watpac carried out a risk workshop during the preparation of the CEMP, and will do so each time the CEMP is revised, to collate and identify environmental risks and utilise the template risk matrix from the Sydney Metro Risk Management Standard (SM-17-00000182). The risk workshops focus on first identifying and categorising the sources of risk, potential incidents, the potential consequences and the likelihood of those risks. Each risk is assessed with 'business as usual controls' then re-evaluated with proposed management and So Far As Is Reasonably Practicable (SFAIRP) additional controls and treatments to minimise those risks.

The environmental risk assessment for the project is included in Appendix I.

Risks are rated in four levels: Very High – High - Medium - Low

Nil Very High Risks were identified. Some High Risks were identified and mitigated to Medium risk. Any High Risks will require priority focus and are considered undesirable and will require confirmation from Sydney Metro that all reasonably practical treatments have been implemented. Medium Risks were identified are considered tolerable but are subject to reasonable and practical controls. Low Risks which are broadly acceptable subject to appropriate monitoring and standard controls.

Further detail on risk context is provided in Sydney Metro Risk Management Standard (SM-17-00000182).

The program for ongoing analysis of the key environmental risks and a review of the environmental risk assessment in Appendix I will occur as follows:

- During the six-monthly update of the CEMP
- At the completion of environmental audits if required and when opportunities for improvement are identified
- As a result of changes in environmental legislation or other requirements applicable to the project, and
- If there is a change to the scope of the project which may have an environmental impact.

4. Environmental Management Requirements

4.1 Environmental Control Maps

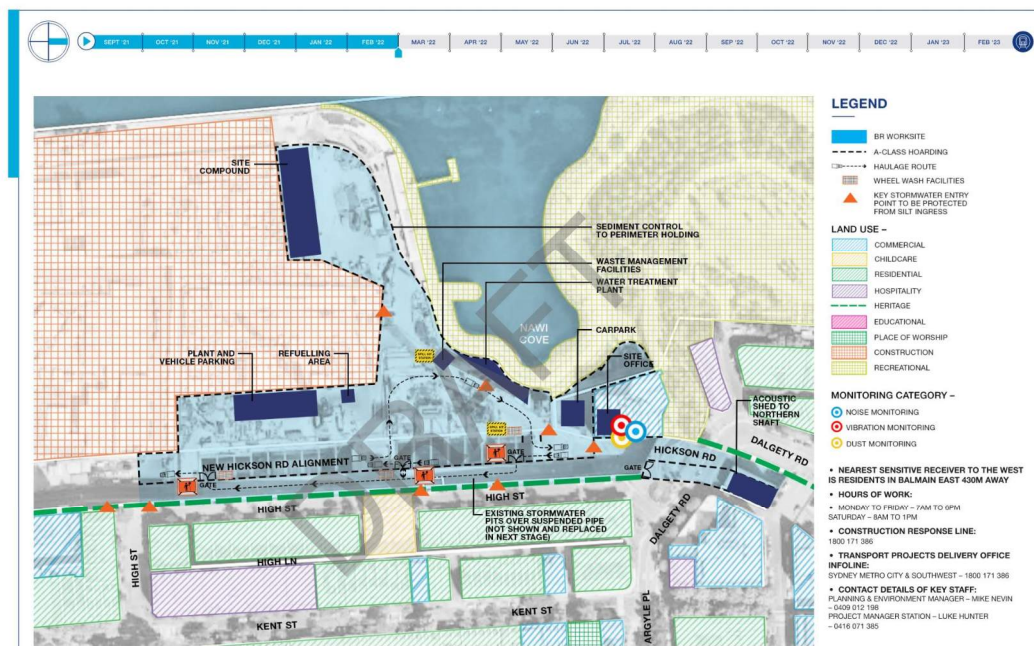
To assist construction planning and on-site construction management, an Environmental Control Maps (ECM) has been prepared as part of this CEMP which is described below.

The ECM identifies:

- Those environmental procedures, environmental approvals, or licences which are applicable
- Environmentally sensitive areas and/or receivers on and adjacent to the site, including any exclusion zones
- Waterways, including stormwater drains
- Erosion and sediment control measures
- Significant structures, work areas, machinery and vehicle parking, spoil stockpiling and fuel/ chemical areas
- Tree protection zones
- Monitoring locations (e.g., noise, vibration and water), and
- Location of sensitive receivers (e.g., residents, hotels, pre-schools).

The ECM is a 'developing document' and will be updated and re-issued periodically as required.. The ECM will be issued prior to any construction works or low impact works such as site establishment occurring. The ECM will be approved by the BESIX Watpac Planning and Environment Manager. Due to the need to change and support construction activities and environmental risks, the ECM will be controlled as a standalone document outside of the CEMP.

Figure 5 *Exemplar Environmental Control Map (ECM) - DRAFT*



Sydney Metro City & South West
Barangaroo
Construct Only Package

NOT TO SCALE
 NOT FOR CONSTRUCTION

DRAWING NAME:
 ENVIRONMENTAL CONTROL MAP -
 MARCH 2022 TO FEBRUARY 2023
DWG #: EC-0002
REV #: 04
DATE #: 22/07/2021



4.2 Condition Surveys

Condition surveys of properties potentially affected by Construction have been offered to owners and, if accepted, were carried out a minimum of four weeks prior to being granted site access in accordance with CoA E59.

In accordance with CoA E90, a Road Dilapidation Report has been prepared for local roads proposed to be used by heavy vehicles for the Project. Copies of the report were submitted to relevant stakeholders within one month of use of roads by heavy construction vehicles in accordance with CoA E90.

The condition survey and dilapidation report were prepared by an independent consultant and will be used at the end of the high-risk activities as a base to assess possible links with any observed damage.

4.3 Reinstatement

The site will be reinstated in accordance with Section 5.3 of the CEMP at the conclusion of Construction as follows:

- BESIX Watpac will clear and clean all working areas and accesses at project completion
- At the completion of construction all plant, temporary buildings or vehicles not required for the subsequent stage of construction will be removed from the site
- All land, including roadways, footpaths, loading facilities or other land having been occupied temporarily will be returned to their pre-existing condition or better
- Reinstatement of any impacted community spaces, infrastructure and services will occur as soon as possible after completion of construction, and
- Within three months of completion of construction, all property owners of buildings for which a building condition survey was carried out in accordance with CoA E59 must be offered a second building condition survey.

4.4 Register of Hold Points

Hold points beyond which approval is required to proceed with a certain activity are summarised in Table 6 below:

Table 6 *List of Hold Points*

Hold Point	Release of Hold point	By Whom
Prior to ground disturbance	Erosion and Sediment controls	BESIX Watpac Planning & Environmental Manager
Prior to any discharge of water off site	Approval of the WDIA, WQMP and updated Soil and Water Procedure	BESIX Watpac Planning Manager
Discharge of Water	Water tested to verify compliance prior to discharge	BESIX Watpac Planning & Environmental Manager
Out of Hours works	Construction Noise and Vibration Management plan and Out of Hours Works Approval	BESIX Watpac Planning & Environmental Manager, Sydney Metro, the Independent Acoustics Advisor (AA) and the ER
Use of Local roads by Heavy vehicles	Road dilapidation report	Transport engineering consultant engaged by Contractor
Unexpected Heritage find	Primary Historic Excavation Director approval to progress construction	Primary Historic Excavation Director
Unexpected Heritage find (Aboriginal Heritage)	Aboriginal Heritage Excavation Director approval to progress construction	Aboriginal Heritage Excavation Director
Construction identified as affecting building (e.g.	Building condition survey	Structural engineering consultant engaged by Contractor

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Hold Point	Release of Hold point	By Whom
excavation and or dewatering)		
CEMP & Sub-plans	Site specific CEMP and sub-plans have been developed, reviewed, and approved.	DPE, AA (CNVMP) and ER
Transport of Controlled / Hazardous waste from the site	Verification that the waste has been classified in accordance with the guidelines, transport licensing in place and landfill can lawfully receive the waste Section 143 notice or equivalent from waste receiver has been received	BESIX Watpac Project Engineers
Spoil import and removal	Verification that the spoil has been classified and the disposal location can lawfully receive the waste. Section 143 notice or equivalent from waste receiver has been received Imported material has classification reports or appropriate testing to demonstrate that it meets any EPA exemptions Records maintained in Waste Spoil Register	BESIX Watpac Project Engineer and Planning and Environment Manager
Pre-construction compliance report	Pre-Construction Compliance Report (PCCR) to be completed in accordance with CoA A32 and submitted to DPE at least one month prior to the commencement of Construction	Sydney Metro
Construction Monitoring Programs	Endorsement of the programs by the ER and submission to DPE for approval at least one month prior to the commencement Construction Relevant baseline data for the specific construction activity has been collected.	BESIX Watpac Planning & Environmental Manager, Sydney Metro, the Independent Acoustics Advisor (AA) and the ER

4.5 Unexpected Finds– Asbestos or Contaminated Land

In the event of an unexpected find of materials containing asbestos or potentially contaminated soil BESIX Watpac will utilise the Spoil Management Plan and Sampling, Analysis & Quality Plan (SMPSAQP) and Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) included in Appendix O in addition to the BESIX Watpac Standard Environmental Protocol (F.12) and actions below:

- Cease work in the immediate area
- Notify the BESIX Watpac Construction Managers and Planning and Environment Manager
- BESIX Watpac Construction Managers to notify any other parties such as WHS Manager, and consultant Hygienist and consult with the BESIX Watpac Planning and Environment Manager.
- Water spray if asbestos required to keep dust level down
- Restrict affected workers from moving around site or leaving site with contamination on clothes and boots
- BESIX Watpac Planning and Environment Manager to assess if additional specialist expertise is required and that management, monitoring established to minimise risk.
- Comply with the requirements of the Sydney Metro reporting requirements.

4.6 Hazardous Chemicals

Typically only low volumes of hazardous chemical will be stored on site.

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Dangerous goods, as defined by the Australian Dangerous Goods Code, will be stored and handled in accordance with:

- All relevant Australian Standards
- For liquids, a minimum bund volume requirement of 110% of the volume of the largest single stored volume within the bund
- EPA guidelines for best practice

Safety Data Sheets (SDS) of all hazardous chemicals will be kept on file in the site office, the SDS will be regularly reviewed through environmental inspections. All hazardous chemicals will be kept in locked containers, positioned away from vehicle movements, and have access to clean and dry spill kits.

5. Roles and Responsibilities

5.1 Key personnel

The below roles and environmental responsibilities have been set out to satisfy CoA C2(j).

5.1.1 Project Director

The environmental responsibilities for the BESIX Watpac Project Director are:

- Ensure the requirements of this CEMP are fully implemented, and that environmental requirements are not secondary to other construction requirements
- Endorse and support the environmental policy (Appendix A)
- Liaise with Sydney Metro and other government authorities as required
- Participate and provide guidance in the regular review of this CEMP and supporting documentation
- Provide adequate resources (personnel, financial and technological) to ensure effective development, implementation and maintenance of this CEMP
- Ensure that all personnel receive appropriate induction training, including details of the environmental and community requirements
- Ensure that complaints are investigated, and issues are resolved in accordance with the community and stakeholder engagement plan, and
- Direct that works be stopped immediately where there is an actual or potential risk of harm to the environment, property and/or human health.

5.1.2 Construction Managers

The BESIX Watpac Construction Managers are responsible to the Project Director to ensure effective environmental controls are implemented for the duration of the project.

Specifically, the Construction Managers are responsible for the:

- Planning construction works so that it minimises impact to the environment
- Implementing and maintaining the CEMP
- Reviewing the environmental aspects at project start-up and ensuring the CEMP addresses all requirements
- Providing guidance, motivation and resources to achieve the provisions of the CEMP
- Ensuring that subcontractors and suppliers are aware of BESIX Watpac's environmental policy and objectives, through conditions of contract, tender interviews, scopes of work and site environmental inductions as applicable
- Establishing monitoring records and ensuring the scope and frequency of monitoring activities satisfies the requirements of the CEMP

The Construction Managers shall have sufficient authority and independence to:

- Identify and record any environmental problems
- Initiate solutions to the environmental problem
- Stop the works, if such a decision becomes necessary, in order to prevent or mitigate adverse environmental conditions, or if corrective measures recommended are not being carried out, and
- Provide recommendations for EMS and operational improvements to the BESIX Watpac Planning and Environment Manager.

5.1.3 Planning and Environment Manager

The BESIX Watpac Planning and Environment Manager is responsible for establishing and maintaining the Company's Environment Management System for the project and represents BESIX Watpac on all environmental matters pertinent to the CEMP and EMS.

The Planning and Environment Manager is responsible for:

- Reports to the Project Director on performance and implementation of the CEMP
- Assisting the Construction Managers with the implementation of the CEMP
- Providing support and technical assistance to the Project Site Engineers
- Monitoring the effectiveness of the Environmental Management System.
- Primary contact with Sydney Metro and other government authorities on environmental and approvals issues.
- Ensures CEMP reviews are carried out in accordance with the CEMP
- Monthly environmental reports
- Applies and obtains all licenses
- Has authority to stop the works, if such a decision becomes necessary, in order to prevent or mitigate adverse environmental conditions, or if corrective measures recommended are not being carried out
- Assists stakeholder and community manager on environmental issues
- Attend environmental inspections and report on environmental incidents and non-compliances against the CoAs and REMMs, and
- Continually assess environmental risks.

The Planning and Environment Manager is authorised to require all employees, including Construction Managers to comply with the provisions of the CEMP and EMS and may issue directions to that effect.

5.1.4 Environmental Coordinator

The Environmental Coordinator is responsible to the Planning and Environment Manager and Construction Managers for the maintenance of the EMS and CEMP.

The Environmental Coordinator will prepare/compile registers, records, plans and forms necessary for the implementation of environmental controls.

Responsibilities of the Environmental Coordinator will include:

- Monitor the construction processes to ensure that appropriate environmental protection/procedures are in place
- Identify and record any environmental issues
- Recommend and initiate solutions to environmental problems and verify the implementation of solutions
- Investigate all environmental complaints (which shall be recorded on the project records)
- Control and maintain project environmental records, including indexing records, prior to archiving
- Implement any environmental checklists, field records and procedures as applicable to the works
- Maintenance the CEMP and control of distribution
- Provide recommendations to the Planning and Environment Manager for EMS and operational improvements, and
- Collates input for monthly reports for the Planning and Environment Manager.

5.1.5 Document Controller

The BESIX Watpac Project Document Controller with respect to environmental issues reports to the Planning and Environment Manager. Responsibilities include:

- Uploading and maintaining controlled versions of the CEMP on the Principal and Contractor's PDCS and websites

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- Notices to the Principal regarding audits, corrective actions and dissemination of environmental audit reports, and
- Upload of monthly reports.

5.1.6 Independent Verification and Audit Staff

Individual employees or consultants may be appointed by BESIX Watpac to assist the Planning and Environment Manager to carry out internal environmental verification and audit.

Independent Verification staff will not be drawn from personnel who are performing or directly supervising the activities being inspected.

5.1.7 Independent Environmental Auditor

The Independent Environmental Auditor is a stakeholder that is responsible for carrying out environmental audits of the project on behalf of Sydney Metro. The Independent Environmental Auditor will undertake external audits on environmental management as co-ordinated with Sydney Metro.

5.1.8 Stakeholder and Community Relations Manager

With respect to environmental issues the Stakeholder and Community Relations Manager is responsible for:

- Ensuring communities are informed in accordance with the Project requirements
- Report to the Planning and Environment Manager of any issues raised by the community
- Reporting to the Project Director
- Maintaining a 24-hour complaints hotline
- Maintaining the project website and reviews/endorse all content provided to that website
- Drafting and issuing community notifications for works taking place out of hours
- Representing BESIX Watpac at meetings with local stakeholders and community groups

Refer to the Community Communications Strategy and Business Plan (a sub plan to the Contract Management Plan which is separate to this CEMP)

5.1.9 Independent Environmental Representative

A suitably qualified and experienced Environmental Representative (ER) who is independent of the design and construction personnel has been nominated by Sydney Metro, approved by the Secretary and engaged by Sydney Metro for the duration of construction of the CSSI. The responsibilities of the independent ER are defined in CoA A24.

5.1.10 Independent Acoustic Advisor

A suitably qualified and experienced Acoustics Advisor (AA) who is independent of the design and construction personnel has been nominated by Sydney Metro, approved by the Secretary engaged by Sydney Metro for the duration of construction of the CSSI. The responsibilities of the independent AA are defined in CoA A25. Refer to the CNVMP for further detail.

5.1.11 Contracts Manager

The Contracts Manager shall be responsible to the Construction Managers to ensure proper procedures are followed for the procurement of goods and services to ensure that BESIX Watpac's environmental policy and objectives and the requirements of the CEMP are achieved.

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5.1.12 Direct Labour

Each tradesperson, trades assistant, operator and employee shall be responsible for carrying out their work in accordance with BESIX Watpac's stated Environmental Policy and objectives, the CEMP and as instructed by their supervisor.

5.1.13 Subcontractors and Suppliers

BESIX Watpac will ensure all subcontractors and suppliers are responsible for conducting their activities in an environmentally sensitive manner and in compliance with the requirements of this CEMP; ISO 14001 and the CEMP and sub-plans.

Site inductions will include detailed and site-specific environmental information. Any trade likely to have a high impact on the environment is required to submit an EMP, which is assessed using the "Subcontractor EMP assessment checklist" to ensure it is comprehensive.

All personnel shall notify the BESIX Watpac Site Manager of any activity or incident, or any deviations from workplace practices and procedures set out in this CEMP.

Subcontractor audits can be conducted. The standard audit checklist forming part of the BESIX Watpac quality assurance system environmental criteria which can be adapted to the nature of the trade work.

Contractors shall ensure their personnel working at the site:

- Have the appropriate environmental awareness training and / or qualification for the task undertaken, and
- Are aware of the potential environmental impacts of their activities on the site and the procedures by which such impacts are to be minimised or prevented.

5.1.14 Specialist Consultants

BESIX Watpac will engage consultants as per Table 7 below for environmental matters.

Table 7 Propose Consultant Team

Environmental Category	Consultant	Scope
Geotechnical / Contamination / Soil	Douglas Partners	Development of the SMPSAQP, ASSMP and Preliminary Site Investigation (Contamination)
Water	WSP	WDIA
Noise & vibration	Renzo Tonin	Refer CNVMP
Heritage	AMBS	Refer HMP
Sustainability	WSP	Refer SMP
Community	ERM	Refer CCSBMP
Water Quality Monitoring	Property Risk Australia (PRA)	Monitoring of water quality to meet the requirements of the WQMP

5.2 Environmental Training

As part of their site induction all personnel engaged in the works shall be made aware of the provisions of this CEMP to promote a general awareness of the environment and to minimise any potential impact upon it.

Targeted environmental training will be appropriately commensurate with their roles and environmental responsibilities in the project. Specifically, the following environmental training will be undertaken by BESIX Watpac construction personnel:

- Use of noise monitoring equipment
- Use of water quality sampling equipment
- Use of spill kits

Contractors shall be responsible for providing evidence to BESIX Watpac, as applicable, prior to commencing work that:

- Environmental training needs of their personnel working at the site been assessed and satisfied, and
- Contractor personnel have received the appropriate environmental awareness training and / or qualification for the task to be undertaken.

Training requirements for BESIX Watpac personnel are identified and planned on appointment to their role, and for each project. The Construction Managers in consultation with the Planning and Environment Manager will monitor the skills required by BESIX Watpac personnel and contractors to effectively implement the CEMP and its procedures on site.

All project personnel including subcontractors will be required to attend a general induction prior to commencement on site. General inductions will also have a structured component focussing on environmental issues and management.

The environmental induction will include:

- Relevant details of the CEMP
- General environmental management requirements, and
- Incident response and reporting requirements.

The Project Safety Advisor will establish a register (date, name, role/position, key activities) of all personnel inducted. The register will be maintained by the Project Safety Advisor for the duration of the project.

5.2.1 Toolbox talks

To assist with ongoing awareness, Construction Managers and delegated representatives are to include relevant environmental specific management issues in toolbox talks.

Toolbox talks will be tailored to specific environmental issues including (but not limited to):

- Erosion and sedimentation control
- Hours of work
- Emergency and spill response
- Heritage
- Noise
- Housekeeping and waste
- Concrete washout
- Excavation dewatering
- Dust control
- General procedures for site preparation prior to absence or significant rain events
- Out of hour work approval processes

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- Working outside of standard construction hours (including monitoring of noise and light spill)
- Dealing with members of the public and/or stakeholders
- Use of non-tonal reverse alarms, and
- Respite periods.

Toolbox talk attendance is mandatory, and attendees of Toolbox talks are required to sign an attendance form. Records of toolbox talk attendance will be maintained by the Environmental Coordinator.

The Planning & Environment Manager will review the training program and monitor its implementation.

6. Implementation

6.1 Environmental Monitoring, Inspections and Auditing

The BESIX Watpac Planning and Environment Manager will facilitate the following program of monitoring, reviews and audits, to satisfy CoA C2(f), as per Table 8 below:

Table 8 *Proposed Monitoring and Audit Frequency*

Activity	Sub-category	Responsibility	Frequency
Environmental Site Surveillance	Erosion and sediment controls	Environmental Coordinator	Weekly and before and after any heavy rainfall event
	Water treatment plant	Environmental Coordinator	Daily, Monthly & Quarterly
	Dust - Air quality	Environmental Coordinator	Daily
	Noise control	Environmental Coordinator Refer CNVMP	Continuous
	Contamination identification, isolation and treatment	Environmental Coordinator	Daily during high risk activities
	Heritage finds, protection and recording	Environmental Coordinator refer HMP	Daily during high risk activities
	Visual amenity	Environmental Coordinator) refer VAP	Daily for damage and graffiti
ER Inspections	All relevant site environmental aspects	ER accompanied with the Planning & Environmental Manager and the Environmental coordinator	Between fortnightly and an as needs basis dependent on level of onsite work activities and environmental risk profile
Review of environmental actions and controls	All site environmental controls	BESIX Watpac Planning & Environmental Manager	Between weekly and an as needs basis dependent on level of onsite work activities and environmental risk profile
Formal Compliance Review of Requirements	Conditions of Approval, REMMs	BESIX Watpac Planning & Environmental Manager, and ER review	Quarterly
Independent Environmental Auditing	Scope TBC	Independent Auditor accompanied with BESIX Watpac Planning & Environmental Manager as required for access and records	As per the Independent Audit Schedule
	Water treatment plant	Independent auditor accompanied with ER as required for access and records	Annually
	Dust - Air quality	Independent auditor accompanied with ER as required for access and records	Annually
	Noise control	Refer CNVMP	Six monthly
	Contamination identification, isolation and treatment	Independent auditor accompanied with ER as required for access and records	Annually
	Heritage finds, protection and recording	Independent auditor accompanied with ER as	Annually

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Activity	Sub-category	Responsibility	Frequency
		required for access and records	
Contractor Review	CEMP & Sub Plan	Planning & Environmental Manager, Environmental Coordinator, Construction Managers & Project Director	Six monthly and 4 weeks prior to SM review (Update maximum annually following approved revision)
Contractor Review	Environmental Risk Register and Risk assessment	Planning & Environmental Manager, Environmental Coordinator Construction Managers	Six monthly or at any time initiated by the Planning & Environmental Manager to address new or changed construction activities
Contractor Review	Environmental Management System	Planning & Environmental Manager, Environmental Coordinator Construction Managers	Annually or at any time initiated by the Planning & Environmental Manager to address new or changed construction activities
Contractor Internal Audits	All site environmental aspects	Planning & Environmental Manager and QA Lead (NSW) accompanied with the ER	Six monthly
Contractor Review	CEMP & Sub Plans	BESIX Watpac Planning & Environment Manager	Six monthly.

6.1.1 Environmental Management System Audit

Auditing of the project Environmental Management System (EMS) will be carried out in accordance with ISO14001:2015 Environmental Management Systems and AS/NZS ISO 19011:2014 -Guidelines for Auditing Management Systems

The audit will evaluate compliance with this CEMP and associated documentation including:

- Compliance with any approval, permit or licence conditions
- Compliance with the EMS, CEMP, SMP, sub-plans and procedures
- Community consultation and complaint response
- Environmental training records, and
- Environmental monitoring and inspection results.

The audits will be conducted by BESIX Watpac's Quality Manager, or an independent consultant engaged by BESIX Watpac.

An audit report will be issued by the Quality Manager to the Planning and Environment Manager for action. Actions will be followed up for close-out of actions within one month of the issue of the audit report.

The Independent Environmental Audit Program required by conditions A37 to A40 will be managed by Sydney Metro. BESIX Watpac will participate in these external audits as required by the Audit Working Group audit schedule.

6.1.2 Management Review

The Project Management Team will check the status and adequacy of the CEMP to ensure that it meets current Sydney Metro and BESIX Watpac requirements as well as relevant environmental standards.

The CEMP and an analysis of key environmental risks as defined in Appendix I will be reviewed during the course of the contract when the following situations arise:

- Sydney Metro recommendations for changes (particularly following initial review)
- Changes to the EMS, and
- Opportunities for improvement or deficiencies in the project system are identified.

6.1.3 Environmental Audits

The audit frequencies noted above must be aligned with the Project Audit Program and the Compliance Tracking Program, a master program controlled by Sydney Metro. BESIX Watpac will provide Sydney Metro with all documentation relating to the Barangaroo Station construction activities to enable Sydney Metro to comply with the requirements of CoAs A37 to A45 as they relate to the Environmental Audit Program. The Planning and Environment Manager (or as delegated to the document controller) must notify the Principal with regard to audits timing with 10 days advance notice to enable opportunity to attend.

The Planning and Environment Manager will be responsible for maintaining a controlled register of environmental issues arising from internal and external reviews and formal audits. The register will be updated within 24 hours of new information and reviewed monthly prior to the production of the monthly progress report.

The Environmental issues register will be structured as follows:

- Item No
- Source (Observation, ER inspection, internal review, external review, internal audit, external audit)
- Notice type (improvement request, non compliance, incident etc)
- Date logged
- Date targeted for closing out
- Environmental category
- Description of the issue
- Action owner (as directed/authorised by the Planning and Environment Manager or Project Director)
- Proposed action
- Referenced evidence of action
- Date closed
- Findings & improvement identification (e.g. update inductions, training, CEMP, EMS etc)
- Comments on closeout and improvements

Independent auditors will require, and be granted access to, all relevant environmental procedure and records of which access will be facilitated by the Planning and Environment Manager or as directed and delegated any BESIX Watpac staff.

6.2 Environmental Non-Conformances, Corrective and Preventive Actions and Planning Non-Compliances

The BESIX Watpac Planning and Environment Manager will identify and evaluate all non-conformances with legal requirements; applicable permits; specifications and the requirements with this CEMP.

Non-conformance Reports shall be raised as appropriate to clearly identify the nature of the non-conformance and document the proposed remedial action and the person responsible.

The Planning and Environment Manager will work with the Construction Managers to verify that the follow-up action is implemented and effective. Reports will be distributed and filed on the Contractor's PDCS.

Corrective and Preventive Action Requests will be raised, where appropriate, to correct and/or prevent non-conformances in construction activities and in the operation of the EMS.

Actions as a result of Corrective and Preventive Action requests will be implemented, followed-up and recorded in the Project records.

Non-compliances with the planning approval will be documented and addressed by BESIX Watpac in accordance with the Sydney Metro Environmental Incident and Non-compliance Reporting Procedure.

6.3 Environmental Records and Compliance Reporting

6.3.1 Records

The following records are to be retained:

- Environmental Inspection Reports from the ER
- Environmental Incident and Complaint Reports
- Environmental Non-conformance Reports
- Environmental Corrective and Preventive Action Requests
- Environmental Reports from Specialist consultants
- Copies of all applicable Environmental Permits
- Environmental Monitoring Records
- Environmental Induction and Training Records
- Environmental Audit Reports
- Any correspondence regarding environmental issues relating to the site, and
- CoA and REMMs compliance tracking (as related to this CEMP and sub plans).

Environmental documents maintained and kept electronically include:

- Environmental Control Maps (controlled revisions)
- Erosion and Sediment control Plans (controlled revisions)
- The CEMP, sub-plans and corresponding risk assessments.

Records and their summaries form key baseline information for monthly reports generated as per Section 6.3.3 below. Records will be retained onsite for the duration of works and following completion, records will be retained by BESIX Watpac for a period of no less than 7 years.

6.3.2 Compliance Tracking

BESIX Watpac will undertake compliance tracking to meet the requirements of CoAs A28 to A30 utilising the Compliance Tracking Program which SM have overall responsibility to manage. BESIX Watpac will monitor compliance tracking internally, quarterly at compliance tracking internal workshops where the status of those Conditions of Approval which BESIX Watpac are responsible for will be reviewed. On a quarterly basis the Planning and Environment Manager will meet with Sydney Metro and the ER to collaboratively review and update the Compliance Tracking Report to comply with the Sydney Metro Compliance Tracking Program CoAA30.

Non-compliances identified will be rectified to satisfy the requirements of CoA C2(h).

6.3.3 Monthly Reporting

The BESIX monthly progress report will contain a standalone section specifically for environmental reporting which has the following structure:

- executive summary
- summary performance against the environmental management requirements of this CEMP
- status of the CEMP and all sub-plans
- status of environmental construction method statements
- identification and management of any consistency reviews to comply with the EP&A Act (NSW)
- status (summary) of environmental obligations identified in the compliance tracking program
- status of and performance against environmental licences
- confirmation of compliance with relevant Environmental Law

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- performance against environmental KPIs and targets
- graphical representation of the monthly frequency of environmental issues and incidents each month for the previous 12 months, including an analysis of trends and what actions are being taken to improve performance
- summarised details of environmental incidents or emergencies
- summary of environmental inspection reports
- the results, findings and any environmentally relevant actions of any internal or external reviews and audits carried out
- summary of the number of employees that have received environmental training and the type of training they received
- outline data on spoil management which cross referenced to the sustainability management section of the monthly progress report

Sustainability issues reporting is defined in the Sustainability Management Plan.

Monthly reports will focus on activities and records from that month prior, and if no change from previous month will not repeat that information.

6.4 Construction Monitoring Program

Construction monitoring programs, as required by CoA C9, have been developed by specialist consultants for monitoring of noise and vibration as outlined in *Appendix A – Applicability of C2S CoAs to each Stage*, of the Staging Report. Details of the noise and vibration monitoring program are included in the CNVMP. As required by CoA C10, the monitoring program will include the following:

- details of baseline data available
- details of baseline data to be obtained and when
- details of all monitoring of the project to be undertaken
- the parameters of the project to be monitored
- the frequency of monitoring to be undertaken
- the location of monitoring
- the reporting of monitoring results
- procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory, and
- any consultation to be undertaken in relation to the monitoring programs captured in a Consultation Matrix.

The monitoring programs will be developed in consultation with relevant government agencies and managed in accordance with CoA C12, C13, C15, and C16.

The Construction Monitoring Programs, as approved by the Secretary including any minor amendments approved by the ER, must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater in accordance with CoA C13.

Construction did not commence until the Secretary had approved all the required Construction Monitoring Programs and all baseline data for the specific construction activity collected as required by CoA C14.

Construction monitoring programs will be implemented for the duration of construction and for any longer period as may be required by the monitoring program or specified by the Secretary as required by CoA C15.

Whilst a water quality monitoring program is not a requirement of the Staging Report or the CoA, a Water Quality Monitoring Program (WQMP) has been developed to satisfy CoA E107, that the *NSW Water Quality Objectives* be maintained, and to meet Section 120 of the POEO Act. The WQMP will monitor the

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impact of BESIX Watpac's construction activities on groundwater and surface water and has been developed for assurance purposes in managing the environmental risks surrounding the discharge of treated water from the WTP, and water pumped from the western civil pit directly to the harbour bypassing the WTP. This water monitoring program will be detailed within the Soil and Water Management Procedure and follow the recommendations made in the WDIA.

7. Communication and Consultation

7.1 Consultation

In accordance with CoA A9 all consultation with identified parties is required to be recorded with:

- Details of the consultation
- Matters raised by the parties, and
- How the matters were considered against the strategies, plans programs, reviews, audits and protocols.

The respective consultations in the preparation of this CEMP and sub plans are noted within each Plan.

The CEMP sub-plans are required to be prepared in consultation with the relevant government agencies as listed in CoA C3 and as per Table 9 as follows

Table 9 CEMP sub-plan consultation

CEMP sub-plan	Government agency being consulted
Construction Noise and Vibration Management Plan (CNVMP)	<ul style="list-style-type: none">• City of Sydney Council – Responded 6th July 2021 (accepted)
Construction Noise and Vibration Monitoring Plan (CNVMP) (issued as appendix in CNVMP)	<ul style="list-style-type: none">• City of Sydney – Responded 6th July 2021 (accepted)• NSW Environment Protection Authority (EPA) – Responded 13th July 2021 (accepted)
Heritage Management Plan (CHMP)	<ul style="list-style-type: none">• Heritage NSW – Responded 6th August 2021 (accepted)• City of Sydney Council – Responded 6th July 2021 (accepted)• Registered Aboriginal Parties (RAPs) – 13 RAPs issued HMP on 18th June 21. Three RAPs have accepted. Remaining RAPs were phoned on the 9th of July 21 and follow up email sent. No comments from remaining 10 at date of submission.

A record of consultation which has been undertaken is contained within the Consultation Matrix which follows in Appendix K. Refer to Community Communication Strategy and Business Management Plan (CCS) for further detail.

7.2 Coordination meetings

Planning and environment meetings will be held for representatives from Sydney Metro, the ER and BESIX Watpac key personnel. Meetings will take place following a site inspection by the ER and will be held on a fortnightly basis generally, unless the activities taking place on site and associated risk necessitate a more frequent meeting regime:

The agenda for the meetings will be to discuss the following:

- ER site inspection
- Status of planning approvals
- Any issues with respect to the project's environmental management
- Any complaints and Non-conformances, and
- Ensuring preparedness for short to mid-term look ahead in construction activities.

Meetings will be chaired by Sydney Metro and key actions minuted and distributed for action by Sydney Metro.

7.3 Internal Communication

Environmental management will be included in the weekly agenda of BESIX Watpac Project leadership meetings attended by the Project Director, Construction Managers, Commercial Manager, Program

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Manager, OHS Manager, Interface Manager, Planning and Environment Manager and other key managers as required. These are structured weekly meetings to share insights and issues as to how the project is being managed, how subcontractors are performing and agree on actions to formalise with rest of the team.

7.4 Communication with Agencies and Authorities

Development of the CEMP is reliant on prior and ongoing consultation with various government agencies and authorities. The BESIX Watpac Planning and Environment Manager will be the primary contact with any external agencies regarding approvals, permits and environment.

7.5 CEMP feedback from stakeholders

Comments received from stakeholder reviews will be logged in a register maintained in Appendix K of this CEMP. The register will record the author, date raised, the issue, the response to the issue and status. The **BESIX Watpac** Planning and Environmental Manager will be responsible for the maintenance and inclusion of the register in subsequent CEMP updates.

8. Incident and Emergency Management

An outline of incident and emergency management is provided below. Refer Incident Emergency and Crisis Management Plan for further details.

8.1 Definition

An incident is defined in the project planning approval as *“an occurrence or set of circumstances that causes, or threatens to cause, material harm to the environment, community or any member of the community, being actual or potential harm to the health or safety of human beings or to threatened species, endangered ecological communities or ecosystems that is not trivial”*.

Material harm to the environment is defined by Section 147 of the POEO Act as follows:

“harm to the environment is material if:

- » *it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or*
- » *it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (or such other amount as is prescribed by the regulations), and*

loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

For the purposes of this Part, it does not matter that harm to the environment is caused only in the premises where the pollution incident occurs.”

Under Section 148 of the POEO Act environmental incidents causing or threatening material harm to the environment must be reported to the EPA.

All environmental incidents and emergencies will be managed and classified in accordance with the *Sydney Metro Environmental Incident and Non-compliance Reporting Procedure Version 5.1 (SM-17-00000096)*, as required by CoA A41 the Secretary will be notified as soon as possible and in any event within 24 hours of the incident occurring.

8.2 Response

In the event of an environmental incident causing or threatening ‘material harm’ to the environment the following general process would be followed:

8.2.1 Assess and declare incident

- All potential or actual environmental incidents would be verbally notified to the Construction Manager immediately
- All works on the site, in the vicinity of the incident, are to cease immediately and the Construction Manager would immediately notify the Site Manager, , Environmental Coordinator and Planning & Environment Manager of the incident.
- The Construction Manager or Planning and Environment Manager would direct actions to contain and/or minimise material harm caused by the incident and protect the environment and community where safe to do so. An exception to this would be where such action would result in additional material harm to the environment
- The Planning & Environment Manager would document detailed information regarding the incident including:
 - » Time, date, nature, duration and location of the incident
 - » Location of the place where pollution is occurring or is likely to occur
 - » Nature, the estimated quantity or volume and the concentration of any pollutants involved (if known)
 - » Circumstances in which the incident occurred (including the cause of the incident, if known)

- » Any action taken or proposed to be taken to deal with the incident and any resulting pollution or threatened pollution

8.2.2 Notify the incident

The Planning & Environment Manager, or Construction Managers will immediately notify the Sydney Metro Construction Director, Sydney Metro Environmental Manager (or delegate) and the Independent ER of any environmental incident occurring on site in accordance with the Sydney Metro Environmental Incident and Non-compliance Reporting Procedure. The notification of an incident under Condition A41 will comply with CoA A42 and include the time and date of the incident, details of the incident and will identify any non-compliance with the conditions of approval. The Secretary will be notified as soon as possible of any incidents categorised as being Class 1 or Class 2, and in any event within 24 hours of the incident in accordance with CoA A41 by Sydney Metro. The Secretary will be notified of the time and date of the incident, details of the incident and any non-compliance with the conditions of approval as per CoA A42. BESIX Watpac, Sydney Metro and the ER would work together to immediately determine if the incident is to be notified to the regulatory authorities as per environmental legislative requirements (and the planning approval). If the incident is deemed to be required to be notified, relevant authorities must be notified immediately as required based on the nature of the incident:

- EPA
- DPE
- NSW Health
- SafeWork NSW
- Local council
- Fire and Rescue NSW

If statutory notification is given to the EPA as required under the POEO Act in relation to the CSSI, such notification will also be provided to the Secretary via Sydney Metro for information within 24 hours, in accordance with CoA A44, after the notification was given to the EPA.

8.2.3 Manage the Incident

The Planning & Environment Manager (or delegate) would arrange to attend the site as soon as possible to inspect the environmental incident and advise the Construction Manager on additional management and monitoring measures to be implemented in addition to initial clean up measures previously implemented.

If required, the Planning & Environment Manager would liaise with the Sydney Metro Environmental Manager (or delegate) and the ER to determine response measures for the control and management of the environmental incident.

Any requirements of the Secretary or Relevant Public Authority to address the cause or impact of the incident will be met within the timeframe determined by the Secretary or relevant public authority.

8.2.4 Record the Incident

The Planning & Environment Manager will confirm recorded details of the environmental incident. Incident reports will be provided to Sydney Metro within 24 hours of becoming aware of the incident, including a root cause analysis and lessons learnt from each environmental incident and proposed measures to prevent the occurrence of a similar incident. Incidents will be closed out as quickly as possible and all required actions taken to resolve each environmental incident recorded.

8.3 Emergency Response Plan

The response procedures, emergency contact numbers, responsibilities and required actions for responding to environmental emergencies have been integrated into the Incident Emergency and Crisis

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Management Plan (sub plan to the WH&S Management Plan). Environmental Emergency Management Protocols are outlined below in Table 10:

Table 10 Outline Environmental Emergency Management Protocols

Emergency Management Protocols	
Objective	<p>The Site Manager shall ensure that:</p> <ul style="list-style-type: none"> • A spill kit is always available on site • All reasonable measures are taken to prevent environmental emergencies • The project emergency plan is readily accessible to all site personnel • Emergency plans are part of site inductions
Reporting	All emergency situations to be reported, investigated and recorded
In the event of an environmental incident	<p>Stop work and secure the area if safe to do so</p> <p>Initiate the Project Crisis Checklist</p> <p>Prevent the incident from escalating</p> <p>Notify applicable management, emergency services and authorities</p> <p>Clean up the affected area. Engage specialist help if required</p> <p>Investigate the circumstances</p> <p>Record the incident</p> <p>Implement actions to prevent a recurrence</p> <p>Follow-up to ensure the actions were correctly implemented and effective</p>
Extreme Wet Weather	<p>Alert site personnel and stop all external work on if applicable</p> <p>Check site for plant, equipment and materials on site and secure anything not in immediate use</p> <p>Check water outlets, water catchments, stormwater and sedimentation controls</p>
Unplanned Interruptions to Existing Services	<p>Shut down and isolate plant if safe to do so</p> <p>Immediately notify relevant emergency services and service providers</p> <p>Secure the area and erect hazard markers as required</p> <p>Protect stormwater outlets, implement controls if required.</p> <p>Do not recommence work until approved by the relevant authority</p>
High Wind Warning	<p>Alert outdoor workers of potential dangers and stop all external work</p> <p>Secure any loose object that could become missiles</p> <p>Ensure stockpiles are covered</p>
Dangerous goods spill or leak	<p>In the event of spill:</p> <ul style="list-style-type: none"> • Assess: evaluate the spill to determine if it can be dealt with by an individual, the spill response team or if outside assistance is required • Secure: make the site safe for all personnel and the general public • Contain: spill response equipment such as spill booms, drain covers or bunding can be used to contain the spill. for solids, tarps may be used to cover and prevent dampness to granules or possible dispersion by wind • PPE: identify the liquid and check the MSDS to ascertain the required PPE • Absorb: once the liquid is contained, it will need to be converted to a solid by absorption. Use the appropriate absorbing pads or absorbent to soak up the spill by placing them over the Liquid. remove the saturated pads and replace as necessary. on porous surfaces, sprinkle loose absorbent over the spill and broom through until surface appears dry • Dispose: place the spent absorbent in the disposal bags. correctly dispose of contaminants off site using a licensed contaminated waste disposal contractor • Report: document the incident and include what happened, when it happened, where it happened; and what was done to eliminate or minimise the impact • Restock: order and replace used up PPE and absorption materials
Water Treatment Plant overflow	<p>Sump pumps feeding WTP to be turned off</p> <p>Reinforce containment and sediment controls</p>

Emergency Management Protocols	
	<p>Contact plant operator to respond and repair equipment</p> <p>Contact Planning and Environmental Manager</p> <p>Identify likely cause and location of overflow to identify any obvious mitigations</p> <p>Report: document the incident and include what happened, when it happened, where it happened; and what was done to eliminate or minimise the impact</p>

9. Environmental Management

9.1 BESIX Watpac Environmental Management System

The BESIX Watpac EMS contains guidelines and procedures for managing environmental aspects during construction.

Key forms include the following, which available on request:

- Compliance & Incident Management procedure (C-PRO-023)
- Project Compliance and Incident register (C-FRM-061), and
- Complaint & Incident Report form (C-FRM-018).

The environmental risk assessment will be undertaken as per Section 3 of this CEMP and this replaces BESIX Watpac standard risk assessment form. Forms and register will be updated to align with data fields noted in Section 8.2 above.

Erosion and Sediment Control Guidelines (C-PLA-014) is BESIX Westpac comprehensive guide on controlling sediment with stormwater runoff.

Standard operating procedures are from BESIX Watpac's EMS are listed in Section 9.4 and included in Appendix F.

9.2 Sub Plans

9.2.1 Construction Noise & Vibration Management Plan

BESIX Watpac will undertake noise and vibration monitoring as outlined in the Construction Noise and Vibration Management Sub plan (CNVMP) – included in Appendix C of this CEMP.

9.2.2 Construction Heritage Management Plan

BESIX Watpac will manage potential heritage impacts from construction works as outlined in the Construction Heritage Management Plan (CHMP) – included in Appendix D of this CEMP.

9.2.3 Visual Amenity Management Plan

BESIX Watpac will manage visual amenity impacts from construction works as outlined in the Visual Amenity Management Plan (VAMP) – included in Appendix E of this CEMP.

9.3 Other Environmental Management Categories

9.3.1 Soil and Water Procedure

As required by Table 5 of the Staging Report, soil and water management has been addressed as an activity specific soil and water procedure in Appendix N.

9.3.2 Flooding risk

The change-over of existing stormwater drainage to permanent drainage may require short term temporary stormwater solutions to enable construction activities in construction zones 1 and zone 4.. In accordance with REMM FH1, BESIX Watpac will assess flood risk during construction staging. This would include identification of measures to avoid, where feasible and reasonable, the worsening of existing flooding characteristics up to and including the 100-year annual recurrence interval event in the vicinity of the project. In general, the temporary stormwater arrangement will have the same capacity as the existing stormwater network to avoid it becoming overwhelmed in the event of a high rainfall event.

9.3.3 Air Quality Procedure

As required by the Table 5 of the Staging Report, air quality management has been addressed as activity specific procedure, in Appendix M.

9.3.4 Stockpiles, Contamination & Spoil Management

A key environmental management objective for this site is for 100% of spoil that can be reused to be beneficially reused on site in accordance with REMM WM2. The bulk of the site requires filling with select materials but will offer some opportunities for utilising reusable spoil where it can meet the engineering and environmental reuse criteria. Spoil categorised as unusable or contaminated will be assessed, managed and removed in accordance with the Spoil Management Plan Sampling, Analysis & Quality Plan, and Acid Sulfate Soils will be addressed in accordance with the Acid Sulfate Soils Management Plan (ASSMP). Spoil removed from site will be listed on the waste tracking register.

Temporary spoil stockpiles will be generated from:

- Trenching for the stormwater trunk mains in construction zone 1
- Trenching for cooling water pipes north of the station box
- Excavation of the existing road pavement on Hickson Road zone 6, and
- General civil construction activities.

Specific soil and water management requirements are detailed in the Soil and Water Management Procedure in Appendix N.

9.3.5 Excavation risk to services and buildings

BESIX Watpac have engaged a geotechnical consultant to provide construction phase services such as monitoring of excavations and confirmation of bearing pressure capacities of excavated areas associated with services trenching. This is to ensure that the works are constructed in accordance with the design, and that potential impacts to nearby structures and services are mitigated.

9.3.6 Blasting

No blasting will be undertaken as part of the BR COP activities and this CEMP does not contemplate blasting being undertaken.

9.3.7 In-ground services identification survey

In-ground services have been identified on the design drawings, however there is a risk that the information is incomplete. Prior to any excavation activities in areas with potential live services, BESIX Watpac will undertake Dial before you Dig desktop services search and non-destructive pothole surveys to locate underground utilities. The Construction Manager is responsible for authorising this work and ensuring information is distributed to SM, relevant subcontractors and the project team. Site services information and photo overlay will be displayed in the site office and included in inductions.

9.3.8 Construction Traffic Management

Refer to the Construction Traffic Management Plan (CTMP) which is separate to this CEMP.

9.3.9 Flora and Fauna Management

As required by Table 5 of the Staging Report, Flora and Fauna / Biodiversity management has been addressed as an activity specific procedure in Appendix L.

9.3.10 Carbon & Energy, Material Management, Waste Management and Recycling

In accordance with CoA E106, "waste generated during construction will be dealt with in accordance with the following priorities:

- Waste generation will be avoided and where avoidance is not reasonably practicable, waste generation will be reduced;
- Where avoiding or reducing waste is not possible, waste will be re-used, recycled, or recovered; and
- Where re-using recycling or recovering waste is not possible, waste will be treated or disposed of".

Refer to the Carbon and Energy Management, Materials, and Waste and Recycling sub-plans of the Sustainability Management Plan (SMP) which are separate to this CEMP.

9.4 BESIX Watpac Standard Operating Procedures

BESIX Watpac relevant Standard Operating Procedures (SOPs) listed below in Table 11 are included in Appendix F. Environmental SOPs have been developed to manage each environmental aspect pertinent to this project, as identified in the Environmental Risk Assessment and are described in greater detail in Appendix F.

SOPs document the objective, strategy, action plan, control measures and performance targets for each identified aspect of the Environmental Risk Assessment. Each SOP is outlined separately under sub-headings in the page's hereafter. SOP describe minimum standard requirements and are applied where relevant to the construction activities and environmental aspects. Where more onerous requirements and processes are stipulated in the CEMP and sub plans they supersede these SOP. Where noted actions are deferred to a person or role, the endorsement of this role on environmental matters is always subject to endorsement of the Planning and Environmental Manager.

Table 11 List of standard operating procedures

No	Title	Comment
F.1	Site Accommodation	
F.2	Site Amenities	
F.3	Air quality & Dust	
F.4	Noise	Refer CNVMP
F.5	Vibration	Refer CNVMP
F.6	Water Quality	
F.7	Erosion & sediment control	
F.8	Spill Response and management	
F.11	Weed Control	
F.12	Land Contamination	
F.13	Protection of Cultural Heritage and Aboriginal Artefacts	Refer HMP
F.14	Fire Protection	
F.16	Identification and Protection of existing Utility Services	
F.17	Waste Management	Refer SMP
F.18	Artificial Lighting	Refer VAMP
F.19	Vehicular and pedestrian Traffic Management	Refer CTMP
F.20	Acid Sulphate soils	
F.22	Asbestos	

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No	Title	Comment
F.23	Hazardous substances and dangerous goods	
F.24	Pests animals, vermin and infestation control	
F.25	Site demobilisation	Refer CTMP



Appendix A **BESIX Watpac Environmental Policy**

Environmental Policy - Barangaroo Station BESIX Watpac

BESIX Watpac is committed to protecting the environment. We strive to improve environmental outcomes through the way we work, and the processes we use to review, monitor and learn to improve on. This policy is our ongoing commitment as a company and for the Barangaroo Project to:



- Meet legislative and regulatory requirements.
- Understanding, and manage risks to the environment with the goal of minimising or eliminating those risks.
- Apply management systems that meet the requirements of AS/NZS ISO 14001
- Regular review of the documented Environmental Management System against project environmental objectives and measurable performance targets to facilitate continual improvement.
- Review all environmental incidents to evaluate causes and develop actions to prevent future recurrence.
- Engage and recognise stakeholders and communities' interests on protection of the environment.
- Holding employees and subcontractors to account for proactively meeting their environmental and social sustainability responsibilities.
- Promote environmental awareness among employees and subcontractors, through defined roles and responsibilities and provision of training.
- Monitor, with a view to improve our energy, water, and resources usage.
- Ensure activities are conducted in a manner that promotes reuse and minimisation of waste.
- Transparent reporting on environment and sustainability issues

BESIX Watpac empowers, promotes and supports all personnel in making the necessary decisions to ensure the intent of this policy is upheld.




Giovanni Polimeni
Operations Manager

Date 14/05/21



Appendix B **Compliance Matrix** (REMMs & CoAs)



Caption: One Central Park, Sydney

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Table 12 Conditions of Approval & REMMs Compliance Matrix

ID	Requirement	Reference
Conditions of Approval (CoAs) – SSI 7400 (Mod 8)		
A9	Where the terms of this approval require consultation with identified parties, details of the consultation undertaken, matters raised by the parties, and how the matters were considered must accompany the strategies, plans, programs, reviews, audits, protocols and the like submitted to the Secretary.	Appendix K CEMP
A16	<p>Ancillary facilities that are not identified by description and location in the EIS as amended by the documents listed in A1, must meet the following criteria, unless otherwise approved by the Secretary:</p> <p>(a) the facility is development of a type that would, if it were not for the purpose of the CSSI, otherwise be exempt or complying development; or</p> <p>(b) the facility is located as follows:</p> <ul style="list-style-type: none"> i. at least 50 metres from any waterway unless an erosion and sediment control plan is prepared and implemented so as not to adversely affect water quality in the waterway in accordance with Managing Urban Stormwater series; ii. within or adjacent to land upon which the CSSI is being carried out unless it can be demonstrated that performance criteria established in this approval can be met and that there will be a reduction in impact at other sites and a reduction in the construction program; iii. with ready access to a road network; iv. to prevent heavy vehicles travelling on local streets or through residential areas in order to access the facility, except as identified in the EIS and amended by the documents listed in A1; v. on level land; vi. so as to be in accordance with the Interim Construction Noise Guideline (DECC 2009) or as otherwise agreed in writing with affected landowners and occupiers; vii. so as not to require vegetation clearing beyond the extent of clearing approved under other terms of this approval except as approved by the ER as minor clearing; viii. so as not to have any impact on heritage items (including areas of archaeological sensitivity) beyond the impacts identified, assessed and approved under other terms of this approval; ix. so as not to unreasonably interfere with lawful uses of adjacent properties that are being carried out at the date upon which construction or establishment of the facility is to commence; x. to enable operation of the ancillary facility during flood events and to avoid or minimise, to the greatest extent practicable, adverse flood impacts on the surrounding environment and other properties and infrastructure; and xi. so as to have sufficient area for the storage of raw materials to minimise, to the greatest extent practicable, the number of deliveries required outside standard construction hours. 	Section 1.2.3
A17	<p>Before establishment of any ancillary facility that satisfies the criteria in Condition A16, the Proponent must prepare an Ancillary Facilities Management Plan which outlines the environmental management practices and procedures to be implemented for the establishment and operation of the ancillary facility. The Ancillary Facilities Management Plan must be prepared in consultation with the EPA and the relevant council(s) and submitted to the Secretary and EPA for information one month before installation of the relevant ancillary facilities. The Ancillary Facilities Management Plan must detail the management of the ancillary facilities and include:</p> <p>(a) a description of activities to be undertaken during construction (including scheduling of construction);</p> <p>(b) a program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of construction of the CSSI; and</p> <p>(c) details of how the activities described in subsection (a) of this condition will be carried out to:</p> <ul style="list-style-type: none"> i. meet the performance outcomes stated in the EIS as amended by the documents listed in A1; and ii. manage the risks identified in the risk analysis undertaken in subsection (b) of this condition. 	Section 1.2.3
A18	Minor ancillary facilities comprising lunch sheds, office sheds, and portable toilet facilities, or the like, that are not identified in the EIS as amended by the documents listed in A1 and which do not satisfy the criteria set out in Condition	Section 1.2.3

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ID	Requirement	Reference
	<p>A16 of this approval must satisfy the following criteria:</p> <ul style="list-style-type: none"> (a) have no greater environmental and amenity impacts than those that can be managed through the implementation of environmental measures detailed in the CEMP required under Condition C1 of this approval; and (b) have been assessed by the ER to have: <ul style="list-style-type: none"> i. minimal amenity impacts to surrounding residences and businesses, after consideration of matters such as compliance with the Interim Construction Noise Guideline (DECC 2009), traffic and access impacts, dust and odour impacts, and visual (including light spill) impacts; ii. minimal environmental impact with respect to waste management and flooding; and iii. no impacts on biodiversity, soil and water, and heritage items beyond those already approved under other terms of this approval. 	
A 22	<p>A suitably qualified and experienced Environmental Representative (ER) who is independent of the design and construction personnel must be nominated by the Proponent, approved by the Secretary and engaged for the duration of construction of the CSSI. Additional ERs may be engaged for the purpose of this condition in which case the obligations to be carried out by an ER under the terms of this approval may be satisfied by any ER that is approved by the Secretary. The details of nominated ER(s) must be submitted to the Secretary for approval no later than one month before the commencement of works, or within another timeframe agreed with the Secretary.</p>	Section 5.1.9
A23	<p>Works must not commence until an ER nominated under Condition A22 of this approval in response of such work has been approved by the Secretary.</p>	Section 5.1.9
A24	<p>From commencement of construction until completion of construction, the approved ER must:</p> <ul style="list-style-type: none"> (a) receive and respond to communications from the Secretary in relation to the environmental performance of the CSSI; (b) consider and inform the Secretary on matters specified in the terms of this approval; (c) consider and recommend any improvements that may be made to work practices to avoid or minimise adverse impact to the environment and to the community; (d) review documents identified in Conditions C1, C3 and C9 and any other documents that are identified by the Secretary, to ensure they are consistent with requirements in or under this approval and if so: <ul style="list-style-type: none"> i. make a written statement to this effect before submission of such documents to the Secretary (if those documents are required to be approved by the Secretary), or ii. make a written statement to this effect before the implementation of such documents (if those documents are required to be submitted to the Secretary for information or are not required to be submitted to the Secretary); (e) regularly monitor the implementation of environmental management related documents to ensure implementation is being carried out in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of incidents in accordance with Condition A41 of this approval; (g) as may be requested by the Secretary, help plan, attend or undertake Department audits of the CSSI, briefings, and site visits; (h) if conflict arises between the Proponent and the community in relation to the environmental performance of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; (i) review any draft consistency assessment that may be carried out by the Proponent, and provide advice on any additional mitigation measures required to minimise the impact of the work; (j) consider any minor amendments to be made to the documents listed in Conditions C1, C3 and C9 and any document that requires the approval of the Secretary (excluding noise and vibration documents) that comprise updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the documents listed in Conditions C1, C3 and C9 or other documents approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; (k) assess the impacts of minor ancillary facilities as required by Condition A18 of this approval; and (l) prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Environmental Representative Report detailing the ER's 	Section 5.1.9

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ID	Requirement	Reference
	actions and decisions on matters for which the ER was responsible in the preceding month (or other timeframe agreed with the Secretary). The Environmental Representative Report must be submitted within seven (7) days following the end of each month for the duration of works and construction of the CSSI, or as otherwise agreed with the Secretary.	
	ACOUSTICS ADVISER	
A25	<p>A suitably qualified and experienced Acoustics Advisor (AA), who is independent of the design and construction personnel, must be nominated by the Proponent and engaged for the duration of construction and for no less than six (6) months following operation of the CSSI.</p> <p>The details of the nominated AA must be submitted to the Secretary for approval no later than one (1) month before commencement of works, or within another timeframe as agreed with the Secretary. The Proponent may nominate additional suitably qualified and experienced persons to assist the lead Acoustics Advisor for the Secretary's approval.</p> <p>The Proponent must cooperate with the AA by:</p> <ul style="list-style-type: none"> (a) providing access to noise and vibration monitoring activities as they take place; (b) providing for review of noise and vibration plans, assessments, monitoring reports, data and analyses undertaken; and (c) considering any recommendations to improve practices and demonstrating, to the satisfaction of the AA, why any recommendation is not adopted. 	Section 5.1.10
A27	<p>The approved AA must:</p> <ul style="list-style-type: none"> (a) receive and respond to communication from the Secretary in relation to the performance of the CSSI in relation to noise and vibration; (b) consider and inform the Secretary on matters specified in the terms of this approval relating to noise and vibration; (c) consider and recommend, to the Proponent, improvements that may be made to work practices to avoid or minimise adverse noise and vibration impacts; (d) review all noise and vibration documents required to be prepared under the terms of this approval and, should they be consistent with the terms of this approval, endorse them before submission to the Secretary (if required to be submitted to the Secretary) or before implementation (if not required to be submitted to the Secretary); (e) regularly monitor the implementation of all noise and vibration documents required to be prepared under the terms of this approval to ensure implementation is in accordance with what is stated in the document and the terms of this approval; (f) review the Proponent's notification of noise and vibration incidents in accordance with Condition A41 of this approval; (g) in conjunction with the ER (where required), the AA must: <ul style="list-style-type: none"> i. consider requests for out of hours construction activities and determine whether to endorse the proposed activities in accordance with Condition E47; ii. as may be requested by the Secretary or Complaints Mediator, help plan, attend or undertake audits of noise and vibration management of the CSSI including briefings, and site visits; iii. if conflict arises between the Proponent and the community in relation to the noise and vibration performance during construction of the CSSI, follow the procedure in the Community Communication Strategy approved under Condition B3 of this approval to attempt to resolve the conflict, and if it cannot be resolved, notify the Secretary; iv. consider relevant minor amendments made to any noise and vibration document approved by the Secretary that require updating or are of an administrative or minor nature, and are consistent with the terms of this approval and the document approved by the Secretary and, if satisfied such amendment is necessary, approve the amendment. This does not include any modifications to the terms of this approval; v. assess the noise impacts of minor ancillary facilities as required by Condition A18 of this approval; and vi. prepare and submit to the Secretary and other relevant regulatory agencies, for information, a monthly Noise and Vibration Report detailing the AAs actions and decisions on matters for which the AA was responsible in the preceding month (or other timeframe agreed with the Secretary). The Noise and Vibration Report must be submitted within seven (7) days following the end of each month for the duration of construction of the CSSI, or as otherwise agreed with the Secretary. 	Section 5.1.10

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ID	Requirement	Reference
A28	A Compliance Tracking Program to monitor compliance with the terms of this approval must be prepared, taking into consideration any staging of the CSSI that is proposed in a Staging Report submitted in accordance with Condition A12 and Condition A13 of this approval.	Section 6.1.3
A29	The Compliance Tracking Program must be endorsed by the ER then submitted to the Secretary for information before the commencement of works or within another timeframe agreed with the Secretary.	Completed by Sydney Metro
A30	The Compliance Tracking Program in the form required under Condition A28 of this approval must be implemented for the duration of construction and for a minimum of one (1) year following commencement of operation, or for a longer period as determined by the Secretary based on the outcomes of independent environmental audits, Environmental Representative Reports and regular compliance reviews submitted through Compliance Reports. If staged operation is proposed, or operation is commenced of part of the CSSI, the Compliance Tracking Program must be implemented for the relevant period for each stage or part of the CSSI.	Section 6.3.2
A31	A Pre-Construction Compliance Report must be prepared and submitted to the Secretary for information no later than one month before the commencement of construction or within another timeframe agreed with the Secretary.	Section 6.3.2
A32	The Pre-Construction Compliance Report must include: (a) details of how the terms of this approval that must be addressed before the commencement of construction have been complied with; and (b) the commencement date for construction.	Section 6.3.2
A33	Construction must not commence until the Pre-Construction Compliance Report has been submitted to the Secretary.	Section 6.3.2
A34	Construction Compliance Reports must be prepared and submitted to the Secretary for information every six (6) months from the date of the commencement of construction or within another timeframe agreed with the Secretary, for the duration of construction. The Construction Compliance Reports must include: (a) a results summary and analysis of environmental monitoring; (b) the number of any complaints received, including a summary of main areas of complaint, action taken, response given and proposed strategies for reducing the recurrence of such complaints; (c) details of any review of, and minor amendments made to, the CEMP as a result of construction carried out during the reporting period; (d) a register of any consistency assessments undertaken and their status; (e) results of any independent environmental audits and details of any actions taken in response to the recommendations of an audit; (f) a summary of all incidents notified in accordance with Condition A41 and Condition A44 of this approval; and (g) any other matter relating to compliance with the terms of this approval or as requested by the Secretary.	Sydney Metro have overall responsibility for this CoA. BESIX Watpac will provide Sydney Metro with all documentation relating to the Barangaroo Station construction activities to enable Sydney Metro to comply with this CoA.
A37	An Environmental Audit Program for independent annual environmental auditing against the terms of this approval must be prepared in accordance with AS/NZS ISO 19011:2014 - Guidelines for Auditing Management Systems and submitted to the Secretary for information no later than one month before the commencement of construction or within another timeframe agreed with the Secretary.	Section 6.1.3
A38	The Environmental Audit Program, as submitted to the Secretary, must be implemented for the duration of construction and operation.	Section 6.1.3
A39	All independent environmental audits of the CSSI conducted under Conditions A37 and A38 must be conducted by a suitably qualified, experienced and independent team of experts in auditing and be documented in an Environmental Audit Report which: (a) assesses the environmental performance of the CSSI, and its effects on the surrounding environment; (b) assesses whether the project is complying with the terms of this approval;	

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	(c) reviews the adequacy of any document required under this approval; and (d) recommends measures or actions to improve the environmental performance of the CSSI, and improvements to any document required under this approval.	
A40	The Proponent must submit a copy of the Environmental Audit Report to the Secretary with a response to any recommendations contained in the audit report within six (6) weeks of completing the audit, or within another timeframe agreed with the Secretary.	Section 6.1.3
A41	The Secretary must be notified as soon as possible and in any event within 24 hours of any incident.	Section 8.2
A42	Notification of an incident under Condition A41 of this approval must include the time and date of the incident, details of the incident and must identify any non-compliance with this approval.	Section 8.2
A43	Any requirements of the Secretary or Relevant Public Authority (as determined by the Secretary) to address the cause or impact of an incident reported in accordance with Condition A41 of this approval, must be met within the timeframe determined by the Secretary or relevant public authority.	Section 8.2
A44	If statutory notification is given to the EPA as required under the POEO Act in relation to the CSSI, such notification must also be provided to the Secretary for information within 24 hours after the notification was given to the EPA.	Section 8.2
B6	A Complaints Management System must be prepared before the commencement of any works in respect of the CSSI and be implemented and maintained for the duration of works and for a minimum for 12 months following completion of construction of the CSSI.	CCS & BMP
B7	The Complaints Management System must include a Complaints Register to be maintained recording information on all complaints received about the CSSI during the carrying out of any works associated with the CSSI and for a minimum of 12 months following the completion of construction. The Complaints Register must record the: (a) number of complaints received; (b) number of people affected in relation to a complaint; and (c) nature of the complaint and means by which the complaint was addressed and whether resolution was reached, with or without mediation.	CCS & BMP
B9	The following facilities must be available within one (1) month from the date of this approval and for 12 months following the completion of construction and appropriately broadcast to collect community enquiries and complaints: (a) a 24 hour telephone number for the registration of complaints and enquiries about the CSSI; (b) a postal address to which written complaints and enquires may be sent; (c) an email address to which electronic complaints and enquiries may be transmitted; and (d) place-based community manager for each of the station locations available to meet with community members on request.	CCS & BMP
B10	The telephone number, postal address and email address required under Condition B9 of this approval must be published in a newspaper circulating in the local area and on site hoarding at each construction site before commencement of construction and published in the same way again before commencement of operation. This information must also be provided on the website required under Condition B15 of this approval.	CCS & BMP
B11	A Community Complaints Mediator that is independent of the design and construction personnel must be nominated by the Proponent, approved by the Secretary and engaged during all works associated with the CSSI. The nominated Community Complaints Mediator must be submitted to the Secretary for approval within one month of the date of this approval or within another timeframe agreed with the Secretary.	CCS & BMP
B12	The role of the Community Complaints Mediator must address any complaint where a member of the public is not satisfied by the Proponent's response. Any member of the public that has lodged a complaint which is registered in the Complaints Management System identified in Condition B6 may ask the	CCS & BMP

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ID	Requirement	Reference
	Community Complaints Mediator to review the Proponent's response. The application must be submitted in writing and the Community Complaints Mediator must respond within 28 days of the request being made or other specified timeframe agreed between the Community Complaints Mediator and the member of the public.	
B13	<p>The Community Complaints Mediator will:</p> <p>(a) review the Proponent's unresolved disputes between the project and members of the public if the procedures and mechanisms under Condition B2(g)(iii) do not satisfactorily address complaints; and</p> <p>(b) make recommendations to the Proponent to satisfactorily address complaints, resolve disputes or mitigate against the occurrence of future complaints or disputes.</p>	CCS & BMP
B14	The Community Complaints Mediator will not act before the Proponent has provided an initial response to a complaint and will not consider issues such as property acquisition where other dispute processes are provided for in this approval, or clear government policy and resolution processes are available, or matters which are not within the scope of the CSSI.	CCS & BMP
B15	<p>A website providing information in relation to the CSSI must be established before commencement of works and maintained for the duration of construction, and for a minimum of 12 months following the completion of construction or other timeframe as agreed with the Secretary. The following up-to-date information (excluding confidential, private and commercial information or other documents as agreed to by the Secretary) must be published prior to the relevant works commencing, or in the case of documents prepared in accordance with E66 and E67 when finalised in accordance with the requirements of this approval, and maintained on the website or dedicated pages:</p> <p>(a) information on the current implementation status of the CSSI;</p> <p>(b) a copy of the documents listed in Condition A1 and Condition A2 of this approval, and any documentation relating to any modifications made to the CSSI or the terms of this approval;</p> <p>(c) a copy of this approval in its original form, a current consolidated copy of this approval (that is, including any approved modifications to its terms), and copies of any approval granted by the Minister to a modification of the terms of this approval;</p> <p>(d) a copy of any Environment Protection Licence obtained in relation to the CSSI or link to any existing Environment Protection Licence applied to the CSSI; and</p> <p>(e) a current copy of each document required under the terms of this approval must be published within one week of its endorsement / approval or before the commencement of any works to which they relate or before their implementation as the case may be.</p> <p><i>Note: Environment Protection Licences relevant to each stage of the project need to be clearly differentiated to identify how and where they specifically apply.</i></p>	Refer CCSBMP
C1	A Construction Environmental Management Plan (CEMP) must be prepared in accordance with the Construction Environmental Management Framework (CEMF) included in the PIR and the Department's <i>Guideline for the Preparation of Environmental Management Plans</i> to detail how the performance outcomes, commitments and mitigation measures specified in Chapter 11 of the PIR, as amended by the documents listed in A1 , will be implemented and achieved during construction.	Appendix H
C2	<p>The CEMP must provide:</p> <p>(a) a description of activities to be undertaken during construction (including the scheduling of construction);</p> <p>(b) details of environmental policies, guidelines and principles to be followed in the construction of the CSSI;</p> <p>(c) a schedule for compliance auditing;</p> <p>(d) a program for ongoing analysis of the key environmental risks arising from the activities described in subsection (a) of this condition, including an initial risk assessment undertaken before the commencement of construction of the</p>	<p>(a) Section 1.2.5</p> <p>(b) Section 1.9,</p> <p>Appendix A, Section 2.3</p> <p>(c) Section 6.1</p> <p>(d) Section 3</p> <p>Appendix I</p> <p>(e) Section</p> <p>(f) Section 6.1</p>

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	<p>CSSI;</p> <p>(e) details of how the activities described in subsection (a) of this condition will be carried out to:</p> <p>i. meet the performance outcomes stated in the EIS as amended by the PIR; and</p> <p>ii. manage the risks identified in the risk analysis undertaken in subsection (d) of this condition;</p> <p>(f) an inspection program detailing the activities to be inspected and frequency of inspections;</p> <p>(g) a protocol for managing and reporting any:</p> <p>i. incidents; and</p> <p>ii. non-compliances with this approval and with statutory requirements;</p> <p>(h) procedures for rectifying any non-compliance with this approval identified during compliance auditing, incident management or at any time during construction;</p> <p>(i) a list of all the CEMP sub-plans required in respect of construction, as set out in Condition C3. Where staged construction of the CSSI is proposed, the CEMP must also identify which CEMP sub-plan applies to each of the proposed stages of construction;</p> <p>(j) a description of the roles and environmental responsibilities for relevant employees and their relationship with the ER;</p> <p>(k) for training and induction for employees, including contractors and sub-contractors, in relation to environmental and compliance obligations under the terms of this approval;</p> <p>(l) for periodic review and update of the CEMP and all associated plans and programs.</p>	<p>(g) Section 8</p> <p>(h) Section 6.2</p> <p>(i) Section 1.1.3</p> <p>(j) Section 5.1</p> <p>(k) Section 5.2</p> <p>(l) Section 1.10</p>
C3	<p>The following CEMP sub-plans must be prepared in consultation with the relevant government agencies identified for each CEMP sub-plan and be consistent with the CEMP and CEMP referred to in Condition C1.</p> <p>(a) Noise and Vibration (Council to be consulted)</p> <p>(b) Biodiversity (OEH and Council to be consulted)</p> <p>(c) Air Quality (n/a consultation)</p> <p>(d) Soil and Water (DPI Water, Council, OEH, SES, NSW Fire and Rescue to be consulted)</p> <p>(e) Groundwater (DPI Water)</p> <p>(f) Blasting</p> <p>(g) Heritage (Heritage Council and Council to be consulted)</p> <p>(h) Construction Traffic</p>	Appendix K
C4	<p>The CEMP sub-plans must state how:</p> <p>(a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1 will be achieved;</p> <p>(b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented;</p> <p>(c) the relevant terms of this approval will be complied with; and</p> <p>(d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.</p>	This Plan
C5	<p>The CEMP sub-plans must be developed in consultation with relevant government agencies. Where an agency(ies) request(s) is not included, the Proponent must provide the Secretary justification as to why. Details of all information requested by an agency to be included in a CEMP sub-plan as a result of consultation and copies of all correspondence from those agencies, must be provided with the relevant CEMP sub-plan.</p>	This Plan
C6	<p>Any of the CEMP sub-plans may be submitted to the Secretary along with, or subsequent to, the submission of the CEMP but in any event, no later than one (1) month before commencement of construction</p>	This Plan
C7	<p>The CEMP must be endorsed by the ER and then submitted to the Secretary for approval no later than one (1) month before the commencement of construction or within another timeframe agreed with the Secretary.</p>	Section 1.6
C8	<p>Construction must not commence until the CEMP and all CEMP sub-plans have been approved by the Secretary. The CEMP and CEMP sub-plans, as approved by the Secretary, including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration sub-plan), must be</p>	Section 1.6

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ID	Requirement	Reference
	implemented for the duration of construction. Where the CSSI is being staged, construction of that stage is not to commence until the relevant CEMP and sub-plans have been approved by the Secretary.	
	CONSTRUCTION MONITORING PROGRAMS	
C13	The Construction Monitoring Programs must be endorsed by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program) and then submitted to the Secretary for approval at least one (1) month before commencement of construction or within another timeframe agreed with the Secretary.	Refer CNVMP
C 14	Construction must not commence until the Secretary has approved all of the required Construction Monitoring Programs, and all relevant baseline data for the specific construction activity has been collected.	Sydney Metro will notify BESIX Watpac once approval of the Secretary granted
C15	The Construction Monitoring Programs , as approved by the Secretary including any minor amendments approved by the ER (or AA in regards to the Noise and Vibration Construction Monitoring Program), must be implemented for the duration of construction and for any longer period set out in the monitoring program or specified by the Secretary, whichever is the greater.	Refer CNVMP
C16	The results of the Construction Monitoring Programs must be submitted to the Secretary for information, and relevant regulatory agencies, for information in the form of a Construction Monitoring Report at the frequency identified in the relevant Construction Monitoring Program.	Refer CNVMP
C17	Where a relevant CEMP sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP sub-plan.	Refer CNVMP
E6	<p>The CSSI must be designed to retain as many trees as possible and provide replacement trees such that there a net increase in the number of trees. The Proponent must commission an independent, experienced and suitably qualified arborist to prepare a comprehensive Tree Report before removing any trees as detailed in the EIS, as amended by the documents listed in A1. The Tree Report must include:</p> <p>(a) a description of the conditions of the tree(s) and its amenity and visual value;</p> <p>(b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and</p> <p>(c) measures to avoid tree removal, minimise damage to, and ensure the health and stability of those trees to be retained and protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, materials storage and protection of public utilities.</p> <p>In the event that tree removal cannot be avoided, then replacement trees are to be planted within, or in close proximity to the CSSI or other location in consultation with the Relevant Councils and agreed by the Secretary. The size of the replacement trees will be determined in consultation with the relevant Council. A copy of the Tree Report must be submitted to the Secretary before the removal, damage and/or pruning of any trees, including those affected by the site establishment works. All recommendations of the Tree Report must be implemented by the Proponent, unless otherwise agreed by the Secretary.</p> <p>The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where tree removal and/or pruning is proposed.</p>	Appendix L
E36	Construction, except as allowed by Condition E48 (excluding cut and cover tunnelling), must only be undertaken during the following standard construction hours:	Refer CNVMP

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ID	Requirement	Reference
	(a) 7:00am to 6:00pm Mondays to Fridays, inclusive; (b) 8:00am to 6:00pm Saturdays; and (c) at no time on Sundays or public holidays	
E44	<p>Notwithstanding Condition E36 construction associated with the CSSI may be undertaken outside the hours specified under those conditions in the following circumstances:</p> <p>(a) for the delivery of materials required by the NSW Police Force or other authority for safety reasons; or (b) where it is required in an emergency to avoid injury or the loss of life, to avoid damage or loss of property or to prevent environmental harm; or (c) where different construction hours are permitted or required under an EPL in force in respect of the construction; or (d) construction that causes LAeq(15 minute) noise levels: i. no more than 5 dB(A) above the rating background level at any residence in accordance with the Interim Construction Noise Guideline (DECC, 2009), and ii. no more than the noise management levels specified in Table 3 of the Interim Construction Noise Guideline (DECC, 2009) at other sensitive land uses, and iii. continuous or impulsive vibration values, measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.2 of Assessing Vibration: a technical guideline (DEC, 2006), and intermittent vibration values measured at the most affected residence are no more than those for human exposure to vibration, specified in Table 2.4 of Assessing Vibration: a technical guideline (DEC, 2006); or (e) where a negotiated agreement has been reached with a substantial majority of sensitive receivers who are within the vicinity of and may be potentially affected by the particular construction, and the noise management levels and/or limits for ground-borne noise and vibration (human comfort) cannot be achieved. All agreements must be in writing and a copy forwarded to the Secretary at least one (1) week before the works commencing; or (f) construction approved through an Out of Hours Work Protocol referred to in Condition E47, provided the relevant council, local residents and other affected stakeholders and sensitive receivers are informed of the timing and duration at least five (5) days and no more than 14 days before the commencement of the works.</p> <p><i>Note: This condition does not apply where an EPL is in force in respect of the construction.</i></p>	Refer CNVMP
E58	The CSSI must be designed and constructed with the objective of minimising impacts to, and interference with, third party property and infrastructure, and that such infrastructure and property is protected during construction.	This CEMP, CNVMP, HMP
E59	Before commencement of construction, all property owners of buildings identified as being at risk of damage must be offered a building condition survey. Where an offer is accepted a structural engineer must undertake the survey. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed, and if agreed by the owner, the Relevant Council within three (3) weeks of completing the Survey Report and no later than one (1) month before the commencement of construction.	Section 4.5
E60	Within three (3) months of the completion of construction, all property owners of buildings for which a building condition survey was carried out in accordance with Condition E59 must be offered a second building condition survey. Where an offer is accepted, building condition surveys must be undertaken by a structural engineer. The results of the surveys must be documented in a Building Condition Survey Report for each building surveyed. Copies of Building Condition Survey Reports must be provided to the owners of the buildings surveyed within one (1) month of the survey being completed.	Section 4.5
E61	The Proponent must install appropriate equipment to monitor areas in proximity to construction sites and the tunnel route during construction and for a period of not less than six (6) months after settlement has stabilised with particular reference to risk areas identified in the building and infrastructure condition surveys required by conditions E59 and E60 and/or the geotechnical analysis as required. If monitoring during construction indicates exceedance of the criteria, then all construction affecting settlement must	Section 6.4

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ID	Requirement	Reference
	cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings.	
E66	A Site Contamination Report, documenting the outcomes of Phase 1 and Phase 2 contamination assessments of land upon which the CSSI is to be carried out, that is suspected to be, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the Contaminated Land Management Act 1997 (NSW).	Section 9.3.4
E67	If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with	Section 9.3.4
E68	A copy of the Site Audit Statement and Site Audit Report must be submitted to the Secretary and Council for information no later than one (1) month before the commencement of operation.	Section 9.3.4
E69	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction.	Section 9.3.4
E70	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	4
E106	Waste generated during construction and operation is to be dealt with in accordance with the following priorities: (a) waste generation is to be avoided and where avoidance is not reasonably practicable, waste generation is to be reduced; (b) where avoiding or reducing waste is not possible, waste is to be re-used, recycled, or recovered; and (c) where re-using, recycling or recovering waste is not possible, waste is to be treated or disposed of.	Section 9.3.10 Refer SMP
E107	The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Sections 1.2.8, 4.4, 6.1 and 6.4 and Refer SWMP
Revised Environmental Mitigation Measures (REMMs)		
SWC 1	Updated desktop contamination assessments would be carried out for Chatswood dive site, Victoria Cross Station, Artarmon substation , Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station and the Sydenham Maintenance Centre site within surface track works south . If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out. Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdensville Oval. In the event a Remediation Action Plan is required, these would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged.	Section 9.3.4
SWC 2	Prior to ground disturbance in high probability acid sulphate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, Sydenham Station and the surface track works south , testing would be carried out to determine the presence of acid sulphate soils. If acid sulphate soils are	Section 9.3.4

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	encountered, they would be managed in accordance with the Acid Sulphate Soil Manual (Acid Sulphate Soil Management Advisory Committee, 1998).	
SWC 3	Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event.	Section 9.3.1
SWC 4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project.	Section 2.2, Section 6.1
SO2	Specific consultation would be carried out with sensitive community facilities (including aged care, child care centres, educational institutions and places of worship) potentially impacted during construction. Consultation would aim to identify and develop measures to manage the specific construction impacts for individual sensitive community facilities.	Refer CCSBMP
B3	The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.	Section 9.3.8
FH1	Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, not worsen existing flooding characteristics up to and including the 100-year annual recurrence interval event in the vicinity of the project. Not worsen is defined as: › A maximum increase flood levels of 50mm in a 100-year Average Recurrence interval flood event › A maximum increase in time of inundation of one hour in a 100 year Average Recurrence interval flood event › No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence interval flood event.	Section 9.3.2
FH9	<p>Design of the project would be reviewed to, where feasible and reasonable, not worsen existing flooding characteristics up to and including the 100 year annual recurrence interval event in the vicinity of the project. Detailed flood modelling would consider:</p> <ul style="list-style-type: none"> • Potential changes to flood prone land and flood levels • Potential changes to overland flow paths • Redistribution of surface runoff as a result of project infrastructure • Behaviour of existing stormwater runoff • Potential changes required to flood evacuation routes, flood warning systems and signage. <p>Flood modelling to support detailed design would be carried out in accordance with the following guidelines:</p> <ul style="list-style-type: none"> • Floodplain Development Manual (NSW Government, 2005b) • Floodplain Risk Management Guideline: Practical Consideration of Climate Change (DECC, 2007b) • Floodplain Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Flood Risk Assessments (DECCW, 2010c) • New guideline and changes to section 117 direction and EP&A Regulation on flood prone land, Planning Circular PS 07-003 (NSW Department of Planning, 2007). <p>Flood modelling and consideration of mitigation measures would be carried out in consultation with the relevant local councils, the Office of Environment and Heritage and the State Emergency Services.</p> <p>Not worsen is defined as:</p> <ul style="list-style-type: none"> • A maximum increase flood levels of 50mm in a 100 year Average Recurrence interval flood event • A maximum increase in time of inundation of one hour in a 100 year Average Recurrence interval flood event 	Sydney Metro have responsibility for the design of the Barangaroo Metro Station. BESIX Watpac to implement the design under the COP.

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ID	Requirement	Reference
	<ul style="list-style-type: none"> No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence interval flood event 	
	<p>During detailed design, project infrastructure would be designed to meet the following criteria, where feasible and reasonable:</p> <p>Locate station and service entrances to underground stations above the greater of the 100 year annual recurrence interval flood level plus 500mm or the probable maximum flood level</p> <p>Provide site surface grading and drainage collection systems at the Chatswood and Marrickville dive structures to manage the risk of local catchment and overland flooding for events up to and including the probable maximum flood event</p> <p>Locate aboveground rail system facilities (such as traction power supply sub stations) at least above the 100 year annual recurrence interval flood level plus 500mm</p> <p>Protect facilities that are identified as being critical to emergency response operations from the probable maximum flood level</p>	Sydney Metro have responsibility for the design of the Barangaroo Metro Station. BESIX Watpac to implement the design under the COP.
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011).	Section 4.6
HR2	Dial before you dig searches and non-destructive digging would be carried out to identify the presence of underground utilities.	Section 9.3.7
WM1	All waste would be assessed, classified, managed and disposed of in accordance with the <i>NSW Waste Classification Guidelines</i>	Section 9.3.4 Refer to the Sustainability Management Plan
WM2	100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.	Section 9.3.4
WM3	A recycling target of at least 90 per cent would be adopted for the project	Refer to the Sustainability Management Plan
WM4	Construction waste would be minimised by accurately calculating materials brought to the site and limiting materials packaging.	Refer to the Materials Management sub-plan




Appendix C Noise and Vibration Management Plan



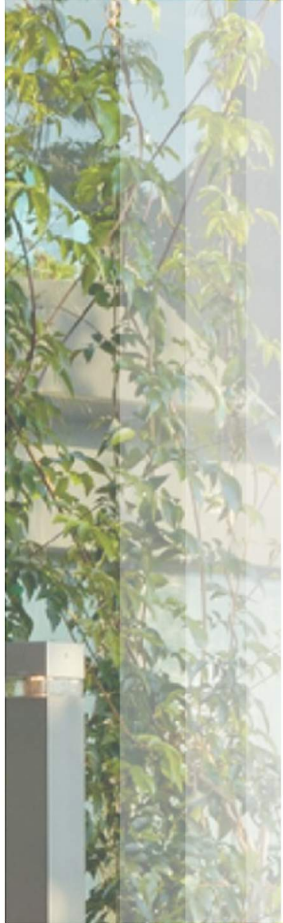
Appendix D Heritage Management Plan



Appendix E **Visual Amenity Management Plan**



Caption: One Central Park, Sydney



Appendix F

BW SOP



Caption: One Central Park, Sydney

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Construction Environmental Management Plan

Standard Operating Procedures for Environmental Risks

Environmental Standard Operating Procedures (SOPs) have been developed to manage each environmental aspect pertinent to this project, as identified in the Environmental Risk Assessment.

These SOPs document the objective, strategy, action plan, control measures and performance targets for each identified aspect. Each SOP is outlined separately under sub-headings in the page's hereafter. SOP describe minimum standard requirements and are applied where relevant to the construction activities and environmental aspects. Where more onerous requirements and processes are be stipulated in the CEMP and sub plans they supersede these SOP. Where noted actions are deferred to a person or role, the endorsement of this role on environmental matters is always subject to endorsement of the Planning and Environmental Manager.

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Site Accommodation	
Standard Environmental Protocol F.1	
Objective	Control, minimise or avoid contamination or spoiling of areas in the establishment, operation and disestablishment of temporary site accommodation facilities.
Management Strategy	<p>Establish temporary site offices, amenities and ablution facilities, including provision for sanitary waste, in accordance with the requirements of the relevant local authority, all relevant Acts and Regulations and industry best practice.</p> <p>Remove all temporary buildings and facilities from site when no longer needed and make good all disturbed areas, including landscaping where required.</p>
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• Site offices, amenities and ablution facilities are located and operated in such a manner as not to cause environmental concern• Site offices, hoarding, crossovers and fencing complies with the approved Site Plan or approved revision• Consider materials laydown area(s). Prioritise areas that will not have a deleterious effect on vegetation or stabilisation; this includes frequency of vehicle access• Spill kits should be nearby to materials laydown areas and plant access areas• Adequate firefighting equipment is provided and maintained for the works• Required permits and approvals are received prior to commencing works• Install automatic shut-off taps to water points and utilise low voltage luminaries to site facilities• No trees or vegetation is damaged or removed for site accommodation facilities. Adequate tree protection will be provided• Construction routes are cleaned regularly at weekly intervals or as required• Efficient use of energy needed for lighting, space and water heating, and equipment in the site facilities, including offices, cafeteria and washroom facilities, toilets and any other temporary accommodation and storage areas on site.
Performance Indicators	<p>Appropriate location and operation of all facilities.</p> <p>Site reinstated upon completion of project</p>
Reference	<ul style="list-style-type: none">• Approved Site Plan• Australian Standard 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites• Development Approval Conditions (extract as required)• Environmental Planning and Assessment Act 1979 (NSW)• Local Land Services Act 2013 (NSW)• Protection of the Environment Operations (Noise Control) Regulation 2008 (NSW)

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Site Amenities	
Standard Environmental Protocol F.2	
Objective	Maintain hygiene and reduce nuisance created by site accommodation.
Management Strategy	Keep site clean and tidy Monitor area
Action	<p>Project Manager shall ensure that:</p> <p><u>Ablution</u></p> <ul style="list-style-type: none">• Septic waste issues from overflowing portable toilets and unaccounted sewerage pipe burst is avoided.• Adequate lavatory systems are provided within reasonable proximity of working areas• Septic waste removal service is scheduled• Toilet facilities are well maintained• Clean up procedures are included in induction• There is bunding around temporary septic systems• There is a suitable and adequate amount of signage• Site induction demonstrate proper site behaviour <p><u>Waste</u></p> <ul style="list-style-type: none">• Paper waste from site office is collected in paper recycling bins and regularly collected.• Cardboard waste bin is provided on site.• All putrescible waste is stored in secure containers until removal and disposal off site. weekly• A daily 'sweep' of the entire area is done to remove any stray/windblown litter.• Designate specific areas on site for the temporary management of waste, i.e. general domestic waste, works waste and contaminated waste• Waste streams will be segregated to enhance recycling opportunities where practicable i.e. general domestic waste, works waste and contaminated waste• All domestic and industrial waste to be disposed of in dedicated industrial bins• Waste bin lids to be closed at all times to avoid, littering, access by birds and scavenging by vermin, birds or native wildlife• Waste oils to be recycled where practicable• No waste will be burnt on site.
Performance Indicators	No odour or vermin present

BARANGAROO STATION

Construction Environmental Management Plan

Air Quality (Including Dust)	
Standard Environmental Protocol F.3	
Objective	Avoid, control or minimise contaminant emissions to the atmosphere caused by rising dust, vehicle/plant emissions, noxious fumes/odours, or paint spraying activities.
Management Strategy	Site environmental induction to address the issue of air quality and protective measures to prevent avoidable discharge of contaminant to the atmosphere Implement measures for control and suppression of dust
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• Deposition over an averaging period not to exceed 4g/m² /month. Visual observance of dust is low, 20km visibility is maintained• Work areas kept free of dust• Equipment to cut and grind concrete should be fitted with effective dust extractors• Cutting areas will be provided that are isolated dust extraction areas; all concrete cutting including blockwork and wall sheeting should be done in these areas• Concrete grinding should be supported an H-Class vacuum• Captured dust should be bagged and tied prior to dumping into general waste• All trades vacuum/sweep up as they go• Decks should be cleaned progressively including magnet extraction of reinforcement tailings and off-cuts to avoid a big deck blow-off prior to pouring and future-proof against strong winds• Materials deliveries such as fill, soil, sand, gravel, landscaping supplies etc, are transported to the site under covered loads• Stockpiles are stabilised with suitable materials• Site conditions are regularly inspected, and hand-held sprinklers and/or water cart are used as required to minimise dust• External paint spraying activities are undertaken in accordance with local authority requirements and not carried out during adverse weather conditions• All machinery and equipment used at the site will be maintained to relevant standards to reduce emissions to as low as possible• Disturbed areas will be re-vegetated as soon as practicable after construction of the works• Earth wetting using water cart and water sprays will be undertaken as required during construction to minimise dust generation at the site• Roads will be cleaned regularly to prevent the spread of dirt on roads surrounding the site• On-site speed restrictions and the need to control dust are formally discussed during site inductions• During the construction phase screening will be used by Watpac where necessary to prevent the spread of dust. This screening will also serve to screen the construction site from surrounding land uses and mitigate potential landscape impacts• Construction plant, machinery and vehicle access is to occur along designated access tracks only• Staff training and inductions, including:<ul style="list-style-type: none">• Procedures for the application of dust suppression measures• General site management• Periodic toolbox training to be provided to relevant construction personnel to present new information or reiterate information relating to minimising potential impacts to air quality.
Performance Indicators	Visual observance of dusts levels; vehicle and plant emissions No dust complaints
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	<ul style="list-style-type: none">• Protection of the Environment Operations Act 1997 (NSW)• Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW)• National Greenhouse and Energy Reporting Act 2007 (NGER Act)

Air Quality (Including Dust)	
	<ul style="list-style-type: none">National Environmental Protection Measure (NEPM) for Ambient Air QualityContaminated Land Management Act 1997 (NSW)

BARANGAROO STATION

Construction Environmental Management Plan

Noise	
Standard Environmental Protocol F.4	
Objective	Control, minimise or avoid environmental nuisance caused by 'unreasonable' levels of noise.
Management Strategy	Site environmental induction to address the issue of noise and protective measures to prevent 'unreasonable' noise caused by construction activities.
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none"> All construction activities will be undertaken mindful of the provisions of AS 2436:1981 - Guide to Noise Control on Construction & Demolition Sites Under the Protection of the Environment and Operations Act 1997 the occupier of any premises who operates any plant (other than control equipment) at those premises in such a manner as to cause the emission of noise from those premises is guilty of an offence if the noise so caused, or any part of it, is caused by the occupier's failure— <ul style="list-style-type: none"> (a) to maintain the plant in an efficient condition, or (b) to operate the plant in a proper and efficient manner. The works are carried out in accordance with the Interim Construction Noise Guidelines (DECC 2009) and the Conditions of Approval CSSI 7400 MOD8 for noise management as they relate to the works under the contract. Out of Hours Work – Watpac will provide at least five days' notice to the Principal prior to requiring access to the Site out of the access hours. A minimum of two personnel must be present on Site when work is being conducted outside the access hours. Each item of plant is fitted with effective noise suppression devices (generally exhaust mufflers) as applicable. Fit mufflers/silencers to pneumatic tools (e.g. breakers) Substitute impact piling for bored piling or hydraulic piling where possible. If impact piling is adopted, place a resilient pad (dolly) between the hammer head and the pile. Enclose the hammer head and the top of the pile in an acoustic screen. All plant, equipment and machinery are operated and maintained in accordance with acceptable industry standards and turned off when not in use. Two-way radios are used for site signalling and communication. When construction work is permitted outside designated hours, notice is given to occupiers of properties within the immediate precinct of the works providing details of the work to be done, together with the hours to be worked. Power generators used for after-hours lighting are positioned and acoustically treated, as far as practical, to minimise noise emissions. Watpac will notify the Principal a minimum of 48 hours in advance if any of the following activities are to be undertaken on Site and are likely to disturb occupants within the adjacent facilities: <ul style="list-style-type: none"> Impact drilling concrete, floors or masonry Chasing into walls Use of explosive powered tools Electric sawing of any material Any noisy activity that may need to take place outside normal business hours.
Performance Indicators	<p>No complaints concerning noise nuisance.</p> <p>No fines received.</p>
Reporting	<p>Daily monitoring reflected in daily site diary entries</p> <p>Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form</p>
Reference	<ul style="list-style-type: none"> Protection of the Environment Operations Act 1997 (NSW) Protection of the Environment Operations (Noise Control) Regulation 2008 (NSW) Contract Specifications Australian Standard 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites AS2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites

BARANGAROO STATION

Construction Environmental Management Plan

Vibration	
Standard Environmental Protocol F.5	
Objective	Control, minimise or avoid disturbance caused by vibration in ground works or other structural activities.
Management Strategy	Site environmental induction to address the issue of vibration and protective measures to prevent disturbance/incidents caused by vibration. Identify works likely to cause high vibration—communicate this to the Principal and to neighbours.
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• The Conditions of Approval CSSI 7400 MOD8 for vibration management as they relate to the works under the contract are adhered to.• Vibration is controlled in accordance with AS 2670.2.• A survey of properties in the immediate precinct of the site is undertaken and notes made, together with a photographic record of existing conditions• All equipment and machinery is operated and maintained in accordance with industry standards• Any blasting, rock breaking, drilling or piling activities are carried out under strictly controlled conditions• The use of heavy machinery in the proximity of retained buildings or other structures will be limited to absolute essential activities and only upon approval by the site manager• Extra vigilance is to be exercised while using rock breaking equipment near structures, hoarding walls and underground services. Activity is to cease at the first sign of risk and a risk assessment is to be carried out and ratified by the Site management team prior to proceeding.• Watpac will notify the Principal a minimum of 48 hours in advance if any of the following activities are to be undertaken on Site and are likely to disturb occupants within the adjacent facilities:<ul style="list-style-type: none">– Piling– Compacting– Use of explosive powered tools– Electric sawing of any material– In-ground, consider pre-drilling options to mitigate vibration.
Performance Indicators	No disturbances/incidents or complaints.
Reporting	Monitoring records to be maintained during construction activities with potential to generate vibration Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	<ul style="list-style-type: none">• Protection of the Environment Operations Act 1997• Assessing vibration: a technical guideline 2006• AS 2670.2-1990 Evaluation of human exposure to whole-body vibration Continuous and shock-induced vibration in buildings (1 to 80 Hz)• BS6472 Guide to Evaluate Exposure to Vibration in Building (1Hz to 80Hz)• DIN4150 Part 3 Structural Vibration – Effects of vibration on structures

BARANGAROO STATION

Construction Environmental Management Plan

Water Quality	
Standard Environmental Protocol F.6	
Objective	Maintain the health of any impacted nearby waterbodies.
Management Strategy	<p>Site environmental induction to address:</p> <p>The issues concerned with the conservation of water usage in construction activities.</p> <p>The issue of water quality and protective measures to prevent avoidable discharge into, or contamination of, waterways or established drainage systems.</p>
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none"> Any water leaving the site must be compliant with the following discharge limits: No more than 50mg/L Turbidity, or 50 NTU, after establishing correlation pH must be between 6.5 and 8.5 Dissolved Oxygen must be greater than 6 mg/L or 80% saturation level for a normal 24 hr period Temperature of the receiving waters must not rise more than 2°C above seasonal mean temperature No visible oils, films, litter, coarse material, cement or other chemicals can be present in discharge Wet discharge must be managed. This includes designated areas for washing out of concrete trucks, concrete pumps, paint, masonry cutting, and plaster. Refer to C-PLA-014 for more information Use of water for wet trades' clean-up is minimal, self-contained and recycled where possible, or optionally not using any washdown at all. Paint, solvents, oils etc. are correctly stored in bunded and contained area. Stockpiles of bulk materials are located well clear of any waterway or drainage systems, protected by sediment fences, and covered by tarp, seed, mulch or chemical binder Where available, a recycled water source will be used for dust suppression Where water discharge compliance can't be achieved, contaminated wastewater is to be used as dust suppressant or collected by a licenced contractor to a licenced facility Roadways can be swept, not washed down Work in or around watercourses should be managed to minimise impact in accordance with Watpac Erosion and Sediment Control guidelines
Performance Indicators	<p>No incidents of inadvertent waste of water</p> <p>No pollution or contamination of waterways</p>
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	Trade Waste Approval – "Special Approval"
Reference	<ul style="list-style-type: none"> Protection of the Environment Operations Act 1997 Managing Urban Stormwater: Soils and Construction. Volume 1, 4th Edition. Blue Book. NSW EPA Approved Methods for the Sampling and Analysis of Water Pollutants in NSW Protection of the Environment Operations Act 1997 (NSW), Section 120 Standard Methods for the Examination of Water and Wastewater, 20th Edition. American Public Health Association. Water Act 1912 (NSW) Water Management Act 2000 (NSW) and Amendment Act 2010 Water NSW Act 2014 Water Management (General) Regulation 2011 (NSW) Australian and New Zealand Guidelines For Fresh and Marine Water Quality 2000 Australian Guidelines for Water Quality Monitoring and Reporting 2000

BARANGAROO STATION

Construction Environmental Management Plan

Spill Response and Management	
Standard Environmental Protocol F.8	
Objective	Control, minimise or avoid spillage of hazardous or prohibited substances, and react quickly to contain spills in the event they occur.
Management Strategy	Induct all personnel to handle chemicals with care. Ensure spill kits are positioned near potential escape points.
Action	<p>In event of spill:</p> <ul style="list-style-type: none"> Assess: Evaluate the spill to determine if it can be dealt with by an individual, the spill response team or if outside assistance is required i.e.; hazchem, police, fire brigade, specialist spill response company. Secure: Make the site safe for all personnel and the general public. Contain: Spill response equipment such as spill booms, drain covers or bunding can be used to contain the spill. For solids, tarps may be used to cover and prevent dampness to granules or possible dispersion by wind. PPE: Identify the liquid and check the MSDS to ascertain the required PPE Absorb: Once the liquid is contained, it will need to be converted to a solid by absorption. Use the appropriate absorbing pads or absorbent (according to the type of material spilled) to soak up the spill by placing them over the liquid. Remove the saturated pads and replace as necessary. On porous surfaces, sprinkle loose absorbent over the spill and broom through until surface appears dry. Dispose: Place the spent absorbent in the disposal bags. Correctly dispose of contaminants off site using a licensed contaminated waste disposal contractor. Report: Document the incident and include what happened, when it happened, where it happened; and what was done to eliminate or minimise the impact. Restock: Order and replace used up PPE and absorption materials. <p>Project Manager shall ensure:</p> <ul style="list-style-type: none"> Spill containment and treatment equipment and materials will be available near storage areas of hazardous materials and escape points of the site. Spill kits and other suitable incident response equipment will also be located at other key points around the site and maintained ready for use. Transport of chemicals is planned and controlled to minimise change of spillage. Transport is only to occur in a bunded and secure vehicle, with checks in place to ensure container lids are secure. Subcontractors will be required to provide and maintain their own spill kits where required. Spills of hazardous materials will be collected by licensed contractor and collected for treatment at a licensed waste disposal facility. All regulated waste will be tracked (as per the Sustainability Management Plan requirements) Contaminated ground is made good and contaminated material that is to be removed from site is disposed of in an approved manner. SWMS must be submitted and approved for the handling and use of hazardous chemicals. Any waste oils, lubricants and contaminated cloths, resulting from maintenance of plant on-site, are placed in suitable containers prior to removal and disposal at an approved waste receiving facility.
Performance Indicators	No spillages. Spill kits readily accessible.
Reporting	Immediate contact and incident reporting through Environmental Manager in event of spill. Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	<ul style="list-style-type: none"> Work Health and Safety Regulation 2011 s357 Protection of the Environment Operations Act 1997 Protection of the Environment Operations (Waste) Regulation 2014 EPA Waste Classification Guidelines 2014 & EPA Act 1994, s 443, s 11, s 15-17

BARANGAROO STATION

Construction Environmental Management Plan

Erosion and Sediment Control	
Standard Environmental Protocol F.7	
Objective	Avoid, or minimise and control, contamination caused by sedimentation run-off or the discharge of pollutants into waterways or established drainage systems. Conserve the use of water to minimal requirements.
Management Strategy	Site environmental induction to address: The issue of water quality and protective measures to prevent avoidable discharge into, or contamination of, waterways or established drainage systems The site-specific Erosion and Sedimentation and Control Plans are to be implemented and maintained.
Action	Project Manager shall ensure: <ul style="list-style-type: none">Any water leaving the site must be compliant with the following discharge limits:No more than 50mg/L Turbidity, or 50 NTU, after establishing correlationErosion and Sediment Control to be established in accordance with the site Erosion and Sediment Control plans, and BESIX Watpac Erosion and Sediment Control GuideSediment fences are to be dug into the ground 200mm, using a bidim A34 productVehicle entry/exits will be established with shake-down grids, rumble rock and/or bunds. Rumble pad will be bottom lined with geotextile fabric materialAny batters that are to remain are promptly and appropriately treated/revegetatedEarth bunds, swales/ channels or sediment fencing should be set up around the perimeter of the site so as to minimally disturb the natural overland flow of the surrounding watercourse and provide minimal run-off into nearby waterways that are diverted through the siteSediment basins: Refer to BESIX Watpac Erosion and Sediment Control Guidelines for establishing, managing and servicing Sediment Basins (if required)Areas for plant and construction material storage are designatedUpstream stormwater runoff is diverted around disturbed areas of the siteDisturbed areas are stabilised as soon as practicableStormwater quality discharging from the site is monitored, and the implement additional measures or modify existing measures if requiredTransport routes are designated and marked of across the site to minimise dust disturbanceDrainage structure protection devices are installed to existing stormwater inlet structures within the site, and within the road ways adjacent to the site.Site personnel are educated to the sediment and erosion control measures implemented on siteWhere available, a recycled water source will be used for dust suppressionRefer to C-PLA-014, Erosion and Sediment Control Guide, for a detailed manual on following ESC Plans and establishing on site.
Performance Indicators	No sedimentation run-off No pollution or contamination of waterways.
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	<ul style="list-style-type: none">Protection of the Environment Operations Act 1997Soil and Construction, Volume 1, 4th Edition, March 2004 (Managing Urban Stormwater, Landcom)EPA, A Resource guide for local councils: Erosion and sediment control, 2006AS/NZS 5667.1:1998 Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples

Weed Control	
Standard Environmental Protocol F.11	
Objective	To detect and manage identified weeds and pests.

BARANGAROO STATION

Construction Environmental Management Plan

Weed Control	
Management Strategy	Monitor site for weeds and pests
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• An herbicide treatment strategy should be approved with the Landscape Architect and Environmental Representative if weed treatment is required. This is to ensure the planting is not affected by the weed treatment• A company with demonstrated weed management credentials would need to be engaged to provide advice on control methods and the application of herbicide if appropriate• Sweeps should be done on a week basis before, during and after works, particularly during hydro-mulching of ground for "on-maintenance" handover• Ensure all imported fill is certified clean• All excavated spoil leaving site should be inspected for deleterious organic material• Methods for disposal include deep burying, mulching or putting the weeds in a plastic bag and leaving in bright sunlight until they are dead• Refer to C-PLA-15, "Weed Management Guide."
Performance Indicators	No spread or release of weeds
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	It is illegal to possess, sell or release weed or pest species without a permit
Reference	<ul style="list-style-type: none">• Biosecurity Act 2015• Biosecurity Regulation 2017

BARANGAROO STATION

Construction Environmental Management Plan

Land Contamination	
Standard Environmental Protocol F.12	
Objective	To detect and manage contaminated land, prevent leaching of contaminated materials or groundwater infiltration during earthworks, and detect services prior to commencement. Avoid or minimise contamination of land caused by the use of imported materials, or by spillage of fuels, paint, form oil, chemicals etc.
Management Strategy	<ul style="list-style-type: none">• Expert Consultants are engaged to provide a detailed assessment of the quality of the earth before earthworks begin• Services will be identified before earthworks commences• Controls are in place to capture and treat tainted water and earth.
Action	Project Manager shall ensure: <ul style="list-style-type: none">• Soil contamination risk for the site will be discussed in Section 3 of this Environmental Plan• Unexpected contamination may present itself during earthworks. Signs include pockets of discoloured or poorly textured soil (noticeable different from the surrounding soil); and malodours that present (e.g. oil, sulphur, chlorine, sewerage).
Performance Indicators	No release of contaminated materials or compromised water from the site.
Reporting	Immediate liaison with the Environmental Manager in event of unexpected contamination finds Incident reporting in event of release or discovery of contamination
Applicable Permits	Permits for removal and disposal of contaminated soil
Reference	<ul style="list-style-type: none">• Protection of the Environment Operations Act 1997• Protection of the Environment Operations (Waste) Regulation 2014• EPA Waste Classification Guidelines 2014• Contaminated Land Management Act 1997• Contaminated Land Management Regulation 2013• EPA Contaminated Sites: Guidelines on Significant Risk of Harm from Contamination & the Duty to Report 1999• Assessment of Site Contamination NEPM 1999• EPA Contaminated Sites: Guidelines for Assessing Service Station Sites 1994• EPA Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd edition) 2006• EPA Guidelines for the Assessment and Management of Groundwater Contamination 2007• EPA Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites 1997• EPA Contaminated Sites: Sampling Design Guidelines 1995• AS/NZS 5667.11:1998 Water quality – Sampling – Guidance on sampling of groundwaters

BARANGAROO STATION

Construction Environmental Management Plan

Protection of Cultural, Heritage and Aboriginal Artefacts	
Standard Environmental Protocol F.13	
Objective	Avoid damage or disturbance to archaeological/cultural artefacts including skeletal remains, shell middens or other cultural artefacts.
Management Strategy	<p>Conduct a historical investigation of the site to establish, as far as practical, the likelihood of existence of archaeological/cultural artefacts.</p> <p>Site environmental induction to address likelihood of discovery of archaeological/cultural artefacts.</p> <p>Excavation personnel to remain vigilant over ground penetration points.</p>
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• Where archaeological/cultural artefacts are discovered, personnel cease work in the subject area and effect practical protection measures• The Principal and DES is promptly advised of significant discoveries• Directions from DES are followed• If suspected human remains are discovered that work is ceased and the Superintendent, Police and State Coroner's Office are contacted, and if applicable, the Department of Aboriginal Affairs.
Performance Indicators	No damage, or minimal disturbance, to any archaeological/cultural artefacts discovered.
Reporting	<p>Superintendent is immediately notified of any discovery</p> <p>Daily monitoring reflected in daily site diary entries</p> <p>Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form</p>
Reference	<ul style="list-style-type: none">• Heritage Act 1977• Aboriginal and Torres Strait Islander Heritage Protection Act 1984• Aboriginal and Torres Strait Islander Heritage Protection Regulations 1984• Australian Heritage Council Act 2003

BARANGAROO STATION

Construction Environmental Management Plan

Fire Protection	
Standard Environmental Protocol F.14	
Objective	Prevent the ignition and spread of fire.
Management Strategy	Areas prone to fire will be assessed. Site inductions will address fire risk minimisation controls.
Action	Project Manager shall ensure: <ul style="list-style-type: none">• Fire extinguishers will be located as per AS-2444• Site rules and Inductions include prohibition of smoking and lighters• Combustible materials shall be stored in cool, dry locations, protected from weather• Weekly inspections to monitor build-up of flammable organic materials which may present a fire path, e.g. understorey fuels such as loose bark, fallen leaves and branches, and spear grass• Grass may need to be mowed and organic materials collected and disposed of or burned in a controlled manner• In extreme situations, fire breaks may need to be rutted out around the perimeter of the site• Fire control advantages should be identified, such as fire trails, water supply points, dams, and helipads
Performance Indicators	No fires, minimisation of fire-spreading paths.
Reporting	Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form.
Applicable Permits	A bushfire management plan is required in areas of high bushfire risk as per the risk overlay mapping.
Reference	<ul style="list-style-type: none">• Fire and Rescue Service Act 1990, s 62, 65, 72, 67• AS-2444-2001 Portable fire extinguishers and fire blankets - Selection and location

BARANGAROO STATION

Construction Environmental Management Plan

Identification and Protection of Existing Utility Services	
Standard Environmental Protocol F.16	
Objective	Avoid damage to, or unplanned interruption of, utility services.
Management Strategy	Site environmental induction to address location of and protective measures for utility services. Identify, mark and protect utility services (electricity, water, gas etc.). Ensure all necessary interruptions to utility services are planned and communicated to all relevant persons and Authorities.
Action	Project Manager shall ensure: <ul style="list-style-type: none">Existing services plans will be studied and services will be located and marked prior to commencing any worksServices locations must be known prior to commencing earthworksVacuum excavation/Services Detection will be undertaken wherever services are likely to be encounteredContact telephone numbers for emergency services for utilities are established and readily available in the Site Emergency PlanStorage areas are located remote from utility servicesAccess ways, haul roads and turning points are arranged to avoid possible clashes with utility servicesOverhead protection/warning is provided for high loads, vehicles, cranes etcSpotters are provided when work is undertaken beneath overhead power linesWhere it is found necessary to temporarily interrupt, remove, divert or make connection to an existing service or other existing work beyond the control of the Watpac, written approval from the Principal will be sought prior to undertaking Works
Performance Indicators	No unplanned interruptions to any utility service.
Reporting	Notification to relevant authorities Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	Dial Before You Dig Permit to Dig (Watpac NSMS Form)
Reference	<ul style="list-style-type: none">Work Health and Safety Act 2011Energy and Utilities Administration Act 1987 (NSW)

BARANGAROO STATION

Construction Environmental Management Plan

Waste Management	
Standard Environmental Protocol F.17	
Objective	To control the disposal of waste generated from construction activities.
Management Strategy	<p>Site environmental induction to address the issue of waste management and protective measures to prevent environmental incidents caused by inappropriate methods of disposal of waste.</p> <p>Designated bin storage locations (for both Wheelie bins & skips), and an appropriate regime for clearance.</p>
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• All construction waste shall be taken off site and appropriately disposed of in accordance with all relevant State/Territory regulations during or at the completion of construction.• A Waste Management Plan is developed and implemented maximise the volume of waste demolition and construction waste that is reused or recycled during the project. This shall include an assessment of alternative construction waste minimisation strategies shall be undertaken and implemented as appropriate. These alternatives could include but not be limited to initiatives such as supplier take-back of packaging and off-cuts, pre-manufacturing or on-site waste grinding to produce construction materials (e.g. grinding of bricks/concrete/wood to make aggregate and woodchips), or "Ship to point of use" techniques to minimise protective wrappings or enclosures.• All topsoil affected by the construction works shall be separated and protected from degradation, erosion or mixing with fill, contamination or waste.• The MSDS of Chemicals and Hazardous Substances should be consulted before disposal instructions, which will usually involve dropping of containers to Chemical Waste/Hazardous Collection stations. Containers must not be washed out and disposed of as normal.• All PVC products shall be recycled and/or reused when being disposed, when not available, disposed of at a licensed landfill facility.• Waste is minimised through the use of careful measurement and conservative ordering to prevent oversupply of materials.• All waste will be sorted (including that from clearing, demolition, off cuts, etc.) into appropriate categories for recycling or disposal.• Watpac will ensure that appropriate recycling receptacles are provided for scrap steel.• A recycling bin will be provided separately to the bin for Construction waste material and general waste (food scraps, cans, etc). Recyclable materials will include cardboard, glass, and plastics.• Any mulch accrued as a result of tree clearing can be used as erosion stabilisation.• Waste skips/bins are easily accessible and protected from weather dispersal.• Paper recycling bins are to be maintained in the office. Used toner cartridges should be collected and deposited at head office.• The construction site is kept free from build-up of waste materials by directing regular clean-ups by subcontractors.• No burning of waste takes place on-site.• Paint washouts will be provided and when full will be taken off-site to be filtered before discharging.• Any liquid waste, including backwash of wet trades, should be treated for adequate water quality before discharge, or collected by a liquid waste contractor.
Performance Indicators	No incidents arising from the disposal of end waste.
Reporting	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection.
Reference	<ul style="list-style-type: none">• NEPM (Movement of Controlled Waste between States and Territories)• Protection of the Environment Operations (Waste) Regulation 2014• Waste Avoidance and Resource Recovery Act 2001• EPA Waste Classification Guidelines 2014• Construction and Demolition Waste Guide - Recycling and Reuse across the Supply Chain

BARANGAROO STATION

Construction Environmental Management Plan

Waste Management

- National Waste Policy: less waste, more resources 2009
- National Packaging Covenant Work
- AS 1940 – 2004: The Storage and Handling of Flammable and Combustible Liquids and the chemical's Safety Data Sheet (SDS)

BARANGAROO STATION

Construction Environmental Management Plan

Artificial Lighting	
Standard Environmental Protocol F.18	
Objective	Control or minimise disturbance caused by after-hours lighting.
Management Strategy	Site environmental induction to address the issue of after-hours lighting. Ensure all necessary after-hours work is planned and communicated to all relevant persons and authorities. As far as possible, plan all construction activities for normal daytime work.
Action	Project Manager shall ensure: <ul style="list-style-type: none">• Minimising lighting pollution impact from external lighting provided during construction on neighbouring properties and their occupants and neighbouring ecological areas (external to the construction site), in accordance with Australian Standard "4282 Control of the obtrusive effects of outdoor lighting".• Directional lighting and type of lights used will be planned and designed with the above in mind;• Shining downwards and only where required.• Reduced by screening• Effective programming of work• Any lighting must be positioned to ensure light pollution does not enter the wildlife corridors.• All lighting equipment is installed in such a manner as not to cause a safety hazard to pedestrian or vehicular traffic within the immediate surrounds of the site.• Where required or deemed necessary, advisory/warning signs are posted in appropriate locations.• Relevant authorities are notified; approvals obtained and put into effect; adjoining property owners/occupiers are advised of when planned after hours lighting will occur.
Performance Indicators	No incidents or complaints.
Reporting	Monitoring records to be maintained for the duration of after-hours lighting. Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form.
Reference	<ul style="list-style-type: none">• Protection of the Environment Operations Act 1997

BARANGAROO STATION

Construction Environmental Management Plan

Vehicular and Pedestrian Traffic Management	
Standard Environmental Protocol F.19	
Objective	Avoid interference of, or obstruction to, roadways, footways or access points by the use of appropriate traffic control measures.
Management Strategy	Site environmental induction to address the issues of access and delivery arrangements for materials including timing and unloading of materials. Coordinate construction programme and delivery times to avoid hold-ups and traffic congestion. Provide appropriate fencing/hoardings and protection for the public.
Access	Access to the site will be determined to minimise impact.
Action	Project Manager shall ensure: <ul style="list-style-type: none">• Controls documented in the approved Traffic Management Plan are implemented• Vehicle entry/exits with shakedown grids will be established to remove the potential for vehicles departing the site to deposit debris on the roads. Watpac will deploy street sweepers as required• Site fencing/hoarding is properly secured and lockable; access points are clearly designated and appropriate signage erected• Materials set-down areas are established.• All required Approvals are obtained and Traffic Controllers are engaged where necessary when temporary road closures are required.• Traffic management controls are monitored• Construction programme and delivery times are coordinated to avoid delays and possible traffic congestion• Access points for each stage of construction are unobstructed to facilitate prompt service to set-down areas within the site• Materials handling is managed to cause least disruption to traffic and local amenity.
Performance Indicators	Reports or complaints of interruption or interference with pedestrian or vehicular traffic movement around the site.
Reporting	Daily monitoring reflected in daily site diary entries Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Applicable Permits	Road Corridor Permit Traffic Control Permit
Reference	<ul style="list-style-type: none">• Public Health Act 2010 (NSW)• Road Transport Act 2013 (NSW)• Road Transport (General) Regulation 2013 (NSW)• Roads Act 1993 (NSW)

BARANGAROO STATION

Construction Environmental Management Plan

Acid Sulphate Soil	
Standard Environmental Protocol F.20	
Objective	To avoid significant impact caused by the disturbance of Acid Sulphate Soils (ASS).
Management Strategy	<p>A soil investigation and analysis will be conducted to determine the extent of ASS on-site.</p> <p>Site environmental induction to address management of ASS.</p> <p>Excavations will be confined to minimum requirements.</p> <p>Bunds around all disturbed areas of ASS will be provided.</p>
Action	<p>Initial approach and planning</p> <p>A soil investigation and analysis will be conducted to determine the extent of ASS on site, including the possible and potential acid sulphate soils, and at what depths.</p> <p>An Acid Sulphate Soils Management Plan will be produced to outline the risks and liming rates to inform the earthworks contractors.</p> <p><u>Field Indicators</u></p> <ul style="list-style-type: none"> Field indicators for Actual Acid Sulphate include: Water of pH <5.5 in groundwater or adjacent streams, drains, groundwater or ponding on the surface Unusually clear or milky blue-green drain water within or flowing from the area (aluminium released by the acid sulphate soils acts as a flocculating agent) Extensive iron stains on any drain or pond surfaces, iron-stained water or ochre deposits Any jarositic (jarosite is a pale-yellow mineral deposit which can precipitate as pore fillings and coatings on fissures) horizons or iron oxide mottling in auger holes or recently dug surfaces. With a fluctuating water table, jarosite may be found along cracks and root channels in the soil — however, jarosite is not always found in actual acid sulphate soils Jarosite present in surface encrustations or in any material dredged or excavated and left exposed Corrosion of concrete and/or steel structures Dominance of mangroves, reeds, rushes and other swamp-tolerant vegetation – including estuarine occurrences of swamp trees Field indicators for Potential Acid Sulphate include: Typically waterlogged, soft muds (soft, buttery texture) or estuarine silty sands Mid to dark grey to dark greenish-grey coloured soils or sediments Offensive odour, predominantly due to ‘rotten egg gas’ (H₂S). <p><u>Screening process</u></p> <ul style="list-style-type: none"> Soils are usually “screened” to isolate areas of interest to test for. pH_F and pH_{FOX} indicate possible actual acid sulphate soils (AASS) or potential acid sulphate soils (PASS). pH_F — measure of soil pH of a soil: water paste. pH_F <4 indicates oxidation has occurred in the past and that AASS is present. pH_{FOX} — measure of soil pH after rapid oxidation with hydrogen peroxide (H₂O₂). pH_{FOX} <3, plus a pH_{FOX} reading at least one pH unit below pH_F, plus a strong reaction with peroxide, strongly indicates the presence of PASS. Effervescence (or reaction rate) — a visual measure of the vigorousness of the oxidation reaction where: 1 = slight; 2 = moderate; 3 = high; and 4 = extreme. <p><u>Assessment Process</u></p> <ul style="list-style-type: none"> Lab tests are the only truly definitive way of measuring for actual or potential acid sulphate. This is done by the SPOCAS or Chromium Suite method. The SPOCAS suite is effective for coarser textured sediments. The Chromium Suite (aka SCR suite) is effective for assessing soils with lower percentages of sulphide and for soils containing organic material.

Acid Sulphate Soil

- Chromium reducible sulphur values (SCR) greater than 0.01% S indicate a significant level of sulphides, and where greater than 0.03% S then the soil has a high potential acidity level and an Acid Sulphate Soils Management Plan will be required.
- Net Acidity (TAA + SCR + SNAS – ANC/1.5) of greater than or equal to 0.03% S for soils, for greater than 1000 tonnes of disturbance.

Preparing a neutralisation zone/liming pad

- Prepare a liming pad/stockpile site of appropriate area for the volume of soil to be treated. The pad should be prepared on relatively level or gently sloping ground to minimise the risk of any potential instability issues, with a natural (or shaped) fall to the local drainage sump.
- Where the subgrade soils are other than low permeability clays, the surface of the pad should be lined with selected approved compacted clay (at least two layers to a combined compacted thickness of 0.5m) or a geosynthetic liner. Where the subgrade soils comprise low permeability clay, no clay or geosynthetic lining will be required.
- A guard layer of 'ag lime' should be applied over the clay subgrade or compacted clay liner, to neutralise downward seepage.. The guard layer of lime should be applied at a rate of approximately 5kg lime per square metre of surface area for every 1 m height of stockpiled soil.
- Liming pads should be bunded off, and a circumference drain excavated to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.

Neutralisation Process

- Supervision by a Scientist is not considered mandatory.
- Soil neutralisation can only be validated by lab tests (SPOCAS or Chromium suite).
- Ag-lime is the mandatory treatment material. Using ag-lime, over liming isn't an issue—it's not ecologically harmful as it only has neutralising properties on exposure to acid. In water it has low solubility (because water is neutral).
- Indicative liming rates can be applied before arranging lab tests, so lab tests are only done on the verification stage—rather than both the initial and verification stages.
- The excavated soil should then be spread onto the guard layer in layers of no greater than 200mm thickness, leaving a 1m flat area between the toe of the spread soil and the containment bund or drain. When spreading the first soil layer, care should be taken not to churn up the lime guard layer.
- It should be noted that saturated soil cannot be neutralised effectively with lime, particularly where it is cohesive (i.e.. comprises a majority of silt/clay sized particles). This is because the lime must be well mixed into the soil and this cannot be performed when the soil is overly wet and 'sticky'. Hence, the excavated soil must be dried back on a limed pad, before effective mixing can take place with earthmoving machinery. This is to enable the collection and separate treatment of any acid leachate formed during the soil drying and liming process. Wet weather will thus have a potential to delay the lime treatment process.

the stockpiled soil at the indicative liming rate given above over each spread layer and mix through spreading the next layer.

- ASS testing should be carried out on each layer to verify the lime dosing rates to be applied. This would confirm ASS soils have been neutralised and allow identification of problem material.
- Continue the spreading/liming/mixing cycle till excavation is finished.
- When testing indicates that lime neutralisation is complete, then the stockpiled soil may be removed from the liming/neutralisation pad.
- Verification testing of the soil is required to be conducted after the addition of lime to test whether or not mixing has been adequate, and to reduce the risk of acidic water being returned to other watercourses. The soil and water contained within the treatment bunds should not be removed until the target values have been achieved.
- Validation samples of soil should be collected and tested at a frequency of approximately one per 500m³ of treated soil. Similarly, additional layers of soil should not be added to the bunded stockpile for treatment until the underlying layers have been validated.

BARANGAROO STATION

Construction Environmental Management Plan

Acid Sulphate Soil

Water Run-off

- All water draining from the soil, once it is removed from the excavation, should be considered as potentially acidic and should be separated in a controlled area, such as the above referred bunded and lined pad, and not be allowed to flow back into waterways or stormwater until it has been tested for pH and for any other environmental tests required by the appropriate regulatory authority.
- Liming pads should be bunded off, and a circumference drain excavated to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.
- The pH of all ponded drainage water around the confines of the treatment bunds should be measured daily.

Soil Testing and Verification

- Soil sampling for verification (and assessment) will be as soon as practically possible within 66 hours (i.e.3 nights). Large shells (>2 mm), fragments of wood, charcoal and stones will be noted before being removed from the samples in the field. Biological remnants such as small roots will not be removed from the soil sample as they may contain sulphides:
- Divide the treatment pad area into areas containing a volume of soil equivalent to the nominated verification testing rate (e.g. for a treatment pad holding 2000m³ and a test rate of 1 per 1000m³, divide the pad into two sections). A treatment pad holding 500m³ at a test rate of 1 per 1000m³ is considered as 'one' treatment area/section.
- Within each area, use a randomised procedure to nominate at least six random sampling locations.
- Within each area, use a consistent-volume sampler to gather subsamples of treated soil from each of the pre-defined locations on the treatment pad (at least 4 x 250g subsamples). Subsamples should extend through the total depth of the treated material but avoid sampling the underlying guard layer.
- Composite the subsamples thoroughly together in a container with a secure lid (e.g. clean plastic 5L plastic pail).
- Subsample approximately 400g of the composited material and submit it for analysis.
- Leave the soil on the treatment pad until the results are available.
- Samples will be collected in laboratory supplied acid sulphate soil bags, stored on ice in a cool box and submitted to a laboratory (with chain of custody documentation) that is accredited by the National Association of Testing Authorities (NATA) for acid sulphate soil analysis. Visual and olfactory monitoring of the surrounding receiving environment to identify and report any potential concerns or impacts as a result of the activities conducted within the Acid Sulphate Soil Treatment Area.

Off-Site Treatment

- The following excavation procedures will be adopted during works onsite:
- All excavations below the upper ASS horizon shall be programmed to ensure that the period of open excavation is kept to a minimum;
- Any exposed walls of excavations shall be treated by "dusting" with fine agricultural lime prior to backfilling;
- Where provisions have been made, all ASS material is to be immediately placed onto trucks and transported to a licenced treatment facility;
- Where the immediate transfer to trucks is not feasible, on-site storage of untreated ASS is not permitted for more than 18 hours for sandy material, and 70 hours for peat or clays.
- In the event temporary stockpiling of soils is required, the soils should be placed on bunded limestone pad approximately 300mm thick, in a location up gradient of the development area to prevent potential leaching or run off into undisturbed areas.

Performance Indicators

No acid discharge from site.
Satisfactory laboratory results of tests on stockpiled ASS.

Reporting

Daily monitoring reflected in daily site diary entries

BARANGAROO STATION

Construction Environmental Management Plan

Acid Sulphate Soil	
	Weekly Inspections undertaken and recorded on the Weekly Environment Inspection Form
Reference	<ul style="list-style-type: none">• ANZECC/NHMRC Guidelines• NEPM for Assessment of Site Contamination.

BARANGAROO STATION

Construction Environmental Management Plan

Asbestos	
Standard Environmental Protocol F.22	
Objective	To avoid threat to human health or contamination of the environment in the removal of asbestos materials.
Management Strategy	<p>Investigation of the site to determine the extent and type of asbestos contaminated materials.</p> <p>Site environmental induction to make personnel aware of the presence of asbestos contaminated materials and procedures for their identification and removal.</p> <p>Engagement of a certified, licensed asbestos removal contractor in terms of Environmental Protection regulations.</p>
Action	<p>Generally speaking, asbestos management requires:</p> <ul style="list-style-type: none">• Asbestos Management Plan by an Environmental Scientist--• Asbestos Removal Control Plan by a Licenced Asbestos Removalist—the plan for how to safely undertake the works by the people actually doing it.• Watpac's Project Safety Management Plan. <p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• Asbestos contaminated areas are identified and restricted to authorised personnel until the contaminated materials have been removed and the area declared safe.• The project hygienist is engaged to assess materials suspected of containing asbestos• The project hygienist is engaged to develop a fully documented Asbestos Management Plan to detail the requirements and controls for removal of all asbestos containing materials• A licensed asbestos removal contractor is engaged to manage the removal and disposal of all asbestos contaminated materials• The licensed Asbestos Removalist to comply with the Watpac Asbestos Management Procedure; the Asbestos Management Plan and the Australian Government Code of Practice for the Safe Removal of Asbestos.• The project hygienist is to provide Clearance Certificates
Performance Indicators	Satisfactory post-removal monitoring results.
Reporting	Project hygienist to provide site safety clearance certificate and documented evidence of proper disposal.
Applicable Permits	Licence under WHS Regulations
Reference	<ul style="list-style-type: none">• Work Health and Safety Regulation 2011 Ch 8• Watpac NSMS Asbestos Management Procedure• Asbestos Management Plan• Code of Practice for the Safe Removal of Asbestos

BARANGAROO STATION

Construction Environmental Management Plan

Hazardous Substances and Dangerous Goods	
Standard Environmental Protocol F.23	
Objective	<p>To avoid contamination of the environment or risk to human health</p> <p>To appropriately manage the discovery of Hazardous Materials on site</p>
Management Strategy	<ul style="list-style-type: none"> Site environmental induction to make personnel aware of the project handling and storage procedures to manage Hazardous Substances and Dangerous Goods All hazardous materials introduced onto site must be accompanied by a MSDS and the material entered onto the project register. All hazardous materials must be stored in compliance with the manufacturer's recommendations and in accordance with Australian Standards No bulk fuels are to be retained on site. Refuelling of plant is to be undertaken on a just-in-time basis and only within a prepared designated area. Any discovery of a hazardous material is immediately reported to the Principal
Action	<p>Project Manager shall ensure that:</p> <ul style="list-style-type: none"> Hazardous chemicals are stored in an impervious storage area, which is cool and dry, vented, lockable, and banded to 110% the volume of the chemical container. Conflicting chemicals are kept segregated in accordance with AS 3833 and AS 1940. The quantities of Hazardous Substances and Dangerous Goods on site are minimised. No bulk diesel is to be stored on site. Fuelling and maintenance of vehicles and equipment on site is avoided. Where refuelling is unavoidable, the location and procedures will be strictly controlled. Refer to NSMS procedures on refuelling. Subcontractors are trained in the use and precautions of their hazardous substances in accordance with the MSDS. Subcontractors advise the Site Manager of the type of material, location, volume and any special handling / storing precautions in relation to any dangerous gases or flammable materials that are proposed to be brought on site. Subcontractors do not use any materials which are classified as Hazardous in or adjacent to occupied areas without the prior approval of the Site Manager. Subcontractors provide a current MSDS for all Hazardous Substances and Dangerous Goods proposed to be brought onto site. A Site MSDS Register is to be developed and maintained. A Spill Kit and Site Emergency Plan are readily accessible. Clean up materials are disposed of in compliance with regulatory requirements All oxygen and acetylene cylinders are properly stored in an upright position and adequately restrained away from heat sources. Persons handling dangerous chemicals and materials will wear appropriate PPE and receive appropriate training in its use Fuels and hazardous chemicals will not be decanted or handled in the vicinity of the central drainage line and major stormwater inlet points. Decanting of liquids is to be done in temporary banded area. Paint storage does not need to incorporate 110% volumetric bund but should be sufficient to envelope an incidental spill. Material Safety Data Sheets (MSDS) will be located at the site office for all hazardous and dangerous goods used during construction operations. The contractor will ensure that all materials are handled, used and disposed of in accordance with their MSDS
Performance Indicators	No spillages, incidents or complaints
Reporting	Licensed removal contractor to provide site safety clearance certificate and documented evidence of proper disposal.
Reference	<ul style="list-style-type: none"> Work Health and Safety Regulation 2011, s 357 National Code of Practice "Managing Risks of Hazardous Chemicals in the Workplace" National Code of Practice "Labelling of Workplace Hazardous Chemicals"

BARANGAROO STATION

Construction Environmental Management Plan

Pest Animals, Vermin, and Infestation Control	
Standard Environmental Protocol F.24	
Objective	Minimise the possibility of infestation from rats, mice, insects, or other scavenging wildlife.
Management Strategy	Keep site clean and tidy Monitor area for infestation Consult Pest Management Contractor if required
Action	<p>Project Manager shall ensure that:</p> <ul style="list-style-type: none">• Keep site clean and tidy with daily clean-ups.• Ensure all putrescible waste is disposed of in an appropriately sealed receptacle.• Six weeks prior to the commencement of any demolition, individual blocks, properties and the surrounding area should be inspected in order to identify the presence and extent of any infestations. Where infestations are identified, appropriate treatments must be implemented by licenced Pest Control Contractors to eliminate infestation before demolition.• Pest animals include:<ul style="list-style-type: none">– European rabbits and hares– Mice– Feral or wild pigs– Wild dogs and dingoes– Red foxes• It is not incumbent on Watpac to destroy these animals, particularly if it is unsafe to do so.• Minimise ponding and exposed water sources to prevent mosquitos and midges.• Ideally, licenced Pest Control Contractors should be consulted for management strategies after the substructure is completed. Frequently the dark cold environment can be a pest habitat which presents an unacceptable working environment.• To prevent rat egress from live drains and sewers to new systems, the live systems should be temporarily sealed off with expanding drainage stoppers until connection to new drainage is completed.• Where vermin presents itself as a problem on site, consult a Pest Control company for advice. Do not attempt to address the problem internally.
Performance Indicators	No infestations.
Reporting	None
Reference	<ul style="list-style-type: none">• Work Health and Safety Regulation 2011• Plant Protection Act 1989

BARANGAROO STATION

Construction Environmental Management Plan

Site Demobilisation	
Standard Environmental Protocol F.25	
Objective	Control and minimise damage to the receiving environment as a result of site demobilisation.
Management Strategy	Ensure ground is stabilised and operational stormwater controls are commissioned prior to demobilisation. Clean up during after demobilisation.
Action	<p>Project Manager shall ensure:</p> <ul style="list-style-type: none">• Ensure any landscaping is sufficiently stabilised, either of their own accord or supported by an erosion blanket such as jute mesh. Any permanent stormwater that can't be relied on must be continue to supported by erosion and sediment controls that are maintained during the planting establishment period• Tenting of erosion blankets can prevent vegetation growth, and trap wildlife. Ensure good ground contact is made and pinned• Hydroseeding and hydro-mulching can be used for accelerated grass growth for cover and stabilisation• Basins should be removed or integrated into permanent stormwater system. Temporary sediment controls must be installed downslope of this process, and captured water must be properly disposed of. The footprint of the basin will require revegetation• Plan routes of plant access, such as removal of sheds, so that it can be accessed without disturbing earth or vegetation• Conduct a site clean-up before and after shed removal. Invariably a fair amount of rubbish will have accumulated under the sheds
Performance Indicators	Minimal disturbance because of site demobilisation.
Reporting	None
Reference	None



Appendix G Site Establishment Plans

PHASE 1:
EARLY SITE ACESS
FROM 15 AUGUST 2021
TO 29 SEPTEMBER 2021

BR VEHICLE
ACCESS

BR CONTRACTOR
CONSTRUCTION SITE

TSE CONTRACTOR
CONSTRUCTION SITE

Temp. Water
Treatment
Plant

Temp.
Substation

TSE
CONTRACTOR

GATE MANAGED BY
TSE CONTRACTOR

TSE CONTRACTOR
CONSTRUCTION SITE

TSE CONTRACTOR
CONSTRUCTION SITE

Crossover
Cavern

Northern
Shaft

LEGEND:

PEDESTRIAN ACCESS:

PEDESTRIAN ACCESS

FENCE / HOARDING

PERSONNEL SITE ENTRY

UNDERCOVER PERSONNEL ACCESS

OPEN PERSONNEL ACCESS

STAIR ACCESS TO STATION BOX

EMERGENCY ASSEMBLY POINT

FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:

CONSTRUCTION VEHICLE ACCESS

SITE GATE

GATE NUMBER

RUMBLE GRIDS / WASHDOWN BAYS

SLAB OPENING AT SURFACE LEVEL

SLAB OPENING BELOW SURFACE LEVEL

VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:

BESIX WATPAC CONSTRUCTION SITE

TSE CONSTRUCTION SITE

CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN



PHASE 2:
EARLY SITE ACCESS
FROM 30 SEPTEMBER 2021
TO 27 OCTOBER 2021

NOTE:
ADDITONNAL SUBCONTRACTOR'S AMENITIES
WILL BE SETUP IN THE CROSSOVER CAVERN
FOR STAGE 2 DURATION

LEGEND:

PEDESTRIAN ACCESS:

- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:

- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- GATE NUMBER
- RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:

- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN

BR VEHICLE ACCESS

Site compound progressively relocated

BR CONTRACTOR CONSTRUCTION SITE

TSE CONTRACTOR CONSTRUCTION SITE

BR CONTRACTOR CONSTRUCTION SITE

GATE MANAGED BY TSE CONTRACTOR

BR CONTRACTOR CONSTRUCTION SITE

BR CONTRACTOR CONSTRUCTION SITE



DRAWING NAME:

DWG #:
REV #:

DATE #:

PHASE 3:
FROM 28 OCTOBER 2021
TO 31 DECEMBER 2021

LEGEND:

STAGING ZONES:

- POSSSESSION UNTIL 30/06/22
- POSSSESSION UNTIL 1/02/23
- POSSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:

- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:

- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- GATE NUMBER
- RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:

- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN



PHASE 4:
FROM 1 JANUARY 2022
TO 22 FEBRUARY 2022

LEGEND:

STAGING ZONES:

POSSSESSION UNTIL 30/06/22

POSSSESSION UNTIL 1/02/23

POSSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:

PEDESTRIAN ACCESS

FENCE / HOARDING

PERSONNEL SITE ENTRY

UNDERCOVER PERSONNEL ACCESS

OPEN PERSONNEL ACCESS

STAIR ACCESS TO STATION BOX

EMERGENCY ASSEMBLY POINT

FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:

CONSTRUCTION VEHICLE ACCESS

SITE GATE

Gx

GATE NUMBER

WD

RUMBLE GRIDS / WASHDOWN BAYS

SLAB OPENING AT SURFACE LEVEL

SLAB OPENING BELOW SURFACE LEVEL

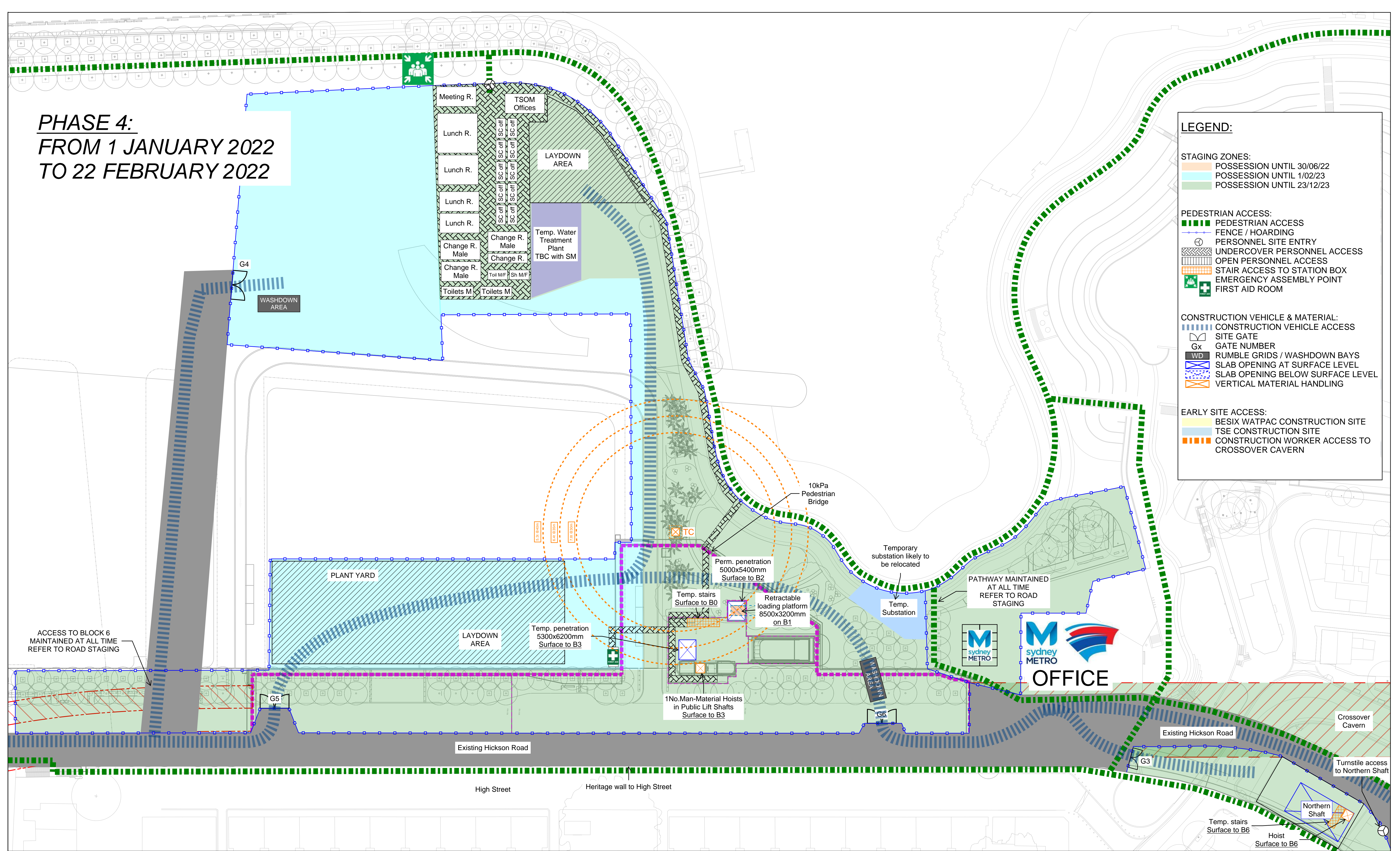
VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:

BESIX WATPAC CONSTRUCTION SITE

TSE CONSTRUCTION SITE

CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN



PHASE 5:
FROM 23 FEBRUARY 2022
TO 31 JANUARY 2023

LEGEND:

STAGING ZONES:

POSSESSION UNTIL 30/06/22

POSSESSION UNTIL 1/02/23

POSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:

PEDESTRIAN ACCESS

FENCE / HOARDING

PERSONNEL SITE ENTRY

UNDERCOVER PERSONNEL ACCESS

OPEN PERSONNEL ACCESS

STAIR ACCESS TO STATION BOX

EMERGENCY ASSEMBLY POINT

FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:

CONSTRUCTION VEHICLE ACCESS

SITE GATE

Gx

GATE NUMBER

WD

RUMBLE GRIDS / WASHDOWN BAYS

SLAB OPENING AT SURFACE LEVEL

SLAB OPENING BELOW SURFACE LEVEL

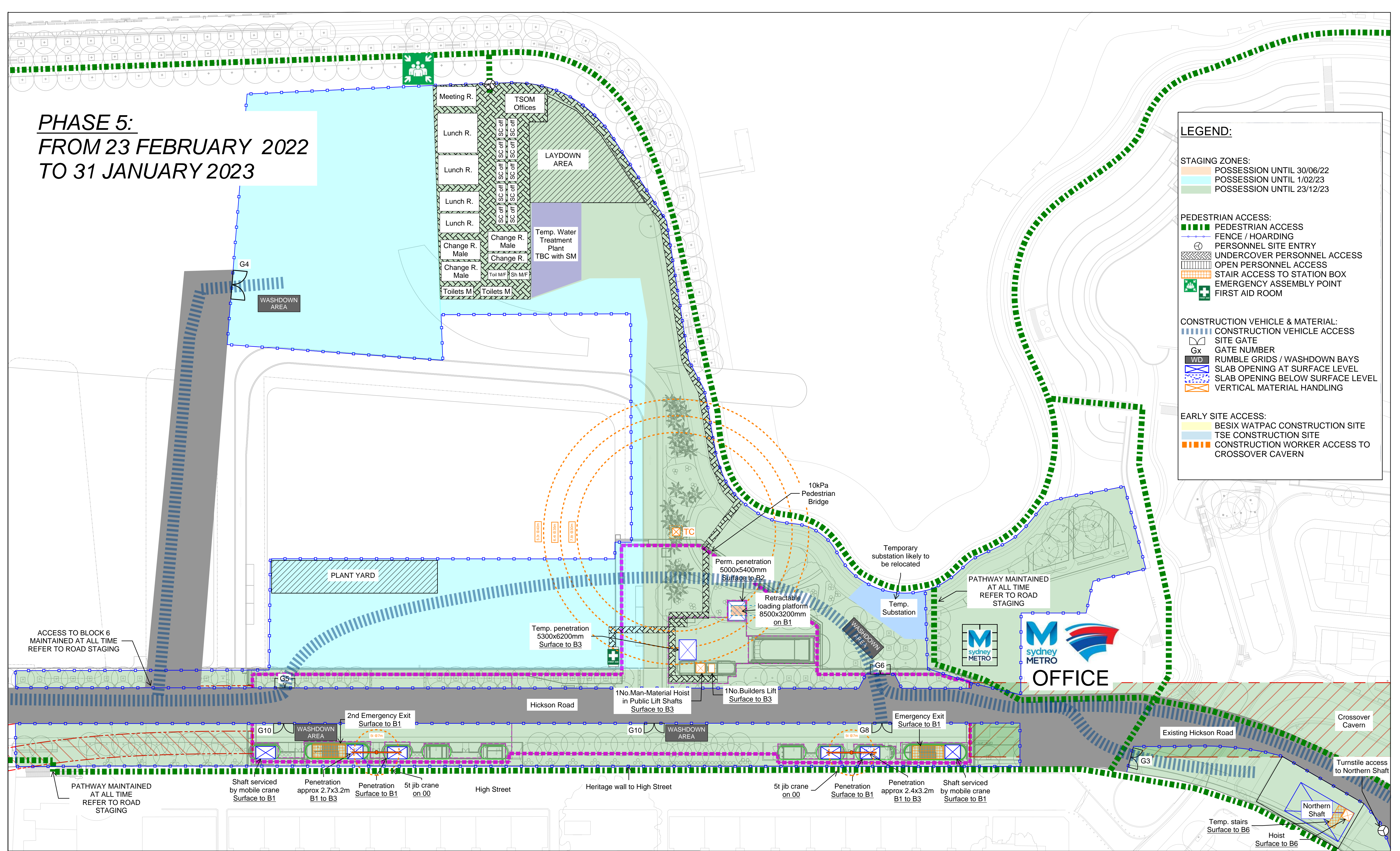
VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:

BESIX WATPAC CONSTRUCTION SITE

TSE CONSTRUCTION SITE

CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN



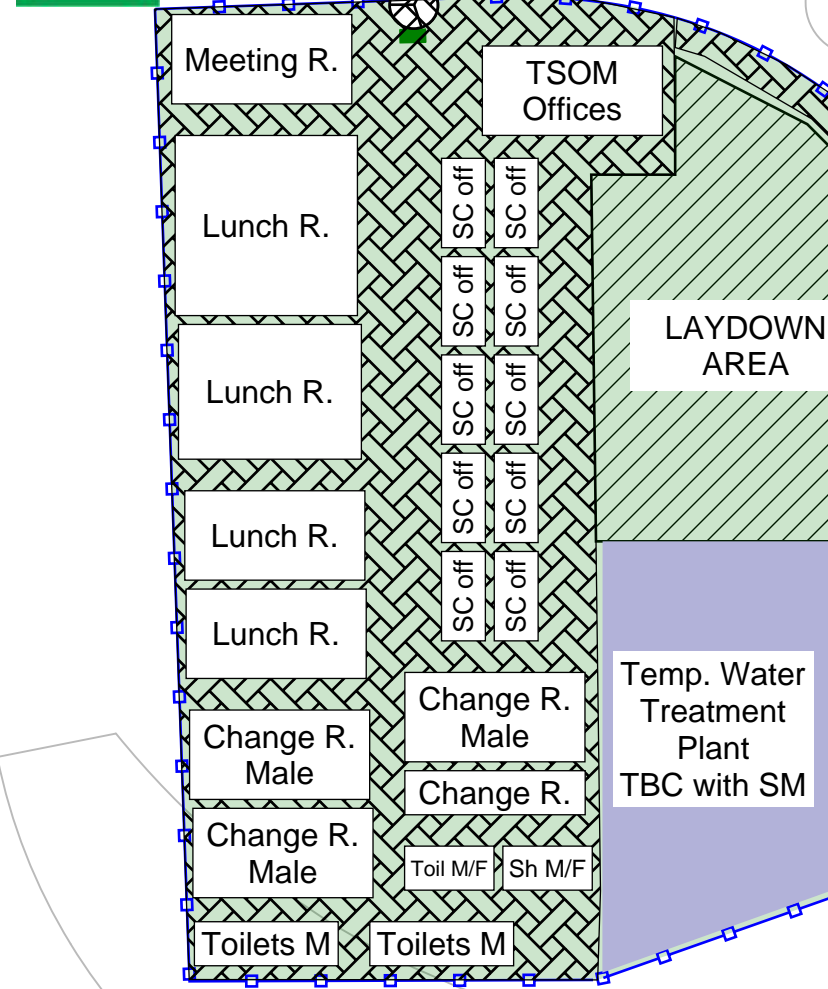
DRAWING NAME:

DWG #:
REV #:

DATE #:



PHASE 6:
FROM 1 FEBRUARY 2023
TO 30 MAY 2023



LEGEND:

STAGING ZONES:

- POSSESSION UNTIL 30/06/22
- POSSESSION UNTIL 1/02/23
- POSSESSION UNTIL 23/12/23

PEDESTRIAN ACCESS:

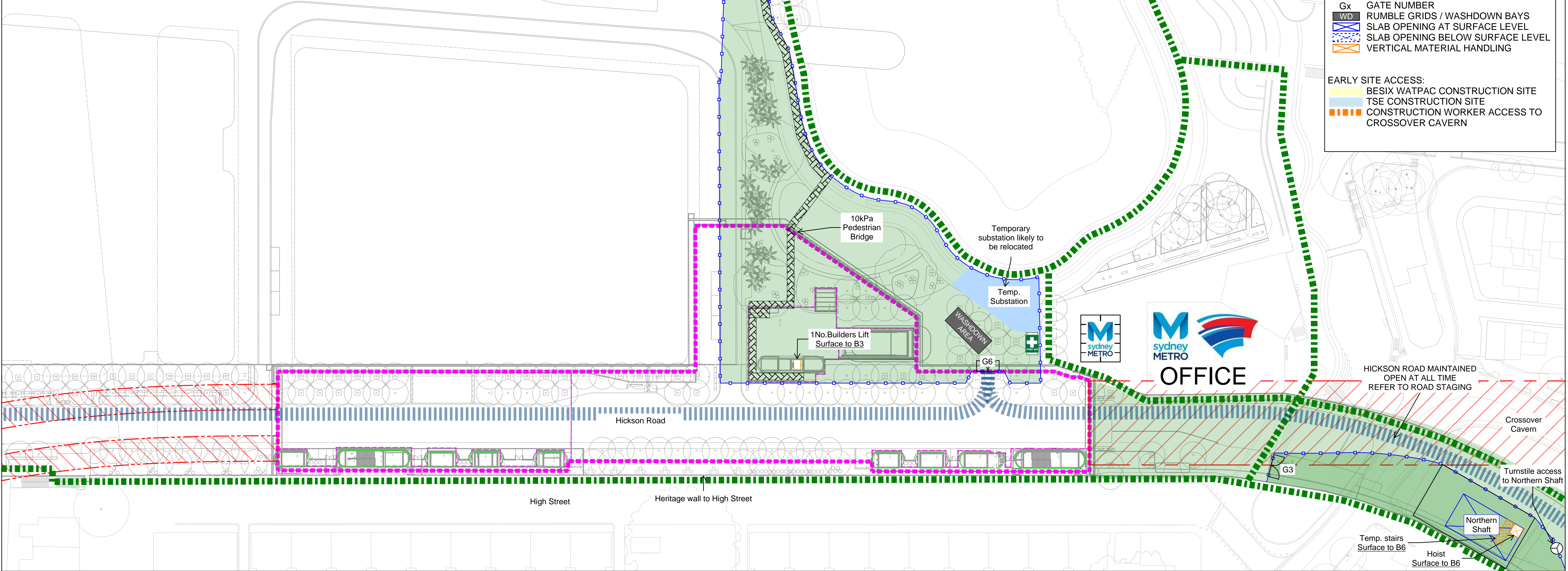
- PEDESTRIAN ACCESS
- FENCE / HOARDING
- PERSONNEL SITE ENTRY
- UNDERCOVER PERSONNEL ACCESS
- OPEN PERSONNEL ACCESS
- STAIR ACCESS TO STATION BOX
- EMERGENCY ASSEMBLY POINT
- FIRST AID ROOM

CONSTRUCTION VEHICLE & MATERIAL:

- CONSTRUCTION VEHICLE ACCESS
- SITE GATE
- GATE NUMBER
- RUMBLE GRIDS / WASHDOWN BAYS
- SLAB OPENING AT SURFACE LEVEL
- SLAB OPENING BELOW SURFACE LEVEL
- VERTICAL MATERIAL HANDLING

EARLY SITE ACCESS:

- BESIX WATPAC CONSTRUCTION SITE
- TSE CONSTRUCTION SITE
- CONSTRUCTION WORKER ACCESS TO CROSSOVER CAVERN



DRAWING NAME:

DWG #:
REV #:

DATE #:



Appendix H Compliance with the CEMF

BARANGAROO STATION

Construction Environmental Management Plan

Extracted from the Metro's document "Chatswood to Sydenham – Staging Report v7.0"

The applicability of the CEMF to each stage allows for effective and efficient management of environmental issues that is commensurate to the impacts of each stage on each environmental management category (refer to Sections 3.2(b) and 3.3(b) of the CEMF). The requirements of the CEMF have been allocated to this project as per Table 2 below which indicates the applicability of the requirements relating to each CEMF environmental management category. This includes for each environmental management category (from the highest risk level to the lowest risk level):

- Whether a stand-alone 'CEMP sub-plan', 'CTMP', 'SMP sub-plan' or 'WFDIP Plan' will be prepared.
- Whether the category risks will be addressed in the main CEMP/SMP document in the form of a procedure ('CEMP-P' or 'SMP-P'),
- Whether the category risks will be addressed in the main CEMP/SMP document only ('CEMP' or 'SMP'), or
- Whether the category risks are not applicable to the stage ('N/A').

This assessment from Metro was based on each stage's scope of work, relevant CoA and REMM requirements and the relevant environmental risks and impacts identified in the C2S EIS and modification reports

Table 13 CEMF Applicability to Barangaroo

CEMF Environmental Management Category	Location
Spoil	CEMP
Groundwater	CEMP
Noise & Vibration	CEMP sub-plan
Heritage	CEMP sub-plan
Flora & Fauna/Biodiversity	CEMP-Procedure
Visual Amenity	CEMP sub-plan
Soil & Water	CEMP-Procedure
Air Quality	CEMP-Procedure

The general and environmental issue specific CEMF requirements relevant to this CEMP are addressed in Table 14. Other environmental issue specific CEMF requirements are addressed in the CEMP sub-plans and procedures.

Table 14 CEMF Compliance

Section	Requirement	Reference
3.1 a	Principal Contractors are required to have a corporate Environmental Management System certified under AS/NZS ISO 14001:2004 and to have transitioned this accreditation into AS/NZS ISO 14001:2015 by September 2018	BESIX Watpac environmental management system (EMS) Section 9.1
3.1 b	Principal Contractors are required to develop a project based Environment and Sustainability Management System (E&SMS). The E&SMS will: (i) Be consistent with the Principal Contractors corporate Environmental Management System and AS/NZS ISO 14001:2004 or 2015; (ii) Be supported by a process for identifying and responding to changing legislative or other requirements; (iii) Include processes for assessing design or construction methodology changes	BESIX Watpac environmental management system (EMS)

BARANGAROO STATION

Construction Environmental Management Plan

Section	Requirement	Reference
	for consistency against the planning approvals; (iv) Include processes for tracking and reporting performance against sustainability and compliance targets; (v) Include a procedure for the identification and management of project specific environmental risks and appropriate control measures; and (vi) Be consistent with the SM C&SW Sustainability Strategy and Sydney Metro Environment and Sustainability Policy	
3.1 c	All sub-contractors engaged by the Principal Contractor will be required to work under the Principal Contractor's E&SMS	BESIX Watpac environmental management system (EMS)
3.1 d	The relationship between key documents within the Sydney Metro Environment and Sustainability Management System and the Principal Contractor's Environment and Sustainability Management System is shown in Figure 2.	This Plan
3.3 a	Principal Contractors are required to prepare and implement a Construction Environmental Management Plan (CEMP) relevant to the scale and nature of their scope of works. The CEMP shall comprise of a main CEMP document, issue specific sub plans, activity specific procedures and site based control maps. The CEMP shall illustrate the relationship between other plans required by the contract, in particular those that relate to design management	This Plan
3.3 b	Depending on the scope and scale of the works. Sydney Metro may decide to streamline the CEMP and sub-plan requirements. For example, depending on the risk associated with particular environmental issues it may be appropriate to remove the need for sub plan, or replace with a procedure as part of the ECMP.	Staging Plans
3.3 c	The CEMP will cover the requirements of the relevant planning approval documentation, the conditions of all other permits and licences, the Principal Contractors corporate EMS, the environmental provisions of the contract documentation and this Construction Environmental Management Framework	This Plan
3.3 d	As a minimum the CEMP will:	
3.3 d	i) Include a contract specific environmental policy	BESIX Watpac Environmental Policy – Appendix A
	ii) Include a description of activities to be undertaken during construction;	Section 1.2.1 - Detail Construction Activities
	iii) For each plan under the CEMP include a matrix of the relevant Conditions of Approval or Consent referencing where each requirement is addressed	Refer Compliance Matrix in individual plans
	iv) For each plan under the CEMP, set objectives and targets, and identify measurable key performance indicators in relation to these	Section 1.3 - CEMP Purpose
	v) For each role that has environmental accountabilities or responsibilities, including key personnel, provide a tabulated description of the authority and roles of key personnel, lines of responsibility and communication, minimum skill level requirements and their interface with the overall project organisation structure	Section 5.0 - Roles and Responsibilities
	vi) Assign the responsibility for the implementation of the CEMP to the Environment Manager, who will have appropriate experience. The Principal Contractor's Project Director will be accountable for the implementation of the CEMP;	Section 5.1.1 - Project Director
	vii) Identify communication requirements, including liaison with stakeholders and the community	Section 7 - Communication and Consultation
	viii) Include induction and training requirements and a summary of the Training Needs Analysis required in Section 3.9(b);	Section 5.2 - Environmental Training
	ix) Management strategies for environmental compliance and review of the performance of environmental controls;	Section 6 - Implementation

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Section	Requirement	Reference
	x) Processes and methodologies for surveillance and monitoring, auditing and review, and reporting on environmental performance including environmental compliance tracking;	Section 6.1.3
	xi) Include procedures for emergency and incident management, non-compliance management, and corrective and preventative action	Section 8 Incident and Emergency Management
	xii) Include procedures for the control of environmental records	Section 6.3.1 Records
3.3 e	The CEMP and associated sub-plans will be reviewed by Sydney Metro and/or an independent environmental representative (see Section 3.11) prior to any construction work commencing. Depending on the Conditions of Approval, the CEMP and certain sub-plans may also require the approval of the Department of Planning and Environment (DP&E).	Section 1.11.2
3.3 f	Where a corresponding system document exists within the Sydney metro Integrated Management System, the Principle Contractor's procedures will be required to be consistent with any requirements in those documents	Section 8
3.4	<p>a. Subject to Section 3.3(b) and Section 3.2(b) the Principal Contractor will prepare issue specific environmental sub plans to the CEMP and SMP which address each of the relevant environmental impacts at a particular site or stage of the project. Issue specific sub plans will include:</p> <ul style="list-style-type: none"> i. Spoil management; ii. Groundwater management; iii. Traffic and transport management; iv. Noise and vibration management; v. Heritage management; vi. Flora and fauna management; vii. Visual amenity management; viii. Carbon and energy management; ix. Materials management; x. Soil and water management; xi. Air quality management; and xii. Waste management and recycling. <p>b. Additional detail on the minimum requirements for these sub plans is provided in Sections 6-17 of this CEMP.</p>	Refer Appendix B.1, to B.5 inclusive Staging Report
3.5 a	The Principal Contractor will prepare and implement activity specific environmental procedures. These procedures should support environmental management sub plans, but may substitute for sub plans in agreement with Sydney Metro if a reasonable risk based justification can be made and the sub plans in agreement with Sydney Metro if a reasonable risk based justification can be made and the sub plan is not a requirement of any approval	Appendix L Appendix M Appendix N
3.5 b	<p>The procedures will include;</p> <ul style="list-style-type: none"> (i) A breakdown of the work tasks relevant to the specific activity and indicate responsibility for each task; (ii) Potential impacts associated with each task; (iii) A risk rating for each of the identified potential impacts; (iv) Mitigation measures relevant to each of the work tasks; and (v) Responsibility to ensure the implementation of the mitigation measures 	Appendix L Appendix M Appendix N
3.5 c	<p>The Principal Contractor will prepare and implement site based progressive Environmental Control Maps (ECM's) which as a minimum:</p> <ul style="list-style-type: none"> (i) Is a progressive document depicting a current representation of the site; (ii) Indicates which environmental procedures, environmental approvals, or licences are applicable; (iii) Illustrates the site showing significant structures, work areas and boundaries; (iv) Illustrates environmental control measures and environmentally sensitive 	Section 9.1 BESIX Watpac Environmental Management System

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Section	Requirement	Reference
	<p>receivers;</p> <p>(v) Is endorsed by the Principal Contractors Environmental Manager or delegate;</p> <p>and</p> <p>(vi) Relevant workers will be trained in the requirements of and will sign off the procedures prior to commencing works on the specific site and / or activity.</p>	
3.6	<p>a. Where the requirement for an additional environmental assessment is identified, this will be undertaken prior to undertaking any physical works. The environmental assessment will include:</p> <ol style="list-style-type: none"> A description of the existing surrounding environment; Details of the ancillary works and construction activities required to be carried out including the hours of works; An assessment of the environmental impacts of the works, including, but not necessarily limited to, traffic, noise and vibration, air quality, soil and water, ecology and heritage; Details of mitigation measures and monitoring specific to the works that would be implemented to minimise environmental impacts; and Identification of the timing for completion of the construction works, and how the sites would be reinstated (including any necessary rehabilitation). 	Section 1.6.1 Consistency Assessments
3.7	<p>a. Prior to the commencement of construction the Principal Contractors will offer Pre-construction Building Condition Surveys, in writing, to the owners of buildings where there is a potential for construction activities to cause cosmetic or structural damage. If accepted, the Principal Contractor will produce a comprehensive written and photographic condition report produced by an appropriate professional prior to relevant works commencing.</p> <p>b. Prior to the commencement of construction the Principal Contractor will prepare a Road Dilapidation Report for all local public roads proposed to be used by heavy vehicles.</p>	Refer Construction Noise and Vibration Management Sub Plan
3.8	<p>a. Principal Contractors will identify hold points, beyond which approval is required to proceed with a certain activity. Example activities include vegetation removal and water discharge. Hold points will be documented in relevant CEMPs.</p> <p>b. Table 1.4 provides the structure for the register of hold points as well as a preliminary list of hold points which will be implemented.</p>	Section 4.4 Register of Hold Points
3.9	<p>a. Principal Contractors will be responsible for determining the training needs of their personnel. As a minimum this will include site induction, regular toolbox talks and topic specific environmental training as follows:</p> <ol style="list-style-type: none"> The site induction will be provided to all site personnel and will include, as a minimum: <ul style="list-style-type: none"> Training purpose, objectives and key issues; Contractor's environmental policy and key performance indicators; Due diligence, duty of care and responsibilities; Relevant conditions of any environmental licence and/or the relevant conditions of approval; Site specific issues and controls including those described in the environmental procedures; Reporting procedure for environmental hazards and incidents; and Communication protocols. Toolbox talks will be held on a regular basis in order to provide a project or site wide update, including any key or recurring environmental issues; and Topic specific environmental training should be based upon, but is not limited to, Issue specific sub-plans required under Section 3.4 (a) (i-xi). <p>b. Principal Contractors will conduct a Training Needs Analysis which:</p> <ol style="list-style-type: none"> Identifies that all staff are to receive an environmental induction and undertake environmental incident management training; Identifies the competency requirements of staff that hold environmental roles and responsibilities documented within the Construction Environmental Management Plan and sub-plans; 	Section 5.2 Environmental Training

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Section	Requirement	Reference
	<p>iii. Identifies appropriate training courses/events and the frequency of training to achieve and/or maintain these competency requirements; and</p> <p>iv. Implements and documents as part of the CEMP a training schedule that plans attendance at environmental training events, provides mechanisms to notify staff of their training requirements, and identifies staff who do not attend scheduled training events or who have overdue training requirements.</p>	
3.10	<p>a. Principal Contractors will develop and implement a Pollution Incident Response Management Plan, in accordance with the requirements of the POEO Act. Contractors' emergency and incident response procedures will also be consistent with any relevant SMDO procedures and will include:</p> <ol style="list-style-type: none"> Categories for environmental emergencies and incidents; Notification protocols for each category of environmental emergency or incident, including notification of TfNSW and notification to owners / occupiers in the vicinity of the incident. This is to include relevant contact details; Identification of personnel who have the authority to take immediate action to shut down any activity, or to affect any environmental control measure (including as directed by an authorised officer of the EPA); A process for undertaking appropriate levels of investigation for all incidents and the identification, implementation and assessment of corrective and preventative actions; and Notification protocols of incidents to the EPA, DP&E or OEH that are made by the Contractor or TfNSW. <p>b. The Contractor will make all personnel aware of the plan and their responsibilities.</p>	Section 8 Incident and Emergency Management
3.11	<p>a. Sydney Metro will engage Independent Environmental Representatives (ERs) to undertake the following, along with any additional roles as required:</p> <ol style="list-style-type: none"> Review, provide comment on and endorse (where required) any relevant environmental documentation to verify it is prepared in accordance with relevant environmental legislation, planning approval conditions, Environment Protection Licences, relevant standards and this CEMP; Monitor and report on the implementation and performance of the above mentioned documentation and other relevant documentation; Provide independent guidance and advice to Sydney Metro and the Contractors in relation to environmental compliance issues and the interpretation of planning approval conditions; Be the principal point of advice for the DP&E in relation to all questions and complaints concerning the environmental performance of the project; Ensure that environmental auditing is undertaken in accordance with all relevant project requirements; and Recommend reasonable steps, including 'stop works', to be taken to avoid or minimise adverse environmental impacts. 	ER Appointed by Sydney Metro
3.12	<p>a. In relation to Roles and Responsibilities the CEMP will:</p> <ol style="list-style-type: none"> Describe the relationship between the Principal Contractor, Sydney Metro, key regulatory stakeholders, the independent environmental representative and the independent certifier; For each role that has environmental accountabilities or responsibilities, including key personnel, provide a tabulated description of the authority and roles of key personnel, lines of responsibility and communication, minimum skill level requirements and their interface with the overall project organisation structure; Provide details of each specialist environment, sustainability or planning consultant who is employed by the Principal Contractor including the scope of their work; and Provide an overview of the role and responsibilities of the Independent Environmental Representative, the Independent Certifier and other regulatory stakeholders. <p>b. All sub-contractors engaged by the Principal Contractor will be required to operate within the EMS documentation of that Principal Contractor.</p>	Section 5 Roles and Responsibilities
3.13	<p>a. Issue specific environmental monitoring will be undertaken as required or as additionally required by any approval, permit or licence conditions.</p>	Section 6.3

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Section	Requirement	Reference
	<p>b. The results of any monitoring undertaken as a requirement of the EPL will be published on the Principal Contractor's, or a project specific, website within 14 days of obtaining the results.</p> <p>c. Environmental inspections will include:</p> <ul style="list-style-type: none"> i. Surveillance of environmental mitigation measures by the Site Foreman; and ii. Periodic inspections by the Principal Contractor's Environmental Manager (or delegate) to verify the adequacy of all environmental mitigation measures. This will be documented in a formal inspection record. d. Regular site inspections by the ERs and Sydney Metro representatives at a frequency to be agreed with the Principal Contractor. e. Principal Contractors must undertake internal environmental audits. <p>The scope will include:</p> <ul style="list-style-type: none"> i. Compliance with any approval, permit or licence conditions; ii. Compliance with the E&SMS, CEMP, SMP, sub-plans and procedures; iii. Community consultation and complaint response; iv. Environmental training records; and v. Environmental monitoring and inspection results. <p>f. Sydney Metro (or an independent environmental auditor) will also undertake periodic audits of the Principal Contractor's E&SMS and compliance with the environmental aspects of contract documentation, including this Construction Environmental Management Framework.</p>	
3.14	<p>a. Principal Contractors will document and detail any non-compliances arising out of the above monitoring, inspections and audits. Sydney Metro will be made aware of all non-compliances in a timely manner.</p> <p>b. Principal Contractors will develop and implement corrective actions to rectify the non-compliances and preventative actions in order to prevent a re-occurrence of the non-compliance. Contractors will also maintain a register of non-compliances, corrective actions and preventative actions.</p> <p>c. Sydney Metro or the Environmental Representative may raise non-compliances against environmental requirements.</p>	<p>Section 6.2</p> <p>Section 8</p>
3.15	<p>a. Principal Contractors will maintain appropriate records of the following:</p> <ul style="list-style-type: none"> i. Site inspections, audits, monitoring, reviews or remedial actions; ii. Documentation as required by performance conditions, approvals, licences and legislation; iii. Modifications to site environmental documentation (e.g. CEMP, sub-plans and procedures); and iv. Other records as required by this Construction Environmental Management Framework. <p>b. Records will be retained onsite for the duration of works.</p> <p>c. Additionally records will be retained by the Principal Contractor for a period of no less than 7 years. Records will be made available in a timely manner to Sydney Metro (or their representative) upon request.</p> <p>d. Compliance reports detailing the outcome of any environmental surveillance activity including internal and external audits (refer to Section 3.13) will be produced by the Principal Contractors Environmental Manager or delegate. These reports will be submitted to Sydney Metro at an agreed frequency.</p>	<p>Section 6.3.1</p> <p>Records</p>
3.16	<p>a. Principal Contractors will ensure the continual review and improvement of the E&SMS. This will generally occur in response to:</p> <ul style="list-style-type: none"> i. Issues raised during environmental surveillance and monitoring; ii. Expanded scope of works; iii. Environmental incidents; and iv. Environmental non-conformances. <p>b. A formal review of the E&SMS by the Principal Contractor's Senior Management Team will also occur on an annual basis, as a minimum. This review shall generate actions for the continual improvement of the E&SMS and supporting management plans.</p>	<p>Section 9.1</p> <p>BESIX Watpac Environmental Management System</p>



Appendix I **Risk Assessment**

Revision Number	Date	Remarks / Notes
O	13/04/2021	Draft for Environment Risk workshop
A	8/06/2021	Issued for SM review
B	8/07/2021	Interim update
C	12/07/2021	Updated following SM comments
D	19/07/2021	Update following ER initial comments for Submission to DPIE
E	24/09/2021	Updated to address the revised site establishment proposal
1	29/08/2022	6 monthly CEMP update review

Barangaroo Metro Station - Environmental Risk Register

Rev 1



Risk Number	Soil/Water	Noise/Vibration	Heritage	Contamination	Key Environmental Aspects						Construction Activity	Equipment	Zone	Out of Hours potential	Cause What could cause environmental impact	Risk What could go wrong and what might happen as a result	Risk Rating before any Control Measures are Implemented			Control Measures Incorporated into Activity (Consider Hierarchy of Control - Avoidance, Reduction, Transfer, Retention)	Comments	Residual Risk Rating after Existing Control Measures were implemented			
					Flora/Fauna/Biodiversity	Air Quality	Community	Traffic	Visual Amenity	Approvals/Licensing							Waste	Consequence	Likelihood			Rating	Consequence	Likelihood	Risk Rating
1	Y			Y							Site establishment including bringing temporary demountable site sheds onto the site which include a temporary grey water storage tank	Hiab	Zone 1	No	The grey water tank could overflow if not pumped out correctly and frequently enough	Grey water could run onto the hardstand in the site compound and find its way into the local environment	C1 - Insignificant	L3 - Possible	D - Low	Grey water will be pumped away by a licensed contractor and disposed of correctly. The level of grey water in the tank will be monitored daily.	activities to be managed with SOP	C1 - Insignificant	L5 - Rare	D - Low	
2	Y	Y				Y	Y				Prepare trenching areas including saw cut and remove existing slab / remove tarmac / overburden	concrete saw, 30t Excavator	Zone 2	No	Dust combined with wind and equipment movements	Dust and noise in proximity to public using foreshore walk	C1 - Insignificant	L2 - Likely	C - Medium	Noisy works will only be carried out during allowable construction hours	activities to be managed with SOP	C1 - Insignificant	L3 - Possible	D - Low	
3	Y								M		Stockpile saw cut concrete and removed tarmac	30t Excavator	Zone 1	No	loose soil connected to materials being held for reuse or classification prior disposal	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L3 - Possible	C - Medium	Keep soil separate from concrete. Cover stockpile with geotextile. Silt controls to perimeter	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	
4					Y						Relocate site hoarding closer toward Sydney Harbour to excavate Western civil pit	Telehandler	Zone 1	No	The hoarding needs to be repositioned to site over 2 juvenile trees along the foreshore	Damage to these trees	C2 - Minor	L2 - Likely	C - Medium	Trees will be removed by an arborist and stored off site until the works are complete.	activities to be managed in accordance with NVMP	C2 - Minor	L5 - Rare	D - Low	
5	Y						Y				150t Crawler crane, high frequency vibrodriver type PTC 24-HVF or similar		Zone 1	No	crawler crane movements and vibrodriver operation	potentially annoying noise to public using foreshore walk and childcare operation	C1 - Insignificant	L3 - Possible	D - Low	choice of high frequency vibrodrammer will reduce noise, only work in standard hours, breaks to coincide with childcare nap time if necessary	activities to be managed in accordance with NVMP	C1 - Insignificant	L3 - Possible	D - Low	
6	Y										Installation of propping to protect trench	Franna Crane	Zone 1	No	Steel cutting and fixing	potentially annoying noise to public using foreshore walk	C1 - Insignificant	L3 - Possible	D - Low	regularly assess material for contaminants, applied unexpected finds procedure, control risk of silt to stormwater run off	activities to be managed in accordance with NVMP	C1 - Insignificant	L5 - Rare	D - Low	
7	Y			M		Y					Excavation of trench to formation level	30t Excavator	Zone 1	No	Silt and possibility of contaminated soil	mixing of contaminated material with clean	C3 - Moderate	L3 - Possible	C - Medium	pump all seepage water to water treatment plant, ensure sufficient storage and capacity to not overload plant	activities to be managed with SOP for soil water and unexpected finds	C3 - Moderate	L5 - Rare	D - Low	
8	Y										Form pump and dewatering of stormwater trench	Water Pumps	Zone 1	Yes	groundwater seepage into trench	untreated groundwater making its way into harbour	C3 - Moderate	L2 - Likely	B - High	regularly assess material for contaminants, applied unexpected finds procedure, control risk of silt to stormwater run off	to be included in water discharge impact assessment	C2 - Minor	L4 - Unlikely	D - Low	
9	Y			M		Y					Stock pile excavated material from within trench	30t Excavator	Zone 1	No	significant volume of materials being held for reuse or classification prior disposal	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L2 - Likely	B - High	Cover stockpiles with geotextile. Silt controls to perimeter. Testing prior to excavation to dispose non reusable spoil during activity and reduce quantity of stockpiles	activities to be managed with SOP	C3 - Moderate	L3 - Possible	C - Medium	
10		M									Install stormwater pipework	Franna Crane	Zone 1	No	equipment operation	potentially annoying noise to public using foreshore walk	C1 - Insignificant	L3 - Possible	D - Low	hoarding and works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C1 - Insignificant	L4 - Unlikely	D - Low	
11						Y					Fill excavated trench to levels	30t Excavator	Zone 1	No	Tipper and excavator movements	dust generation in proximity of foreshore walk	C2 - Minor	L3 - Possible	C - Medium	water spray for dust suppression, hoarding, works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C1 - Insignificant	L3 - Possible	D - Low	
12	Y										FRP storm water pits	Franna Crane, concrete vibrators	Zone 1	No	concrete works, sawing cutting materials	concrete and out materials mixing with water flushing into harbour,	C3 - Moderate	L3 - Possible	C - Medium	plan pours in dry weather, plug stormwater outlets until concrete set	activities to be managed with SOP	C3 - Moderate	L5 - Rare	D - Low	
13	Y	Y		M		Y					Remove and demolish existing stormwater services	30t Excavator, Tipper	Zone 1	No	ground disturbance	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L3 - Possible	C - Medium	silt protection, water spray for dust suppression, works will only be carried out during allowable construction hours, equipment to comply with NVMP	activities to be managed with SOP	C3 - Moderate	L5 - Rare	D - Low	
14	Y			M			M				Remove sheet piles	150t Crawler crane, high frequency vibrodriver type PTC 24-HVF or similar	Zone 1	No	ground disturbance, and cleaning of piles	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L3 - Possible	C - Medium	silt protection, water spray for dust suppression, works will only be carried out during allowable construction hours, equipment to comply with NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	
15	Y										Dewatering of the Western Civil pit into Sydney Harbour	60 litre / second pump	Zone 1	No	Water not meeting the discharge criteria required by the WDA being pumping into Sydney Harbour	Breach of CoA E107 or pollution of the harbour	C4 - Major	L3 - Possible	B - High	Water quality will be checked prior to and following pumping at the pumping location and in Sydney Harbour. Turbidity, Oil and Grease and pH will be checked throughout the pumping process.	Process is outlined in the Soil and Water Management Procedure.	C4 - Major	L4 - Unlikely	C - Medium	
16	Y								M		Waterproofing of station concrete roof and install protective screed	concrete agitator, concrete pump, finishing screed	Zone 2	No	wet concrete screed mixing with rainwater, leftover screed dumped on ground	concrete mixing with water making its way into drains	C2 - Minor	L2 - Likely	C - Medium	water collected at roof interface level is below surrounding ground, to be pumped to water treatment plant, protect perimeter from risk of overland flow from areas outside	activities to be managed with SOP. Consider staging	C2 - Minor	L5 - Rare	D - Low	
17	Y	Y							M		Install services over sharks fin and back filling	truck mounted crane, tower crane, roller compactor	Zone 2	No	wet concrete, rubbish and mixing with rainwater,	concrete and rubbish mixing with water making its way into drains	C2 - Minor	L2 - Likely	C - Medium	regular cleanups, divert collected water to treatment plant	activities to be managed with SOP	C2 - Minor	L5 - Rare	D - Low	
18	Y								M		Complete station entry pods, Install lifts and escalators and cladding over entry pods	scissor lifts, powered hand tools	Zone 2	No	cutting, rubbish	rubbish mixing with water making its way into drains	C3 - Moderate	L2 - Likely	B - High	regular cleanup of rubbish, allocate cutting areas	activities to be managed with SOP	C3 - Moderate	L5 - Rare	D - Low	
19		Y					Y				Complete landscaping	hand tools, wet saw	Zone 2	No	processing and cutting of pavers and other materials	annoying noise to sensitive receivers	C2 - Minor	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low	
20	Y										Waterproofing of station concrete roof and install screed	hand tools	Zone 3	No	Run off from surrounding roads (Hickson Rd and High St) and overland surface will collect in the low point above the stationbox causing potential flood risk	Unprecedented rain event may cause excessive collection of water in the low point of site, which could flood the stationbox	C3 - Moderate	L3 - Possible	C - Medium	Temporary civil engineer to review of rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall Temporary civil engineer to review of rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall Design and installation of waterproofed hobs to penetrations in the station box lid at surface level. All hobs to be constructed to the PMF level, or if not achievable then a risks assessment to be conducted Temporary works civil connections for the Hickson Road demolition will be designed with the temporary civil works engineer and assessed by Sydney Metro and METRON	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	
21		Y					Y		M		Demolish piled wall and capping beam to correct levels	30t excavator with rock breaking tool	Zone 3	No	concrete breaking and loading to tipper	excessive noise and vibration impacting local sensitive receivers	C3 - Moderate	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	
22	Y						Y				Remove steel beams and girders	150t crawler crane, Rattle guns	Zone 3	No	crawler crane movements and loading to trucks	annoying noise to sensitive receivers	C3 - Moderate	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	
23	Y						Y		M		Stockpile steel beams, cut down to transportable sizes and remove from site	150t crawler crane, Oxy Acetylene torch	Zone 9	No	steel sections material handling	moving dropping sections causing annoying noise and vibration	C2 - Minor	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low	
24	Y					Y	Y				Demolish access bridge concrete and remove steel beams	Concrete pecker / rock hammer, 150t crawler crane	Zone 3	No	concrete breaking and loading to tipper	excessive noise and vibration impacting local sensitive receivers,	C3 - Moderate	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP.	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	
25						Y	Y				Demolish access bridge concrete and remove steel beams	Concrete pecker / rock hammer, 150t crawler crane	Zone 3	No	concrete breaking and loading to tipper	generation of dust	C1 - Insignificant	L2 - Likely	C - Medium	use of water sprays for dust suppression	activities to be managed with SOP	C1 - Insignificant	L4 - Unlikely	D - Low	
26						Y					Back fill, install primary and secondary service and compact fill	30t excavator, tipper trucks, roller compactor	Zone 3	No	Tipper and excavator movements, Franna crane	dust generation in proximity of foreshore walk	C2 - Minor	L4 - Unlikely	D - Low	water spray for dust suppression,	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low	
27	Y						M				Back fill, install primary and secondary service and compact fill	30t excavator, tipper trucks, roller compactor	Zone 3	No	Tipper and excavator movements, Franna crane	noise generation in proximity of foreshore walk	C2 - Minor	L3 - Possible	C - Medium	works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low	
28	Y										Install road, FRP, kerb and guttering and landscaping works	Asphalt trucks, rollers, concrete trucks, concrete pumps, wet saws to cut pavers	Zone 3	No	processing of materials, delivery and installation of concrete and asphalt	concrete and rubbish mixing with water making its way into drains, annoying noise	C3 - Moderate	L2 - Likely	B - High	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L3 - Possible	C - Medium	
29	Y						Y	Y			Shift road from East to West	Lighting towers, Truck mounted crane	Zone 3	Yes	traffic impacts require nightworks	light pollution, noise to sensitive receivers	C4 - Major	L3 - Possible	B - High	scope works to minimise noisy activities, ensure equipment exhausts have compliant attenuation	activities to be managed with SOP	C4 - Major	L4 - Unlikely	C - Medium	
30			Y	Y							Zone 3.1 activities occurring to the South of the Station	N/A	Zone 3.1	No	Activities occurring to the South of the Station excavation, which has not been excavated previously have a greater risk of heritage finds or contamination	Higher risk of contamination and Heritage discoveries as this areas has not recently been excavated	C4 - Major	L3 - Possible	B - High	This area will be managed under the proposed Heritage and Soil and Water / Contamination Management plans and the works will be more closely monitored during excavation	Activities to be managed under the Heritage Management Plan and Soil Plan	C4 - Major	L5 - Rare	C - Medium	
31											Suspend stormwater pipework off the Hickson Road wall temporarily to enable demolition of the Hickson Road bridge deck and steel support structure. Includes coring into the concrete section of the wall to locate existing downpipes behind the wall	Stitch coring rig, PVC pipe	Zone 4	No	Coring into the wall	Damage to the Hickson Road wall which located in a heritage precinct	C4 - Major	L3 - Possible	B - High	A heritage consultant will produce a methodology document in support of these works. Coring will occur through concrete section of the wall only. No impact on sandstone sections of the wall will be allowed. Concrete will be re-installed in consultation with heritage consultant	activities to be managed with SOP	C4 - Major	L4 - Unlikely	C - Medium	
32		Y					Y				Demolish temporary Hickson road, remove propped steel girders and services hanging under Hickson Road	Concrete pecker / rock hammer, 150t crawler crane, 30t excavator, rattle guns	Zone 4	Yes	steel cutting and loading	excessive noise impacting local sensitive receivers,	C2 - Minor	L3 - Possible	C - Medium	noisy works limited during select times - refer NVMP	activities to be managed with SOP	C2 - Minor	L4 - Unlikely	D - Low	
33	Y	Y									FRP concrete ventilation and stair pods	Concrete trucks, concrete vibrators	Zone 4	No	concrete works, sawing cutting materials	concrete and out materials mixing with stormwater	C3 - Moderate	L3 - Possible	C - Medium	regular cleanup of rubbish, allocate cutting areas	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium	

34	Y	Y						Waterproofing of station concrete roof, waterproof pods and install screed	concrete agitator, concrete pump, leftover screed dumped on ground	Zone 4	No	wet concrete screed mixing with rainwater, leftover screed dumped on ground	concrete mixing with water making its way into drains	C2 - Minor	L2 - Likely	C - Medium	water collected at roof interface level is below surrounding ground, to be pumped to water treatment plant, protect perimeter from risk of overland flow from areas outside.	activities to be managed with SOP. Consider staging	C2 - Minor	L2 - Likely	C - Medium
35	Y	Y		Y				Back fill, install primary and secondary service and compact fill	30t excavator, tipper trucks, roller compactor fill	Zone 4	No	Tipper and excavator movements, Franna crane	noise and dust generation in proximity of sensitive receivers	C2 - Minor	L3 - Possible	C - Medium	water spray for dust suppression, works will only be carried out during allowable construction hours, muffler on Franna to comply with NVMP	activities to be managed with SOP	C3 - Moderate	L3 - Possible	C - Medium
36	Y	Y		Y				Install roof, FRP, berbs and gutting	Asphalt trucks, rollers, concrete trucks, concrete pumps	Zone 4	No	processing of materials, delivery and installation of concrete and asphalt	concrete and rubbish mixing with water making its way into drains, annoying noise	C3 - Moderate	L2 - Likely	B - High	noise works limited during select times - refer NVMP	activities to be managed with SOP	C3 - Moderate	L4 - Unlikely	C - Medium
37		Y						Remove Heritage Wall Road dust mesh and protection and repair render locally around firing points (note provisional sum so scope TBC)	Scissor lift, cherry picker	Zone 4	No	unknown causes of deterioration of wall eg increased hydraulic pressure behind wall	damage to wall during works	C3 - Moderate	L3 - Possible	C - Medium	undertake in stages, confirm via survey or inspection wall is secure prior to works		C3 - Moderate	L4 - Unlikely	C - Medium
38		Y	Y					Zone 4 activities occurring to the South of the Station	N/A	Zone 4.1	No	Zone 4 activities occurring to the South of the Station excavation, which has not been excavated previously have a greater risk of heritage finds or contamination	Higher risk of contamination and Heritage discoveries as this area has not recently been excavated	C4 - Major	L3 - Possible	B - High	noise area use noise management measures proposed in the Heritage and Soil and Water / Contamination Management plans and the works will be more closely monitored during	Activities to be managed under the Heritage Management Plan and Soil Plan	C4 - Major	L5 - Rare	C - Medium
39			Y					Remove trees in Zone 5 in advance of Zone 5 construction activities	Chainsaw and chipper truck	Zone 5	No	Incorrect approvals in place	Non-compliance with planning approval by removing trees without approval.	C2 - Minor	L3 - Possible	C - Medium	Tree Report to be approved and removal documented in the Flora and Fauna Management procedure.		C2 - Minor	L5 - Rare	D - Low
40	M	M						Excavate trench to install condenser water pipework between station sharks fin and the headland park including excavating the carpark in front of the Dalgety Bond Store	30t excavator	Zone 5	No	The carpark in front of the Dalgety Wool Store has not previously been excavated as part of the development of Baragano so has the potential to contain contamination or heritage artifacts	Heritage items of significance could be damaged or lost	C3 - Moderate	L5 - Rare	D - Low	This area will be managed under the project Heritage management plan. Works to be monitored during construction for items of heritage significance	Activities in this area will be managed under the project Heritage Management Plan	C3 - Moderate	L5 - Rare	D - Low
41	Y		Y					Decommission the existing water treatment plant	Tower crane	Zone 5	No	dismantling and removal works	chemical spills and sludge mixing with stormwater	C3 - Moderate	L3 - Possible	C - Medium	ensure all elements, tanks and vessels are cleaned prior to dismantling	consider decommissioning plan to be developed at later stage	C3 - Moderate	L4 - Unlikely	C - Medium
42								Install condensed water pipework in trench, other services and and fill	30t excavator	Zone 5	No	loose and stockpiled excavated materials	soil mixing with rainwater making its way into drains close to the harbour	C3 - Moderate	L4 - Unlikely	C - Medium			C2 - Minor	L4 - Unlikely	D - Low
43	Y							Remediated pavement and landscaping excavated to complete condensed water pipework, complete new landscaping, public lighting and bollards	General landscaping equipment, wet saw	Zone 5	No	landscape activities such as cutting pavers	potentially annoying noise to public using foreshore walk	C1 - Insignificant	L3 - Possible	D - Low		activities to be managed in accordance with NVMP	C2 - Minor	L6 - Almost Unprecedented	D - Low
44		Y		Y				Remove transformers, install and operate back up power	Generator	Zone 5	No	Operation of generator 24/7	attenuation is insufficient and noise impacts sensitive receivers out of hours	C3 - Moderate	L2 - Likely	B - High	ensure noise performance certified prior to installation, - refer to NVMP		C3 - Moderate	L4 - Unlikely	C - Medium
45		Y		Y				Operate the Northern access shaft acoustic shed, ventilation fan and gantry crane throughout the course of the works	Vehicle movements reversing into the Northern shaft to deliver goods into the crossover cavern	Zone 6	Yes	heavy usage out of hours	insufficient noise mitigations, causing annoyance to sensitive receivers	C3 - Moderate	L2 - Likely	B - High	ensure compliance equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP		C3 - Moderate	L3 - Possible	C - Medium
46		Y		Y				Backfill the northern access shaft with stabilised sand, compact and cap with concrete lid	Gantry crane used to lower stabilised sand into the shaft, compactors, small excavators to move material around in the northern shaft	Zone 6	Yes	heavy usage out of hours	insufficient noise mitigations, causing annoyance to sensitive receivers	C3 - Moderate	L2 - Likely	B - High	ensure compliance equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP	ensure community is well informed prior to works	C3 - Moderate	L3 - Possible	C - Medium
47	Y	Y			Y			Demolish existing road, kerb and gutting along Hickson Road in vicinity of the Northern access shaft	Concrete pavers, rock materials, 30t excavator, trucks to remove excavated concrete, asphalt and kerb	Zone 6	Yes	heavy use of various plant out of hours	insufficient noise mitigations, causing annoyance to sensitive receivers	C3 - Moderate	L2 - Likely	B - High	ensure compliance equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP	ensure community is well informed prior to works	C3 - Moderate	L3 - Possible	C - Medium
48	Y	Y		M		Y		Install new services under road, install new FRP kerb and gutting and complete landscaping works	Asphalt trucks, rollers, concrete trucks, concrete pumps	Zone 6	No	heavy use of various plant	insufficient noise mitigations, causing annoyance to sensitive receivers	C2 - Minor	L2 - Likely	C - Medium	ensure compliance equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP	ensure community is well informed prior to works	C2 - Minor	L3 - Possible	C - Medium
49		Y						Platform precast installation & overtrack steelwork	14t forklift, Franna crane	Station Box	Yes	supply of precast, transport and handling equipment	noisy deliveries of precast into station	C3 - Moderate	L3 - Possible	C - Medium	ensure compliance equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP		C3 - Moderate	L3 - Possible	C - Medium
50	M			Y				Blockwork installation	14t forklift, hand tools, wet saw	Station Box	Yes		spoil mixing with stormwater going directly to harbour	C3 - Moderate	L2 - Likely	B - High	ensure allocated areas for cutting are away from open vents refer NVMP		C2 - Minor	L2 - Likely	C - Medium
51	Y							Seawall diving, incl installation on stainless steel entry/exit cages and clearing of waterway entry/exit	15t mobile crane	Zone 7	No	modification of existing infrastructure	use of materials and rubbish going directly into harbour	C3 - Moderate	L4 - Unlikely	C - Medium	ensure all rubbish is controlled and cleaned up each day		C3 - Moderate	L5 - Rare	D - Low
52	Y							Main walkway, incl 2x chambers works, install pipe work connectors	Suction truck	Zone 7	No	installation pipework, commissioning	use of materials and rubbish going directly into harbour	C3 - Moderate	L3 - Possible	C - Medium	ensure spoil contained in operation		C3 - Moderate	L3 - Possible	C - Medium
53	Y							Headland to BR CDP install supply/return chiller lines, LV feeder and control cables	cable roll feed, hand tools	Zone 7	No	installation pipework, commissioning	reduced quality of surrounding aesthetics, generation of rubbish	C3 - Moderate	L4 - Unlikely	C - Medium	ensure all rubbish is controlled and cleaned up each day		C3 - Moderate	L4 - Unlikely	C - Medium
54		Y			Y		Y	Main laydown area, materials, equipment and vehicle park	14t forklift, Franna,	Zone 9	Yes	arrangement of materials and equipment		C3 - Moderate	L3 - Possible	C - Medium	daily monitoring and cleanup		C3 - Moderate	L3 - Possible	C - Medium
55		Y						Demolish temporary Hickson road, remove propped steel girders and services hanging under Hickson Road	Various equipment	Zone 4	No	Accidental plant equipment impact to heritage wall	Damage to Heritage Wall	C2 - Minor	L3 - Possible	C - Medium	Footpath between works and wall to have hoarding. Any works within footpath to be expedited to ensure no impact to wall		C2 - Minor	L4 - Unlikely	D - Low
56			Y					Excavate trench to install condensed water pipework between station sharks fin and the headland park including excavating the carpark in front of the Dalgety Bond Store	30t excavator	Zone 5	No	Excavation in root zone, impact to canopy	Damage to existing trees (not contemplated for removal under the Tree Report)	C1 - Insignificant	L3 - Possible	D - Low	During works, apply tree protection zone in accordance with arborist recommendations	Note - trees are relatively juvenile	C1 - Insignificant	L5 - Rare	D - Low
57	Y		M					Construction of new SW drainage along Hickson Rd	Various equipment	Zone 4	No	Temporary diversion of existing SW	Local Flooding to properties in High St	C3 - Moderate	L4 - Unlikely	C - Medium	Review staging in detail with SW consultant to assess expected flooding in High st and eliminate likelihood of affecting properties by amending culvert times and provision of overflows		C3 - Moderate	L6 - Almost Unprecedented	D - Low
58					Y			Site sheds	15t Mobile Crane	Zone 1	No	Long term arrangement of site compound having negative impact on surrounding aesthetics	Unightly sheds and associated plant, noisy workers	C1 - Insignificant	L3 - Possible	D - Low	Sheds are low rise and located behind shoring/blending		C1 - Insignificant	L3 - Possible	D - Low
59					Y			Main laydown area, materials, equipment and vehicle park	Various	Zone 9	No	Long term arrangement of laydown area having negative impact on surrounding aesthetics	Unightly, noisy workers, generation of rubbish	C1 - Insignificant	L3 - Possible	D - Low	Located behind shoring. Laydown material and plant to be arranged in orderly way. Rubbish to be regularly cleaned		C1 - Insignificant	L6 - Almost Unprecedented	D - Low
60			Y					General - Diesel powered plant, and equipment	Various	All	Yes	poorly maintained equipment leading to incomplete combustion and increased noxious gases and particulates	increased air pollution and irritant to locals and workers in vicinity of exhausts	C2 - Minor	L3 - Possible	C - Medium	All diesel powered plant subject to visual assessment on exhaust (not visible min 10 seconds). Excavators and mobile cranes on site more than three months must comply with USA EPA Tier 4 emissions standards.		C2 - Minor	L4 - Unlikely	D - Low
61			Y					General - above ground works and buildings - fauna	N/A	All	N/A	unexpected find of native animal or bird nest	disturbance or injury from construction activities	C2 - Minor	L5 - Rare	D - Low	Remove animal using qualified ecologist in accordance with Flora and Fauna procedure	very low chance due to lack of native environment	C2 - Minor	L5 - Rare	D - Low
62				Y	Y			General - construction worker vehicles & parking	small vehicles	N/A	Yes	workers parking in surrounding streets	loss of on street parking affecting local residents and businesses	C2 - Minor	L2 - Likely	C - Medium	regular inductions to encourage use of public transport, car pooling and off street public carparking		C2 - Minor	L3 - Possible	C - Medium
63				Y				General - trucks waiting to access site	trucks	N/A	Yes	trucks standing in surrounding streets awaiting delivery to site	disturbance to local residents and businesses resulting in complaints	C3 - Moderate	L2 - Likely	B - High	Vehicles making deliveries must comply with Traffic Management plan and not wait in sensitive areas prior to commencement of working hours		C1 - Insignificant	L6 - Almost Unprecedented	D - Low
64					Y			General - Pre Planning of construction activities	N/A	All	N/A	not necessary appropriate approvals, licences or permits and proceeding without them	works delayed, infringements, prosecution, poor community relations, reputational loss	C4 - Major	L3 - Possible	B - High	ensure compliance equipment and operations considerate to potential noise impacts. Aim to minimise noise after 10pm. Refer to NVMP		C4 - Major	L4 - Unlikely	C - Medium
65			Y					General - Potential discovery of contaminated soil or asbestos	N/A	All	N/A	encountering asbestos in works	transferring material to previously uncontaminated areas	C3 - Moderate	L3 - Possible	C - Medium	excavated material during construction, apply unexpected finds procedure. Conduct further investigations	conduct regular toolbox talks on how to manage unexpected finds	C3 - Moderate	L4 - Unlikely	C - Medium
66				Y				General - recycling	N/A	All	N/A	Poorly arranged or insufficient recycling facilities	creation of non recyclable waste streams, not meeting sustainability targets	C2 - Minor	L2 - Likely	C - Medium	ensure waste managed in accordance with sustainability management plan, waste bins are regularly checked for categories, regular inductions to all subcontractors		C1 - Insignificant	L4 - Unlikely	D - Low
67				Y				General - waste to landfill	N/A	All	N/A	Poor planning of works	site adjustments and cutting leading to more waste materials going to landfill than necessary, increased cost to subcontractors	C2 - Minor	L3 - Possible	C - Medium	ensure all key float works are preceded with site measure		C2 - Minor	L4 - Unlikely	D - Low

Y - Yes
N - No
M - Maybe

Risk Assessment Matrix			Consequence Score					
			C1 - Insignificant	C2 - Minor	C3 - Moderate	C4 - Major	C5 - Severe	C6 - Catastrophic
			No appreciable changes to environment and/or highly localized event	Changes from normal conditions within environment within environmental regulatory limits and environmental effects are within site boundaries	Short term and well contained environmental effects. Minor remedial actions probably required.	Impacts external ecosystem and considerable remediation is required.	Long term environmental impact in neighbouring or valued ecosystems. Extensive remediation required	Invernsible large scale environmental impact with loss of valued ecosystems
Likelihood	L1 - Almost Certain	Expected to occur frequently during time of activity or project	C - Medium	B - High	B - High	A - Very High	A - Very High	A - Very High
	L2 - Likely	Expected to occur occasionally during time of activity or project	C - Medium	C - Medium	B - High	B - High	A - Very High	A - Very High
	L3 - Possible	More likely to occur than not to occur during time of activity or project	D - Low	C - Medium	C - Medium	B - High	B - High	A - Very High
	L4 - Unlikely	More likely not to occur during time of activity or project	D - Low	D - Low	C - Medium	C - Medium	B - High	B - High
	L5 - Rare	Not expected to occur during time of activity or project	D - Low	D - Low	D - Low	C - Medium	C - Medium	B - High
	L6 - Almost Unprecedented	Not expected to ever occur during time of activity or project	D - Low	D - Low	D - Low	D - Low	C - Medium	C - Medium

A1 Consequence Table

Consequence Table						
Rating	C1	C2	C3	C4	C5	C6
Descriptor Impact Area	Insignificant	Minor	Medium	Major	Severe	Catastrophic
Health and Safety (People and Diseases)	Stress, first aid or minor treatment required	Stress or minor injuries requiring medical treatment	Single moderate to severe injuries or illnesses, occupational illness	1-10 major injuries, hospitalization and/or multiple days loss of work, occupational illness	Single fatal, serious or 10-20 major occupational illnesses/diseases	Multiple fatalities and/or >20 major occupational illnesses/diseases
Environment	No appreciable changes to environment and/or highly localized event	Change from normal conditions within environmental regulatory limits and environmental effects are within site boundaries	Short term and well contained environmental effects. Minor remedial actions probably required	Impacts external ecosystem and considerable remediation is required	Long term environmental impact in neighbouring or valued ecosystems. Extensive remediation required	Invernsible large scale environmental impact with loss of valued ecosystems
Customer Experience/Operational Activity	Short duration disruptions affecting part of one transport mode	Minor disruptions affecting several parts of one transport mode	Serious disruptions affecting operation of one complete transport mode	Major disruptions affecting operation of one transport mode with effects on one or more other modes of transport	Short duration disruptions or substantial disruptions affecting multiple transport modes with safety affecting activity	Extensive disruptions or substantial disruptions with safety affecting activity
Government Reputation / Public Trust/ Compliance	Negative articles in local media. No significant reputational impacts or loss of confidence in the project	Minor negative articles in local media. Some reputational impacts and loss of confidence in the project	Disappointment - Negative articles in local media. Confidence and trust are affected but are quickly restored	Concern - Short-term negative reputational impacts. Confidence and trust are affected but are quickly restored	Disruption - Substantial negative reputational impacts. Confidence and trust are severely damaged and recovery both time and cost effort	Change - Material damage to the public reputation of the project. Confidence and trust are severely damaged and recovery both time and cost effort
Regulatory or Legal Breach	Low level non-compliance with legal and regulatory requirements or delays by regulatory or legal authorities	Minor non-compliance with legal and regulatory requirements or delays by regulatory or legal authorities	Medium non-compliance with legal and regulatory requirements or delays by regulatory or legal authorities	Major non-compliance with legal and regulatory requirements or delays by regulatory or legal authorities	Severe non-compliance with legal and regulatory requirements or delays by regulatory or legal authorities	Catastrophic non-compliance with legal and regulatory requirements or delays by regulatory or legal authorities
Management Reputation / Organizational Image	No event, the impact of which can be considered as normal activity	An event, the impact of which can be considered as minor activity	An event, the impact of which can be considered as medium activity	An event, the impact of which can be considered as major activity	An event, the impact of which can be considered as severe activity	An event, the impact of which can be considered as catastrophic activity
Budget, Costs or Revenue	< \$100k	\$100k - \$1m	\$1m - \$10m	\$10m - \$50m	\$50m - \$100m	> \$100m

A2 Likelihood Criteria

Likelihood						
Rating	L6	L5	L4	L3	L2	L1
Descriptor Definition	Almost Unprecedented	Very Unlikely	Unlikely	Likely	Very Likely	Almost Certain
Qualitative Expectation	Not expected to ever occur during time of activity or project	Not expected to occur during time of activity or project	More likely not to occur than occur during time of activity or project	More likely to occur than not occur during time of activity or project	Expected to occur occasionally during time of activity or project	Expected to occur frequently during time of activity or project
Sydney Metro Probability Analysis	<10%	10-25%	25-50%	50-75%	75-90%	>90%

A4 Sydney Metro Risk Tolerance and Response

Risk Rating		Descriptor	Description & Required Response	Review frequency
Increasing risk and concerns	A	Generally Intolerable	Very High Very high risks are generally intolerable and should be avoided except in extraordinary circumstances. Where the risk has health, safety or environmental consequences, the activity must not be undertaken without the explicit approval of the Greater Sydney Region, an alternative solution must be found and all necessary steps must be taken to reduce the risk below this level without delay. Risks are to be reported to the NSW Project Director or nominated delegate who is to verify that the risk is a Key Risk.	Monthly
	B	Unacceptable	High High risks are unacceptable. They can only be tolerated if it is not reasonably practicable to reduce the risk further. Where the risk has health, safety or environmental consequences the activity must not be undertaken without the explicit approval of the NSW Project Director or nominated delegate who is to verify that all reasonably practicable treatments have been implemented. High risks are considered to be on the verge of being unacceptable and must be given immediate priority. Risks are to be reported to the relevant Responsible Manager with 48hrs who will determine whether the risk should be reported as a 'Key Risk'.	Monthly
	C	Tolerable	Medium Medium risks are tolerable if it is not reasonably practicable to reduce the risk further. Where the risk has health, safety or environmental consequences the activity should be reviewed to determine if the risk can be reduced further and whether all reasonable and practicable controls have been considered and/or applied. Additional treatment measures should be sought if significant benefit can be demonstrated and/or there is an additional treatment measure which is recognised as good practice in other like environments. The relevant Line Manager must be alerted and regularly updated, who will determine whether the risk should be reported to the relevant Responsible Manager.	Two Monthly
	D	Broadly Acceptable	Low Low risks are considered to be broadly acceptable. Where the risk has health, safety or environmental consequences control measures should be effective, reliable and subject to appropriate monitoring. If options for further risk reduction exist and are proportionate to the benefits, then implementation of such measures should be considered. The risk and its treatments should be subject to appropriate degrees and forms of monitoring to ensure that remains at this level. Risks to be communicated as part of standard risk reporting by exception only.	Quarterly

"D" Risks Little or No Risk Accepted	Low (1-10)	Risk Appetite Is the level of risk we are willing to take to achieve our Strategic Objectives
"C" Risks A Balanced and Informed Approach	Med (11-21)	
"B" Risks High Risks are accepted with Effective Controls	High (22-30)	
"A" Risks Very High Risks are accepted with Executive Approval	Very High (31-36)	

Risk Rating: Very High - A - 31-36 High - B - 22-30 Medium - C - 11-21 Low - D - 1-10			CONSEQUENCE					
			Insignificant	Minor	Moderate	Major	Severe	Catastrophic
			C6	C5	C4	C3	C2	C1
LIKELIHOOD	Almost certain	L1	20	22	29	32	34	36
	Very Likely	L2	14	18	23	28	31	35
	Likely	L3	9	12	16	24	27	33
	Unlikely	L4	6	7	11	17	25	30
	Very Unlikely	L5	3	4	8	13	19	26
	Almost unprecedented	L6	1	2	5	10	15	21

All identified risks (and associated controls and treatments) must be subject to detailed periodic review, the frequency of which will be determined by the Current risk rating (refer to [Appendix B: Sydney Metro Risk Matrix](#)):

Rating	Descriptor	Review frequency
A	Very High	Monthly
B	High	Monthly
C	Medium	Two Monthly
D	Low	Quarterly



Appendix J

Head Contract

Specification

Compliance



Caption: One Central Park, Sydney

BARANGAROO STATION

Construction Environmental Management Plan

Compliance Table

Table 15 Compliance Table - Particular Specification & General Specification (CEMP)

Clause	PS/GS Paragraph [Note: updated to Addenda 7 requirements]	Reference Section
Particular Specification - Plans and Reporting		
5.1(g)	<i>For the purposes of section 5.1.4.2.3 of the General Specifications, the Contractor must comply with Sydney Metro Risk Management Standard (SM-17-00000182) rather than SM RM-ST-201.</i>	CEMP, Section 10 & Appendix H
Particular Specification - Planning and Environmental Management		
2.6 (a)	<p>(ii) Materials which are not suitable for incorporation in the Project Works must be removed from the Construction Site and disposed in accordance with the contract.</p> <p>(iii) Stockpiles must not be placed in drainage lines, channels or paths.</p> <p>(iv) All stockpiles must be managed in accordance with “managing urban stormwater: soils and construction volume 1 (Blue Book)”.</p>	CEMP, Section 9.2.3
2.6.1 (a)	<i>The Contractor must develop, implement and maintain a corporate environmental management system that complies with AS/NZS ISO 14001 for the duration of the Contractor’s Activities.</i>	CEMP, Section 9.1
2.6.1 (b)	<i>The Contractor must comply with the Sydney Metro Construction Environmental Management Framework (CEMF) (SM ES-ST-204).</i>	CEMP, Section 1.5 & Appendix G (Compliance matrix) Appendix C,D & E sub plans
General Specification – Independent Environmental Representatives		
2.6.3 (i)	<i>Environmental inspections (led by ER) will be held weekly, unless otherwise agreed with the Principal’s Representative</i>	CEMP, Section 6.1
Particular Specification – Spoil Management		
2.7.13(b)	<p>(b) Beneficial reuse of spoil must be in accordance with the following spoil reuse hierarchy, in order of preference:</p> <p>(i) within the project;</p> <p>(ii) environmental works;</p> <p>(iii) other development projects;</p> <p>(iv) land restoration; and</p> <p>(v) landfill management.</p>	Refer Sustainability Management Plan. The CEMP will adopt objectives of 2.7.13 (b) in Section 9.3.3
2.7.13 (c)& (d)	<p>(c) The Contractor must utilise reuse appropriate site-won materials onsite.</p> <p>(d) The Contractor must ensure that landscape mounding and gabion wall features use site-won materials if they meet quality requirements.</p>	CEMP Section 9.3.3
Particular Specification –Pollution Control		
2.7.14 (a)	<i>The Contractor must identify and implement pollution control initiatives and target zero major pollution incidents.</i>	CEMP Section 1.8, Appendix A Environmental Policy
2.7.14 (b)	<i>The Contractor must, where practicable, ensure that all excavators and mobile cranes used for the Contractor’s Activities, which are onsite for more than three months, comply with United States Environmental Protection Agency (US EPA) Tier 4 exhaust emission standards.</i>	CEMP Section 9.3.2
Particular Specification – Temporary Site Facilities		
2.7.15 (a) (i) and (ix)	<p>(a) The Contractor must ensure that, where reasonable and feasible, any temporary site facilities provided by the Contractor incorporate:</p> <p>- energy efficient lighting schemes and light fittings;</p>	Appendix D Visual Amenity Sub Plan

BARANGAROO STATION

Construction Environmental Management Plan

Clause	PS/GS Paragraph [Note: updated to Addenda 7 requirements]	Reference Section
	- crime prevention through environmental design principles.	
2.7.15 (b)	(b) Any security and warning lighting used by the Contractor must be installed so that light is not directed at neighbouring properties or in such a way that light reflects onto structures or neighbouring properties.	Appendix D Visual Amenity Sub Plan
General Specification – Site Investigations and survey		
3.11.1 (c)	The Contractor must undertake site investigation work associated with Contamination in accordance with the NSW Environment Protection Authority requirements.	CEMP Section 6.1,
3.11.1 (d) part	The Contractor must maintain records of all site investigations....	CEMP Section 6.1,
3.11.1 (h)	All contamination laboratory test results must be provided in environmental data management software (ESDAT) electronic lab data format.	CEMP Section 6.1,
General Specification – Construction Environmental Management Plan (CEMP) and sub-Plans		
5.1.4.8(a)	(a) The Contractor must submit Construction Environmental Management Plan and Sub-Plans to the Principal for Review in accordance with Table 1.	(4) CEMP, Section 4.1
5.1.4.8(c)	(c) The Construction Environmental Management Plan and Sub-Plans must comply with the Sydney Metro Construction Environmental Management Framework.	(4) CEMP, Appendix G
5.1.4.8(d)	(d) The Contractor must develop, submit for Review, implement and maintain all plan and sub-plans required by the Construction Environmental Management Framework.	(4) CEMP, Section 1.10
General Specification – Notifications		
6.8.3 (a)	The Contractor must proactively notify stakeholders and the community of current and upcoming Contractor's Activities, and any Interface Contractors' activities, with the potential to impact on stakeholders and the community, in agreement with outcomes of the CICG.	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
6.8.3 (b)	Contractor should issue notifications on a regular basis for: (i) start of work; (ii) new work with a new activity that has the potential to impact on stakeholders and the community; and (iii) those required to comply with relevant Environmental Protection Licence (EPL).	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
6.8.3 (c)	In the event of works to address an Emergency Event, the Contractor must provide written and verbal notification to occupiers of properties immediately adjacent to or impacted by any works to address an Emergency Event within two hours after commencing such works. The use of email and phone call is acceptable for providing notification. In cases where contact details are not available, the Contractor must doorknock the property and provide a written (paper) notification to the occupier.	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
6.8.3 (d)	The Contractor must provide an Emergency Event notification to the Principal's Representative for distribution via the digital application (see the "Social Media Application (App)" section of this General Specification). This should occur during the Business Day immediately preceding the Emergency Event (where works have been anticipated), or within 2 hours of the start of the following Business Day.	CEMP, Section 7.7 Refer Contract Management Plan - Community Communications and Business management Sub Plan
General Specification – Building Surveys		
2.9.5 (ii)	The Contractor must utilise an independent Surveyor to survey all existing buildings on each Site and each Extra Land site in accordance with:	Where relevant - Heritage sub Plan

BARANGAROO STATION

Construction Environmental Management Plan

Clause	PS/GS Paragraph [Note: updated to Addenda 7 requirements]	Reference Section
	<p>(i) Sections 4 and 5 of the “Royal Institute of Chartered Surveyors (RICS) Guidance Note 63/2010 Building surveys and technical due diligence”; or</p> <p>(ii) “AS 4349 Inspection of Buildings – General Requirements”, and with specific regard to the heritage element</p>	
General Specification – Reporting (CEMP)		
5.2.1(a)	During the Contractor’s Activities, the Contractor must provide regular Progress Reports to the Principal’s Representative in accordance with this section.	CMP, Section 6 & 7 CEMP, Section 6.3
5.2.2.8(a)	<p>Environment Management: The monthly Progress Report must include an “Environment Management” section which must address and detail:</p> <ul style="list-style-type: none"> (i) an executive summary; (ii) the Contractor’s performance against the environmental management requirements of the Construction Environmental Management Plan; (iii) the status of the Construction Environmental Management Plan including all sub-plans and environmental construction method statements; (iv) management strategies for environmental compliance; (v) management strategies to identify the need for, and to undertake, consistency reviews under the Environmental Planning and Assessment Act 1979 (NSW) (EP&A Act); (vi) the status of environmental obligations including those identified in the Contractor’s compliance tracking program; (vii) the status of and performance against environmental licences held for the Contractor’s Activities; (viii) details of compliance with relevant Environmental Law; (ix) the Contractor’s performance against environmental key performance indicators; (x) graphical representation of the monthly frequency of environmental issues and incidents each month for the previous 12 months, including an analysis of trends and what actions are being taken to improve performance; (xi) details of environmental incidents or emergencies; (xii) environmental inspection reports; (xiii) the results, findings and any environmentally relevant actions of any internal or external audits carried out; (xiv) reports that include the number of employees that have received environmental training and the type of training they received; and (xv) a sustainability section within the report which must, as a minimum, include: <ul style="list-style-type: none"> A. a summary of performance in meeting sustainability requirements and targets, which includes the identification of areas of actual or potential non-compliance; and B. data on resource consumption, carbon emissions, waste recycling and disposal, spoil management and concrete mixes in the form of a completed Sydney Metro Sustainability Reporting Template (SM-18-00043350). 	CEMP, Section 6.3.3 (8) SMP Section
5.2.2.8(b)	The Contractor must maintain a current documented description of evidence for each Minister’s condition of approval and Revised Environmental Mitigation Measure allocated to the Contractor and submit this record to the Principal’s Representative promptly upon request.	CEMP, Section 1.6
5.2.2.8(c)	Where reference is made to a piece of evidence in (b), that reference must include a document reference number and be retrievable from the PDCS.	CEMP, Section 1.6
5.2.2.8(d)	The Contractor must submit via the PDCS the documented evidence of (b) in a format and frequency specified by the Principal’s Representative.	CEMP, Section 1.6
5.2.2.8(e)	In addition to (d), a PDCS submission is required 2 weeks prior to the anticipated date for commencement of construction which documents all evidence that all Minister’s conditions of approval and Revised Environmental Mitigation Measures which have a pre-construction requirement have been met and are compliant.	CEMP, Section 1.6



Appendix K **CEMP** Consultation Matrix



Caption: One Central Park, Sydney

BARANGAROO STATION

Construction Environmental Management Plan

Table 16 CEMP Consultation Matrix

Authority / Organisation	Contact(s)	Date Issued	Status
Noise and Vibration Management Plan - CoA C3(a)			
City of Sydney Council	Elise Webster	15-06-21	City of Sydney responded 6th July 2021 finding the plan satisfactory (accepted)
Noise and Vibration Monitoring Plan – C9(a)			
NSW Environmental Protection Authority (EPA)	Mark Jansons	9-07-21	The EPA responded on 13 th July 2021 with no comment made on the CNVMP (accepted)
City of Sydney Council	Elise Webster	15-06-21	City of Sydney responded 6th July 2021 finding the plan satisfactory (accepted)
Heritage Management Plan – C3(g)			
Heritage Council	Rajeev Maini Siobhan Lavelle	8-06-21	Plan issued on the 9 th of June 2021 with follow up email 9 th July 2021. The Heritage Council responded on 12 th July 21 committing to provide comment by 16 th July 21. The Heritage Council responded on 6 th August 21 finding the Heritage Management Plan to be “fit for purpose” document.
City of Sydney Council	Elise Webster	11-06-21	City of Sydney responded 6 th of July 2021 finding the plan satisfactory (accepted)
Darug Land Observations	Gordon Workman Jamie Workman	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Murra Bidgee Mullangari Aboriginal Corporation	Ryan Johnson	18-06-21	Endorsement received on the 21 st of June 21 (accepted)
Tocomwall	Danny Franks Sarah Franks Scott Franks	18-06-21	Endorsement received on 14 th July 21 (accepted)
Kamilaroi-Yankuntjatjara Working Group	Pollowan Phillip Kahn	18-06-21	Endorsement received on the 29 th of June 21 (accepted)
Woronora Plateau Gundangarra Elders Council	Kayla Williamson	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Aboriginal Archaeology Service	Tony Williams Andrew Williams	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Metropolitan Local Aboriginal Land Council	Nathan Moran	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Gundungurra Tribal Technical Services	Christopher Payne Peter Foster David Bell	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Darug Aboriginal Cultural Heritage Assessments	Celestine Everingham	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Bilinga Cultural Heritage Technical Services	Robert Brown Wandai Kirkbright	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Gunyuu Cultural Heritage Technical Services	Darlene Hoskins- McKenzie	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Munyunga Cultural Heritage Technical Services	Robert Brown Suzanne McKenzie Levi McKenzie- Kirkbright	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)

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Construction Environmental Management Plan

Authority / Organisation	Contact(s)	Date Issued	Status
Wingikara Cultural Heritage Technical Services	Suzannah McKenzie Wandai Kirkbright	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)
Duncan Suey & Associates	Darren Duncan	18-06-21	No comments received. Follow up phone call on the 9 th of July 21 and email resent 9 th of July 21 (overdue)



Appendix L **Fauna & Flora / Biodiversity Procedure**

Barangaroo Station

Fauna & Flora / Biodiversity Management Procedure

N217

BR COP

1 April 2022



Project overview

Project Site Address:

Hickson Road
Barangaroo
NSW 2000

BESIX Watpac State Division Address:

Level 24, 44 Market Street
SYDNEY
NSW 2000

Project Commencement Date:

12 March 2021

BESIX Watpac ABN:

71 010 462 816




Document Control

Client:	Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Fauna & Flora / Biodiversity Management Procedure
Owner / Approver:	Planning & Environment Manager / Senior Construction Manager
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PRO-000030
TB Revision:	00

Revision history

Version	Date	Revision Description	Release Sign off
A	18/06/21	Submission for Review	Luke Hunter / Contractor's Representative
B	9/7/21	Updated following SM comments	Luke Hunter / Contractor's Representative
C	19/07/21	Updated following ER comments for submission to DPIE	Luke Hunter / Contractor's Representative
00	01/04/2022	Six monthly update	Luke Hunter / Senior Construction Manager

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Mike Nevin	Author / Planning & Environment Manager		01/04/2022
Daniel Gooch	Reviewer / Engineering Manager		01/04/2022
Luke Hunter	Reviewer / Contractor's Representative		01/04/2022

Note: A controlled copy of the Fauna & Flora / Biodiversity Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedures, when printed, will be uncontrolled and it will the responsibility of each user to confirm the currency of the plan through the project document control system.

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Fauna & Flora / Biodiversity Management Procedure

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1.1 Document Purpose

The purpose of the Flora and Fauna and / Biodiversity Procedure is to minimise the impacts of construction activities related to the Barangaroo Construct Only Package (BR COP) to flora and fauna.

1.2 Construction Overview

An overview of BR COP construction activities has been presented below::

- Structural and civil completion works to the station box,
- Stormwater trunk mains works from Hickson Road precinct to the existing pit at the western end of the site
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework including the connection of the system to an existing network of pipes in Sydney Harbour.
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft, and
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

1.3 Key Risks and Potential Impacts

The majority of the construction activities taking place occur in an area that is already a construction site which has been extensively excavated with the bulk of the fauna and flora cleared from the site.

There are a group of newly planted trees to the west of the Dalgety Bond Store at 25 Hickson Road, Barangaroo, as shown below in Figure 1 which will need to be removed to facilitate the installation of civil services through the area. In accordance with the requirements of CoA E6, a Tree Report, for the removal of these trees, has been prepared by a suitably qualified arborist and submitted to the Secretary. The removal of, and replacement of, trees in this area will be carried out in accordance with the recommendations made in the Tree Report.

Figure 1 *Bond Store and adjacent trees*



Two trees located to the West of the site, adjacent to the entry to Nawi Cove, as shown below in Figure 2 will be temporarily relocated to facilitate civil works in this area. These trees will be removed from site and

replanted at the conclusion of construction activities in this area. An arborist has prepared a Tree Transplantation Specification to manage this activity.

Figure 2 *Trees to West of site for temporary removal*

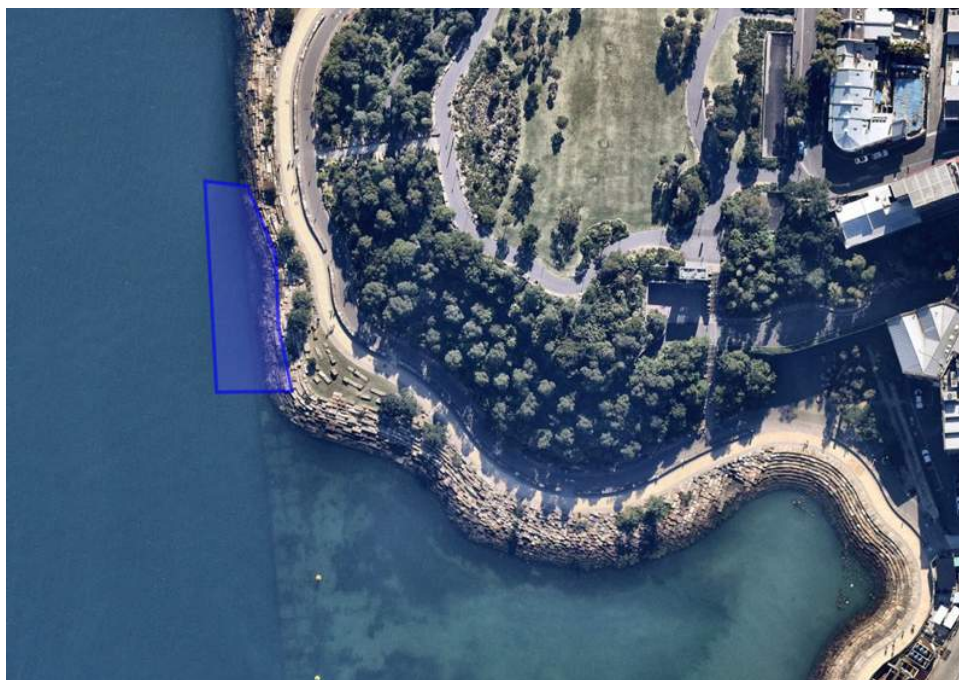


Potential impacts to Flora and Fauna will include:

- Removal of the existing trees shown in Figure 1 during the construction of the civil services in this area, resulting in a loss of habitat for local fauna.
- Risk of proliferation of weeds on the construction site and subsequent spread of weeds from within the construction site to adjacent areas of Barangaroo (low risk due to lack of soil)
- Any native fauna unexpectedly finding its way onto the site such a bird, bat, possum etc needing removal to a safer environment (low likelihood, low risk)

Figure 3 below shows the location of a network of cooling water pipes existing in Sydney Harbour. BESIX Watpac will use divers to enter Sydney Harbour in this location to carry out an inspection of these pipes to check for any damage to, or degradation of the pipes and to clean them out if necessary. There is not anticipated to be any impact to marine flora or fauna resultant from this activity.

Figure 3 *Nawi Cove Headland - Location of cooling water pipework existing in Sydney Harbour*



1.4 Fauna & Flora Management Objectives

The Chatswood to Sydenham Submissions and Preferred Infrastructure Report (SPIR) nominates the following environmental performance outcome during construction:

- The project would minimise impacts to biodiversity.

Further, in Section 11.1 of the Chatswood to Sydenham Construction Environmental Management Framework (CEMF) identifies the following flora and fauna management objectives applicable to construction:

- Minimise impacts on flora and fauna
- Appropriately manage the spread of weeds and plant pathogens, and
- Retain and enhance existing flora and fauna habitat wherever possible.

1.5 Roles and Responsibilities

An overview of the specific responsibilities for flora and fauna management as they relate to each role on the project are outlined in Table 1 below:

Table 1 *Roles and Responsibilities*

Activity	Responsibility
Responsibility for the implementation of the CEMP and this Fauna & Flora / Biodiversity Procedure	Project Director Project Managers Planning and Environment Manager
Implementation of mitigation measures Recording and reporting on effectiveness of mitigation measures Visual inspection for weeds on site	Environmental Coordinator
Visual inspection for weeds on site Implementation of mitigation measures Disposal of weeds	Site Foreman
The management, action and discharge of any complaints received in accordance with the process as outlined in the CCS and BMP	Stakeholder & Community Relations Manager

1.6 Requirements Specific to Flora and Fauna

The following fauna and flora requirements specific to this project have been extracted from the CEMF, Revised Environmental Mitigation Measures (REMMs) and Conditions of Approval (CoA) as below:

Table 2.1 **Relevant CEMF requirements**

CEMF reference	Requirement
11.1	Flora and Fauna Management Objectives
	i. Minimise impacts on flora and fauna;
	ii. Design waterway modifications and crossings to incorporate best practice principles;
	iii. Retain and enhance existing flora and fauna habitat wherever possible; and
	iv. Appropriately manage the spread of weeds and plant pathogens.
11.2	Flora and Fauna Management Implementation
	a. Principal Contractors will develop and implement a Flora and Fauna Management Procedure which will include, as a minimum:
	i. The ecological mitigation measures as detailed in the environmental approval documentation;
	ii. The responsibilities of key project personnel with respect to the implementation of the plan;
	iii. Procedures for the clearing of vegetation and the relocation of flora and fauna;
	iv. Details on the locations, monitoring program and use of nest boxes by fauna;
	v. Procedures for the demarcation and protection of retained vegetation, including all vegetation outside and adjacent to the construction footprint;
	vi. Plans for impacted and adjoining areas showing vegetation communities; important flora and fauna habitat areas; locations where threatened species, populations or ecological communities have been recorded;
	vii. Vegetation management plan(s) for site where native vegetation is proposed to be retained;
	viii. Identification of measures to reduce disturbance to sensitive fauna;
	ix. Rehabilitation details, including identification of flora species and sources, and measures for the management and maintenance of rehabilitated areas (including duration of the implementation of such measures);
	x. Weed management measures focussing on early identification of invasive weeds and effective management controls;
	xi. A procedure for detailing with unexpected EEC threatened species identified during construction, including cessation of work and notification of the Department, determination of appropriate mitigation measures in consultation with the OEH (including relevant relocation measures) and updating of ecological monitoring or off-set requirements;
	xii. Details on the methodology for vegetation mapping and survey;
	xiii. Ecological monitoring requirements; and
	xiv. Compliance record generation and management.
	b. Principal Contractors would undertake the following ecological monitoring as a minimum:
	i. A pre-clearing inspection will be undertaken prior to any native vegetation clearing by a suitable qualified ecologist and the Contractor's Environmental Manager (or delegate).
	<ul style="list-style-type: none"> The pre-clearing inspection will include, as a minimum: Identification of hollow bearing trees or other habitat features; Identification of any threatened flora and fauna; A check on the physical demarcation of the limit of clearing; An approved erosion and sediment control plan for the worksite; and The completion of any other pre-clearing requirements required by any project

CEMF reference	Requirement
	<ul style="list-style-type: none"> • approvals, permits or licences.
	ii. The completion of the pre-clearing inspection will form a HOLD POINT requiring sign-off from the Contractor's Environmental Manager (or delegate) and a qualified ecologist; and
	iii. A post clearance report, including any relevant Geographical Information System files, will be produced that validates the type and area of vegetation cleared including confirmation of the number of hollows impacted and the corresponding nest box requirements to offset these impacts.
	c. The Principal Contractor's regular inspections will include a check on the ecological mitigation measures and project boundary fencing.
	d. The following compliance records would be kept by the Principal Contractor: <ul style="list-style-type: none"> i. Records of pre-clearing inspections undertaken; ii. Records of the release of the pre-clearing hold point; and iii. Records of ecological inspections undertaken.
11.3	Flora and Fauna Mitigation
	<p>a. Examples of flora and fauna mitigation measures include:</p> <ul style="list-style-type: none"> i. Areas to be retained and adjacent habitat areas will be fenced off prior to works to prevent damage or accidental over clearing; ii. Clearing will follow a two-stage process as follows: <ul style="list-style-type: none"> • Non-habitat trees will be cleared first after sign-off of the pre-clearing inspection; and • Habitat trees will be cleared no sooner than 48 hours after non-habitat trees have been cleared. A suitably qualified ecologist will be present on site during the clearing of habitat trees. Felled habitat trees will be left on the ground for 24 hours or inspected by the ecologist prior to further processing. iii. Weed management is to be undertaken in areas affected by construction prior to any clearing works in accordance with the Noxious Weeds Act 1993.

Table 2.2 *Relevant REMMs requirements*

REMMs Reference	Requirement
B1	An ecologist would be present during the removal of any hollow-bearing trees.
B3	The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

Table 2.3 *Relevant CoA requirements*

CoA Reference	Requirement
E5	<p>The CSSI must be designed to retain as many trees as possible and provide replacement trees such that there is a net increase in the number of trees. The Proponent must commission an independent, experienced and suitably qualified arborist to prepare a comprehensive Tree Report before removing any trees as detailed in the EIS, as amended by the documents listed in A1. The Tree Report must include:</p> <ul style="list-style-type: none"> (a) a description of the conditions of the tree(s) and its amenity and visual value; (b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and (c) measures to avoid tree removal, minimise damage to, and ensure the health and stability of those trees to be retained and protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, materials storage and protection of public utilities. <p>In the event that tree removal cannot be avoided, then replacement trees are to be planted within, or in close proximity to the CSSI or other location in consultation with the Relevant Councils and agreed by the Secretary. The size of the replacement trees will be determined in consultation with the relevant Council. A copy of the Tree Report must be submitted to the Secretary before the removal, damage and/or pruning of any trees, including those affected by the site establishment works. All recommendations of the Tree Report must be implemented by the Proponent, unless otherwise agreed by the Secretary.</p>

CoA Reference	Requirement
	The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where tree removal and/or pruning is proposed.

1.7 Mitigation Measures

The following mitigation measures will be implemented during construction to minimise the risk of adverse impacts on fauna and flora and to meet the requirements as outlined in the CEMF and Revised Environmental Mitigation Measures (REMMs):

CEMF Section 11.2 requirements include for this site:

- v. Procedures for the demarcation and protection of retained vegetation, including all vegetation outside and adjacent to the construction footprint;
- x. Weed management measures focusing on early identification of invasive weeds and effective management controls;
- xi. A procedure for dealing with unexpected EEC threatened species identified during construction, including cessation of work and notification of the Department, determination of appropriate mitigation measures in consultation with the OEH (including relevant relocation measures) and updating of ecological monitoring or off-set requirements;

REMMs requirements include:

- Item B3 – The local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

In accordance with the requirements of CoA E6, those trees which are nominated in the Tree Report as needing to be removed will be replaced. The size of the replacement trees will be determined in consultation with Infrastructure NSW and City of Sydney Council.

1.7.1 Tree Management

The trees located to the west of the Dalgety Bond Store indicated in Figure 1 are to be managed and removed in accordance with the Tree Report approved as per CoA E6.

The trees located to the west of the site adjacent to Nawi cove, as indicated in Figure 2 which are to be removed from site temporarily and transplanted will be done so in accordance with the Tree Transplantation Specification prepared by an arborist. These trees are not recorded in the Tree Report as they were not identified in the EIS and have been recently planted as part of the project. They are being temporarily removed from sight and will be stored off-site, cared for, and re-instated as the completion of the civil construction works in the area.

1.7.2 Fauna Mitigation

As required by REMMs Condition B3, the local WIRES group and / or veterinarian would be contacted if any fauna are injured on site or require capture and / or relocation.

1.7.3 Flora Mitigation

Weed manage management will be undertaken in areas affected by construction prior to any clearing works in accordance with the *Biosecurity Act 2015*.

1.7.4 Marine Mitigation

Remediation activities include pipe cleaning, repairing underwater pipework and provision of new underwater bell mouths. High pressure water jetting of the pipework will be carried out so that dislodged marine materials impacting water quality and any chemicals used to disinfect or scour are collected for disposal and not discharged into the harbour. These works will be subject to a separate environmental risk assessment.

1.7.5 Biodiversity impact mitigation

Due to the already highly modified and barren nature of the site, construction activities will have little to no measurable impacts to local biodiversity in most areas of the site. An impact to biodiversity will result from the removal of those trees nominated for removal in the Tree Report. This will be mitigated by these trees being replaced. The size of the replacement trees will be determined in consultation with Infrastructure NSW and City of Sydney Council.

1.8 Records Management

Records will be maintained by the project Environmental Co-ordinator, as follows:

- Records of any pre-clearing weed management inspections undertaken
- Records of ecological inspections undertaken
- Records of any fauna removed from site
- Photographic record of trees contemplated for removal in the Tree Report
- Record of trees removed from the site
- Record of trees pruned on site



Appendix M **Air Quality Management Procedure**





Barangaroo Station

Air Quality Management Procedure

N217
BR COP
1 April 2022

Project overview

Project Site Address:

25 Hickson Road
Barangaroo
NSW 2000

BESIX Watpac State Division Address:

Level 24, 44 Market Street
SYDNEY
NSW 2000

Project Commencement Date:

12 March 2021

BESIX Watpac ABN:

71 010 462 816

Document Control


Client:	Sydney Metro
Title:	BARANGAROO STATION
Subtitle:	Air Quality Management Procedure
Owner / Approver:	Planning & Environment Manager / Senior Construction Manager
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PRO-000029
TB Revision:	00

Revision history

Version	Date	Revision Description	Release Sign off
A	18/06/21	Submission for Review	Luke Hunter / Contractor's Representative
B	09/07/21	Updated following SM comments	Luke Hunter / Contractor's Representative
C	19/07/21	Updated following ER comments for submission to DPIE	Luke Hunter / Contractor's Representative
00	01/04/22	Six Monthly update	Luke Hunter / Senior Construction Manager

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Mike Nevin	Author / Planning & Environment Manager		01/04/2022
Daniel Gooch	Reviewer / Engineering Manager		01/04/2022

Name	Role & Title	Signature	Date
Luke Hunter	Reviewer / Contractor's Representative		01/04/2022

Note: A controlled copy of the Air Quality Management Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedure, when printed, will be uncontrolled and it will be the responsibility of each user to confirm the currency of the plan through the project document control system.

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1.1 Document Purpose

The purpose of the Air Quality Management Procedure is to minimise the impacts of construction activities related to the Barangaroo Construct Only Package (BR COP) to air quality and receivers in proximity to the construction site.

1.2 Construction Overview

An overview of BR COP construction activities has been presented below:

- Structural and civil completion works to the station box
- Stormwater trunk mains works from Hickson Road precinct to the existing pit at the western end of the site
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework including the connection of the system to an existing network of pipes in Sydney Harbour
- Demolition works associated with the removal of the Hickson Road temporary steel structure, road deck and concrete demolition
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft, and
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.

1.3 Potential Impacts

Dust, and other emissions, being generated on site because of construction activities may have the following negative impacts:

- Dust and the emissions from vehicle and other construction plant and equipment can have adverse health impacts on local residents as well as people working and carrying out recreational activities in proximity to the construction site
- Dust can settle on and impact property, resulting in community complaints and the need to carry out significant cleaning and potentially damage to property
- Dust emissions offsite can cause the site to be shutdown and/or result in prosecution by the regulator, and
- Odours from construction activities can travel beyond the boundary of the site causing nuisance to local receivers and impact water quality of adjacent Sydney Harbour.

1.4 Air Quality Management Objectives

The Chatswood to Sydenham Construction Environment Management Framework (CEMF) is part of a broader report, the Chatswood to Sydenham Environmental Impact Assessment (EIS) and the Chatswood to Sydenham Submissions and Preferred Infrastructure Report (SPIR).

The CEMF nominates the following environmental performance outcome during construction:

- Dust and exhaust emissions during construction would be minimised.

Further, Section 16.1 of the CEMF identifies the following air quality objectives applicable to construction:

- Minimise gaseous and particulate pollutant emissions from construction activities as far as feasible and reasonable, and
- Identify and control potential dust and air pollutant sources.

1.5 Roles and Responsibilities

An overview of the specific responsibilities for air quality management as they relate to each role on the project are outlined in Table 1 below:

Table 1 *Roles and Responsibilities*

Activity	Responsibility
Responsibility for implementation of the CEMP and this Air Quality Management Procedure	Project Director Construction Managers Environment and Planning Manager
Environmental monitoring and visual inspections of mitigation measures Implementing mitigation measures Recording and reporting of effectiveness of mitigation measures Weekly look ahead of expected weather patterns	Environmental Coordinator
Daily weather monitoring Implementation of mitigation measures Inspection of mitigation measures Recording implementation of mitigation measures	Site Foreman Environmental Coordinator
The management, action and discharge of any complaints received in accordance with the process as outlined in the CCS and BMP	Community Relations Manager

1.6 Requirements Specific to Air Quality

The following air quality requirements specific to this project have been extracted from the CEMF, Revised Environmental Mitigation Measures (REMMs) and Conditions of Approval (CoA) as below:

Table 2.1 *Relevant CEMF requirements*

CEMF reference	Requirement
16.1	Air Quality Management Objectives
	a. The following air quality management objectives will apply to construction:
	i. Minimise gaseous and particulate pollutant emissions from construction activities as far as feasible and reasonable; and
	ii. Identify and control potential dust and air pollutant sources.
16.2	Air Quality Management Implementation
	a. Principal Contractors will develop and implement an Air Quality Management Plan which will include, as a minimum:
	i. The air quality mitigation measures as detailed in the environmental approval documentation;
	ii. The requirements of any applicable EPL conditions;
	iii. Site plans or maps indicating locations of sensitive receivers and key air quality / dust controls;
	iv. The responsibilities of key project personnel with respect to the implementation of the plan;
	v. Air quality and dust monitoring requirements; and
	vi. Compliance record generation and management.
	b. Air quality and dust monitoring will involve the following as a minimum:
	i. Meteorological conditions will be monitored and appropriate responses will be organised and undertaken periodically by the Principal Contractor;
	ii. Regular visual monitoring of dust generation from work zones; and

CEMF reference	Requirement
	iii. Monitoring emissions from plant and construction vehicles to ensure they have appropriate emission controls and are being maintained correctly.
	c. The following compliance records will be kept by the Principal Contractor:
	i. Records of any meteorological condition monitoring;
	ii. Records of any management measures implemented as a result of adverse, windy weather conditions; and
	iii. Records of air quality and dust inspections undertaken.
16.3	Air Quality Mitigation
	a. Examples of air quality mitigation measures include:
	i. Plant and equipment will be serviced and maintained in good working order to reduce unnecessary emissions from exhaust fumes;
	ii. Water suppression will be used for active earthwork areas, stockpiles, unsurfaced haul roads and loads of soil being transported to reduce wind-blown dust emissions;
	iii. Wheel-wash facilities or rumble grids will be provided and used near the site exit points, as appropriate; and
	iv. Dust extraction and filtration systems will be installed for tunnel excavation works and deep excavation with limited surface exposure.

Table 2.2 *Relevant REMMs requirements*

REMMs Reference	Requirement
AQ1	The engines of all on-site vehicles and plant would be switched off when not in use for an extended period.
AQ2	Plant would be well maintained and serviced to minimise emissions. Emissions from plant would be considered as part of pre-acceptance checks.
AQ3	Construction site layout and placement of plant would consider air quality impacts to nearby receivers.
AQ4	Hard surfaces would be installed on long term haul routes and regularly cleaned.
AQ5	Unsurfaced haul routes and work area would be regularly damped down in dry and windy conditions.
AQ6	All vehicles carrying loose or potentially dusty material to or from the site would be fully covered.
AQ7	Stockpiles would be managed to minimise dust generation.

Table 2.3 *Relevant CoA requirements*

CoA Reference	Requirement
E5	In addition to the performance outcomes, commitments and mitigation measures specified in PIR, all reasonably practicable measures must be implemented to minimise the emission of dust and other air pollutants during the construction and operation of the CSSI.

1.7 Key risk activities to air quality

Air quality is largely affected by any construction activities with the potential to generate dust in combination with wind and dry weather. The environmental risk assessment included in Appendix I of the CEMP identified the following activities:

- Trenching & backfilling
- Stockpiling of soil
- Concrete cutting and demolition

- Vehicles tracking soil
- Blockwork and drywall cutting
- Topsoil, compost, and organics
- Diesel powered plant and vehicle emissions too can contribute to poor air quality

1.8 Mitigation Measures

The following mitigation measures will be implemented during construction to minimise the risk of adverse air quality and dust impacts as outlined in the CEMF and REMMs:

- Plant and equipment will be serviced in good working order to reduce unnecessary emissions from exhaust fumes.
- Emissions from plant will be considered as part of pre-acceptance checks
- Water suppression will be used for active earthwork areas, stockpiles, unsurfaced haul roads and loads of soil being transported to reduce wind-blown dust emissions
- Wheel-wash facilities or rumble grids will be provided and used near the site exit points where appropriate
- Construction site layout and placement will consider air quality impacts to nearby receivers
- All vehicles carrying loose or potentially dusty material to or from the site will be fully covered
- Stockpiles will be managed to minimise dust generation including being covered when not used for longer than seven (7) days, or during dry and windy conditions.
- Vehicles and plant being used on site will be switched off when not in use for an extended period
- The construction hoarding and site compound will be inspected regularly, and dust build up cleaned off when required
- Water will be used during saw-cutting activities likely to generate dust, and
- Gaseous plant and equipment used for construction, including the on-site water treatment plant (WTP) will be correctly stored, monitored and maintained to prevent the accidental release of gas.

1.9 Monitoring

Monitoring activities, as outlined in Table 3 will be implemented during construction to minimise adverse impacts resultant from dust and emissions:

Table 3 **Monitoring Activities**



Monitoring Activities	Frequency
Visual inspections for air borne dust being generated on, and leaving the site, dust settling on hoardings and in the local vicinity to the project	Daily
Weather conditions being experienced on site (focusing on those which are likely to adversely impact dust and emissions such as hot weather, windy conditions)	Daily
Weather conditions expected to be experienced on site (focusing on those likely to increase the risk of dust propagation (dry, hot and windy conditions, bushfires, etc)	Weekly look ahead in advance on construction activities
Construction activities will be monitored to confirm that dust mitigation measures are in place and functioning correctly (wheel wash facilities, water trucks, misters, and the like)	Daily

Where monitoring identifies visible dust leaving the site, the construction activities causing the dust will be ceased immediately and an inspection carried out by the Environmental Coordinator and Site Manager to agree corrective actions to be implemented. The Site Manager will be responsible for ensuring actions are implemented prior to construction activities recommencing.

1.10 Record Management

Records will be maintained by the project Environmental Co-ordinator, as follows:

- Inspections of dust and air quality on site undertaken
- Corrective actions raised and close out
- Records of weather patterns throughout construction
- Records of implementation measures used
- Acceptance records for plant and equipment being used on the site



Appendix N **Soil and Water Management Procedure**



Barangaroo Station

Soil & Water Management Procedure

N217
BR COP
1 April 2022

Project overview

Project Site Address:

25 Hickson Road
Barangaroo
NSW 2000

BESIX Watpac State Division Address:

Level 24, 44 Market Street
SYDNEY
NSW 2000

Project Commencement Date:

12 March 2021

BESIX Watpac ABN:

71 010 462 816




Document Control

Client:	Sydney Metro
Title:	BARANGAROO METRO STATION
Subtitle:	Soil & Water Management Procedure
Owner / Approver:	Planning & Environment Manager / Senior Construction Manager
TB Document Reference:	SMCSWSBR-BWC-SBR-EM-PRO-000031
TB Revision:	00

Revision history

Version	Date	Revision Description	Release Sign off
A	17/06/21	Submission for Review	Luke Hunter / Snr Project Manager
B	09/07/21	Submission for Review	Luke Hunter / Snr Project Manager
C	19/07/21	Updated following ER comments for submission to DPIE	Luke Hunter / Snr Project Manager
D	22/09/21	General Update	Luke Hunter / Snr Project Manager
E	25/09/21	Update to address ER comments	Luke Hunter / Snr Project Manager
00	01/04/22	6 monthly update	Luke Hunter / Snr Construction Manager

BESIX Watpac Approvals

Name	Role & Title	Signature	Date
Mike Nevin	Author / Planning & Environment Manager		01/04/22
Daniel Gooch	Reviewer / Engineering Manager		01/04/22
Luke Hunter	Reviewer / Contractor's Representative		01/04/22

Note: A controlled copy of the Soil and Water Management Procedure will be distributed to the Sydney Metro Principal's Representative, Independent Certifier (IC) and other nominated stakeholders, and it will be made available to all BR COP employees and subcontractors in soft copy format through the project document control system.

This procedure, when printed, will be uncontrolled and it will be the responsibility of each user to confirm the currency of the plan through the project document control system.

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ID	Requirement	Reference
Conditions of Approval (CoAs) – SSI 7400 (Mod 8)		
E65	All reasonably practicable erosion and sediment controls must be installed and appropriately maintained to minimise any water pollution. When implementing such controls, any relevant guidance in the Managing Urban Stormwater Series must be considered.	Section 6
E66	A Site Contamination Report, documenting the outcomes of Phase 1 and Phase 2 contamination assessments of land upon which the CSSI is to be carried out, that is suspected to be, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the Contaminated Land Management Act 1997 (NSW).	Section 6
E67	If a Site Contamination Report prepared under Condition E66 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with.	Section 6
E69	An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction.	Section 6.3
E70	The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	Section 6.3
E107	The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with.	Section 7
Revised Environmental Mitigation Measures (REMMs)		
SWC1	Updated desktop contamination assessments would be carried out for Chatswood dive site, Victoria Cross Station, Artarmon substation, Blues Point temporary site, Barangaroo Station, Central Station and Waterloo Station and the Sydenham Maintenance Centre site within surface track works south. If sufficient information is not available to determine the remediation requirements and the impact on potential receivers, then detailed contamination assessments, including collection and analysis of soil and groundwater samples would be carried out. Detailed contamination assessment would also be carried out for the Barangaroo power supply route within Hickson Road and the Marrickville power supply route adjacent to Sydney Park and Camdensville Oval. In the event a Remediation Action Plan is required, these would be developed in accordance with Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998) and a site auditor would be engaged.	Section 6
SWC2	Prior to ground disturbance in high probability acid sulfate areas at Barangaroo Station, Waterloo Station and Marrickville dive site, Sydenham Station and the surface track works south, testing would be carried out to determine the presence of acid sulfate soils. If acid sulfate soils are encountered, they would be managed in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998).	Section 6
SWC3	Erosion and sediment control measures would be implemented in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Managing Urban Stormwater: Soils and Construction Volume 2 (Department of Environment and Climate Change, 2008a). Measures would be designed as a minimum for the 80th percentile; 5-day rainfall event.	Section 6
SWC4	Discharges from the construction water treatment plants would be monitored to ensure compliance with the discharge criteria in an environment protection licence issued to the project.	Section 7
FH1	Detailed construction planning would consider flood risk at Barangaroo Station, Martin Place Station and the Waterloo Station construction sites. This would include identification of measures to avoid, where feasible and reasonable, not worsen existing flooding characteristics	Section 8

	up to and including the 100 year annual recurrence interval event in the vicinity of the project. Not worsen is defined as: › A maximum increase flood levels of 50mm in a 100 year Average Recurrence Interval flood event › A maximum increase in time of inundation of one hour in a 100 year Average Recurrence Interval flood event › No increase in the potential for soil erosion and scouring from any increase in flow velocity in a 100 year Average Recurrence Interval flood event.	
HR1	All hazardous substances that may be required for construction would be stored and managed in accordance with the Storage and Handling of Dangerous Goods Code of Practice (WorkCover NSW, 2005) and Hazardous and Offensive Development Application Guidelines: Applying SEPP 33 (Department of Planning, 2011).	Section 9
WM1	All waste would be assessed, classified, managed and disposed of in accordance with the <i>NSW Waste Classification Guidelines</i>	Section 6
WM2	100 per cent of spoil that can be reused would be beneficially reused in accordance with the project spoil reuse hierarchy.	Section 6
CEMF		
15.1a	Soil and Water Management Objectives a. The following soil and water management objectives will apply to construction: i. Minimise pollution of surface water through appropriate erosion and sediment control; ii. Maintain existing water quality of surrounding surface watercourses; and iii. Source construction water from non-potable sources, where feasible and reasonable.	Section 4
15.3	Soil and Water Mitigation a. Examples of surface water and flooding mitigation measures include: i. Clean water will be diverted around disturbed site areas, stockpiles and contaminated areas; ii. Control measures will be installed downstream of works, stockpiles and other disturbed areas; iii. Exposed surfaces will be minimised, and stabilised / revegetated as soon feasible and reasonable upon completion of construction; iv. Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume; and v. Spill kits will be provided at the batch plants, storage areas and main work sites.	Section 8 & 9

1 Document Purpose

The purpose of the soil and water management procedure is to minimise potential adverse soil and water environmental impacts occurring during BESIX Watpac's construction activities.

2 Construction Overview

The following construction activities have been identified as having the potential to impact upon soil and water:

- Structural and civil completion works to the station box,
- Stormwater trunk mains works from Hickson road precinct to the existing pit at western end of the site
- Installation of a cooling water system within the Barangaroo cutaway and associated trenching and pipework
- Hickson Road precinct works including road, footpath, cycleway, landscaping, street lighting, stormwater, utilities works and ventilation pod risers
- Backfilling and surface reinstatement of the temporary northern (Hickson Road) shaft, and
- Staging and temporary works required to deliver the permanent works, including removal of the temporary Hickson Road bridge structure.
- Discharge of water off site from the Water Treatment Plant (WTP).
- Discharge of water off site from the western civil pit (bypassing the WTP).

3 Potential Impacts

Construction activities occurring on site may result in the following negative impacts to soil and water:

- Soil erosion
- Soil contamination
- Water pollution

4 Soil and Water Management Objectives

The following soil and water management objectives will apply to construction activities:

- Minimise pollution of surface water through appropriate erosion and sediment control measures.
- Ensure that all contaminated soil is managed in accordance with relevant legislation and the Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQP)
- Ensure that acid sulfate soil is managed in accordance with relevant legislation and the Acid Sulfate Soils Management Plan (ASSMP)
- Maintain existing water quality of surrounding surface watercourses
- Ensure compliance with *NSW Water Quality Objectives* through the adoption of the Water Discharge Impact Assessment (WDIA) and implementation of a Water Quality Monitoring Program (WQMP)
- Ensure no uncontrolled surface water run-off from the site into Sydney Harbour
- Re-use 100% of spoil that can be reused in the project
- Mitigate flooding risk through an engineered approach with robust planning and controls

5 Roles and Responsibilities

5.1 Key BESIX Watpac Personnel

An overview of the specific responsibilities of the BESIX Watpac project team for water and soil management as they relate to each role on the project are outlined in Table 1 below:

Table 1 *Roles and Responsibilities*

Role	Authority and Responsibility
Project Director Construction Managers	<ul style="list-style-type: none"> Manage the delivery of Barangaroo Metro Station including overseeing the implementation of the CEMP, associated sub-plans and procedures
Environment and Planning Manager	<ul style="list-style-type: none"> Oversee the implementation of all environmental, soil, water and groundwater management initiatives Report on environmental performance Authority to direct personnel and subcontractors to carry out actions to avoid or minimise environmental impacts Review of water quality monitoring reports (CWQMR) prepared by the water quality monitoring consultant Conduct an investigation in the event of a water quality exceedance Authority to discharge water offsite from the WTP.
Environmental Co-ordinator	<ul style="list-style-type: none"> Daily weather monitoring Visual inspection to establish whether mitigation measures are required On site environmental monitoring and visual inspections of mitigation measures in place Records keeping and reporting in implemented mitigation measures Monitoring and record keeping of the on-site WTP Collection of water quality samples and undertaking of field analysis of certain samples collected Coordinate on site testing with agencies undertaking testing and laboratories analysing sampling results
Site Manager Project Engineers Construction Foremen	<ul style="list-style-type: none"> Visual inspections of mitigation measures in place Establishment of mitigation measures Record keeping in relation to mitigation measures Ensure compliance with the CEMP and soil and water procedure Conduct inductions and toolbox talks in relation to soil and water responsibilities Authority to direct personnel and subcontractors to carry out actions to avoid or minimise environmental impacts
Sustainability Manager	<ul style="list-style-type: none"> Track and report soil and water elements against sustainability targets
Commercial Manager	<ul style="list-style-type: none"> Ensure that relevant soil and water and groundwater management requirements are considered in procurement

5.2 Specialist Consultants

5.2.1 Contamination & Acid Sulphate Soils Expert

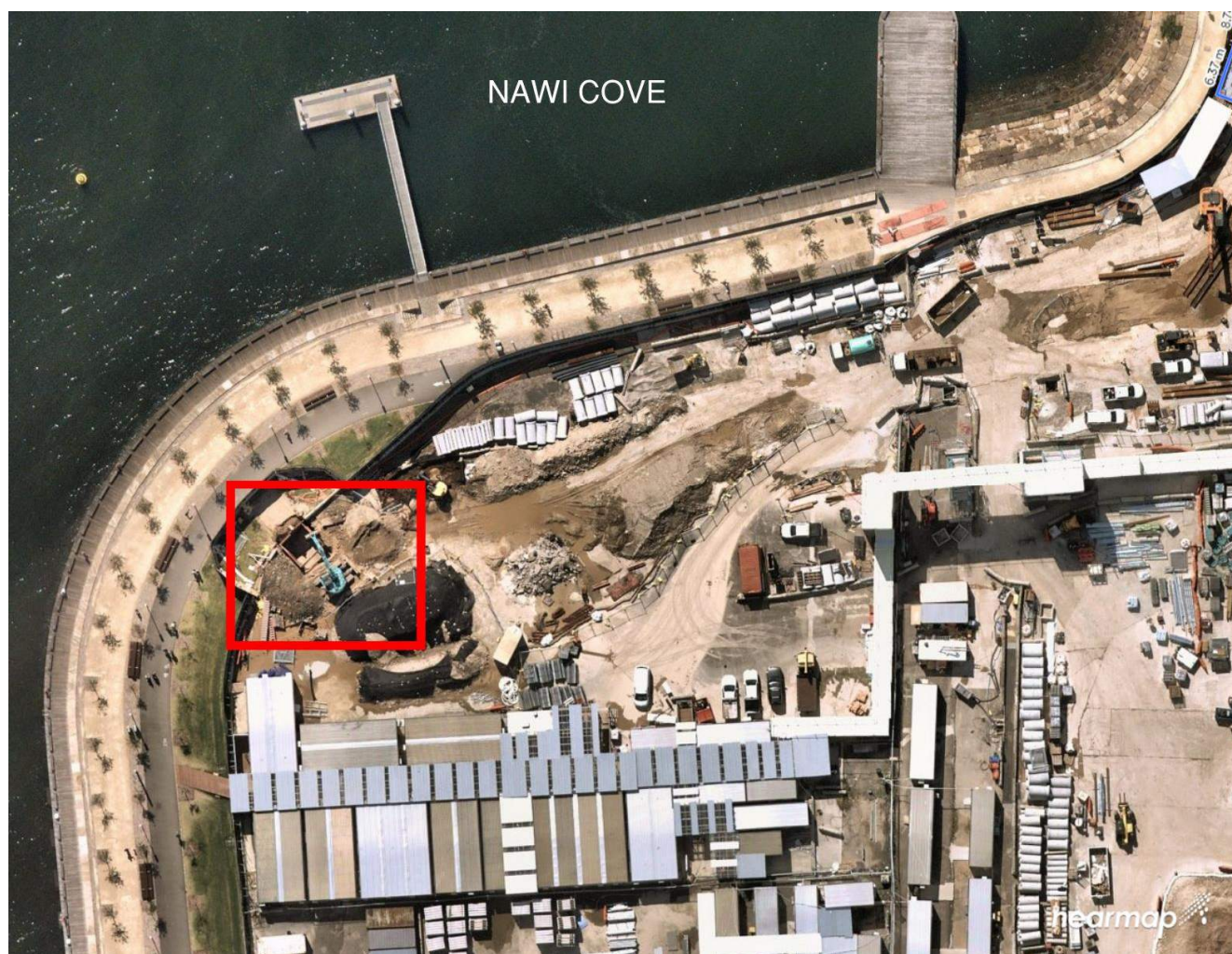
BESIX Watpac have engaged Douglas Partners, a consultancy specialist in geotechnical, environmental and groundwater engineering, to carry out a desktop analysis of existing environmental investigations undertaken in the vicinity of the Barangaroo Metro Station and to produce a Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQ), Acid Sulphate Soils Management Plan (ASSMP) and

establish the spoil testing regime to be implemented by BESIX Watpac during construction. Douglas Partners will also review the Remediation Action Plan (RAP) and Site Audit Statement (SAS) produced by the TSE Contractor for the excavation of the station.

5.2.2 Environmental Engineering

BESIX Watpac have engaged WSP as the specialist environmental engineering consultant responsible for producing the Water Discharge Impact Assessment (WDIA) for the existing on-site Water Treatment Plant (WTP) to assess its fitness for purpose for in treating ground and surface water collected as part of BESIX Watpac's construction activities and to ensure that *NSW Water Quality* objectives are being maintained in accordance with CoA E107. WSP have also produced an amendment to the WDIA which contemplates discharge of water directly off site, bypassing the WTP, to enable dewatering required for the installation of civil stormwater pipework and junction pits. This activity is limited to the discharge of water from the western civil pit as shown below in Figure 1, to allow the put base slab to be poured and the pit constructed.

Figure 1 *Western Civil Pit*



5.2.3 Water Quality Monitoring

BESIX Watpac have engaged an independent environmental consultancy to undertake monitoring of the water quality in Sydney Harbour (SW_B_01), the discharge point of the WTP (BN-3) and groundwater

within the station box at Basement levels 3 (GR-2) and 6 (GR-1), in accordance with the requirements of the Water Quality Monitoring Program (WQMP) on a monthly and quarterly basis.

6 Soil Management

The following mitigation measures will be implemented during construction to minimise potentially adverse impacts on soil, and to meet the requirements as outlined in the CEMF and Revised Environmental Mitigation Measures (REMMs):

6.1 Contamination and Acid Sulfate Soils

Extensive environmental investigations, and remediation, have been undertaken in the Barangaroo area in the vicinity of the Barangaroo Metro Station as summarised in Table 2 below:

Table 2 Summary of Key Environmental Investigations undertaken in the vicinity of Barangaroo Metro Station

No	date	Author	Title	Scope/Purpose	Comment
1	1 June 2010	ERM	Overarching Remedial Action Plan for the Barangaroo Project Site, Sydney	Covers 22 Ha area including Hickson Road and former gasworks site. Identifies the remediation options on the Remediation area and makes recommendations	Engaged by the Barangaroo Delivery Authority. Summarises contamination issues identified in previous Environmental Site Assessments (those key being two by ERM 2007&2008 which include Stage One and Stage Two investigations, one by Coffey 2008 focussing on road section between Nos 30 and 38 Hickson Rd, one by URS 2001, and various earlier other studies). The declared Remediation Site covers the former gasworks and portion Hickson Road adjacent.
2	May 2016	Jacobs	Technical Paper 8: Phase 1 Contamination Investigation (incorporating Preliminary Site Investigation)	Forms part of Environmental Impact Statement (EIS) for the Sydney Metro Chatswood to Sydenham.	Engaged by TfNSW. Uses information provided by the Barangaroo Delivery Authority on seven previous studies in 2012, 2013, six from JBS, and one from Environ in and around Barangaroo Central. Recommendations informed CoA and REMMs as relating to Contamination.
3	May 2018	Douglas Partners	<u>Remediation Action Plan</u> Sydney Metro City & South West - Tunnel and Station Excavation Works Package Proposed Barangaroo Station, Hickson Road, Barangaroo	Covers the basement bulk excavation footprint only. Purpose is to render site suitable for proposed land use.	TSE's Remediation Action Plan. Commissioned by John Holland CPB Ghella JV. Referenced previous Douglas Partners report on Preliminary site investigation March 2018, detailed site investigation May 2018, PSM Hydrogeological Interpretive Report 19 March 2018, all the above referenced reports and two reports from Golder May 2016, and January 2017.
4	27 February 2019	Douglas Partners	Addendum to Remediation Action Plan (TSE)	Provides qualification on limits to groundwater modelling, and proposed alternative assessment approach with inspections and sampling	Addendum is a brief letter
5	September 2021	Douglas Partners	Report on Validation of Remediation (TSE)	Assesses the suitability of the site for the proposed station following completion of remediation works. Report considers sources of contamination within the bulk excavation and contaminated groundwater potentially present outside of the bulk excavation.	Undertaken by the preceding TSE Contractor confirming remediation carried.

The excavation of the station footprint has been undertaken by the TSE Contractor and remediated by the TSE Contractor in accordance with the TSE Remediation Action Plan (RAP). The site has been assessed as suitable for its intended future use as a station by others (Table 2 report No. 5), and further contamination assessment for this purpose is not required. This assessment does not, however, assess (nor is it reliant on the absence of) contamination at the site outside of the station box bulk excavation footprint. The remainder of the site therefore potentially contains contaminated soils which may require management during works.

For the remainder of the site, outside of the station box bulk excavation footprint, the land use will not be changed for the proposed works, and Douglas Partners consider that the works do not trigger the need for contamination assessment under the *Contaminated Land Management Act (CLM Act) 1997*.

BESIX Watpac has engaged Douglas Partners as the specialist consultant responsible for preparing a Spoil Management Plan Sampling, Analysis & Quality Plan (SMPSAQ) which sets out the requirements for managing spoil excavated during the works to meet the requirements of the POEO Act. BESIX Watpac have prepared an Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) based on the requirements as outlined in the SMPSAQ and to meet the requirements of CoA E69 and E70. The adopted thresholds for on-site re-use have been determined with consideration of waste minimisation in accordance with CoA E106 and environmental risk associated with keeping contamination impacted soil on site.

Douglas Partners have undertaken a desktop review of the existing contamination and acid sulfate soil assessments, as listed in Table 2 as well as any others provided by Sydney Metro, to determine the current understanding of contamination issues at the site and identify what further investigation is required to meet the above objectives and this is summarised in a Preliminary Site Investigation Report. The report provides advice on any contamination specific work health and safety measures that are considered appropriate for the works based on the available data. Further investigation may be undertaken in situ and/ or on stockpiled spoil as determined to best facilitate the works. This item addresses REMM SCW1.

Acid Sulfate Soil (ASS) is expected to be present at the site, and Douglas Partners have prepared an Acid Sulfate Soil Management Plan (ASSMP) describing the works required to treat and manage ASS to mitigate on-site pollution incidents and for disposal in accordance with the POEO Act. The ASSMP has been developed in accordance with the requirements of the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998) (ASSMAC, 1998). This item addresses REMM SCW1. Prior to ground disturbance in high probability ASS areas testing will be carried out to determine the presence of ASS in accordance with the requirements of REMM SCW2. If ASS is present then works will be conducted in accordance with the ASSMP.

BESIX Watpac will implement the SMPSAQ during all excavation works, and the ASSMP where required. BESIX Watpac will also include contamination risks identified by the above reports listed in Table 2 in the applicable Work Method Statement(s) where relevant.

Stockpiled spoil will be managed in accordance with the recommendations of the SMPSAQ. Erosion and sediment control measures will be implemented on site and surrounding stockpiled materials in accordance with Managing Urban Stormwater: Soil and Construction (Landcom, 2008) – the “Blue Book and REMM Condition SCW3 to ensure there is no risk of contaminated spoil, or water runoff, from site.

6.2 Waste Classification and disposal

Soils to be disposed of off-site will be classified in accordance with the *POEO (Waste) Regulation 2014*, and POEO Act (including the NSW EPA Waste Classification Guidelines, where applicable) prior to leaving the site in accordance with REMM WM1.

Each excavated area / stockpile will be tracked on the Material Tracking Register to identify where the material was excavated from and document the soil classification and volumes of each stockpile. The Material Tracking Register will be read in conjunction with a site map mark-up of the stockpiles, to assist in

managing where material was excavated from and tracking the different classification of materials on site. Once waste classification reports are issued, it will be determined whether the spoil can be reused, or whether it needs to be taken to a licenced landfill in accordance with the SMPSAQ and/or ASSMP. All material that is taken to licenced landfills will be tipped at locations licenced to take the classification of spoil. Tipping dockets from the licenced landfill will be provided by the civil subcontractor and be recorded in the Material Tracking Register. Waste Classification Report references will also be recorded in the relevant section of the Materials Tracking Register.

If in-situ waste classification identifies contamination, ex-situ waste classification will be conducted. If upon visual inspection excavated material does not look or smell like its in-situ classification, an ex-situ waste classification will be undertaken. The visual inspection of all stockpiles will be undertaken and documented as required.

6.3 Unexpected Contamination

Where unexpected contamination in the form of contaminated soil, ASS or asbestos is discovered on site, the SMPSAQ outlines the process to be followed to mitigate environmental risks from unexpected contamination. In addition, and to meet the requirements of CoA E69 and E70, an Unexpected Contaminated Land and Asbestos Finds Procedure (UCLAFP) has been prepared by BESIX Watpac to outline the responsibilities of all site personnel as they relate to unexpected contamination and the process to be followed, and individual responsibilities, should it be observed or suspected on site. The UCLAFP is an appendix of the CEMP.

6.4 Erosion & Runoff

Erosion and sediment control measures will be implemented in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Managing Urban Stormwater: Soils and Construction Volume 2* (Department of Environment and Climate Change, 2008a) Measures will be designed as a minimum for the 80th percentile, 5-day rainfall event. Control measures will be placed downstream of stockpiles and disturbed excavation works and stockpiles will not be located in drainage lines, channels or overland flow paths.

Progressive Erosion and Sediment Control Plans (ESCPs) will be developed and implemented to detail all required erosion and sediment control measures for the site prior to any works commencing. ESCPs will be updated progressively throughout the project to reflect the current and changing site conditions. Any amendments to the ESCP will be approved by the Planning and Environment Manager.

6.5 Soil Monitoring

Monitoring activities, as outlined in Table 3 will be implemented during construction to minimise adverse impacts to soil and testing of excavated material will be undertaken in accordance with the SMPSAQ:

Table 3 **Monitoring Activities**

Monitoring Activities	Frequency
Inspections of erosion and sediment control measures in place including a record of issues identified and rectification	Weekly and before any significant inclement weather event
Additional inspections will be undertaken prior to and following significant rainfall events, classed as greater than 20mm over a 24-hour period	Prior to and following significant rainfall events (>20mm in 24 hours)

6.6 Material Importation

Soil is to be imported for filling of the temporary northern shaft, backfill of the station box to form the new Hickson Road alignment, and other excavations where on-site spoil is not deemed suitable for use as fill. Imported materials, including a suitable growth medium, will be used for landscaping.

Soil imported to the site will meet the following requirements:

- The soil must be legally able to be imported onto the site in accordance with the *Protection of the Environment Operations (Waste) Regulation 2014* and any required works specific approvals
- The soils must meet the assessment criteria in Appendix C of the SMPSAQP.
- The soils must meet the geotechnical requirements for their proposed use.
- The soils must be classified as VENM, Excavated Natural Material (ENM) or other materials legally able to be imported onto the site based on a Resource Recovery Order and Exemption. Soils must be assessed in accordance with the EPA requirements. For VENM this generally includes having no signs of concern, metal concentrations at background levels and organic compounds below appropriate laboratory limits of reporting. For non-VENM materials the EPA requirements would generally include assessment in accordance with the appropriate Resource Recovery Order. Prior to importation, appropriate documentation should be provided to, and approved by, the Environment and Planning Manager or Construction Manager and the materials should, where practicable, be inspected at the source site to confirm that there are no signs of contamination. Quarried materials (i.e., materials sourced from a quarry that are not recycled) need not be subject to assessment by the Environmental Consultant, however other inspection and record keeping requirements still apply to these materials.
- The material must be inspected during importation, and any materials not meeting the description given in the provided documentation or displaying signs of contamination will be rejected. The Environmental Consultant may also conduct inspections during and / or following importation to check the same.
- Additional testing of the imported material may be required, as recommended by the Environmental Consultant, commensurate with the documentation provided for review and the material type/ classification. The contractor will track and keep a record of all soil materials imported onto the site in the material tracking registerl.

7 Water Management

7.1 Background Information

BESIX Watpac has been awarded the Barangaroo Metro Station package, which includes the below scope of works;

- Station fitout works including secondary structural elements
- Third party works including Hickson Road construction, public domain works, utilities, and landscaping
- Interface works including the provision of facilities, plant and equipment for Interface Contractors

The Tunnel and Excavation Contractor (TSE) was a JV between John Holland, CPB and Gheller (JHCPBG), who carried out the excavation of the Barangaroo station box and shark's fin underground structure. TSE were responsible for managing groundwater, surface water, and construction surface water on site, managed in accordance with their documentation as follows:

- Construction Environmental Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002010)
- Construction Soil, Water and Groundwater Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002014)
- Stormwater and Flooding Management Plan (SMCSWTSE-JCG-TPW-DN-PLN-0020032)
- Water Reuse and Discharge Management Procedure (SMCSWTSE-JCG-TPW-EM-MPR-003002)
- Surface Water Quality Monitoring Program (SMCSWTSE-JCG-TPW-EM-RPT-097238)

As part of the requirement to manage the groundwater, surface water and construction water TSE installed a Water Treatment Plant (WTP) that has been maintained by Aquatic Engineering Pty Ltd. The WTP has been handed over to BESIX Watpac who are now responsible for its management. The WTP is currently configured to treat 15 l/s of water. The WTP is located adjacent to Nawi Cove as shown in Figure 2 and discharges into a stormwater drainage pit that discharges directly into Sydney Harbour at the discharge point shown below in Figure 4.

7.2 Existing Water Management Arrangements

The station box is fully tanked up to basement level 3 (B3), where there is a break in the tanking behind the shoring wall to allow for the construction of the future southern entrance between Barangaroo Station and the neighbouring Block 7 development. The TSE works included installing a 250mm diameter civil drainage depressurisation pipe at B3 level that reduces the hydrostatic pressure on the Hickson Road heritage wall, also known as the High Street Cutting, and drains groundwater to a holding tank on B3. Water entering the un-tanked section of the shoring wall at the southern entrance is drained to this holding tank via a series of geotechnical strip drains. The groundwater in the holding tank is then pumped to the WTP for treatment prior to being discharged into Sydney Harbour. This depressurisation system will remain in place until the southern entrance between Block 7 and Barangaroo Station is constructed, which is anticipated to be after August 2023, when BESIX Watpac will have completed Barangaroo Station.

Sump pumps are in place at the bottom of the northern shaft at basement level 6 (B6) as shown in Figure 3 that capture groundwater entering the northern shaft through the rock face and pump it to the WTP for treatment prior to discharge into Sydney Harbour. Principle Contractor status of the northern shaft was handed to the Linewide contractor on 31 March 2022. BESIX Watpac will continue to treat the water pumped from B6 to the WTP whilst the Linewide contractor finalises arrangements to treat the water themselves. A pre-pump inspection record is filled out before BESIX Watpac accept water from the Linewide contractor which confirms that no visible oil and grease is present in the water and no recent spills or incidents have occurred.

The WTP and all associated pipework and pumps are nominated as 'Handover Items', being a key piece of equipment used for the operation of the site that were transferred from TSE to BESIX Watpac on site possession. BESIX Watpac operate the WTP to treat groundwater and surface water collected on site during construction activities and utilise the same network of pits and pumps to collect water and transfer it

to the WTP for treatment prior to discharge into Sydney harbour (subject to water quality monitoring parameters being met as per the WQMP).

Figure 2 Location of the on site existing Water Treatment Plant (WTP)



Figure 3 Dewatering Sump Pit & Pump in the Northern Shaft Basement 6 (GR-1)



7.3 Water Treatment Plant

The TSE Contractor previously discharged water from the WTP under an Environmental Protection Licence (EPL 20971), which nominated discharge criteria for key pollutants, as per Table 4 below.

Table 4 Barangaroo WTP discharge Criteria under TSE EPL 20971 condition L2.8

Parameter	Unit	Discharge Criteria
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/l	50

Parameter	Unit	Discharge Criteria
Oil and Grease	Visible	Not visible

Once the site was handed over to BESIX Watpac on 16 September 2021, the project was no longer required to operate under an EPL. BESIX Watpac engaged WSP to produce a Water Discharge Impact Assessment (WDIA) to assess the fitness for purpose of the WTP for treating ground and surface water collected as part of BESIX Watpac's construction activities and to ensure that *NSW Water Quality Objectives* are being maintained in accordance with CoA E107 and Section 120 of the POEO Act. Section 2 of the WDIA sets out the regulatory obligations which BESIX Watpac must comply with when operating the WTP. A Water Quality Monitoring Program (WQMP) has been prepared to outline the type and frequency of water quality monitoring to be undertaken, based on the recommendations made in the WDIA and the process to be followed if a water quality exceedance event occurs.

BESIX Watpac has engaged Aquatic Engineering Australia (AEA) to undertake the ongoing maintenance of the WTP. AEA is the incumbent WTP installer and maintenance contractor who has been responsible for the installation and maintenance of numerous water treatment plants established by TSE as part of the Project.

The Barangaroo WTP is a coagulation/ flocculation clarification type WTP. The process for coagulation/ flocculation clarification follows with further detailed provided in the AEA operation and maintenance manual which has been included in Appendix A.

- Pre-treatment (water collection and initial solids removal)
- Coagulation (pH control and oxidant dosing)
- Flocculation (including removal of emulsified oil)
- Clarification (sludge to sludge holding tank and filter press)
- Post pH correction and media filtration

The WTP has an internal automatic water quality monitoring system which checks turbidity and pH, including a secondary back up, which monitors water and transmits results to an online portal where they can be viewed in real time. Water will not be discharged from the WTP until discharge parameters are correct. The outlet from the WTP comprises twin 1050mm diameter pipes which discharge by gravity into Nawi Cove which is part of Sydney Harbour.

The regulatory obligations which BESIX Watpac must comply with regarding the WTP for the management of water discharging to Sydney Harbour are addressed in detail in Section 2 of the WDIA and include:

- Section 120 of the POEO Act;
 - (1) A person who pollutes any waters is guilty of an offence.
 - Note— An offence against subsection (1) committed by a corporation is an offence attracting special executive liability for a director or other person involved in the management of the corporation—see section 169.
 - (2) In this section— pollute waters includes cause or permit any waters to be polluted.

CoA E107 states: *"The CSSI must be constructed and operated so as to maintain the NSW Water Quality Objectives where they are being achieved as at the date of this approval, and contribute towards achievement of the NSW Water Quality Objectives over time where they are not being achieved as at the date of this approval, unless an EPL in force in respect of the CSSI contains different requirements in relation to the NSW Water Quality Objectives, in which case those requirements must be complied with".*

The NSW Water Quality Objectives are the agreed environmental values and long-term goals for NSW's surface waters. They set out:

- the community's values and uses for our rivers, creeks, estuaries and lakes (i.e. healthy aquatic life, water suitable for recreational activities like swimming and boating, and drinking water); and

- a range of water quality indicators to help us assess whether the current condition of our waterways supports those values and uses.

The Objectives are consistent with the agreed national framework for assessing water quality set out in the Australian and New Zealand Guideline for Fresh and Marine Water Quality (ANZECC 2000 Guidelines). These guidelines provide an agreed framework to assess water quality in terms of suitability for a range of environmental values (including human uses). The Water Quality Objectives provide environmental values for NSW waters and the ANZECC 2000 Guidelines provide the technical guidance to assess the water quality needed to protect those values. To determine the receiving water quality criteria, the ANZECC 2000 guidelines provide standardised criteria relevant to achieving the public health and environmental water quality for the water body (Sydney Harbour Lower Estuary). Appendix A of the WQMP identifies the water quality parameters to be monitored against the NSW Water Quality and ANZECC 2000 guidelines.

7.4 Water Discharge Impact Assessment (WDIA)

BESIX Watpac has engaged WSP in the role of environmental engineer to undertake a Water Discharge Impact Assessment (WDIA) for the discharge of water from the WTP to validate the requirements of CoA E107 to maintain the *NSW Water Quality Objectives* and determine if modification or improvements to the performance of the WTP need to be considered to treat surface and groundwater collected by BESIX Watpac during their construction activities.

A summary of the key findings made by the WDIA and recommendations which BESIX Watpac will adopt are as follows:

- The 15 l/s treatment capacity of the WTP is adequate under both typical and worst-case flow condition scenarios
- Discharge when operated by the TSE Contractor generally achieved the ANZECC (2000) guidelines trigger values for 95% species protection of aquatic ecosystems for toxicants, with the exception of ammonia, cyanide, copper and zinc.
- The marine environment at the outlet of the WTP where water discharges into Sydney Harbour should be considered to be a *highly disturbed system* based on the ANZECC (2000) ecological condition
- For a *highly disturbed system* the ANZECC (2000) 80% or 90% species protection for toxicants is acceptable
- Given the WTP is generally achieving ANZECC (2000) 95% species protection of aquatic ecosystems these trigger values will be adopted for toxicants other than ammonia, copper cyanide and zinc
- Copper, cyanide and zinc will be monitored against the 80% species criteria
- An Environmental Protection License (EPL) will no longer be in place for BESIX Watpac's use for discharge from the WTP. Whilst BESIX Watpac are not required to operate in accordance with the TSE EPL discharge from the WTP will continue to be tested, prior to discharge off site, for the same turbidity and pH parameters as were nominated in the TSE EPL.
- An addendum to the WDIA has been prepared to address dewatering from the western civil pit shown in Figure 1 back to Sydney Harbour, bypassing the WTP as described in Section 5.2.2.

Based on the recommendations made in the WDIA, BESIX Watpac will continue to operate the WTP in its current configuration and adopt the monitoring frequency, locations and monitoring parameters recommended by the WDIA and as outlined in the WQMP.

Monitoring undertaken by BESIX Watpac up to the date of this report has shown that discharge from the WTP has generally met the requirements of the WQMP and recommendations made in the WDIA. Where exceedances have occurred an investigation has been undertaken to establish the cause.

7.5 Water Quality Monitoring

The Sydney Metro City and Southwest Chatswood to Sydenham Staging Report Revision 7 (Staging Report) sets out the planning approval requirements relevant to each project site. The Staging Report 'switches on' Construction Monitoring Program requirement CoA C9(a) only for the Barangaroo Station project (Noise and Vibration). According to the Staging Report, Construction Monitoring Program requirements CoAs C9(c) & (d) to CoA C17 are not applicable to the Barangaroo Station project in relation to water quality and groundwater monitoring programs.

Notwithstanding this, a Water Quality Monitoring Program (WQMP) has been produced to monitor the impact of BESIX Watpac's construction activities on groundwater and surface water in the vicinity of the site and to monitor the effectiveness of mitigation measures implemented to meet the requirements of CoA E107 and Section 120 of the POEO Act. The WTMP sets out a program of monitoring to be undertaken to check the quality of water, which is being discharged from the WTP, and within Sydney Harbour, to meet the recommendation made in the WDIA and to maintain the NSW Water Quality Objectives in accordance with CoA E107.

Water quality monitoring records will be issued in a Construction Water Quality Monitoring Report (CWQMR) which will be issued on a quarterly basis.

BESIX Watpac will continue to utilise water quality monitoring locations BN-3 and SW_B_01 as the locations for monitoring water quality associated with BESIX Watpac's construction activities. These are the existing monitoring locations utilised by the TSE Contractor and are shown below in Figure 4. Water quality monitoring will be undertaken at these locations monthly. Additionally, groundwater will be monitored at monitoring locations GW-1 on B3 and GW-2 on B6 on a quarterly basis.

7.5.1 Water Quality Monitoring – Western civil pit

Water quality monitoring has been undertaken within the western civil pit, and harbour adjacent, on a periodic basis to check the water quality in the pit is of similar quality to the harbour to justify bypassing the WTP. This monitoring data has informed the amendment to the WDIA in support of this activity.

It is anticipated that the construction of the western civil pit will take 10 days to complete. The pit will need to be de-watered into Sydney Harbour each day (dewatering event) for a duration of 8 hours.

The following water quality monitoring will be undertaken:

- Those parameters which the WDIA nominates as needing to be monitored prior to discharge (TSS, pH and no visible oil and grease) will be monitored in real-time with hand apparatus during each de-watering event. Each parameter will be checked daily prior to dewatering commencing and hourly whilst de-watering is taking place.
-
- Water quality in the Western civil pit will be checked for compliance with those parameters nominated in Appendix A of the WQMP prior to discharge off site commencing for the first dewatering event. A water quality sample will also be taken at the discharge point shown in Figure 4 below and at the control location SW-B-01.
- The above process will be repeated at the conclusion of all dewatering activities. Expedited results will be requested from the independent laboratory undertaken the testing to ascertain as quickly as possible if any exceedances have occurred in the water discharged into the harbour.

The results of all water quality undertaken associated with the construction of the Western civil pit will be presented in a water quality monitoring report and submitted to Sydney Metro and the ER.

If at any stage during the dewatering process tested water is found to be unsuitable for discharge into the harbour then dewatering will immediately be ceased and the pit allowed to refill.

Water will be pumped from the western civil pit into settlement tanks prior to it being pumped into the harbour to ensure that turbidity is within discharge parameters.

Figure 4 **Water Quality Monitoring Locations**



7.6 Water Mitigation Measures

The following water mitigation measures will be implemented:

- Clean water will be diverted around disturbed site area, stockpiles and contaminated areas
- Control measures will be installed downstream of works, stockpiles and other disturbed areas
- Dangerous goods and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume
- Spill kits will be provided on site and a spill management procedure followed in the event of a spill
- The WTP will be correctly maintained by AEA
- All accumulated water shall be checked and treated to ensure that *NSW Water Quality Objectives* are met prior to re-use or discharge from the site as required by Condition of Approval (CoA) E107 and as outlined in the WDIA.
- All discharge from the WTP will be monitored to ensure compliance with the discharge criteria and monitoring program as outlined in the WQMP with monitoring reports issued in the CWQMR

- A hold point will be put in place (as required by *Table 1.4 Preliminary Register of Hold Points* of the CEMF) where water will be tested to verify compliance and not discharged unless discharge requirements are met
- Any rainwater or surface water flowing into the site, including from the Linewide contractor laydown areas, will be collected and pumped to the WTP for treatment prior to discharge, unless part of the western pit dewatering activity addressed in the addendum to the WDIA
- Water pumped from areas where Linewide are working on the site, to the WTP, will be done so under a pre-pump inspection record.

8 Environmental Planning & Flooding

Uncontrolled overland flow of water or unmanaged stormwater could potentially lead to flooding and environmental impact to the project and the adjacent waterway. The environmental impact and mitigation measures are outlined below in Table 5.

Table 5 Flood impact and migration measures

Environmental Aspect	Potential Impact	Mitigation Measure
Rainfall in excavated areas/zones	<ul style="list-style-type: none"> • Rainfall falling into trenches or onto the station lid (low point) has the potential to cause flooding in these areas and in the station and adjoining tunnel network if this is not appropriately managed 	<ul style="list-style-type: none"> • Detail construction planning including the development and implementation of ESCPs . • Review of the stormwater quantity inputs that are treated by the WTP to confirm capacity of the plant and if detention tanks are required. •
Flooding during extreme rainfall from adjacent roads and stormwater systems	<ul style="list-style-type: none"> • Overland flows/flooding from adjacent surface areas such as Hickson Road, High Street, and the existing hardstand area on Block 7. • It is important to note that worksites may not be experiencing rain at the time of the incident as water could be from discharge into the stormwater system • The sumps and holding tank in the station will not have sufficient capacity for flood waters in extreme storm events (i.e. the Probably Maximum Flood (PMF) event). 	<ul style="list-style-type: none"> • Temporary civil engineer to review rainfall quantities and temporary pumping needed to mitigate flooding effects and ensure capacities of pumps can accommodate rainfall • Design and installation of waterproofed hobs to penetrations in the station box lid at surface level. All hobs to be constructed to the PMF level, or if not achievable then a risks assessment to be conducted • Temporary works civil connections for the Hickson Road demolition will be designed with the temporary civil works engineer and approved by Sydney Metro and METRON prior to undertaking the works.
Localised flow paths causing nuisance flooding on the worksite	<ul style="list-style-type: none"> • Nuisance flooding as result of localised overland flow paths could make the worksite un-trafficable in areas of excavation for workers. 	<ul style="list-style-type: none"> • Diversion drains and swales will be implemented in the ESCPs

9 Spill Response Management

Spill prevention measures and monitoring will be adopted as outlined below and in accordance with the BESIX Watpac Spill Response Management Procedure (F.8):

9.1 Spill Mitigation Measures

- Dangerous goods and hazardous chemicals including fuel to be stored within bunded areas with a capacity of 110% of the maximum single stored volume.
- Chemicals and fuel to be labelled and stored in bunded areas in accordance with the safety data sheet (SDS).
- Spill kit and fire response equipment to be located where chemical and fuel using plant or equipment is stored or operated and outlined in Environmental Control Maps (ECMs)
- All hazardous chemicals are to be stored and managed in accordance with the NSW *Work Health and Safety Regulation 2017*, the NSW Code of Practice for Managing Risks of Hazardous Chemicals in the Workplace 2019, and the NSW Code of Practice for Labelling of Workplace Hazardous Chemicals 2019.
- Spill kits will be provided on site

9.2 Storage and Handling – Hazardous Chemicals



Hazardous chemicals, must be stored and handled strictly in accordance with:

- All relevant Australian Standards and legislation
- For liquids, a minimum bund volume of requirement of 110% of the volume of the largest single stored volume within the bund
- *Storage and Handling Liquids: Environmental Protection – Participants Manual* (Department of Environment and Climate Change, May 2007)
- *The Environmental Compliance Report: Liquid Chemical Storage, Handling and Spill Management – Part B Review of Best Practice and Regulation* (Department of Environment and Conservation (NSW), 2005)


10 Record Management

Records will be maintained by the project Planning and Environment Manager and Environmental Co-ordinator and transmitted to Sydney Metro / ER via TeamBinder for compliance tracking purposes, as follows:

- Copies of current ESCPs for all active construction sites and areas
- Records of soil and water inspections undertaken
- Records of testing (monitoring program results) of any water prior to discharge and quality of water discharged in the CWQMR
- Records of the release of the hold point to discharge water from the construction site to the receiving environment
- Records of the treatment of contaminated material in accordance with the SMPSAQ
- Records of the treatment of acid sulfate soils in accordance with the ASSMP
- Copies of waste classification reports
- Copies of all trucking and tipping dockets for spoil that is tipped at landfill.
- Discharge under the COS will be recorded in a Controlled Overflow Strategy Summary Report (COSSR).
- Material Tracking Register
- Water Quality Monitoring Reports



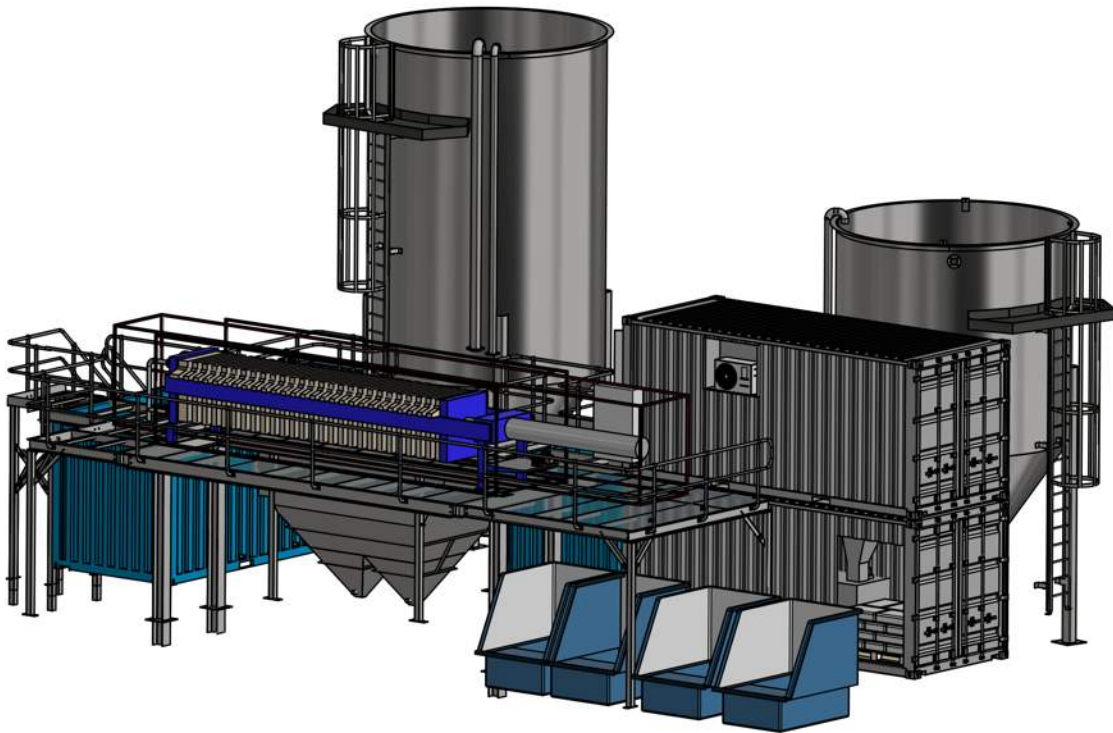
Appendix A **WTP** Operation & Maintenance Manual





Sydney Metro

15 LPS Water Treatment Plants



Operation and Maintenance Manual

Project No.: P35-15LPS

Issue Date: May 10th, 2019

Revision: A

Aquatic Engineering Australia Pty Limited

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Sydney Metro Water Treatment Plant – 15 LPS

Operation and Maintenance Manual

Revision History

Date	Revision	Reason for Issue	Author
10/10/17	Draft	Draft – Issued for information	Josh Bucholtz
10/05/19	A	As built	Josh Bucholtz

Introduction



Read this manual before installing, operating or servicing this equipment.

Follow all lockout procedures when installing and servicing.

It is the user's responsibility to ensure before commencing any work or operating this plant, the contents of this manual are read, clearly understood and fully complied with.

Please pay special attention to the Safety & Chemical Handling Sections (Section 4) of this manual and the Safety Data Sheets. Ensure that the contents and instructions are fully complied with.

This Water Treatment Plant (WTP) has been designed and manufactured to treat the groundwater generated by Sydney Metro tunnelling operations at:

- Victoria Cross
- Martin Place (Bligh Street)
- Pitt Street (North)

It is important not only to operate and maintain the equipment as detailed in this manual, but also to carefully monitor and control the chemical addition processes to achieve efficient operation of the WTP.

If you have consulted this manual and you are unable to resolve any operational or maintenance difficulty, please contact:

Aquatic Engineering Australia Pty Limited

Level 2, Tower 1, 495 Victoria Ave

Chatswood NSW 2067



Sydney Metro Water Treatment Plant – 15 LPS

Operation and Maintenance Manual

Telephone: 1300 364 749

Email: info@aquatic-engineering.com

Please retain this Manual for future reference.

Safety and Chemical Handling

a. General

- Do not operate the plant without the proper instructions given inside this manual.
- Always read and understand fully the Safety Data Sheets (SDS) before handling any products.
- Always wear the correct personal protective equipment/clothing when handling any chemicals. Refer to the SDS.







- Do not undertake any works without completing a risk assessment and preparing Safe Work Method Statements (SWMS). Many pipelines contain chemicals or effluent under pressure even when the plant has been shut down for some time and most items are crucial to the effective treatment of the effluent and it is unlikely that the chemical separation will function without them.
- Do not ask tradesmen to repair the plant when it is full of chemicals.
- **MAKE IT SAFE FIRST** by flushing out any chemical residues from the pumps and pipelines and isolating the equipment.
- When in doubt **ASK**. Consult this manual, a trained operator or failing this contact Aquatic Engineering Australia Pty Limited.
- Always electrically isolate the plant and switch off local isolator **BEFORE** you dismantle any electrical equipment.
- The liquids in the plant are quite conductive, electrical work in the presence of spilled liquids is **DANGEROUS**.

HAZCHEM Information Summary

Refer to the SDS for detailed information.

Product	UN No.	Class	Packaging Group	Hazchem Code	Poison Schedule
AEA 416 – Coagulant					
AEA 102 – Flocculant					
AEA 490 - Antifoam					
30% Liquid Caustic Soda	1824	8	II	2R	S6
50% Sulphuric Acid	2796	8	II	2R	-

1) Equipment Warnings

	DANGER: Electrical Power Present.
	DANGER: Moving Parts Present.
	DANGER: Mandatory Electrical Lockout To Service
	DANGER: Mandatory Eye Protection For Service



HMI Operator Interface

The water treatment plant is controlled via the HMI Operator Interface (Touch Panel) on the front of the Main Control Panel.

Set points and timers have been determined during commissioning. They are adjustable via the HMI, however this is not recommended with first consulting Aquatic Engineering Australia P/L

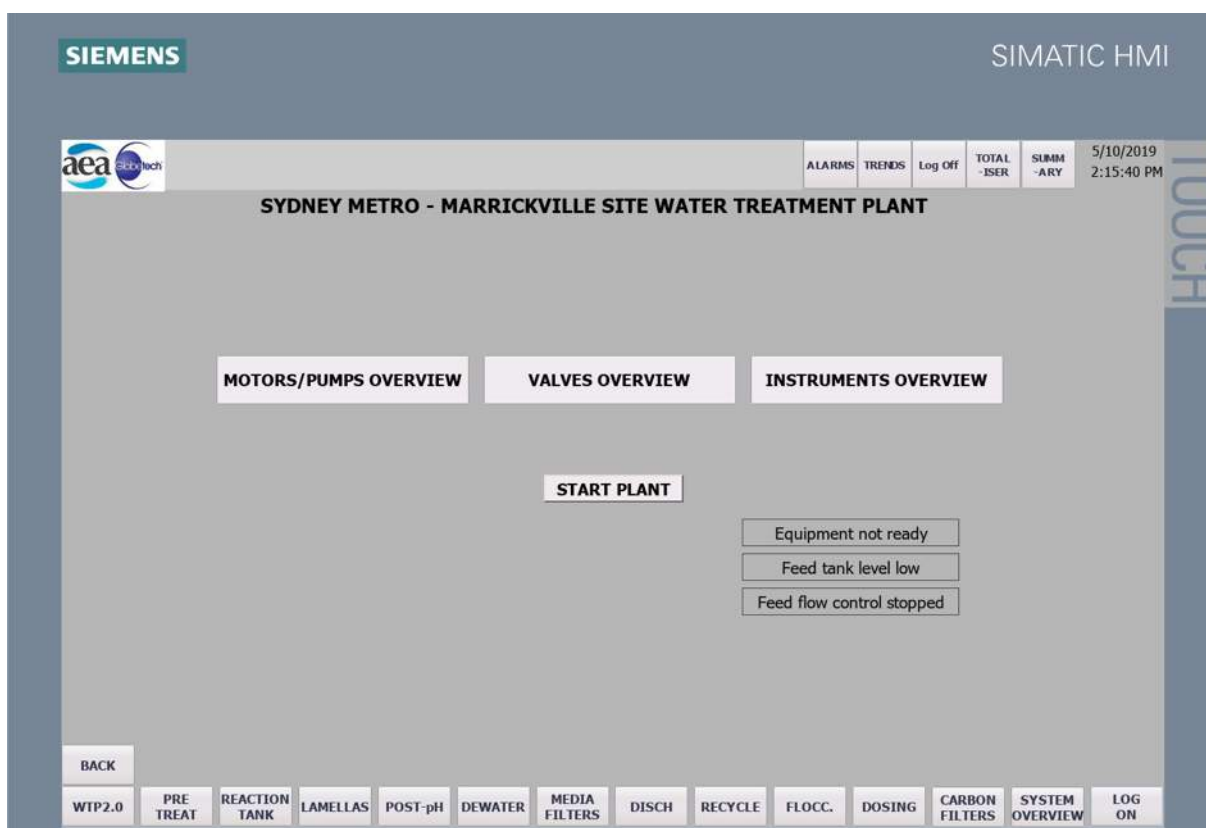
Log On/Out

Operator can log into the system to make changes to operational set points. This is achieved by pushing the Log On button on the button right hand side of the screen:

User: engineer

Password: 6040

Summary Screen



The summary screen is displayed on power up and can be accessed by pushing the summary button, on the top right hand corner of the HMI during normal operation.

This page allows :

- Access to Overview pages for motors/instruments/valves
- Status of conditions to allow plant to start
 - Equipment ready/not ready: Motors/valves in Auto
 - Feed tank level sufficient to process water
- Start/stop the plant



Overview

The overview pages allow a the operator a quick summary of the status of the plant. The Pump and Motors as well as the Valve Overview page allows the operator to select all items to “AUTO”

Motors/Pumps Overview

SIEMENS SIMATIC HMI

aea

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SUMMARY - PUMPS AND MOTORS

Tag & Description	Stopped	Healthy	Manual
P11-1 - Plant Sump Pump	Stopped	Healthy	Manual
P11-2A - Off Spec Return Pump A	Stopped	Healthy	Manual
P11-2B - Off Spec Return Pump B	Stopped	Healthy	Manual
P11-3 (SV11-2) - Feed silo transfer pump	Stopped	Healthy	Manual
P11-4 - Emergency return pump	Stopped	Healthy	Manual
M12-1 - Reaction tank mixer	Stopped	Healthy	Manual
M12-3 - Oil Skimmer	Stopped	Healthy	Manual
P12-1 - Waste oil transfer pump	Stopped	Healthy	Manual
M13-1 - Lamella Settler 1 mixer	Stopped	Healthy	Manual
M13-2 - Lamella Settler 2 mixer	Stopped	Healthy	Manual
P13-1 (SV13-2) - Sludge transfer pump	Stopped	Healthy	Manual
P13-2 (SV13-4) - Sludge transfer pump	Stopped	Healthy	Manual
M14-1 - Post pH control tank mixer	Stopped	Healthy	Manual
P14-1A - Media filter feed pump A	Stopped	Healthy	Manual
P14-1B - Media filter feed pump B	Stopped	Healthy	Manual
P16-1A - Discharge pump A	Stopped	Healthy	Manual
P16-1B - Discharge pump B	Stopped	Healthy	Manual
P32-1 - Circulation pump	Stopped	Healthy	Manual
P32-2 - Hypochlorite dosing pump	Stopped	Healthy	Manual
P32-3 - Ammonia dosing pump	Stopped	Healthy	Manual
P32-4 - Hypochlorite dosing pump	Stopped	Healthy	Manual
P33-1A - Discharge pump A	Stopped	Healthy	Manual
P33-1B - Discharge pump B	Stopped	Healthy	Manual
P17-1 (SV17-2) - Filter press feed pump	Stopped	Healthy	Manual
P18-1 - Acid dosing pump	Stopped	Healthy	Manual
P18-2 - Acid dosing pump	Stopped	Healthy	Manual
P18-3 - Acid dosing pump	Stopped	Healthy	Manual
P18-4 - Acid dosing pump spare	Stopped	Healthy	Manual
P18-5 - Caustic dosing pump	Stopped	Healthy	Manual
P18-6 - Caustic dosing pump	Stopped	Healthy	Manual
P18-7 - Coagulant dosing pump	Stopped	Healthy	Manual
P18-8 - Coagulant dosing pump spare	Stopped	Healthy	Manual
P18-9 - Oxidant dosing pump	Stopped	Healthy	Manual
P18-10 - Anti-foam dosing pump	Stopped	Healthy	Manual
M19-1 - Flocculant screw feeder	Stopped	Healthy	Manual
M19-2 - Flocculant blending mixer	Stopped	Healthy	Manual
M19-3 - Flocculant aging mixer	Stopped	Healthy	Manual
M19-4 - Flocculant dosing mixer	Stopped	Healthy	Manual
P19-1 - Lamella 1 floc dosing pump	Stopped	Healthy	Manual
P19-2 - Lamella 2 floc dosing pump	Stopped	Healthy	Manual
P19-3 - Lamella spare floc dosing pump	Stopped	Healthy	Manual
P33-1A - Discharge pump A	Stopped	Healthy	Manual
P33-1B - Discharge pump B	Stopped	Healthy	Manual

SET ALL TO AUTO

WTP2.0 PRE TREAT REACTION TANK LAMELLAS POST-pH DEWATER MEDIA FILTERS DISCH RECYCLE FLOCC DOSING CARBON FILTERS SYSTEM OVERVIEW LOG ON

Each pump and motor is shown on this page along with it's status as shown below

	Running/Stopped	Healthy/Faulted	Manual/Auto
Motor/ Pump	Stopped	Healthy	Manual
Tag & Description	Running	Faulted	Auto



Valve Overview

SIEMENS SIMATIC HMI

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SUMMARY PAGE - VALVE

SV11-1 - Feed silo dump valve	Closed	Manual	XV16-8 (SV16-1) - Reject divert valve	Closed	Manual
CV11-13 - Feed flow control valve	##... %	Manual	XV16-9 (SV16-2) - Discharge valve	Closed	Manual
SV13-1A - Lamella 1 sludge draw off valve A	Closed	Manual	XV16-10 (SV16-3) - Recycle valve	Closed	Manual
SV13-1B - Lamella 1 sludge draw off valve B	Closed	Manual	XV17-4 (SV17-1) - Filter press feed valve	Closed	Manual
SV13-3A - Lamella 2 sludge draw off valve A	Closed	Manual	SV19-1 - Make up water solenoid	Closed	Manual
SV13-3B - Lamella 2 sludge draw off valve B	Closed	Manual			
SV15-1 - Media filter bypass valve	Closed	Manual			
SV15-2 - Media filter 15-1 valve	Filtering	Manual			
SV15-3 - Media filter 15-2 valve	Filtering	Manual			
SV15-4 - Media filter 15-3 valve	Filtering	Manual			
SV15-5 - Media filter 15-4 valve	Filtering	Manual			
SV15-6 - Media filter 15-5 valve	Filtering	Manual			
VF15-6 (SV15-7) - Product water valve	Open	Manual			

BACK SET ALL TO AUTO PUMPS - MOTORS

WTP2.0 PRE TREAT REACTION TANK LAMELLAS POST-pH DEWATER MEDIA FILTERS DISCH RECYCLE FLOCC. DOSING CARBON FILTERS SYSTEM OVERVIEW LOG ON

Each valve is shown on this page along with it's status as shown below

	Running/Stopped	Manual/Auto
Valve	Closed	Manual
Tag & Description	Open	Auto



Instrument Overview

SIEMENS SIMATIC HMI

aea microtech

ALARMS TRENDS Log Off TOTAL -ISER SUMM -ARY 5/10/2019 2:21:28 PM

SUMMARY - INSTRUMENTS

	Value		Value
AE11-2 FEED pH	####	LE16-1 DISCHARGE BUFFER TANK LEVEL (%)	####
AT11-1 FEEDS SOLIDS (g/L)	####	FE16-1 DISCHARGE FLOWMETER (LPS)	####
LE11-3 FEED SILO LEVEL (%)	####	AE16-1a - TURBIDITY 'A' (NTU)	####
FE11-1 RETURNED WATER FLOW (LPS)	####	AE16-1b - TURBIDITY 'B' (NTU)	####
FE11-2 PLANT FEED FLOW (LPS)	####	AE16-2a - pH 'A'	####
FE11-3 SLUDGE SILO FEED FLOW (LPS)	####	AE16-2b - pH 'B'	####
		AE16-3 DISCHARGE CONDUCTIVITY	####
AE12-1 REACTION TANK pH	####	LE17-1 SLUDGE SILO LEVEL (%)	####
AE12-2 REACTION TANK SOLIDS (g/L)	####	FE17-1 FILTER PRESS FEED FLOW (LPS)	####
AE14-1 POST pH TANK pH	####	FE17-2 FILTER PRESS DISCHARGE FLOW (LPS)	####
AE14-2 POST pH TANK TURBIDITY (ntu)	####	LE18-1 ACID TANK LEVEL (%)	####
LE14-1 POST pH TANK LEVEL (%)	####	LE18-2 CAUSTIC IBC LEVEL (%)	####
PT15-1 MEDIA FILTER FEED PRESSURE (kPa)	###	LE18-3 COAGULANT TANK LEVEL (%)	####
PT15-2 MEDIA FILTER DISCHARGE PRESSURE (kPa)	###	LE18-4 OXIDANT IBC LEVEL (%)	####

BACK

WTP2.0 PRE TREAT REACTION TANK LAMELLAS POST-pH DEWATER MEDIA FILTERS DISCH RECYCLE FLOCC DOSING CARBON FILTERS SYSTEM OVERVIEW LOG ON

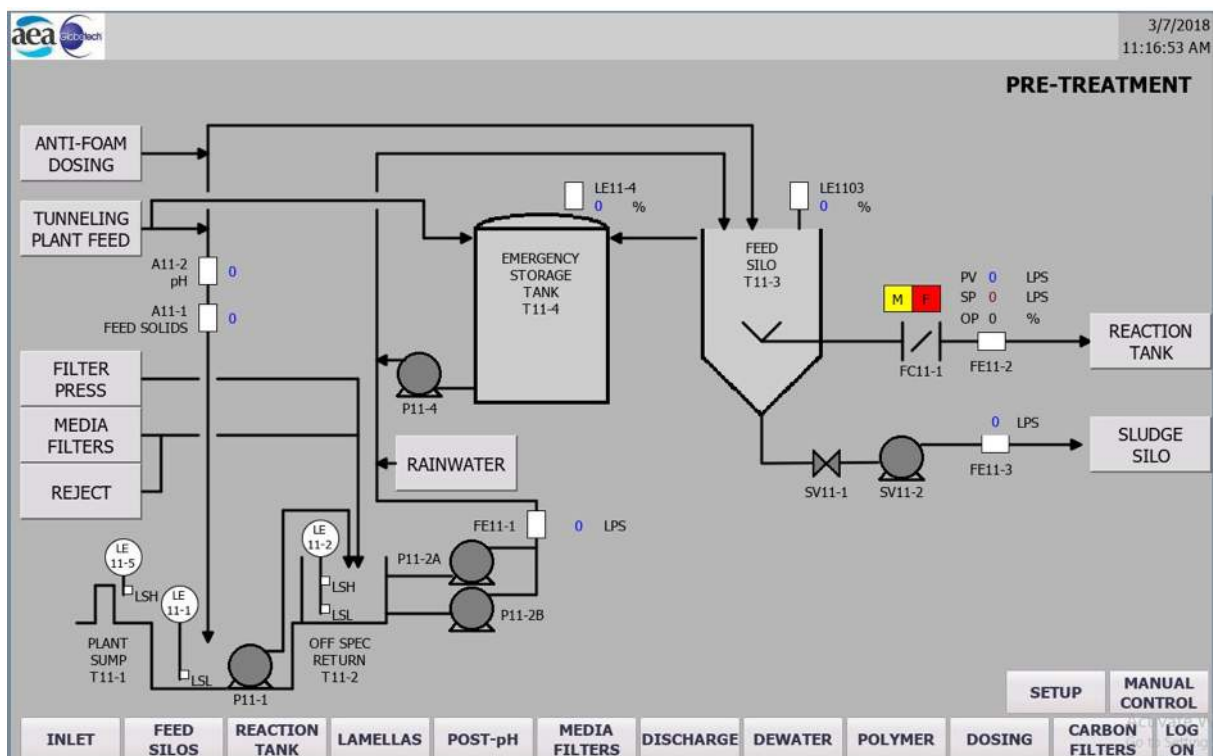
The current reading of all instruments is shown Instrument Overview page.



Process Control

The water treatment plant is broken down into sections and these are displayed as individual pages on the HMI. Each page corresponds to the matching PID for that section. Pages are accessed by pushing the desired page button along the bottom of the HMI.

Process Control Page



Each page shows:

- Schematic of process
- Status of motors/pumps

	Running/Stopped	Healthy/Faulted	Manual/Auto
Motor/ Pump	Stopped	Healthy	Manual
Tag & Description	Running	Faulted	Auto



Sydney Metro Water Treatment Plant – 15 LPS

Operation and Maintenance Manual

- Status of valves

	Running/Stopped	Manual/Auto
Valve	Closed	Manual
Tag & Description	Open	Auto

- Process variables such as tank levels, flowrates, pH, etc are depicted in **BLUE**
- Buttons to access the following pages:
 - Connecting processes
 - Set up
 - Manual Control

Setup Page

3/7/2018 11:23:51 AM

POST pH CONTROL TANK - SETUP

TANK MIXER & DOSING RUN ON 0 min TANK pH SETPOINT 0

OPERATOR SETPOINTS

COMMISSIONING SETPOINTS

	EU Min	EU Max	LL	L	M	H	HH	Hyst.	Debounce	Value
AE14-1	0	0	0	0	0	0	0	0	0	0
AE14-2	0	0	0	0	0	0	0	0	0	0

	P	I	D	L LIM	H LIM	Output	Manual
AE14-1 PID	0	0	0	0	0	0	0

Auto Manual

BACK


INLET FEED SILOS REACTION TANK LAMELLAS POST-pH MEDIA FILTERS DISCHARGE DEWATER POLYMER DOSING CARBON FILTERS LOG ON

The setup page is split into two sections:

- Operator Setpoints – these are no password protected settings that the operator can adjust to suit the operating conditions of the plant
- Commissioning Setpoints – these are password protected settings



Manual Control Page

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POST pH CONTROL TANK - MANUAL CONTROLS

M14-1 - Post pH control tank mixer	Stopped	Healthy	Auto	Manual	
P14-1A - Media filter feed pump A	Stopped	Healthy	Auto	Manual	
P14-1B - Media filter feed pump B	Stopped	Healthy	Auto	Manual	

BACK

INLET

FEED SILOS

REACTION TANK

LAMELLAS

POST-pH

MEDIA FILTERS

DISCHARGE

DEWATER

POLYMER

DOSING

CARBON FILTERS


LOG ON

The operator can switch drives/valves from AUTO to MANUAL and ON/OFF (OPEN/CLOSED). The status of the drive/valve is also highlighted as previously indicated in this section.



Alarms

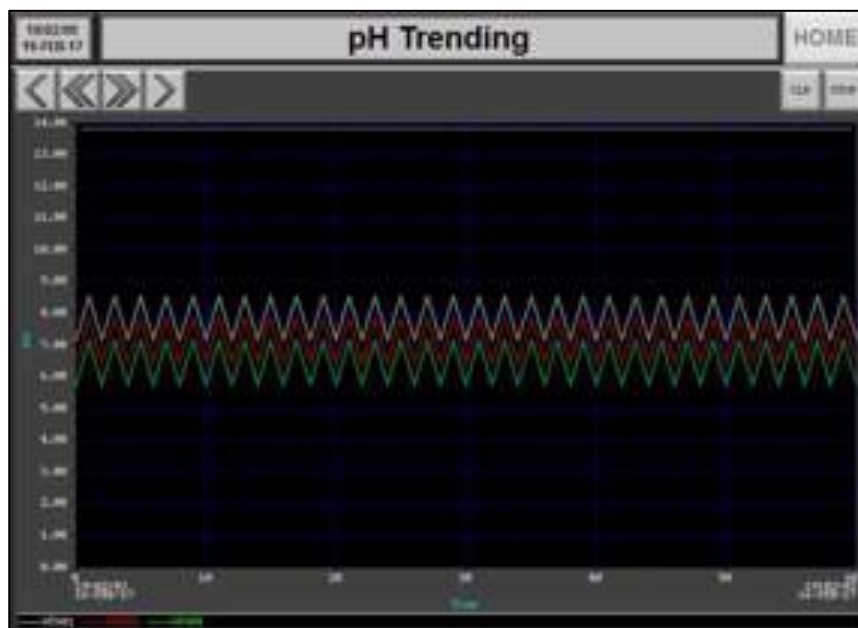
Details of plant alarms are listed on the Alarm Page. It indicates the alarm, time when activated, time deactivated and if confirmed by operator.



Alarm Summary		Total of 4 Alarms		
Message	Status	Activated	Confirmed	Deactivated
Message-1	Received	17/02/16 18:02:00		
Message-2	Received	17/02/16 18:02:00		
Message-3	Received	17/02/16 18:02:00	17/02/16 18:02:00	
Message-4	Received	17/02/16 18:02:00	17/02/16 18:02:00	17/02/16 18:02:00

Trending

Key process parameters are trended for compliance reporting and for troubleshooting.



Process & Operation Description

To be read with drawings AEA-P35-11 to 29 rev4

The treatment system, from a control perspective, consists the following unit processes (all controlled from the HMI):

- Pre-Treatment: Water collection and initial solids removal
- Gravity feed to reaction tank via flow control valve
- Chemical Pre-Treatment in Reaction tank (acid/caustic/coagulant)
- Trident Lamella separator with flocculant dosing and stirred flocculation tank.
- Trident Lamella underflow (sludge) pumped to Sludge Holding Tank
- Trident Lamella Overflow to Post pH Correction tank (acid dosing). Also acts as Media Filter feed tank.
- Media Filtration
- Discharge to drain via monitoring instruments with off spec diversion
- Sludge dewatering (Filter Press)



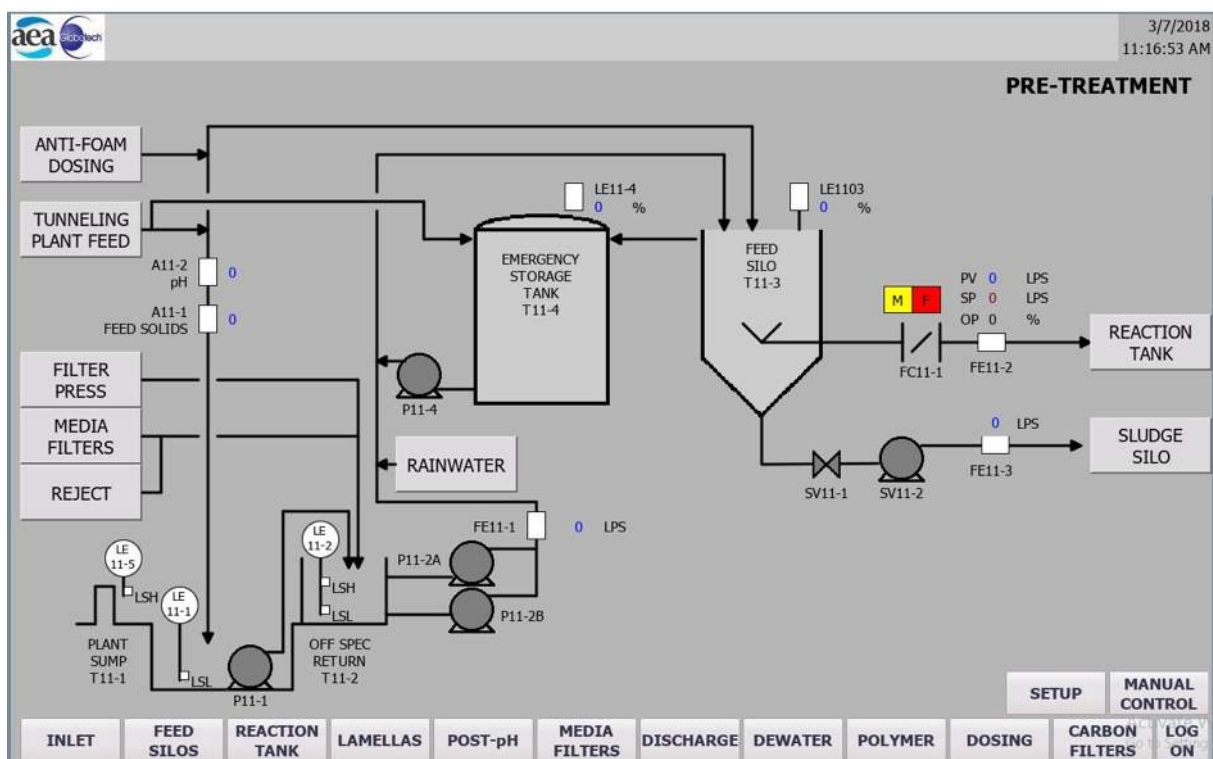
Pre-treatment and Collection

Water from the plant feed tank is pumped into the feed silo(s). Solids settle to the bottom of the silo and supernatant then flows into the reaction tank. The solids are pumped from the bottom of the feed silo to sludge silo and processing through filter press. The sludge

underflow pump P21-3, operators on an ON/OFF cycle timer. The volume of material drawn off the Feed Silo is measured by the Underflow Flowmeter FE21-3.

Supernatant is drawn off from a point above the top of the cone, with level control by guided radar. Access to the top silo is via a caged ladder as there is requirement for routine access. Feed to the tanks is via an energy dissipating pot in the top of the cone.

On the HMI, this is covered on the “PRETREAT” page.



Feed to Chemical Coagulation/Flocculation

When the start level is reached in the Feed Silo, water is gravity fed to Reaction Tank. will be flow controlled modulated via flow meter and modulating valve. Water is gravity feed from the Feed Silo to the Reaction Tank. The flowrate is controlled via a modulating butterfly valve (CV01) and Magflo meter (FE21-2) at the inlet to the reaction tank. This allows the water flow to be paced to match prevailing plant conditions, and the flow rate will be measured for flow paced dosing of coagulant and flocculant. The flowrate is set by the operator on the “PRETEAT SETUP” page

PRE-TREATMENT - SETUP

LAMELLAS OPERATING: 1 2 BOTH

SLUDGE DRAW OFF - ON TIME: ### min

SLUDGE DRAW OFF - OFF TIME: ### min

ANTI-FOAM DOSING - ON TIME: ### min

ANTI-FOAM DOSING - OFF TIME: ### min

FC11-1 PLANT FEED FLOW PID SETPOINT CALC: ### L/s [Auto] [Manual]

OPERATOR SETPOINTS

COMMISSIONING SETPOINTS

	LSLL	LSL	LSM	LSH	LSHH	Hysteresis	Debounce	Value
AE11-2 FEED pH	####				####	####	####	####
AT11-1 FEEDS SOLIDS (g/L)	####				####	####	####	####
LE11-3 FEED SILO LEVEL (%)	####	####	####	####	####	####	####	####
FE11-1 RETURNED WATER FLOW (LPS)	####	####		####	####	####	####	####
FE11-2 PLANT FEED FLOW (LPS)	####	####	####	####	####	####	####	####
FE11-3 SLUDGE SILO FEED FLOW (LPS)	####	####	####	####	####	####	####	####

	Setp (L/s)	P	I	D	Output
FC11-1 PLANT FEED FLOW PID	####	####	####	####	####

BACK

WTP2.0 PRE TREAT REACTION TANK LAMELLAS POST-pH DEWATER MEDIA FILTERS DISCH RECYCLE FLOCC. DOSING CARBON FILTERS SYSTEM OVERVIEW LOG ON

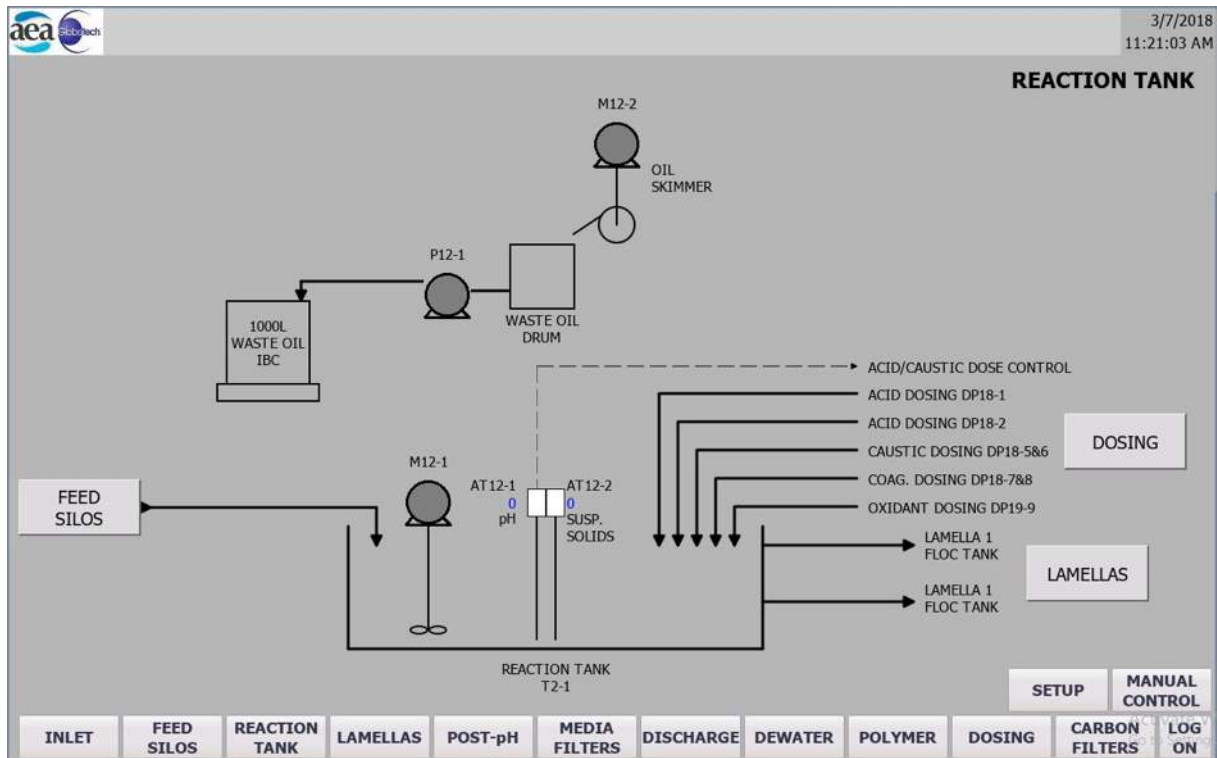
Control points set are a “PRETREAT SETUP” page.

1. Sludge Draw On/Off Timer – P23-1 cycle times
2. Antifoam Dosing On/Off Timer - In AUTO, the dosing pump will run to these times
3. Plant Flow Rate – 0 – 15 L/s
 - a. Auto – The PLC will adjust the flow from 15 L/s when the Feed Silo is @ LSH linearly down to 7.5 L/s @ LSL
 - b. Manual – Operator inputted set point between 0 – 15 L/s

Chemical Treatment & Reaction Tank

Flow will enter the mixed reaction tank where the first stage of pH correction will occur. Acid and caustic addition via dosing pumps linked to the PLC. Coagulant is added into the reaction tank at a rate proportional to the inlet flow. The reaction tank is fitted with a pH and suspended solids monitor. The reaction tank is also fitted with an oil skimmer to remove an free oil from the surface.


On the HMI, this is covered on the “REACTION TANK” page.



Control points set are a “REACTION TANK SETUP” page.

1. Reaction Tank Mixer run on time – Duration of time the mixer runs once flow from the Feed Silo stops
2. Oil Skimmer On/Off Timer – In AUTO, the skimmer will operate for this duration when the reaction tank mixer is off
3. Reaction Tank pH – Typically set in the range 6.5 to 8.5. This may vary due to water quality conditions
4. Coagulant Dose Rate – 0 to 100%

Whenever the flow is detected on FE21-1 (from Feed Silo) the Coagulant, Acid and Caustic Dosing Pumps plus reaction tank mixer are enabled.



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REACTION TANK - SETUP

REACTION TANK MIXER RUN ON 0 min
 OIL SKIMMER - ON TIME 0 min
 OIL SKIMMER - OFF TIME 0 min

REACTION TANK pH SETPOINT 0
 COAGULANT DOSE RATE 0 %

OPERATOR SETPOINTS
COMMISSIONING SETPOINTS

	EU Min	EU Max	LL	L	M	H	HH	Hyst.	Debounce	Value
AE12-1	0	0	0	0	0	0	0	0	0	0
AE12-2	0	0	0	0	0	0	0	0	0	0

	P	I	D	L LIM	H LIM	Output
AE12-1 PID	0	0	0	0	0	0

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pH Control

The Reaction Tank is fitted with a high speed mixer and an immersed pH sensor (AE22-1). The pH sensor provides feedback to the PLC as to the pH of the contents in the reaction tank. The PLC then regulates automatically, the amount of caustic or acid solution to be dosed into the reaction tank to correct the pH to the desired pH set point. The desired pH set point (between pH 6.5 and 8.5) is set by the operator on the Prominent pH controller.

Acid is stored in 10,000 L (Martin Place and Pitt Street) or 20,000 (Victoria Cross) bulk storage tanks. Caustic is dosed from a 1,000 L IBC's. A suction lance which is inserted into the IBC feeds the dosing pumps.



Coagulant Addition

Coagulant is dosed to the reaction tank at a rate proportional to the feed flow rate to the plant.

Dosing is via by the Coagulant Dosing Pumps DP28-7 and DP28-8, drawing feed from the 3,000 L bulk storage tank. The Coagulant Dosing Pump is flow paced from the 4-20mA signal derived from the inlet flow meter. The speed of the dosing pump, proportional to the inlet feed flow rate is set on the HMI. The dosing rate can be varied further varied by adjusting the stroke length dial on the dosing pump.

Oxidant Dosing

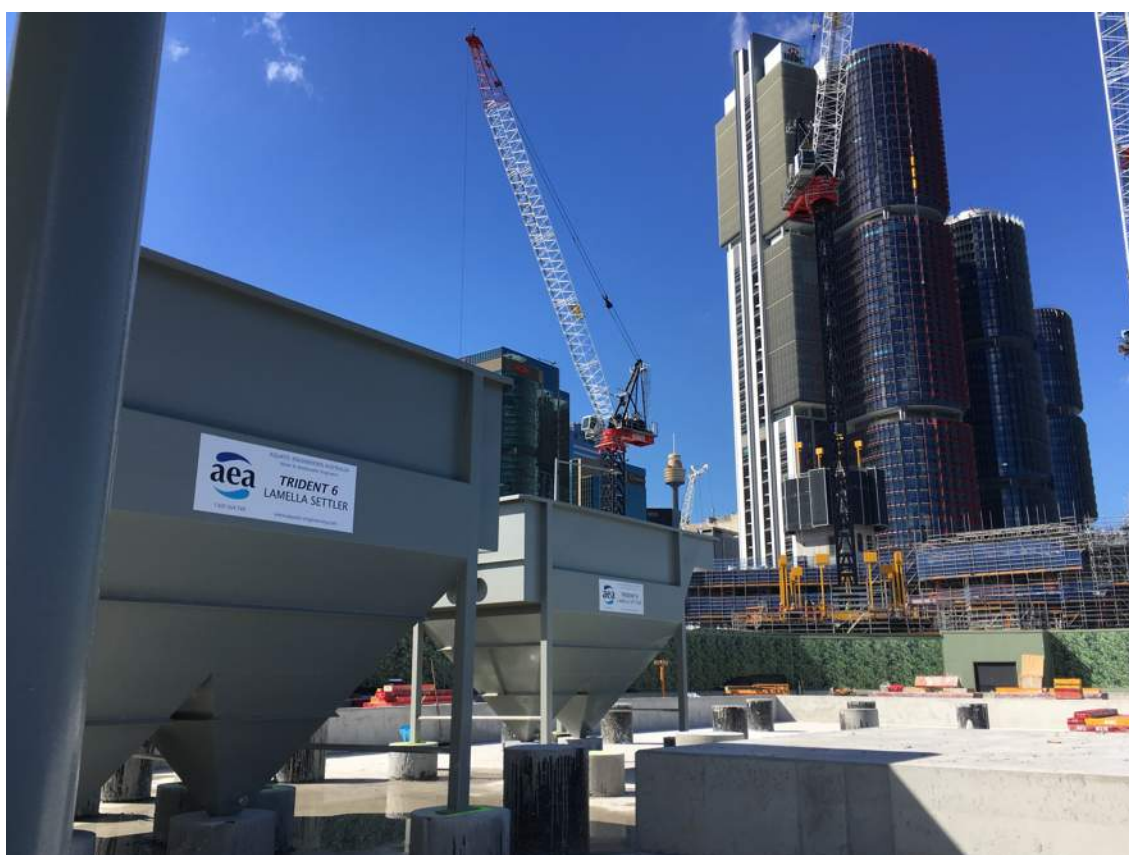
In the case that dissolved iron is present in the water, the plant is fitted with an oxidant dosing. The oxidant (potassium permanganate) is added at a fixed rate into Reaction Tank, via Oxidant Dosing Pump, DP28-9. The stroke is set locally on the dosing pump, as determined by the operator. The speed is set at 0-100% and is proportional to the process water flow



Reaction Tank, Lamella Flocculation Tank and Lamella Clarifier

Trident Lamella Separators

Clarification of the flocculated water is achieved in an AEA Trident6 Lamella Separator, with integrated flocculation tanks. Each AEA Trident6 Lamella Separator has a nominal treatment capacity of 15 L/s.



Flocculation

Water is feed to the AEA Trident6 Lamella Separators from the reaction tank, via gravity, to the flocculation tanks. The tank is fitted with a slow speed mixer for blending in dosed polymer to flocculate the fine solids created in the reaction tank into large readily settling flocs. *The adjacent picture shows good floc particles and clear water.*

The Lamella Flocculant Dosing Pumps, P29-1 and P29-2 are small helical rotor pump mounted in the polymer container. These pumps draw from the flocculant blending system and dose at a rate proportional to the incoming flow.

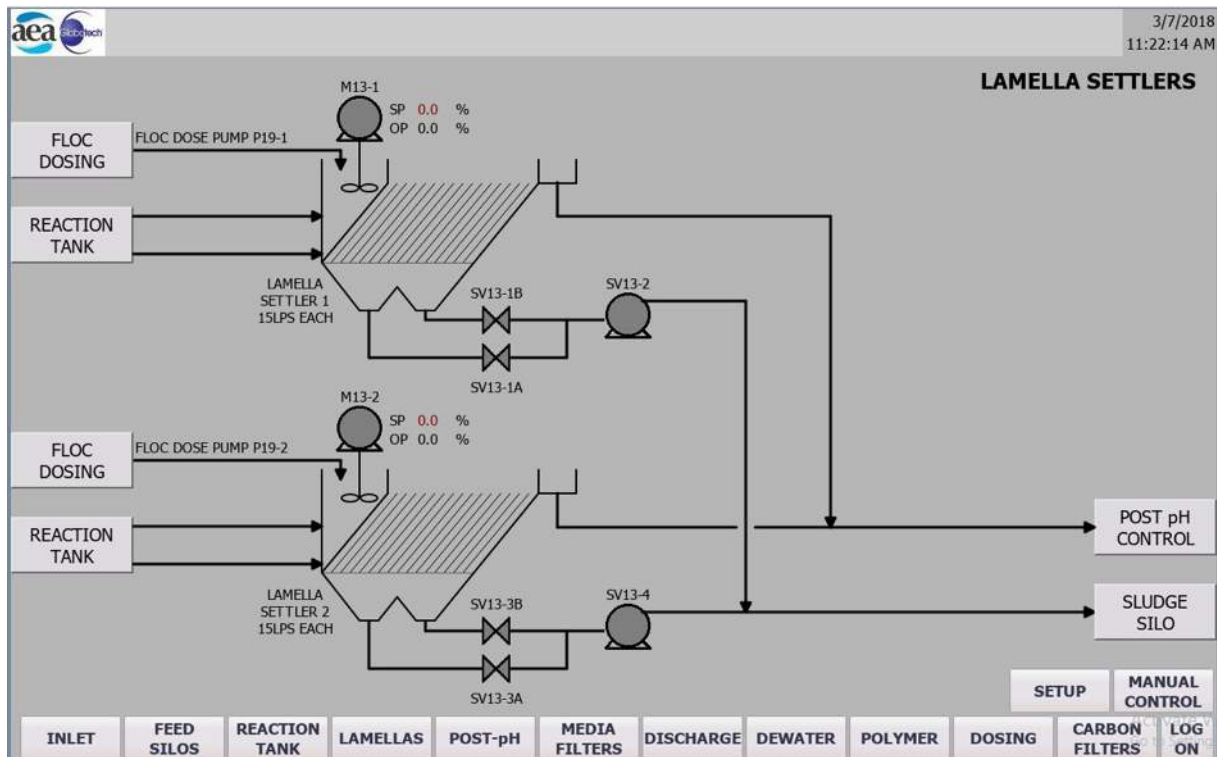
The dosing rate, and so the speed of the Lamella Flocculant Dosing Pumps, is set on the HMI. This will in turn step up or down the frequency output from the VSD proportional to the incoming flow.

Clarification

The flocculated flow passes to into the clarifier section of the AEA Trident6 Lamella Separator, in which the solids are allowed to settle. The clarified water discharges via overflow weirs.



The AEA Trident6 Lamella Separator have two (2) hopper bottoms, each fitted with automatic sludge take off valves for removal of settled solids. These valves are independently controlled.



A single Trident6 Lamella is used for the 15 L/s plant

Sludge is removed from the AEA Trident6 Lamella Separator at set time intervals in the following way:

- The sludge transfer pumps are located next to the hopper bottoms. These are used to suck the sludge from the Trident6's.
- The first is the sludge transfer pump off timer. This is the set period between sludge dump cycles and can be varied dependent on the amount of sludge being generated by the plant. In Auto, the run time of the Sludge Transfer Pump, is the sum of the time that both of the sludge valves are open.
- The other timers are for the duration that the sludge valves (one timer for each valve) are open. These can be varied dependent on the amount of sludge being generated by the plant



3/7/2018
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LAMELLAS OPERATING

12BOTH

LAMELLA - SETUP

LAMELLA 1

MIXER & DOSING RUN ON TIME0 min

MIXER SPEED0 %

HOPPER 1 SLUDGE DRAW OFF - ON TIME0 min

HOPPER 1 SLUDGE DRAW OFF - OFF TIME0 min

HOPPER 2 SLUDGE DRAW OFF - ON TIME0 min

HOPPER 2 SLUDGE DRAW OFF - OFF TIME0 min

FLOCCULANT DOSE RATE0 %

DUTY FLOCC. PUMP

P19-1

P19-3

LAMELLA 2

MIXER & DOSING RUN ON TIME0 min

MIXER SPEED0 %

HOPPER 1 SLUDGE DRAW OFF - ON TIME0 min

HOPPER 1 SLUDGE DRAW OFF - OFF TIME0 min

HOPPER 2 SLUDGE DRAW OFF - ON TIME0 min

HOPPER 2 SLUDGE DRAW OFF - OFF TIME0 min

FLOCCULANT DOSE RATE0 %

DUTY FLOCC. PUMP

P19-2

P19-3

OPERATOR SETPOINTS

COMMISSIONING SETPOINTS

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DISCHARGE

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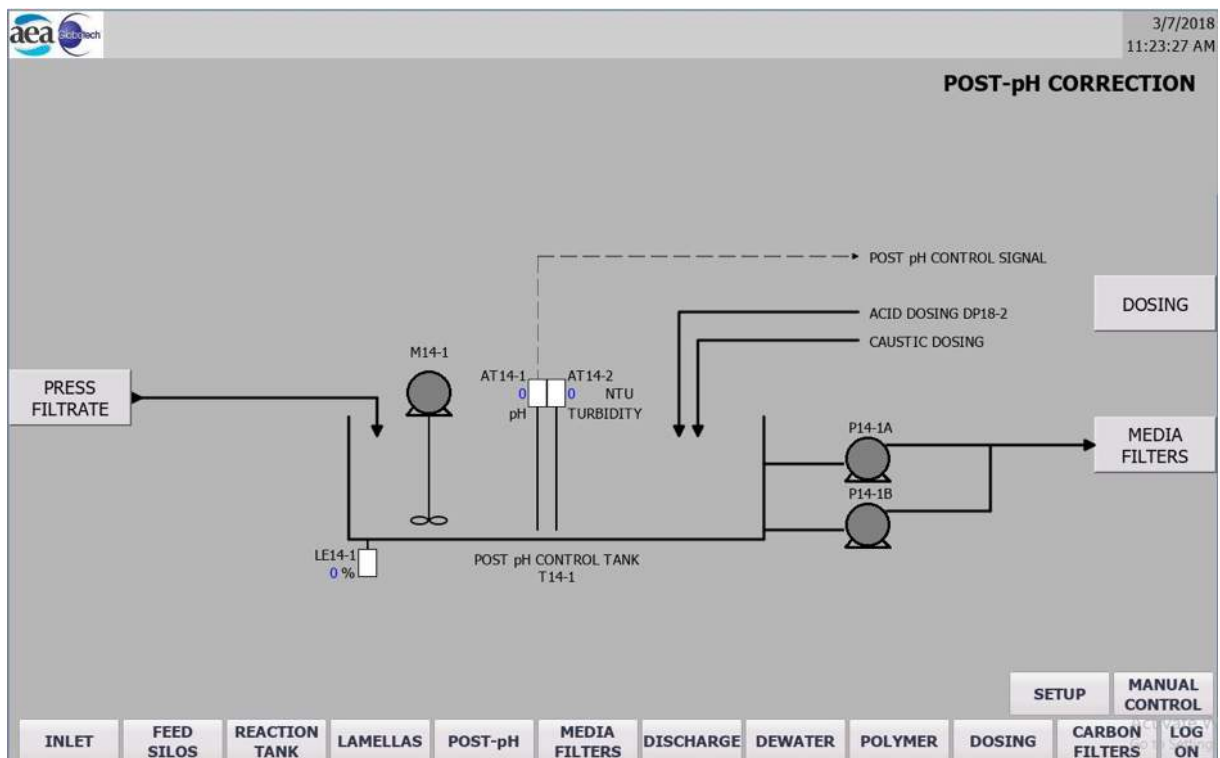
When the Sludge Transfer Pump starts, the Sludge Discharge Valves open in sequence for the time period set on the “LAMELLA SETTINGS” page.

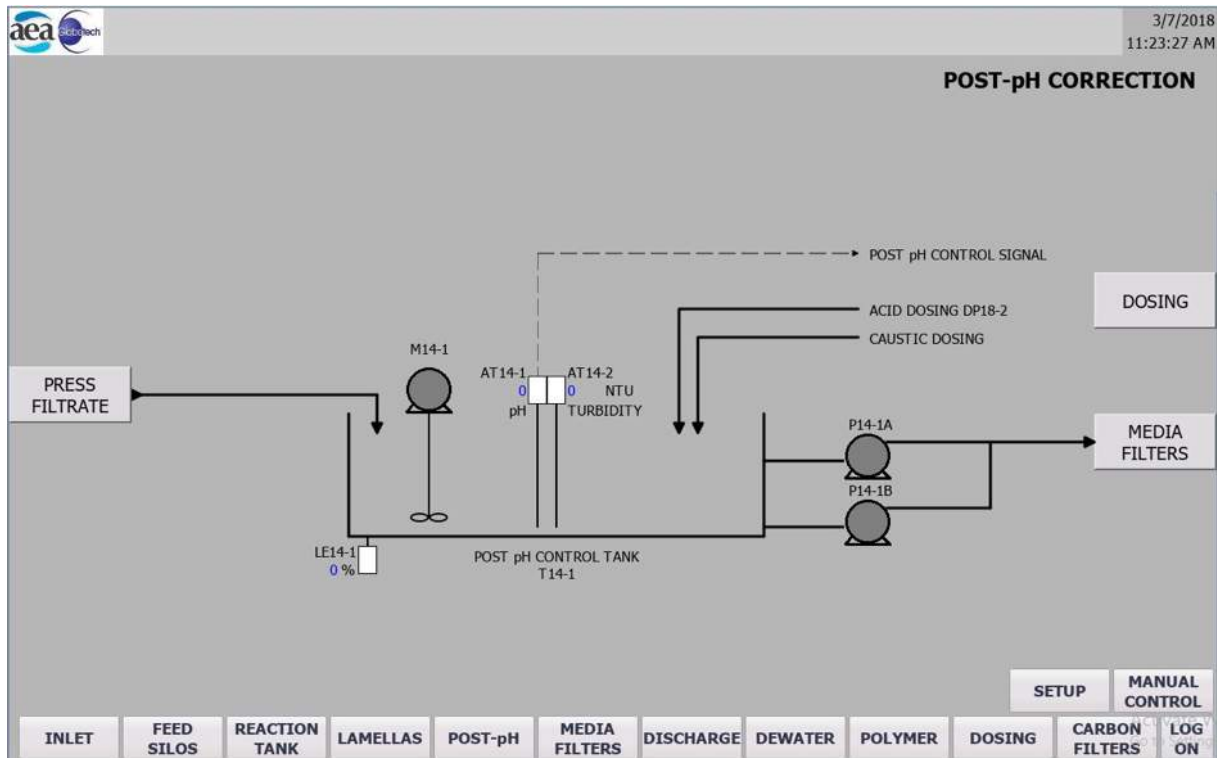
Clarified water from the Trident6 overflows from the weirs at run along the length of the unit. This water flows from the Tridents into the Media Filter Feed Tank.



Post pH Correction and Media Filter Feed

Overflow of clarified water from the Trident6's flows into the Post pH Correction Tank, T24-1. T24-1 is fitted with a high speed mixer and an immersed pH (AE24-1) and turbidity sensor (AE24-2). The pH sensor provides feedback to a PLC then regulates automatically the amount of acid or caustic solution to be dosed to maintain the desired pH set point. The desired pH set point (6.5 - 8.5).

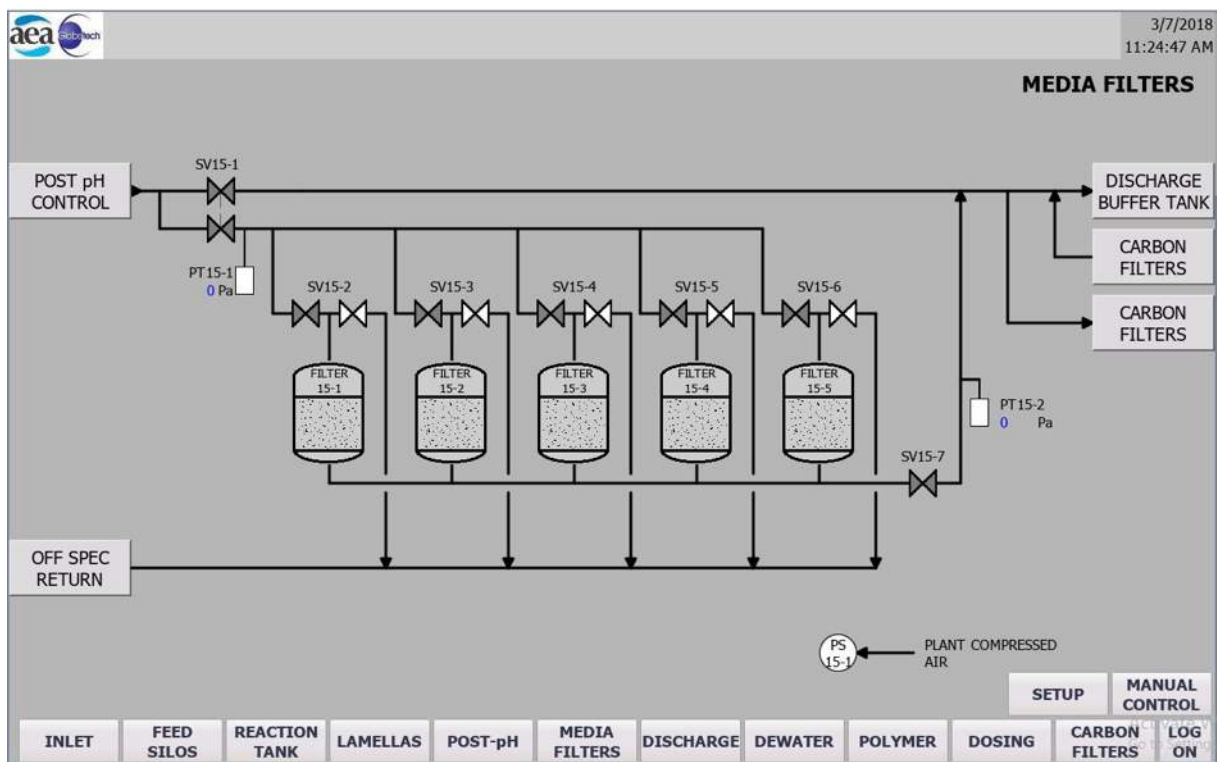




Treated Water is pumped from the Media Filter Feed Tank, via the Media Filter Feed Pumps P24-1 a/b, into the filters.

Media Filters

Water from the Post pH Correction Tank is polished through media filters prior to discharge. The media filters are fully automated pressure media filters arranged in a parallel bank for each plant size with automatic backwashing. Backwash is carried out on a time basis. Backwashing is also triggered if the differential pressure across the media filters exceeds the trigger set point. Backwash is returned to the Off Spec Tank for reprocessing.



Three (3) media filters are used for the 15 L/s WTP's.

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11:25:13 AM

MEDIA FILTER - SETUP

MEDIA FILTERS MANUAL BACKWASH

WASH

MEDIA FILTER BACKWASH PERIOD	0	Hrs	0	Hrs						
MEDIA FILTER 15-1 BACKWASH PERIOD	0	sec	0	sec	MEDIA FILTER 15-4 BACKWASH PERIOD	0	sec	0	sec	
MEDIA FILTER 15-2 BACKWASH PERIOD	0	sec	0	sec	MEDIA FILTER 15-5 BACKWASH PERIOD	0	sec	0	sec	
MEDIA FILTER 15-3 BACKWASH PERIOD	0	sec	0	sec	MEDIA FILTER 15-6 BACKWASH PERIOD	0	sec	0	sec	

OPERATOR SETPOINTS

COMMISSIONING SETPOINTS

	EU Min	EU Max	LL	L	M	H	HH	Hyst.	Debounce	Value
PT15-1	0	0	0	0	0	0	0	0	0	0
PT15-2	0	0	0	0	0	0	0	0	0	0

MEDIA FILTERS BYPASS

ENABLE DISABLE

MEDIA FILTERS BACKWASH PRESSURE TRIGGER

0 Pa

MEDIA FILTERS BACKWASH TURBIDITY TRIGGER

0 NTU

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Discharge, Monitoring and Off-Spec Diversion

Clarified water exiting the media filters flows into the Discharge Buffer Tank, T26-1. T26-1 is fitted with an ultrasonic level sensor. When the start level is reached, the discharge pump(s), P26-1 a/b, start. A sample is taken off this discharge line and flows into the sampling box. The water is monitored for the following to ensure that it complies with the discharge requirements:

- pH (dual sensors): 6.5 to 8.5
- Turbidity (dual sensors): < 30 NTU
- Conductivity: Monitoring only, no discharge limit

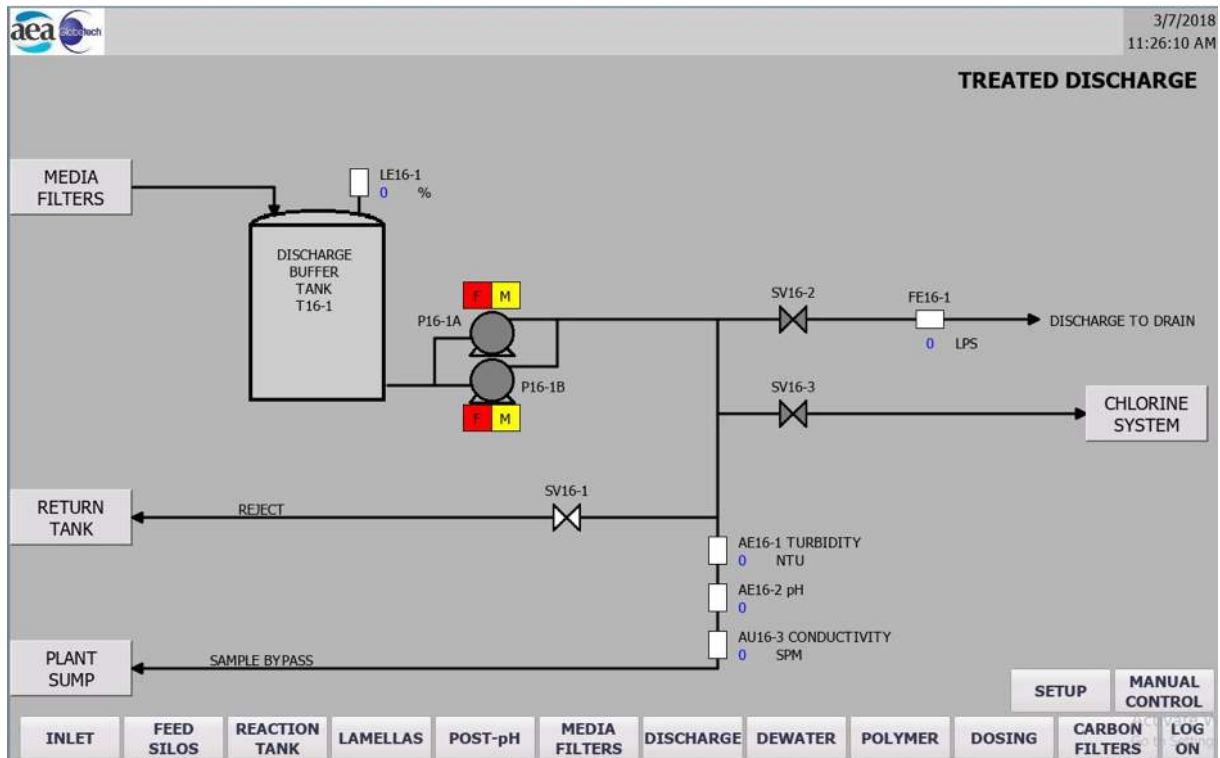
If the water is within the discharge limits, the discharge valve opens and it is pump to the discharge point, via the flowmeter FE26-1.

Treated water with a pH or turbidity outside the discharge criteria, the discharge valve closes, and the divert valve opens return the water to the Off Spec tank for retreatment.



Sydney Metro Water Treatment Plant – 15 LPS

Operation and Maintenance Manual



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TREATED DISCHARGE - SETUP

LE16-1 DISCHARGE START LEVEL 0 %

LE16-1 DISCHARGE STOP LEVEL 0 %

OPERATOR SETPOINTS

COMMISSIONING SETPOINTS

	EU Min	EU Max	LL	L	M	H	HH	Hyst.	Debounce	Variance	Value
LE16-1	0	0	0	0	0	0	0	0	0		0
FE16-1	0	0	0	0	0	0	0	0	0		0
AE16-1	0	0	0	0	0	0	0	0	0	0	0
AE16-2	0	0	0	0	0	0	0	0	0	0	0
AE16-3	0	0	0	0	0	0	0	0	0		0

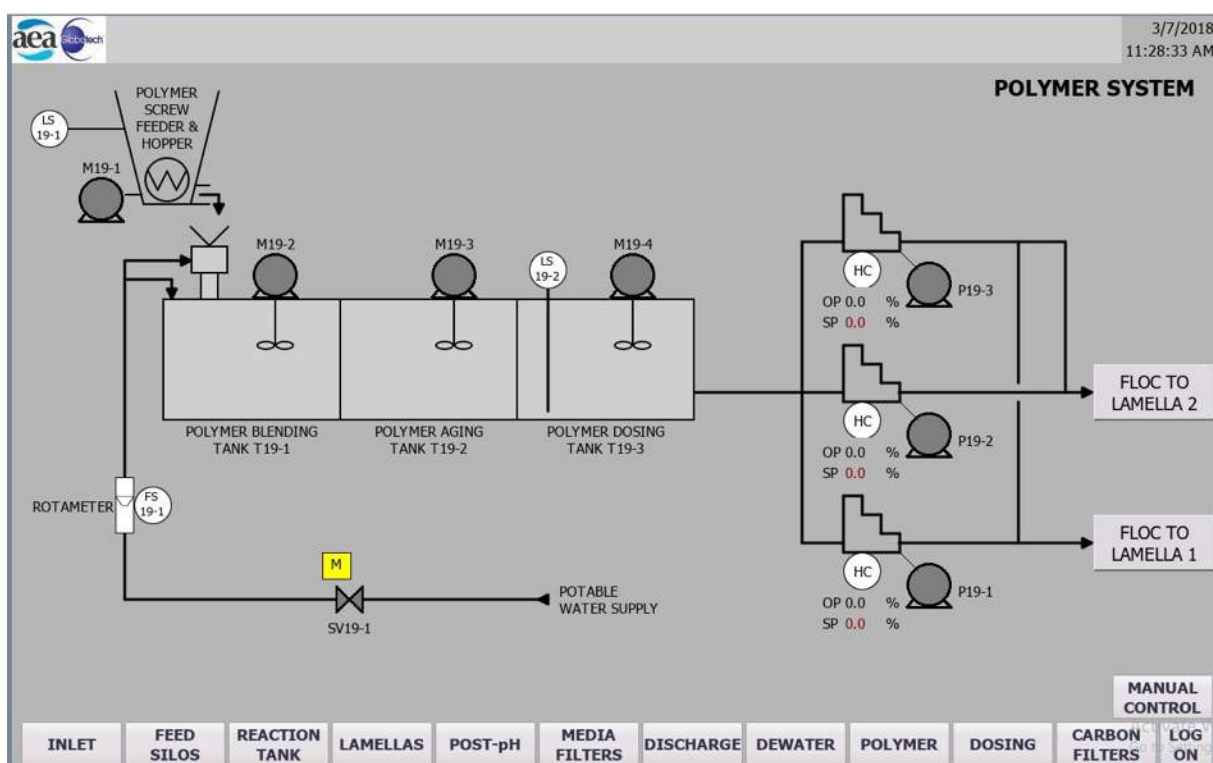
BACK

INLET FEED SILOS REACTION TANK LAMELLAS POST-pH MEDIA FILTERS DISCHARGE DEWATER POLYMER DOSING CARBON FILTERS LOG ON

Discharge limit settings cannot be changed at the operator level

Flocculant Preparation

The plant is fitted with a three tank polymer preparation system. When the level in the Polymer Dosing Tank drops, the make up water solenoid SV29-1 opens. The water passes via an educator, where powdered flocculant is added via the Polymer Screw Feed, M29-1. Powdered flocculant, AEA 102, is stored in the hopper.

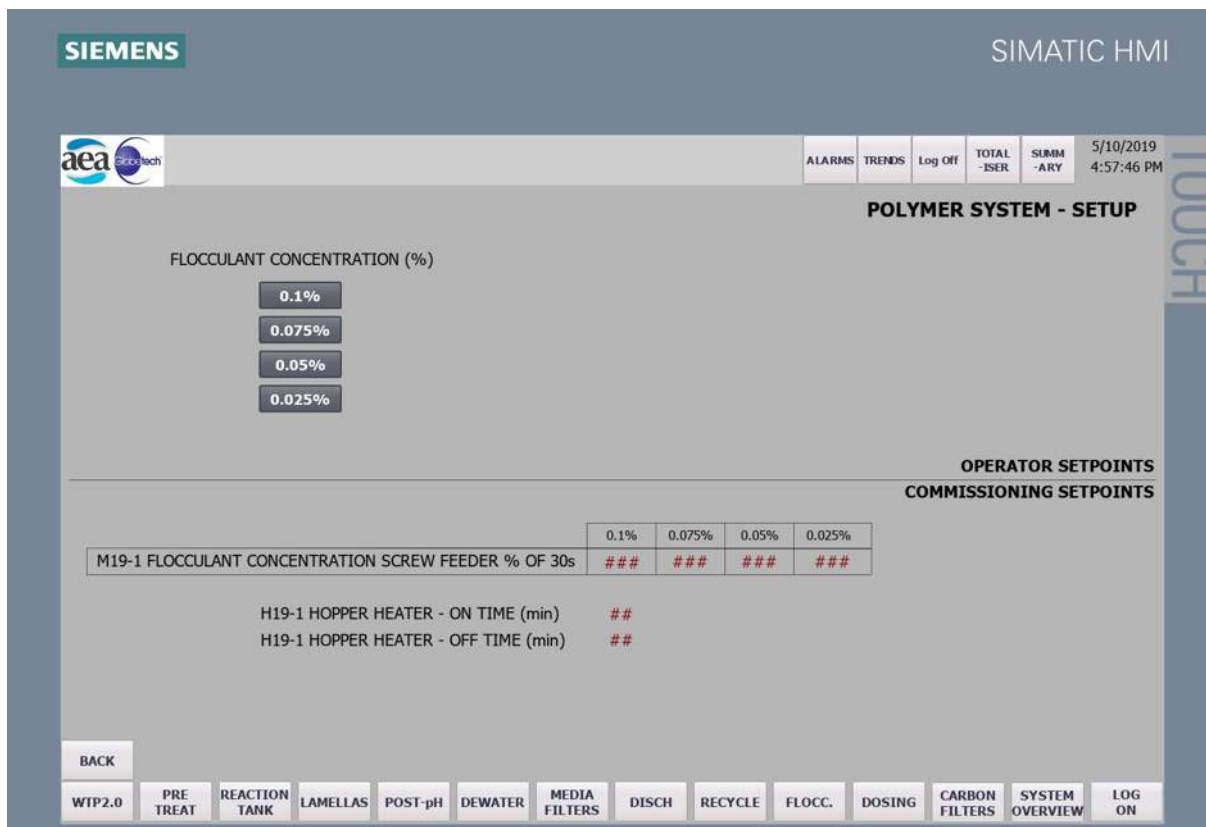


The water/flocculant mix underflows and overflows through the blending and aging tanks into the dosing tank.

A low-level float in the Polymer Dosing Tank will stop the polymer dosing pumps (when in AUTO) from operating to avoid running them dry and damaging the pumps.

The screw feeder is fitted with a heat to prevent condensation and flocculant particles starting to gel.

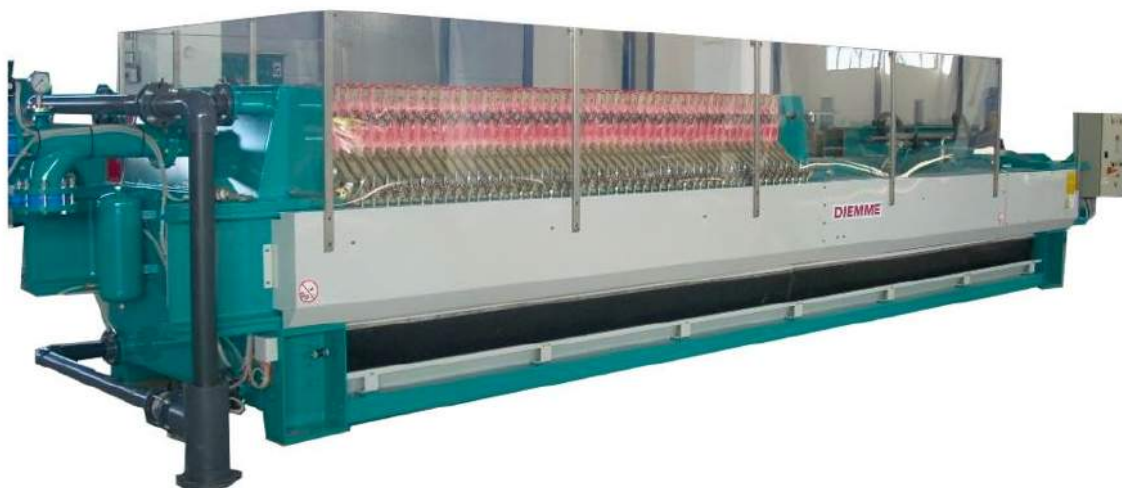
Low flow on the make up water will alarm and prevent the system making up



The flocculant concentration is adjusted by selecting it on the “POLYMER SETUP” page.

Filter Press - Sludge Dewatering System

Additional information on the Diemme process description and operation is detailed Appendix 3 of this manual.



The filter press is operated from its own control panel, refer to Appendix 3. The WTP control panel provides a link to the filter press panel for:

- Sludge tank level
 - Filter press start/stop levels
- Alarms
 - A fault on the Filter press control panel will be shown on WTP panel

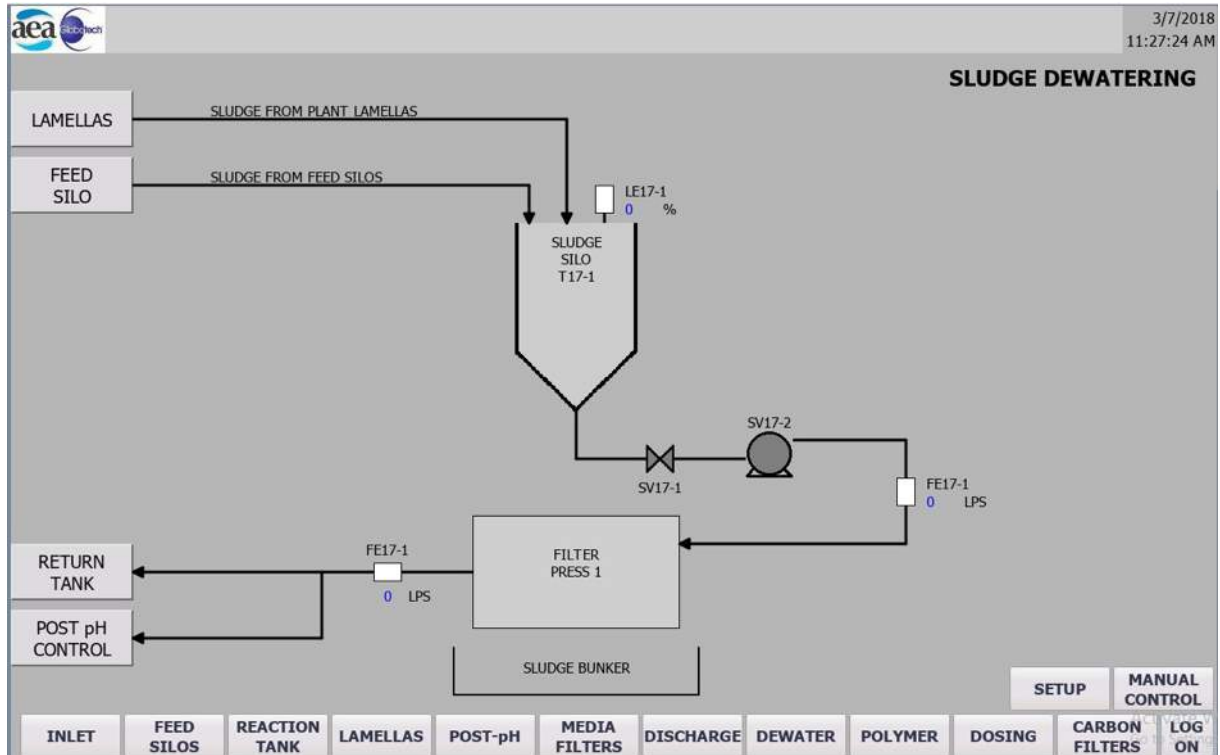
Underflow from the Feed Silo and the Lamella(s) is combined in sludge silo, T27-1. T27-1 is fitted with an ultrasonic level sensor for control. If sufficient sludge is available, the operator may start the filter press. Sludge is drawn from the bottom of the silo and pumped into the filter press via the feed pump, P27-1, via the feed flowmeter FE27-1.

Filtrate from the press is returned to the off spec tank for retreatment. There is an option to divert the filtrate to directly to the post pH correction tank, but this is only for maintenance and commissioning. The volume of filtrate is recorded by the filtrate flowmeter FE27-2.



Sydney Metro Water Treatment Plant – 15 LPS

Operation and Maintenance Manual



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TREATED DISCHARGE - SETUP

LE17-1 SILO HH ALARM LEVEL 0 %

LE17-1 SLUDGE AVAILABLE LEVEL 0 %

LE17-1 NO SLUDGE LEVEL 0 %

OPERATOR SETPOINTS

COMMISSIONING SETPOINTS

	EU Min	EU Max	LL	L	M	H	HH	Hyst.	Debounce	Value
LE17-1	0	0	0	0	0	0	0	0	0	0
FE17-1	0	0	0	0	0	0	0	0	0	0
FE17-2	0	0	0	0	0	0	0	0	0	0

BACK

INLET FEED SILOS REACTION TANK LAMELLAS POST-pH MEDIA FILTERS DISCHARGE DEWATER POLYMER DOSING CARBON FILTERS LOG ON



Chemical Dosing and Storage

Acid is stored in 10,000 L (Martin Place and Pitt Street) or 20,000 (Victoria Cross) bulk storage tanks. Caustic is dosed from a 1,000 L IBC's. A suction lance which is inserted into the IBC feeds the dosing pumps. These tanks are all fitted with level sensors which provide a signal back to the HMI of the level in the tank 0 - 100%.



Operation Instructions

For additional information refer to the manufacturer's manuals in the Appendices

START UP

General

- Check all pipe work for leaks, rectify as necessary
- Ensure the suction and discharge valves for all pumps are open
- Turn on the power to the control panel
- Ensure all local isolators are switched on
- Ensure all valves are set in the correct position (see PID)
- Ensure air and water services are available and on

HMI

The total system is controlled via the HMI Operator Interface (Touch Panel) on the front of the Control Panel.

- Power on
- Acknowledge alarms
- Set all drives to AUTO

ProMinent Diaphragm Dosing Pumps

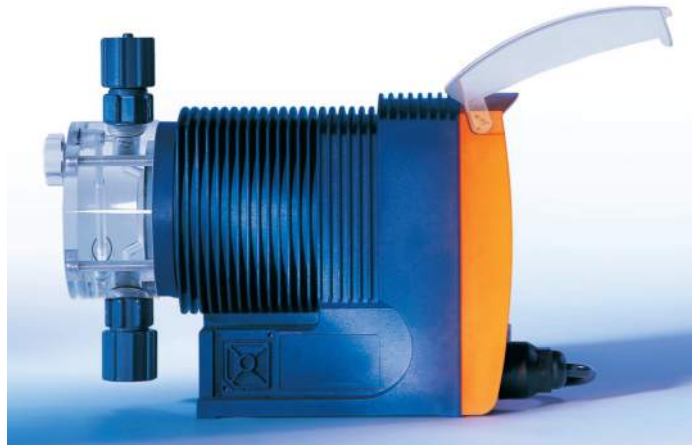


Only adjust the stroke rate when the pump is running, to avoid damaging the pump

- Ensure the speed is set to “EXTERNAL/ANALOGUE” mode on all pumps
- Check inlet and outlet connections are tight. **DO NOT OVERTIGHTEN.**

- Ensure suction and discharge valves are open.
- The pumps are self priming, but there is a small bleed valve on the back of the pump at will assist in priming. Extreme care should be taken when priming the pumps to avoid contact with or spills of the chemicals.

Bleed
valve



pH Monitoring and Controlling Equipment



pH set points and control parameters have been set by the commissioning engineers. If further adjustment is required consult the Aquatic Engineering Australia

Mounting of pH Electrodes



pH probes degrade when dry. Always ensure probes are stored in the “pH Probe Storage Solution” and should be only installed just prior to start up.

- Remove the protective (gel) caps from the pH probes. Retain gel caps.
- Insert the discharge pH probe into the pipe. **DO NOT OVERTIGHTEN.**
- Insert the reaction tank pH probe into the holder.



Chemicals

- Fill polymer hopper
- Ensure suction wands are in the correct IBC's

Trident6 Lamella Separators

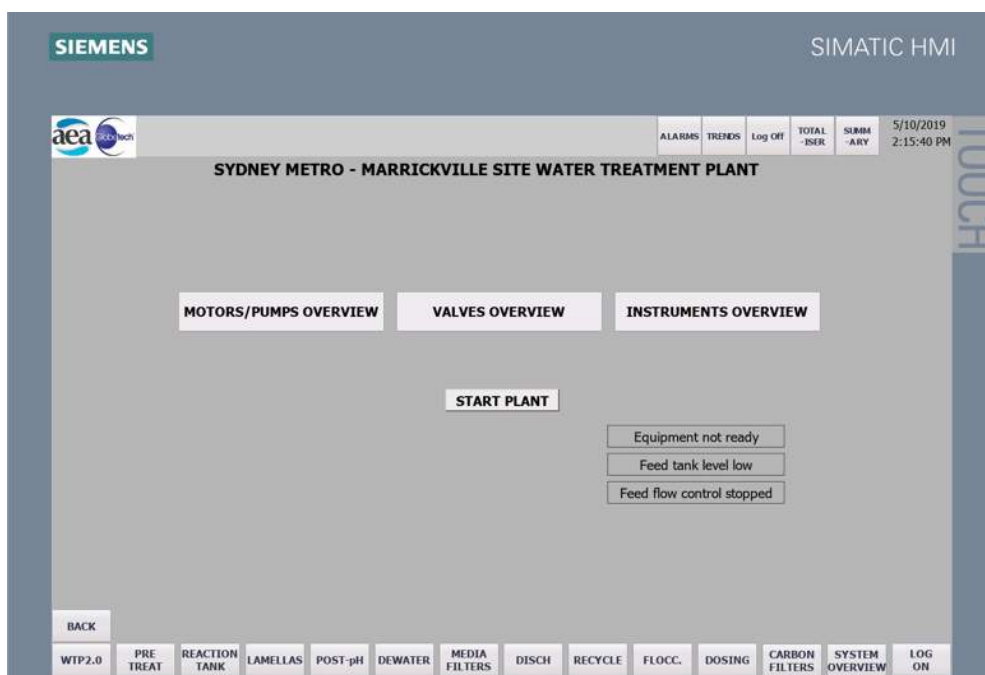
- Fill unit completely with clean water
- Check for leaks
- Ensure units are level
- Ensure inlet valves are open

Filter Press




- Refer to Manufacturers O&M in Appendix 3

The system is now ready for AUTO operation

The plant is started by pushing the start plant button on the PRETREAT or SUMMARY pages on the HMI.



Shutdown Procedure

	DANGER: Electrical Power Present.
	DANGER: Mandatory Electrical Lockout To Service
	DANGER: Mandatory Eye Protection For Service

General

- Flush chemical dosing pump with water to remove any residual.
- To shut the plant down for maintenance or decommissioning, isolate the electrical control panel from the power supply by switching main isolator to "OFF".
- Observe mandatory lock out/tag out procedures.

Individual Drives

- Individual drives can be stopped via the HMI
- Observe mandatory lock out/tag out procedures.



By having individual drives not in AUTO, the operation of the plant may be compromised. Ensure you have a complete understanding of the effects of isolating components, when attempting to continue normal operation of the plant. Consult Aquatic Engineering Australia P/L

Stopping the Plant

The plant is started by pushing the start plant button on the PRETREAT or SUMMARY pages on the HMI.

Control Stop

The control stop on located under the HMI on the MCC stops all outputs from the PLC and the plant stops. It is activated by pushing the button. To reset, twist to release and then acknowledge the alarm on the HMI.



This is a control stop button not an Emergency Stop button!

Activating the button does not stop power to motors/drives, only stop control outputs from the PLC



Maintenance

Please refer to the Manufacturers Catalogues in Appendices of this manual for detailed instructions

10.1 DAILY

Operator checks should be made at regular intervals during the day covering the following:

- Check plant for any alarms
- Check that all pumps are primed and operating correctly
- Check chemical tank levels, change if necessary
- Check and clean pH and turbidity probes
- Check water is flowing into discharge sample box
- Check pH and turbidity levels are within the desired control range
- Visually check product water flow and turbidity
- Check floc formation in Trident Lamella Floc Tanks
- Check and empty filter press sludge bin as necessary
- Check solids levels in Trident Lamellas
- Check sludge level in sludge holding tank
- Check for oil on the surface of tanks/lamellas
- Fill in log sheet

10.2 WEEKLY

- Manually compare the discharge pH (via portable meter or papers) to that on the pH controller. Calibrate if necessary
- Hose down filter press cloth to clear any sludge that may have dried on it
- Check flocculant screw feeder to ensure no build up at wetting head



10.3 MONTHLY

- Calibrate pH meters
- Calibrate turbidity meter
- Check that all pump connections are tight
- Grease bearings on belt press

10.4 THREE MONTHLY

- Grease cartridge bearing on stirrers
- Drain and clean Trident Lamella Separators

10.5 ANNUALLY

- Complete system clean down and inspection for damage and corrosion
- Change gear oil on stirrers
- Calibrated discharge flowmeter
- Replace diaphragm and “O” rings in dosing pumps



pH Probe Calibration Procedure

Please refer to the Manufacturer's Operating Instructions in Appendices of this manual for further information.

Calibration to be carried out using pH 7.00 and 10.00 buffers

The pH probes used in the Water Treatment Plant are Krohne SMARTPAT™ pH probes. They are a digital pH probe and are calibrated using PACTware™ software. pH probes are connected to the computer via Krohne Optibridge.

Manual hold

- Start the function **calibration** in menu mode **Quick Setup** or **Setup**
- Activate the function **manual hold** to avoid an alarm
- Select **yes**
- Press **Next** to proceed.

Temperature compensation

- Set the **temperature compensation** for calibration
- Select between **automatic** or **manual**
 - If you have selected manual temperature compensation, please enter the temperature of the pH buffer solution. Default setting: 25°C / 77°F
- Press **Next** to proceed

Start calibration procedure

- Dip the sensor into the first pH buffer solution **1** and wait till the value is stable
- Press **Next** to proceed
 - The measurement of pH buffer solution 1 starts and the values pH and temperature appear. After approx. 10 seconds the following values appear:
 - pH value

- temperature value
- identified buffer value
- Press **Next** to confirm the identified pH buffer solution. If necessary, change the value of the pH buffer solution manually. If the sensor does not recognise the pH buffer solution the message **buffer not recognised** appears.
- Press **Next** to proceed
 - The value 0 for the pH buffer solution appears. Enter the value of the pH buffer solution manually.
- Press **Next** to proceed with the calibration procedure
- Clean the sensor with demineralised water **2**



- Dip the sensor into the second pH buffer solution **3** and wait till the value is stable
- Press **Next** to proceed
 - The measurement of **pH buffer solution 2** starts and the values pH and temperature appear. After approx. 10 seconds the following values appear:
 - pH value
 - temperature value
 - identified buffer value
- Press **Next** to confirm the identified pH buffer solution. If necessary, change the value of the pH buffer solution manually.

If the sensor does not recognise the pH buffer solution the message **buffer not recognised** appears

- Press **Next** to proceed
 - The value 0 for the pH buffer solution appears. Enter the value of the pH buffer solution manually
- Press Next to proceed with the calibration procedure.
- Clean the sensor with demineralised water 2.
- After a successful calibration the following values appear:
 - Buffer solution 1
 - Buffer solution 2
 - Offset in mV
 - Slope in mV/pH
- Press **Next** to proceed
- Set the calibration date with DD-MM-YYYY and calibration time with HH-MM-SS
- Press Next to proceed.
 - The message **Save values?** appears.
- Select **yes** to save the values.
- Press **Next** to proceed.
- Select **no** to deactivate the function manual hold
- Press Next to leave the calibration menu.

A pH calibration is necessary in regular intervals or when installing a new pH sensor.

If the calibration was not successful, the message **Warning! Offset out of range!** appears behind the value **Offset** and/or the message **Warning! Slope out of range!** behind the value **Slope**.

In case the value of the slope is not plausible, additionally the message **No saving possible** appears.

- Press **Next** to proceed
 - The messages **Warning! Offset out of range!** or **Warning! Slope out of range!** Appear

- Press **Next** to proceed
- Set the calibration date with DD-MM-YYYY and calibration time with HH-MM-SS
- Press **Next** to proceed
- The message **Save values?** appears.
- Select between **yes** or **no**.
- Press **Next** to proceed.
- Select **no** to deactivate the function manual hold.
- Press **Next** to leave the calibration menu.

If the message **Warning! Slope out of range!** appears together with the message **No saving possible**, no data can be saved.

- Press **Next** to proceed
- Select **no** to deactivate the function manual hold.
- Press **Next** to leave the calibration menu.

In a fully functional sensor, the optimal slope is -59 mV for each pH unit and the optimal zero point is 0 mV at pH 7. The slope should at least have a value between -50...-65 mV per pH unit. Re-calibrate the sensor if the slope does not approximate those limits. The pH sensor ages, the slope gets flatter and the zero error increases.



- *Never touch or scratch the pH sensitive glass tip of the sensor.*
- *Make sure that the sensor tip is clean and dust-free. If necessary, clean the tip as described*



Moisture on the sensor connector must be avoided! Moisture may cause a short-circuit and a malfunction of the sensor!

If moisture has entered the connector dry it with air (e.g. hot air gun)

Turbidity Calibration Procedure

Please refer to the Manufacturer's Operating Instructions in Appendices of this manual for further information.

Optical components such as LED and photodiodes can have a small drift during their lifetime. The windows between the measuring light source/detector and medium to be measured will age as well due to scratches and more.



Ensure that the sensor is clean and free from any deposits on the measurement windows. Please clean with clear water and a soft cloth as some deposits can be clear and be visible for the measurement electronics due to infrared operation, but not visible to our eye.

The sensor requires a 2-point calibration. The sensor is factory calibrated by means of standard solution and it is ready for use. The operator can perform the field calibration via controller by means of the sensitivity and zero adjustment.



It is suggested to verify the sensor periodically and calibrate in case of need to get the requested accuracy on the specific application.



- *Never touch or scratch the measurement windows of the sensor.*
- *Make sure that the measurement windows are clean and dust-free. If necessary, clean the measurement windows as described on page 42 of the manufacturers manual*

To avoid alarms on the distributed control system (DCS) when temporarily removing the sensor (i.e. for maintenance), the signal converter has a hold function. This function "freezes" all outputs (i.e. the display and the current outputs) of the last measured value.



As an indication that the manual hold function is active, the warning sign in the upper left corner of the display appears. Meanwhile the status messages show checks in progress. For more details about how to select the manual hold function refer to the signal converter manual

After starting-up the signal converter, the measuring screen appears. This is the standard screen which is displayed automatically in the normal operating mode. In this mode the calibration can be started. Activate the hold function in the first step.



As Make sure there are no air bubble in front of the optics as they will be causing measurement signals due to reflection and light scattering effects and such might cause a wrong reading

Step 1: Activating the hold function

<ul style="list-style-type: none"> Press > for more than 2.5 seconds, then release the button. You are on the main menu level. Press ▼ or ▲ until the main menu quick setup is highlighted. 	
	MAIN MENU > A quick setup B test C setup D service
<ul style="list-style-type: none"> Press > to enter the chosen menu. 	
	You are on the first submenu level. In the upper line of the display quick setup appears, beneath the submenu language is highlighted.
<ul style="list-style-type: none"> Press ▼ or ▲ until the submenu manual hold is highlighted. Press > to enter the chosen menu. 	
	You are on the second submenu level. In the upper line of the display manual hold appears, beneath the option off is highlighted.
<ul style="list-style-type: none"> Press ▼ or ▲ to choose the option on. Press ↵ to confirm the entered value. 	

- You have activated the **manual hold** function. Go to the next step and prepare the calibration procedure. You have to return to the measuring mode.
- Press ↵ until you reach the measuring mode again.

Step 2: Preparing the calibration procedure

- For re-calibration, remove the sensor from the process.
- If you calibrate a sensor, make sure that the sensor is correctly connected to the signal converter.
- Check the sensor for damages, check the measurement windows for coating and rinse the sensor tip with tap water and gently swipe it with a soft tissue.
- Do not touch or scratch the windows.
- Repeat the cleaning step twice to make sure that the sensor is clean as well from deposits we can not detect with human eye (e.g. polymer film).



Use a soft tissue to wipe the window clean. Otherwise the polymer films are not being removed and interfere with later calibration



Before proceeding with **product cal.** make sure that the **offset** is set to 0.000 NTU

Step 3a: Accessing the calibration menu via the main menu setup

<ul style="list-style-type: none"> Press > for more than 2.5 seconds, then release the button. You are on the main menu level. Press ▼ or ▲ until the main menu setup is highlighted. 	
MAIN MENU A quick setup B test > C setup D service	
<ul style="list-style-type: none"> Press > to enter the chosen menu. 	
You are on the first submenu level. In the upper line of the display setup appear. Press ▼ or ▲ until the submenu process input A is highlighted.	
<ul style="list-style-type: none"> Press > to enter the chosen menu. 	
You are on the second submenu level. In the upper line of the display process input A appear. Press ▼ or ▲ until the submenu product cal. is highlighted.	
<ul style="list-style-type: none"> Press > to enter the chosen menu. 	
The actual measured value is displayed.	

Step 3b: accessing the calibration menu via the main menu quick setup

<ul style="list-style-type: none"> Press > for more than 2.5 seconds, then release the button. You are on the main menu level. Press ▼ or ▲ until the main menu quick setup is highlighted. 	
MAIN MENU > A quick setup B test C setup D service	
<ul style="list-style-type: none"> Press > to enter the chosen menu. 	
You are on the first submenu level. In the upper line of the display quick setup appear. Press ▼ or ▲ until the submenu product cal. is highlighted.	
<ul style="list-style-type: none"> Press > to enter the chosen menu. 	
The actual measured value is displayed.	

Step 4: Preparing the zero point calibration

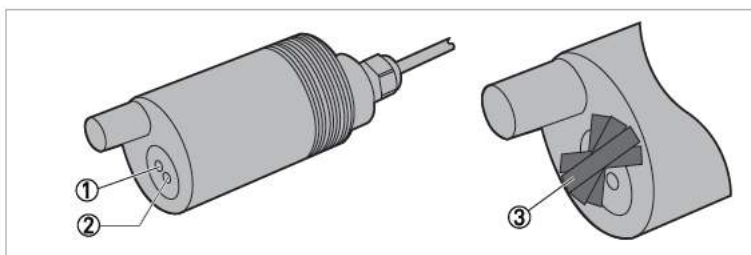


Figure 5-1: Preparing the zero calibration

- ① Detector
- ② Ermitter
- ③ Black electrical isolation tape

- Tape three to four layers of new black electrical isolation tape across the detector window.
- While taping you will notice that the measuring value decreases.
- Make sure that the detector is absolutely sealed from light sources.

Step 5: Zero point calibration

	<p>Please wait till the measured value is stable.</p> <ul style="list-style-type: none"> • Press ↵ to confirm. <p>Press ▼ or ▲ to change the value and press ➤ to move to the next digit in the displayed value. To select the standard value (e.g. 0.000 NTU) confirm with ↵. The sensor default is 0.020 NTU</p> <p>The submenu calibrate zero? start calib. is displayed.</p> <ul style="list-style-type: none"> • Press ↵ to start the calibration. <p>The message zero calibration successful is displayed.</p> <ul style="list-style-type: none"> • Press ↵ to confirm. <p>The actual measured value is displayed.</p>
--	--



The zero calibration value is allowed to deviate a maximum of 0.4 NTU from 0.0. The sensitivity calibration value is allowed to be within 70-130% of calculated signal strength

Step 6: Preparing the sensitivity calibration

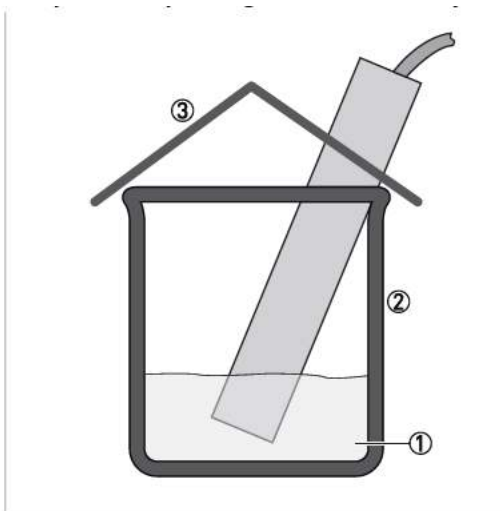


Figure 5-2: Sensitivity calibration

- ① Standard solution (e.g. 100,00 NTU)
- ② Dark beaker
- ③ Opaque cover

- Position the sensor in a cup or bucket out of a material which has little to none light reflecting characteristics.
- Pour in the standard solution making sure that the complete sensor optics is submersed in it.
- The sensor shall not stand vertical, but at a light angle to reduce any influences due to reflection.
- Cover the setup with a cloth to shut out any interfering sun light.

Step 7: Sensitivity calibration

	Please wait till the measured value is stable.
	• Press ↵ to confirm.
	Press ▼ or ▲ to change the value and press ▶ to move to the next digit in the displayed value. To select the standard value (e.g. 100.00 NTU) confirm with ↵ .
	The submenu sensitivity calibration start calib. is displayed.
	• Press ↵ to start the calibration.
	The message sensitivity calibration successful is displayed.
	• Press ↵ to proceed.
	If calibration successful is highlighted, press ↵ several times to save the calibration and to return to main menu level.



- *If an error occurs during the calibration procedure, the display shows an error message.*
- *If the calibration was not successful repeat the process.*
- *If the calibration was unsuccessful refer to Troubleshooting on page 40 of manufacturers manual in the Appendices*

Step 8: switching back to measurement

- Deactivate the function **manual hold** again.
- Install the sensor in the measuring location

Suspended Solids Calibration Procedure

Please refer to the Manufacturer's Operating Instructions in Appendices of this manual for further information.



Observe the linearisation before you start with the calibration. The calibration may not be used as curve setup (linearization). Calibration is an adjustment of the declared suspended solids curve.

When trying to calibrate an instrument to measure suspended solids it is often difficult to keep the solids in suspension long enough for an accurate calibration to be made. The use of a magnetic stirrer in many cases will improve this. In the linearisation setup menu the probe signals should have been entered from the prepared samples and the output will now be linear with percent solids. In many cases this is all that is required. When the instrument is installed into the process the indicated readings can be verified by sample analysis in the laboratory. The readings produced from the laboratory may not correlate with the instrument readings. This is more likely in liquids, which have large particles, which separate out easily. For example: yeast, waste water, or white water in the paper industry. To correct for any discrepancies the instrument allows for both a sensor zero adjustment and sensor span adjustment.



It is suggested to verify the sensor periodically and calibrate in case of need to get the requested accuracy on the specific application.

To avoid alarms on the distributed control system (DCS) when temporarily removing the sensor (i.e. for maintenance), the signal converter has a "Off-line" mode. This function "freezes" all outputs (i.e. the display and the current outputs) of the last measured value.

After starting-up the signal converter, the measuring screen appears. This is the standard screen which is displayed automatically in the normal operating mode. In this mode the calibration can be started. Activate the manual "Off-line" in the first step.



Make sure there are no air bubble in front of the optics as they will be causing measurement signals due to reflection and light scattering effects and such might cause a wrong reading.

Step 1: activating the "Off-line" mode

<ul style="list-style-type: none"> You are on the main menu level. CHANNELS is highlighted. Press ↵ to enter the chosen menu. 	
	CHANNELS SETUP
	Depending on the installed card select either the input channel you wish to edit Press ↓ or ↑ until the submenu you wish to edit is highlighted. For example CHANNEL 1 → SUSPENDED SOLID CHANNEL 2 → pH CHANNEL 3 → COND SIMULATE CHANNELS
<ul style="list-style-type: none"> Press ↵ to enter the chosen menu. 	
	CHANNELS SETUP 1,2 or 3 --> SUSPENDED SOLIDS
	<ul style="list-style-type: none"> Press ↓ or ↑ until the submenu MODE is highlighted. Press ↵ to enter the chosen menu.
	Enter the access code with the help of ↓ or ↑ . The default security access code is 1000 Press ↵ to enter the chosen menu.
	<ul style="list-style-type: none"> Press ↓ or ↑ to choose the option OFF-LINE. Press ↵ to confirm the entered value.
<ul style="list-style-type: none"> Press EXIT several times to return to the measuring mode. 	

You have activated the **OFF-LINE** mode. **OFF-LINE** will appear in the front screen.

If the message "Cannot Edit Digital Input Has Control" appears, then an associated digital input is currently controlling the on-line / off-line state of the channel.

Step 2: preparing the calibration procedure

- For re-calibration, remove the sensor from the process.
- If you calibrate a sensor, make sure that the sensor is correctly connected to the signal converter
- Check the sensor for damages, check the emitter and detector for coating and rinse the sensor with a soft tissue.
- Repeat the cleaning step twice to make sure that the sensor is clean as well from deposits we can not detect with human eye (e.g. polymer film).



Use a soft tissue to wipe the sensor. Otherwise any dirt or product or polymer films are not being removed and interfere with later calibration.

Step 3a: Sensor zero adjustment

The sensor zero adjustment will either add or subtract a bias value to the zero point, which will shift the entire curve by this value. The slope of the curve is unchanged.

Zero adjustment

<ul style="list-style-type: none"> You are on the main menu level. CALIBRATION is highlighted. Press ↵ to enter the chosen menu. 	
	CALIBRATION Depending on the installed card select either the input channel you wish to edit Press ↓ or ↑ until the submenu you wish to edit is highlighted. For example CHANNEL 1 → SUSPENDED SOLID 4-20 mA OUTPUTS RESET USER CALIBRATION
<ul style="list-style-type: none"> Press ↵ to enter the chosen menu. 	
	CALIBRATE CHANNEL 1 <ul style="list-style-type: none"> Press ↓ or ↑ until the submenu SENSOR ZERO ADJ. is highlighted. Press ↵ to enter the chosen menu.
	Enter the access code with the help of ↓ or ↑ . The default security access code is 1000 Press ↵ to enter the chosen menu.
	<ul style="list-style-type: none"> Press ↓ or ↑ to adjust the sensor reading Press ↵ to confirm the entered value. Press YES or NO to confirm the update cal due date
<ul style="list-style-type: none"> Press EXIT several times to return to the measuring mode. 	

Step 3b: Sensor span adjustment

If the zero point of the measuring point is correct but the highest calibration point is incorrect then the sensor span adjustment will shift the end point of the curve up or down. This changes the slope of the output curve. The amount of slope adjustment currently being applied to the sensor as a %. Where 100% equals no adjustment, a slope of greater than 100% equals a steeper slope and a slope of less than 100% equals a shallower slope.

Span Adjustment

<ul style="list-style-type: none"> You are on the main menu level. CALIBRATION is highlighted. Press ↵ to enter the chosen menu. 	
	CALIBRATION Depending on the installed card select either the input channel you wish to edit Press ↓ or ↑ until the submenu you wish to edit is highlighted. For example CHANNEL 1 → SUSPENDED SOLID 4-20 mA OUTPUTS RESET USER CALIBRATION
<ul style="list-style-type: none"> Press ↵ to enter the chosen menu. 	
	CALIBRATE CHANNEL 1 <ul style="list-style-type: none"> Press ↓ or ↑ until the submenu SENSOR SPAN ADJ. is highlighted. Press ↵ to enter the chosen menu.
	Enter the access code with the help of ↓ or ↑ . The default security access code is 1000 Press ↵ to enter the chosen menu.
	<ul style="list-style-type: none"> Press ↓ or ↑ to adjust the sensor reading Press ↵ to confirm the entered value. Press YES or NO to confirm the update cal due date
<ul style="list-style-type: none"> Press EXIT several times to return to the measuring mode. 	



Step 4: switching back to measurement

- Install the sensor in the measuring location.
- Activate the function **ON-LINE**



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Equipment Description

Plant ID/Tag	Name	Description
P21-1	Plant Sump Pump (Victoria Cross Only)	Manufacturer: Xylem/Flygt Model: BKS2610-172-MT234
T21-3	Feed Silo	Manufacturer: Aquatic Engineering Australia P/L Model: 72 m3
P21-2a,b	Off Spec Pump	Manufacturer: Ebara Model: 3LS 50-125/4
A21-1	Feed pH	Manufacturer: Krohne Model: SMARTPAT 2390
A21-2	Feed Suspended Solids	Manufacturer: Krohne Model: OPTISENS TSS 3000
LE21-1	Plant Sump Level (Victoria Cross Only)	Manufacturer: MAC3 Model: NPM1006UB0
LE21-2	Off Spec Tank Level	Manufacturer: MAC3 Model: NPM1006UB0
FE21-1	Off Spec Return Flowmeter	Manufacturer: Krohne Model: Optiflux 2100C
LE21-3	Feed Silo Level	Manufacturer: Krohne Model: Optiwave 5400C
FE21-2	Feed Flowmeter	Manufacturer: Krohne Model: Optiflux 2100C
FE21-3	Feed Silo Underflow Flowmeter	Manufacturer: Krohne Model: Optiflux 2100C
CV21-13	Feed Control Valve Positioner	Manufacturer: Braeco Model: YT-1000
P21-3	Feed Silo Underflow Pump	Manufacturer: Wilden Model: T8 – 2" with Saniflex Diaphragms
M22-1	Reaction Tank Mixer	Manufacturer: Fluid Solutions Australia Model: S25DDFT150
M22-2	Oil Skimmer	Manufacturer: Bulbeck Enviromental Model: OS-15
A22-1	Reaction Tank pH	Manufacturer: Krohne Model: SMARTPAT 2390
A22-2	Reaction Tank Suspended Solids	Manufacturer: Krohne Model: OPTISENS TSS 3000
T23-1	Lamella Clarifier	Manufacturer: Aquatic Engineering Australia P/L Model: Trident 6
M23-1	Lamella Mixer	Manufacturer: Fluid Solutions Australia Model: S25 GDFT37LP
P23-1	Lamella Underflow Pump	Manufacturer: Wilden Model: T8 – 2" with Saniflex Diaphragms
M24-1	Post pH Tank Mixer	Manufacturer: Fluid Solutions Australia Model: S25DDFT150



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A24-1	Post pH Tank pH	Manufacturer: Krohne Model: SMARTPAT 2390
A24-2	Post pH Tank Turbidity	Manufacturer: Krohne Model: OPTISENS TUR 2000
LE24-1	Post pH Tank Level	Manufacturer: Krohne Model: Optibar P101C
P24-1 a,b	Media Filter Feed Pumps	Manufacturer: Ebara Model: 3LS 50-160/5.5
PT25-1, 2	Media Filter Pressure	Manufacturer: Krohne Model: Optibar P101C
P26-1 a,b	Discharge Pumps	Manufacturer: Ebara Model: 3LS 50-160/5.5
	Discharge Pumps (Martin Place)	Manufacturer: Ebara Model: 3LS 50-200/11.0
A26-1 a,b	Discharge pH	Manufacturer: Krohne Model: SMARTPAT 2390
A26-2 a,b	Discharge Turbidity	Manufacturer: Krohne Model: OPTISENS TUR 2000
A26-3	Discharge Conductivity	Manufacturer: Krohne Model: SMARTCON1200
LE26-1	Discharge Tank Level	Manufacturer: Krohne Model: Optisound 3010C
FE26-1	Discharge Flowmeter	Manufacturer: Krohne Model: Optiflux 2100C
T26-1	Sludge Silo	Manufacturer: Aquatic Engineering Australia P/L Model: 50 m3
FE27-1	Filter Press Feed Flowmeter	Manufacturer: Krohne Model: Optiflux 2100C
FE27-2	Filtrate Flowmeter	Manufacturer: Krohne Model: Optiflux 2100C
LE27-1	Sludge Silo Level	Manufacturer: Krohne Model: Optisound 3030C
P27-1	Filter Press Feed Pump	Manufacturer: Wilden Model: T8 – 2" with Saniflex Diaphragms
	Filter Press	Manufacturer: Aqseptence/Diemme Model: ME1200
P28-1,2	Reaction Tank Acid Dosing Pump	Manufacturer: ProMinent Fluid Controls Model: S2CbH16130PVTS410UC010S0ENP2
P28-3,4	Post pH Tank Acid Dosing Pump	Manufacturer: ProMinent Fluid Controls Model: BT5b0232PPE0000UC0100000P2
P28-5,6	Caustic Dosing Pump	Manufacturer: ProMinent Fluid Controls Model: BT5b0232PPE0000UC0100000P2
P28-7,8	Coagulant Dosing Pump	Manufacturer: ProMinent Fluid Controls Model: BT5b0232PPE0000UC0100000P2
P28-9	Oxidant Dosing Pump	Manufacturer: ProMinent Fluid Controls Model: BT5b0232PPE0000UC0100000P2
P28-10	Antifoam Dosing Pump	Manufacturer: ProMinent Fluid Controls



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		Model: Bt4b0413PVT2000UC010000P2
LE26-1	Acid Tank Level	Manufacturer: Krohne Model: Optisound 3010C
LE26-2	Caustic IBC Level	Manufacturer: Control-Logic Model: BD Sensor 3961600BC1333005610
LE26-3	Coagulant Tank Level	Manufacturer: Krohne Model: Optisound 3010C
LE26-2	Oxidant IBC Level	Manufacturer: Control-Logic Model: BD Sensor 3961600BC1333005610
Poly	Polymer System	Manufacturer: Chi-Shun Model: APD-500
P29-1, 2	Lamella Flocculant Dosing Pump	Manufacturer: Roto Model: RDCA491R6CD1PX09
	Air Box Soleniod	Manufacturer: Metal Work Pneumatic Model: 70820310



Trouble Shooting

General

Problem	Diagnostic Action or Symptom	Action
Plant will not start in "AUTO"	No power to plant	<ul style="list-style-type: none"> Ensure power on UPS will provide power to HMI and PLC only, not power to run drives (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Tank levels below start set point	<ul style="list-style-type: none"> Ensure plant feed pump is in "AUTO"
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Emergency Stop Activated	<ul style="list-style-type: none"> Check for reason that Emergency stop has been activated. If safe, twist to unlock emergency stop. Press the Emergency stop reset on the control panel
	No air	<ul style="list-style-type: none"> Ensure air is on
	Power to plant has been interrupted	<ul style="list-style-type: none"> Push alarm/E stop reset buttons on HMI
	Plant in "Stop"	<ul style="list-style-type: none"> On Pre-treatment page, push "Start Plant" button
	Feed Silo, Post pH Correction and Off Spec Tank HLA's all active whilst media filters trying to backflush	<ul style="list-style-type: none"> Manually operator Feed Silo Underflow Valve XV21-17 and Pump P21-3, to lower Feed Silo Level below HLA Return to "AUTO" Switch Off Spec Return pump P21-2 a and/or b to "MANUAL" Drain down T21-2 Off Spec Tank until HLA is no longer active CAUTION – THIS MAY RESULT IN OVERFLOWING THE FEED SILO Return to "AUTO"
Individual motors will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)



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T21-1 Plant Sump (Victoria Cross Only)

Problem	Diagnostic Action or Symptom	Action
P11-1 Plant Sump Pump will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Tank levels below start set point	<ul style="list-style-type: none"> Ensure plant feed pump is in "AUTO"
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Water level not at height to start pump	<ul style="list-style-type: none"> Nil
	LE21-1 Floats stuck or faulty	<ul style="list-style-type: none"> Check floats are not obstructed Check operation of float
	T21-2 Off Spec Tank HLA Active	<ul style="list-style-type: none"> Pump will restart when T21-2 Off Spec tank HLA is no longer active
P21-1 Plant Sump Pump will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
Low or zero flow	Blocked suction	<ul style="list-style-type: none"> Check for obstructions around the pump suction
	Blocked discharge	<ul style="list-style-type: none"> Ensure discharge valve is open Check pipework and valves for blockages. Clear is required



T21-2 Off Spec Tank

Problem	Diagnostic Action or Symptom	Action
P21-2 a/b Off-Spec Return Pumps will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Tank levels below start set point	<ul style="list-style-type: none"> Ensure plant feed pump is in "AUTO"
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Water level not at height to start pump	<ul style="list-style-type: none"> Nil
	LE21-2 Floats stuck or faulty	<ul style="list-style-type: none"> Check floats are not obstructed Check operation of float
	T21-3 Feed Silo HLA Active	<ul style="list-style-type: none"> Pump will restart when T21-3 Feed Silo HLA is no longer active
P21-2 a/b Off-Spec Return Pumps will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
Low or zero flow	Blocked suction/impeller	<ul style="list-style-type: none"> Ensure the valves between the tank and the pumps are open Check pump impeller
	Blocked discharge	<ul style="list-style-type: none"> Ensure discharge valve is open Check pipework and valves for blockages. Clear is required
	Air locked	<ul style="list-style-type: none"> Ensure water level in tank is above the pump impeller Bleed air from impeller casing
HLA Active / Overflowing	Low or zero flow on pumps	<ul style="list-style-type: none"> See above
	Pumps not on	<ul style="list-style-type: none"> See above
	Excessive incoming water volume	<ul style="list-style-type: none"> Locate and isolate source if possible, until water level is reduced



T21-3 Feed Silo

Problem	Diagnostic Action or Symptom	Action
HLA Active / Overflowing	Low or zero flow on pumps	<ul style="list-style-type: none"> See above
	Pumps not on	<ul style="list-style-type: none"> See above
	Excessive incoming water volume	<ul style="list-style-type: none"> Locate and isolate source if possible, until water level is reduced
P23-1 Feed Silo Underflow Pump will not start in "AUTO"	Air off	<ul style="list-style-type: none"> Ensure air supply to pump
	Tank levels below start set point	<ul style="list-style-type: none"> Ensure plant feed pump is in "AUTO"
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Water level not at height to start pump	<ul style="list-style-type: none"> Nil
	LE21-1 Floats stuck or faulty	<ul style="list-style-type: none"> Check floats are not obstructed Check operation of float
	T27-1 Sludge Tank HLA Active	<ul style="list-style-type: none"> Pump will restart when T27-1 Sludge tank HLA is no longer active
Low or zero flow when valve open	Blockage	<ul style="list-style-type: none"> Check for obstructions
		<ul style="list-style-type: none"> Ensure discharge valve is open Check pipework and valves for blockages. Clear is required



T22-1 Reaction Tank

Problem	Diagnostic Action or Symptom	Action
M22-1 Reaction Tank Mixer will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Flow not detected or below set point for FE21-2 Feed Control Flowmeter	<ul style="list-style-type: none"> Check air is on Control valve in "AUTO" SV21-3 In "AUTO"
M22-1 Reaction Tank Mixer will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
Overflowing	Valves between Reaction Tank and Lamellas closed or blocked	<ul style="list-style-type: none"> Ensure valves are open Ensure lines are clear of blockages and obstructions
	Lamella blocked	<ul style="list-style-type: none"> Drain and clean
	Incoming water from Feed Silo exceeding 15 L/s	<ul style="list-style-type: none"> Ensure feed control valve in "AUTO" If in manual, ensure feed flowrate is below 15 L/s Check feed control valve functioning correctly
Unable to reach desired pH range	Dirty pH Probe	<ul style="list-style-type: none"> Clean pH Probe
	pH Probe out of calibration	<ul style="list-style-type: none"> Buffer check probe Calibrate as required
	Insufficient chemical being added to correct pH	<ul style="list-style-type: none"> Check chemical dosing tanks. Refill if required.
		Check operation of dosing pumps: <ul style="list-style-type: none"> Power on Pumps primed Increase stroke rate Ensure pump is not in "STOP"
	Extremely low or high pH of incoming water	<ul style="list-style-type: none"> Reduce flowrate of incoming water
		<ul style="list-style-type: none"> Temporarily stop feed pump Run Reaction tank mixer (When mixer is running, dosing pumps will run as required) Allow pH to reach set point Return to "AUTO"
	Dosing pumps have incorrect settings	Check pump settings: <ul style="list-style-type: none"> Acid Pump P28-1 Speed: "Analogue"



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		<ul style="list-style-type: none"> • Acid Pump P28-2 Speed: "Analogue" • Caustic Pump P28-5 Speed: "External" • Stroke Length: various
	No signal from PLC	<ul style="list-style-type: none"> • Check output on Reaction Tank Set Up page • Ensure signal is being received at pump (ELECTRICIAN)
A22-2 Reaction Tank Suspended Solids HLA active	Excessive solids in reaction tank	<ul style="list-style-type: none"> • High solids in feed
	Sludge blanket in the feed silo is at, or above the water take off point	<ul style="list-style-type: none"> • Increase feed silo underflow pump timer cycle and run time • Run underflow pump in "MANUAL" to lower sludge blanket. Return to "AUTO" when finished
	Dirty Sensor	<ul style="list-style-type: none"> • Clean sensor



T23-1 Lamella

Problem	Diagnostic Action or Symptom	Action
M23-1 Lamella Mixer will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Local isolator turned "ON" or "OFF" while mixer running	<ul style="list-style-type: none"> Reset VSD (ELECTRICIAN)
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Flow not detected or below set point for FE11-2 Feed Control Flowmeter	<ul style="list-style-type: none"> Check air is on Control valve in "AUTO" SV21-3 In "AUTO"
	Lamella not selected as running on HMI	<ul style="list-style-type: none"> Select which Lamella's are running on the "PRE TREAT" HMI setup page
M23-1 Lamella Mixer will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Local isolator turned "ON" or "OFF" while mixer running	<ul style="list-style-type: none"> Reset VSD (ELECTRICIAN)
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
Low or zero flow	Valves between Reaction Tank and Lamellas closed or blocked	<ul style="list-style-type: none"> Ensure valves are open Ensure lines are clear of blockages and obstructions
	Blockage in Lamella	<ul style="list-style-type: none"> Drain and clean
Overflowing of flocculation tank	Blockage in Lamella	<ul style="list-style-type: none"> Drain and clean
Poor Water Quality	Incorrect chemical dose rates	<ul style="list-style-type: none"> Check pH is between 6.5 and 8.5 Check all dosing pumps Carry out jar tests and adjust dose rates as required
	Sludge Blanket Level in Lamella's is too high	<ul style="list-style-type: none"> Check sludge discharge valves and pump are in AUTO Ensure air is on Increase valve open times/pump run time Manually open valves and run sludge pump via HMI to drain down sludge level. Ensure pump and valves are returned to AUTO once finished Drain and clean Lamella
	To determine cause: 1. Take a sample of water from the aeration tank (about 500 mL)	For INCORRECT pH then <ul style="list-style-type: none"> Check and clean pH probes



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	<p>2. Check that pH is between 6.5 and 8.5.</p> <p>3. If pH is not within this range, coagulation will not effectively occur</p>	<ul style="list-style-type: none"> Check chemical levels. Replace if necessary Check operation of dosing pumps
	<p>4. Let it still for 2 minutes and look to see if small 'pin' flocs are present.</p> <p>5. Take syringe of polymer out of polymer tank and add about 4 mL to sample. Stir in well.</p> <p>6. If chunky flocs form with clear water, then problem is NOT ENOUGH POLYMER</p>	<p>For NOT ENOUGH POLYMER then:</p> <ul style="list-style-type: none"> Check polymer is blended and available and that dosing pump is dosing If 1. is OK, then go to Flocculation Tank Polymer Pump and increase the Dose Rate from the HMI on both Lamella 1 and Lamella 2 pages. Should see the VSD display speed up. Check again after a few minutes (look in flocculation tank)
	<p>7. If no flocs form, then problem is NOT ENOUGH COAGULANT</p>	<p>For NOT ENOUGH COAGULANT then:</p> <ul style="list-style-type: none"> Check coagulant tank is full and that dosing pump is dosing (eg not lost prime) If 1. is OK, then go to the coagulant pump and increase the stroke length dial on the pump. Check again after a few minutes (look in flocculation tank). <p><i>In the case of not enough coagulant or flocculant, the tank to which the chemical is being added can be 'shock' dosed by adding the chemical direct to that tank</i></p>



T24-1 Post pH Correction Tank

Problem	Diagnostic Action or Symptom	Action
M24-1 Post pH Correction Tank Mixer will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Start level not reached	<ul style="list-style-type: none"> Nil
M24-1 Post pH Correction Tank Mixer will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
P24-1 a/b Media Filter Feed Pumps will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Start level not reached	<ul style="list-style-type: none"> Nil
	Off Spec Return Tank Full while media filter backwashing	<ul style="list-style-type: none"> Ensure Off Spec Return Pumps are in "AUTO" See Troubleshooting T21-2 Off Spec Return Tank
P24-1 a/b Media Filter Feed Pumps will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
Overflowing	Incoming water from Feed Silo not stopping when HLA reached	<ul style="list-style-type: none"> Ensure feed control valve in "AUTO" Check feed control valve functioning correctly
	P24-1 a/b Media Filter Feed Pumps not running	<ul style="list-style-type: none"> See above
	LE24-1 Level sensor fault	<ul style="list-style-type: none"> Check operation of level sensor (ELECTRICIAN)
Unable to reach desired pH range	Dirty pH Probe	<ul style="list-style-type: none"> Clean pH Probe
	pH Probe out of calibration	<ul style="list-style-type: none"> Buffer check probe Calibrate as required
	Insufficient chemical being added to correct pH	<ul style="list-style-type: none"> Check chemical dosing tanks. Refill if required.
		<ul style="list-style-type: none"> Check operation of dosing pumps: <ul style="list-style-type: none"> Power on



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		<ul style="list-style-type: none"> • Pumps primed • Increase stroke rate • Ensure pump is not in “STOP”
	Extremely low or high pH of incoming water	<ul style="list-style-type: none"> • Reduce flowrate of incoming water • Temporarily stop feed pump • Run Post pH Correction Tank tank mixer • (When mixer is running, dosing pumps will run as required) • Allow pH to reach set point • Return to “AUTO”
	Dosing pumps have incorrect settings	Check pump settings: <ul style="list-style-type: none"> • Acid Pump P28-3 Speed: “External” • Acid Pump P28-4 Speed: “External” • Caustic Pump P28-6 Speed: “External” • Stroke Length: various
	No signal from PLC	<ul style="list-style-type: none"> • Check output on Post pH Correction Tank Set Up page • Ensure signal is being received at pump (ELECTRICIAN)
A22-2 Turbidity HLA active	Poor water quality exiting Lamellas	<ul style="list-style-type: none"> • See trouble shooting Lamellas
	Sludge carry over from lamellas	<ul style="list-style-type: none"> • See trouble shooting Lamellas
	Foaming	<ul style="list-style-type: none"> • Add sufficient AEA 490D antifoam to control/eliminate the foaming
	Dirty Sensor	<ul style="list-style-type: none"> • Clean sensor



T15 Media Filters

Problem	Diagnostic Action or Symptom	Action
Low or zero flow	Blocked suction	<ul style="list-style-type: none">• Check for obstructions around the pump
	Blocked discharge	<ul style="list-style-type: none">• Ensure discharge valve is open• Check pipework and valves for blockages. Clear is required
	Plant feed pump not in "AUTO"	<ul style="list-style-type: none">• Change Plant feed pump operation to "AUTO" on HMI
Poor Product Water Quality	Blocked or dirty media	<ul style="list-style-type: none">• Initiate backwashing• Inspect and replace if necessary
	Media being discharged from vessel	<ul style="list-style-type: none">• Broken internals• Inspect and replace if necessary
	Insufficient media in vessel	<ul style="list-style-type: none">• Inspect and replace if necessary
Media Filters DP alarm	Blocked or dirty media	<ul style="list-style-type: none">• Initiate backwashing• Inspect and replace if necessary
Excessive Backwashing	Blocked or dirty media	<ul style="list-style-type: none">• Initiate backwashing• Inspect and replace if necessary
Media/Sand/Gravel in Discharge	Media being discharged from vessel	<ul style="list-style-type: none">• Broken internals• Inspect and replace if necessary



T26-1 Discharge Buffer Tank

Problem	Diagnostic Action or Symptom	Action
P26-1 a/b Discharge Pumps will not start in "AUTO"	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
	Control Stop Activated	<ul style="list-style-type: none"> Check for reason that Control stop has been activated. If safe, twist to unlock
	Start level not reached	<ul style="list-style-type: none"> Nil
	Off Spec Return Tank Full and discharge parameters "OUT OF SPEC"	<ul style="list-style-type: none"> Ensure Off Spec Return Pumps are in "AUTO" See Troubleshooting T21-2 Off Spec Return Tank
P26-1 a/b Discharge Pumps will not start in "MANUAL"	No power to plant	<ul style="list-style-type: none"> Check power supply and connection (ELECTRICIAN)
	Local isolators "OFF"	<ul style="list-style-type: none"> Switch local isolators to "ON".
	Motor overload	<ul style="list-style-type: none"> Check for cause of motor overload. Reset overload (ELECTRICIAN)
Overflowing	Incoming water from Feed Silo not stopping when HLA reached	<ul style="list-style-type: none"> Ensure feed control valve in "AUTO" Check feed control valve functioning correctly
	P26-1 a/b Media Filter Feed Pumps not running	<ul style="list-style-type: none"> See above
	LE26-1 Level sensor fault	<ul style="list-style-type: none"> Check operation of level sensor (ELECTRICIAN)
No discharge – discharge parameters "IN SPEC"	P26-1 a/b Discharge Pumps not running	<ul style="list-style-type: none"> Nil. Discharge will occur when pump starts
	P26-1 a/b Discharge Pumps not in "AUTO"	<ul style="list-style-type: none"> Select "AUTO" for P26-1 a/b Discharge Pumps on DISCHARGE Page
System recycling - discharge parameters "IN SPEC"	Recycle valve not in "MANUAL"	<ul style="list-style-type: none"> Select "AUTO" for all valves on DISCHARGE Page
	Air supply problem to discharge valves	<ul style="list-style-type: none"> Check air supply
	Reset timer not complete	<ul style="list-style-type: none"> Check value of reset timer on SETTINGS page on HMI. Once timer has run, valve will re-open, restarting discharge
	Discharge line blocked	<ul style="list-style-type: none"> Check and clear
Discharge occurring - discharge parameters "OUT OF SPEC"	Delay time not complete	<ul style="list-style-type: none"> Check value of on timer on ENGINEERING/ALARM SET POINT page on HMI – Requires Specialist Password. Once timer has run, valve will close, preventing discharge



Appendices

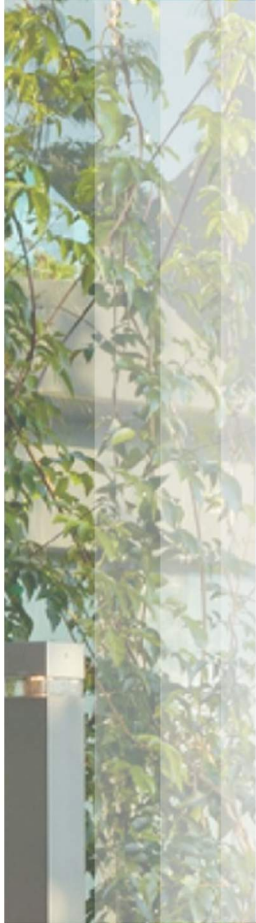

A1	P&ID's
A2	Electrical Drawings
A3	Filter Press O&M
A4	Sump Pump O&M
A5	Off Spec Return Pump O&M
A6	pH 2390 O&M
A6	Suspended Solids O&M
A7	Flowmeter O&M
A8	Feed Silo Radar O&M
A9	Turbidity Monitor O&M
A10	Wilden Pump O&M
A11	pH/Conductivity Display O&M
A12	Reaction Tank/Post pH Tank Mixer O&M
A13	Lamella Floc Tank Mixer O&M
A14	Control Valve O&M
A15	Media Filter Pressure Transducers
A16	Sludge Tank Level Sensor
A17	Polymer Make Up System
A18	Media Filter Feed Pump O&M
A19	Flocculant Dosing Pumps
A20	Media Filter Vessels
A21	Optisound O&M
A22	IBC Level
A23	Sludge Tank Mixer
A24	Reaction Tank Acid Dosing Pump
A25	Dosing Pumps (All others)
A26	Water Treatment Plant Logsheet
A27	SDS – 30% Caustic Soda
A28	SDS – 50% Sulphuric Acid
A29	SDS – AEA 416



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- A30 SDS – AEA 102
- A31 SDS – Potassium Permanagante
- A32 SDS – AEA 490D



Appendix O


Unexpected

Contaminated

Land &

Asbestos Finds

Procedure



UNEXPECTED CONTAMINATION AND ASBESTOS FINDS PROCEDURE

MANAGEMENT AND RESPONSIBILITY

