St Leonards South Areas 22 & 23
26-50 Park Road, 27-47 Berry Road and 48-54 River Road, St Leonards
Civil Infrastructure & Stormwater Management Report

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1. Introduction

This Civil Infrastructure and Stormwater Management Report has been prepared by AT&L on behalf of JQZ in support of the proposed development of Area 22 and Area 23 within the St Leonards South (SLS) Precinct.

1.1. Site Location

The location of the Site is presented in Figure 1. The development site is generally bound by low density residential dwellings to the north, Berry Road to the east, River Road to the south and Park Road to the west.

Figure 1: Site Location

1.2. Site Description

JQZ is the owner of the Site that consists of Area 22 and Area 23 and is proposing to deliver a high-density residential development, consisting of around 306 apartments.

This Site is approximately 1.26 hectares of low-density residential dwellings, which has been identified in both Local and State Government policy documents for substantial redevelopment.

Part of the existing Berry Lane, which currently connects the Pacific Highway and River Road, will be removed through the Site.

The site consists of several existing lots, as listed in Table 1.

Table 1: Lots within the Site

Address	Lot / DP	Approx. area (m^2)	Location within the SLS Precinct
26 Park Road	Lot 44 Section 3 in DP 3044	439	Area 22
28 Park Road	Lot 43 Section 3 in DP 3044	440	
30 Park Road	Lot 5 in DP 305449	447	
32 Park Road	Lot 4 in DP 305449	445	
34 Park Road	Lot 3 in DP 305449	439	
27 Berry Road	Lot 19 in DP 82696	431	
29 Berry Road	Lot 1 in DP 533847	219	
31 Berry Road	Lot 2 in DP 533847	216	
33 Berry Road	Lot 21 Section 3 in DP 3044	438	
35 Berry Road	Lot 22 Section 3 in DP 111237	429	
37 Berry Road	Lot 23 in DP 79978	435	
39 Berry Road	Lot 24 Section 3 in DP 3044	434	New DCP Road
36 Park Road	Lot 2 in DP 305449	442	
38 Park Road	Lot 1 in DP 305449	435	Area 23
40A Park Road	Lot 37 in DP 666528	456	
40B Park Road	Lot 36 in DP 3044	430	
42 & 42A Park Road	Lot 351 & 352 in DP 848236	439	
44 – 50 Park Road	Lot 1 – Lot 4 in DP 225445	840	
48 River Road	Lot 29 in DP 72918	495	
50 River Road	Lot 1 in DP 1223070	478	
52 River Road	Lot 31 Section 3 in DP 3044	451	
1/54 Park Road and 2/54 Park Road	Lot 1 & Lot 2 in SP 16063	617	
41 Berry Road	Lot 25 in DP 3044	432	
43A & 43B Berry Road	Lot 1 & 2 in DP 734702	439	
45 & 47 Berry Road	Lot 27 & 28 section 3 in DP 3044	859	
Berry Lane	N/A (Road Reserve)	984	Areas 22 & 23 + New DCP Road

1.3. Scope of this Report

This report has been prepared to satisfy the requirements and conditions of the following documents:

- *Lane Cove Development Control Plan – Part C: Residential Development* (amended 24 February 2016)
- *Lane Cove Development Control Plan – Part O: Stormwater Management* (amended 9 December 2011)
- *St Leonards South Landscape Master Plan* (Oculus, December 2020)

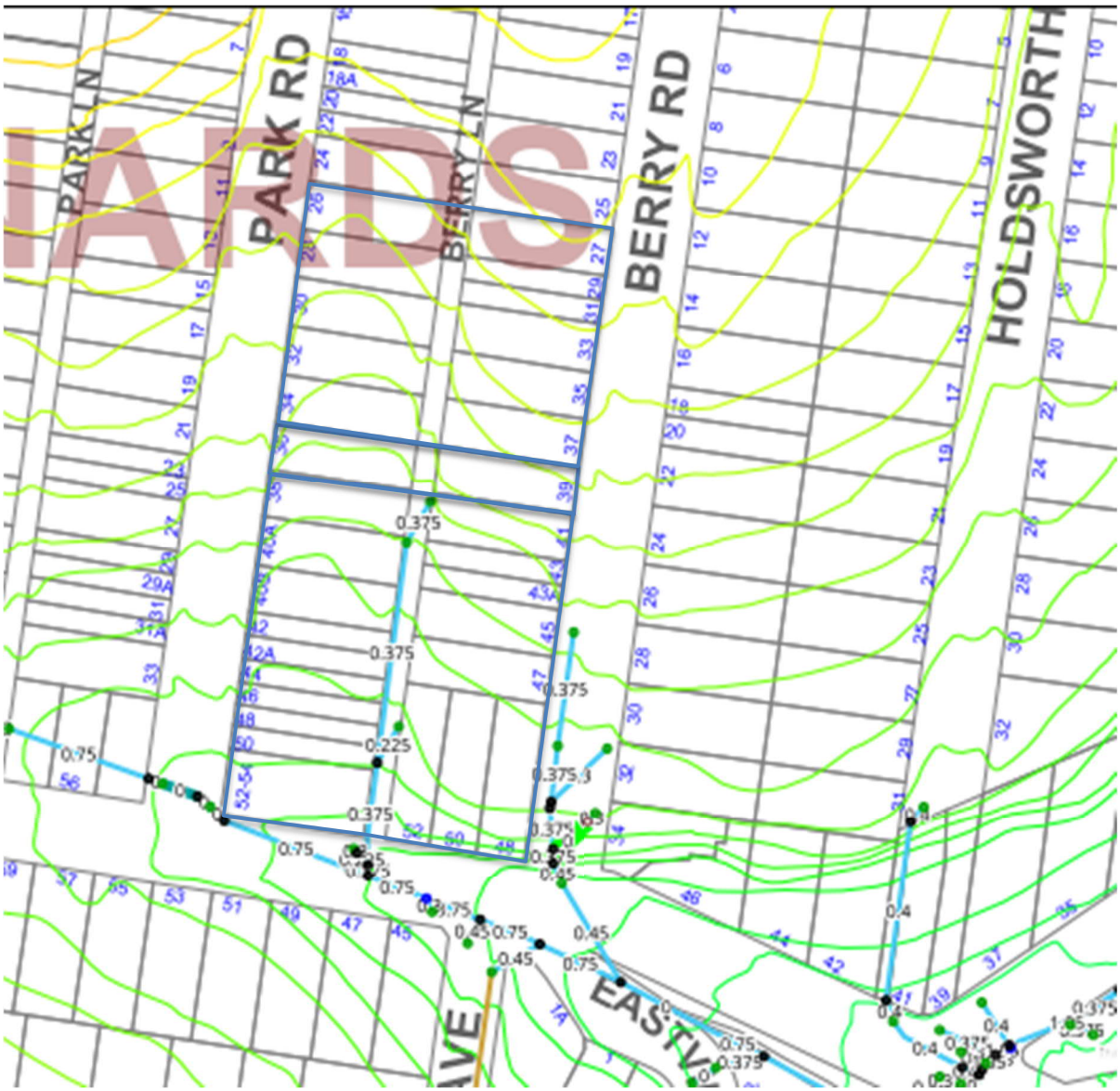
This report should be read in conjunction with the Civil Works Package, included as Appendix A.

2. Existing Environment

The Site is characterised as low-density residential area, consisting of free-standing dwellings on lots that are generally between 430 m^2 and 450 m^2.

The topography of the Site is considered steep, with slopes generally between 10% and 15% grading in a southerly direction towards River Road.

The Site is located within the catchment of Berrys Creek, which generally drains in a southerly direction and discharges to Sydney Harbour approximately 700 metres south of River Road.



3. Project Description

The proposed development of the Site will include three multi-storey residential buildings – two within Area 22 and one U-shaped building within Area 23. The buildings will front either Park Road or Berry Road, with a Green Spine to be located between the proposed buildings. The Green Spine will run between the northern and southern boundaries of Area 22 and along approximately two-thirds the depth of Area 23. The layout of the proposed development, as designed by DKO Architects, is presented as Figure 2.

Figure 2: Proposed Site Plan (DKO Architects)

The New DCP Road will run east-west between Park Road and Berry Road, separating Area 22 and Area 23.

In summary, the scope of work under the proposed development will include the following:

- Demolition of all existing buildings within Area 22 and 23.
- Demolition and removal of existing pavements, vegetation and utility services within Area 22 and Area 23.
- Bulk earthworks and installation of a perimeter retention system to enable construction of a three-level basement, which will comprise around 542 parking spaces, storage facilities and waste management facilities.
- Construction of three residential apartment buildings, ranging in height between four and twelve storeys, containing 306 apartments.
- Creation of a Green Spine communal open space.
- Vehicular access to the basement (entry and exit) via a new driveway off Park Road between River Road and the new DCP Road.
- Construction of the new DCP Road that will connect Park Road and Berry Road.

4. Erosion and Sediment Control

Construction phase erosion and sediment control measures will be installed and maintained in accordance with Council's requirements and *Managing Urban Stormwater, Soils and Construction* (Landcom, 2004).

The staged demolition and construction of the Project will be managed to minimise erosion and water quality impacts during construction.

An Erosion and Sediment Control Plan and typical details are presented in drawings DAC1601 and DAC1602 respectively. This Plan incorporates measures to prevent the discharge of soil and waterborne pollutants outside the extent of work during and immediately following construction.

In accordance with the Erosion and Sediment Control Plan, it is recommended that, as a minimum, the following measures be implemented:

- Stabilised site access at all entry and exit points to the extent of work (NB: the exact locations of these points is yet to be confirmed).
- Diversion of clean water around disturbed areas at the upstream extent of work.
- Kerb inlet filters (e.g., gravel-filled bag or coir mesh sock) are to be installed at existing stormwater pits on River Road, Park Road, Berry Road and Berry Lane and new stormwater pits as they are constructed.
- Installation of sediment fence at the downstream extent of all disturbed areas.
- Appropriate management of stockpiled materials such as covering, watering or planting with Hydromulch.
- Rehabilitation of disturbed areas as soon as practical.

Implementation of these controls would ensure that the proposed work will not have significant adverse impacts on the quality of stormwater in receiving waters during construction periods.

5. Stormwater Drainage

5.1. Design Criteria

Stormwater drainage has been designed in accordance with the following standards and guidelines:

- *Lane Cove Development Control Plan 2010, Part O – Stormwater Management* (LCDCP)
- *Australian Rainfall and Runoff: A Guide to Flood Estimation,* © Commonwealth of Australia (Geoscience Australia), 2019
- *AS3500.3: Plumbing and drainage – Stormwater drainage*

The proposed drainage network has been designed to safely convey major and minor flows within and adjacent to the Site. Design rainfall intensities for the proposed drainage network have been adopted as follows:

- Minor system (pits and pipes / culverts): 50-year ARI (2% AEP) – as per LCDCP requirement for residential flat buildings
- Major system (overland flow paths): 100-year ARI (1% AEP)

5.2. Existing Stormwater Drainage

Existing stormwater drainage in the vicinity of the Site is presented in Figure 3. This includes:

- A 750mm diameter line that drain in an easterly direction along River Road towards Eastview Street.
- A 375mm / 450mm diameter line that runs along the western side of Berry Road towards the 750mm line in River Road.
- A 375mm diameter line that runs along the western side of Berry Lane towards the 750mm line in River Road. This line will be removed to allow the proposed development within Area 23.

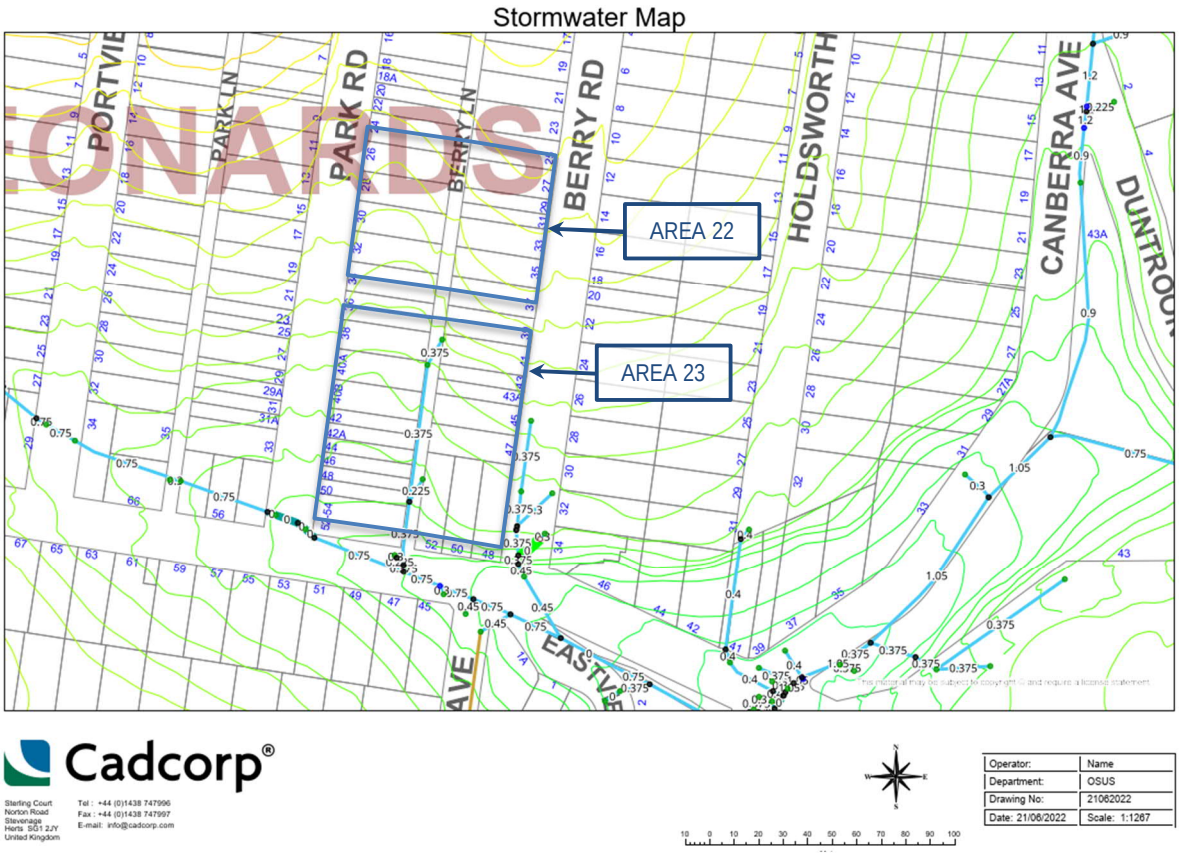


Figure 3: Existing stormwater drainage

5.3. Proposed Stormwater Drainage

The extent of proposed stormwater drainage that will be required to support development of the Site is presented on drawings 22-1013-DAC1101 and DAC1102.

All proposed stormwater drainage within and adjacent to the Site will be design and constructed in accordance with Council standards and guidelines.

5.3.1. External catchments

The extent of external catchments that drain towards and adjacent to the Site is presented on drawing 22-1013-DAC1521. The three main external catchments are described in Table 2.

Table 2: Description of external catchments

Catchment ID (refer to drawing 22-1013-DAC1521)	Area (m^2)	Description	Discharges to:
A1	2062	Eastern side of River Road between the Pacific Highway and new kerb return north of the new DCP Road	Proposed new drainage line A along the eastern side of River Road adjacent to Areas 22 and 23. This will connect to the existing stormwater pit on Park Road near the intersection at River Road.
C1	6914	Existing properties south of the Pacific Highway between Park Road and Berry Lane	New external diversion line C, which will run along the northern side of the eastern building on Area 22.
C2	7733	Existing properties south of the Pacific Highway between Berry Road and Berry Lane	New diversion line C, which will run along the western side of Berry Road adjacent to Areas 22 and 23. This will connect to the existing stormwater line that runs through the reserve at the southern end of Berry Road.

The proposed diversion of the external catchment that currently drains along Berry Lane and ultimately towards the existing stormwater drainage network in River Road will be diverted via the proposed Line C as shown on drawing 22-1013-DAC1101. This line will be upgraded to a point just upstream of River Road, where it will connect to a new surcharge pit that will be located in the reserve between Berry Road and River Road. This diversion line has been designed to capture and convey the peak 1% AEP flow from the external catchment to avoid overland flow from the external catchment draining through the Area 22 Green Spine. The inlet pit arrangement, which may require multiple standard sized grated inlets or a custom grated inlet, will be sized to capture the peak 1% AEP flow with allowance for 50% blockage (assuming it will be a sag inlet).

5.3.2. Internal catchments

The proposed development of Areas 22 and 23 will incorporate a network of stormwater drainage that will discharge into the basement at Area 23 and ultimately into the proposed combined rainwater tank and on-site stormwater detention (OSD) tank. The internal stormwater drainage network will be designed to capture and convey peak flows for storm events up to and including the 1% AEP, on the basis that:

- All stormwater discharge from the Site will drain to the proposed OSD tank, which will be designed to detain and attenuate flow for a range of storm events up to the 1% AEP event.
- There is no formal passage for 'major' system flow (difference between the 1% AEP flow and the 'minor' system flow) from Area 23 to the adjacent public domain (Berry Road or River Road)

The outlet line from the OSD tank will discharge to an existing stormwater pit north of River Road. Given the invert level of the proposed OSD tank outlet and the proposed stormwater drainage from Berry Road, it is likely that this existing stormwater pit will need to be reconstructed.

5.3.3. New DCP Road

Stormwater drainage within the new DCP Road is proposed to drain in a westerly direction towards the proposed new line A along Park Road. Given the new DCP Road has been designed with one-way crossfall (north to south), drainage will only be required on the southern side of the road.

5.3.4. Emergency overland flow path from Area 23 to Berry Road

For storm events in excess of the 1% AEP design event, or in the event that the internal stormwater drainage network is blocked to a degree greater than the design requirement (20% for on-grade pits, 50% for sag pits), an emergency overland flow path will be incorporated into the corridor that provides pedestrian connection between the building entry at Berry Road and the Green Spine (refer to Figure 4). The intent of this emergency overland flow path is to minimise the risk of inundation of habitable floor areas that may occur in the unlikely event of either:

a) Significant blockage of the internal drainage network within the Area 23 Green Spine, or

b) Intense rainfall in excess of the 1% AEP design storm event.

To convey overland flow from the Area 23 Green Spine to Berry Road, the lobby area has been set down below the nominal Basement Level 2 finished floor level of RL 62.30 to a nominal level of RL 62.00. This requires ramps to transition between the corridor and the habitable floor level at Basement Level 2. Measures will be incorporated into the architectural design to ensure the passage of emergency overland flow through the corridor.

Figure 4: Emergency overland flow path between Area 23 and Berry Road

5.4. Planned drainage upgrades in the vicinity of Areas 22 and 23

As per the Pre-DA Meeting Notes provided by Lane Cove Council further to Meeting 1 held with Council on 25 July 2022, it is understood that Council plan to install a new stormwater drainage system around the Site. To date, Council has not provided details of the planned upgrades.

Subject to coordination with Council, there is potential to incorporate the proposed drainage works presented on drawings 22-1013-DAC1101 and DAC1102 into the planned upgrades by Council.

6. On-site Stormwater Detention

6.1. Design Criteria

In accordance with Section O.7 of the Lane Cove DCP, on-site stormwater detention (OSD) is required to limit stormwater discharge from developments. It is noted in the DCP that Council's OSD requirements have been formulated to ensure there is no increase in discharges from a site for rainfall events having a 1 in 100 year ARI (1% AEP).

The design criteria for OSD are as follows:

- The Permissible Site Discharge (PSD) from all developments shall not exceed 140 l/s/ha.
- The Site Storage Requirement (SSR) shall be designed to provide for 0.025 m^3 for each square metre of basin catchment.

Based on these criteria, the minimum requirements for the OSD for the Site are as follows:

- PSD: 140 l/s/ha x 1.16 ha = 162.4 l/s
- SSR: 0.025 m^3/m^2 x 11,640 m^2 = 291 m^3

6.2. OSD Tank Parameters

The proposed development will incorporate one OSD tank adjacent to Berry Road and River Road. The extent of the proposed OSD tank is shown on drawing 22-1013-DAC1530. The tank will be located below Basement Level 4 and will discharge to the existing stormwater drainage network near the south-eastern corner of Area 23.

An outlet chamber will be required to control outflow from the OSD tank such that the peak discharge does not exceed the PSD. The outlet chamber will nominally incorporate a 525mm diameter outlet pipe, which will drain to the existing stormwater pit in River Road.

The proposed OSD tank will comply with the design criteria outlined in Section O.7 of the LCDCP.

7. Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) measures have been incorporated into the project, such that the requirements outlined in Part C8 (Residential Localities – St Leonards South) and Part O (Stormwater Management) of the *Lane Cove Development Control Plan* (LCDCP) are addressed. Specific provisions relating to Water Management and Conservation that are outlined in Part C8 of the LCDCP are summarised in Table 3.

Table 3: Water Management and Conservation provisions in Part 8 of the LCDCP

Provision in Part C8 of LCDCP	Response
▪ *Collect, store and treat on site*	A rainwater tank has been incorporated into the basement within Area 23 – refer to drawing 22-1013-DAC1530 and Section 7.1.1 for further details.
▪ *Maintain maximum Green Spine and other deep soil for percolation*	The extent of the proposed Green Spine within the proposed development is consistent with the extent shown in the Landscape Master Plan incorporated in Part C8 of the LCDCP
▪ *Provide on-site stormwater and infiltration including bio-retention systems such as rain gardens*	Stormwater quality management is proposed to be provided in the form of proprietary cartridge filters, which will be located adjacent to the OSD tank at Basement Level 4. As an alternative, and pending coordination with the landscape design for the Green Spine, there is potential to incorporate measures such as rain gardens and proprietary bioretention systems (e.g., Filterra®) into the Green Spine.
▪ *Buildings shall comply with Part B Cl 6.3 of Council's Development Control Plan (All developments are to capture and reuse rainwater for irrigation of landscape areas and for apartments, townhouses, villas and mixed use or commercial development also for toilet flushing and washing machines.)*	Refer to Section 7.1.1 for further details of the proposed rainwater tank, which will capture rainwater for irrigation of the Green Spine.
▪ *All other stormwater management measures are detailed in Council's Development Control Plan Part O (Stormwater Management)*	All other measures outlined in Part O of the LCDCP, including property drainage systems, disposal of stormwater, OSD and erosion and sediment control have been addressed in this report and documented in the Civil Works Package prepared by AT&L.

The LCDCP and Pre-DA Meeting Notes do not specify pollutant reduction targets or allowable loads for development. As such, in the absence of specific pollutant reduction targets, the principles of Neutral or Beneficial Effect (NorBE) have been applied to the proposed development. For stormwater, NorBE is assessed by comparing the quality of runoff from the pre-development site with that from the post-development site including proposed stormwater treatment measures that are needed to mitigate pollutant loads and concentrations resulting from a proposed change in landuse. Criteria for NorBE have been adopted by WaterNSW and are outlined in their guideline titled *Using MUSIC in the Sydney Drinking Water Catchment* (Second edition: June 2019).

To satisfy the NorBE requirement for stormwater quality, the following criteria have been adopted:

- The mean annual pollutant loads for the post-development scenario (including mitigation measures) should be at least 10% less than the pre-development scenario for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). For gross pollutants, the post-development load should be less than the pre-development load.
- Pollutant concentrations for TP and TN for the post-development scenario (including mitigation measures) should be equal to or less than the pre-development scenario between the 50th percentile and 98th percentile over the modelling period (not accounting for periods of zero flow).

7.1. Proposed Stormwater Management Measures

The MUSIC software package has been utilised to simulate the existing and post-development conditions and to estimate the treatment train effectiveness of a number of proposed stormwater management measures. Modelling has been undertaken in accordance with the NSW MUSIC Modelling Guidelines (BMT WBM, August 2015).

The stormwater quantity and quality control measures that have been incorporated into the design are summarised in the following sections.

7.1.1. Rainwater tank for non-potable reuse

The MUSIC model was developed to simulate the effectiveness of the proposed rainwater tank, which will be located at Basement Level 4. The tank will have a nominal volume of 18 kL and will be located adjacent to the OSD tank. To estimate the effectiveness of the rainwater tank, the following assumptions have been applied in the MUSIC model:

- A non-potable demand of 450 mm/year (equivalent to 4.5 ML/ha/year) has been adopted for irrigation of the lawn and mass planting areas within the Green Spine (total area of 1340 m^2), resulting in an annual irrigation demand of 603 kL/year. Irrigation demand has been applied in MUSIC using a monthly distribution, variable by potential evapotranspiration (PET) minus rainfall.
- 100% of the building roof area will drain to the rainwater tank, and the remainder of the Site (Green Spine, courtyards and other landscape areas) will bypass the rainwater tank.

A summary of the rainwater tank volumes adopted in MUSIC and the results of the tank water balance are presented in Table 4.

Table 4: Summary of rainwater tank parameters

Parameter	Value
Total Site area (ha)	1.246
Building roof area to rainwater tank (ha)	0.575
Adopted rainwater tank volume (kL)	18
Non-potable demand	
Landscape irrigation (kL/yr)	603
Tank Water Balance	
Inflow (ML/yr)	5.56
Overflow (ML/yr)	5.13
% non-potable reuse demand met	71.1
% flow reduction	7.7

7.1.2. Gross pollutant traps

The proposed stormwater treatment train will consist of gross pollutant traps (GPTs) in the form of pit basket inserts (e.g., OceanGuard™ or equivalent). For the purpose of MUSIC modelling, it has been assumed that the pit basket inserts would be limited to the two proposed kerb inlet pits within the new DCP Road. However, depending on the size and nature of stormwater drainage within the Green Spine it may be possible to incorporated additional pit basket inserts within the Green Spine drainage.

7.1.3. Proprietary Filtration

A proprietary filtration device (Ocean Protect StormFilter® or equivalent) has been adopted to treat stormwater from the Site. For the purpose of MUSIC modelling, it has been assumed that all roof areas and landscape areas would discharge to the StormFilter tank, which would be located directly adjacent to the OSD tank.

To satisfy the adopted pollutant reduction targets, it is estimated that 10 x 690mm PhosphoSorb™ (PSorb) cartridges would be required.

7.1.4. On-site stormwater detention

Surface water runoff within the Site will be collected via a network of pits and pipes and will drain through the basement and into the proposed OSD tank on Basement Level 4. The OSD tank volume and outlet control has been designed such that Council's PSD and SSR are satisfied. Further details of the OSD tank are outlined in Section 6.2.

7.2. Scenario Modelling

A MUSIC model was created to simulate existing conditions and post-development conditions. The post-development model was created based upon the proposed catchment extents as shown on drawing 22-1013-DAC1521. Source nodes for each of the proposed land uses within the Site have been based on default values contained within MUSIC.

The layout of the existing and post-development scenarios is presented in Figure 5.

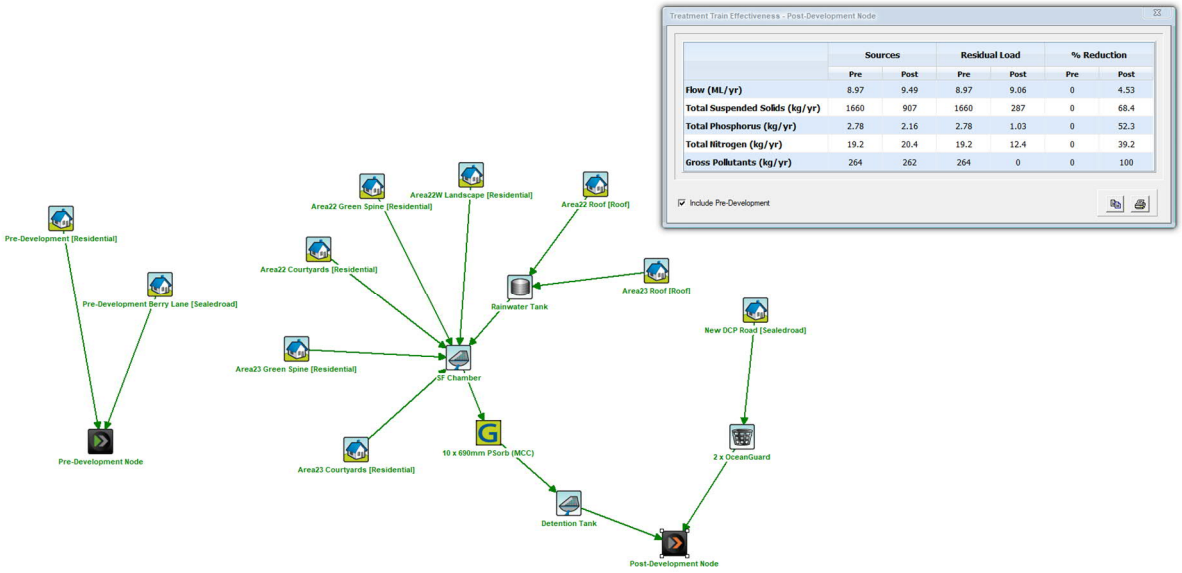


Figure 5: Existing and post-development MUSIC model layout

7.3. Performance against stormwater quality targets

MUSIC model results presented as mean annual loads at the receiving node indicate that the adopted stormwater quality target reductions are achieved, as shown in Table 5.

Table 5: Summary of MUSIC model results

Parameter	Sources – Pre-Development	Sources – Post-Development	Residual – Post-Development	Pollutant Reduction (Post-development to pre-development)
TSS (kg/yr)	1660	907	287	82.7%
TP (kg/yr)	2.78	2.16	1.03	62.9%
TN (kg/yr)	19.2	20.4	12.4	35.4%
Gross pollutants (kg/yr)	264	262	0	100%

The MUSIC model results presenting pollutant reduction as a proportion of post-development average annual load (including mitigation measures) compared to pre-development mean annual load demonstrate that the proposed stormwater management measures will satisfy the adopted NorBE stormwater quality targets, being at least a 10% reduction on pre-development mean annual loads for TSS, TP and TN.

Cumulative frequency graphs showing concentrations of TP and TN under pre-development and post-development conditions are presented as Figure 6 and Figure 7 respectively. These figures show that the concentrations of TP and TN under post-development conditions will be less than pre-development between the 50th percentile and the 98th percentile.

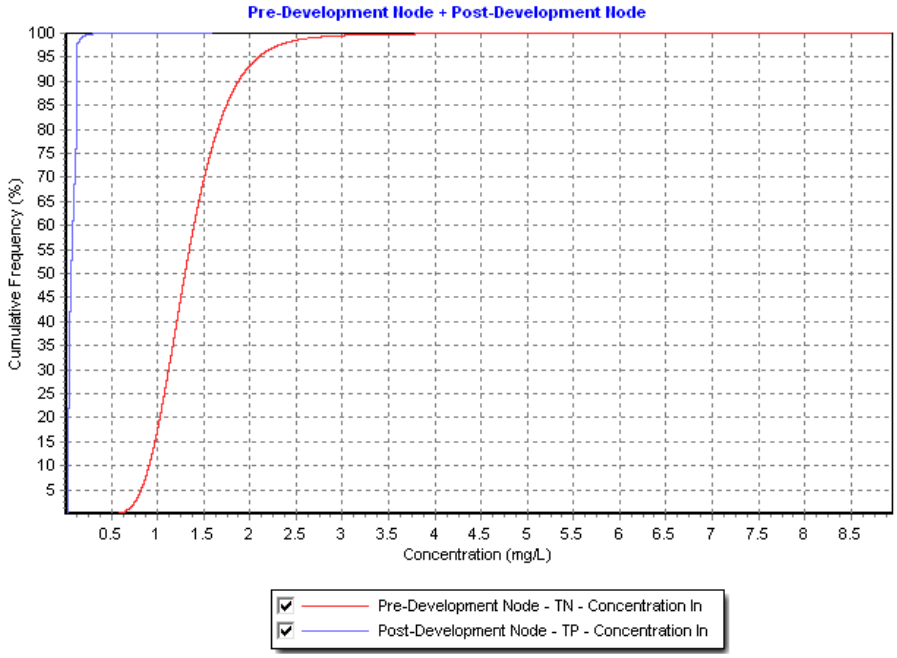


Figure 6: Cumulative frequency graph for TP under pre-development and post-development conditions

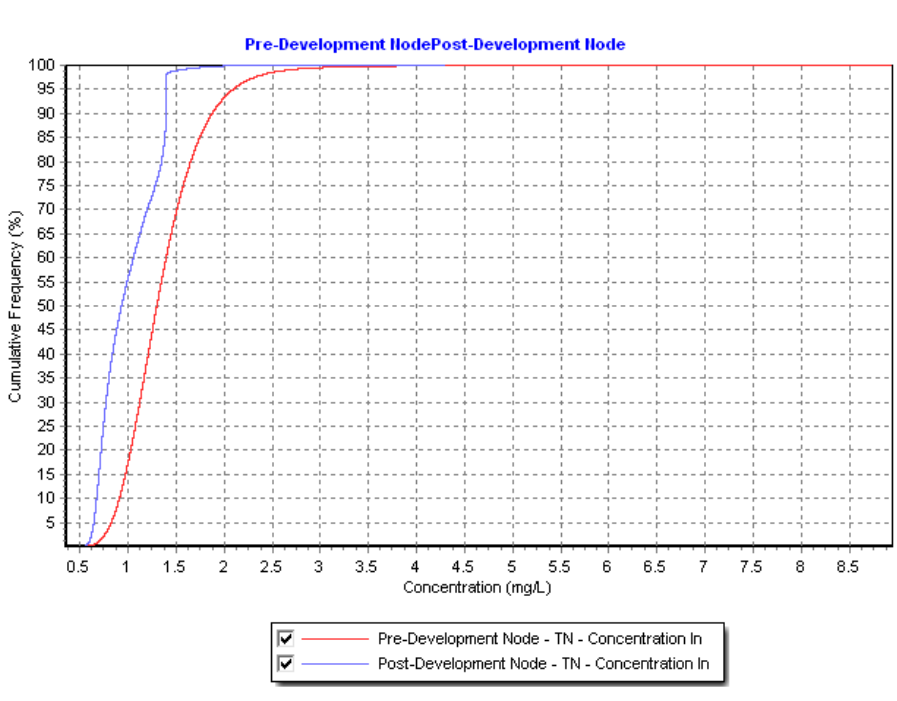


Figure 7: Cumulative frequency graph for TN under pre-development and post-development conditions

Based on the treatment train effectiveness and cumulative frequency of TP and TN concentrations, the proposed stormwater management measures described above will satisfy the adopted NorBE criteria for stormwater quality improvement.

8. Road Design

8.1. Design Criteria

The proposed new DCP Road and adjustments to River Road and Berry Road that will be required as part of the development have generally been designed in accordance with the following standards and guidelines:

- *Lane Cove Development Control Plan, Part C Locality 8 (St Leonards South Precinct)*
- Austroads *Guide to Road Design*
- Australian Standards including:
  - AS2890.5 – Parking facilities: On-street parking
  - AS1742 – Manual of uniform traffic control devices
  - AS1428 – Design for access and mobility

8.2. New DCP Road

The design of the new DCP Road is consistent with the objectives for access within the St Leonards South Precinct (refer to extract of the LCDCP presented in Figure 8).

Figure 8: St Leonards South Precinct Access Network (LCDCP 2010)

8.3. Design Vehicles

The layout of the new DCP Road and intersections at River Road and Berry Road have been designed to accommodate an 8.8 metre long medium rigid vehicle (MRV). Parameters for the design vehicle have been adopted from Austroads *Guide to Road Design*.

An option for an interim Y-head turning bay within the Area 22 green spine has been presented on drawing 22-1013-DAC1802. This shows the dimensions required for an 8.8m MRV.

8.4. Design Speed

The new DCP Road has been designed on the basis of a 60 km/h design speed and 50km/h signposted speed.

8.5. Road Geometry and Width

Road geometry design has been generally undertaken in accordance with the typical section adopted in the LCDCP, reproduced below as Figure 9.

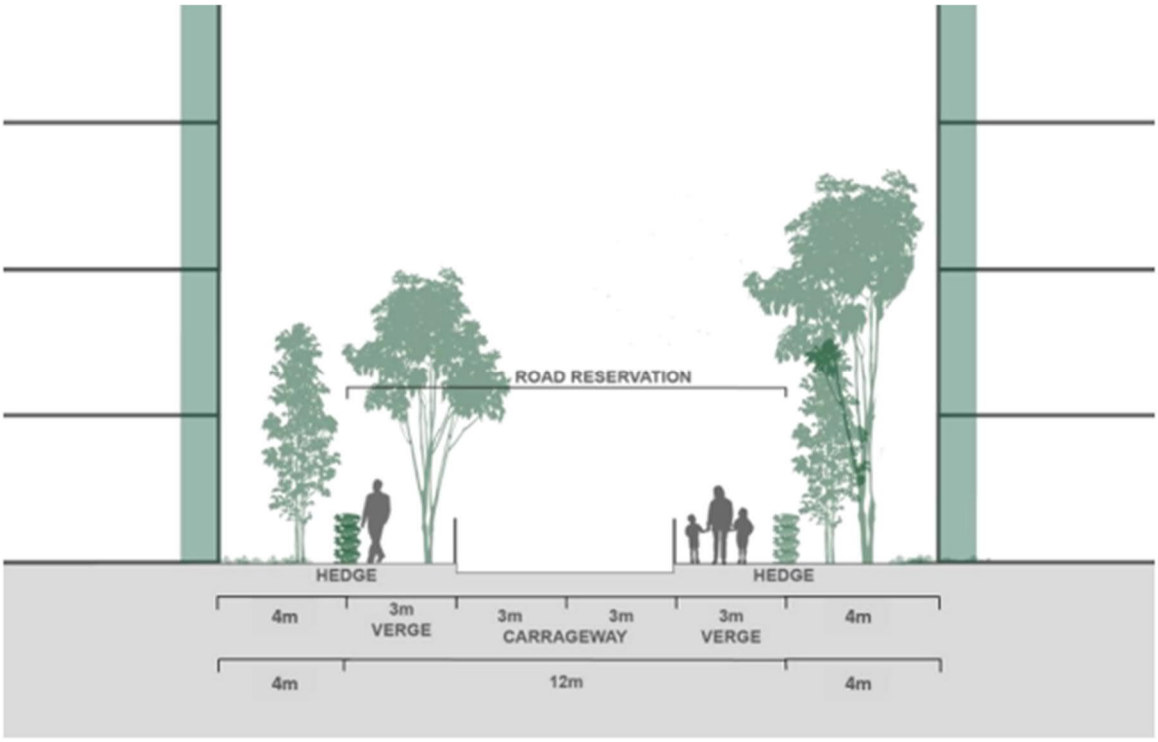


Figure 9: Typical section of new DCP Road adopted in the LCDCP

The typical section adopted is presented on drawing 22-1013-DAC1004. Key parameters are:

- Carriageway width = 6 metres (2 x 3m lanes)
- Southern verge width = 3 metres
- Northern verge width = 3 metres
- Kerb only on the northern side of the carriageway
- Kerb and gutter on the southern side of the carriageway

Kerb returns for the new DCP Road have been designed to accommodate the swept path of the design vehicle and are in accordance with Council's engineering design and construction specifications.

The roads and intersections have generally been designed to ensure that geometric design criteria relating to sight distances and aesthetics (K-values) have been achieved.

Appendix A

Civil Development Application Drawings

at&l

NORTH SYDNEY
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