NORTHWEST RAPID TRANSIT

PROJECT INTEGRATED MANAGEMENT SYSTEM

CONSTRUCTION SOIL AND WATER MANAGEMENT PLAN

FOR

SYDNEY METRO NORTHWEST OPERATIONS, TRAINS and SYSTEMS PPP

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Construction Soil and Water Management Plan Approval Records

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FUNCTION	POSITION	NAME	SIGNATURE	DATE
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Reviewed by	Infrastructure Director	David Jackson		12-11-18
Reviewed by	Trains & Systems Director	Roger Ho RD		12-11-18
Reviewed by	D&D Director	Malachy Breslin		19/11/18
Reviewed by	MTS CEO	Ivan Lai		21/11/18
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Amendment Record

Changes made to this document since its last revision, which affect its scope or sense, are marked in the right margin by a vertical bar (|).

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19/12/2016	04	Yearly update	Cameron Newling	CN
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Certification Record

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1 Introduction

This *Construction Soil and Water Management Plan* (CSWMP) outlines the construction environmental management arrangements by which Northwest Rapid Transit (NRT), in partnership with Transport for NSW (TfNSW), is delivering the Operations, Trains and Systems (OTS) Public Private Partnership (PPP) component of the Northwest Rail Link (NWRL) Project.

Note: In June 2015, TfNSW changed the project's name to Sydney Metro Northwest (from the North West Rail Link) to reflect its role in Sydney's new railway network. Any references to the North West Rail Link in this plan can be assumed to be referring to the Sydney Metro Northwest. Similarly, the Rapid Transit Rail Facility (RTRF) has now been renamed to the Sydney Metro Trains Facility (SMTF).

1.1 OTS PPP

Sydney Metro is Australia's largest public transport project. Sydney Metro Northwest, formerly known as the North West Rail Link, is the first stage of Sydney's new fully automated metro system and will open to customers in the first half of 2019.

Stage 2, Sydney Metro City & Southwest, will extend metro rail under Sydney Harbour, through the CBD and southwest to Bankstown.

The $8.3 billion Sydney Metro Northwest will deliver eight new railway stations and 4,000 commuter car parking spaces to Sydney's growing North West. Services will start with a train every four minutes in the peak. The project also includes the upgrade and conversion of five existing railway stations to metro standards.

The OTS contract is a 15-year PPP project – the largest in the history of New South Wales as well as the largest of the three delivery contracts for Sydney Metro Northwest.

NRT is delivering Sydney's new generation metro trains; building the new stations and car parks; installing tracks, signalling, mechanical and electrical systems; building and operating the RTRF at Tallawong Road; upgrading and converting the railway between Epping to Chatswood to rapid transit standards; and operating Sydney Metro Northwest – including all maintenance work.

1.2 Purpose and Application

This *Construction Soil and Water Management Plan* (CSWMP) describes how NRT will manage soil and water issues during Phase 1, ECRL Conversion, Phase 2, Norwest Pedestrian Link, 33kV Underground Feeder Powerline Works and Rouse Hill Temporary Bypass Powerline Works of the delivery of the NWRL OTS contract.

Figure 1 below illustrates the delineation of the Phase 1, ECRL Conversion and Phase 2 of the OTS Works.

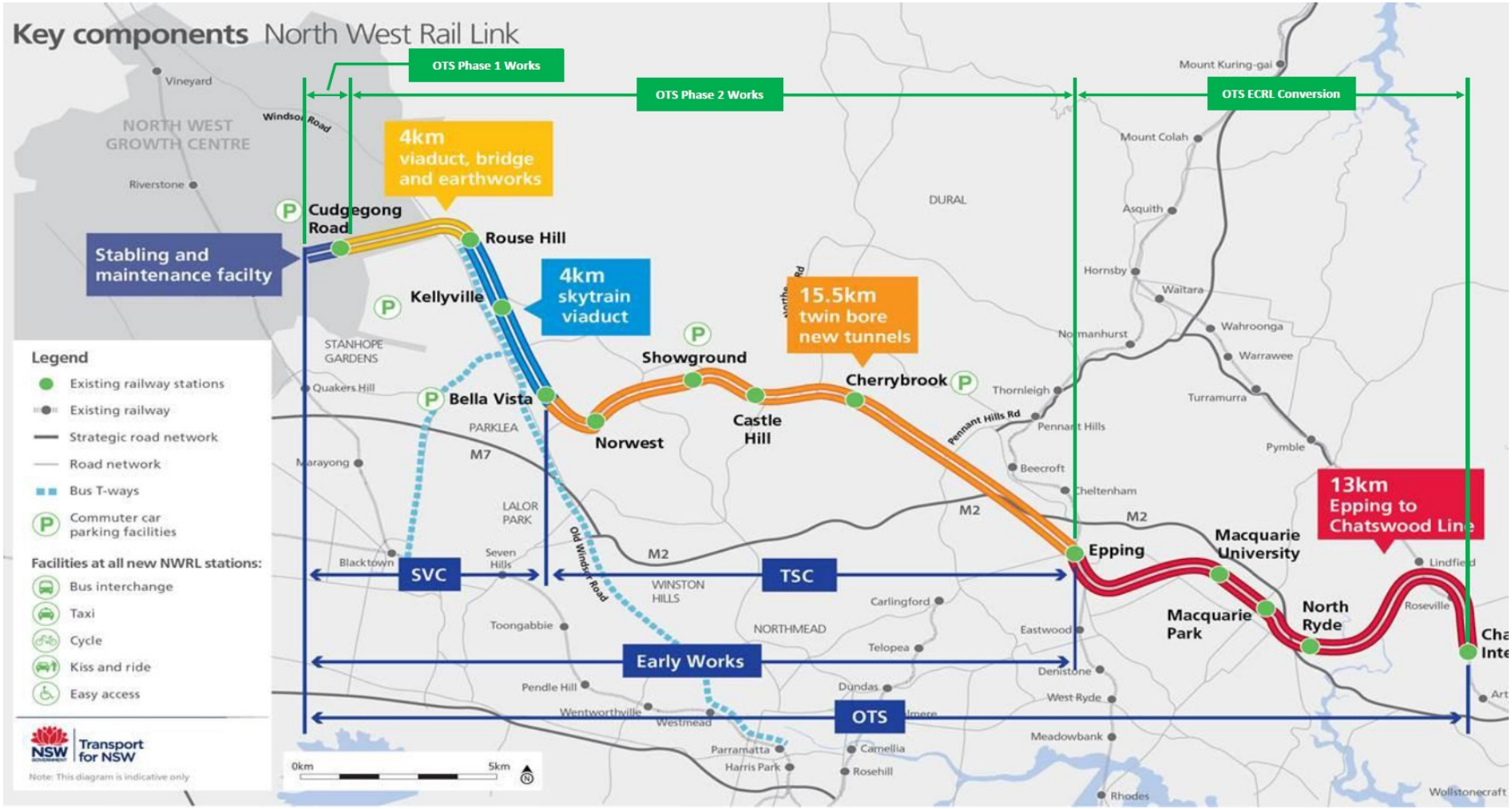


Figure 1 Schematic of NWRL OTS Phase 1, ECRL and Phase 2 Works

In summary, NWRL OTS Phase 1 covers the works associated with the delivery of the SMTF and the Cudgegong Road Precinct Enabling Works – see Figure 2 below.

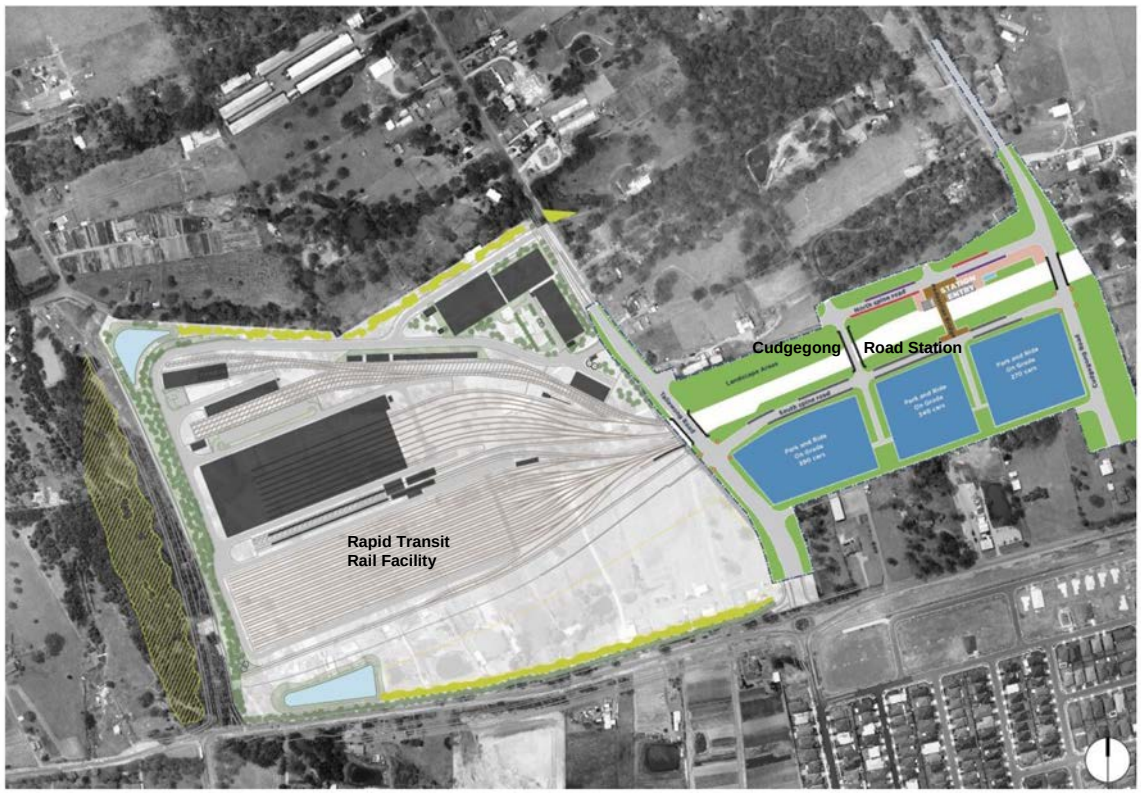


Figure 2 Indicative NWRL OTS Phase 1 Site: RTRF and Cudgegong Road Station

ECRL Conversion works refer to the conversion of the existing Epping to Chatswood Rail Line to rapid transit. See Figure 3 below.

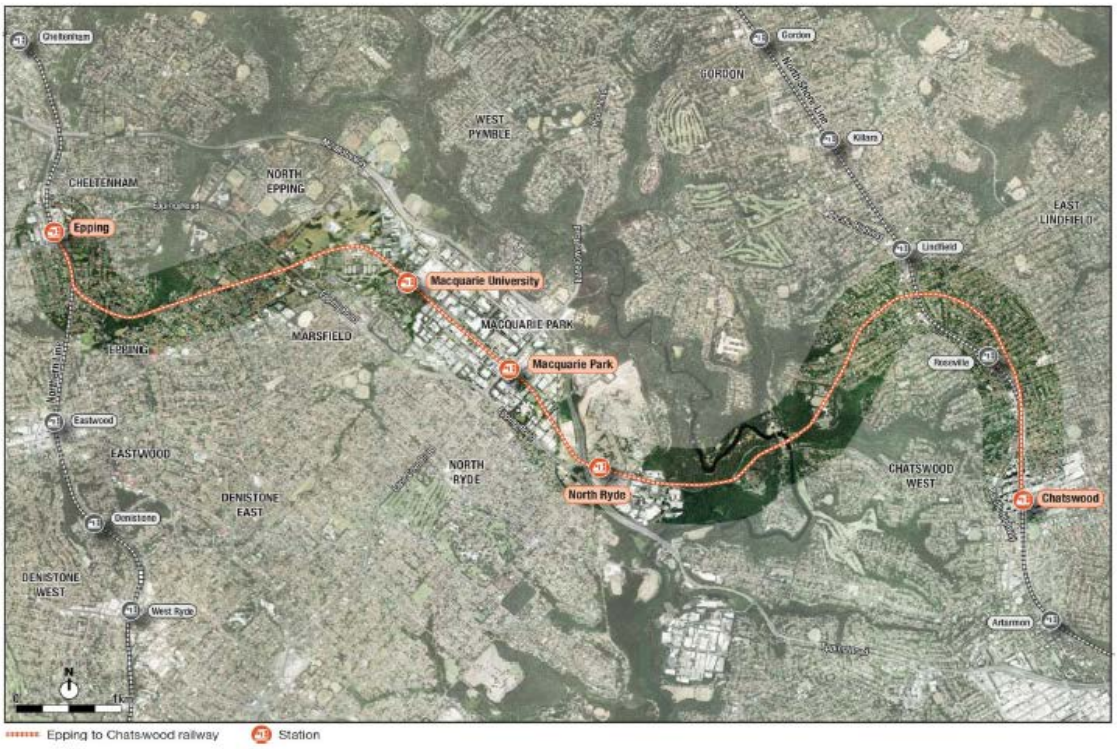


Figure 3 Indicative ECRL Conversion Works Area

Phase 2 Works refer to the construction of:

- New railway stations and precincts at Rouse Hill, Kellyville, Bella Vista, Norwest, Showground, Castle Hill and Cherrybrook (connecting to the Phase 1 works to the west and ECRL conversion works to the south-east.
- Services facilities at Cheltenham and Epping
- Rail infrastructure and systems
- Infrastructure such as road works, pedestrian/cycle facilities, landscaping associated with construction of precincts and stations.

The scope of Phase 2 Works is illustrated in Figure 4 Figure 2 below.

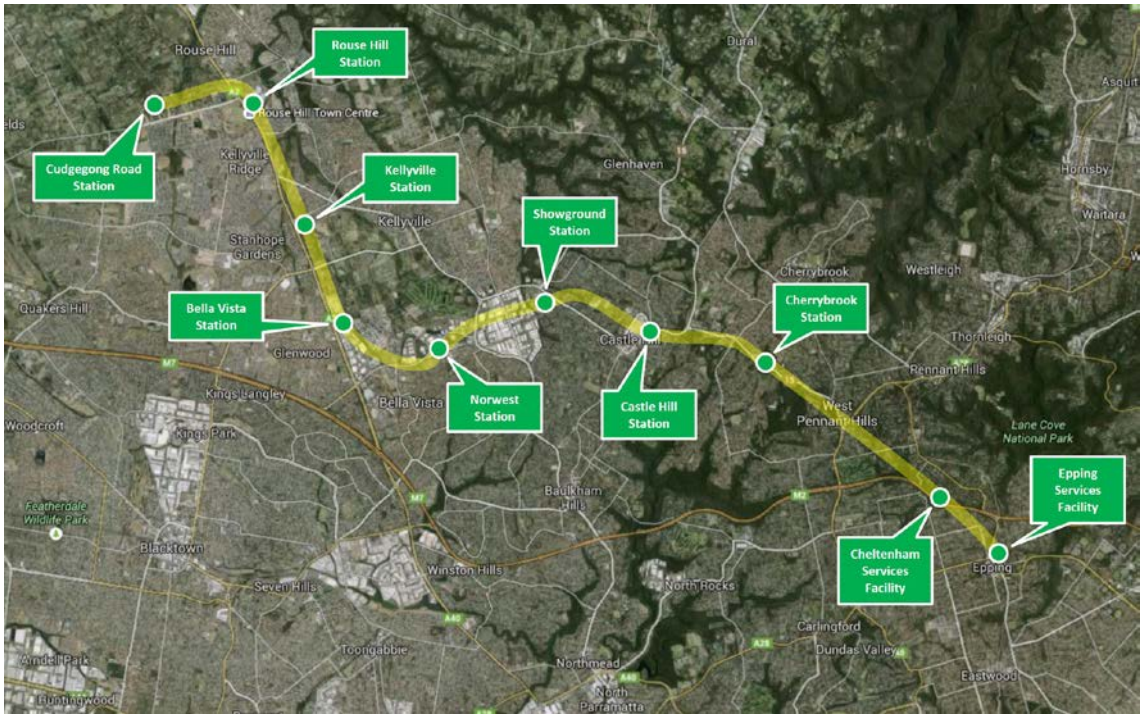


Figure 4 Indicative NWRL OTS Phase 2 Works Areas

Norwest Pedestrian Link works refer to the installation of an underground pedestrian link and second station entry on the northern side of Norwest Boulevard at Norwest Station. See Figure 5 below.

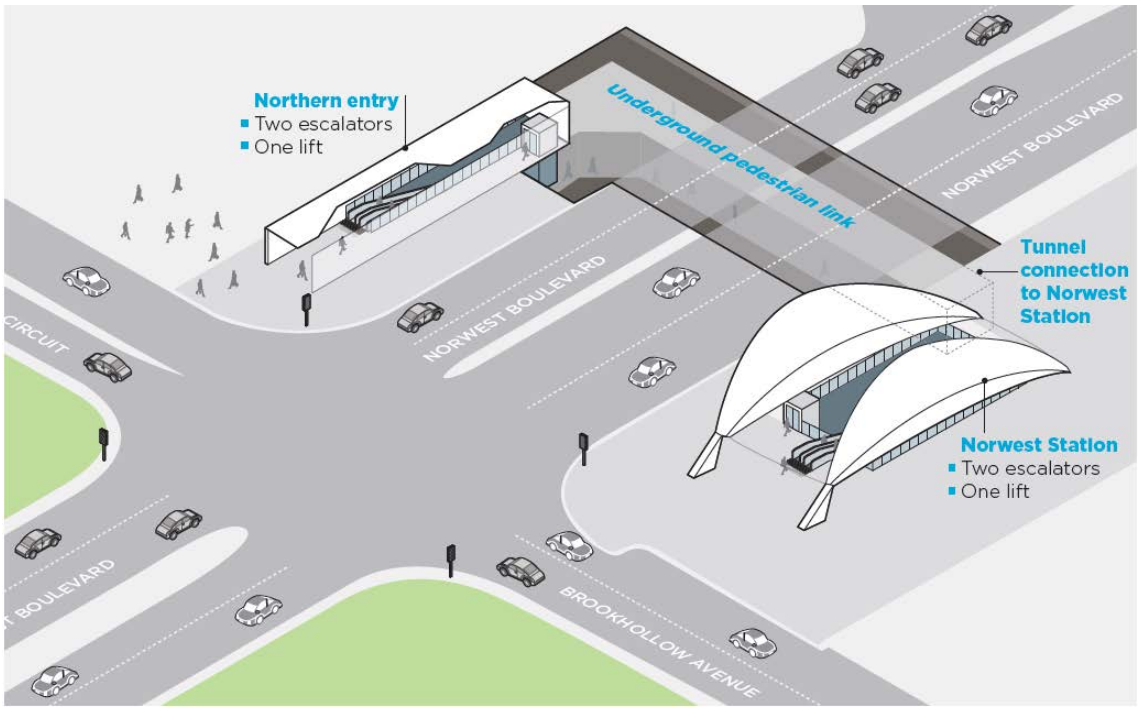


Figure 5 Artist Impression of the Underground Pedestrian Link

The 33kV Underground Feeder Powerline works refer to the building and maintaining a new five kilometre 33kV feeder power line between Ausgrid's Willoughby Subtransmission Substation and the TfNSW Chatswood North Traction Substation.

The proposal is required to provide dedicated, independent 33kV connection in order to meet the reliable supply of electricity requirements for this project. See Figure 6.

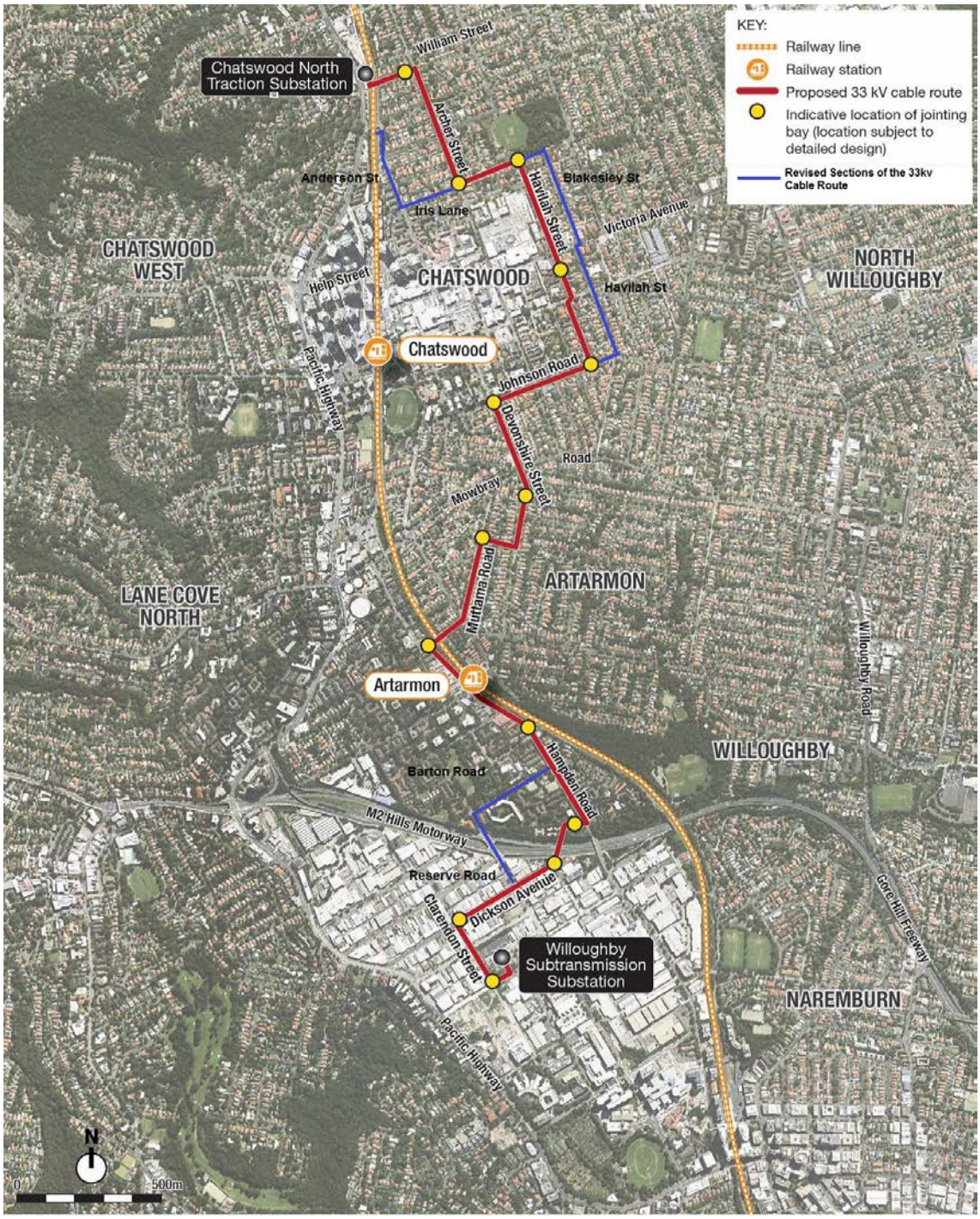


Figure 6 Overview of the 33kV Underground Feeder Powerline Route

The Rouse Temporary Bypass Powerline involves the construction of a temporary powerline from the southern side of the Sydney Metro Windsor Road Bridge crossing Schofields Road, running underground through Castlebrook Memorial Park transitioning back to overhead and crossing Windsor Road to the Rouse Hill traction substation located south of Sanctuary Drive. The purpose of the temporary powerline is to enable energisation and commissioning of the rail systems associated with the construction of Sydney Metro Northwest. See Figure 7 below.

Figure 7 Rouse Temporary Bypass Powerline Work Area

Specifically, this Sub Plan:

- Describes the legislative framework specific to Soil and Water Issues
- Defines the procedures that will be implemented by NRT to ensure there are no adverse impacts on the environment due to soil and water management
- Identifies potential for the reuse and recycling of water during the construction process
- Defines procedures for monitoring, checking and implementing corrective actions in the event of an unacceptable impact.

This Plan is a Sub Plan of the Phase 1, ECRL Conversion, Phase 2, Norwest Pedestrian Link and the 33kV Underground Feeder Powerline Construction Environmental Management Plan (CEMP). The relationship of this Plan to other NRT Plans is described in detail below in Section 1.4

1.3 Scope and Objectives

This CSWMP addresses the following requirements:

- OTS Project Deed, Operations, Trains and Systems, Exhibit 1, Scope and Performance Requirements, Appendix 54 – Project Plan Requirements, Section 3.17
- Project Planning Approval – Rapid Transit Rail Facility (ref SSI-5931)
- Project Planning Approval (and Modification 20 May 14) – NWRL Stage 2 – Stations, Rail Infrastructure & Systems (SSI-5414) – applicable to NWRL OTS works, as defined in Staging Report
- ECRL Conversion Determination Report Conditions of Approval

- Applicable Revised Environmental Mitigation Measures from Project EISs:
  - Environmental Impact Statement 2 (EIS2) and Submissions Report (including – NWRL Stage 2 Stations, Rail Infrastructure and Systems (2012/3)
  - Environmental Impact Statement and Submissions Report – Tallawong Road, Rouse Hill Rapid Transit Rail Facility (RTRF, 2013)
- ECRL Conversion Review of Environmental Factors (Parsons Brinkerhoff, 10 October 2014) and Submissions Report (Parsons Brinkerhoff, 5 February 2015)
- Norwest Pedestrian Link Review of Environmental Factors (Parsons Brinkerhoff 4 June 2015) and Submissions Report (Parsons Brinkerhoff, 1 October 2015)
- Norwest Pedestrian Link Determination Report Conditions of Approval
- Willoughby to North Chatswood 33kV Underground Feeder Powerline Review of Environmental Factors (Parsons Brinkerhoff 20 October 2015) and Submissions Report (Parsons Brinkerhoff 9 March 2016)
- 33kV Underground Feeder Powerline Determination Report Conditions of Approval
- Rouse Hill Temporary Bypass Powerline Environmental Impact Assessment (EIA)
- NWRL Construction Environmental Management Framework (Rev 1.4)
- Applicable Legislative Obligations.

The Compliance Matrix in Annexure B details how the CSWMP complies with the requirements of the applicable CoAs requiring the Plan to be prepared, consulted and approved. Annexure B provides a comprehensive list of compliance requirements, environmental documents and the contract documents. Additional detail on compliance management is also contained in Section 2.2.

NRT's soil and water management objectives & targets for the delivery of the Phase 1, ECRL Conversion Phase 2, Norwest Pedestrian Link, 33kV Underground Feeder Powerline Works and Rouse Hill Temporary Bypass Powerline Works of the OTS Contract are:

Prevent pollution of surface water through appropriate erosion and sediment control

- Maintain existing water quality of surrounding surface watercourses
- Source construction water from non-potable sources, where feasible and reasonable
- Reduce the potential for drawdown of surrounding groundwater resources
- Prevent the pollution of groundwater through appropriate controls
- Reduce the potential impacts of groundwater dependant ecosystems.

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

1.4 NRT Environmental Management System

In accordance with the OTS Project Deed, Exhibit 1, Scope and Performance Requirements, Section 5.2, NRT must implement and maintain an effective Management System, which addresses all its obligations under the Deed.

The Management Systems must seamlessly integrate all NRT's systems and processes, including those related to rail safety and rail accreditation quality, environmental, sustainability, health and safety and they must accommodate, coordinate and give effect to the Project Plans.

Details of NRT's Integrated Management System including the integrated relationship of the CSWMP with the other Project Plans and with the delivery Core Processes are contained in the Project Management Plan [LINK]. As improvements are made to the processes and systems, these will be reflected in updates to the relevant Project Plans. All elements of the Integrated Management System will reside on Aconex as controlled copies. An intranet will contain a front page to the Integrated Management System with links between documents, processes and forms utilising the Aconex search engine.

1.5 Approval Before Submission

The *CSWMP* and future updates are to be approved by NRT's CEO before being submitted to TfNSW.

1.6 Certification by Independent Certifier

This updated CSWMP and any future update is to be submitted, in accordance with the provisions of clause 8 [LINK] of the Deed, to TfNSW for comment and to the OTS Independent Certifier for certification prior to its implementation by NRT.

1.7 Update and Ongoing Development

The *CSWMP* is incorporated as Appendix 76 of the Deed.

The *CSWMP* will be updated regularly in accordance with the requirements of the *Deed,* clause 8 and annually as required in *Exhibit 1, Scope and Performance Requirements, Appendix 54 – Project Plan Requirements, Table 1.*

NRT will undertake the ongoing development, amendment and updating of the *CSWMP* to ensure it remains consistent with Project priorities, risk management, client requirements and Project objectives, taking into account:

- The status and progress of NRT'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 Plans resulting from any comments from the OTS Independent Certifier
- Changes to Project Plans as directed by TfNSW's Representative under the Deed.

1.8 Agency and Stakeholder Consultation

1.8.1 Phase 1 Works

The Minister's Conditions of Approval requires that the CSWMP be prepared in consultation with the NSW Office of Water (NOW). As this plan also contains the water quality monitoring programs required, consultation was also undertaken with DPI (Fishing and Aquaculture) and Blacktown City Council.

Further, the Plan is required to be approved by the Department of Planning & Environment (DP&E) prior to construction as part of the CEMP.

Annexure A details the comments received during this consultation process and NRT's response. It is noted that these stakeholders will have an ongoing role in the reviewing relevant subsequent Plans and documents relating to the NRT's works.

1.8.2 Phase 2 Works

As per Phase 1 Works, the Minister's Conditions of Approval requires that the CSWMP revised for Phase 2 Works be prepared in consultation with the NSW Office of Water (NOW). As this plan also contains the water quality monitoring programs required, for Phase 2 works, consultation was also undertaken with DPI (Fishing and Aquaculture), Blacktown City Council, The Hills Shire Council and Hornsby Shire Council.

Furthermore, the Plan is required to be approved by the Department of Planning & Environment (DP&E) prior to construction as part of the CEMP.

Annexure A details the comments received during this consultation process and NRT's response. It is noted that these stakeholders will have an ongoing role in the reviewing relevant subsequent Plans and documents relating to the NRT's works.

No further consultation was required for any updates of this plan for approvals under Part 5 of EP&A Act.

2 Legal and Other Requirements

2.1 Relevant Legislation

Key legislation relevant to soil and water management includes:

- *Environmental Planning and Assessment Act 1979*
- *Contaminated Land Management Act 1997*
- *Protection of the Environment Operations Act 1997*
- *Water Management Act 2000*

Refer to the CEMP for details of the relevant legislation.

Environment Protection Licence (EPL) No. 20544 issued under the POEO Act for the OTS Works includes a number of conditions relevant to soil and water management, which may be varied during construction. The POEO Act defines waters as the whole or any part of:

- Any river, stream, lake, lagoon, swamp, wetlands, unconfined surface water, natural or artificial watercourse, dam or tidal waters (including the sea), or
- Any water stored in artificial works, any water in water mains, water pipes or water channels, or any underground or artesian water.

Section 120 of the *Protection of the Environment Operations Act 1997* states that it is illegal to pollute waters. Under this Act, 'water pollution' includes introducing litter, sediment, oil, grease, wash water, debris, and flammable liquids such as paint etc. into waters or placing such material where it is likely to be washed or blown into waters or the stormwater system or percolate into groundwater. All practicable steps are to be taken to minimise the risk of pollution of waters.

2.2 Compliance Requirements

Soil and water management requirements from the Project Deed, Project Approval and Revised Environmental Management Measures are included in Annexure B.

All compliance requirements pertinent to this Sub Plan are tracked and reported via the Compliance Tracking Program developed in accordance with CoA D5((a)-(h)).

2.3 Relevant Guidelines

Additional guidelines and standards relating to the management of soil and water 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').

- ANZECC (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (collectively known as the ‘ANZECC Guidelines’).
- ANZECC (2000). Australian and New Zealand Guidelines for Water Quality Monitoring and Reporting (collectively known as the ‘ANZECC Guidelines’).
- NSW Fisheries (2004). Guidelines for Controlled Activities, Policy and Guidelines for Fish-Friendly Waterway Crossings.
- NSW Fisheries (1999). Policy and Guidelines for Design and Construction of Bridges, Roads, Causeways, Culverts and Similar Structures.
- ASSMAC (1998). Acid Sulfate Soil Manual. Acid Sulfate Soil Management Advisory Committee, NSW.
- Transport for NSW’s Water Discharge and Re-use Guideline.

3 Roles and Responsibilities

3.1 Key NRT Personnel

The roles and responsibilities of key NRT Personnel with respect to soil and water are as follows:

Table 1 Roles and Responsibilities

Project Director	Managing the delivery of the NRT Works including overseeing implementation of soil, water and groundwater management measures Act as Contractor's Representative
Environment Manager	Oversee the implementation of all soil, water and groundwater management initiatives Responsible for managing ongoing compliance with the CoA and environmental document requirements
Commercial Manager	Ensure that relevant soil, water and groundwater management requirements are considered in procuring materials and services
Construction Managers Site Superintendent	Manage the delivery of the construction process, in relation to soil, water and groundwater management across all sites in conjunction with the Environment Manager
Sustainability Manager	Track and report soil and water elements against sustainability targets
Environment Coordinator	Manage the on-ground application of soil and water management measures during construction (e.g. erosion and sediment control, water treatment and monitoring) Monitor and report on soil and water management during construction
Project Engineer	Implement soil and water management activities during construction works
Specialist Consultant	Specialist consultants will be engaged to undertake investigations and respond to unexpected finds

3.2 Soil Conservationist

A specialist soil conservationist has been engaged to provide expert advice which has been incorporated into this Plan. They will continue to provide specialist advice and services in the development and implementation of this plan to ensure that impacts can be avoided, minimised or appropriately mitigated including:

- Development and sign-off as a Certified Professional in Erosion and Sediment Control (CPESC) of a Primary Erosion and Sediment Control Plan, from which Progressive ESCPs will be generated
- Providing input into design of erosion and sediment controls
- Providing input into the design and implementation of surface cover, surface treatments and stabilisation controls

- Reviewing plans for erosion and sediment controls and advising on the proposed strategy for erosion and sediment control and use of new technologies (where appropriate) regarding construction-phase soil and water management
- Conducting regular site inspection with environmental and construction personnel to review performance, recommend improvements and advise on potential enhancements
- Providing training to all key staff regarding erosion and sediment control. This will include legislative requirements, the application of best-practice (i.e. Blue Book Volumes 1 and 2), correct use, maintenance and installation of erosion and sediment control techniques.

4 Existing Environment

4.1 Phase 1 Works

4.1.1 Existing Soil Landscape

The published 1:100,000 series Soil Landscape maps for Sydney (sheet 9130) and Penrith (sheet 9030) indicate that the project area is underlain by the Blacktown Soil Landscape, defined by the former Department of Land and Water Conservation.

Soils in the Blacktown Landscape occur on low undulating terrain on the Wianamatta Group shales. They are generally moderately deep (1.0 m) red and brown podsols. These soils are moderately reactive, highly plastic and generally poorly drained.

4.1.2 Geology

The project area is characterised by a sub-horizontally lying Permo-Triassic sedimentary sequence and is shown within the Regional Geological Map GSNSW (1991) to be underlain by Bringelly Shale. Bringelly Shale consists of undifferentiated shale, carbonaceous claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff of the Wianamatta group.

The results of test pitting conducted during preparation of the EIS indicate that Minchinbury Sandstone underlies the site. The test holes indicate the material is variably weathered across the site with some test holes encountering weathered fine grained sandstone to 5m and 7m depth. Deeper bulk excavations and the detailed excavations for foundations are likely to extend into fresh Mulgoa Laminite.

4.1.3 Groundwater

The regional water table within the Hawkesbury Sandstone is affected by the beds of low lying permanently flowing streams in the Beecroft / Castle Hill area. The water table rises away from these watercourses, following the topography but in a more subdued fashion deep between ridges, shallow close to streams. The level of the water table may fluctuate by several metres between wet and dry seasons, especially beneath ridges. Recharging water is believed to enter the system along the upper, non-perennial tributaries of these streams, and to ultimately discharge at sea level.

The North West Rail Link Geotechnical Data Report (AECOM, 2012) installed two monitoring wells adjacent to Tallawong Road and Cudgegong Road. Groundwater levels measured at the highest part of the site (on the Tallawong Road boundary) were measured to be between 13 m and 18 m deep. Groundwater flow is expected to be north westerly towards First Ponds Creek and Eastern Creek.

Several other groundwater bores were identified in the vicinity of the site as shown in Figure 8. Two of these are located immediately down gradient of the site. The nature and extent of the groundwater bores is unknown and no information was available at the time of searching.

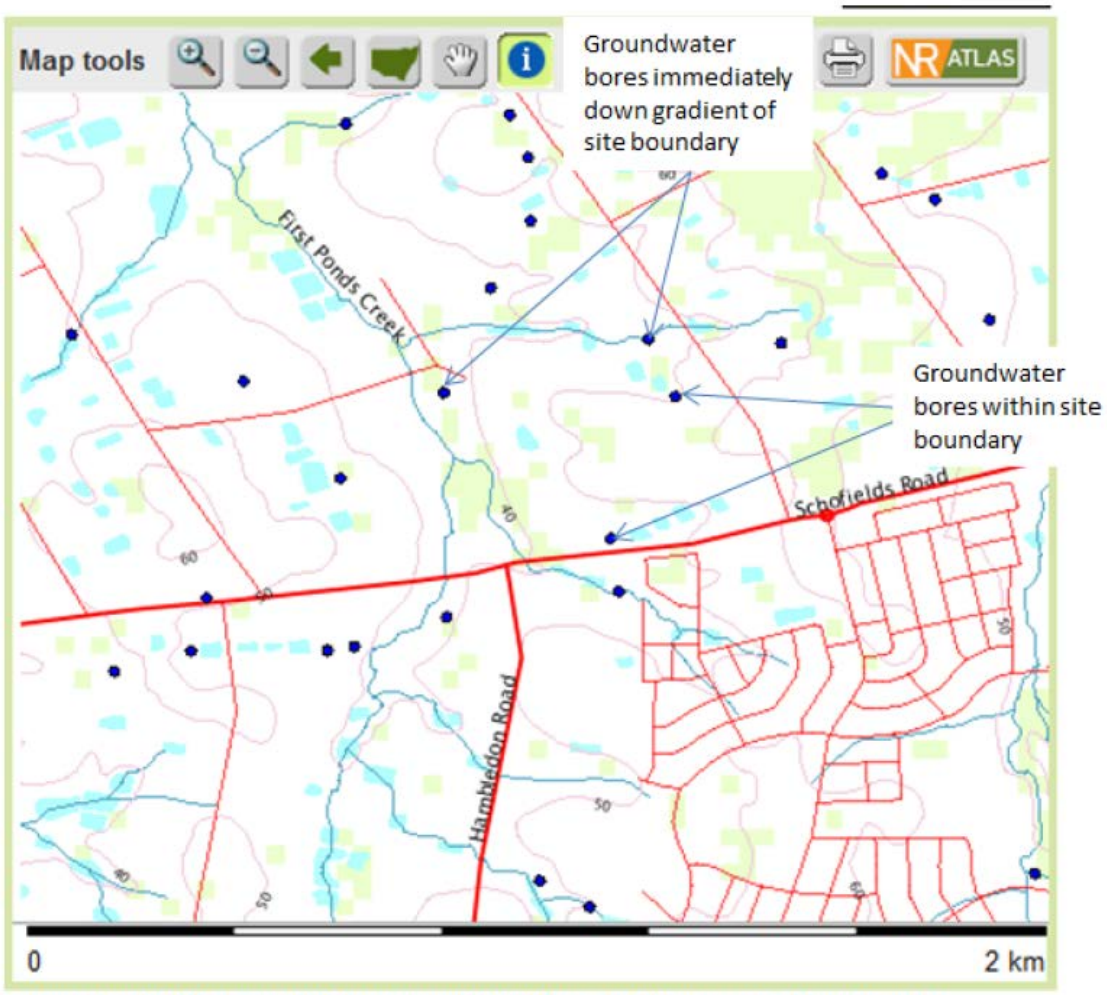


Figure 8 Groundwater Bores

4.1.4 Salinity

NRT engaged Environmental Earth Sciences to conduct a Salinity Assessment in accordance with Condition C35 (SSI-5414) and C9 (SSI-5931). This assessment was undertaken to establish the following information:

- Identify areas of surface salinity in relation to plant phytotoxicity
- Identify the sodicity of the soil in surface locations onsite
- Identify likely exposure classification for concrete
- identify likely concrete strength required for potential development on the site.

Based on the salinity risk maps it is evident that if saline conditions in soil exist they may be at depth. Data gaps do exist in the lack of sub-surface observations and supportive chemical data. There was only one area on site which indicated potential saline conditions with this being in plot No.1 (adjacent to the First Ponds Creek channel). Pooled water was observed in this area that could indicate poor drainage conditions.

The results of Electrical Conductivity (EC) from surface soil testing generally indicated a negligible potential salinity rating. Soil aggressively testing for sulfate in surface soils indicated that all surface areas of the site had a “non-aggressive” rating.

4.1.5 Acid Sulfate Soils

Review of the NSW Natural Resource Atlas acid sulfate soils risk maps for coastal NSW, (http://nratlas.nsw.gov.au; verified 26 April 2014) shows the site is located in an area of no known occurrence of acid sulfate soils.

Further evidence supporting this conclusion is the fact that the site is generally located in a topographically high area (~50 m above sea level), where acid sulfate soils do not occur.

For comparison, acid sulfate soils typically occur along river or creek banks and subsurface, where fine grained sediments are deposited.

4.1.6 Surface Water

The RTRF site exists to the east of Second Ponds Creek. Second Ponds Creek has an upstream catchment area in the order of 620 hectares. The catchment has undergone significant urban development over recent years. Parts of the catchment, particularly in the immediate vicinity of the Project corridor, are largely undeveloped and consists mainly of rural residential. Urban development in the catchment is ongoing.

The western edge of the site between Tallawong Road and Cudgegong Road borders on a tributary of First Ponds Creek. The tributary drains a catchment area of approximately 55 hectares to the south of the project corridor. The junction with First Ponds Creek is approximately 150m further downstream (to the north) at which location the catchment area draining to First Ponds Creek is approximately 300 hectares. The First Ponds Creek catchment is currently largely undeveloped, consisting of rural residential development. Future urbanisation is proposed as part of the Alex Avenue Precinct.

Figure 9 below shows the watercourses adjacent to the work site.

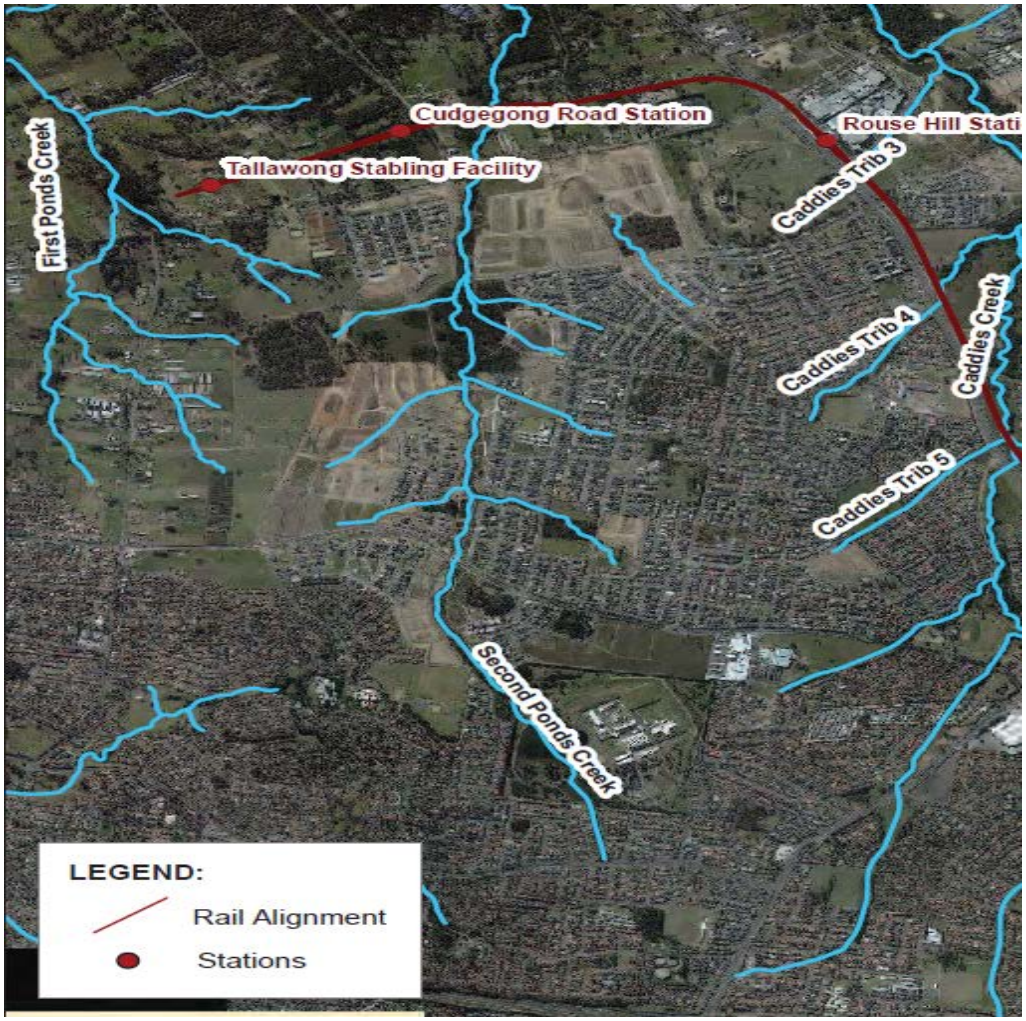


Figure 9 Watercourses near the Site

Note – Tallawong Stabling Facility is now the SMTF.

4.1.7 Water Quality

The Hawkesbury-Nepean River Environmental Monitoring Program (DECC 2009) describes current water quality within the wider Hawkesbury-Nepean River System as poor due to sewage treatment plant discharges as well as uncontrolled pollution from urban and agricultural runoff. Water quality monitoring in First Ponds Creek collected between 2008 and 2011 by Blacktown City Council at the Windsor Road Bridge in Riverstone (approximately 4.2 kilometres north-west and down-gradient of the RTRF site) was compared with ANZECC (2000) water quality investigation trigger values for the protection of fresh water ecosystems in lowland rivers in eastern Australia. The results were considered to be representative of the water quality in First Ponds Creek at the RTRF site given the consistency of the rural land use within the catchment upstream of the RTRF, and between the RTRF site and sampling location.

The water quality data indicates that downstream of the RTRF site, First Ponds Creek is heavily impacted with mean concentrations for Total Nitrogen (TN) over four times the investigative trigger value (500µg/L) and Total Phosphorus (TP) over eight times the trigger value (50µg/L). Mean concentrations of Dissolved Oxygen (DO) were also outside the acceptable limits.

No data was available for Second Ponds Creek.

4.1.8 Flooding

The First Ponds Creek 100 year Average Recurrence Interval (ARI) flood extent is shown to have a variable width of between 140 to 250 metres adjacent to the RTRF site with a typical width of approximately 160 metres. The 100 year ARI flood extents are wider than the riparian corridor but do not encroach into the site as shown in Figure 10.

The Probable Maximum Flood (PMF) extent ranges in width between approximately 200 and 300 metres adjacent to the RTRF site with a typical flood width of 210 metres. The PMF has been shown to cross into the RTRF site at the very northern and southern extents of the site as shown in Figure 10.

The site between Cudgegong Road and Tallawong Road is located above the PMF level and so the risk of flooding from Second Ponds Creek is low, as shown in Figure 11.

The site was largely undeveloped and contained a number of drainage lines and depressions that currently convey overland flows through the site.

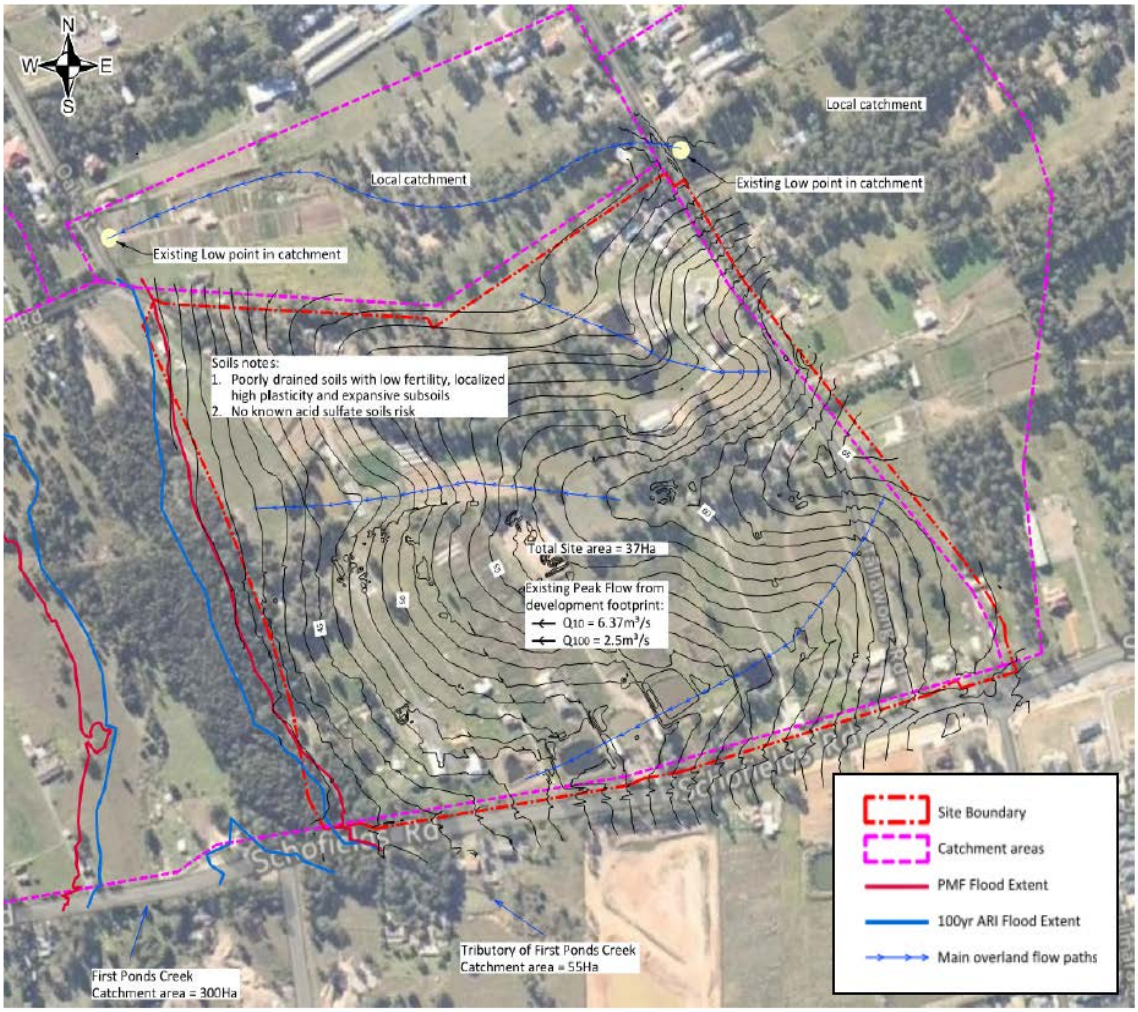


Figure 10 Flooding Extents – RTRF Site (From RTRF EIS)

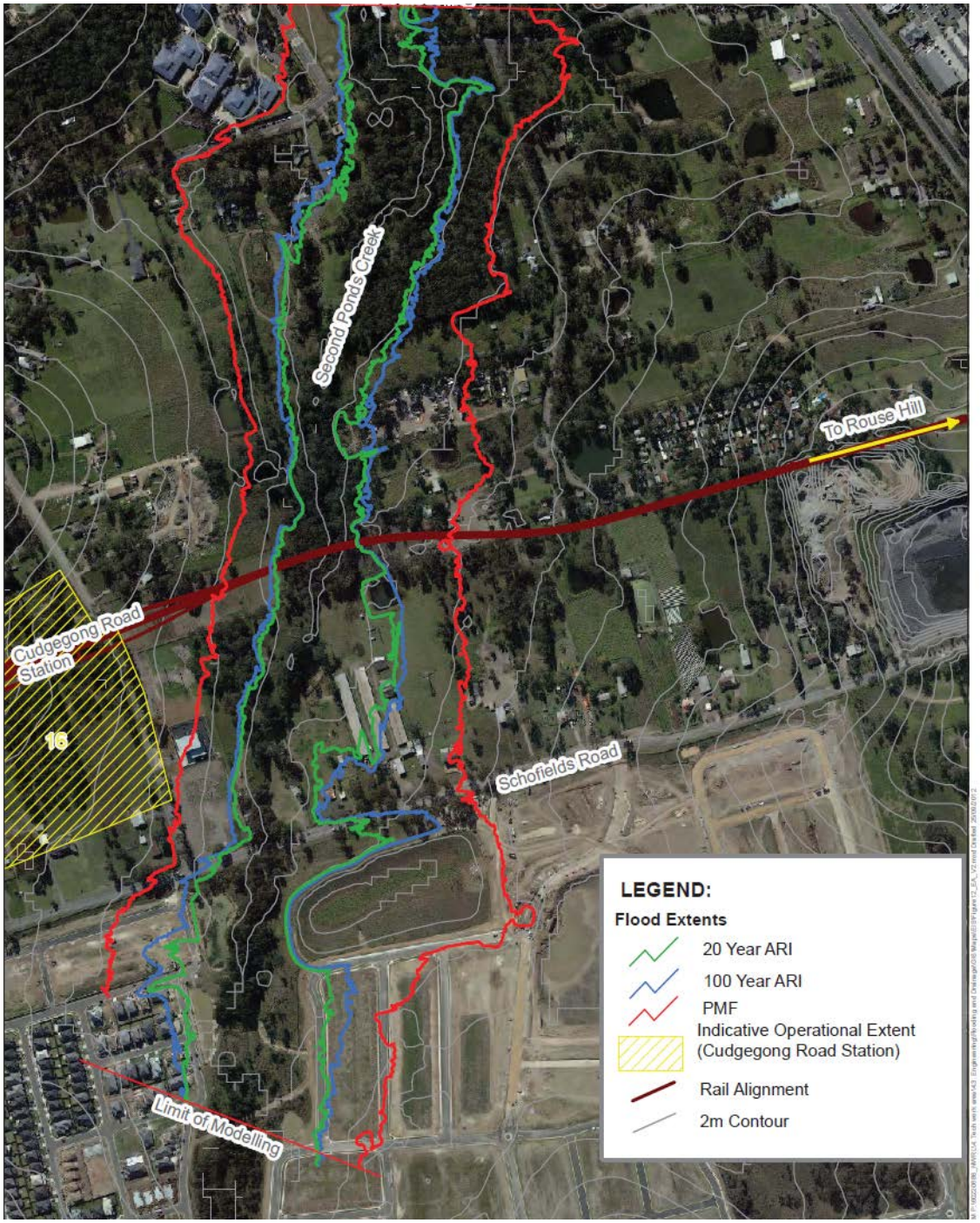


Figure 11 Flooding Extents – Cudgegong Road Precinct (from EIS 2)

4.1.9 Contamination

4.1.9.1 EIS Assessment

A field and laboratory program was completed as part of EIS 2 to assess the identified Areas of Environmental Concern (AEC) and Contamination of Potential Concern (CoPC) at selected accessible areas, utilising the geotechnical sampling points.

A summary of the assessment is detailed in Table 2 below.

Table 2 Contamination Assessment

Area of environmental concern	Medium	Assessment summary
RTRF	Soil	The RTRF site comprises predominately market gardens and farm paddocks in semi-rural allotments. Properties which store minor amounts of waste material such as stockpiles of metal and soil and undertake machinery maintenance. Concentrations of CoPC in the soil samples analysed were generally detected below the limits of reporting (LORs) or typical of background concentrations indicating that there is no broad scale contamination across the site. The contamination assessment has not specifically targeted all of the Areas of Environmental Concern i.e. individual above-ground storage tanks (AST), farm dams, and asbestos in buildings. However, contamination, if present, is likely to be in localised areas limited to the near surface soil.
	Groundwater	Concentrations of CoPC in groundwater samples analysed were generally typical of background concentrations. One borehole located immediately adjacent to Tallawong Road showed exceedences of the assessment criteria for Nickel, Zinc and Copper. It is highlighted that concentrations of Nickel and Copper are below the typical values for road run-off. In the same borehole, concentrations of sodium, chloride and TDS (Total Dissolved Solids) were reported above the adopted criteria but are considered to be representative of slightly saline groundwater conditions typical in the formations in Sydney.
Tallawong Road to Cudgegong Road	Soil	The site is similar in nature to the RTRF site. The contamination assessment at this stage was not comprehensive and not all of the Areas of Environmental Concern in this area were specifically targeted, i.e. individual above-ground storage tanks, farm dams and asbestos in buildings. Additional assessment and waste classification may be required.
	Groundwater	Concentrations of CoPC in groundwater samples analysed were generally typical of background concentrations.

4.1.9.2 Further Assessment

NRT engaged Environmental Earth Sciences to complete a further contamination assessment in accordance with Condition C13 (SSI-5931) and C42 (SSI-5414).

The soil investigation comprised of a detailed site inspection of each individual plot, collecting detailed descriptions, photographs, and documenting any features which may have constituted sources of potential contamination. See Figure 12.

Source – Google Earth December 2014

Legend

Approximate site boundary

P1 Plot Numbers based on Lot and DP identification

Nearest sensitive receptor - First Ponds Creek

ENVIRONMENTAL EARTH SCIENCES

Title: Assessment plot locations

Location: Schofields, NSW

Client: John Holland		Job No: 114071
Drawn By: SG	Scale: NTS	Source: Google
Proj Man: CN	Date: Dec 2014	Figure 4

Figure 12 Investigation Locations – Phase 1 Works

A soil and surface water sampling programme was then conducted based upon the diagnostic review and observations made during the site inspection.

There was no evidence of any current or historical industrial land uses on site and hence sources of contamination. Potential non-industrial sources of contamination identified during the investigation include the following:

- Asbestos containing materials – derived from the use of hazardous building materials used within the fabrication of domestic structures, and the demolition of such structures leading to potential residual impact upon surface soils namely in the location of the former building footprints
- Farm waste dumps/stockpiles – containing wastes derived from demolition of domestic structures, agricultural and small scale farming activities
- Domestic waste oil or chemical containers – derived from agricultural and small scale farming activities
- Illegal dumping (fly-tipping) of waste material along roadways and site boundaries.

Thirty three (33) surface soil samples and eleven (11) stockpile samples were collected from the across the investigation area.

A summary of the inspection findings are contained below in Figure 13.

Source – Google Earth December 2014

Legend

- Farm demolition waste
- Asbestos containing materials observed in stockpiles or former building footprints
- Observed oil staining or chemical containers

ENVIRONMENTAL EARTH SCIENCES	Title: Summary of Site Inspection Findings	
	Location: Schofields, NSW	
Client: John Holland		Job No: 114071
Drawn By: SG	Scale: NTS	Source: Google
Proj Man: CN	Date: Dec 2014	Figure 3

Figure 13 Contamination Assessment Findings – Phase 1 Works

Site specific EILs (Ecological Investigation Levels) for arsenic, copper, lead, nickel, zinc, naphthalene and DDT in accordance with method described Schedule B5c of the National Environment Protection (Assessment of Site Contamination) Measures (NEPMs were derived.

Laboratory analytical results for all samples reported concentrations either below laboratory limit of reporting and/or below the EILs derived above with the exception of the following:

- Plot No. 6:
  - Chromium at 67 mg/kg exceeded the adopted criterion of 28 mg/kg
  - Nickel at 29 mg/kg exceeded the adopted criterion of 17 mg/kg
  - Zinc at 3470 mg/kg exceeded the adopted criterion of 155 mg/kg.
- Plot No. 18:
  - Copper at 282 mg/kg exceeded the adopted criterion of 44 mg/kg
  - Nickel t 34 mg/kg exceeded the adopted criterion of 17 mg/kg.
- Plot No. 24:
  - Copper at 45 mg/kg exceeded the adopted criterion of 44 mg/kg
  - Nickel at 24 mg/kg exceeded the adopted criterion of 17 mg/kg
  - Zinc at 158 mg/kg exceeded the adopted criterion of 155 mg/kg.

Thirteen samples of material suspected of containing Asbestos Containing Material (ACM) were collected and submitted for the identification of presence/absence. ACM was positively identified in eight samples in Plots 4, 5, 13, 19 and 25 (see Figure 13).

Laboratory analytical results for all surface water samples were reported either below laboratory limit of reporting and/or below the adopted Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resources Management Council of Australia and New Zealand (ARMCANZ) guidelines with the exception of the following samples and analytes:

- Plot No. 1 – Farm Dam:
  - Aluminium at 0.08mg/l exceeded the adopted criterion of 0.055mg/L
  - Copper at 0.004mg/l exceeded the adopted copper criterion of 0.002mg/L.

The copper trigger value was adjusted for hardness in accordance with the method set out in table 3.4.3 of ANZECC & ARMCANZ (2000).

The groundwater bore search indicates that with the exception of localised temporal groundwater above the weathered shale, groundwater is likely to be represented by the regional aquifer confined in fractured shale and sandstone at depths >15 m. Yield was recorded in GW108452 at 1.35 L/minute, which is considered to be low. Furthermore, the presence of the boreholes in Wianamatta Shale indicates that the salinity of the water may have been elevated beyond levels necessary for consumption.

The NSW DEC (2007) Guidelines for the Assessment and Management of groundwater Contamination, intrusive investigations are considered unnecessary where groundwater is present at depths greater than 15 m below the ground surface

where the natural background quality of the groundwater is poor and the groundwater yield is low.

4.2 ECRL Conversion Works

4.2.1 Existing Environment

The works would be carried out within the existing Epping to Chatswood railway corridor and station precincts. Each of the Epping to Chatswood railway corridor and existing station precincts are entirely constructed environments that would be undergoing modifications. At these locations, no significant earthworks or highly disturbing construction activities would be undertaken. Thus no assessment of the existing soil environment or soil contamination potential is relevant to these developed areas.

4.2.2 Contamination

Given that the works undertaken within the Epping to Chatswood railway rail corridor and at station precincts will primarily involve the removal and replacement of electrical, communication and signalling systems and minor track modifications, no significant disturbance to ground surfaces are anticipated within the Epping to Chatswood railway corridor. In addition the works within the corridor will be undertaken within existing developed hardstand areas and will not involve works within soils or exposed surfaces. As a result, the potential for contamination of soils is considered to be low.

Some support structure(s) and ground slabs would be required for the proposed chiller units at Epping, Macquarie Park and North Ryde stations. These supports would require some, minor excavation works. As the amount of excavation required is minimal, the potential for impacting upon contaminated soils is considered to be low.

4.3 Phase 2 Works

NRT's Phase 2 will consist of work on the remainder of the project area. NRT will progressively take over sites that were previously occupied and disturbed by the Tunnel and Stations Civil (TSC) Works and Surface and Viaduct Civil (SVC) Works contractors. Information and reports prepared by the other packages have been used in this section where the information has been made available to NRT.

4.3.1 Existing Soil Landscape

The published 1:100,000 series Soil Landscape maps for Sydney (sheet 9130) and Penrith (sheet 9030) indicate that the proposed NWRL route corridor is underlain by three categories of soil landscape, defined by the former Department of Land and Water Conservation.

Five soil groupings are crossed being the Glenorie, West Pennant Hills, Hawkesbury, Luddenham and Blacktown landscapes. The five soil landscapes above comprise the following classifications:

- Residual (Glenorie, Blacktown and Hawkesbury Soil Grouping)
- Colluvial (Hawkesbury Soil and West Pennant Hills Grouping)
- Erosional (Luddenham Soil Grouping).

4.3.2 Geology

The NWRL corridor is situated in the north-west of Sydney, in the Sydney Basin, which is characterised by a sub-horizontally lying Permo- Triassic sedimentary sequence. The published 1:100,000 series geological maps for Sydney (sheet 9131) and Penrith (sheet 9030) indicate the proposed route corridor is underlain by Wianamatta Group rocks and the older Hawkesbury Sandstone Formation. The Mittagong Formation separates the two major units across much of the Sydney Basin.

The centre of the Sydney Basin is commonly identified as the Fairfield Basin where the greatest thickness of the sedimentary sequence has been encountered. The Fairfield Basin is located to the west and south of the proposed NWRL alignment, resulting in a general regional dip of up to 3° to the south west. The alignment passes close to the structural features known as the “Hornsby Warp”, a tectonic feature known to have resulted in localised faulting and/or folding, the ‘Roseville Warp’ and the Dural Dome.

The stratigraphic units to be encountered along the length of the NWRL will comprise the Bringelly Shale, Minchinbury Sandstone, Ashfield Shale, Mittagong Formation and Hawkesbury Sandstone Formation.

Igneous dykes and breccia diatremes of Jurassic Age are sparsely distributed throughout the Sydney Region, with the Sydney 1:100,000 Geology Sheet (9131) indicating the presence of 25 diatremes and over 100 dykes. The dykes within the Sydney region generally consist of linear basaltic rock bodies, typically less than 3m wide intruded into the surrounding country rock. The dykes are typically extremely weathered and altered to white kaolinitic clay to a depth of some 10m to 20m below ground level.

4.3.3 Groundwater

Groundwater resources in the area traversed by the route between Epping and Bella Vista are limited. The Ashfield Shale does not provide useful groundwater and the Hawkesbury Sandstone typically provides limited useful groundwater yield. The NSW Natural Resource Atlas provides access to a list of registered groundwater bores. The registered groundwater bores within 1 and 2 km of each of the station and shaft locations are shown in Figure 14Figure 14. There are six groundwater bores within 1 km of the project that are registered for domestic or irrigation purposes:

- One near Bella Vista – GW100981, 102 m deep
- One near Norwest – GW019837, 48.7 m deep
- One near Castle Hill – GW106144, 240 m deep
- Two near Cherrybrook – GW105750, 126.5 m deep and GW107347, 195 m deep
- One near the Epping Services Facility – GW028354, 103.6 m deep.

Considering the distance from the stations and shafts and the depth of the bores, by inspection, there are not expected to adversely impact on existing groundwater users.

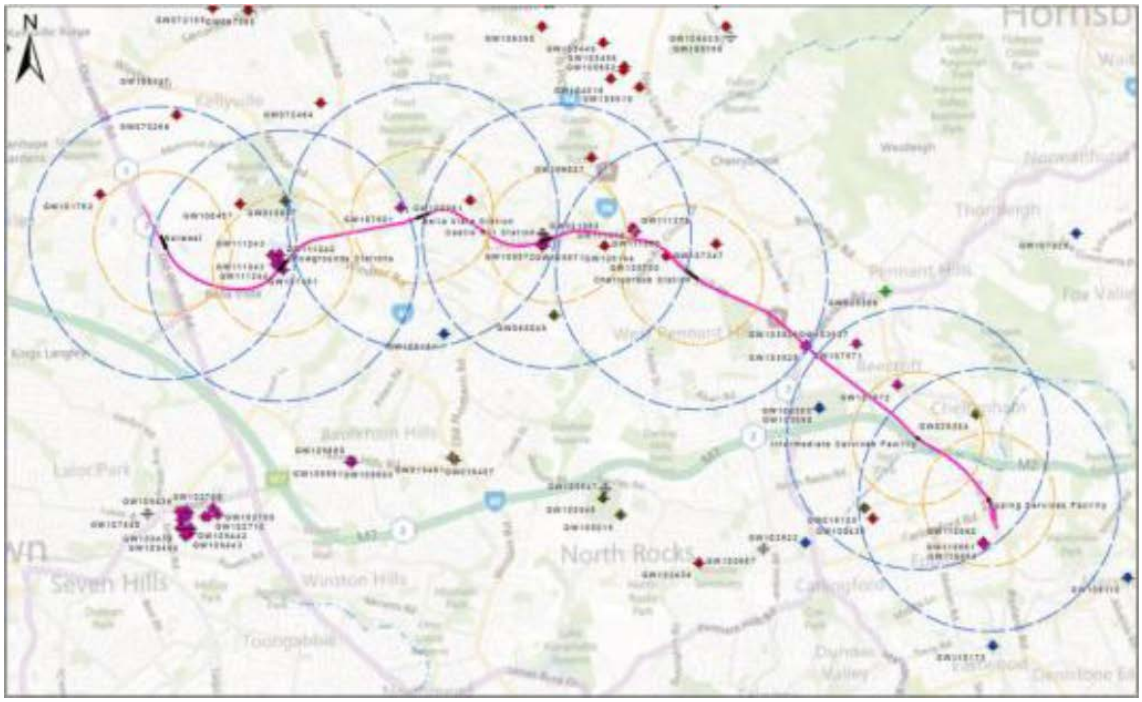


Figure 14 Groundwater Bores between Epping and Bella Vista

The Environmental Impact Statement Stage 2 – Stations, Rail Infrastructure and Systems (Chapter 8 – Soils and Groundwater), October 2012 provided the following summary of baseline data for groundwater monitoring conducted for the EIS.

The groundwater monitoring network established for NWRL investigations consisted of 57 monitoring wells. Groundwater sampling was undertaken in each monitoring well to identify any groundwater contamination and characterise groundwater quality.

Monitoring found that groundwater within Hawkesbury Sandstone is typically of low to moderate salinity, with electrical conductivity (EC) generally between 500 microsiemens per centimetre (µS/cm) and 2000µS/cm and pH generally varying between 4.5 and 6.5. The sandstone tends to have naturally elevated iron concentrations.

The SVC contractor has installed groundwater piezometers at the following locations along the viaduct:

- Two locations within the TSC works area south of Balmoral Road
- One location north of Balmoral Road, in the Balmoral Road site (BH517)
- Two locations north and one location south of Windsor Road/Old Windsor Road (BH663 and BH656 respectively)
- Four locations between Windsor Road and Cudgegong Road (BH670A, BH714, BH726 & BH677).

The quality of groundwater in shale of the Wianamatta Group (the geology for SVC works) tends to be inferior to groundwater in sandstone, with EC varying between 2000µS/cm to in excess of 10,000µS/cm in this part of the Sydney Basin.

The pH and TDS results indicate that salinity of groundwater along the alignment is high overall, and pH is near neutral. Sandstone underneath the Wianamatta Group has slightly higher salinity and a lower pH than the overlying shale.

Samples were tested for the following:

- Major cations
- Total Nitrogen
- Sulfate
- Chloride
- Magnesium and Calcium
- Carbonate, Bicarbonate, and Total Alkalinity as $CaCO_3$
- Dissolved Iron
- Sulfate Reducing Bacteria Count.

Selected samples were also analysed for TPH, BTEX, PAH, Phenols, Metals (dissolved), and OCP.

The historical groundwater data will be used in preparation of the background water quality monitoring review.

4.3.4 Salinity

Based on salinity potential maps prepared by the former Department of Infrastructure, Planning and Natural Resources (DIPNR, 2002), areas around Caddies Creek, First Ponds Creek and Second Ponds Creeks show high salinity potential or known salinity.

Potential areas of soil salinity in the general vicinity of the NWRL are shown in Figure 15Figure 15. Construction in areas of known soil salinity can have the following potential environmental impacts:

- Soil and water contamination through leaching of disturbed saline soils
- Soil and water contamination through modification of groundwater levels
- Increased salinity of waterways.

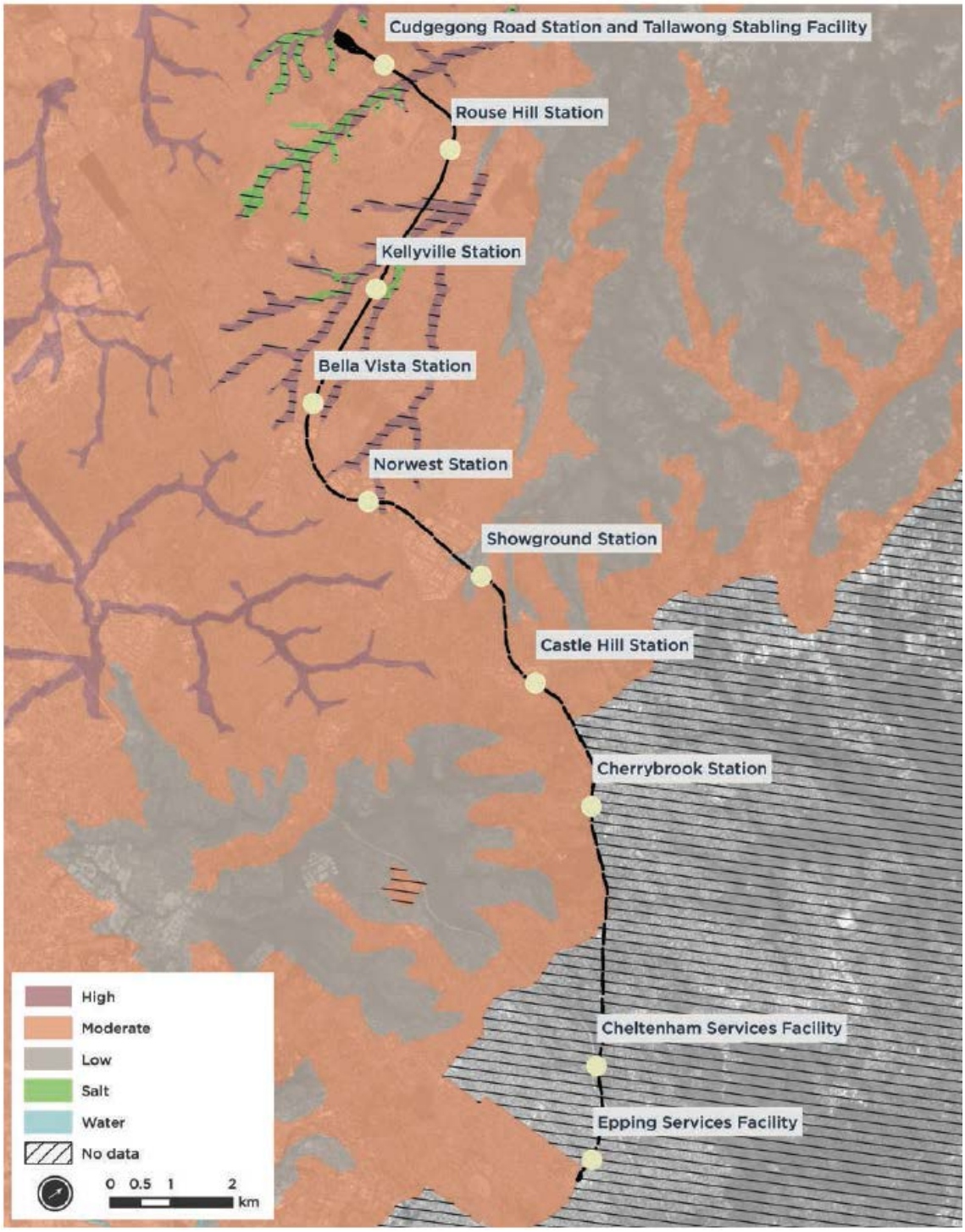


Figure 15 Soil Salinity Map

4.3.4.1 SVC Salinity Assessment

A Salinity Assessment was completed as part of the SVC contract (contained within the ISJV Construction Soil and Water Management Plan NWRLSVC-ISJ-SVC-PM-PLN-120203).

The report found that the areas most at risk of salinity are:

- Lands on the fluvial soil landscapes (South Creek Soil Landscape and Second Ponds Creek Soil Landscape)
- Lands at the foot of significant slopes.

Elsewhere, the likelihood of salinity is moderate to low (about 20%) as shown by the soil test results. However, localised salinity could occur:

- Anywhere that residual soil has, or will be, removed or significantly thinned by erosion or human activities
- In areas where ground disturbance activities expose saline soils or encourage excessive infiltration
- In areas where the local geology or man-made structures cause groundwater to surface.

4.3.4.2 TSC Salinity Assessment

A soil salinity assessment was completed as part of the TSC contract (NWRLTSC-TPS-20008-TSC-GE-RPT). The report found that the majority of the alignment is located on areas considered as very low salinity potential", and "moderate salinity potential", where saline areas may occur. The salinity potential is elevated at locations along the route where the geology is associated With the presence of Wanamatta Shales. The only two areas with potential high risk are east of Norwest within the driven tunnel and adjacent to the Bella Vista Worksite.

- For the overall sites, the results of the testing generally considered non-sodic, and slightly saline results of the testing program indicated that the site may be generally considered moderately aggressive to concrete structures and mildly aggressive to steel structures embedded in soil.
- At Bella Vista the results of the testing program indicated the worksite may be considered moderately saline. It may be considered moderately aggressive to concrete structures embedded in soil; and moderately aggressive to steel structures embedded in soil.

4.3.5 Acid Sulfate Soils

Acid sulfate soil (ASS) typically occur along river or creek banks and subsurface, where fine grained sediments are deposited.

ASS risk mapping for the area undertaken by the former Department of Land and Water Conservation (DLWC) in 1998 show that the Phase 2 works lie within areas designated as ‘no known risk’ of ASS or Potential ASS.

4.3.6 Surface Water

Phase 2 of NRT will have worksites near or adjacent to some creeks as indicated in Table 3 and illustrated in Figure 16.

Table 3 Watercourses in the Vicinity of the Phase 2 Works

Section	Relevant work site	Watercourses	Distance (approx.)
Epping Station to Bella Vista Station (Predominantly tunnel)	Epping Services Facility	Devlins Creek	50m
	Cheltenham Services Facility		100m
	Cherrybrook Station	Pyes Creek	500m
	Castle Hill Station	Castle Hill Creek	500m
	Showground Station	Cattai Creek	30m
	Norwest Station	Strangers Creek	200m
	Bella Vista Station	Elizabeth Macarthur Creek	150m
Bella Vista Station to Rouse Hill Station (Predominantly on viaduct)	Balmoral Road		50m
	Memorial Road		50m
	Kellyville Station		200m
	Windsor Road / Old Windsor Road	Caddies Creek (including Tributaries 3, 4 and 5)	50m
	Old Windsor Road / Whitehart Drive		50m
	Rouse Hill Station		50m
Rouse Hill Station to Cudgegong Road (Predominantly at-grade)	Windsor Road Viaduct	Second Ponds Creek	10m
	Windsor Road Viaduct to Cudgegong Road	Second Ponds Creek	200m

Figure 16 below shows the watercourses adjacent to the Phase 2 Work sites.

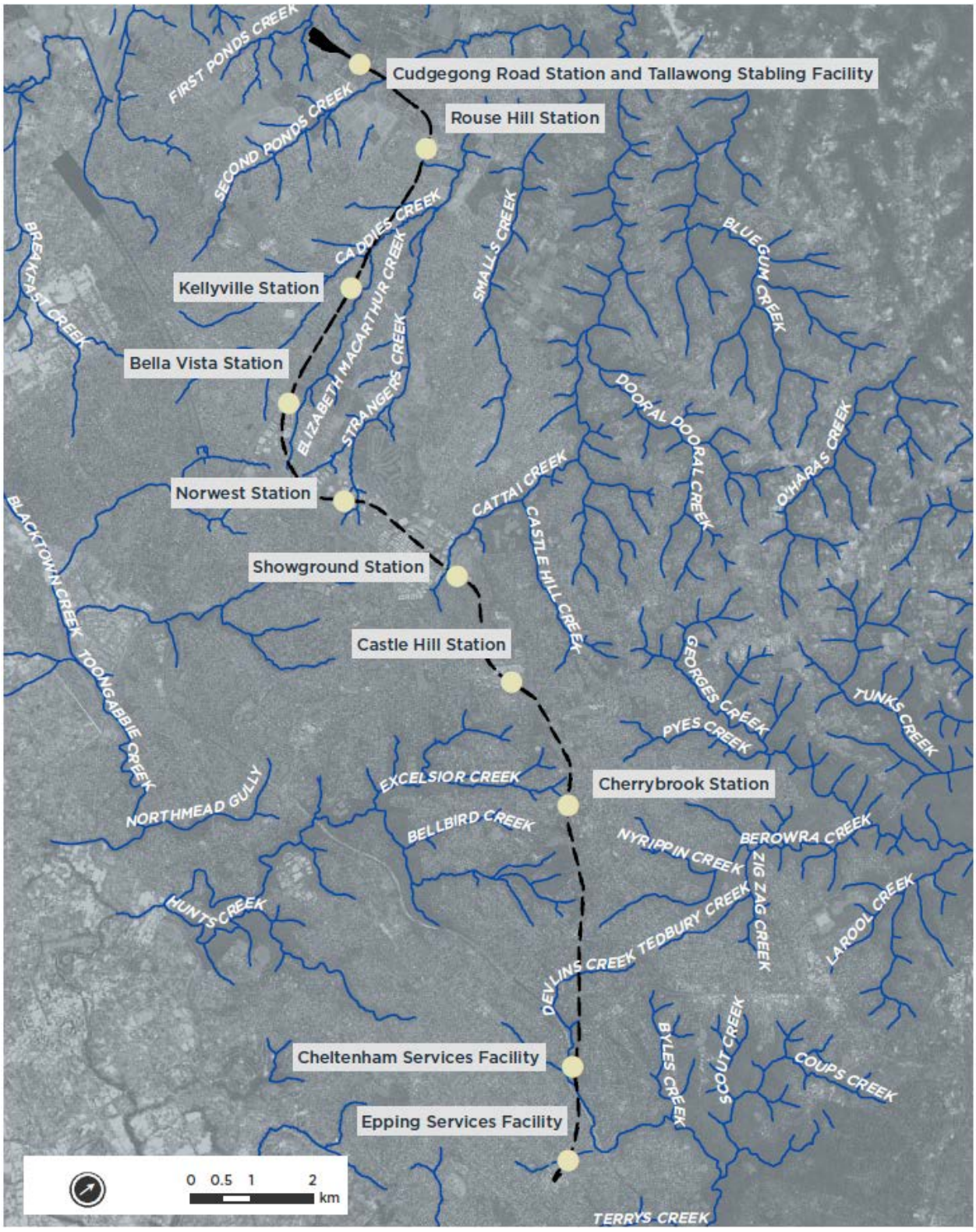


Figure 16 Watercourses near the Phase 2 Works Sites (from EIS2)

4.3.7 Water Quality

Background water quality for the areas covered by the Phase 2 Works is described in EIS 2 and from the Surface Water Quality Monitoring Program from the TSC contractor for the period between January and July 2015. Details are summarised below.

4.3.7.1 Devlins Creek (including Beecroft Road Tributary)

Hornsby Shire Council has established a monitoring station on Devlins Creek, approximately 200m downstream of the Cheltenham Services Facility. The monitoring station is adjacent to Sutherland Road at Cheltenham.

At Hornsby Monitoring Location 8 occasional high levels of faecal coliforms have been encountered, particularly after storms. The source of elevated levels is reported to be from stormwater runoff and/or sewer pipe overflows. Results exceeded the ANZECC Guidelines for Ammonium Nitrogen (NH_3) and phosphorous concentrations in the majority of samples taken. However, because faecal coliforms were low, sewer leaks were not suspected. The levels of turbidity and suspended solids in urban sites were generally acceptable. Test results showed typically low Dissolved Oxygen (DO) levels, especially at low flow conditions when the pools tend to turn black.

4.3.7.2 Pyes Creek

Hornsby Monitoring Location 5 is located on Pyes Creek at Cherrybrook (refer Figure 18.1). The catchment draining to the monitoring site is approximately 380 hectares, of which 79% is zoned residential. The monitoring site is located in a section of creek that has extensive patches of exposed bedrock, and is located approximately 3km downstream of Cherrybrook Station and is therefore not suitable to provide a direct analysis of potential changes in runoff quality from the project. However, results provide a useful background to the nature of the broader downstream receiving system.

Monitoring results exceeded the ANZECC guidelines for Ammonium Nitrogen (NH_3) and phosphorous concentrations in the majority of samples taken. The levels of turbidity and suspended solids in Pyes Creek were generally recorded at acceptable levels. Sewer leaks were not suspected due to low faecal coliform readings.

The TSC monitoring program consisted of three events. Results were considered normal (within trigger values) with the exception of some minor exceedances for TSS, EC, Salinity and some ions were attributed to upstream events unrelated to the TSC works.

4.3.7.3 Cattai Creek

The Hills Shire Council operates three monitoring locations on Cattai Creek, upstream of the Showground Station, downstream of Showground Road and one site a further 1.2km downstream. Additional monitoring locations have previously been operated by the Environment Protection Authority, Sydney Catchment Authority, Sydney Water, Department of Land and Water Conservation and the Hawkesbury Nepean Catchment Management Trust.

In general, E. Coli and nutrients Total Nitrogen and Total Phosphorous were found to be above the ANZECC guidelines in over half the samples, with dissolved oxygen readings below recommended guidelines.

The TSC monitoring program consisted of 4 events. Results were considered normal (within trigger values) with the exception of some minor exceedances for TSS, EC, Salinity and some ions were attributed to events unrelated to the TSC works.

4.3.7.4 Strangers Creek

The Hills Shire Council operates two monitoring locations on Strangers Creek, downstream of Norwest Station. Results of monitoring indicate nutrient levels below ANZECC guidelines, with dissolved oxygen readings below recommended guidelines.

4.3.7.5 Elizabeth Macarthur Creek

Two monitoring sites operated by The Hills Shire Council are located on Elizabeth Macarthur Creek, off Celebration Drive upstream of the proposed Bella Vista Station and off Clovelly Crescent, upstream of the confluence with Caddies Creek. The former site has generally shown readings within acceptable limits for secondary contact recreation under the ANZECC guidelines. Slightly more than half the samples showed elevated Total Nitrogen levels. Results at the other monitoring site indicate poorer quality, with elevated levels of Total Nitrogen and Total Phosphorous in nearly all the samples taken, along with elevated E. Coli in approximately half the samples. Dissolved Oxygen at this location was below recommended levels within the ANZECC guidelines.

The TSC monitoring program included three events. Results were considered normal (within trigger values) with the exception of some minor exceedances for TSS, DO, and some metals. The results were attributed to activities unrelated to the TSC works.

4.3.7.6 Caddies Creek (including Tributaries 3, 4 and 5)

The Hills Shire Council operates two monitoring sites on Caddies Creek, one located approximately 1km downstream of the proposed Rouse Hill Station and another further 500m downstream.

Results from both sites indicate E. Coli and nutrients Total Nitrogen and Total Phosphorous are above the ANZECC guidelines in over half the samples, with dissolved oxygen readings below recommended guidelines.

4.3.7.7 Second Ponds Creek

The Hills Shire Council operates one monitoring site on Second Ponds Creek, located approximately 2.5km downstream of the project corridor and therefore not suitable to provide a direct indication of the existing runoff quality relevant to the NWRL project.

4.3.8 Flooding

NRT's Phase 2 Works traverse a number of catchments associated with the waterways identified in Section 4.3.6.

While the Probable Maximum Flood (PMF) flood extent will encroach slightly within the Bella Vista Worksite and the Showground Worksite, there is no crucial infrastructure located within these zones.

Norwest Worksite is located outside both the PMF and 1 in 100 year ARI level, however the height of the capping beam has been extended to account for external overland flows in the event of a 100 year ARI occurrence.

The Epping Worksite lies within the PMF flood extent and therefore flood protection works will be undertaken to ensure that the tunnel and shafts are protected from flooding.

Development within the catchments in the south east portion of the project (Epping to Bella Vista Station) is typically well established. This includes the suburbs of Epping, Cherrybrook, Castle Hill and Bella Vista.

For catchments within the North West Growth Centre (covering Strangers Creek, Caddies Creek and tributaries, Elizabeth Macarthur Creek, First Ponds Creek and Second Ponds Creek) a considerable degree of development is underway and ongoing. To manage changes in flow behaviour as a result of urbanisation, water management strategies have been incorporated into the planning of these growth areas that include the provision of detention basins to offset potential increases in runoff.

Particular areas within the North West Growth Centre where significant future development has been identified include Balmoral Release area, Area 20 Precinct, Alex Avenue, Riverstone, The Ponds and Beaumont Hills.

Background flooding information from the respective Stormwater and Flooding Management Plans prepared by SVC and TSC contractors are summarised below. An updated Stormwater and Flooding Management Plan will prepared by NRT as part of the detailed design process.

4.3.8.1 Epping

The site facilities are all above the site flood planning level and do not require protective works. The services shaft excavation is above the 100 year ARI flood levels, but below the PMF level. Flows from the adjacent Devlins Creek require diversion to avoid entering the construction site. The required acoustic wall has been designed as a flood protection wall to protect the shaft from flooding.

4.3.8.2 Cheltenham

There are no regional flooding issues at the site. In terms of local flooding, there is an overland flow path arriving at the site from the upstream catchment. Volumetric runoff calculations have been undertaken and diversion drains designed to safely divert flows around the worksite.

4.3.8.3 Cherrybrook

There are no regional flooding issues at the site.

4.3.8.4 Castle Hill

There are no regional flooding issues at the site. In terms of local flooding, the station excavation is situated at a crest and all areas surrounding the station fall away from the proposed excavation

4.3.8.5 Showground

The station will be considerably above the site flood planning level and do not require protective works. In terms of local flooding, most areas fall away from the edge of the station box.

4.3.8.6 Norwest

The assessment indicated that a catchment approximately 6.50 hectares in size drains along Brookhollow Avenue towards the station excavation. The early construction of a bridge over the station excavation to allow Brookhollow Avenue to remain open during construction required the inclusion of the drainage in the bridge structure to allow overland flows to traverse over the bridge without overtopping into the excavation. A concrete barrier designed at the PMF was incorporated to the bridge design

4.3.8.7 Bella Vista

The station area is considerably above the site flood protection level and do not require protective works. In terms of local flooding, most areas fall away from the edge of the station box.

4.3.8.8 Bella Vista to Kellyville

There is potential for floodwaters from Elizabeth Macarthur Creek to spill into the dive entrance and flow into the railway tunnel. However, according to the results of detailed 2D flood modelling undertaken for Elizabeth Macarthur Creek, Sites 9 to 10 are located outside of (or above) the Probable Maximum Flood (PMF) extent. Kellyville Station and the associated temporary car park is located within Site 11 (south of Samantha Riley Drive), to the west of Elizabeth Macarthur Creek. Modelling shows that the works will result in an afflux during the 100 year ARI flood of up to 23mm across the channel adjacent to the temporary car park. This increase is contained within the natural waterway area and does not impact on the adjacent residential properties or any roadways.

The PMF model results show afflux of up to 300mm across Old Windsor Road and up to 150mm across the north and west portion of the Kellyville Station. The PMF modelling has assumed full blockage of the Kellyville Station Precinct to the 100 year ARI flow.

4.3.8.9 Windsor Road to White Hart Drive

The flood modelling shows that there would be no significant flood level or velocity impacts at Caddies Creek Tributary 4 during the 100 year ARI event. The modelling also shows that there will be no flood level or velocity increases along Tributary 4 during the PMF.

4.3.8.10 Rouse Hill Station

Previous hydraulic studies show that the Tributary 3 culvert crossing has in excess of a 100 year ARI capacity. Consequently, aside from run-off from the local drainage network, the precinct is not expected to be affected by flooding up to the 100 year ARI event.

4.3.8.11 Windsor Road Viaduct to Cudgegong Road

At the Cudgegong Road substation site the lowest ground levels are over 2m above the 100 year ARI flood level. Ground levels are approximately 0.7m above the PMF level. The proposed bridge abutments will be located outside of the PMF extent.

4.3.9 Contamination

4.3.9.1 Previous Assessment

A field and laboratory program was completed as part of EIS 2 to assess the identified Areas of Environmental Concern (AEC) and Contamination of Potential Concern (CoPC) at selected accessible areas, utilising the geotechnical sampling points.

A summary of the assessment for the Phase 2 Works is detailed in Table 4 below.

Table 4 Contamination Assessment

Area of environmental concern	Medium	Assessment summary
Cherrybrook Station (Opencut Station)	Soil	A low concentration of lead was reported east of the proposed station. Further delineation and / or waste classification may be required if excavation and offsite disposal of soil is to take place in this area, during the construction of Cherrybrook Station.
	Groundwater	Concentrations of CoPC were reported at levels considered to be indicative of background levels.
Castle Hill Station (Underground Station)	Soil	Concentrations of CoPC in the soil samples analysed were either detected below the Limits of Reporting (LOR) or typical of background concentrations.
	Groundwater	Concentrations of CoPC were generally typical of background concentrations with the exception of trace levels of TPH found in a sample well. This anomalous detection is considered potentially to be naturally occurring though the well is directly outside the former Mobil service station. Due to this anomaly, further monitoring of the wells within the former service station site would be undertaken during the detailed construction planning stage of the project.
Showground Station (Underground Station)	Soil	Further delineation and / or waste classification may be required if excavation and offsite disposal of soil is to take place in this area, during the construction of the Showground Station, assessed to have nickel and PAH impacts and the presence of asbestos fibres.
	Groundwater	TPH, PAH and phenol impacts were identified. Given that groundwater in the vicinity of The Hills Shire Depot is likely to be disturbed during construction of ShowgroundStation, impacts on the construction workers (via dermal contact and inhalation) as well as disposal management would need to be further assessed during the detailed construction planning stage of the project. Further delineation, remediation or management may be required.
Norwest Station (Underground Station)	Soil	Concentrations of CoPC in the soil samples analysed were either detected below the LOR or typical of background concentrations.
	Groundwater	TPH impact was identified in groundwater. Given that groundwater in the vicinity of the Shell service station is likely to be disturbed during construction of the Norwest Station, impacts on the construction workers (via dermal contact and inhalation) as well as disposal management would need to be further assessed during the detailed construction planning stage of the project. Further delineation, remediation or management may be required.

Area of environmental concern	Medium	Assessment summary
Bella Vista Station (Open cut Station)	Soil	Further waste classification in this area may be required if excavation and offsite disposal of fill is to take place in this area, during the construction of the Station due to concentrations of nickel in the fill material.
	Groundwater	Concentrations of CoPC in groundwater samples analysed were generally typical of background concentrations. Further assessment of groundwater in the vicinity of the BP service station would be required if the shallow seepage water is to be disturbed during construction of Bella Vista Station as TPH and PAH impacts were identified at the BP service station.
Bella Vista to Rouse Hill (Open Cutting for Bella Vista Dive and skytrain)	Soil	If excavation for offsite disposal is to take place, additional assessments for waste classification may be required due to low TPH and heavy metals impacts reported in fill samples. Further assessment in this area may be required if disturbance is to take place in this area.
	Groundwater	If groundwater is to be disturbed, groundwater management may be required due to low concentrations of TPH and PAH reported in this area.
Rouse Hill to Cudgegong Road (Earthworks and Bridges)	Soil	If excavation for offsite disposal is to take place, additional assessments for waste classification may be required due to low TPH and phenol impacts reported in fill samples. The contamination assessment at this stage is not intended to be comprehensive and not all of the Areas of Environmental Concern in this area were specifically targeted, i.e. individual above-ground storage tanks, farm dams and asbestos in buildings. Additional assessment and waste classification may be required.
	Groundwater	Concentrations of CoPC in groundwater samples analysed were generally typical of background concentrations.
Rouse Hill to Cudgegong Road (On-grade Works)	Soil	The contamination assessment at this stage is not intended to be comprehensive and not all of the Areas of Environmental Concern in this area were specifically targeted, i.e. individual above-ground storage tanks, farm dams, and asbestos in buildings. Further assessment and waste classification may be required. The contamination assessment at this stage is not intended to be comprehensive and not all of the AEC in this area were specifically targeted, i.e. individual Above-ground Storage Tanks (AST), farm dams, asbestos in buildings, and therefore additional assessment and waste classification may be required.
	Groundwater	Concentrations of CoPC in groundwater samples analysed were generally typical of background concentrations.

4.3.9.2 TSC Contamination Assessment

Contamination assessments were completed by the TSC contractor in accordance with the requirements of Project Approval SSI-5100. A summary of the findings for each of the precincts are detailed below:

Bella Vista

The report concluded that the site is compatible with the proposed use as an open railway station, extending from ground surface to 13 m depth, with associated access and parking areas.

On the basis of the results of the analysis the filling described in the borehole logs can be classified as General Solid Waste (non-putrescible) for disposal off site. On the basis of site observations, the natural soil described in the borehole logs can be classified as VENM provided that the material is not cross-contaminated or mixed with other non-VENM material including fill.

Asbestos-containing materials have not been detected by observation or by laboratory analysis either on the surface of the site or in fill at the locations sampled and analysed.

Metals were recorded in the groundwater at concentrations above the GIL. However, it is considered that the groundwater encountered is likely to be perched or minor transmission through the joints and bedding planes in the upper shale lithology and not part of a regional groundwater table.

Norwest

Fill depths across the assessment area have been reported in the bores to range between 0.25 m and 4.50 m bgl. The fill generally comprised gravelly clay filling with shale, brick and cement fragments.

The general fill across the assessment area has been assigned an in situ waste classification of general solid waste (non-putrescible) in accordance with DECCW (2009).

The natural soils beneath the fill across the assessment area have been assigned a VENM classification.

Asbestos-containing materials have not been detected by observation or by laboratory analysis either on the surface of the site or in fill at the locations sampled and analysed.

Only shallow groundwater monitoring wells were installed and water could only be recovered from one (likely to be perched). No contamination issues were identified in this water sample.

Showground

The assessment area west of Doran Drive (former Hills Shire Council Depot) contains highly variable fill, particularly in the southern portion of the former depot. Main contaminants of concern include metals, TRH, PAH, phenols and Asbestos.

The remaining assessment area to the east of Doran Drive has been assessed in situ as general solid waste (non-putrescible).

Additional investigations were undertaken to assess the waste classification of soils to the west and east of Doran Drive including beneath buildings which have been demolished which were classified as ENM and VENM.

There is a risk that asbestos will be encountered during the proposed works in particular in the areas to the west of Doran Drive. The area surrounding the three

known USTs has localised groundwater contamination including TPH, PAH and phenols.

Castle Hill

Areas of fill have been reported across the site to depths between 0.0 m and 1.0 m bgl. The fill comprised topsoil, sandy gravelly clay or sand with fragments of brick, concrete and/or ironstone.

The general fill across the assessment area has been assigned an in situ waste classification of general solid waste (non-putrescible) in accordance with DECCW (2009).

The natural soils beneath the fill across the assessment area have been assigned a VENM classification.

Zinc was recorded in the groundwater at concentrations above the GIL in all three samples and above typical background concentrations for the Sydney area in one sample. However, it is considered that the groundwater encountered is likely to be perched or minor transmission through the joints and bedding planes in the upper shale lithology and not part of a regional groundwater table.

Asbestos-containing materials have not been detected by observation or by laboratory analysis either on the surface of the site or in fill at the locations sampled and analysed.

Cherrybrook

Localised areas of fill have been reported in three bores to depths of between 0.2 m and 0.5 m bgl. The fill comprised gravelly sand, sand and clayey silt filling with fragments of concrete.

The general fill across the assessment area has been assigned an in situ waste classification of general solid waste (non-putrescible) in accordance with DECCW (2009).

The natural soils beneath the fill and topsoil across the assessment area have been assigned a VENM classification.

Only shallow groundwater monitoring wells were installed and water could only be recovered from one (likely to be perched). No contamination issues were identified in this water sample.

Asbestos-containing materials have not been detected by observation or by laboratory analysis either on the surface of the site or in fill at the locations sampled and analysed.

A UST was encountered and removed during excavation works. It was found that the results of analysis of the samples taken within the pit excavation, the tank and surrounding impacted material have been removed to a satisfactory standard. The remaining material is considered suitable for re-use on-site based on comparison to relevant adopted SAC (site acceptance criteria).

Cheltenham

Areas of fill have been reported across the site to maximum depths of 0.7 m bgl (in areas surrounding the netball courts) to 2.3 m bgl (area of the netball courts). The fill

generally comprised topsoil, clayey sand, sand and clay including traces of sandstone gravels and bitumen.

The soil (including filling and natural) analysis recorded concentrations of the contaminants of concern below the adopted SAC.

The general fill across the assessment area has been assigned a preliminary in situ waste classification of General Solid Waste (non-putrescible) in accordance with DECCW (2009).

The filling encountered across the assessment area generally complies with the threshold criteria for ENM.

The natural soils beneath the fill have been assigned a visual VENM classification.

A groundwater monitoring well was installed which recorded groundwater levels in March and April 2012 as 9.18 m and 9.02 m bgl, respectively. The groundwater samples analysed generally recorded concentrations typical of background concentrations apart from trace levels of total petroleum hydrocarbons (TPH) which were considered by CG to be naturally occurring.

Asbestos-containing materials have not been detected by observation or by laboratory analysis either on the surface of the site or in fill at the locations sampled and analysed.

Epping

The assessment area contains highly variable filling including inclusions of building rubble to a maximum encountered depth of 4.2 m.

Filling and natural soils encountered are generally considered suitable for re-use onsite given results are within adopted SAC with the exception of:

- The area around bore EP1: This has an in situ classification of Hazardous Waste. This is considered to be limited to the area surrounding EP1 and bound by EP101, EP106, EP102 and EPSS01 (and extending vertically to 2 m bgl). Removal of impacted soils in this area must be validated prior to undertaking bulk excavation in the vicinity. This material is not suitable for re-use onsite given its exceedances above the SAC
- Filling encountered during excavation found to contain high levels of building rubble and other foreign inclusions e.g. plastic, metal and wood. These should be separated from the more homogenous sand and clay layers for offsite disposal
- Excluding the Hazardous Waste classification surrounding EP1 the remaining areas of in situ filling on site have an in situ classification of General Solid Waste (non-putrescible) in accordance with DECCW (2009
- The natural soils beneath the fill have been assigned a preliminary VENM classification
- The Stockpile SP2 (which incorporates material from the SP1) has a waste classification of Special Waste (Asbestos).

4.3.9.3 SVC Contamination Assessment

No contamination reports were provided to NRT at the time that this CSWMP was being prepared.

4.4 Norwest Pedestrian Link Works

4.4.1 Existing Soil Landscape

The project area is located on the interface of the Blacktown and Luddenham soil landscapes.

Soils in the Blacktown Landscape occur on low undulating terrain on the Wianamatta Group shales. They are generally moderately deep (1.0 m) red and brown podsols. These soils are moderately reactive, highly plastic and generally poorly drained.

Soils in the Luddenham Landscape are a sub-set of the Blacktown Landscape and are characterised by being highly erosive.

Geotechnical investigations confirmed that the proposal footprint is probably underlain by fill material, which is likely to have been placed when the wider business park area was developed in the 1980s.

4.4.2 Acid Sulfate Soils

Regional mapping shows that there is no known risk of acid generating soils being present across the Project area. However, the iron-rich bands that occur in Ashfield Shale can contain iron-sulphide material and as such the risk of encountering Acid Sulfate Soils (ASS) cannot be fully discounted.

4.4.3 Contamination

The local area has been heavily developed since the 1980s. Within the Project Area there are two specific land issues that present a contamination risk. They include the surficial fill material, as it origin is unknown and the Shell service station that is located about 20 metres east of the limit of the Project footprint.

Previous investigations for Norwest Station did not note or raise concern regarding the quality of the fill under the station however the groundwater encountered was recorded as containing elevated hydrocarbon concentrations, believed to be associated with the service station.

With regards to the Project site, the unknown condition, origin and variability in underlying fill material means that it may still contain various contaminants. As hydrocarbons have been identified within the groundwater, it is likely at there is some impact on surrounding soils. Although this has not been confirmed it is reasonable to assume that the soils may have been impacted within the Project site.

There are no registered contaminated sites within or adjacent to the Project area as confirmed by reviewing the NSW Environment Protection Authority (EPA) contaminated land records.

4.4.4 Surface Water

The nearest natural surface watercourse is Strangers Creek, approximately 500 metres west of the Project site. It is classed as a lower-order creek and forms a tributary of Cattai Creek which drains to the Nepean River. There are also a number of artificial water bodies developed to improve the amenity of the area. The closest of these is Norwest Lake, approximately 200 metres north east of the Project site.

4.4.5 Groundwater

Nearby groundwater monitoring confirmed that a perched water table is present at about six metres below ground surface within shale with a base flow in the sandstone at about 14 metres below the ground surface. While the same conditions would be likely to occur under the Project site, they may vary due to the unpredictable characteristics of any underlying fill material.

Groundwater testing close to Norwest Station confirmed the presence of hydrocarbons in the form of total petroleum hydrocarbons (TPH). The source of the hydrocarbons has been attributed to the Shell service station approximately 30 metres from the Project site. The presence of hydrocarbons would make the groundwater unsuitable for drinking, however it could be used for stock watering, industry or construction.

4.5 33kV Underground Feeder Powerline Works

4.5.1 Existing Soil Landscape

The project site is located within the board sandstone plateau of the Sydney Basin. The sandstone geology is generally overlaid on the broader portions of the ridge crest landforms by Ashfield Shale and Hawkesbury Sandstone. Soils would largely be residual in nature, with some colluvial movement on slopes and fluvial deposition associated with watercourses.

4.5.2 Acid Sulfate Soils

The Willoughby City Council acid sulfate soils maps series indicates that the project site is located in an area of Class 5 Acid Sulfate Soils, indicating a low likelihood of potential ASS occurring.

4.5.3 Contamination

There is no evidence that the alignment contains any substantial contamination. Potential contaminants associated with the existing road reserve or existing rail corridor would be the most likely sources of potential contamination. A search of OEH's contaminated land register identified two registered contaminated sites (a former petrol station and the Chatswood Toyota site) both of which are located along the Pacific Highway and are not likely to present significant risk.

4.5.4 Surface Water

The site is located within the Sydney Harbour and Parramatta River Catchment area. The closest waterways to the alignment are:

- Flat Rock Creek in Artarmon Reserve – approximately 300 metres to the east of the alignment
- Scott's Creek, near Penshurst Street, Chatswood – approximately 350 metres to the east of the alignment

The alignment transverses paved areas with existing drainage infrastructure. No surface waterways have been identified which cross the alignment.

4.6 Rouse Hill Temporary Bypass Powerline Works

4.6.1 Existing Soil Landscape

The project area is in a landform pattern of rolling hills sloping north east. Most of the alignment is on what was originally a mid-hill slope. The land crossing Castlebrook Memorial Park features a number of ephemeral drainage depressions that flow in a north - easterly direction as tributaries of Caddies Creek that flows about 750 m to the west and north-west.

The land surrounding the alignment has been cleared and subject to human activities that has disturbed the ground surface and subsurface to varying degrees. The previous land use disturbance levels are summarised as follows:

- The land north of, and including, Schofields Road has been highly disturbed from earthworks activities related to the Sydney Metro Northwest project and the construction of Schofields Road.
- The proposed underground high voltage route traverses Castlebrook Memorial Park. Although the alignment does not traverse any graves or memorial structures, the landscape is likely to have been landscaped to achieve its desired look. Furthermore, there are localised areas of high disturbance from the construction of water dams.
- The land to the east and south of Castlebrook Memorial Park along Windsor Road has been highly disturbed from the construction of Windsor Road and the Northwest transitway.

4.6.2 Acid Sulfate Soils

ASS risk mapping for the area undertaken by the former Department of Land and Water Conservation (DLWC) in 1998 show that the Phase 2 works lie within areas designated as 'no known risk' of ASS or Potential ASS.

4.6.3 Contamination

There is no evidence that the alignment contains any substantial contamination.

4.6.4 Surface Water

No impact to waterways are expected. However care should be taken during the excavation parallel to the man made dam within Castlebrook.

5 Aspects and Potential Impacts

The key aspects and potential impacts associated with the management of soil and water during the delivery of Phase 1, Phase 2,Norwest Pedestrian Link and 33kV Underground Feeder Powerline Works are listed in Table 5.

These identified risks have been taken into account in the development of the soil and water management strategy and site-specific procedures for the works.

Activities relate to all locations.

Table 5 Summary of Overall Aspects and Potential Impacts

Aspects	Potential impacts/opportunities	Risk level L=low, M = medium, H = high
All sites		
Discharge of contaminated water from within site boundary during rainfall Concrete washout	• Contamination of adjacent watercourse and riparian environment • Contamination of soils	L
Dust from the worksites or from vehicles	• Potential pollution of waterways and air	M
Earthworks / Embankment works	• Sediment degrading surrounding environment • Change to flooding characteristics	M
Flooding of worksites	• Contamination of floodwaters by sewage, fuels and/or chemicals onsite • Potential for floodwaters to drain into Station or Service Facility excavations	L
Leaks or spillages of fuels, oils and grease from construction plant and equipment and at compounds	• Contamination of soil • Contamination of watercourse, riparian environment and groundwater ecosystems	M
Modifications to natural hydrology or water quality from excavations	• Localised pollution of waterways • Potential loss of surface flow from existing drainage lines	L
Sediment laden runoff during rainfall	• Runoff entering creeks and drainage lines causing pollution and impacting aquatic life	M
Sediment tracking onto public roads from vehicles leaving site	• Potential impact on traffic safety • Potential for sediment laden runoff during rainfall • Potential for generation of dust	L

Aspects	Potential impacts/opportunities	Risk level L=low, M = medium, H = high
Storage of hazardous substances	• Contamination as a result of a spill • Impact to riparian areas and watercourses from pollution	L
RTRF Site		
Construction works adjacent to First Ponds Creek runs to the west of the site	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for saline water to enter creek due to exposure of saline soils • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	M
Cudgegong Road Precinct		
Construction works adjacent to Second Ponds Creek runs to the east of the site	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Rouse Hill Precinct		
Construction works near Second Ponds Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for saline water to enter creek due to exposure of saline soils • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Kellyville Precinct		
Construction works near Elizabeth Macarthur Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for saline water to enter creek due to exposure of saline soils • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Bella Vista Precinct		
Construction works near Elizabeth Macarthur Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite Potential for saline water to enter creek due to exposure of saline soils	L

Aspects	Potential impacts/opportunities	Risk level L=low, M = medium, H = high
Norwest Precinct		
Construction works near Strangers Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite • Potential for saline water to enter creek due to exposure of saline soils	L
Castle Hill Precinct		
Construction works near Cattai Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Showground Precinct		
Construction works near Cattai Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Cherrybrook Precinct		
Construction works near Pyes Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Cheltenham Precinct		
Construction works near Devlins Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Epping Precinct		
Construction works near Devlins Creek	• Potential for pollutants to wash into creek • Sediment laden/ contaminated runoff entering creek • Potential for contamination of floodwaters by sewerage, fuels and/or chemicals onsite	L
Norwest Pedestrian Link		

Aspects	Potential impacts/opportunities	Risk level L=low, M = medium, H = high
Construction works within potentially contaminated land / groundwater	• Potential for exposure of workers during construction to hydrocarbon contaminated land, principally through inhalation • Potential of incorrect storage, treatment and disposal of contaminated material • Potential for dispersion over a wider area than may be currently impacted	M
33kV Underground Feeder Powerline		
Leakage and disposal of borehole fluid during Horizontal Directional Drilling works	• Potential for 'frac-outs' (drilling mud release through fractured bedrock into the surrounding rock and sand and travels toward the surface) during construction of the underbore	L

6 Water Balance

A water balance estimation for the entire OTS works package was undertaken as part of the early design development process and construction planning process and is presented in Table 6.

Table 6 Water Balance

Water Usage	Total Demand (kL)	Water Supply (kL)		
		Potable	Non-potable Recycled	Non-potable Site won
Human consumption – includes ablution, drinking and food preparation				
Staff	10,000	10,000		
Labour – direct	210,000	210,000		
Direct use – plant and materials				
Dust suppression and miscellaneous supply – water carts, street sweepers and potholing	114,000	57,000		57,000
Condition site won and imported fill – water carts	45,000	22,500		22,500
Concrete	69,575	34,788	34,788	
Total demand	**448,575**	**334,288**	**34,788**	**79,500**
% of Total Use	100%	74.5%	7.8%	17.7%

This exercise was designed to provide a holistic approach to understanding water demands and potential sources and provide an opportunity to look for optimises water utilisation process across the OTS works.

A key factor which was taken into account in the process is the water quality of both demand and supply, matching the quality of these two aspects becomes the critical exercise. As shown in Table 6 by the demands identified in the coloured demand boxes, the majority of demand is for potable sources due to workplace health and safety requirements and functional requirements of the construction process.

Upon completion of final design development, an updated water balance will be produced as part of the Infrastructure Sustainability Council of Australia (ISCA) works program (refer to Sustainability Plan).

Measures to minimise water use and maximum reuse are detailed Section 7.3.1, Annexure B.

7 Soil and Water Management

7.1 Erosion and Sediment Control

7.1.1 General Principles

Environmental protection during construction will involve the installation, use and maintenance of a number of temporary erosion and sediment control measures as required in accordance with the following principles:

- Before undertaking any construction work (including any earthmoving or vegetation removal works), implement all soil and water management works required to minimise pollution of waters
- All erosion and sediment controls will be installed in accordance with best-practice guidelines such as NSW Blue Book Volumes 1 and 2D (Landcom, 2004 and DECC, 2008)
- Maintaining ground cover for as long possible to prevent erosion and sedimentation
- Diversion of 'clean' run-off from offsite around or through the worksite without it contacting exposed soils or mixing with 'dirty' onsite water and maintaining existing drainage infrastructure wherever possible
- Installation of any permanent scour protection measures required for the operational phase would occur as soon as practical
- Minimisation of soil erosion and mobilisation of sediment during rain events
- Use of suitable sediment retention structures and control measures to filter or retain mobilised sediment generated during rain events over surface disturbances
- Maximum sediment capture through effective positioning of temporary erosion and sediment control structures such as sediment basins
- Progressive rehabilitation and/or stabilisation of completed areas to minimise erosion hazard
- Inspection and maintenance of all erosion and sediment controls to ensure they are effective
- Use of water efficient fittings and fixtures where reasonable and feasible for temporary site facilities
- Targeted training on ERSED principles for key staff
- NRT would ensure that any road, footpath, shared path or cycleway which is open to the public is at all times kept free of mud, dirt, dust, deleterious material, debris, obstructions and trip hazards arising from NRTs activities in accordance with the project approval
- NRT would install, maintain and utilise wheel wash facilities as a minimum, and cover all construction vehicles to prevent any loss of fuels, lubricants, load or other substances, whether in the form of duct, liquids, solids or otherwise
- Any spillage or build-up of such material or debris would be cleaned up promptly

- Groundwater encountered during the construction of the project would be managed in accordance with the requirements of the Waste Classification Guidelines (DECCW 2009) and Transport for NSW's Water Discharge and Re-use Guideline
- A Sydney Water authorised water servicing coordinator will be engaged to oversee the design and construction of any works to the existing water or sewer mains
- The existing Sydney Trains and Council drainage systems would remain operational throughout the construction of the ECRL conversion works.

7.1.2 Resources

Ultimate responsibility for erosion and sediment control will rest with the Construction Personnel within the Construction Team, led by Construction Managers, who will be responsible for the on-ground installation and maintenance of erosion and sediment controls. This would include (although is not limited to):

- Sediment basin construction and maintenance, including flocculation and discharge (pending authority to discharge from the Environment Coordinator)
- Hard standing and deployment of spray-on soil stabilisers as required
- Installation, cleaning and maintenance of controls such as sediment fences, gravel socks, inlet filters, straw bales, sandbags etc.
- Installation of temporary drain and channel liners (e.g. geofabric, jute matting etc.)
- All dewatering activities.

Relevant personnel will receive training and ongoing toolbox talks on installation and maintenance of erosion and sediment controls.

7.1.3 Sediment Basins

Sediment basins will be used as the primary end-of-line control for all construction worksites. A specialist soil conservationist will be engaged to prepare the primary ERSED plan and design the sediment basin locations and size in accordance with Landcom's Managing Urban Stormwater, Soils and Construction (2004) (the Blue Book).

7.1.3.1 Phase 1 Sediment Basins

The design rainfall event for the sediment basins are 32.2mm (85th percentile) or 24.6mm (80th Percentile). It is assumed that the basins will overflow in an event of more than 32.2mm/24.6mm over any 5 day event.

The Environmental Protection Licence (EPL) includes an administrative process to include discharge points once the sediment basins are ready to be commissioned.

The design storage capacity of the sediment basins installed on the premises will be reinstated within 5 days of the cessation of a rainfall event that causes runoff to occur on or from the premises.

7.1.3.2 ECRL Conversion Sediment Basins

It is not anticipated that sediment basins would be required for ECRL Conversion works, due to space constraints and the minimal amount of earthworks proposed. A soil conservationist will review the sites where earthworks will be occurring and provide further advice if they would be required, and then any subsequent design.

7.1.3.3 Phase 2 Sediment Basins

NRT will take over the TSC and SVC contractors' sediment basins as their worksites are progressively handed over.

The capacity and design rainfall event for the sediment basins will be assessed once they are in NRT's control to determine they adequacy for NRT's use.

Discharge points will be added to NRT's Environmental Protection Licence (EPL) once the sediment basins are handed over and in NRT's control.

The design storage capacity of the sediment basins installed on the premises will be reinstated within 5 days of the cessation of a rainfall event that causes runoff to occur on or from the premises.

7.1.3.4 Norwest Pedestrian Link Sediment Basins

Requirements for use of a sediment basin during the Norwest Pedestrian Link works will be assessed during capacity and adequacy assessments of the existing basins. Should a sediment basin be required, the sediment basin servicing the Norwest Station works is expected to be utilised for the Norwest Pedestrian Link works.

7.1.3.5 33kV Underground Feeder Powerline Sediment Basins

It is not anticipated that sediment basins would be required for 33kV Underground Feeder Powerline works, due to space constraints and the minimal amount of earthworks proposed. A soil conservationist will review the sites where earthworks will be occurring and provide further advice if they would be required, and then any subsequent design.

7.1.4 Erosion and Sediment Control Plans

A Primary ERSED plan for Phase 1 Works has been prepared and is contained in Annexure E.

Site-specific Erosion and Sediment Control Plans (ESCPs) will be developed for each of the construction worksites. All ESCPs will require sign-off by the Environment Coordinator and Site Supervisor prior to implementation. The Soil Conservationist will conduct regular reviews of all ESCPs developed for the OTS Works to ensure they meet best-practice (i.e. the NSW Blue Book).

The ESCP's contain the following key management measures:

- Site Entry and Access Requirements
  - Establish stabilised access points with rumble grids or wheel washes to prevent mud tracking on roads. This would be assessed on a case by case basis where

required and depending on site conditions (such as the amount of hardstand on site and risk of mud tracking etc)

- Clearly delineate access points
- Use of street sweepers
- Longer term and/or heavily used haul roads would generally be sealed. Sealed haul roads would be regularly cleaned.
- Unsealed haul roads would be regularly damped down with fixed or mobile sprinkler systems.
- Appropriate site speed limits would be imposed and signed on haul routes.
- Exclusion zones would be designated on construction sites to limit disturbance

- Soil Stripping and Stockpiling
  - Stockpile areas are to be established within approved low-hazard areas at least 40m clear of watercourses and at least 2m from the dripline of any retained trees.
  - Diversion drains/bunds are to be installed on the high side of stockpiles if run—off from upslope lands could impact on the stockpile.
  - As much as is feasible, mulched vegetation, topsoil and subsoil (if applicable) are to be stockpiled separately
  - Stockpiles will be secured with sediment fence downslope, diversion berm/drains upslope, and will be stabilised within 10 days of completion of formation to at least 70% cover. Long-term stockpiles with material continually coming or going will have a working face at one end and will be stabilised at the other.
  - Topsoil and mulch stockpiles will be constructed to no more than 2m in height where possible.
  - Stockpiles will be battered down to a maximum slope of 2:1 (H:V) where space permits.
  - Material transport from site to surrounding pavement surfaces would be minimised
- Dust Control
  - Dust suppression will be carried out whenever necessary to minimise sediments becoming air borne due to wind erosion.
  - Wherever possible, water detained onsite will be re-used for dust control.
- Stabilisation
  - Undertake progressive stabilisation of ground surfaces as quickly as possible as they are completed rather than at the end of the works program.
  - Progressively revegetate disturbed areas utilising appropriate species in those areas to be revegetated. Seek advice from the Project Soil Conservationist.
  - Temporary ground covers such as hydraulic soil stabilisers or geotextile fabric will be used as much as possible to stabilise batters, stockpiles and large surface areas.
  - Scour protection and energy dissipation would be used around discharge points at local points to reduce erosion where necessary.
- Sediment Controls

- Sediment controls will be installed around stormwater inlet pits where appropriate and where they won't cause or exacerbate flooding. Traffic management and safety will need to be considered if installing such devices on or near live traffic.
- Maximise the diversion of turbid construction runoff into sediment retention devices such as sediment basins, sediment sumps, sediment fences and other sediment traps.
- Mulch bunds will not be used in concentrated flow areas or if they have the potential to result in tannin leachate into waterways.
- All erosion and sediment controls will be inspected at least weekly, before forecast rain events, before a site closure of two days or more, and after rainfall exceeding 10 mm in 24 hours. Maintenance will be carried out as required prior to the next forecast rainfall event
- Concrete washout will be confined to designated concrete washout locations or using a Concrete Waste Separation Unit (CWSU), which allows for recycling of concrete waste
- Clean water diversions would be constructed and stabilised around work areas
- No stockpiles of materials or storage of fuels or chemicals would be located adjacent to the existing culverts

An erosion and sediment control plan has yet to be developed for ECRL Conversion Works. This will be prepared prior to the commencement of works where there is the possibility to generate sediment runoff.

The Primary ESCP and site specific ESCPs have yet to be developed for the Phase 2 Works, Northwest Pedestrian Works and 33kV Underground Feeder Powerline Works. These will be prepared prior to the commencement of works as sites are handed over to NRT from the TSC and SVC contractors.

7.2 Groundwater Management

NRT will implement the following mitigation and controls measures to manage groundwater during the construction of the OTS Works:

- A groundwater monitoring plan will be prepared for the duration of the construction period. Parameters to be monitored include groundwater levels and groundwater quality with field parameters, laboratory parameters and sample frequency to be developed prior to construction.
- Water sampling and testing of groundwater 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 or recycling nearby will be utilised in the first instance. Should groundwater inflows and required treatment volumes outstrip potential for water reuse for construction purposes; options for discharge will be investigated.
- Iron reducing bacteria in discharge water would be typically treated by biocide dosing.
- A groundwater monitoring network to monitor groundwater levels and groundwater quality will be established throughout the construction phase. The groundwater

monitoring network contains monitoring wells along the whole NWRL route intersecting groundwater in both Ashfield Shale and Hawkesbury Sandstone.

- Groundwater quality is subject to testing. Where it does not meet license requirements it would be treated prior to discharge.
- All feasible and reasonable measures would be implemented during construction, to limit operational groundwater inflows to stations and crossovers. Any inflows would be collected and treated prior to discharge.
- A groundwater water supply from the Hawkesbury Sandstone for construction purposes will be used where feasible and reasonable. Negotiation with the NOW would be undertaken regarding impacts and applicable licences.
- A typical discharge into a natural waterway (where approved) requires a groundwater treatment process that includes the following steps:
  - Inlet buffer tank, with aeration
  - Coagulation / flocculation
  - Dissolved air floatation (solids removal)
  - Multimedia filtration (25 micrograms)
  - Cartridge filtration (2 micrograms)
  - Brackish water reverse osmosis
  - Disposal of water brine concentrate to sewer (dependent on future environmental policies)
  - Discharge of adequately treated water (into aquifer of origin, stormwater (creek catchments), sewer under a trade waste agreement, onsite reuse or recycling or a combination of these options)."
- Groundwater discharge quality will comply with the relevant Environment Protection Licence.
- Any groundwater which is treated at the Lady Game Drive water treatment plant is not discharged into the Lane Cove River without first meeting the discharge criteria below (Table 7).

Table 7 Lady Game Drive Water Treatment Plant Discharge Criteria

Analyte	Recommended Discharge Criteria
pH	7.0 - 8.5
Total Suspended Solids (mg/L)	-
Turbidity (NTU)	0.5 – 10
Dissolved Oxygen (mg/L)	8.2-10
Oil & Grease (mg/L)	<5 or ND
Sulfate	-
Ammonia (mg/L)	2.8
Oxidised Nitrogen (mg/L)	7.2
Total Nitrogen (mg/L)	2.8
Total Phosphorus (mg/L)	0.03
Aluminium (mg/L)	0.69
Beryllium (mg/L)	-
Chromium (mg/L)	0.14
Copper (mg/L)	0.005
Iron (mg/L)	7.7
Lead (mg/L)	0.028
Manganese (mg/L)	10
Nickel (mg/L)	0.32
Tin (mg/L)	0.00175
Zinc (mg/L)	0.2
Coliforms (CFU/100 mL)	-

(Source: EIS 2)

- The discharge criteria in would be discussed in consultation with the EPA to ensure the level of discharge will not cause pollution of waters.
- Specific processes regarding groundwater discharge and treatment methods will be identified during detailed design.
- A Water Quality Monitoring Program will be prepared and implemented to monitor impacts on surface and groundwater quality resources and wetlands during construction and operation. The Program shall be developed in consultation with DPI (Fisheries), NOW and Blacktown City Council.
- The management of groundwater and surface water ingress, including the design of capture, treatment and discharge methods shall be undertaken in consultation with the EPA. All intercepted groundwater and surface water shall be treated to ensure that relevant ANZECC water quality guidelines are met, prior to discharge.
- The following groundwater management objectives will apply to the construction of the project:
  - Reduce the potential for drawdown of surrounding groundwater resources
  - Prevent the pollution of groundwater through appropriate controls.

  - Reduce the potential impacts of groundwater dependant ecosystems
- NWRL 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. The NSW Office of Water will be consulted during the development of the Groundwater Management Plan in relation to dewatering and licensing arrangements.
  - 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.
  - A groundwater monitoring plan.
  - Compliance record generation and management.
- The Groundwater Monitoring Plan will
  - Outline the parameters to be monitored (field parameters and laboratory parameters) and the sample frequency.
  - Include details of a groundwater monitoring network to monitor groundwater levels and groundwater quality throughout the construction phase. The groundwater monitoring network will contain monitoring wells along the whole NWRL route intersecting groundwater in both the Ashfield Shale and Hawkesbury Sandstone. NWRL Contractors will retain compliance records of all groundwater monitoring undertaken.
  - NWRL Contractors will retain compliance records of all groundwater monitoring undertaken.
- 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 ECRL Conversion Works, groundwater encountered during construction would be managed in accordance with the requirements of the Waste Classification Guidelines (DECCW 2009) and Transport for NSW's Water Discharge and Re-use Guideline.

7.3 Water Reuse and Discharge

Where practicable, water from sediment basins or any collected groundwater will be reused within the Premises (e.g. dust suppression, watering retained vegetation, cooling). The Water Reuse and Discharge Procedure regulates both onsite reuse and offsite point source discharge. Prior to any discharge off the premises, or reuse within the premises, the Environment Coordinator is to sign off that the water is suitable for reuse or discharge.

7.3.1 Onsite Reuse

For onsite reuse the following criteria will be utilised:

- No visible oil and grease
- No potential for water to leave the premises
- 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
- No visible fines (concrete washout water only)
- If transporting water to sediment basins, the sediment basin must not be overfilled.

7.3.2 Offsite Discharge

No water will be discharged off site until it is tested. Water quality testing will be undertaken prior to discharge offsite in accordance with Transport for NSW's Water Discharge and Re-use Guideline and EPL Condition L2.4 for the following parameters and monitored on a daily basis:

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

The EPL does not authorise the pollution of waters by any pollutant other than those specified above.

Monitoring for the concentration of a pollutant discharged to waters or applied to a 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.

As set out in EPL Condition L2.5, based on a 5-day, percentile rainfall depth (Landcom, 2004), should rainfall received within a 5 day period exceed 32.2mm (85th percentile) or 24.6mm (80th percentile) it is expected that sediment basins may discharge naturally over their spillway without an opportunity to flocculate and test basins for TSS, pH or the presence of oil and grease. It should also be noted that other types of sediment controls may also be overwhelmed during such an event and that repair work will be undertaken when it has been determined by the Site Supervisor that it is safe to do so.

Laboratory testing will be undertaken in conjunction with field testing initially to establish a correlation between TSS and turbidity (NTU) for each sediment basin. The correlation between TSS and turbidity will be specific to that location only and there may be multiple correlations developed depending on the discharge locations. Once the correlation is established NTU measurements will be undertaken to demonstrate that TSS is below the site discharge criteria. The EPA will be provided with a copy of the statistical correlation assessment methodology and results before using NTU in place of TSS. A method to enable the ongoing verification of the relationship between NTU and TSS will be implemented. The EPA will be provided with any amendments made to the statistical correlation as a result of the ongoing verification required by Condition L2.8 before using the revised statistical correlation.

Where testing demonstrates that the water does not meet the discharge criteria, appropriate treatment will be applied (flocculation, acid dosing etc.). Any polymer based flocculants used to treat water before discharge from the premises will have a 48-hour EC50 (immobilisation) for water fleas and a 96-hour EC50 (imbalance) for fish, greater than 100 milligrams per litre.

- The location of discharge points is defined by the most recently approved discharge point register held on the EPA Electronic File
- The discharge point register is not deemed to be approved by the EPA unless confirmed as such in writing by the EPA.

The discharge point register must be submitted to the EPA no later than 5 business days prior to any proposed changes to the register.

7.4 Refuelling, Chemicals and Spill Management

Hazardous substances and dangerous goods will be stored and used onsite in accordance with the following protocols and details on the SEP:

- Hazardous substances will be stored onsite in lockable containers, in their original receptacles.
- Emergency spill kits would be kept on-site at all times. All staff would be made aware of the location of the spill kit and be trained in its use.
- All hazardous substances will be clearly labelled and will have Hazardous Chemicals and Safety Data Sheets (SDS) affixed or available nearby. The SDS will be used to determine compatibility of hazardous chemicals to be stored together, i.e. no flammables with corrosives, not all corrosives compatible with each other etc.
- A bund sized to 110% of the largest stored receptacle will be established around any storage area for hazardous substances.
- Storage and handling of flammable or combustible liquids will be in accordance with OEH guidelines for Bunding and Spill Management, as well as AS 1940-1993 – The Storage and Handling of Flammable and Combustible Liquids.
- An up-to-date register of hazardous substances will be kept onsite at all times.
- Hazardous substances will only be used onsite as required, in accordance with the manufacturer/supplier instructions.
- Any substances with the potential to impact water quality will be assessed by the Environment Manager to determine what environmental safeguards or procedures are required for that substance to minimise the risk of environmental harm. TRA's would be reviewed to ensure any potentially ecological impacts have been assessed.
- The use of any hazardous substance that could result in a spill will be undertaken away from drainage or stormwater lines and, wherever possible, within defined bunds.

- Any refuelling undertaken on site shall be undertaken in designated areas only.
- All spills or leakages will be immediately contained and absorbed. Routine inspections of all construction vehicles and equipment would be undertaken for evidence of fuel/oil leaks
- Vehicles and machinery would be properly maintained to minimise the risk of fuel/oil leaks
- In the event of a spill the Spill Management Procedure will be implemented. As set out in the CEMP, the management of environmental incidents where material harm to the environment is caused or threatened will be managed in accordance with the Emergency Response Plan.
- Construction plant, vehicles and equipment would be refuelled off-site, or in designated re-fuelling areas located at a minimum distance of 50 metres from drainage lines or waterways

7.5 Contamination

7.5.1 Phase 1 Works

7.5.1.1 General Contamination

While levels of copper, nickel and zinc were reported in excess of the site specific EILs, they are not considered potential sources of contamination as:

- Western Sydney soil situated upon Wianamatta Group shales generally contain naturally elevated levels of certain heavy metals (e.g. nickel, copper and zinc) and results observed are within this natural variance
- The concentrations do not appear to be affecting the vegetation growth on these plots compared to the surrounding area.

Therefore no specific management or remediation is required, or the requirement to engage a site auditor. Any unexpected finds would be managed in accordance with Section 7.9.

7.5.1.2 Asbestos Material

Identified fragments of ACM on the surface and within miscellaneous stockpiles on site would be managed in accordance with the WHS Management Plan, Asbestos Management Plan, and a task specific Asbestos Removal Control Plan.

Removal would be by a licensed asbestos removal contractor who would produce the following

- Asbestos removal licences for workers performing the removal works
- A task specific TRA
- Evidence of notification to the relevant authority

- Where there is uncertainty as to whether the exposure standard may be exceeded, or if it is likely to be exceeded, then air monitoring must be performed by a competent person who is independent of the removalist
- At the completion of the removal works a clearance certificate must be obtained from a competent person
- An EPA waste disposal certificate must be provided by the removalist following the completion of the works to prove that any asbestos containing material removed from the site has gone to an approved landfill facility.

7.5.2 ECRL Conversion Works

As noted in Section 4.2.2, the potential for contamination to be encountered is low, and no further assessment was carried out or required as a condition of approval. Any evidence of contamination would be managed in accordance with the unexpected finds procedure in Section 7.9.

7.5.3 Phase 2 Works

7.5.3.1 Cudgegong Road to Bella Vista

As noted in Section 4.3.9.3, no contamination information was provided to NRT at the time that this SWMP was prepared. Further contamination investigation and assessment will be undertaken, where required, as sites are progressively handed over to NRT from the SVC contractor. However it is expected that no further investigations would be required as the SVC contractor would have already disturbed the majority of the work areas to be taken over by NRT.

Any unexpected finds would be managed in accordance with Section 7.9.

7.5.3.2 Bella Vista to Epping

Based on the reports provided by the TSC contractor, it is not expected that any further contamination investigations are required. The majority of the worksites have already been disturbed and investigated.

Further demolition work and the removal of the three UST’s would be required at Showground. These areas would be subsequently sampled and validated to ensure the surrounding soil and groundwater meets the SAC.

7.5.3.3 Asbestos Materials

Asbestos materials would be managed the same way during Phase 2 Works as they are during Phase 1 Works. Identified fragments of ACM on the surface and within miscellaneous stockpiles on site would be managed in accordance with the WHS Management Plan, Asbestos Management Plan, and a task specific Asbestos Removal Control Plan.

Removal would be by a licensed asbestos removal contractor who would produce the following

- Asbestos removal licences for workers performing the removal works
- A task specific TRA
- Evidence of notification to the relevant authority
- Where there is uncertainty as to whether the exposure standard may be exceeded, or if it is likely to be exceeded, then air monitoring must be performed by a competent person who is independent of the removalist
- At the completion of the removal works a clearance certificate must be obtained from a competent person
- An EPA waste disposal certificate must be provided by the removalist following the completion of the works to prove that any asbestos containing material removed from the site has gone to an approved landfill facility.

7.5.3.4 Waste Classification

Any material going offsite for disposal or reuse would be classified in accordance with the Spoil Management Plan and NSW EPA Waste Classification Guidelines.

7.5.4 Norwest Pedestrian Link Works

As noted in Section 4.4.3 there is a risk of discovering hydrocarbons in the groundwater or soils under the proposal footprint given it recorded presence at elevated concentrations locally, specifically in relation to the Shell Service Station close by.

Before starting on site, soil sampling will be undertaken to determine if there is the presence of any contamination.

7.5.5 33kV Underground Feeder Powerline Works

As noted in Section 4.5.3, the potential for contamination to be encountered is low, and no further assessment was carried out or required as a condition of approval. Any evidence of contamination would be managed in accordance with the unexpected finds procedure in Section 7.9.

7.5.6 Rouse Hill Temporary Bypass Powerline Works

As noted in Section 4.6.3, the potential for contamination to be encountered is low, and no further assessment was carried out or required. Any evidence of contamination would be managed in accordance with the unexpected finds procedure in Section 7.9.

7.6 Salinity

7.6.1 Phase 1 Works

If required, further additional investigation into the deeper soils and/or groundwater (if intersected) would be undertaken around First Ponds Creek. At this stage, all works

around the First Ponds Creek area are currently in fill areas, with the exception of the permanent sediment basin. No evidence of saline material was encountered during excavation of the basin.

As part of the design process, additional geotechnical investigations and laboratory testing was undertaken to further assess the ground conditions at the RTRF. Based on the soil test results, the soil pH is ranging from 5.1 to 6.6 at a depth of <3.0m and 8.1 to 8.4 at a depth >3.0m with low sulphate and chloride and predominately low concentrations of magnesium. The test data indicates the groundwater has a pH of 6.0 with low sulphate concentrations. The concentration of chloride in the groundwater is 76 mg/l indicating a low level of salinity of the groundwater at the test location within RTRF boundary.

The exposure classification of buried reinforced concrete elements was therefore based on the test results above. The soil test results indicate a low probability of the presence of ASS/PASS with soil pH above 5.17 with low sulphate concentration and chloride and moderate magnesium concentrations. Thus, a B2 / Moderate exposure classification has been adopted for the buried concrete footing; piles caps, ring beams and base slabs, based on the above assessment for buried concrete elements exposed to High Permeable, Non-ASS/PASS Soil.

Generally, for other soils in this area, the following would be considered:

- Building materials be selected that are suitable for construction in a moderately saline area
- Any vegetation and landscaping plans for the site should consider salinity, both in terms of the potential impact from salinity on the plants, and in regard to the role of vegetation and landscaping in good salinity management
- Use of water-wise gardening is recommended for gardens and landscaping in areas with a slight to moderate salinity potential at the site.

The main water-wise gardening techniques for consideration in the planning and design of works involve:

- The use of low water requiring species
- ‘Smart’ irrigation systems that respond to soil moisture and climate conditions to reduce over-watering
- Careful installation of irrigation systems to avoid over-spray, drift or ponding affecting built structures
- Grouping of plants with similar water needs
- Checking irrigation systems for leaks
- Mulching garden beds
- Reduced lawn areas.

7.6.2 ECRL Conversion Works

The REF did not indicate any issues with regards to soil salinity.

7.6.3 Phase 2 Works

For corridor works between Cudgegong Road and Bella Vista, activities that increase the amount of infiltration could cause or exacerbate offsite salinity impacts. As such, the following management measures will be applied:

- Sediment basins will be de-watered within 5 dry (rain-free) days of a rainfall event that caused inflow
- Dust suppression using water carts will avoid over-watering and only use sufficient water to manage dust rise. Surface ponding will be avoided during dust suppression
- Irrigation of rehabilitated or landscaped areas will utilize low-water-use fixtures such as drippers, sub-surface irrigation or similar. Water will be applied sparingly and only in quantities sufficient to promote plant growth. Subsoil moisture will be physically checked (through visual observation) regularly during irrigation to ensure watering rates are not excessive.
- Water used for construction purposes (e.g. to achieve adequate compaction rates) will be applied sparingly and carefully to minimise the potential for infiltration.
- Any stockpiles of potentially-saline material are to be covered with impermeable material (e.g. builders' plastic) to minimise the risk of saline water leaching from the stockpile. Alternatively, stockpiles are to be completely bunded to minimise runoff and collected water evaporated or treated prior to release.
- Use of water-wise gardening is recommended for gardens and landscaping in areas with a slight to moderate salinity potential at the site.

For works around Bella Vista and the station precincts, the following would apply:

- Minimising any groundwater level rises that may mobilise potential salinity in soils..
- Minimising surface infiltration into the groundwater system. This may include the design and construction of an efficient and effective surface drainage system with adequate cross falls, the use of impervious
- Appropriate management of any water collected from sub-surface drainage systems prior to discharge. Examples of appropriate management strategies include:
  - Evaporation: Evaporation involves either allowing inflow to evaporate in place, or reusing the water on Site such as dust suppression, or on-site irrigation.
- Drainage design adequately sized to allow for peak flows of both external and internal catchments.
- Considering the impact of salinity and the aggressiveness of soil materials to the durability of building materials used
- Considering the impact of soil dispersivity on drainage and water retention structures

  Use of water-wise gardening is recommended for gardens and landscaping in areas with a slight to moderate salinity potential at the site.

7.6.4 Norwest Pedestrian Link Works

The REF did not indicate any issues with regards to soil salinity.

7.6.5 33kV Undergound Feeder Powerline Works

The REF did not indicate any issues with regards to soil salinity.

7.6.6 Rouse Hill Temporary Bypass Powerline Works

The EIA did not indicate any issues with regards to soil salinity.

7.7 Acid Sulfate Soils

As noted in Section 4.1.5 and the relevant EIS and REF, there is considered to be no risk of exposure of acid sulfate soils during construction works.

Whilst ASS has not been identified as a risk for the Phase 1, ECRL Conversion, Phase 2, Norwest Pedestrian Link, 33kV Underground Feeder Powerline works or Rouse Hill Temporary Bypass Powerline works, a contamination and acid sulfate soil contingency procedure has been contained in Annexure F.

7.8 Riparian Zones

7.8.1 Phase 1 Works

First Ponds Creek and Second Ponds Creek are required to have a 50m riparian buffer zone. For Phase 1 works, Second Ponds creek is approximately 150m away from the nearest boundary point of the works and thus is not affected.

For First Ponds Creek, the following would apply:

- No materials would be stockpiled within the 50m riparian zone
- Exclusion zone fencing and signage would be installed to prevent access
- If works are required within the 50m zone, ERSED controls would be installed as per the ERSED control plan and in accordance with advice from the Specialist Soil Conservationist
- Restoration works would be carried out in accordance with Conditions C2 (RTRF Approval) and C26 (OTS Approval), and as detailed in the Flora and Fauna Management Plan.

7.8.2 Phase 2 Works

Riparian zones are required to have a 50m buffer from the works area. For Phase 2 Works, the relevant watercourses are Devlins Creek, Pyes Creek, Cattai Creek, Strangers Creek, Elizabeth Macarthur Creek, Caddies Creek (including Tributaries 3, 4 and 5), and Second Ponds Creek.

For riparian zones during Phase 2 Works, the following would apply:

- No materials would be stockpiled within the 50m riparian zone

- Exclusion zone fencing and signage would be installed to prevent access
- If works are required within the 50m zone, ERSED controls would be installed as per the ERSED control plan and in accordance with advice from the Specialist Soil Conservationist

Restoration works would be carried out in accordance with Condition C26 (OTS Approval), and as detailed in the Flora and Fauna Management Plan

7.9 Unexpected Finds

In the event of unexpected finds of contamination the Contamination Unexpected Finds and Contingency procedure will be implemented.

In brief, the following would occur:

- Cease work in the area of concern immediately.
- Isolate the area with barrier tape or any other physical barrier to prevent workers from entering the potentially contaminated location.
- Report the area of concern to the Environment Manager and WHS Manager immediately. Nearby work groups would be notified.
- Environment Manager will engage a suitably qualified contamination consultant inspect the site and carry out an initial assessment of the nature and extent of the contamination.
- The Contamination Consultant will advise what management is required in accordance with this plan and the contamination report.

8 Water Quality Monitoring Program

The Water Quality Monitoring Program is being implemented to monitor impacts on surface water quality resources as well as the effectiveness of the mitigation measures applied as part of the OTS Works. The detailed methodology provided below sets out the Program to be implemented to comply with condition C10 of project approval 5931, and condition C37 from project approval 5414, and the Director-General's approval will be sought to implement this Program as part of seeking approval of this Plan. This Program has three key phases:

- Pre-construction OTS Works water quality monitoring
- OTS Works construction stage water quality monitoring
- Post OTS Works completion water quality monitoring.

Monitoring of groundwater and surface water to be undertaken at each of these phases is addressed below.

8.1 Scope and Objectives

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

- The prevention of pollution
- Minimising the risk of polluted, sediment-laden or contaminated water leaving the premises and impacting both surface and groundwater
- Implementing a comprehensive management and monitoring regime on site.

Although monitoring will also be conducted offsite in the receiving waters as set out below, this will simply be a proactive mechanism to trigger investigations and ensure that site processes and procedures are more than adequate.

Surface water quality monitoring of the receiving environment prior to construction is highly unlikely to define suitable standards or benchmarks for water quality discharges from the OTS Works given that:

- Waterways along the site mostly ephemeral
- Water quality from urban areas is highly variable and changes according to prevailing weather patterns and also day-to-day during rainfall.

Surface water quality monitoring will be undertaken as follows:

- Pre-construction OTS Works – monthly when given site control
- OTS Works construction stage – every three months
- Post OTS Works completion – every three months for a minimum of 3 years or until any affected waterways are certified as being rehabilitated to an acceptable condition.

The water quality monitoring set out in Section 8.3 below will be undertaken in addition to the monitoring to be undertaken within the Premises prior to discharge during construction set out in Section 7.3.

8.2 Monitoring Parameters

The range of parameters to be tested for water quality monitoring of surrounding waterways is detailed in Table 8.

Table 8 Surface Water Quality Parameters for Monitoring of Surrounding Waterways

Parameter	Sampling Methods	Analytical Method	ANZECC Criteria	Trigger Values	Action
Temperature (oC)	Probe	Field analysis	> 80%ile < 20%ile	Downstream results are > than upstream results by 20% in rainfall events up to and including the design event of 32.2mm in 5 days.	Environment Coordinator to re-test to confirm results and undertake an inspection of the adjacent works and propose actions where required.
Dissolved Oxygen (DO)	Probe	Field analysis	Lower limit – 85 Upper limit – 110		
Turbidity (NTU)	Probe	Field analysis	6 - 50		
Oil and grease	Visual analysis, then grab sample if required	Visual assessment. Confirmed with lab analysis if required	-		
pH	Grab sample and probe	Field analysis. Lab assessment if required	Lower limit – 6.5 Upper limit – 8.5		
Total Suspended Solids (TSS)	Grab sample and probe	Lab analysis as required to calibrate field analysis for Turbidity			

8.3 Surface Water Quality Monitoring

8.3.1 Phase 1 Works

The surface water quality monitoring locations and the frequency of monitoring that will be conducted pre-construction, during construction and post completion of the OTS Works are identified in Table 9. Water monitoring will be undertaken First Ponds Creek as per Table 9 (upstream, downstream of the worksite and within the middle of the worksite – refer to Annexure C for maps showing indicative surface water quality monitoring locations). The parameters to be tested are identified in Table 8 above.

Second Ponds Creek will not be monitored as part of this phase, as works are unlikely to result in any direct impacts; and secondly the creek runs directly though works associated with the SVC contract where a separate water quality monitoring program is currently being undertaken.

Results of water quality monitoring will be recorded on the Water Quality Monitoring Form.

Table 9 Surface Water Monitoring Locations and Frequency

Waterway	Monitoring Point	Interaction with OTS works	Monitoring location, Scope and Frequency		
			Preconstruction works	During Construction	Post Construction
First Ponds Creek	FPC-1	Receiving waters for the RTRF site	Monthly for parameters detailed in Table 8 One wet weather event for the parameters detailed in Table 8 Note: A wet weather event is when the receiving area has received >32.2mm of rain in 5 days.	Three-monthly for parameters detailed in Table 8 Up to four wet weather events per year for the parameters in Table 8.	Three-monthly for parameters detailed in Table 8for three years following the completion of construction or until the affected waterways and/or groundwater resources are certified by an independent expert as being rehabilitated to an acceptable condition. One wet weather event for the parameters detailed in Table 8for a maximum of six months following the completion of the OTS Works in the vicinity.
	FPC-2				
	FPC-3				
	FPC-4				
	FPC-5				

8.3.2 Phase 2 Works

It is anticipated that surface water quality monitoring will occur at the same locations used by the TSC and SVC contractors. These locations will be reviewed for appropriateness as NRT takes each relevant worksite. See Annexure C for locations.

8.4 Groundwater Quality Monitoring

8.4.1 Phase 1 Works

Impacts to groundwater during construction works are not expected to be significant. Dewatering works could potentially lower groundwater levels within the local area which could indirectly impact groundwater dependent ecosystems. There are no tunnels proposed during construction and the majority of the site is likely be filling activities rather than cutting activities. Excavation works in the Cudgegong Road Precinct are unlikely to reach the depth of the groundwater table which varies between 13 and 18m. As such, the excavation works are not expected to result in significant amounts of dewatering during construction

The existing groundwater piezometer previously installed will be utilised for the groundwater quality monitoring program. These are:

- NWR-BH088 near Tallawong Road
- NWR-BH084 near Cudgegong Road (if able to be located – otherwise data for NWR-BH088 will be utilised)

Pre-construction groundwater monitoring will be carried out at these locations and on a monthly basis once site access is granted.

The range of parameters to be tested for groundwater quality is detailed below. All samples will be tested at a NATA registered laboratory. After six months, the groundwater monitoring results will be reviewed to determine ongoing requirements (parameters, triggers, locations, frequency etc.) and improvements for the program. The review will be forwarded to the ER and TfNSW.

Any ongoing Construction groundwater monitoring would be undertaken based on the findings of the review of pre-construction monitoring. Trigger points against which action would be taken are indicated below.

Refer to Annexure D for a more detailed plan of groundwater quality monitoring locations.

Table 10 Groundwater Quality Monitoring Parameters

Parameter	Sampling Methods	Analytical Method	Criteria	Trigger Values	Action
pH	pH units	Lab	Range 4.1 to 14, average 7.	Significant change (>20%) over pre-construction background levels observed	Obtain specialist advice if trigger levels reached.
Sulfate	mg/L	Lab	Range <2 to 460 mg/L, average 95 mg/L		
Chloride	mg/L	Lab	Range 7 to 6400 mg/L, average 1452 mg/L		
EC	µs/cm	Lab	Range 630 to 9200 µS/cm, average 2820		
TDS	mg/L	Lab	Range 160 to 9800 mg/L, average 3025 mg/L		
Total Alkalinity	mg/L	Lab	Range 13 to 1830 mg/L, average 459 mg/L		

8.4.2 Phase 2 Works

It is anticipated that groundwater quality monitoring will occur at the same locations used by the TSC and SVC contractors. These locations will be reviewed for appropriateness as NRT takes control of each relevant worksite and the results of the monitoring. NRT's works are predominantly above ground and are not predicted to impact groundwater at all. This is owing to the fact that the station boxes and tunnels have been excavated and will be fully tanked prior to NRT taking possession; and no additional significant deep excavation works are proposed to occur along the alignment.

It is anticipated that the parameters and limits identified in Table 10 will also apply to Phase 2 Works.

8.4.3 Norwest Pedestrian Link Works

Groundwater quality monitoring for the Norwest Pedestrian Link will be undertaken at the existing locations as per Phase 2. The parameters and limits identified in Table 10 will also apply to the Norwest Pedestrian Link Works.

8.5 Adaptive Management

Water quality monitoring frequency in any particular area or zone could be extended if potential impacts attributable to the OTS Works are identified. The work method and management practices will be assessed and revised or adapted if considered necessary.

8.6 Reporting

In addition to the reporting requirements under the Environment Protection Licence, water quality monitoring results will be reported at six monthly intervals during construction and following the completion of the OTS Works to the Department of Planning and Environment, the Environment Protection Authority, the Department of Primary Industries, Blacktown Council, The Hills Shire Council and Hornsby Shire Council and the NSW Office of Water.

9 Training, Reporting and Review

9.1 Training

All personnel working on site will undergo site induction training relating to soil and water issues. The training will cover the following issues such as:

- Legislative requirements (POEO Act, EPL etc.) including Section 120.
- Erosion and sedimentation control planning and hold points
- 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)
- Contamination and Unexpected Finds.

Detailed training will be provided to key personnel regarding erosion and sediment control. This training will include:

- Legislation as it applies to erosion and sediment control
- Basics of soil management, handling and stockpiling
- Sediment basin management and dewatering
- Appropriate use, installation and maintenance of various erosion and sediment control techniques
- Effective site rehabilitation and stabilisation
- Use of erosion control techniques such as geotextiles, organic fibre mats, mulches and soil polymer stabilisers
- Preparing, reading and interpreting Erosion and Sediment Control Plans
- Typical controls around existing drains, maintenance of controls and Water Treatment Plants.
- Operation of the water treatment plans and relevant testing and reporting

Toolbox talks will also be used to further reinforce awareness of Soil and Water issues.

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

9.2 Monitoring, Compliance and Reporting

NRT will regularly review the OTS Works to ensure compliance with this Plan. A regular inspection, program for soil and water will be conducted as follows:

- Details of daily inspections undertaken by the Site Supervisor will be logged in their respective site diaries.
- Routine weekly inspections are to be conducted to monitor erosion and sediment controls in active worksites. Weekly inspections will be documented on the Environmental Inspection Form.
- Inspect the operation of soil and water management works installed on the premises and undertake any works required to repair and/or maintain these controls:
  - at least weekly during normal construction hours outlined in EPL condition L4.1
  - prior to any major rainfall event forecasted
  - daily following a major rainfall event in any 24 hour period, if safe to do so
  - prior to any site closure of greater than 24 hours
- The soil conservationist will complete routine site inspections to review the implementation of the ESCPs, and provide ongoing advice and recommendations.

Typical records generated would include:

- Copies of current ESCPs for all active construction sites
- Records of soil and water inspections undertaken
- Observations and works undertaken to repair and/or maintain soil and water management works
- 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
- Unexpected finds
- Records for contamination management – soil classification, spoil tracking, disposal dockets, remedial action plans, occupational hygienist clearances, and Site Auditor sign-offs.

Results and outcomes of inspections, monitoring and auditing will be reported internally on a monthly basis. Six-monthly construction compliance reports will be prepared to report on compliance with the Project Approval.

9.3 Review and Improvement

A non-conformance is an action or omission that does not conform to the requirements of this Plan or any legal and other requirements. Any member of the project team or the Environmental Representative can identify a non-conformance or opportunity for improvement. The CEMP identifies the process for identifying, reporting, recoding and reviewing non-conformances. This will ensure continual improvement.

The processes described in the CEMP may result in the need to update or revise this Plan. This will occur as needed. This Plan will be audited within six months of the commencement of construction and thereafter as per the CEMP. The Plan shall be reviewed and updated based on the findings of the audit.

Annexure A Stakeholder Consultation Feedback

Condition of Approval SSI-5931	Condition of Approval SSI-5414	CEMP Document	— Agency Consultation	— Status	— Comments
Phase 1					
E29(d), C10	E35(d), C37	Construction Soil and Water Quality Management Plan (including Water Quality Monitoring Program)	Environment Protection Authority	Response received 5 January 2015	EPA has notified by email (5/1/15) that they do not review and endorse management plans and as such will not be providing comment on the plan.
			NSW Office of Water	Response received 16 December 2014	The Office of Water has reviewed these plans and is satisfied that they adequately address potential impacts to water resources from the proposed activities
			Blacktown City Council	Submitted 3 December 2014	No comment received as at 18/12/14.
			DP&E (Fisheries)	Response received 1 December 2104	Fisheries NSW has reviewed these plans and supports what is proposed with no suggested changes
C9	C35	Soil Salinity Report	NSW Office of Water	Report submitted to Office of Water on 9 February 2015	No comment received as at 12 February 2015
			Office of Environment and Heritage	Report submitted to OEH on 9 February 2015	No comment received as at 12 February 2015
Phase 2					
N/A	E35(d), C37	Construction Soil and Water Quality Management Plan (including Water Quality Monitoring Program)	Environment Protection Authority	Response received on 12 October 2015	Thanks for your email requesting comments on the Construction Noise and Vibration Management Plan, Construction Soil and Water Management Plan and Water Quality Monitoring Program. As you are aware the EPA encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, we do not approve or endorse these documents as our role is to set environmental objectives for environmental management and not to be directly involved in the development of strategies to achieve those objectives. The EPA will manage any issues within their jurisdiction (during the construction phase of the project) relating to these matters through specific conditions of the EPL.
			NSW Office of Water	No response received as of 28 October 2015.	N/A
			Hornsby Shire Council	Response received on the 16 October 2015	No issues for the CEMP, Flora and Fauna Management Plan and Soil and Water Management Plan. Generally supportive of the controls, monitoring and reporting included.
			Hills Shire Council	Response received on 20 October 2015	Advised I have been overseas on leave for the past month and only returned to work yesterday. Consequently I have not had a chance to review the various Construction Environmental Management Plans that were emailed to me on 1st October for comment. I am still keen for the relevant Council officers to review the documents but acknowledge that any comments will have to considered as part of the regular 6 monthly review process.
			NSW Fisheries	Response received on 6 October 2015	Fisheries NSW has reviewed the NRT Construction Environment Management Plan and NRT CEMP Sub Plan Construction Soil and Water Management Plan and has no objections or suggested changes to make to this document.

Annexure B Soil and Water Management Measures and Compliance Matrix

ID	Measure	Timing	Requirement	Responsibility	Reference
Project Approval – Specific Management Plan Requirements					
1)	A Construction Soil and Water Quality Management Plan to manage surface and groundwater impacts during construction of the SSI. The Plan shall be developed in consultation with NOW and include, but not necessarily be limited to:	Before Construction	RTRF Approval SSI-5931 CoA E29d	Environment & Sustainability Manager	This Plan Annexure A
2)	details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater	Before Construction	RTRF Approval SSI-5931 CoA E29d(i)	Environment Manager	Section 5
3)	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;	Before Construction	RTRF Approval SSI-5931 CoA E29d(ii)	Environment Manager	Section 7.2, 7.3 Groundwater is not proposed to be extracted for use
4)	surface water and ground water impact assessment criteria consistent with Australian and New Zealand Environment Conservation Council (ANZECC) guidelines	Before Construction	RTRF Approval SSI-5931 CoA E29d(iii)	Environment Manager	Section 8
5)	management measures to be used to minimise surface and groundwater impacts, including 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;	Before Construction	RTRF Approval SSI-5931 CoA E29d(iv)	Environment Manager	Section 7 Spoil Management Plan Section 4.1.8 Stormwater and Flooding Management Plan

ID	Measure	Timing	Requirement	Responsibility	Reference
6)	a contingency plan, consistent with the Acid Sulphate Soils Manual, to deal with the unexpected discovery of actual or potential acid sulfate soils, including procedures for the investigation, handling, treatment and management of such soils and water seepage	Before Construction	RTRF Approval SSI-5931 CoA E29d(v)	Environment Manager	Section 7.7 Contamination Unexpected Finds and Contingency Procedure (Annexure F)
7)	management measures for contaminated material and a contingency plan to be implemented in the case of unanticipated discovery of contaminated material during construction	Before Construction	RTRF Approval SSI-5931 CoA E29d(vi)	Environment Manager	Section 7.5, Contamination Unexpected Finds and Contingency Procedure (Annexure F)
8)	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 non-compliance can be rectified; and	Before Construction	RTRF Approval SSI-5931 CoA E29d(vii)	Environment Manager	Section 8, 9.2
9)	mechanisms for the monitoring, review and amendment of this Plan.	Before Construction	RTRF Approval SSI-5931 CoA E29d(viii)	Environment Manager	Section 9.3
10)	A Construction Soil and Water Management Plan to manage soil surface and groundwater impacts during construction of the SSI. The plan shall be developed in consultation with the EPA and NOW and include, but not necessarily be limited to:	Before Construction	OTS Approval SSI-5414 CoA E35d	Environment Manager	This Plan Annexure A
11)	details of construction activities and their locations, which have the potential to impact on water courses, storage facilities, stormwater flows, and groundwater	Before Construction	OTS Approval SSI-5414 CoA E35d(i)	Environment Manager	Section 5

ID	Measure	Timing	Requirement	Responsibility	Reference
12)	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;	Before Construction	OTS Approval SSI-5414 CoA E35d(ii)	Environment Manager	Section 7.3 Groundwater is not proposed to be extracted for use
13)	surface water and ground water impact assessment criteria consistent with the principles of the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines	Before Construction	OTS Approval SSI-5414 CoA E35d(iii)	Environment Manager	Section 8
14)	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	Before Construction	OTS Approval SSI-5414 CoA E35d(iv)	Environment Manager	Section 7 Spoil Management Plan Section 4.1.8 Stormwater and Flooding Management Plan
15)	a contingency plan, consistent with the Acid Sulfate Soils Manual, to deal with the unexpected discovery of actual or potential acid sulfate soils, including procedures for the investigation, handling, treatment and management of such soils and water seepage	Before Construction	OTS Approval SSI-5414 CoA E35d(v)	Environment Manager	Section 7.7 Contamination Unexpected Finds and Contingency Procedure (Annexure F)
16)	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;	Before Construction	OTS Approval SSI-5414 CoA E35d(vi)	Environment Manager	Section 7.5, Contamination Unexpected Finds and Contingency Procedure (Annexure F)

ID	Measure	Timing	Requirement	Responsibility	Reference
17)	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 non-compliance can be rectified; and	Before Construction	OTS Approval SSI-5414 CoA E35d(vii)	Environment Manager	Section 8, 9.2
18)	mechanisms for the monitoring, review and amendment of this Plan.	Before Construction	OTS Approval SSI-5414 CoA CoA E35d(viii)	Environment Manager	Section 9.3
Revised EIS Environmental Management Measures					
19)	In the event of discovery of previously unidentified area(s) of potentially contaminated material, all work would cease in the vicinity of the discovery and not recommence until the extent of contamination has been assessed and if necessary, a Remediation Action Plan or similar has been prepared and endorsed by an accredited Site Auditor.	During Construction	RTRF EIS REMM SG14 EIS 2 REMM SG14	Site Supervisor Environment Coordinator	Section 7.9
20)	A Site Auditor would be required to certify that any contaminated areas have been remediated to a standard consistent with the intended land use prior to operation of the remediated site(s)	During Construction	RTRF EIS REMM SG15 EIS 2 REMM SG15	Environment Manager	Section 7.5
21)	Bunds around fuel depots and stockpile areas would be installed to minimise the risk of contaminants reaching the water table.	During Construction	RTRF EIS REMM SG16 EIS 2 REMM SG16	Site Supervisor Environment Coordinator	Section 7.4
22)	A groundwater monitoring plan would be prepared for the duration of the construction period. Parameters to be monitored would include groundwater levels and groundwater quality with field parameters, laboratory parameters and sample frequency to be developed prior to construction.	During Construction	RTRF EIS REMM SG17 EIS 2 REMM SG17	Environment Manager	Section 8.4

ID	Measure	Timing	Requirement	Responsibility	Reference
23)	Water sampling and testing of groundwater would be undertaken during construction to determine the most suitable treatment processes to meet the required water quality standards.	During Construction	RTRF EIS REMM SG19 EIS 2 REMM SG19	Environment Coordinator	Section 8.4
24)	All feasible and reasonable opportunities for groundwater reuse for construction purposes or recycling nearby would be utilised in the first instance. Should groundwater inflows and required treatment volumes outstrip potential for water reuse for construction purposes; options for discharge would be investigated	During Construction	RTRF EIS REMM SG26 EIS 2 REMM SG26	Environment Coordinator	Section 7.2, 7.3
25)	Where water salinity is found to be too high for discharge to creeks, brackish water reverse osmosis would be undertaken	During Construction	RTRF EIS REMM SG27 EIS 2 REMM SG27	Environment Coordinator	Section 7.3.2 Salinity Management Plan
26)	Dissolved iron would typically be removed from discharge water by oxidising the Ferric ion (Fe3+) to Ferrous (Fe2+) which enables precipitation and physical removal.	During Construction	RTRF EIS REMM SG28 EIS 2 REMM SG28	Environment Coordinator	Noted.
27)	Water turbidity would typically be treated by settling/filters.	During Construction	RTRF EIS REMM SG29 EIS 2 REMM SG29	Environment Coordinator	Section 7.3
28)	Iron reducing bacteria in discharge water would be typically treated by biocide dosing.	During Construction	RTRF EIS REMM SG30 EIS 2 REMM SG30	Environment Coordinator	Noted.
29)	Appropriate soil salinity mitigation measures would be adopted in accordance with Western Sydney Regional Organisation of Council's Draft Salinity Code of Practice and the former Department of Infrastructure, Planning and Natural Resources' Guidelines to Accompany Map of Salinity Potential in Western	During Construction	RTRF EIS REMM SG34 EIS 2 REMM SG34	Environment Manager	Section 7.6 Salinity Management Plan

ID	Measure	Timing	Requirement	Responsibility	Reference
	Sydney (2002). These mitigation measures would be included within Sub-Plans to the CEMP at all sites within areas of known risk of soil salinity.				
30)	Excavation for offsite disposal will be subject of additional assessments for waste classification with particular focus on Areas of Environmental Concern including above-ground storage tanks, farm dams and asbestos in buildings.	During Construction	RTRF EIS REMM SG41 EIS 2 REMM SG41	Environment Manager	Section 7.5
31)	Water quality mitigation measures would be implemented in accordance with relevant requirements of:- Landcom Managing Urban Stormwater - Soils and Construction Volumes 1 and 2 (2009). • NOW Guidelines for Controlled Activities • ANZECC Guidelines for Fresh and Marine Water Quality • ANZECC Guidelines for Water Quality Monitoring and Reporting • *Water Management Act 2000* • Applicable Environment Protection Licences.	During Construction	RTRF EIS REMM SW14 EIS 2 REMM SW14	Environment Coordinator	Section 2 Section 7
32)	Treatment measures would be applied to water collected in sediment basins, including settling of coarse sediments, the use of flocculation for finer sediments and pH correction.	During Construction	RTRF EIS REMM SW15 EIS 2 REMM SW15	Environment Coordinator Site Supervisor	Section 7.3.2
33)	As a first preference, treated surface water collected in sediment basins would be reused onsite, e.g. for dust suppression. Additional opportunities for re-using water on site or for construction would be investigated and implemented where feasible and reasonable.	During Construction	RTRF EIS REMM SW16 EIS 2 REMM SW16	Environment Coordinator Site Supervisor	Section 7.3.1
34)	Exclusion zones would be designated on construction sites to limit disturbance.	During Construction	RTRF EIS REMM SW17 EIS 2 REMM SW17	Environment Coordinator Site Supervisor	Section 7.1.4

ID	Measure	Timing	Requirement	Responsibility	Reference
35)	Re-vegetating or stabilising disturbed areas would occur as soon as feasible.	During Construction	RTRF EIS REMM SW18 EIS 2 REMM SW18	Environment Coordinator Site Supervisor	Section 7.1.1
36)	Appropriate erosion control measures would be installed such as sediment fencing, check dams, temporary ground stabilisation, diversion berms or site regrading.	During Construction	RTRF EIS REMM SW20 EIS 2 REMM SW20	Environment Coordinator Site Supervisor	Section 7.1
37)	Clean water runoff would be diverted away from the works or disturbed areas wherever possible.	During Construction	RTRF EIS REMM SW21 EIS 2 REMM SW21	Environment Coordinator Site Supervisor	Section 7.1
38)	Temporary sediment basins would be installed as appropriate. The exact size and layout of sediment basins would be determined as part of the CEMP in accordance with the requirements of the relevant Environment Protection Licence	During Construction	RTRF EIS REMM SW22 EIS 2 REMM SW21	Environment Coordinator Site Supervisor	Section 7.1
39)	Surface controls to promote ground stability, limit run-off lengths and reduce run-off velocities within the work sites would be implemented.	During Construction	RTRF EIS REMM SW26 EIS 2 REMM SW26	Environment Coordinator Site Supervisor	Section 7.1
40)	Ground stability would be re-established as soon as practicable following the completion of construction.	During Construction	RTRF EIS REMM SW27 EIS 2 REMM SW27	Environment Coordinator Site Supervisor	Section 7.1
41)	Installation of any permanent scour protection measures required for the operational phase would occur as soon as practical.	During Construction	RTRF EIS REMM SW28 EIS 2 REMM SW28	Environment Coordinator Site Supervisor	Section 7.1

ID	Measure	Timing	Requirement	Responsibility	Reference
42)	Where water is released into local creeks, outlet scour protection and energy dissipation would be implemented. The discharge point would be at the upstream end of a large pool where feasible and reasonable, to allow for slowing of water.	During Construction	RTRF EIS REMM SW32 EIS 2 REMM SW32	Environment Coordinator Site Supervisor	Section 7.1.4
43)	Temporary stockpile locations for both site establishment and earthworks operations would be specified prior to the commencement of construction activities. Diversion drains and erosion and sediment control measures would be in place prior to the commencement of any stockpiling activities. Material would only be stockpiled in designated stockpiling areas.	During Construction	RTRF EIS REMM SW37 EIS 2 REMM SW37	Environment Coordinator Site Supervisor	Section 7.1.4
44)	Site specific controls would be developed to reduce the potential for environmental releases of potentially harmful chemicals and to reduce the risk of any such releases entering local waterways. Storage of hazardous materials such as oils, chemicals and refuelling activities would occur in bunded areas.	During Construction	RTRF EIS REMM SW38 RTRF EIS REMM SW38	Environment Coordinator Site Supervisor	Section 7.4
45)	A qualified environmental officer would be employed to advise on appropriate controls and to monitor the implementation and maintenance of mitigation measures.	During Construction	RTRF EIS REMM SW40 EIS 2 REMM SW40	Environment Coordinator	Section 3.1
46)	All site staff would be engaged through toolbox talks or similar with appropriate training on soil and water management practices.	During Construction	RTRF EIS REMM SW41 EIS 2 REMM SW41	Environment Coordinator Site Supervisor	Section 9.1
47)	A surface water quality monitoring program for the construction period would be implemented to monitor water quality upstream and downstream of the construction areas. The monitoring programme would commence prior to commencement of any construction works and would build on available water quality data.	During Construction	RTRF EIS REMM SW42 EIS 2 REMM SW42	Environment Coordinator	Section 8
48)	Surface water and water quality monitoring would be carried out periodically and after rainfall events. Monitoring would examine a range of appropriate indicators in accordance with standard guidelines.	During Construction	RTRF EIS REMM SW43 EIS 2 REMM SW43	Environment Coordinator	Section 8

ID	Measure	Timing	Requirement	Responsibility	Reference
49)	Inspection of water quality mitigation controls (e.g. sediment control fences, sediment basins) would be carried out regularly and following significant rainfall to detect any breach of performance.	During Construction	RTRF EIS REMM SW44 EIS 2 REMM SW44	Environment Coordinator	Section 9.2
50)	A stormwater management plan that identifies the appropriate design standards for flood mitigation based on the duration of construction, proposed activities and flood risks would be developed for each construction site. The plan would develop procedures to ensure that threats to human safety and damage to infrastructure are not exacerbated during the construction period.	During Construction	RTRF EIS REMM SW45 EIS 2 REMM SW45	Environment Manager	Stormwater and Flooding Management Plan
51)	Stockpiles would be located away from sensitive receivers, where feasible and reasonable, and protected from the elements through barriers, covering or establishing a cover crop.	During Construction	RTRF EIS REMM A11 EIS 2 REMM A11	Environment Coordinator Site Supervisor	Section 7.1.4
52)	Longer term and/or heavily used haul roads would generally be sealed. The criteria for sealing haul roads would be defined during detailed construction planning. Sealed haul roads would be regularly cleaned.	During Construction	RTRF EIS REMM A12 EIS 2 REMM A12	Environment Coordinator Site Supervisor	Section 7.1.4
53)	Unsealed haul roads would be regularly damped down with fixed or mobile sprinkler systems.	During Construction	RTRF EIS REMM A13 EIS 2 REMM A13	Environment Coordinator Site Supervisor	Section 7.1.4 Watercarts would be used instead of mobile sprinkler systems
54)	Vehicular and foot traffic would be restricted to designated areas.	During Construction	RTRF EIS REMM A14 EIS 2 REMM A14	Environment Coordinator Site Supervisor	Section 7.1.4
55)	Appropriate site speed limits would be imposed and signed on haul routes.	During Construction	RTRF EIS REMM A15 EIS 2 REMM A15	Environment Coordinator Site Supervisor	Section 7.1.4

ID	Measure	Timing	Requirement	Responsibility	Reference
56)	Wheel-wash facilities or rumble grids would be provided and used near site exit points, and a street cleaning regime would be implemented to remove any dirt tracked onto roads.	During Construction	RTRF EIS REMM A16 EIS 2 REMM A16	Environment Coordinator Site Supervisor	Section 7.1.4
57)	Any contaminated areas directly affected by the project would be investigated and remediated prior to the commencement of construction works. All remediation works would be undertaken in accordance with the requirements of the Contaminated Land Management Act 1997 and Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites (EPA, 1997b).	During Construction	EIS 2 REMM SG11	Environment Manager	Section 7.5
58)	Prior to the commencement of site preparation or construction in potentially contaminated areas, a summary of soil contamination would be prepared detailing the outcomes of the Stage 2 contamination site investigations. The summary would detail, where relevant, whether or not the soil is suitable for the intended land use or can be made suitable for reuse through the application of a Remediation Action Plan (or similar).	Before Construction	EIS 2 REMM SG12	Environment Manager	Section 7.5
59)	An accredited Site Auditor would endorse the documentation of site contamination and any Remediation Action Plan or similar.	During Construction	EIS 2 REMM SG13	Environment Manager	Section 7.5
60)	A groundwater monitoring network to monitor groundwater levels and groundwater quality would be established throughout the construction phase. The groundwater monitoring network would contain monitoring wells along the whole NWRL route intersecting groundwater in both Ashfield Shale and Hawkesbury Sandstone.	During Construction	EIS 2 REMM SG18	Environment Coordinator	Section 8.4
61)	Groundwater quality would be subject to testing. Where it does not meet license requirements it would be treated prior to discharge.	During Construction	EIS 2 REMM SG20	Environment Coordinator	Section 8
62)	All feasible and reasonable measures would be implemented during construction, to limit operational groundwater inflows to stations and crossovers. Any inflows would be collected and treated prior to discharge.	During Construction	EIS 2 REMM SG22	Environment Coordinator	Stormwater and Flooding Management Plan
63)	A groundwater water supply from the Hawkesbury Sandstone for construction purposes would be used where feasible and reasonable. Negotiation with the NOW would be undertaken regarding impacts and applicable licenses.	During Construction	EIS 2 REMM SG24	Environment Coordinator	Section 7.2, 7.3

ID	Measure	Timing	Requirement	Responsibility	Reference
64)	If ASS are encountered, they would be managed in accordance with the Acid Sulfate Soil Manual (Acid Sulfate Soil Management Advisory Committee, 1998)	During Construction	EIS 2 REMM SG25	Environment Coordinator	Section 7.5
65)	A typical discharge into a natural waterway (where approved) would require a groundwater treatment process that includes the following steps: Inlet buffer tank, with aeration Coagulation / flocculation Dissolved air floatation (solids removal) Multimedia filtration (25 micrograms) Cartridge filtration (2 micrograms) Brackish water reverse osmosis Disposal of water brine concentrate to sewer (dependent on future environmental policies) Discharge of adequately treated water (into aquifer of origin, stormwater (creek catchments), sewer under a trade waste agreement, onsite reuse or recycling or a combination of these options)."	During Construction	EIS 2 REMM SG31	Environment Coordinator	Section 7.2, 7.3
66)	Groundwater discharge quality would comply with the relevant Environment Protection Licence	During Construction	EIS 2 REMM SG32	Environment Coordinator	Section 7.2, 7.3
67)	Specific processes regarding groundwater discharge and treatment methods would be identified during detailed design.	During Construction	EIS 2 REMM SG33	Environment Manager	Section 7.2, 7.3
68)	A soil salinity assessment would be undertaken for each high risk site in accordance with the Site Investigations for Urban Salinity (DLWC 2002), including Phase 2 and Phase 3 investigation. This assessment would enable site specific mitigation measures to be developed to ensure saline soils are appropriately managed and damage to the environment and infrastructure is minimised. These investigations would be informed by the completed groundwater monitoring program.	During Construction	EIS 2 REMM SG35	Environment Manager	Section 7.6
69)	A low concentration of lead was reported east of the proposed station. Further delineation and / or waste classification may be required, if excavation and	During Construction	EIS 2 REMM SG36	Environment Coordinator	Section 7.5.3, 7.9

ID	Measure	Timing	Requirement	Responsibility	Reference
	offsite disposal of soil is to take place in this area, during the construction of Cherrybrook Station.				
70)	Showground Station. Further delineation and / or waste classification may be required if excavation and offsite disposal of soil is to take place in this area, during the construction of the Showground Station due to nickel and Polycyclic aromatic hydrocarbons (PAH) impacts and the presence of asbestos fibres.	During Construction	EIS 2 REMM SG37	Environment Coordinator	Section 7.5.3, 7.9
71)	Further waste classification in the area of Bella Vista Station may be required if excavation and offsite disposal of fill is to take place, during the construction of the Station due to concentrations of nickel in the fill material.	During Construction	EIS 2 REMM SG38	Environment Coordinator	Section 7.5.3, 7.9
72)	Bella Vista to Rouse Hill (Open Cutting for Bella Vista Dive and skytrain). If excavation for offsite disposal is to take place, additional assessments for waste classification may be required as low TPH and heavy metals impacts were reported in fill samples. Further assessment in this area may be required if disturbance is to take place in this area.	During Construction	EIS 2 REMM SG39	Environment Coordinator	Section 7.5.3, 7.9
73)	Rouse Hill to Cudgegong Road (Earthworks and Bridges). Should excavation for offsite disposal take place, additional assessments for waste classification may be required as low TPH and phenol impacts were exported in fill samples. Not all of the Areas of Environmental Concern in this area have been specifically targeted, i.e. individual above-ground storage tanks, farm dams and asbestos in buildings. Additional assessment and waste classification may be required.	During Construction	EIS 2 REMM SG40	Environment Coordinator	Section 7.5.3, 7.9
74)	Castle Hill Station. Concentrations of CoPC were generally typical of background concentrations with the exception of trace levels of TPH found in a sample well. Due to this anomaly, further monitoring of the wells within the former service station site would be undertaken during the detailed construction planning stage of the project	During Construction	EIS 2 REMM SG42	Environment Coordinator	Section 7.5.3, 7.9
75)	Showground Station. TPH, PAH and phenol impacts were identified. As groundwater in the vicinity of the Hills Shire Depot is likely to be disturbed during construction of the Showground Station, impacts on the construction workers (via dermal contact and inhalation) as well as options for disposal management would be further assessed during the detailed construction planning stage of the project and further delineation, remediation or management would be required.	During Construction	EIS 2 REMM SG43	Environment Coordinator	Section 7.2, 7.5.3, 7.9

ID	Measure	Timing	Requirement	Responsibility	Reference
76)	Norwest Station. TPH impact has been identified. Given that groundwater in the vicinity of the Shell service station is likely to be disturbed during construction of the Norwest Station, impacts on the construction workers (via dermal contact and inhalation) as well as options for disposal management would need to be further assessed during the detailed construction planning stage of the project and further delineation, remediation or management would be required.	During Construction	EIS 2 REMM SG44	Environment Coordinator	Section 7.2, 7.5.3, 7.9
77)	Bella Vista Station. Should shallow seepage water be disturbed during construction of Bella Vista Station, further assessment of groundwater in the vicinity of the BP service station would be required owing to TPH and PAH impacts reported at the BP service station.	During Construction	EIS 2 REMM SG45	Environment Coordinator	Section 7.2, 7.5.3, 7.9
78)	Bella Vista to Rouse Hill (Open Cutting for Bella Vista Dive and skytrain). If groundwater is to be disturbed, groundwater management may be required due to low concentrations of TPH and PAH reported in this area.	During Construction	EIS 2 REMM SG46	Environment Coordinator	Section 7.2, 7.5.3, 7.9
79)	Soil and land remediation is to occur as soon as practicable following construction. This is to include remediation in stages as the construction process allows.	During Construction	EIS 2 REMM SG47	Environment Coordinator	Section 7.2, 7.5.3, 7.9
80)	Stockpile sites would be generally located outside the 20 year ARI flood. The exact level of flood immunity provided to stockpile sites would depend on the duration of stockpiling operations, the type of material stored and the nature of the downstream waterway or any other specified requirements. This would be defined during detailed construction planning.	During Construction	EIS 2 REMM SW12	Environment Coordinator	Stormwater and Flooding Management Plan Section 7.1.4
Project Approval – Specific Conditions					
81)	Riparian Buffer Widths for waterways (including First Ponds Creek and Second Ponds Creek) which are affected by the SSI are to be managed for a Total Riparian Buffer Width of between 10m to 50m dependant on the Category of Watercourse determined by the Riparian Corridor Management Study (DIPNR, 2OO4)."	During Construction	RTRF Approval SSI-5931 CoA C2	Environment Manager	Section 7.8
82)	Riparian Buffer Widths for waterways which are affected by the SSI are to be managed for a Total Riparian Buffer Width of between 10m to 50m where feasible and reasonable, dependant on the Category of Watercourse determined	During Construction	OTS Approval SSI-5414 CoA C24	Environment Manager	Section 7.8

ID	Measure	Timing	Requirement	Responsibility	Reference
	by the Riparian Assessment for the North West Rail Link (Ecological Australia, 2011)				
83)	Riparian vegetation in and around watercourses affected by the SSI shall be restored and rehabilitated to a condition equal to or better than its current state in consultation with NOW and DPI (Fisheries) and with the relevant Council/s. Consultation with NOW and DPI (Fisheries) should include duration of restoration and rehabilitation measures, including timeframes and reporting on completion of works	During Construction	RTRF Approval SSI-5931 CoA C3	Environment Manager	Section 7.8 Construction Flora and Fauna Management Plan Urban Design and Landscaping Plan
84)	Riparian vegetation in and around watercourses affected by the SSI shall be restored and rehabilitated in consultation with NOW and DPI (Fisheries) and with the relevant Council/s. Restoration and rehabilitation measures, including timeframes and reporting on completion of works, shall be included in the Construction Flora and Fauna Management Plan (condition E34(f)).	During Construction	OTS Approval SSI-5414 CoA C26	Environment Manager	Section 7.8 Construction Flora and Fauna Management Plan Urban Design and Landscaping Plan
85)	Except as may be provided by an EPL, the SSI shall be constructed and operated to comply with section 120 of the Protection of the Environment Operations Act 1997, which prohibits the pollution of waters.	During Construction	RTRF Approval SSI-5931 CoA C6 OTS Approval SSI-5414 CoA C32	Environment Coordinator	Section 2
86)	Stormwater and Flooding Management Plan shall be prepared in consultation with the Department (Strategies and Land Release), OEH and Blacktown City Council during detailed design of the SSI and prior to construction, or as otherwise agreed by the Director General. The Plan shall identify actions to ensure that the SSI addresses existing flooding characteristics within the vicinity of the SSI for a full range of flood sizes, up to and including Probable Maximum Flood. The Plan shall be prepared by an appropriately qualified person(s) and facilitate a holistic	Before Construction	RTRF Approval SSI-5931 CoA C8	Environment Manager	Stormwater and Flooding Management Plan

ID	Measure	Timing	Requirement	Responsibility	Reference
	approach to detailed hydrologic assessment and stormwater management, which gives consideration to the cumulative of the SSI allocation with its construction and operation and, shall include but not be limited to: (a) the design of the permanent works of the SSI to not worsen, to the extent that it is feasible and reasonable, existing and known future flooding characteristics. (b) the design of temporary works, compensatory and management measures to not worsen existing and known future flooding characteristics (c) the identification of flood risks to the SSI and adjoining areas, including the consideration of local drainage catchment assessments, strategies and guidelines; and climate change implications on rainfall and drainage characteristics; (d) the identification design and mitigation measures that would be implemented to protect proposed operations and not worsen existing flooding characteristics during construction and operation, including soil erosion and scouring. Design of mitigation measures should consider more frequent floods besides flood of design; (e) the identification of drainage system upgrades; and (f) the preparation of a flood/emergency management plan. For components of the SSI located on floodplains, flood impacts shall be confirmed in accordance with the Floodplain Development Manual (2005), and other relevant NSW Government Guidelines."				
87)	A Stormwater and Flooding Management Plan(s) shall be prepared in consultation with the Department (Strategies and Land Release), OEH, and relevant Councils during detailed design of the SSI and prior to construction, or as otherwise agreed by the Director General. The Plan shall identify actions to ensure that the SSI addresses existing flooding characteristics within the vicinity of the SSI for a full range of flood sizes up to and including the probable maximum flood. The Plan(s) shall be prepared by appropriately qualified person(s) and facilitate a holistic approach to detailed hydrologic assessment and stormwater management, which gives consideration to the cumulative impacts of the SSI associated with its construction and operation, and shall include but not be limited to:	Before Construction	RTRF Approval SSI-5414 CoA C34	Environment Manager	Stormwater and Flooding Management Plan

ID	Measure	Timing	Requirement	Responsibility	Reference
	(a) the design of temporary works, compensatory and management measures that would be implemented during construction to not worsen, to the extent that it is feasible and reasonable, existing and known future flooding characteristics; (b) the identification of flood risks to the SSI and adjoining areas, including the consideration of local and regional drainage catchment assessments, strategies and guidelines; and climate change implications on rainfall and drainage characteristics; (c) the design and layout of each station precinct and rail service facility to not worsen, to the extent that is feasible and reasonable, existing and known future flooding characteristics; (d) identification of design and mitigation measures that would be implemented to protect proposed construction and operational activities and not worsen existing flooding characteristics, including soil erosion and scouring. Design of mitigation measures should consider more frequent floods besides flood of design; and (e) identify flood risk, potential for inflows, potential consequences and required mitigation measures for each tunnel entrance; (f) specific information related to flood risk in larger floods (for example PMF) and the incorporation of management measures in the flood emergency response planning required under condition F4. For surface components of the SSI located on floodplains, flood impacts shall be confirmed in accordance with the Floodplain Development Manual (2005), and other relevant NSW Government Guidelines.				
88)	A Soil Salinity Report detailing the outcomes of geotechnical investigations and groundwater monitoring, to determine the presence, extent of soil salinity within the SSI area and impacts to groundwater resources and hydrology, shall be prepared and submitted to the Director General prior to the commencement of bulk earthworks activities, or as otherwise agreed by the Director General. The report shall be prepared in consultation with NOW and detail, where relevant, that the SSI minimises, avoids and/or mitigates impacts on local/regional salinity processes, impacts on groundwater systems, and receiving environments. The recommendations of the Soil Salinity Report shall be incorporated into the Construction Soil and Water Quality Management Plan (condition E37(d)).	Before Construction	RTRF Approval SSI-5931 CoA C9	Environment Manager	Salinity Management Plan Section 7.6

ID	Measure	Timing	Requirement	Responsibility	Reference
89)	A Soil Salinity Report detailing the outcomes of geotechnical investigations and groundwater monitoring, to determine the presence, extent and severity of soil salinity within the SSI area and impacts to groundwater resources and hydrology, shall be prepared and submitted to the Director General prior to the commencement of bulk earth activities, or as otherwise agreed by the Director General. The report shall be prepared in consultation with OEH and NOW and detail, where relevant, that the SSI minimises, avoids and/or mitigates impacts on local/regional salinity processes, impacts on groundwater systems, and receiving environments. The recommendations of the Soil Salinity Report shall be incorporated into the Construction Soil and Water Quality Management Plan (condition E3a(c)). The Soil Salinity Report, prepared to meet condition Cg of State Significant infrastructure approval SSI-5100, may be revised, if necessary and resubmitted	Before Construction	OTS Approval SSI-5414 CoA C35	Environment Manager	Section 4.3.4
90)	A Water Quality Monitoring Program shall be prepared and implemented to monitor impacts on surface and groundwater quality resources and wetlands during construction and operation. The Program shall be developed in consultation with DPI (Fisheries), NOW and Blacktown City Council and shall include, but not be limited to: (a) identification of surface and groundwater quality monitoring locations which are representative of the potential extent of impacts from the SSI; (b) identification of the water quality parameters to be monitored at each location; (c) identification of works and activities during construction and operation of the SSI, including emergencies and spill events that have the potential to impact on surface water quality of potentially affected waterways; (d) presentation of parameters and standards against which any changes to water quality will be assessed, having regard to the pr8.2inciples of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC, 2000), and identification of 'trigger points' for further investigation for action to be taken; (e) representative background monitoring of surface and groundwater quality parameters, to establish baseline water conditions, unless otherwise agreed by the Director General;	Before Construction	RTRF Approval SSI-5931 CoA C10	Environment Manager	Section 8 Section 8.3 Section 8.4 Section 5 Section 8.2 Section 8.3 Section 8.4

ID	Measure	Timing	Requirement	Responsibility	Reference
	(f) identification of the frequency water sampling during background, and construction monitoring periods; (g) a minimum monitoring period of three years following the completion of the construction or until the affected waterways and/or groundwater resources are certified by an independent expert as being rehabilitated to an acceptable condition; (h) contingency and ameliorative measures in the event that adverse impacts to water quality relevant to the SSI are identified; and (i) reporting of the monitoring results to the Department, DPI, NOW and Blacktown City Council.				Section 8.5 Section 8.6
91)	The Proponent shall design and construct the SSI as far as is feasible and reasonable, in a manner that minimises impacts to groundwater hydrology including capture, drawdown and quality.	During Construction	RTRF Approval SSI-5931 CoA C11 OTS Approval SSI-5414 CoA C38	Environment Manager	Section 4.1.3 Section 5 Section 8.4
92)	The management of groundwater and surface water ingress, including the design of capture, treatment and discharge methods shall be undertaken in consultation with the EPA. All intercepted groundwater and surface water shall be treated to ensure that relevant ANZECC water quality guidelines are met, prior to discharge.	During Construction	RTRF Approval SSI-5931 CoA C12	Environment Manager	Section 1.8 Section 7.2, 7.3
93)	The Proponent shall undertake further assessment of contamination to ensure that any areas of contamination are appropriately assessed and remediated prior to the commencement of construction	Before Construction	RTRF Approval SSI-5931 CoA C13	Environment Manager	Contamination Assessment Section 7.5
94)	The following documents shall be submitted to the Director General, within the identified timeframes, unless otherwise agreed by the Director General: (a) reports detailing Contamination Site Investigations in areas identified as having a moderate to high risk of contamination, and a Site Auditor endorsed Remediation Action Plan (or similar), here required, prior to site preparation or construction; and	Before Construction	RTRF Approval SSI-5931 CoA C14	Environment Manager	Contamination Assessment Section 7.5

ID	Measure	Timing	Requirement	Responsibility	Reference
	(b) Certification by a Site Auditor, that any contaminated land has been remediated to a standard consistent with the intended land use, prior to the use of the land. Note: Terms used in this condition have the same meaning as in the Contaminated Land Management Act 1997				
95)	Where the investigations identify that the site is suitable for the intended operations and that there is no need for a specific remediation strategy, measures to identify, handle and manage potential contaminated spoils, materials and groundwater shall be incorporated into the Construction Environmental Management Plan (condition E36).	Before Construction	RTRF Approval SSI-5931 CoA C15	Environment Manager	Contamination Assessment Section 7.5
96)	HAZARDS AND RISKS Dangerous goods, as defined by the Australian Dangerous Goods Code, shall be stored and handled strictly in accordance with: (a) all relevant Australian Standards; (b) for liquids, a minimum bund volume requirement of 1|Qo/o of the volume of the largest single stored volume within the bund; and (c) the Environment Protection Manual for Authorised Officers: Bunding and Spill Management, technical bulletin (Environment Protection Authority, 1 997). In the event of an inconsistency between the requirements listed from (a) to (c) above, the most stringent requirement shall prevail to the extent of the inconsistency.	During Construction	RTRF Approval SSI-5931 CoA C15 OTS Approval SSI-5414 CoA C44	Environment Manager	Section 7.4
97)	Soil and water management measures consistent with Managing Urban Stormwater - Soils and Construction Vols. 1 and 2, 4th Edition (Landcom, 2004) shall be employed during the construction of the SSI to minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters.	During Construction	RTRF Approval SSI-5931 CoA E16 OTS Approval SSI-5414 CoA E28	Environment Manager	Section 2.3 Section 7
98)	Where available, and of appropriate chemical and biological quality, stormwater, recycled water or other water sources shall be used in preference to potable water for construction activities, including concrete mixing and dust control.	During Construction	RTRF Approval SSI-5931 CoA E17	Environment Coordinator Site Supervisor	Section 7.3

ID	Measure	Timing	Requirement	Responsibility	Reference
			OTS Approval SSI-5414 CoA E29		
99)	Watercourse crossings (temporary and permanent) shall be designed in consultation with NOW, and where feasible and reasonable, be consistent with the Guidelines for Controlled Activities, Policy and Guidelines for Fish Friendly Waterway Crossings (NSW Fisheries, 2004) and Policy and Guidelines for Design and Construction of Bridges, Roads, Causeways, Culverts and Similar Structures (NSW Fisheries, 1999). Where multiple cell culverts are proposed for creek crossings, at least one cell shall be provided for fish passage, with an invert or bed level that mimics creek flows.	During Construction	OTS Approval SSI-5414 CoA C36	Environment Coordinator Site Supervisor	Flora and Fauna Management Plan
100)	A Water Quality Monitoring Program shall be prepared and implemented to monitor impacts on surface and groundwater quality resources and wetlands during construction and operation. The Program shall be developed in consultation with the EPA, DPI (Fisheries), NOW and relevant Councils and shall include but not necessarily be limited to: (a) Identification of surface and groundwater quality monitoring locations which are representative of the potential extent of impacts from the SSI. This should include representative locations near the discharge point of the Lady Game Drive Water Treatment Plant; (b) identification of the water quality parameters to be monitored at each location; (c) identification of works and activities during construction and operation of the SSI, including emergencies and spill events, that have the potential to impact on surface water quality of potentially affected waterways; (d) presentation of parameters and standards against which any changes to water quality will be assessed, having regard to the principles of the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 (ANZECC, 2000), and identification of 'trigger points' for further investigation or action to be taken; (e) representative background monitoring of surface and groundwater quality parameters, to establish baseline water conditions, unless otherwise agreed by the Director General;	Before Construction	OTS Approval SSI-5414 CoA C37	Environment Coordinator Site Supervisor	Section 8

ID	Measure	Timing	Requirement	Responsibility	Reference
	(f) identification of the frequency of water sampling during background, and construction monitoring periods; (g) a minimum monitoring period of three years following the completion of construction or until the affected waterways and/ or groundwater resources are certified by an independent expert as being rehabilitated to an acceptable condition; (h) contingency and ameliorative measures in the event that adverse impacts to water quality relevant to the SSI are identified; and (i) reporting of the monitoring results to the Department, EPA, DPI, NoW and relevant Councils. The Program shall be submitted to the Director General for approval prior to the commencement of construction of the SSI, or as otherwise agreed by the Director General. A copy of the Program shall be submitted to the EPA, DPI (Fishing and Aquaculture) and NOW prior to its implementation. The Water Quality Monitoring Program, prepared to meet condition C11 of State Significant Infrastructure approval SSI- 5100, may be revised, if necessary and resubmitted				
101)	The management of groundwater and surface water ingress into the station boxes and tunnels, including the design of capture, monitoring, treatment and discharge methods shall be undertaken in consultation with the EPA.	During Construction	OTS Approval SSI-5414 CoA C40	Environment Coordinator Site Supervisor	Stormwater and Flooding Management Plan
102)	The Proponent shall ensure that groundwater which is treated at the Lady Game Drive water treatment plant is not discharged into the Lane Cove River without first meeting the discharge criteria outlined in Table 8.5 of the document referred to in condition B1(b). The Proponent shall review the discharge criteria in consultation with the EPA to ensure the level of discharge will not cause pollution of waters.	During Construction	OTS Approval SSI-5414 CoA C41	Environment Coordinator Site Supervisor	Section 7.2
103)	The following documents shall be submitted to the Director General, within the identified timeframes, unless otherwise agreed by the Director General: (a) reports detailing Stage 2 Contamination Site Investigations in areas identified as having a risk of contamination (soil, water and building materials), and a Site Auditor endorsed Remediation Action Plan (or similar), where required, prior to site preparation or construction; and	Before Construction	OTS Approval SSI-5414 CoA C42	Environment Manager	Contamination Assessment Section 7.5

ID	Measure	Timing	Requirement	Responsibility	Reference
	(b) Certification by a Site Auditor that any contaminated land and/or groundwater, identified in (a) has been remediated to a standard consistent with the intended land use, prior to the use of the land.				
104)	Where the investigations identify that the site is suitable for the intended operations and that there is no need for a specific remediation strategy, measures to identify, handle and manage potential contaminated spoils, materials and groundwater shall be incorporated into the Construction Environmental Management Plan (condition E33).	Before Construction	OTS Approval SSI-5414 CoA C43	Environment Manager	Contamination Assessment Section 7.5
North West Rail Link Construction Environmental Management Framework					
105)	Groundwater Objectives The following groundwater management objectives will apply to the construction of the project: • Reduce the potential for drawdown of surrounding groundwater resources. • Prevent the pollution of groundwater through appropriate controls. • Reduce the potential impacts of groundwater dependant ecosystems	During Construction	NWRL CEMP Framework Section 7.1	Environment Manager	Section 1.3
106)	Groundwater Management Implementation NWRL 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. The NSW Office of Water will be consulted during the development of the Groundwater Management Plan in relation to dewatering and licensing arrangements. • 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. • A groundwater monitoring plan.	Before Construction	NWRL CEMP Framework Section 7.2	Environment Manager	Incorporated into this plan Annexure B Annexure B Section 3 Section 7.2, 7.3 Section 8 Section 9.2

ID	Measure	Timing	Requirement	Responsibility	Reference
	• Compliance record generation and management. The Groundwater Monitoring Plan will • Outline the parameters to be monitored (field parameters and laboratory parameters) and the sample frequency. • Include details of a groundwater monitoring network to monitor groundwater levels and groundwater quality throughout the construction phase. The groundwater monitoring network will contain monitoring wells along the whole NWRL route intersecting groundwater in both the Ashfield Shale and Hawkesbury Sandstone. NWRL Contractors will retain compliance records of all groundwater monitoring undertaken. • NWRL Contractors will retain compliance records of all groundwater monitoring undertaken.				Section 8.2 Section 8.4 Section 9.2
107)	Groundwater Mitigation 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	NWRL CEMP Framework Section 7.3	Environment Manager	Section 7.2 Section 8.4, Flora and Fauna Management Plan
108)	Soil and Water Management Objectives The following soil and water management objectives will apply to the construction of the project: Prevent pollution of surface water through appropriate erosion and sediment control. Maintain existing water quality of surrounding surface watercourses. Source Construction water from non-potable sources, where feasible and reasonable.	During Construction	NWRL CEMP Framework Section 15.1	Environment Manager	Section 1.3
109)	Soil and Water Implementation	Before Construction	NWRL CEMP Framework Section 15.2	Environment Manager	This Plan

ID	Measure	Timing	Requirement	Responsibility	Reference
	NWRL 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. 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. Procedures for the treatment, testing and discharge of water from the site. Procedures for spill response. Soil and water monitoring requirements. Compliance record generation and management				Annexure B Annexure B Section 3 Section 7.1.4 Stormwater and Flooding Management Plan Section 7.3 Section 9.2 Section 9.2
110)	NWRL Principal Contractors will develop and implement progressive erosion and sediment control plans (ESCPs) for all active worksites in accordance with Managing Urban Stormwater: Soils & Construction Volume 1 (Landcom, 2004) (known as the “Blue Book”). The ESCPs will be approved by the Contractor’s Environmental Manager (or delegate) prior to any works commencing (including vegetation clearing) on a particular site. Copies of the approved ESCP will be held by the relevant Contractor personnel including the Engineer and the Site Foreman. ESCPs will detail all required erosion and sediment control measures for the particular site at the particular point in time and be progressively updated to reflect the current site conditions. Any amendments to the ESCP will be approved by the Contractors Environmental Manager (or delegate)	During Construction	NWRL CEMP Framework Section 15.2	Environment Manager	Section 7.1.4
111)	NWRL Principal Contractors will develop and implement Stormwater and Flooding Management Plans for the relevant construction sites. These plans will identify the appropriate design standard for flood mitigation based on the duration of construction, proposed activities and flood risks. The plan will develop procedures	During Construction	NWRL CEMP Framework Section 15.2	Environment Manager	Stormwater and Flooding Management Plan

ID	Measure	Timing	Requirement	Responsibility	Reference
	to ensure that threats to human safety and damage to infrastructure are not exacerbated during the construction period.				
112)	NWRL Principal Contractors will undertake the following soil and water monitoring as a minimum: • Weekly inspections of the erosion and sediment control measures. Issues identified would be rectified as soon as practicable. • Additional inspections will be undertaken following significant rainfall events (greater than 20 mm in 24 hours). • All water will be tested (and treated if required) prior to discharge from the site in order to determine compliance with the parameters of the EPL. No water will be discharged from the site without written approval of the Contractor's Environmental Manager (or delegate). This is to form a HOLD POINT.	During Construction	NWRL CEMP Framework Section 15.2	Environment Manager	Section 9.2 Section 7.3
113)	The following compliance records will be kept by the NWRL 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	NWRL CEMP Framework Section 15.2	Environment Manager	Section 9.2
114)	Soil and Water Mitigation Examples of surface water and flooding mitigation measures include: • Clean water will be diverted around disturbed site areas, stockpiles and contaminated areas. • Control measures will be installed downstream of works, stockpiles and other disturbed areas. • Exposed surfaces will be minimised, and stabilised / revegetated as soon feasible and reasonable upon completion of construction. • Dangerous good and hazardous materials storage will be within bunded areas with a capacity of 110 per cent of the maximum single stored volume.	During Construction	NWRL CEMP Framework Section 15.3	Environment Manager	Section 7

ID	Measure	Timing	Requirement	Responsibility	Reference
	• Spill kits will be provided at the batch plants, storage areas and main work sites.				
115)	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. 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.	During Construction	NWRL CEMP Framework Section 15.4	Environment Manager	Section 1.3 Section 7
Project Deed Requirements					
116)	Stockpiling of materials for construction (a) OpCo must make its own arrangements for temporary or permanent stockpiles of materials arising from the Delivery Activities. (b) Materials which are not suitable for incorporation in the OTS Works must be removed from the Construction Site and disposed of at a construction waste recycling facility, or alternatively re-used, to the maximum extent possible. (c) Stockpiles located on land outside the Construction Site are subject to the land owner's and occupier's written consent, compliance with the law, consent of relevant Authorities and compliance with the Environmental Documents.	During Construction	Project Deed Main Body – Section 6.5.7	Environment Manager	7.1.4

ID	Measure	Timing	Requirement	Responsibility	Reference
	(d) Stockpiles must not be placed in drainage lines, channels or paths.				
117)	(a) Without limiting the requirements of the deed, all water including groundwater seepage captured within the Construction Site must be treated and disposed of in accordance with the Environmental Documents and the requirements of relevant Authorities. (b) OpCo must monitor the quality of water discharged from the Construction Site.	During Construction	Project Deed Main Body – Section 6.5.15	Environment Manager	Section 8 Section 7.2, 7.3
118)	OpCo must ensure that any road, footpath, shared path or cycleway which is open to the public is at all times kept free of mud, dirt, dust, deleterious material, debris, obstructions and trip hazards arising from OpCo's Activities in accordance with the Environmental Documents. OpCo must install, maintain and utilise wheel wash facilities as a minimum, and cover all construction vehicles to prevent any loss of fuels, lubricants, load or other substances, whether in the form of duct, liquids, solids or otherwise. Any spillage or build-up of such material or debris must be cleaned up promptly and any damage caused by such an occurrence must be immediately repaired.		Project Deed Main Body – Section 6.5.17a) – c)	Environment Manager	Section 7.1.1
119)	Temporary site facilities OpCo must ensure that, where reasonable and feasible, any temporary site facilities provided by OpCo incorporate: (vi) rainwater harvesting; (vii) water efficient fixtures, fittings and controls;		Project Deed App 50 – Section 2.11(a)	Environment Manager	Section 7.3.1 Section 7.1.1
120)	In addition to the requirements identified in the Environmental Documents, the Construction Soil and Water Management Plan must: (i) include a water balance study that describes the sources, uses and estimated quantities of potable and non-potable water (including as percentages of total demand) which will be created and used in the performance of OpCo's Activities; (ii) identify initiatives that will be implemented to maximise water re-use, including from captured stormwater, wastewater and groundwater; and (iii) identify initiatives that will be implemented	During Construction	Project Deed App 54 – Section 3.17 (g)	Environment Manager	This Plan Section 6

ID	Measure	Timing	Requirement	Responsibility	Reference
EPL Requirements					
121)	The location of discharge points is defined by the most recently approved discharge point register held on the EPA Electronic File EF14/30890.	During Construction	P1.3	Environment Manager	Section 7.3.2
122)	The discharge point register is not deemed to be approved by the EPA unless confirmed as such in writing by the EPA	During Construction	P1.4	Environment Manager	Section 7.3.2
123)	The discharge point register must be submitted to the EPA no later than 5 business days prior to any proposed changes to the register	During Construction	P1.5	Environment Manager	Section 7.3.2
124)	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	L1.1	Environment Manager	Section 2
125)	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	L2.1	Environment Manager	Section 7.3.2
126)	Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges	During Construction	L2.2	Environment Manager	Section 7.3.2
127)	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	L2.3	Environment Manager	Section 7.3.2
128)	Water and/or Land Concentration Limits 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	During Construction	L2.4	Environment Manager	Section 7.3.2

ID	Measure	Timing	Requirement	Responsibility	Reference
129)	Exceedance of the limits specified in Condition L2.4 of this licence for pH and total suspended solids (TSS) for discharges from the sediment basins identified in Conditions P1.2 and P1.3 of this licence is only permitted if: (a) the discharge occurs solely as a result of rainfall measured at the Premises exceeding 24.6mm for the 80th percentile sediment basin(s) and 32.2mm for the 85th percentile sediment basin(s) over any consecutive five (5) day period immediately prior to the discharge occurring from these basins; and (b) The sediment basins and other erosion and sediment controls on the site have been designed, constructed, installed, maintained and managed in accordance with best management principles and practices described in the guideline "Managing Urban Stormwater – Soils and Construction – Volume 1, 4th edition, 2004" produced by Landcom.	During Construction	L2.5	Environment Manager	Section 7.3.2
130)	If the licensee uses turbidity (NTU) in place of TSS to determine compliance with Condition L2.4, the licensee must develop a statistical correlation which identifies the relationship between NTU and TSS for water quality in the sediment basin/s in order to determine the NTU equivalent of 50 mg/L TSS before its use.	During Construction	L2.6	Environment Manager	Section 7.3.2
131)	The licensee must provide the EPA with a copy of the statistical correlation assessment methodology and results before using NTU in place of TSS.	During Construction	L2.7	Environment Manager	Section 7.3.2
132)	The licensee must develop and implement a method to enable the ongoing verification of the relationship between NTU and TSS.	During Construction	L2.8	Environment Manager	Section 7.3.2
133)	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 L2.8 before using the revised statistical correlation.	During Construction	L2.9	Environment Manager	Section 7.3.2
134)	Polymer-Based Flocculent The licensee must ensure that any polymer based flocculants used to treat water before discharge from the premises has a 48-hour EC50 (immobilisation) for water fleas and a 96-hour EC50 (imbalance) for fish, greater than 100 milligrams per litre. Note: In accordance with the EPA Approved Methods Publication any analysis should be undertaken by a laboratory accredited to perform those analyses by an	During Construction	O4.1	Environment Manager	Section 7.3.2

ID	Measure	Timing	Requirement	Responsibility	Reference
	independent accreditation body acceptable to the EPA, such as the National Association of Testing Authorities (NATA) or equivalent				
135)	Erosion and Sediment Control The licensee must, before undertaking any construction work (including any earthmoving or vegetation removal works), implement all soil and water management works required to minimise pollution of waters	During Construction	O6.1	Environment Manager Project Engineer	Section 7.1.1
136)	The licensee must inspect the operation of soil and water management works installed on the premises and undertake any works required to repair and/or maintain these controls: a) at least weekly during normal construction hours outlined in condition L4.1; b) prior to any major rainfall event forecasted; c) daily following a major rainfall event in any 24 hour period, if safe to do so; and d) prior to any site closure of greater than 24 hours.	During Construction	O6.2	Environment Coordinator	Section 9.2
137)	The licensee must record all such inspections, including observations and works undertaken to repair and/or maintain soil and water management works	During Construction	O6.3	Environment Manager	Section 9.2
138)	The licensee must ensure the design storage capacity of the sediment basins installed on the premises is reinstated within 5 days of the cessation of a rainfall event that causes runoff to occur on or from the premises.	During Construction	O6.4	Environment Manager	Section 7.1.3
139)	Requirement to monitor concentration of pollutants discharged 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	During Construction	M2.1	Environment Manager	Section 7.3.2
140)	Water and/ or Land Monitoring Requirements	During Construction	M2.2	Environment Manager	Section 7.3.2

ID	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				
141)	Testing methods - concentration limits M3.1 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	M3.1	Environment Manager	Section 7.3.2
ECRL Determination Report Conditions of Approval					
142)	Soil and Water Management Measures hall be documented in the CEMP (or a sub-plan) and include as a minimum the environmental management measures documented in the EIA.	Before Construction	CoA 33	Environment Manager	This Plan Annexure B
143)	The proponent shall engage a Sydney Water authorised water servicing coordinator to oversee the design and construction of any works to the existing water or sewer mains.	During Construction	CoA 39	Project Engineer	Section 7.1.1
ECRL Submissions Report Revised Environmental Management Measures					
144)	Soil and water management measures would be identified in consultation with relevant government agencies and Councils, and would be consistent with the principles and practises detailed in Landcom's (2004) Managing Urban Stormwater: Soils and Construction.	Before Construction	REMM H1	Environment Manager	Section 7 Refer to CEMP for consultation completed
145)	No stockpiles of materials or storage of fuels or chemicals would be located adjacent to the existing culverts	During Construction	REMM H2	Project Engineer	Section 7.1.4

ID	Measure	Timing	Requirement	Responsibility	Reference
				Environment Coordinator	
146)	Vehicles and machinery would be properly maintained to minimise the risk of fuel/oil leaks	During Construction	REMM H3	Site Supervisor	Section 7.4
147)	Routine inspections of all construction vehicles and equipment would be undertaken for evidence of fuel/oil leaks.	During Construction	REMM H4	Site Supervisor	Section 7.4
148)	All fuels, chemicals and hazardous liquids would be stored within an impervious bunded area in accordance with Australian standards and EPA Guidelines.	During Construction	REMM H5	Site Supervisor	Section 7.4
149)	All water discharges would be undertaken in accordance with Transport for NSW's Water Discharge and Re-use Guideline.	During Construction	REMM H6	Environment Coordinator	Section 7.3.2
150)	Emergency spill kits would be kept on-site at all times. All staff would be made aware of the location of the spill kit and be trained in its use.	During Construction	REMM H7	Site Supervisor	Section 7.4
151)	Construction plant, vehicles and equipment would be refuelled off-site, or in designated re-fuelling areas located at a minimum distance of 50 metres from drainage lines or waterways.	During Construction	REMM H8	Site Supervisor	Section 7.4
152)	The existing Sydney Trains/RailCorp and Council drainage systems would remain operational throughout the construction of the proposal.	During Construction	REMM H9	Site Supervisor	Section 7.1.1
153)	Groundwater encountered during the construction of the project would be managed in accordance with the requirements of the Waste Classification Guidelines (DECCW 2009) and Transport for NSW's Water Discharge and Re-use Guideline	During Construction	REMM H10	Environment Coordinator	Section 7.1.1
154)	Stabilised surfaces would be reinstated as quickly as practicable after construction.	During Construction	REMM H11	Site Supervisor	Section 7.1.4
155)	Material transport from site to surrounding pavement surfaces would be minimised.	During Construction	REMM H12	Site Supervisor	Section 7.1.4
156)	Clean water would be diverted around the worksite in accordance with Landcom's (2004) Managing Urban Stormwater: Soils and Construction.	During Construction	REMM H13	Site Supervisor	Section 7.1.1

ID	Measure	Timing	Requirement	Responsibility	Reference
				Environment Coordinator	Section 7.1.4
Norwest Pedestrian Link Determination Report Conditions of Approval					
157)	Land contamination shall be managed in accordance with the *Contaminated Land Management Act 1997*	During Construction	CoA 23	Site Supervisor Environment Coordinator	Section 2 Section 7.5
158)	Except as may be provided by an EPL, the Project shall be construction and operated to comply with Section 120 of the Protection of the Environment Operations Act 1997, which prohibits the pollution of waters	During Construction	CoA 29a	Site Supervisor Environment Coordinator	Section 2
159)	Soil and water management measures consistent with *Managing Urban Stormwater – Soils and Construction Vols 1 and 2, 4th Edition* (Landcom, 2004) shall be employed during the construction of the Project to minimise soil erosion and the discharge of sediment and other pollutants to land and/or waters	During Construction	CoA29b	Site Supervisor Environment Coordinator	Section 2 Section 7
160)	The Proponent shall design and construction the Project so far as feasible and reasonable, in a manner that minimises impacts to groundwater hydrology including capture, drawdown and hydrology	Before Construction During Construction	CoA 30	Project Engineer Site Supervisor Environment Coordinator	Section 5 Section 8.4
Norwest Station Subsurface Pedestrian Link and Northern Entry REF Environmental Management Measures					
161)	Any contaminated areas directly affected by the project would be investigated and remediated prior to the construction work starting. All remediation works would be undertaken in accordance with the requirements of the *Contaminated Land Management Act 1997* (NSW Government, 1997a) and *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 1997). Given that groundwater in the vicinity of the adjacent service station is likely to be disturbed during construction, there is an exposure risk to construction workers. There is also a risk of waste management and disposal. This would need to be further assessed during the detailed construction planning stage. If required further delineation, remediation or management would need to take place before construction starts. Any investigations undertaken to confirm the contamination and pollution risk would be forwarded to TfNSW for approval along with any Site Auditor endorsed Remediation Action Plan (or similar). A Site Auditor would need	Before Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 4	Environment Coordinator	Section 7.5

ID	Measure	Timing	Requirement	Responsibility	Reference
	to certify that any contaminated land or polluted groundwater had been remediated to a standard consistent with its proposed use.				
162)	A specific process regarding groundwater discharge and treatment methods would be identified during detailed design. As part of this process the management of groundwater and surface water ingress into pedestrian link and northern entry, including the design of capture, monitoring, treatment and discharge methods shall be undertaken in consultation with the NSW Environment Protection Authority.	Before Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 5	Environment Coordinator	Section 7.2
163)	Stormwater management controls would be implemented to: ▪ Manage runoff volumes through the use of measures to promote stormwater infiltration. ▪ Minimise increases in peak flows through the use of detention and retention measures as appropriate. Treating stormwater through a range of at source and end point measures that are integrated with the urban landscape.	Before Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 6	Environment Coordinator	Section 7.1
164)	All feasible and reasonable opportunities would be identified for the reuse of captured groundwater.	Before Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 7	Site Supervisor Environment Coordinator	Section 7.2
165)	Procedures to quickly address any contaminant spill or accident would be developed and implemented during operation of Norwest Station sites.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 10	Environment Manager	Section 7.4
166)	All feasible and reasonable opportunities for groundwater reuse for construction purposes or recycling nearby would be taken in the first instance. Should groundwater inflows and required treatment volumes outstrip the potential for reusing the water for construction purposes discharge options would be investigated.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 11	Environment Manager	Section 7.3
167)	A groundwater monitoring plan (GMP) would be prepared for implementation during construction. Parameters to be monitored would include groundwater levels and groundwater quality with field parameters, laboratory parameters and sample frequency to be developed prior to construction.	Before Construction	Norwest Station Subsurface Pedestrian Link and Northern	Environment Manager	Section 7.2

ID	Measure	Timing	Requirement	Responsibility	Reference
		During Construction	Entry REF EMM 12		
168)	A network would be established to monitor groundwater levels and groundwater quality during construction. The groundwater monitoring network would contain monitoring wells that intersect the Ashfield Shale and Hawkesbury Sandstone.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 13	Environment Manager	Section 8.4
169)	Groundwater sampling would be undertaken during construction to determine the most suitable treatment processes to meet the required water quality standards. Where the groundwater quality does not meet licence requirements it would be treated prior to discharge. Also the proposal would be designed and constructed to minimise its groundwater impact including capture and drawdown.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 14	Environment Manager	Section 8.4
170)	All feasible and reasonable measures would be implemented during construction to limit groundwater inflows to no greater than 0.5 ML/day. Any inflows would be collected and treated prior to reuse or discharge.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 15	Site Supervisor Project Engineer	Section 7.2
171)	Groundwater water supply from the Hawkesbury Sandstone for construction purposes would be used where feasible and reasonable. Negotiation with the NSW Office of Water would be undertaken regarding impacts and applicable licenses.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 16	Environment Manager Site Supervisor	Section 7.2
172)	A Construction Soil and Water Management would be prepared to manage soil, surface water and ground water. The plan shall include, but not be limited to: ■ Details of construction activities and their locations that have the potential to impact on water courses, stormwater flows and groundwater. ■ Detail the proposed extraction, use and disposal of groundwater, and the measures to mitigate potential impacts on groundwater sources, incorporating monitoring, impact trigger definitions, and response actions for all likely affected groundwater sources.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 17	Environment Manager	This document

ID	Measure	Timing	Requirement	Responsibility	Reference
	■ Surface water and groundwater impact criteria consistent with the principles of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1: The Guidelines* (Australian and New Zealand Environment and Conservation Council, 2000). ■ Management measures to be used to minimise surface and groundwater impacts, including the identification of water treatment measures and discharge points, details of how spoil and fill material will be sources, handled, stockpiled, reused and managed. Also included would be erosion and sediment control measures and salinity control measures. ■ A contingency plan consistent with the NSW *Acid Sulphate Soil Manual Assessment Guidelines* (NSW Acid Sulfate Soils Management Advisory Committee, 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. ■ A description of how the effectiveness of these actions and measures would be monitored during construction, clearly indicating how often monitoring would take place, how the monitoring results would be recorded and reported and if any exceedances are detected, how any non-compliance would be rectified. ■ Mechanisms for monitoring, reviewing and amending this plan. Additional water quality mitigation measures would be implemented in accordance with relevant requirements of: ■ *Managing Urban Stormwater – Soils and Construction Volumes 1 and 2* (Landcom and NSW Government, 2004 and 2006). ■ *Guidelines for Controlled Activities* (NSW Office of Water, 2000). ■ *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1: The Guidelines* (Australian and New Zealand Environment and Conservation Council, 2000). ■ NSW *Water Management Act 2000* (NSW Government, 2000b). ■ Applicable Environment Protection Licences. A holistic approach to water quality and stormwater management would be adopted that incorporates Water Sensitive Urban Design principles to minimise impacts on the existing hydrologic regime. Such measures would include: ■ Managing total runoff volumes through the use of rainwater tanks and measures that promote stormwater infiltration. ■ Minimising increases in peak flows through the use of detention and retention measures as appropriate.				

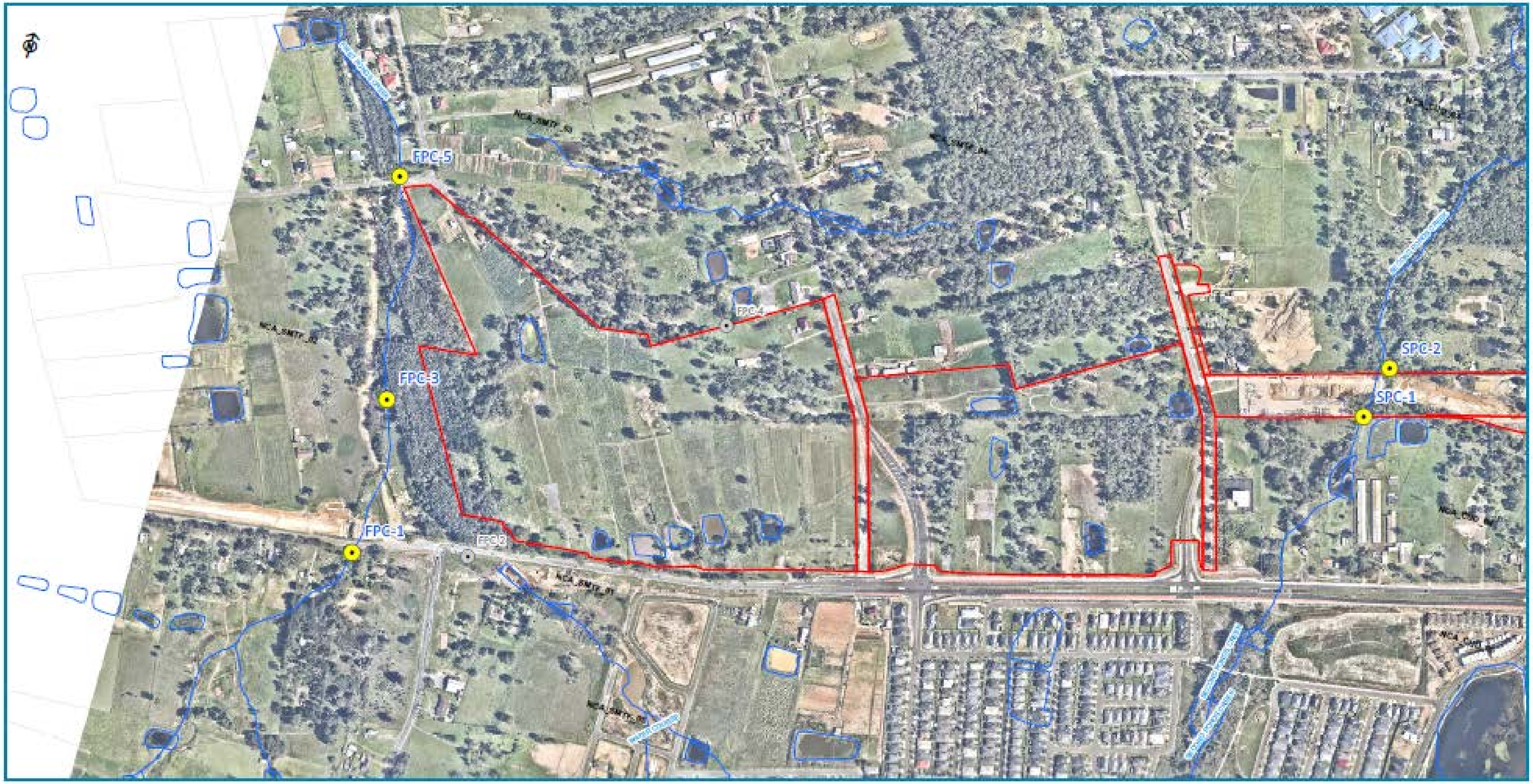
ID	Measure	Timing	Requirement	Responsibility	Reference
	Appropriate erosion control measures would be installed such as sediment fencing, check dams, temporary ground stabilisation, diversion berms or site regrading. Inspection of water quality mitigation controls (e.g. sediment fences, sediment basins) would be carried out regularly and following significant rainfall to detect any breach in performance.				
173)	Before starting on site, a summary of soil contamination would be prepared detailing the outcomes of any further contamination site investigations. The summary would detail, where relevant, whether or not the soil is suitable for the intended land use or can be made suitable for reuse through the application of a Remediation Action Plan (or similar). An accredited Site Auditor would endorse the documentation and any Remediation Action Plan or similar. In the event of encountering potentially contaminated materials during construction all work would cease in the vicinity of the discovery and it would not recommence until the extent of contamination has been assessed, and if necessary, a Remediation Action Plan or similar had been prepared and endorsed by an accredited Site Auditor. Soil and land remediation is to occur as soon as practicable following construction. This is to include remediation in stages as the construction process allows. Any investigations undertaken to confirm the contamination and pollution risk would be forwarded to TfNSW for approval along with any Site Auditor endorsed Remediation Action Plan (or similar). A Site Auditor would need to certify that any contaminated land or polluted groundwater had been remediated to a standard consistent with its proposed use. Where the investigations identify that the site is suitable for its intended use and that there is no need for a specific remediation strategy, measures to identify handle and manage potential contaminated spoil, materials and groundwater shall be incorporated into the CEMP.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 18	Environment Manager	Section 7.5
174)	Dissolved iron would typically be removed from discharge water by oxidising the Ferric ion (Fe3+) to Ferrous (Fe2+) which enables precipitation and physical removal. Water turbidity would typically be treated by settling/filters. Iron reducing bacteria in discharge water would be typically treated by biocide dosing. The management of groundwater and surface water ingress, including the design of capture, monitoring, treatment and discharge methods shall be undertaken in consultation with the NSW EPA.	Before Construction During Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 19	Environment Coordinator	Section 8
175)	Procedures to quickly address any contaminant spill or accident would be developed and implemented during the proposal's operation.	Construction	Norwest Station Subsurface Pedestrian Link and Northern	Environment Coordinator	Section 7.4

ID	Measure	Timing	Requirement	Responsibility	Reference
			Entry REF EMM 20		
176)	Storage of hazardous materials such as oils, chemicals and refuelling activities would occur in bunded areas.	Construction	Norwest Station Subsurface Pedestrian Link and Northern Entry REF EMM 21	Site Supervisor Environment Coordinator	Section 7.4
Willoughby to North Chatswood 33kV Underground Feeder Powerline Submissions Report Revised Environmental Management Measures					
177)	The following mitigation measures would be implemented during the construction: ■ No stockpiles of materials or storage of fuels or chemicals would be located adjacent to existing culverts. ■ Vehicles and machinery would be properly maintained to minimise the risk of fuel/oil leaks. ■ All water discharges would be undertaken in accordance with TfNSW's *Water Discharge and Re-use Guideline.* ■ Construction plant, vehicles and equipment would be refuelled at the main construction compound at Epping, or in designated re-fuelling areas located at a minimum distance of 50 metres from drainage lines or waterways. ■ The existing council drainage systems would remain operational throughout construction. ■ Stabilised surfaces would be reinstated as quickly as practicable after construction. ■ Material transport from site to surrounding pavement surfaces would be minimised. ■ Any potential groundwater identified during construction would be extracted and handled in accordance with a Groundwater Management Plan (subject to further investigation during detailed design).	Construction	REMM 13	Site Supervisor Environment Coordinator	Section 7
178)	The following mitigation measures are proposed to manage soils: ■ An Erosion and Sedimentation Control Plan would be developed and maintained for the site in accordance with *Managing Urban Stormwater, Soils and Construction Guidelines* (Landcom, 2004) (the Blue Book). ■ Excavated material would be reassessed for reuse as backfill material, prior to removal. ■ All material unable to be used as backfill material would to be appropriately tested and classified against the *Waste Classification Guidelines* prior to being disposed of off-site (EPA, 2014).	Construction	REMM 14	Site Supervisor Environment Coordinator	Section 7

ID	Measure	Timing	Requirement	Responsibility	Reference
	■ Site rehabilitation of disturbed areas would be undertaken progressively as activities are completed. ■ 'Clean' run-off from offsite would be diverted around or through the worksite without it contacting exposed soils or mixing with 'dirty' onsite water. ■ Suitable sediment retention structures and control measures would be used to filter or retain mobilised sediment generated during rain events over surface disturbances. ■ Temporary drain and channel liners (e.g. geofabric, jute matting etc.) would be installed where required.				
179)	The following mitigation measures are proposed: ■ All fuels, chemicals and hazardous liquids would be stored in accordance with Australian standards and EPA Guidelines (2014). ■ Any refuelling undertaken on site would be undertaken in designated areas only. ■ Spill kits would be available as part of any worksite for use in case of fuels, chemical or other spill(s) which may occur during construction. ■ All spills or leakages would be immediately contained and absorbed. ■ Should any signs of contamination be identified during work within the site, the material would be tested against the National Environment Protection Council's National Environment Protection (Assessment of Site Contamination) Measure 1999, and managed accordingly. ■ Soil excavated in areas with identified surrounding industrial land uses (including former uses) would be assessed for either its potential re-use on-site or classified for waste disposal purposes. ■ If groundwater is encountered during the works, groundwater quality would be investigated and appropriate management measures implemented to avoid further impacts. ■ Hazardous substances would only be used onsite as required, in accordance with the manufacturer/supplier instructions. ■ The use of any hazardous substance that could result in a spill would be undertaken away from drainage or stormwater lines and, wherever possible, within defined bunds. ■ In the event of unexpected finds of contamination, a Contamination Unexpected Finds and Contingency (refer to the Construction Soil and Water Management Plan) procedure would be implemented.	Construction	REMM 15	Site Supervisor Environment Coordinator	Section 7

ID	Measure	Timing	Requirement	Responsibility	Reference
180)	• Erosion and sediment control measures shall be implemented in accordance with the Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book) • Appropriate stockpiling of materials would take placea way from drainage lines and drains • Disturbed areas shall be appropriately stabilised to minimise erosion and be reinstated as soon as practicable	During Construction	EIA Control Measure	Project Engineer Site Supervisor Environment Coordinator	Section 7.1

Annexure C Surface Water Monitoring Locations



Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

EPL_Premises

Revsion

REV	AMENDMENT DESCRIPTION	BY	CHECK	ACCEPTANCE	DATE
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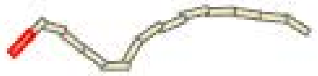
02					
03					



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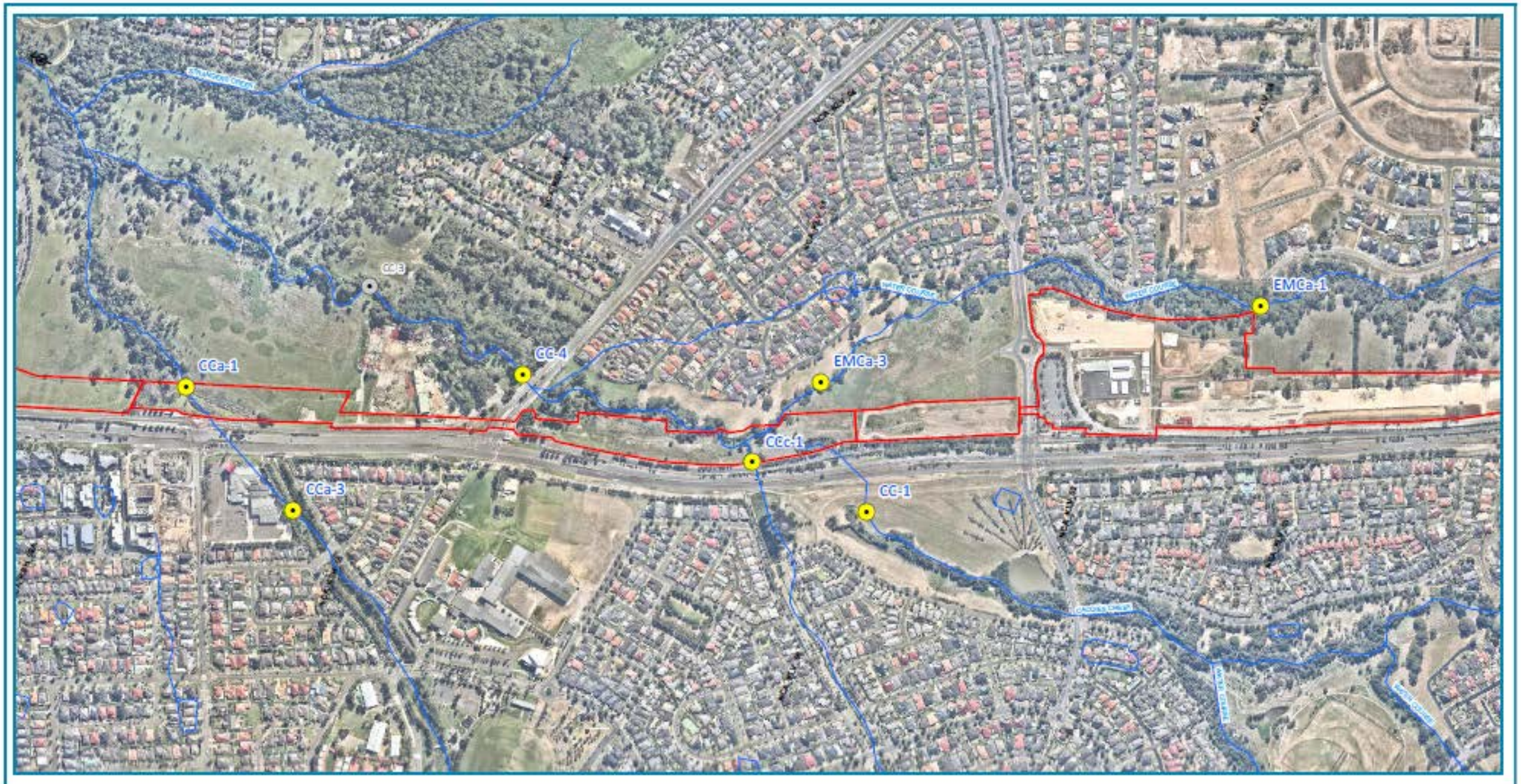

Active monitoring point

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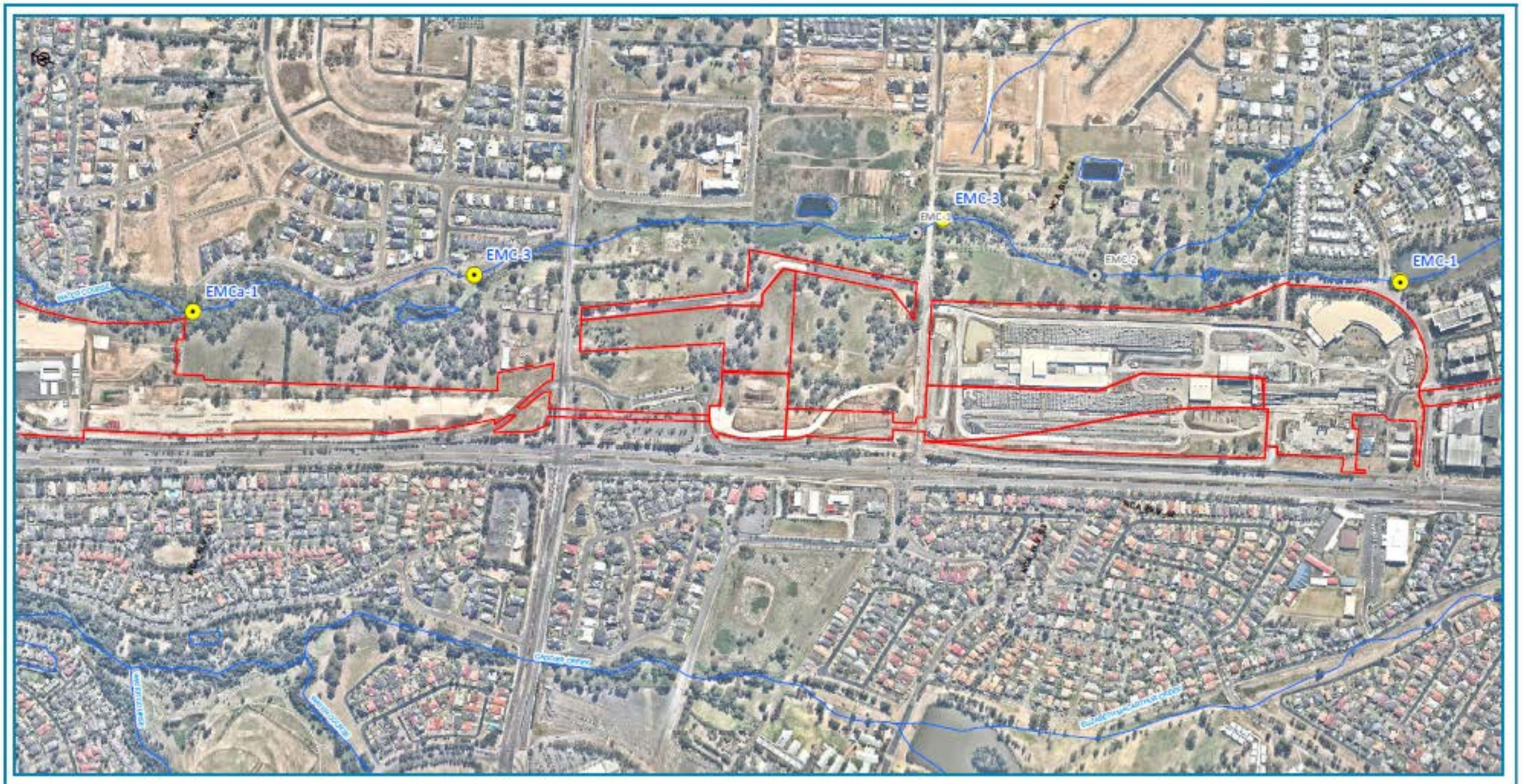

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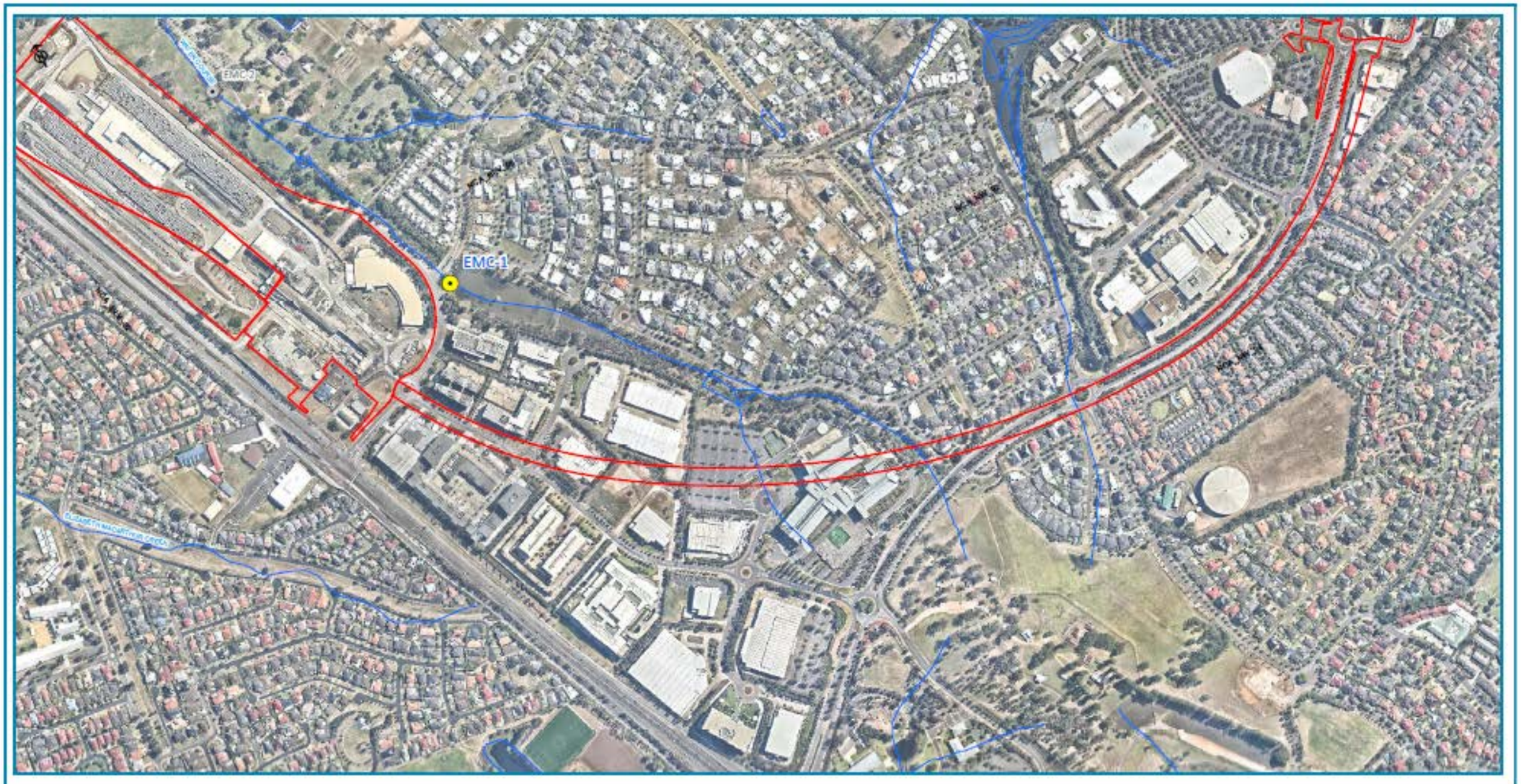

Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

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Revsion

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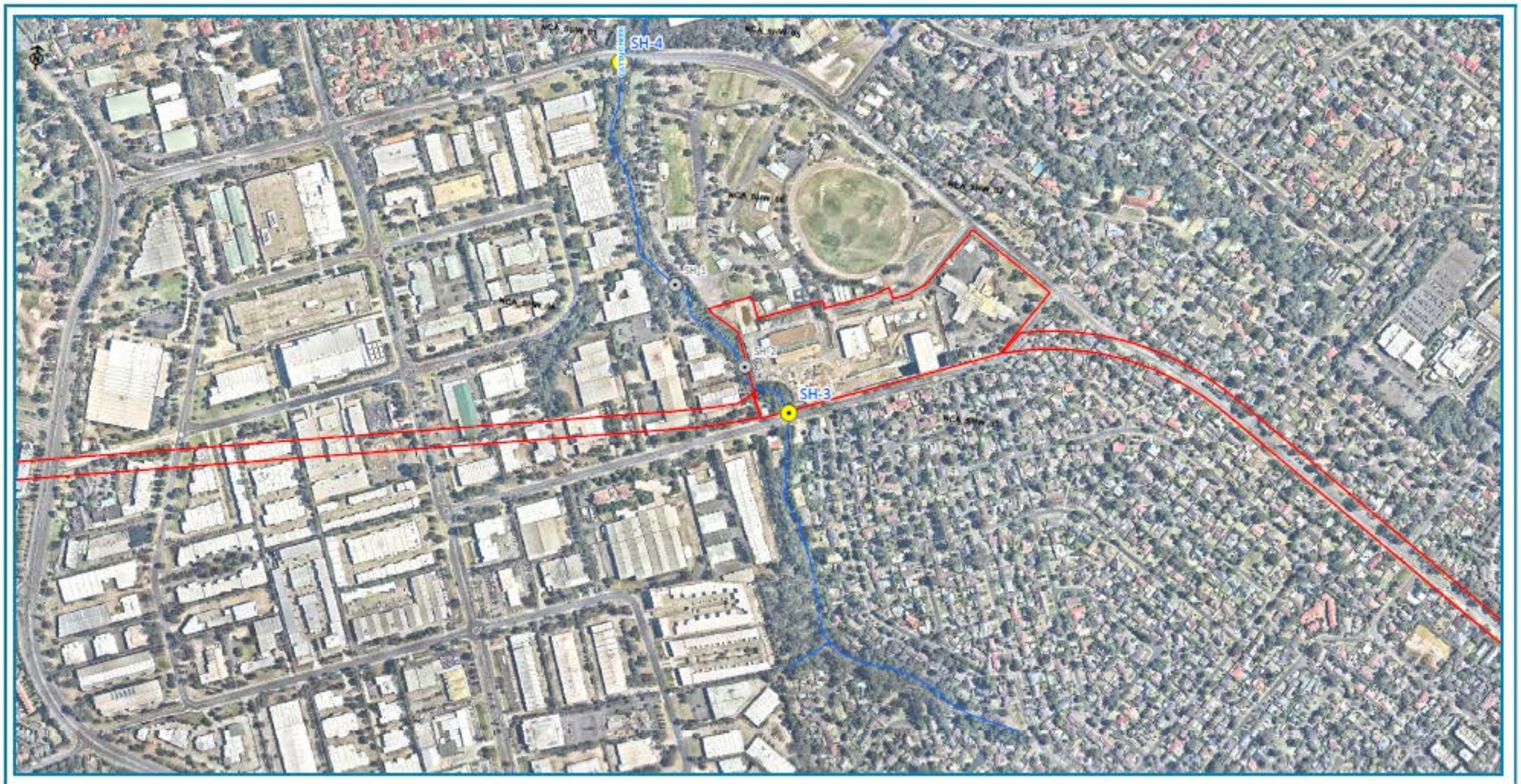

Active monitoring point

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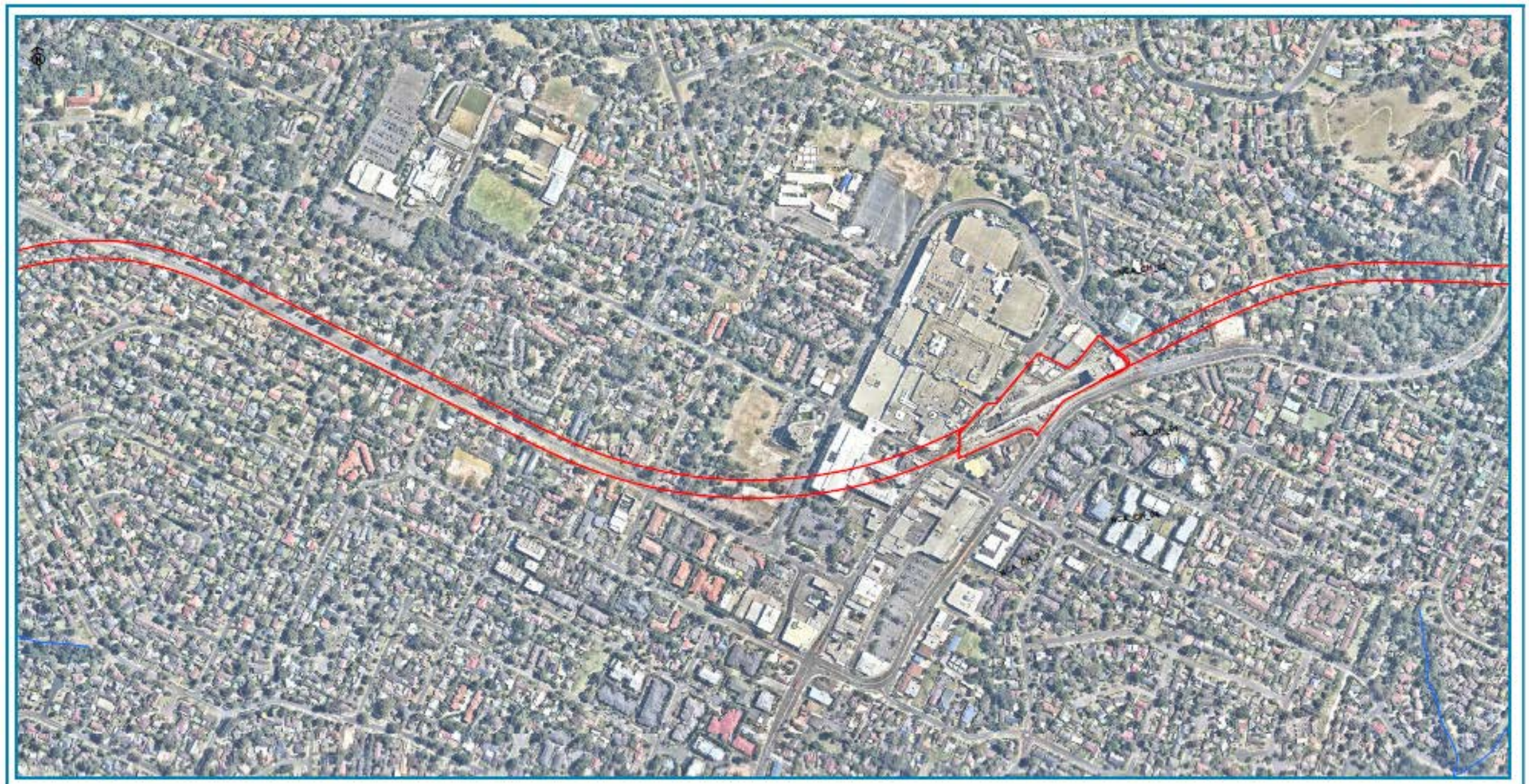

Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

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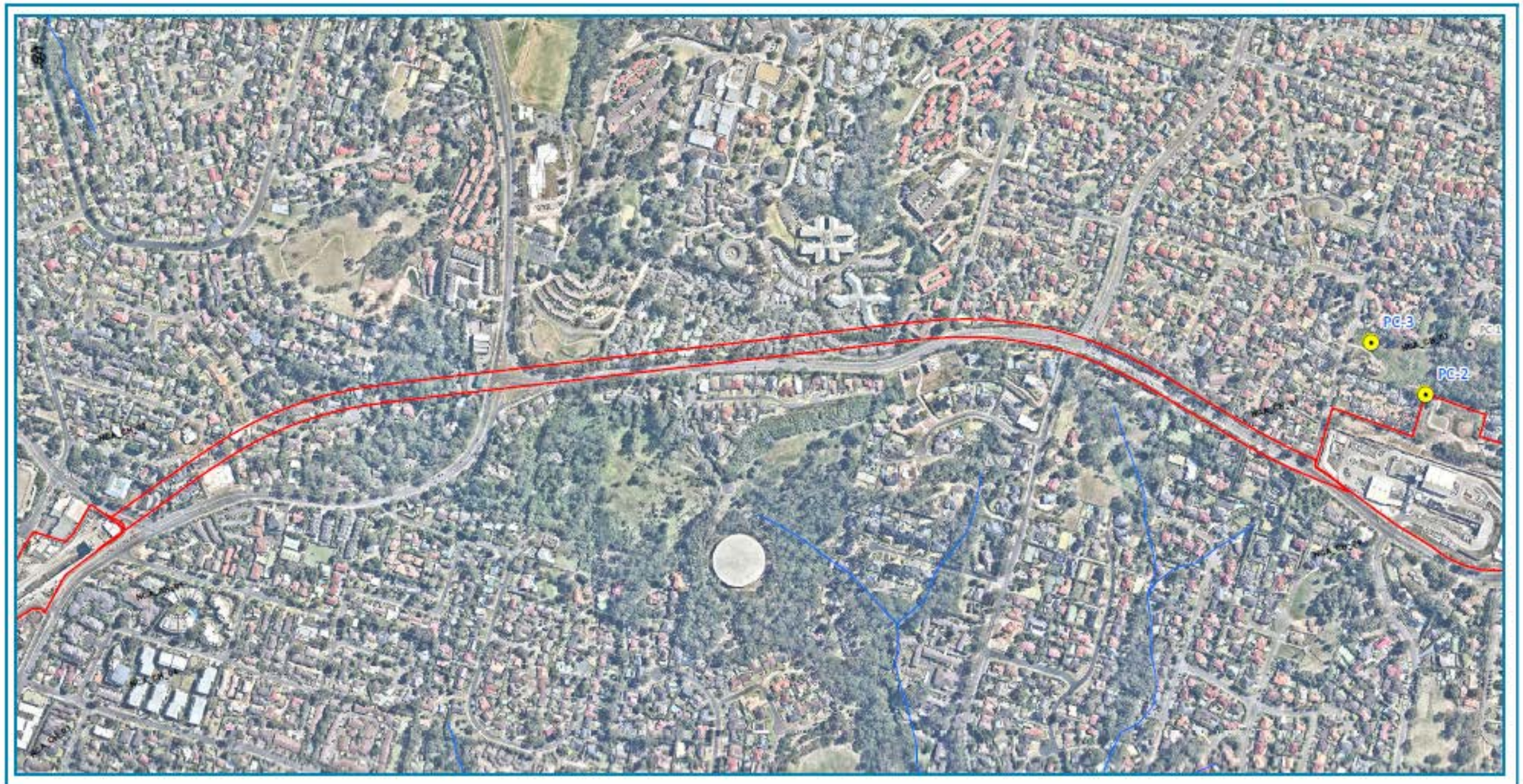

Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

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Revsion

REV	AMENDMENT DESCRIPTION	BY	CHECK	ACCEPTANCE	DATE
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SURFACE WATER QUALITY MONITORING POINTS

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Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

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Revsion					
REV	AMENDMENT DESCRIPTION	BY	CHECK	ACCEPTANCE	DATE
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Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

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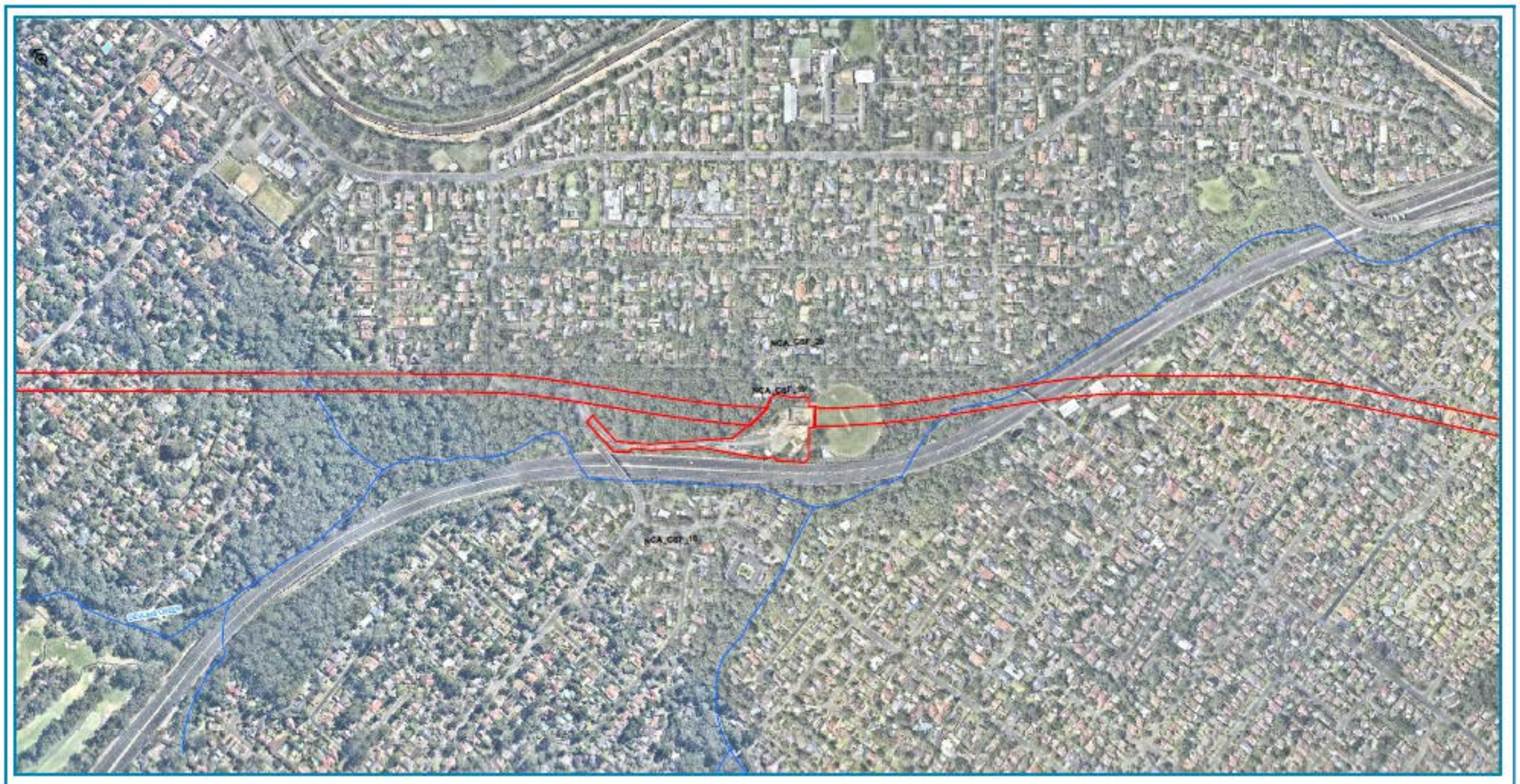

Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

EPL_Premises

Revsion					
REV	AMENDMENT DESCRIPTION	BY	CHECK	ACCEPTANCE	DATE
00	DRAFT	PMO		PMO	
01	Monitoring locations as per Rev 6 of the WMP	PMO		PMO	12/09/17
02					
03					

MAP SHEET INDEX

Disclaimer
Issued for implementation of the Construction Environmental Management Plan and associated sub-plans.
Design elements illustrated on these plans may not be IFC.

SCALES:
1:6,330 (at A3)

SURFACE WATER QUALITY MONITORING POINTS
NRT

DRAWING No.:
SHEET No.: 13 of 23
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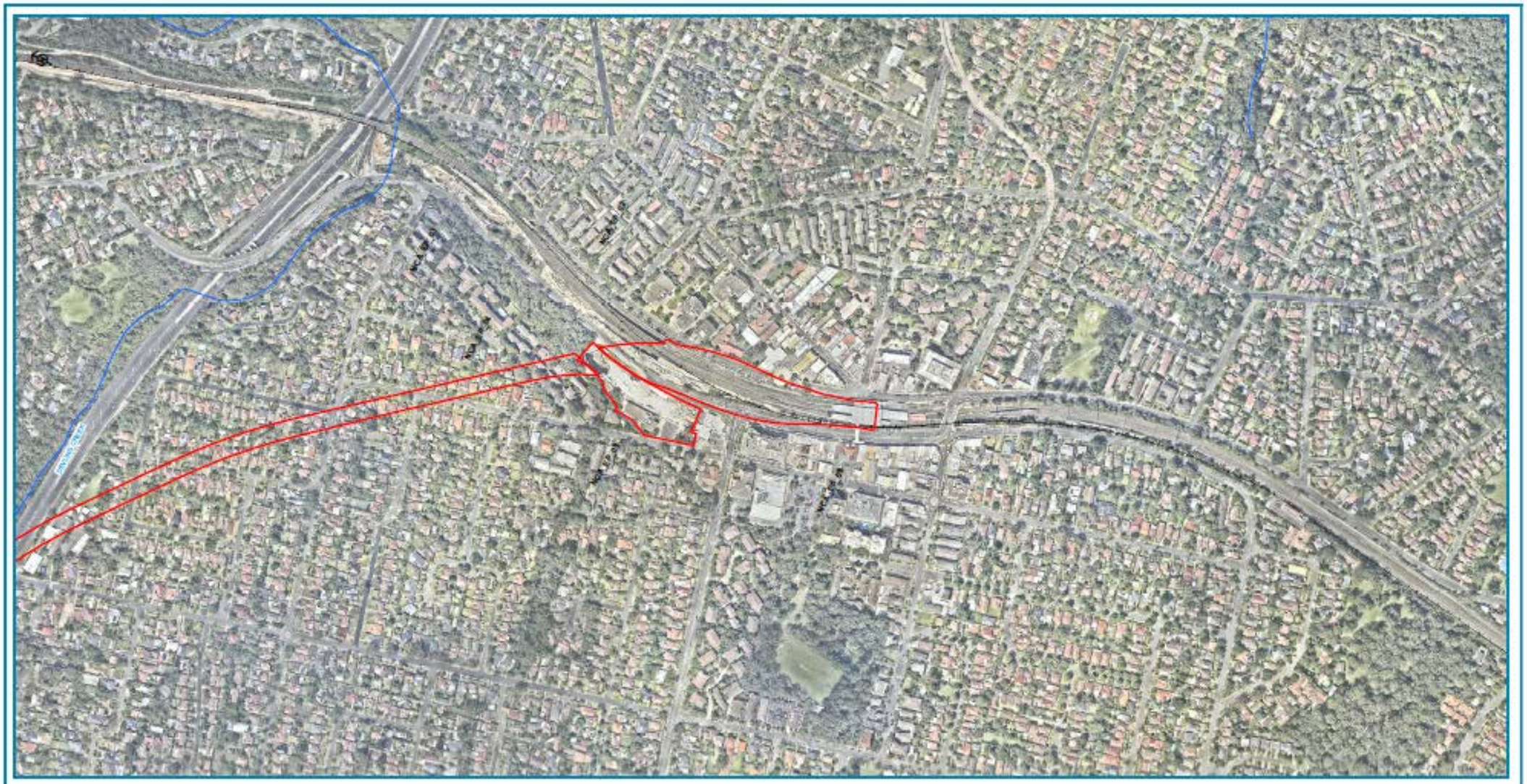

Active monitoring point

Former monitoring point (ceased, inaccessible, relocated)

EPL_Premises

Revsion

REV	AMENDMENT DISCRIPTION	BY	CHECK	ACCEPTANCE	DATE
00	DRAFT	PMO		PMO	
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03					

MAP SHEET INDEX

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SCALES:
1:6,330 (at A3)

SURFACE WATER QUALITY MONITORING POINTS

NRT

DRAWING No.:
SHEET No.: 14 of 24
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Annexure D Groundwater Monitoring Locations

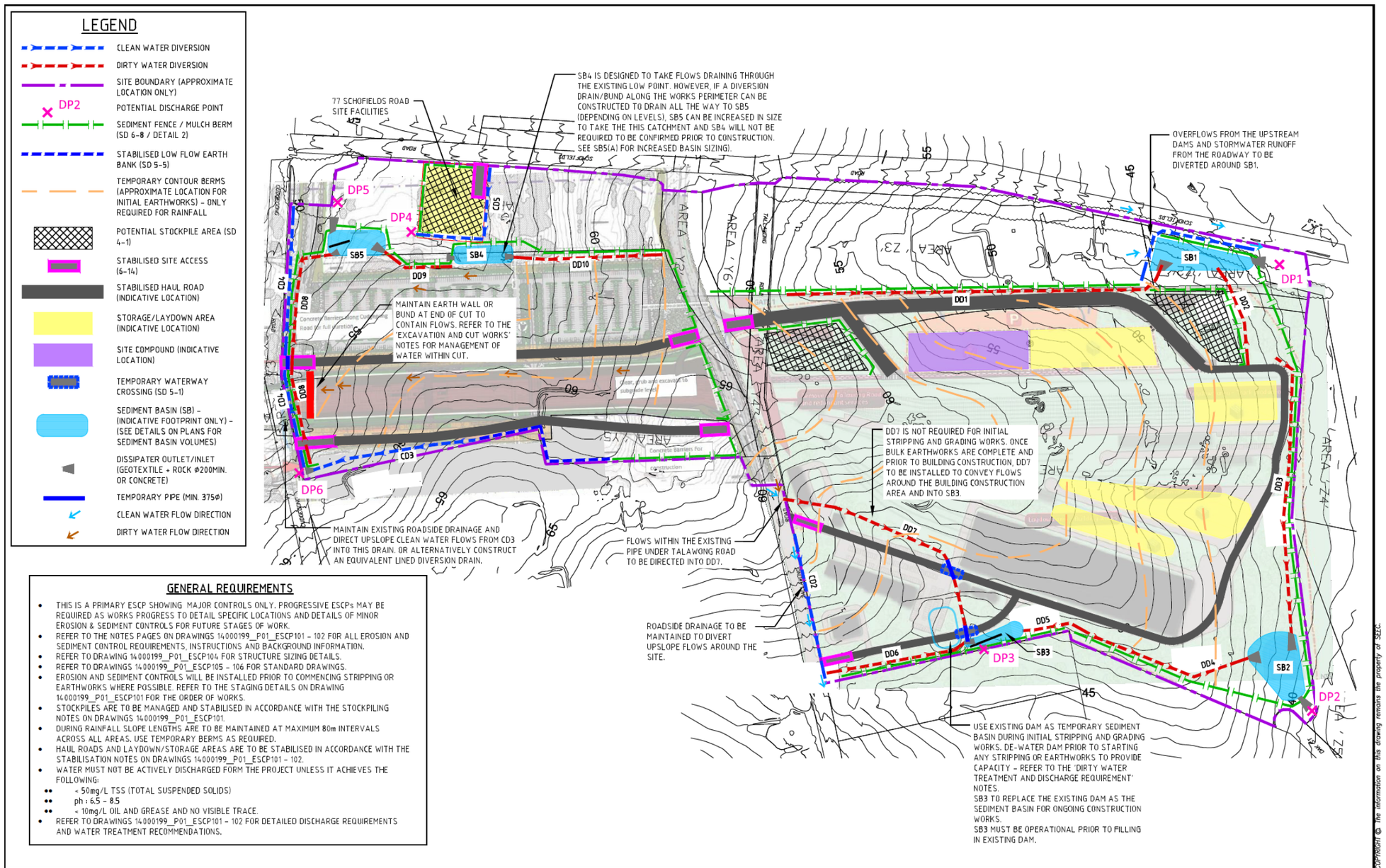
Monitoring Point (indicative)

Site Boundary

N


310000
313000
320000
6265000
N
Bella Vista Inset, 1:10,000
KELLYVILLE
GLENHAVEN
CASTLE HILL
BELLA VISTA
KINGS LANGLEY
BAULKHAM HILLS
WEST PENNANT HILLS
NORTH ROCKS
CARLINGFORD
Showground
Bella Vista
Norwest
Castle Hill
Cherrybrook
Intermediate Services Facility
Epping Services Facility
NWR-BH060
NWR-BH055
NWR-BH049
NWR-BH047
NWR-BH006
NWR-BH042
NWR-BH033
NWR-BH038
NWR-BH039
NWR-BH031
NWR-BH029
NWR-BH026
NWR-BH092
NWR-BH093
NWR-BH021
NWR-BH022
NWR-BH022A
NWR-BH019
NWR-BH015
NWR-BH014
NWR-BH012A
NWR-BH012
NWR-BH011
NWR-BH008
NWR-BH006
NWR-BH003
BV-19
BV-18
BV-16
BV-17
BV-13
BV-4
BV-1
BV-8
NW-4
NW-5
NW-6
SG-12
SG-13
SG-11
SG-9
CA-12
CA-4
CA-5
CA-14
CB-9
CB-5
EP-2
EP-5
LEGEND
NWRL Planned Station Excavations - No salinity impact
NWRL Planned Alignment - No salinity impact
Bella Vista Site Boundary - Some salinity impact
Very low salinity potential
Moderate salinity potential
High salinity potential
Known salinity
Soil Chemistry
Water Chemistry
Note: Salinity potential after Department of Infrastructure, Planning and Natural Resources (DIPNR), 2002, "Salinity Potential in Western Sydney"

Annexure E Primary ERSED Plan – Phase 1 Works



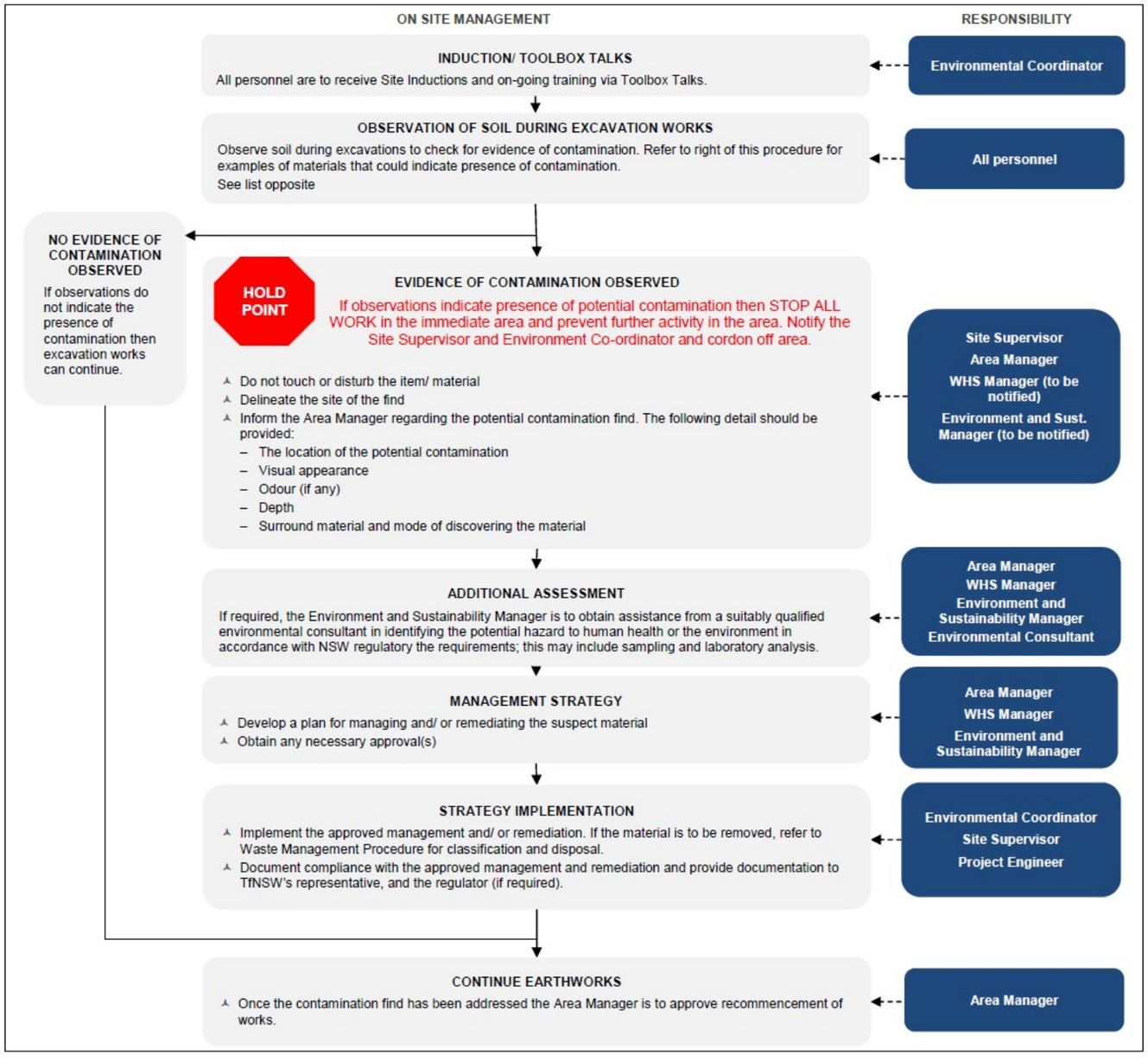
Annexure F Contamination and Acid Sulfate Soils Contingency Procedure

CONTAMINATION AND CONTINGENCY ACID SULFATE SOILS MANAGEMENT PROCEDURE

This **procedure** describes how we manage contamination and Acid Sulphate Soils throughout the construction stage of the Northwest Rapid Transit.

Aconex Ref: NWRLOTS-NRT-PRD-EN-PRO-910073
PIMS Ref: PIMS-CP-04/03

Sponsor: Kelie Pittaway



Indicators of Contamination

Examples of materials that could indicate the presence of contamination include (but are not necessarily limited to):

- Asbestos cement fragments or other potentially asbestos containing materials
- Odorous or stained soil;
- Buried chemical drums or containers
- High proportion of waste materials or building debris
- Tarry or ashy material
- Brightly or unusually coloured material
- A yellow and/or red mottling in the soil profile indicates there may be Acid Sulphate Soils (ASS)

Asbestos

Asbestos finds are to be managed in accordance with the Project WHS Management Plan

Acid Sulfate Soils (ASS)

ASS are naturally occurring soils, sediments or organic substrates that are formed under waterlogged conditions in coastal areas. When exposed to air after being disturbed, soils containing iron sulfides produce sulfuric acid and often release toxic quantities of iron, aluminium and heavy metals.

It is extremely unlikely that potential or actual ASS will be encountered during the OTS Works as they are inland, notwithstanding, the Department of Planning and Environment have required that NRT prepare a contingency plan. Any suspected ASS must be assessed in accordance with this procedure.

If ASS is encountered, possible management strategies include:

- Modifying the Project to avoid the area of ASS
- Delineation and removal to a suitably licenced facility
- Onsite treatment to neutralise the ASS, which could include the application of lime in accordance with recommendations of the Environmental Consultant

Note: The management of any ASS needs to include appropriate erosion and sedimentation controls to minimise the potential for pollution to waters.

Management and Disposal of Contaminated Material

Specific approval may be required to implement management strategies and a Task Risk Assessment (TRA) must be prepared prior to undertaking any remediation work, except in emergency situations (see Emergency Response Plan)

Contaminated material will be disposed of in accordance with the Waste Management Procedure

Note: Spoil classification is addressed in the Spoil Classification and Reuse Procedure

Annexure G Glossary

Term	Definition
AEC	Areas of Environmental Concern
AHIMS	Aboriginal Heritage Information Management System
AMS	Activity Method Statement
ANZECC	Australian and New Zealand Environment Conservation Council
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resources Management Council of Australia and New Zealand
ASS	Acid Sulfate Soil
Blue Book	Managing Urban Stormwater: Soils and Construction (Landcom 2004)
BOM	Bureau of Meteorology
CAQMP	Construction Air Quality Management Plan
CBD	Central Business District
CCAMP	Construction Compounds and Ancillary Facilities Management Plan
CEEC	Critically Endangered Ecological Community
CEMF	Construction Environmental Management Framework
CEMP	Construction Environmental Management Plan
CFFMP	Construction Flora and Fauna Management Plan
CHMP	Construction Heritage Management Plan
CNVIS	Construction Noise and Vibration Impact Statement
CNVMP	Construction Noise and Vibration Management Plan
CoA	Condition of Approval
CoPC	Contaminants of Potential Concern
CPESC	Certified Professional in Erosion and Sediment Control
CSWMP	Construction Soil and Water Management Plan
DACHA	Darug Aboriginal Cultural Heritage Assessments
DACHi	Darug Aboriginal Land Care Inc.
DCAC	Darug Custodian Aboriginal Corporation

Term	Definition
DECC	Department of Environment and Climate Change (now OEH and EPA)
DECCW	Department of Environment, Climate Change and Water (now OEH and EPA)
DLALC	Darkinjung Local Aboriginal Land Council
DLO	Darug Land Observations
DLWC	Department of Land and Water Conservation (now NSW Office of Water)
DP&E	Department of Planning and Environment
DPI	Department of Primary Industries
DTAC	Darug Tribal Aboriginal Corporation
E&M	Environment Manager
EC	Environmental Coordinator
ECRL	Epping to Chatswood Rail Link
EEC	Ecologically Endangered Community
EIA	Environmental Impact Assessment
EIL	Ecological Investigation Levels
EIS	Environmental Impact Statement
EIS 1	EIS for SSI-5100 – NWRL Early Works and Major Civil Construction Works (Incorporating Staged Infrastructure Modification Assessment)
EIS 2	EIS for SSI-5414 – NWRL works associated with the construction and operation of stations and wider precincts, service facilities, rail infrastructure and systems
EMS	Environmental Management System
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPA	Environment Protection Authority
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999 (Cth)*
EPL	Environment Protection Licence
EPM	Environmental Planning and Approvals Manager
ER	Environmental Representative
ERP	Emergency Response Plan
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater Dependant Ecosystems

Term	Definition
IC	Independent Certifier
IFD	Intensity-Frequency-Duration
IJV	Infrastructure Joint Venture (of NRT)
ITP	Inspection and Test Plan
JHET	John Holland Event Tracking
JHPL	John Holland Propriety Limited
LCPL	Leighton Contractors Propriety Limited
LOR	Limits of Reporting
MLALC	Metropolitan Local Aboriginal Land Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NOW	NSW Office of Water
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NRT	Northwest Rapid Transit
NTU	Nephelometric Turbidity Units
NWRL	North West Rail Link (now Sydney Metro Northwest)
OEH	Office of Environment and Heritage
OpCo	OTS Operating Company
OTS	Operations, Trains and Systems
PAD	Potential Archaeological Deposit
PASS	Potential Acid Sulfate Soil
PIMS	Project Integrated Management System
PIRMP	Pollution Incident Response Management Plan
PMF	Probable Maximum Flood
POEO Act	*Protection of the Environment Operations Act 1997*
PPP	Public Private Partnership
Project	Sydney Metro Northwest OTS Project
Project Approval	Minister for Planning and Infrastructure's Approval for SSI-5414, SSI-5931 and TfNSW's Approval for the ECRL Conversion Works

Term	Definition
RAP	Registered Aboriginal Parties
REF	Review of Environmental Factors
REMM	Revised Environmental Management Measures
RFP	Request for Proposal
RFT	Request for Tender
RMS	Roads and Maritime Services
RTRF	Rapid Transit Rail Facility (now Sydney Metro Trains Facility)
RTRF EIS	EIS for SSI-5931 – Rapid Transit Rail Facility
SAC	Site Acceptance Criteria
SDS	Safety Data Sheet
SEP	Site Environment Plan
SEPP	State Environmental Planning Policy
SES	State Emergency Service
SEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now Department of the Environment)
SM	OTS Sustainability Manager
SMP	Spoil Management Plan
SMTF	Sydney Metro Trains Facility
Spoil	Material generated by excavation into the ground
SPR	Scope and Performance Requirements
SQERM	Safety, Quality and Environment Risk Management
SSI	State Significant Infrastructure
SVC	Surface and Viaduct Civil Works
SWTC	Scope of Works and Technical Criteria
TBM	Tunnel Boring Machine
TDS	Total Dissolved Solids
TfNSW	Transport for New South Wales
TRA	Task Risk Assessment
TSC	Tunnels and Station Civil Works
TSC Act	*Threatened Species Conservation Act 1995*

Term	Definition
TSS	Total Suspended Solids
VAMP	Visual Amenity Management Plan
VENM	Virgin Excavated Natural Material – natural material (such as clay, gravel, sand, soil and rock) that is not mixed with any other type of waste and/or has been excavated from areas of land that are not contaminated
WAD	Works Authorisation Deed
WBNM	Watershed Bound Network Model
WM Act	*Water Management Act 2000*
WMRP	Waste Management and Recycling Plan
WRA	Workplace Risk Assessment
WRAPP	Waste Reduction and Purchasing Policy
WTP	Water Treatment Plant