



Soil and Water Management Plan

Googong Township IWC Project: Stage B Network

Prepared by:

RPS MANIDIS ROBERTS PTY LTD

Level 9, 17 York Street
Sydney NSW 2000

T: +61 2 9248 9800
F: +61 2 9248 9810
E: sydney@rpsgroup.com.au

Client Manager: Rob Salisbury
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Prepared for:

GOOGONG TOWNSHIP PTY LTD (GTPL)

Level 3, 64 Allara Street
Canberra ACT 2600

T: +61 2 6230 0800
F: +61 2 6230 0811
W: www.googong.net

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1.0 Introduction

1.1 Context

This Soil and Water Management Plan (SWMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for Stage B Network.

Refer to Section 1 and Section 2 of the CEMP for additional detail on the scope of Stage B Network to which this SWMP applies.

This SWMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the Statement of Commitments (SoC), the safeguards listed in the Googong Township water cycle project Environmental Assessment (EA), submissions report, and all applicable legislation.

1.2 Background

The Googong Township water cycle project EA assessed the impacts of construction and operation of the IWC Project on soil and water.

As part of EA development, a detailed assessment was prepared to address the Director-General's Requirements issued by the former Department of Planning and Infrastructure (DP&I). The water quality and hydrology, soil and groundwater assessments were addressed in Sections 7, 9 and 10 of the EA.

The EA concluded that there were unlikely to be significant soil and water impacts associated with the construction and operation of the IWC Project, following the implementation of the proposed mitigation measures identified in the EA.

1.3 Environmental Management System overview

The overall Environmental Management System for Stage B Network and approach to managing environmental impacts during construction is described throughout the CEMP.

This SWMP forms part of the environmental management framework for Stage B Network, as described in Section 1.6 of the CEMP. In accordance with CoA C20(a), this Plan has been developed in consultation with the NSW Environment Protection Agency (EPA) (formerly the Office of Environment and Heritage) and Queanbeyan City Council (QCC).

2.0 Purpose and objectives

2.1 Purpose

The purpose of this Plan is to describe how Googong Township Proprietary Limited (GTPL) and the contractor will manage soil and water issues and protect the environment during construction of Stage B Network. This Plan encompasses:

- Erosion control.
- Sedimentation.
- Spoil management.
- Groundwater.
- Water quality.
- Contamination.

This Plan also assists in ensuring that the construction of Stage B Network meets the environmental objectives and targets as defined in Section 3.5 of the CEMP.

2.2 Objectives

The key objective of the SWMP is to ensure that impacts to soil and water are minimised. To realise this objective, the following will be undertaken:

- Ensure appropriate controls and procedures are implemented during construction activities to avoid or minimise potential adverse impacts to soil and water (refer Section 5.1).
- Ensure appropriate measures are implemented to address the relevant CoA and SoC, and the safeguards detailed in the EA and submissions report (refer Sections 3.2 and 3.3).
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3.1 of this Plan.

3.0 Environmental requirements

3.1 Relevant legislation and guidelines

Section 3.1 of the CEMP identifies the legal and other requirements applicable to the IWC Project and the construction of Stage B Network. This section identifies the key legislation applicable to managing soil and water.

3.1.1 Legislative requirements

3.1.1.1 [Environmental Planning and Assessment Act 1979 \(EP&A Act\)](#)

As outlined in Section 3.1 of the CEMP, the IWC Project has been assessed and approved by the Planning Assessment Commission under delegation from the Minister for Planning and Infrastructure under Part 3A (now repealed) of the EP&A Act.

3.1.1.2 [Fisheries Management Act 1994 \(FM Act\)](#)

The primary aim of the FM Act is to conserve, develop and share fisheries resources of NSW to benefit present and future generations.

As the IWC Project was approved under Part 3A of the EP&A Act, the IWC Project is exempt from seeking permits under Section 201 (dredging and reclamation work), Section 205 (disturbance of marine plants) and Section 219 (disruption to fish passage) of the FM Act (as per Section 75U of the EP&A Act). Regardless, the IWC Project will conform to the comparable guidelines and standards where relevant. The Department of Primary Industries (DPI) Fisheries will be consulted for any action that may impact on fisheries. However construction of Stage B Network is unlikely to impact fisheries resources.

3.1.1.3 [Protection of the Environment Operations Act 1997 \(POEO Act\)](#)

The POEO Act is the key piece of environment protection legislation, and is administered by EPA. The objective of the POEO Act is to protect, restore and enhance the quality of the environment in NSW with a need to maintain ecologically sustainable development. To achieve this, the following tools are employed:

- Integrated environment protection licensing.
- Regulation of scheduled and non-scheduled activities.
- Environmental protection offences and penalties.
- Environmental protection notices.
- Establishment of a general duty to notify of environmental harm.
- Powers for authorised officers to investigate actual or potential pollution events.

Under Section 47 of the POEO Act, a Scheduled Development Environment Protection Licence (EPL) is required for construction of Stage B Network for works that will enable a scheduled activity (Sewage Treatment – as listed in Schedule 1 of the POEO Act). GTPL has obtained an EPL (No. 20188) and the conditions of the licence must be adhered to during the construction of Stage B Network (refer SW2).

The EPL will be available for inspection by all personnel and will be kept on site at all times. The EPL will be produced to any authorised officer of the EPA who asks to see it.

In addition to the main objective, the POEO Act assists in achieving the objectives of the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act).

3.1.1.4 Water Management Act 2000 (WM Act)

The WM Act is the main piece of water legislation in NSW and governs:

- Extraction of water from waterways and bores.
- Extraction of water from any excavation.
- The construction of water storage and supply structures.
- Development or building within the proximity of waterways.
- A licensing system established under the *Water Management Act 2000* allows for regulated usage of water resources.
- The management of groundwater resources under groundwater sharing plans.

There are two water sharing plans (WSPs) relevant to groundwater and unregulated surface water at the site:

- WSP for the NSW Murray Darling Basin Fractured Rock Groundwater Sources
- WSP for the Murrumbidgee Unregulated and Alluvial Water Sources.

Where a WSP is in place, the WM Act governs the issuing of water access licences (WALs) and water management and activity approvals. As WSPs are in place for the surface and groundwater sources at the site, the WM Act applies.

Under Part 2 of Chapter 3 of the WM Act, it is an offence to take water from a source regulated by the WM Act unless in accordance with a WAL. A geotechnical investigation for the site (Douglas Partners, May 2014) indicates that groundwater will be intercepted during construction of the Stage B Network. The estimated likely dewatering requirements over a 16 week excavation period is 330 kilolitres. The water will not be discharged into Montgomery Creek but may be used for dust suppression. Based on the predicted dewatering volumes, timeframes and proposed use, the NSW Office of Water advised on 30 May 2014 that a WAL will not be required.

The IWC Project has been approved under Part 3A (now repealed) of the EP&A Act. Section 75U states that a water use approval under Section 89, a water management work approval under Section 90 or an activity approval under Section 91 of the WM Act is not required.

3.1.1.5 Contaminated Land Management Act 1997 (CLM Act)

The main objective of the CLM Act is to establish a process for investigating and remediating land areas where contamination presents a significant risk of harm to human health or some other aspect of the environment.

Under the CLM Act the EPA has the power to:

- Declare an investigation site and order an investigation.
- Declare a remediation site and order remediation to take place.
- Agree to a voluntary proposal to investigate or remediate a site.

The CLM Act enables EPA to respond to contamination that is causing significant risk of harm to human health or the environment. The construction of Stage B Network will be undertaken in accordance with this act to reduce the risk to human health or environment.

3.1.2 Relevant guidelines

The following guidelines and documents have been reviewed in the preparation of this Plan:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000).
- *Environmental Best Management Practice guideline for Concreting contractors* (DEC, 2002).
- *Managing Urban Stormwater: Soils and Construction 'The Blue Book'* (Landcom, 2004).
- *Guidelines for Controlled Activities on Waterfront Land* (NOW, 2012).
- *Development Construction Specification C101- General* (QCC, 2011).
- *Development Construction Specification C211- Control of Erosion and Sedimentation* (QCC, 2011).

3.1.3 Discharge water quality criteria

The following discharge water quality criteria will be applied for any dewatering into the surrounding environment. Refer to Appendix 2 for details on dewatering procedure. Discharge water quality criteria have been developed in accordance with the *Blue Book* (Landcom, 2004) and *Managing urban stormwater: soils and construction, Volume 2A: Installation of Services* (DECC, 2008).

Table 1 Water quality criteria

Parameter	Criteria
pH	6.5 – 8.5
Total suspended solids	<50 mg/L
Conductivity (salinity)	<1,500 μScm^{-1}
Oil and grease	No visible

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan are listed Table 2. A cross reference is also included to indicate where the condition is addressed in this Plan or other management documents.

Table 2 Conditions of Approval relevant to soil and water

CoA No.	Condition requirements	Document reference
B2	Except as may be expressly provided by an Environment Protection Licence for the project, the Proponent shall comply with section 120 of the <i>Protection of the Environment Operations Act 1997</i> .	Section 3.1.1 Table 7 (SW27, SW19)
B4	Erosion and Sediment controls consistent with <i>Managing Urban Stormwater: Soils and Construction Manual</i> (Landcom 2004, or its latest version) are to be installed prior to the commencement of soil disturbance and maintained until such time as the disturbed area has been rehabilitated in accordance with the rehabilitation objectives in the CEMP.	Table 7 (SW5, SW6, SW7, SW8, SW9, SW10)
B5	The Proponent shall carry out rehabilitation progressively, and as soon as reasonably practicable following disturbance in accordance with Condition C20(e).	Table 7 (SW32, SW33, SW34)
C2	Prior to commencing construction of the project, the Proponent shall investigate the presence and extent of any soil contamination on the site, including but not limited to the sites identified in the EA.	Section 4.1.4
C3	The Proponent shall ensure any areas affected by the project that are potentially contaminated are remediated prior to commencing construction in those areas. All remediation work shall be conducted in accordance with the requirements of the <i>Contaminated Land Management Act 1997</i> and <i>Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites</i> (EPA, 1997).	Section 4.1.4

CoA No.	Condition requirements	Document reference
C20 (a)	A Soil and Water Management Plan to manage water quality impacts and to minimise soil erosion and the discharge of sediments and other pollutants to lands and/or waters during construction. The Plan shall be prepared in consultation with OEH and Councils and shall include, but not necessarily be limited to:	This Plan Section 1.3
	(i) detailed engineering designs for the recycled water discharge structure;	N/A to Stage B Network
	(ii) detailed engineering designs and rehabilitation methodology for each category of watercourse crossing;	Section 4.3.3 Table 5.1 (SW16, SW17)
	(iii) a description of the quantity and source of all water supplies relating to construction, hydro-testing and operation;	Section 4.3.4 Section 4.3.5 Table 7 (SW22, SW23)
	(iv) a description of any dewatering activities associated with groundwater interception and measures to minimise the impacts associated with dewatering activities, including the disposal or reuse of water;	Table 7 (SW21, SW19) Dewatering Procedure (Appendix 2)
	(v) details on potential occurrence of expansive soils and saline areas within the project site and management and mitigation measures;	Section 4.1.1 Table 7 (SW14)
	(vi) details of the measures to mitigate the risk of impacting the local groundwater recharge levels (such as the planning of construction works during dry periods and the employment of construction techniques which aim to shorten the time the trenches are left open);	Table 7 (SW30, SW31)
	(vii) a description of measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, including progressive rehabilitation; and	Table 7 (SW3, SW4, SW5, SW6, SW8, SW9, SW10, SW30, SW32, SW33, SW34, SW35)
	(viii) monitoring of impacts on water quality and soils;	Section 6.3 Table 7 (SW5, SW6, SW8, SW10)

3.3 Statement of Commitments

The SoC relevant to this Plan are listed Table 3. A cross reference is also included to indicate where the commitment is addressed in this Plan or other management documents.

Table 3 Statement of commitments relevant to soil and water

Objective	Ref. No.	Commitment	Timing	Document reference
Ensure proper management of soils.	S1	Soil and water management plans will be developed and implemented for the construction phase, via the CEMP, in accordance with <i>Managing urban stormwater: soils and construction, Volume 1</i> (the 'Blue book').	Prior to construction	Table 7 (SW6)
		Soil types will be identified and delineated within the study area. Soil management measures will be developed according to soil type and be documented in the CEMP.	Prior to construction, construction	Section 4.1.1 Table 7 (SW4, SW5, SW6, SW9, SW10)

Objective	Ref. No.	Commitment	Timing	Document reference
Prevent soil erosion and minimise loss of topsoil.	S2	The CEMP will detail erosion and sedimentation control measures, to maintain surface and soil stability at all times during cut and fill excavation activities (also necessary to ensure site safety).	Construction	Table 7 (SW4, SW5, SW6, SW9, SW10)
		<p>Graded soil will be stockpiled separately so that local soils can be recovered for re-spreading. During restoration and cleanup, the following will be applied in relation to stabilisation of soils:</p> <ul style="list-style-type: none"> ▪ Reprofiling of the site to achieve soil stability and congruity with the surrounding landscape. This will be done in consideration of the landscape and open space strategy (LOSS) for the Googong Township. ▪ Reseeding and the use of geotextile materials as required. ▪ Backfilling of trenches in layers with compaction. <p>Management and exclusion of site access to assist with site recovery.</p>		Table 7 (SW9, SW10, SW13, SW32, SW33, SW34)
Prevent and manage spills.	S3	<p>To prevent and manage spills, the proponent will:</p> <ul style="list-style-type: none"> ▪ Implement chemical transport, storage, handling and disposal procedures, in accordance with requirements for dangerous goods, of environmental legislation and industry standards. ▪ Ensure spill response procedures and equipment for containment and recovery are available on site. ▪ Conduct workforce training on the transport, storage, handling and disposal procedures relating to chemicals. 	Construction	<p>Section 6.2 Table 7 (SW3, SW24, SW26, SW27, SW28, SW29) Spill Response Procedure (Appendix 1)</p>
Manage potential and/or real soil contamination on site.	S4	<p>To manage soil contamination, the proponent will:</p> <ul style="list-style-type: none"> ▪ Manage contaminated soil disposal or removal from site in accordance with <i>OEH Waste Classification Guidelines</i>. ▪ Conduct further investigations at the newly identified area of concern (AEC – identified as Site 3 in Section 9.3.5 of the EA) prior to construction. An OEH accredited site auditor will provide advice on the need for further investigations at AEC3, if it is to be disturbed by the Project. ▪ Develop a sampling strategy for AEC2 (shown in Section 9.3.5 of the EA) as soon as the existing uses at the site cease, in consultation with a OEH accredited site auditor. ▪ If potential or actual contamination is found during earthworks, stop all work in the affected area until a suitably qualified person has inspected the site, the hazard has been assessed and appropriate action has been taken (including delineating areas of concern as required until earthworks can resume safely). 	Prior to and during construction	<p>Section 4.1.4 Table 7 (SW12, SW15)</p>

Objective	Ref. No.	Commitment	Timing	Document reference
Ensure minimal impact on soil salinity and groundwater quality.	S5	Ensure that appropriate materials are used to mitigate against the corrosive impacts of high salinity.	Prior to and during construction	Table 7 (SW1)
		Design, where possible, the salt sensitive urban stormwater drainage system to direct potential saline runoff to a water body that is able to assimilate the expected salt load being applied to the landscape, without adverse impacts on aquatic and riparian ecosystems. Place and design built structures in consideration of existing and potential soil salinity levels.	Prior to and during construction	N/A to Stage B Network – relates to stormwater design.
		The proposed WRP should be designed to minimise the need for additions of chemicals for phosphorus removal, to minimise salt loading. The Proponent will explore options to switch off the phosphorus removal process during peak irrigation demand periods in accordance with Statement of Commitment OP1.	Prior to and during construction	N/A to Stage B Network
		Early stages of Googong township will be used as a trial to better understand the movement of salt in the landscape. It will involve the installation of carefully located piezometers and the monitoring of results, as well as monitoring the effectiveness of pre-emptive measures such as any subsurface drainage system. The results will be used to improve strategies for ensuing stages.	Prior to and during construction	Water Management Plan
		Recycled water users will be informed of the specific risks associated with irrigation with recycled water, in the context of developing a complete awareness of the Project and its environmental trade-offs. This will include: <ul style="list-style-type: none"> ▪ Education on salinity impacts on soil and plant damage and regrowth. ▪ Encouragement to grow salt-tolerant species, particularly in areas considered to be of high risk. Householders will be educated on the benefits of using detergents that are low in phosphorus, sodium and salt – in terms of the impact on recycled water quality. This will form part of the broad community education program.	Prior to and during construction	Community Education Strategy
Implement water quality and hydrology management procedures.	WQ1	To reduce risks associated with water quality, soil and water management plans will be developed and implemented for the construction phase, via the CEMP, in accordance with <i>Managing urban stormwater: soils and construction, Volume 1</i> (the Blue Book).	Construction	Table 7 (SW6)

Objective	Ref. No.	Commitment	Timing	Document reference
Minimise the risk of surface water contamination.	WQ2	<p>A spill management and response procedures will be developed in the CEMP for the construction phase of the Project. These will specify that:</p> <ul style="list-style-type: none"> ▪ Any fuels and chemicals will be stored to meet relevant standards in bunded or contained areas and a spill kit will be provided at all locations where fuels and/or chemicals are used. ▪ Fuel and chemical storage sites will not be located in the vicinity of any permanent and/or flowing waterway. ▪ The maintenance or refuelling of equipment will not be undertaken within the vicinity (within 150m) of any waterway. 	Construction	<p>Table 7 (SW24, SW26, SW27, SW28)</p> <p>Spill Response Procedure (Appendix 1)</p> <p>PIRMP (Appendix 15 of CEMP)</p>
Ensure bank stabilisation in construction sites	WQ3	<p>The CEMP will incorporate measures to ensure that creek banks are stabilised during the construction phase, such as:</p> <ul style="list-style-type: none"> ▪ Stabilising where required by establishing rocks, sandbags/ matting to prevent scouring, ensuring that they are placed to conform as far as possible with existing contours. ▪ Re-spreading topsoil over the area from where it was removed. 	Construction	Table 6 (SW16)
Monitor impacts on waterways	WQ4	<p>A monitoring program to assess the potential impacts of the Project on the Queanbeyan River (including water quality, flow, fish migration, macrophytes and macro invertebrate communities) will be undertaken.</p> <ul style="list-style-type: none"> ▪ Details of the monitoring program will be determined in consultation with relevant government authorities/stakeholders (including the OEH, DPI and, potentially, ACTEW Corporation). Such consultation will ensure the sharing of available data for the Queanbeyan River for comparative and impact assessment purposes. ▪ A new monitoring site within the Queanbeyan River is proposed to measure water quality and aquatic ecology impacts over the medium term. This site will be located near the confluence of Googong Creek and Queanbeyan River (and will be sited to enable comparison with data collected from upstream and downstream sites). ▪ Monitoring will commence approximately 12 months prior to commissioning the water recycling plant. 	Construction	Water Management Plan
Prevent impacts to groundwater recharge.	G1	Timing of trench construction will be monitored and planned to ensure, where practical, the time the trench is open is reduced and during periods of low rainfall.	Construction	Table 7 (SW30, SW31)

Objective	Ref. No.	Commitment	Timing	Document reference
Minimise groundwater contamination.	G2	<p>Site environmental management measures will be developed and outlined in the CEMP with the purpose of minimising the potential for spills to occur and implementing remedial actions (refer to SG1). These will include:</p> <ul style="list-style-type: none"> ▪ Mapping unregistered nearby groundwater bores, if identified. ▪ Ensuring that all refuelling, where possible, occurs at designated fuel distribution points. These points will be underlain by compacted earth to prevent the significant loss of fuel to the ground during a spill and will be bunded to contain large spills. 	Prior to and during construction	Table 7 (SW25, SW26, SW27, SW28) Water Management Plan
Minimise the potential for groundwater mounding.	G5	Construct in accordance with the approved materials and provisions of water supply code (WSA) 03-2002 to minimise leakage from water cycle infrastructure.	Construction	Table 7 (SW36)
Avoid impacts on and monitor changes to aquatic ecology.	A1	<p>Aquatic ecology impacts are considered under WQ4.</p> <p>A water quality and aquatic ecology monitoring program will be developed to monitor construction and operation impacts of the Project on waterways (refer to WQ4 for further details). The monitoring program will include siting of the aquatic ecology monitoring location to ensure viable comparison with historical and other recent river ecology data.</p> <p>Riparian vegetation, weeds and invasive scrub will be managed within the Googong township site. This will include surveying, mapping and managing invasive species.</p>	Prior to and during construction	Water Management Plan

4.0 Environmental aspects and impacts

The following sections summarise existing soil and water issues identified in the environmental assessment. Identified impacts are then reviewed. The key reference documents are Sections 7, 9 and 10; and Appendix D, E and M of the EA and the Submissions Report.

4.1 Environmental aspects

4.1.1 Soil

The Stage B Network site is predominantly located within the Burra soil landscape. A section of the rising main to the north of the site is located with the Anembo soil landscape. The soil landscape characteristics for these soil types are detailed in Table 4. Soils at the Stage B Network site extend to a depth of about 0.2 to 1.1 metres until bedrock is encountered.

Table 4 Soil landscape characteristics

Soil landscape	Characteristics	Erosion potential
Burra	This landscape is characterised by undulating to rolling hills and alluvial fans associated with the weathering of the underlying Silurian volcanic units, with the ground surface almost completely cleared of woodland. The soils are described as strongly acidic with low fertility and low available water-holding capability. Subsoils also have low permeability.	Concentrated flows– moderate erosion potential.
Anembo	This landscape is characterised by undulating rises and flats over granitic material. The ground surface typically exhibits extensively cleared, open to tall open forest with woodland and low woodland in frost hollows. The area of Anembo soil landscape has been extensively cleared. Soils are of gravely low fertility and low water-holding capacity and are prone to waterlogging. Some subsoils have very low permeability.	Non-concentrated flows– moderate erosion potential. Concentrated flows–high to very high erosion potential.

The following observations on soil were made as part of geotechnical investigations undertaken by Douglas Partners for the proposed SPS2 site, in April 2014:

- **Topsoil:** moist, dark brown silty topsoil encountered at all borehole locations to depths of 0.2 – 0.3 metres.
- **Bedrock:** initially low to medium strength, highly to moderately weathered, fragmented to fractured dacite below depths of 0.2 – 0.3 metres, becoming high strength then very high to extremely high strength, fractured to slightly fractured or unbroken dacite below depths of 1.3 – 3.8 m.

In addition, the following observations on soil were made as part of geotechnical investigations undertaken by Douglas Partners for the proposed Residential Development Neighbourhood 1B site, of which Stage B Network is located, in February 2014:

- **Topsoil:** silty sand topsoil encountered at all pit locations to depths of 0.1 – 0.15 metres.
- **Silt/sand:** medium dense, variable mixture of silt and sand with varying amounts of gravel in some pits to depths of 0.3 – 0.5 metres.
- **Clay, gravel, sand and silt:** stiff to hard or medium dense to dense, dry to moist, mixture of clay, gravel, sand and silt to depths of 0.6 – 1.2 metres in some pits.
- **Bedrock:** very low to high strength, highly to moderately weathered adamellite bedrock below depths of 0.2 – 1.2 metres in most pits.

4.1.2 Surface water

4.1.2.1 Catchments

Drainage in the IWC Project area consists of a number of small ephemeral and semi-permanent creeks, farm dams and depressions. The main catchments in the IWC Project area are:

- Queanbeyan River: The majority of land drains to the Queanbeyan River below the Googong Dam. The Queanbeyan River has undergone considerable changes since construction of the Googong Dam, and the base flow has been regulated to about 0.1 cubic metres per second (down from one cubic metre per second prior to damming).
- Montgomery Creek: This is the major watercourse in the vicinity of the Stage B Network area, and flows from the southern boundary of the IWC Project area to the eastern corner near the WRP, joining the Queanbeyan River just below Googong Dam. The construction footprint for the Stage B Network is located more than 40 metres from Montgomery Creek. Two unnamed ephemeral drainage lines are intersected by the Stage B Network works, draining west to east into Montgomery Creek (refer Figure 1).

4.1.2.2 Montgomery Creek characteristics

Montgomery Creek is the major watercourse within the study area, and flows from the southern boundary to the eastern corner of the study area and joins the Queanbeyan River just below Googong Dam. It can be divided into three main parts:

- The external catchment south of the study area, which has an area of 224 hectares.
- Upper Montgomery Creek within the study area, which has an area of 199 hectares. This section is a flat plain, climbing rapidly to the western edge of the IWC Project site. It has been cleared and is well grassed with scattered trees. Part of this catchment has been used for agricultural production in the past, although its current use is for grazing. There are some remnant beds and banks in this section although the watercourse is discontinuous and has been modified. There are at least three small dams through this section of the catchment.
- Lower Montgomery Creek within the study area, which has an area of 237 hectares. Unlike the section upstream, this lower section is characterised by steep side slopes of up to 25 per cent, particularly in the lowest part of the creek. The bed and banks of the creek are well defined with much of the creek being located on the underlying rock. The creek consists of a series of rock pools linked by a vegetation section. Approximately halfway downstream of this section there is a small waterfall.

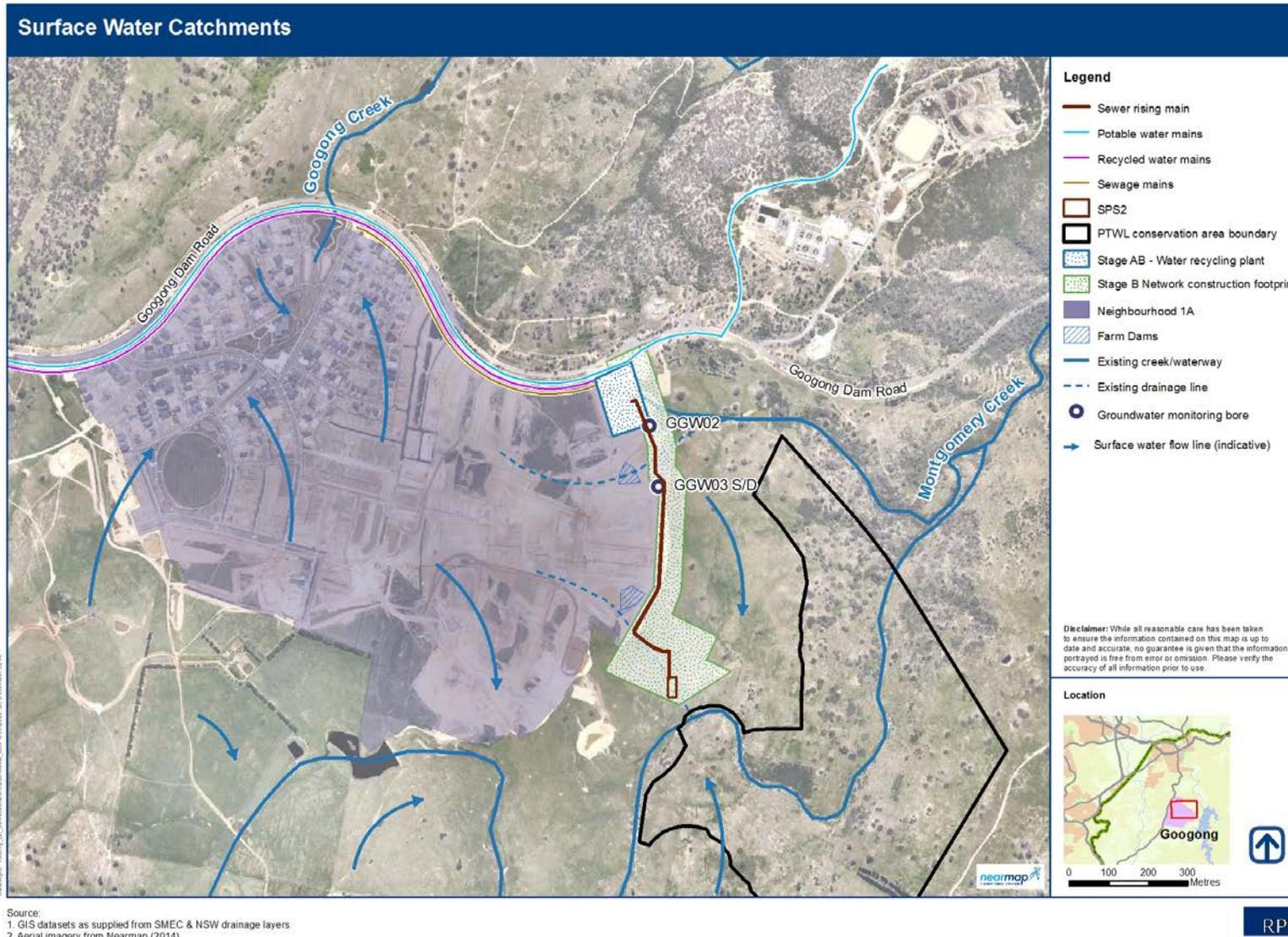


Figure 1 Surface water catchments [updated construction footprint]

4.1.2.3 Existing surface water quality

A preliminary assessment of the current water quality in the Queanbeyan River was conducted in 2008 (Ecowise, 2008). Data was obtained from ACTEW, which is based on ACTEW's ongoing monitoring program within the Queanbeyan River.

The monitoring sites adopted by ACTEW include:

- Upstream site (QBN 704) – one kilometre downstream of Googong Dam.
- Wickerslack Lane site (QBN 703) – four kilometres downstream of where the proposed recycled water discharges (within stormwater flows) would meet the Queanbeyan River via Googong Creek.
- Downstream site (QBN 679) – located at the ACT border.
- Recent available water quality information for these sites is provided in Table 5 for data obtained between 1994 and 2008. Bold font indicates results that are above or outside the range of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) guideline trigger values. As can be seen from the table, the ambient surface water quality in Queanbeyan River is mostly above the ANZECC guideline trigger values for upland rivers.
- A Surface Water and Aquatic Ecology Monitoring Program has been developed as part of the Water Management Plan for the IWC Project (CoA D8) and will provide additional baseline data for multiple sites in the catchment including Montgomery Creek prior to entering Queanbeyan River.

Table 5 Water quality at monitoring sites on Queanbeyan River

Indicator	ANZECC guideline	Upstream site (QBN 704)		Wickerslack Lane site (QBN 703)		Downstream site (QBN 679)	
	Upland river	75th %ile**	Max	75th %ile**	Max	75th %ile**	Max
Nutrients							
Total nitrogen (mg/L)	<0.25	0.51	0.54	0.62	1.7	0.63	1.7
Total phosphorus (mg/L)	<0.02	0.02	0.023	0.031	0.18	0.052	0.13
N:P ratio	N/A	41	55	34	66	20	80
NH ₄ (mg/L)	<0.013	0.0098	0.011	0.009	0.16	0.028	0.19
NO _x (mg/L)	<0.015	0.034	0.037	0.018	0.87	0.077	0.71
Physio-chemical							
Temperature (°C)	N/A	21.4	25.8	22.7	25.4	19.5	24.2
Turbidity (NTU)	N/A	2.3	9.4	3.0	10	7.3	59
pH	6.5–7.5	8	8.9	7.8	8.1	7.4	8.2
DO (mg/L)	8.2–10 @ 20°C	9.6	12	9.9	12.7	8.7	12
Conductivity (µS/cm)	30–350	140	150	200	340	295	490
Suspended solids (mg/L)	N/A	-	-	5.4	15	7.3	37
Microbiological							
Faecal coliforms (cfu/100mL)*	150	1	58	8	8	365	14,000

Indicator	ANZECC guideline	Upstream site (QBN 704)		Wickerslack Lane site (QBN 703)		Downstream site (QBN 679)	
Algae							
Chlorophyll (µg/L)	N/A	4.5	15	6.7	16	7.5	22
Total algae (cells/mL)*	15,000–20,000	7,500	260,000	NA	NA	1,200	14,000
Cyanobacteria (cells/mL)*	15,000–20,000	1,700	260,000	NA	NA	77	320

* Primary contact.

** The 75th percentile calculation is adopted as a matter of course by Ecowise in its professional water quality assessments, for comparison with ANZECC (2000) trigger values.

4.1.3 Groundwater

4.1.3.1 Groundwater quality

The groundwater quality within the study area is considered to have relatively low total dissolved solids (TDS). The TDS (salt) in most of the bores is below 1,200 milligrams per litre, which is considered to be within the acceptable limits for human consumption.

4.1.3.2 Standing water levels, groundwater flow and gradients

Three monitoring bores (GGW2, GGW3S and GGW3D) were drilled within the Stage B Network construction footprint in August 2013, the locations of which are shown in Figure 1. Details of the total depths drilled and water bearing zones at each bore are as follows:

- GGW2 – total depth drilled is eight metres; water bearing zone is at three to eight metres depth
- GGW3S – total depth drilled is seven metres; water bearing zone is at four to seven metres depth
- GGW3D – total depth drilled is 25.6 metres; water bearing zone is at 19 to 29 metres depth.

This is relatively consistent with the findings of recent geotechnical investigations for the proposed Residential Development Neighbourhood 1B site in February 2014, where groundwater was not encountered at test pits that extended up to a depth of four metres. However it was noted that groundwater seepage could be encountered in excavation in the sandy slopewash mantle and/or in the fractures of the bedrock.

Further groundwater investigations were undertaken in the vicinity of SPS2 in April 2014 by Douglas Partners. This comprised the drilling and testing of three boreholes (Bores 1-3). After drilling, groundwater levels were monitored in the standpipe piezometers. The depths to water recorded are summarised in Table 6 and indicate artesian conditions in Bores 1 and 3.

Table 6 Summary of groundwater level monitoring

Bore	Groundwater Depth				
	23/4/2014	24/4/2014			2/5/2014
	Depth (m)	Initial Depth (m)	Depth 30 minutes after bailing (m)	Depth 5 hours after bailing (m)	Depth (m)
1	-0.4 (RL 710 m)	-0.4 (RL 710 m)	0.15 ¹ (RL 709.45 m)	-0.35 (RL 709.95 m)	-0.45 (RL 710.05 m)
2	0.4 (RL 710 m)	0.5 (RL 709.9 m)	7.35 (RL 703.05 m)	1.65 (RL 708.75 m)	0.5 (RL 709.9 m)
3	-0.5 (RL 708.1 m)	-0.4 (RL 708 m)	7.3 (RL 700.3 m)	1.15 (RL 706.45 m)	-0.3 (RL 707.9 m)

¹ Bore 1 was only able to be bailed to 9 m below ground level due to presence of an obstruction in the bottom 1 m of well

(-) indicates water levels above ground level

Shallow groundwater flow throughout the study area is seasonal and heavily influenced by the local topography with local and regionally significant peaks and ridges delineating local groundwater divides. The majority of groundwater within the study area flows in a northerly direction, into the Queanbeyan River catchment, with most expected to drain to the north-north-east and lower reaches of the river.

4.1.3.3 Groundwater recharge and discharge

Rainfall recharge of fractured rock aquifers occurs through areas of open fracturing, either at the surface or through superficial unconsolidated material. In the latter case, there may be a delay between a rainfall event and the entry of water into the aquifer, due to storage in the unconsolidated material of the recharge zone.

4.1.3.4 Groundwater-dependent ecosystems

No groundwater-dependent ecosystems are located within the IWC Project area (Ecowise, 2008).

4.1.4 Contamination

Two Areas of Environmental Concern (AEC), AEC2 and AEC3 were identified in the EA, but will not be impacted by Stage B Network as they related to the subdivision works, approved by QCC under Part 4 of the EP&A Act.

The EA also noted that there was further potential for contamination on the rest of the IWC Project site due to its previous use as grazing land. A site survey to confirm the presence of any actual or potential contamination sites was carried out in July 2012. No additional areas of potential or actual contamination were identified including at the Stage B Network site.

4.2 Construction activities

Construction activities that may affect soil and water quality include:

- Vegetation clearance, topsoil stripping and soil disturbance.
- Storage of fuels and chemicals, refuelling.
- Earthworks (including groundwater dewatering).
- Water use.
- Commissioning.

4.3 Soil and water impacts

4.3.1 Vegetation clearing, topsoil stripping and soil disturbance

Changes in waterway channel or bank form may result from loss of riparian vegetation and lead to increased erosion potential or geomorphologic impacts. This would be particularly evident in areas of good, intact native riparian vegetation. The extent of erosion and sedimentation is dependent on bank and streambed material, flow velocity and existing vegetation, as well as the proximity of construction activities to waterways.

Clearing of vegetation and topsoil stripping may result in the exposure of soil horizons and construction materials that are susceptible to erosion. This can lead to erosion of exposed areas and stockpiles; deposition of eroded sediment in waterways increasing turbidity and smothering benthic habitat and organisms; and carriage of nutrients to waterways causing algal growth and eutrophication.

4.3.2 Storage of fuels and chemicals, refuelling

Incorrect storage or accidental spillage of fuels, oils and/or construction materials (e.g. concrete) can affect aquatic flora and fauna if the spills reach water bodies via runoff. Depending on the severity of the spill, these have the potential to have acute effects or longer-term, chronic effects on aquatic environments. This can include groundwater contamination through open excavations when a spill occurs.

4.3.3 Earthworks

4.3.3.1 Erosion and sedimentation

Earthworks may result in exposure of soils that are susceptible to erosion. Soil erosion is most likely to occur during excavation works, particularly during any trench construction. Erosion can be from water (creating inter-rill erosion, rill and gully erosion and tunnel erosion) and wind. Potential impacts include the erosion of exposed areas, damage to retained vegetation due to eroded soils, sedimentation of waterways increasing turbidity and smothering benthic habitat and organisms.

4.3.3.2 Groundwater

Excavation also has the potential to result in a slight increase in the localised recharge, if significant rainfall is experienced when there are a large number of trenches and/or excavations open across the site. However, increases in recharge potential are expected to be minor because:

- Trenches are generally expected to be less than five metres across the site (the anticipated excavation depth of the rising main is one to two metres), with the exception of excavation works at SPS2.
- Low to very low hydraulic gradients and conductivities are expected over much of the site.

Groundwater seepages into excavations at SPS2 should be expected to occur through fractures in the bedrock, particularly following periods of rain. Drawdown testing undertaken at Bore 1 during geotechnical investigation by Douglas Partners in April 2014 indicated that water was flowing into the monitoring well at a rate of approximately two to three litres per minute. No drawdown was observed in the nearby bores during pumping or bailing of each of the monitoring bores. The excavation activities associated with SPS2 are not anticipated to have a significant impact on local or regional groundwater levels in the area.

4.3.3.3 Watercourses

The Stage B Network works will intercept two ephemeral drainage lines that drain into Montgomery Creek. Mains pipework, including rising mains for sewage, recycled water and potable water will be installed across these drainage lines through the construction of a trench. Activities associated with trenching could have the potential to impact on water quality by transferring increased quantities of fine sediments and polluting waterways with fuel or chemicals used in construction.

4.3.3.4 Groundwater monitoring bore

Three groundwater monitoring bores (GGW2, GGW3S and GGW3D) are located within the construction footprint for the rising main. Activities associated with trenching, particularly the movement of heavy vehicles, could have the potential to damage this infrastructure. This could pose a risk to GTPL fulfilling their compliance requirement to undertake comprehensive baseline monitoring of groundwater across the IWC Project area, as outlined in the Water Management Plan.

4.3.4 Water use

The construction of Stage B Network will require water for the production of concrete, asphalt and dust suppression. Water for construction purposes (approximately 10 kL/day) will be sourced from tankering from offsite sources or from the water reticulation system within the development (with approval from QCC). In addition, the NSW Office of Water advised on 30 May 2014 that the dewatered groundwater during excavation may be used onsite for dust suppression. The source of the water would be decided by the contractor but is likely to be from an ACTEW or QCC filling point. Drinking water will likely be tankered to site for storage in temporary tank(s) at the compound.

4.3.5 Wet commissioning (with potable water)

The total quantity of water required for commissioning purposes is in the order of 500 kilolitres. Water for commissioning purposes is likely to be sourced from tankering from offsite sources or from the water reticulation system within the development (with approval from QCC).

Once constructed, the Stage B Network will be tested in a dry environment and then tested with potable water to test for strength and leaks. The test involves filling each component with potable water to test a specific test pressure.

The water used for commissioning will be tankered away or reused for dust suppression on site or within the development (subject to water quality). Water used during commissioning may be polluted. Typical pollutants include sediment, chlorine and high pH. Any commissioning water will be settled, tested for pH and dechlorinated prior to reuse onsite - refer to Table 5.1 (SW35). Hydrostatic test water will not be discharged directly to stormwater systems or waterways.

5.0 Environmental control measures

5.1 Soil and water mitigation and management measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the CoA, SoC and the EA. Specific measures and requirements to address impacts on soil and water are outlined in Table 7. Responsibilities have been assigned to roles that GTPL considers will be required by the contractor. However the contractor will be responsible for confirming roles prior to the commencement of construction.

Table 7 Soil and water mitigation measures

ID	Measure	When to implement	Reference	Responsibility
Design				
SW1	Ensure that appropriate materials are used to mitigate against the corrosive impacts of high salinity.	Pre construction	SoC 5	Design Manager Project Engineer
Construction (general)				
SW2	Construction activities for Stage B Network must be undertaken in accordance of the conditions of EPL 20188. The EPL will be available for inspection by all personnel and will be kept on site at all times. The EPL will be produced to any authorised officer of the EPA who asks to see it.	Pre construction and construction	CoA A7	Construction Manager Environment Manager Project Engineer
Training				
SW3	All personnel will be required to attend the project induction training and will receive ongoing training via toolbox talks, regarding their responsibilities related to soil conservation issues, erosion and sediment control systems and the need to prevent land degradation and water pollution.	Construction	CoA C20(a)(vii) SoC S3	Environment Manager Project Engineer
Erosion and sedimentation				
SW4	Measures to ensure limited tracking of dirt off site will be implemented at access points. Where required the controls may include exit rumble grids at all points of egress onto public (sealed) roads, sweeping of sealed roads to remove deposited material where applicable, and/or stabilisation of site roads/tracks with aggregate where appropriate.	Construction	CoA C20(a)(vii)	Construction Manager Environment Manager Project Engineer
SW5	During construction, weather forecast will be reviewed daily. Erosion and sedimentation controls will be inspected prior to and after each rain period and during periods of prolonged rainfall. Any defects will be rectified immediately.	Construction	CoA C20(a)(viii)	Project Engineer

ID	Measure	When to implement	Reference	Responsibility
SW6	<p>Site-specific Erosion and Sediment Control Plans (ESCPs) will be prepared progressively to include the management strategies and controls for all Project activities with the potential to impact on sediment loss and erosion. They will contain detailed erosion and sedimentation (ERSED) control information and will include drainage systems, location of sediment fences and other ERSED control structures, and sediment basin locations. ESCPs will be prepared in accordance with <i>Managing Urban Stormwater: Soils and Construction</i> (Landcom, 2004) and will include (but not limited to) the following measures:</p> <ul style="list-style-type: none"> Implement pollution control measures at the site to prevent the egress of material off site. Undertake regular inspections of controls to ensure they are maintained in a proper and efficient condition prior to any forecast rain events. Maintain a program of regular audits of the construction site and assessment of the activities on the site to assess existing pollution controls and implement any recommended and necessary additional measures required to minimise the potential for further water pollution events. <p>ESCPs will be submitted to the Environment Representative for approval.</p>	Prior to construction, construction	CoA C20(a)(vii) CoA C20(a)(viii) CoA B2 CoA B4 SoC S1 SoC S2 SoC WQ1	Environment Manager Project Engineer
Sediment basins				
SW7	Sediment basins will be designed and constructed in accordance with <i>Managing Urban Stormwater: Soils and Construction</i> (Landcom, 2004) and located as specified in relevant ESCPs.	Prior to construction, construction	Best practice	Construction Manager Project Engineer
SW8	<p>All runoff from disturbed areas within the work site will be directed to sediment basins (or other appropriate sediment control structures).</p> <p>Sediment basins will only be discharged to receiving waters when confirmed as complying through field tests/laboratory analysis tests with discharge guidelines. Refer to Dewatering Procedure (Appendix 2).</p> <p>Laboratory analysis will be used to validate the field testing methods and results (where required).</p>	Construction	CoA C20(a)(vii) CoA C20(a)(viii) SoC B2 SoC S2	Construction Manager Environment Manager Project Engineer
Spoil management				
SW9	Erosion and sediment measures to secure the stockpile areas (e.g. diversions, sediment fences) will be installed prior to the commencement of spoil stockpiling activities.	Construction	CoA C20(a)(vii) CoA B2 SoC S2	Construction Manager Environment Manager Project Engineer
SW10	Stockpiles will be checked for stability weekly and after heavy rainfall. Erosion controls inspected at least weekly and maintained as required.	Construction	CoA C20(a)(vii) CoA C20(a)(viii)	Environment Manager Project Engineer
SW11	Clean spoil will be reused or recycled on the Stage B Network site where possible, in preference to transporting off site, in accordance with the waste minimisation hierarchy principles of avoid, reduce, reuse, recycle or dispose.	Construction	Best practice	Project Engineer

ID	Measure	When to implement	Reference	Responsibility
SW12	Spoil and fill materials, whether imported or generated on site, will be assessed and classified (where this has not already been done) in accordance with the Waste Classification Procedure (refer to Waste and Resource Management Plan). Any material identified as 'contaminated', or that has a waste classification (according to the <i>Waste Classification Guidelines</i> (DECCW, 2008)) that restricts reuse on or off site, will be disposed in accordance with the EPA requirements, at an appropriately licensed facility. Records of spoil classification will be kept on site.	Construction	CoA B2 SoC S4	Environment Project Engineer-Manager
SW13	Topsoil will be conserved, where reasonable and feasible, for use in site rehabilitation/revegetation. The top 50-100 millimetres of topsoil will be stripped, scalped for weeds and stockpiled separately. Weed infested topsoil will be reused as fill where possible, and will not be reused for landscaping.	Construction	SoC S2	Construction Manager Environment Manager Project Engineer
SW14	Should any expansive or saline soils be encountered on site, they will be managed in accordance with the relevant legislation and guidelines.	Construction	CoA 20(a)(v)	Environment Manager Project Engineer
Contaminated material				
SW15	If potentially contaminated land, spoil or fill is encountered works in the vicinity will be stopped or modified and will not recommence until the material has been analysed, the hazard has been assessed and appropriate action has been taken (including delineating areas of concern as required until earthworks can resume safely).	Construction	SoC S4	Construction Manager Environment Manager Project Engineer
Working in or near waterways				
SW16	Stabilise the drainage line banks, where required, by establishing rocks, sandbags/ matting to prevent scouring, ensuring that they are placed to conform as far as possible with existing contours.	Construction	SoC WQ3	Construction Manager Environment Manager
SW17	Rehabilitation of the riparian zone, if required, at the two intersected drainage lines will be undertaken as soon as practical after completion of works in that area and at least within two weeks of completion of those works in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (NOW, 2012).	Construction	CoA 20(a)(ii)	Environment Manager Project Engineer
Working near groundwater monitoring bores				
SW18	The groundwater monitoring bores will be flagged and a temporary barrier erected around them prior to commencement of works. No works will occur within this zone. A plan showing their location and the exclusion zone will be retained on site and all on-site personnel advised accordingly. If the groundwater monitoring bores are damaged during construction activity, the GTPL Assistant Project Director will be notified immediately.	Construction	N/A	Environment Manager Project Engineer

ID	Measure	When to implement	Reference	Responsibility
Groundwater dewatering				
SW19	Dewatering activities will be undertaken in accordance with the Dewatering Procedure in Appendix 2	Construction	CoA C20(a)(iv) CoA B2	Environment Manager Project Engineer
SW20	Dewatered groundwater will not be discharged to Montgomery Creek.	Construction	N/A	Environment Manager Project Engineer
Water use				
SW21	Where available and of appropriate chemical and biological quality for its proposed purpose, water collected in sediment basins will be used in preference to potable water for construction, including dust control.	Construction	CoA C20(a)(iv)	Construction Manager Project Engineer
SW22	Construction water will be tankered to the site or sourced from the water reticulation system within the development. All relevant licenses and permits for access to water will be sought in accordance with the relevant legislation.	Construction	CoA C20(a)(iii)	Construction Manager Project Engineer
SW23	The carting of any water to the site must be undertaken in accordance with the <i>NSW Guidelines for Water Carters</i> (NSW Health, 2012).	Construction	CoA C20(a)(iii)	Construction Manager Project Engineer
Chemical, fuel, wastewater management and spills				
SW24	Storage areas for fuels, oils and chemicals used during construction will be covered and contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area. Any spillage will be immediately contained and absorbed with a suitable absorbent material. The contaminated material will be disposed of according to manufacturers and OEH requirements.	Construction	SoC S3 SoC WQ2	Construction Manager Environment Manager Project Engineer
SW25	Potentially hazardous and contaminating activities including major equipment maintenance/servicing, wash down of construction plant and concrete washout to be conducted in bunded areas away from watercourses and other environmentally sensitive areas.	Construction	SoC G2	Construction Manager Environment Manager Project Engineer
SW26	Spills will be managed in accordance with the Spill Response Procedure (Appendix 1) and the Pollution Incident Response Management Plan (refer Appendix 15 of the CEMP).	Construction	SoC S3 SoC WQ2 SoC G2	Construction Manager Environment Manager Project Engineer
SW27	All plant maintenance or refuelling of mobile equipment and vehicles is to occur in locations greater than 150 metres from waterways and other environmentally sensitive areas. This should take place towards the northern boundary of the construction footprint.	Construction	SoC S3 SoC WQ2 SoC G2	Construction Manager Environment Manager Project Engineer

ID	Measure	When to implement	Reference	Responsibility
SW28	Spill kits will be provided at each fuel/chemical storage area and where handling and use of dangerous goods occur. Staff will be provided with appropriate training in spill response.	Construction	SoC S3 SoC WQ2 SoC G2	Construction Manager Environment Manager Project Engineer
SW29	Chemical transport, storage, handling and disposal procedures would be implemented in accordance with the requirements of dangerous goods and environmental legislation, and industry standards.	Construction	SoC S3	Construction Manager Environment Manager Project Engineer
SW29	Wherever possible, trench construction will be planned for dry periods.	Construction	CoA C20(a)(vi) CoA C20(a)(vii) SoC G1	Construction Manager Environment Manager Project Engineer
SW31	To limit potential for groundwater recharge, where rain is forecast, trenches will be covered at the end of each of each day to prevent infill by rain.	Construction	CoA C20(a)(vi) SoC G1	Construction Manager Environment Manager Project Engineer
Rehabilitation				
SW32	There will be progressive revegetation, stabilisation and restoration works of earthworks areas in accordance with <i>Managing Urban Stormwater: Soils and Construction</i> (Landcom, 2004).	Construction	CoA C20(a)(vii) CoA B5 SoC S2	Construction Manager Environment Manager Project Engineer
SW33	The site will be re-profiled to achieve soil stability and congruity with the surrounding landscape. This would be done in consideration of the landscape and open space strategy for the Googong township development.	Construction	CoA C20(a)(vii) CoA B5 SoC S2	Construction Manager Environment Manager Project Engineer
SW34	Trenches will be backfilled and compacted in layers.	Construction	CoA C20(a)(vii) CoA B5 SoC S2	Construction Manager Environment Manager Project Engineer
Commissioning				
SW35	Hydrostatic test water will be dechlorinated and tested for sedimentation and pH prior to onsite reuse.	Construction (commissioning)	CoA C20(a)(vii)	Construction Manager Environment Manager Project Engineer
Operational considerations				
SW36	Infrastructure will be constructed in accordance with the approved materials and provisions of water supply code (WSA) 03-2002 to minimise leakage from water cycle infrastructure.	Pre-construction, construction	SoC G5	Construction Manager

ID	Measure	When to implement	Reference	Responsibility
				Environment Manager Project Engineer

6.0 Compliance management

6.1 Roles and responsibilities

The project team's roles and responsibilities are outlined in Section 4.1 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 5.0 of this Plan.

6.2 Training

All personnel working on site will undergo site induction training relating to soil and water issues. The induction training will address elements related to soil and water management including:

- Spill response and management.
- Implementation of erosion and sediment control measures.
- Refuelling protocols.
- Appropriate transport, storage and handling and disposal of chemicals.

Further details regarding induction and training are outlined in Section 5 of the CEMP.

6.3 Inspections

Inspections of sensitive areas and activities with the potential to impact soil and water will occur for the duration of construction. Daily visual inspections of the construction site will be undertaken by the Environment Manager to identify any potential risks to soil and water quality arising from construction works, and any mitigation measures that need to be implemented to address these.

The Environment Manager will undertake weekly environmental inspections, including an inspection of soil and water management measures. This will include auditing of construction activities to ensure all mitigation measures are properly installed and working effectively. These inspections will be documented on the weekly checklist.

The Environmental Representative will inspect the site regularly to inspect soil and water controls.

Requirements and responsibilities in relation to inspections are documented in Section 8.1 of the CEMP.

6.4 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this Plan, CoA and other relevant approvals, licenses and guidelines.

Audit requirements are detailed in Section 8.4 of the CEMP.

6.5 Reporting

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 IWC Project Approval. Reporting requirements and responsibilities are documented in Section 8.5 of the CEMP.

7.0 Review and improvement

7.1 Non-conformity, corrective and preventative actions

A non-conformance is an action or omission that does not conform with 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. Section 8.3 of the CEMP identifies the process for identifying, reporting, recoding and reviewing non-conformances. This will ensure continual improvement.

7.2 Management plan update and amendment

The processes described in Section 7 and Section 8 of the CEMP (relating to incidents, inspections, monitoring and auditing). This will occur as needed.

Appendix I

Spill Response Procedure

Distribution

There are no restrictions on the distribution or circulation of this procedure within the Googong IWC Project Stage B Network.

Purpose

This procedure details the requirements for managing and clearing up spills ie chemical, fuel or oil spills/leaks that occur on site. The procedure when followed will ensure that Googong Township Pty Ltd (GTPL) personnel, the contractor and associated sub-contractors meet all notification obligations under the *Protection of the Environment Operations Act 1997* (POEO Act).

Spills should be classified, managed and reported as environmental incidents (Category one or Category two) in accordance with Section 7 of the CEMP.

Induction/training

All personnel including sub-contractors involved in use of fuels, oils and chemicals are to be familiar with this procedure so that in the event of a spill they are able to respond appropriately and in a timely fashion.

Where required, personnel will be made aware of this procedure as required through toolbox talks.

Training will include employee responsibilities and legal obligations in relation to spills, stormwater management and water pollution, and the systems in place at the Stage B Network site to address spills.

Scope

This procedure is applicable to all activities conducted by the contractor or sub-contractors that have the potential to spill or leak fuels, oils or other chemicals.

This procedure details the process involved in the following elements of spill management.

Roles and responsibilities

Role	Responsibility
All personnel	<ul style="list-style-type: none"> ▪ To attend project and site inductions and where appropriate spill management training in order to become familiar with incident response procedures ▪ To implement this procedure if a spill occurs. ▪ To stop work associated with a spill of fuel or chemicals if a spill occurs. ▪ To contact 000 if it is identified that there is a threat to human health or property. ▪ To cooperate with and assist emergency agencies and other authorities with respect to spill control and management. ▪ To notify the Construction Manager and/or Environment Manager of any spills.
Environment Manager	<ul style="list-style-type: none"> ▪ To prepare, deliver, and keep records of, environmental inductions and any spill management training ▪ To ensure that appropriate spill kits are provided at all refuelling points, chemical storage areas and where appropriate with plant and equipment ▪ To inspect all project sites regularly to ensure that all hazards and spills are identified ▪ To assess the extent and nature of spills to determine if the EPA should be notified and provide advice to GTPL.

Role	Responsibility
	<ul style="list-style-type: none"> ▪ To work with site personnel to complete spill/incident report forms. ▪ To notify the GTPL Assistant Project Director immediately as they become aware for a spill.
Construction Manager	<ul style="list-style-type: none"> ▪ To ensure that staff are advised of their responsibilities with respect to this procedure and all other environmental procedures. ▪ To ensure that this procedure is fully implemented in the event of a spill ▪ To cooperate with the relevant authorities should further investigation regarding a spill is required. ▪ To assess the extent and nature of spills to determine if the EPA should be notified and provide advice to GTPL. ▪ To notify the GTPL Assistant Project Director immediately as they become aware for a spill.

Notification requirements

Recent changes to the POEO Act require occupiers of premises, the employer or any person undertaking an activity which causes a pollution event such as a spill to immediately notify each relevant authority (the appropriate regulatory authority (ARA) is usually the EPA and the local authority is usually a local council). If the event is threatening human health or property an emergency should be raised by immediate notification of the NSW Fire Brigade or the NSW Rural Fire Service and NSW Ambulance by calling 000. There may also be a requirement to notify WorkCover Authority if personnel are injured.

Incident reporting and emergency contact details are provided in Section 7.3 of the CEMP respectively.

Spill containment kit

At any site where there is a significant risk/consequence of a spill, an appropriate spill kit(s) is to be available (different kinds are available for different pollutants). The environment manager can provide advice on purchasing the correct spill kit.

Procedure

Spill procedure steps

Step 1 – Assessment of the spill

- Stop all work in the affected area.
- Ensure the safety of all workers, visitors and the public in the vicinity of the spill/leak.
- Immediately notify the Environment Manager and/or Construction Manager.
- Cordon off the area around the spill/leak to stop foot/vehicle passage through the affected area.
- Conduct a short assessment of the affected area and notify the Environment Manager of the results of this assessment. The assessment should include consideration of the:
 - » Quantity of the substance spilt.
 - » Type of substance (i.e. corrosive, poisonous, flammable etc).
 - » Location, and potential impact on the environment, and the health and safety of personnel.
 - » Whether the spill is manageable and the best method of clean up (only after referring to the relevant safety data sheet (SDS)).
 - » Photographs of the location and extent of the spill.
- Refer to the container label or SDS for detailed information on the substance spilled and to determine the appropriate personnel protective equipment (PPE) and clean up/storage and disposal requirements.

- Where the spill is not manageable and presents an immediate danger to people, property or the environment, the following needs to be determined:
 - » Whether sufficient spill control equipment and materials, and personal protective equipment exist on site to deal with the spillage.
 - » Whether attempts to deal with the spill on site would pose any risk to employee safety.
 - » Whether the site's waste management contractor should be contacted for clean up, removal and safe disposal of the spilt substance.

Step 2 – Notification of Emergency Services

Where it is determined that the spill cannot be managed by the resources on site, efforts shall be made (only where safe to do so) to protect stormwater drains and sensitive areas. Notify the NSW Fire Brigade or NSW Rural Fire Service (phone 000).

Step 3 – Spill management

- Personal protective equipment (PPE):
 - » Prior to any clean-up, appropriate personal protective PPE is to be worn as per the SDS. No clean up should occur without the correct PPE.
 - » Control the source.
 - » Stop the source of the spill/leak if it is safe to do so.
- Protect drains, channels or other pathways for environmental reasons:
 - » If there is a possibility that the spill/leak will contaminate a greater area or move off site, protect drains, channels or other pathways for environmental release.
 - » If required, geo-fabric, absorbent materials, booms and sandbags should be placed around drains and grates.
- Contain the spread of the spill:
 - » Stop the spill/leak from spreading by using absorbent materials from spill kit (ie booms, pads, pillows, granules etc) sand bagging, spoil or impermeable silt sausages, any handy physical barrier.
 - » Place booms around outside edges of spilled/leaked substance. Ensure booms are overlapped to prevent leakage.
 - » Ensure there are no gaps between the boom and the affected surface.

Step 4 – Spill clean up

- Deploy booms first to contain spill. Deploy booms first to contain or divert spill from waterway.
- If the booms alone cannot absorb the spill/leak, then use absorbent granules to soak up spilled liquid. Granules are quick and absorbent, good for small spills.
- Lay down pads or pillows. Pillows are best for thickly spread liquids. Pads are best for thinly spread liquids.
- Reduce the size of the spill/leak by gently pushing the booms towards the centre of the spill.

Step 5 – Disposal of material used in clean up

- Booms, pads, pillows, gloves and absorbent granules to be placed in yellow waste bag found within spill kit. These are then to be disposed of to the contaminated waste bin.
- Spilled liquid waste to be placed into a labelled sealed container

- Consult with the Environment Manager to determine the appropriate testing and classification of the waste material – implement the Waste Classification procedure where appropriate.

Step 6 – Notification and review (refer also Section 7 of the CEMP)

- After cleaning up the spill/leak, notify the Construction Manager and/or Environment Manager as soon as possible to:
 - » Record the incident and the mitigation measures employed on the incident register.
 - » Ensure that any clean up materials are replaced.
 - » Implement non-conformance and corrective action and record on the non-conformance register.

Appendix 2

Dewatering Procedure

Distribution

There are no restrictions on the distribution or circulation of this procedure within the Googong IWC Project Stage B Network.

Purpose

This procedure details the requirements for dewatering excavations, sediment basins and other water capture points in the construction areas of Stage B Network.

Induction/training

Where required, project personnel will be made aware of this procedure as required through toolbox talks.

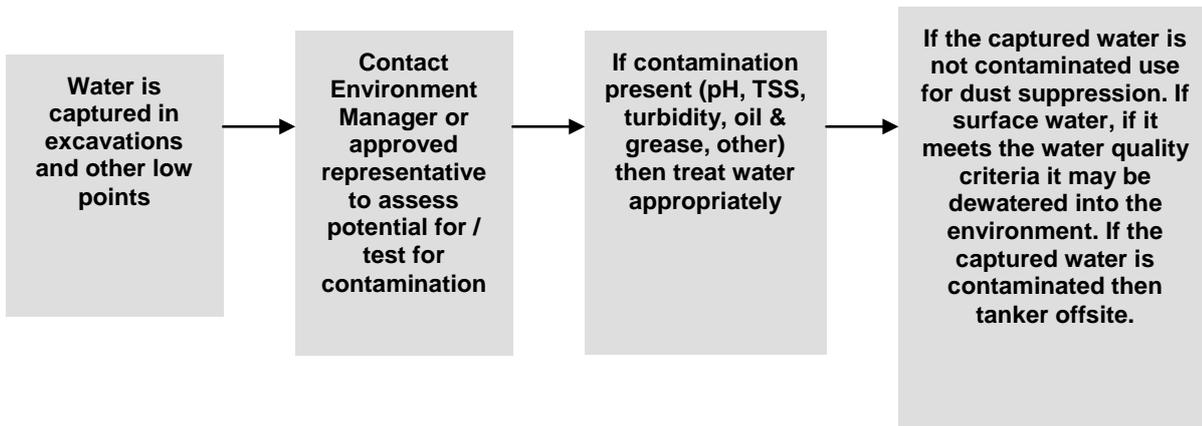
Scope

This procedure is applicable to all activities conducted by the contractor or sub-contractors that have the potential to impact on soil and water, as a result of dewatering.

Procedure

The dewatering of water capture points (including excavations, sediment basins and general low points on the alignment) is required to allow for continued work in construction areas.

In the case of groundwater interception, the NSW Office of Water advised on 30 May 2014 that a licence to dewater will not be required under the *Water Act 1912* or *Water Management Act 2000*.



1. Identifying dewatering points

This procedure relates to all water capture points and includes locations such as sediment basins, below ground excavations where groundwater or stormwater has been captured, or above ground water capture points (e.g. depressions on the alignment).

Water captured at the surface will be tested to determine if it meets onsite water use or environmental discharge requirements. If the water is found to be contaminated then it will be tankered offsite to an appropriate waste facility or approval to discharge will be sought from the EPA.

In the event that the construction works intercept groundwater and the excavation requires dewatering, the water will be tested to determine if it meets onsite water use requirements. If the water is found to be contaminated then it will be tankered offsite to an appropriate waste facility. Groundwater from dewatering will not be discharged into Montgomery Creek.

2. Assessing contamination

Potential contamination could be from numerous sources. The most likely sources will be Total Suspended Solids (TSS), oil and grease and pH.

3. Treating contaminated water

The treatment of contaminated water would be done in accordance with the relevant legislation and guidelines. In summary, pH can be raised or lowered using lime or diluted hydrochloric acid, TSS can be treated using gypsum, and oil and grease can be cleaned up by spill booms.

The timing of water treatment will depend on if, and what treatment is required. Where TSS treatment is required, transfer to a treatment basin shall occur first as solids will be stirred up during transport/pumping.

Where only pH neutralisation is required, treatment can be done at any point.

4. Water treatment

pH

If the pH of sediment pond water is outside the range of 6.5-8.5, it will need to be treated to bring it within the acceptable range.

- If the water pH is above 8.5, hydrochloric acid is used to lower the pH:
 - A 500-millilitre dose of acid lowers 7000 litres of water by a pH of approximately 1.5.
 - To treat water with acid, safety requirements must be followed as outlined in relevant Safety Data Sheets (SDS) and Environmental Work Method Statements (EWMS).
- If the water pH is below 6.5, a base such as agricultural lime, with a pH of about 8.2, will be used to raise the pH.

Suspended Solids (TSS)

If the TSS of water is greater than 50 mg/L a flocculent should be used as follows:

- Treating water with flocculent (eg gypsum, liquid alum or flocculent blocks) will make the sediments drop to the bottom. Water retention tanks also have internal baffles installed to further assist with reducing the sediment load. Dosing rates of 30 kilograms per 100m³ will be used and application methods will be applied as per methods recommended in the Blue Book (Landcom, 2004). Note that an even application over the captured water is essential for effective flocculation. Apply evenly in water and wait for the sediment to settle out.
- Only environmentally safe flocculants are to be used based on the environmental representative's review of SDS information.

Hydrocarbons

- If an oily sheen is found on the surface of the water absorbent material from a spill kit will be used to absorb and skim off the sheen prior to discharge.

5. Dewatering

Where dewatering is required, the quantity and quality of water is to be considered. For large quantities or poor quality, as assessed by the Environment Manager, the water will be preferentially removed by water trucks and used for onsite dust suppression or pumped/carted to sediment basins or points for discharge. The water must be tested by an Environment Manager or approved representative on the day of discharge.

Where the amount of water is considered to be minor and the environmental impact is considered negligible, based on sample results, following approval from the Environment Manager or approved representative, water is to be released through appropriate erosion and sedimentation controls (sediment trap or fence, mulch or grass filters).

Pumps must only be operated by dedicated dewatering crews who have been toolboxed on this procedure. During dewatering pumps must be manned at all times to ensure that sediment is not picked up during discharge and water is discharged through erosion and sedimentation controls.

6. Document results

Any water test results should be stored and included in the Monthly environmental report.

7. Water quality criteria for discharge

Parameter	Criteria
pH	6.5 – 8.5
Total suspended solids	50 mg/L
Conductivity (salinity)	<1,500 μScm^{-1}
Oil and grease	No visible