STORMWATER MANAGEMENT PLAN

PROPOSED RESIDENTIAL DEVELOPMENT

PROPOSED LOT 1, 52A TWEED RD, BOWENFELS NSW 2790

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Document Information

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Contents

1. INTRODUCTION

1.1. Background

Samana Blue Engineering Pty. Ltd. have been engaged to prepare a Stormwater Management Plan (SMP) suitable for submission to Lithgow City Council (LGC) for a proposed residential development.

1.2. Revision D

Revision D of this report accommodates a minor increase in the traffic turning areas adjacent to Lots 6 and 7. An updated layout is provided in the Appendix of this report.

1.3. Property Details

The proposed development is situated on proposed lot 1 of a 1-into-2 subdivision located at 52A Tweed Rd, BOWENFELS NSW 2790 within the LGC area. The existing land area and titles are given in Table 1 below.

Table 1 - Existing Site Details

Title	Lot 11 DP1155154
Street Address	52A Tweed Rd, BOWENFELS NSW 2790
Site Area (total)	9,700m^2
Zoning	R1 - General Residential

The site location is shown in Figure 1.

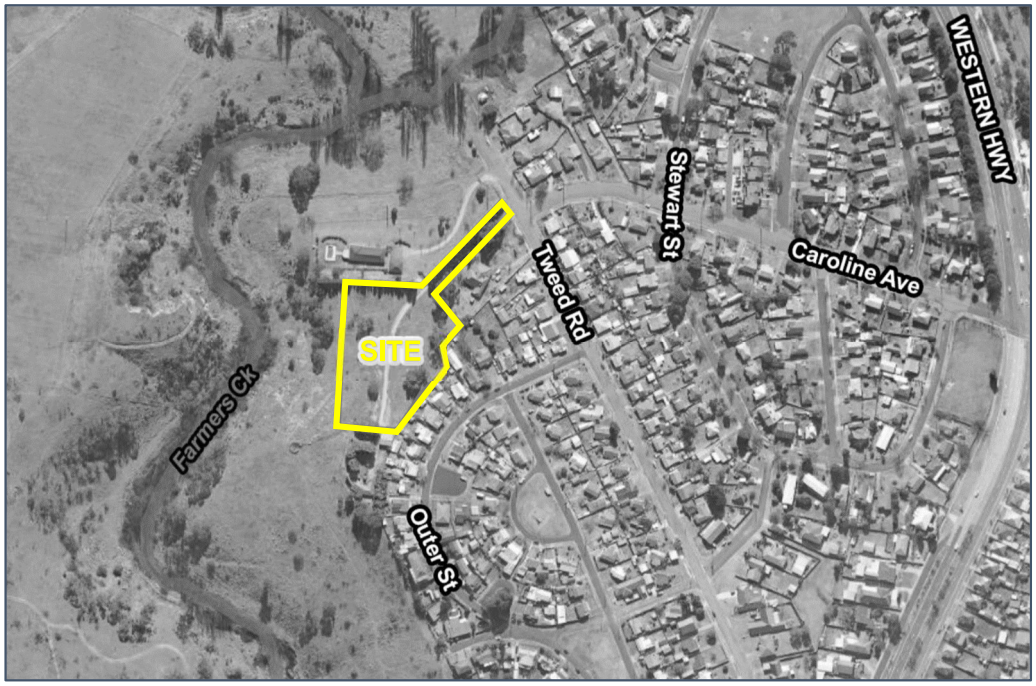


Figure 1 – Locality Map

1.4. Existing Site Features

The subject site is located on the western side of Tweed Rd, refer Figure 1. The site is currently vacant grassland with a gravel accessway. The total area occupied by the subject site is approximately 9,700m^2.

A local watercourse (Farmers Ck) runs close to the western site boundary and continues in a southerly direction towards the Coxs River / Lake Lyall. Under existing conditions, a portion of the western side of the site drains directly to this creek (see also Figure 2). The remaining site area grades towards Tweed Rd, where it then is collected by the local pit / pipe network and directed into Farmers Ck slightly north of the subject site. Under proposed conditions, a small portion of the developed site will continue to drain to Tweed Rd, while the remainder will be directed to Farmers Ck through a (new) easement.

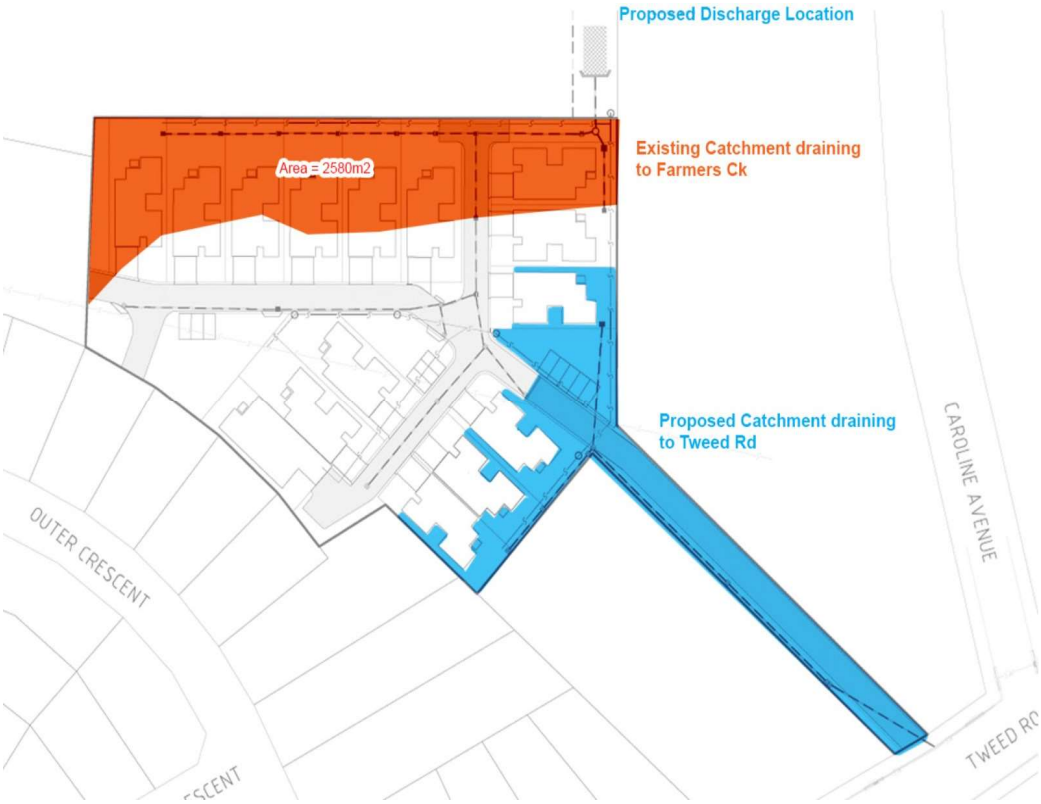


Figure 2 – Existing and Proposed Catchments

1.5. Surrounding Land Use

The subject site is surrounded predominately by R1 - General Residential zoning, with some E4 – Environmental Living zoning further to the west.

2. PROPOSED DEVELOPMENT

The proposed development is for a residential development to be assessed under the relevant LGC planning requirements and specifications.

The proposed development comprises of:

- New access driveways
- Multiple small bio-retention basins
- Rainwater tanks
- Stormwater infrastructure
- Sewer and Water Infrastructure

For more information, refer to the concept civil engineering plans given in Appendix 1 – Select Civil Engineering Plans.

2.1. External Catchments

The subject site does not have any notable external catchments. Minor flows from adjoining properties may be directed around the site without causing any nuisance.

2.2. Lawful Point of Discharge

The lawful points of discharge are per discussion in Section 1.4 above.

3. STORMWATER QUANTITY ASSESSMENT

The aim of the stormwater quantity assessment is to ensure that the development proposed shall impose no negative effects on adjacent or downstream properties or to receiving water bodies. Furthermore, this assessment is carried out to ensure that the conveyance of flows will be in a safe manner with minimal risk of human endangerment as well as the following objectives:

- Address the need for stormwater quantity control measures;
- Confirm that there is no negative impact associated with increase in peak stormwater discharges from the subject site for events up to and including a 1% Annual Exceedance Probability (AEP);
- Certify that all quantity control measures will detain and convey flows in accordance with relevant minimum freeboard requirements.

3.1. Proposed Development and Associates Issues

As noted in Lithgow City Council's "Guidelines for Civil Engineering Design and Construction for Development" (February 2012), Onsite Detention (OSD) is sometimes required for developments where the downstream drainage network has insufficient capacity. Given that we propose to direct the stormwater runoff from most of the subject site to Farmers Ck directly, we do not believe the Tweed Rd system will be overloaded by the proposed development. Thus, we do not believe that OSD will be necessary for this development.

3.2. Pre-Development Strategy

No OSD is required, therefore pre-developed analysis is not necessary. Refer Section 3.1.

3.3. Post-Development Strategy

No OSD is required, therefore post-developed analysis is not necessary. Refer Section 3.1.

3.4. Stormwater Quantity Modelling

No OSD is required, therefore quantity modelling is not necessary. Refer Section 3.1.

3.5. Flooding Considerations

A review of the LGC's online mapping indicates the site is clear of any flooding overlays.

4. STORMWATER QUALITY ASSESSMENT

This assessment investigates any pollutant related issues associated with stormwater runoff and evaluates possible water quality treatment methods. The aim of this assessment is to evaluate and determine the best possible practical solutions for improving the water quality of the subject site's stormwater runoff.

The quality assessment aims to provide the following:

- Removal of Nitrogen and Phosphorous
- Removal of Gross Pollutants and Suspended Solids
- Design such that all impervious areas will pass through appropriate treatment measures
- Treatment device selection criteria that adhere to best practice and, WSUD engineering guidelines
- Provision of engineering diagrams showing the stormwater quality treatment of the proposed development.

4.1. Construction Phase – Erosion & Sediment Control

There is an increased risk of erosion and sediment movement associated with the large area of disturbed land accompanying a projects construction phase. As such, measures should be implemented to mitigate erosion on-site throughout the construction phase. Erosion and Sediment Controls (ESC) shall be designed and further outlined in a construction management plan, or otherwise given by the project's contractor. As a minimum, measures should be adopted throughout the lifecycle of a project as follows:

4.1.1. Pre-construction

ESC measures are to be implemented prior to any earth disturbing activities take place.

4.1.2. Construction

ESC measures are to be maintained to acceptable standards, as specified by project management and any given drawings.

4.1.3. Pre-Operational

ESC measures may only be removed once approved by project management.
Stabilisation measures should be implemented to disturbed areas to mitigate any further erosion and sediment movement.

4.2. Operational Phase – Water Quality Management & MUSIC Model

The subject site falls within the WaterNSW "Warragamba Catchment", and as such the requirements of WaterNSW to achieve Neutral or Beneficial (NorBE) will apply to the proposed development. Water quality modelling was undertaken by Stormwater360 (now OceanProtect) using MUSIC. MUSIC (Model for Urban Stormwater Improvement Conceptualisation) was developed by the Co-operative Research Centre (CRC) for Catchment Hydrology and is designed to evaluate conceptual stormwater treatment designs by simulating the performance of stormwater quality improvement measures and comparing with water quality targets.

The adopted MUSIC model parameters were as follows:

- MUSIC version 6.3;
- "Using MUSIC in Sydney's Drinking Water Catchment" Sydney Catchment Authority (Dec 2012);
- Rainfall Station for MUSIC Climate Zone: "Zone-4" (Figure 3.1);
- Sydney Catchment Management Authority (CMA) Source Node(s) utilizing modified % impervious area, rainfall threshold, soil properties & pollutant concentrations;
- No drainage routing between nodes.

With respect to Rainwater re-use we have assumed:

- An annual demand of 825 kL per year for external (landscape watering) use, corresponding to 55 kL per year for each of the 15 dwellings, as noted in the relevant CMA table;
- A daily demand of 14.1 kL per day for internal use; we have assumed an Urban dwelling, 4-bedroom, re-use for toilets-laundry-hotwater-other (100%) as noted in the relevant CMA table, which corresponds to 0.94 kL/day for each of the 15 dwellings.

Catchment area delineations as modelled are depicted in Figure 3.

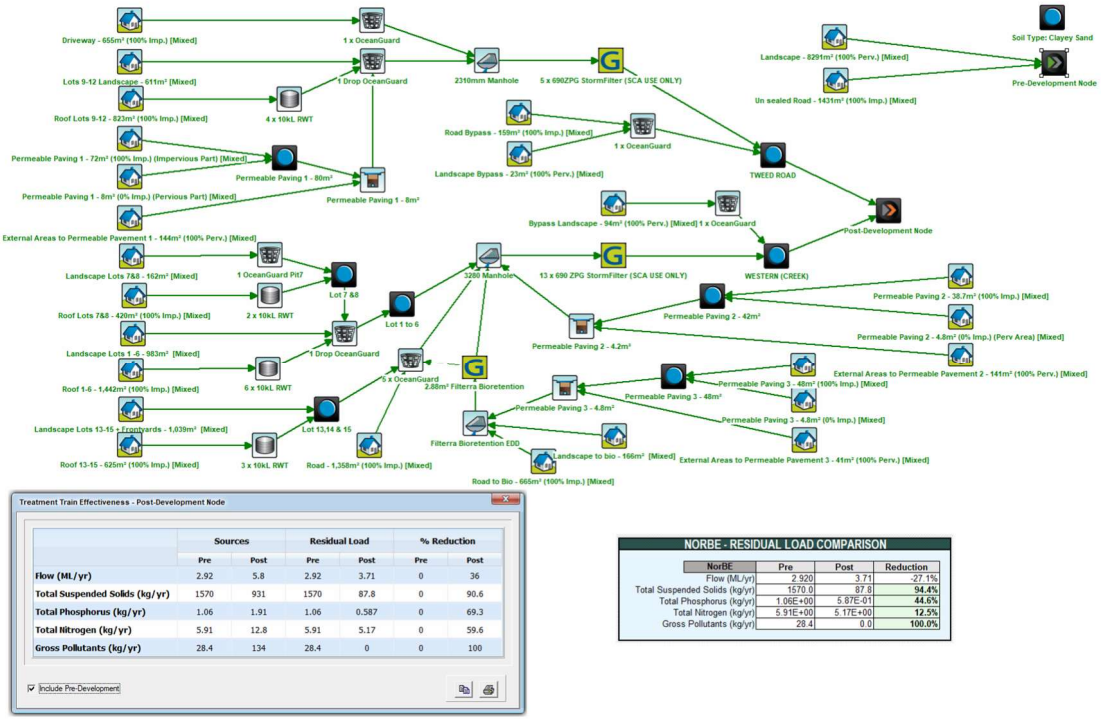
Figure 3 – MUSIC Model Catchments

The following WSUD measures are required to be implemented to achieve NorBE targets:

A. All dwellings are to be provided with a 10 kL Rainwater tank (RWT);
B. The catchment draining to Tweed Rd requires Ocean Protect OceanGuard pit baskets in all driveway pits, and 5 x 690 mm ZPG cartridges within a Ø2310 precast manhole with a minimum internal depth of 1,100 mm at the end of the driveway;

C. A portion of the internal driveway (draining to Farmers Ck) will drain to small bio-retention areas located at the edge of the driveway. A total bio-infiltration area of 2.88 m^2 is required;
D. The catchment draining to Farmers Ck will additionally require Ocean Protect OceanGuard pit baskets and 13 x 690 mm ZPG cartridges within a Ø3280 precast manhole with a minimum internal depth of 1,100 mm.

MUSIC model results are detailed below in Figure 4 and Table 2. These results indicate that the NorBE targets will be achieved for the proposed development, provided that the treatment train is implemented as described in this report.



Treatment Train Effectiveness - Post-Development Node

	Sources		Residual Load		% Reduction	
	Pre	Post	Pre	Post	Pre	Post
Flow (ML/yr)	2.92	5.8	2.92	3.71	0	36
Total Suspended Solids (kg/yr)	1570	931	1570	87.8	0	90.6
Total Phosphorus (kg/yr)	1.06	1.91	1.06	0.587	0	69.3
Total Nitrogen (kg/yr)	5.91	12.8	5.91	5.17	0	59.6
Gross Pollutants (kg/yr)	28.4	134	28.4	0	0	100

Include Pre-Development

NORBE - RESIDUAL LOAD COMPARISON

NorBE	Pre	Post	Reduction
Flow (ML/yr)	2.92E+00	3.71E+00	-27.1%
Total Suspended Solids (kg/yr)	1.57E+03	8.78E+01	94.4%
Total Phosphorus (kg/yr)	1.06E+00	5.87E-01	44.6%
Total Nitrogen (kg/yr)	5.91E+00	5.17E+00	12.5%
Gross Pollutants (kg/yr)	2.84E+01	0.0E+00	100.0%

Figure 4 – MUSIC Model Results

Table 2 – MUSIC Model Results

Pollutant	Pre-dev	Post-dev (no treatment)	Post-dev (with WSUD)
Total Suspended Solids [kg/yr]	1,570	931	87.8
Total Phosphorus [kg/yr]	1.06	1.91	0.587
Total Nitrogen [kg/yr]	5.91	12.8	5.17
Total Gross Pollutants [kg/yr]	28.4	134	0

All internal stormwater drainage is to be designed and constructed in accordance with AS3500.3, alongside all other relevant standards and guidelines.

For drawings refer to the civil engineering plans in Appendix 1 – Select Civil Engineering Plans.

4.3. On-Site Treatment Lifecycle Costs

A lifecycle cost analysis is not within the scope of this report. The chosen water treatment devices shall be wholly contained within the site and shall be maintained and serviced by the relevant body corporate.

4.4. Water Quality Monitoring

Water monitoring is deemed unnecessary for the scale of this project, as such no monitoring is proposed at current.

4.5. Maintenance

It will be the responsibility of the relevant body corporate to implement a maintenance program in accordance with the manufacturers recommendations and upkeep the suggested bio-retention basins and treatment devices as necessary.

4.6. Stage 1 Previous Approval

Previously stage 1 was approved which incorporated the civil works (roads, drainage etc) and 3 (out of the 15 eventual residential dwellings). The Ocean Protect modelling in this report (as well as the previously approved report) confirms that NorBE targets are reached for the entire 15 dwellings. Figure 5 and Table 3 below were the previous Stage 1 results.

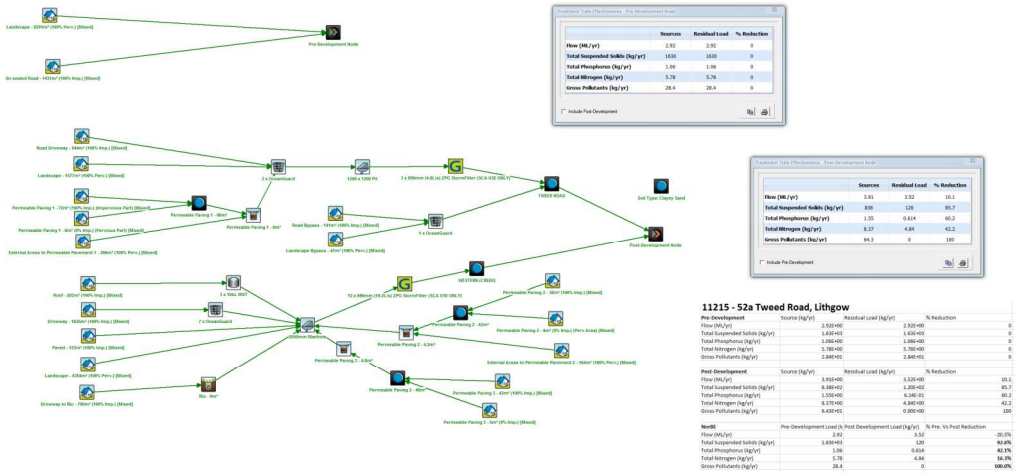


Figure 5 – MUSIC Model Results Stage 1 only

Table 2 – MUSIC Model Results Stage 1 only

Pollutant	Post-dev (no treatment)	Post-dev Stage 1 (with WSUD)
Total Suspended Solids [kg/yr]	1,630	120
Total Phosphorus [kg/yr]	1.06	0.61
Total Nitrogen [kg/yr]	5.78	4.84
Total Gross Pollutants [kg/yr]	28.4	0

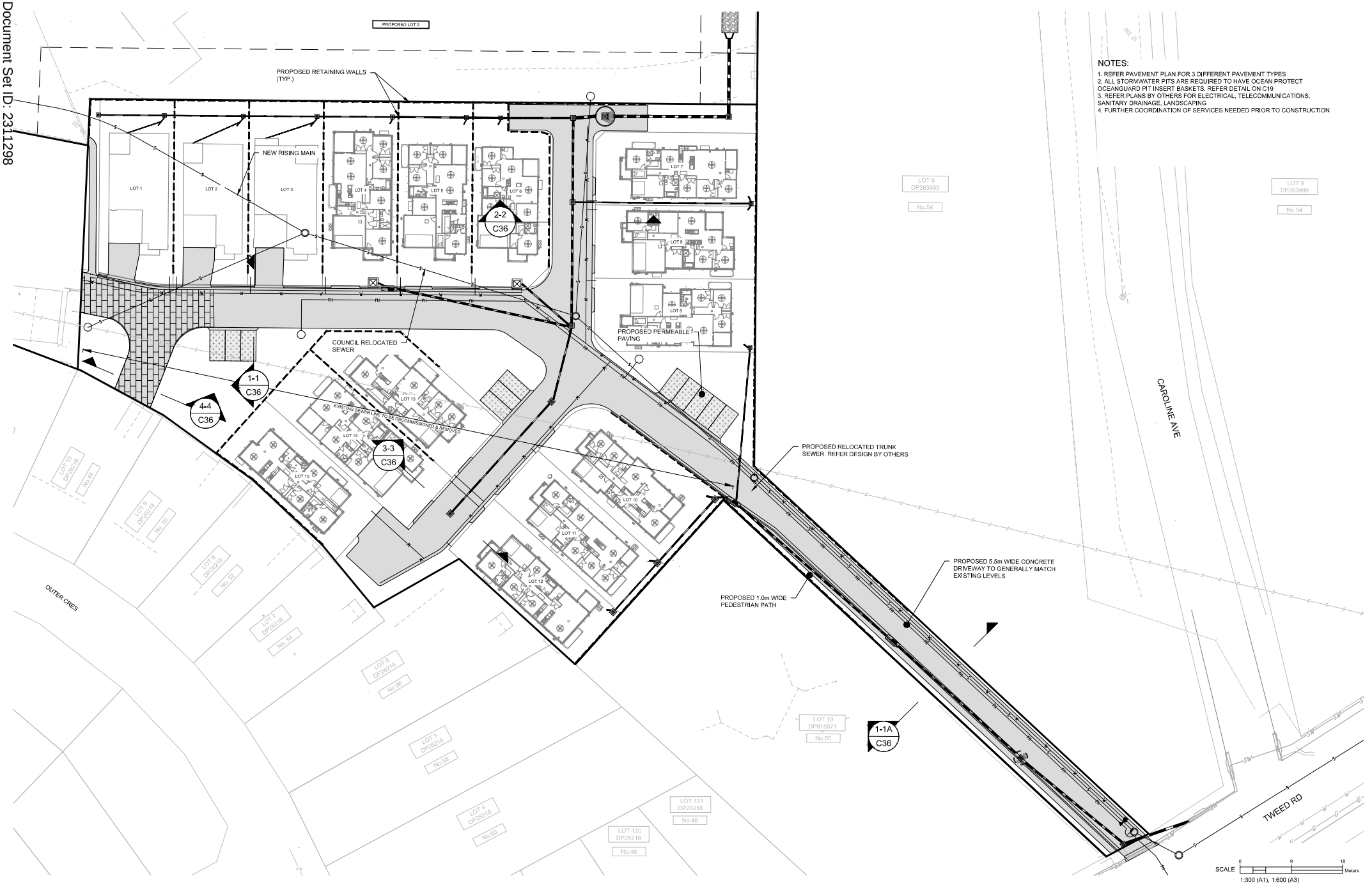
5. CONCLUSION

As discussed within Section 3, we conclude that:

- No Onsite Detention will be required, noting that the majority of the site will discharge directly to Farmers Ck under proposed conditions.
- WSUD measures will be required as described in this report, in order to achieve WaterNSW NorBE targets.
- NorBE targets are reached for the entire 15 dwelling development with the recommended WSUD elements.

Appendix 1 – Select Civil Engineering Plans

The updated layout plan has been attached in the following page.



NOTES:
1. REFER PAVEMENT PLAN FOR 3 DIFFERENT PAVEMENT TYPES
2. ALL STORMWATER PITS ARE REQUIRED TO HAVE OCEAN PROTECT OCEANGUARD PIT INSERT BASKETS. REFER DETAIL ON C19
3. REFER PLANS BY OTHERS FOR ELECTRICAL, TELECOMMUNICATIONS, SANITARY DRAINAGE, LANDSCAPING
4. FURTHER COORDINATION OF SERVICES NEEDED PRIOR TO CONSTRUCTION

CIVIL ENGINEERING

REV	DESCRIPTION	BY	DATE
B	ISSUED FOR REVIEW	TG	
A	ISSUED FOR REVIEW	TG	29.07.2024

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DESIGN: SK
DRAWN: TG
DWG SIZE: A3

OVERALL CIVIL WORKS PLAN

PROPOSED RESIDENTIAL DEVELOPMENT
52A TWEED RD, BOWENFELS NSW 2790

2021045IFC - C08 B