Proposed Residential Subdivision

Stormwater Drainage Strategy

Lot 8 DP 855275, Lots 141 and 142 DP 1225076
6 Wilton Drive East Maitland and
62 Mount Vincent Road East Maitland

East Maitland Land 62 Pty Ltd

DA 2024-731

Revision 3

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CIVIL DESIGN | PROJECT MANAGEMENT

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List of Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
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
DA	Development Application
DLWC	Department of Land and Water Conservation
FFL	Finished Floor Level
FPL	Flood Planning Level
IFD	Intensity Frequency Duration
LGA	Local Government Area
MCC	Maitland City Council
MUSIC	Model for Urban Stormwater Improvement Conceptualisation
R.L	Reduced Level
SWC	Subdivision Works Certificate
TN	Total Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
TWL	Top Water Level

1. INTRODUCTION

1.1. Background

Fisher Consulting Engineers has been engaged by East Maitland Land 62 Pty Ltd to formulate a Stormwater Drainage Strategy to support a proposed Development Application for a residential subdivision at 6 Wilton Drive East Maitland and 62 Mount Vincent Road East Maitland. The site is known as Lot 8 DP855275, Lot 141 DP1225076 and Lot 142 DP1225076, and is situated within the Maitland City Council Local Government Area. The stormwater drainage strategy addresses stormwater quantity and quality requirements, and flood levels for the proposed development, at the development's outlet.

A locality plan is shown in Figure 1.

1.2. Site Description

The site is generally bounded by existing residential lots to the north, Mount Vincent Road to the East, and existing rural land to the south and west.

The site has natural surface slopes typically in the order of 6-8%. The total area of the site is approximately 21.9Ha, with approximately 50% of this area excluded from the development proposal footprint. The site varies in level from approximately R.L 45m AHD in the northern eastern portion of the site adjacent to the eastern end of existing Lot 10 DP855275, to approximately R.L 6.5m AHD along the south western boundary adjacent to the existing rural land.

1.3. Proposed Development

The proposal is for the creation of a 76 lot residential subdivision over the developable footprint, with a residue lot for the excluded portion. An indicative lot layout has been prepared and is shown in Figure 2.

Access to the proposed development will be via Wilton Drive.

1.4. Drainage Catchment

The site generally drains towards the southern boundary, with a gully running from north to south west adjacent to the eastern edge of the proposed development footprint. Stormwater runoff from the site generally flows toward the low-lying areas of the existing rural land. Wilton Drive drainage currently discharges on the site in 3 locations with outlet headwalls just inside the property boundary.

1.5. Scope of Work

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

- Identification of the requirements of Maitland City Council for the development site.
- Identify the impacts of the proposed residential development on existing waterways.
- Develop a strategy to minimise the effects of the development on downstream waterways.
- Provide concept sizing of the proposed stormwater management facilities in accordance with the adopted strategy.

1.6. Available Data

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

- An indicative lot layout plan supplied by High Definition Design P/L (HDD). A copy of the lot layout plan is shown in Appendix A.

1.7. Strategy Objectives / Criteria

1.7.1. Stormwater Runoff Quantity Criteria

Stormwater flow management criteria include:

- The adoption of a major / minor flow approach to the design of the local stormwater flow management system.
- Conveyance of major flows through the site in a safe manner.
- Limiting the post development discharge rates from the subject site to pre-development discharge rates.

1.7.2. Stormwater Runoff Quality Criteria

Stormwater runoff from the development should be treated prior to discharge, consistent with normal practice for new developments, and with consideration to opportunities for integration with existing site features and topography.

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.

Stormwater quality management for the subject site could comprise a treatment train of structures consisting of some of the following:

- water harvesting for reducing runoff volumes;
- gross pollutant traps (GPTs);
- vegetated swales;
- stormwater bioretention basins;

- stormwater nutrient control ponds – constructed wetlands;
- Proprietary water quality improvement devices for primary, secondary and/or tertiary treatment.

1.7.3. Flooding Criteria

Maitland City Council's Development Control Plan 2011, Part C Design Guidelines, C.10 Subdivision, 3. Design Elements, EC.3 Hazards, Flooding, states:

EC.3.1 All lots within new residential subdivisions shall have safe access made available to satisfy Clauses 5.21 and 5.22 of Maitland Local Environmental Plan.

EC.3.2 All new residential lots are to be wholly above Council's adopted flood standard (the 1% AEP or 1 in 100 flood event). Parts of the lot may be permitted below the adopted flood standard, where lot sizes have been increased to provide sufficient flood free area for erection of a dwelling and associated structures.

Accordingly, all proposed lots are to be at or above the 1% AEP flood event level, with all dwellings to be at or above the flood planning level, which is the 1% AEP flood level plus 500mm freeboard for residential development.

Supplied information stated the 1% AEP flood level for the site is R.L 9.73m AHD.

2. STORMWATER DRAINAGE MANAGEMENT STRATEGY

The proposed stormwater drainage strategy involves:

- Roof areas on lots will outlet to rainwater tanks within each lot for re-use, which are likely to be a requirement by BASIX (Building Sustainability Index) regulations. Tanks will overflow via a piped connection to the IAD or street drainage system.
- Capture of stormwater from lot and road reserve areas by a conventional pit and pipe drainage network located in the street or in interallotment 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 basin.
- Discharge from the catchments outlets will be conveyed over land, generally similar to the discharge from the undeveloped catchments.

Other key points on the proposed stormwater drainage strategy are set out below:

- It is anticipated that roof areas on lots will outlet to rainwater tanks within each lot for re-use, as a requirement by BASIX (Building Sustainability Index) regulations. Generally, rainwater tanks will overflow via a piped connection to the IAD or street drainage system. Although rainwater tanks are required for individual lots at the time of their individual development, rainwater tanks have not been modelled within the Stormwater Runoff Quantity portion of this strategy to ensure that rainwater tanks do not impact on any stormwater detention requirements.

Details of the proposed local drainage system, being pit type and pipe size, etc., will be determined at the time of Subdivision Works Certificate application, to Council's published standard requirements.

3. METHODOLOGY

3.1. Stormwater Runoff Quantity

3.1.1. Stormwater Flow Model

Existing and post-development flowrates are estimated using hydrological computer modelling software in order to demonstrate the magnitude of the local catchment flowrates.

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

A stormwater flow model was prepared for the purpose of estimating existing and post-development flowrates to demonstrate the magnitude of the local catchment flowrates.

3.1.1.1. Catchment Plan and Model Data

Surface runoff flowrates from the site were modelled in two differing scenarios using the DRAINS – Urban Drainage Model, firstly in the existing state and secondly as a developed catchment.

The IL-CL module was used within the DRAINS software for both scenarios.

For the existing state the development site was divided into three catchments, Catchments A, B and C. Figure 3 shows the location of the existing state catchment boundaries, including the external catchment where required. DRAINS model data is included in Appendix B.

For the developed state the development site was divided into six catchments, Catchments A, B, C, D, E and F. However, the catchments were modified to reflect the developed catchment, including redirection of stormwater where flow is conveyed via the developments internal road drainage system. In particular, Catchment D has been created to cater for stormwater flows which by-pass the proposed detention facility. Figure 4 shows the location of the developed state catchment boundaries, including the external catchment where required. DRAINS model data is included in Appendix B.

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 assess runoff characteristics from the 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:

- Estimation of existing peak stormwater flowrates at the downstream drainage outlets of the site using DRAINS software.
- Revise the existing scenario in the DRAINS model to include the additional impervious areas that will arise due to development of the site. This resulted in the developed DRAINS model.

- The critical storm was then selected for each AEP. The hydrographs of the 1% AEP critical storms were plotted to enable comparison of the developed state storm event to the existing state storm event.

3.1.1.2. Rainfall Data

Rainfall for the 1EY, 10% and 1% AEP design events, and storm durations from 5 minutes to 4.5 hours for each, were modelled in order to identify the critical storm for each AEP from the site. The required rainfall Intensity Frequency Duration (IFD) rainfall data was obtained from Australian Rainfall and Runoff, and the BOM website.

3.1.1.3. DRAINS Model Parameters

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

Table 1: Storage and loss parameter values adopted in DRAINS hydrological models

Parameter	Value
Pervious Area Initial Loss (mm)	20[1]
Pervious Area Continuing Loss (mm/hr)	1.12[1]
Impervious Area Initial Loss (mm)	1.0
Impervious Area Continuing Loss (mm/hr)	0.0

[1] Value determined from ARR Data Hub

3.1.1.4. Model Subcatchment Data

Full DRAINS model subcatchment data is provided in Appendix B. Surface roughness values, n*, used in the DRAINS models are summarised in Table 2.

Table 2: Roughness parameter values, n*, adopted in the DRAINS models

Model – surface type	Surface roughness 'n*' value
Existing pervious areas	0.35
Existing impervious areas	0.011
Proposed pervious areas	0.21
Proposed impervious areas	0.011

Subcatchment impervious area percentage values used in the DRAINS models are summarised in Table 3.

Table 3: Impervious area percentage values adopted in the DRAINS models

Model - type	Impervious Area Percentage
Existing site area	0%
External existing residential lots	60%
External existing large lots	By measurement
Residential Development area	60%
Residential Development area, including road reserve	65%
Road reserve	70%

Proposed Lots 217 and 218 do not readily drain toward the proposed road system, and thereafter to the proposed combined detention and bioretention basin. Accordingly, these two lots have been modelled in DRAINS as draining directly to the site's outlet point, with the basin being modelled to cater for the bypass flow.

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* (version 6.1) and the publication *Using MUSIC in Sydney Drinking Water Catchment, A WaterNSW Current Recommended Practice* (Published by WaterNSW, Paramatta, February 2023).

The treatment criteria published in *Australian Runoff Quality, Table 1.2* (Engineers Australia, 2006) were adopted for this study, and are summarised in Table 4. This criteria is consistent with Council's criteria published in MOES 2014 Section 8.2 Stormwater Quality.

Table 4: Stormwater treatment objectives for New South Wales

Pollutant	Stormwater treatment objective
Total Suspended Solids (TSS)	80% retention of average annual load
Total Phosphorus (TP)	45% retention of average annual load
Total Nitrogen (TN)	45% retention of average annual load

3.2.1. MUSIC Parameters

3.2.1.1. Land Use Types

The developed land use was modelled using both the residential 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 Williamtown weather station (061078). The rainfall data used in the analysis was from the year 2000. The average annual rainfall during this period was 961mm.

Monthly average areal potential evapotranspiration (PET) values from MUSIC's default values for Newcastle were used in the modelling. The estimated total annual areal PET is 1410mm.

3.2.1.3. Time Step

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

3.2.1.4. Hydrology

MUSIC hydrology parameters used are summarised below in Table 5.

Table 5: MUSIC Rainfall-Runoff Parameters

Parameter	Land Use / Zoning				
	Treated Catchment			Bypass Catchment	
	Residential	Roof	Road	Residential	Roof
Impervious Area Properties					
Land Use Area (ha)	2.269	2.220	2.445	0.160	0.060
Impervious Area (%)	21	100	70	45	100
Rainfall Threshold (mm/day)	1	0.3	1	1	0.3
Pervious Area Properties					
Soil Storage Capacity (mm)	120			120	
Initial Storage (% of Capacity)	30			30	
Field Capacity (mm)	70			70	
Infiltration Capacity Coefficient – a	180			180	
Infiltration Capacity Exponent – b	3.0			3.0	
Groundwater Properties					
Initial Depth (mm)	10			10	
Daily Recharge Rate (%)	25			25	
Daily Baseflow Rate (%)	5			5	
Daily Deep Seepage Rate (%)	0			0	

Proposed Lots 217 and 218 do not readily drain toward the proposed road system, and thereafter to the proposed combined detention and bioretention basin. Accordingly, these two lots have been modelled in MUSIC as draining directly to the site's outlet point, with the bioretention basin being modelled to cater for the bypass flow.

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 pervious 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 Drinking Water Catchment, A WaterNSW Current Recommended Practice* (Published by WaterNSW, Paramatta, February 2023), and are provided in Table 6.

Table 6: 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 (TN) (log_{10} mg/L)	
	Mean	**Std. Dev**	**Mean**	**Std. Dev**	**Mean**	**Std. Dev**
Baseflow						
Residential	1.20	0.17	-0.85	0.19	0.11	0.12
Roof	-	-	-	-	-	-
Road	1.20	0.17	-0.85	0.19	0.11	0.12
Stormflow						
Residential	2.15	0.32	-0.60	0.25	0.30	0.19
Roof	1.30	0.32	-0.89	0.25	0.30	0.19
Road	2.43	0.32	-0.30	0.25	0.34	0.19

3.3. Flooding

Following the stormwater modelling process, and the inclusion of any required stormwater detention measures and/or stormwater flow conveyance structures, proposed lots are reviewed against localised 1% AEP stormwater flood levels to confirm that the lots are at or above the 1% AEP flood event level, enabling all dwellings to be at or above the flood planning level, which is the 1% AEP flood level plus 500mm freeboard for residential development.

As stated in Section 1.7.3, supplied information stated the 1% AEP flood level for the site is R.L 9.73m AHD.

4. MODEL RESULTS

4.1. Stormwater Runoff Quantity

4.1.1. DRAINS Model Results

The DRAINS models for the site were run for various design storm durations to determine critical storm flowrates.

The model-predicted flowrates for the existing and developed state are summarised and compared in Table 7. Full model results are included in Appendix C for the 1EY, 10% and 1% AEP events.

Table 7: DRAINS Critical Flow Results for the Catchment's Outlet

AEP	Critical Flowrate (m^3/s)		% Change
	Existing State	Developed State	
1EY	0.554	0.958	+73%
10%	1.68	2.57	+53%
1%	3.75	5.20	+39%

The results above determine that the increase in impervious area from development of the Catchment, requires stormwater detention to reduce flowrates to at or below existing state flowrates.

A hydrograph for 1% AEP event showing both existing and developed flowrates is contained in Appendix D.

The model-predicted flowrates for the existing state and the developed state with detention are summarised and compared in Table 8. Full model results are included in Appendix C for the 1EY, 10% and 1% AEP events.

To facilitate the detention requirements for the development, a detention basin is proposed, and has been modelled, for the contributing catchment.

Table 8: DRAINS Critical Flow Results with Detention for the Catchment's Outlet

AEP	Critical Flowrate (m^3/s)		% Change
	Existing State	Developed State with Detention	
1EY	0.554	0.544	- 1.8%
10%	1.68	1.65	- 1.8%
1%	3.75	3.74	- 0.3%

The 5% AEP event was modelled for the developed state with detention, and the corresponding detention basin storage depth result for the 5% AEP event was 1.18m, being less than Council's prescribed maximum depth of 1.2m.

The modelled detention basin volume required for the site is shown below in Table 9.

Table 9: Detention Volume

Structure	Detention Volume (m^3)
Detention Basin	1937

4.1.2. DRAINS Modelled Detention Basin Outlet Controls

Outflows from the Detention Basin have been designed so that the 1% AEP storm event is controlled and conveyed through an outlet structure and embankment spillway. Modelled AEP events below the 1% AEP will be controlled and conveyed via the outlet structure. The outlet structure will restrict the flow and water will be detained in the detention basin. The spillway has been designed to convey the 1% AEP storm event entering the basin as an emergency overflow, to cater for complete blockage of the outlet structure.

Table 10 shows a summary of the parameters and proposed outlet controls used in the DRAINS model.

Table 10: Summary of Basin and Outlet Structures

Structure	Parameter	Description
Basin	Detention basin storage area invert level	R.L 4.10
	Top Water Level	R.L 5.53
	Top of Bank	R.L 5.90
	Outlet Structure Size (4 sided grated surcharge pit)	1.2m (L) x 1.2m (W)
	Outlet Structure Surface Level	R.L 5.60
	Outlet Structure Invert Level	R.L 3.00
	Outlet Structure Inlet Orifice No. 01 Size	DN450mm
	Outlet Structure Inlet Orifice No. 01 Invert Level	R.L 4.10
	Outlet Structure Inlet Orifice No. 02 Size	600mmW x 450mmH
	Outlet Structure Inlet Orifice No. 02 Invert Level	R.L 4.66
	Outlet Structure Inlet Orifice No. 03 Size	600mmW x 450mmH
	Outlet Structure Inlet Orifice No. 03 Invert Level	R.L 4.66
	Outlet Structure Outlet Pipe Size	DN750mm RCP
	Outlet Structure Outlet Pipe Invert Level	R.L 3.00
	Basin Spillway Length	6.0m
	Basin Spillway Level	R.L 5.30

Figure 5 shows the proposed stormwater management plan. A plan showing the proposed detention basin layout for the development is included in Figure 6. Typical cross sections of the proposed detention basin are shown in Figure 7.

4.2. Stormwater Runoff Quality

4.2.1. MUSIC Results – Post Development Land Use (No Treatment)

The modelled average annual pollutant loads leaving the site in its post development land use, without any treatment measures, is shown in Table 11. Pollutant load estimates are provided for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). Figure 8 shows the node layout used in the MUSIC modelling.

Table 11: MUSIC Model Results for the Site's Post Development Land Use (No Treatment)

Land Use	Average Annual Pollutant Load (kg/yr)		
	Total Suspended Solids (TSS)	Total Phosphorus (TP)	Total Nitrogen (TN)
Post Development Node	7520	14.5	104

Standard engineering practice is to ensure that runoff from the proposed new impervious areas 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.

4.2.2. 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.

4.2.2.1. Treatment Devices

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

- Rainwater Tanks
- Gross Pollutant Trap (GPT)
- Bioretention Basin

4.2.2.1.1. Rainwater Tanks

The rainwater tank node was included immediately following the roof area node, using the default rainwater tank treatment node within MUSIC. Rainwater tanks for all proposed lots within each subcatchment were modelled as one MUSIC treatment node

Rainwater tank treatment node data included:

- Stored water would be utilised by internal reuse on each lot. (WaterNSW Table 5.4)
- Rainwater tank volume is 3kL per lot.
- Daily usage demand of 0.845kL/day per lot. (WaterNSW Table 5.4)

4.2.2.1.2. Gross Pollutant Trap

The GPT node was included downstream of the development area and prior to the proposed bioretention basin. A Humegard GPT node was created from the Humes website literature and utilised in the MUSIC Modelling. The input parameters for the GPT node are shown below in Table 12.

Table 12: Humegard Treatment Parameters

Parameter		Value
High Flow By-pass (m^3/s) - HG18		0.60
Removal Rate	- Total Suspended Solids (TSS)	49%
	- Total Phosphorus (TP)	40%
	- Total Nitrogen (TN)	26%

GPT sizing to be confirmed during detailed design of the drainage network in the SWC phase.

4.2.2.1.3. 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 13.

Table 13: Bioretention Basin Treatment Parameters

Parameter	Value
Bioretention Basin.	
Inlet Properties	
Low Flow By-pass (m^3/s)	0.000
High Flow Bypass (m^3/s)	100.000
Storage Properties	
Extended Detention Depth (m)	0.30
Surface Area (m^2)	450
Filter and Media Properties	
Filter Area (m^2)	43
Unlined Filter Media Perimeter (m)	36
Saturated Hydraulic Conductivity (mm/hr)	180.00
Filter Depth (m)	0.40
TN Content of Filter Media (mg/kg)	800
Orthophosphate Content of Filter Media (mg/kg)	50.0
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)	2.00
Underdrain Present?	Yes
Submerged Zone with Carbon Present?	No

4.2.2.2. Modelling Results

The modelled average annual pollutant loads leaving the site in its post development land use, utilising treatment measures, is shown in Table 14. Pollutant load estimates are provided for total suspended solids (TSS), total phosphorus (TP) and total nitrogen (TN). Figure 8 shows the node layout used in the MUSIC modelling.

Table 14: 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 Node	1250	5.38	50.4

The results above show that the pollutant export for the post development land use with treatment measures is significantly lower than the post development land use with no treatment measures.

The treatment train effectiveness, expressed as a percentage reduction in post development land use pollutant loads generated by the modelled sources, is summarised in Table 15.

Table 15: MUSIC Model Treatment Train Effectiveness Results

Pollutant	Export Value		Treatment Train Effectiveness
	Post Development	Post Development with treatment measures	
TSS (kg/yr)	7520	1250	83.4%
TP (kg/yr)	14.5	5.38	62.8%
TN (kg/yr)	104	50.4	51.3%

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 Maitland City Council's Manual of Engineering Standards, Section 8.2.

4.3. Flooding

Following the stormwater modelling process, and the inclusion of any required stormwater detention measures and/or stormwater flow conveyance structures, proposed lots are reviewed against localised 1% AEP stormwater flood levels to confirm that the lots are at or above the 1% AEP flood event level, enabling all dwellings to be at or above the flood planning level, which is the 1% AEP flood level plus 500mm freeboard for residential development.

Maitland City Council's LEP 2011, Flood Planning Map, shows the declared flood planning area adjacent to the western edge of the developable footprint of the site. From a review of Council's LEP 2011, Land Zoning Map, it is considered that the Flood Planning Map informs the Zoning Boundary on the subject site, which concludes the developable footprint within the development zoned area is outside the flood planning area. A copy of MCC LEP 2011 Flood Planning Map, Sheet FLD_004D, is contained in Appendix E.

As stated in Section 1.7.3, supplied information stated the 1% AEP flood level for the site is R.L 9.73m AHD.

5. SOIL AND WATER MANAGEMENT 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 is 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

Although a BASIX's requirements review is not a specific requirement of this stormwater management strategy, it is anticipated that BASIX's requirements would require all individual dwellings to provide rainwater tanks for re-use in conjunction with other BASIX's requirements. Where installed, rainwater tanks would provide at-source stormwater management benefits.

Stormwater Flow Management (stormwater runoff quantity and quality)

The strategy for management of stormwater runoff from the development is depicted on Figure 5, and comprises:

- Capture of stormwater from lot and road reserve areas by a conventional pit and pipe drainage network located in the street or in interallotment drainage easements where required.
- Conveyance of captured stormwater within the drainage pipe network to a gross pollutant trap (GPT) for primary treatment prior to discharge into the proposed combined detention and bioretention basin.
- The detention basin will provide attenuation of developed stormwater flowrates to existing flowrate conditions for the development site.
- The bioretention basin will provide secondary/tertiary treatment and polishing of the stormwater runoff from the development site prior to discharge downstream.
- Discharge from the catchments outlets will be conveyed over land, 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 ARQ and MOES 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, being pit type and pipe size, etc., will be determined at the time of Subdivision Works Certificate application, to Council's published standard requirements.

As illustrated by Figure 5, there is sufficient capability to provide stormwater drainage management measures to negate the impact of the proposed development.

Flooding

Maitland City Council's LEP 2011, Flood Planning Map, shows the declared flood planning area adjacent to the western edge of the developable footprint of the site. From a review of Council's LEP 2011, Land Zoning Map, it is considered that the Flood Planning Map informs the Zoning Boundary on the subject site, which concludes the developable footprint within the development zoned area is outside the flood planning area.

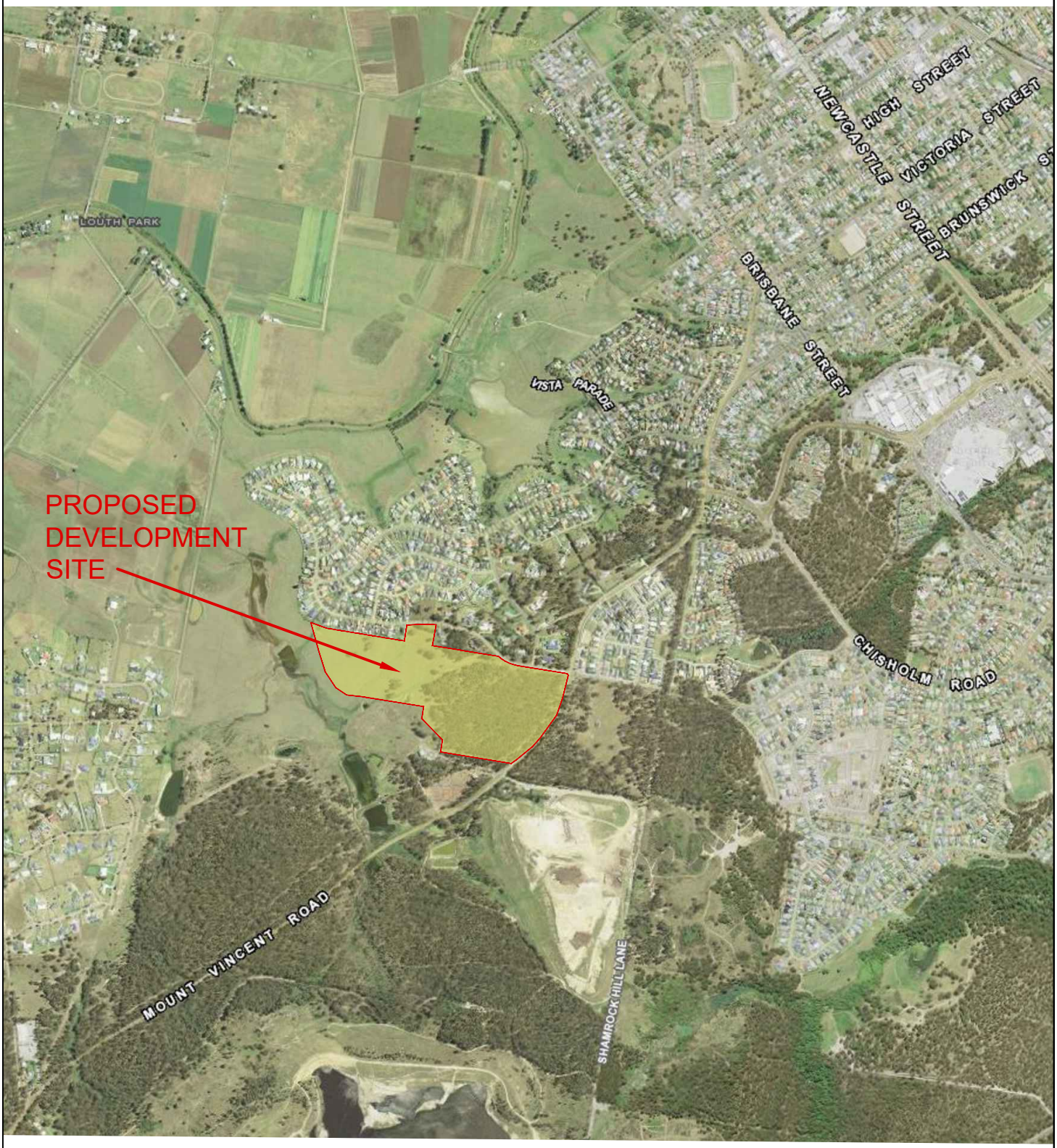
The site's levels, including any site regrading that may be proposed, should be reviewed in the SWC phase of the development to confirm that developable areas are at or above the 1% AEP flood level, enabling future habitable dwellings to be located at or above the flood planning level.

7. REFERENCES

- Maitland City Councils Manual of Engineering Standards, 2014.
- Australian Rainfall and Runoff, Institution of Engineers, Australia, 2019.
- Australian Runoff Quality, Engineers Australia, 2006.
- Using MUSIC in Sydney Drinking Water Catchment, A WaterNSW Current Recommended Practice (Published by WaterNSW, Paramatta, February 2023).
- The Constructed Wetlands Manual, DLWC, 1998.
- Humegard GPT Technical Manual, Issue 7, February 2022, publication by Holcim (Australia).

FIGURES

FISHER CONSULTING ENGINEERS



Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

LOCALITY PLAN
FIGURE 1

FISHER CONSULTING ENGINEERS

WILTON DRIVE

GLOAMING AVENUE

WILTON DRIVE

WILTON DRIVE

LOT 8
DP 855275

ROAD 1

ROAD 2

LOT 14
DP 1225076

ROAD 2/5

ROAD 4

ROAD 3

ROAD 2/5

LOT 142
DP 1225076

218 217 216 215 214 213 212 211 210 209 208 207 206 205 204 203 202

106 105 107 108

101 102 103 104

201 301 302 303 304 305 306 307

219 401 402 403 404 405 406 407 412 411 410 409 408

313 314 315 316 317 318 319 501 502 503 504 505 506 507

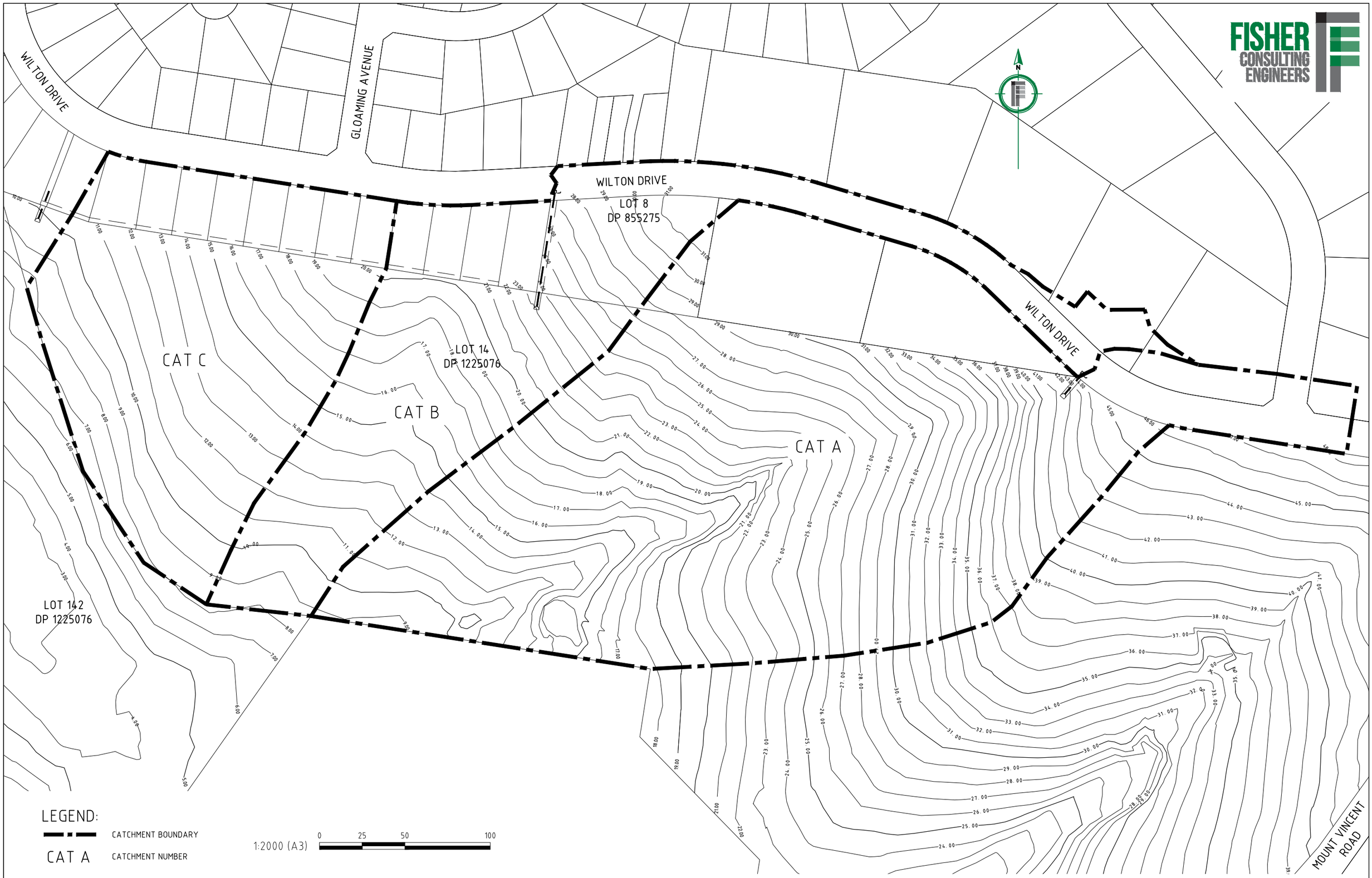
513 512 511 510 509 508 514 515 516 517

520 521 522 523 519 518

1:2000 (A3) 0 25 50 100

Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

INDICATIVE LOT LAYOUT
FIGURE 2



FISHER CONSULTING ENGINEERS

Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

EXISTING CATCHMENT PLAN
FIGURE 3

FISHER CONSULTING ENGINEERS

WILTON DRIVE

GLOAMING AVENUE

WILTON DRIVE

LOT 8
DP 855275

CAT C

CAT D

ROAD 1

ROAD 2

LOT 14
DP 1225076

WILTON DRIVE

CAT B

ROAD 4

ROAD 3

ROAD 2

ROAD 2/5

CAT E

CAT A

CAT F

LOT 142
DP 1225076

MOUNT VINCENT ROAD

LEGEND:

CATCHMENT BOUNDARY

CAT A CATCHMENT NUMBER

1:2000 (A3) 0 25 50 100

Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

CATCHMENT PLAN
FIGURE 4

FISHER CONSULTING ENGINEERS

WILTON DRIVE

GLOAMING AVENUE

WILTON DRIVE

EXISTING PIPE

EXISTING PIPE

ROAD 1

ROAD 2

ROAD 2

WILTON DRIVE

EXISTING PIPE

BASIN
MIN. VOL. = 1937m³

ROAD 2/5

ROAD 4

ROAD 3

ROAD 2/5

SCANNED CREEK LINE

APZ OFFSET

APZ OFFSET

1:2000 (A3)

0 25 50 100

NOTE:

LOT LAYOUT SUPPLIED BY HDD.

LOTS TO HAVE SITE REGRADING, AS REQUIRED, TO ENSURE DEVELOPED FLOWS DRAIN TO THE DETENTION / BIORETENTION BASIN FOR STORMWATER MANAGEMENT

GPT TO HAVE SPLITTER PIT ARRANGEMENT TO LIMIT LOW FLOWS ONLY TO GPT.

LEGEND:

PROPOSED PIPE NETWORK

PROPOSED GPT

PROPOSED DETENTION / BIORETENTION BASIN

Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

STORMWATER MANAGEMENT PLAN
FIGURE 5

FISHER CONSULTING ENGINEERS

N

A Fig7

B Fig7

TOP OF BANK (T.O.B) R.L 5.90m

TOP WATER LEVEL (T.W.L) R.L 5.53m

DETENTION I.L 4.10m

BIORETENTION SURFACE LEVEL 3.80m

BASIN

PROPOSED SPILLWAY
6.0m WIDE
R.L 5.30m

PROPOSED OUTLET STRUCTURE

PROPOSED ø750RCP OUTLET PIPE

APZ OFFSET

SCANNED CREEK LINE

LOT 142
DP 1225076

PROPOSED GPT

PROPOSED SPLITTER PIT

3.0m WIDE BASIN ACCESS TRACK

3.0m WIDE

ROAD 2

ROAD 2/5

1:500 (A3)

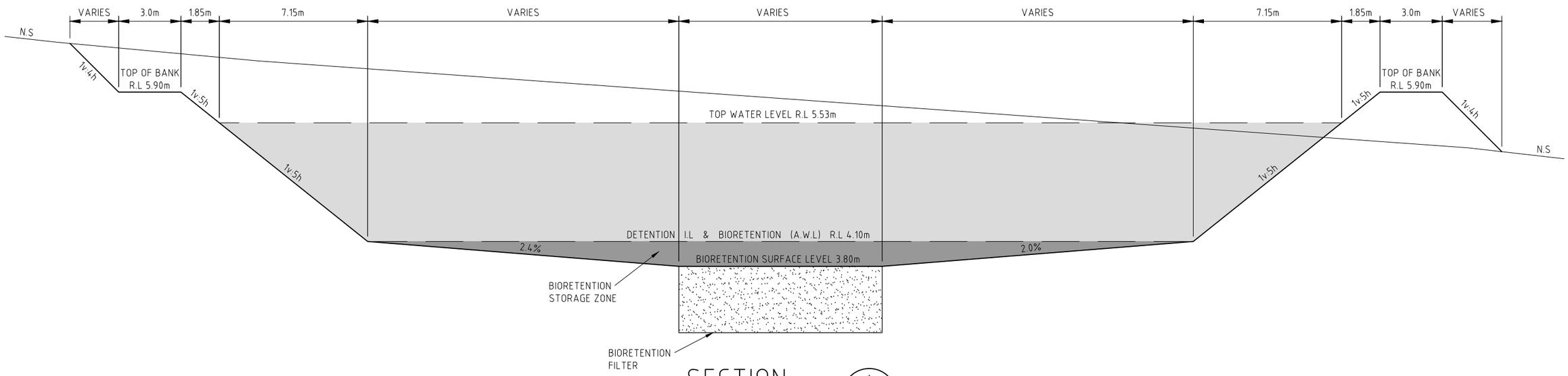
0 5 10 20

LEGEND:

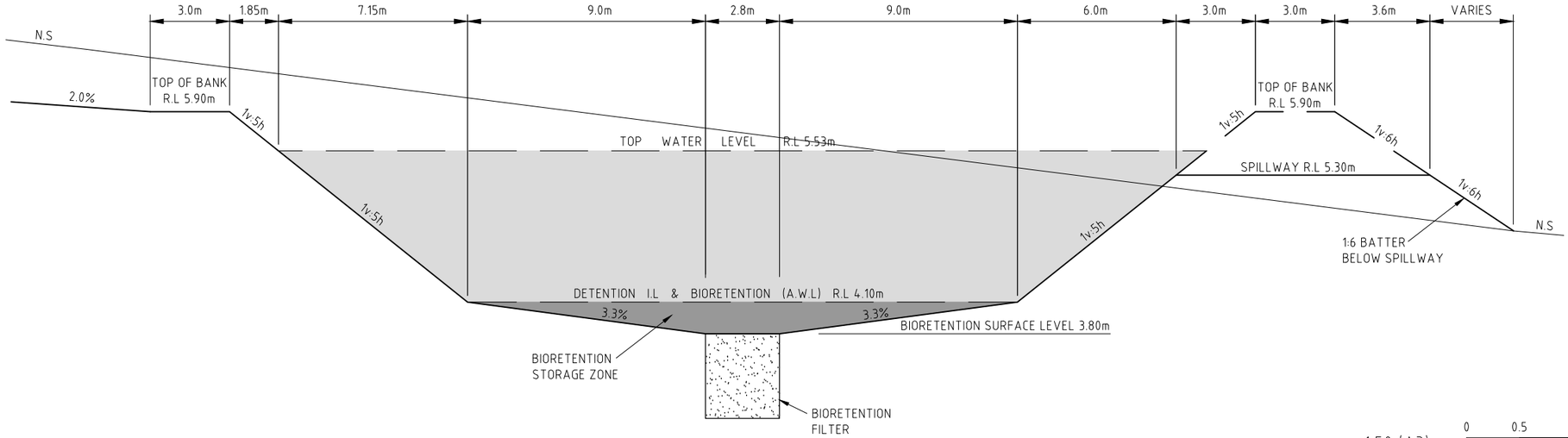
- PROPOSED PIPE NETWORK
- PROPOSED GPT
- PROPOSED DETENTION / BIORETENTION BASIN
- BIORETENTION FILTER AREA

Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

PROPOSED DETENTION/BIORETENTION BASIN PLAN
FIGURE 6



SECTION A
SCALE 1:50 vert
1:200 horiz
Fig6



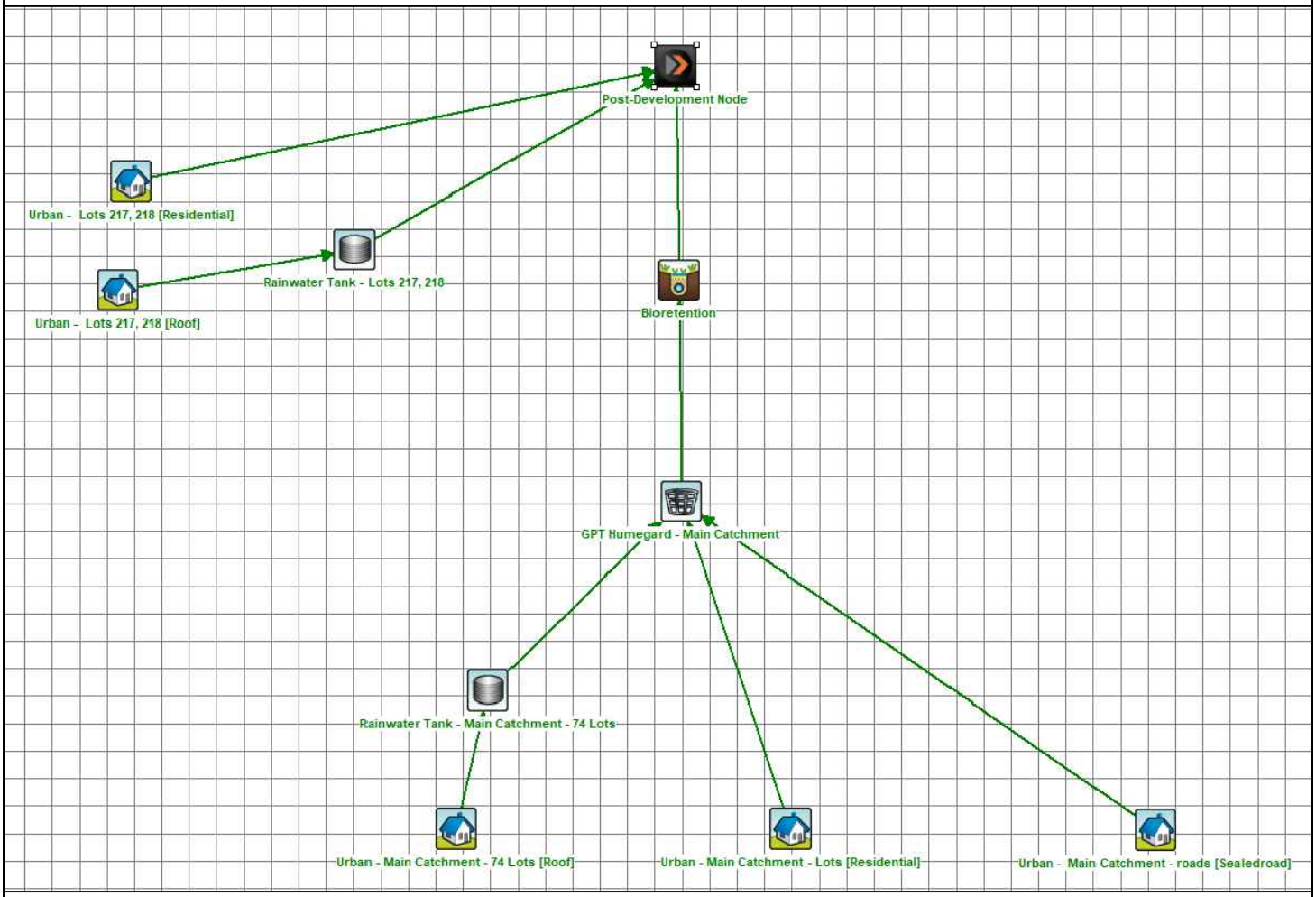
SECTION B
SCALE 1:50 vert
1:200 horiz
Fig6

1:50 (A3) 0 0.5 1 2

1:200 (A3) 0 2.5 5 10

Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

PROPOSED DETENTION / BIOETENTION BASIN TYPICAL SECTION
FIGURE 7

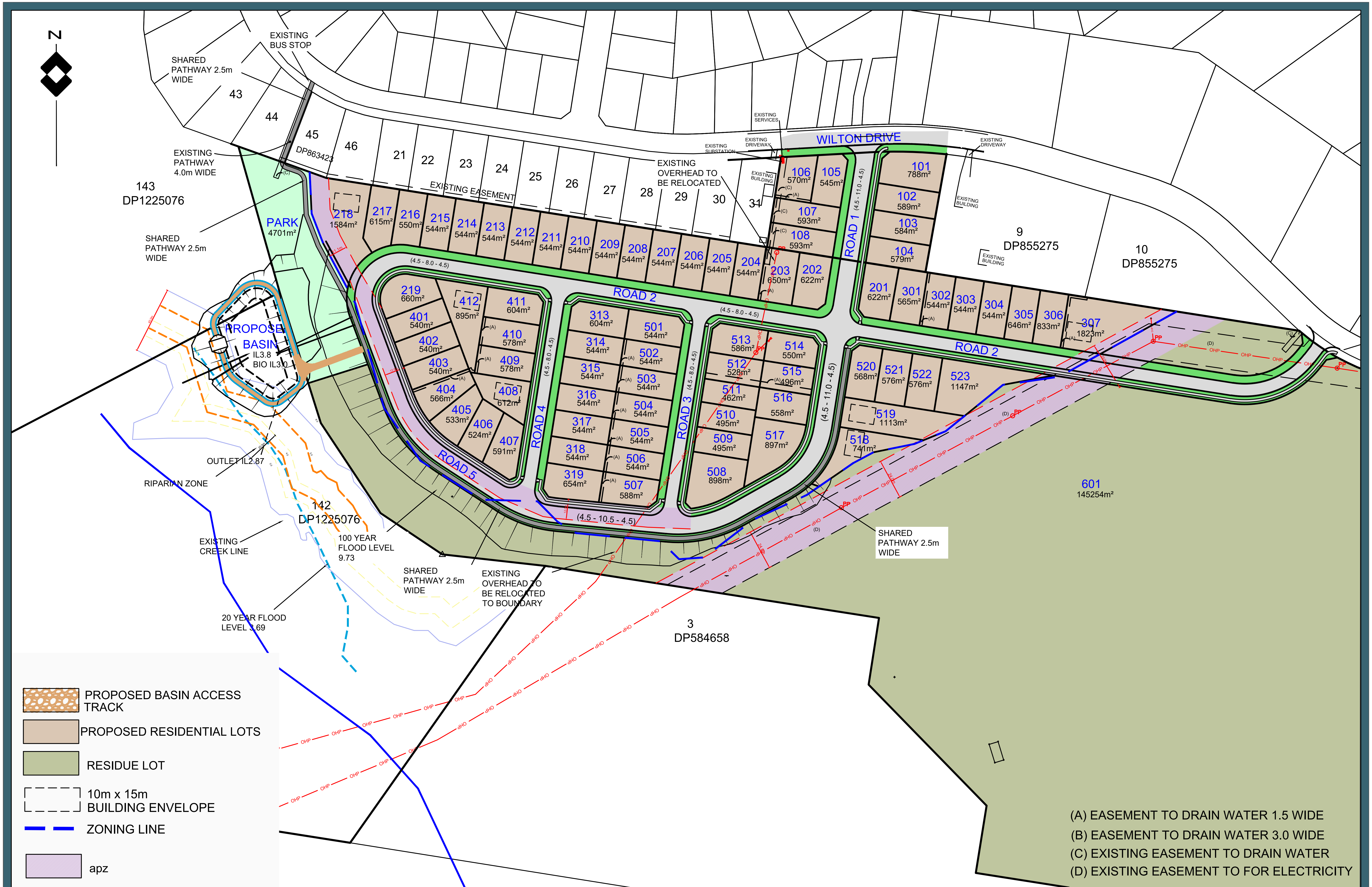


Client: East Maitland Land 62 Pty Ltd
Project: Stormwater Management Strategy
Location: Mount Vincent Road East Maitland

MUSIC NODE LAYOUT
FIGURE 8

Appendix A

Development Layout Plan (supplied by HDD)



TITLE: PROPOSED SUBDIVISION LOT 141 & 142 DP1225076 & LOT 8 DP855275
WILTON DRIVE EAST MAITLAND

APZ PLAN

High Definition Design Pty Ltd
KEVIN URANE 0412009891

Date: 28.08.23 Scale: 1:2000 A3 Designed: KU
Cad Ref: HD374 r13

No	Amendment	Drawn	Date
13	AMEND APZ	KU	21.07.25
9	DA ISSUE	KU	16.07.24
8	client issue	KU	03.07.24

Project No HD374
Drawing No HD16
Revision 13

Appendix B

DRAINS Data Spreadsheets

DRAINS Data Spreadsheet - Undeveloped Catchment

PIT / NODE DETAILS

Name	Type	Family	Version 15 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)
Extg Pit 02	OnGrade	IAD Pit	IAD Pit		0.2	28		0	0	366120.674	6373528	No	2	1 x Ku	No	Existing	
Extg Hwall 02	Node					23		0		366108.613	6373461.2		148		No		
Extg Pit 01	OnGrade	IAD Pit	IAD Pit		0.2	44.5		0	0	366430.68	6373421	No	5	1 x Ku	No	Existing	
Extg Hwall 01	Node					42.5		0		366419.812	6373414.2		74		No		
N A Outlet	Node					9		0		366028.16	6373274.8		36		No		
N Combined Outlets	Node					4		0		365875.53	6373231.8		123		No		
N Dummy	Node					3		0		365820.447	6373262.7		126		No		
N B Outlet	Node					8		0		365948.824	6373286.9		178		No		
N C Outlet	Node					6		0		365845.94	6373366.5		1022323		No		
Extg Pit 03	OnGrade	IAD Pit	IAD Pit		0.2	20.5		0	0	366026.215	6373486.7	No	1321293	1 x Ku	No	Existing	
Extg Pit 04	OnGrade	IAD Pit	IAD Pit		0.2	11		0	0	365843.208	6373515.4	No	1321294	1 x Ku	No	Existing	
Extg Hwall 03	Node					9		0		365816.805	6373510.4		1321325		No		
N B2	Node					14		0		366025.759	6373377		1321301		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 Length(m	id

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	EIA %	Perv Area %	RIA %	EIA Time (min)	Perv Time (min)	RIA Time (min)	EIA Length (m)	Perv Length (m)	RIA Length (m)	EIA Slope(%) %	Perv Slope %	RIA Slope %	EIA Rough	Perv Rough	RIA Rough
Cat B1	Extg Pit 02	0.8385	65	35	0	0	0	0	365	365	0	4.8	4.8	0	0.011	0.35	0
Cat A1	Extg Pit 01	0.5855	58	42	0	0	0	0	160	160	0	2.5	2.5	0	0.011	0.35	0
Cat A2	N A Outlet	8	0	96.4	3.6	0	0	5	0	430	0	0	7.6	5	0.011	0.35	0.011
Cat B3	N B Outlet	2.6462	0	100	0	0	0	0	0	248	0	0	5.8	0	0.011	0.35	0
Cat C2	N C Outlet	2.7598	0	100	0	0	0	0	0	210	0	0	6.7	0	0.011	0.35	0
Cat B2	Extg Pit 03	0.4059	60	40	0	5	10	0									
Cat C1	Extg Pit 04	0.7209	60	40	0	5	10	0									

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)
Extg Pipe 02	Extg Pit 02	Extg Hwall 02	68	26.5	22.44	5.97	Concrete,	375	375	0.013	Existing	1	Extg Pit 0	0			
Extg Pipe 01	Extg Pit 01	Extg Hwall 01	12	43	41.6	11.67	Concrete,	375	375	0.013	Existing	1	Extg Pit 0	0			
Extg Pipe 03	Extg Pit 03	Extg Pit 04	185	19.5	10	5.14	uPVC, not	225	242	0.012	Existing	1	Extg Pit 0	0			
Extg Pipe 04	Extg Pit 04	Extg Hwall 03	26	10	8.5	5.77	uPVC, not	300	303	0.012	Existing	1	Extg Pit 0	0			

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Ser (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
OF Extg Pipe 02	Extg Hwall 02	N B2	0.9				Grassed D	0.3	0.3	0.6	6.7	50	1321299	22.44	14	126
OF Extg Pipe 01	Extg Hwall 01	N A Outlet	3				Grassed D	0.3	0.3	0.6	7.58	100	78	41.6	9	430
OF Cat A	N A Outlet	N Combined Outle	0.1				Grassed D	0.3	0.3	0.6	100	0	129	9	4	10
OF Combined Outlets	N Combined Out	N Dummy	0.1				Grassed D	0.3	0.3	0.6	100	0	130	4	3	1
OF Cat B	N B Outlet	N Combined Outle	0.1				Grassed D	0.3	0.3	0.6	100	0	187	8	4	10
OF Cat C	N C Outlet	N Combined Outle	0.1				Grassed D	0.3	0.3	0.6	20	0	1022327	6	4	10
OF Pit 03	Extg Pit 03	N B2	0.8				Grassed D	0.3	0.3	0.6	5.91	0	1321317	20.5	14	110
OF Pit 04	Extg Pit 04	N C Outlet	1.5				Grassed D	0.3	0.3	0.6	6.7	0	1321349	11	6	210
OF B2	N B2	N B Outlet	1				Grassed D	0.3	0.3	0.6	4.92	50	1321306	14	8	122

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover (m	Cover (m)
Extg Pipe 02	Concrete, under	375	0.6	0.15
Extg Pipe 01	Concrete, under	375	0.6	0.49
Extg Pipe 03	uPVC, not under	242	0.3	0.75
Extg Pipe 04	uPVC, not under	303	0.3	0.19

This model has no pipes with non-return valves

DRAINS Data Spreadsheet - Developed Catchment

PIT / NODE DETAILS

Name	Type	Family	Version 15 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)
Extg Pit 02	OnGrade	IAD Pit	IAD Pit		0.2	28		0	0	366120.674	6373528	No	2	1 x Ku	No	Existing	
Extg Hwall 02	Node					23		0		366108.613	6373461.2		148		No		
Extg Pit 01	OnGrade	IAD Pit	IAD Pit		0.2	44.5		0	0	366430.68	6373421	No	5	1 x Ku	No	Existing	
Extg Hwall 01	Node					42.5		0		366419.812	6373414.2		74		No		
N A Outlet	Node					9		0		366027.555	6373276.2		36		No		
N Combined Outlets	Node					2.5		0		365798.76	6373365.7		123		No		
N Dummy	Node					2.4		0		365783.443	6373336.1		126		No		
N E Outlet	Node					6		0		365845.94	6373366.5		1022323		No		
Extg Pit 03	OnGrade	IAD Pit	IAD Pit		0.2	20.5		0	0	366026.215	6373486.7	No	1321293	1 x Ku	No	Existing	
Extg Pit 04	OnGrade	IAD Pit	IAD Pit		0.2	13.5		0	0	365893.708	6373505.6	No	1321294	1 x Ku	No	Existing	
Extg Pit 05	OnGrade	IAD Pit	IAD Pit		0.2	11		0	0	365839.943	6373515.7	No	5702164	1 x Ku	No	Existing	
Extg Hwall 03	Node					9		0		365816.805	6373510.4		1321325		No		
N B2	Node					17.5		0		366016.43	6373443.9		1321301		No		
N B Outlet	Node					11.4		0		365866.513	6373421.6		3238013		No		
N D1	Node					10.5		0		365839.786	6373503.3		5702206		No		
N F Outlet	Node					8		0		365949.928	6373285.7		6860496		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 Length(m	id

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	EIA %	Perv Area %	RIA %	EIA Time (min)	Perv Time (min)	RIA Time (min)	EIA Length (m)	Perv Length (m)	RIA Length (m)	EIA Slope(%)	Perv Slope %	RIA Slope %	EIA Rough	Perv Rough	RIA Rough
Cat B2	Extg Pit 02	0.8135	65	35	0	0	0	0	365	365	0	4.8	4.8	0	0.011	0.35	0
Cat B1	Extg Pit 01	0.5855	58	42	0	0	0	0	160	160	0	2.5	2.5	0	0.011	0.35	0
Cat A1	N A Outlet	3.824	0	100	0	0	0	0	0	478	0	0	7.75	0	0.011	0.35	0.011
Cat E1	N E Outlet	0.8055	0	100	0	5	10	0									
Cat C3	Extg Pit 03	0.4059	60	40	0	5	10	0									
Cat C4	Extg Pit 04	0.5195	60	40	0	5	10	0									
Cat C5	Extg Pit 05	0.2014	60	40	0	5	10	0									
Cat B3	N B Outlet	8.4171	56	44	0	0	0	0	595	595	0	4.3	4.3	0	0.011	0.24	0
Cat D1	N D1	0.22	60	40	0	5	10	0									
Cat F1	N F Outlet	0.1646	0	100	0	5	10	0									

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)
Extg Pipe 02	Extg Pit 02	Extg Hwall 02	68	26.5	22.44	5.97	Concrete,	375	375	0.013	Existing	1	Extg Pit 0		0		
Extg Pipe 01	Extg Pit 01	Extg Hwall 01	12	43	41.6	11.67	Concrete,	375	375	0.013	Existing	1	Extg Pit 0		0		
Extg Pipe 03	Extg Pit 03	Extg Pit 04	132	19.5	12.5	5.3	uPVC, not	225	242	0.012	Existing	1	Extg Pit 0		0		
Extg Pipe 04	Extg Pit 04	Extg Pit 05	53	12.5	10	4.72	uPVC, not	300	303	0.012	Existing	1	Extg Pit 0		0		
Extg Pipe 05	Extg Pit 05	Extg Hwall 03	26	10	8.5	5.77	uPVC, not	300	303	0.012	Existing	1	Extg Pit 0		0		

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Ser (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
OF Pipe 02	Extg Hwall 02	N B2		0.9			7.5 m roa	0.3	0.15	0.4	3.77	10	1321299	22.44	17.5	131
OF Extg Pipe 01 NEW	Extg Hwall 01	N B Outlet		3.7			7.5 m roa	0.3	0.15	0.4	5.08	0	9179176	41.6	11.4	595
OF Cat A	N A Outlet	N Combined Outle		0.1			Grassed D	0.3	0.3	0.6	65	0	9179144	9	2.5	10
OF Combined Outlets	N Combined Out	N Dummy		0.1			Grassed D	0.3	0.3	0.6	10	0	130	2.5	2.4	1
OF Cat E	N E Outlet	N Combined Outle		0.1			Grassed D	0.3	0.3	0.6	35	0	1022327	6	2.5	10
OF Pit 03	Extg Pit 03	N B2		0.3			Grassed D	0.3	0.3	0.6	7.14	0	1321317	20.5	17.5	42
OF Pit 04	Extg Pit 04	N B Outlet		0.9			Grassed D	0.3	0.3	0.6	2.45	0	1321349	13.5	11.4	85.6
OF B2	N B2	N B Outlet		2.1			7.5 m roa	0.3	0.15	0.4	2.19	0	1321306	17.5	11.4	278
OF Cat B	N B Outlet	N Combined Outle		0.1			Grassed D	0.3	0.3	0.6	89	0	9179163	11.4	2.5	10
OF Cat D1	N D1	N Combined Outle		0.1			Grassed D	0.3	0.3	0.6	80	0	5702212	10.5	2.5	10
OF Cat F	N F Outlet	N Combined Outle		0.1			Grassed D	0.3	0.3	0.6	55	0	9179143	8	2.5	10

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover (m	Cover (m)	
Extg Pipe 02	Concrete, under	375	0.6	0.15	Unsafe
Extg Pipe 01	Concrete, under	375	0.6	0.49	Unsafe
Extg Pipe 03	uPVC, not under	242	0.3	0.75	
Extg Pipe 04	uPVC, not under	303	0.3	0.69	
Extg Pipe 05	uPVC, not under	303	0.3	0.19	Unsafe

This model has no pipes with non-return valves

DRAINS Data Spreadsheet - Developed Catchment with Detention

PIT / NODE DETAILS

Name	Type	Family	Version 15 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)
Extg Pit 02	OnGrade	IAD Pit	IAD Pit		0.2	28		0	0	366120.674	6373528	No	2	1 x Ku	No	Existing	
Extg Hwall 02	Node					23		0		366108.613	6373461.2		148		No		
Extg Pit 01	OnGrade	IAD Pit	IAD Pit		0.2	44.5		0	0	366430.68	6373421	No	5	1 x Ku	No	Existing	
Extg Hwall 01	Node					42.5		0		366419.812	6373414.2		74		No		
N A Outlet	Node					9		0		366027.555	6373276.2		36		No		
N Combined Outlets	Node					2.5		0		365798.76	6373365.7		123		No		
N Dummy	Node					2.4		0		365783.443	6373336.1		126		No		
N E Outlet	Node					6		0		365845.94	6373366.5		1022323		No		
Extg Pit 03	OnGrade	IAD Pit	IAD Pit		0.2	20.5		0	0	366026.215	6373486.7	No	1321293	1 x Ku	No	Existing	
Extg Pit 04	OnGrade	IAD Pit	IAD Pit		0.2	13.5		0	0	365893.708	6373505.6	No	1321294	1 x Ku	No	Existing	
Extg Pit 05	OnGrade	IAD Pit	IAD Pit		0.2	11		0	0	365839.943	6373515.7	No	5702164	1 x Ku	No	Existing	
Extg Hwall 03	Node					9		0		365816.805	6373510.4		1321325		No		
N B2	Node					17.5		0		366016.43	6373443.9		1321301		No		
N B Outlet	Node					11.4		0		365866.513	6373421.6		3238013		No		
N D1	Node					10.5		0		365839.786	6373503.3		5702206		No		
N F Outlet	Node					8		0		365949.928	6373285.7		6860496		No		
Basin Control Pit	OnGrade	Junction Pit or Ma	Junction Pit or Manhole		1.5	5.6		0	0	365829.968	6373392.5	Yes	1.3E+07	1 x Ku	No	New	
N Basin Outlet	Node					2.8		0		365813.97	6373379.7		1.3E+07		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 Length(m	id
Basin	4.10	858		None						365851.753	6373409.3	No			12578572
	5.60	1973													
	5.90	2238													

SUB-CATCHMENT DETAILS

Name	Pit or Node	Total Area (ha)	EIA %	Perv Area %	RIA %	EIA Time (min)	Perv Time (min)	RIA Time (min)	EIA Length (m)	Perv Length (m)	RIA Length (m)	EIA Slope(%) %	Perv Slope %	RIA Slope %	EIA Rough	Perv Rough	RIA Rough
Cat B2	Extg Pit 02	0.8135	65	35	0	0	0	0	365	365	0	4.8	4.8		0	0.011	0.35	0
Cat B1	Extg Pit 01	0.5855	58	42	0	0	0	0	160	160	0	2.5	2.5		0	0.011	0.35	0
Cat A1	N A Outlet	3.824	0	100	0	0	0	0	0	478	0	0	7.75		0	0.011	0.35	0.011
Cat E1	N E Outlet	0.8055	0	100	0	5	10	0										
Cat C3	Extg Pit 03	0.4059	60	40	0	5	10	0										
Cat C4	Extg Pit 04	0.5195	60	40	0	5	10	0										
Cat C5	Extg Pit 05	0.2014	60	40	0	5	10	0										
Cat B3	N B Outlet	8.4171	56	44	0	0	0	0	595	595	0	4.3	4.3		0	0.011	0.24	0
Cat D1	N D1	0.22	60	40	0	5	10	0										
Cat F1	N F Outlet	0.1646	0	100	0	5	10	0										

PIPE DETAILS

Name	From	To	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Type	Dia (mm)	I.D. (mm)	Rough	Pipe Is	No. Pipes	Chg From	At Chg	Chg (m)	Rl (m)	Chg (m)
Extg Pipe 02	Extg Pit 02	Extg Hwall 02	68	26.5	22.44	5.97	Concrete,	375	375	0.013	Existing	1	Extg Pit 0		0		
Extg Pipe 01	Extg Pit 01	Extg Hwall 01	12	43	41.6	11.67	Concrete,	375	375	0.013	Existing	1	Extg Pit 0		0		
Extg Pipe 03	Extg Pit 03	Extg Pit 04	132	19.5	12.5	5.3	uPVC, not	225	242	0.012	Existing	1	Extg Pit 0		0		
Extg Pipe 04	Extg Pit 04	Extg Pit 05	53	12.5	10	4.72	uPVC, not	300	303	0.012	Existing	1	Extg Pit 0		0		
Extg Pipe 05	Extg Pit 05	Extg Hwall 03	26	10	8.5	5.77	uPVC, not	300	303	0.012	Existing	1	Extg Pit 0		0		
Pipe Basin Outlet	Basin Control Pit	N Basin Outlet	25	3	2.8	0.8	Concrete,	750	750	0.013	New	1	Basin Cor		0		

DETAILS of SERVICES CROSSING PIPES

Pipe	Chg (m)	Bottom Elev (m)	Height of Ser (m)	Chg (m)	Bottom Elev (m)	Height of S (m)	Chg (m)	Bottom Elev (m)	Height of Service (m)	etc	etc

CHANNEL DETAILS

Name	From	To	Type	Length (m)	U/S IL (m)	D/S IL (m)	Slope (%)	Base Width (m)	L.B. Slope (1:?)	R.B. Slope (1:?)	Manning n	Depth (m)	Roofed

OVERFLOW ROUTE DETAILS

Name	From	To	Travel Time (min)	Spill Level (m)	Crest Length (m)	Weir Coeff. C	Cross Section	Safe Depth Major Storms (m)	SafeDepth Minor Storms (m)	Safe DxV (sq.m/sec)	Bed Slope (%)	D/S Area Contributing %	id	U/S IL	D/S IL	Length (m)
OF Pipe 02	Extg Hwall 02	N B2	0.9				7.5 m roac	0.3	0.15	0.4	3.77	10	1321299	22.44	17.5	131
OF Extg Pipe 01 NEW	Extg Hwall 01	N B Outlet	3.7				7.5 m roac	0.3	0.15	0.4	5.08	0	9179176	41.6	11.4	595
OF Cat A	N A Outlet	N Basin Outlet	0.1				Grassed D	0.3	0.3	0.6	62	0	9179144	9	2.8	10
OF Combined Outlets	N Combined Out	N Dummy	0.1				Grassed D	0.3	0.3	0.6	10	0	130	2.5	2.4	1
OF Cat E	N E Outlet	N Basin Outlet	0.1				Grassed D	0.3	0.3	0.6	32	0	1022327	6	2.8	10
OF Pit 03	Extg Pit 03	N B2	0.3				Grassed D	0.3	0.3	0.6	7.14	0	1321317	20.5	17.5	42
OF Pit 04	Extg Pit 04	N B Outlet	0.9				Grassed D	0.3	0.3	0.6	2.45	0	1321349	13.5	11.4	85.6
OF B2	N B2	N B Outlet	2.1				7.5 m roac	0.3	0.15	0.4	2.19	0	1321306	17.5	11.4	278
OF Cat B	N B Outlet	Basin	0.2				4 m wide p	0.3	0.15	0.4	14.6	0	9179163	11.4	4.1	50
OF Cat D1	N D1	N Basin Outlet	0.1				Grassed D	0.3	0.3	0.6	77	0	5702212	10.5	2.8	10
OF Cat F	N F Outlet	N Basin Outlet	0.1				Grassed D	0.3	0.3	0.6	52	0	9179143	8	2.8	10
OF Basin	Basin	N Basin Outlet	0.1	5.3	6	1.7	Spillway 6	0.5	0.3	0.6	10	0	12578583	5.3	2.8	25
OF Basin Outlet	N Basin Outlet	N Combined Outle	0.1				Spillway 1	1	0.6	0.6	3	0	12578600	2.8	2.5	10

PIPE COVER DETAILS

Name	Type	Dia (mm)	Safe Cover (m	Cover (m)	
Extg Pipe 02	Concrete, under	375	0.6	0.15	Unsafe
Extg Pipe 01	Concrete, under	375	0.6	0.49	Unsafe
Extg Pipe 03	uPVC, not under	242	0.3	0.75	
Extg Pipe 04	uPVC, not under	303	0.3	0.69	
Extg Pipe 05	uPVC, not under	303	0.3	0.19	Unsafe
Pipe Basin Outlet	Concrete, not un	750	0.45	-0.81	Unsafe

This model has no pipes with non-return valves

Appendix C

DRAINS Results Spreadsheets

FISHER CONSULTING ENGINEERS

Undeveloped Catchment

DRAINS Results Spreadsheet - Undeveloped Catchment - 1EY AEP

DRAINS results prepared from Version 2024.07.8959.15835

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	26.67		0.115		1.33		None
Extg Hwall 02	22.47		0				
Extg Pit 01	43.14		0.084		1.36		None
Extg Hwall 01	41.63		0				
N A Outlet	9.03		0.179				
N Combined Outlets	4.04		0.612				
N B Outlet	8.03		0.15				
N C Outlet	6.03		0.134				
Extg Pit 03	19.64		0.085		0.86	0	None
Extg Pit 04	10.23		0.15		0.77	0	None
Extg Hwall 03	8.67		0				
N B2	14.03		0.109				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B1	0.105	0.103	0.002	7.44	0	59.29	1EY AEP, 10 min burst, Storm 7
Cat A1	0.077	0.077	0	5.04	0	40.2	1EY AEP, 5 min burst, Storm 1
Cat A2	0.26	0	0.26	0	5	102.54	1EY AEP, 2 hour burst, Storm 5
Cat B3	0.108	0	0.108	0	0	73.94	1EY AEP, 1.5 hour burst, Storm 5
Cat C2	0.129	0	0.129	0	0	64.08	1EY AEP, 1.5 hour burst, Storm 5
Cat B2	0.058	0.058	0.014	5	0	10	1EY AEP, 20 min burst, Storm 2
Cat C1	0.103	0.103	0.025	5	0	10	1EY AEP, 20 min burst, Storm 2

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
Extg Pipe 02	0.104	3.22	26.672	22.565	1EY AEP, 10 min burst, Storm 10
Extg Pipe 01	0.077	4.05	43.137	41.686	1EY AEP, 5 min burst, Storm 1
Extg Pipe 03	0.054	1.89	19.643	10.231	1EY AEP, 20 min burst, Storm 5
Extg Pipe 04	0.149	3.71	10.231	8.665	1EY AEP, 20 min burst, Storm 5

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Extg Pipe 02	0.102	0.103	10.939	0.032	0.02	9.82	0.55	1EY AEP, 10 min burst, Storm 7
OF Extg Pipe 01	0.042	0.286	10.756	0.051	0.04	11.78	0.79	1EY AEP, 1.5 hour burst, Storm 10
OF Cat A	0.286	0.286	7.099	0.032	0.05	9.72	1.47	1EY AEP, 1.5 hour burst, Storm 10
OF Combined Outlets	**0.554**	0.554	7.099	0.036	0.08	10.27	2.35	1EY AEP, 1.5 hour burst, Storm 8
OF Cat B	0.158	0.158	7.099	0.025	0.03	8.44	1.16	1EY AEP, 45 min burst, Storm 9
OF Cat C	0.129	0.129	9.208	0.027	0.02	8.79	0.85	1EY AEP, 1.5 hour burst, Storm 5
OF Pit 03	0	0	11.185	0	0	0	0	
OF Pit 04	0	0	10.939	0	0	0	0	
OF B2	0.08	0.113	11.474	0.037	0.02	10.37	0.5	1EY AEP, 25 min burst, Storm 5

DRAINS Results Spreadsheet - Undeveloped Catchment - 10% AEP

DRAINS results prepared from Version 2024.07.8959.15835

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	26.78		0.256		1.22		None
Extg Hwall 02	22.49		0				
Extg Pit 01	43.2		0.201		1.3		None
Extg Hwall 01	41.64		0				
N A Outlet	9.05		0.524				
N Combined Outlets	4.06		1.78				
N B Outlet	8.04		0.432				
N C Outlet	6.04		0.406				
Extg Pit 03	20.48		0.178		0.02	0	None
Extg Pit 04	11.02		0.316		0	0.007	Outlet System
Extg Hwall 03	8.79		0				
N B2	14.05		0.253				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B1	0.244	0.236	0.007	5.19	0	41.4	10% AEP, 5 min burst, Storm 1
Cat A1	0.161	0.153	0.008	3.85	0	30.7	10% AEP, 5 min burst, Storm 1
Cat A2	0.81	0	0.81	0	5	65.06	10% AEP, 1 hour burst, Storm 7
Cat B3	0.341	0	0.341	0	0	50.71	10% AEP, 1 hour burst, Storm 1
Cat C2	0.395	0	0.395	0	0	40.77	10% AEP, 45 min burst, Storm 6
Cat B2	0.137	0.117	0.044	5	0	10	10% AEP, 15 min burst, Storm 3
Cat C1	0.243	0.208	0.079	5	0	10	10% AEP, 15 min burst, Storm 3

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
Extg Pipe 02	0.242	4.05	26.779	22.64	10% AEP, 5 min burst, Storm 1
Extg Pipe 01	0.161	4.58	43.203	41.733	10% AEP, 5 min burst, Storm 1
Extg Pipe 03	0.134	2.9	20.391	11.017	10% AEP, 15 min burst, Storm 5
Extg Pipe 04	0.302	4.19	10.838	8.803	10% AEP, 15 min burst, Storm 4

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Extg Pipe 02	0.224	0.215	10.939	0.045	0.03	11.21	0.69	10% AEP, 5 min burst, Storm 1
OF Extg Pipe 01	0.116	0.868	10.756	0.086	0.09	15.26	1.11	10% AEP, 1 hour burst, Storm 6
OF Cat A	0.868	0.868	7.099	0.051	0.11	11.8	2.15	10% AEP, 1 hour burst, Storm 6
OF Combined Outlets	**1.679**	1.679	7.099	0.059	0.2	12.62	3.33	10% AEP, 45 min burst, Storm 7
OF Cat B	0.44	0.44	7.099	0.04	0.06	10.68	1.58	10% AEP, 45 min burst, Storm 2
OF Cat C	0.395	0.395	9.208	0.044	0.05	11.09	1.22	10% AEP, 45 min burst, Storm 9
OF Pit 03	0	0	11.185	0	0	0	0	
OF Pit 04	0.007	0.005	10.939	0.024	0	8.06	0.23	10% AEP, 15 min burst, Storm 5
OF B2	0.176	0.305	11.474	0.057	0.04	12.39	0.7	10% AEP, 20 min burst, Storm 8

DRAINS Results Spreadsheet - Undeveloped Catchment - 1% AEP

DRAINS results prepared from Version 2024.07.8959.15835

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	27.39		0.52		0.61		None
Extg Hwall 02	22.5		0				
Extg Pit 01	43.28		0.363		1.22		None
Extg Hwall 01	41.65		0				
N A Outlet	9.07		1.131				
N Combined Outlets	4.09		4.061				
N B Outlet	8.06		1.007				
N C Outlet	6.07		1.037				
Extg Pit 03	20.53		0.31		0	0.093	Outlet System
Extg Pit 04	11.2		0.551		0	0.189	Outlet System
Extg Hwall 03	8.79		0				
N B2	14.06		0.566				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B1	0.427	0.402	0.026	4.26	0	33.99	1% AEP, 5 min burst, Storm 1
Cat A1	0.279	0.25	0.029	3.16	0	25.2	1% AEP, 5 min burst, Storm 1
Cat A2	1.786	0	1.786	0	5	49.36	1% AEP, 45 min burst, Storm 3
Cat B3	0.732	0	0.732	0	0	38.48	1% AEP, 45 min burst, Storm 6
Cat C2	0.864	0	0.864	0	0	30.07	1% AEP, 30 min burst, Storm 9
Cat B2	0.232	0.147	0.085	5	0	10	1% AEP, 10 min burst, Storm 7
Cat C1	0.413	0.261	0.152	5	0	10	1% AEP, 10 min burst, Storm 7

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
Extg Pipe 02	0.427	4.42	27.213	22.747	1% AEP, 5 min burst, Storm 1
Extg Pipe 01	0.279	5.33	43.281	41.78	1% AEP, 5 min burst, Storm 1
Extg Pipe 03	0.134	2.92	20.442	11.203	1% AEP, 5 min burst, Storm 1
Extg Pipe 04	0.305	4.23	11.009	8.803	1% AEP, 5 min burst, Storm 1

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Extg Pipe 02	0.411	0.413	10.939	0.06	0.05	12.63	0.85	1% AEP, 5 min burst, Storm 1
OF Extg Pipe 01	0.22	1.912	10.756	0.124	0.16	19.12	1.39	1% AEP, 45 min burst, Storm 10
OF Cat A	1.912	1.912	7.099	0.074	0.2	14.08	2.73	1% AEP, 45 min burst, Storm 10
OF Combined Outlets	**3.749**	3.749	7.099	0.086	0.37	15.31	4.26	1% AEP, 25 min burst, Storm 7
OF Cat B	1.001	1.001	7.099	0.058	0.12	12.44	2.08	1% AEP, 20 min burst, Storm 2
OF Cat C	0.972	0.972	9.208	0.067	0.11	13.38	1.61	1% AEP, 25 min burst, Storm 10
OF Pit 03	0.093	0.086	11.185	0.031	0.02	9.58	0.51	1% AEP, 10 min burst, Storm 7
OF Pit 04	0.189	0.18	10.939	0.053	0.03	11.99	0.55	1% AEP, 15 min burst, Storm 3
OF B2	0.411	0.688	11.474	0.084	0.07	15.04	0.89	1% AEP, 15 min burst, Storm 8

FISHER CONSULTING ENGINEERS

Developed Catchment

DRAINS Results Spreadsheet - Developed Catchment - 1EY AEP

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	26.67			0.112	1.33		None
Extg Hwall 02	22.51			0			
Extg Pit 01	43.14			0.084	1.36		None
Extg Hwall 01	41.66			0			
N A Outlet	9.02			0.127			
N Combined Outlets	2.58			1.107			
N E Outlet	6.02			0.117			
Extg Pit 03	19.64			0.085	0.86	0	None
Extg Pit 04	12.71			0.108	0.79	0	None
Extg Pit 05	10.23			0.042	0.77		None
Extg Hwall 03	8.67			0			
N B2	17.57			0.108			
N B Outlet	11.44			0.974			
N D1	10.51			0.046			
N F Outlet	8.01			0.024			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)	
Cat B2	0.102	0.1	0.002	7.44	0	59.29	1EY AEP, 10 min burst, Storm 7	
Cat B1	0.077	0.077	0	5.04	0	40.2	1EY AEP, 5 min burst, Storm 1	
Cat A1	0.116	0	0.116	0	0	108.62	1EY AEP, 2 hour burst, Storm 10	
Cat E1	0.098	0	0.098	5	0	10	1EY AEP, 45 min burst, Storm 9	
Cat C3	0.058	0.058	0.014	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat C4	0.074	0.074	0.018	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat C5	0.029	0.029	0.007	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat B3	0.858	0.839	0.019	10.3	0	65.51	1EY AEP, 10 min burst, Storm 8	
Cat D1	0.031	0.031	0.008	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat F1	0.02	0	0.02	5	0	10	1EY AEP, 45 min burst, Storm 9	

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
Extg Pipe 02	0.101	3.2	26.669	22.563	1EY AEP, 10 min burst, Storm 10
Extg Pipe 01	0.077	4.05	43.136	41.686	1EY AEP, 5 min burst, Storm 1
Extg Pipe 03	0.054	1.91	19.644	12.71	1EY AEP, 20 min burst, Storm 2
Extg Pipe 04	0.123	2.3	12.71	10.231	1EY AEP, 20 min burst, Storm 5
Extg Pipe 05	0.149	3.71	10.231	8.665	1EY AEP, 20 min burst, Storm 5

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Pipe 02	0.1	0.104	0.88	0.077	0.11	2.35	1.59	1EY AEP, 10 min burst, Storm 7
OF Extg Pipe 01 NEW	0.056	0.052	0.956	0.065	0.08	1.91	1.54	1EY AEP, 20 min burst, Storm 1
OF Cat A	0.116	0.116	7.749	0.02	0.02	7.38	1.23	1EY AEP, 2 hour burst, Storm 10
OF Combined Outlets	**0.958**	0.958	10.232	0.078	0.1	14.49	1.26	1EY AEP, 25 min burst, Storm 6
OF Cat E	0.097	0.097	8.499	0.021	0.02	7.62	0.94	1EY AEP, 45 min burst, Storm 9
OF Pit 03	0	0	10.861	0	0	0	0	
OF Pit 04	0	0	8.861	0	0	0	0	
OF B2	0.079	0.079	0.671	0.08	0.08	2.47	1.18	1EY AEP, 15 min burst, Storm 2
OF Cat B	0.857	0.857	7.288	0.045	0.12	11.15	2.6	1EY AEP, 10 min burst, Storm 4
OF Cat D1	0.031	0.031	7.496	0.011	0.01	5.51	0.91	1EY AEP, 20 min burst, Storm 2
OF Cat F	0.02	0.02	7.871	0.01	0.01	5.39	0.64	1EY AEP, 45 min burst, Storm 9

DRAINS Results Spreadsheet - Developed Catchment - 10% AEP

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	26.77			0.249	1.23		None
Extg Hwall 02	22.53			0			
Extg Pit 01	43.2			0.201	1.3		None
Extg Hwall 01	41.68			0			
N A Outlet	9.03			0.38			
N Combined Outlets	2.62			2.991			
N E Outlet	6.03			0.275			
Extg Pit 03	20.48			0.178	0.02	0	None
Extg Pit 04	13.53			0.228	0	0.049	Outlet System
Extg Pit 05	10.98			0.088	0.02		None
Extg Hwall 03	8.79			0			
N B2	17.6			0.265			
N B Outlet	11.47			2.306			
N D1	10.52			0.097			
N F Outlet	8.01			0.056			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B2	0.236	0.229	0.007	5.19	0	41.4	10% AEP, 5 min burst, Storm 1
Cat B1	0.161	0.153	0.008	3.85	0	30.7	10% AEP, 5 min burst, Storm 1
Cat A1	0.366	0	0.366	0	0	76.77	10% AEP, 1.5 hour burst, Storm 9
Cat E1	0.243	0	0.243	5	0	10	10% AEP, 15 min burst, Storm 6
Cat C3	0.137	0.117	0.044	5	0	10	10% AEP, 15 min burst, Storm 3
Cat C4	0.175	0.15	0.057	5	0	10	10% AEP, 15 min burst, Storm 3
Cat C5	0.068	0.058	0.022	5	0	10	10% AEP, 15 min burst, Storm 3
Cat B3	1.883	1.708	0.175	7.88	0	50.11	10% AEP, 10 min burst, Storm 5
Cat D1	0.074	0.064	0.024	5	0	10	10% AEP, 15 min burst, Storm 3
Cat F1	0.05	0	0.05	5	0	10	10% AEP, 15 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
Extg Pipe 02	0.234	4	26.773	22.636	10% AEP, 5 min burst, Storm 1
Extg Pipe 01	0.161	4.58	43.203	41.733	10% AEP, 5 min burst, Storm 1
Extg Pipe 03	0.135	2.94	20.388	13.525	10% AEP, 15 min burst, Storm 3
Extg Pipe 04	0.237	3.29	13.42	10.975	10% AEP, 10 min burst, Storm 3
Extg Pipe 05	0.299	4.15	10.8	8.803	10% AEP, 15 min burst, Storm 3

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Pipe 02	0.228	0.239	0.88	0.102	0.18	3.26	1.94	10% AEP, 5 min burst, Storm 1
OF Extg Pipe 01 NEW	0.143	0.146	0.956	0.081	0.14	2.5	1.84	10% AEP, 15 min burst, Storm 9
OF Cat A	0.366	0.366	7.749	0.034	0.06	10.04	1.73	10% AEP, 1.5 hour burst, Storm 9
OF Combined Outlets	**2.57**	2.57	10.232	0.124	0.21	19.12	1.67	10% AEP, 15 min burst, Storm 6
OF Cat E	0.243	0.243	8.499	0.032	0.04	9.72	1.25	10% AEP, 15 min burst, Storm 6
OF Pit 03	0	0	10.861	0	0	0	0	
OF Pit 04	0.049	0.027	8.861	0.031	0.01	9.63	0.39	10% AEP, 15 min burst, Storm 5
OF B2	0.199	0.195	0.671	0.107	0.14	3.54	1.43	10% AEP, 15 min burst, Storm 9
OF Cat B	2.004	2.004	7.288	0.066	0.22	13.32	3.37	10% AEP, 15 min burst, Storm 6
OF Cat D1	0.074	0.074	7.496	0.016	0.02	6.44	1.19	10% AEP, 15 min burst, Storm 3
OF Cat F	0.05	0.05	7.871	0.014	0.01	6.21	0.91	10% AEP, 15 min burst, Storm 6

DRAINS Results Spreadsheet - Developed Catchment - 1% AEP

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	27.08			0.504	0.92		None
Extg Hwall 02	22.56			0			
Extg Pit 01	43.28			0.363	1.22		None
Extg Hwall 01	41.7			0			
N A Outlet	9.05			0.822			
N Combined Outlets	2.67			5.872			
N E Outlet	6.04			0.479			
Extg Pit 03	20.52			0.31	0	0.093	Outlet System
Extg Pit 04	13.66			0.397	0	0.176	Outlet System
Extg Pit 05	10.99			0.154	0.01		None
Extg Hwall 03	8.79			0			
N B2	17.63			0.549			
N B Outlet	11.49			4.648			
N D1	10.52			0.168			
N F Outlet	8.02			0.098			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B2	0.414	0.39	0.025	4.26	0	33.99	1% AEP, 5 min burst, Storm 1
Cat B1	0.279	0.25	0.029	3.16	0	25.2	1% AEP, 5 min burst, Storm 1
Cat A1	0.821	0	0.821	0	0	56.47	1% AEP, 1 hour burst, Storm 3
Cat E1	0.438	0	0.438	5	0	10	1% AEP, 15 min burst, Storm 10
Cat C3	0.232	0.147	0.085	5	0	10	1% AEP, 10 min burst, Storm 7
Cat C4	0.298	0.188	0.109	5	0	10	1% AEP, 10 min burst, Storm 7
Cat C5	0.115	0.073	0.042	5	0	10	1% AEP, 10 min burst, Storm 7
Cat B3	3.469	3.145	0.477	6.42	0	40.82	1% AEP, 10 min burst, Storm 1
Cat D1	0.126	0.08	0.046	5	0	10	1% AEP, 10 min burst, Storm 7
Cat F1	0.089	0	0.089	5	0	10	1% AEP, 15 min 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
Extg Pipe 02	0.412	4.38	26.917	22.737	1% AEP, 5 min burst, Storm 1
Extg Pipe 01	0.279	5.33	43.281	41.78	1% AEP, 5 min burst, Storm 1
Extg Pipe 03	0.136	2.95	20.438	13.661	1% AEP, 10 min burst, Storm 10
Extg Pipe 04	0.238	3.29	13.551	10.992	1% AEP, 5 min burst, Storm 1
Extg Pipe 05	0.3	4.17	10.815	8.803	1% AEP, 10 min burst, Storm 4

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Pipe 02	0.406	0.415	1.037	0.118	0.24	4.21	2.11	1% AEP, 5 min burst, Storm 1
OF Extg Pipe 01 NEW	0.27	0.287	0.956	0.108	0.21	3.58	2.24	1% AEP, 5 min burst, Storm 1
OF Cat A	0.821	0.821	7.749	0.047	0.11	11.39	2.3	1% AEP, 1 hour burst, Storm 3
OF Combined Outlets	**5.201**	5.201	10.232	0.17	0.36	22.21	2.09	1% AEP, 10 min burst, Storm 7
OF Cat E	0.438	0.438	8.499	0.041	0.06	10.8	1.5	1% AEP, 15 min burst, Storm 10
OF Pit 03	0.093	0.093	10.861	0.03	0.02	9.26	0.54	1% AEP, 10 min burst, Storm 7
OF Pit 04	0.176	0.171	8.861	0.05	0.02	11.63	0.54	1% AEP, 15 min burst, Storm 5
OF B2	0.429	0.429	1.224	0.139	0.21	5.2	1.57	1% AEP, 10 min burst, Storm 1
OF Cat B	4.05	4.05	7.288	0.092	0.38	15.9	4.17	1% AEP, 10 min burst, Storm 7
OF Cat D1	0.126	0.126	7.496	0.02	0.03	7.26	1.4	1% AEP, 10 min burst, Storm 7
OF Cat F	0.089	0.089	7.871	0.018	0.02	7.03	1.09	1% AEP, 15 min burst, Storm 10

FISHER CONSULTING ENGINEERS

Developed Catchment with Detention

DRAINS Results Spreadsheet - Developed Catchment with Detention - 1EY AEP

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	26.67		0.112		1.33		None
Extg Hwall 02	22.51		0				
Extg Pit 01	43.14		0.084		1.36		None
Extg Hwall 01	41.66		0				
N A Outlet	9.02		0.127				
N Combined Outlets	2.56		0.604				
N E Outlet	6.02		0.117				
Extg Pit 03	19.64		0.085		0.86	0	None
Extg Pit 04	12.71		0.108		0.79	0	None
Extg Pit 05	10.23		0.042		0.77		None
Extg Hwall 03	8.67		0				
N B2	17.57		0.108				
N B Outlet	11.47		0.974				
N D1	10.51		0.046				
N F Outlet	8.01		0.024				
Basin Control Pit	3.47		0		2.13		None
N Basin Outlet	2.85		0.277				

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)	
Cat B2	0.102	0.1	0.002	7.44	0	59.29	1EY AEP, 10 min burst, Storm 7	
Cat B1	0.077	0.077	0	5.04	0	40.2	1EY AEP, 5 min burst, Storm 1	
Cat A1	0.116	0	0.116	0	0	108.62	1EY AEP, 2 hour burst, Storm 10	
Cat E1	0.098	0	0.098	5	0	10	1EY AEP, 45 min burst, Storm 9	
Cat C3	0.058	0.058	0.014	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat C4	0.074	0.074	0.018	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat C5	0.029	0.029	0.007	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat B3	0.858	0.839	0.019	10.3	0	65.51	1EY AEP, 10 min burst, Storm 8	
Cat D1	0.031	0.031	0.008	5	0	10	1EY AEP, 20 min burst, Storm 2	
Cat F1	0.02	0	0.02	5	0	10	1EY AEP, 45 min burst, Storm 9	

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
Extg Pipe 02	0.101	3.2	26.669	22.563	1EY AEP, 10 min burst, Storm 10
Extg Pipe 01	0.077	4.05	43.136	41.686	1EY AEP, 5 min burst, Storm 1
Extg Pipe 03	0.054	1.91	19.644	12.71	1EY AEP, 20 min burst, Storm 2
Extg Pipe 04	0.123	2.3	12.71	10.231	1EY AEP, 20 min burst, Storm 5
Extg Pipe 05	0.149	3.71	10.231	8.665	1EY AEP, 20 min burst, Storm 5
Pipe Basin Outlet	0.398	2.13	3.386	3.13	1EY AEP, 45 min burst, Storm 8

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Pipe 02	0.1	0.104	0.88	0.077	0.11	2.35	1.59	1EY AEP, 10 min burst, Storm 7
OF Extg Pipe 01 NEW	0.053	0.055	0.956	0.061	0.09	1.79	1.58	1EY AEP, 25 min burst, Storm 5
OF Cat A	0.116	0.116	7.723	0.02	0.02	7.38	1.23	1EY AEP, 2 hour burst, Storm 10
OF Combined Outlets	**0.544**	0.544	10.232	0.06	0.06	12.67	1.06	1EY AEP, 45 min burst, Storm 10
OF Cat E	0.097	0.097	8.533	0.021	0.02	7.62	0.94	1EY AEP, 45 min burst, Storm 9
OF Pit 03	0	0	10.861	0	0	0	0	
OF Pit 04	0	0	8.861	0	0	0	0	
OF B2	0.079	0.081	0.671	0.08	0.09	2.46	1.19	1EY AEP, 15 min burst, Storm 2
OF Cat B	0.852	0.852	1.318	0.072	0.27	4	3.78	1EY AEP, 10 min burst, Storm 4
OF Cat D1	0.031	0.031	7.502	0.011	0.01	5.62	0.84	1EY AEP, 20 min burst, Storm 2
OF Cat F	0.02	0.02	7.951	0.01	0.01	5.39	0.64	1EY AEP, 45 min burst, Storm 9
Orifice 3	0.026	0.026						1EY AEP, 45 min burst, Storm 8
Orifice 2	0.026	0.026						1EY AEP, 45 min burst, Storm 8
Orifice 1	0.345	0.345						1EY AEP, 45 min burst, Storm 8
OF Basin	0	0	4.375	0	0	0	0	
OF Basin Outlet	0.544	0.544	10.044	0.051	0.04	15.61	0.7	1EY AEP, 45 min burst, Storm 10

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin	4.74	684.3	0.398	0	0.398

DRAINS Results Spreadsheet - Developed Catchment with Detention - 10% AEP

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	26.77			0.249	1.23		None
Extg Hwall 02	22.53			0			
Extg Pit 01	43.2			0.201	1.3		None
Extg Hwall 01	41.68			0			
N A Outlet	9.03			0.38			
N Combined Outlets	2.6			1.799			
N E Outlet	6.03			0.275			
Extg Pit 03	20.48			0.178	0.02	0	None
Extg Pit 04	13.53			0.228	0	0.048	Outlet System
Extg Pit 05	10.98			0.088	0.02		None
Extg Hwall 03	8.79			0			
N B2	17.6			0.265			
N B Outlet	11.51			2.306			
N D1	10.52			0.097			
N F Outlet	8.01			0.056			
Basin Control Pit	3.86			0	1.74		None
N Basin Outlet	2.9			0.725			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B2	0.236	0.229	0.007	5.19	0	41.4	10% AEP, 5 min burst, Storm 1
Cat B1	0.161	0.153	0.008	3.85	0	30.7	10% AEP, 5 min burst, Storm 1
Cat A1	0.366	0	0.366	0	0	76.77	10% AEP, 1.5 hour burst, Storm 9
Cat E1	0.243	0	0.243	5	0	10	10% AEP, 15 min burst, Storm 6
Cat C3	0.137	0.117	0.044	5	0	10	10% AEP, 15 min burst, Storm 3
Cat C4	0.175	0.15	0.057	5	0	10	10% AEP, 15 min burst, Storm 3
Cat C5	0.068	0.058	0.022	5	0	10	10% AEP, 15 min burst, Storm 3
Cat B3	1.883	1.708	0.175	7.88	0	50.11	10% AEP, 10 min burst, Storm 5
Cat D1	0.074	0.064	0.024	5	0	10	10% AEP, 15 min burst, Storm 3
Cat F1	0.05	0	0.05	5	0	10	10% AEP, 15 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
Extg Pipe 02	0.234	4	26.773	22.636	10% AEP, 5 min burst, Storm 1
Extg Pipe 01	0.161	4.58	43.203	41.733	10% AEP, 5 min burst, Storm 1
Extg Pipe 03	0.135	2.94	20.388	13.525	10% AEP, 15 min burst, Storm 3
Extg Pipe 04	0.237	3.29	13.42	10.975	10% AEP, 10 min burst, Storm 3
Extg Pipe 05	0.299	4.15	10.8	8.803	10% AEP, 15 min burst, Storm 3
Pipe Basin Outlet	1.159	2.87	3.75	3.444	10% AEP, 1 hour burst, Storm 7

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

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
OF Pipe 02	0.228	0.239	0.88	0.102	0.18	3.26	1.94	10% AEP, 5 min burst, Storm 1
OF Extg Pipe 01 NEW	0.143	0.148	0.956	0.079	0.14	2.43	1.87	10% AEP, 15 min burst, Storm 9
OF Cat A	0.366	0.366	7.723	0.034	0.06	10.04	1.73	10% AEP, 1.5 hour burst, Storm 9
OF Combined Outlets	**1.649**	1.649	10.232	0.101	0.15	16.77	1.48	10% AEP, 1 hour burst, Storm 3
OF Cat E	0.243	0.243	8.533	0.033	0.04	9.84	1.21	10% AEP, 15 min burst, Storm 6
OF Pit 03	0	0	10.861	0	0	0	0	
OF Pit 04	0.048	0.026	8.861	0.032	0.01	9.65	0.39	10% AEP, 15 min burst, Storm 5
OF B2	0.196	0.202	0.671	0.105	0.15	3.45	1.49	10% AEP, 10 min burst, Storm 6
OF Cat B	2	2.001	1.318	0.111	0.58	4	5.21	10% AEP, 15 min burst, Storm 6
OF Cat D1	0.074	0.074	7.502	0.016	0.02	6.56	1.12	10% AEP, 15 min burst, Storm 3
OF Cat F	0.05	0.05	7.951	0.014	0.01	6.21	0.91	10% AEP, 15 min burst, Storm 6
Orifice 3	0.359	0.359						10% AEP, 1 hour burst, Storm 7
Orifice 2	0.359	0.359						10% AEP, 1 hour burst, Storm 7
Orifice 1	0.44	0.44						10% AEP, 1 hour burst, Storm 7
OF Basin	0	0	4.375	0	0	0	0	
OF Basin Outlet	1.649	1.649	10.044	0.101	0.11	16.21	1.05	10% AEP, 1 hour burst, Storm 3

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin	5.15	1260.6	1.159	0	1.159

DRAINS Results Spreadsheet - Developed Catchment with Detention - 1% AEP

DRAINS results prepared from Version 2025.01.9147.24925

PIT / NODE DETAILS

Name	Max HGL	Max Pond HGL	Max Surface Flow Arriving (cu.m/s)	Version 8 Max Pond Volume (cu.m)	Min Freeboard (m)	Overflow (cu.m/s)	Constraint
Extg Pit 02	27.08			0.504	0.92		None
Extg Hwall 02	22.56			0			
Extg Pit 01	43.28			0.363	1.22		None
Extg Hwall 01	41.7			0			
N A Outlet	9.05			0.822			
N Combined Outlets	2.65			4.293			
N E Outlet	6.04			0.479			
Extg Pit 03	20.52			0.31	0	0.093	Outlet System
Extg Pit 04	13.67			0.397	0	0.175	Outlet System
Extg Pit 05	10.99			0.154	0.01		None
Extg Hwall 03	8.79			0			
N B2	17.63			0.547			
N B Outlet	11.56			4.648			
N D1	10.52			0.168			
N F Outlet	8.02			0.098			
Basin Control Pit	4.55			0	1.05		None
N Basin Outlet	2.96			2.665			

SUB-CATCHMENT DETAILS

Name	Max Flow Q (cu.m/s)	EIA Max Q (cu.m/s)	Remaining Max Q (cu.m/s)	EIA Tc (cu.m/s)	RIA Tc (min)	PA Tc (min)	Due to Storm (min)
Cat B2	0.414	0.39	0.025	4.26	0	33.99	1% AEP, 5 min burst, Storm 1
Cat B1	0.279	0.25	0.029	3.16	0	25.2	1% AEP, 5 min burst, Storm 1
Cat A1	0.821	0	0.821	0	0	56.47	1% AEP, 1 hour burst, Storm 3
Cat E1	0.438	0	0.438	5	0	10	1% AEP, 15 min burst, Storm 10
Cat C3	0.232	0.147	0.085	5	0	10	1% AEP, 10 min burst, Storm 7
Cat C4	0.298	0.188	0.109	5	0	10	1% AEP, 10 min burst, Storm 7
Cat C5	0.115	0.073	0.042	5	0	10	1% AEP, 10 min burst, Storm 7
Cat B3	3.469	3.145	0.477	6.42	0	40.82	1% AEP, 10 min burst, Storm 1
Cat D1	0.126	0.08	0.046	5	0	10	1% AEP, 10 min burst, Storm 7
Cat F1	0.089	0	0.089	5	0	10	1% AEP, 15 min 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
Extg Pipe 02	0.412	4.38	26.917	22.737	1% AEP, 5 min burst, Storm 1
Extg Pipe 01	0.279	5.33	43.281	41.78	1% AEP, 5 min burst, Storm 1
Extg Pipe 03	0.136	2.95	20.437	13.672	1% AEP, 10 min burst, Storm 1
Extg Pipe 04	0.238	3.29	13.562	10.991	1% AEP, 5 min burst, Storm 1
Extg Pipe 05	0.3	4.17	10.815	8.803	1% AEP, 10 min burst, Storm 7
Pipe Basin Outlet	1.595	3.7	3.75	3.506	1% AEP, 25 min burst, Storm 6

CHANNEL DETAILS

Name	Max Q (cu.m/s)	Max V (m/s)	Due to Storm

OVERFLOW ROUTE DETAILS

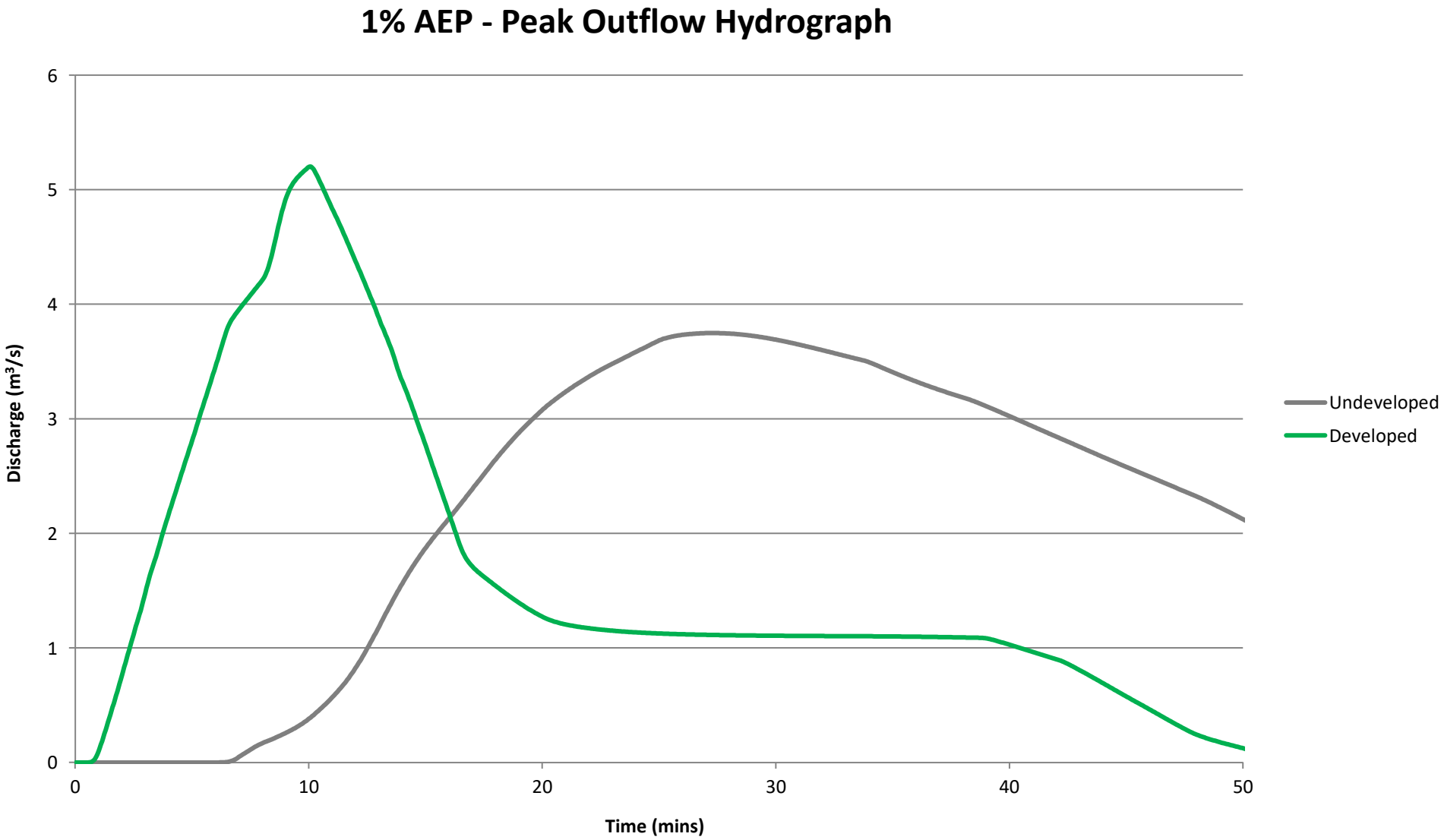
Name	Max Q U/S	Max Q D/S	Safe Q	Max D	Max DxV	Max Width	Max V	Due to Storm
OF Pipe 02	0.406	0.415	1.037	0.118	0.24	4.21	2.11	1% AEP, 5 min burst, Storm 1
OF Extg Pipe 01 NEW	0.27	0.287	0.956	0.108	0.21	3.63	2.25	1% AEP, 5 min burst, Storm 1
OF Cat A	0.821	0.821	7.723	0.048	0.11	11.44	2.26	1% AEP, 1 hour burst, Storm 3
OF Combined Outlets	**3.739**	3.739	10.232	0.147	0.28	20.81	1.89	1% AEP, 25 min burst, Storm 6
OF Cat E	0.438	0.438	8.533	0.042	0.06	10.86	1.47	1% AEP, 15 min burst, Storm 10
OF Pit 03	0.093	0.093	10.861	0.03	0.02	9.26	0.54	1% AEP, 10 min burst, Storm 7
OF Pit 04	0.175	0.174	8.861	0.05	0.02	11.69	0.54	1% AEP, 15 min burst, Storm 2
OF B2	0.429	0.431	1.224	0.136	0.21	5.13	1.58	1% AEP, 10 min burst, Storm 1
OF Cat B	4.042	4.041	1.318	0.164	1.11	4	6.82	1% AEP, 10 min burst, Storm 3
OF Cat D1	0.126	0.126	7.502	0.02	0.03	7.38	1.33	1% AEP, 10 min burst, Storm 7
OF Cat F	0.089	0.089	7.951	0.018	0.02	7.03	1.09	1% AEP, 15 min burst, Storm 10
Orifice 3	0.585	0.585						1% AEP, 25 min burst, Storm 6
Orifice 2	0.585	0.585						1% AEP, 25 min burst, Storm 6
Orifice 1	0.463	0.463						1% AEP, 1.5 hour burst, Storm 2
OF Basin	1.032	1.032	4.361	0.091	0.16	7.1	1.73	1% AEP, 25 min burst, Storm 6
OF Basin Outlet	3.739	3.739	10.067	0.165	0.23	16.97	1.42	1% AEP, 25 min burst, Storm 6

DETENTION BASIN DETAILS

Name	Max WL	MaxVol	Max Q Total	Max Q Low Level	Max Q High Level
Basin	5.53	1936.5	2.664	0	2.664

Appendix D

1% AEP Hydrographs


1% AEP - Peak Outflow Hydrograph
Discharge (m³/s)
0
1
2
3
4
5
6
0
10
20
30
40
50
Time (mins)
Undeveloped
Developed

Appendix E

MCC LEP 2011 Flood Planning Map - Sheet FLD_004D

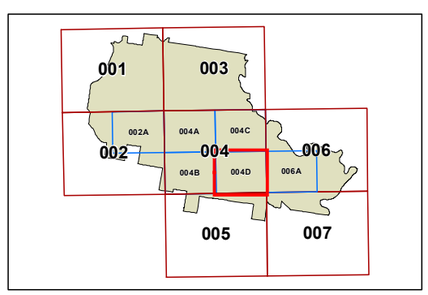
Maitland Local Environmental Plan 2011

Flood Planning Map - Sheet FLD_004D

Flood Planning Area

Cadastre

Base Data 03/03/1997 © NSW Land and Property Information (LPI)
Addendum Data 09/09/2016 © Maitland City Council



N
W E
S

0 400 800
Metres

Projection: GDA 1994
MGA Zone 56

Scale:1:20,000 @ A3

Map Identification Number: 5050_COM_FLD_004D_020_20161028