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PLL CONTRACTORS

SOIL EROSION AND DRAINAGE MANAGEMENT PLAN AND SITE-BASED STORMWATER MANAGEMENT PLAN FOR ALLOTMENT 39 IN D93426, RENMARK WEST

MARCH 2026

Document Control

Details and distribution

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Revision	Date	By	Nature of change	Checked By	Approved By
1	27/03/2026	Estelle O'Donohue Aarohi Singhel	Draft	Adrian Crocetti	Estelle O'Donohue

Executive Summary

This report has been completed by Neilly Group Pty Ltd to provide drainage, erosion and sediment control services, water quality assessment, and analysis to support optimised stormwater management at Allotment 39 IN D93426, Renmark West (55 Arumpo St, West Renmark). The report contains the following project information:

- site location details
- Soil Erosion and Drainage Management Plan
- Site-based Stormwater Management Plan.

The Soil Erosion and Drainage Management Plan (SEDMP) sets out the on-site requirements for erosion and sediment control (ESC) during construction, and the Site-based Stormwater Management Plan (SBSMP) demonstrates how stormwater will be managed in terms of both quality and quantity, ensuring that the proposed development does not increase flows to downstream catchments or contribute additional pollutants that may impact the environment.

1. Documentation provided for assessment

1.1. Soil Erosion and Drainage Management Plan

The Soil Erosion and Drainage Management Plan (SEDMP) for Allotment 39 in D93426, Renmark West identifies the site as moderate risk for erosion based on the *Protecting Waterways Guidelines (Department of Infrastructure and Transport, 2021)*. The primary contributors to erosion risk include site clearing, topsoil removal, service installation, earthworks, building construction, and landscaping.

The SEDMP ensures sediment is captured onsite, runoff is controlled, and pollutant loads are minimised, protecting downstream waterways and ensuring compliance with regulatory requirements.

1.2. Site Based Stormwater Management Plan

According to LiDAR data, the site is generally flat and stormwater runoff currently sheet-flows across the site. The 12.48-hectares site will be configured into 48 rural neighbourhood lots. As part of preparing this report, Neilly Group also developed a concept road design, which provided an opportunity to redefine sub-catchments through road profile adjustments. This approach enables the majority of runoff to be directed to a bioretention basin and retention basin via roadside swales and pipes (refer to Figure 1 for swale and bioretention basin locations). Under this arrangement:

- 7 Lots fronting Arumpo St (Lots 1 to 3, Lots 44 to 48):
    i) Roof runoff will be collected by 15kL rainwater tanks, with overflow directed to roadside swales.
- Remaining 41 allotments (Lots 4 to 44):
    i) Roof runoff will be collected by 15kL rainwater tanks
    ii) Surface runoff from each lot will be directed towards roadside swales through profiling the properties.

iii) Stormwater collected within the swales will then be captured by grated inlet pits (GIPs) and conveyed via underground stormwater pipes to the bioretention basin and retention basin.

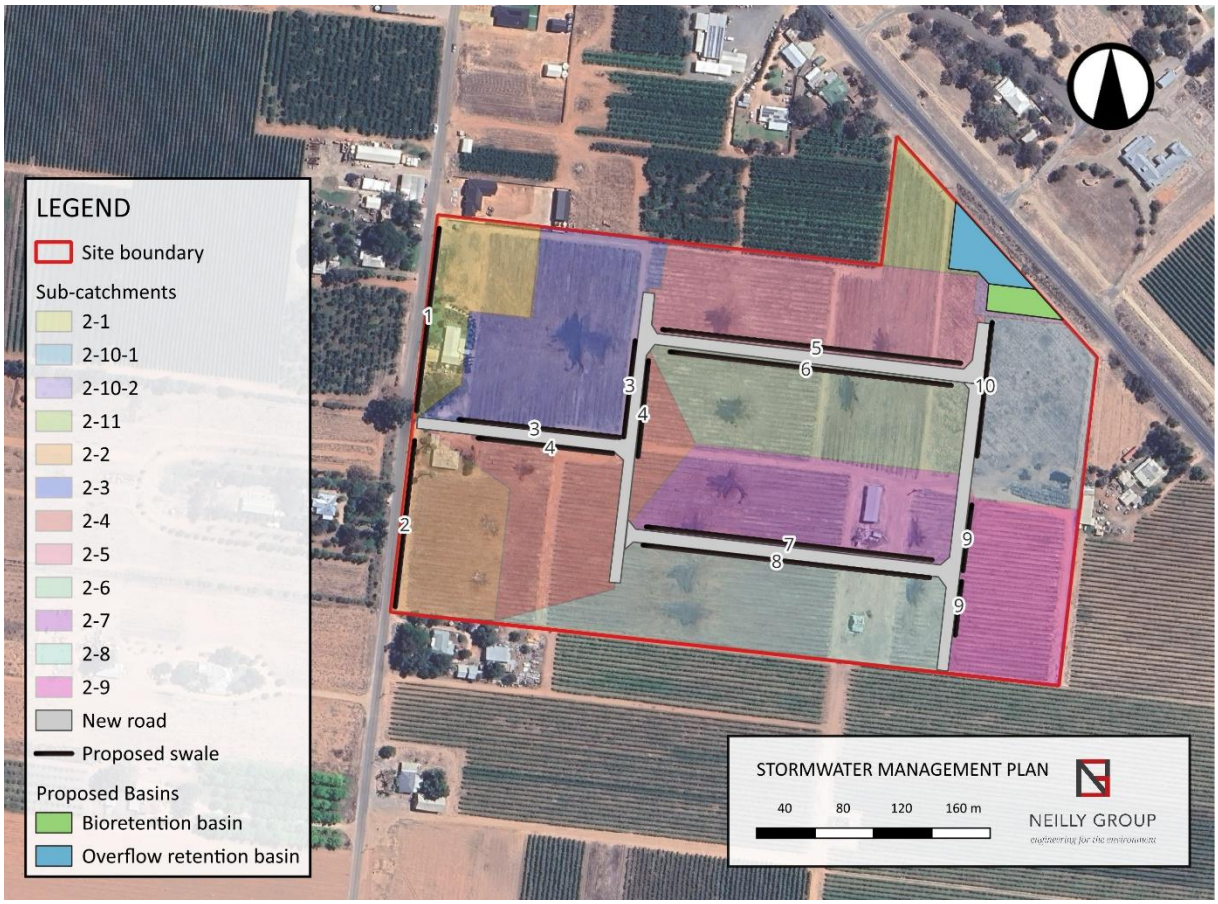
DRAINS and MUSIC models were developed to assess catchment behaviour and evaluate the effectiveness of the proposed solutions.

2. Results

Modelling results indicate that, while development is expected to increase flows and pollutant loads, the implementation of the recommended mitigation measures would achieve reductions in both stormwater quantity and pollutant loads relative to pre-development conditions.

3. Recommendations

Neilly Group recommends the installation of swales, bioretention, and rainwater tanks to accommodate the additional impervious areas, reduce pollutant loads and to provide a stormwater harvesting and reuse function for the site.
Figure 1 shows the locations of the stormwater treatment train.



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Acronyms

Acronym	Meaning
ESC	Erosion and Sediment Control
GIP	Grated Inlet Pit
GP	Gross Pollutant
PET	Potential Evapotranspiration
SBSMP	Site-based Stormwater Management Plan
SEDMP	Soil Erosion and Drainage Management Plan
TN	Total Nitrogen
TP	Total Phosphorous
TSS	Total Suspended Solids
WSUD	Water Sensitive Urban Design

1. Introduction

Neilly Group Pty Ltd is pleased to undertake erosion and sediment control, water quality assessment and analysis for the optimised stormwater management at Allotment 39 in D93426, Renmark West (55 Arumpo St, West Renmark). Neilly Group have prepared a Soil, Erosion and Drainage Management Plan (SEDMP), and a Site-based Stormwater Management Plan (SBSMP) contained within this report. The site location is shown in Figure 2.

The SEDMP outlines the on-site requirements for soil, erosion and sediment control (ESC) during construction, based on the *Protecting Waterways Guidelines Attachment A, Environmental and Heritage Technical Manual October 2021 (Department of Infrastructure and Transport South Australia).* The SBSMP demonstrates how stormwater will be managed in terms of both quality and quantity, ensuring that the proposed development does not increase flows or contribute additional pollutants that may impact the environment.

A conceptual road design has also been prepared to support integrated infrastructure planning and is contained in a separate report.

Figure 2. Site boundary

This report contains the following project information:

- site location details
- SEDMP and erosion plan
- SBSMP including basin sizing, pipe sizing and rainwater tanks sizing.

2. Scope of works

The following steps have been undertaken to form a Soil Erosion and Drainage Management Plan and a Site-Based Stormwater Management Plan, including;

- Investigation of site characteristics
- Analysis of erosion risks
- Provide sediment and erosion control measures and approaches
- Provide water quality monitoring plan
- Produce Soil Erosion and Drainage Management Plan (SEDMP) for the site
- Analysis of catchment
- Identify suitably size and position stormwater treatment system via DRAINS modelling
- Conduct MUSIC modelling of the proposed treatment system in accordance with SA MUSIC Guidelines, including analysis of pollutant reduction rates Demonstration of stormwater management and mitigation strategies
- Produce a Site-Based Stormwater Management Plan (SBSMP) with basin layout, including sizing details and inlet and outlet requirements

3. Soil Erosion and Drainage Management Plan (SEDMP)

3.1. Site Characteristics

3.1.1. Project Details and Location

The site is situated approximately 5km west of River Murray and approximately 1.2km north-west of Bookmark Creek extension. The development proposes changing the current configuration of a single 12-hectare rural lot into the establishment of 48 Rural Neighbourhood blocks with dwellings, and construction of a new road. A portion of the property falls within 1956-flood extent, as shown in Figure 3. The property was protected from 2022-23 floods by levees, as shown in Figure 4. The proposed development plan is present in Figure 7.

3.1.2. Assumptions and Qualifications

This submission has been prepared based on the following assumptions and any variance from these assumptions may attract additional fees, depending upon the circumstances.

Any scope changes/modifications will be completed as an agreed variation to this proposal.

A revegetation plan has not been included in this draft SEDMP scope.

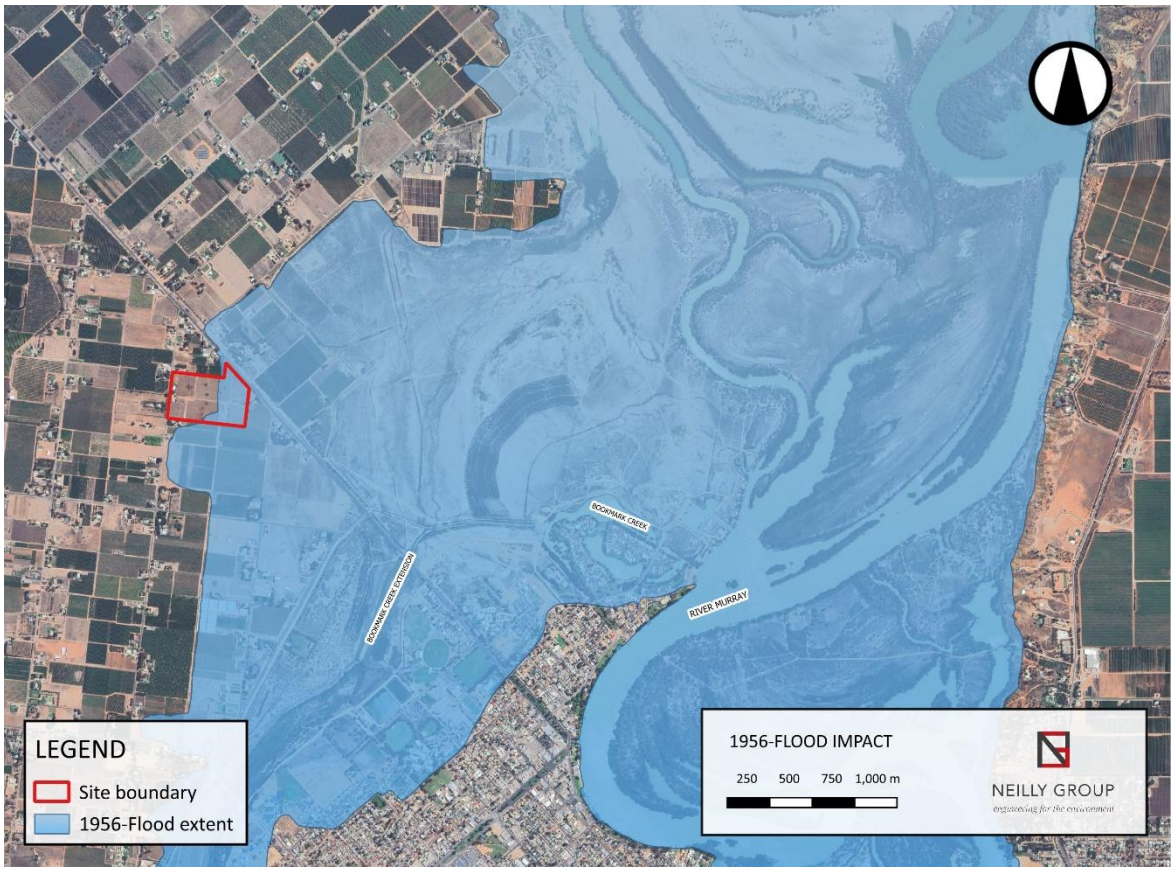


Figure 3. 1956-Flood extent

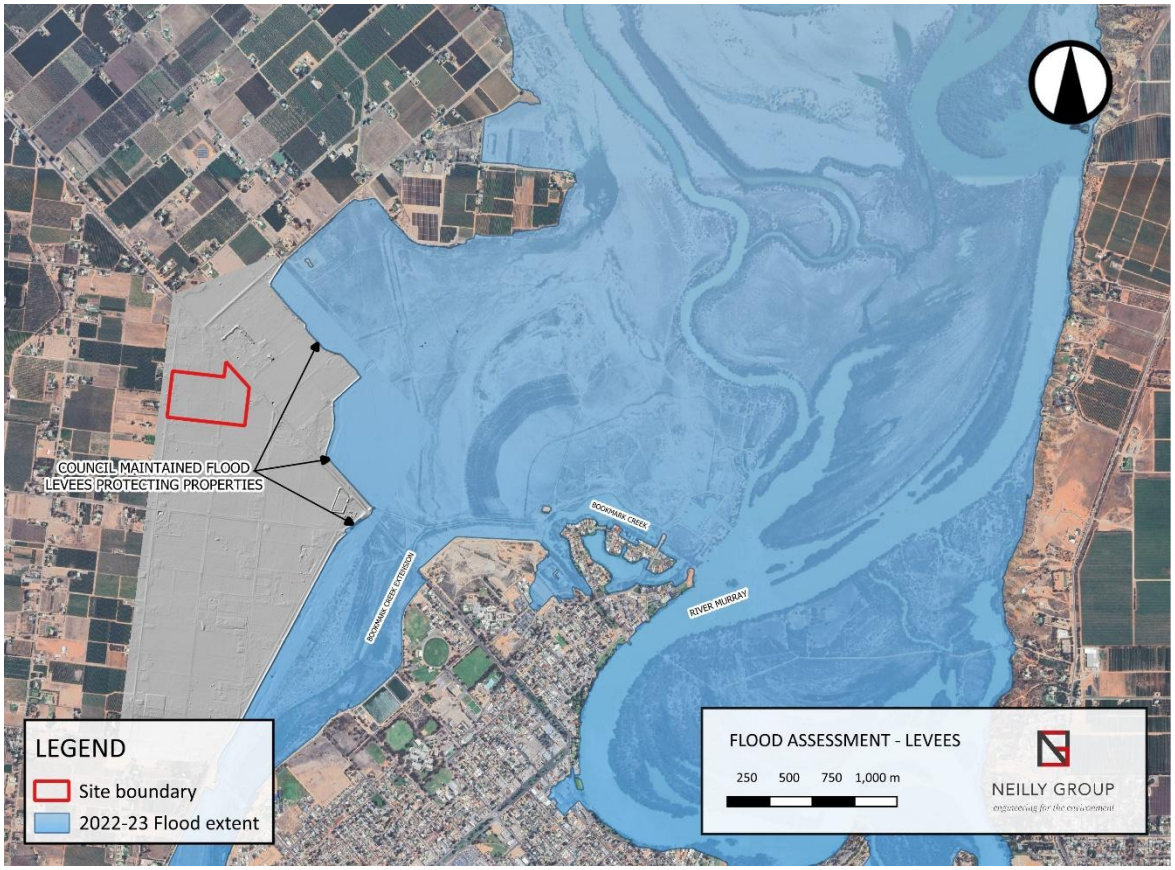


Figure 4. 2022-23 Flood extent and levees

3.1.3. Elevation Information

The elevations around the property were assessed to determine the elevation profiles and overflow patterns across the site (Figure 5).

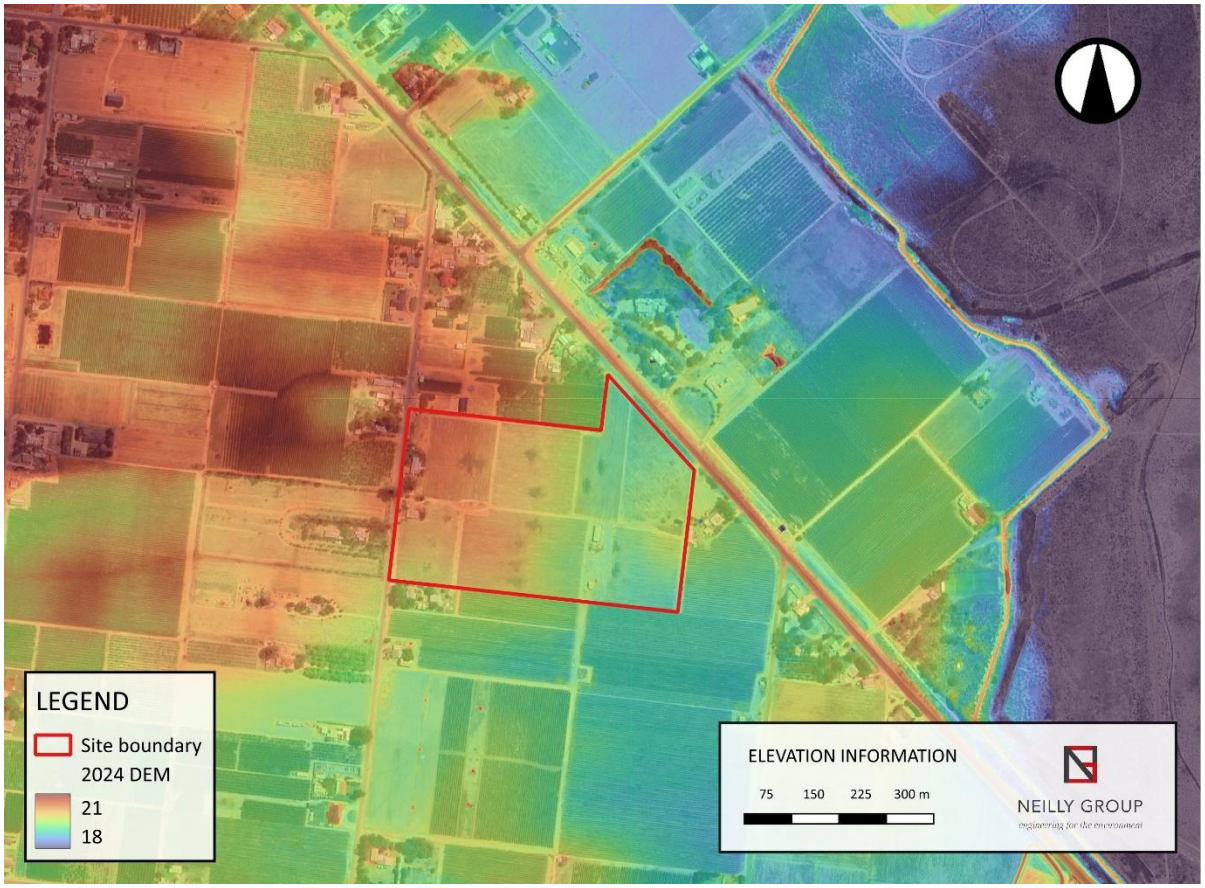


Figure 5. Elevation information

3.2. Erosion Management

3.2.1. Proposed Development

The development construction activities on site will include:

- Ancillary infrastructure setup – including establishment of a temporary site office and amenities, designated laydown area for receiving plant equipment and materials, vehicle parking areas, and installation of temporary heavy and light vehicle access tracks.
- Erosion protection works – to safeguard the site and downstream environment, the initial step will involve installation of sedimentation fencing along site boundaries and placement of a rock pad at the site entrance via the newly formed public road.
- Topsoil removal and management – excess material will be stripped and stored in a bunded hardstand area until redistributed across landscaped and stabilised areas following completion of bulk earthworks.
- Installation of services – provision of utilities including water, electricity, stormwater management, and sewerage infrastructure to support plant operations.

- Earthworks and site shaping – to prepare level platforms for processing facilities and associated infrastructure, works will be carried out in a staged manner to minimise sediment creation, with progressive stabilisation measures applied.
- Construction of processing facilities – including the primary lime and silica sand processing plant, associated storage sheds, and service buildings.
- Landscaping – landscaped buffer zones and open areas will be topsoiled, mulched, and planted out to provide long-term stabilisation and reduce erosion potential.
- Road re-laying and upgrades – the current easement laneway will be converted into a Council-owned public road, with final surfacing works scheduled after construction completion to minimise damage and ensure effective erosion control.

3.3. Erosion Risks

The activities that will contribute the largest erosion risk to the site include:

- Clearing and grubbing
- Topsoil removal
- Installation of services
- Earthworks
- Construction of buildings
- Landscaping

3.3.1. Approach

The SEDMP was followed to analyse and evaluate the potential water and erosion risks that can arise on site. The water quality, and erosion and sedimentation controls implemented on site will be regularly visually monitored throughout the planning, design, and construction phases. The parameters given in Table 2-4 and 2-5 of Protecting Waterways Guidelines, Environmental and Heritage Technical Manual Attachment 6A (Department of Infrastructure and Transport, 2021), categorise Allotment 39 in D93426 as a moderate-risk site.

The guidelines provide a SEDMP checklist (given in Appendix A) which was followed while preparing the concept plan shows the parametric ranges and scores for the Initial Soil Erosion Risk Assessment. The scores outlined in red represents the scores for the Allotment 39 in D934260, project site. The total of this score is 14.

Table 2 shows the level of risk and site assessment requirements for each score range. According to this, our project site is at moderate risk of erosion and a medium level SEDMP to be completed.

Table 1. Initial Soil Erosion Risk Assessment (Protecting Waterways Guidelines, EHTM Attachment 6A, Table 2-4)

Parameter	Ranges	Score
Location (for determining erosivity)	Areas over 500mm rainfall	2
	Other areas	1
Average slope before construction works (from topographical maps of the site)	Not greater than 2 percent	1
	Greater than 2 to 5 percent	2
	Greater than 5 to 10 percent	4
	Greater than 10 percent	8
Soil type by Universal Soil Classification (where there is more than one type, select the highest score)	Sandy soil or gravel	0
	Sandy loam	1
	Clay loam	2
	Clay soil	3
Expected duration of risk undertaken at any one time	3 months or less	1
	3 to less than 6 months	2
	6 to less than 12 months	4
	Longer than 12 months	8
Expected area disturbed at any one time	Less than 500 m^2	1
	More than 500 m^2 but not exceeding 1000 m^2	2
	More than 1000 m^2 but not exceeding 2500 m^2	4
	More than 2500 m^2	8
Sensitivity of receiving environment	Highly disturbed system	0
	Slightly to moderately disturbed system	2
	High conservation or ecological value system	4
	Total	14

Table 2. Details Required for SEDMP (Protecting Waterways Guidelines, EHTM Attachment 6A, Table 2-5)

Score	Level of Risk	Site Assessment Requirements
Over 20	Extreme	Detailed SEDMP High level of site management Third party auditing with regular (e.g. fortnightly or monthly) reporting to demonstrate compliance
16 to 20	High	Detailed SEDMP High level of site management Self-auditing with regular (e.g. fortnightly or monthly) inspections/reporting to demonstrate compliance
10 to 15	Moderate	Medium level SEDMP Self-auditing with regular (e.g. fortnightly or monthly) inspections/reporting to demonstrate compliance
0 to 9	Low	Simple SEDMP Self-auditing with regular (e.g. fortnightly or monthly) inspections/reporting to demonstrate compliance

3.4. Sediment Erosion Control Measures

3.4.1. Construction and Design to Minimise Soil Loss

The largest risk of erosion during the construction phase is when majority of the site will be cleared of all groundcovers until construction is complete. There is no distinct dry season in Renmark, see rainfall figure below (Figure 6), so works to be staged to ensure the shortest possible timeframes for delivery.

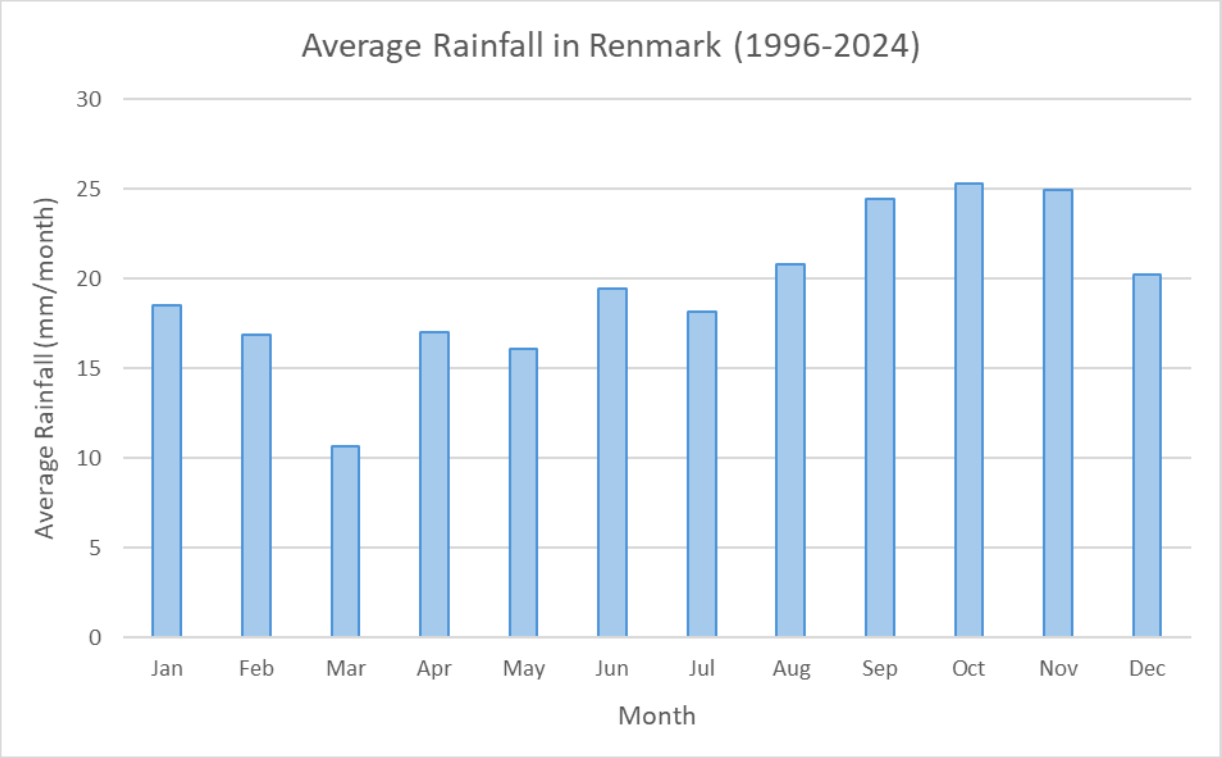


Figure 6. Monthly average rainfall in Renmark (Data Period: 1996-2025)

The construction and progressive rehabilitation of the site has been planned to minimise the erosion risk. The hierarchy of preferred measures to reduce soil loss are to implement

- **Drainage Controls** – minimise the quantity or velocity of runoff and occurrences for concentration
- **Erosion Controls** – prevent or minimise soil loss from the source
- **Sediment Controls** – minimise the movement of sediment off the site
- **Site access controls** – reduce movement of soil off site

1 Drainage Controls

Install drainage controls to separate clean upslope water from on-site runoff until the construction activities are completed, using diversion drains and berms to keep external flows out of disturbed areas. Manage on-site water through controlled drainage to sediment basin for treatment. Key strategies include shortening and slowing flows to reduce erosion, staging earthworks to limit exposed soil, and scheduling work based on rainfall triggers.

2 Erosion Controls

On disturbed ground, key measures include stabilising construction entry/exit with rumble pads and applying rapid groundcover such as hydromulch, tackifier or bonded fibre matrix on exposed soils prior to rainfall or idle for over 14 days. Stockpiles should be kept under 2 meters high, covered with geofabric or temporary seed/mulch, and encircled by silt fences.

Trenching should be staged with spoil placed upslope, backfilled and compacted same day, and inlet protection on connected pits. For steep slopes and batters, use erosion control blankets or jute mesh, bench long faces, and vegetate promptly.

If extended periods of rain or flooding is predicted then consider covering any bare soils with a soil binder such as a tackifier (Australasia International Erosion Control Association; Catchments & Creeks Pty Ltd, 2010 (Soil Binder)) to reduce sediment movement offsite.

3 Sediment Controls

The aim of the sediment controls is for total capture of any generated sediment laden water within the site and to exclude the external clean water drains from entering the disturbed works area. A suitable sediment fence (Australasia International Erosion Control Association; Catchments & Creeks Pty Ltd, 2009 & 2010 (Sediment Fence)) or earthen bund (300mm high) will surround the site and tie into the site entry point's rock pad.

All reasonable and practicable measures are taken to prevent, or at least minimise, the release of sediment from the site into any downstream drainage or stormwater systems.

4 Site Access Controls

A single access point to the site is specified on the ESC Plan to reduce movement of soil off site and onto the adjacent local roads.

An entry exit rock pad to be installed to IECA Best Practice Erosion and Sediment Control document (Australasia International Erosion Control Association; Catchments & Creeks Pty Ltd, 2010 (Rock Pads)) will ensure any soils attached to vehicles will be removed prior to exiting the site.

3.4.2. Construction Phasing

Construction will occur over approximately 6 months. The construction sequencing and timeframe will involve:

1) **Site preparation -** Install ancillary infrastructure including setup of a:
    - temporary site office and amenities
    - laydown area for receiving material
    - vehicle parking
    - temporary vehicle access tracks
2) **Erosion and sediment protection**
    - Install sedimentation fence around site per ESC Plan attached
    - Install Entry/Exit Rock Pad

3) **Topsoil Stripping**

- Undertake topsoil stripping of the site to minimum 200mm depth
- Stockpile soil in specified Laydown area or remove from site and dispose
- The immediate catchment for direct rainfall is such that all rainfall that occurs outside the works area will naturally drain away from the construction area.

4) **Service Installation o**f the following services and connect to existing or new connection points:
   - Water supply (RIT connection)
   - Electricity
   - Data
   - Stormwater
   - Sewer
5) **Earthworks**
   - Civil works to be completed
6) **Construction of Buildings**
   - Dwellings and storage buildings to be constructed
7) **Landscaping**
   - Complete landscaping and surface finishes across site
8) **Road Re-Laying**
   - Strip existing road surface to required depths
   - Lay new road finishes per designs attached

3.5. Construction Erosion Controls

3.5.1. Site Establishment Phase Controls

- Establishment of set areas for
- Office
- Laydown / Vehicle Park-up
- Laydown / Materials storage
- Vehicle access
- Hardstand and stockpile areas

3.5.2. Construction Phase Controls

- Installation of the sediment controls around the site to capture any sediment mobilised from earthworks
- Wash-down (using river water) any rock material while on the hardstand to minimise deposition of fines into the waterway

3.5.3. Rehabilitation Phase Controls

- Stabilise and apply surface finishes as soon as possible to completed areas.

3.5.4. Procedure In the event of on-coming rainfall

- No works are to occur when the site is wet or when rainfall is occurring
- Site inspection to ensure all runoff from the surrounding paddocks will flow away from the works area.
- Runoff will be directed away from the site prior to rainfall. Install additional drainage controls if necessary.

3.5.5. Surface Soil / Spoil Stockpiles

- Construct bunding around the hardstand (soil stockpile area) to ensure runoff is collected within the designated area
- Install geofabric or another temporary impermeable surface over surface stockpiles, OR
- Install tackifier or appropriate cover (geofabric, etc.) over the surface of the stockpiles, if windy or stormy weather is forecast
- Track walk and compact the battered area within safe operating limits

4. Site-Based Stormwater Management Plan (SBSMP)

4.1. Design concept and stormwater generation

4.1.1. Design concept

A concept road design was prepared by Neilly Group and overlaid onto the available feature survey (see Figure 7).

The total area of the development application is 12.48 hectares, comprising 48 allotments. Allotment sizes range from 2,070 m² to 2,931 m², with the exception of Lot 3, which has an area of 1,433 m².

It is proposed that roadside swales be constructed on both sides of the roads to collect stormwater runoff. Grated inlet pits (GIPs) will be located within the swales to capture stormwater, which will then discharge via pipes into two basins located within the large reserve area at the northeastern corner of the development site (see Figure 8).

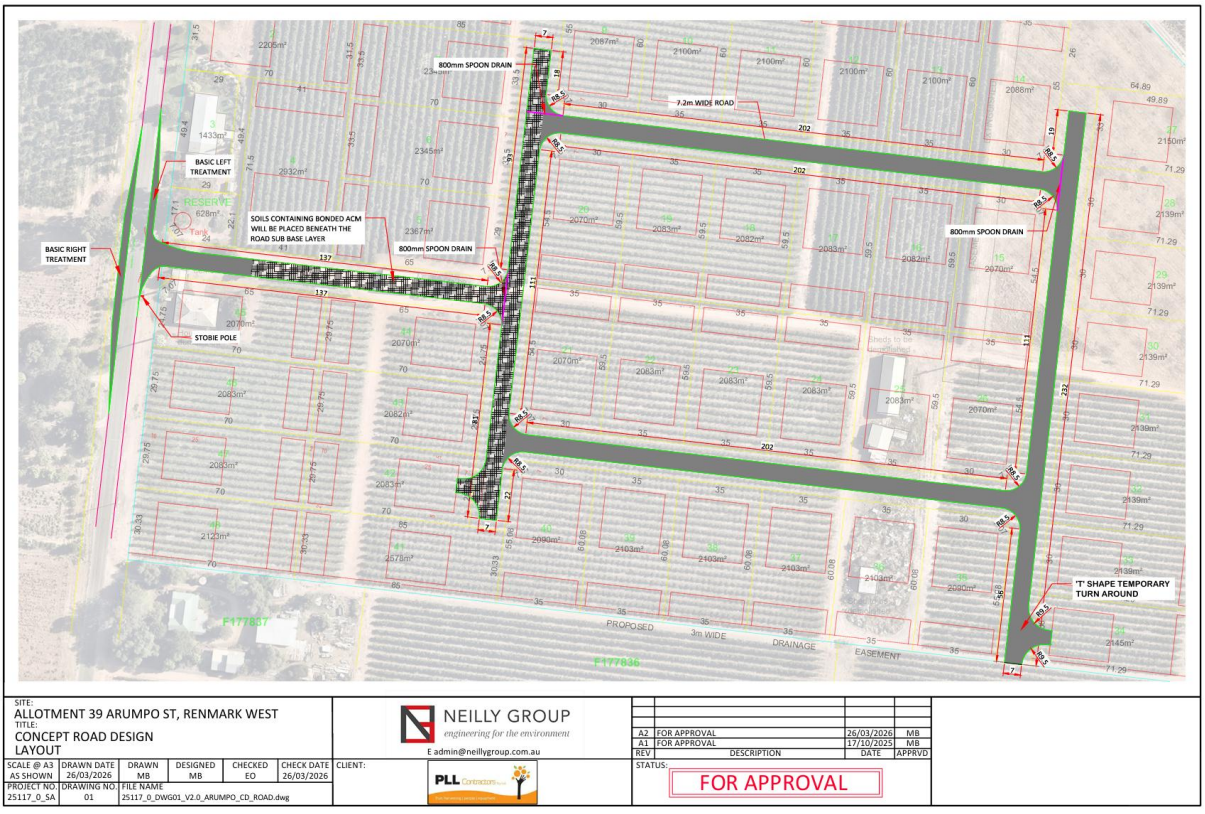
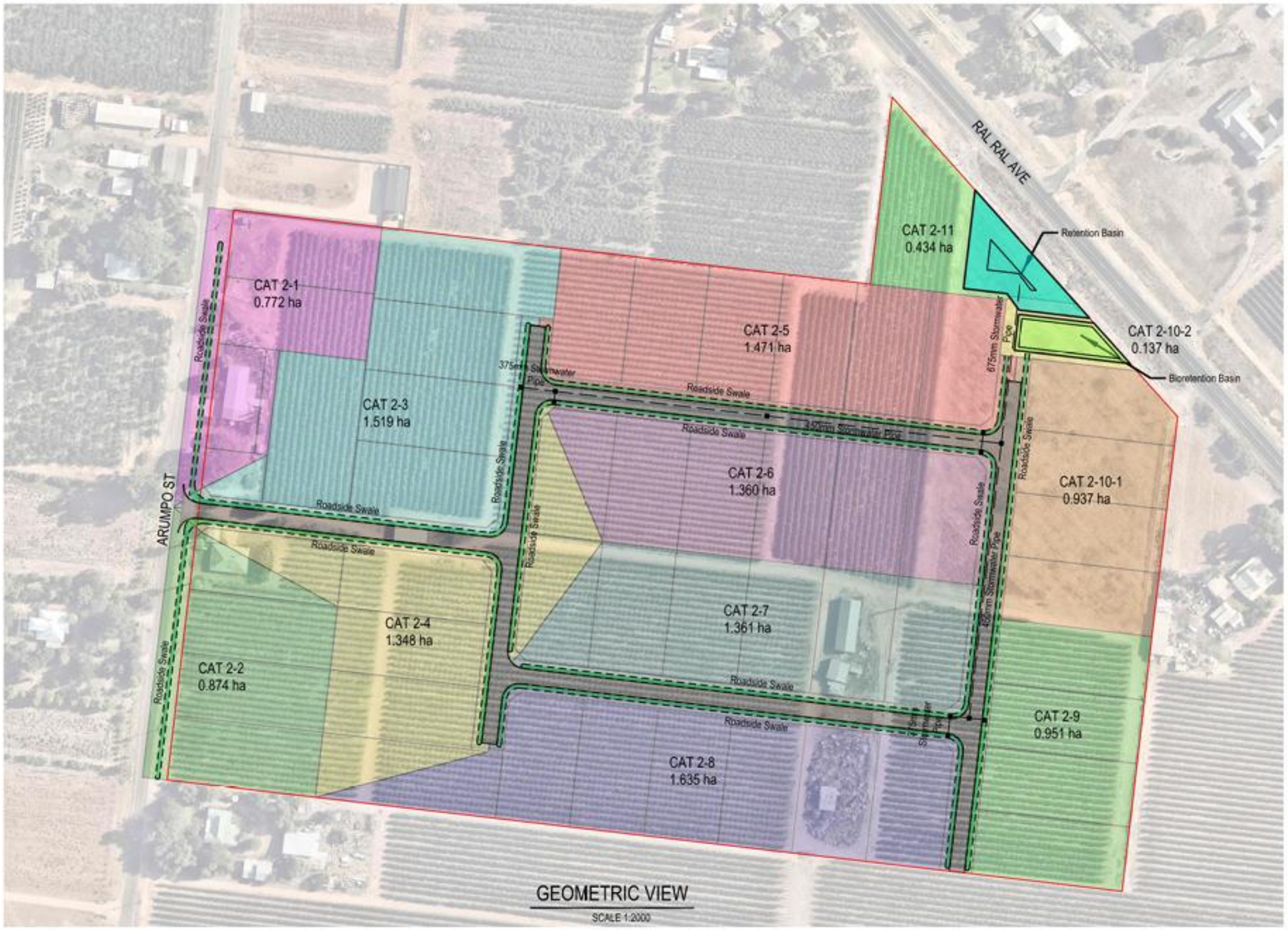


Figure 7. Concept Road Design Plan



NOTES:

ALL UNITS ARE IN MILLIMETERS UNLESS SHOWN OTHERWISE.

SITE: 55 ARUMPO STREET, RENMARK WEST, SA 5341					
TITLE: STORMWATER CONCEPT DESIGN					
SCALE @ A3	DRAWN DATE	DRAWN	DESIGNED	CHECKED	CHECK DATE
1:2000	23/03/2026	EO	EO	AC	25/03/2026
PROJECT NO.	DRAWING NO.	FILE NAME			
25117_0	1	25117_0_DGN_V1.0_55_ARUMPO_ST_SBSMP.DGN			

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CLIENT: PLL Contractors

REV	DESCRIPTION	DATE	APPRVD
A1	FOR APPROVAL	25/03/2026	AC

STATUS: FOR APPROVAL

Figure 8. Proposed Mitigation Measures

4.1.2. DRAINS modelling

A DRAINS model has been developed to size the basins and pipes based on the design concept described above. The model and associated results are presented in Appendix C.

IL-CL Model and Rainfall Data

Renmark is in an arid area without ARR loss values, so values from nearby Pinnaroo were used as a reference. Although rainfall is similar, soil differences mean slightly lower values were adopted for Renmark. These were then adjusted using Watercom's Climate Change Rainfall Modifier (CCRM).

The final loss parameters used in each model are provided in Table 3.

Design rainfall data was sourced from the ARR Data Hub and the Bureau of Meteorology (the Bureau).

Table 3. Loss parameters for hydrologic modelling.

	Initial Loss (mm)	Continuing Loss (mm/hr)
EXISTING CONDITIONS		
Impervious Area	2	0
Pervious Area	26	1.6
FUTURE CONDITIONS		
Impervious Area	2	0
Pervious Area	26	1.7

The critical events for the existing (pre-development) scenario, along with the corresponding stormwater peak flows and volumes, are summarised in Table 4.

Table 4. Critical events and stormwater volumes

Event	Critical Storm	Sub-catchment	Maximum Flow Rate	Volume
Minor Event	10% AEP, 3 hour burst, Storm 2	Pre-Development sub-catchment 1-1	0.229 m^3/s	777.2 m^3
		Pre-Development sub-catchment 1-2	0.188 m^3/s	553.6 m^3
			Total	**1330.8 m^3**
Major Event	1% AEP, 1.5 hour burst, Storm 3	Pre-Development sub-catchment 1-1	0.720 m^3/s	2079.7 m^3
		Pre-Development sub-catchment 1-2	0.576 m^3/s	1513.5 m^3
			Total	**3593.2 m^3**

The same storm events were subsequently used to assess the effectiveness of the proposed stormwater system.

Modelling results indicate that the proposed basins would effectively reduce runoff volumes flowing towards Ral Ral Avenue (see Table 6).

However, overflows within the roadside swales along Arumpo Street, in front of Lots 1 to 3 and 45 to 48, are considered unsafe.

Additionally, to achieve flood immunity up to the 10% AEP event, the overflows within swales would need to be reduced. Modelling confirms that the hydraulic grade line is constrained by invert levels; therefore, increasing basin capacity within the available space (without encroaching on the power cable easement) would not resolve this flooding issue.

Hence, it is proposed that the affected allotments be provided with rainwater tanks designed to capture all roof runoff.

Table 5. Post-development stormwater volumes

Event	Critical Storm	Sub-catchment	Maximum Flow Rate	Volume
Minor Event	10% AEP, 3 hour burst, Storm 2	Outlet Node to Ral Ral Ave (OUT 1)	0 m^3/s	0 m^3
		Outlet Node on Arumpo St (OUT 2)	0.076 m^3/s	279 m^3
			Total	**279 m^3**
		Change from Pre-development Scenario		*-1051.8 m^3*
Major Event	1% AEP, 1.5 hour burst, Storm 3	Outlet Node to Ral Ral Ave (OUT 1)	1.03 m^3/s	1693.5 m^3
		Outlet Node on Arumpo St (OUT 2)	0.245 m^3/s	577.8 m^3
			Total	**2271.3 m^3**
		Change from Pre-development Scenario		*-1321.9 m^3*

4.1.3. Rainwater Tank Sizing

Figure 9 presents the IFD (Intensity–Frequency–Duration) design rainfall depths for the site, obtained from the Bureau of Meteorology (BOM) website. The rainfall depth corresponding to a 5% AEP (1 in 20-year) event with a 10-minute duration has been adopted as the design rainfall.

Ten years of rainfall data from the nearby Renmark Irrigation SA station (Station No. 024003) were also downloaded from the BOM website to assess the suitability of the selected design rainfall event. Figure 10 compares the daily rainfall data from the past ten years with the adopted design rainfall depth. The analysis indicates that only 22 rainfall events (3.1%) out of 713 recorded events over the past ten years exceeded the adopted design rainfall depth.

The impervious and pervious area percentages have been assumed in accordance with the South Australian MUSIC Guidelines (Water Sensitive SA, 2021):

For rural residential areas smaller than 0.4ha per lot, the impervious fraction ranges from 10% to 25%. For rural residential areas greater than 0.4ha per lot, the impervious fraction ranges from 5% to 20%.

For this assessment, an impervious fraction of 25% has been conservatively adopted for each allotment.

The detention volume of each rainwater tank has been calculated using the following equation:

$$Vol\ (m^3) = Roof\ Area\ (m^2) \times Design\ Rainfall\ Depth\ (mm)/1000$$

Based on this calculation, it is proposed that each lot be provided with a rainwater tank with a minimum detention volume of 10kL.

IFD Design Rainfall Depth (mm)

Issued: 26 February 2026

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

Table | Chart

Unit: mm

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	1.10	1.32	2.07	2.63	3.23	4.11	4.84
2 min	1.87	2.23	3.48	4.44	5.47	6.97	8.21
3 min	2.54	3.03	4.74	6.03	7.43	9.46	11.1
4 min	3.12	3.73	5.83	7.42	9.13	11.6	13.7
5 min	3.62	4.34	6.78	8.64	10.6	13.5	15.9
10 min	5.44	6.53	10.2	13.0	16.0	20.3	23.9
15 min	6.63	7.96	12.5	15.9	19.5	24.8	29.2
20 min	7.52	9.02	14.2	18.0	22.1	28.1	33.2
25 min	8.23	9.87	15.5	19.7	24.2	30.7	36.2
30 min	8.82	10.6	16.6	21.1	25.9	32.9	38.7
45 min	10.2	12.2	19.0	24.2	29.7	37.7	44.4
1 hour	11.2	13.4	20.8	26.4	32.4	41.1	48.4
1.5 hour	12.8	15.2	23.4	29.7	36.3	46.0	54.2
2 hour	14.0	16.6	25.4	32.1	39.2	49.7	58.4
3 hour	15.9	18.7	28.4	35.7	43.6	55.0	64.5
4.5 hour	18.0	21.1	31.7	39.7	48.3	60.7	71.1
6 hour	19.7	23.0	34.3	42.8	51.8	65.0	76.0
9 hour	22.2	25.8	38.1	47.4	57.2	71.4	83.4
12 hour	24.0	27.9	41.0	50.9	61.2	76.2	88.8
18 hour	26.7	30.9	45.2	55.8	67.0	83.1	96.7
24 hour	28.5	33.0	48.1	59.3	71.1	88.1	102
30 hour	29.9	34.5	50.3	61.9	74.2	91.8	106
36 hour	30.9	35.7	51.9	64.0	76.6	94.7	110
48 hour	32.4	37.4	54.4	66.9	80.1	98.9	114
72 hour	34.2	39.5	57.2	70.4	84.2	104	120
96 hour	35.3	40.7	58.9	72.4	86.5	106	123
120 hour	36.1	41.6	60.1	73.7	87.8	108	124
144 hour	36.7	42.3	61.0	74.6	88.7	108	125
168 hour	37.4	43.1	61.8	75.4	89.4	108	125

Figure 9. IFD Rainfall Depth

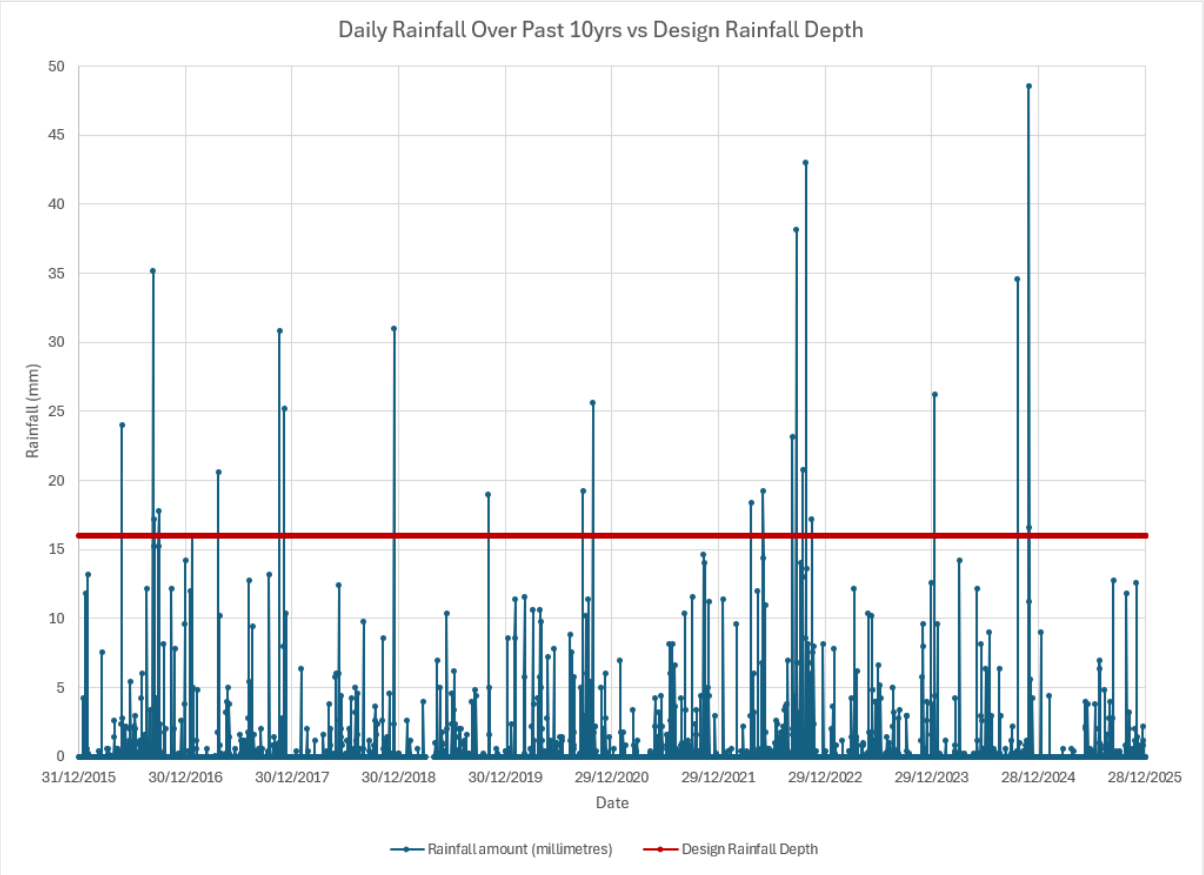

Figure 10. 10yr Daily Rainfall vs Design Rainfall

4.2. Model setup

4.2.1. MUSIC meteorological data

The meteorological data utilised for this project incorporated average monthly potential evapotranspiration (PET) values and rainfall data sourced from the Renmark Aero Station. MUSIC modelling was completed for the rainfall data period from 2001 to 2010.

4.3. Scenarios and modelling

Pre and post development Scenarios were developed in MUSIC to analyse the catchments and evaluate the outcomes of the recommended solutions.

MUSIC Scenario 1 (Figure 11) represents the site's existing condition as comprised of rural neighbourhood zone (per South Australian Planning & Design Code Zones). The current land use is defined as rural areas which drains out without any treatment.

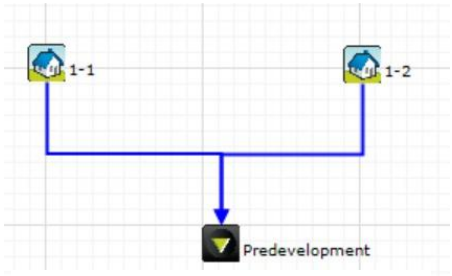

Figure 11. Scenario 1 MUSIC model

Scenario 2 (Figure 12 and Figure 13) shows long-term stormwater management and flood mitigation strategies. It consists of rainwater tanks, 10 swales, one bioretention basin with an overflow retention basin.

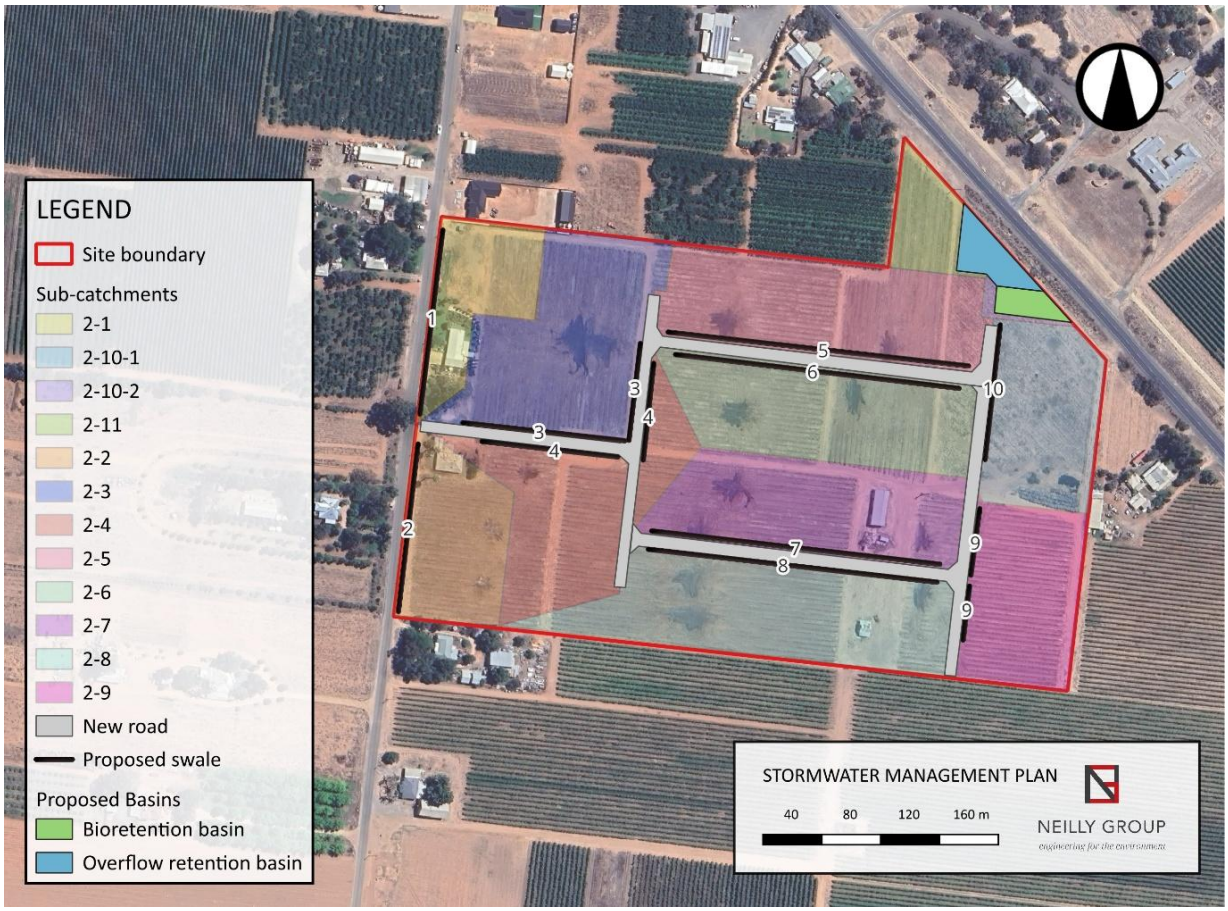

Figure 12. Scenario 2 map

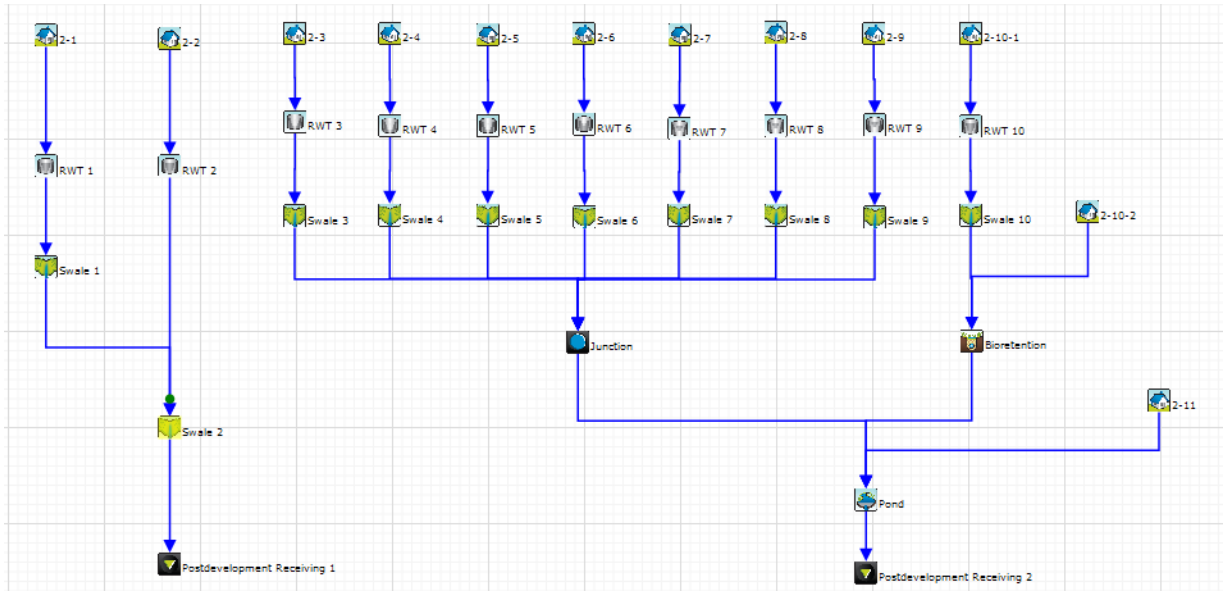

Figure 13. Scenario 2 MUSIC model

4.4. Modelling Results

4.4.1. Scenario 1 – Pre-development

The MUSIC model analyses the impact of existing catchment conditions on water quality. The results for Scenario 1 are summarised in Table 6 below.

Table 6. Scenario 1 MUSIC results

	Sources
Flow (ML/yr)	150.39
Total Suspended Solids (kg/yr)	23956.21
Total Phosphorus (kg/yr)	36.71
Total Nitrogen (kg/yr)	280.08
Gross Pollutants (kg/yr)	12.83

4.4.2. Scenario 2 – Post Construction

Roof runoff will be captured in individual 15 kL rainwater tanks, with overflow directed to roadside swales. These swales will collect allotment overflow and road runoff, which will be conveyed via grated inlet pits (GIPs) and underground pipes to a bioretention and/or retention basin.

The proposed stormwater management measures include rainwater tanks, swales, a bioretention basin, and a retention basin. MUSIC results are shown in Table 7.

Table 7. Scenario 2 MUSIC results

	Pre-development	Post-development	Post-development with mitigation strategies		
	Sources	Sources	Combined Residual Load	% Reduction	Comparing with Pre-development
Flow (ML/yr)	150.39	170.63	133.19	22%	-17.20
Total Suspended Solids (kg/yr)	23,956.21	28,526.26	14,312.58	50%	- 9,643.63
Total Phosphorus (kg/yr)	36.71	43.51	26.83	38%	-9.88
Total Nitrogen (kg/yr)	280.08	331.24	239.76	28%	-40.32
Gross Pollutants (kg/yr)	12.83	1038.15	0.00	100%	-12.83

MUSIC results (Table 7) show improved stormwater quality compared to both the post-development scenario and also pre-development scenario, with significant reductions in pollutant loads.

5. Recommendations and Conclusion

MUSIC modelling result highlighted the significant impact of land development on stormwater quantity and quality across all phases. While the predevelopment condition produces minimum runoff, the post construction phase generates increased pollutant loads. MUSIC model for post-development stormwater management shows reductions in TSS, TP, TN and GP by 50%, 38%, 28% and 100%, respectively.

Stormwater runoffs and overflows will be captured via roadside swales, collected through grated inlet pits (GIPs), and conveyed via underground pipes to a bioretention basin and/or retention basin.

It is recommended that allotments be equipped with rainwater tanks to improve flood immunity and enable stormwater reuse.

References

This report has referenced the following documents and links which Neilly Group has permission to share:

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Attachment A: SEDMP Checklist

The following sub-sections detail some key factors to be considered when developing a SEDMP:

Earthworks

- Undertake earthworks in a manner that conserves topsoil and minimises disturbance. Separate topsoil and store for use in rehabilitation.
- Avoid any soil disturbance beyond the limit of approved development.
- Where possible, avoid disturbance to areas of high or extreme erosion risk.
- Use appropriate treatment measures to treat runoff.
- When necessary, install erosion and sediment control structures before the commencement of site disturbance and construction works.
- Schedule earthworks to retain as much protective ground cover as possible at all times.
- Program site stabilisation and revegetation as soon as possible after completion of earthworks.

Drainage

- Divert off site and "clean" drainage around disturbed areas.
- Intercept and redirect runoff on the site to protect exposed areas.
- Where appropriate, install sediment detention basins early so that site drainage can be directed to them as soon as possible.
- Consider the impact of all works including minor works such as service trenches, pavement cutting.

Treatment Train Approach

- Use a treatment train approach to minimise erosion and velocity of runoff to reduce the need, size and cost of sediment collection basins. For example:
- Locate catch (diversion) drains above proposed cuttings where upslope drainage is into the cutting area;
- Construct diversion drains to protect slopes by directing intercepted drainage to a stable outlet;
- Construct batter toe or catch drains to collect runoff from batter slopes. Direct to drainage system or watercourse;
- Protect minor drainage lines to slow water velocities and filter sediment with measures such as sand bags, hay bales, silt fences, gabions or local materials. Typically, these are suitable for drainage areas of less than 0.5 hectares. Construct level spreaders to convert concentrated flows to sheet flow at non-erosive velocities. Direct sheet flow across stabilised, vegetated areas; and
- Where conditions permit, use grass filter strips as a simple sediment trapping measure. These are more effective on low gradient slopes.
- Where possible retain or convert site treatment measures for operations phase water quality treatment. Sediment detention basins may be either temporary, or can be integrated into the operations-phase treatment system. For example, a sediment basin used in construction may be converted at a later stage into a sediment trap upstream of a wetland system.

Site Facilities

- Ensure site facilities such as depots, access tracks and stockpile sites are identified and established in appropriate locations.
- Ensure sediment controls around these areas where there is an erosion risk exists.
- Ensure sediment controls at site exits such as shaker ramps, washdown bays or street sweeping to minimise off site sediment from vehicles.

Landscaping and Rehabilitation

- Begin rehabilitation of disturbed areas as soon as possible after final land formation for each area. Options available include installation of the permanent landscape or a temporary cover of

a sterile or non-seeding grass species (e.g. sterile rye grass), chipped or mulched vegetation, biodegradable mats or soil binders.

Inspection and Monitoring

- Regularly inspect and maintain all treatment devices on site. Check that suitable site measures are in place prior to rain events. After each significant runoff event, inspect treatment devices for damage or clogging by silt or debris and replace or clean out as necessary.
- Ensure temporary drainage measures such as diversion channels are in place on site at the end of each day, particularly if rain is forecast.
- Ensure all environmental authorisation conditions are complied with.
- On sensitive sites, where appropriate, or where required by contract or licence conditions, undertake water quality monitoring to effectively manage the site. Such monitoring should be undertaken simultaneously up stream and down stream of the site and include stream flow.
- Inspection and management measures should be documented as part of the records of implementation of the SEDMP and Weekly Site Reports and be made available to the contract manager. Records should include details of rainfall; water quality testing (if required); the effectiveness of site management measures and any modifications proposed; and other matters which contribute to the level of performance of work practices.
- If inspection and monitoring indicates a notable failure in the SEDMP, the source of the failure should be investigated and remediation measures undertaken and procedures modified, as appropriate.

Site Waste Management

- Minimise the risk of pollution from other construction activities by adopting the following:
  - Appropriate collection and disposal of wastes;
  - Undercover storage and suitable bunding of materials such as paints, chemicals, fuel etc;
  - Suitable disposal of washdown waters from cleaning vehicles;
  - Discharge of wastewater and wash water in an approved manner to a sewer (if applicable), or approved disposal site.

Further waste management and chemical storage requirements are detailed in the Department's Master Specification.

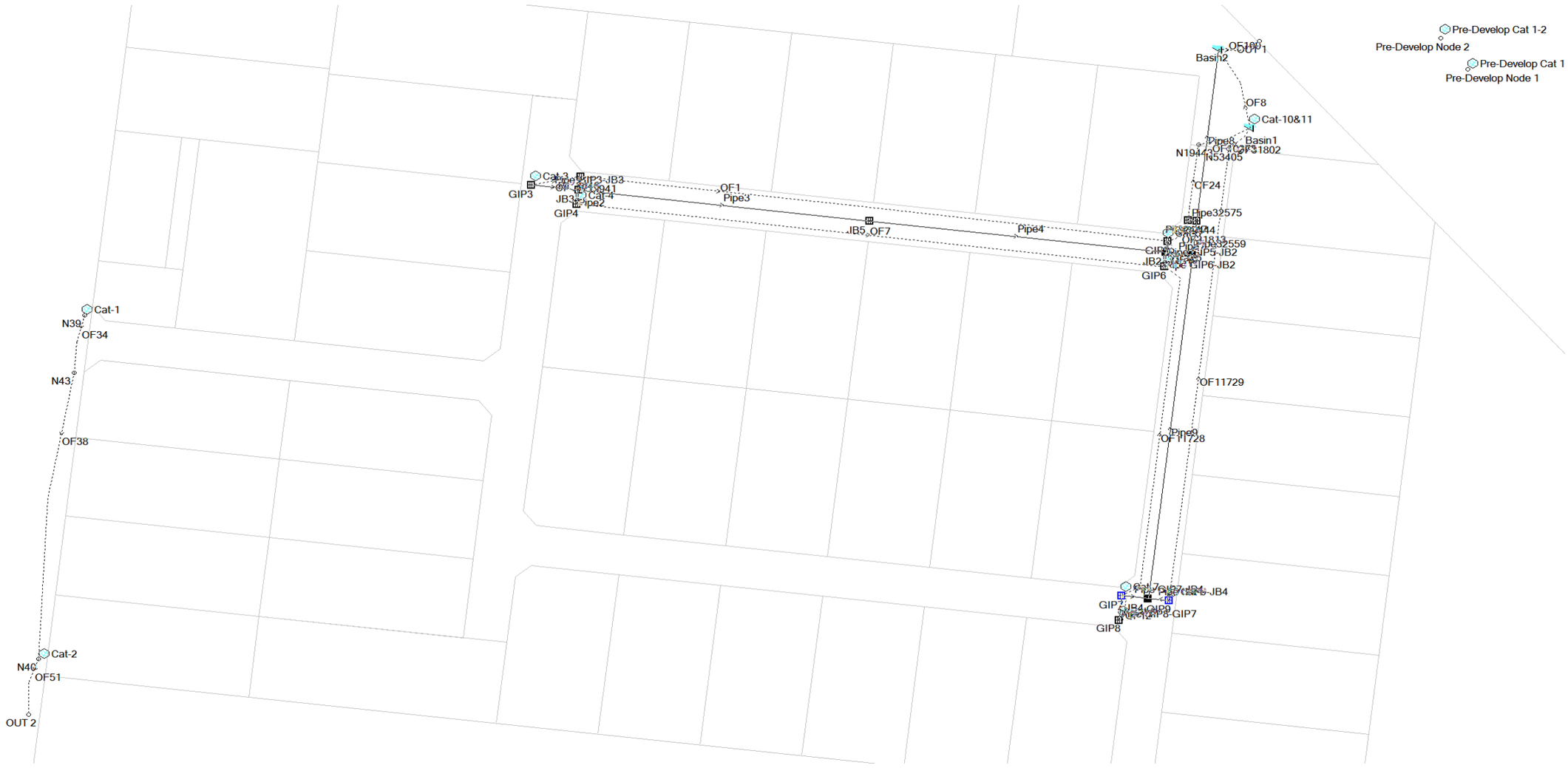
Attachment B: Water Quality Monitoring Checklist

Section	Checklist Items	Remarks
1. General Information	☐ Project name and location ☐ Construction activities affecting water quality ☐ Receiving waters issues ☐ Regulatory requirements (EPA, council, permits) ☐ Key personnel responsible for monitoring	
2. Monitoring Objectives	☐ Prevent sediment/pollutant discharge ☐ Ensure compliance with regulations ☐ Protect downstream ecosystems ☐ Provide early warnings of pollution incidents	
3. Parameters to Monitor	☐ pH ☐ Turbidity (NTU) ☐ Suspended solids (TSS) ☐ Dissolved oxygen ☐ Conductivity/salinity ☐ Hydrocarbons/oils (visual or lab) ☐ Metals, nutrients (if required)	
4. Monitoring Locations	☐ Upstream reference/control site ☐ Site discharge points (sediment basins, dewatering outlets) ☐ Downstream receiving waters ☐ On-site stormwater drains or detention ponds	
5. Monitoring Frequency	☐ Regular visual inspections ☐ Weekly water sampling (turbidity, pH, TSS) ☐ After rainfall events >10 mm ☐ Continuous monitoring	
6. Methods & Equipment	☐ Turbidity meter/photometer ☐ pH and conductivity probe ☐ Sampling bottles (for lab) ☐ Chain-of-custody forms ☐ Field logbook for notes and observations	
7. Recording & Reporting	☐ Field data sheets completed ☐ Photographic evidence of site/water	

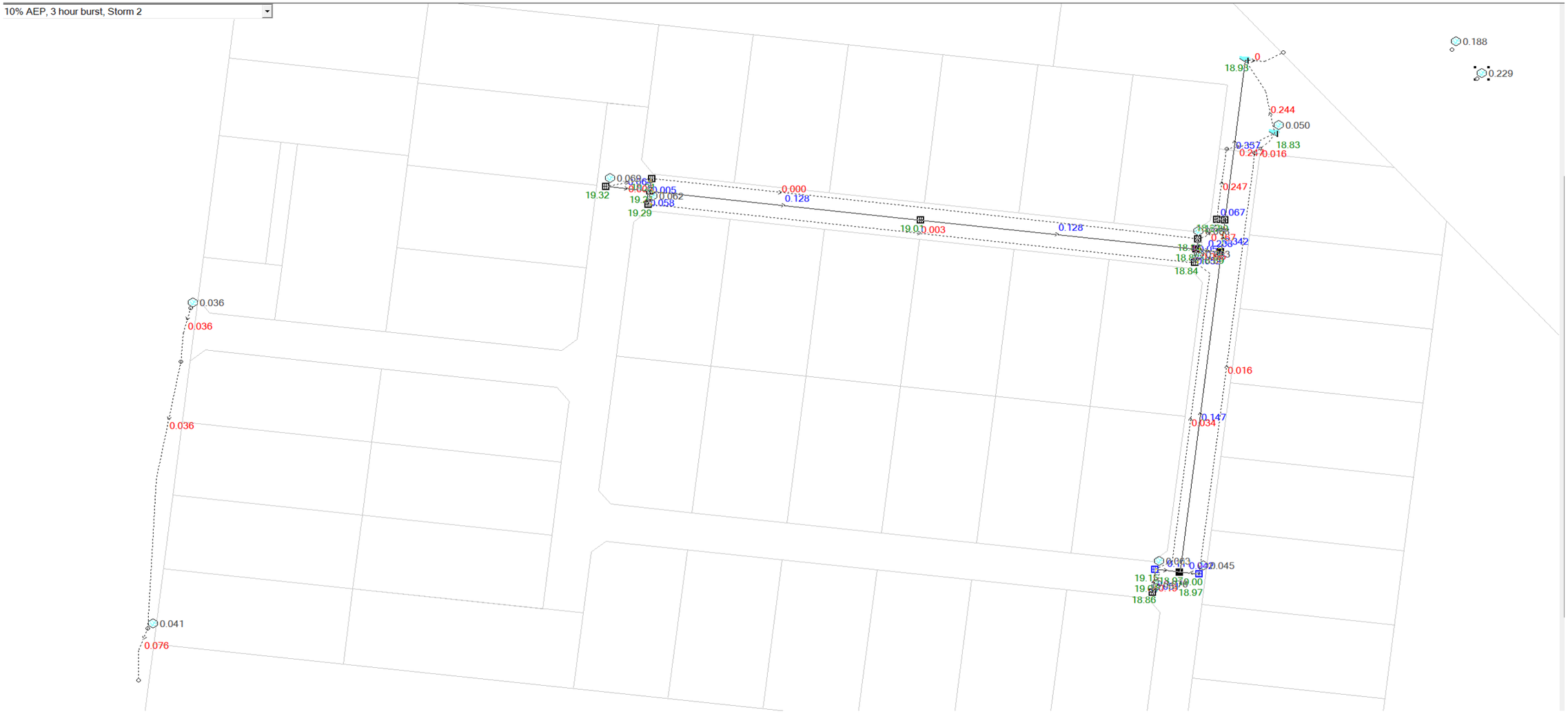
Section	Checklist Items	Remarks
	☐ Compare results with baseline/trigger values ☐ Incident reporting procedure for exceedances ☐ Fortnightly/ monthly/quarterly reports	
8. Corrective Actions	☐ Install/repair erosion & sediment controls ☐ Cease dewatering until compliance ☐ Treat water (flocculants, filtration) ☐ Notify environmental manager/regulator if limits exceeded ☐ Document & close out corrective actions	
9. Review & Audit	☐ Periodic review of monitoring results ☐ Internal audits of practices ☐ Update plan if conditions/regulations change	

Attachment C: DRAINS Modelling and Results

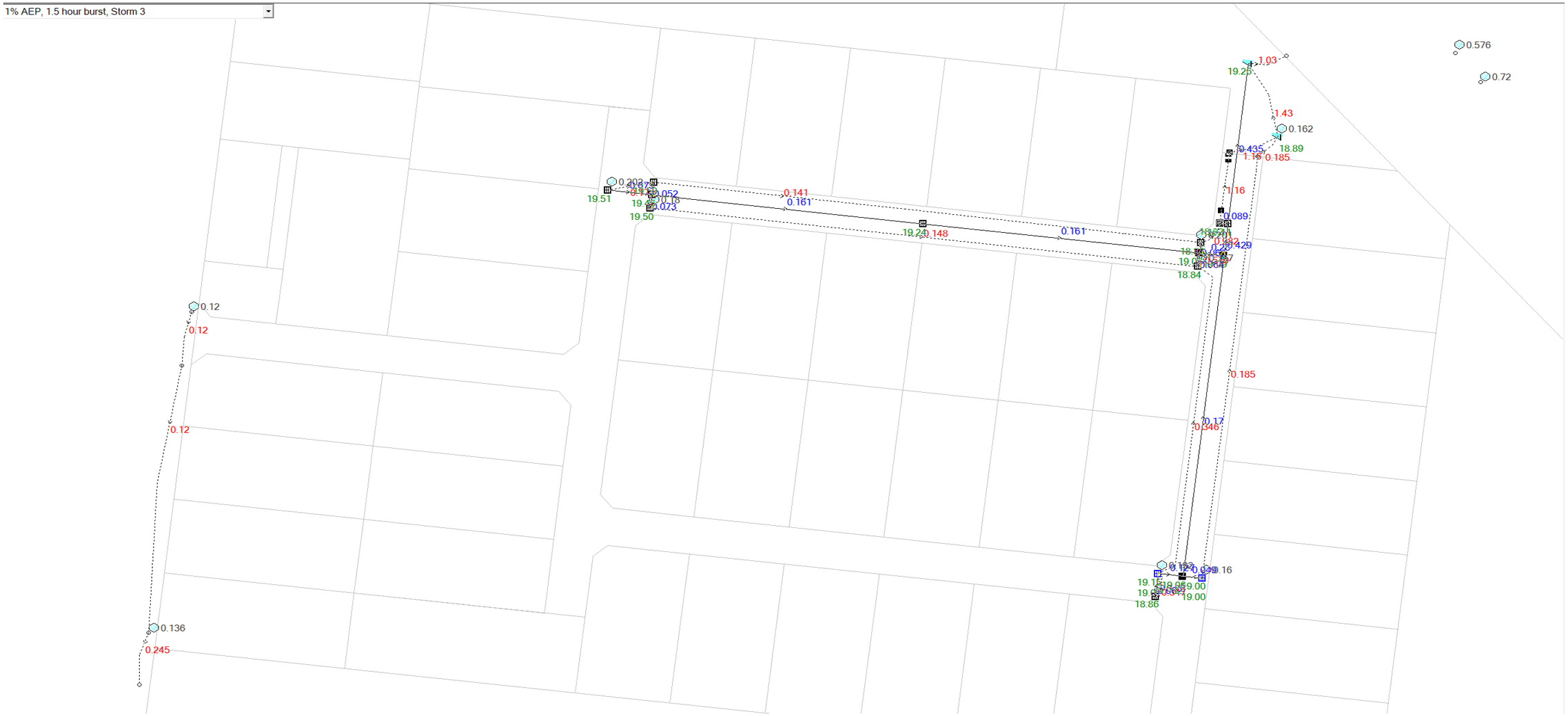
DRAINS Modelling Setup



Minor Event - 10% AEP



Major Event – 1% AEP



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