

Water Reuse Strategy – Operation Phase

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Glossary/Abbreviations

Abbreviation	Definition
ANZECC	Australia and New Zealand Environment Conservation Council
CoA	Conditions of Approval
EIS	Environmental Impact Statement
EPA	NSW Environment Protection Authority
EPL	Environment Protection Licence
ERSED	Erosion and Sediment
ESD	Ecologically Sustainable Development
FWC	Fire Water Complex
MCC	Motorway Control Centre
MOC	Motorway Operations Centre
OEMP	Operation Environmental Management Plan
POEO Act	Protection of the Environment Operations Act 1997
RMS	Roads and Maritime Service
SMC	Sydney Motorway Corporation
SPiR	Submissions and Preferred Infrastructure Report
SSI	State Significant Infrastructure
SWTC	Scope of Works and Technical Criteria
UDLP	Urban Design and Landscape Plan
WRS	Water Reuse Strategy
WTP	Water Treatment Plant

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1 Introduction

1.1 Project Description

WestConnex is one of the NSW Government's key infrastructure projects which aims to ease congestion, create jobs and connect communities. It is the largest integrated transport and urban revitalisation project in Australia.

The 33-kilometre project was a key recommendation of the State Infrastructure Strategy released in October 2012. It brings together several important road projects which together form a vital link in Sydney's Orbital Network. They include a widening of the M4 east of Parramatta, a duplication of the M5 East and new sections of motorway to provide a connection between the two key corridors.



Figure 1: WestConnex project map

WestConnex will support Sydney's long-term growth and boost the city's economic productivity. It will:

- Provide quicker, more reliable trips between Western Sydney and the Port Botany/Sydney Airport precinct to support Sydney's urban freight task
- Help distribute traffic across the wider road network, removing bottlenecks and relieving congestion for local trips
- Provide better connections along the M4 and M5 corridors to cater for the forecast growth in employment and population along these routes
- Allow urban revitalisation and increase opportunities for active and public transport along and across Parramatta Road.

The WestConnex project includes a number of stages:

- Stage 1a – M4 Widening
- Stage 1b – M4 East

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- Stage 2 – New M5
- Stage 3 – M4-M5 Link

In November 2015, the Sydney Motorway Corporation (SMC) awarded the CPB Contractors Dragados Samsung Joint Venture (CDS JV) the contract for the design and construction of Stage 2 – New M5. The New M5 will run from the existing M5 East corridor at Beverly Hills via a tunnel to St Peters, providing improved access to the airport, south Sydney and Port Botany precincts.

Key features of the New M5 include:

- New twin tunnels which are higher, wider and flatter. These will more than double capacity along the M5 East corridor and provide motorway access to north of Sydney Airport
- A new interchange at an industrial site at St Peters, which reduces the impact on nearby residential areas
- Connections from the interchange to key roads in the area, including Campbell Road/Street, Euston Road and across the canal to Bourke Road
- Widening of Campbell Road/Street and Euston Road through existing road widening reservations
- Western tunnel entry and exit points at Kingsgrove.
- Five Motorway Operations Centres (MOCs) and one Fire Water Complex (FWC) (detailed in Figure 2).

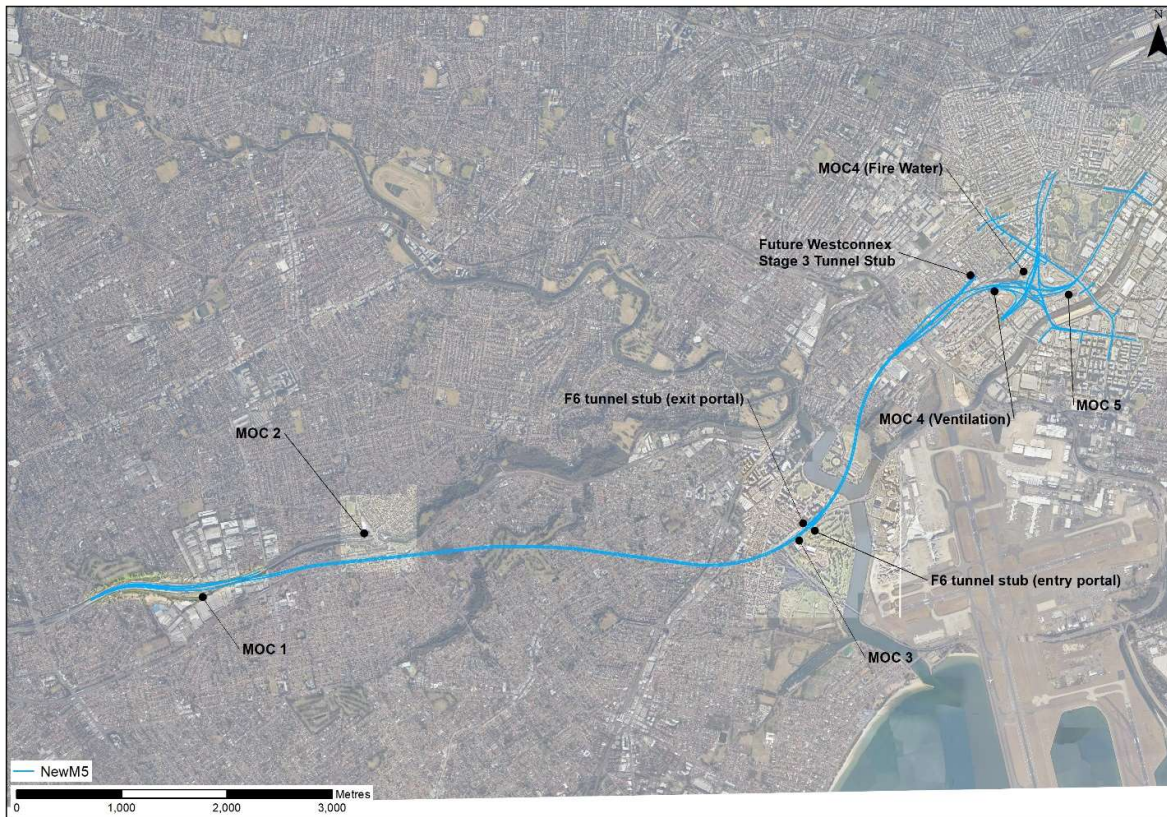


Figure 2: New M5 Motorway Operations Centres

1.2 Purpose

CDS-JV has prepared this Water Reuse Strategy in accordance with Condition of Approval (CoA) B30 of the infrastructure Approval for the New M5 Project.

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The purpose of the Strategy is to:

- Detail the use of water on the project through the operation phase;
- Investigate and evaluate all feasible reuse options for operational stormwater and groundwater; and
- Address the requirements of the CoA.

1.3 Scope

This strategy addresses the water use requirements and reuse options for the operations phase of the New M5 tunnel. Water reuse is focused on groundwater, rainwater and stormwater collected within the asset boundaries.

This Strategy addresses and details the following issues:

- Water use requirements for all five of the Motorway Operations Centres (MOCs) and the Fire Water Complex (FWC);
- Water use for surface and ventilation facilities; and
- Groundwater management throughout the tunnel operation, including treatment, storage and discharge of treated water.

This Strategy does not consider the:

- Treatment and reuse of sewerage;
- Construction water reuse – the delivery of the Water Reuse Strategy, as required by CoA B30, was staged by CDS-JV to separate the construction and operational phases of the Project. A Construction Water Reuse Strategy (M5N-ES-PLN-PWD-0035) was prepared separately and approved by the Department of Planning and Environment (DP&E) in November 2016. This Strategy will continue to be implemented until the completion of construction.

1.3.1 Compliance with CoA B30

An Operational Water Reuse Strategy is required by CoA B30. A description of compliance of this CoA is provided in Table 1 below.

Table 1: CoA B30 requirements

Requirement	Where addressed
The Proponent must prepare a Water Reuse Strategy which sets out feasible and reasonable options for the reuse of collected stormwater and groundwater during construction and operation of the SSI. The Water Reuse Strategy must include, but not be limited to:	This Strategy addresses the operational phase of the project. A separate strategy was prepared for the construction phase of the project.
(a) evaluation of all feasible and reasonable reuse options;	Section 4
(b) details on the preferred reuse option(s), including volumes of water to be reuse, proposed reuse locations and/or activities, proposed treatment (if required), and any additional licences or approvals that may be required; and	Section 4
(c) a time frame for the implementation of the preferred reuse option(s).	Section 4
Justification must be provided in the event that it is concluded that no feasible or reasonable reuse options prevail.	Section 4

Requirement	Where addressed
<p>A copy of the Water Reuse Strategy must be submitted to the Secretary for approval prior to commencement of tunnelling works.</p> <p>Nothing in this condition prevents the Proponent from preparing separate Water Reuse Strategies for the construction and operational phases of the SSI. Where a separate Strategy is prepared for the operation of the SSI, this must be submitted to the Secretary for approval at least six months prior to the commencement of operation of the SSI.</p>	Noted

1.3.2 Additional requirements

In addition to the requirements of CoA B30, this Strategy has also been prepared with consideration of the revised environmental management measures (REMMs) listed in the New M5 Submissions and Preferred Infrastructure Report (SPIR) and the sustainability requirements listed in Table D5-2 of the Appendix D5 of the Scope of Works and Technical Criteria (SWTC). Requirements that relate to this Strategy are provided in Table 2.

Table 2: Additional requirements that relate to water reuse during operation

Reference	Requirement	Where addressed
REMM GW07	Treated waste water would be stored and re-used for project purposes wherever possible. Groundwater reuse would be in accordance with the policies of sustainable water use of the NSW Office of Water, such as dust suppression and earthworks.	Section 4
SWTC D5-2	15% of non-potable water demand shall be sourced from non-potable water sources during operation.	Section 4
SWTC D5-2	5% of water (rainwater, stormwater, wastewater, groundwater, tunnel inflow water) generated/collected during operation shall be reused, recycled or reclaimed.	Section 4

1.3.3 Associated plans and environmental documents

The Operation Water Reuse Strategy is supported by the below-listed documents prepared as part of the planning, approvals and management processes of the project. This strategy will support these documents and in no way intends to replace or supersede existing documents. These documents include the following:

- New M5 Environmental Impact Assessment
- New M5 Submission Report
- New M5 Operation Environmental Management Plan
- New M5 Operation Water Management Plan
- New M5 Operation Water Quality Plan and Monitoring Program
- New M5 Urban Design and Landscape Management Plan

2 Operational Water Requirements

Operational water requirements will not be as significant as the water required for construction purposes. As detailed in Section 5.8.5 of the EIS, and validated as part of the Project ISCA Design Submission, operation of the asset will require around four megalitres of water per annum. This equates to approximately ten percent of the construction phase water demand, estimated to be 430 megalitres per annum. This will include water for maintenance activities, fire testing and for domestic purposes such as toilets and showers. This section details the water use for the various components needed to operate the asset.

2.1 Motorway Operations Centres

Kingsgrove (MOC1) and St Peters (MOC5) will house the office buildings for the WCX New M5 operational staff, including the Motorway Control Centre (MOC5). The other centres (MOC2, 3 and 4) will host maintenance workshops and other operational facilities. Water at MOC1 and MOC5 will be used primarily for the following purposes:

- Site amenities including toilets, showers, sinks, cleaning and kitchens;
- Workshop water for maintenance and cleaning;
- Tunnel washing; and
- Garden and landscape maintenance (if required).

Once established, these activities will require no more than one megalitre of water per annum depending on the number of staff utilising the office facilities.

2.2 Ventilation and surface facilities

The tunnel is supported with a variety of surface structures including the water treatment plant (MOC3), pump rooms, substations, and ventilation facilities. Minor volumes of water will be required at these sites for maintenance activities and minor processes.

2.3 Tunnel operations

Water will be provided into the tunnel to service the fire systems. The fire system is designed to use a significant amount of water in a short amount of time, and this will only occur regularly in line with the testing requirements or in the case of an emergency. Fire water will be stored within tanks at Kingsgrove (MOC1) and St Peters (FWC). Fire water storage tanks will be sized to provide 100 per cent of the maximum design water flow. In terms of total operational water consumption, fire system testing is predicted to be the highest contributor, consuming over three megalitres per annum.

3 Operational Water Sources for Reuse

Throughout the operational phase of the project, multiple water sources will be utilised for the purposes described in section 2. The following strategy details the potential water reuse options available to the operators during the operation of the asset.

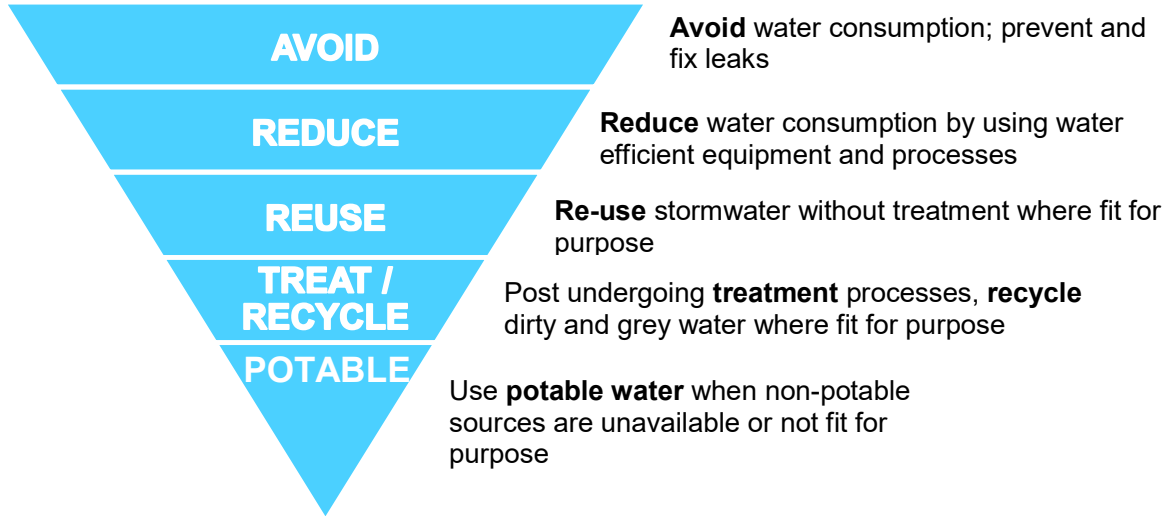


Figure 3: Water Use and Sourcing Hierarchy

The project was designed and constructed with this hierarchy in mind and therefore the use of water efficient fixtures and fittings in the office buildings (MOC1 and MOC5) will see a decrease in potable water demand for that activity by 6%. Where water usage was unavoidable then reuse options were considered. These options were governed by workplace health and safety considerations, economic feasibility and the functional specifications of the design.

Although water demand during operation will be lower when compared to the construction phase, operational water reuse options have been investigated and water efficiencies have been incorporated into the design. These opportunities are aimed at reducing the demand on potable water and fall into three categories of reuse.

3.1 Rain water

After primary treatment (settlement), rainwater can be stored on site and used for tunnel washing and irrigation. Rainwater catchment is focused at the MOCs and the final design includes the installation of a 20kL rainwater harvesting tank at Kingsgrove MOC1. The tank will collect water from the workshop roof and supply water to tap points nominated on the building.

3.2 Groundwater

The tunnel will be built with a significant groundwater management system, including collection sumps, pumping systems and water treatment systems. Groundwater collected within the tunnel during operations will be pumped to the surface (MOC3) and treated in line with the ANZECC (2000) Guidelines to meet the water quality requirements suitable for discharge to the environment (Cooks River). The water treatment facility has been designed to treat approximately 2.3ML of groundwater per day.

3.3 Surface water

Surface water is limited in the operational phase as most of the asset is confined to the underground tunnel environment. Surface water catchment is therefore confined to Kingsgrove (MOC1) and St Peters (MOC5).

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The final design includes operational water basins at both sites for managing stormwater run-off from the roads and surrounding landscapes. The water entering these basins will have contact with the road surface and therefore have a higher risk of being contaminated with oil and grease.

3.3.1 Kingsgrove

The Water Quality Basin (WQB) at Kingsgrove is 400m from the Canterbury Golf Club (CGC). The CGC has a water basin collecting the regional flows in the catchment for reuse. The change in design necessary to accommodate a water sharing arrangement with the CGC is not reasonable or feasible from this location.

Water quality improvement programs are occurring downstream in Wolli Creek. The Water Quality Basin has been designed to support the downstream environment in Wolli Creek by decreasing pollutants in the water/runoff during future rainfall events. The discharge from the Water Quality Basin would better serve Wolli Creek by maintaining existing environmental flows as much as possible.

3.3.2 St Peters

Sharing arrangements with Sydney Park (City of Sydney) from the operational basin at SPI were considered, however, to achieve the water quality requirements, an additional WTP and storage facility would be required at the SPI site. The land available for this facility would be in the SPI recreational Sub Plan area which is intended for other use. The project has been designed (where possible) to minimise the footprint of the Project in accordance with MCoA B61 (a) (vii) and a significant design change (outside the EIS) was not considered a reasonable or feasible option.

The reuse of surface water is also limited by the onsite demand. As discussed in section 2, the water requirements during operation will be minimal.

4 Feasible and Reasonable Evaluation

The design and construction teams were engaged to undertake a water reuse assessment for the operational phase of the asset. Table 3 below details the reuse options and provides an evaluation, considering the feasible and reasonable considerations for this project. The estimated volumes represent the water consumption assuming the water collected for reuse is of suitable water quality and adequately available. Surface water is entirely reliant on rainfall and has limited storage capacity dependant on the size of the basins.

Table 3: New M5 operational water reuse options

Reuse Option	Feasible and Reasonable Considerations	Site	Est. Reused Volume Reused/ day	Implementation Period
Irrigate local parks	The EPA concluded that the groundwater is 'contaminated' and that treatment would be considered a scheduled activity under <i>Schedule 1 of the Protection of the Environment Operations Act (POEO)</i> . Treated groundwater would not be suitable for irrigation, as elevated levels of ammonia within the groundwater are of concern with available treatment options being neither reasonable or feasible to implement. Recycled water reuse in a public space (for irrigation) is considered high risk. The EPL will allow this water to be discharged into Cooks River in which mixing will aid in the dilution of salts and ammonia. A water Discharge Assessment has been completed and included in the EPL application. Currently The Project is working with EPA to finalise an EPL after a Pollution Study & Reduction Program is used to demonstrate that all options to prevent, control, abate or mitigate the discharge to receiving waters have been exhausted, including options for improving effluent quality, in particular, for ammonia.	Arncliffe (MOC3)	Zero	N/A
Water supply for emergency deluge system	The fire deluge system has been designed and constructed in accordance with AS 2419.1:2017 in consultation with Fire NSW. This standard explicitly states that there are only four classifications of water acceptable for a fire sprinkler system: (a) <i>Drinking water from a public water supply.</i> (b) <i>Treated rain water (i.e. drinking, filtered rain water).</i> (c) <i>Bore water—treated and untreated.</i> (d) <i>River, lake or dam water.</i>	Kingsgrove (MOC1) St Peters (FWC)	Not applicable	N/A

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Reuse Option	Feasible and Reasonable Considerations	Site	Est. Reused Volume Reused/ day	Implementation Period
	<p><i>Where the water source is other than a reticulated potable water supply, the materials in the fire sprinkler system must be compatible with the water in the sprinkler system i.e. chemical composition of the water, pH, etc.</i></p> <p>Types (a) and (b) were investigated. Both (c) and (d) were not considered as they were not applicable to the Project.</p> <p>The WTP at MOC3 was not designed to provide a discharge equivalent to a drinking water standard (a). Further, due to the high salinity of the groundwater, there is insufficient space within the MOC3 site to locate a tertiary treatment plant to achieve this requirement. In addition, supplementary storage tanks would be required to capture the treated water or harvest rain water (b) and this would require further land acquisition due to the land constraints. This was not considered to be reasonable or feasible.</p> <p>Further, as detailed in the AS 2419.1:2017, the quality of the water to be used in a fire sprinkler system must be suitable for the long-term operation of the system. Based on four years of water quality data at Arncliffe, the treated groundwater was found to be highly saline and corrosive to plant and equipment underground. Like construction equipment, the treated groundwater would not be suitable for long-term operation of the fire deluge infrastructure, as it would rust and corrode the system. The system uses metal that is prone to corrosion. This is a significant safety risk which has been mitigated by the substitution of the hazard (i.e. treated groundwater with potable water).</p> <p>Collected stormwater was also considered for use in the fire deluge system, however, this option did not meet AS 2419.1:2017 (section 4.2.2). The water supply for the fire deluge system must be connected to a water supply/main that meets the required flow, pressure and capacity requirements for the storage tanks.</p> <p>Fire NSW have confirmed that they would not support the use of non-potable or treated water for use in the deluge or hydrant systems unless it meets the requirements of AS2419.1:2017. As detailed above the treated water will not meet these requirements.</p>			

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Reuse Option	Feasible and Reasonable Considerations	Site	Est. Reused Volume Reused/ day	Implementation Period
Tunnel maintenance activities including tunnel washing	<p>The installation of a rainwater tank at MOC1 (Kingsgrove) was based on the overall water demand for the asset, rainwater availability, tanker size (for collection of water), the availability of space and the manoeuvrability of trucks/water tanker around MOC1.</p> <p>MOC1 also includes the maintenance facility, workshop and tunnel washing facilities.</p> <p>Tunnel washing of the M5 architectural panels will be completed using the harvested rainwater from MOC1. The use of treated groundwater was not considered to be a viable option as the distance to the WTP located at MOC3 (Arncliffe) was considered to be unreasonable for the task. .</p> <p>MOC1 and MOC5 are the only occupied buildings. MOC2, MOC3 and MOC4 have a lower water demand as they are non-occupied spaces e.g. no offices and have limited space for additional infrastructure. The volumes of water capable of being captured at MOC2, MOC3 and MOC4 would be very minor (due to the sizing constraints and land availability) and given the small demand, the rainwater would need to be collected by tanker and transported for reuse elsewhere. This is not a reasonable or feasible option for operational water reuse.</p>	Arncliffe (MOC3)	Up to 20kL *dependent on rainwater availability	Commencement of Operations
Flushing of the frog habitat ponds	<p>The option to reuse water for the flushing of the Green and Golden Bell Frog (GGBF) habitat ponds was detailed in the EIS. Captured stormwater and/or rainwater (via a sump) were considered as an option to flush the ponds as part of the original design. The small area of the ponds, however, meant that an onsite detention basin was not an option and the design was changed.</p> <p>Further, due to the risk of the spread of Chytrid fungus (a specific frog fungal disease), potable water was later specified in the GGBF Plan of Management and the Habitat Creation and Captive Breeding Program. These plans (which formed the basis of design for the ponds) were reviewed and endorsed by the Project Herpetologist and the Proponent. Potable water must be stored for at least 48 hours in the onsite tanks to allow the chlorine to be broken down in the water prior to use, as chlorine is toxic to the GGBF.</p>	Arncliffe (MOC3)	Not applicable	N/A

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Reuse Option	Feasible and Reasonable Considerations	Site	Est. Reused Volume Reused/ day	Implementation Period
	As directed by Proponent, the contractual requirements were amended to reflect the change and mandate the use of potable water for flushing the ponds.			
Landscape watering	As detailed in the Urban Design Landscape Plan (UDLP) and in accordance with the Reuse and Sourcing Water Hierarchy, all plant species used for landscaping will be native and drought tolerant. Establishment generally takes no longer than 28 weeks and plants will be watered using a variety of sources depending on the site and its constraints, e.g. Kingsgrove will use a mixture of captured surface water and potable water, Arncliffe and St Peters will use potable water as there is no appropriate non-potable sources. Due to plant selection, irrigation will not be required post establishment. Should the Operator require additional planting, a mixture of water sources will be available for irrigation depending on the location (e.g. captured stormwater and rainwater at MOC1, or potable water).	Arncliffe (MOC3)	Up to 20kL	Commencement of Operations

The table below demonstrates compliance with the revised environmental management measures (REMMs) and the Scope of Works and Technical Criteria (SWTC).

Table 4: Revised Environmental Management Measures and Scope of Works and Technical Criteria applicable to this plan

Reference	Requirement	How this has been addressed
REMM GW07	Treated waste water would be stored and re-used for project purposes wherever possible. Groundwater reuse would be in accordance with the policies of sustainable water use of the NSW Office of Water, such as dust suppression and earthworks.	The EPA concluded that the groundwater is 'contaminated' and that treatment would be considered a scheduled activity under Schedule 1 of the Protection of the Environment Operations Act (POEO). Treated ground/wastewater would not be suitable for project purposes including irrigation, dust suppression or earthworks as elevated levels of ammonia within the groundwater are of concern with available treatment options being neither reasonable or feasible to implement. Recycled water reuse in a public space (for irrigation) is considered high risk.

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Reference	Requirement	How this has been addressed
SWTC D5-2	15% of non-potable water demand shall be sourced from non-potable water sources during operation.	Limited opportunities are available for water reuse of water generated during operation due to the tunnel water being classified as contaminated by the EPA and the treatment would be considered a scheduled activity under <i>Schedule 1 of the Protection of the Environment Operations Act (POEO)</i> .
SWTC D5-2	5% of water (rainwater, stormwater, wastewater, groundwater, tunnel inflow water) generated/collected during operation shall be reused, recycled or reclaimed.	Limited opportunities are available for water reuse of water generated during operation due to the tunnel water being classified as contaminated by the EPA and the treatment would be considered a scheduled activity under <i>Schedule 1 of the Protection of the Environment Operations Act (POEO)</i> .

5 Monitoring and Reporting

Monitoring will be undertaken to validate and confirm the operational impact of the Asset on the environment.

Monitoring to be undertaken during operations of the Asset is identified in Table 9-1 of the Operation Environment Management Plan (OEMP) and section 8 of the Operational Water Quality Plan and Monitoring Program.

Monthly and annual sustainability reports will be submitted to Project Company throughout the operation of the Asset.

6 Licences and approval

The Water Treatment Plant at Arncliffe (MOC3) will operate under an Environment Protection Licence (EPL) as the EPA concluded that the groundwater is contaminated. The operation (activity) of the WTP is considered to be a scheduled activity identified in the *Protection of the Environment Operations Act 1997* (POEO Act).

Details regarding monitoring and discharge criteria are currently unknown and will be included in the Operational Water Quality Plan and Monitoring Program.

7 Conclusion

This Strategy outlines the water reuse opportunities in the New M5 project operational phase as detailed in Section 4. These opportunities are aimed at reducing the demand on potable water and the overall consumption of water within the project.

These include:

- Harvesting and re-use of rainwater for tunnel washing (MOC1);
- Water efficient fixtures and fittings in the office buildings (MOC1 and MOC5); and
- Reuse of treated groundwater (MOC3) for additional landscaping, if required.

Future potential water re-use options may be investigated and implemented during operations, such as the installation of additional rainwater tanks or the supply of treated groundwater to the local irrigation network at the Kogarah Golf Course or nearby Council green spaces.

