Prepared for
Major Project Canberra
ABN: 66 676 633 401

LRS2A

Water Sensitive Urban Design Report

10-Feb-2023
Doc No. S210-ACM-RPT-URD-PR-0002

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Client: Major Project Canberra

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Prepared by

AECOM Australia Pty Ltd
Ngunnawal Country, Civic Quarter, Lvl 4, 68 Northbourne Avenue, GPO Box 1942, Canberra ACT 2601, Australia
T +61 2 6100 0551 www.aecom.com
ABN 20 093 846 925

10-Feb-2023

Job No.: 60656949

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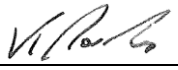
Quality Information

Document	LRS2A
Ref	60656949
Date	10-Feb-2023
Originator	Tim Wakefield
Checker/s	Courtney Henderson
Verifier/s	Lisa Roach

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
A	11-Nov-2022	Draft	Keith Povah Technical Director	Original signed
B	15-Dec-2022	Approvals Submission - Draft	Keith Povah Technical Director	Original signed
C	10-Feb-2023	Approvals Submission - Final	Keith Povah Technical Director	

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1.0 Introduction

Major Projects Canberra (MPC) proposes to extend CLR from its current southern terminus at Alinga Street, Canberra City, to Woden (Light Rail City to Woden).

Light Rail Stage 2 City to Woden is being progressed in two, self-contained stages for a faster project delivery: Light Rail City to Commonwealth Park, Stage 2A, and Light Rail Commonwealth Park to Woden, Stage 2B.

Documentation of applicable assessments are required to support the following approvals:

- Works Approval to the National Capital Authority (NCA) for areas of Designated Land of the Project under the *Australian Capital Territory (Planning and Land Management) Act 1988* (Cth)
- Development Application for Territory Land from the Environment, Planning and Sustainable Development Directorate (EPSDD) under the *Planning and Development Act 2007* (ACT).

This Water Sensitive Urban Design Report has been prepared to address, in part, the requirements of the above approvals. The content of this document only applies to Stage 2A of the light rail project.

2.0 Purpose of this report

This Water Sensitive Urban Design report is provided in accordance with the requirements of Stage 2a of the Canberra light rail project.

The key purposes of this report are to:

- Meet the contractual requirements of the project
- Support the Development Application – “DA”
- Support the Works Approval – “WA”
- Review proposed designs to inform the project designers, engineers and other services of the requirement to integrate water sensitive urban design measures to mitigate potential increases in pollutants in stormwater runoff arising from the project.
- Comply with the project requirement to set pre-discharge water quality targets, based on the requirements of the waterways, WSUD General Code (ACT Planning and Land Authority)

This Water Sensitive Urban Design report covers the Light Rail 2a element from Alinga St to Commonwealth Park inclusive of Edinburgh Ave, City South, and Commonwealth Park stops.

3.0 Water Quality Assessment

3.1 Stormwater Treatment Targets

Stormwater treatment will be incorporated into the design as part of the 2A package of works. Scope and Performance requirements relevant to the incorporation of stormwater treatment systems in design include SPR – Appendix 18: 2.6 Drainage 2.6.7 Water Quality and Water Sensitive Urban Design (WSUD), specifically:

- (a) The quality of all stormwater and groundwater discharge must meet the Environmental Requirements, the applicable requirements of Authorities and the requirements of Appendix 12 (Sustainability).
- (c) The project must set pre-discharge water quality targets, based on the requirements of the waterways, WSUD General Code (ACT Planning and Land Authority) and agree these targets with the Territory.
- (f) Water quality modelling in MUSIC must be undertaken to demonstrate the performance of WSUD measures.

Water quality objectives have been agreed with the Territory for a “neutral or beneficial effect assessment” (NorBE) i.e., a minimum target of “no increase in pollutant loads as a result of the project”. The pollutants of concern relevant to the Waterways’ WSUD General Code are total suspended solids (TSS), total phosphorus (TP), and total nitrogen (TN). These targets were agreed on the basis that the project was located within a highly constrained urban corridor where opportunities for water quality treatment is very limited, but recognising that the project should not result in detrimental environmental impacts.

This agreed water quality objective meets the project‘s Infrastructure Sustainability Council of Australia (ISCA) sustainability rating scheme requirements (ISv2.0 Design) for Env-1 Receiving Water Quality (Level 3). This ISCA target requires that the project implements opportunities to improve receiving water environmental values (i.e., reduces the pollutant loads discharged to the receiving environment). For the purposes of this project, this is interpreted as equivalent to the project delivering a neutral or beneficial effect to pollutant loads in stormwater runoff in comparison to the existing situation.

3.2 Stormwater Treatment Opportunities

The following stormwater treatment opportunities have been investigated and incorporated into the design where appropriate:

- Landscape permeability: Designs seek to increase the permeability of the landscape. Reducing the imperviousness of the landscape decreases the pollutant loads that are carried into stormwater runoff. Where a trafficable surface is required, a reduction in imperviousness can be achieved with the use of porous pavements, which allow water to infiltrate into the soils below. The baseline scope for the project includes a requirement to comply with the ACT Government’s Living Infrastructure Plan, including a target for 30% of urban environments to be permeable or covered by a tree canopy or landscaping.
- Passive Irrigation: Designs seek to incorporate passive irrigation wherever possible. Passive irrigation involves directing runoff from paved areas to areas where water can infiltrate into the landscape soils. This has the dual benefit of providing more water for landscape plantings to support better plant health, whilst diverting stormwater runoff and the associated pollutant loads away from Lake Burley Griffin.

3.3 Design Departures

There are two criteria applicable to the project that require attenuation of stormwater runoff from small events. Such attenuation is designed to protect natural unlined streams from the erosion that results from urban development. Urban development increases the rate and volume of runoff from a catchment, which typically results in scour in the creeks downstream. However, for this project all runoff would discharge into a lined stormwater drainage network, and then to Lake Burley Griffin. Neither of these environments would be detrimentally impacted by an increase in scour potential. Drainage has been designed in accordance with the appropriate scope and performance requirements, which is for the drainage infrastructure to contain a 10% AEP plus 20% to accommodate climate change. Hence, these criteria would impose difficult design constraints whilst providing no environmental benefit. Those criteria are:

- **The ACT Waterways WSUD Code**

Under the ACT Waterways WSUD Code, the following rule could be applicable:

Rule 2.2 On-site stormwater detention. Stormwater detention measures are provided and achieve all of the following:

a) capture and direct runoff from the entire site

b) Stormwater storage capacity of 1kL per 100m² of impervious area is provided to specifically detain stormwater generated on site

c) The detained stormwater is designed to be released over a period of 6 hours after the storm event.

Such a requirement to provide attenuation of runoff for small or frequent events would not be practicable for linear infrastructure, and in the case of this project's receiving environment is not likely to yield any environmental benefit.

- **The ISCA Design Env-1 (Receiving Water Quality) criteria for Level 3**

DL2.2 The infrastructure does not increase peak stormwater flows for rainfall events of up to a 1.5-year ARI event discharge.

Similar to the ACT Waterways WSUD Code - Rule 2.2 On-site stormwater detention, this criterion is designed to protect unlined waterways from scour from frequent, minor rainfall events. Neither of these criteria would yield environmental benefits to Lake Burley Griffin.

For larger events (such as the 1% AEP storm event), the design has been developed to maintain peak flows and prevent impact on the capacity of the downstream stormwater infrastructure and not worsen flooding extents.

3.4 MUSIC Modelling

3.4.1 MUSIC Modelling Assumptions

MUSIC modelling using version MUSIC X was undertaken to assess the impact of the project on the stormwater pollutant loads discharged from the project area. The existing project area was compared to the proposed design. The MUSIC model was based upon the 2A landscape design dated 16/12/22, "Approvals Issue".

MUSIC modelling parameters were configured in accordance with WaterNSW guidelines 'Using MUSIC in Sydney Drinking Water Catchment' (2019). These guidelines were designed for scenarios where modelling is needed to demonstrate a NorBE. It is noted that the NorBE MUSIC modelling guidelines conservatively require a 10% reduction in pollutant loads to accommodate any potential error in the modelling that could pose a risk to drinking water quality. For this project, such precautionary measures were not considered necessary as this is an urban environment and not a drinking water catchment.

Passive watering of street trees has been modelled for proposed new trees as designated within the design. These trees are located along London Circuit, with the majority located from Edinburgh Avenue south to Commonwealth Avenue, and from Commonwealth Avenue east to the limit of works at Constitution Avenue.

Due to the configuration of the streetscape, permeable paving was modelled slightly different to the method recommended in the WaterNSW guidelines. For this project, permeable paving is used as a conduit to direct water from impermeable pavements to the root zone of the trees and modelled as a pervious catchment, rather than as a treatment node. The impermeable paving adjacent to the permeable pavements is graded in such a way that runoff is either intercepted by the permeable paving or drains into the kerb and gutter system, where inlets are positioned within the face of the kerb to capture additional runoff and direct it into the root zone of the tree. Treatment was provided by street trees or landscaped areas, which were modelled as bioretention systems with a very slow infiltration rate of 10 mm/h.

In addition, the Parkes Way East On Ramp, the London Circuit Inner Off Ramp, and the areas within these two branches of the 'clover leaf' have been excluded from MUSIC modelling. These areas of future development will be subject to their own WSUD and water quality requirements, and managed as part of the development planning and approvals process.

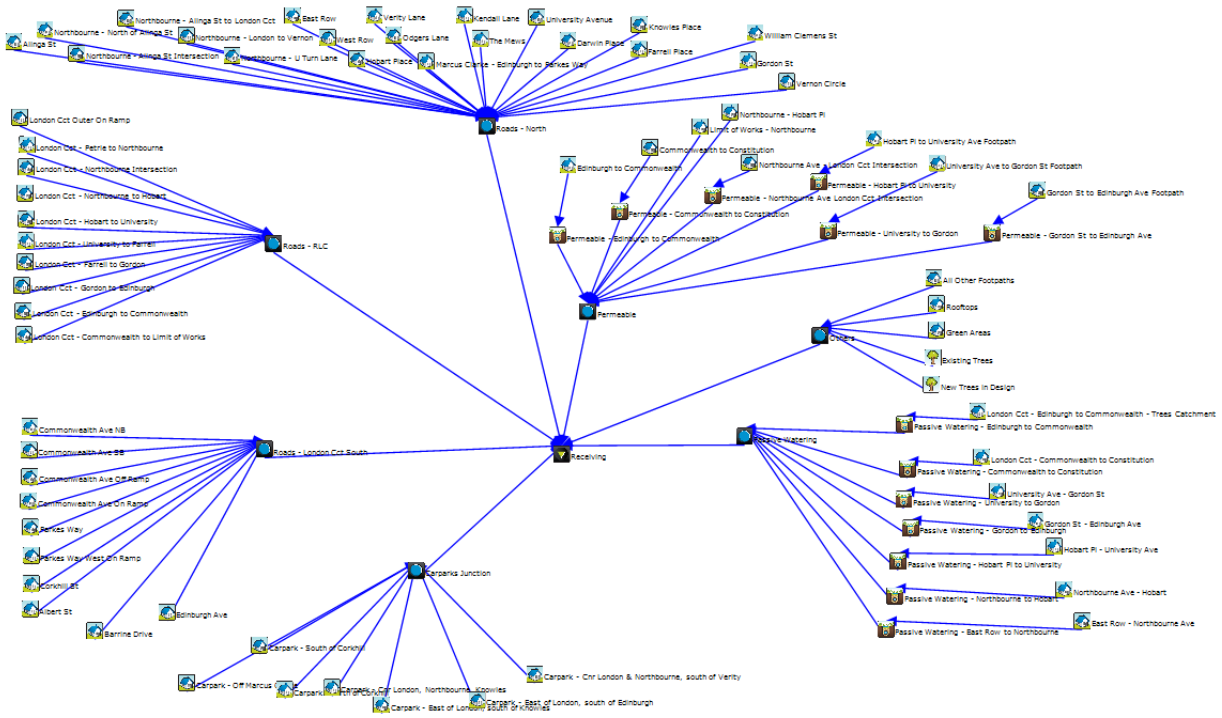

Figure 3-1: Line map of MUSIC model.

3.4.2 Rainfall

6-minute pluviograph data for Canberra was used to create the model. This historical information includes data from 1 January 1968 to 31 December 1977 as per the requirements of the ACT Waterways WSUD Code. This rainfall data has been used in its original state and has not been modified to accommodate climate change predictions.

3.4.3 Results

MUSIC modelling undertaken for the project confirmed that the water quality treatment targets would be met. As shown in Table 3-1, predicted pollutant loads in stormwater runoff from the project are less than the existing conditions. This reduction is due to:

- The reduction in impervious areas across the project, due to the incorporation of porous pavements in the verge and additional landscaping.
- A portion of road runoff being diverted to passively water street trees, diverting pollutants away from the receiving environment.

Table 3-1: Results of MUSIC modelling comparing the existing and developed scenarios for the RLC project.

Pollutant	Pre-Development	Post-Development	% Reduction	NorBE Target met?
TSS (kg/yr)	19,025.2	17,647.3	7.2	Yes
TP (kg/yr)	32.2	30.2	6.4	Yes
TN (kg/yr)	135.5	128.	5.2	Yes

4.0 Outcomes and Recommendations

The mitigation measures proposed are sufficient to attain reductions in pollutant loads for total suspended solids, total phosphorous, and total nitrogen of 7.2, 6.4, and 5.2 percent respectively. Hence the project can be considered to have a beneficial impact on water quality.