Proposed Subdivision

STORMWATER DRAINAGE STRATEGY

Lot 1 DP1228883 and Lot 1 DP 430627

202 BUSHLAND DIRVE, TAREE

22 MAY 2025

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AJA Developments

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Report Number: HD336

Document Control

REVISION	DATE	REVISION DETAILS	AUTHOR	REVIEWER
A	10.05.2023	DA Issue	Joseph Law	Kevin Urane
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Contents

List of Acronyms

AHD	Australian Height Datum
ARI	Average Recurrence Interval
ARQ	Australian Runoff Quality, Engineers Australia, 2006
AR&R	Australian Rainfall and Runoff, Institution of Engineers, Australia, 1987
BASIX	Building Sustainability Index
BOM	Bureau of Meteorology
CC	Construction Certificate
DA	Development Application
DLWC	Department of Land and Water Conservation
FFL	Finished Floor Level
FPL	Flood Planning Level
IAD	Inter-allotment drainage
IFD	Intensity Frequency Duration
LGA	Local Government Area
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
RL	Reduced Level
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids

1. INTRODUCTION

1.1 Background

High Definition Design Pty Ltd was commissioned by AJA Developments to prepare a Stormwater Management Plan & Report in accordance with the stormwater quantity and quality requirements of the Mid-Coast Council's Development Control Plan and the Engineering Guidelines for Subdivisions and Development Standards to support the Development Application for the proposed development at the 202 Bushland Drive, Taree known as Lot 1 DP 1228883 and Lot 1 DP 430627 located within the Mid-Coast Council area, the site location is shown in Figure 1 Appendix A.

The scope of this report includes an identification of the stormwater management requirements for the proposed development and in order to devise a stormwater management strategy.

The report describes the principles and operation of the proposed stormwater system as well as the primary components of the drainage system. As the assessment and evaluation are required under the conditions of consent, the final stormwater system layout may need to be revised in the future during the application for a Construction Certificate.

The following information and documents were used in this investigation:

- Concept plan reference by High Definition Design Pty Ltd, HD336 Sheet s01 Rev C6 dated 28 May 2025.
- Mid-Coast Council – Greater Taree Development Control Plan (DCP) 2010.
- Mid-Coast Council – Guidelines for Water Sensitive Design Strategies 2019
- Mid-Coast Council – Site Stormwater Drainage Guidelines 2022
- "Australian Runoff Quality – A Guide to Water Sensitive Urban Drainage", Engineers Australia (2006).
- "Australian Rainfall and Runoff – A Guide to Flood Estimation", Institute of Engineers Australia (1987).

The increase in impervious areas and alteration of the natural topography due to land development has the potential to increase and concentrate peak storm flows. This has the potential to impact on flow regimes and cause erosion of the downstream drainage network and associated waterways.

To avoid any adverse impact on the downstream drainage systems, the site's stormwater management system must be designed to ensure the safe conveyance of flows throughout the site and within the capacity of the downstream trunk drainage systems in a healthy environmental state for Ecological Sustainable Development.

1.2 Site Description

The site is located at Bushland Drive, Taree, NSW, and is Lot 1, DP122888 and Lot 1 DP 430627 3 with a total area of approximately 8.523 hectares. The site is bounded by Bushland Drive to the North side, access driveway from North to the middle of the site, and water discharge from the basin to the East side of the public reserve.

The site has average natural surface slope from West to the East side at approximately 3.3%, and level from RL22.8m AHD on the south-west corner to RL 13.5m AHD at the east side of the site.

1.3 Proposed Development

The proposed site is for an industrial/ commercial subdivision, creating 3 lots and public road, and a 4 lot to be dedicated to council as public reserve. On proposed lot 3 it is intended to build a bulky good developments. The concept subdivision lot layout has been prepared by High Definition Design Pty Ltd and is shown in Figure 2 Appendix A.

1.4 Internal Catchment

Stormwater runoff from the developed site will be conveyed to a detention basin located along the eastern boundary. The basin will discharge into the public reserve.

Catchment	Area (ha)	Impervious (%)	Slope (%)	Roughness (n)
Predeveloped	7.0	4	4.8	0.08
Developed	7.0	70	2	0.05

1.5 External Catchments

There are three external catchments that flow through the site. These catchments will be diverted around the site.

Catchment	Area (ha)	Impervious (%)	Slope (%)	Roughness (n)
North	19.07	12	8.4	0.12
South	6.51	15	5.7	0.08
West	12.3	0	4.4	0.10

Northern External Catchment

The northern catchment is conveyed under Bushland Drive in an existing 1800 x 750 RCBC. This culvert has the capacity to convey up to and including the 5% AEP. The proposal offers to divert the northern catchment in a 3m wide by 1m deep open drain to the public reserve. Most of the bypass over Bushland Drive will be captured by a series of grated kerb inlet pits in the access road and conveyed to the open drain. The remainder will be conveyed to the proposed detention basin within the road formation.

1.5.1 Southern External Catchment

The southern catchment is conveyed under the North Coast Railway in an existing culvert. The proposal offers to divert the southern catchment in a 2.5m wide by 1m deep open drain to the eastern reserve.

1.5.2 Western External Catchment

The western catchment encompasses the Bunnings development. The proposal offers to capture the 1% AEP flow as determined by Mid Coast Council (2.34 cumecs) and convey it to the public reserve by a 2100 x 600 RCBC. The RCBC will bypass all internal drainage and discharge downstream of the proposed detention basin.

1.6 Objective and Target of Work

This plan of work has been undertaken to provide the following information in support of the Development Application:

- Documentation of the requirements of Mid-Coast Council for this development site.
- Identify the impacts of this proposed residential development on existing waterways and downstream properties.
- Provide stormwater controls that ensure the proposed development does not adversely impact on the quantity of stormwater flows within, adjacent and downstream of the site.
- Provide concept dimensions of the proposed stormwater management services in accordance with the adopted approach by council.

1.7 Available Data

The following information was utilised in the preparation of this strategy:

- Concept plan reference by High Definition Design Pty Ltd, HD336 Sheet S01 to S23 Rev C6
- Mid-Coast Council – Greater Taree Development Control Plan (DCP) 2010.

1.8 Strategy Purposes / Criteria

1.8.1 Stormwater Runoff Quantity Criteria

Stormwater flow management and design criteria of quantity include:

- The adoption of a major / minor flow approach to the design of the local stormwater management system.
- Delivery of major flows through the site to the stormwater system in a safe manner and to avoid impacting on the site and downstream properties.
- Limiting the discharges rates of the proposed to development pre-development discharge rates.

1.8.2 Stormwater Runoff quality Criteria

Stormwater runoff from the development area should be treated prior to discharging to a public Stormwater system consistent with normal practice criteria for new developments, and with consideration to opportunities for integration with developed site features and topography

The design methodology for Stormwater Runoff Quality typically contains stormwater quality treatment devices based on identified opportunities for stormwater quality management referencing the development site and catchment.

Stormwater quality management for the proposed site could include a treatment train of structures consisting of:

- Water harvester for reducing runoff volumes;
- Gross pollutant trap (GPT);
- Stormwater bioretention basins;
- Proprietary water quality improvement devices for runoff water treatment.

1.8.3 Flooding Criteria

Mid-Coast Council Site Stormwater Drainage Guidelines 2022, Section 1 & 4. "Commercial and Industrial & Freeboard to finished floor level", States:

a) For industrial subdivisions, detention volume is to be equivalent to the difference in volume between pre-development and post-development flows up to and including the 1% AEP.
b) For industrial subdivisions, discharge is to be equivalent to pre-development runoff rate for all storm events up to and including the 1% AEP.
c) Finished floor levels of existing and new buildings are to be set with a minimum of 500mm freeboard above the OSD storage's maximum design water surface level and the spillway water level.

Hence, all the proposed lots should be designed at or above the 1 in 100-year flood event level, with all buildings to be above the flood planning level with the 0.5 m freeboard for industrial development.

2. STORMWATER DRAINGE MANAGEMENT STRATEGY

The stormwater drainage management plan involves:

- Output of the collected stormwater from drainage pipe system to gross pollutant traps (GPT's) for primary treatment prior to the discharge into the proposed combined detention and bioretention basins for further treatment.
- Capture of stormwater from lot and road reserve areas by a convectional pit and pipe drainage network located in the street or in IAD easements where required.
- Discharge from the catchment's outlets will be conveyed over land towards the existing waterways, or piped where required, generally similar to the discharge from the undeveloped catchments.
- A basin with-in the proposed subdivision, in accordance with Mid-Coast Council's Development Control Plan, Part E-Flooding Requirements.

Details of the proposed local drainage system will be determined at the time of Construction Certificate application, to Council's standard requirements.

3. METHODOLOGY

3.1 Stormwater Runoff Quantity

The hydrological modelling software has been used to estimate the predeveloped and developed flow to demonstrate the magnitude of the local catchment discharge.

3.1.1 Stormwater Flow Model

The post-development release is compared to the pre-developed discharge, and if higher, detention is usually warranted in accordance with Council's standard requirements.

3.1.1.1 Catchment Plan and Model Data

Surface runoff flowrates from the proposed site were modelled in two differing scenarios (the pre-developed state and post-developed catchment) using DRAINS.

The RAFTS model was used within the DRAINS software package for both scenarios.

For the existing state the development site was formed to be one catchment. Figure 3 Appendix B shows the location of the Post-developed catchment boundaries, including redirection of stormwater where flow is conveyed via the developments internal road drainage system. DRAINS model data is included in Appendix E.

The methodology for stormwater quantity comprised quantitative analysis of available data to estimate existing and future flow behaviour from the development site. The analysis involved examination of surface hydrology to identify runoff characteristics from the proposed site and determination if stormwater mitigation devices are required to negate the impact of site development on existing flowrates from the site.

This involved the following steps:

- Estimate the existing peak stormwater flowrates at the downstream drainage outlets of the site using the DRAINS drainage software package.
- Revise the existing scenario in the DRAINS drainage model to include the additional impervious areas that will arise due to development of the site. This resulted in the developed DRAINS drainage model.
- The critical storm was then selected for each ARI, based on the peak discharge from the site. The hydrographs of these 'critical' storms were plotted to enable comparison of the existing state storm event to the developed state storm event.

3.1.1.2 Rainfall Depths and Losses

Design rainfall depths, patterns, and losses have been sourced from the ARR Data Hub.

Table 1 summarises the catchment storage and loss parameter values adopted in the DRAINS models for both the predeveloped and developed models.

Table 1: Storage and loss parameters adopted in the DRAINS hydrological model

Parameter	Value
Impervious Area Initial Loss (mm)	1
Impervious Area Continuing Loss (mm/hr)	0
Pervious Area Initial Loss (mm)	35*
Pervious Area Continuing Loss (mm/hr)	1.44

* Subject to the Probability Neutral Preburst Loss.

3.1.1.3 Model Catchment Data

Full DRAINS model Catchment data is provided in Appendix E.

3.2 Stormwater Runoff Quality

The methodology for Stormwater Runoff Quality typically involves selection of stormwater quality treatment devices based on identified opportunities for stormwater quality management referencing the development site and catchment conditions, and normal best practice.

The performance of the stormwater management plan was undertaken using the MUSIC stormwater water quality model. MUSIC is a continuous simulation water quality model. The pollutants considered in the water quality modelling were total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN) which are typical components of urbanised stormwater runoff.

MUSIC input parameters include:

- Rainfall and potential evapotranspiration data
- Catchment area and percentage impervious
- Hydrologic parameters
- Statistical pollutant generation parameters

MUSIC outputs include:

- Average annual pollutant export loads
- Treatment train effectiveness expressed in terms of pollutant reduction.

Input parameters used for modelling were derived from BOM Climate Data, parameter values in the *MUSIC User Manual* and the publication *Using MUSIC in Sydney's Drinking Water Catchment, A Sydney Catchment Authority Standard* (Published by Sydney Catchment Authority, Penrith, December 2012).

The treatment criteria of stormwater quality of Mid-Coast Council are summaries in Table 4 as neutral or beneficial effect with no net increase:

Table 2: Stormwater Treatment Objectives

Pollutant	Stormwater Treatment Objective
Total Suspended Solids (TSS)	< Pre-Development Totals
Total Phosphorus (TP)	< Pre-Development Totals
Total Nitrogen (TN)	< Pre-Development Totals

3.2.1 MUISIC Parameters

3.2.1.1 Land Use Type

The post-developed land use was modelled using both the industrial land use/zoning and surface type. The pollutant generation characteristics of the land use/zoning and surface type are shown in Table 6 below.

3.2.1.2 Rainfall and Evapotranspiration

The rainfall data used for the modelling was from Taree (Patanga Close) weather station (060030). The rainfall data used in the analysis was from the year 2000. The average annual rainfall during this period was 1032mm.

Monthly average areal potential evapotranspiration (PET) values from MUSIC's default values for Taree were used in the modelling. Evapotranspiration values are given in Table 5. The estimated total annual areal PET is 1327 mm.

Table 3:Monthly Average Areal PET Values

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
PET (mm/month)	180	135	135	90	62	50	50	70	100	135	150	165

3.2.1.3 Time Step

The model was run with a time step of 6 minutes.

3.2.1.4 Hydrology

The soil hydrological groups are set as group D and the MUSIC hydrology parameters used are summarised below in Table 6 from council WSD Guidelines, section 4.6.5.

Table 4: MUSIC Rainfall-Runoff Parameters

Parameter	Residential	Road

Impervious Area Properties		
Land Use Area (ha)	6.39	0.58
Impervious Area (%)	80	70
Rainfall Threshold (mm/day)	0.5	0.5
Pervious Area Properties		
Soil Storage Capacity (mm)	90	90
Initial Storage (% of Capacity)	25	25
Field Capacity (mm)	65	65
Infiltration Capacity Exponent - a	135	135
Infiltration Capacity Exponent - b	4.0	4.0
Groundwater Properties		
Initial Depth (mm)	10	10
Daily Recharge Rate (%)	10	10
Daily Baseflow Rate (%)	10	10
Daily Deep Seepage Rate (%)	0	0

3.2.1.5 Event Mean Concentrations

The MUSIC model requires pollutant generation parameters for baseflow and stormflow conditions. Baseflow is derived from the groundwater store, which is recharged from the previous soil store. Stormflow is generally generated from the impervious area, and under some conditions the pervious area as well.

The pollutant parameters for the adopted land use types were determined from the *Using* MUSIC in Sydney's Drinking Water Catchment, A Sydney Catchment Authority Standard (Published by Sydney Catchment Authority, Penrith, December 2012), and are provided in Table 7.

Table 5: Adopted Land Use Baseflow and Stormflow Concentration Parameters

Land Use and Flow Type	Total Suspended Solids (TSS) ($\log_{10}$ mg/L)		Total Phosphorus (TP) ($\log_{10}$ mg/L)		Total Nitrogen (TP) ($\log_{10}$ mg/L)	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
Baseflow Roof	1.10	0.17	-0.82	0.19	0.32	0.12
Stormflow Residential Roof	1.20	0.17	-0.85	0.19	0.11	0.12
Stormflow Road	1.20	0.17	-0.85	0.19	0.11	0.12

Stormflow Basin	1.10	0.17	-0.82	0.19	0.32	0.12

4. MODEL RESULTS

4.1 Stormwater Runoff Quantity

4.1.1 DRAINS Model Results

The predeveloped and developed site conditions were modelled to establish the peak flow for the various storm frequencies. A detention basin was designed to attenuate the developed flows back to the predeveloped flows.

Table 6: Basin performance

AEP	Predeveloped Peak Flow (m^3/s)	Developed Peak Flow (m^3/s)	Attenuated Developed Peak Flow (m^3/s)	Basin Top Water Level (RL)	Basin Storage (m^3)
1EY	0.29	0.97	0.32	14.75	900
50%	0.36	1.13	0.38	14.84	1000
20%	0.77	2.02	0.84	15.15	1600
10%	1.06	2.66	1.07	15.32	1900
5%	1.35	3.23	1.24	15.49	2200
2%	1.70	3.93	1.64	15.64	2500
1%	2.08	4.48	2.13	15.74	2700

The DRAINS model for each year has been attached to the report for assessment.

The detention basin calculations do not account for reduced runoff due to the presence of rainwater harvesting tanks. A noticeable reduction in the peak developed flow during the less frequent storms would likely occur after the installation of rainwater harvesting tanks.

In accordance with Council's stormwater requirements, the spillway must be incorporated within the basin embankment. The spillway must also safely convey the 1% AEP peak flow. The peak flow over the basin spillway in the 1% AEP is 36l/s when limited to the internal catchment only. However, some bypass from the external northern catchment does reach basin as the culvert under Bushland Drive does not have the capacity to convey the 1% AEP. The peak flow of 150l/s when this is considered. The proposed spillway can convey this safely.

4.2 External Catchment Diversion Controls

The external catchment diversion controls for the 1% AEP are presented below.

Catchment	1% AEP Peak Flow	Control	Flow Depth (m)
North	5.70	3m wide x 1m deep open drain, 2H:1V batters, 1.8% fall, n = 0.05, 0.3m freeboard.	0.7
South	2.65	2.5m wide x 1m deep open drain, 2H:1V batters, 0.5% fall, n = 0.05, 0.3m freeboard.	0.7
West	2.47	2.1m wide x 0.6m deep RCBC, 1.0% fall, n = 0.012.	0.6

4.3 Stormwater Runoff Quality

4.3.1 MUSIC Results – Post Development land Use (No Treatment)

Parameter	Value
Inlet Properties	
Low Flow By-pass (m^3/s)	0.0
High Flow Bypass (m^3/s)	100.0
Storage Properties	
Extended Detention Depth (m)	0.25
Surface Area (m^2)	1515
Filter and Media Properties	
Filter Area (m^2)	625
Unlined Filter Media Perimeter (m)	100
Saturated Hydraulic Conductivity (mm/hr)	100
Filter Depth (m)	0.6
TN Content of Filter Media (mg/kg)	800
Orthophosphate Content of Filter Media (mg/kg)	55.0
Infiltration Properties	
Exfiltration Rate (mm/hr)	0.00
Lining Properties	
Is Base Lined?	No
Vegetation Properties	
Vegetation with Effective Nutrient Removal Plants?	Yes

Outlet Properties	
Overflow Weir Width (m)	2.0
Underdrain Present?	Yes
Submerged Zone with Carbon Present?	No

Pollutant load estimates are provided for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). Figure 7 Appendix C shows the node layout used in the MUSIC modelling.

Standard engineering practice is to ensure that runoff from the proposed new impervious area of the development is treated to meet the established criteria previously documented in Table 4, and this is the basis for evaluation of the treatment train effectiveness as documented below.

4.3.2 MUSIC Results – Post Development land Use (With Treatment)

The MUSIC model results for the post development land use, with treatment measures, is documented below, enabling the evaluation of the treatment train effectiveness.

4.3.2.1 Treatment Device

Treatment devices modelled in MUSIC for the treatment of runoff from the developments impervious surface areas include:

- Gross Pollutant Traps (GPTs)
- Bioretention Basins

4.3.2.2 Gross Pollutant Traps

The GPT node was included downstream of the development area and prior to the proposed bioretention basins. A GPT node was created by using the Sydney Catchment Authority Standard parameter in MUSIC Modelling.

4.3.2.3 Bioretention Basin

The proposed bioretention basin node was included in the MUSIC model immediately downstream of the proposed GPT node. The MUSIC model parameters used for the bioretention basin node are shown below in Table 11.

Table 7: Bioretention Basin Treatment Parameters

4.3.2.4 Modelling Results

The modelled average annual pollutant loads leaving the site in its post development land use, utilising treatment measures, is shown in Table 12. Pollutant load estimates are provided for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). Figure 7 Appendix C shows the node layout used in the MUSIC modelling.

Table 8:MUSIC Model Results for the Site's Post Development Land Use (with Treatment)

Land Use	Average Annual Pollutant Load (kg/yr)		
	Total Suspended Solids (TSS)	Total Phosphorus (TP)	Total Nitrogen (TN)
Post Development	730	6.80	49.8

The treatment train effectiveness, expressed as a percentage reduction in post development land and pre-development use pollutant loads generated by the modelled sources, is summarised in Table 13.

Table 9: MUSIC Model Treatment Train Effectiveness Results

Pollutant	Export Value		Treatment Train Effectiveness
	Pre-Development	Post Development with treatment measures	
TSS (kg/yr)	2290	730	91.7%
TP (kg/yr)	6.80	6.80	54.4%
TN (kg/yr)	49.7	49.8	55.1%

The treatment train effectiveness results above indicate that the pollutant reduction performance is in accordance with the requirements of the Australian Runoff Quality pollutant removal criteria and Mid-Coast Council's WSD Guidelines, Section 3.3.

5. SOIL AND WATER MANGEMENT DURING CONSTRUCTION

Soil and water management devices to minimise land disturbance during the subdivision construction phase are to be provided in accordance with the publication *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

A detailed erosion and sedimentation control plan are to be undertaken during the detailed design stage of the proposed development. The erosion and sedimentation control plan should generally contain the following range of management practices for effective soil and water management during a land disturbance phase:

- Minimise the area of soil disturbed and exposed to erosion by phasing works so that land disturbance is confined to minimum areas.
- Erect barrier fencing to minimise disturbance by preventing vehicular and pedestrian access to restricted areas.
- Limit access for plant etc. to current construction area to limit amount of disturbed area.
- Conserve topsoil for site rehabilitation/revegetation when site works are complete.
- Installation of sediment filters, such as silt fences, straw bales, or turf strips downstream of disturbed areas.
- Control water flow from the top of, and through the development area. In particular, divert upslope runoff around works and limit slope length to 80 metres on disturbed lands if rainfall is expected.
- Where appropriate, reduce the effects of wind erosion by controlling on-site traffic movement and watering bare soil areas.

  Provision of shaker humps / pads near construction entry and exit locations to remove excess soil materials from vehicle tyres and underbodies.
- Rehabilitate disturbed lands quickly.
- Ensure that all erosion and sediment control measures are kept in a properly functioning condition until all site disturbance works are completed and the site is rehabilitated.

6. SUMMARY AND CONCLUSIONS

At Source Management

Stormwater Flow Management (stormwater runoff quantity and quality)

The strategy for management of stormwater runoff from the development is depicted on Figure 3 and 4 Appendix B, and comprises:

- Capture of stormwater from lot and road reserve areas by a conventional pit and pipe drainage network located in the road or in inter-allotment drainage easements where required.
- Conveyance of captured stormwater within the drainage pipe network to gross pollutant traps (GPT's) for primary treatment prior to discharge into the proposed combined detention and bioretention basins.
- The detention basins will provide attenuation of developed stormwater flowrates to existing flowrate conditions for the development site.
- The bioretention basins will provide secondary/tertiary treatment and polishing of the stormwater runoff from the development site prior to discharge downstream.
- Discharge from the major catchment outlets will be conveyed over land within the existing watercourses, or piped as required, toward southern side of the site towards Swamp Creek, generally similar to the discharge from the undeveloped catchments.

MUSIC modelling has demonstrated that the proposed treatment devices will treat developed stormwater runoff to meet requirements outlined in Manual of Engineering Standard 2014 Section 8.2 Stormwater Quality, and on this basis, it is considered that no further water quality controls will be required within the proposed subdivision development.

Details of the proposed local drainage system will be determined at the time of Construction Certificate application, to Council's standard requirements.

area within the site to provide stormwater drainage management measures to negate the impact of As illustrated by Figure 4 Appendix B, there is sufficient the proposed development.

The catchment area outside our site to the south is not considered as part of this current application as the flow from the lot will not be going to the proposed basin

7. REFERENCES

- Mid-Coast Council – Greater Taree Development Control Plan (DCP) 2010.
- Australian Rainfall and Runoff, Institution of Engineers, Australia, 1987.
- Australian Runoff Quality, Engineers Australia, 2006.
- Using MUSIC in Sydney's Drinking Water Catchment, A Sydney Catchment Authority Standard, Sydney Catchment Authority, Penrith, December 2012.

Appendix A: Site location and Subdivision Plan

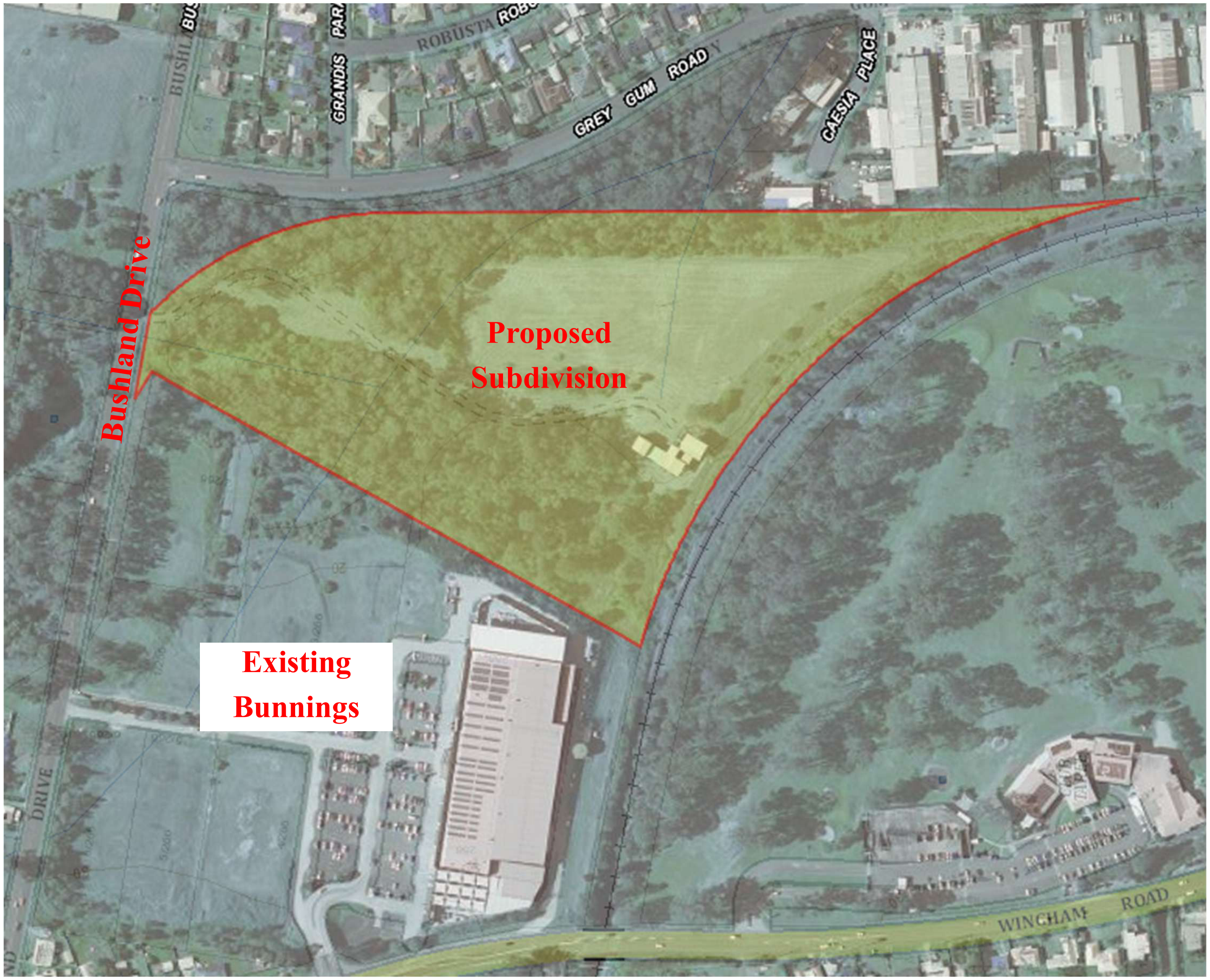
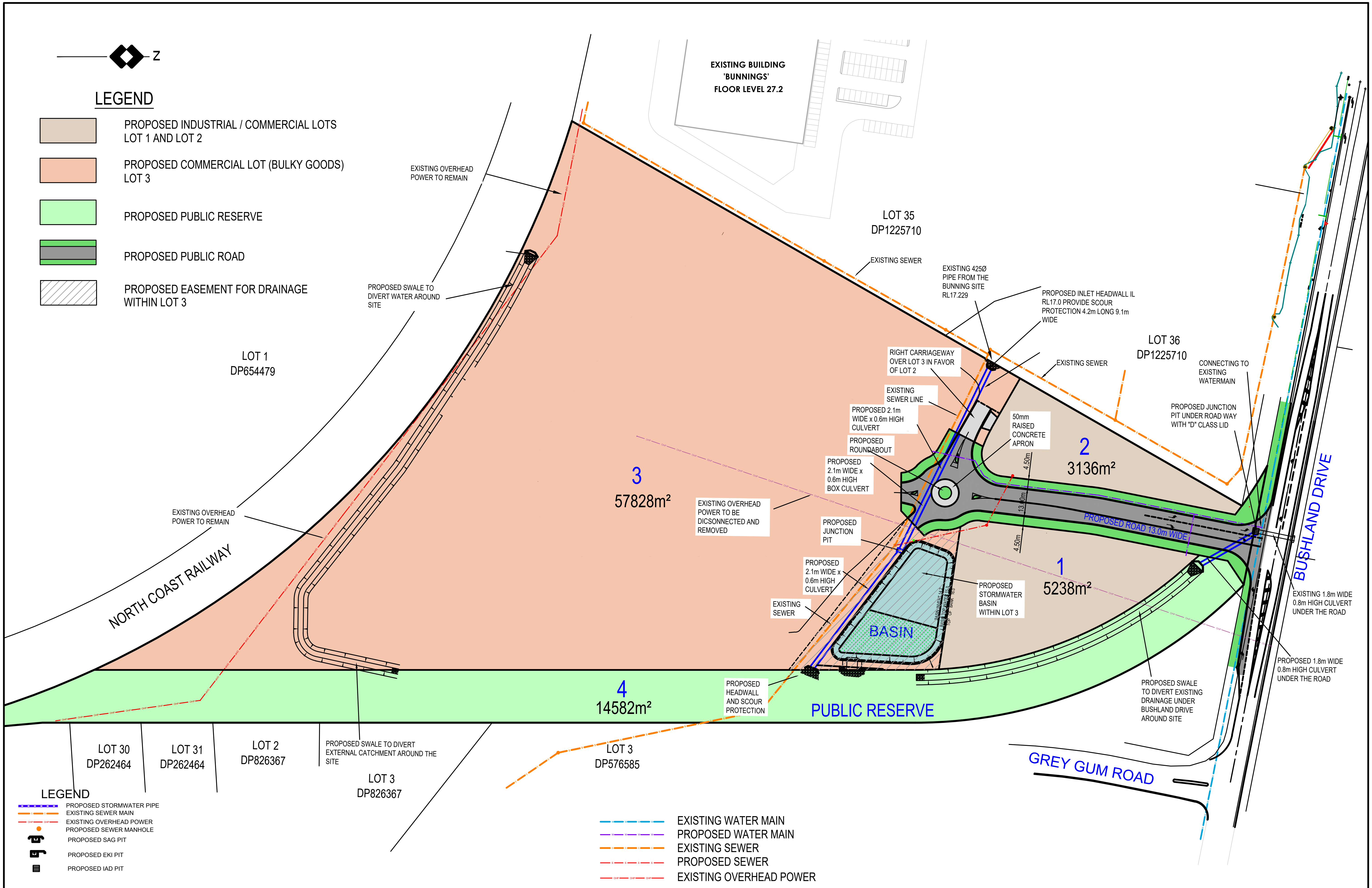


Figure 1: Proposed Site Location



TITLE: PROPOSED SUBDIVISION OF LOT 1 DP1228883 and LOT 1 DP430627
202 BUSHLAND DRIVE TAREE

SUBDIVISION PLAN

CLIENT: AJA DEVELOPMENTS

High Definition Design Pty Ltd

KEVIN URANE 0412009891

NOTE:

ALL EXISTING UNDERGROUND SERVICES MUST BE LOCATED AND EXPOSED PRIOR TO EARTHWORKS COMMENCING AND IT IS RESPONSIBILITY OF THOSE PERSONS USING THIS PLAN TO CONFIRM BOTH POSITION AND LEVEL OF THESE UTILITIES IN CONJUNCTION WITH THE APPROPRIATE AUTHORITY.

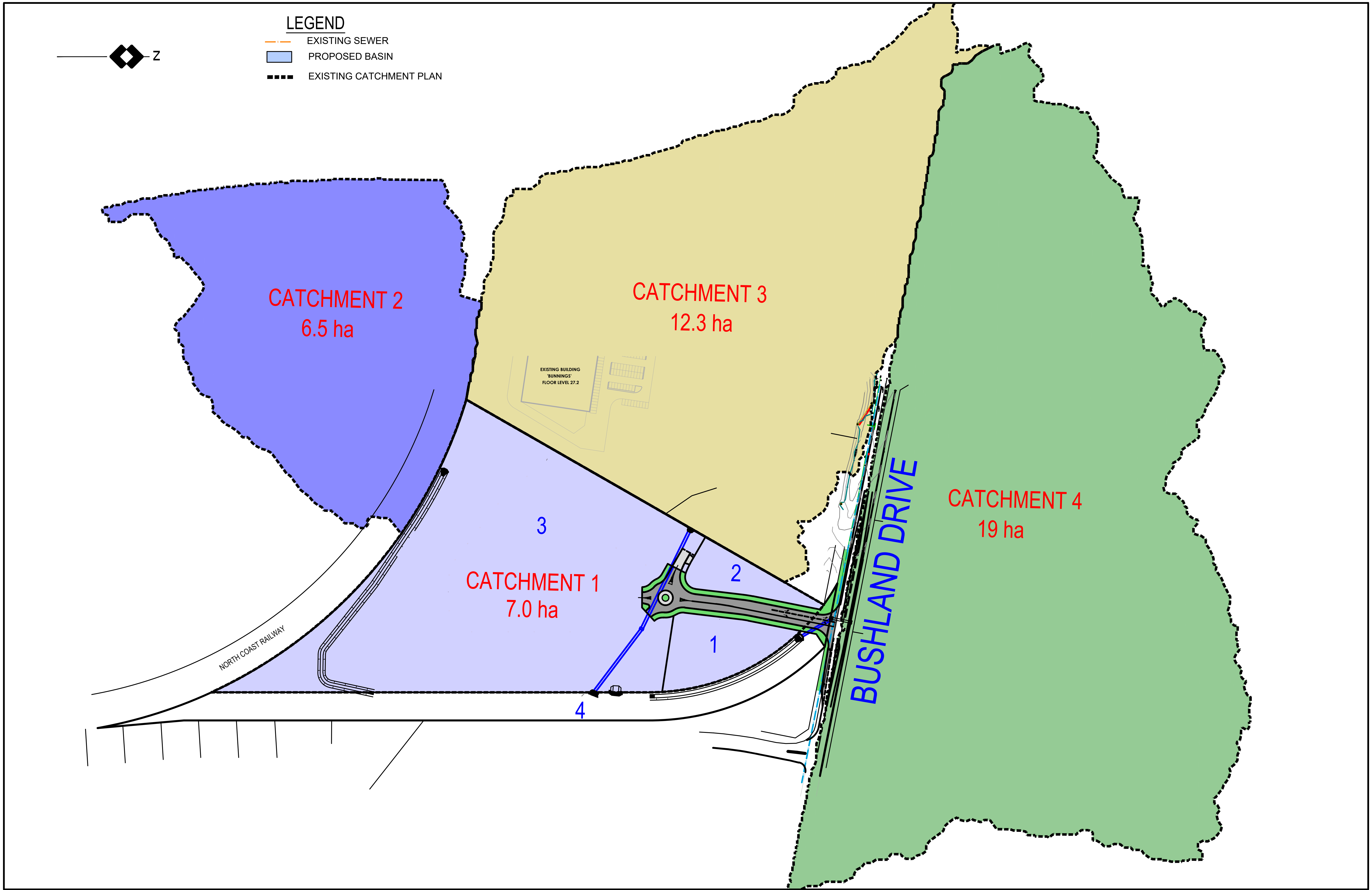
0 10 20 30 40 50m
1:500 (H)

Date: 11.04.23 Scale: 1:500 A1 Designed: KU
Cad Ref: HD336 Civil COMMERCIAL R6

No	Amendment	Drawn	Date
C6	AMEND FLOOR LEVELS	KU	28.05.25
C5	DA ISSUE	KU	20.05.25

Project No: HD336
Drawing No: S01
Revision: C6

Appendix B: Stormwater Management Plans



TITLE: PROPOSED SUBDIVISION OF LOT 1 DP1228883 and LOT 1 DP430627
202 BUSHLAND DRIVE TAREE

EXISTING CATCHMENT PLAN

CLIENT: AJA DEVELOPMENTS

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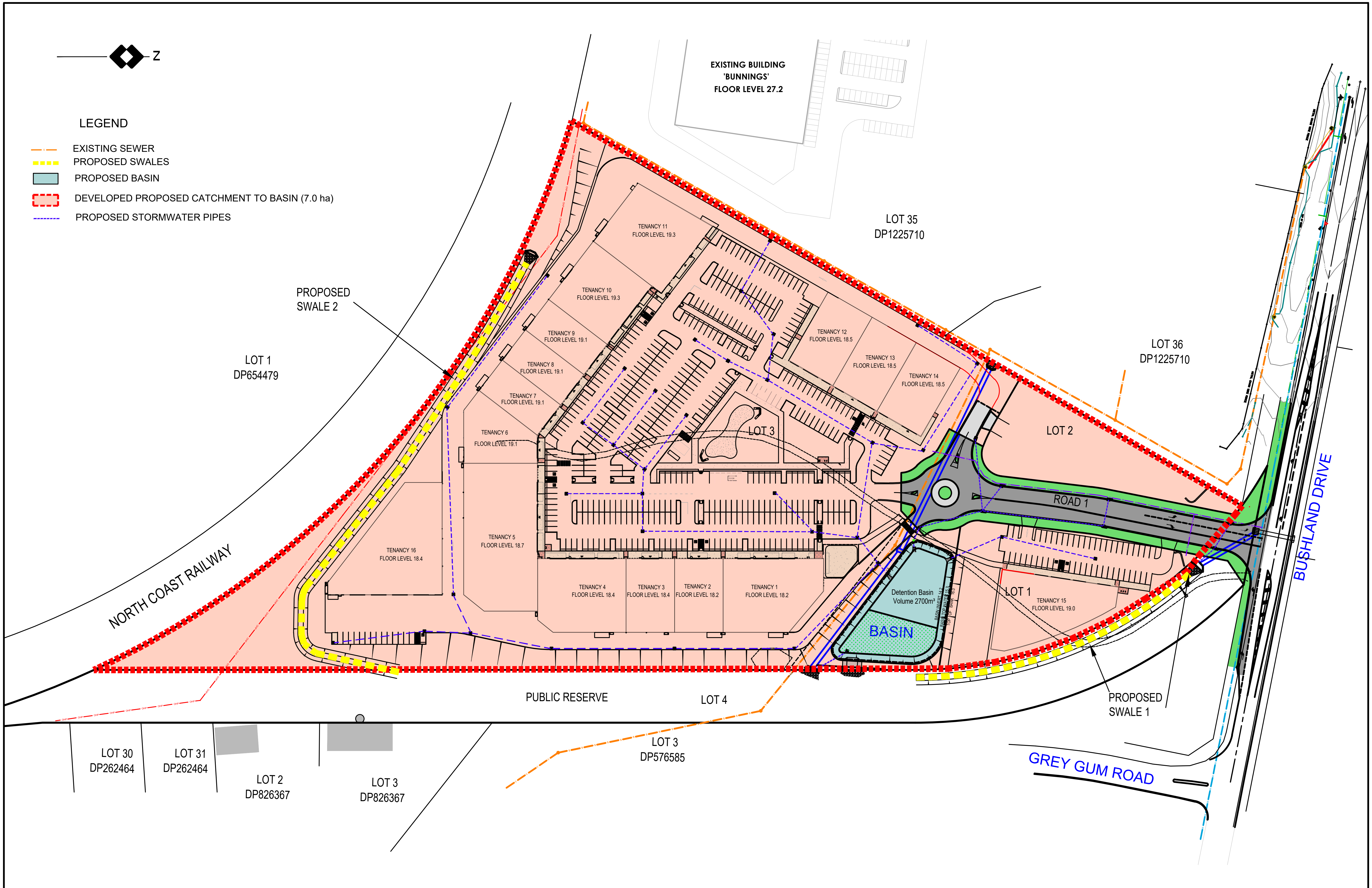

TITLE: PROPOSED SUBDIVISION OF LOT 1 DP1228883 and LOT 1 DP430627
202 BUSHLAND DRIVE TAREE

DEVELOPED CATCHMENT PLAN

CLIENT: AJA DEVELOPMENTS

High Definition Design Pty Ltd

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Cad Ref: HD336 Civil COMMERCIAL R6

No	Amendment	Drawn	Date
C6	AMEND FLOOR LEVELS	KU	28.05.25
C5	DA ISSUE	KU	10.05.25

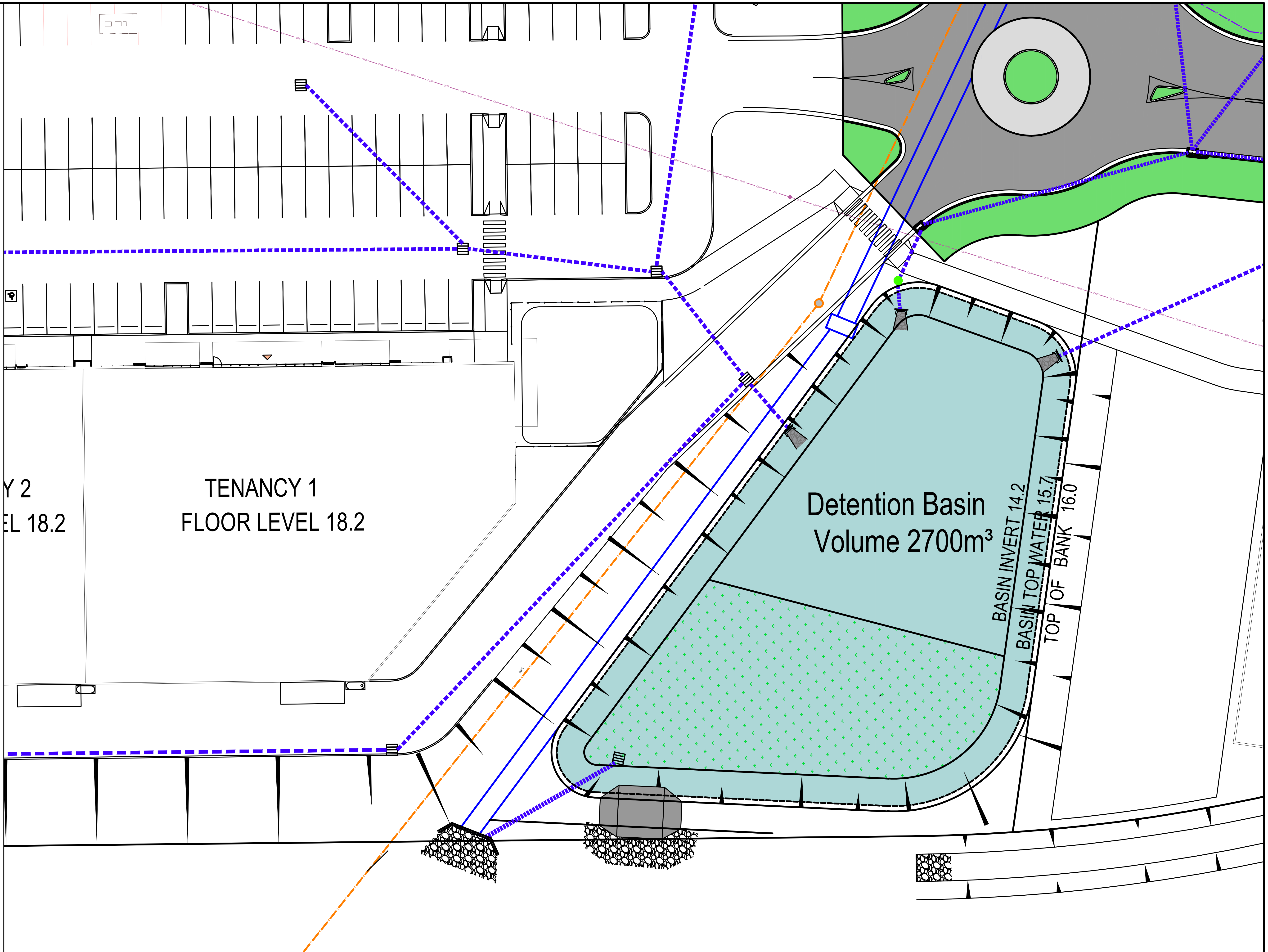
Project No: HD336
Drawing No: D2
Revision: C6

LEGEND

- PROPOSED BASIN
- PROPOSED BIO FILTER
- PROPOSED PIPE NETWORK
- PROPOSED GPT
- EXISTING SEWER MAIN

STORMWATER DETENTION BASIN

Volume Minimum Required $2700m^3$ 1% AEP
Top Bank 16.0
Top Water Level 15.7
Invert Level 14.2
bio filter area $350m^2$



TITLE: PROPOSED SUBDIVISION OF LOT 1 DP1228883 and LOT 1 DP430627
202 BUSHLAND DRIVE TAREE

BASIN PLAN

CLIENT: AJA DEVELOPMENTS

KEVIN URANE 0412009891

High Definition Design Pty Ltd

NOTE:
ALL EXISTING UNDERGROUND SERVICES MUST BE LOCATED AND EXPOSED PRIOR TO EARTHWORKS COMMENCING AND IT IS RESPONSIBILITY OF THOSE PERSONS USING THIS PLAN TO CONFIRM BOTH POSITION AND LEVEL OF THESE UTILITIES IN CONJUNCTION WITH THE APPROPRIATE AUTHORITY.

0 4 8 12 16 20m
1:200 (H)

Date: 11.04.23 Scale: 1:200 A1 Designed: KU
Cad Ref: HD336 Civil COMMERCIAL R6

No	Amendment	Drawn	Date
C6	AMEND FLOOR LEVELS	KU	28.05.25
C5	DA ISSUE	KU	20.05.25

Project No: HD336 DA2
Drawing No: D3
Revision: C6

Appendix C: MUSIC Modelling

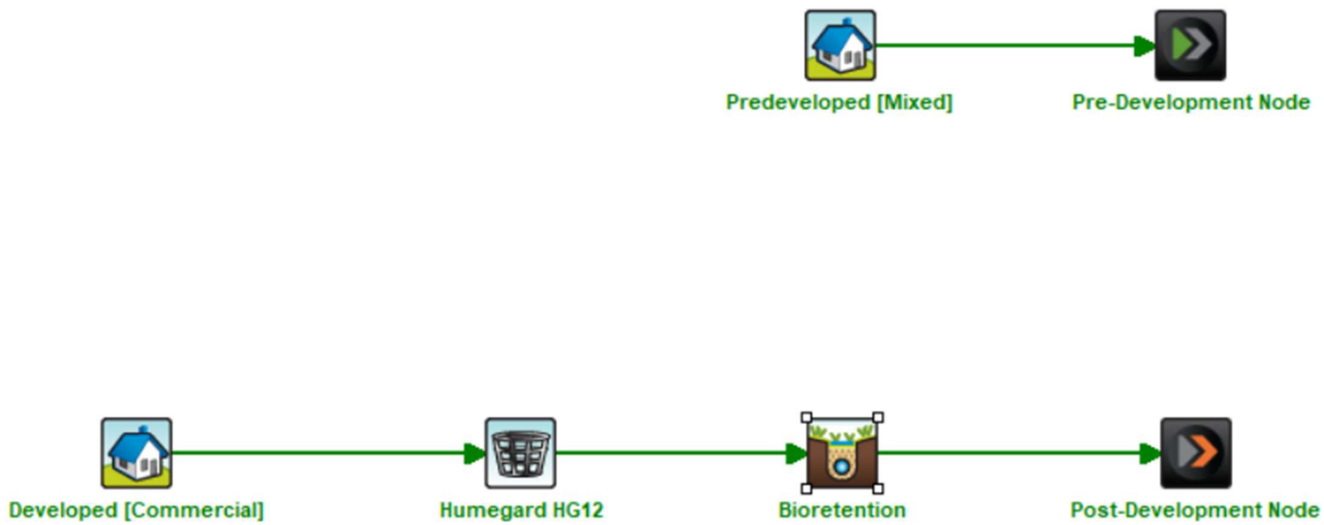


Figure 7: MUSIC Note Layout

Appendix D: DRAINS Data Spreadsheets

PIT / NODE DETAILS Version 15

Name	Type	Family	Size	Ponding Volume (cu.m)	Pressure Change Coeff. Ku	Surface Elev (m)	Max Pond Depth (m)	Base Inflow (cu.m/s)	Blocking Factor	x	y	Bolt-down lid	id	Part Full Shock Loss	Inflow Hydrograph	Pit is	Internal Width (mm)
HW1	Headwall				0.5	18.4		0		447818	6471572		26				
Pit2	OnGrade	NSW Dept.	RM11 1.5 m x 1.5 m		0.2	16		0	0.2	447904.8	6471530	No	5	1 x Ku	No	New	
Node3	Node					15		0		447959.9	6471490		79		No		
Node4	Node					13.3		0		447976	6471478		43841		No		
Node8	Node					10		0		447948	6471534		38835		No		
HW11	Headwall				0.5	21.37		0		447896.8	6471716		16013275				
Pit12	OnGrade	NSW Dept.	RM11 1.5 m x 1.5 m		1.5	20.9		0	0.2	447893.6	6471699	Yes	16015568	1 x Ku	No	New	
Node13	Node					18.84		0		447909.7	6471671		17439111		No		
Node14	Node					17.74		0		447944.5	6471621		17466285		No		
Node15	Node					15.73		0		447963.9	6471538		17466286		No		
Pit16	OnGrade	NSW Dept.	RM10 1.8 m lintel		2.5	20.31		0	0.2	447889.3	6471683	No	18526346	1 x Ku	No	New	
Pit17	OnGrade	NSW Dept.	RM10 1.8 m lintel		2.3	20.27		0	0.2	447888.6	6471679	No	18526347	1 x Ku	No	New	
Pit18	OnGrade	NSW Dept.	RM10 1.8 m lintel		3.5	20.23		0	0.2	447887.8	6471675	No	18526348	1 x Ku	No	New	
Pit19	OnGrade	NSW Dept.	RM10 1.8 m lintel		3.7	20.23		0	0.2	447900.6	6471673	No	18526349	1 x Ku	No	New	
Pit20	OnGrade	NSW Dept.	RM10 1.8 m lintel		2.3	20.31		0	0.2	447902.1	6471681	No	18526350	1 x Ku	No	New	
Pit21	OnGrade	NSW Dept.	RM10 1.8 m lintel		2.3	20.27		0	0.2	447901.3	6471677	No	18526351	1 x Ku	No	New	
Node22	Node							0		447891.8	6471625		18592713		No		
Node9	Node					18.66		0		447765	6471355		22900851		No		
Node10	Node					18.31		0		447825	6471321		12698970		No		
Node6	Node					15.1		0		447949.3	6471510		78		No		
Node7	Node					15.4		0		447955	6471499		1853825		No		

DETENTION BASIN DETAILS

Name	Elev	Surf. Area	Not Used	Outlet Type	K	Dia(mm)	Centre RL	Pit Family	Pit Type	x	y	HED	Crest RL	Crest Leng	id
Basin5	14.2	1515		None						447944.7	6471519	No			10876
	15.7	2035													
	16	2145													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area	Impervious Area	Avg Slope(%)	Mannings n	Time lag (mins)	Rainfall Multiplier	Hydrological Model
CatWest	HW1	12.3	0	4.4	0.1	0	1	RAFTS
PostDev	Basin5	7	70	2	0.05	0	1	RAFTS
PreDev	Node8	7	4	4.8	0.08	0	1	RAFTS
CatNorthA	HW11	19.07	12	8.4	0.12	0	1	RAFTS
CatEastA	Node14	0.6	22	7.1	0.1	0	1	RAFTS
CatSouth	Node9	6.51	15	5.7	0.08	0	1	RAFTS

PIPE DETAILS																	
Name	From	To	Length	U/S IL	D/S IL	Slope	Type	Dia	I.D.	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg	Rl	Chg
			(m)	(m)	(m)	(%)		(mm)	(mm)						(m)	(m)	(m)
Pipe1	HW1	Pit2	96.1	15.15	14.19	1	Box culvert	2.1W x 0.6H		0.012	NewFixed	1	HW1	0			
Pipe2	Pit2	Node3	68.68	14.19	13.5	1	Box culvert	2.1W x 0.6H		0.012	NewFixed	1	Pit2	0			
Existing RC	HW11	Pit12	17.13	19.81	19.49	1.87	Box culvert	1.8W x 0.75H		0.012	Existing	1	HW11	0			
RCBC3	Pit12	Node13	32.45	19.49	18.84	2	Box culvert	1.8W x 0.75H		0.012	NewFixed	1	Pit12	0			
Pipe16	Pit16	Pit17	4	19.14	19.1	1	Concrete,	450	450	0.013	New	1	Pit16	0			
Pipe17	Pit17	Pit18	4	19.1	19.06	1	Concrete,	450	450	0.013	New	1	Pit17	0			
Pipe18	Pit18	Pit19	13	19.06	18.93	1	Box culvert	0.9W x 0.6H		0.012	NewFixed	1	Pit18	0			
Pipe19	Pit19	Node13	9.27	18.93	18.84	0.97	Box culvert	0.9W x 0.6H		0.012	NewFixed	1	Pit19	0			
Pipe20	Pit20	Pit21	4	19.01	18.97	1	Concrete,	450	450	0.013	New	1	Pit20	0			
Pipe21	Pit21	Pit19	4	18.97	18.93	1	Concrete,	450	450	0.013	New	1	Pit21	0			
Pipe6	Node6	Node7	20	13.6	13.5	0.5	Concrete,	750	750	0.013	New	1	Node6	0			

DETAILS of SERVICES CROSSING PIPES										
Pipe	Chg	Bottom	Height of S	Chg	Bottom	Height of S	Chg	Bottom	Height of S	etc
	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	(m)	Elev (m)	(m)	etc

CHANNEL DETAILS													
Name	From	To	Type	Length	U/S IL	D/S IL	Slope	Base Width	L.B. Slope	R.B. Slope	Manning	Depth	Roofed
				(m)	(m)	(m)	(%)	(m)	(1:?)	(1:?)	n	(m)	
Gully2	Node3	Node4	Prismatic	20	13.45	13.25	1	4	1	1	0.05	1.2	No
Swale4	Node13	Node14	Prismatic	61.2	18.84	17.74	1.8	3	2	2	0.05	1	No
Swale5	Node14	Node15	Prismatic	85.97	17.74	15.73	2.34	3	2	2	0.05	1	No
Swale1	Node9	Node10	Prismatic	50	18.66	18.41	0.5	2.5	2	2	0.05	1	No
Gully1	Node7	Node3	Prismatic	5	13.5	13.45	1	4	1	1	0.05	1.2	No

OVERFLOW ROUTE DETAILS																	
Name	From	To	Travel	Spill	Crest	Weir	Cross	Safe Depth	SafeDepth	Safe	Bed	D/S Area		id	U/S IL	D/S IL	Length (m)
			Time	Level	Length	Coeff. C	Section	Major Stor	Minor Stor	DxV	Slope	Contributing					
			(min)	(m)	(m)			(m)	(m)	(sq.m/sec)	(%)	%					
OF1	HW1	Pit2	0.6	18.4	4	1.7	4 m wide p	0.3	0.15	0.4	2.5	0		28	18.4	16	96
OF2	Pit2	Node3	0.5				4 m wide p	0.3	0.15	0.4	1.45	0		72	16	15	68.8
OFEast	HW11	Pit20	0.3	21.37	3	1.7	Overflow a	0.1	0	0.6	3.28	0		18540792	21.36	20.31	32
OFWest	HW11	Pit16	0.3	21.37	3	1.7	Overflow a	0.1	0	0.6	3.28	0		16047490	21.36	20.31	32
OF16	Pit16	Pit17	0.1				12 m roadw	0.3	0.15	0.4	1	0		18535829	20.31	20.27	4
OF17	Pit17	Pit18	0.1				12 m roadw	0.3	0.15	0.4	1	0		18539177	20.27	20.23	4
OF18	Pit18	Node22	0.5				12 m roadw	0.3	0.15	0.4	1	0		18595163	20.23	19.75	48
OF19	Pit19	Node22	0.5				12 m roadw	0.3	0.15	0.4	1	0		18593818	20.23	19.75	48
OF20	Pit20	Pit21	0.1				12 m roadw	0.3	0.15	0.4	1	0		18541746	20.31	20.27	4
OF21	Pit21	Pit19	0.1				12 m roadw	0.3	0.15	0.4	1	0		18542300	20.27	20.23	4

Appendix E: DRAINS Results Spreadsheets for post-development and pre-development

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS — Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
HW1	15.67		1.428		2.73	0	None
Pit2	14.54		0		1.46	0	None
Node3	13.86		1.118				
Node4	13.54		2.353				
HW11	20.91		3.295		0.46	0	None
Pit12	20.34		0		0.56		None
Node13	19.35		0				
Node14	18.23		3.444				
Node15	16.16		3.433				
Pit16	19.36		0		0.95	0	None
Pit17	19.36		0		0.91	0	None
Pit18	19.36		0		0.87	0	None
Pit19	19.36		0		0.87	0	None
Pit20	19.36		0		0.95	0	None
Pit21	19.36		0		0.91	0	None
Node9	19.16		1.73				
Node10	18.31		1.72				
Node6	14.36		0				
Node7	13.87		0				

SUB-CATCHMENT DETAILS

Name	Max Flow (cu.m/s)	Due to Storm
CatWest	1.213	10% AEP, 1.5 hour burst, Storm 6
PostDev	2.664	10% AEP, 10 min burst, Storm 7
PreDev	1.064	10% AEP, 1 hour burst, Storm 6
CatNorthA	2.971	10% AEP, 1 hour burst, Storm 6
CatEastA	0.175	10% AEP, 20 min burst, Storm 4
CatSouth	1.45	10% AEP, 1 hour burst, Storm 10

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe1	1.21	1.71	15.487	14.544	10% AEP, 1.5 hour burst, Storm 6
Pipe2	1.313	1.83	14.532	13.857	10% AEP, 2 hour burst, Storm 10
Existing RC	2.971	2.23	20.55	20.344	10% AEP, 1 hour burst, Storm 6
RCBC3	3.084	3.33	20.159	19.354	10% AEP, 1 hour burst, Storm 6
Pipe16	0.001	0.02	19.356	19.356	10% AEP, 1 hour burst, Storm 7
Pipe17	0.003	0.03	19.356	19.356	10% AEP, 3 hour burst, Storm 3
Pipe18	0.005	0.02	19.356	19.355	10% AEP, 3 hour burst, Storm 3
Pipe19	0.008	0.02	19.355	19.354	10% AEP, 2 hour burst, Storm 7
Pipe20	0.005	0.04	19.36	19.36	10% AEP, 45 min burst, Storm 6
Pipe21	0.004	0.03	19.356	19.355	10% AEP, 45 min burst, Storm 9
Pipe6	1.128	2.81	14.36	14.139	10% AEP, 1 hour burst, Storm 10

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
Gully2	2.061	1.64	10% AEP, 1.5 hour burst, Storm 6
Swale4	2.971	1.53	10% AEP, 1 hour burst, Storm 3
Swale5	3.078	1.86	10% AEP, 1 hour burst, Storm 3
Swale1	1.442	0	10% AEP, 1 hour burst, Storm 10
Gully1	1.067	0.63	10% AEP, 1 hour burst, Storm 7

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	1.436	0	0	0	0	
OF2	0	0	1.094	0	0	0	0	
Orifice2	0.603	0.603						10% AEP, 1 hour burst, Storm 7
WeirPit								
Spillway1								
Orifice1	0.424	0.424						10% AEP, 1 hour burst, Storm 7
OFEast	0	0	0	0	0	0	0	
OFWest	0	0	0	0	0	0	0	
OF16	0	0	0.305	0	0	0	0	
OF17	0	0	0.305	0	0	0	0	
OF18	0	0	0.305	0	0	0	0	
OF19	0	0	0.305	0	0	0	0	
OF20	0	0	0.305	0	0	0	0	
OF21	0	0	0.305	0	0	0	0	

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin5	15.32	1911.7	1.027	0	1.027

Run Log for DRAINS v2025.01.9147.24925 - HD336 Taree Commercial

Run Log for DRAINS v2025.01.9147.24925 - HD336 Taree Commercial.drn run at 13:31:05 on 23/5/2025.

No water upwelling from any pit.

Freeboard was adequate at all pits.

Flows were safe in all overflow routes.

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS — Version 8

Name	Max HGL	Max Pond HGL	Max Surfac Flow Arrivi (cu.m/s)	Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
HW1	16.03		2.816		2.37	0	None
Pit2	14.75		0		1.25	0	None
Node3	14.05		2.827				
Node4	13.71		5.251				
HW11	21.67		6.615		-0.3	0.793	Headwall height/system capacity
Pit12	20.95		0		0		Outlet System
Node13	19.52		0				
Node14	18.39		5.435				
Node15	16.31		5.429				
Pit16	20.5		1.187		0	0.689	Outlet System
Pit17	20.44		1.096		0	0.552	Outlet System
Pit18	20.15		0.994		0.08	0.379	Inlet Capacity
Pit19	20.03		0.934		0.2	0.343	Inlet Capacity
Pit20	20.5		1.187		0	0.679	Outlet System
Pit21	20.43		1.089		0	0.512	Outlet System
Node9	19.34		3.295				
Node10	18.31		3.281				
Node6	14.79		0				
Node7	14.07		0				

SUB-CATCHMENT DETAILS

Name	Max Flow (cu.m/s)	Due to Storm
CatWest	2.468	1% AEP, 2 hour burst, Storm 9
PostDev	4.483	1% AEP, 10 min burst, Storm 7
PreDev	2.077	1% AEP, 45 min burst, Storm 6
CatNorthA	5.701	1% AEP, 45 min burst, Storm 6
CatEastA	0.337	1% AEP, 10 min burst, Storm 7
CatSouth	2.645	1% AEP, 25 min burst, Storm 6

PIPE DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Max U/S HGL (m)	Max D/S HGL (m)	Due to Storm
Pipe1	2.468	2.08	15.763	14.755	1% AEP, 2 hour burst, Storm 9
Pipe2	2.665	2.32	14.738	14.047	1% AEP, 2 hour burst, Storm 2
Existing RC	4.112	3.05	21.209	20.949	1% AEP, 45 min burst, Storm 6
RCBC3	4.112	3.35	20.24	19.521	1% AEP, 45 min burst, Storm 6
Pipe16	0.152	0.95	20.444	20.439	1% AEP, 2 hour burst, Storm 1
Pipe17	0.269	1.69	20.174	20.146	1% AEP, 45 min burst, Storm 6
Pipe18	0.414	0.77	20.041	20.03	1% AEP, 45 min burst, Storm 6
Pipe19	0.86	1.59	19.555	19.521	1% AEP, 45 min burst, Storm 6
Pipe20	0.16	1.01	20.435	20.428	1% AEP, 45 min burst, Storm 7
Pipe21	0.29	1.83	20.069	20.03	1% AEP, 45 min burst, Storm 6
Pipe6	2.097	4.75	14.794	14.25	1% AEP, 45 min burst, Storm 6

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm
Gully2	4.111	2.02	1% AEP, 1 hour burst, Storm 1
Swale4	4.972	1.79	1% AEP, 45 min burst, Storm 6
Swale5	5.147	2.12	1% AEP, 45 min burst, Storm 6
Swale1	2.637	0	1% AEP, 25 min burst, Storm 6
Gully1	2.131	0.83	1% AEP, 45 min burst, Storm 6

OVERFLOW ROUTE DETAILS

Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF1	0	0	1.446	0	0	0	0	
OF2	0	0	1.46	0	0	0	0	
Orifice2	0.768	0.768						1% AEP, 45 min burst, Storm 9
WeirPit	0.939	0.939						1% AEP, 45 min burst, Storm 6
Spillway1	0.036	0.036						1% AEP, 45 min burst, Storm 6
Orifice1	0.48	0.48						1% AEP, 20 min burst, Storm 10
OFEast	0.793	0.793	2.315	0.061	0.09	12.73	1.53	1% AEP, 45 min burst, Storm 6
OFWest	0.793	0.793	2.315	0.061	0.09	12.73	1.53	1% AEP, 45 min burst, Storm 6
OF16	0.689	0.689	1.458	0.197	0.26	7	1.31	1% AEP, 45 min burst, Storm 6
OF17	0.552	0.552	1.458	0.185	0.23	6.28	1.24	1% AEP, 45 min burst, Storm 6
OF18	0.379	0.379	1.458	0.163	0.19	5.04	1.17	1% AEP, 45 min burst, Storm 6
OF19	0.343	0.343	1.458	0.157	0.18	4.7	1.16	1% AEP, 45 min burst, Storm 6
OF20	0.679	0.679	1.458	0.196	0.26	6.96	1.3	1% AEP, 45 min burst, Storm 6
OF21	0.512	0.512	1.458	0.18	0.22	6.02	1.23	1% AEP, 45 min burst, Storm 6

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin5	15.74	2727.6	2.222	0	2.222

Run Log for DRAINS v2025.01.9147.24925 - HD336 Taree Commercial

Run Log for DRAINS v2025.01.9147.24925 - HD336 Taree Commercial.drn run at 13:16:02 on 23/5/2025.

No water upwelling from any pit.

Freeboard was less than 0.15m at Pit21, Pit20, Pit18, Pit17, Pit16

Flows were safe in all overflow routes.