Central Station Main Works Project
Construction Groundwater Management Plan

Final Groundwater Monitoring Report

(October 2022 to May 2023)

Sydney Metro City and Southwest - Central Station Main Works Project

Construction Groundwater Management Plan (CGWMP)

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Central Station Main Works Project
Construction Groundwater Management Plan

Project name	Central Station Main Works
Client	Sydney Metro City & Southwest – Sydney Metro)
Client contract number	CSMW
Laing O'Rourke contract number	K51

Revision history

Rev	Date	Description	Reviewed	Authorised
1	29/03/18	Initial Content Development	JF	DC
2	05/06/18	Revised following comments from Sydney Metro, ER and agencies	CD, DC	DC
3	18/06/18	Revised following comments from Sydney Metro and ER	DC	DC
4	17/07/18	Revised following DPE screening review and detailed comments	CD	CM
5	30/07/18	Revised following DPE comments	JT	CM
6	20/11/18	Revised following close out of NRAR recommendations and finalisation of groundwater monitoring program.	LD	CM
7	28/12/18 18/2/19	Table 7 updated App B- history of NRAR review following DPE comments, and review	LD	CM
8	August 2020	Reviewed and updated.	LD / HN	CM
9	September 2021	Annual review	LD	LD
10	August 2022	Reviewed and updated following document change in the WTP and change in groundwater monitoring frequency	BR	BR
11	June 2023	Annual Review	BR	CM
12	August 2023	Update of monitoring program requirements	CM	LD

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Central Station Main Works Project
Construction Groundwater Management Plan

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Table of Contents

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Central Station Main Works Project
Construction Groundwater Management Plan

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Terms and Definitions

The following terms, abbreviations and definitions are used in this plan

Terms	Explanation
AHD	Australian Heritage Datum
ARI	Average Rainfall Intensity
AS	Australian Standard
Assurance Application	Laing O'Rourke's Online Tool to manage Non-Conformances
CAR	Corrective Action Request
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CoA	Conditions of Approval
CSSI	Critical State Significance Infrastructure
CGWMP	Construction Groundwater Management Plan
CSMW	Central Station Main Works Contract Package
CSWMP	Construction Soil and Water Management Plan
DPE	Department of Planning & Environment
ECM	Environmental Control Map
EIS	Environmental Impact Statement (Sydney Metro City and Southwest Chatswood to Sydenham dated 3 May 2016 submitted to the Secretary seeking approval to carry out the CSSI and as revised as required by the Secretary under the EP&A Act)
EPL	Environment Protection Licence
ER	Environmental Representative
ISO	International Standardization Organisation
Laing O'Rourke	Laing O'Rourke Australia Construction Pty Limited
Minister	NSW Minister for Planning
NRAR	Natural Resources Access Regulator (NRAR, formerly DPI – Water)
OEH	Office of Environment and Heritage
PEM	Project Environmental Manager
PIRMP	Pollution Incident Response Management Plan
RTS	Response to Submissions
SMCSW	Sydney Metro City and Southwest
SWMS	Safe Works Method Statement
TfNSW	Transport for New South Wales

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1. Introduction

1.1 Purpose

This Construction Groundwater Management Plan (CGWMP) outlines the Central Station Main Works (CSMW) Project's (the Project) approach to implementing measures to mitigate the risk of impact to groundwater in accordance with Laing O'Rourke Construction Pty Limited's (Laing O'Rourke) legal, planning and contractual requirements and Laing O'Rourke's environmental management system. This CGWMP has been developed in compliance with Sydney Metro's requirements, Laing O'Rourke's environmental management system and the Minister's Conditions of Approval (CoA). The Plan incorporates the requirements of the Groundwater Management Plan (as detailed in the Construction Environmental Management Framework).

1.2 Background

Sydney Metro City & Southwest – Chatswood to Sydenham Project is a new 30km metro line extending metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2024 with the capacity to run a metro train every two minutes each way through the centre of Sydney. The Project forms part of the Sydney Metro City & Southwest – Chatswood to Sydenham Project and includes the construction of new underground platforms at Central Station and new related pedestrian access ways. The works will be undertaken by Laing O'Rourke. The Project consists of the Metro Station Works, the Central Station Works and the Central Walk Works which are described in the sections below.

1.3 Planning Approval

The Project has been assessed by the Department of Planning Industry and Environment under Section 115ZB of the *Environmental Planning and Assessment Act 1979* (EP&A Act) as Critical State Significant Infrastructure (CSSI). The Project, its impacts, consultation and mitigation were documented in the following suite of documents:

- Critical State Significant Infrastructure Application SSI 15_7400;
- Sydney Metro – Chatswood to Sydenham –Environmental Impact Statement (Jacobs/Aracadis/RPS, 2016);
- Sydney Metro – Chatswood to Sydenham –Response to Submissions and Preferred Infrastructure Report (Jacobs/Aracadis/RPS 2016); and

The Planning Assessment Commission granted Approval for the Project on 9 January 2017 and the Laing O'Rourke scope of works is subject to the Minister's Conditions of Approval.

Following approval of the Sydney Metro City and Southwest – Chatswood to Sydenham Project, a modification (SSI Mod 2: Central Walk) was assessed by the Department of Planning Industry and Environment and subsequently approved on 21 December 2017 under section 115ZI of the EP&A Act.

The consolidated Conditions of Approval's for the Sydney Metro City and Southwest have been defined from the following approval modification documents.

- CSSI 7400 MOD 1 – Victoria Cross and Artarmon Substation (determined 18 October 2017)

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- CSSI 7400 MOD 4 – Sydenham Station and Metro Facility South (determined 13 December 2017)
- CSSI 7400 MOD 2 – Central Walk (determined 21 December 2017)
- CSSI 7400 MOD 3 – Martin Place Metro Station (determined 22 March 2018).
- CSSI 7400 MOD 5 - Blues Point Acoustic Shed (determined 2 November 2018).
- CSSI 7400 MOD 6- Administrative Changes- Modification to Sydney Metro City & Southwest - Chatswood to Sydenham (determined 21 February 2019).
- CSSI 7400 MOD 7 – Modify Condition E100 (determined 29 June 2020)
- CSSI 7400 MOD 8 - Blues Point Access Site (determined 25 November 2020)
- CSSI 7400 MOD 9 – Extension to standard construction hours (determined 30 June 2022)

1.4 Overview of the Central Station Main Works (CSMW) Project

The Metro Station Works include the installation of new platforms that will be constructed using sophisticated excavation techniques to create a cavern with an island platform, beneath Central Station's existing heavy-rail platforms 12, 13, 14 and 15. The Central Station Works include new infrastructure and the adjustments to existing infrastructure at Central Station to construct, operate and maintain the Metro Station Works. The key features of the Central Station Works include:

- a new north-south concourse for Central Station which will link the new metro station with the existing northern entrance and north concourse, a new east concourse entitled 'Central Walk', and the existing southern baggage tunnel; and
- adjustments to the existing Paid Intercity Concourse, Olympic Tunnel, north concourse and northern entrance to Central Station.

The Central Walk Works include the provision of other infrastructure to provide improved connectivity and other operational enhancements throughout Central Station. The key features of the Central Walk Works include:

- a new eastern entrance for Central Station at Chalmers Street;
- a new east concourse for Central Station beneath existing platforms 16 to 23 (the 'Central Walk'), which will link the new eastern entrance, the new north south concourse, existing platforms 16 to 23 and the existing Eastern Suburbs Railway (ESR) concourse; and
- provisions to enable the future construction (by others) of an extension of the Central Walk through a new west concourse and a new western entrance for Central Station.

1.5 CSMW Scope of Works

1.5.1 Permanent Works

The permanent new infrastructure to be constructed includes:

- Shortening of platforms 9 to 14 at the northern end, and a corresponding lengthening at the southern end;

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- Demolition of platforms 13 to 15 and re-instatement of platforms 13 to 14 to accommodate the construction of the new metro station;
- Reinforcement of Platform 12 and demolition of exiting canopies of Platform 12;
- Minor existing canopy modifications for Platform 14 for lift risers
- Station Box excavation requiring the removal of approximately 230,000 cubic metres of spoil;
- Construction of the new eastern entrance, the Central Walk and related station access arrangements to existing platforms including:
  - Demolition of the 'Bounce Hostel'
  - Suburban platforms refreshing;
  - Excavation of an advanced tunnel and associated shafts
  - Installation of four track slabs between the Metro Box and platform 22under track 16, 17/18, 19/20, 21/22.
  - Excavation and removal of approximately 4,000m3 from the suburban island platforms and a further 750m3 below the platform walls via the advanced adit and a further 160m3 below Platform 23 to the ESR perimeter wall to allow for the canopy tubes.
  - Excavation of the Central Walk equating to approximately 8,500m^3 of spoil.
- Construction of power supply from Belmore Park substation to the CSM site; and
- Construction of a padmount substation in Sydney Yard and associated feeders to Lee Street Substation.
- Construction of the Combined Services Route (CSR) around Central Station.

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Refer to Figure 1.1 below for the locations of the works.

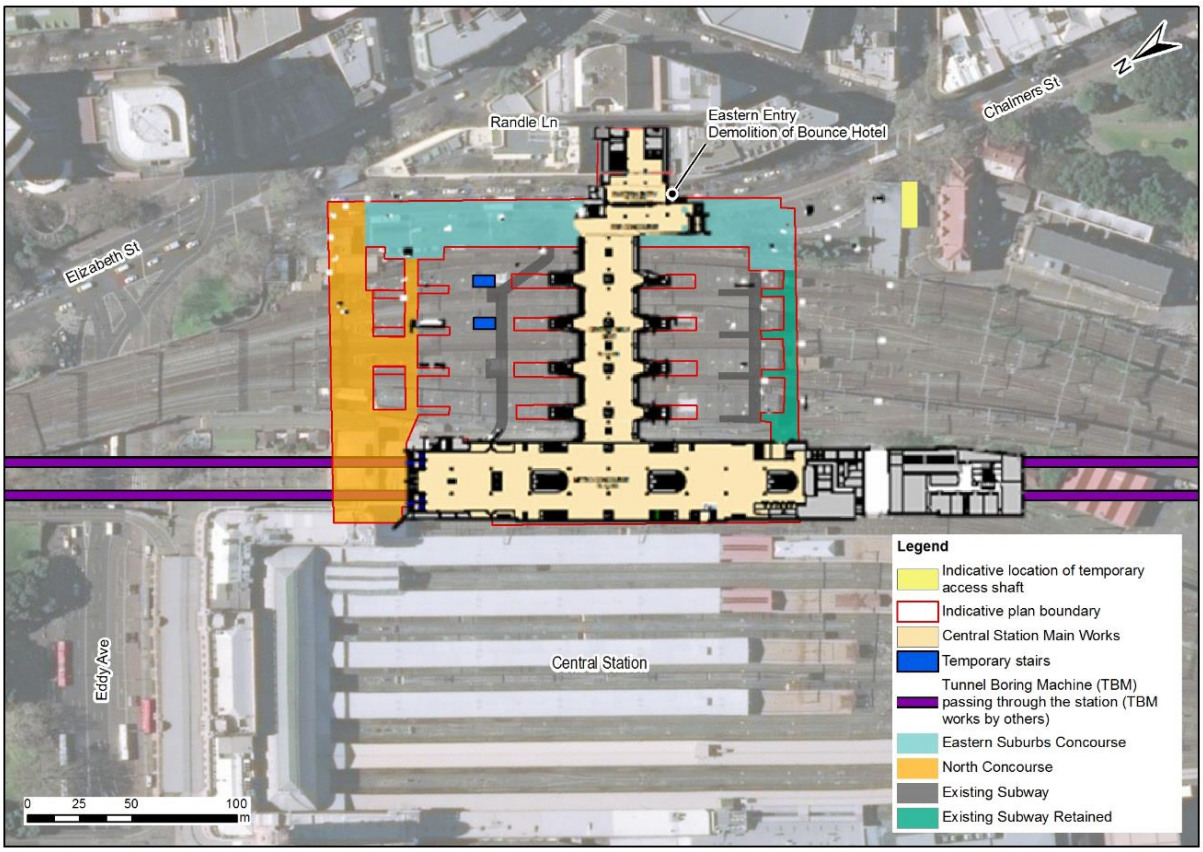

Figure 1.1: CSMW Project Works

1.5.2 Ancillary works

Ancillary works include fencing, maintenance access, utilities works, drainage, noise barriers, road and transport network works and temporary site office, laydown and work sites to support construction.

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Central Station Main Works Project
Construction Groundwater Management Plan

Figure 1.2 Power supply route

1.5.3 Combined Services Route

The CSR for Central Station will provide for Communications (Comms) services (voice, data and IT connectivity, requiring 6 to 8 cables) and High Voltage electrical (HV) services to service the whole site, both existing and the new infrastructure installations that are being introduced as part of the Central Station Main Works. It will extend as a circular route around the site, utilising existing service infrastructure where this is available and providing new installations as required to complete the system.

The CSR was included in the Environmental Impact Statement that was approved under SSI 15_7400 as part of the concept design (refer EIS Chapter 7, Project Description – Construction, Part 7.10.9, p231) and has progressed through a detailed design process as seen below in Figure 1.3. The CSR will be delivered in two phases. Phase A occurs in areas 2, 3 and 4 and is restricted to the Western Baggage Tunnel, Northern Baggage Tunnel and Platform 1. Phase B occurs in all other areas and extends to the Darling Harbour Goods Line, Mortuary Tunnel, Sydney Yard, Water Mains tunnel, Prince Alfred Substation, Railway Institute driveway and Sydney Network Base

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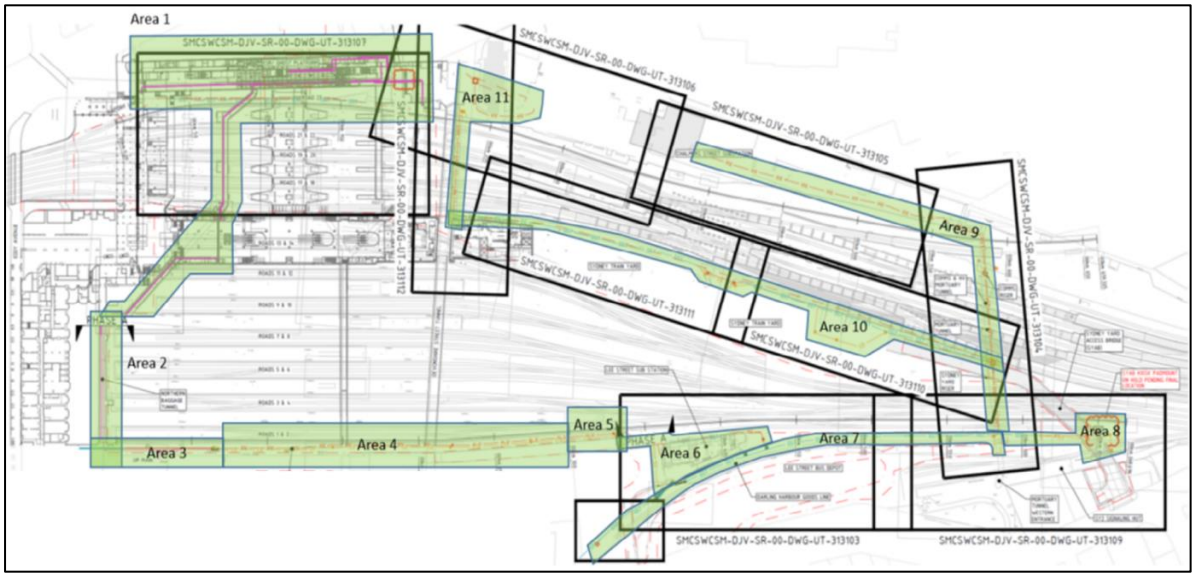

Figure 1.3 CSR around Central Station.

1.6 Construction Hours

In accordance with Condition of Approval (CoA) – E36 - Construction, except as allowed by Conditions E47 and E48 (excluding cut and cover tunnelling), must only be undertaken during the following standard construction hours:

- 7:00am to 6:00pm Mondays to Fridays, inclusive;
- 8:00am to 6:00pm Saturdays; and
- at no time on Sundays or public holidays.

Conditions E44 and E45 also allows construction outside of scheduled hours under a range of conditions such as emergency works, 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, etc.

Condition E47 requires an out of hours work protocol be developed and implemented for work outside of the above standard construction hours. Condition E48 specifies that the following activities may occur 24 hours per day seven days a week, subject to Condition E47:

a) tunnelling and associated support activities (excluding cut and cover tunnelling);
b) excavation within an acoustic enclosure;
c) excavation at Central without an acoustic enclosure (excluding Central Walk works at 20-28 Chalmers Street, Surry Hills);
d) station and tunnel fit out; and
e) haulage and delivery of spoil and materials.

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1.7 Works Location Site Layout

The CSM work location and site layout is highlighted in Figure 1.4.

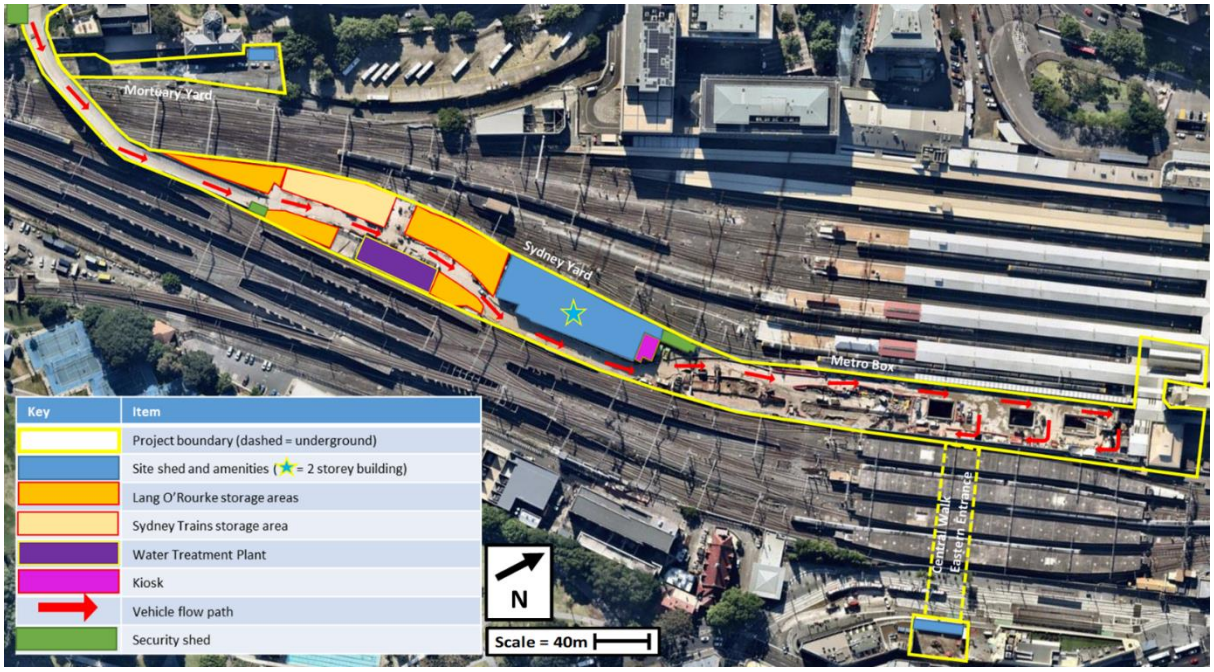

Figure 1.4: CSMW site layout

1.8 Objectives and Targets

The objectives of the CGWMP have been identified from the Construction Environmental Management Framework (CEMF), Environmental Impact Statement, the CEMP, general best practice activities and are as follows:

- Reduce the potential for drawdown of surrounding groundwater resources;
- Prevent the pollution of groundwater through appropriate controls; and
- Reduce the potential impacts of groundwater dependant ecosystems; and
- Sustainable use of water resources.

These objectives conform to TfNSW's objectives as described in the Construction Environmental Management Framework.

The performance targets include:

- Characterise the post-baseline groundwater conditions including groundwater levels and groundwater quality within and surrounding the CSM project area during construction.
- Inform design decisions for the CSM infrastructure as a result of the monitoring program

2. Legal and Other Requirements

Table 2-1 below details the legislation and planning instruments considered during development of this Plan.

Table 2-1: Legislation and Planning Instruments

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Legislation	Description	Relevance to this CGWMP
Environmental Planning and Assessment Act 1979	This Act establishes a system of environmental planning and assessment of development proposals for the State.	The approval conditions and obligations are incorporated into this CGWMP.
Contaminated Land Management Act 1997	This Act provides for a process to investigate and remediate land that has been contaminated and presents a significant risk of harm to human health. Section 60 of the Act is a "Duty to Report Contamination". This duty applies to owners of land and persons who become aware their activities have contaminated the land.	This plan defines how Laing O'Rourke will manage works to comply with this Act
Protection of the Environment Operations Act 1997	This Act includes all the controls necessary to regulate pollution and reduce degradation of the environment, provides for licensing of scheduled development work, scheduled activities and for offences and prosecution under this Act.	This plan defines how Laing O'Rourke will manage works to comply with this Act. The works will be conducted in accordance with the requirements of the EPL. The CSMW project early works will be completed under the Sydney Trains EPL, Laing O'Rourke will obtain an EPL prior to commencement of construction for the project.
Water Management Act 2000 *Water Management (General) Regulation 2004*	This Act and Regulation provide for the protection, conservation and ecologically sustainable development of water sources of the State and in particular to protect, enhance and restore water sources and their associated ecosystems.	This Act will have low relevance to the Project. Sydney Metro projects assessed under Part 5.1 of the Environmental Planning and Assessment Act 1979 (EP&A Act) are exempt from obtaining water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91.
Sydney Water Act 1994	This Act establishes the Sydney Water Corporation as a statutory State owned corporation. The functions of the Sydney Water Corporation is to supply and store water, provide sewerage services, provide stormwater drainage and dispose of waste water within its area of operations.	Coordination may be required with Sydney Water during the works if a Permit to discharge treated groundwater to a Sydney Water stormwater drain or a permit to use approved metered standpipes on Sydney water hydrants is required.
Waste Avoidance and Resource Recovery Act 2001	This Act repeals the Waste Minimisation and Management Act, 1995.The purpose of the Act is to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecological sustainable development. The Act provides for the making of policies and strategies to achieve these ends. It is an offence under the Protection of the Environment Operations Act to wilfully or negligently dispose of waste in a manner that harms or is likely to harm the environment.	The relevance of the Act to this project is to implement the strategies by adopting the hierarchy of avoidance; avoidance of unnecessary resource consumption; resource recovery (including reuse, reprocessing, recycling and energy recovery), disposal (as a last resort).

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2.1 Planning Requirements

The CGWMP addresses the following requirements:

- Sydney Metro City and Southwest - Chatswood to Sydenham Conditions of Approval (CoA) (SSI 15_7400) as modified – dated 9 January 2018;
- The Sydney Metro City and Southwest - Environmental Impact Statement, dated 3rd May 2016;
- The Sydney Metro City and Southwest – Submissions and Preferred Infrastructure Report, dated October 2016;
- The Sydney Metro City and Southwest – Chatswood to Sydenham Modification 2 – Central Walk – Sydney Metro City and Southwest – (SSI Mod 2) – Determined on 21 December 2017.
- Sydney Metro City & Southwest - Chatswood to Sydenham Staging Report;
- The Sydney Metro Construction Environmental Management Framework (CEMF) v3;
- Managing Urban Stormwater: Soils and Construction 4th Edition (Landcom, 2004);
- Infrastructure Sustainability Council of Australia - IS Technical Manual V1.2; and
- Applicable Legislative Obligations.

The Compliance Matrix in Appendix A provides an analysis of how the CGWMP complies with CoAs, Environmental Performance Outcomes, and the CEMF. Appendix B outlines the consultation undertaken with NRAR, the outcomes of the reviews and any follow up actions required.

2.2 Guidelines

Additional guidelines and standards relating to the management of groundwater include:

- Landcom (2004). Managing Urban Stormwater: Soils and Construction. (Volume 1 of the 'Blue Book').
- DECC (2008). Managing Urban Stormwater: Soils and Construction. Volume 2D: Main Road Construction. (Volume 2D of the 'Blue Book').
- EPA (2014) Waste Classification Guidelines
- ANZG (2018). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the 'ANZG Guidelines').
- ASSMAC (1998). Acid Sulphate Soil Manual. Acid Sulphate Soil Management Advisory Committee, NSW.
- Transport for NSW's Water Discharge and Re-use Guideline.
- Infrastructure Sustainability Council of Australia - IS Technical Manual V1.2
- Guidelines for the Management of Acid Sulphate Materials: Acid Sulphate Soils, Acid Sulphate Rock and Monosulfidic Black Ooze, RTA;
- NSW Environmental Protection Authority - Assessing and Managing Acid Sulphate Soils; and
- Environment Protection Authority, Victoria Information Publication 655 - Acid Sulphate Soil and Rock.

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- NSW Office of Water (2012). NSW Aquifer Interference Policy.
- Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources (2011).
- NSW Water Quality Objectives that provide environmental values for NSW waters.

2.3 ISCA

The CSM Project will pursue a rating under the IS Rating Scheme V1.2. This plan relates to several of the IS credits.

2.3.1 Dis-1 Receiving Water Quality

Monitoring and modelling of water discharges and receiving waters demonstrates no adverse impact on receiving water environmental values during construction.

3. Roles and Responsibilities

The roles and responsibilities of key CSMW and other relevant personnel with respect to groundwater are as follows in Table 3-1:

Table 3-1: Key roles and responsibilities

Project Director	Managing the delivery of the Project including overseeing implementation of groundwater management measures. Act as Contractor's Representative.
Project Environment Manager	Oversee the implementation of all groundwater management initiatives. Responsible for managing ongoing compliance with the CoA and environmental document requirements.
Commercial Manager	Ensure that relevant groundwater management requirements are considered in procuring materials and services.
Construction Managers **Site Superintendent**	Manage the delivery of the construction process, in relation to groundwater management across all sites in conjunction with the Project Environment Manager.
Environment Coordinator	Manage the on-ground application of groundwater management measures during construction (e.g. erosion and sediment control, water treatment and monitoring). Monitor and report on groundwater management during construction.
Project Engineer	Implement groundwater management activities during construction works.
Environmental Representative	Provide a review and endorsement role to this plan 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. Regularly monitor the implementation of this plan through inspections.
TfNSW	Provide a review and endorsement role to this plan
Natural Resources Access Regulator (formerly DPI Water)	Provide a review and endorsement role to this plan
Equipment calibration	Specialist suppliers as required by manufacturer's instructions

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Nominated NATA-accredited laboratories	For the analyses of samples as required
Certified Occupational Hygienist	Provide governance over the performance of all occupational health and hygiene activities

4. Existing Environment

The information in this section of the CGWMP is summarised from the Chatswood to Sydenham EIS.

4.1 Hydrogeology

The Chatswood to Sydenham project area traverses seven regional geological units identified by the Sydney 1:100,000 Geological Sheet 9130 (Herbert, 1983).

The proposed metro tunnels would primarily transition through Hawkesbury Sandstone with some sections of Ashfield Shale and Mittagong Formation. For a small part of the Sydney Harbour crossing, the tunnels would pass through fluvial / marine clayey-silty and clayey-sandy sediments.

The geological context for Central Station construction site is predominantly fill, residual soil, Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone.

The permeability of shale, siltstone and sandstone is generally low to very low, with the majority of groundwater flow transmitted through joints and fractures rather than via the porous nature of the material.

4.2 Groundwater

The groundwater level along most of the project alignment is between 10 to 30 metres below ground level. Local shallow groundwater within residual soils is anticipated at two to five metres below ground level. Groundwater baseline conditions and construction phase water quality and drawdown is monitored in the Groundwater Monitoring Program which is discussed in Section 7. Six monthly groundwater monitoring reports have been prepared and can be accessed from the Project website: https://centralstationmetro.com/documents/

A series of steady-state models were run based on a combination of a wide range site-measured and regional recharge and hydraulic conductivity data. The highest average annual inflow to CSM of 4.5 L/s (Model run CentSt2018_020) occurred for the case of uniform vertical anisotropy of 3, which allowed highly increased vertical leakage, 50% recharge over the rail corridor and K increased by an order of magnitude over the initially assumed values. The next highest inflow was 2.5 L/s using the low anisotropy high K but base recharge rates. The lowest value for a case without using the seepage face package was 0.5 L/s for the case of the regional anisotropies noted in Table 1 of the technical memo in Appendix C but with K decreased by a factor of 10, fracture zone grouting and uniform 3% recharge. Various other combinations of K, anisotropy, recharge and grouting fell within the above range. The model predictions are detailed in the Hydrogeological Inflow Assessment Report ref SMCSWCSM-DJV-EW-00-REP-GE-000202 of 23 January 2019.

An inflow rate of 4.2 litres/second was used as an indicative maximum for dewatering purposes. The figure includes a 10% contingency which allows for any groundwater and rainwater from

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Central Walk Works. Peak flooding, resulting from a 10-year storm event using the Rational Method equation, would result in 230 litres/second. Over a five-minute rainfall event this would equate to 69,000 litres. This would take a Water Treatment Plant (WTP) with a 10 litre/second capacity, 3.2 hours to clear.

4.3 Receiving Water Bodies

At the time of the EIS, according to Central Sydney State of the Beaches 2014–2015 (Office of Environment and Heritage BeachWatch, 2015), the water quality over the 12-month period for Sydney Harbour and Parramatta River catchment was considered to be good (refer to Table 18-7 of the EIS). Cockle Bay and Blackwattle Bay are the receiving water bodies for both surface and groundwater discharges. As part of the Sydney Harbour and Parramatta River catchment, both are representative of disturbed ecosystems and, in accordance with the ANZG Guidelines 2018, a 95% species protection criteria applies during construction. It should be noted however, that the existing water quality of water bodies adjacent to Blackwattle bay, including Rozelle Bay and White Bay typically showed levels of heavy metal concentrations which consistently exceeded the 95% Species Protection Criteria (SPC) of the ANZG Guidelines (M4-M5 Vol 2H – App Q Surface Water Quality and Flood). Given this, discharges from the WTP to stormwater may occur when water quality within Cockle Bay and Blackwattle Bay does not meet the 95% criteria. In this instance, discharges to stormwater are likely to be of a quality that is better than the existing environment.

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5. Aspects and Potential Impacts

The key aspects and potential impacts associated with the management of groundwater during the delivery of works are listed in Table 5-1. For a quantitative risk assessment, please refer to the CEMP.

These identified risks have been taken into account in the development of the groundwater management strategy and site specific procedures for the Project.

Table 5-1: Aspects and potential impacts

Aspect	Potential Environmental Impact	P	C	Risk	Control Measure	C	Risk
Risk Assessment Rankings	**>17 = Extreme/unacceptable** **10 - 16 = High** **5 - 9 = Medium** **1 - 4 = Low**	**Initial Risk Rating**				**Residual Risk Rating**	
Discharge of contaminated water from within site boundary during rainfall	• Contamination of receiving waters • Contamination of soils downstream of site	4	5	20	• All major excavations including Metro Box works are complete. • Site dewatering through WTP, where possible • Majority site hardstand; overland flow directed away from site boundary to controls • Increase site water storage capacity and pre-treatment to help drop out sediment. • Installation of ERSED controls at site low points in accordance with Blue Book.	2	3	6

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Central Station Main Works Project
Construction Groundwater Management Plan

Washout of concrete in undesignated areas.	• Sediment laden/alkaline water polluting surrounding groundwater / stormwater system / watercourses.	3	4	12	• Contained and bunded concrete washout designated areas	2	3	6
Storage of hazardous substances, leaking plant and equipment and spillage from refuelling.	• Localised ground contamination / pollution of stormwater requiring clean-up and/or receiving fines. • Contamination of watercourse, riparian environment and groundwater ecosystems • Risk of igniting volatile substances. • Unauthorised access to site / potential vandalism/damage leading to pollution.	4	4	16	• Use bunds to 110% of largest container • Designated refuelling areas, outside of drainage lines, natural or otherwise • Double skinned bunded generators • All plant and equipment brought to site to be inspected and authorised.	2	2	4
Fuel contaminated runoff from construction works leaving site	• Fuel contaminated runoff entering stormwater or waterways (i.e. polluting - not compliant with discharge criteria). • Any fuel or chemical spills associated with construction have the potential to impact habitats, particularly downstream aquatic habitats and groundwater via stormwater systems or waterways.	4	4	16	• Designated refuelling areas, outside of drainage lines, natural or otherwise	2	2	4
Non-compliant water from construction works discharged from site	• Non-compliant water entering stormwater system waterways (i.e. polluting - not compliant with discharge criteria).	5	4	20	• All water to be discharged via WTP, where possible • Controlled overflow strategy •	2	3	6
Works with the potential to intercept Groundwater table	• Groundwater entering excavations without appropriate safeguards onsite could lead to ground water contamination.	3	3	9	• Groundwater monitoring and investigation • Appropriate dewatering system • Conduct waterproofing works as soon as feasibly possible to delineate site from subsoil drainage.	2	3	6

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Central Station Main Works Project
Construction Groundwater Management Plan

Flooding of Central Station and surround	• Contamination of floodwaters by sewage, fuels and/or chemicals onsite. • Potential for floodwaters to impact works within Central Station. • Potential re-direction of flood waters beyond work site as a result of works at Central Station.	5	4	20	• Controlled overflow strategy • Monitor weather conditions and forecasts. • Appropriate specifications for WTP in terms of discharge volume	2	4	8
Intercepting gaswork wastes	• Contamination from former gasworks tanks uncovered during excavation of the Metro Box seeping into the groundwater table and causing localised or extended ground contamination and aquatic system impacts. • Exposed gaswork waste posing a potential health risk to humans and living organisms via skin, oral or olfactory contact. • Exposed gaswork wastes mixing with surface water and imposing a runoff risk to aquatic habitats.	4	4	16	• Appropriate specification for WTP in terms of chemical processing parameters • Minimise spread or exposure of gasworks material through Construction Work Method Statements • Excavated material from gasworks to be appropriately stored to reduce potential of cross contamination • All waste to be disposed of at an appropriately licenced facility, in accordance with the NSW EPA, Waste Classification Guidelines • As part of the requirements of the Remediation Action Plan, provide a design to construct an impermeable barrier to minimise / reduce exposure to workers in the back of house area of the Metro Box.	2	3	6
Management of contaminated or untreated materials	• Non-compliant material and contaminated water entering surrounding waterways. • Decrease in health of nearby ecosystems.	4	5	20	• Non-compliant material and contaminated water entering surrounding waterways. • Decrease in health of nearby ecosystems. • Majority site hardstand; overland flow directed away from site boundary.	2	4	8

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Central Station Main Works Project
Construction Groundwater Management Plan

Water usage during construction activities.	• Excess usage of potable water for site activities leading to wastage.	3	3	9	• Water efficient amenities • Install water meters • Install water capture devices	2	3	6
Groundwater drawdown in the surrounding area. Settlement impacts	• The metro box is located below mean sea level and other subsurface rail infrastructure in this area. As such, there is expected to be a permanent cone of groundwater depression that will develop around the metro box and associate project infrastructure. This drawdown has the potential to generate impacts at surrounding receptors including: more than minimal impact (> 2m) at surrounding groundwater supply bores; and more than minimal impact (>10% of background climatic variations) at any groundwater dependent ecosystem.	3	5	15	• Monitor areas in proximity to construction sites where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria)	3	3	9

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6. Groundwater Management

6.1 General Principles

As identified within Section 4, the groundwater level on the Project Site is between 10 to 30 metres below ground level. Local shallow groundwater within residual soils is anticipated at two to five metres below ground level. Construction of the station box and Central Walk are likely to impact groundwater. Noting that the Metro box cut extends below the groundwater table, minor groundwater inflows were estimated to be 4.2 litres/second, with any groundwater that seeps into the metro box cut flowing to a designated sump before being pumped to the above ground WTP.

A WTP with a capacity of 10 litres/second was constructed in late 2019 prior to intercepting the groundwater table to treat all groundwater and any surface water that runs into the Metro Box before this water is either used onsite or discharged into stormwater drainage. The WTP is located within the Sydney Yard compound within Laing O'Rourke storage area. The WTP occupies an area of approximately 400m^2. Post excavation and as a result of construction of the Metro track and platforms, the site storage capacity will be reduced resulting in the need for a Controlled Overflow Strategy, which has been endorsed by the EPA. Refer to Appendix E of the CSM Soil and Water Management Plan for details.

LOR will implement the following measures during the Project works:

- Water sampling and testing of groundwater, surface water and raw water (pre-treatment) will be undertaken during construction to determine the most suitable treatment processes to meet the required water quality standards;
- All feasible and reasonable opportunities for groundwater reuse for construction purposes will be considered. Should groundwater inflows and required treatment volumes be surplus to onsite construction purposes, the treated water product would be discharged into stormwater drainage at Environmental Protection Licence Discharge Point 1 or 2 (EPL 1 or EPL2) pending test results;
- Groundwater discharge quality must comply with LOR Environment Protection Licence 21148;
- The management of groundwater and surface water ingress, including the design of capture, treatment and discharge methods shall be undertaken in ongoing consultation with Natural Resources Access Regulator (NRAR, formerly DPI – Water) (refer also to Section 7 below). All intercepted groundwater and surface water shall be treated in accordance with the LOR EPL 21148 licence conditions prior to discharge to stormwater at EPL2.
- Condition surveys of buildings and structures in the vicinity of excavations would be carried out prior to the commencement of excavation at each site.
- Drawdown in the deep and shallow aquifers will be monitored

6.2 Resources

Ultimate responsibility for groundwater impact mitigation measures will rest with the Site Supervisors, who will be responsible for the on-ground construction works. This would include (although is not limited to):

- Installation of temporary drain liners (e.g. proprietary in drain gross pollutant traps, geofabric, etc.);
- Installation of sediment baffle tanks prior to pumping to the WTP; and
- All dewatering activities.

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LOR's subcontractor EnviroPacific is responsible for the installation, operation and maintenance of the WTP and ensuring all discharge waters meet specified discharge criteria.

6.3 Onsite Water Treatment Plant

The onsite WTP was constructed within Sydney Yard at the end 2019. Due to completion of the excavation works at Metro Box, the main WTP was decommissioned in early Feb 2022 and the Metro Box dewatering requirements were handed over to the Line Wide Project. Groundwater and stormwater from the footprint of the Metro Box mostly drain to two onsite 150kL detention basins located in the northern and southern end of the Metro Box. Any stormwater or ground water captured within the Metro Box and the Central Walk is pumped to Line Wide WTP through permanent infrastructure.

A smaller WTP temporarily managed the surface water that collected at low points on site from hard surfaces in Sydney Yard or the access road until practical completion of the designed stormwater management system. The temporary WTP was decommissioned in May 2023.

6.4 LOR EPL 21148 and the NSW Water Quality Objectives

In accordance with Condition L1.1 of the LOR Environmental Protection Licence 21148 (EPL), LOR must comply with section 120 of the *Protection of the Environment Operations Act 1997*. In accordance with Condition L2.3 of the EPL, LOR are not authorised to pollute waters by any pollutant other than those specified in Condition L2.4. Discharges must not exceed the 100 percentile concentration limit of the following criteria:

- Oil and grease – none visible;
- Total Suspended Solids (TSS) – <50mg/L; and
- pH – 6.5 to 8.5.

In accordance with Special Frequency 1 of Condition M2.3, oil and grease, TSS and pH will be tested less than 24 hours prior to controlled discharge and daily for any controlled discharge. This requirement is verified continually by the WTP, which uses a pH and TSS probe in its final water storage tank to determine whether water is allowed to be discharged.

In accordance with the Minsters Condition of Approval E107, discharge water quality must contribute towards the NSW WQO. As current discharges relate to the temporary management of surface water that may collect at low points on site from hard surfaces in Sydney Yard and access road, and excavation of spoil with contaminants of concerns has been completed, water is tested for oil and grease, suspended solids and pH only.

6.5 Water Discharge

6.5.1 Onsite Reuse

The TfNSW Water Reuse and Discharge Guideline (April 2016) regulates both onsite reuse and offsite point source discharge. Where any water is reused onsite (e.g. dust suppression, road sweeper, etc) the Environment Manager will verify that the water is suitable for reuse in accordance with the Guideline in accordance with the following criteria:

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- pH – 6.5 to 8.5;
- No visible oil and grease;
- No potential for water to leave the project boundary as defined in the EPL;
- No surface runoff will be generated from the reuse (reuse includes dust suppression, watering retained vegetation etc.);
- No potential for water to reach any watercourse; and
- No visible fines (concrete washout water only)
- Treated for biological contaminants.

6.5.2 Offsite Discharge

No off site discharges will be permitted unless it is via EPL2. All water to be discharged off site must be in accordance with Condition L2.4 of the LOR EPL 21148. Discharges must not exceed the 100 percentile concentration limit of the following criteria:

- Oil and grease – none visible;
- Total Suspended Solids (TSS) – <50mg/L; and
- pH – 6.5 to 8.5.

As current discharges relate to the temporary management of surface water that may collect at low points on site from hard surfaces in Sydney Yard and access road, and excavation of spoil with contaminants of concerns has been completed, water is tested for oil and grease, suspended solids and pH only. As water would meet the EPL criteria but may be non-conforming with the ANZG marine water criteria it will be discharged to EPL2 to land. Discharges are to be monitored to ensure water does not make its way to a stormwater drain.

6.6 Groundwater Drawdown

A detailed groundwater model for the project was developed and was progressively updated during design and construction. The model has primarily been developed to:

- Predict changes to groundwater levels, including at nearby water supply works.
- Inform the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain.

The first revisions of the groundwater modelling works were issued in August 2018 and included conservative drawdown predictions for the metro box. These predictions have been used to inform the monitoring program.

The results are compared to the following groundwater drawdown criteria set for the project as per the EIS – Mitigation Measure GWG1:

- Less than 2.0 metres – general target
- Less than 4.0 metres – where deep building foundations present
- Less than 1.0 metre – residual soils

A review of the NSW Department of Primary Industries – Office of Water / Water Administration Ministerial Corporation information on 26 July 2018 indicates that there are no registered boreholes within 500 m radius CSM Box. The cone of depression that is simulated will be

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compared against SWTC criteria for the project and against NSW impact assessment criteria for groundwater (e.g. The NSW aquifer interference policy minimal impact criteria). The drawdowns simulated will also need to be used by geotechnical specialists to establish if specific measures are required to be implemented to avoid damage from settlement. Any specific measures identified will be implemented.

Before commencement of construction, all property owners of buildings identified as being at risk of damage will undergo a building condition survey in accordance with MCoA E59. Appropriate monitoring equipment will be installed in proximity to the construction site in areas of risk as identified by the geotechnical analysis. Monitoring Reports will be reviewed by the Project Environmental Manager and Sydney Metro, and reviewed by the ER and issued to NRAR and DPIE for review every six months.

Within three months of the completion of construction, a second building condition survey would be provided to the owners of the buildings surveyed in accordance with MCoA59 within one month in accordance with MCoA60.

During construction and for a period of not less than six months after settlement has stabilised, appropriate equipment to monitor areas in proximity to construction sites will be installed. Where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria), a structural assessment of the affected buildings / structures would be carried out and specific measures implemented to address the risk of damage. If exceedance of the criteria is identified, then all construction affecting settlement must cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings in accordance with MCoA61.

The drawdown data was compared against the minimal impact criteria within the NSW Aquifer interference policy to assess impacts to surrounding water supply bores and groundwater dependent ecosystems. While no impacts are expected to surrounding registered users, if monitoring identifies any impacts outside of those modelled, further investigations would be undertaken to assess if more than minimal impacts would be generated and subsequently make good provisions would be implemented as per the Revised Environmental Performance Outcomes.

The monitoring and modelling results suggest that:

- Based on the measured groundwater depths and subsurface soil profiles, groundwater appears to be encountered in two separate aquifers. A shallow aquifer within the alluvium and residual soil profile, followed by a deep aquifer in the sandstone bedrock profile. The shallow aquifer ranges between 14.725 m AHD (SRT_BH063) and 19.785 mAHD (SRT_BH059) in groundwater elevation while the deeper aquifer ranged between 2.68 mAHD (SRT_BH006) and 3.02 mAHD (SRT_BH039).
- The 0.5 m groundwater drawdown contour in residual soils remains inside the rail site boundary. The 4.0 m groundwater drawdown contour in the bedrock aquifer (Hawkesbury Sandstone) generally remains inside the rail site boundary, however, the 2.0 m groundwater drawdown contour extends up to 110 m from the rail site boundary and beneath buildings with deep foundations. It was noted that these drawdowns were expected to be conservative as they did not include drawdown associated with existing infrastructure such as the Eastern Suburbs Railway line.
- Predicted drawdowns are within the criteria set for the project.

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The modelling of monitoring results finds that there are no impacts to surrounding receptors that exceed the minimal impact criteria (refer to the October 2022 to May 2023 Groundwater Monitoring Report for further details).

7. Groundwater Monitoring Program

The Groundwater Quality Monitoring Program was implemented to monitor impacts of surface construction works on the quality of groundwater and the testing of groundwater before it is reused onsite or discharged offsite. The Groundwater Monitoring Program measured the effectiveness of the mitigation measures applied as part of the Project. The Groundwater Monitoring Program was developed in consultation with the NRAR and the NSW EPA (in obtaining an Environment Protection Licence). Consultation records are contained within Appendix B.

The detailed methodology provided below sets out the Program to be implemented to comply with condition C9 of project approval SSI 15_7400. The groundwater monitoring program is required to compare actual performance of construction of the project against predicted performance. The groundwater analytical results from previous monitoring periods are combined with the current period data to analyse trends. The Groundwater Monitoring Reports are found on the project website https://centralstationmetro.com/documents/.

7.1 Scope and Objective

Activities that could result in water quality impacts are set out in Section 5. LOR's objectives for water quality management during construction are:

- The prevention of pollution;
- No adverse impacts on receiving water environmental values;
- Minimising the risk of polluted, sediment-laden or contaminated water leaving the premises and impacting both surface and groundwater;
- Inform design decisions for the CSM infrastructure;
- Implementing a comprehensive management and monitoring regime on site; and
- Comparing actual groundwater performance outcomes against predicted performance outcomes.

7.2 Background Data

Preliminary groundwater sampling conducted prior to CSMW commencing reported concentrations of iron ranging between <0.01 mg/L to 3.4 mg/L) and manganese (1.4 mg/L) concentrations at Central Station. These are low relative to levels encountered elsewhere in the Sydney Region. Concentrations can locally be highly variable within a site.

Information provided by Transport for NSW summaries the potential treatment issues of groundwater likely to be encountered for Sydney Metro and this is replicated in Table 7-1. This information has been reviewed and updated in the Contamination Assessment Design Report (CADR) that collated all available background groundwater data. The CADR was completed in October 2018 and updated in June 2019. The information in the CADR has been used to identify data gaps in the current understanding of groundwater conditions within the CSM works area

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and surrounding area. This information will be used to inform the development of a Remedial Action Plan and has been used to develop the baseline monitoring program outlined below. Data is continuously being collected across the site through monthly groundwater monitoring and six-monthly water quality reports to help further understand the groundwater environment and treatment requirements.

Table 7-1: Anticipated groundwater treatment issues (after information provided by Transport for NSW)

Issue	Comment	Treatment Strategy	Perceived Risk	
			Sandstone	Shale
Water salinity	The receiving environment for the Water Treatment Plant is Cockle Bay via the stormwater system. This is further detailed in the Construction Soil and Water Management Plan. As this is a marine environment, there is no requirement for further reduction in total dissolved solids on the treated groundwater	Reverse osmosis is not required	No	No
Dissolved iron	Oxidisation at drainage system leads to accumulation of precipitates and clogging / staining	Typically removed by oxidising the ferric ion to ferrous which enables precipitation and physical removal	Yes	Yes (minor)
Turbidity	Water too turbid for discharge to the stormwater system	Settling / filters	Yes	Yes (minor)
Iron reducing bacteria	Combine with oxidised iron at drainage points to produce sludge; durability issues	Biocide dosing	Yes	No

7.3 Installation of Wells

As groundwater wells within the construction footprint of Metro Box that were progressively destroyed through excavation of the Metro Box, LOR:

- Installed additional groundwater wells as required around the construction footprint to assess groundwater quality and vapour partitioning across a number of depth profiles/aquifers to enable the vapour risk from groundwater to be assessed at the depth of the service building and associated infrastructure. The locations of these new groundwater wells targeted data gaps identified during the review of the background data, specifically within the deeper Hawkesbury Sandstone Aquifer.
- Drill boreholes to the depth of the proposed Metro Box and collect fill, soil and bedrock samples for laboratory analysis. The results of the laboratory analysis were compared against the relevant waste guidelines and NSW EPA endorsed contaminated land guidelines so that the materials can be appropriately classified and managed to reduce risk to workers, the public and the environment.

Additional wells have been installed to determine potential groundwater contamination related to the gasworks uncovered in the southwestern corner of the Metro Box.

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7.4 Baseline groundwater monitoring

At least one month prior to the commencement of the excavation of the Metro Box the groundwater monitoring program was reviewed by Sydney Metro, provided to NRAR and EPA for consultation, endorsed by the ER (C13) and submitted to the Secretary (or delegate) of DPE for approval (CoA C14).

The draft groundwater monitoring program outlined in the Technical Memo provided in Appendix C was finalised following consultation with NRAR 25 September 2018. The program commenced in September 2018 and included six months of baseline groundwater monitoring on which the performance of Metro Box construction works were compared. The results of the baseline groundwater sampling conducted for CSMW are found on the project website https://centralstationmetro.files.wordpress.com/2020/06/1cfb2-baseline-groundwater-monitoring-program-report.pdf.

Figure 7-1 below presents the location of the wells used during the Baseline Groundwater

Monitoring Period and throughout the construction report period to date of this plan.

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Central Station Main Works Project
Construction Groundwater Management Plan

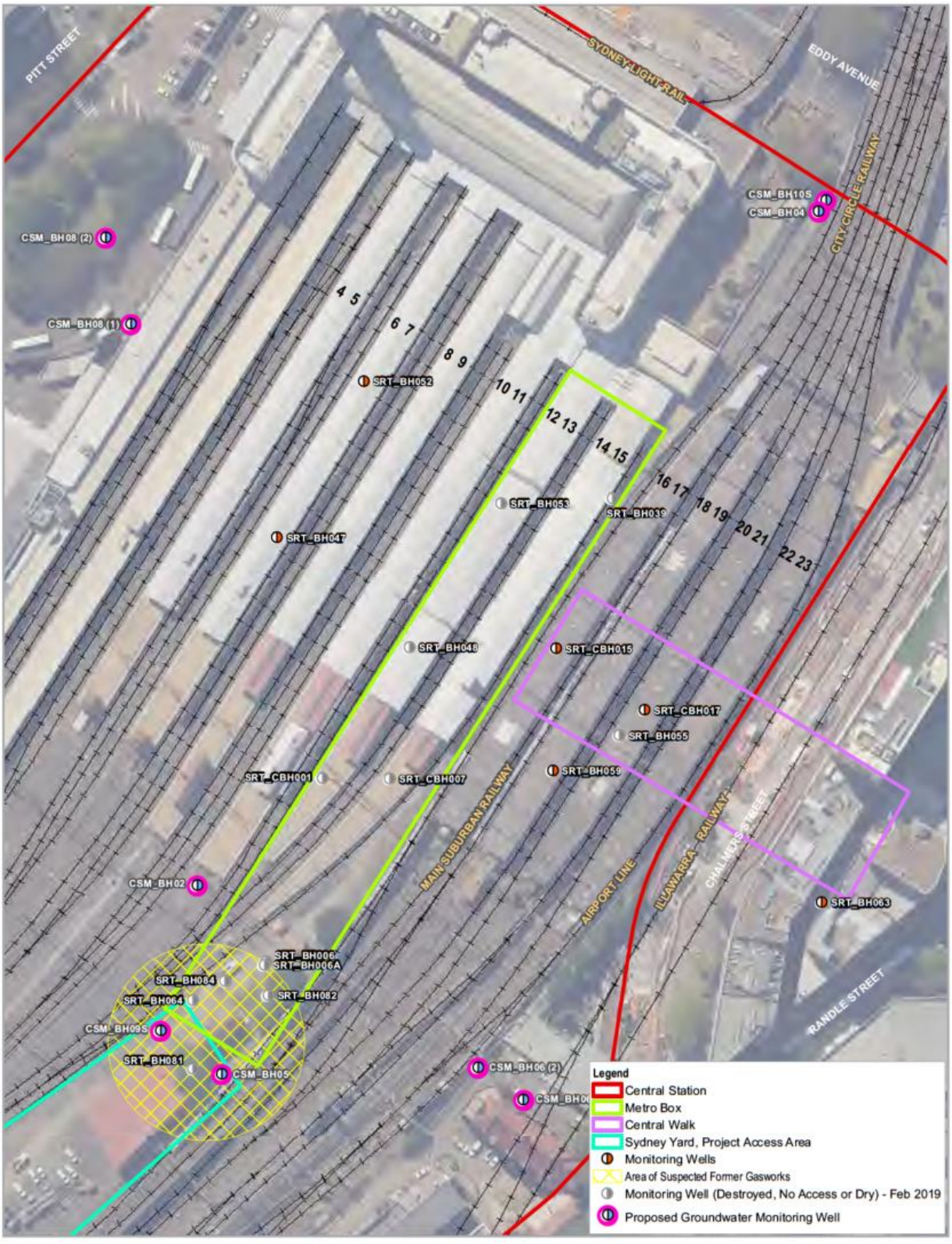

Figure 7-1 Location of Groundwater Monitoring Wells – Baseline Groundwater Monitoring Program (refer to Groundwater Monitoring Reports for more detail)

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7.5 Construction groundwater monitoring

The wells have been monitored for the duration of the construction works at monthly intervals. The October 2022 to May 2023 Groundwater Monitoring Report was the final report for the monitoring program.

Table 7-1 lists all groundwater monitoring wells to date, including their average depths mbTOC (meters below top of bore casing) and the period of monitoring that the wells were used. Where B = Baseline Monitoring Report, and C (numbered 1+), represents each of the 6-monthly Construction Monitoring Report in consecutive order following completion of the Baseline report. Note – some boreholes were never located, or were dry prior to the baseline monitoring report, and were therefore excluded from all monitoring periods.

Table 7-1 – Presents the status and detail of monitoring wells used by either, or both the Baseline and Construction Monitoring Program.

Monitoring Location ID	Monitoring well Condition Baseline (B) Construction (C^{+1}) Destroyed (D)	Depth of monitoring well (m bgs)	Groundwater Quality		Groundwater Elevation	
			Analysis Suite	Frequency of Analysis Suites	Manual / Level Logger	Frequency of Level
CSM-BH02	C1/C2/C3/C4/ C5/C6/C7	34.38	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese	Quarterly	Level logger	Hourly
CSM_BH04	C1/C2/C3/C4/ C5/C6/C7	35.2	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese	Quarterly	Level logger	Hourly
CSM_BH05	C1/D	33.08	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese	Quarterly	Manual	Monthly
CSM_BH06	C1/C2/C3/C4/ C5/C6/C7	35.4	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese	Quarterly	Level logger	Hourly
CSM_BH08	C1/C2/C3/C4/ C5/C6/C7	35	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese	Quarterly	Manual	Hourly
CSM_BH09S	C1/C2/C3/C4/D	10.00	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
CSM_BH10S	C1/C2/C3/C4/ C5/C6/C7	10.00	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean	Quarterly	Level Logger	Hourly

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Monitoring Location ID	Monitoring well Condition Baseline (B) Construction (C^{+1}) Destroyed (D)	Depth of monitoring well (m bgs)	Groundwater Quality		Groundwater Elevation	
			Analysis Suite	Frequency of Analysis Suites	Manual / Level Logger	Frequency of Level
			up, major anions / cations, iron and manganese.			
SRT-CBH001	B/D	8.065	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
SRT_CBH007	B/D	6.72	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
SRT_CBH015	B/C1/C2/D	5.91	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
SRT-CBH017	B/C1/C2/D	4.94	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Level Logger	Hourly
SRT_BH039	B/D	22.55	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
SRT_BH047	B/C1/C2/C3/C4/ C5/C6/C7	6.92	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Level Logger	Hourly
SRT_BH048	B/D	6.375	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
SRT_BH050	C2/C3/C4/C5/ C6/C7	2.77	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
SRT_BH052	B/C1/C2/C3/C4/ C5/C6/C7	7.8	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly

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Monitoring Location ID	Monitoring well Condition Baseline (B) Construction (C^{+1}) Destroyed (D)	Depth of monitoring well (m bgs)	Groundwater Quality		Groundwater Elevation	
			Analysis Suite	Frequency of Analysis Suites	Manual / Level Logger	Frequency of Level
SRT_BH053	B/D	9.92	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
SRT_BH059	B/C1/C2/C3/C4/D	6.00	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
SRT_BH060	C2/C3/C4/C5/ C6/C7	4.29	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
SRT_BH063	B/C1/C2/C3/C4/ C5/C6/C7	14.53	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
SRT_BH064	B/D	4.414	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Hourly
SRT_BH082	B/D	7.9	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
GASW_BH7	C1/C2/C3/C4/ C5/C6/D	6.21	BTEX, TRH C_6-C_{10} and Ammonia	Quarterly	Manual	Monthly
GASW_BH10	C1/C2/C3/C4/ C5/C6/D	25	BTEX, TRH C_6-C_{10} and Ammonia	Quarterly	Manual	Monthly
GASW_BH11	C1/C2/C3/C4/ C5/C6/D	9.01	BTEX, TRH C_6-C_{10} and Ammonia	Quarterly	Manual	Monthly

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Monitoring Location ID	Monitoring well Condition Baseline (B) Construction (C^{+1}) Destroyed (D)	Depth of monitoring well (m bgs)	Groundwater Quality		Groundwater Elevation	
			Analysis Suite	Frequency of Analysis Suites	Manual / Level Logger	Frequency of Level
GASW_BH23A	C1/C2/C3/C4/ C5/C6/D	3.93	BTEX, TRH C_6-C_{10} and Ammonia	Quarterly	Manual	Monthly
GAW_BH25A	C1/C2/C3/C4/ C5/C6/D	2.95	BTEX, TRH C_6-C_{10} and Ammonia	Quarterly	Manual	Monthly
CSM_BH11S	C3/C4/D	5.2	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
CSM_BH12S	C5/C6/C7	10	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
CSM_BH13	C5/C6/C7	35.5	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly
CSM_BH14S	C5/C6/C7	6	8 Metals, BTEX, TRH, PAH, phenol, OCP, OPP, PCB, cyanide. Ammonia, TRH with silica gel clean up, major anions / cations, iron and manganese.	Quarterly	Manual	Monthly

D = Destroyed

B = Baseline Monitoring Report

C1 = April 2019 – Sep 2019

C2 = October 2019 – March 2020

C3 = April 2020-September 2020

C4 = October 2020- March 2021

C5 = April 2021- September 2021

C6 = October 2021- March 2022

C7 = April 2022- September 2022

Figure 7-2 – Groundwater monitoring locations – Construction Groundwater Monitoring Program

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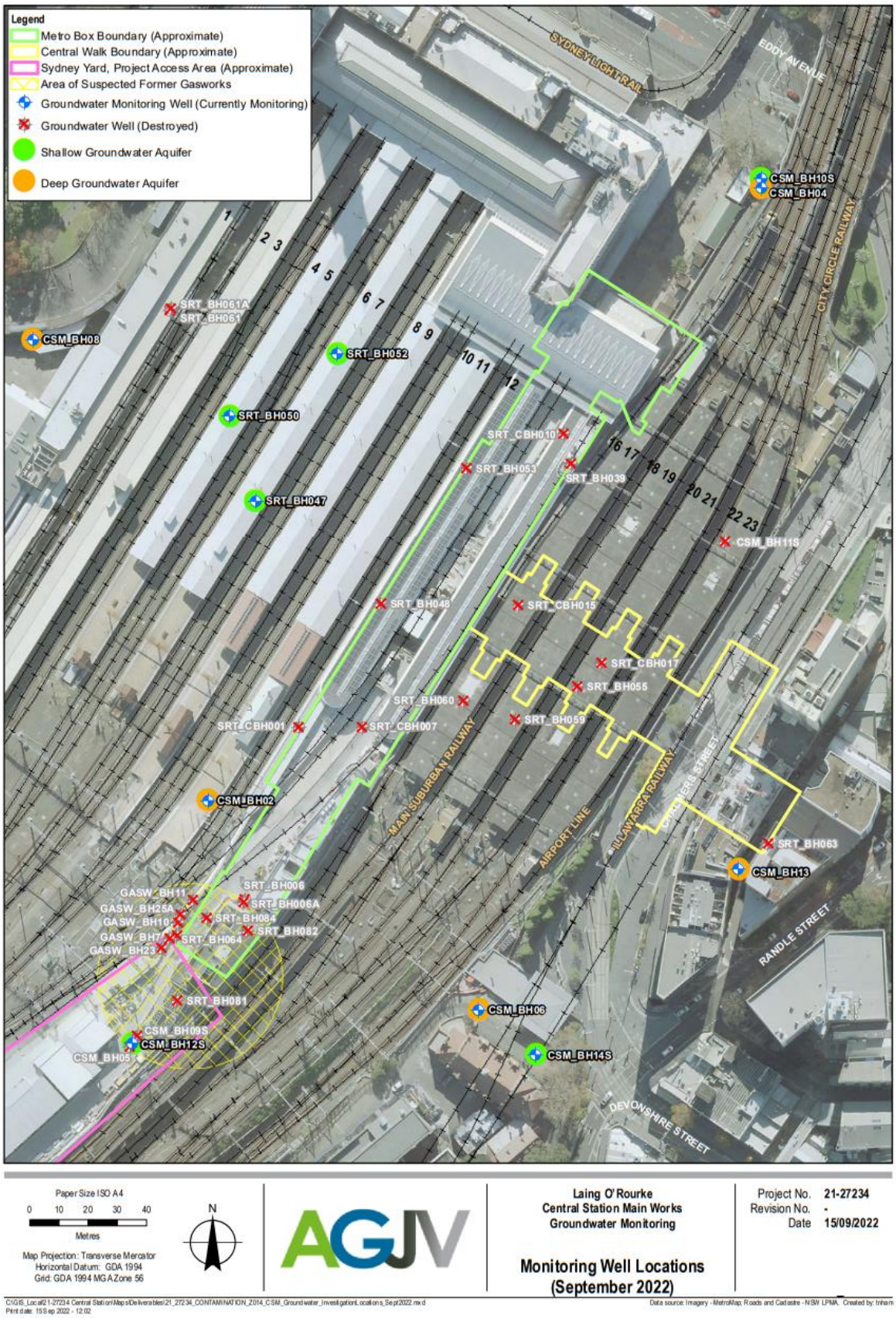

Additional wells were installed to replace those wells destroyed in the construction footprint or as required following additional investigations. Figure 7-2 below presents the location of all monitoring wells.

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The groundwater monitoring program assessed the observed groundwater levels against the model predictions for the site, and the Ministerial Condition of Approval (MCoA) requirements. In general, the modelled drawdowns in the residual soils show that drawdown is predicted as less than 4 m with the 2 to 4 m drawdown zone extending up to around 25 m from the edge of the excavation (and within the Central Station site). Drawdown of the track area is limited to between 0.5 and 1 m, other than a small zone immediately to the northwest and east, above a dyke zone, with up to 2 m of drawdown.

The October 2022 to May 2023 Groundwater Monitoring Report assessed that the monitored groundwater drawdown was within MCoA requirements. Further, it was noted that the associated ground movement monitoring carried out at CSM site has recorded no adverse impacts to adjacent structures. As the monitored groundwater has shown being stabilised, and the recorded drawdown is very limited across the CSM works area and its zone of influence, there is unlikely any ongoing risk of damage. As such, the October 2022 to May 2023 Groundwater Monitoring Report was the final report for the construction phase and makes recommendations for monitoring during the operational phase of CSM. Monitoring reports are reviewed by the Project Environmental Manager, Sydney Metro, and the ER and issued to NRAR and DPE for information every six months. The Final Groundwater Monitoring Report will be completed at the end of the project and provided to NRAR for review.

8. Training

All relevant site personnel working on site will undergo site induction training relating to groundwater as required. The training will cover the following issues such as:

- Legislative requirements (POEO Act, EPL etc.) including Section 120 (offence to pollute waters);
- Duty to notify of environmental harm (or the potential for it) including chain of reporting;
- Spill containment and management procedure;
- Storage and use of hazardous substances;
- Water reuse and discharge procedure;
- Maintenance of environmental controls (e.g. erosion and sediment controls); and
- Contamination and Unexpected Finds.

Detailed training will be provided to key personnel regarding groundwater management. This training will include:

- Legislation as it applies to water quality;
- Typical controls around existing drains, maintenance of controls and WTPs; and
- Operation of the water treatment plans and relevant testing and reporting.

Further details regarding staff induction and training are outlined in the CEMP.

9. Inspection, Auditing, Records and Reporting

LOR will regularly review the Project to ensure compliance with this Plan. A regular inspection program for groundwater management will be conducted as follows:

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- Monitoring of environmental parameters at the discharge point of the WTP in accordance with the EPL;
- Daily inspections undertaken by the Site Supervisor;
- Weekly inspections to be conducted by the Environmental Manager will be documented on the Environmental Inspection Form;
- Inspections by the ER.

Typical records generated will include:

- Monitoring records from the WTP
- Records of groundwater inspections undertaken;
- Observations and works undertaken to repair and/or maintain groundwater management works;
- Records of testing of any water prior to discharge off site;
- Unexpected finds; and
- Records for contamination management – groundwater monitoring results, disposal dockets, remedial action plans, occupational hygienist clearances, and Site Auditor sign-offs (where required).

Results and outcomes of inspections and auditing will be reported internally on a monthly basis and reported to the ER and Sydney Metro on a quarterly basis. Six-monthly Construction Compliance Reports will be prepared to report on compliance with the Project Approval.

Environmental reporting will be undertaken in accordance with Sydney Metro City & Southwest Environmental Reporting Template SM ES-FT-421 (refer to the CEMP Appendix H). Additional reporting requirements are included in the CEMP.

After Sydney Metro and ER review, the Groundwater Monitoring Program Reports will be submitted every six months during construction and following the completion of the Project to the NRAR and the Department of Planning Industry and Environment.

Reporting to the Environment Protection Authority will be conducted in accordance with the EPL 21148.

This plan will be updated to reflect the recommendations of the Six-Monthly Construction Monitoring Reports on an annual basis.

Any non-compliances arising out of the above monitoring, inspections and audits would be made aware to TfNSW, the ER and NRAR in accordance with Section 16 of the CEMP. A review of the appropriate documentation would be undertaken by LOR management to determine the corrective actions to ensure the non-compliance does not happen again.

The NRAR and the ER will be notified of any non-compliances and emerging impacts identified in the monitoring data as soon as practical and will be reported in the ER Monthly Reports that are submitted to DPE.

A register would also be kept, identifying any non-compliances and documenting the corrective and preventative actions.

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10. Review and Improvement

The CGWMP will be reviewed and updated at least annually. LOR will undertake the ongoing development, amendment and updating of the CGWMP to ensure it remains consistent with Project priorities, risk management, client requirements and Project objectives, taking into account:

- The status and progress of LOR's activities;
- Changes in the design, delivery and operations processes and conditions;
- Lessons learnt during delivery and operations;
- Changes in other related Project Plans;
- Requirements and matters not covered by the existing Project Plans;
- Changes to Project Plans as directed by TfNSW's Representative under the Deed; and
- Where deemed appropriate in relation to items raised within inspections or audits.

It is noted that some plans may require the approval of the Department of Planning Industry and Environment prior to construction commencing. The Project Environmental Manager will ensure that this plan and monitoring components is forwarded for approval and ultimate endorsement with any comments addressed with results of this included in this document. This CGWMP requires additional government agency review by NRAR as outlined in CoA-C3.

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 month before commencement of construction. Construction must not commence until the CEMP and all the 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, must be implemented for the duration of construction. Where the CSSI is being staged, construction of that stage will not commence until the relevant CEMP and sub-plans have been approved by the Secretary.

11. Enquiries, Complaints and Incident Management

Environmental incidents and complaints are to be investigated, reported, documented, actioned and closed out as per the details provided in the Community Consultation Strategy (once this has been finalised) and the CEMP.

Should any significant groundwater quality-related environmental incident occur 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 (in accordance with the definition in Section147 of the POEO Act,1997), the EPA would be notified immediately and the Secretary also notified as soon as possible within 24 hours of the incident occurring and include the time and date, details of the incident and any non-compliance with the Project's approval. This would be undertaken in accordance with the Project's Pollution Incident Response Management Plan (PIRMP) which also includes prompt notification of the ER and SM as soon as practicable. The actions taken to address the incident would be undertaken within the timeframe determined by the Secretary or relevant public authority.

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12. Agency Consultation

Laing O'Rourke has consulted with the NRAR about this plan. NRAR provided several comments that are required to be addressed and their responses have been consolidated in Appendix B and Appendix C.

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Appendix A - Construction Groundwater Management Compliance Matrix

Measure	Timing	Requirement	Responsibility	Reference
Project Approval – Specific Management Plan Requirements				
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.	Prior Construction / During Construction	C2S SSI 15_7400 COA – A9	Project Environment Manager	This Plan Section 12, Appendix B
From commencement of construction until completion of construction, the approved ER must: 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 all documents required to be prepared under the terms of this approval, ensure they address any requirements in or under this approval and if so, 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 documents required by the terms of this approval for implementation in accordance with what is stated in the document and the terms of this approval; f) notify the Secretary of an incident 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 CEMP, CEMP sub-plans and monitoring programs that comprise updating or are of an administrative nature, and are consistent with the terms of this approval and the CEMP, CEMP sub-plans and monitoring programs 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;	Prior Construction / During Construction	C2S SSI 15_7400 COA – A24	Project Environment Manager	This plan. Section 3.

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Measure	Timing	Requirement	Responsibility	Reference
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 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.				
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.	During Construction	C2S SSI 15_7400 COA – A34	Environmental Manager	This plan. Section 9.
The Secretary must be notified as soon as possible and in any event within 24 hours of any incident.		C2S SSI 15_7400 COA – A41	Project Manager / Project Environment Manager	This plan. Section 11. PIRMP
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.	During construction	C2S SSI 15_7400 COA – A42	Project Manager / Project Environment Manager	This plan. Section 11. PIRMP

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
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.	During construction	C2S SSI 15_7400 COA – A43	Project Environment Manager	This plan. Section 11. PIRMP
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.	During construction	C2S SSI 15_7400 COA – A44	Project Environment Manager	This plan. Section 11. PIRMP
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 CEMF and CEMP referred to in Condition C1. - Groundwater – DPI Water	During construction	C2S SSI 15_7400 COA – C3	Project Environment Manager	This Plan. Section 12.
The CEMP sub-plans must state how: a) the environmental performance outcomes identified in the EIS as amended by the documents listed in A1will be achieved; b) the mitigation measures identified in the EIS as amended by documents listed in A1 will be implemented; c) the relevant terms of this approval will be complied with; and d) issues requiring management during construction, as identified through ongoing environmental risk analysis, will be managed.	During construction	C2S SSI 15_7400 COA – C4	Project Environment Manager	Section 1.7 Appendix A Section 5 CEMP Appendix C
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.	During construction	C2S SSI 15_7400 COA – C5	Project Environment Manager	This Plan. Section 12.
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.	During construction	C2S SSI 15_7400 COA – C6	Project Environment Manager	This Plan. Section 12
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.	During construction	C2S SSI 15_7400 COA – C7	Project Environment Manager	This Plan. Section 3
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, must be 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.	During construction	C2S SSI 15_7400 COA – C8	Project Environment Manager	This Plan. Section 12.

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
The following Construction Monitoring Programs must be prepared in consultation with the relevant government agencies identified for each Construction Monitoring Program to compare actual performance of construction of the CSSI against predicted performance. Required Construction Monitoring Programs Relevant government agencies to be consulted for each Construction Monitoring Program (a) Noise and Vibration EPA and Relevant Council(s) (b) Blasting EPA and Relevant Council(s) (c) Water Quality EPA and Relevant Council(s) (d) Groundwater DPI Water	Prior to Construction	C2S SSI 15_7400 COA – C9	Project Environment Manager	This Plan. Section 3. Section 7 Section 7.1 Section 12.
Each Construction Monitoring Program must provide: (a) details of baseline data available; (b) details of baseline data to be obtained and when; (c) details of all monitoring of the project to be undertaken; (d) the parameters of the project to be monitored; (e) the frequency of monitoring to be undertaken; (f) the location of monitoring; (g) the reporting of monitoring results; (h) procedures to identify and implement additional mitigation measures where results of monitoring are unsatisfactory; and (i) any consultation to be undertaken in relation to the monitoring programs.	During Construction	C2S SSI 15_7400 COA – C10	Project Environment Manager	Section 7 Appendix B Appendix C CEMP – Section 15
The Construction Monitoring Programs must be developed in consultation with relevant government agencies as identified in Condition C9 of this approval and must include, to the written satisfaction of the Secretary, information requested by an agency to be included in a Construction Monitoring Programs during such consultation. Details of all information requested by an agency including copies of all correspondence from those agencies, must be provided with the relevant Construction Monitoring Program.	During Construction	C2S SSI 15_7400 COA – C12	Project Environment Manager	This Plan. Section 7. Section 12. Appendix B Appendix C
The Construction Monitoring Programs must be endorsed by the ER 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.	During Construction	C2S SSI 15_7400 COA – C13	Project Environment Manager	This plan. Section 12 Section 7.5

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
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.	During Construction	C2S SSI 15_7400 COA – C14	Project Environment Manager	This plan. Section 7
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.	During Construction	C2S SSI 15_7400 COA – C15	Project Environment Manager	This plan. Section 7.5 and 7.6.
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.	During Construction	C2S SSI 15_7400 COA – C16	Project Environment Manager	This plan. Section 2. Section 9
Where a relevant CEMP sub-plan exists, the relevant Construction Monitoring Program may be incorporated into that CEMP sub-plan.	During Construction	C2S SSI 15_7400 COA – C17	Project Environment Manager	This plan. Section 7
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.	Before construction	C2S SSI 15_7400 COA – E59	Project Leader	Section 6.5
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.	End Construction	C2S SSI 15_7400 COA – E60	Environmental Manager Project Leader	Section 6.5
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 cease immediately and must not resume until fully rectified or a revised method of construction is established that will ensure protection of affected buildings.	During Construction	C2S SSI 15_7400 COA – E61	Environmental Manager Project Leader	Section 6.5

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Measure	Timing	Requirement	Responsibility	Reference
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).	During Construction	C2S SSI 15_7400 COA – E66	TfNSW	Refer to the Construction Soil and Water Management Plan
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.	During Construction	C2S SSI 15_7400 COA – E67	Project Environment Manager	Refer to the Construction Soil and Water Management Plan
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.	During Construction	C2S SSI 15_7400 COA – E68	Project Environment Manager	Refer to the Construction Soil and Water Management Plan
The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.	During Construction	C2S SSI 15_7400 COA – E70	Project Environment Manager	Refer to the Construction Soil and Water Management Plan
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.	During Construction	C2S SSI 15_7400 COA – E107	Project Environment Manager Project Engineer Site Superintendent	Section 6

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Measure	Timing	Requirement	Responsibility	Reference
Drainage feature crossings (permanent and temporary watercourse crossings and stream diversions) and drainage swales and depressions must be undertaken in accordance with relevant guidelines and designed by a suitably qualified and experienced person.		C2S SSI 15_7400 COA – E108	Not applicable	
EIS Environmental Management Measures				
A detailed geotechnical model for the project would be developed and progressively updated during design and construction. The detailed geotechnical model would include: • Assessment of the potential for damage to structures, services, basements and other sub-surface elements through settlement or strain • Predicted changes to groundwater levels, including at nearby water supply works. Where building damage risk is rated as moderate or higher (as per the CIRIA 1996 risk-based criteria), a structural assessment of the affected buildings / structures would be carried out and specific measures implemented to address the risk of damage. With each progressive update of the geotechnical model the potential for exceedance of the following target changes to groundwater levels would be reviewed: • Less than 2.0 metres – general target • Less than 4.0 metres – where deep building foundations present • Less than 1.0 metre – residual soils • Less than 0.5 metre – residual soils (Blues Point) (fill / Aeolian sand). Where a significant exceedance of target changes to groundwater levels are predicted at surrounding land uses and nearby water supply works, an appropriate groundwater monitoring program would be developed and implemented. The program would aim to confirm no adverse impacts on groundwater levels or to appropriately manage any impacts. Monitoring at any specific location would be subject to the status of the water supply work and agreement with the landowner. The geotechnical model and groundwater monitoring program would be developed in consultation with the Department of Primary Industries (Water)		C2S EIS REMM – GWG1	Project Environmental Manager	This plan. Section 7.3
Condition surveys of buildings and structures in the vicinity of the tunnel and excavations would be carried out prior to the commencement of excavation at each site.		C2S EIS REMM – GWG2		This Plan. Section 6.5

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Measure	Timing	Requirement	Responsibility	Reference
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 Camdenville 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	During Construction	C2S EIS REMM – SCW1	Project Environment Manager Project Engineer Site Superintendent	Refer to Construction Soil and Water Management Plan
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.	During Construction	C2S EIS REMM – SCW4	Project Environment Manager Project Engineer	Section 6
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).	During Construction	C2S EIS REMM – HR1	Project Environment Manager Project Engineer Site Superintendent	Refer to Construction Environmental Management Plan
Contractual Requirements				
Annexure C: Project Specific Requirements The Contractor must undertake the following investigations within the construction footprint of the Central Station service building: (i) install groundwater wells within the construction footprint to assess groundwater quality and vapour partitioning across a number of depth profiles/aquifers to enable the vapour risk from groundwater to be assessed at the depth of the service building and associated infrastructure;	During construction	MR-E Environmental Requirements – 2.1	Project Manager Project Environmental Manager	This Plan, Section 7

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Measure	Timing	Requirement	Responsibility	Reference
(ii) drill boreholes to the depth of the proposed building (where possible) and collect fill, soil and bedrock samples for laboratory analysis. The results of the laboratory analysis will be compared against the relevant waste guidelines and NSW EPA endorsed contaminated land guidelines so that the materials can be appropriately classified and managed to reduce risk to workers, the public and the environment.				
EIS Environmental Performance Outcomes				
• The project would make good any impacts on groundwater users • The project would avoid any damage to buildings from settlement.	During Construction	C2S EIS EPO – Groundwater	Project Environment Manager Project Engineer	This Plan. Section 6
• Erosion and sediment controls during construction 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) • There would be no impacts on aquatic environments associated with the disturbance of acid sulfate soils during construction • Any contamination on project sites would be remediated to suit future land use • The project would protect or contribute to achieving the Water Quality Objectives, during construction and operation • Construction water quality discharge would comply with the requirements of an environment protection licence issued to the project • Operation water quality discharge would comply with a discharge criteria determined in consultation with the NSW Environment Protection Authority.	During Construction	C2S EIS EPO – Soils, contamination and water quality	Project Environment Manager Project Engineer	This Plan. Section 6. Refer to Construction Soil and Water Management Plan.
Construction Environmental Management Framework				
Key NSW Legislative Requirements The following legislative requirements should be adhered to throughout construction works with regular reviews to be undertaken by TfNSW and its contractors.	During construction	CEMF Section 2.1	Project Environment Manager	Section 2

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Measure	Timing	Requirement	Responsibility	Reference
• Contaminated Land Management Act (1997) - Sydney Metro must follow the process where contaminated land is identified. • Environmental Planning and Assessment Act (1979) - Sydney Metro must adhere to mitigation measures and conditions within the planning approval documentation. The proponent and their contractors must endeavour to deliver in a consistent manner within the assessed scope of works. • Protection of the Environmental Operations Act (1997) - Where Sydney Metro projects are scheduled activities under Schedule 1 of the Act an Environment Protection Licence (EPL) must be obtained.			Project Manager	
Construction Environmental Management Sub-Plans a) Subject to Section 3.3(c) and Section 3.2(c) 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: • Groundwater management. b) Additional detail on the minimum requirements for these sub plans is provided in Sections 6-17 of this CEMF.	During construction	CEMF Section 3.4	Project Environment Manager	This Plan.
Additional Environmental Assessments 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: • 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. • Identification of the timing for completion of the construction works, and how the sites would be reinstated (including any necessary rehabilitation).	During construction	CEMF Section 3.6	Project Environment Manager	This Plan. Section 2, Section 4, Section 6, Section 7.

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Measure	Timing	Requirement	Responsibility	Reference
Register of Hold Points 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. 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. **Table 1.4 Preliminary Register of Hold Points** Hold Point / Release of Hold Point / By Who **Discharge of water** / Environmental Manager to authorise the discharge of all water from the WTP following review and implementation of key treatment processes. / Contractor's Environment Manager or delegate	During construction	CEMF Section 3.8	Project Environmental Manager	This Plan. Section 6.3
Environmental Monitoring, Inspections and Auditing a. Issue specific environmental monitoring will be undertaken as required or as additionally required by approval, permit or licence conditions. 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. c. Environmental inspections will include: • Surveillance of environmental mitigation measures by the Site Foreman. • 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 TfNSW representatives at a frequency to be agreed with the Principal Contractor. e. Principal Contractors will be required to undertake internal environmental audits. Internal audits will include: • Compliance with approval, permit and licence conditions. • Compliance with the E&SMS, CEMP, SMP, sub-plans and procedures.	During construction	CEMF Section 3.13	Project Environmental Manager	Section 7, Section 9 and Construction Environmental Management Plan

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Measure	Timing	Requirement	Responsibility	Reference
• Community consultation and complaint response. • Environmental training records. • Environmental monitoring and inspection results. f. TfNSW (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.				
Environmental Non-compliances a. Principal Contractors will document and detail any non-compliances arising out of the above monitoring, inspections and audits. TfNSW will be made aware of all non-compliances in a timely manner. b. Principal Contractors will develop and implement corrective actions to rectify the non-compliances and preventative actions in order to prevent the re-occurrence of the non-compliance. Contractors will also maintain a register non compliances, corrective actions and preventative actions. c. TfNSW or the Environmental Representative may raise non-compliances against environmental requirements	During Construction	CEMF Section 3.14	Project Environmental Manager Project Manager	Section 9
Environmental Records and Compliance Reporting a. Principal Contractors will maintain appropriate records of the following: • Site inspections, audits, monitoring, reviews or remedial actions. • Documentation as required by performance conditions, approvals, licences and legislation. • Modifications to site environmental documentation (eg CEMP, sub-plans and procedures). • Other records as required by this Construction Environmental Management Framework. b. Records will be retained onsite for the duration of works. c. Additionally records will be retained by the Principal Contractor for a period of no less than 7 years in total. Records will be made available in a timely manner to TfNSW (or their representative) upon request. 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 TfNSW at an agreed frequency.	During Construction	CEMF Section 3.15	Project Environmental Manager Project Manager	Section 9 and Construction Environmental Management Plan

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
Review and Improvement of the E&SMS a. Principal Contractors will ensure the continual review and improvement of the E&SMS. This will generally occur in response to: • Issues raised during environmental monitoring, inspections and audits. • Significant environmental incidents. • Environmental non-conformances. 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 will generate actions for the continual improvement of the E&SMS and supporting management plans.	During Construction	CEMF Section 3.16	Project Environmental Manager Project Manager	Construction Environmental Management Plan
Groundwater Management Objectives a. The following groundwater management objectives will apply to construction: • Reduce the potential for drawdown of surrounding groundwater resources. • Prevent the pollution of groundwater through appropriate controls. • Reduce the potential impacts of groundwater dependent ecosystems.	During Construction	CEMF Section 7.1	Project Environment Manager Project Engineer	Section 1.6
Groundwater Management Implementation a. The following content may be provided within other sub-plans such as the Soil and Water Management Plan and Flora and Fauna Management Plan. b. Principal Contractors will develop and implement a Groundwater Management Plan for their scope of works. The Groundwater Management Plan will include as a minimum: • The groundwater mitigation measures as detailed in the environmental approval documentation. • The requirements of any applicable licence conditions. • Details of proposed extraction, use and disposal of groundwater, and measures to mitigate potential impacts to groundwater sources, incorporating monitoring, impact trigger definition and response actions for all groundwater sources potentially impacted by the SSI. • Evidence of consultation with the NSW Office of Water.	During Construction	CEMF Section 7.2	Project Environment Manager	This Plan. Section 7. Section 12

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Measure	Timing	Requirement	Responsibility	Reference
• The responsibilities of key project personnel with respect to the implementation of the plan. • Procedures for the treatment, testing and discharge of groundwater from the site. • Compliance record generation and management. • Details of groundwater monitoring if required.				
Groundwater Mitigation a. Examples of groundwater mitigation measures include: • Implementing all feasible and reasonable measures to limit groundwater inflows to stations and crossovers. • Undertaking groundwater monitoring during construction (levels and quality) in areas identified as 'likely' and 'potential' groundwater dependent ecosystems.	During Construction	CEMF Section 7.3	Project Environment Manager	This Plan. Section 6. Section 7.
Soil and Water Implementation a. Principal Contractors will develop and implement a Soil and Water Management Plan for their scope of works. The Soil and Water Management Plan will include as a minimum: • The surface water and flooding mitigation measures as detailed in the environmental approval documentation. • details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater; • surface water and ground water impact assessment criteria consistent with the principles of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) guidelines; • management measures to be used to minimise surface and groundwater impacts, including identification of water treatment measures and discharge points, details of how spoil and fill material required by the SSI will be sourced, handled, stockpiled, reused and managed; erosion and sediment control measures; salinity control measures and the consideration of flood events; • a contingency plan, consistent with the Acid Sulphate Soils Manual (EPA 1998), to deal with the unexpected discovery of actual or potential acid sulphate soils, including procedures for the investigation, handling, treatment and management of such soils and water seepage;	During Construction	CEMF Section 15.2a)	Project Environment Manager Project Engineer Site Superintendent	This plan. Section 6. Section 9 Refer to Construction Soil and Water Management Plan

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Measure	Timing	Requirement	Responsibility	Reference
• management measures for contaminated material (soils, water and building materials) and a contingency plan to be implemented in the case of unanticipated discovery of contaminated material, including asbestos, during construction; • a description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be undertaken, the locations where monitoring would take place, how the results of the monitoring would be recorded and reported, and, if any exceedance of the criteria is detected how any noncompliance can be rectified; • The requirements of any applicable EPL conditions. • The responsibilities of key project personnel with respect to the implementation of the plan. • Procedures for the development and implementation of progressive erosion and sediment control plans. • Identification of locations where site specific Stormwater and Flooding Management Plans are required. • Compliance record generation and management.				
Soil and Water Implementation The following compliance records will be kept by the Principal Contractors: • Copies of current ESCPs for all active construction sites. • Records of soil and water inspections undertaken. • Records of testing of any water prior to discharge. • Records of the release of the hold point to discharge water from the construction site to the receiving environment.	During Construction	CEMF Section 15.2f)	Project Environment Manager Project Engineer Site Superintendent	This Plan. Section 9 & 13. Refer to Construction Soil and Water Management Plan
Water Resources Management The following water resources management objectives will apply to the construction of the project: • Minimise demand for, and use of potable water. • Maximise opportunities for water re-use from captured stormwater, wastewater and groundwater.	During Construction	CEMF Section 15.4)	Project Environment Manager Sustainability Manager Project Engineer	This Plan. Section 6

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
• Examples of measures to minimise potable water consumption include: • Water efficient controls, fixtures and fittings in temporary facilities. • Collecting, treating and reusing water generated in tunnelling operations, concrete batching and casting facility processes. • Using recycled water or treated water from onsite sources in the formulation of concrete. • Harvesting and reusing rainwater from roofs of temporary facilities. • Using water from recycled water networks. • Collecting, treating and reusing groundwater and stormwater. • Using water efficient construction methods and equipment. • Providing designated sealed areas for equipment wash down.			Site Superintendent	
The following points referred to in the table are identified in this licence for the purposes of the monitoring and/or the setting of limits for discharges of pollutants to water from the point. ***Water and land*** **EPA Identification no.** / **Type of Monitoring Point** / **Type of Discharge Point** / **Location Description** 1 / Water Discharge / Water Discharge / Discharge of water treatment plant to stormwater system - Sydney Trains Yard (Easting: 333891, Northing: 6248995, MGA56, GDA94 - Refer Discharge Point Map on EPA Electronic File EF18/31724).	During Construction	EPL 21148 P1.1 Location of monitoring/discharge points and areas	Project Environment Manager Project Engineer Site Superintendent	

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.	During Construction	EPL 21148 L1.1 Water Pollution	Project Environment Manager Project Engineer Site Superintendent	
For each monitoring/discharge point or utilisation area specified in the table\s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.	During Construction	EPL 21148 L2.1 Concentration limits	Project Environment Manager Project Engineer Site Superintendent	
Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges.	During Construction	EPL 21148 L2.2 Concentration limits	Project Environment Manager Project Engineer Site Superintendent	
To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\s.	During Construction	EPL 21148 L2.3 Concentration limits	Project Environment Manager Project Engineer Site Superintendent	
Water and/or Land Concentration Limits	During Construction	EPL 21148 L2.4 Concentration limits	Project Environment Manager	

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
POINT 1 **Pollutant** / **Units of Measure** / **50 Percentile concentration limit** / **90 Percentile concentration limit** / **3DGM concentration limit** / **100 percentile concentration limit** Oil and Grease / Visible / / / / Not visible pH / pH / / / / 6.5-8.5 Total suspended solids / milligrams per litre / / / / 50			Project Engineer Site Superintendent	
If the licensee uses turbidity (NTU) in place of TSS to determine compliance with Conditions L2.1 and L2.4 the licensee must develop a statistical correlation which identifies the relationship between NTU and TSS for water quality in the sediment basins, water treatment plants and excavations in order to determine the NTU equivalent of 50 mg/L TSS before NTU is used.	During Construction	EPL 21148 L2.5 Concentration limits	Project Environment Manager Project Engineer Site Superintendent	
The licensee must provide the EPA with a copy of the statistical assessment methodology and results before using NTU in place of TSS.	During Construction	EPL 21148 L2.6 Concentration limits	Project Environment Manager Project Engineer Site Superintendent	
The licensee must develop and implement a method to enable the ongoing verification of the relationship between NTU and TSS.	During Construction	EPL 21148 L2.7 Concentration limits	Project Environment Manager	

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Central Station Main Works Project
Construction Groundwater Management Plan

<table>
<tr><th>Measure</th><th>Timing</th><th>Requirement</th><th>Responsibility</th><th>Reference</th></tr>
<tr><td></td><td></td><td></td><td>Project Engineer
Site Superintendent</td><td></td></tr>
<tr><td>The licensee must provide the EPA with any amendments the licensee makes to the statistical correlation as a result of the ongoing verification required by Condition L2.7 before using the revised statistical correlation.</td><td>During Construction</td><td>EPL 21148 L2.8 Concentration limits</td><td>Project Environment Manager
Project Engineer
Site Superintendent</td><td></td></tr>
<tr><td>For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:</td><td>During Construction</td><td>EPL 21148 M2.1 Requirement to monitor concentration of pollutants discharged</td><td>Project Environment Manager
Project Engineer
Site Superintendent</td><td></td></tr>
<tr><td>Water and/ or Land Monitoring Requirements
POINT 1
<table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Oil and Grease</td><td>Visible</td><td>Special Frequency 1</td><td>Visual Inspection</td></tr><tr><td>pH</td><td>pH</td><td>Special Frequency 1</td><td>In situ</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Special Frequency 1</td><td>Grab sample</td></tr></table></td><td>During Construction</td><td>EPL 21148 M2.2 Requirement to monitor concentration of pollutants discharged</td><td>Project Environment Manager
Project Engineer
Site Superintendent</td><td></td></tr>
<tr><td>For the purposes of Conditions M2.1, the term ‘Special Frequency 1’ means:
a) Less than 24hours prior to controlled discharge and daily for any controlled discharge.</td><td>During Construction</td><td>EPL 21148 M2.3 Requirement to monitor concentration of</td><td>Project Environment Manager
Project Engineer</td><td></td></tr>
</table>

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Central Station Main Works Project
Construction Groundwater Management Plan

Measure	Timing	Requirement	Responsibility	Reference
		pollutants discharged	Site Superintendent	
Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.	During Construction	EPL 21148 M3.1 Testing methods - concentration limits	Project Environment Manager Project Engineer Site Superintendent	

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Appendix B - Government Stakeholder Correspondence

Table 2: History of response to NRAR comments

Comment reference	DPI –Water (Natural Resources Access Regulator) Comments provided 20 May 2018 based on Revision 03 of the CSM CGWMP*	Initial Response by LORA Revision 04 CSM CGWMP	Status as of Rev 08 CSM CGWMP
1	Provide to NRAR with conceptual (at this early stage) diagrams indicating depths of construction and known groundwater level for each of the construction elements (tunnelling, shafts and excavations) which require excavation and or dewatering.	A baseline summary report collating all background groundwater data is currently being completed and will be issued to NRAR prior to the commencement of construction of the Metro Box.	LORA submitted Technical Memorandum (refer Appendix C) to NRAR 30 July 2018. Please refer to Appendix C for a detailed response to NRAR comments. Comments closed out in letter dated 25 September 2018 from NRAR (DoI Water). Incorporated into Rev 06 CSM CGWMP.
2	Clarify to NRAR how early stage estimated take of groundwater (Inflow rate of 4.2 L/second) was derived. Outline projected volumes of groundwater for each construction element per year during construction phase and operational phase.	Further detailed estimates of volumes of groundwater are currently underway and will be provided to the NRAR prior to the commencement of construction of the Metro Box.	Closed out in letter dated 25 September 2018 from NRAR (DoI Water).
3	Implementation of the recommended monitoring programmes for groundwater as outlined in the CSWMP and CGMP within the next 3 months before construction begins.	Monitoring will be conducted prior to construction of the Metro Box. Refer to Section 7 for further details.	LORA submitted Technical Memorandum (refer Appendix C) to NRAR 30 July 2018. Please refer to Appendix C for a detailed response to NRAR comments. Comments closed out in letter dated 25 September 2018 from NRAR (DoI Water). Incorporated into Rev 06 CSM CGWMP.
4	Provide more detailed estimates of volumes of groundwater. Outline how estimates were derived.	Further detailed estimates of volumes of groundwater are currently underway and will be provided to the NRAR prior to the	LORA submitted Technical Memorandum (refer Appendix C) to NRAR 30 July 2018. Please refer to Appendix C for a detailed response to NRAR comments.

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Comment reference	DPI –Water (Natural Resources Access Regulator) Comments provided 20 May 2018 based on Revision 03 of the CSM CGWMP*	Initial Response by LORA Revision 04 CSM CGWMP	Status as of Rev 08 CSM CGWMP
		commencement of construction of the Metro Box.	Comments closed out in letter dated 25 September 2018 from NRAR (DoI Water). Incorporated into Rev 06 CSM CGWMP.
5	Monitoring of surrounding and or any newly installed bores prior to and during all construction phases; and for up to at least 6 months after should any change in groundwater quality and or elevations be recorded.	Monitoring of surrounding and or any newly installed bores prior to and during all construction phases is addressed in Section 7.	LORA submitted Technical Memorandum (refer Appendix C) to NRAR 30 July 2018. Please refer to Appendix C for a detailed response to NRAR comments. Comments closed out in letter dated 25 September 2018 from NRAR (DoI Water). Incorporated into Rev 06 CSM CGWMP.
6	Include a dewatering completion report at the end of the project, or reference within the construction dewatering management plan where the dewatering completion report is outlined. Included in this report will be a clear evaluation and justification of the works surrounding dewatering process and management for construction and ongoing dewatering projection.	A dewatering completion report will be completed at the end of the project and provided to NRAR for review. Refer to Section 7 for further details.	LORA submitted Technical Memorandum (refer Appendix C) to NRAR 30 July 2018. Please refer to Appendix C for a detailed response to NRAR comments. Comments closed out in letter dated 25 September 2018 from NRAR (DoI Water). Incorporated into Rev 06 CSM CGWMP.
7	No comments received on Sydney Metro Central Station Groundwater Baseline Monitoring Report and Sydney Metro Central Station Groundwater Monitoring Report thereafter.		

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Central Station Main Works Project
Construction Groundwater Management Plan

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Appendix C - Technical Memorandum - Response to NRAR

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Carolyn Riley
Director Environment Sustainability and Planning
Sydney Metro
Transport for NSW
PO Box K659
HAYMARKET NSW 1240

16 August 2023

Ref: CSMW CGWMP R12

Dear Carolyn

RE: Endorsement of Sydney Metro City and Southwest Central Station Main Works Project - Construction Groundwater Management Plan Revision 12

Thank you for providing the following documents for Environmental Representative (ER) review and endorsement as required by the Condition of Approval (CoA) A24 (d), and (j) of the Sydney Metro City & Southwest project (SSI – 15_7400 January 9 2017).

- Sydney Metro City and Southwest - Central Station Main Works Construction Groundwater Management Plan (CGWMP) (Revision 12, dated August 2022)

This plan was revised by LOR during an Annual Review and included a review of monitoring requirements to reflect completion of the main construction elements of the project. Changes made in this revision relate to removal of the site Water Treatment Plants (WTPs) given permanent drainage systems are in place, as well as cessation of groundwater monitoring. Sydney Metro has advised that they have no ongoing requirements for groundwater monitoring. The latest Groundwater Monitoring Report by external specialist consultants stated:

"AGJV has assessed that the monitored groundwater drawdown satisfies MCoA requirements. Further, it is noted that the associated ground movement monitoring carried out at CSM site has recorded no adverse impacts to adjacent structures. As the monitored groundwater has shown being stabilised, and the recorded drawdown is very limited across the CSM works area and its zone of influence, there is unlikely any ongoing risk of damage.

and

Overall, there has been no major changes in the COPC [contaminants of potential concern] concentrations due to construction. Condition E107 of the Ministers conditions of approval have been met as to maintain the NSW Water Quality Objectives.

Based on the findings of this final groundwater monitoring period and consideration of findings from the previous monitoring periods, AGJV recommend:

- *Sydney Metro should provide groundwater monitoring results to the contractor of the operational water treatment plant for the treatment of groundwater when required.*
- *The conditions of approval for the project require an operational environmental management plan (OEMP) for groundwater management. This will need to be prepared by the contractor of the water treatment plant.*

With completion of construction expected in June 2023, further monitoring and factual reporting is not required."

Given the above, and that construction activities are essentially complete where these would have a potential to cause further unpredicted impacts groundwater, no further groundwater monitoring is required by Sydney Metro, the LOR Contractors and AGJV (specialist groundwater advisers to LOR).

On this basis, and on the basis that the recommendations of the AGJV final report as detailed will be implemented, the revised Construction Groundwater Management Plan (Rev 12) is approved. It is noted that the ER has relied upon the AGJV final groundwater monitoring report (dated 7 August 2023) report and Sydney Metro's input to make this approval.

Yours sincerely

Michael Woolley
Environmental Representative – Sydney Metro – City and South West