Construction Water Reuse Strategy

Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works

Project Name	Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works
Project Number	N81150
Revision Date	30/08/2022
Revision	A
Document Number	SMWSASCA-CPU-1NL-NL000-SB-STG-000001

Document Approval

Rev.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	30/08/2022	[redacted]	[redacted]	[redacted]	First Version
Signature		[redacted]	[redacted]	[redacted]	
Signature					

Distribution and Authorisation

Document Control

The CPBUI JV Project Director is responsible for ensuring this plan is reviewed and approved. The Project Director is responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

The controlled master version will be maintained on TeamBinder. All circulated hard copies are deemed to be uncontrolled.

Amendments

The implementation of this Plan is under the authority of the CPBUI Delegated Authority Matrix. All Contract personnel will perform their duties in accordance with this Plan, supporting plans, and related procedures.

Revision Details

Rev.	Details
A	First Version

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Abbreviations and definitions

Refer to Definitions, Abbreviations and Acronyms, Sydney Metro – Western Sydney Airport Surface Civil and Alignment Works Package, Schedule C1 General Specification.

Table 1 – Abbreviations and definitions

Abbreviation	Description
Ancillary facility	A temporary facility for construction of the CSSI including an office and amenities compound, construction compound, material crushing and screening plant, materials storage compound, maintenance workshop, testing laboratory and material stockpile area and parking facilities
CEMP	Construction Environmental Management Plan
CoA	Ministers Condition of Approval
Condition	Planning Minister's Conditions of Approval
Construction	Includes all work required to construct the CSSI as described in the documents listed in Condition A1, including commissioning trials of equipment and temporary use of any part of the CSSI, but excluding Low Impact Work.
CPB	CPB Contractors Pty Ltd
CPBUI JV	CPB Contractors Pty Limited and United Infrastructure Pty Limited Joint Venture
CSSI	Critical State Significant Infrastructure
CSWMP	Construction Soil and Water Management Sub-plan
CWRS	Construction Water Reuse Strategy (this report)
DIA	Discharge Impact Assessment
DPE	Department of Planning and Environment
EP&A Act	Environmental Planning and Assessment Act 1979 (NSW)
EPL	Environmental Protection Licence
ESCP	Erosion and Sediment Control Plans
IS	Infrastructure Sustainability *-in reference to the ISC IS rating scheme*
ISC	Infrastructure Sustainability Council
Minister	Minister of the NSW Department for Planning and Public Spaces
Principal, the	Sydney Metro
Project, the	Sydney Metro Western Sydney Airport
REMM	Revised Environmental Mitigation Measure
ROI	Return on Investment
SCAW	Western Sydney Airport Surface and Civil Alignment Works
SEARs	Environmental Assessment Requirements
SMWSA	Sydney Metro Western Sydney Airport
SSI	State Significant Infrastructure
SMP	Sustainability Management Plan
UI	United Infrastructure Pty Limited
WHS Act	Work Health and Safety Act 2011
WSI	Western Sydney International

1. Introduction

1.1. Context

This Construction Water Reuse Strategy (CWRS) has been prepared to address the requirements of the Minister's Conditions of Approval (CoA) for the Surface and Civil Alignment Works (SCAW) project, the Sydney Metro Western Sydney Airport (SMWSA) Environmental Impact Statement dated October 2020 (the EIS), Sydney Metro – Western Sydney Airport Response to Submissions Report dated October 2020 (the RtS) and applicable guidance and legislation.

This CWRS considers water reuse options applicable to the construction phase of The SCAW Project as detailed in the Staging Report (SSI 10051).

1.2. Background

The Sydney Metro Western Sydney Airport will become the transport spine for Greater Western Sydney, connecting communities and travellers with the new Western Sydney International (Nancy-Bird Walton) Airport (referred to as Western Sydney International) and the growing region.

The Sydney Metro Western Sydney Airport EIS was prepared in October 2020 to assess the impacts of construction and operation of the Project and was placed on public exhibition between 21 October 2020 and 2 December 2020. The Project was declared a Critical State Significant Infrastructure (CSSI) Project and is listed in Schedule 5 of *State Environmental Planning Policy (State and Regional Development)*.

The Sydney Metro Western Sydney Airport was approved by the Minister for Planning and Public Spaces on 23 July 2021 (SSI 10051) under section 5.19 of the *NSW Environmental Planning and Assessment Act 1997* (EP&A Act).

1.3. Project description

The Project will be undertaken on Darug Country and will form part of the future Western Parkland City. The Project involves the construction and operation of a new 23 km metro rail line that extends from the existing Sydney Trains suburban T1 western line (at St Marys) in the north to the Aerotropolis (at Bringelly) in the south. The alignment includes a combination of tunnels and civil structures, including viaducts, bridges, and surface and open-cut troughs between the two tunnel sections. The Project also includes six new metro stations, and a stabling and maintenance facility and operational control centre at Orchard Hills.

The SCAW package is the second major contract package to be procured for the Project. The successful and timely completion of the SCAW package is critical to the subsequent construction activities and ultimate completion of the entire Project.

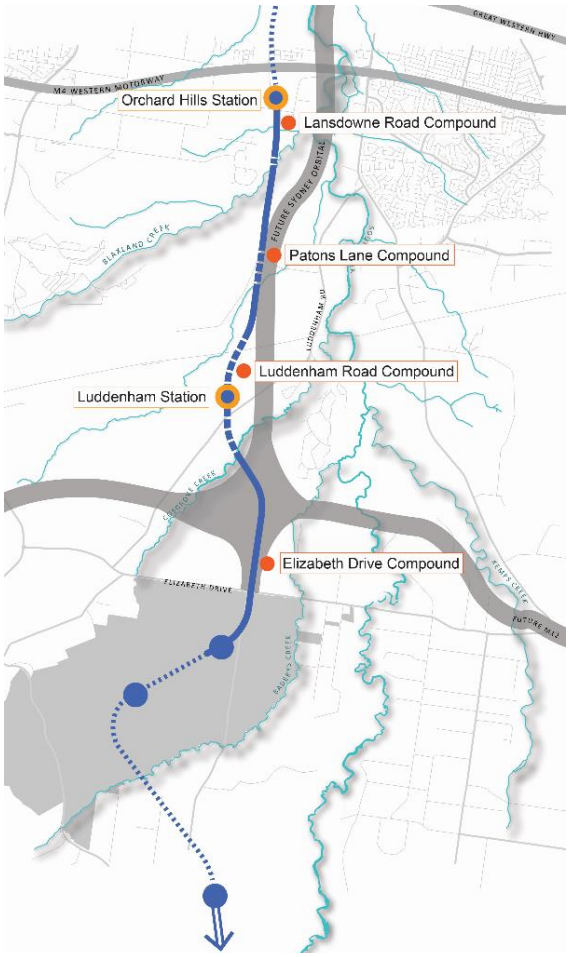

Figure 1 – SCAW Project scope

1.3.1. SCAW scope of works

The scope for the SCAW package includes approximately 10.6km of alignment up to the underside of track formation from Orchard Hills to the Western Sydney International (WSI) airport. This includes approximately:

- 3.6km of viaduct
  - 400 metres of viaduct over Blaxland Creek
  - 660 metres of viaduct over the Patons Lane area and un-named creek

  - 2.5km of viaduct in the Luddenham Road area including across the Warragamba pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek
- 209 metres of bridges
  - A bridge, approximately 187m long, over the proposed M12 Motorway
  - A bridge, approximately 22m long, over the drainage swale on the WSI airport site
- 6.9km of at-grade alignment
  - 600m at Orchard Hills, south of Lansdowne Road
  - 1.6km alongside the stabling maintenance facility in Orchard Hills
  - 900m to the north of the Warragamba pipelines
  - 1.1km north of the proposed M12 motorway
  - 1.4km south of the proposed M12 Motorway on Elizabeth Derive
  - 1.3km within the Airport site from the northern boundary to the Airport Business Park Station
- Temporary and permanent access roads.

1.3.2. SCAW construction methodology

Activities that will be undertaken during construction are summarised in **Error! Reference source not found.** below.

Table 2 – Activities during construction

Works	Activities
Early works	▪ Investigation works – survey, geotechnical, contamination and utilities ▪ Establishment of temporary ancillary facilities, construction site fencing, signage and lighting ▪ Pre-clearing vegetation surveys and setting up environmental 'no-go' zones ▪ Stockpiling of imported spoil for the stabling and maintenance facility ▪ Establishment of a precast concrete yard.
Earth works	▪ Installation of environmental controls ▪ Vegetation clearing ▪ Stripping, stockpiling and management of topsoil and unsuitable material ▪ Embankment and cutting construction, including the improvement layers/treatments, general fill, structural fill zone and capping layers ▪ Importation and reuse of fill materials ▪ Placing, compacting and finishing of rail alignment sub-base and base layers ▪ Dewatering and backfilling farm dams ▪ Preparation of piling pads.
Bridge works	▪ Including the construction of approximately 3.5 kilometres of elevated viaduct structures between Orchard Hills and the Western Sydney Airport in three sections as follows: ▪ 350 metres of viaduct over Blaxland Creek ▪ 650 metres of viaduct over the Patons Lane area and unnamed creek ▪ 2.45 kilometres of viaduct in the Luddenham Road area including across the Warragamba Pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek.
Drainage works	▪ Construction of table drains ▪ Installation of culverts and other drainage structures ▪ Construction of temporary diversion channels ▪ Construction of temporary watercourse crossings such as causeways ▪ Installation of scour protection measures.

1.4. Scope of this Strategy

This strategy addresses the water use requirements and reuse options for the construction phase of the SCAW project (the Project). Water reuse is limited to rainwater collected within the Project boundaries.

This strategy addresses and details the following issues:

- Water use requirements,
- Stormwater management and discharge, and
- Rainwater harvesting and management.

This Strategy does not consider the:

- Treatment and reuse of groundwater,
- Water treatment and reuse during operation,
- Treatment and reuse of sewerage, and
- Treatment and reuse of any contaminated water.

This CWRS considers water reuse options applicable to the construction phase of the SCAW Project as detailed in the Staging Report – Sydney Metro Western Sydney Airport – CSSI Staging Report (SSI 10051). This Strategy is prepared in accordance with CoA E102.

2. Purpose and Objectives

2.1. Purpose

The purpose of this CWRS is to set out options for the reuse of collected water during construction of the Project.

2.2. Objectives and Targets

Performance objectives outlined in the Secretaries Environmental Assessment Requirements (SEARs) are presented in Table 3, below.

Table 3 - SEARs performance outcomes

SEARs desired performance outcome	Project performance outcome	Timing	Reference
Conservation of natural resources is maximised	The use of potable water for non-potable purposes is avoided if non-potable water is available	Construction and operation	Section 7
	The reuse of water is maximised, either on-site or off-site	Construction and operation	Section 7

Specific water objectives outlined in the Sustainability Management Plan are:

- Reduce the volume of water required during delivery, to the greatest extent practicable
- Replace potable water with sustainable non-potable sources, where feasible
- Monitor and measure water consumption during delivery.

Other sustainability objectives include:

- Demonstrate sustainability leadership and continuous improvement,
- Optimise resource efficiency (materials, energy, water, land, waste) throughout the Project life cycle,
- Increase resilience to future climate,
- Deliver lasting value for stakeholders, and
- Implement innovative solutions in sustainable design and construction.

2.3. Targets

Specific Water targets outlined in the Sustainability Management Plan (SMP) are provided in Table 4 below:

Table 4 - Sustainability targets

Number	Sustainability Targets
1	Reuse at least 80% of concrete production operation water into concrete production at onsite or offsite batching plants for all concrete used.
2	Use a maximum of 1000 kilolitres of water from potable water mains in the performance
15	Reduce water use by 15% compared to base case footprint, achieving a Level 2.5 for credit Wat-1 'Water use monitoring and reduction'.
16	Replace potable water with non-potable water sources by at least 33%, achieving a Level 1 for credit Wat-2 'Replace potable water'

The Project specific water reuse requirements are detailed in the Conditions of Approval, the Sustainability Management Plan, General Specification and Particular Specification, and the Infrastructure Sustainability Council (ISC) IS Technical Manual Version 1.2 (2018). Section 3 describes these requirements and where they are addressed within this strategy.

3. Project Requirements

3.1. Ministers Conditions of Approval

A Water Reuse Strategy is required by Minister's CoA E102. A description of compliance with the requirements of CoA E102 and where they are addressed are detailed in Table 5

Table 5 - Minister's Conditions of Approval relevant to this Strategy

Condition	Condition Requirements	Reference
E102	A Water Reuse Strategy must be prepared, which sets out options for the reuse of collected stormwater and groundwater during construction and operation. The Water Reuse Strategy must include, but not be limited to:	This document
	(a) evaluation of reuse options;	Section 7.1
	(b) details of the preferred reuse option(s), including volumes of water to be reused, proposed reuse locations and/or activities, proposed treatment (if required), and any additional licences or approvals that may be required;	Section 7 Water Balance Model (SMWSASCA-CPU-SWD-NL000-EN-SB-STG-000002)
	(c) measures to avoid misuse of recycled water as potable water;	Section 6.4
	(d) consideration of the public health risks from water recycling; and	Section 6.4
	(e) a time frame for the implementation of the preferred reuse option(s).	Section 7.1
	The Water Reuse Strategy must be prepared based on best practice and advice sought from relevant agencies, as required. The Strategy must be applied during construction and operation.	Section 6.6
	Justification must be provided to the Planning Secretary if it is concluded that no reuse options prevail.	N/A
	A copy of the Water Reuse Strategy must be made publicly available.	A copy will be provided on the project website once submitted to DPE
	Note: Nothing in this condition prevents the Proponent from preparing separate Water Reuse Strategies for the construction and operational phases of the CSSI.	This strategy is only relevant for the construction phase of the SCAW project.

3.2. Contract

A description of compliance with the requirements of the SCAW Contract are addressed in the Sustainability Management Plan (SMP). Performance criteria relevant to water reuse are provided in Table 6, below.

Table 6 - Contract general Specification requirements

No.	Key Sustainability Performance Requirements	Reference
2.8.2 (d)	In achieving the "design" rating, the SCAW Contractor must, as a minimum, achieve the following levels using the ISCA IS rating tool version 1.2 … (iii) Level 2.5 for credit Wat-1 'Water use monitoring and reduction', demonstrating a reduction in water use of 15% compared to a base case footprint. (iv) Level 1 for credit Wat-2 'Replace potable water', demonstrating that at least 33% of water used is from non-potable sources.	Sections 7 and 8 Water Balance Model (SMWSASCA-CPU-SWD-NL000-EN-SB-STG-000002)
2.8.2 (f)	In achieving the "as built" rating, the SCAW Contractor must, as a minimum, achieve the following levels using the ISCA IS rating tool version 1.2 … (iii) Level 2.5 for credit Wat-1 'Water use monitoring and reduction', demonstrating a reduction in water use of 15% compared to a base case footprint. (iv) Level 1 for credit Wat-2 'Replace potable water', demonstrating that at least 33% of water used is from non-potable sources.	Sections 7 and 8 Water Balance Model (SMWSASCA-CPU-SWD-NL000-EN-SB-STG-000002)
3.4.4.1 (c)	The SCAW Contractor must minimise water demand including total water consumption and potable water consumption during the design and construction phase by: ▪ Harvesting rainwater wherever available ▪ Collecting, treating and reusing stormwater and wastewater	Sections 7 and 8
3.4.5.2 (b)	The SCAW Contractor must ensure that, where reasonable and feasible, any temporary site facilities provided by the SCAW Contractor incorporate: ▪ Rainwater harvesting	Sections 7 and 8

3.3. Sustainability Management Plan

The SMP outlines potential initiatives to promote water reuse on site. These initiatives are outlined in Table 7 below:

Table 7 - Potential initiatives related to water management

Initiative Type	Initiative
Minimisation	Use of efficient water practices during construction activities and site establishment
	Installation of water-efficient fixtures and fittings in the showers, basins and waterless urinals
	Installation of wheel wash systems

Initiative Type	Initiative
	Inclusion of water minimisation practices in the construction methodology statements
	Procure sustainable site facilities to reduce water consumption (e.g ensuring temporary facilities have efficient fixtures and fittings)
Replacement	Installation of rainwater tanks on site facilities to allow for rainwater harvest for site facilities to use rainwater
	Ensure the reuse at least of 80% concrete production operation water into concrete production at onsite or offsite batching plants.

3.4. Infrastructure Sustainability Council

The CoA and SMP require CPBUI JV to achieve an Excellent Design and As Built rating of 75 or higher under the Infrastructure Sustainability Council Design and As-Built rating tool (version 1.2). As part of the Project's Sustainability Strategy, CPBUI JV is targeting the following IS Rating benchmarks relating to the Water Category. Note that these targeted credits and levels may alter throughout the life of the Project as materiality adjusts as a result of dynamic and unforeseen Project changes.

Table 8 - Indicative design phase IS targets

Credit	Name of credit	Target Level	Comments	Reference
Wat-1	Water use monitoring and reduction	2.5	Monitoring of water usage to take place as part of monthly reporting processes.	Sections 8 and 9 Water Balance Model (SMWSASCA-CPU-SWD-NL000-EN-SB-STG-000002)
Wat-2	Replace Potable Water	1.0	Options to reduce potable water use may be achieved through reuse of treated water. Other potential initiatives include the use of rainwater tanks, smart metering of water usage, and the reuse of captured water from construction activities for dust suppression and misting, plant and equipment wash down, and compaction.	Sections 7, 8 and 9 Water Balance Model (SMWSASCA-CPU-SWD-NL000-EN-SB-STG-000002)

4. Water Use Requirements

Water will be required throughout the construction phase of the project for general construction activities. Water use will primarily be for the purposes of earthworks and dust suppression. Water will also be required to supply ancillary sites for ablutions and other ancillary activities. Both potable and non-potable will be required for the following activities:

- Dust suppression on exposed surfaces and roads;
- General wash down and wheel wash;
- Compaction and general earthworks;
- Street sweeping;
- Conditioning of fill material;
- Site amenities including toilets, showers, cleaning and drinking; and
- Establishment of landscaping.

Water demand from site offices and amenities will depend on the number of personnel based at a particular site and the hours of operation. Estimated usage has been calculated based on Project personnel forecasts and is detailed in the Water Balance Study (SMWSASCA-CPU-1NL-NL000-SB-STG-000002), included in Appendix A

5. Water Sources

Throughout construction of the project multiple water sources will be utilised for the purposes described in section 2.

Water will be sourced from the mains supply and a range of non-potable sources including:

- Onsite construction sediment basins; and
- Rainwater harvesting from construction buildings.

Preference will be made for the use of non-potable water over potable water. The extent to which non-potable water sources can be used will be governed by workplace health and safety considerations, economic feasibility and the functional specifications of the design. The use of non-potable water is more likely to be feasible for temporary works, such as dust suppression, rather than permanent works. Reclaimed stormwater and recycled water and will need to meet the guidelines set out in the tip sheet Use of Reclaimed Water. Section 7 further discusses water reuse options.

There is a high priority during construction on minimising the project footprint and associated area of disturbance. This in turn will minimise site capacity for containment and treatment, which may limit the above opportunities. Further feasibility will be conducted throughout construction and balanced against environmental, social and economic factors.

5.1. Mains Supply Potable Water

All construction sites will have access to potable water supplies through metered connections to the Sydney Water network. During construction and operations, potable water will supply the site offices and amenities and be used to supplement non-potable water supplies as needed. Where manufacturers' or technical specifications require, potable water will also be required for certain construction activities

6. Considerations for Water Reuse

6.1. Water Use Hierarchy

Over the course of construction, several water sources will be utilised for the purposes described in Section 2. CPBUI JV will adopt the Water Use and Sourcing Hierarchy illustrated in Figure 2.

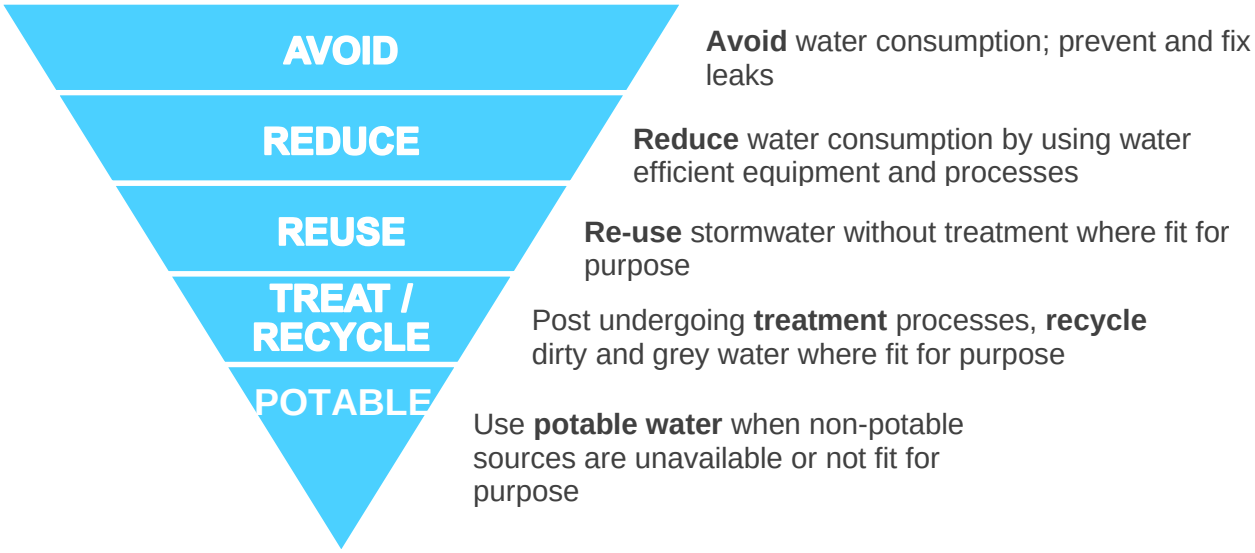

Figure 2 - Water Use and Sourcing Hierarchy

6.2. Climatic and Seasonal Conditions

Construction of the project will occur over a three-year timeframe and therefore seasonal variation and climatic events will affect the volume and quality of water available for reuse at any time. A water reuse strategy reliant on rainwater and stormwater will therefore be opportunistic to enable beneficial reuse when conditions allow.

In addition, any water collected on site after a rainfall event may not be usable for irrigation or dust suppression if the site has become saturated. Storage of captured water would be required for reuse after the site has dried out sufficiently. If discharge is required conditions and guidance from the Discharge Impact Assessment (DIA) and the site Environmental Protection Licence (EPL) will be followed.

6.3. Water Storage Capacity

Storage capacity will be required to meet the demand for water use. While potable water will be utilised on a case-by-case basis, the reuse of non-potable water sources (such as from sediment basins or rainwater tanks) will require the need for adequate storage capacity. Further information about sediment basin volume requirements is found in the DIA.

6.4. Public Health

The potential health risks associated with non-potable water on site have been considered and appropriate strategies have been identified to mitigate these risks. Following best practices and lessons learnt from previous projects, these risks are best avoided:

- By separating the recycled water system from the potable water system;
- Controlling the direction of flow where potable water is required to top up the recycled waste supply; and
- Ensuring no possible consumption of non-potable water.

6.5. Recycled Water Network

No network/pipeline exists within a feasible pumping distance for the Project to utilise. The use of any such network is prohibited by cost and distance.

6.6. Best Practice and Advice

This Strategy has considered water use practices and advice from similar major infrastructure projects in NSW. CPB and UI have a combined breadth of experience in sustainability and water reuse initiatives in civil infrastructure projects, this is further detailed within Section 8 of this report.

7. Water Reuse

7.1. Evaluation of Water Reuse Options

An evaluation of the reuse options for the SCAW project are provided in Table 9.

Table 9 - Evaluation of potential reuse options

Non-potable Water Source	Evaluation of reuse option	Justification	Implementation period of option
Rainwater harvesting	Suitable	Rainwater will be captured on site where spatial constraints permit. The installation of rainwater capture through roof canopy drainage/tanks and associated infrastructure are to be installed where return on investment (ROI) threshold is achieved. All compound areas are to be assessed based on the facilities lifespan for viability to achieve roof capture ROI. Based on this, rainwater tanks are to be installed at Project ancillary facilities, where practical.	3 months after site establishment until demolition
Sediment basins	Suitable	Stormwater affected by project works and which is captured by construction sediment basins will be reused where conditions permit and in accordance with the project's DIA and EPL.	Concurrent with construction start up (at each new site) until construction is complete
Groundwater	Unsuitable	The project is unlikely to intercept significant volumes of groundwater during construction. Any perched water encountered during the construction will be placed in construction water basins for eventual reuse as per Section 7.3 .	N/A
Recycled water network	Unsuitable	No network/pipeline exists within a feasible pumping distance for the Project to utilise. The use of any such network is prohibited by cost and distance.	N/A
Recirculating water from construction activities	Under Review	Potential opportunities with specific trades to import recycled water or capture and reuse water from construction activities. The Project will assess tendering suppliers/sub-contractors for capability to provide water reuse opportunities in construction works. The Project will evaluate those sub-contractors using non-financial criteria, promoting through the sustainability component those parties that enable water reuse	N/A

Non-potable Water Source	Evaluation of reuse option	Justification	Implementation period of option
		to facilitate meeting the targets in section 3.2. Note: Water quality from recycled network may affect the quality of the final product and will be assessed for reuse on a case-by-case basis.	

7.2. Rainwater Harvesting

Rainwater has been identified as a potential source of non-potable water suitable for use during construction. Rainwater runoff from site shed roof canopies may be captured in rainwater tanks for use in site amenities such as toilets and cleaning or for irrigation and dust suppression. The capacity of rainwater storage at each of the compound areas will depend on available space at each ancillary facility and the size of roof catchment available. Installation of rainwater capture will be subject to a return on investment (ROI) assessment per site.

The harvesting of rainwater will be completed in accordance with best practice guidelines, specifically the Australian Guidelines for Water Recycling1 (NWQMS 2009)

7.3. Sediment Basins

The availability of surface water runoff into sediment basins is uncertain and solely dependent on weather conditions. The sediment basins will be sized to meet the design criteria required in the EPL and DIA (i.e., 85th percentile 5-day rainfall event). The restriction for sediment basins is that they need to be emptied with 5 days to reinstate the design capacity. However, where space allows, some of these basins will be constructed larger than this design capacity which will allow some storage retention for water. All the construction catchments have been assessed for the suitability of a sediment basin as part of the Construction Soil and Water Management Sub-plan (CSWMP) and the DIA. The exact location, size and management of each sediment basin will be in accordance with the CSWMP and applicable erosion and sediment control plans.

All sediment basins will have the capability to reuse available water for non-potable purposes such as dust suppression, irrigation and fill conditioning. Available water will be determined on a site –by-site basis.

Water from sediment basins with signs of contaminants, such as oil and grease, will be determined unsuitable for construction reuse. Stormwater harvesting through the sediment basins will be the preferred water source for non-potable construction purposes but is entirely dependent on the availability of surface water on the site and environmental conditions (i.e., storage capacity needed to forecast rain).

[1] *Australian Guidelines for Water Recycling Stormwater Harvesting and Reuse,* National Water Quality Management Strategy, Document No 23, July 2009, (NWQMS 2009)

8. Water Use Reduction Opportunities

In attempt to meet the sustainability requirements for water use on the SCAW project a list of water use reduction opportunities has been devised below:

- Investigate suitable dust suppressants to reduce water demand, such as Vital Bon-Matt HR or similar biodegradable products
- Schedule water-consuming activities such as dust suppression during cooler periods of the day to avoid evaporation
- Investigate the use of rainwater in the site shed toilets
- Capture rainwater and stormwater in strategic locations for reuse
- Install water efficient taps within site facilities (auto-off function) with minimum WELS rating of 5 Stars
- Install water efficient toilets within site facilities with minimum WELS rating of 5 Stars
- Install water efficient showers within site facilities with minimum WELS rating of 3 Stars
- Site induction to cover water efficiency protocols, and strategically located signage to reinforce point-of-use actions.

Water reduction initiatives will be included in the site shed specification for discussion with prospective suppliers to determine what is feasible.

9. Measuring and Reporting

Measuring and reporting on water use will involve the metering of water use from potable, non-potable and from water discharges, where possible. Water usage data may also be derived from invoicing (for potable water), permits, or other site forms, as relevant. Water consumption and reuse data will be reported in Project monthly and quarterly sustainability reporting, and will be used in the IS Rating As Built submission.

Further details on measuring and reporting are included in Section 8 of the SMP.

10. Evaluation and Improvement

Water reuse during the SCAW project will be managed by the sustainability team in conjunction with onsite personnel. Audits, inspections and reviews of Project sustainability performance, including water reuse, will be undertaken throughout Project delivery in line with the requirements of the IS Rating Technical Manual Version 1.2 (refer to Section 9 of the SMP).

Appendix A – SCAW Water Balance Study (Rev A)

Water Balance Study

Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works

Project Name	Sydney Metro – Western Sydney Airport, Surface and Civil Alignment Works
Project Number	N81150
Revision Date	18/08/2022
Revision	A
Document Number	SMWSASCA-CPU-1NL-NL000-SB-STG-000002

Document Approval

Rev.	Date	Prepared by	Reviewed by	Approved by	Remarks
A	18/08/2022	Ann Azzopardi	Chris Mueller	Greg Edwards	For submission to SM
Signature					
Signature					

Distribution and Authorisation

Document Control

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The controlled master version will be maintained on TeamBinder. All circulated hard copies are deemed to be uncontrolled.

Amendments

Any revisions or amendments must be approved by the Sustainability Manager and/or client before being distributed / implemented.

Revision Details

Rev.	Details
A	For submission to Sydney Metro

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Abbreviations and definitions

Refer to Definitions, Abbreviations and Acronyms, Sydney Metro – Western Sydney Airport, Surface Civil and Alignment Works Package, Schedule C1 General Specification.

Table 1 – Abbreviations and definitions,

Abbreviation	Description
BAU	Business As Usual
CMS	CPB Contractors Management System – *the PMS is the project specific version*
CPB	CPB Contractors Pty Ltd
CPBUI JV	CPB Contractors Pty Limited and United Infrastructure Pty Limited Joint Venture
Deed	Surface and Civil Alignment Works Design and Construction Deed, Contract No: WSA-300-SCAW
EIS	Environmental Impact Statement, *in reference to WSA Sydney Metro, Oct 2020*
EMS	Environmental Management System
ENM	Excavated Natural Material, as per the *Excavated Natural Material Exemption 2014*
GREP	NSW Government Resource Efficiency Policy
iPKL	Interactive Project Knowledge Library -*CPB Contractor's knowledge sharing hub*
IS	Infrastructure Sustainability -*in reference to the ISC IS rating scheme*
ISAP	Infrastructure Sustainability Accredited Professional
ISC	Infrastructure Sustainability Council - *previously known as ISCA (A= Australia)*
LCA	Life Cycle Assessment
MCA	Multi-criteria Analysis
PRR	Principal Risk Register
RFT	Request for Tender
RVTM	Requirements Verification Traceability Matrix – *in the Systems Engineering MP (SEMP)*
SCAW	Surface & Civil Alignment Works Contract
SDG	United Nations Sustainable Development Goals
SM-WSA	Sydney Metro – Western Sydney Airport project
SMP	Sustainability Management Plan
SMS	CPB Contractors Sustainability Management System
SLT	Senior Leadership Team
SSTOM	Station, Systems, Trains, Operations & Maintenance Contract
TfNSW	Transport for NSW
UDLP	Urban Design and Landscape Plan
UI	United Infrastructure Pty Limited
VE	Value Engineering
WoL	Whole of Life

Part A Overview

1. Introduction

This Water Balance Study (this Study) has been prepared to detail the water consumption needs and water reduction and replacement opportunities of CPB Contractors, United Infrastructure Joint Venture (CPBUI JV) during construction of the Western Sydney Airport, Surface and Civil Alignment Works project (SCAW) on behalf of Sydney Metro Authority. This Study addresses the requirements of the General Specification and Particular Specification, particularly SM-WSA-SCAW-PS-3060.

1.1. Project Scope

The SM-WSA Project involves the construction and operation of a new 23km metro rail line that extends from the existing Sydney Trains suburban T1 western line (at St Marys) in the north to the Aerotropolis (at Bringelly) in the south. The alignment includes a combination of tunnels and civil structures, including viaducts, bridges, and surface and open-cut troughs between the two tunnel sections. The Project also includes six new metro stations, and a stabling and maintenance facility and operational control centre at Orchard Hills. The SCAW package is the second major contract package to be procured for the Project. The successful and timely completion of the SCAW package is critical to the subsequent construction activities and ultimate completion of the entire Project.

1.1.1. Package scope

The scope for the SCAW package includes approximately 10.6km of alignment up to the underside of track formation from Orchard Hills to the WSI airport. This includes approximately:

- 3.5km of viaduct
  - 400m of viaduct over Blaxland Creek
  - 660m of viaduct over the Patons Lane area and un-named creek
  - 2.5km of viaduct in the Luddenham Road area including across the Warragamba pipeline, at Luddenham Station, across Luddenham Road and across Cosgrove Creek
- 210m of elevated bridges
  - An over rail bridge, approximately 180m long, over the proposed M12 Motorway
  - An over rail bridge, approximately 25m long, over the drainage swale on the WSI airport site
- 6.7km of at-grade alignment
  - 600m at Orchard Hills, south of Lansdowne Road
  - 1.6km alongside the stabling maintenance facility in Orchard Hills
  - 900m to the north of the Warragamba pipelines
  - 1.1km north of the proposed M12 motorway
  - 1.4km south of the proposed M12 Motorway on Elizabeth Derive
  - 1.3km within the Airport site from the northern boundary to the Airport Business Park Station
- Temporary and permanent access roads.

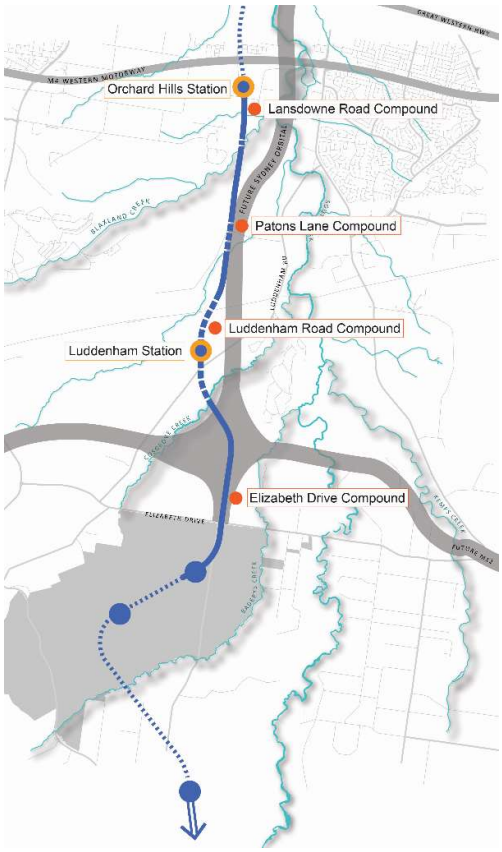


Figure 1 – SCAW Project scope

2. Contract Requirements

The SCAW Contract requirements relevant to this Water Balance Study are set out in Table 2.

Table 2 – Relevant SCAW Contract requirements

Reference	Requirement	Compliance
Particular Specification		
3.4.4.1 (a)	The SCAW Contractor must undertake a water balance study and submit it to the Principal's Representative, within 100 days of the commencement of the D&C Deed and again prior to the commencement of Project Works and Temporary Works, that identifies the sources, uses and estimated quantities of potable and non-potable water which will be either created or used in the performance of the SCAW Contractor's Activities.	This Study Appendix A
3.4.4.1 (b)	The SCAW Contractor must ensure that the water balance study in (a) above identifies initiatives to reduce water demand and use non-potable water, which must be adopted in order to achieve both the sustainability ratings and the performance targets set out in the section 2.8 (Sustainability) of the General Specification.	This Study Appendix A
3.4.4.1 (c)	The SCAW Contractor must minimise water demand including total water consumption and potable water consumption during the design and construction phase by: (i) using water efficient controls, fixtures and fittings; (ii) harvesting rainwater wherever available; (iii) using water from recycled water networks where available; (iv) collecting, treating and reusing stormwater and wastewater; and (v) metering and sub-metering water use.	Sustainability Management Plan (SMWSASCA-CPU-1NL-NL000-SB-PLN-000001) Water Reuse Strategy (SMWSASCA-CPU-1NL-NL000-SB-STG-000001)
3.4.4.1 (d)	The SCAW Contractor must not use potable water as a substitute for non-potable water where on-site or local sources of non-potable water are suitable for the SCAW Contractor's Activities and are available.	This Study Appendix A
General Specification		
2.8.1 (b)	The SCAW Contractor must meet the following sustainability targets: … (ii) use a maximum of 1000 kilolitres of water from potable water mains in the performance of SCAW Contractor's Activities	This Study Appendix A NB. The original estimate of 1,000 kL only included for water usage for site facilities, and did not account for plant supplier water usage requirements (e.g. spray grass application)

Reference	Requirement	Compliance
2.8.2 (d)	In achieving the “design” rating, the SCAW Contractor must, as a minimum, achieve the following levels using the ISCA IS rating tool version 1.2 … (iii) Level 2.5 for credit Wat-1 'Water use monitoring and reduction', demonstrating a reduction in water use of 15% compared to a base case footprint. (iv) Level 1 for credit Wat-2 'Replace potable water', demonstrating that at least 33% of water used is from non-potable sources.	This Study Appendix A NB. This Water Balance Study has been prepared based on currently available information and may be subject to change as the Project’s design and construction planning develops. Further, achievement of IS Rating credit levels is subject to external verification as part of the IS Rating process.

3. Water Management

One of CPBUI's key sustainability objectives is to *maximise efficiencies to reduce our footprint, in relation to water during design and construction.* The CPBUI is committed to minimising water demand and using alternative water sources to potable water. The strategy we will adopt to support sustainable consumption of water during delivery of the SCAW Works is based on the following three principles:

1. Reduce the volume of water required during delivery, to the greatest extent practicable
2. Replace potable water with sustainable non-potable sources, where feasible
3. Monitor and measure water consumption during delivery.

3.1. Water Balance Study

This water balance study has been prepared for the construction of the SCAW Project. A copy of the Water Balance Study is included in Appendix A.

Water demand estimates have been prepared for the following key uses:

- Site facilities
- Earthworks (compaction, dust suppression, wheel washing)
- Landscaping establishment

It is noted that there is no operational water usage associated with the Project scope.

Water usage estimates are based on the current design and information available, which may change as the design and construction planning develops. This includes the potential for additional water reduction and non-potable replacement initiatives to be identified progressively as the Project is designed and delivered. Further opportunities may also be identified through engagement with suppliers as part of the procurement process.

The table below details potential water minimisation and replacement initiatives for SCAW.

Table 3 – Potential initiatives related to water management

Initiative type	Initiative
Minimisation	Use of efficient water practices during construction activities and site establishment.
	Installation of water-efficient fixtures and fittings in the showers, basins and waterless urinals
	Installation of wheel wash systems
	Inclusion of water minimisation practices into the construction methodology statements
	Procure sustainable site facilities to reduce water consumption (e.g. ensuring temporary facilities have efficient fixtures and fittings)
Replacement	Installation of rainwater tanks on site facilities to allow for rainwater harvest for site facilities to use rainwater
	Use of water collected in sediment basins and dams for construction activities

3.2. Monitoring and reporting of water use

During construction, we will monitor the use of water from both potable and non-potable sources. Water use will be monitored using smart meters and supported by meter reads, invoices or estimations (e.g. for recirculation systems). Data will be captured and reported as per reporting requirements detailed in the Sustainability Management Plan (SMWSASCA-CPU-1NL-NL000-SB-PLN-000001).

Part B Appendices

Appendix A – Water Balance Study

SCAW Water Balance Study

SMWSASCA-CPU-1NL-NL000-SB-STG-000002
Revision A

Summary

CPBUI is committed to maximising effencies during the design and construction of the SCAW Project to reduce our water footprint. We plan to achieve this by adopting the following principles:
1. Reduce the volume of water required during delivery, to the greatest extent practicable
2. Replace potable water with sustainable non-potable sources, where feasible
3. Monitor and measure water consumption during delivery.

This Water Balance Study provides an estimate of water usage required during construction of the SCAW Project. It is noted that there is no operational water usage associated with the Project scope. Water usage estimates are based on the current design and information available, which may change as the design is developed. This includes the potential for additional water reduction and non-potable replacement initiatives to be identified progressively as the Project is designed and delivered.

Water reduction and replacement initiatives include:
- Use of efficient water practices during construction activities and site establishment.
- Installation of water-efficient fixtures and fittings in the showers, basins and waterless urinals
- Installation of wheel wash systems
- Inclusion of water minimisation practices into the construction methodology statements
- Procure sustainable site facilities to reduce water consumption
- Installation of rainwater tanks on site facilities to allow for rainwater harvest for site facilities to use rainwater

NB. The requirement for use of a maximum of 1000 kilolitres of water from potable water mains (GS 2.8.1 (b) (ii)) was derived based on site facility water use only. The use on non-potable water will be subject to acceptance by subcontractors engaged in the operation of plant and equipment for irrigation and the establishment of temporary crop cover and permanent landscaping.

Water reduction

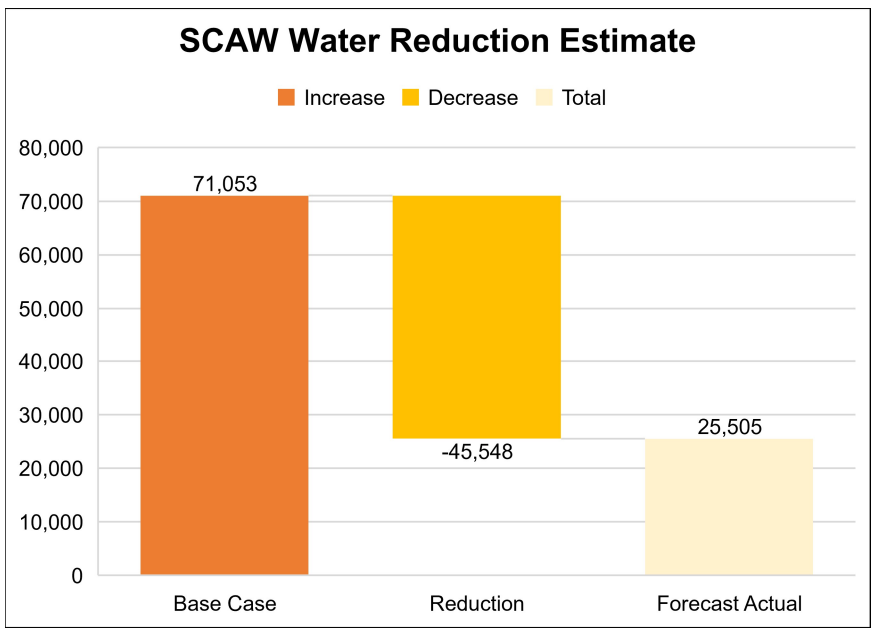
Water Demand	Consumption (kL)		Difference (kL)
	Base Case	Forecast Actual	
Site Facilities	13.28	8.01	5.26
Earthworks	59,909.54	34,409.54	25,500.00
Landscaping	11,130.00	11,130.00	0.00
TOTAL	**71,052.82**	**45,547.55**	**25,505.26**

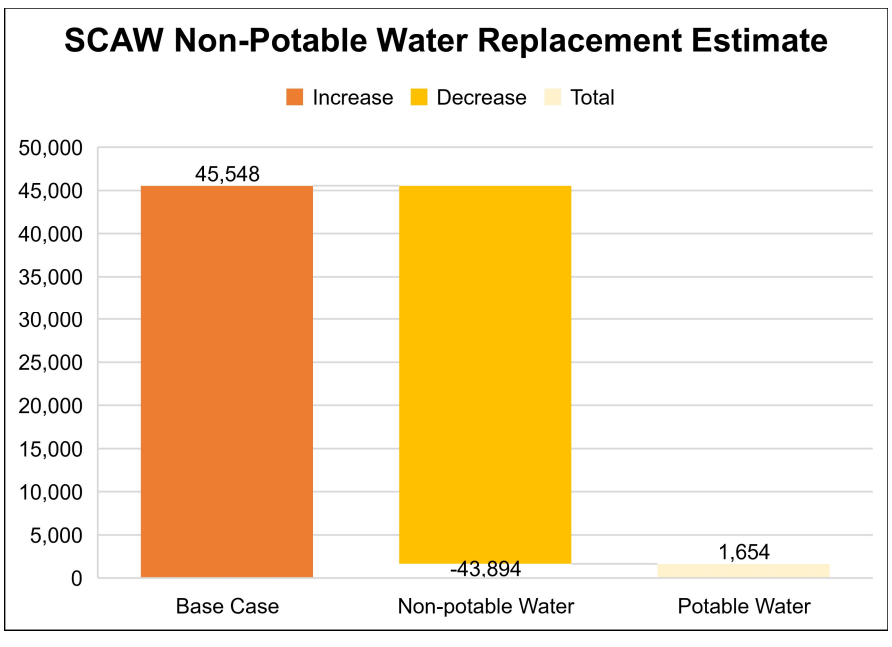
Water reduction
36%

Non-potable water replacement

Water Usage	Consumption (kL)	
	Base Case	Forecast Actual
Potable	45,547.55	1,653.89
Non-potable	0.00	43,893.66

Non-potable replacement
96%





Site Facilities

Base case assumptions:
- 3 star WELS rated fixtures and fittings as per Green Star base case
- 100% potable water usage (no non-potable water replacement)

Current initiatives:
- 5 star WELS rated fixtures and fittings
- Use of rainwater for toilet flushing and urinals
- Assumed ratio of 15% women on site as per current construction male:female ratios
- Predicted water consumption derived from Green Star Office v3 – Potable Water Calculator Guide, specifically Table 2: Data for average usage of water consuming facilities in offices

Opportunities:
The following opportunities have not yet been accounted for in this Water Balance Study. If adopted, these will be calculated and added into future revisions of this study:
- Adoption of waterless urinals

Usage	Consumption (kL)		Difference (kL)	Project source (potable/non-potable)	Comments and assumptions
	Base Case	Forecast Actual			
WC	2.33	1.75	0.58	Non-potable	3 star WELS as base case, 5 star WELS as actual case
Urinals	3.16	2.37	0.79	Non-potable	3 star WELS as base case, 5 star WELS as actual case
Water basin and sink	7.78	3.89	3.89	Potable	3 star WELS as base case, 5 star WELS as actual case
TOTAL	**13.28**	**8.01**	**5.26**	**-**	**-**

Earthworks

Base case assumptions:
- Base case is based on reference design
- 100% potable water usage (no non-potable water replacement)

Current initiatives:
- Water reduction through application of dust control polymer to haul roads and areas of exposed soil (reducing the need for water carts)
- Use of non-potable water from sediment basins, dams, and rainwater tanks

Opportunities:
The following opportunities have not yet been accounted for in this Water Balance Study. If adopted, these will be calculated and added into future revisions of this study:
- Further efficiencies in construction methodology resulting in reduced water needs (other than the onsite reuse of the Bringelly Shale material)
- Use of water efficient plant and equipment

Usage	Consumption (kL)		Difference (kL)	Project source (potable/non-potable)	Comments and assumptions
	Base Case	Forecast Actual			
Compaction					
Cut to Fill / Stockpile	4,856.69	4,106.69	750.00	Non-potable	- 50 litres of water per m3 of spoil - Reuse of site-won Bringelly shale material resulting in reduced stockpiling and double handling of imported material
Topsoil Respread	665.30	665.30	0.00	Non-potable	50 litres of water per m3 of spoil
Import / Place & Compact	3,975.93	3,975.93	0.00	Non-potable	50 litres of water per m3 of spoil
Import / Place & Compact - Basecours	86.63	86.63	0.00	Non-potable	50 litres of water per m3 of spoil
Dust suppression					
Cut to Fill / Stockpile	49,500.00	24,750.00	24,750.00	Non-potable	- 5 x 15,000 L water cart loads per day - Estimated 660 working days - Reduction associated with application of polymer spray dust suppressant on haul roads and stockpiles
Wheel wash / Street sweeper					
Wheel wash / Street sweeper	825.00	825.00	0.00	Non-potable	- Usage rate of 2,500 L every two days - Estimated 660 working days
TOTAL	**59,909.54**	**34,409.54**	**25,500.00**	**-**	**-**

Landscaping

Base case assumptions:
- Base case is based on reference design
- 100% potable water usage (no non-potable water replacement)

Current initiatives:
- Use of non-potable water for watering from sediment basins, dams, and rainwater tanks

Opportunities:
The following opportunities have not yet been accounted for in this Water Balance Study. If adopted, these will be calculated and added into future revisions of this study:
- Use of non-potable water for spray grass application (subject to supplier plant requirements)
- Watering reduction opportunities for establishment of vegetation planting

Usage	Consumption (kL)		Difference (kL)	Project source (potable/non-potable)	Comments and assumptions
	Base Case	Forecast Actual			
Temporary Landscaping					
Hydroseeding application	1,650.00	1,650.00	0.00	Potable	- Hydromulching with cover crop for temp landscaping - Area of 660,000 m2 - 2.5 L per m2 for application
Watering of temporary landscaping	6,600.00	6,600.00	0.00	Non-potable	- Hydromulching with cover crop - Area of 660,000 m2 - Watered twice at 5 L per m2
Vegetation Planting					
Establishment of planting areas	2,880.00	2,880.00	0.00	Non-potable	- Area of 4000 m2 with 6 plants per m2 (24,000 plants) - 5 L of water per plant every 2 days for 2 weeks - 5 L of water at weekly intervals for 10 weeks - 5 L of water at fortnightly intervals for 14 weeks
TOTAL	**11,130.00**	**11,130.00**	**0.00**	**-**	**-**

TOTALS

Usage - 3 Star	**21.00**	**kL**
Usage - 5 Star	**13.16**	**kL**
Usage - 5 Star w/o urinals	**9.27**	**kL**

3 Star

Monthly Water Use (L)	WC		Urinal		Water Basin & Sink	
	Male	Female	Male	Female	Total	
Mar-22	2.04	2.76	6.8	0	6.75	
Apr-22	16.32	22.08	54.4	0	54	
May-22	29.58	40.02	98.6	0	97.875	
Jun-22	40.086	54.234	133.62	0	132.6375	
Jul-22	44.676	60.444	148.92	0	147.825	
Aug-22	48.246	65.274	160.82	0	159.6375	
Sep-22	56.916	77.004	189.72	0	188.325	
Oct-22	56.406	76.314	188.02	0	186.6375	
Nov-22	60.996	82.524	203.32	0	201.825	
Dec-22	69.666	94.254	232.22	0	230.5125	
Jan-23	81.906	110.814	273.02	0	271.0125	
Feb-23	89.046	120.474	296.82	0	294.6375	
Mar-23	97.206	131.514	324.02	0	321.6375	
Apr-23	100.368	135.792	334.56	0	332.1	
May-23	100.878	136.482	336.26	0	333.7875	
Jun-23	98.328	133.032	327.76	0	325.35	
Jul-23	97.818	132.342	326.06	0	323.6625	
Aug-23	96.288	130.272	320.96	0	318.6	
Sep-23	93.432	126.408	311.44	0	309.15	
Oct-23	86.802	117.438	289.34	0	287.2125	
Nov-23	84.252	113.988	280.84	0	278.775	
Dec-23	84.252	113.988	280.84	0	278.775	
Jan-24	82.722	111.918	275.74	0	273.7125	
Feb-24	81.702	110.538	272.34	0	270.3375	
Mar-24	78.642	106.398	262.14	0	260.2125	
Apr-24	75.072	101.568	250.24	0	248.4	
May-24	72.522	98.118	241.74	0	239.9625	
Jun-24	72.522	98.118	241.74	0	239.9625	
Jul-24	67.932	91.908	226.44	0	224.775	
Aug-24	62.832	85.008	209.44	0	207.9	
Sep-24	60.282	81.558	200.94	0	199.4625	
Oct-24	57.222	77.418	190.74	0	189.3375	
Nov-24	42.942	58.098	143.14	0	142.0875	
Dec-24	29.682	40.158	98.94	0	98.2125	
Jan-25	7.65	10.35	25.5	0	25.3125	
Feb-25	6.63	8.97	22.1	0	21.9375	
Mar-25	1.02	1.38	3.4	0	3.375	
TOTAL (L)	**2334.882**	**3158.958**	**7782.94**	**0**	**7725.7125**	**21002.49 L**
						21.00249 kL

5 Star

Monthly Water Use	WC		Urinal		Water Basin & Sink	
	Male	Female	Male	Female	Total	
Mar-22	1.53	2.07	3.4	0	4.5	
Apr-22	12.24	16.56	27.2	0	36	
May-22	22.185	30.015	49.3	0	65.25	
Jun-22	30.0645	40.6755	66.81	0	88.425	
Jul-22	33.507	45.333	74.46	0	98.55	
Aug-22	36.1845	48.9555	80.41	0	106.425	
Sep-22	42.687	57.753	94.86	0	125.55	
Oct-22	42.3045	57.2355	94.01	0	124.425	
Nov-22	45.747	61.893	101.66	0	134.55	
Dec-22	52.2495	70.6905	116.11	0	153.675	
Jan-23	61.4295	83.1105	136.51	0	180.675	
Feb-23	66.7845	90.3555	148.41	0	196.425	
Mar-23	72.9045	98.6355	162.01	0	214.425	
Apr-23	75.276	101.844	167.28	0	221.4	
May-23	75.6585	102.3615	168.13	0	222.525	
Jun-23	73.746	99.774	163.88	0	216.9	
Jul-23	73.3635	99.2565	163.03	0	215.775	
Aug-23	72.216	97.704	160.48	0	212.4	
Sep-23	70.074	94.806	155.72	0	206.1	
Oct-23	65.1015	88.0785	144.67	0	191.475	
Nov-23	63.189	85.491	140.42	0	185.85	
Dec-23	63.189	85.491	140.42	0	185.85	
Jan-24	62.0415	83.9385	137.87	0	182.475	
Feb-24	61.2765	82.9035	136.17	0	180.225	
Mar-24	58.9815	79.7985	131.07	0	173.475	
Apr-24	56.304	76.176	125.12	0	165.6	
May-24	54.3915	73.5885	120.87	0	159.975	
Jun-24	54.3915	73.5885	120.87	0	159.975	
Jul-24	50.949	68.931	113.22	0	149.85	
Aug-24	47.124	63.756	104.72	0	138.6	
Sep-24	45.2115	61.1685	100.47	0	132.975	
Oct-24	42.9165	58.0635	95.37	0	126.225	
Nov-24	32.2065	43.5735	71.57	0	94.725	
Dec-24	22.2615	30.1185	49.47	0	65.475	
Jan-25	5.7375	7.7625	12.75	0	16.875	
Feb-25	4.9725	6.7275	11.05	0	14.625	
Mar-25	0.765	1.035	1.7	0	2.25	
TOTAL (L)	**1751.1615**	**2369.219**	**3891.47**	**0**	**5150.475**	**13162.33 L**
						13.16233 kL
					Without urinals	**9270.855 L**
						9.270855 kL

People per Month	Total	Male	Female
Mar-22	2	1.7	0.3
Apr-22	16	13.6	2.4
May-22	29	24.65	4.35
Jun-22	39.3	33.405	5.895
Jul-22	43.8	37.23	6.57
Aug-22	47.3	40.205	7.095
Sep-22	55.8	47.43	8.37
Oct-22	55.3	47.005	8.295
Nov-22	59.8	50.83	8.97
Dec-22	68.3	58.055	10.245
Jan-23	80.3	68.255	12.045
Feb-23	87.3	74.205	13.095
Mar-23	95.3	81.005	14.295
Apr-23	98.4	83.64	14.76
May-23	98.9	84.065	14.835
Jun-23	96.4	81.94	14.46
Jul-23	95.9	81.515	14.385
Aug-23	94.4	80.24	14.16
Sep-23	91.6	77.86	13.74
Oct-23	85.1	72.335	12.765
Nov-23	82.6	70.21	12.39
Dec-23	82.6	70.21	12.39
Jan-24	81.1	68.935	12.165
Feb-24	80.1	68.085	12.015
Mar-24	77.1	65.535	11.565
Apr-24	73.6	62.56	11.04
May-24	71.1	60.435	10.665
Jun-24	71.1	60.435	10.665
Jul-24	66.6	56.61	9.99
Aug-24	61.6	52.36	9.24
Sep-24	59.1	50.235	8.865
Oct-24	56.1	47.685	8.415
Nov-24	42.1	35.785	6.315
Dec-24	29.1	24.735	4.365
Jan-25	7.5	6.375	1.125
Feb-25	6.5	5.525	0.975
Mar-25	1	0.85	0.15

Uses per day	Male	Female		
WC	0.3	2.3	1 flush	
Urinal	2	0	1 flush	
Water basin and a kitchen sinks	2.5	2.5	9 seconds	0.15

	3 Star	5 Star
WC - 1 flush (L)	4	3
Urinal - 1 flush (L)	2	1
Water basin and a kitchen sinks L/min	9	6
Water basin and a kitchen sinks L/0.15min	1.35	0.9