



MIRVAC

Everleigh Stormwater Masterplan

Report – Version 3

QC4060_005-REP-701-3

14 MARCH 2025

**PLANS AND DOCUMENTS
referred to in the PDA
DEVELOPMENT APPROVAL**

Approval no: DEV2016/768/63

Date: 1 August 2025



DISCLAIMER

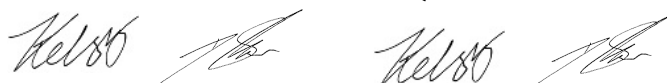
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1. INTRODUCTION

This document acts as the updated Stormwater Masterplan (Masterplan) for Mirvac's Everleigh development. This update has been undertaken to reflect the development yield and layout as current in May 2024.

The development comprises of an approximate 3,560 lot residential subdivision located at Teviot Road, Greenbank (the Site). Everleigh sits within the Logan City Council Local Government Area (LGA), however the Site falls within a declared Priority Development Area (PDA), with the assessing authority being Economic Development Queensland (EDQ).

This Masterplan comprises of the following:

- Stormwater quantity management – quantification of changes in catchment hydrology as a result of the development and the required stormwater detention infrastructure in order to meet mitigation targets.
- Stormwater quality management – modelling and specification of a stormwater quality treatment train to demonstrate compliance with relevant guidelines.

The Masterplan has been prepared with reference to the following key guidelines and planning documents:

- Logan City Council Planning Scheme (LCC, 2015) and Temporary Local Planning Instrument (LCCTLPI 2024)
- Queensland Urban Drainage Manual (QUDM) (IPWEAQ, 2017).
- Australian Rainfall and Runoff (ARR) (Ball et. al., 2019).
- MUSIC Modelling Guidelines (Water By Design, 2018).
- Framework for the Integration of Flooding and Stormwater Management into Open Space (Water By Design, 2011).
- State Planning Policy (DILGP, 2017).

1.1 Document History

This document is the third iteration of the Everleigh Stormwater Masterplan produced for the development. Previous iterations of the Masterplan are noted below:

- Stormwater Master Plan – Teviot Road, Greenbank (Engeny, 2016) (Version 1 - Revision 4).
- Everleigh Stormwater Masterplan (Engeny, 2020) (Version 2 - Revision 3).

This update reflects the latest yield projections for the Development at time of writing. Key changes to the layout reflected in this SWMP include are the addition of a secondary school.

1.2 Development Progress

As staging of the development progresses, individual Stormwater Management Plans (SMP) for each Reconfiguration of Lot (ROL) will be produced. The management strategy in these SMPs will remain consistent with this Masterplan, however, minor changes to the infrastructure based on detailed design will be reflected in the SMPs.

At the time of writing this report, the following individual SMPs for ROLs have been submitted:

- Precinct 2 ROL: Everleigh Precinct 2 ROL - Stormwater Detention and Water Quality Analysis (Engeny, 2019).
- ROL 6: Everleigh ROL06 – Stormwater Detention and Water Quality Analysis (Engeny, 2020).
- ROL 5: Everleigh ROL05 – Stormwater Detention and Water Quality Analysis (Engeny, 2020).
- Precinct 8 ROL: Everleigh Precinct 8 – Stormwater Detention and Water Quality Analysis (Engeny, 2022).

2. SITE DETAILS

2.1 Site Location

The Site is located off Greenbank Road and Teviot Road, Greenbank. The Site originally comprised Lot 434 on RP845844, Lot 9 on S312355 and Lot 205 on RP 854844, is approximately 481 hectares in size and was used as farmland (predominately grazing). The total yield is anticipated to be in the order of 3,560 lots. The location of the Site is presented in Figure 2.1.

2.2 Site Encumbrances

In its pre-development conditions, the site comprised the following:

- Four primary drainage lines (Tributaries of Norris Creek) that traverse the Site generally in a West to East direction.
- Two farm dams that had an impact on attenuation of pre-developed flows (have since been removed).
- Easements over two services on the northern border of the Site (power and water).
- Environmental constraints, with Environmental Protection and Biodiversity Conservation overlay.

2.3 Topography and Drainage

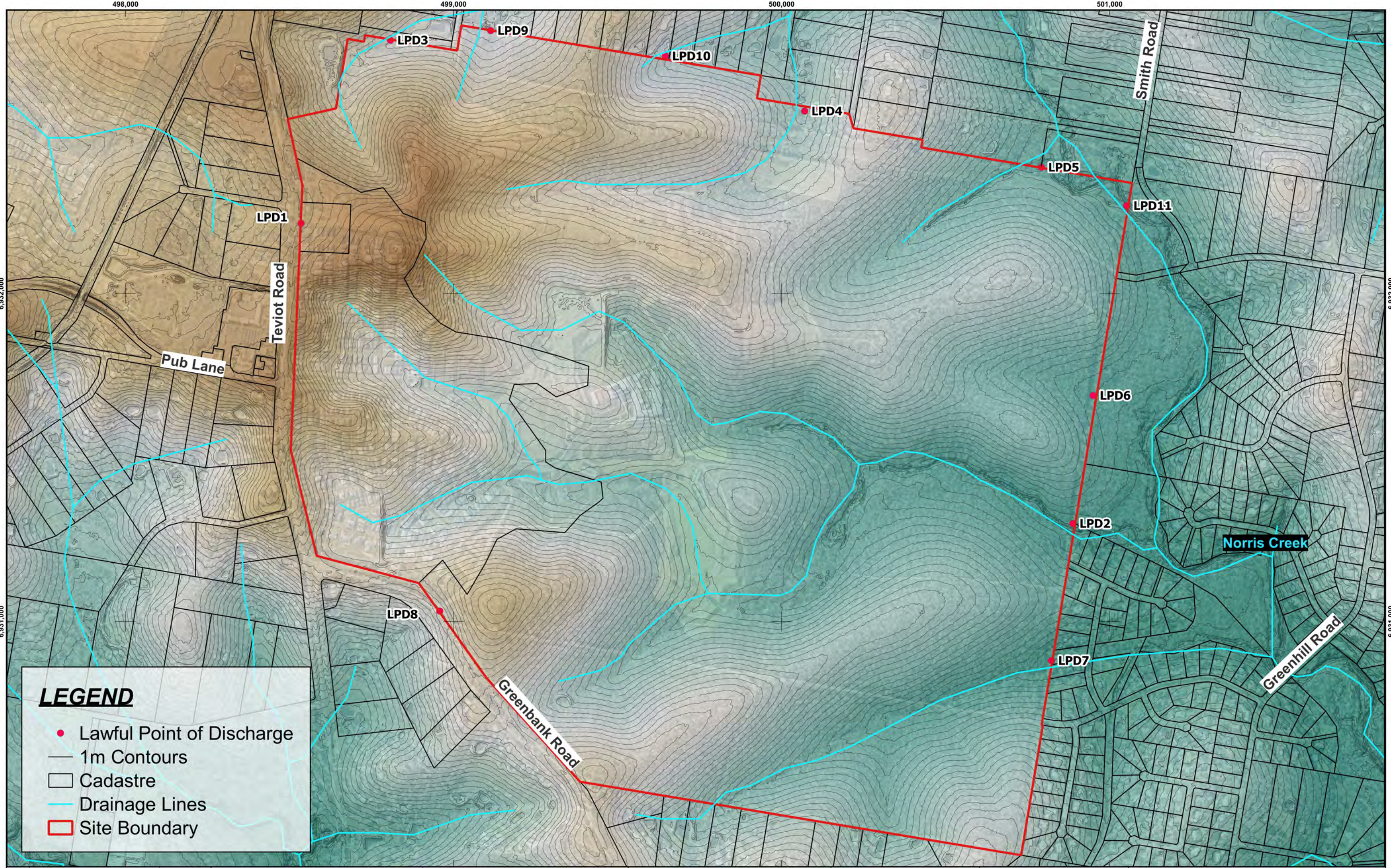
The Site is located in the Logan River catchment and the current site topography and drainage characteristics are described as follows:

- Elevations on the Site range from 25 to 78 m AHD.
- Minimal upstream catchment, the majority of the upstream catchment comprises the Site.
- Drainage lines are well defined and provide the Lawful Point of Discharge (LPD) for Site runoff at the development boundary. The predominant drainage lines flows from west to east across the Site before discharging into the Logan River through Norris Creek. An additional drainage line is located south of the major drainage line and also flows towards the east. Three minor drainage lines flow across the northern boundary.

Site topography and main drainage lines are shown in Figure 2.1.

2.4 Lawful Points of Discharge

When land is developed, the roof and stormwater runoff from that land and any external catchment (draining through the development site) must be discharged to a defined lawful point of discharge (LPD). The LPDs to be retained following development of the Site have been identified in accordance with the relevant guidelines (refer Appendix B) and are also shown on Figure 2.1.



LEGEND

- Lawful Point of Discharge
- 1m Contours
- Cadastre
- Drainage Lines
- ▭ Site Boundary

R	DETAILS	DATE
1	Final Issue	31-10-2023

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DRAWN	RS	CHECKED	KM
APPROVED	DS	DATE	31-10-2023
NOTES:			


0 0.2 0.4 km

SCALE @ A3 - 1:10,300
GDA94 / MGA zone 56

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source



ENGENY



Figure 2.1

Mirvac
Everleigh Masterplan Update
Site Locality

Dwg Ref.
QC4060-005-SKE-0001

2.5 Proposed Development

The proposed development site is approximately 481 hectares. The predominant post-development land use will be approximately 3,560 residential lots, with the summary of the various land uses as below:

- Residential – standard lots at 15 dwellings per hectare.
- Residential – interface lots at 2.4 dwellings per hectare.
- Primary school.
- High school.
- Neighbourhood centre.
- State community health centre.
- Numerous local, neighbourhood, and linear parks.
- Regional sports and recreation park.
- Conservation parkland.

Figure 2.2 presents the key details of the proposed layout, with the full Masterplan layout included in Appendix A.



Figure 2.2: Proposed Development Layout

3. STORMWATER QUANTITY MANAGEMENT STRATEGY

3.1 Summary of Strategy

A stormwater quantity management strategy has been developed to ensure non-worsening at all site LPDs, in accordance with the relevant design standards for the Site (refer Appendix B). The strategy involves the strategic placement of stormwater detention on key drainage flow paths. By utilising timing of run-off from various catchments, the full development footprint of the Site has not been required to be detained. The following sections outline the key modelling details and a summary of the proposed stormwater detention infrastructure.

3.2 Modelling Approach

The stormwater quantity management strategy has been supported through the hydrologic software XPRAFTS. The assessment considered the following scenario:

- Existing scenario (the Site in its condition prior to any development works).
- Post-development scenario (the Site with ultimate proposed land-use; and,
- Mitigated post-development scenario (the Site with ultimate proposed land-use including mitigation basins).

An assessment of peak flows was completed reviewing each of the LPDs, as well as at the Greenhill Road crossing approximately 980 m downstream where the Site sub-catchments ultimately combine. The various stormwater detention basins required to mitigate post-development flows were sized to ensure no adverse peak flood flows occur downstream.

The complete details of the hydrologic modelling are provided in Appendix C.

Additional modelling to ensure the proposed detention basins are suitable under a future climate change scenario has been completed and is also summarised in Appendix C. The assessment indicated that all detention basins are sized adequately to contain the 1% AEP 2090 horizon Representative Concentration Pathway (RCP) 4.5 flood event (the climate change scenario as consistent with Logan City Council's (LCC) Temporary Local Planning Instrument (LCC, 2023)).

3.3 Summary of Stormwater Detention

The resultant proposed detention 1:100 AEP basin volumes and footprints, proposed outlet configuration and the respective LPD identification number is provided in Table 3.1, with the existing scenario, post-development scenario and post-development mitigated scenario peak flows provided in Table 3.2.

Peak flow reporting is provided below for LPDs 1-8, where either an increase to the impervious fraction or an increase to the contributing catchment is expected within the contributing catchments. At LPDs 9-11, no increases to impervious fraction or catchment area are proposed due to the retainment of pre-development conditions, with flows equal or less than those in the existing scenario, and hence peak flow reporting has not been provided. Due to the alignment of the property boundaries to the topography, sheet flow is also observed at some boundary locations outside of the proposed LPDs. As this discharge is not from a defined flow path, and no change to impervious fraction or catchment area is proposed post-development at these locations, these localities have not been defined as formal LPDs, nor is peak flow reporting provided for these localities.

The location of the detention basins and the contributing catchments is shown on Figure 3.1. At the time of writing this report, detention basins 2 and 4 are progressing through detailed design.

TABLE 3.1: DETENTION BASIN REQUIREMENTS

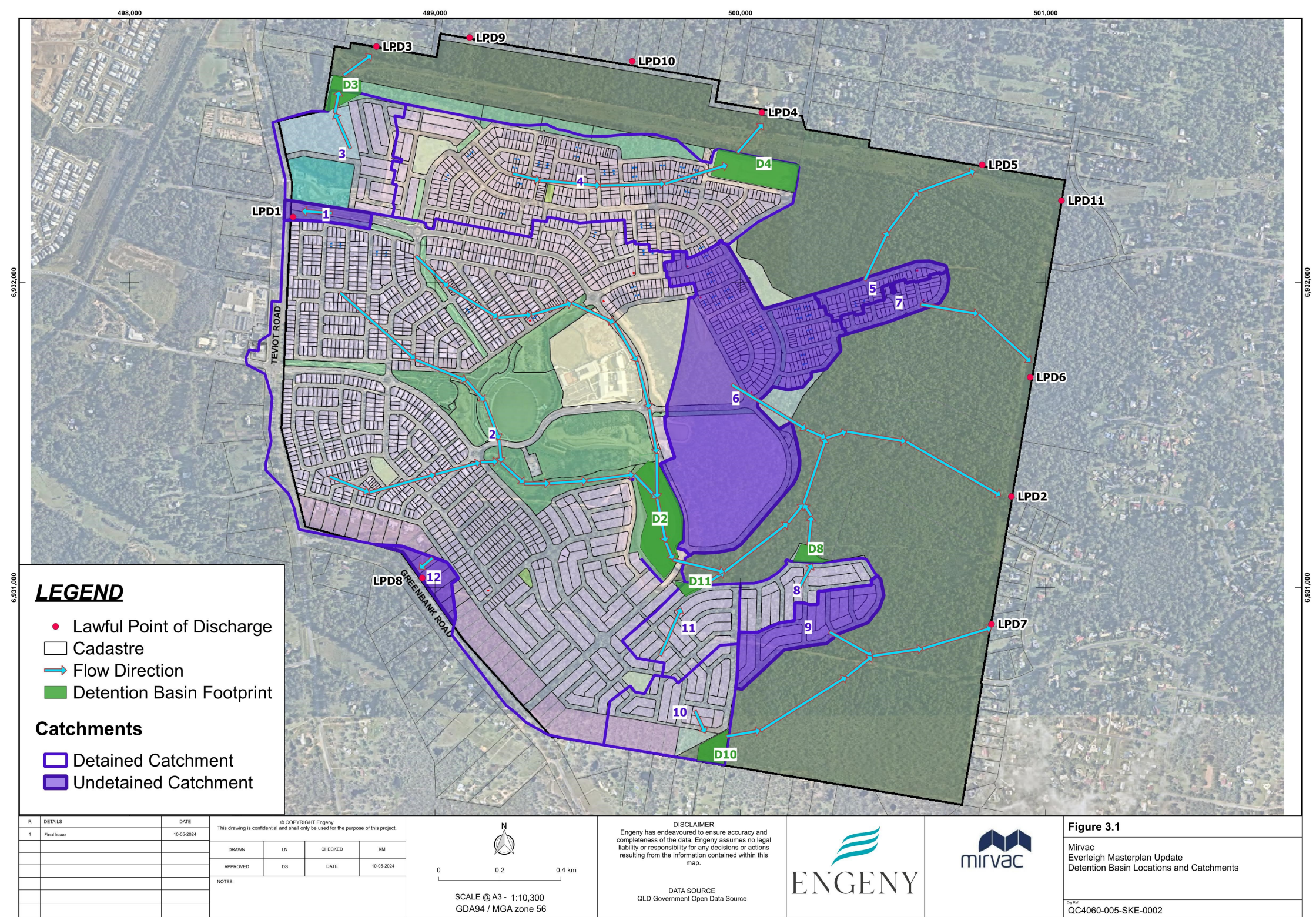
Catchment ID	Basin ID	1% AEP Stored Volume (m ³)	1% AEP Approximate Footprint (m ²)	Proposed Outlet Configuration	LPD ID
2	D2	85,700	22,600	3/900x900mm RCBC at invert 7/1500x900mm RCBCs at 1.9m depth Spillway - NONE	2
3	D3	9,200	6,200	4/300mm RCPs at invert 6/300mm RCPs at 0.55m depth 5m spillway at 1.45m depth	3
4	D4	24,300	11,300	5/450x300mm RCBCs at invert 4/1200x300mm RCBCs at 1.25m depth 5m spillway at 1.85m depth	4
5 (Not detained)	-	-	-	-	5
6 (Not detained)	-	-	-	-	2
7 (Not detained)	-	-	-	-	6
8	D8	1,400	900	1/225mm RCP at invert 30m spillway at 1.5m depth	2
9 (Not detained)	-	-	-	-	7
10	D10	7,100	4,800	4/675mm RCPs at invert 10m spillway at 1.5m depth	7
11	D11	1,400	900	1/225mm RCP at invert 30m spillway at 1.5m depth	2
12 (Not detained)	-	-	-	-	8

TABLE 3.2: PEAK FLOW REPORTING SUMMARY

	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
LPD 1	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	1.95	0.70	N/A	-64%
1:50 AEP	1.67	0.59	N/A	-64%
1:20 AEP	1.08	0.52	N/A	-52%
1:10 AEP	0.84	0.42	N/A	-50%
1:5 AEP	0.62	0.36	N/A	-42%
1:2 AEP	0.38	0.28	N/A	-25%
LPD 2	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	40.97	54.05	39.70	-3%
1:50 AEP	33.77	47.27	31.35	-7%
1:20 AEP	25.93	38.76	22.75	-12%
1:10 AEP	19.95	31.87	19.34	-3%
1:5 AEP	15.79	25.79	15.13	-4%
1:2 AEP	9.40	18.01	9.26	-2%
LPD 3	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	2.38	8.06	1.95	-18%
1:50 AEP	2.03	7.27	1.53	-25%
1:20 AEP	1.56	6.06	1.27	-19%
1:10 AEP	1.17	5.26	1.09	-7%
1:5 AEP	0.90	4.46	0.78	-14%
1:2 AEP	0.52	3.48	0.45	-14%

	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
LPD 4	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	8.13	18.59	7.52	-7%
1:50 AEP	6.52	16.63	5.96	-9%
1:20 AEP	4.56	13.87	4.22	-7%
1:10 AEP	3.63	12.94	2.99	-18%
1:5 AEP	2.61	10.60	2.02	-22%
1:2 AEP	1.63	8.16	1.46	-10%
LPD 5	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	7.66	6.16	N/A	-20%
1:50 AEP	6.36	4.88	N/A	-23%
1:20 AEP	4.42	3.50	N/A	-21%
1:10 AEP	3.47	2.76	N/A	-20%
1:5 AEP	2.61	1.98	N/A	-24%
1:2 AEP	1.59	1.27	N/A	-20%
LPD 6	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	4.09	3.51	N/A	-14%
1:50 AEP	3.34	2.86	N/A	-14%
1:20 AEP	2.32	1.97	N/A	-15%
1:10 AEP	1.84	1.47	N/A	-20%
1:5 AEP	1.29	1.05	N/A	-19%
1:2 AEP	0.81	0.65	N/A	-19%

	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
LPD 7	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	18.54	19.25	17.25	-7%
1:50 AEP	15.27	18.85	14.59	-4%
1:20 AEP	11.69	12.48	11.06	-5%
1:10 AEP	9.48	10.12	8.85	-7%
1:5 AEP	6.89	7.67	6.82	-1%
1:2 AEP	4.20	4.63	3.95	-6%
LPD 8	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	1.08	0.73	N/A	-33%
1:50 AEP	0.97	0.63	N/A	-35%
1:20 AEP	0.75	0.48	N/A	-36%
1:10 AEP	0.60	0.39	N/A	-34%
1:5 AEP	0.43	0.28	N/A	-34%
1:2 AEP	0.25	0.18	N/A	-29%
Greenhill Road	Existing Scenario Peak Flow (m ³ /s)	Post-Development Scenario Peak Flow (m ³ /s)	Post-Development Mitigated Scenario Peak Flow (m ³ /s)	Reduction in Peak Flow (%)
1:100 AEP	134.60	142.62	128.07	-5%
1:50 AEP	108.92	119.94	103.57	-5%
1:20 AEP	86.78	92.67	82.24	-5%
1:10 AEP	69.30	74.19	61.34	-11%
1:5 AEP	50.50	57.03	46.26	-8%
1:2 AEP	33.51	36.49	31.24	-7%



4. STORMWATER QUALITY MANAGEMENT

4.1 Summary of Strategy

In accordance with the design standards for the Site as provided in Table B.2 and with the State Planning Policy (SPP) 2017, a stormwater quality management strategy has been developed to ensure that the Water Quality Objectives have been met for the site. The following sections outline the types of treatment measures and the modelling approach adopted to meet the SPP stormwater quality objectives.

4.2 Treatment Types

The stormwater quality strategy incorporates a number of different WSUD assets including bioretention systems, a wetland, stormwater harvesting systems and waterway enhancement works. A description of the infrastructure is in the below sections.

4.2.1 Bioretention Basin

Bioretention located within detention basins will be incorporated below the detention storage and therefore the water quality extended detention depth is not included within the detention basin storage curve. Basin inflows will be directed into a sediment basin that will protect the filter media from sediment loads. During larger flow events, bioretention systems will be protected via a high flow bypass or backwater over the filter media where bioretention systems are located in detention basins. Inflows will be managed with adequate scour protection and located far enough away from the bioretention filter media to not pose an erosion risk. The orientation of each system and scour protection requirements will be addressed further in detailed design stage.

4.2.2 Wetland and Water Harvesting

The master plan strategy also proposes the inclusion of a wetland, to be located at the southern end of the new central park. The wetland is integrated with a stormwater harvesting system which enables harvesting and reuse of stormwater for irrigation of sports fields within the sports and recreation park. The wetland and associated infrastructure will consist of an inlet pond (sediment basin), wetland, harvesting pond and a pump/irrigation system.

The wetland is proposed to be combined with Detention Basin D2 which is to be located in the same area. Once again, the 300 mm extended detention depth required for water quality requirements within the wetland has not been included in the detention basin storage curve.

The harvesting pond will be located adjacent to the wetland and receive treated low flows from the wetland to ensure stored stormwater has undergone the maximum amount of treatment through the wetland. The harvesting pond will be separated from the wetland to ensure that water used for harvesting purposes does not draw down on water within the wetland therefore impacting on the drought resilience of the wetland. This will be achieved through an outlet structure that will only allow flows from the wetland into the harvesting pond above the wetlands normal water surface level. Water levels within the harvesting basin will be drawn down to a maximum of 400 mm, this is to maintain water quality, minimize impacts to visual amenity and ensure enough depth for aquatic species to survive in times of drought. The harvesting pond batters, and safety bench will be densely planted to manage safety and provide further water quality treatment within the harvesting pond.

Council has previously confirmed it has no concerns with stormwater harvesting proposal providing a number of conditions are met, refer Appendix H.

4.2.3 Waterway Enhancement

Revegetation and stabilization of riparian zones is proposed as an alternative treatment measure to bioretention systems where flows discharge to drainage lines within the Environmental area. It is proposed to revegetate 4 m² of riparian habitat for every 1 m² of bioretention filter media required to meet the SPP treatment objectives for the catchment according to the MUSIC model for the development.

As part of the revegetation, it is proposed to undertake all the earthworks required for successful vegetation establishment along the relevant sections of waterway. Detailed plans for the riparian revegetation are to be included as part of the stormwater management plans for the relevant development stages.

The success of the riparian revegetation will be assessed based on a 60% plant survival rate assessed 1 year following installation of plants. A monitoring plan to assess these conditions is to be developed, as part of the future Stormwater Management Plans.

We believe this innovative approach to water quality treatment will offer the following additional benefits to council:

- Increase in waterway stability.
- Reduction in maintenance activities due to sedimentation in downstream drains and channels.
- Reduced regular maintenance as this work will replace four WSUD assets all of which would require ongoing maintenance activities.
- Improved natural habitat.
- Improvements to water quality associated with filtration of water through vegetation, shading of the waterway and reduced sediment loads associated with instream erosion.



Figure 4.1: Existing Eroded Creek Line within the Site

4.3 Modelling Approach

The stormwater quality management strategy has been modelled in accordance with the MUSIC modelling guidelines. An assessment of the post-development (the Site with the ultimate proposed land-use) was undertaken with the inclusion of the proposed treatment trains to meeting the SWQ objectives in Table 4.1. The details of the proposed stormwater quality treatment sizes are proposed in Table 4.2.

TABLE 4.1: ADOPTED WATER QUALITY OBJECTIVES

Pollutant	Target Load Reduction %	Achieved Load Reduction %
Total Suspended Solids	80	80.1
Total Phosphorus	60	68.9
Total Nitrogen	45	45.9
Gross Pollutants > 5mm	90	98.9

4.4 Summary of Stormwater Quality Treatment

There has been previous discussion with Council with regards to the stormwater harvesting system (W2 & HP2) from the ROL6 precinct, which has been supported and endorsed for construction by the key stakeholders. Reference to this endorsement is provided within Appendix H.

In addition, it should be noted that treatment measures SB1 and B1 have already been constructed to manage stormwater quantity as part of the earlier stages of the development. Detailed stormwater quality approach and parameters are outlined in Appendix F.

It is noted that a number of the below bioretention basins exceeded the recommended maximum bioretention size of 800 sqm as recommended by the Bioretention Technical Design Guidelines (Healthy Land and Water, 2014). As the basins proceed through Reconfiguration of Lot and compliance submissions, the designs will ensure that these larger bioretention basins will consist of individual cells not exceeding 800 sqm, and that gravel maintenance tracks are provide around the cells to ensure that adequate maintenance can be undertaken.

The water quality catchments and proposed treatment locations are represented in Figure 4.2.

TABLE 4.2: PROPOSED WATER QUALITY TREATMENT MEASURES

Treatment ID	Catchment	Treatment Type	Sizing
		Sediment Basin	Surface Area (m²)
SB1	1	Sediment Basin (Constructed)	1,500
SB2	2	Sediment Basin	575
SB3	3	Sediment Basin	350
SB4	4	Sediment Basin	800
SB6	6	Sediment Basin	950

Treatment ID	Catchment	Treatment Type	Sizing
SB8	8	Sediment Basin	450
SB10	10	Sediment Basin	330
SB11	11	Sediment Basin	300
		Bioretention Basin	Filter Media Area (m²)
B1	1	Bioretention Basin (Constructed)	2,000
B3	3	Bioretention Basin	800
B4	4	Bioretention Basin	2,400
B6	6	Bioretention Basin	1,080
B8	8	Bioretention Basin	300
B10	10	Bioretention Basin	650
B11	11	Bioretention Basin	500
		Riparian Vegetation	Surface Area (m²)
RP6	6	Riparian Vegetation	3,900 (modelled as 1,155 m ² bioretention filter media area in MUSIC)
RP8	8	Riparian Vegetation	1,200 (modelled as 300 m ² bioretention filter media area in MUSIC)
RP9	9	Riparian Vegetation	1,360 (modelled as 340 m ² bioretention filter media area in MUSIC)
		Wetland	Surface Area (m²)
W2	2	Wetland	11,200
		Harvesting Pond	Surface Area (m²)
HP2	2	Harvesting Pond	8,000

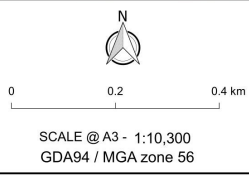
Catchments with bioretention systems and catchment areas above 5 Ha have been modelled to include a sediment basin. The size of the sediment basins were based on 30 m² per hectare of catchment, which is consistent with the ratio adopted for the approved and constructed sediment basin SB1.



LEGEND

- Lawful Point of Discharge
- Cadastre
- Bioretention Footprint
- ▭ Treated Catchments
- Direction of Flow

R	DETAILS	DATE	© COPYRIGHT Engeny This drawing is confidential and shall only be used for the purpose of this project.			
1	Final Issue	10-05-2024	DRAWN	LN	CHECKED	KM
			APPROVED	DS	DATE	10-05-2024
NOTES:						



DISCLAIMER
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DATA SOURCE
QLD Government Open Data Source



Figure 4.2

Mirvac
Everleigh Masterplan Update
Stormwater Treatment Locations and Contributing Catchments

Dwg Ref:
QC4060-005-SKE-0002

5. SUMMARY

The stormwater masterplan for the proposed MIRVAC Everleigh development has been developed to achieve the required stormwater management objectives as outlined in the State Planning Policy (SPP) 2017. The key objectives of the stormwater masterplan included:

- Stormwater quality modelling to develop a stormwater quality treatment train to demonstrate compliance with SPP water quality objectives.
- Hydrologic assessment to quantify the Site's potential impact on peak flow discharge, and to size appropriate mitigation measures to achieve "no worsening" at suitable reporting locations.

Key stormwater quality management design outcomes for the Site are as follows:

- Seven bioretention basins are proposed to be incorporated within the development.
- One Wetland and an associated harvesting pond are proposed to be included at the southern end of the new Central Park. It is proposed to channel outflows from the wetland into the harvesting pond, where they will be captured for use as irrigation water for the neighbouring sports park.
- Three catchments have been identified as suitable for the application of riparian revegetation rather than conventional water quality treatment through bioretention. In these areas it is proposed to revegetate 4 m² of the existing riparian waterway for every 1 m² of bioretention filter media required to meet the SPP water quality objectives in the music model.
- The details of the riparian revegetation are to be developed, as part of the stormwater management plans for the relevant development stages.

Key stormwater quantity management design outcomes for the Site as follows:

- A total of six detention basins are required to mitigate increased runoff from the development for the ultimate development scenario.

The Master Plan has achieved the stormwater management objectives through the use of detention basins, bioretention systems, wetland with stormwater harvesting pond, and riparian revegetation. The proposed treatment train will not only mitigate additional pollutant loads as results of the development but will also significantly improve the existing stormwater water quality. This masterplan is intended to set a stormwater management benchmark for future developments of this type.

6. REFERENCES

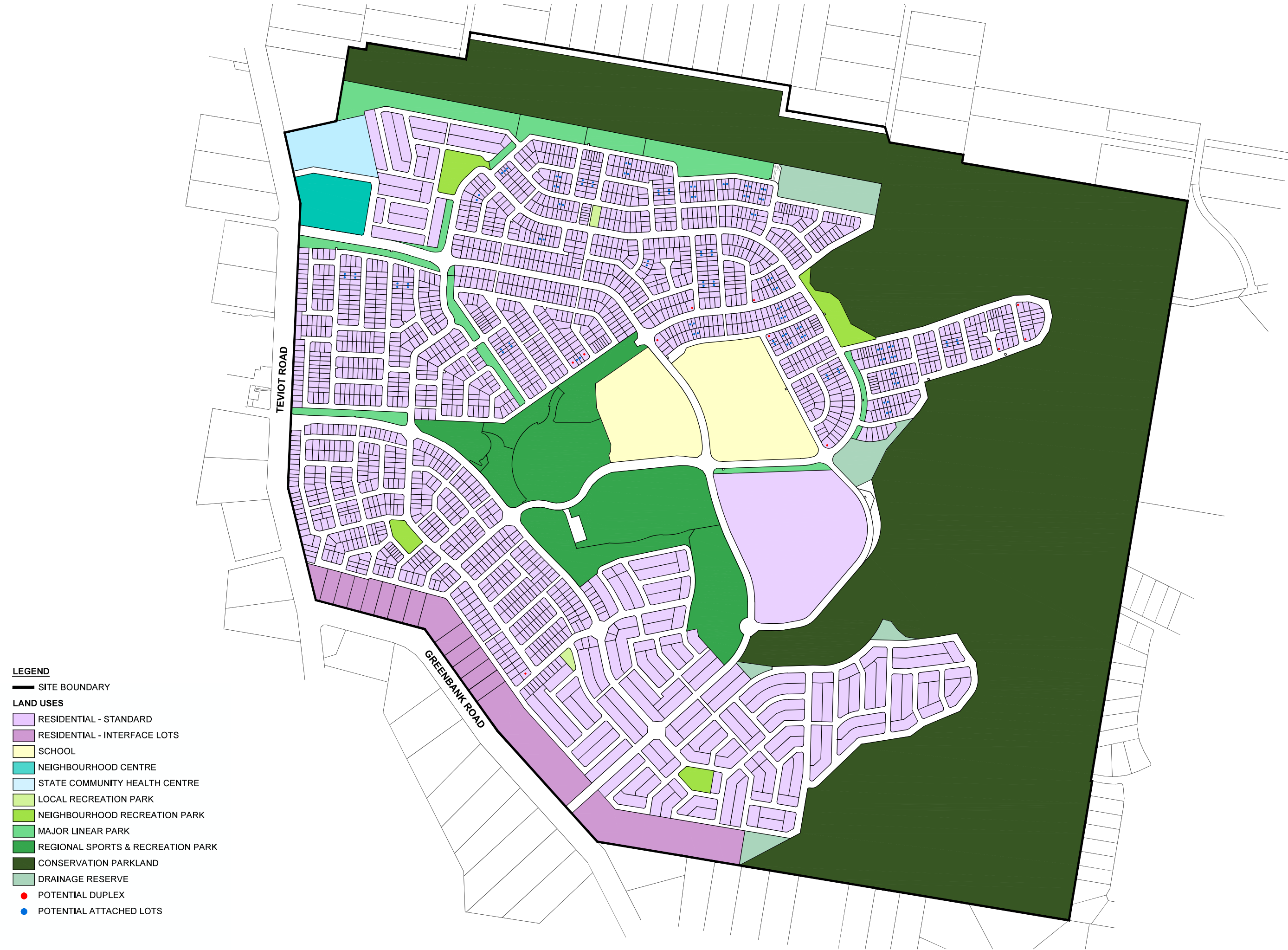
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7. QUALIFICATIONS

- (a) In preparing this document, including all relevant calculation, and modelling, Engeny Australia Pty Ltd (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.
- (b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.
- (c) Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:
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 - (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.
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- (g) This Report does not provide legal advice.

APPENDIX A: DEVELOPMENT LAYOUT





- LEGEND**
- SITE BOUNDARY
 - LAND USES**
 - RESIDENTIAL - STANDARD
 - RESIDENTIAL - INTERFACE LOTS
 - SCHOOL
 - NEIGHBOURHOOD CENTRE
 - STATE COMMUNITY HEALTH CENTRE
 - LOCAL RECREATION PARK
 - NEIGHBOURHOOD RECREATION PARK
 - MAJOR LINEAR PARK
 - REGIONAL SPORTS & RECREATION PARK
 - CONSERVATION PARKLAND
 - DRAINAGE RESERVE
 - POTENTIAL DUPLEX
 - POTENTIAL ATTACHED LOTS



APPENDIX B: DESIGN STANDARDS



TABLE B.1: DESIGN OUTCOMES

Element	Design Outcome
Lawful Point of Discharge	The point of discharge for outlet works is considered lawful where discharge is to waterways, drainage channels, or drainage features within: • The balance land of the subject development site. • Land to be dedicated / transferred to Council, or otherwise to be under the control of Council. • Reconfigured allotments within the subject development site where access to the discharge infrastructure is secured by an easement (if relevant), or, • Private allotments outside the subject development site where access to the discharge infrastructure is secured by an easement (if relevant). The point of discharge from the development site is considered lawful where discharge is to existing waterways, drainage channels, or drainage features at the site boundary.
Non-Worsening	Non-worsening is defined as: • No increase in peak discharge from the development boundary for the 1:2, 1:5, 1:10, 1:20, 1:50 & 1:100 AEP flood events. • No increase in flood levels external to the development boundary for the 1:2, 1:5, 1:10, 1:20, 1:50 & 1:100 AEP flood events. • No change to timing of peak flow without appropriate runoff routing modelling for the 1:2, 1:5, 1:10, 1:20, 1:50 & 1:100 AEP flood events. • No increase in frequency and duration of discharge for the minor storm (i.e. 1:1 AEP flood event) • No reduction to capacity of external drainage system. When assessing stormwater quantity, the point of measurement is defined as the point of discharge from the development site rather than individual points of discharge from balance parcels.
Owner's Consent	Downstream property owner's consent is not required if the requirements for Lawful Point of Discharge and non-worsening are met (where non-worsening is measured at the boundary of the development site and at Greenhill Road).
Minimum Habitable Floor Level	The minimum habitable floor level for buildings (not gazebos or structures open on 3 or more sides) is to be the 1:100 AEP + 500 mm.
Flood Immunity - Essential Service Infrastructure	Essential service infrastructure likely to fail when inundated will be set above the 1:100 AEP flood level.
Flood Immunity - Roads	• Depth x velocity products in accordance with QUDM. • Maximum depth over roads of 300 mm in 1:100 AEP event.
Quantity Modelling Event Assumptions	Masterplan and individual stormwater management plans will be assessed against 1:2, 1:5, 1:10, 1:20, 1:50 & 1:100 AEP flood events for the critical storm duration.
Infrastructure design	• Stormwater assets in parkland or other public land must be designed to not look like a hydraulic structure but rather it must have special character. This will involve using variable slopes, retaining upstream gullies, camouflaging inlets, and outlet structures and similar (a rectangular or geometrically shaped basin is generally undesirable). • Safe egress and adequate signage are to be considered in accordance with a risk based approach. • Overland flow paths are to be designed to convey the 1:100 AEP flood event.

Element	Design Outcome
	Stormwater detention basins / bioretention basins and the like are to be sited on land which is to be dedicated / transferred to Council, or otherwise under the control of Council.
Stormwater detention	- Stormwater detention may be required to manage stormwater discharge by limiting post development peak flows to the pre-development flow rates for all design storm events. - Stormwater detention may be achieved using road embankments or online storage in areas outside of the conservation area. - Stormwater detention systems are to be free draining.
Water Quality Modelling	- Water quality modelling to be undertaken in accordance with the Water by Design MUSIC modelling guidelines. - Waterway rehabilitation and stabilisation is acceptable as an offset to traditional WSUD measures. - SPP water quality objectives adopted where traditional WSUD measures are proposed.
Design	- Stormwater management systems used within waterway buffers must be vegetated stormwater management systems (earth and vegetation) which provide stormwater management and ecological function. - Design of channel works as part of development maximises the use of natural channel design principles where possible.

Notes:

- Development outcomes are acceptable where in accordance with the design outcomes above, or part thereof.
- Alternate design outcomes may be proposed and deemed acceptable.

TABLE B.2: DESIGN STANDARDS/RESOURCES

Reference
Queensland Urban Drainage Manual (QUDM) 2017
Logan City Council Planning Scheme 2015
Logan City Council Temporary Local Planning Instrument No. 1/2023
Queensland Environmental Protection (Water) Policy 2009
Queensland State Planning Policy (SPP) 2017
Queensland State Planning Policy (SPP) 2017: State Interest Water Quality – Supplementary Implementation Guideline
Queensland State Development Assessment Provisions 2019
Water by Design: Bioretention Technical Design Guidelines 2014
Water by Design: Music Modelling Guidelines 2018

Reference

Water by Design: Framework for the Integration of Flooding and Stormwater Management into Open Space 2011

Water by Design: Living Waterways Tool 2020

Australian Rainfall and Runoff (ARR) 2019

Brisbane City Council Natural Channel Design Guideline 2003

Queensland Road Drainage Manual 2019

Notes:

- *The Design Standards / Resources above are considered acceptable Standards / Resources.*
 - *Development outcomes in accordance with the Design Standards / Resources, or part thereof, are considered acceptable outcomes.*
 - *Alternate Standards / Resources may be proposed and deemed acceptable.*
-

APPENDIX C: STORMWATER QUANTITY MODELLING



C.1 Introduction

The hydrologic assessment for the Site has been undertaken utilising XPRAFTS hydrologic modelling software. An assessment of the existing scenario (the Site in its condition prior to any development works) and post-development (the Site with ultimate proposed land-use) peak flows was completed, and the various stormwater detention basins required to mitigate post-development flows were also sized. The following sections outline the hydrologic modelling.

C.1.1 Existing Scenario XPRAFTS Model Development

C.1.1.1. Catchment Parameters

A XPRAFTS split-catchment approach model was developed to reflect existing scenario site conditions. Existing scenario catchment delineation and land use can be viewed in Table C.1.

The impervious and pervious portions of the catchment were modelled as separate catchments with 100% and 0% fraction impervious values, respectively. Land use areas for the catchment were delineated using aerial imagery and cadastral boundary data. Fraction impervious values for the catchments were adopted from the delineated land use types summarised in Table C.1. These impervious fractions have been adopted in accordance with Table 4.5.1 of QUDM (IPWAEQ, 2017).

The full XPRAFTS catchment parameters can be found in Appendix D.

TABLE C.1: EXISTING SCENARIO FRACTION IMPERVIOUS PER LAND USE

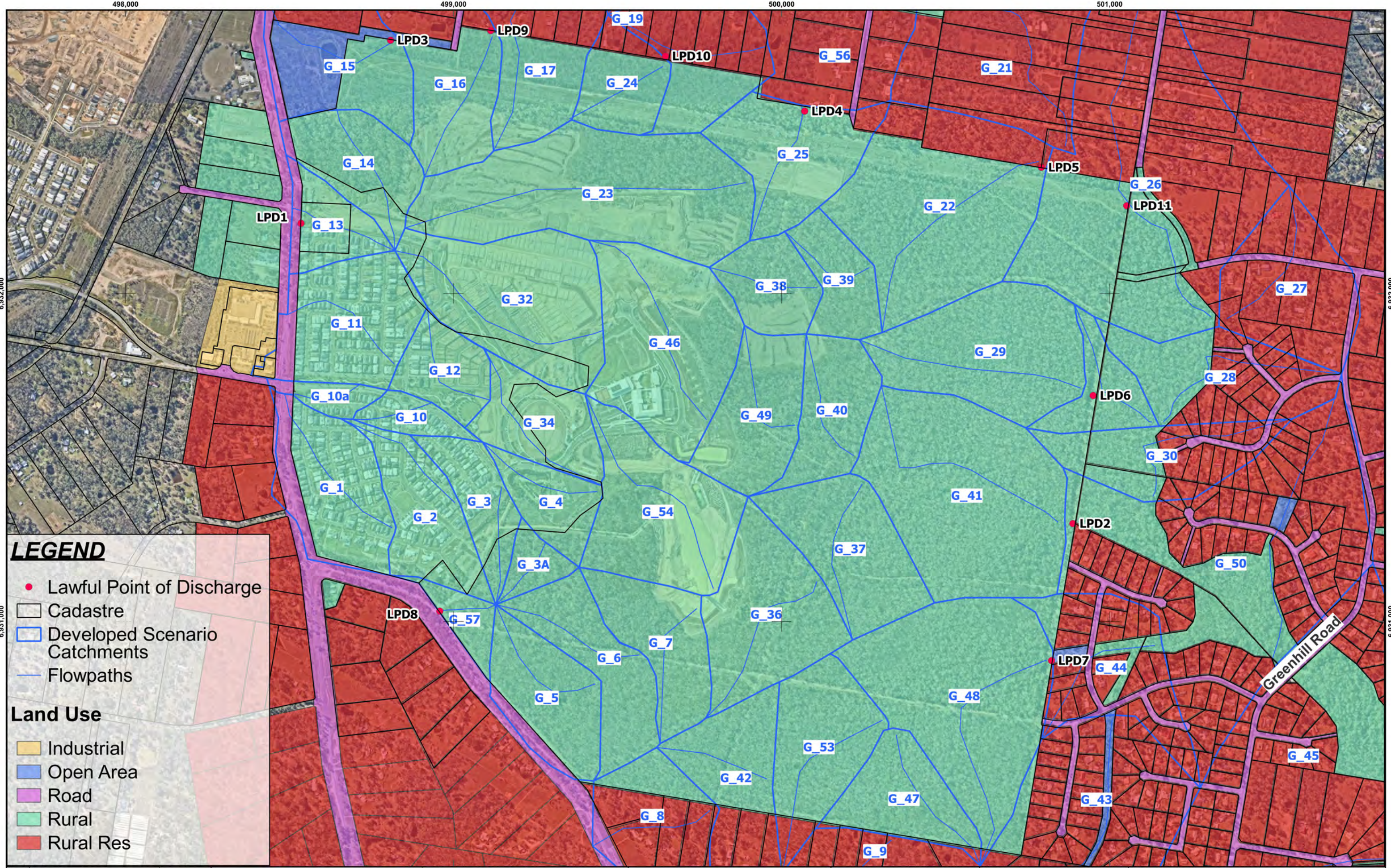
Land Use	Fraction Impervious
Rural	0%
Road	90%
Rural Residential	10%
Open Area	0%
Industrial	90%

The PERN values were applied globally for pervious and impervious portions of catchment and are summarised in Table C.2.

TABLE C.2: PERN VALUES FOR EXISTING SCENARIO

Catchment Type	Manning's "n" Value
Pervious	0.06
Impervious	0.025

A hydrograph lag approach to link-lag was utilised, calculated using appropriate average stream velocity values as indicated by Table 4.6.6 in QUDM.



LEGEND

Lawful Point of Discharge

Cadastre

Developed Scenario Catchments

Flowpaths

Land Use

Industrial

Open Area

Road

Rural

Rural Res

R	DETAILS	DATE
1	Final Issue	01-11-2023

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DRAWN	RS	CHECKED	KM
APPROVED	DS	DATE	01-11-2023
NOTES:			

00.20.4

SCALE @ A3 - 1:10,300
GDA94 / MGA zone 56

DISCLAIMER
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DATA SOURCE
QLD Government Open Data Source



Figure C1

Mirvac
Everleigh Masterplan Update
Existing Scenario Catchments and Land Use

Dwg Ref:
QC4060-005-SKE-0001

C.1.1.2. Rainfall and Losses

Design rainfall depths and intensities were generated using the ARR 2019 data hub tool (<https://data.arr-software.org/>), utilising the centroid of the main flow path catchment as the reference point (-27.741, 152.999). The data hub output for the Site is provided in Appendix E.

The recommend losses for application in the XPRAFTS model were:

- Initial loss: 25.0 mm.
- Continuing loss: 1.1 mm/hr.

Median pre-burst has also been applied in accordance with ARR19 for each storm utilising XPRAFTS Automatic Storm Generator Utility.

C.1.1.3. Estimation of Farm Dam Discharge

A localised TUFLOW hydraulic model was built to produce discharge rating curves for the overtopping behaviour for the existing farm dams on the Site. Localised flow was applied to each dam, with the head level in the dam versus the flow downstream of the spillway recorded to produce the discharge rating curve. The rating curves are provided in Table C.3. The discharge rating curves were then applied to storage nodes in the XPRAFTS model representing each dam.

TABLE C.3: FARM DAM DISCHARGE RATING CURVE

Northern Farm Dam		Southern Farm Dam	
Water Level Elevation (m AHD)	Discharge (m ³ /s)	Water Level Elevation (m AHD)	Discharge (m ³ /s)
46.20	0.00	53.00	0.00
46.47	0.24	53.08	0.97
46.51	0.50	53.10	1.49
46.55	0.82	53.11	1.81
46.57	1.35	53.12	2.27
46.60	2.05	53.14	2.90
46.62	2.67	53.15	3.46

C.1.1.4. Rational Method Validation

The existing development scenario XPRAFTS hydrological model was validated utilising the Rational Method at three LPDs on Table C.5. Based on the outcomes from the validation, the XPRAFTS model is considered fit for purpose to complete the runoff estimation for the proposed site. The input parameters for the Rational Method validation are summarised in Table C.4.

TABLE C.4: RATIONAL METHOD VALIDATION PARAMETERS

Parameter	LPD2	LPD4	LPD7
Catchment Area (ha)	254.1	44.6	91.4
C10 Value	0.52	0.52	0.52
Time of Concentration (min)	69.6	69.5	47.2

TABLE C.5: RATIONAL METHOD VALIDATION SUMMARY

Flood Event	LPD2			LPD4			LPD7		
	Rational Method (m ³ /s)	XPRAFTS (m ³ /s)	Difference (XPRAFTS-Rational Method)	Rational Method (m ³ /s)	XPRAFTS (m ³ /s)	Difference (XPRAFTS-Rational Method)	Rational Method (m ³ /s)	XPRAFTS (m ³ /s)	Difference (XPRAFTS-Rational Method)
1:100 AEP	37.03	40.97	10.6%	6.51	8.13	24.8%	16.84	18.54	10.1%
1:50 AEP	31.54	33.77	7.1%	5.54	6.52	17.5%	14.41	15.27	5.97%
1:20 AEP	24.16	25.93	7.3%	4.25	4.56	7.2%	11.11	11.69	5.2%
1:10 AEP	19.74	19.95	1.1%	3.47	3.63	4.7%	9.11	9.48	4.0%
1:5 AEP	15.97	15.79	-1.2%	2.81	2.61	-7.2%	7.40	6.89	-6.8%
1:2 AEP	11.11	9.40	-15.3%	1.95	1.63	-16.5%	5.15	4.20	-18.6%

C.1.2 Post-Development Scenario XPRAFTS Model Development

The post-development scenario XPRAFTS model was developed to reflect the proposed development density and land use, utilising the proposed masterplan for the Site. Similar to the existing scenario model, a split-catchment approach was adopted. The rainfall intensities and losses for the developed scenario are consistent with the existing scenario.

C.1.2.1 Catchment Parameters

Post-development scenario catchment delineation and land use can be viewed in Figure C.2. Fraction impervious values for the catchments were adopted from the delineated land use types summarised in Table C.6. These impervious fractions have been adopted in accordance with Table 4.5.1 of QUDM (IPWAEQ, 2017).

The full XPRAFTS catchment parameters can be found in Appendix D.

TABLE C.6: DEVELOPED SCENARIO FRACTION IMPERVIOUS PER LAND USE

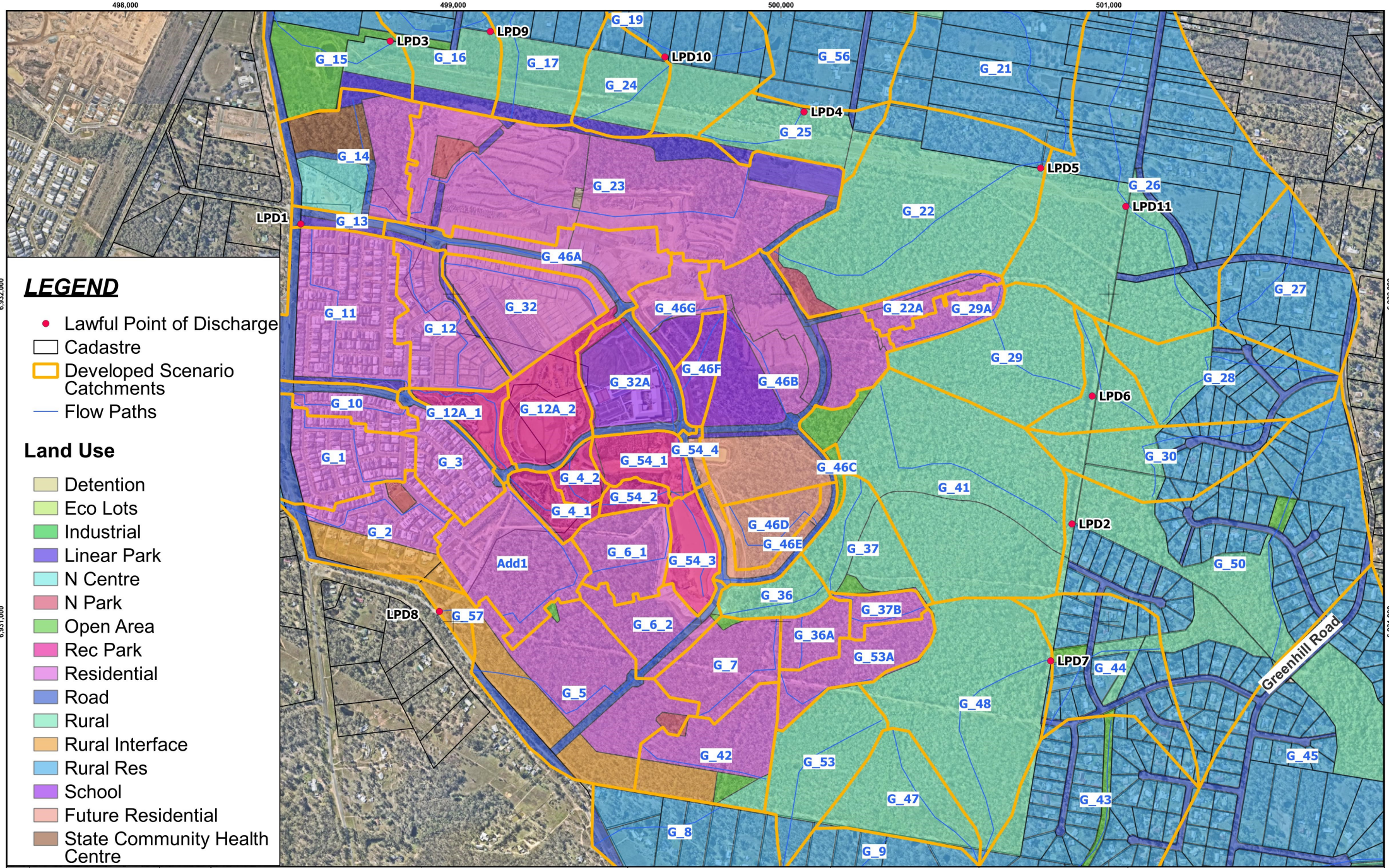
Land Use	Fraction Impervious
Residential – Standard Lots	0.7
Roads	0.9
Rural Residential	0.1
Residential - Interface Lots	0.15
Recreation Park	0.1
Neighbourhood Centre	0.9
Open Area	0.02
Linear Park	0.02
Rural	0
Neighbourhood Park	0.02
School	0.7
Residential - Eco Lots	0.08
Industrial	0.9
Drainage Reserve	0
Future Residential	0.8
Local Recreation Park	0.02
State Community Health Centre	0.9

The PERN values are expected to vary across portions of the Site in the post-development scenarios. The adopted roughness values are summarised in Table C.7.

TABLE C.7: PERN VALUES FOR DEVELOPED SCENARIO

Catchment Type	Manning's "n" Value
Pervious – within residential standard lots area	0.04
Pervious – within open space	0.05
Pervious – for all other areas	0.06
Impervious	0.025

For natural stream paths on site a hydrograph lag approach to link-lag was utilised equal to that in the existing scenario, calculated using appropriate average stream velocity values as indicated by Table 4.6.6 in QUDM. Where the flow paths are expected to be urbanised in the post-development scenario, pipe flow calculations were utilised to estimate the expected hydrograph lag.



C.2 Detention Sizing

An analysis was undertaken on the expected change to peak flow rates at the Site LPDs for the 1:2 AEP to the 1:100 AEP flood event. Where increases in peak flow are expected, detention basins have been sized to mitigate post-development scenario peak flows down to existing scenario peak flows. The following assumptions are relevant to the detention sizing undertaken for the Site:

- Where detailed design has progressed on detention basins, real storage curves extracted from the post-development design TIN have been included in XPRAFTS. For basins that have not progressed to design, a simplified linear storage curve has been included in RAFTS.
- Outlet configurations have been specified as required to mitigate peak flows from each basin to the required existing scenario flow and consist of combinations of low flow culverts at invert, high flow culverts and weirs.
- Detention has not been provided for the entirety of the developable area, where catchments are able to discharge direct to existing flow paths without mitigation or are located on flow paths where favourable timing ensures that upstream detention is sufficient to provide mitigation of peak flows.

TABLE C.8: DETENTION REPORTING – D2, D8, AND D11 AT LPD2

Flood Event	Existing Peak Discharge (m ³ /s)	Developed Peak Discharge (m ³ /s)	Developed Mitigated Peak Discharge (m ³ /s)	Difference (%)
1:100 AEP	40.97	54.05	39.70	-3%
1:50 AEP	33.77	47.27	31.35	-7%
1:20 AEP	25.93	38.76	22.75	-12%
1:10 AEP	19.95	31.87	19.34	-3%
1:5 AEP	15.79	25.79	15.13	-4%
1:2 AEP	9.40	18.01	9.26	-2%

TABLE C.9: DETENTION REPORTING – D3 AT LPD 3

Flood Event	Existing Peak Discharge (m ³ /s)	Developed Peak Discharge (m ³ /s)	Developed Mitigated Peak Discharge (m ³ /s)	Difference (%)
1:100 AEP	2.38	8.06	1.95	-18%
1:50 AEP	2.03	7.27	1.53	-25%
1:20 AEP	1.56	6.06	1.27	-19%
1:10 AEP	1.17	5.26	1.09	-7%
1:5 AEP	0.90	4.46	0.78	-14%
1:2 AEP	0.52	3.48	0.45	-14%

TABLE C.10: DETENTION REPORTING – D4 AT LPD4

Flood Event	Existing Peak Discharge (m³/s)	Developed Peak Discharge (m³/s)	Developed Mitigated Peak Discharge (m³/s)	Difference (%)
1:100 AEP	8.13	18.59	7.52	-7%
1:50 AEP	6.52	16.63	5.96	-9%
1:20 AEP	4.56	13.87	4.22	-7%
1:10 AEP	3.63	12.94	2.99	-18%
1:5 AEP	2.61	10.60	2.02	-22%
1:2 AEP	1.63	8.16	1.46	-10%

TABLE C.11: DETENTION REPORTING – D10 AT LPD7

Flood Event	Existing Peak Discharge (m³/s)	Developed Peak Discharge (m³/s)	Developed Mitigated Peak Discharge (m³/s)	Difference (%)
1:100 AEP	18.54	19.25	17.25	-7%
1:50 AEP	15.27	18.85	14.59	-4%
1:20 AEP	11.69	12.48	11.06	-5%
1:10 AEP	9.48	10.12	8.85	-7%
1:5 AEP	6.89	7.67	6.82	-1%
1:2 AEP	4.20	4.63	3.95	-6%

TABLE C.12: DETENTION BASIN REQUIREMENTS

Catchment ID	Basin ID	1% AEP Stored Volume (m³)	1% AEP Approximate Footprint (m²)	Proposed Outlet Configuration	LPD ID
2	D2	85,700	22,600	3/900x900mm RCBC at invert 7/1500x900mm RCBCs at 1.9m depth Spillway - NONE	2
3	D3	9,200	6,200	4/300mm RCPs at invert 6/300mm RCPs at 0.55m depth 5m spillway at 1.45m depth	3
4	D4	24,300	11,300	5/450x300mm RCBCs at invert	4

Catchment ID	Basin ID	1% AEP Stored Volume (m ³)	1% AEP Approximate Footprint (m ²)	Proposed Outlet Configuration	LPD ID
				4/1200x300mm RCBCs at 1.25m depth	
				5m spillway at 1.85m depth	
5 (Not detained)	-	-	-	-	5
6 (Not detained)	-	-	-	-	2
7 (Not detained)	-	-	-	-	6
8	D8	1,400	900	1/225mm RCP at invert	2
				30m spillway at 1.5m depth	
9 (Not detained)	-	-	-	-	7
10	D10	7,100	4,800	4/675mm RCPs at invert	7
				10m spillway at 1.5m depth	
11	D11	1,400	900	1/225mm RCP at invert	2
				30m spillway at 1.5m depth	
12 (Not detained)	-	-	-	-	8

C.3 Climate Change Assessment

The climate change scenario selected as appropriate for assessment of the proposed detention basin configurations under climate change conditions was the 1% AEP 2090 horizon Representative Concentration Pathway (RCP) 4.5, as it is consistent with Logan City Council's (LCC) Temporary Local Planning Instrument 1/2023 (LCC, 2023). The process undertaken for the sensitivity involved updating the hydrologic model to simulate the 1% AEP 2090 CC RCP4.5 rainfall intensities, in accordance with the Australian Rainfall and Runoff (ARR) 2019 Data Hub recommendations (<https://data.arr-software.org/>).

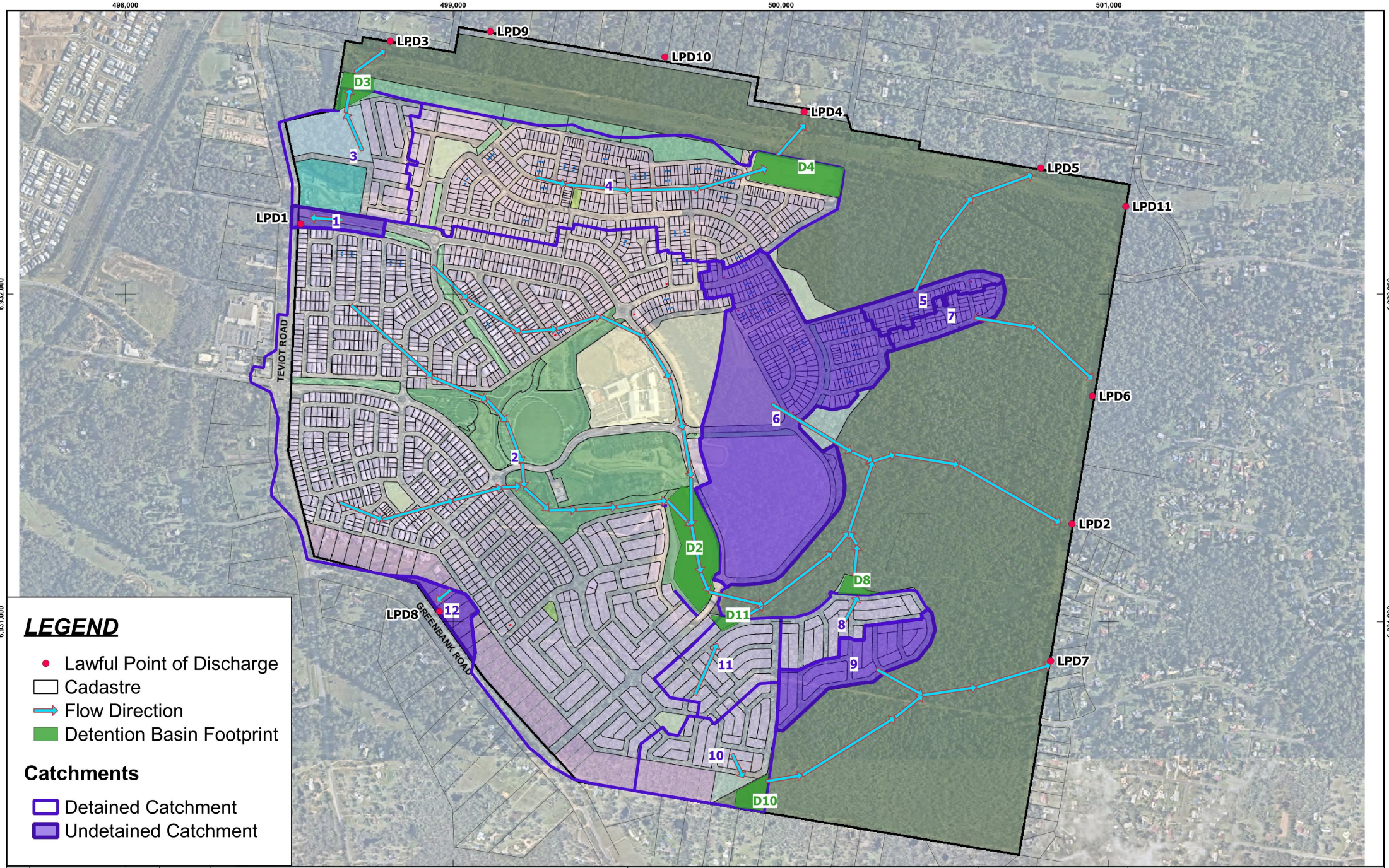
The summary of the detention basin climate change assessment is provided in Table C.13. The proposed detention basin configurations as noted below are suitable in all instances to cater for the climate change scenario assessed. They have sufficient freeboard to ensure the 2090 RCP4.5 climate change conditions 1% AEP peak levels (under blocked and unblocked outlets conditions) will not overtop the crests.

TABLE C.13: SUMMARY OF CLIMATE CHANGE DETENTION BASIN SENSITIVITY

Parameter/Scenario	Detention Basin 2	Detention Basin 3	Detention Basin 4	Detention Basin 8	Detention Basin 10	Detention Basin 11
Basin Configuration						
Contributing Catchment Area	169.4	13.0	41.2	5.71	10.9	7.64
Basin Crest	38.00 m AHD	*1.79 m	46.45 m AHD	*1.66 m	*2.09 m	*1.68 m
Low Flow Outlet	3 / 900 x 900 RCBC at basin invert at 34.2 m AHD	4 / 300 RCP at basin invert	5 / 450 x 300 RCBC at basin invert at 44.0 m AHD	1 / 225 RCP at basin invert	4 / 675 RCP at basin invert	1 / 225 RCP at basin invert
High Flow Outlet	7 / 1500 x 900 RCBC at 36.1 m AHD (1.90 m depth)	6 / 300 RCP at *0.55 m	4 / 1200 x 300 RCBC at 45.3 m AHD (1.25 m depth)	NONE	NONE	NONE
Spillway	NONE	5 m wide at *1.45 m	5 m wide at 45.9 m AHD	30 m wide at *1.50 m	10 m wide at *1.5 m	30 m wide at * 1.5 m
Scenario Results						
1% AEP Stored Volume Current Condition	85,700 m ³	9,240 m ³	24,270 m ³	1,360 m ³	7,100 m ³	1,385 m ³
1% AEP Stored Volume RCP4.5 Climate Change Condition	90,890 m ³	9,840 m ³	26,550 m ³	1,380 m ³	7,500 m ³	1,395 m ³
1% AEP Peak Level Current Condition	37.10 m AHD	*1.54 m	46.02 m AHD	*1.64 m	*1.64 m	*1.67 m
Freeboard	900 mm	250 mm	430 mm	20 mm	450 mm	10 mm
1% AEP Peak Level RCP4.5 Climate Change	37.24 m AHD	*1.64 m	46.15 m AHD	*1.66 m	*1.73 m	*1.68 m

Parameter/Scenario	Detention Basin 2	Detention Basin 3	Detention Basin 4	Detention Basin 8	Detention Basin 10	Detention Basin 11
Condition						
Freeboard	760 mm	150 mm	300 mm	0 mm	360 mm	0 mm
SENSITIVITY						
1% AEP Peak Level (Under Blocked Conditions) Current Condition	37.54 m AHD	*1.72 m	46.29 m AHD	*1.65 m	*1.97 m	*1.67 m
Freeboard	460 mm	70 mm	160 mm	10 mm	120 mm	10 mm
SENSITIVITY						
1% AEP Peak Level (Under Blocked Conditions) RCP4.5 Climate Change Condition	37.71 m AHD	*1.79 m	46.37 m AHD	*1.66 m	*2.09 m	*1.68 m
Freeboard	290 mm	0 mm	80 mm	0 mm	0 mm	0 mm

* In relation to basin invert



LEGEND

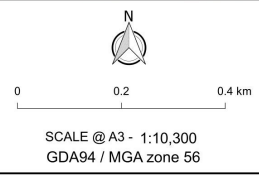
- Lawful Point of Discharge
- ▭ Cadastre
- ➡ Flow Direction
- Detention Basin Footprint

Catchments

- ▭ Detained Catchment
- ▭ Undetained Catchment

R	DETAILS	DATE
1	Final Issue	10-05-2024

© COPYRIGHT Engeny This drawing is confidential and shall only be used for the purpose of this project.			
DRAWN	LN	CHECKED	KM
APPROVED	DS	DATE	10-05-2024
NOTES:			



DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source



Figure C3

Mirvac
Everleigh Masterplan Update
Detention Basin Locations and Catchments

Doc Ref:
QC4060-005-SKE-0002

APPENDIX D: XPRAFTS CATCHMENT PARAMETERS

The bottom half of the page features a series of four thick, white, wavy lines that sweep from the bottom left towards the top right, creating a sense of movement and depth against the solid teal background.

TABLE D.1: EXISTING SCENARIO XPRAFTS PARAMETERS

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
G_1_B1	1	11.53	0.06	0	3.47
	2	2.53	0.025	100	3.47
G_2	1	10.59	0.06	0	5.48
	2	0.001	0.025	100	5.48
G_3	1	6.75	0.06	0	6
	2	0.001	0.025	100	6
G_4	1	6.26	0.06	0	1.6
	2	0.001	0.025	100	1.6
G_5	1	10.41	0.06	0	4.71
	2	1.13	0.025	100	4.71
G_6	1	11.37	0.06	0	5.48
	2	0.001	0.025	100	5.48
G_7	1	10.68	0.06	0	3.26
	2	0.001	0.025	100	3.26
G_8	1	10.54	0.06	0	3.44
	2	1.52	0.025	100	3.44
G_9	1	12.61	0.06	0	3.88
	2	1.43	0.025	100	3.88
G_10	1	3.09	0.06	0	6.05
	2	0.001	0.025	100	6.05
G_11	1	13.22	0.06	0	4.44
	2	1.78	0.025	100	4.44
G_12	1	6.47	0.06	0	3.84
	2	0.001	0.025	100	3.84
G_13	1	5.33	0.06	0	3.57
	2	0.91	0.025	100	3.57
G_14	1	9.76	0.06	0	3.95
	2	0.31	0.025	100	3.95
G_15	1	13.66	0.06	0	3.05
	2	1.15	0.025	100	3.05
G_16	1	8.38	0.06	0	5.02
	2	0.33	0.025	100	5.02
G_17	1	17.19	0.06	0	2.34
	2	1.1	0.025	100	2.34

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
G_18	1	22.43	0.06	0	2.08
	2	3.92	0.025	100	2.08
G_19	1	13	0.06	0	3.02
	2	2.03	0.025	100	3.02
G_20	1	42.17	0.06	0	1.92
	2	6.14	0.025	100	1.92
G_21	1	46.61	0.06	0	1.08
	2	5.13	0.025	100	1.08
G_22	1	30	0.06	0	1.37
	2	0.57	0.025	100	1.37
G_23	1	30.91	0.06	0	1.98
	2	0.001	0.025	100	1.98
G_24	1	7.16	0.06	0	5.08
	2	0.13	0.025	100	5.08
G_25	1	13.58	0.06	0	1.8
	2	0.19	0.025	100	1.8
G_26	1	50.11	0.06	0	1.33
	2	4.38	0.025	100	1.33
G_27	1	12.87	0.06	0	4.6
	2	2.57	0.025	100	4.6
G_28	1	13.04	0.06	0	2.99
	2	1.75	0.025	100	2.99
G_29	1	19.8	0.06	0	2.29
	2	0.001	0.025	100	2.29
G_30	1	10.74	0.06	0	2.47
	2	1.244314	0.025	100	2.47
G_31	1	5.99	0.06	0	2.73
	2	0.001	0.025	100	2.73
G_32_B2	1	21.4	0.06	0	4.24
	2	0.001	0.025	100	4.24
G_34	1	9.16	0.06	0	1.78
	2	0.001	0.025	100	1.78
G_36	1	16.76	0.06	0	2.69
	2	0.001	0.025	100	2.69
G_37	1	14.18	0.06	0	1.72
	2	0.001	0.025	100	1.72

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
G_38	1	7.11	0.06	0	4.45
	2	0.001	0.025	100	4.45
G_39	1	6.74	0.06	0	2.86
	2	0.001	0.025	100	2.86
G_40	1	9.36	0.06	0	3.53
	2	0.001	0.025	100	3.53
G_41	1	31.04	0.06	0	1.4
	2	0.001	0.025	100	1.4
G_42	1	12.69	0.06	0	5.32
	2	0.44	0.025	100	5.32
G_43	1	29.18	0.06	0	2.18
	2	4.8	0.025	100	2.18
G_44	1	12.66	0.06	0	1.9
	2	2.68	0.025	100	1.9
G_45	1	69.13	0.06	0	2.34
	2	10.77	0.025	100	2.34
G_46	1	21.76	0.06	0	2.92
	2	0.001	0.025	100	2.92
G_47	1	9.75	0.06	0	3.86
	2	0.03	0.025	100	3.86
G_48	1	29.08	0.06	0	2.42
	2	0.04	0.025	100	2.42
G_49	1	11.69	0.06	0	4.8
	2	0.001	0.025	100	4.8
G_50	1	46.2	0.06	0	2.69
	2	6.54	0.025	100	2.69
G_51	1	29.99	0.06	0	2.04
	2	5.49	0.025	100	2.04
G_52	1	22.84	0.06	0	1.61
	2	5.45	0.025	100	1.61
G_53	1	13.26	0.06	0	5.32
	2	0.12	0.025	100	5.32
G_54	1	18.01	0.06	0	1.35
	2	0.001	0.025	100	1.35
G_55	1	13.01	0.06	0	2.87
	2	1.02	0.025	100	2.87

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
G_56	1	23.86	0.06	0	2.16
	2	1.53	0.025	100	2.16
G10_a	1	2.19	0.06	0	6.86
	2	0.27	0.025	100	6.86
G_3A	1	2.86	0.025	0	6
	2	0.001	0.025	100	6
G_16A	1	14.66	0.06	0	4.33
	2	0.02	0.025	100	4.33
G_57	1	3.1	0.05	0	6.5
	2	0.01	0.025	100	6.5

TABLE D.2: POST-DEVELOPMENT SCENARIO XPRAFTS PARAMETERS

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
G_1	1	2.75	0.040	0	3.03
	2	7.13	0.025	100	3.03
G_2	1	5.74	0.040	0	5.23
	2	5.06	0.025	100	5.23
G_3	1	1.75	0.040	0	3.65
	2	4.56	0.025	100	3.65
G_4_2	1	1.79	0.050	0	1.64
	2	0.31	0.025	100	1.64
G_5	1	10.35	0.040	0	2.11
	2	12.37	0.025	100	2.11
G_7	1	2.42	0.040	0	3.62
	2	5.22	0.025	100	3.62
G_8	1	11.82	0.060	0	3.44
	2	1.98	0.025	100	3.44
G_9	1	12.59	0.060	0	3.88
	2	1.43	0.025	100	3.88
G_10	1	1.13	0.040	0	3.7
	2	3.27	0.025	100	3.7
G_11	1	5.14	0.040	0	2.14
	2	12.01	0.025	100	2.14
G_12	1	3.20	0.040	0	3.28
	2	6.23	0.025	100	3.28

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
G_14	1	2.72	0.030	0	4.02
	2	10.33	0.025	100	4.02
G_15	1	11.48	0.050	0	3.05
	2	1.30	0.025	100	3.05
G_16	1	11.57	0.050	0	2.71
	2	1.00	0.025	100	2.71
G_17	1	20.72	0.060	0	2.34
	2	2.71	0.025	100	2.34
G_18	1	22.38	0.060	0	2.08
	2	3.91	0.025	100	2.08
G_19	1	12.97	0.060	0	3.02
	2	2.02	0.025	100	3.02
G_20	1	42.07	0.060	0	1.92
	2	6.12	0.025	100	1.92
G_21	1	46.50	0.060	0	1.08
	2	5.11	0.025	100	1.08
G_22A	1	0.95	0.040	0	0.77
	2	2.13	0.025	100	0.77
G_24	1	7.36	0.050	0	4.36
	2	0.15	0.025	100	4.36
G_23_OUT	1	0.00	0.025	0	0.01
G_26	1	49.02	0.060	0	1.33
	2	5.44	0.025	100	1.33
G_27	1	12.84	0.060	0	4.6
	2	2.56	0.025	100	4.6
G_28	1	13.02	0.060	0	2.99
	2	1.85	0.025	100	2.99
G_29	1	15.27	0.060	0	2.29
	2	0.02	0.025	100	2.29
G_30	1	10.72	0.060	0	2.47
	2	1.34	0.025	100	2.47
G_31	1	5.97	0.060	0	2.73
	2	0.01	0.025	100	2.73
G_32	1	3.50	0.040	0	4.36
	2	7.09	0.025	100	4.36
G_32A	1	2.75	0.050	0	1.52

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
	2	6.25	0.025	100	1.52
G_36	1	3.86	0.060	0	1.13
	2	0.06	0.025	100	1.13
G_37	1	7.87	0.060	0	1.95
	2	0.11	0.025	100	1.95
G_41	1	33.13	0.060	0	2.46
	2	0.03	0.025	100	2.46
G_42	1	5.75	0.040	0	5
	2	5.18	0.025	100	5
G_43	1	29.09	0.060	0	2.18
	2	4.81	0.025	100	2.18
G_44	1	12.62	0.060	0	1.9
	2	2.69	0.025	100	1.9
G_45	1	68.94	0.060	0	2.34
	2	10.74	0.025	100	2.34
G_47	1	9.73	0.060	0	3.86
	2	0.03	0.025	100	3.86
G_48	1	25.04	0.060	0	2.42
	2	0.17	0.025	100	2.42
G_46B	1	7.76	0.040	0	2.09
	2	19.62	0.025	100	2.09
G_50	1	46.09	0.060	0	2.69
	2	6.64	0.025	100	2.69
G_51	1	29.91	0.060	0	2.04
	2	5.47	0.025	100	2.04
G_52	1	22.79	0.060	0	1.61
	2	5.46	0.025	100	1.61
G_53	1	10.89	0.060	0	5.32
	2	0.19	0.025	100	5.32
G_55	1	13.03	0.060	0	2.87
	2	1.02	0.025	100	2.87
G_56	1	23.81	0.060	0	2.16
	2	3.5	0.025	100	2.16
G_54_3	1	3.95	0.050	0	1.45
	2	0.47	0.025	100	1.45
G_12A_2	1	7.07	0.050	0	1.81

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
	2	1.23	0.025	100	1.81
G_6_2	1	1.92	0.040	0	3.45
	2	4.52	0.025	100	3.45
G_29A	1	0.95	0.040	0	1.87
	2	2.21	0.025	100	1.87
Add1	1	3.63	0.040	0	2.23
	2	8.45	0.025	100	2.23
G_46A	1	3.11	0.040	0	3.58
	2	7.16	0.025	100	3.58
G_46C	1	0.47	0.040	0	22.2
	2	0.07	0.025	100	22.2
G_23	1	16.52	0.040	0	1.94
	2	24.75	0.025	100	1.94
G_53A	1	1.93	0.040	0	0.59
	2	4.49	0.025	100	0.59
G_36A	1	1.03	0.040	0	5.1
	2	2.34	0.025	100	5.1
G_37B	1	0.71	0.040	0	2.02
	2	1.62	0.025	100	2.02
G_22	1	33.23	0.060	0	2
	2	0.77	0.025	100	2
D9	1	0.001	0.025	0	0.001
G_54_OUT	1	0.001	0.025	0	0.001
D9_OUT	1	0.001	0.025	0	0.001
G_42_OUT	1	0.001	0.025		0.001
G_14_OUT	1	0.001	0.025		0.001
G_25	1	8.29	0.050	0	1.98
	2	0.17	0.025	100	1.98
G_13	1	0.71	0.040	0	2.23
	2	0.83	0.025	100	2.23
G_57	1	1.54	0.050	0	6.5
	2	0.32	0.025	100	6.5
G_46D	1	0.93	0.040	0	2.17
	2	3.63	0.025	100	2.17
G_46E	1	0.77	0.040	0	1.03
	2	3.03	0.025	100	1.03

Catchment ID	Sub-catchment Number	Total Area [ha]	Catchment PERN	Percentage Impervious [%]	Vectored Slope [%]
D9_B	1	0.001	0.025	0	0.001
D9_B_OUT	1	0.001	0.025	0	0.001
G_12A_1	1	3.01	0.050	0	1.81
	2	0.74	0.025	100	1.81
G_4_1	1	2.45	0.050	0	1.64
	2	0.42	0.025	100	1.64
G_54_1	1	4	0.050	0	1.45
	2	0.51	0.025	100	1.45
G_54_2	1	1.52	0.050	0	1.45
	2	0.17	0.025	100	1.45
G_6_1	1	1.95	0.040	0	3.45
	2	4.61	0.025	100	3.45
G_54_4	1	0.23	0.025	0	0.44
	2	0.68	0.025	100	0.44
G_46G	1	1.58	0.025	0	4.17
	2	3.66	0.025	100	4.17
G_46F	1	0.89	0.025	0	3.16
	2	2.11	0.025	100	3.16

APPENDIX E: ARR 2019 DATA HUB OUTPUT

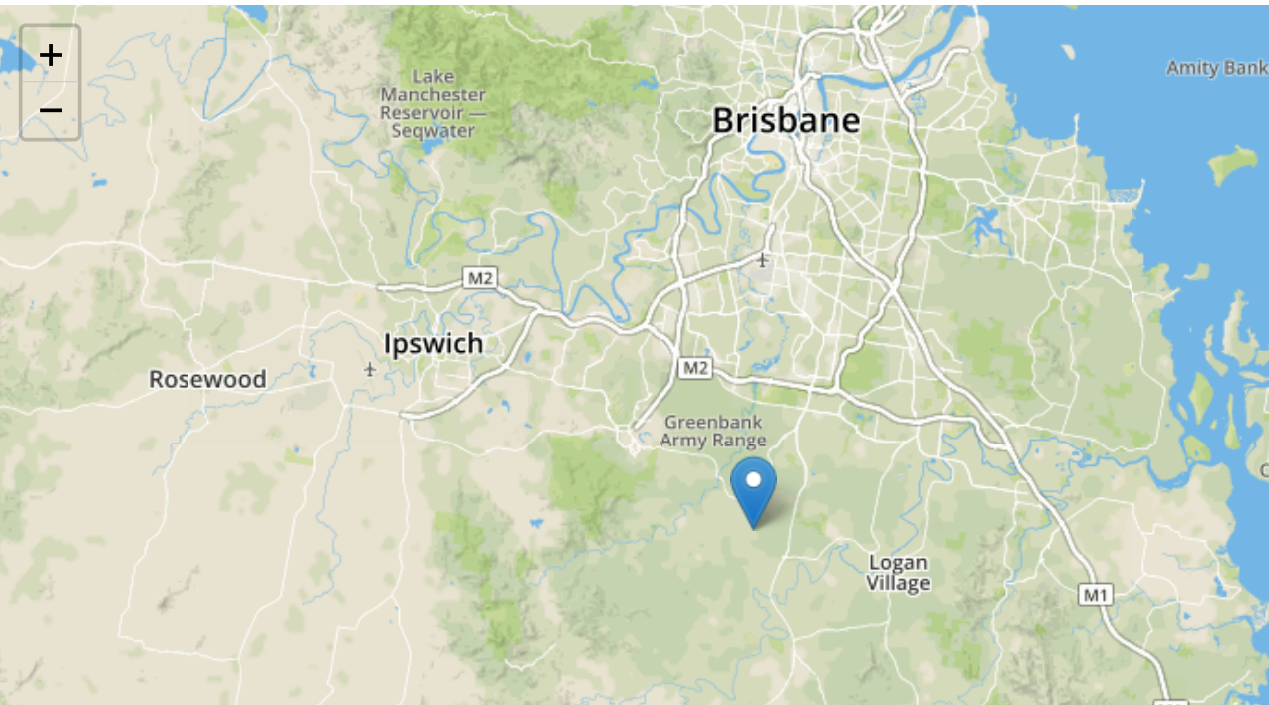
The bottom half of the page features a series of four thick, white, wavy lines that sweep from the bottom left towards the top right, creating a sense of movement and modern design against the teal background.

ATTENTION: This site was updated recently, changing some of the functionality. Please see the changelog (./changelog) for further information

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	152.999
Latitude	-27.741
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Interim Climate Change Factors	show





Data

River Region

Division	North East Coast
River Number	45
River Name	Logan-Albert Rivers

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2016_v1

ARF Parameters

$$ARF = Min \left\{ 1, \left[1 - a \left(Area^b - \log_{10} Duration \right) Duration^{-d} + e Area^f Duration^g (0.3 + \log_{10} AEP) + h 10^{i Area \frac{Duration}{1440}} (0.3 + \log_{10} AEP) \right] \right\}$$

Zone	a	b	c	d	e	f	g	h	i
East Coast North	0.327	0.241	0.448	0.36	0.00096	0.48	-0.21	0.012	-0.0013

Short Duration ARF

$$ARF = Min \left[1, 1 - 0.287 \left(Area^{0.265} - 0.439 \log_{10}(Duration) \right) . Duration^{-0.36} + 2.26 \times 10^{-3} \times Area^{0.226} . Duration^{0.125} (0.3 + \log_{10}(AEP)) + 0.0141 \times Area^{0.213} \times 10^{-0.021 \frac{(Duration-180)^2}{1440}} (0.3 + \log_{10}(AEP)) \right]$$

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

ID	29205.0
Storm Initial Losses (mm)	25.0
Storm Continuing Losses (mm/h)	1.1

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2016_v1

Temporal Patterns | Download (.zip) (static/temporal_patterns/TP/ECnorth.zip)

code	ECnorth
Label	East Coast North

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2016_v2

Areal Temporal Patterns | Download (.zip) (./static/temporal_patterns/Areal/Areal_ECnorth.zip)

code	ECnorth
arealabel	East Coast North

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2016_v2

BOM IFDs

Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-27.741&longitude=152.999&sdmin=true&sdhr=true&sdday=true&user_label=) to obtain the IFD depths for catchment centroid from the BoM website

Layer Info

Time Accessed	28 July 2020 08:56AM
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Median Preburst Depths and Ratios

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.3 (0.009)	2.9 (0.059)	4.6 (0.079)	6.2 (0.092)	7.1 (0.088)	7.8 (0.086)
90 (1.5)	0.1 (0.002)	2.0 (0.036)	3.2 (0.049)	4.5 (0.058)	11.9 (0.129)	17.4 (0.167)
120 (2.0)	0.0 (0.000)	3.6 (0.061)	6.1 (0.084)	8.4 (0.099)	15.5 (0.153)	20.8 (0.182)
180 (3.0)	0.4 (0.009)	5.1 (0.076)	8.2 (0.102)	11.2 (0.118)	22.7 (0.198)	31.4 (0.240)
360 (6.0)	0.1 (0.002)	7.8 (0.093)	12.8 (0.127)	17.7 (0.148)	30.6 (0.211)	40.3 (0.243)
720 (12.0)	1.8 (0.023)	9.1 (0.084)	14.0 (0.106)	18.7 (0.120)	31.4 (0.166)	40.9 (0.189)
1080 (18.0)	0.5 (0.005)	8.5 (0.066)	13.9 (0.089)	19.0 (0.103)	28.3 (0.126)	35.2 (0.136)
1440 (24.0)	0.7 (0.007)	5.7 (0.039)	9.0 (0.051)	12.2 (0.058)	22.9 (0.090)	31.0 (0.106)
2160 (36.0)	0.2 (0.002)	2.8 (0.016)	4.6 (0.022)	6.3 (0.025)	12.7 (0.042)	17.5 (0.050)
2880 (48.0)	0.0 (0.000)	1.6 (0.008)	2.7 (0.011)	3.7 (0.013)	12.0 (0.035)	18.2 (0.046)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	1.8 (0.004)	3.1 (0.007)

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.2 (0.003)	0.3 (0.005)	0.4 (0.006)	0.4 (0.004)	0.3 (0.004)
90 (1.5)	0.0 (0.000)	0.1 (0.001)	0.1 (0.001)	0.1 (0.002)	0.7 (0.008)	1.1 (0.011)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.6 (0.006)	1.0 (0.009)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	1.1 (0.009)	1.9 (0.014)
360 (6.0)	0.0 (0.000)	0.1 (0.001)	0.2 (0.002)	0.3 (0.002)	2.7 (0.018)	4.5 (0.027)
720 (12.0)	0.0 (0.000)	0.9 (0.009)	1.6 (0.012)	2.2 (0.014)	4.4 (0.023)	6.1 (0.028)
1080 (18.0)	0.0 (0.000)	0.3 (0.002)	0.4 (0.003)	0.6 (0.003)	4.4 (0.019)	7.2 (0.028)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.1 (0.000)	0.1 (0.001)	1.8 (0.007)	3.1 (0.011)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.1 (0.000)	0.2 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	9.4 (0.270)	22.0 (0.452)	30.4 (0.520)	38.4 (0.565)	34.0 (0.420)	30.7 (0.337)
90 (1.5)	2.9 (0.075)	17.5 (0.318)	27.1 (0.411)	36.3 (0.471)	67.5 (0.731)	90.9 (0.871)
120 (2.0)	8.1 (0.190)	24.1 (0.404)	34.7 (0.484)	44.9 (0.534)	85.6 (0.847)	116.2 (1.014)
180 (3.0)	11.9 (0.250)	38.5 (0.575)	56.1 (0.695)	73.0 (0.769)	102.0 (0.889)	123.7 (0.947)
360 (6.0)	20.2 (0.338)	38.4 (0.458)	50.5 (0.498)	62.0 (0.519)	100.0 (0.690)	128.5 (0.775)
720 (12.0)	24.8 (0.321)	42.4 (0.389)	54.0 (0.409)	65.2 (0.419)	86.9 (0.459)	103.2 (0.476)
1080 (18.0)	18.5 (0.204)	37.7 (0.293)	50.5 (0.323)	62.7 (0.339)	82.8 (0.368)	97.9 (0.380)
1440 (24.0)	18.7 (0.184)	34.5 (0.237)	44.9 (0.254)	54.8 (0.262)	73.6 (0.288)	87.6 (0.299)
2160 (36.0)	13.7 (0.116)	22.1 (0.129)	27.6 (0.131)	32.9 (0.132)	47.4 (0.155)	58.2 (0.166)
2880 (48.0)	3.3 (0.025)	12.3 (0.064)	18.2 (0.078)	23.9 (0.085)	49.6 (0.144)	68.8 (0.174)
4320 (72.0)	0.4 (0.003)	5.6 (0.026)	9.1 (0.034)	12.5 (0.039)	30.5 (0.077)	44.0 (0.096)

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	25.0 (0.716)	69.8 (1.431)	99.5 (1.703)	128.0 (1.882)	115.7 (1.430)	106.5 (1.172)
90 (1.5)	14.5 (0.369)	53.5 (0.974)	79.3 (1.203)	104.1 (1.350)	176.9 (1.915)	231.4 (2.217)
120 (2.0)	29.1 (0.685)	67.5 (1.133)	92.9 (1.295)	117.2 (1.394)	180.0 (1.781)	227.0 (1.981)
180 (3.0)	65.3 (1.369)	107.1 (1.599)	134.8 (1.668)	161.3 (1.698)	222.1 (1.936)	267.7 (2.049)
360 (6.0)	56.9 (0.954)	85.8 (1.024)	104.9 (1.035)	123.2 (1.032)	192.1 (1.326)	243.8 (1.471)
720 (12.0)	52.8 (0.684)	92.6 (0.851)	119.0 (0.902)	144.3 (0.927)	182.9 (0.965)	211.7 (0.976)
1080 (18.0)	52.7 (0.581)	79.8 (0.620)	97.8 (0.625)	115.0 (0.622)	157.9 (0.702)	190.1 (0.737)
1440 (24.0)	52.4 (0.516)	81.1 (0.559)	100.1 (0.566)	118.4 (0.565)	149.8 (0.587)	173.3 (0.592)
2160 (36.0)	38.3 (0.323)	57.7 (0.336)	70.4 (0.336)	82.7 (0.332)	124.0 (0.407)	155.0 (0.443)
2880 (48.0)	33.0 (0.251)	58.3 (0.305)	75.0 (0.320)	91.1 (0.325)	113.8 (0.331)	130.8 (0.331)
4320 (72.0)	19.9 (0.134)	42.0 (0.193)	56.7 (0.211)	70.8 (0.219)	79.4 (0.199)	85.8 (0.187)

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

Interim Climate Change Factors

	RCP 4.5	RCP6	RCP 8.5
2030	0.869 (4.3%)	0.783 (3.9%)	0.983 (4.9%)
2040	1.057 (5.3%)	1.014 (5.1%)	1.349 (6.8%)
2050	1.272 (6.4%)	1.236 (6.2%)	1.773 (9.0%)
2060	1.488 (7.5%)	1.458 (7.4%)	2.237 (11.5%)
2070	1.676 (8.5%)	1.691 (8.6%)	2.722 (14.2%)
2080	1.810 (9.2%)	1.944 (9.9%)	3.209 (16.9%)
2090	1.862 (9.5%)	2.227 (11.5%)	3.679 (19.7%)

Layer Info

Time Accessed	28 July 2020 08:56AM
Version	2019_v1
Note	ARR recommends the use of RCP4.5 and RCP 8.5 values. These have been updated to the values that can be found on the climate change in Australia website.

Download TXT (downloads/1ba7f115-59bf-43c7-842c-897d6f53c24b.txt)

Download JSON (downloads/78d327a7-43dd-4761-a2b3-f66652604902.json)

Generating PDF... (downloads/3c9f71db-07ea-4980-a0cd-2141669d4a4b.pdf)

APPENDIX F: STORMWATER QUALITY MODELLING

The bottom half of the page features a series of four thick, white, wavy lines that sweep from the bottom left towards the right, creating a sense of movement and depth against the solid teal background.

F.1 Introduction

F.1.1 Water Quality Design Objectives

A conceptual stormwater quality treatment strategy has been developed in accordance with the State Planning policy (SPP) 2014. Based on the provisions of the SPP, the load based pollutant reduction targets have been used to demonstrate compliance with objectives. Load based targets identified in the SPP were adopted for discharge targets as outlined in Table F.1.

TABLE F.1: WATER QUALITY OBJECTIVES

Pollutant	Load Reduction %
Total Suspended Solids (TSS)	80
Total Phosphorus (TP)	60
Total Nitrogen (TN)	45
Gross Pollutants (GP)	90

F.2 MUSIC Modelling

F.2.1 Climate Data

Climate data for the catchment was sourced from the Bureau of Meteorology (BoM). Rainfall data was obtained from Greenbank Thompson Rd (40659) for the 10 years between 1980 and 1989 at six (6) minute intervals as specified by MUSIC Modelling Guidelines for South East Queensland (Water By Design, 2018).

F.2.2 Catchment Properties

The catchment areas for the water quality are based on the proposed development layout and is presented in **Figure F.1**. A lumped catchment approach was considered appropriate and adopted for the assessment of the urban residential catchments. Due to the vast areas of open green space within the sports and Recreation Park, this area has been excluded from the water quality model, with the exception of the impervious areas of carparking and the netball courts.

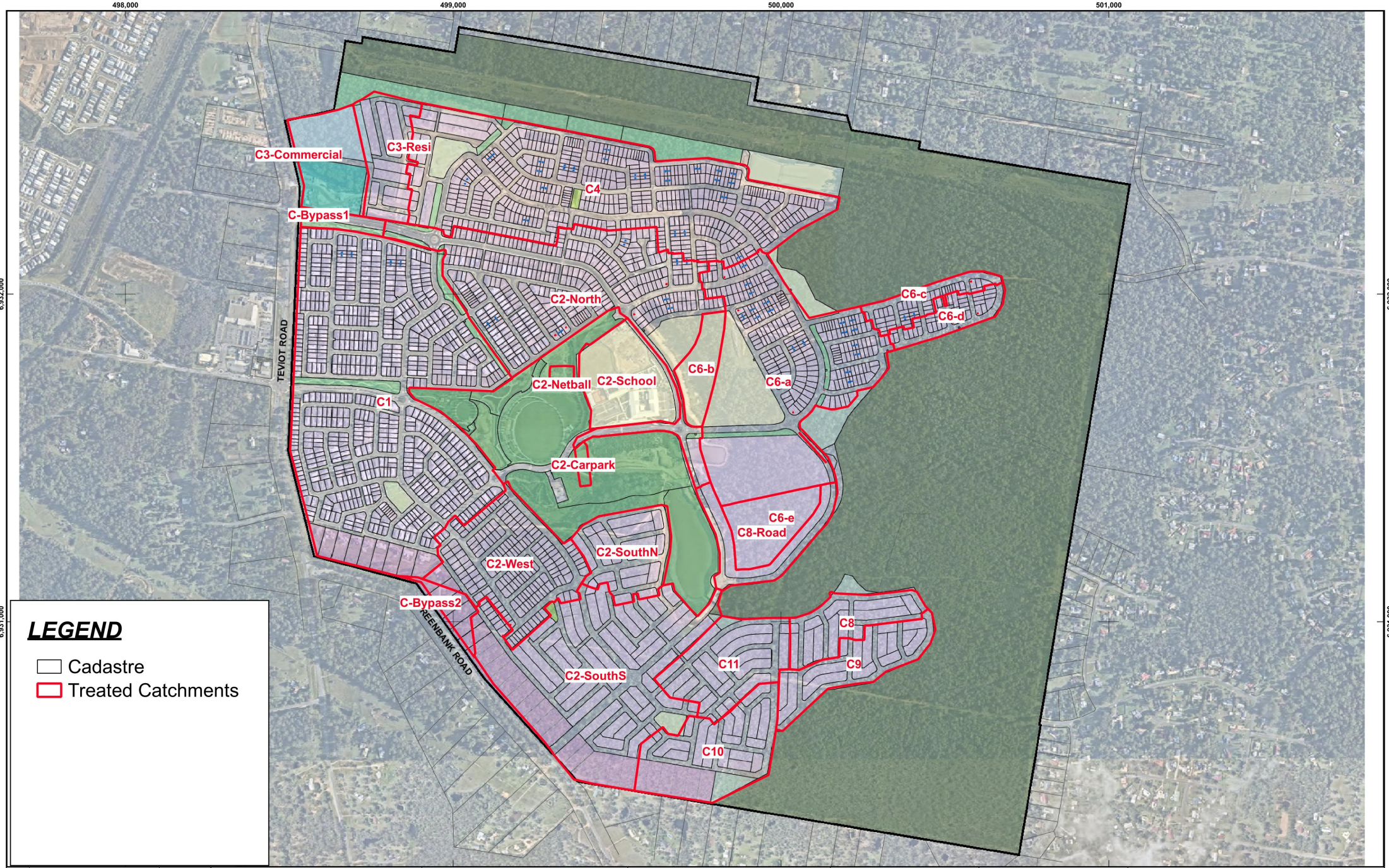
Rainfall-runoff and pollutant export parameters were adopted from the recommended values identified in Tables 3.8 and Table 3.9 Music Modelling Guidelines for South East Queensland (Water by Design, 2018).

Table F.2 provides a summary of the MUSIC Modelling parameters adopted with the various land uses throughout the study area. Fraction impervious was adopted based on the recommended values provided by MUSIC Modelling Guidelines for South East Queensland (Water by Design, 2018).

TABLE F.2: MUSIC MODEL CATCHMENT PARAMETERS

Catchment ID	MUSIC Land Use	Area (ha)	Impervious Fraction (%)
C1	Residential	51.821	55% (Based on Table 3.7, Water by Design MUSIC Modelling guidelines, 2018)
C2-North	Residential	28.335	55%
C2-SouthN	Residential	6.562	55%
C2-SouthS	Residential	27.461	55%
C2-Netball	Residential	0.507	55%
C2-School	Public Zones	7.237	70%

Catchment ID	MUSIC Land Use	Area (ha)	Impervious Fraction (%)
C2-Carpark	Public Zones	0.452	100%
C2-West	Residential	12.577	55%
C3-Commercial	Commercial	6.101	90%
C3-Residential	Residential	5.667	55%
C4	Residential	36.697	55%
C6-a	Residential	27.5	55%
C6-b	Residential	2.982	55%
C6-c	Residential	2.996	55%
C6-d	Residential	3.161	55%
C6-e	Residential	4.449	55%
C8	Residential	5.235	55%
C8-Road	Residential	3.769	55%
C9	Residential	6.424	55%
C10	Residential	9.937	55%
C11	Residential	8.132	55%
Bypass 1	Residential	1.347	55%
Bypass 2	Residential	1.551	55%



LEGEND

- Cadastre
- Treated Catchments

R	DETAILS	DATE
1	Final Issue	10-05-2024

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DRAWN	LN	CHECKED	KM
APPROVED	DS	DATE	10-05-2024
NOTES:			

0 0.2 0.4 km

SCALE @ A3 - 1:10,300
GDA94 / MGA zone 56

DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source



Figure F1

Mirvac
Everleigh Masterplan Update
Water Quality Catchments

Dwg Ref:
QC4060-005

F.2.3 Treatment Sizing

Treatment system parameters have been adopted based on the WSUD Technical Design Guidelines for South East Queensland and the Water by Design MUSIC Modelling Guidelines for South East Queensland. The parameters used for the proposed bioretention basin and wetland are provided in Table F.3 and Table F.4, respectively. The proposed treatment device sizes are included in Table F.6 and the layout of the MUSIC model is included as Figure F.2.

A Concept Layout Plan depicting the locations of the proposed water quality treatment devices for the developed scenario is included in Figure F.3.

TABLE F.3: MODELLED BIORETENTION PARAMETERS

Parameter	Value
Extended Detention Depth	300 mm
Filter Depth	Riparian vegetation modelled as bioretention = 500 mm Bioretention B4 = 400 mm Bioretention B6 = 700 mm All others = 500 mm
Batter Slope to Natural Surface	1 in 4 (V:H)
Orthophosphate Content of Filter Media ¹	5 mg/kg

1 – The orthophosphate content of filter media based on River Sands Pty Ltd product data sheet for Bioretention Filter Media. (Refer to Appendix G)

TABLE F.4: MODELLED WETLAND PARAMETERS

Parameter	Value
Extended Detention Depth	400 mm
Permanent Pool Volume	6,400 m ³
Wetland Surface Area	11,200 m ²
Notional Detention Time	26 hours

TABLE F.5: MODELLED HARVESTING POND PARAMETERS

Parameter	Value
Extended Detention Depth	200 mm
Permanent Pool Volume	12,000 m ³
Harvesting Pond Area	8,000 m ²
Water Harvesting Rate	66,00 kL/year
Water Harvesting Distribution	PET
% of Demand met from Harvesting	70%

1 – Harvesting rate based on 12,000 kL per hectare of per year activity area 8.34 Ha, which is derived from a recent sports field irrigation project in Ipswich over 5.5 Ha of sports field.

TABLE F.6: PROPOSED WATER QUALITY TREATMENT MEASURES

Treatment ID	Catchment	Treatment Type	Sizing
		Sediment Basin	Surface Area (m²)
SB1	1	Sediment Basin (Constructed)	1,500
SB2	2	Sediment Basin	575
SB3	3	Sediment Basin	350
SB4	4	Sediment Basin	800
SB6	6	Sediment Basin	950
SB8	8	Sediment Basin	450
SB10	10	Sediment Basin	330
SB11	11	Sediment Basin	300
		Bioretention Basin	Filter Media Area (m²)
B1	1	Bioretention Basin (Constructed)	2,000
B3	3	Bioretention Basin	800
B4	4	Bioretention Basin	2,400
B6	6	Bioretention Basin	1,080
B8	8	Bioretention Basin	300
B10	10	Bioretention Basin	650
B11	11	Bioretention Basin	500
		Riparian Vegetation	Surface Area (m²)
RP6	6	Riparian Vegetation	3,900 (modelled as 1,155 m ² bioretention filter media area in MUSIC)
RP8	8	Riparian Vegetation	1,200 (modelled as 300 m ² bioretention filter media area in MUSIC)
RP9	9	Riparian Vegetation	1,360 (modelled as 340 m ² bioretention filter media area in MUSIC)
		Wetland	Surface Area (m²)
W2	2	Wetland	11,200
		Harvesting Pond	Surface Area (m²)
HP2	2	Harvesting Pond	8,000

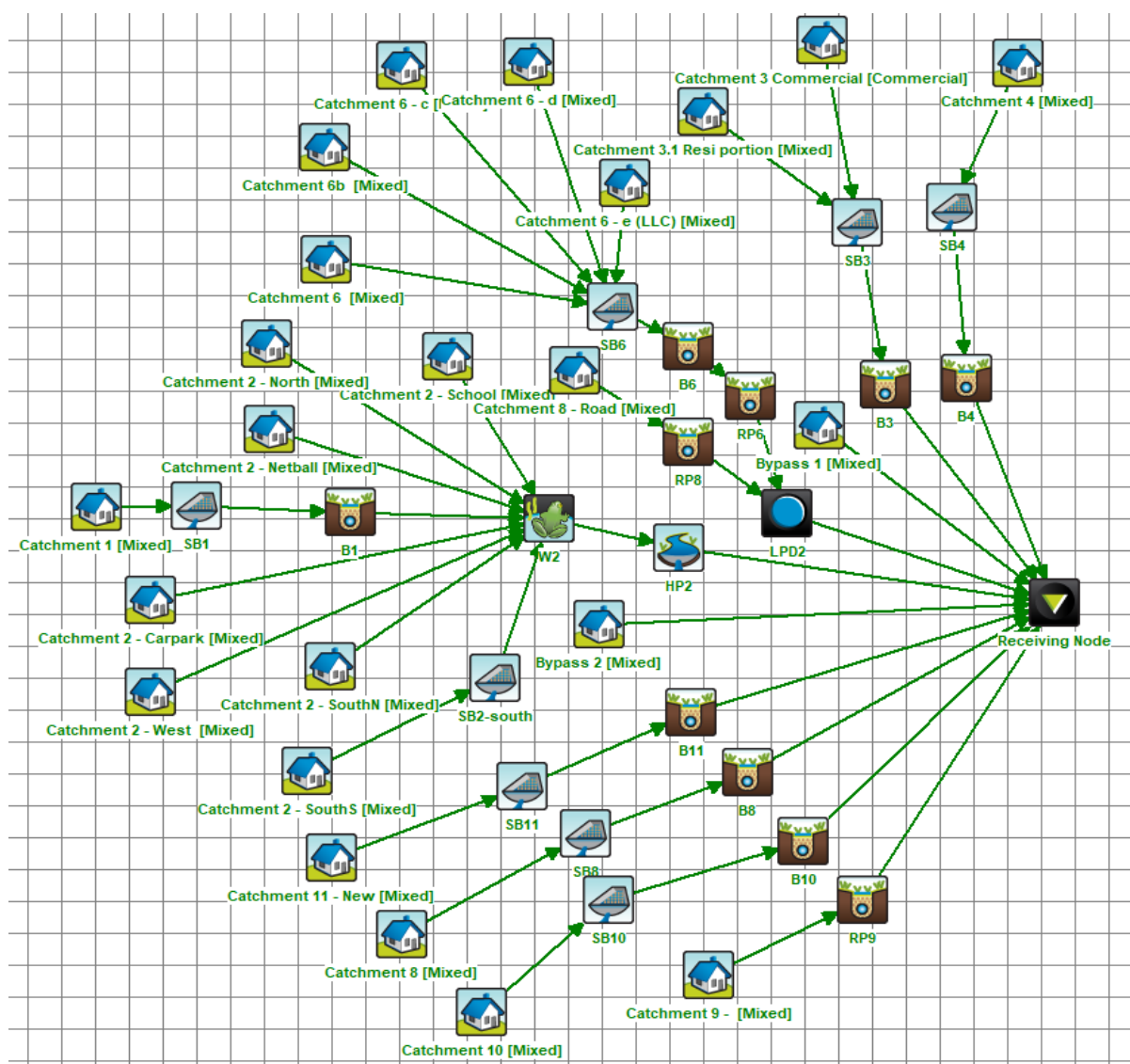


FIGURE F.2: MUSIC MODEL LAYOUT

F.2.3.1. Water Quality Model Results

The results of the MUSIC modelling indicate that the load-based reduction targets have been achieved with the proposed treatment train. The results of the MUSIC model are presented in Table F.7.

TABLE F.7: MUSIC MODEL RESULTS

Pollutant	Load Based Reduction Target (%)	Modelled Reduction (%)
TSS	80	80.1
TP	60	68.9
TN	45	45.9
GP	90	98.9

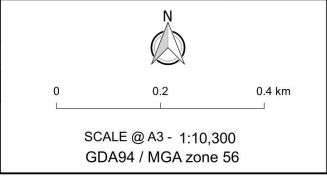


LEGEND

- Lawful Point of Discharge
- Cadastre
- Bioretention Footprint
- ▭ Treated Catchments
- Direction of Flow

R	DETAILS	DATE
1	Final Issue	10-05-2024

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DRAWN	LN	CHECKED	KM		
APPROVED	DS	DATE	10-05-2024		
NOTES:					



DISCLAIMER
Engeny has endeavoured to ensure accuracy and completeness of the data. Engeny assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

DATA SOURCE
QLD Government Open Data Source



Figure F3

Mirvac
Everleigh Masterplan Update
Stormwater Treatment Locations and Contributing Catchments

Dwg Ref:
QC4060-005-SKE-0002

APPENDIX G: BIORETENTION FILTER MEDIA – DATA SHEET



PRODUCT DATA SHEET

This is a typical analysis of material produced and does not constitute product certification for material supply.

Product River Sands Certified BioMedia

Bioretention Filter Media

Manufactured to Meet:

- The Facility for Advance Water Biofiltration Guidelines (V 3.01 June 2009)
- The Healthy Waterways / Water By Design Specifications (V1, October 2012)

Main Applications

Bioretention Filter Media for Bioretention Systems to be used with Bioretention Transition Layer and Drainage Layer to assist in removing pollutants and supporting vegetation.

Sieve Standards

ASTM C136, AS1141.11.1

Sampling Methods

ASTM D75, AS1141.3.1

Note

Indicative grading only. Grading analysis will vary over time due to changes in raw feed.

Technical Properties:		
Analysis	FAWB Specification	Result
Organic Matter (%)	>3-10% (Ideally 5-10%)	3-7%
Saturated Hydraulic Conductivity (Ksat) (mm/hr)	100-600 mm/hr	100-400 mm/hr
Electrical Conductivity (1:5) (dS/m)	<1.2dS/m	0.60dS/m
pH (1:5) in H ₂ O (pH units)	5.5-7.5	5.5-7.5
Total Nitrogen (mg/kg)	<1000 mg/kg	500.0 mg/kg
Orthophosphate (mg/kg)	<80 mg/kg	5.0 mg/kg

Grading Properties:		
<i>The below attached Particle Size Distribution (PSD) is a recommended range and is of secondary importance compared with saturated hydraulic conductivity (Ksat).</i>		
Size (mm)	FAWB Indicative PSD	Result
<0.05	2-6%	2%
0.05-0.15	5-30%	14%
0.15-0.25	10-30%	45%
0.25-1.0	40-60%	38%
1.0-2.0	7-10%	1%
2.0-3.35	<3.0%	0%
>3.35		0%
D85 (Filter Media Layer)	AS 1141.11.1	0.4mm
5 x D85 (Filter Media Layer)	AS 1141.11.1	2.0mm
Fines <0.002mm	< 2 %	✓
<i>To meet 'bridging criteria' the smallest 15% of the sand particles in the transition layer should bridge with the largest 15% of the filter media layer. As per section 4.3.2. Transition Layer. (Where using alternate materials please check bridging criteria before use.)</i>		
D15 (Transition Layer) ≤ 5 x D85 (Filter Media Layer)	0.22mm (D15 River Sands BioTrans 1mm) ≤ 2.0mm (5 x D85 River Sands BioMedia)	✓

This product may contain metallic impurities. Please review suitability of this product prior to use.

River Sands Pty Ltd operates and maintains a certified quality system in accordance with AS/NZS ISO 9001:2015.

The Quality System is third party certified by BCI/NCSI.

River Sands Pty Ltd maintains a Registered NATA Laboratory.

Registration #6898

Registration #10470

Updated: April 2020

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APPENDIX H: STORMWATER HARVESTING CONDITIONS



Project: MIRVAC EVERLEIGH
Location: GREATER FLAGSTONE PDA
Subject: LOGAN CITY COUNCIL CONDITIONS – STORMWATER HARVESTING

Background

- § Mirvac intends to include stormwater harvesting within its Everleigh community in Greenbank.
- § Mirvac and Logan City Council (Council) have met to discuss the proposal
- § Council has confirmed it has no concerns with the stormwater harvesting proposal providing a number of conditions are met (refer left hand column below)

Purpose

Mirvac has reviewed Council's conditions and either agrees or agrees in principle with same. Notwithstanding, Mirvac wishes to clarify several aspects of the conditions to ensure that both Council and Mirvac understand expectations going forward. The right-hand column below provides Mirvac's response to Council's conditions and requests Council feedback for some aspects.

Council Conditions & Mirvac Response

Council Advice	Mirvac Response
Council has no objection to the stormwater harvesting concept proposed for Everleigh provided that the following conditions are met:	
1. that the scheme only irrigate sporting fields, noting Council does not irrigate any recreational parks and does not want to be responsible for providing recycled stormwater to education facilities;	Agreed.
2. that an appropriate backup option be maintained should the scheme fail, ensuring sports fields can continue to be irrigated from the potable water supply;	Agreed.

3. that the scheme uses an appropriately coloured pipe (noting lilac is proposed) to ensure differentiation from the reticulated potable water supply;
4. that the alignment of the pipeline for the stormwater reticulation be on a different alignment to the potable water supply (1.4 m) and sewer alignments (2.3 m) so that the stormwater reticulation is clearly separate from the potable water supply reticulation – the alignment should maintain a 0.7 metre separation to the potable water supply reticulation;
5. that Council has a preference for UV treatment of stormwater as opposed to chemical treatment, recognising typically lower costs and more practical operational requirements;
6. that the recycled stormwater quality will meet the Australian standards and requirements of the Council asset custodian for use on sporting fields;

Agreed.

Agree in principal.

While every reasonable effort will be made to comply, the final arrangement will be subject to the number and size of the other services. Mirvac commits to consulting with Council to discuss and resolve alternate alignments if the specified alignments cannot be achieved.

Please confirm Council is accepting of potential alternate alignments on this basis.

Agreed in principal.

We understand that neither UV or chemical treatment are mandatory where acceptable water quality outcomes can be achieved without same. The Mirvac proposal will seek to avoid the need for UV or chemical treatment by meeting acceptable water quality outcomes through the treatment train in the stormwater masterplan (i.e. bioretention systems, vegetated swales and wetland). Should acceptable water quality outcomes not be achieved through the stormwater treatment train, Mirvac acknowledges that UV treatment is Council's preferred option.

Please confirm Council is accepting that UV or chemical treatment is not required where acceptable water quality outcomes can be achieved through the stormwater treatment train.

Agree in principal.

We are not aware of a specific Australian Standard applicable to recycled water quality. The *Australian Guidelines for Water Recycling: Managing*

Health and Environmental Risks (Natural Resources Management Ministerial Council, the Environment Protection and Heritage Council, and the National Health and Medical Research Council, 2009) seeks to incorporate the relevant parts of several Australian and international standards. We propose to adopt the risk-based assessment outlined in the guideline above. This provides a practical way for both Mirvac and Council to manage potential public health and environmental risks associated with the reuse of urban stormwater.

Please confirm this approach is acceptable to Council.

7. that the ultimate Council asset custodian, nominated as Sport and Leisure Facilities; be involved in all elements of the detailed design for the scheme and for each subsequent stage of delivery;

Agree in Principal.

Note that the it would be practical to agree gates or hold points for Sport and Leisure Facilities input (e.g. concept design, 70% design development, 100%/approval, prestart, on-maintenance, off-maintenance).

Please confirm this approach is acceptable to Council

8. that the transfer of all scheme assets be subject to Economic Development Queensland's on maintenance / off maintenance processes but with the opportunity for the Council asset custodian to be involved in those processes and that the on-maintenance period be a period of 36 months to allow the developer to demonstrate the successful operation of the scheme over a number of weather seasons and to confirm operational costs; and
9. that there be agreement between the developer and the Council asset custodian regarding asset handover.

Agreed.

Agreed.