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Conceptual Stormwater Management Plan

470 Rochdale Road, Rochedale

470 Rochedale Land Pty Ltd

November 2026

BC-26073

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Executive Summary

This report has been prepared on behalf of 470 Rochedale Land Pty Ltd and presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during the operational phase of the development.

In order to address the management of stormwater quality, a single bioretention basin has been proposed with a filter area of 210 m^2 for treatment of the development site. MUSIC modelling of the proposed basin configuration demonstrates pollutant removal efficiencies of 80%, 60%, 45% and 90% for TSS, TP, TN and gross pollutants respectively for Catchment 1 (the development extent).

It is noted that detention has been proposed within a temporary detention area adjacent to the permanent bioretention basin as part of Stage 1 of the development. This area has been provided to mitigate peak discharge from the site until such time as connection to the northern development (Ref: A006169872) and downstream trunk infrastructure upgrades to Ford Road and Rochedale Road are completed.

The temporary detention area is connected to the bioretention basin via a balance pipe system with the flow control structures (pit and weir) located within the permanent bioretention basin. The temporary system has been designed to;

- Maintain pre-development peak discharges from the site until downstream trunk infrastructure of Rochedale Road has been constructed; and
- Limit outflows to Rochedale Road to the nominated pipe design capacity (based on the approved Arise At Rochedale – Stage 16 External Stormwater design drawings (Council Ref: A005364788)).

The proposed design includes an estimated detention volume of 481 m^3 within the proposed temporary basin. Modelling of the detention basin and associated outlet structures indicate that pre-developed site flows can be maintained for all nominated ARI events until such time as connection is available to the northern development and downstream trunk infrastructure upgrades have been constructed.

The subsequent stage of the development (Stage 2A) is proposed for completion in association with the downstream development drainage works and trunk upgrades to Ford and Rochedale Road. This stage will include the decommissioning of the temporary detention basin area and connection to the site drainage network of the northern development.

The level of detail provided within this report is suitable for development assessment only and should not be relied upon for construction purposes. Detailed design documentation should be prepared in conjunction with civil operational works to finalise the stormwater concepts presented in this report.

This report has been reviewed by a Registered Professional Engineer of Queensland (RPEQ), and certification has been provided that if the design parameters set out in this report are included within the development:

- there should be no worsening in site peak discharge as a result of the proposed development (Stage 1); and
- stormwater pollutant load reductions in accordance with best practice should be achieved.

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1 Introduction

This Conceptual Stormwater Management Plan (CSMP) has been prepared so as to be considered as part of a Reconfiguration of a Lot (ROL) and Material Change of Use (MCU) application over Lot 2 on RP97162 at 470 Rochedale Road, Rochedale (the subject site).

The report has been prepared on behalf of 470 Rochedale Land Pty Ltd and presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during the operational phase of the development.

The level of detail provided within this report is suitable for development assessment only and should not be relied upon for construction purposes. Detailed design documentation should be prepared in conjunction with civil operational works to finalise the stormwater concepts presented in this report.

1.1 Objectives

The overarching objective of this report is to present practical conceptual stormwater designs which can be integrated into the development proposal so as to ensure that the development does not cause an unacceptable impact or nuisance which could result in actionable damage to downstream properties and receiving environments during the operational phase of development. In addition, the report aims to address the requirements of the Brisbane City Council City Plan Stormwater Code and Flood Overlay Code (Appendix A) and the State Planning Policy – Water Quality Objectives (SPP).

The following objectives are to be achieved.

Operational Phase Objective (Quantity)	Achieve a Lawful Point of Discharge (LPD) for all site catchments in accordance with QUDM (2016).
Operational Phase Objective (Quality)	Stormwater discharged from the site achieves the specified load-based reduction targets in accordance with Chapter 7 of the Infrastructure Design Planning Scheme Policy of the Brisbane City Plan 2014. For the development site relevant targets are TSS 80%, TP 60%, and TN 45%.

2 Site Location

The site is located within the Brisbane City local government area at 470 Rochedale Road, Rochedale and comprises a singular allotment, Lot 2 on RP97162. The lot has a total area of approximately 2.17 ha and is currently zoned Emerging Community under the Brisbane City planning scheme. Rochedale Road bounds the site to the west and is the current access point for the site. The allotment to the north (Lot 1 on RP71823, 39 Ford Road) is currently being developed for residential allotments.

The subject site is disturbed with isolated moderate to dense vegetation present. Vegetation within the site generally consists of exotic species and has limited woody native species. There are several structures within the site including sheds and a house in association with the previous land use (nursery).

The site is considered relatively flat and generally falls from south to north at mild grades (between 1-2%). Runoff from the site is generally conveyed as overland sheet and channel flow to the northern neighbouring allotment (Lot 1 on RP71823) before being collected within the Ford Road reserve.

Refer to Figure 2.1 below which presents an aerial image (sourced from Queensland Globe mapping) of the subject site depicting the site's location and surrounding road network.



Figure 2.1 Site Location

2.1 Overland Flow & LGIP – Future Stormwater Network

A small portion of the site along the eastern boundary of the site is mapped within an Overland Flow flood planning area under the Brisbane City Plan (refer to Figure 2.2 below). The width of this area extends over the eastern neighbouring allotment (Lot 121 SP336340, 480 Rochedale Road) and continues north to Ford Road. The area aligns with the location of the LGIP Future Stormwater Network upgrades (Refer to Figure 2.3 below).

Based on Council pre-lodgement advice (Request No. ASR-16184-H5G dated 1st July 2026), it is understood that parts of the trunk stormwater network upgrade are in progress including the Ford Road infrastructure. However, works at the Rochedale Road intersection and north of the intersection to the ultimate outfall location are yet to be completed.

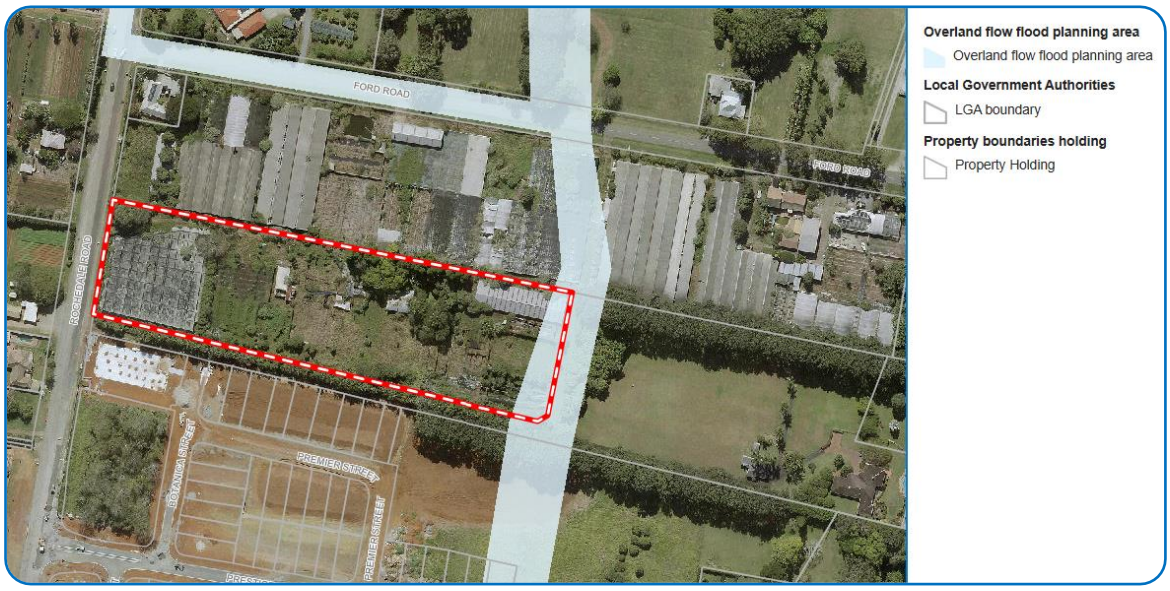


Figure 2.2 City Plan – Overland flow flood planning area (BCC)

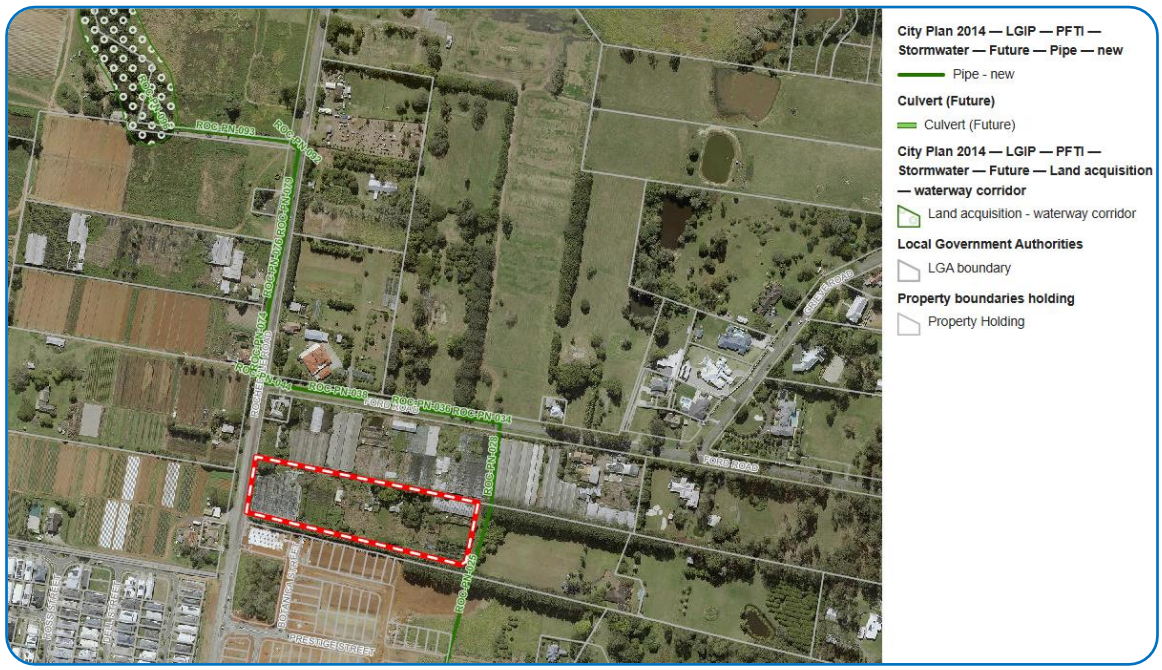


Figure 2.3 City Plan – LGIP – Stormwater Network PFTI (BCC)

2.1.1 Surrounding Development Applications - Flood & Stormwater

There are currently development applications for residential subdivisions in progress for the neighbouring allotments to the north and east of the site including:

- Pinnacle Arise Stages 9 & 10 at 39 Ford Road, Rochedale (Reference: A006169872). Refer to Figure 2.4 for Concept Roadworks and Drainage Layout Plan by Colliers; and
- 480-500 Rochedale Road, Rochedale (Reference: A006494916). Refer to Figure 2.5 for Concept Roadworks and Drainage Layout Plan by Colliers.

The surrounding development proposals include road and stormwater connections for the subject site to the north, and road connection (via neighbourhood spine road) to the east.

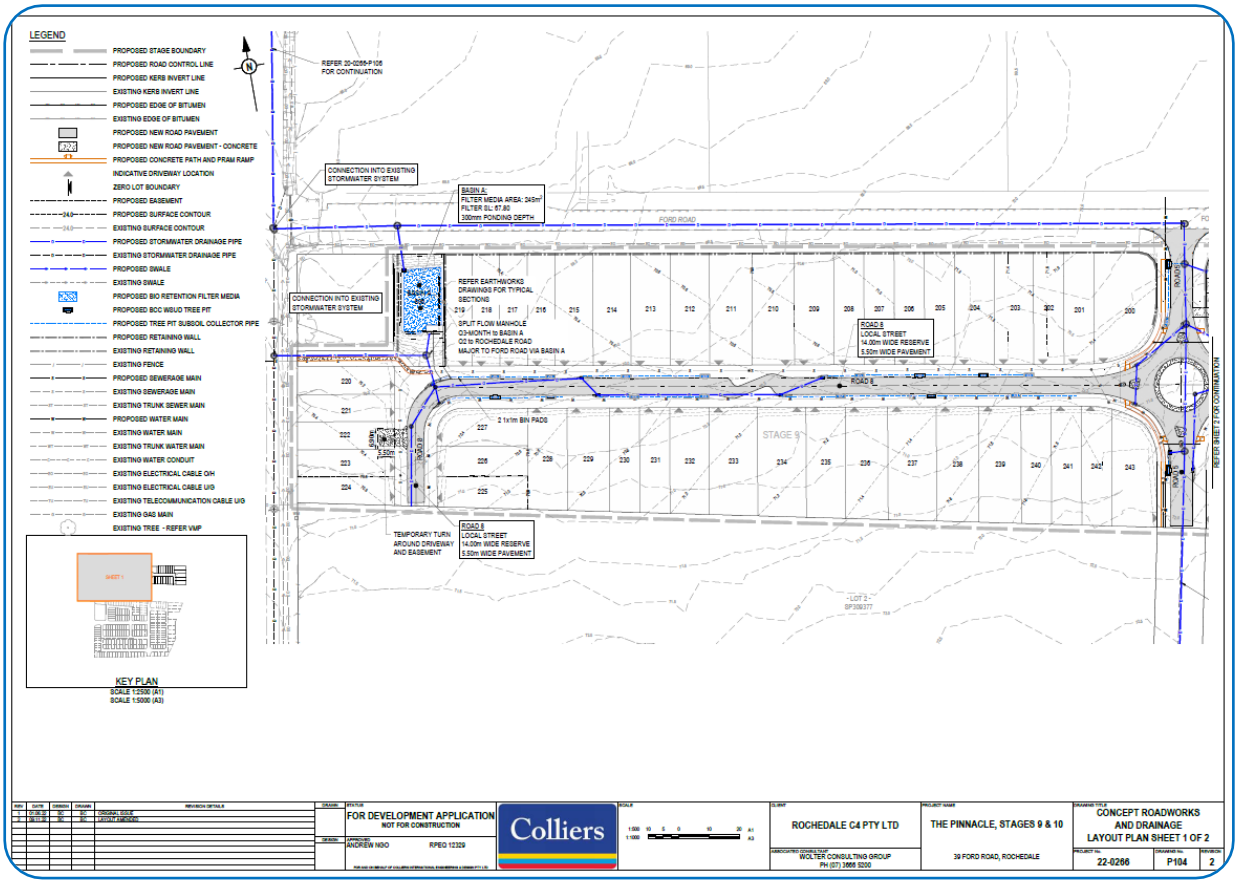


Figure 2.4 The Pinnacle Stages 9 & 10 Concept Roadworks & Drainage (Colliers, 2022)

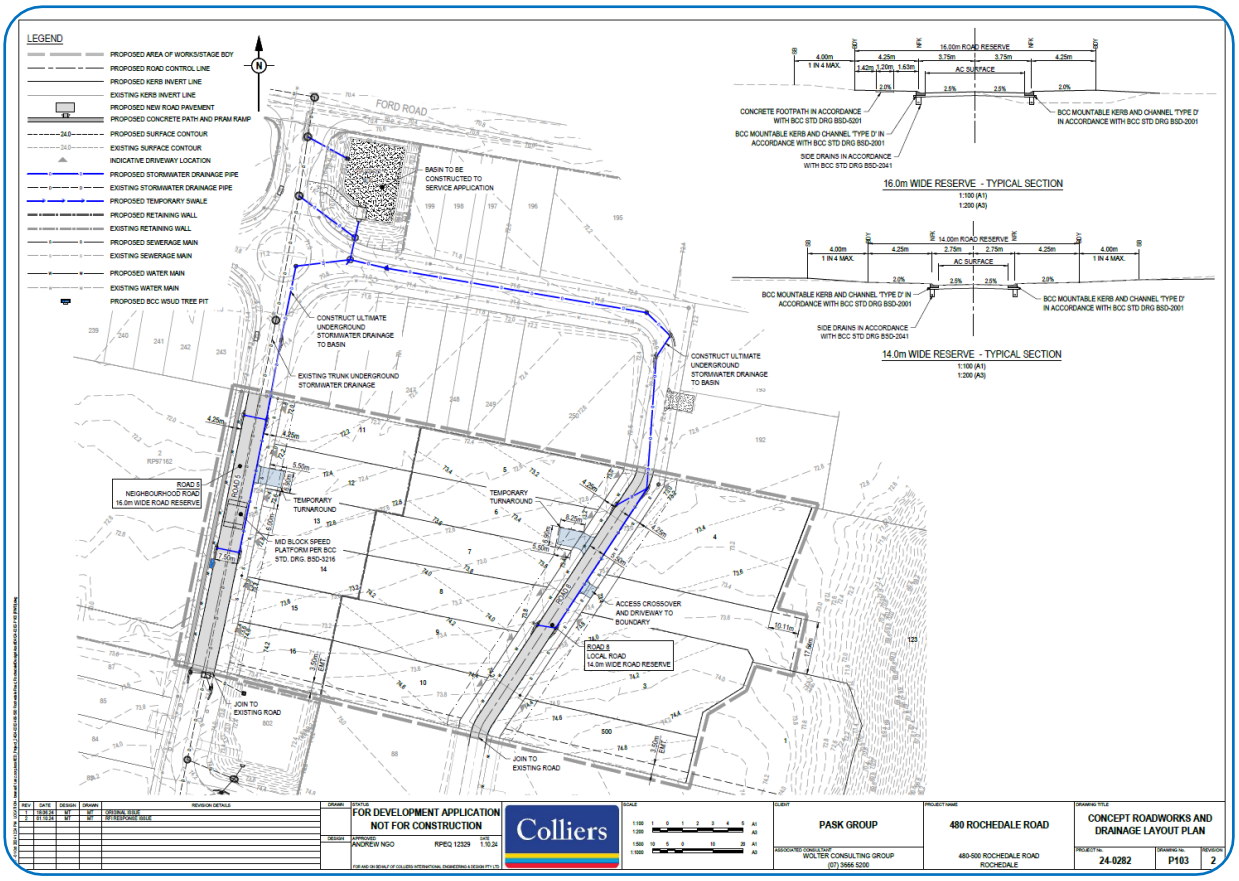


Figure 2.5 480 Rochedale Road Concept Roadworks & Drainage (Colliers, 2024)

A recent 'Flooding and Stormwater Management Plan' (FSMP) prepared by Colliers International Engineering & Design Pty Ltd (dated 16 October 2026, Council Application reference: A006494916) has been undertaken for the Pinnacle Arise development, which includes the subject site within the study context area (identified as catchment 'A11'). The report assesses the proposed works associated with both developments including the construction of the neighbourhood spine road to the east and includes consideration of an 'Ultimate Development Scenario' in which a completely developed and un-detained catchment reports to the future drainage trunk main. In this scenario an imperviousness of 70% has been assumed for the subject site catchment – A11 (as detailed in Table 2-4 of the report).

As described in Section 2.2.3 of the FSMP, the stormwater quantity management measures proposed for the development include utilising the proposed neighbourhood spine road which connects to Ford Road as the 'major' overland flow path and the stormwater trunk main to pipe the 10% AEP 'minor' storm.

Results of the modelling by Colliers included within the FSMP indicate that during a major 1% AEP event for the ultimate development scenario, overland flows are fully contained within the neighbourhood spine road to the east of the site and do not encroach on the subject site (Refer to Figure 2.6 below). Flood levels within the road are predicted to range from RL 73.4 m AHD to RL 71.85 m AHD.

Based on the modelling undertaken it would therefore be expected that the eastern portion of the subject site would no longer be encumbered by overland flooding once the surrounding developments proceed and construction of the neighbourhood road to the east has been completed.

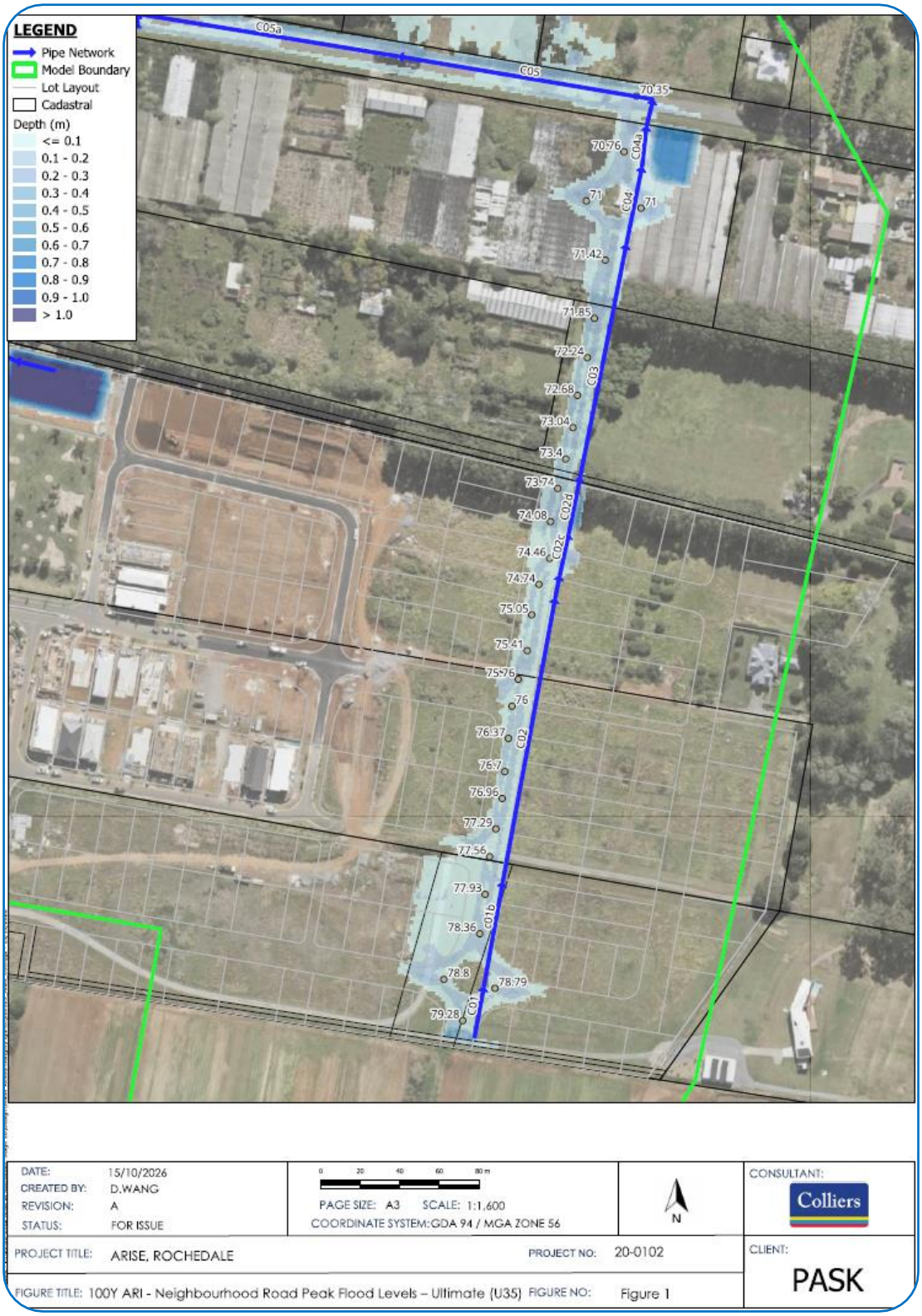


Figure 2.6 100 year ARI Neighbourhood Road Peak Flood Levels (Extract from FSMP by Colliers)

3 Existing Case – Hydrological Assessment

xpstorm was utilised to assess the site's existing hydrology and generate hydrographs to represent the stormwater flows expected from the site. Modelling was based on existing catchment areas and surface characteristics for the subject site. Peak discharge rates for nominated Annual Exceedance Probabilities (AEPs) were derived from the output hydrographs. The following sections detail the input parameters used in the *xpstorm* modelling. Catchments have been delineated on Drawing DWG-200 – Appendix B.

3.1 Existing Case – Discharge Locations

Flows from the subject site currently discharge across the site's northern boundary as sheet and channel flow to the neighbouring allotment (Lot 1 on RP71823). From Lot 1, flows continue north to Ford Road and are concentrated within the swales in the road reserve. Flows contained within the road reserve are conveyed west to Rochedale Road then head north along Rochedale Road outletting to a bank of culverts approximately 300 m north of the Ford/Rochedale Road intersection. Flows conveyed underneath Rochedale Road via the culverts outlet to an existing channel which ultimately outlets to a waterway to the west of Rochedale Road.

Whilst the site's current discharge location is the northern freehold allotment (Lot 1 on RP71823, 39 Ford Road, Rochedale), upgrades to the stormwater network of Rochedale Road completed as part of Stage 16 – Arise at Rochedale (Reference: A005364788) have accommodated for the subject site and provided a stormwater connection point within Rochedale Road (Structure G3/4 identified within the design drawings by Peak Urban – included in Appendix C). Based on review of the approved designs, an allowance of 0.957 m^3/s has been accommodated within the stormwater network for the subject site (via the 750 mm pipe connection to G3/4). This connection point is identified as the nominated point of discharge for the site.

The connection point for the site on Rochedale Road is shown on the external drainage design drawings by Peak Urban contained within Appendix C and the site survey contained within Appendix D.

For hydrological assessment purposes, the total flows from the site have been assessed for comparison of peak discharge.

3.2 Existing Case – Internal Catchments

The subject site has been considered a single internal catchment area for hydrological assessment purposes. The characteristic of the site's catchments are detailed in Table 3.1 below.

Table 3.1 Existing Case – Internal Catchment Characteristics

Catchment ID		Area (ha)	Cover (%)	Discharge Condition	PD ID
Internal	1	2.17	90 – Grassed/Vegetated 10 - Hardstand	Sheet - Channel	PD-1

3.3 Existing Case – *xpstorm* Runoff

The "Laurenson" routing method was applied to *xpstorm* for hydrological calculation and hydrograph generation. The contributing catchment was split into pervious (with 0% impervious fraction) and impervious (with 100% impervious fraction) areas. Adopted parameters for the Laurenson routing method include a Manning's roughness coefficient (n) for impervious and pervious areas respectively. Infiltration uniform losses have been applied to the hydrologic

model based on information obtained from the Australian Rainfall and Runoff Data Hub tool (reference: https://data.arr-software.org).

Temporal Patterns and Rainfall Data

The hydrologic analysis undertaken in this report will rely on Australian Rainfall and Runoff (ARR) temporal patterns and enveloped QRA SEQ IFD, LIMB IFD and BOM data obtained for the site from ARR Data Hub. This data includes climate change adjustments for a 2030 baseline A summary of the ARR data applied for modelling including climate change factors applied to IFD data is included in Appendix E of this report. Table 3.2 presents the resultant IFD data adopted for modelling purposes.

Table 3.2 Adopted Intensity Frequency Data (mm/hr)

Storm Duration	Annual Exceedance Probability (AEP)					
	0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
5 minute	142.80	166.80	195.60	226.80	259.20	306.00
10 minute	117.60	139.20	166.20	184.20	210.60	244.80
15 minute	100.00	119.20	143.20	158.80	178.40	207.60
20 minute	86.70	104.10	126.00	140.40	155.70	181.20
25 minute	76.80	92.40	112.56	125.76	140.16	161.52
30 minute	69.00	83.40	101.80	114.20	127.80	146.60
45 minute	53.47	64.93	80.00	90.40	102.13	117.20
60 minute	44.10	53.70	66.40	75.50	85.90	99.60
90 minute	32.87	40.20	50.13	57.47	65.93	77.53
120 minute	26.55	32.60	40.90	47.05	54.40	64.50
180 minute	19.67	24.27	30.67	35.53	41.43	49.70

Critical Storm Duration Assessment

The critical storm duration for each catchment was determined utilising the Ensemble Statistics Utility in *xpstorm*. From the critical storm duration, the median storm ensemble was utilised to determine peak flows for each respective catchment. Table 3.3 presents the critical storm duration and chosen median storm ensemble for each of the modelled catchments. Box and Whisker Plots showing the 1% AEP peak flows for the range of durations modelled is contained within Appendix F.

Table 3.3 Existing Case – Critical Storm Assessment

Catchment ID	Critical Storm	Annual Exceedance Probability (AEP)					
		0.393 (2 yr ARI)	0.181 (5 yr ARI)	0.095 (10 yr ARI)	0.049 (20 yr ARI)	0.02 (50 yr ARI)	0.01 (100 yr ARI)
1	Duration (min)	30	60	30	30	30	25
	Median Storm	8	5	8	8	2	9

The tables below contain the modelling parameters relied upon and present the resulting peak discharges expected from the subject site.

Table 3.4 Existing Case – *xpstorm* Catchment Details

Catchment ID		Impervious Area		Pervious Area	
		Area (ha)	Slope (%)	Area (ha)	Slope (%)
Internal	1	0.214	2.0	1.956	2.0

Table 3.5 Existing Case – Adopted Initial and Continuing Losses

Impervious Area			Pervious Area		
IL (mm)	CL (mm/hr)	Manning's n	IL (mm)	CL (mm/hr)	Manning's n
0	0	0.014	14	1.7	0.040

Table 3.6 Existing Case – *xpstorm* Peak Discharge (m^3/s)

Catchment/Point of Discharge	Annual Exceedance Probability (AEP)					
	39.3% (2 yr ARI)	18.1% (5 yr ARI)	9.5% (10 yr ARI)	4.9% (20 yr ARI)	2% (50 yr ARI)	1% (100 yr ARI)
1	0.36	0.51	0.63	0.73	0.84	0.97
TOTAL SITE	*0.36*	*0.51*	*0.63*	*0.73*	*0.84*	*0.97*

3.4 Existing Case – Model Validation (Rational Method)

For validation purposes, peak discharge values were calculated for 0.01 AEP using Rational Method and compared to those generated using *xpstorm.* The comparison is shown in Table 3.7 below and Rational calculations, which are in accordance with QUDM 2016 Section 4, are detailed within Appendix G.

Table 3.7 Existing Case – Peak Flow Validation *xpstorm* vs Rational

Catchment & Point of Discharge ID		*xpstorm* (m^3/s)	Rational (m^3/s)	Difference (%)
Internal	1	0.97	1.08	-11.3

The peak discharge calculated using Rational method is generally within 20% of the value generated using *xpstorm* for the 1% AEP. The modelling is therefore considered to be appropriately validated.

4 Proposed Development

The proposal is for a residential subdivision to establish freehold residential allotments, a stormwater treatment area (drainage reserve) and internal road network.

It is noted that the development has been staged to coincide with the construction of the northern and eastern connection points. Stage 1 will result in the delivery of the majority of the residential allotments and internal road infrastructure. A temporary road connection will be provided to Rochedale Road. This stage will also include the delivery of a stormwater treatment basin in Lot 900, with outlets to Rochdale Road (0.957 m^3/s). In addition, a temporary basin will be constructed on proposed Lot 201 for the mitigation of peak discharge. This basin will be required until the ultimate downstream trunk stormwater infrastructure is delivered.

On completion of the northern development and downstream trunk stormwater infrastructure, Stage 2A will include the decommissioning of the temporary road connection to Rochedale Road and the temporary detention basin. An additional stormwater connection will be provided through the northern development which will connect to truck stormwater infrastructure. Stage 2B will include connection to the neighbourhood road to the east once works are complete.

The proposal is shown on the plan of development by Survey Mark included as Figures 4.1-4.3 (below).

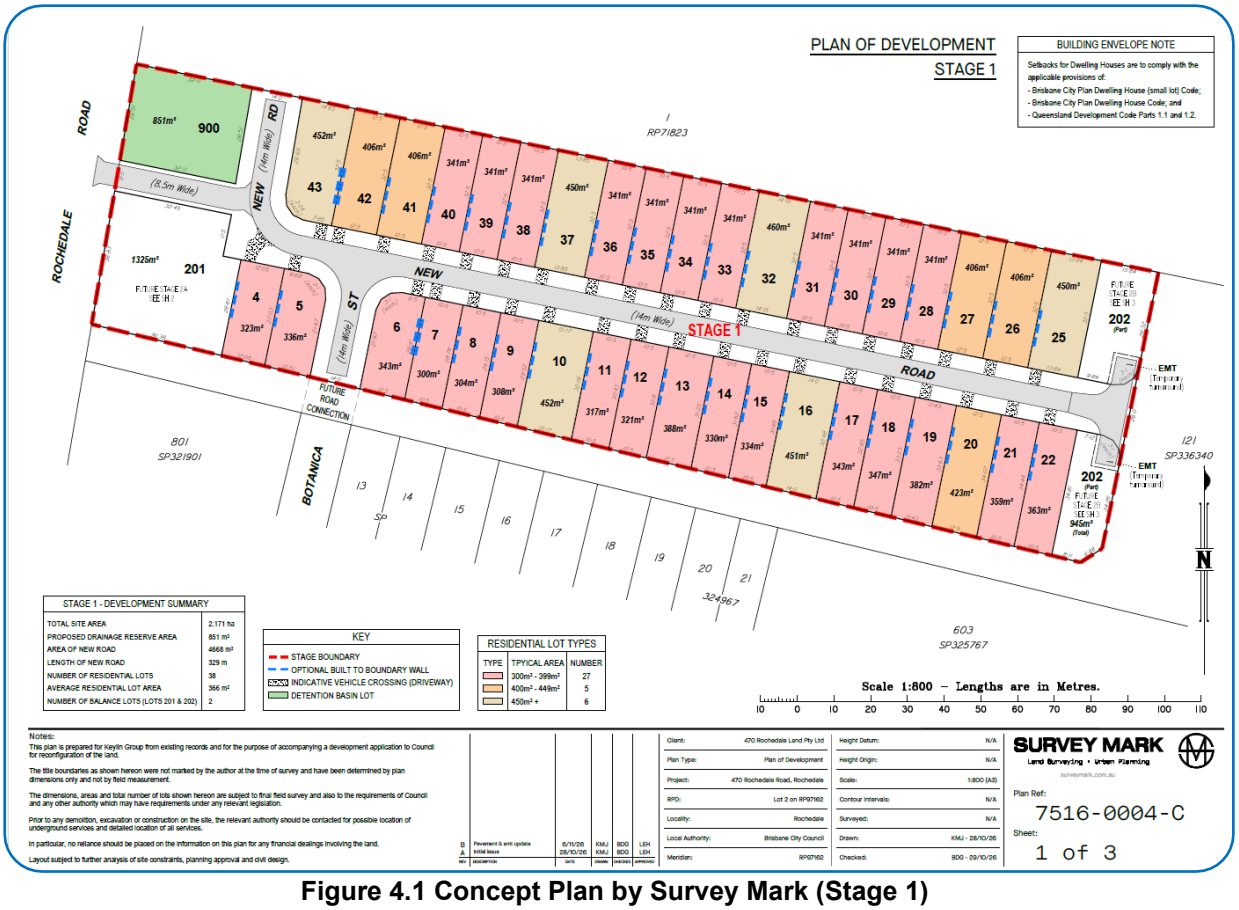


Figure 4.1 Concept Plan by Survey Mark (Stage 1)

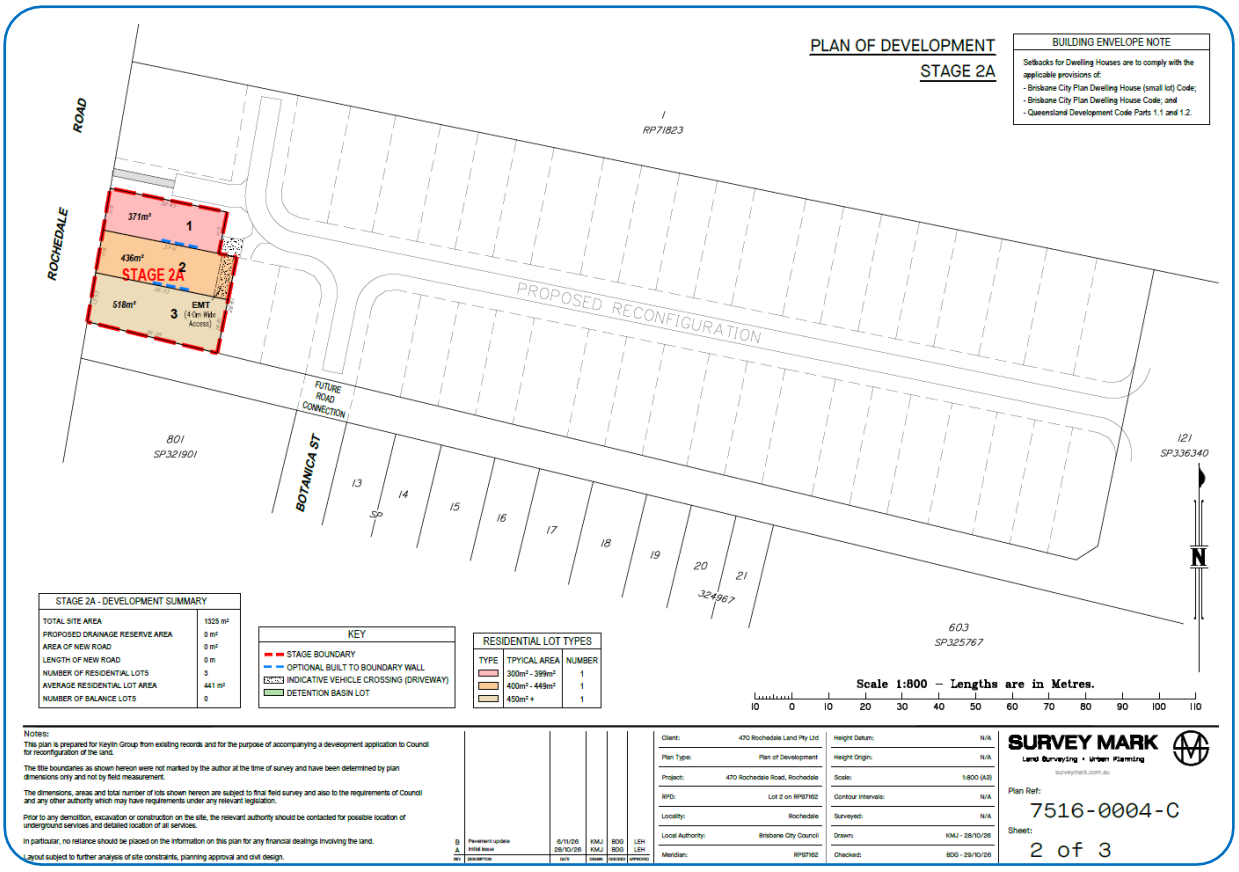


Figure 4.2 Concept Plan by Survey Mark (Stage 2A)

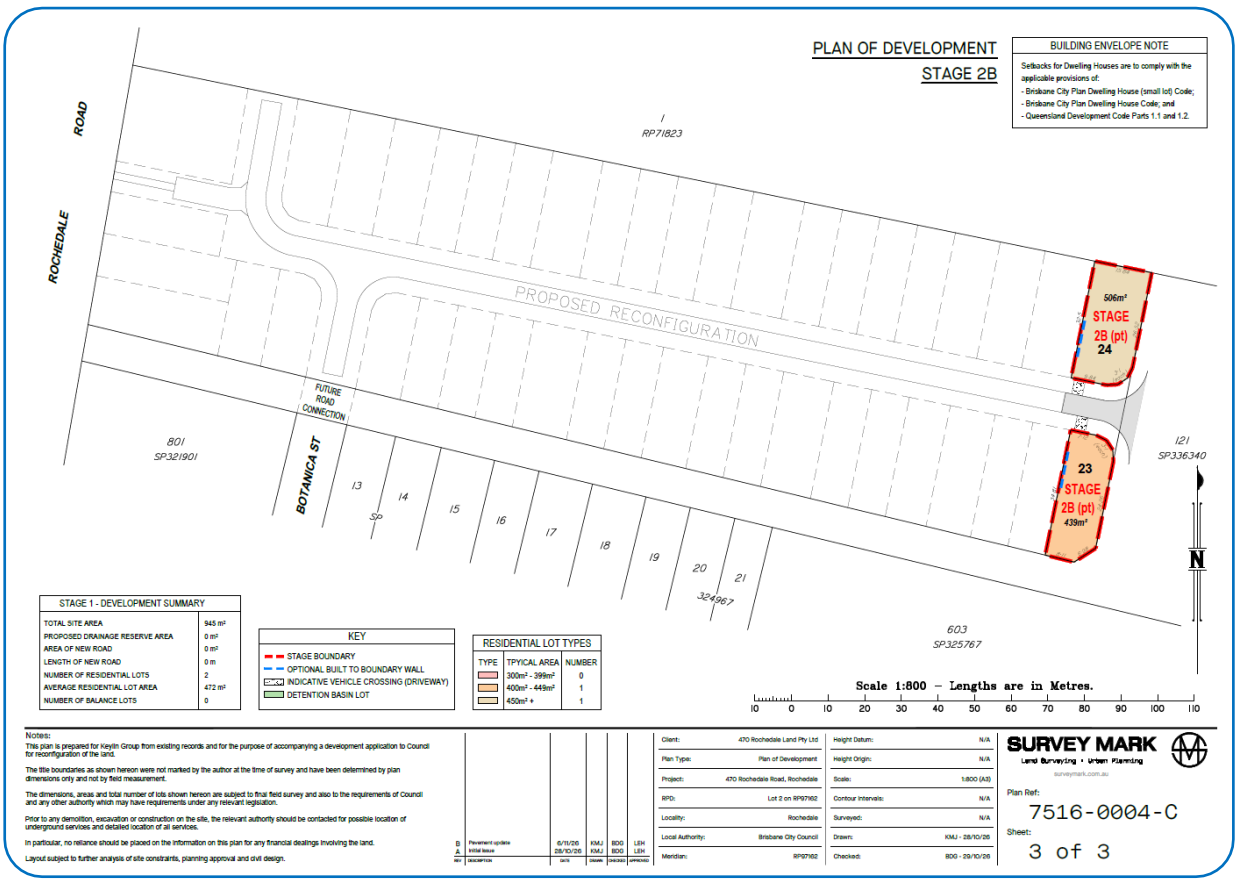


Figure 4.3 Concept Plan by Survey Mark (Stage 2B)

The proposed civil grading plan by Civil 360 is included below as Figure 4.4. The proposed pad levels for Lot 23 have been set at between RL 72.75 and 73.05 m AHD and for Lot 24 between 72.40 and 72.65 AHD.

With reference to Figure 2.6 of this report and the Colliers FSMP the predicted 1% AEP flood levels within the adjacent neighbourhood spine road to the east fall from RL 73.4 to RL 71.85 m AHD.

In accordance with Table 8.2.11.3.J newly created residential allotments are required to be set at the 300 mm freeboard.



Figure 4.4 Civil Grading by Civil360

Based on the modelling undertaken by Colliers and the pad levels shown on the civil grading plans by Civil360 the proposed pads for Lot 23 and 24 will need to be raised to achieve the required flood immunity freeboard. The recommended minimum lot levels for each lot area included in Table 4.1 below.

Table 4.1 Recommended Minimum Lot Levels

Lot 23		Lot 24	
Building Pad Level	RL 73.7 m AHD	Rear Property Boundary	RL 72.54 m AHD

5 Developed Case – Hydrological Assessment

xpstorm was utilised to assess the site's developed hydrology and generate hydrographs and peak discharge from the development site. The following sections detail the parameters used in the *xpstorm* modelling. The subject site has been maintained as a single site catchment for modelling and peak discharge comparison purposes.

5.1 Developed Case – Internal Catchments

The site will undergo substantial earthworks to profile the development area. Underground piped drainage will be installed to collect minor stormwater flows, with major flows conveyed via an internal road network.

A single internal post development catchment has been delineated based on the preliminary civil designs by Civil360. The characteristics of the site's catchments are detailed in Table 5.1 below.

Table 5.1 Developed Case – Internal Catchment Characteristics

Catchment ID		Area (ha)	Cover (%)	Discharge Condition	PD ID
Internal	1	2.17	100 – Res Dev	Road/Piped/Weir	Rochedale Road – Existing Stormwater connection

5.2 Developed Case – *xpstorm* Runoff

The "Laurenson" routing method was applied to *xpstorm* for hydrological calculation and hydrograph generation. The contributing catchment was split into pervious (with 0% impervious fraction) and impervious (with 100% impervious fraction) areas. Adopted parameters for the Laurenson routing method include a Manning's roughness coefficient (n) for impervious and pervious areas respectively. Infiltration uniform losses have been applied to the hydrologic model.

The tables below contain the modelling parameters relied upon and present the resulting peak discharges expected for each catchment. The flows reported at each PD represent the combined catchment inflows at this point.

Table 5.2 Developed Case – *xpstorm* Catchment Details

Catchment ID		Impervious Area		Pervious Area	
		Area (ha)	Slope (%)	Area (ha)	Slope (%)
Internal	1	1.52	1.0	0.65	1.0

Table 5.3 Developed Case – Adopted Initial and Continuing Losses

Impervious Area			Pervious Area		
IL (mm)	CL (mm/hr)	Manning's n	IL (mm)	CL (mm/hr)	Manning's n
0	0	0.014	14.0	1.7	0.040

Table 5.4 Developed Case – *xpstorm* Peak Discharge (m^3/s)

Catchment/Point of Discharge	Annual Exceedance Probability (AEP)					
	39.3% (2 yr ARI)	18.1% (5 yr ARI)	9.5% (10 yr ARI)	4.9% (20 yr ARI)	2% (50 yr ARI)	1% (100 yr ARI)
1	0.67	0.86	0.99	1.14	1.34	1.50
TOTAL SITE	*0.67*	*0.86*	*0.99*	*1.14*	*1.34*	*1.50*

5.2.1 Validation of Flows

Table 5.5 illustrates that the peak discharges generated using both methods compare well for the 1.0 % AEP as both hydrological methods are within 20% of each other for the 1% AEP. The modelling is therefore considered to be appropriately validated.

Table 5.5 Developed Case – Peak Flow Validation *xpstorm* vs Rational

Catchment/Point of Discharge		*xpstorm* (m^3/s)	Rational (m^3/s)	Difference (%)
Internal	1	1.50	1.66	-10.7

5.2.2 Peak Discharge Comparison (m^3/s) – Existing vs Developed (Unmitigated)

Table 5.6 presents a comparison of the peak discharges expected from the site. Results indicate increases in peak discharge are expected from the site due to the increase in site imperviousness.

Table 5.6 Peak Discharge Comparison (m^3/s)

PD	Scenario	Contributing Catchment Area (ha)	Annual Exceedance Probability (AEP)					
			39.3% (2 yr ARI)	18.1% (5 yr ARI)	9.5% (10 yr ARI)	4.9% (20 yr ARI)	2% (50 yr ARI)	1% (100 yr ARI)
TOTAL SITE	Existing	2.17	0.36	0.51	0.63	0.73	0.84	0.97
	Developed (Unmitigated)	2.17	0.67	0.86	0.99	1.14	1.34	1.50
	Difference		**+0.31**	**+0.35**	**+0.36**	**+0.41**	**+0.50**	**+0.53**

6 Stormwater Management – Operational Phase

In order to ensure that the operational phase objectives outlined within Section 1.1 of this report can be achieved, a network of stormwater management measures are proposed for inclusion within the development.

To achieve these objectives, both external and internal flows will need to be adequately managed prior to discharge to the site's points of discharge.

Whilst the downstream trunk infrastructure has been designed with capacity of a unmitigated discharge from the subject site, given the uncertain timing of the delivery of this trunk stormwater to the north and east of the site, stormwater quantity management for the site has been staged.

In Stage 1 of the development – interim detention is proposed within an additional area adjacent to the permanent stormwater quality treatment basin (Lot 900). The temporary detention area and permanent basin are proposed to be connected via balance drainage structures. The temporary detention has been sized to mitigate critical peak site flows to the pre-development scenario. Additionally outflows into Rochedale Road have been limited to at or below the piped design capacity of 0.957 m^3/s as outlined within the approved design drawings by Peak Urban (refer to Appendix C). The intention of this approach is to allow Stage 1 to proceed without the reliance on the Rochedale Road stormwater trunk upgrades proposed to the north of the Ford Road intersection.

Stage 2A of the development will be progressed when stormwater and road connections are available to the northern development at 39 Ford Road. In Stage 2A, the temporary basin is to be decommissioned and an additional connection provided to the northern development. It is noted that the pit upstream of the permanent bioretention basin includes an outlet to the north which conveys the balance of minor flows to the north (noting that the treatment flows up to the 0.5EY are to be directed to the bioretention basin). Refer to the Concept Roadworks and Drainage Plan by Civil360 for further details of the proposed works (Appendix H).

Stage 2B of the development includes the connection to the neighbourhood road to the east.

The permanent bioretention basin for stormwater quality treatment is to be constructed within Stage 1 of the development. The filter area of this basin has been sized for the fully development subject site.

6.1 Schematic Design Plan

With consideration given to the existing site characteristics, the proposed development configuration and the range of available stormwater management control measures, a set of conceptual stormwater management designs have been proposed and detailed within the drawing set contained within Appendix H.

6.1.1 Overland Flow Paths

The mapped overland flow paths which encumber the eastern portion of the site are largely contained within Stage 2B of the development and would be removed in conjunction with the construction of the eastern neighbourhood road (as discussed in Section 2.1 of this report).

6.1.2 Internal Drainage

The site's internal catchments will be developed for residential dwellings which will be graded so as to allow minor stormwater flows to be collected within the road piped drainage systems with higher flows conveyed with road reserves. A single stormwater treatment basin has been

proposed for the management of stormwater for the site. This basin has been sized to treat stormwater flows form the development extent.

6.2 Quantity Control – Detention (Interim for Stage 1)

The proposed development will result in an increase in impervious and hardstand area and therefore an increase in peak discharge. A temporary detention basin has been proposed to detain stormwater flows so as to ensure that there is no increase in site flows until such time as the downstream trunk drainage infrastructure of Rochedale Road has been built. The temporary detention basin is to be located adjacent to the permanent stormwater quality basin (Lot 900) and is connected via a balance pipe. The proposed detention volumes exclude the bioretention extended detention.

6.2.1 *xpstorm* Modelling Parameters

xpstorm has been relied upon to size the required temporary detention measures and develop appropriate outlet configurations. *xpstorm* requires a depth area relationship to be defined when modelling an onsite detention (OSD). As the interim detention will be connected to the bioretention basin, the depth vs area relationship is a combined area and has been configured to exclude the bioretention extended detention depth (representing the treatment volume being full at the storm onset).

A summary of the total depth-area relationship applied to the storage node of the *xpstorm* model in the post-development (mitigated) scenario is contained in Table 6.1. The dimensions and proposed levels of the outlet structures used to mitigate the developed case peak discharge and achieve the required detention volumes are detailed in Table 6.2. It is noted that the outlets have been located within the permanent basin area.

Table 6.1 Depth Area Relationship

Detention ID	RL (m AHD)	Depth (m)	Surface Area (ha)
Interim Detention	69.30	0.00	0.001
	69.40	0.10	0.001
	69.55	0.25	0.044
	69.65	0.35	0.047
	69.75	0.45	0.050
	69.85	0.55	0.052
	69.95	0.65	0.055
	70.05	0.75	0.058
	70.15	0.85	0.062
	70.25	0.95	0.065
	70.35	1.05	0.068
	70.45	1.15	0.072
	70.55	1.25	0.076
	70.65	1.35	0.080
	70.75	1.45	0.084
	70.85	1.55	0.088
	70.95	1.65	0.092
	71.05	1.75	0.097

Table 6.2 Outlet Structures

Detention Basin ID		Orifice	Outlet Pit(s) & Pipe(s)	Emergency Overflow
Basin 1 (Lot 900)	Pit 1 (within Bioretention basin – Lot 900)	3 x 200 mm (H) x 450 mm (W) @ RL 69.6 m AHD	1 x 900 mm x 900 mm Crest @ RL 70.2 m AHD 1 x 600 mm dia RCP outlet to Rochdale Road stormwater network.	10 m Weir Crest @ RL 71.05 m AHD (100% Blocked Case)

6.2.2 Modelling Results

The results of *xpstorm* modelling indicate that the inclusion of the temporary detention area will mitigate the expected increases in site peak discharge during all nominated ARI events.

Table 6.3 presents a comparison between the expected peak flows during nominated ARI events for the pre- and post-development mitigated cases. The figure below presents a comparison of the site flow hydrograph.

Table 6.3 Peak Discharge Comparison (m^3/s) – Total Site Flow

Scenario	Contributing Catchments	Contributing Catchment Area (ha)	Annual Exceedance Probability (AEP)					
			39.3% (2 yr ARI)	18.1% (5 yr ARI)	9.5% (10 yr ARI)	4.9% (20 yr ARI)	2% (50 yr ARI)	1% (100 yr ARI)
Total Site Flow								
Pre-Development	1	2.17	0.36	0.51	0.63	0.73	0.84	0.97
Post-Development (Unmitigated)	1	2.17	0.67	0.86	0.99	1.14	1.34	1.50
Post-Development (Mitigated)	1	2.17	0.36	0.43	0.57	0.66	0.80	0.93
Difference (Pre vs Post Mitigated)			**0.00**	**-0.08**	**-0.06**	**-0.07**	**-0.04**	**-0.04**

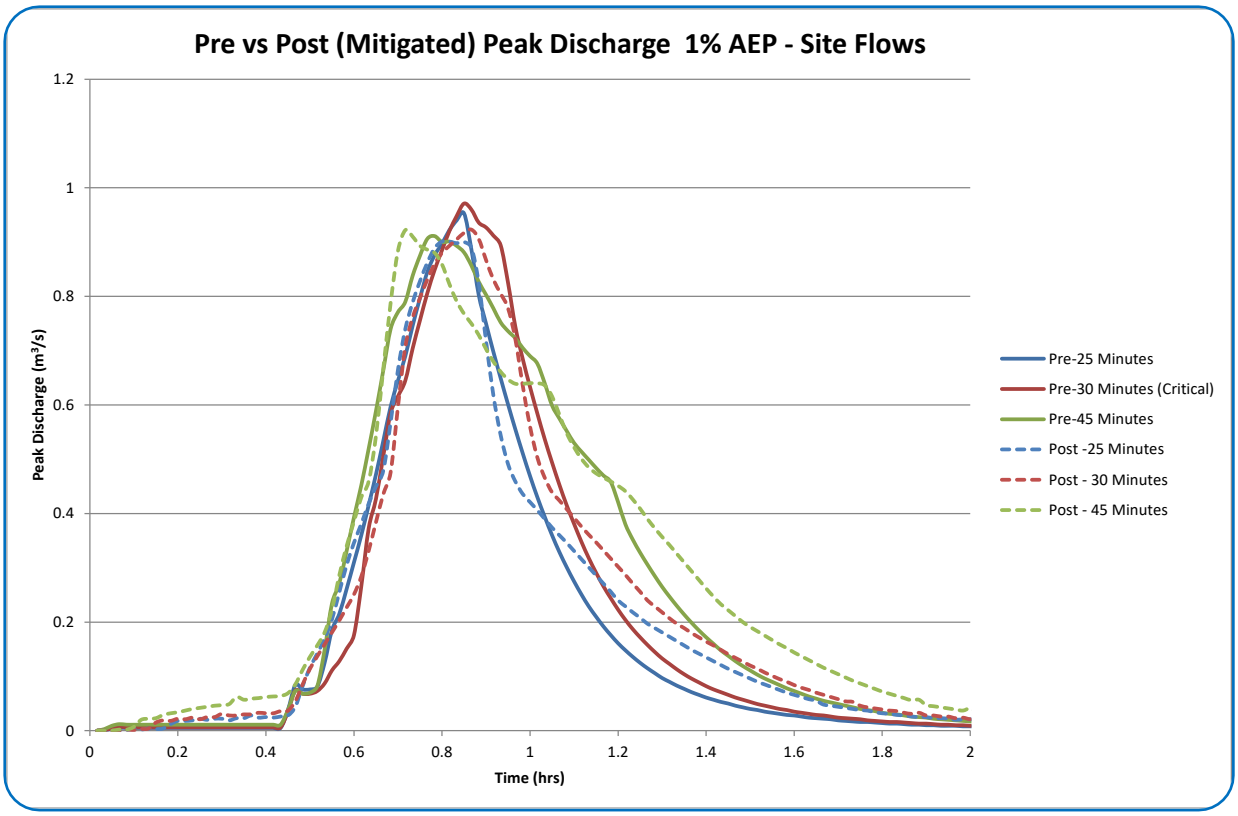


Figure 6.1 Comparison 100 year ARI Hydrography (Site Flows)

6.2.3 QUDM Minimum Design Safety Standards – Detention Depth

In accordance with the QUDM the depth of water in a detention basin is not to exceed 1.2 m during the 20 year ARI. A freeboard of 300 mm should also be achieved, along with a weir flow depth of no greater than 300 mm.

Table 6.4 presents the peak water levels, depths and volumes expected within the detention during both the 20 year ARI and 100 year ARI. Based on the *xpstorm* modelling of the proposed post-development scenario, including the additional outlet riser and pipe, the design will not result in water depths outside the recommended design criteria.

It is noted the that temporary detention area and permanent basin are connected via balance drainage structures – therefore levels and volumes are across the combined permanent basin and temporary detention area.

Table 6.4 Detention Storage Details, Depths and Volumes (Basins 1)

Parameter	Basin 1	
	0.049 (20 yr ARI)	**0.01 (100 yr ARI)**
Base Level (m AHD)	69.30	69.30
Top of Bund Level (m AHD)	71.20	71.20
Weir Level (m AHD) (PIT 2)	71.05	71.05
Peak Water Surface (m AHD)	70.29	70.36
Peak Depth of Water (m)	0.99	1.06
Peak Volume (m^3)	431	481
Freeboard Achieved (m)	0.91	0.84
Depth of Weir Flow (m)	-	-

As water depths are expected to rise above 1.0 m within the detention basin during major events, in accordance with QUDM Section 5.12 it is recommended that a depth indicator be installed within the basin with its zero level relative to the lowest point in the basin floor. Warning signs are also recommended to deter public access during rainfall events (refer to Figure 6.2 below).



Figure 6.2 Typical Depth Indicator and Detention Basin Warning Signs

6.2.4 Sensitivity Analysis

Blockage

In accordance with the requirements of QUDM Section 7.5, consideration has been given to the consequences of outlet blockage. Table 6.5 illustrates the expected peak water levels within the basin if low flow orifices became fully blocked and the pits were 100% blocked. In this event, water levels would increase in the basin with all flow discharging over the high flow weir structure. Based on the configuration, peak water levels would not be expected to exceed the Top of Bund during the 1% AEP. The expected maximum depth of flow over the high flow weir has been modelled at 0.3 m.

Table 6.5 Blockage Sensitivity Analysis Results for 1% AEP

Basin ID	Peak Water Level (m AHD)	Top of Bund (m AHD)	Depth of Weir Flow (m)
Basin 1	71.19	71.20	0.14

6.3 Lawful Point of Discharge

The criteria for determining a Lawful Point of Discharge (LPD) as specified within the Queensland Urban Drainage Manual (2016) is as follows:

a. Will the proposed development alter the site's stormwater discharge characteristics in a manner that may substantially damage a third party property?

- If not, then no further steps are required to obtain tenure for a lawful point of discharge (assuming any previous circumstances and changes were lawful).
- If there is a reasonable risk of such damage then consider (ii) or (iii).

b. Is the location of the discharge from the development site under the lawful control of the local government or other statutory authority from whom permission to discharge has

been received? This will include a park, watercourse, drainage or road reserve, stormwater registered drainage easement, or land held by local government (including freehold land).

- If so, then no further steps are required to obtain tenure for a lawful point of discharge
- If not, then consider issue (iii). A land owner or regulator may require that the developer obtain an authority to discharge as described in (iii) in order for the stormwater to ultimately flow to a location described in (ii).

c. An authority to discharge over affected properties will be necessary. In descending order of certainty, an authority may be in the form of:

- Dedication of a drainage reserve or park;
- A registered easement for stormwater discharge/works; or
- Written approval.

Each point of discharge has been assessed against the above criteria and it is considered that a Lawful Point of Discharge will be achieved at each discharge location. Provided that the design measures set out in this report are implemented it is not anticipated that substantial damage will be caused to a third party property at any discharge point.

6.4 Quality Control – Pollutant Reduction (All Stages)

In accordance with the local government planning scheme, treatment measures have been included to achieve the minimum mean annual load based reductions of 80% for Total Suspended Solids (TSS); 60% for Total Phosphorus (TP), 45% for Total Nitrogen (TN), and 90% for Gross Pollutants (GP).

The Model for Urban Stormwater Improvement Conceptualisation (*MUSIC X*) has been used to estimate the potential pollutant loads generated by the development and to size the proposed treatment measures. The following sections outline the parameters relied upon within the *MUSIC X* modelling.

6.4.1 Rainfall and Evapotranspiration Data

Rainfall and evapotranspiration data has been obtained from the Bureau of Meteorology (BOM) and is summarised within Table 6.6 below.

Table 6.6 Meteorological and Rainfall Runoff Data Reporting

Station	Brisbane City Council (40223)
Period	1/01/1980 to 31/12/1990 (10 years)
Time step	6 minute
Mean annual rainfall (mm)	1,149
Evapotranspiration	1,459

6.4.2 Catchment Parameters

The developed site has been modelled as having an Urban Residential land use. The internal catchment has been modelled as a lumped source node for development assessment purposes. Table 6.7 summarises the sub-catchment areas and Drawing DWG-201 – Appendix B presents the sub-catchment delineation. The adopted pollutant export and runoff parameters for each

sub catchment are based on data from the Water by Design *MUSIC v6* Modelling Guidelines (2010), as summarised in Tables 6.8 and 6.9.

Table 6.7 *MUSIC X* Sub-Catchment Areas

Catchment ID	Land Use	Area (ha)	Total Impervious (%)
Catchment 1	Urban Residential – LUMPED	2.17	70
Total (ha)	-	**2.17**	-

Table 6.8 Rainfall Runoff Parameters

Parameter	All Nodes
Landuse	Residential
Rainfall threshold (mm)	1
Soil storage capacity (mm)	500
Initial storage (% capacity)	10
Field capacity (mm)	200
Infiltration capacity coefficient a	211
Infiltration capacity exponent b	5.0
Initial depth (mm)	50
Daily recharge rate (%)	28
Daily baseflow rate (%)	27
Daily deep seepage rate (%)	0

Table 6.9 Pollutant Export Parameters (log mg/L)

Flow Type	Surface Type	Total Suspended Solids (log_{10} mg/L)		Total Phosphorous (log_{10} mg/L)		Total Nitrogen (log_{10} mg/L)	
		Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.
Urban Residential							
Base Flow	Lumped	1.00	0.34	-0.97	0.31	0.20	0.20
Storm Flow	Lumped	2.18	0.39	-0.47	0.32	0.26	0.23

6.4.3 Treatment Measures

In order to determine the design requirements for the necessary stormwater treatment measures, key "Treatment Nodes" were added to the *MUSIC X* model. The following sections outline the modelling parameters relied upon for each "Treatment Node".

Bioretention

It is proposed that bioretention measures be incorporated into the development layout to provide the necessary load-based reductions. Bioretention systems operate by capturing and retaining water in an extended ponding area (no more than 400 mm deep for a maximum of four (4) days to prevent anaerobic conditions, plant death and insect breeding), before filtering through a soil media. The devices remove pollutants via the following physical processes:

- Sedimentation in the extended detention storage;
- Filtration by filter media;

- Nutrient uptake by biofilms;
- Nutrient adsorption and pollutant decomposition by soil bacteria; and
- Adsorption of metals and nutrients by filter particles (Somes & Crosby, 2007).

In accordance with Water by Design Guidelines, Table 6.10 summarises the treatment node parameters used in the *MUSIC X* modelling whilst Figure 6.3 provides typical design parameters for the proposed bioretention devices.

Table 6.10 Bioretention Parameters

Bioretention Parameter	Bioretention Basin A
Drainage Profile (Type 1 = Saturated Zone, Type 2 = Sealed, Type 3 = Conventional, Type 4 = Pipeless)	Type 3
Surface area (m^2)	220
Extended detention depth (m)	0.3
Filter area (m^2)	210
Unlined filter media perimeter (m)	0.01
Saturated hydraulic conductivity (mm/hr)	200
Filter depth (m)	0.6
TN content of filter media (mg/kg)	400**
Proportion of organic material in filter (%)	< 5
Orthophosphate content of filter media (mg/kg)	30*
Is the base lined?	Yes
Effectiveness of plant TN removal	Effective
Overflow weir width (m)	Surface Area/10
Exfiltration rate (mm/hr)	0.00
If an exfiltration rate has been used, have node water balance losses been used in calculation of treatment train effectiveness?	N/A
If exfiltration rate has been used, is the exfiltration rate justified?	N/A
Underdrain present?	Yes
Submerged zone with carbon present?	Yes
Depth of submerged zone (m)	0.4
Confirmation that K and C* remain default?	Yes
Sediment Forebay Required (>2 ha contributing catchment)	Yes

**As per Healthy Land and Water Recommendations for MUSIC modelling

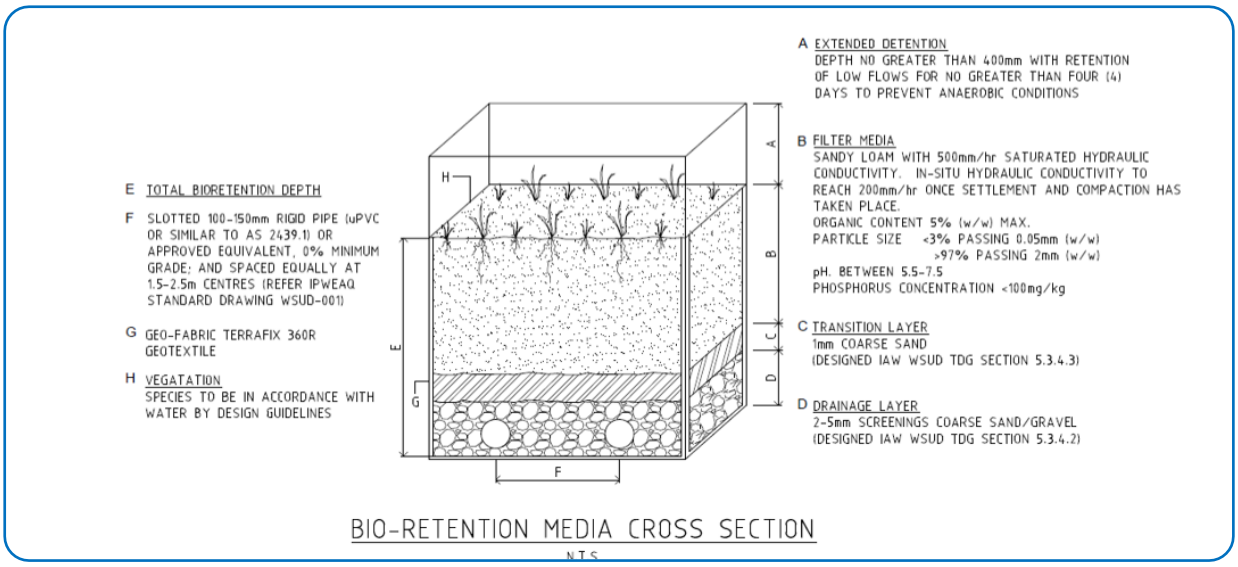


Figure 6.3 Bioretention specifications

Coarse Sediment Forebay

As the contributing catchment to the bioretention measure will be greater than 2 ha a coarse sediment forebay will be installed at the piped discharge point into the bioretention basin. The forebay will limit sediment accumulation over the bioretention filter surface and reduce the potential for clogging. This will also help to reduce the frequency of maintenance required for the bioretention systems. Table 6.11 provides a summary of the sediment forebay calculations and requirements. The sediment forebays have been excluded from the *MUSIC X* modelling.

Table 6.11 Sediment Forebay Parameters

Forebay ID	Contributing Catchment Area (ha)	Q_{3month} Inflow Rate (m^3s)	Settling Velocity (m/s)	Area (m^2)	Depth (m)	Capture Efficiency (%)
Basin 1	2.17	0.25	0.1	30	0.20	80

6.4.4 Modelling Results

Results of the *MUSIC X* modelling for the treatment train effectiveness are summarised in Table 6.12. The results indicate the 80%, 60%, 45% and 90% reduction target for TSS, TP, TN and GP respectively are achieved for the rainfall data set simulated for all flows captured and conveyed to the proposed bioretention basins. A screen capture of the *MUSIC X* modelling results is included as Figure 6.4.

Table 6.12 Treatment Train Effectiveness

Catchment ID	Pollutant	Inflows (kg/yr)	Outflows (kg/yr)	Reduction (kg/yr)	Reduction (%)	Water Quality Objective (%)
TOTAL	TSS	3,961	713	3,248	**82.0**	80.0
	TP	7.4	2.9	4.6	**61.7**	60.0
	TN	36.7	18.2	18.5	**50.5**	45.0

NOTE: All simulations have been run with pollutant export estimation set to “stochastic generation”.

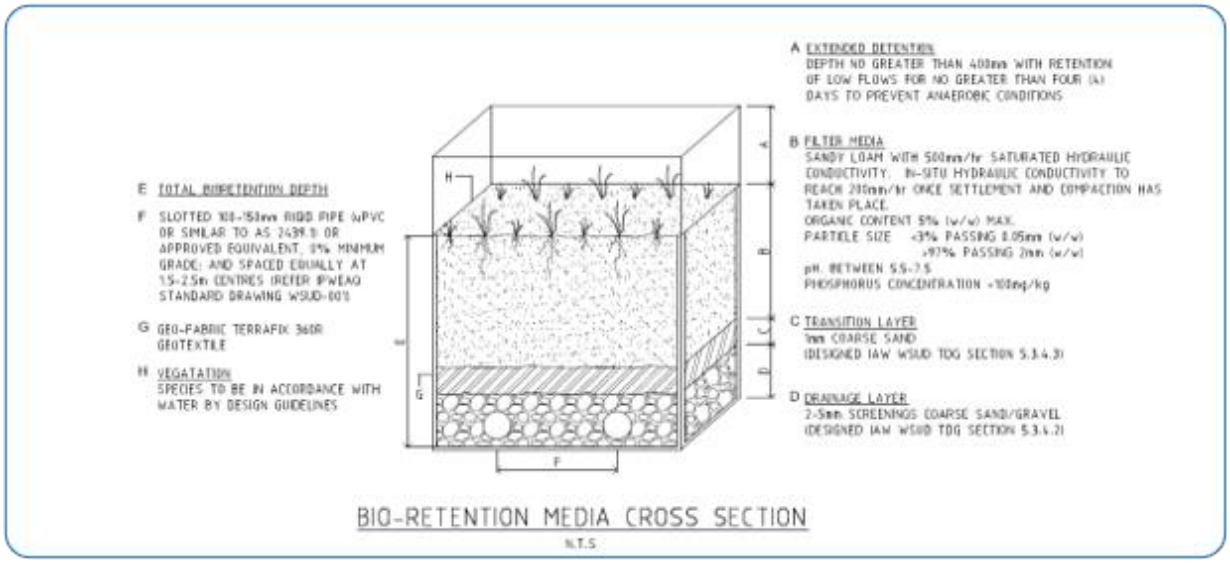


Figure 6.4 Screen Capture of MUSIC Modelling Results (TOTAL)

6.5 Maintenance Access

The bioretention system will require regular maintenance, including cleanouts, weeding, and replanting. The bioretention filter, inlet area, and the surrounds will therefore include the access provisions detailed in Table 6.13 and on the drawing set included in Appendix H to facilitate these maintenance activities.

In order to limit public access to the bioretention system, a lockable park gate should be provided at the site access/top of access ramp in accordance with Council Specifications (refer to Figure 6.5 for typical detail).

Table 6.13 Maintenance Access Requirements

Access Type	Description	Width (m)	Batter	Material/Design Requirements
ACCESS TO INLET				
Site Access	Provides formal access to the basin for maintenance activities and is to be suitable for maintenance vehicle	3.5		Reinforced Concrete suitable for heavy machinery (up to 40 Tonne).
Access Ramp	Access Ramp to extend to concrete base of sediment forebay	≥3.0	1:6 (Max)	Reinforced Concrete Capable of supporting maintenance vehicles. Barrier to be provided at top to prevent unauthorised vehicle access (i.e. gate, bollard, and/or fence)
BIORETENTION FILTER AREA				
Filter and Vegetation Maintenance Access (Bioretention Cells)	Access path provided for regular inspections and maintenance of bioretention filter media cells.	1.0 m trafficable path along min 40% of perimeter	-	Turf, Concrete or Gravel (suitable for foot traffic)
Outlet Pipe(s) Access	A maintenance access track trafficable by small earthmoving equipment provided from access point to outlet pipe locations	As required	1:4 (Max)	Gravel, reinforced turf or other
Maintenance Edge (Filter Media)	Maintenance edges are not considered appropriate as bioretention located adjacent to riparian rehabilitation area			

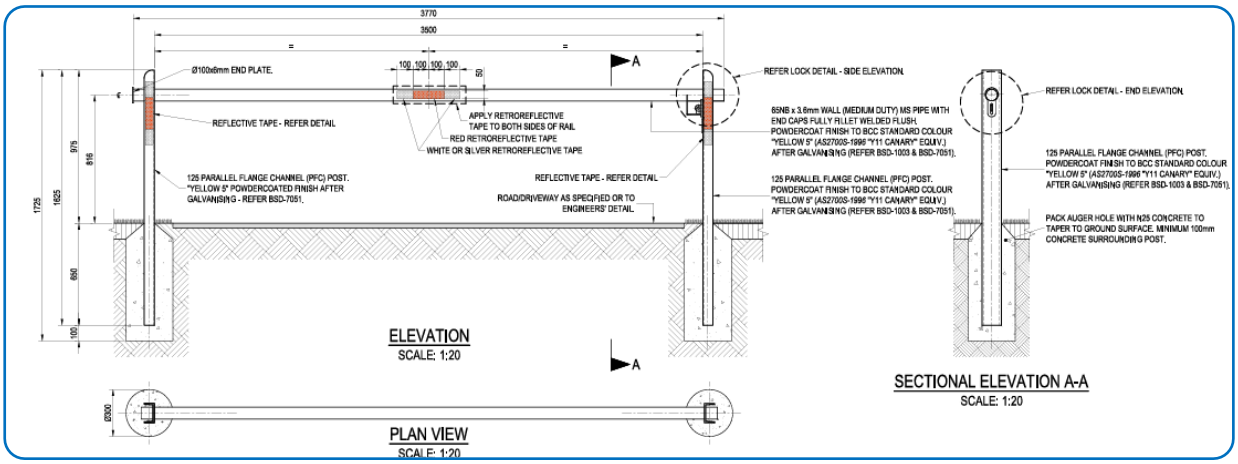


Figure 6.5 Entrance Barrier – Lockrail with Steel Posts (BCC, Drawing: BSD-7054)

6.6 Bioretention Basin Staged Construction and Establishment

In accordance with the Water by Design Construction and Establishment Guidelines: Swales Bioretention Systems and Wetlands (C & E Guidelines), inflow of sediment-laden runoff during the building stage is a major risk to the successful and long-term functioning of bioretention systems.

During the building phase of developments, sediment can seal the surface of the filter media, move into and clog the filter media and accumulate in the under-drainage. Within the C & E Guidelines, there are two (2) options recommended to overcome the challenges associated with delivering bioretention systems. These generally include the following options:

- Option 1: High Efficiency Sediment Basin; and
- Option 2: Temporary Surface Protection;

Any of the above options will ensure adequate protection of the bioretention during the building phase and are suitable for implementation.

It is proposed that the Option 2 method for temporary surface protection of the bioretention system be implemented for the proposed development. This method is progressed in three (3) stages as follows:

Stage 1 Civil Works – earthworks and bulking out of basin followed by the installation of the hydraulic structures, liner, underdrainage and filter media. Installation of surface protection over filter media (filter cloth, topsoil and turf)

Stage 2 Building Phase Protection – the system operates as a shallow sediment pond; and

Stage 3 Landscape Establishment

- when 90% of building in the catchment is complete, removal of the surface protection measures;
- clean out of under-drainage, flattening of filter surface (additional filter media may be required); and
- planting and establishment of vegetation in the bioretention system.

For details of the procedure and order of construction for Option 2 method please refer to Section 2.7 (Steps 1-4, 8-40) of the C & E Guidelines. If an alternative option is found to be more suitable for the site, construction methods and steps should be referenced from the C & E Guidelines.

6.7 Water Quality Monitoring and Maintenance

In order to ensure that the stormwater management measures detailed within this management plan function correctly in the long term and to ensure that impacts to downstream receiving environments are mitigated, appropriate operational phase water maintenance and monitoring is to be undertaken. The following sections detail the minimum requirements for each specific control device.

6.7.1 Operational Phase Water Quality Monitoring

Surface water quality monitoring should be undertaken at discharge points from the site with samples collected for TSS, pH, dissolved oxygen (DO), TP, TN and hydrocarbons. Sampling should be performed in accordance with procedures set out in the Department of Environment and Science's Monitoring and Sampling Manual. A NATA registered laboratory is to be used to analyse the collected samples. Table 6.14 specifies the sampling parameters and frequencies required. Results of the monitoring program are to be compiled monthly into an ongoing Water Quality Monitoring Report. A copy of the report and monitoring data is to be maintained.

Table 6.14 Operational Phase Water Quality Parameters and Sampling Frequencies

Sampling Parameter	Sampling Frequency
TSS	Rainfall events of 25 mm or greater in any 24 hour period monthly for a minimum period of 12 months, or as specified by the Local Authority conditions of approval for the development.
pH	
Dissolved Oxygen (DO)	
TN	
TP	
Hydrocarbons	

Table 6.15 sets the water quality criteria for water discharged from the development site.

Table 6.15 Operational Phase Water Quality Discharge Criteria

Water Quality Parameter	Discharge Criteria
TSS	No net deterioration of the downstream receiving environment as a result of discharge from the development.
Turbidity (NTU)	
pH	
DO	
TN	
TP	
Hydrocarbons	

6.7.2 Operational Phase Device Maintenance

In order for each of the proposed stormwater treatment devices to achieve the necessary pollutant removal efficiencies regular maintenance is necessary. Poorly maintained devices will result in under performance and in some instances may cause leaching of pollutants to downstream receiving environments. Based on the proposed treatment train Table 6.16 details appropriate maintenance regimes for each treatment device.

Table 6.16 Operational Phase Device Maintenance Requirements

Treatment Device	Maintenance Action
Bioretention	Routine inspection to identify obvious increased sediment deposition. Remove sediment when flow within the bioretention is impeded or smothering of vegetation occurs.
	Routine inspection of inlet and outlet pit to identify any areas of scour, litter build up or blockages.
	Tilling of the bioretention surface if there is evidence of clogging.
	Regular watering of vegetation until plants are established.
	Removal and management of invasive weeds.
	Removal and replacement of dead and dying vegetation.
	Regular inspection and removal of litter and gross pollutants.
	Resetting (i.e. complete reconstruction) of the bioretention will be required if the flow within the bioretention system is reduced by 25% due to an accumulation of sediment.

All material removed during maintenance, whether solid or liquid, is to be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.

7 Conclusions

The report has been prepared on behalf of 470 Rochedale Land Pty Ltd and presents a comprehensive review of available Stormwater Quality Improvement Devices (SQID) and stormwater Best Management Practices (BMP) to ensure that the proposed development adequately addresses the management of stormwater quantity and quality during the operational phase of the development.

In order to address the management of stormwater quality, a single bioretention basin has been proposed with a filter area of 210 m^2 for treatment of the development site. MUSIC modelling of the proposed basin configuration demonstrates pollutant removal efficiencies of 80%, 60%, 45% and 90% for TSS, TP, TN and gross pollutants respectively for Catchment 1 (the development extent).

Temporary detention has been proposed for the mitigation of peak flows from Stage 1 of the development until such time as the downstream stormwater trunk infrastructure of Rochedale Road has been constructed and stormwater connections have been provided within the northern development at 39 Ford Road.

The temporary system has been designed to;

- Maintain pre-development peak discharges from the site until downstream trunk infrastructure of Rochedale Road has been constructed; and
- Limit outflows to Rochedale Road to the nominated pipe design capacity (based on the approved Arise At Rochedale – Stage 16 External Stormwater design drawings (Council Ref: A005364788)).

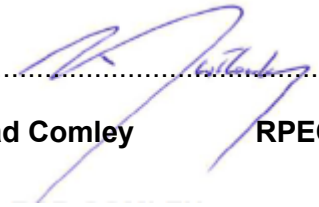
The proposed design includes an estimated detention volume of 481 m^3 within the proposed temporary basin. Modelling of the detention basin and associated outlet structures indicate that pre-developed site flows can be maintained for all nominated ARI events until such time as connection is available to the northern development and downstream trunk infrastructure upgrades have been constructed.

8 RPEQ Certification

I am aware that Council may rely upon the contents and findings of this assessment for the purposes of development assessment. In my opinion, the Council can rely upon the information contained within the report and there are no reservations or qualifications in respect to the information other than set out in the report.

I confirm that if the design parameters set out in this report are included within the development:

- there should be no worsening in peak discharge, as a result of the proposed development that would result in actionable damage to downstream properties; and
- stormwater pollutant load reductions in accordance with best practice should be achieved.



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Brad Comley **RPEQ 17706** **DATE**

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Appendix A

Stormwater Code Response & Flood Overlay Code Response

9.4.9 Stormwater code

9.4.9.1 Application

1. This code applies to assessing a material change of use, reconfiguring a lot or operational work if:
    a. assessable development where this code is identified as a prescribed secondary code in the assessment benchmarks column of a table of assessment for a material change of use (section 5.5), reconfiguring a lot (section 5.6) operational work (section 5.8) or an overlay (section 5.10); or
    b. impact assessable development, to the extent relevant.
2. When using this code, reference should be made to section 1.5 and section 5.3.3.

Note—The following purpose, overall outcomes, performance outcomes and acceptable outcomes comprise the assessment benchmarks of this code.

Note—Where this code includes performance outcomes or acceptable outcomes that relate to infrastructure design and construction works, guidance is provided in the Infrastructure design planning scheme policy.

9.4.9.2 Purpose

1. The purpose of the Stormwater code is to assess the suitability of the stormwater aspects of development.
2. The purpose of the code will be achieved through the following overall outcomes:
    a. Development achieves acceptable levels of stormwater run-off quality and quantity by applying water sensitive urban design principles as part of an integrated stormwater management framework.
    b. Development protects public health and safety and protects against damage or nuisance caused by stormwater flows.
    c. Development has a stormwater management system which maintains, recreates or minimises impact to natural catchment hydrological processes.
    d. Development ensures that the environmental values of the city's waterways are protected or enhanced.
    e. Development minimises run-off, including peak flows.
    f. Development maintains or enhances the efficiency and integrity of the stormwater infrastructure network.
    g. Development minimises the whole of life cycle cost of stormwater infrastructure.

9.4.9.3 Performance outcomes and acceptable outcomes

Table 9.4.9.3.A—Performance outcomes and acceptable outcomes

Performance outcomes	Acceptable outcomes	Comments
Section A—If for a material change of use, reconfiguring a lot, operational work or building work		

Note—Compliance with the performance outcomes and acceptable outcomes in this section should be demonstrated by the submission of a site-based stormwater management plan for high risk development only.		
PO1 Development provides a stormwater management system which achieves the integrated management of stormwater to: a. minimise flooding; b. protect environmental values of receiving waters; c. maximise the use of water sensitive urban design; d. minimise safety risk to all persons; e. maximise the use of natural waterway corridors and natural channel design principles. Editor's note—The stormwater management system to be developed to address PO1 is not intended to require management of stormwater quality.	**AO1** Development provides a stormwater management system designed in compliance with the Infrastructure design planning scheme policy.	**Complies with AO1** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy which details the proposed management of stormwater quantity within and external to the site.
PO2 Development ensures that the stormwater management system and site work does not adversely impact flooding or drainage characteristics of premises which are up slope, down slope or adjacent to the site.	**AO2.1** Development does not result in an increase in flood level or flood hazard on up slope, down slope or adjacent premises. **AO2.2** Development provides a stormwater management system which is designed in compliance with the standards in the Infrastructure design planning scheme policy.	**Complies with AO1 and AO2** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. Detention has been included within Stage 1 to mitigate increased runoff and ensure that a lawful point of discharge is maintained.
PO3 Development ensures that the stormwater management system does not direct stormwater run-off through existing or proposed lots and property where it is likely to adversely affect the safety of, or cause nuisance to properties.	**AO3.1** Development ensures that the location of the stormwater drainage system is contained within a road reserve, drainage reserve, public pathway, park or waterway corridor. **AO3.2** Development provides a stormwater management system which is designed in compliance with the	**Complies with PO3** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. Detention has been included within Stage 1 to mitigate increased runoff and ensure that a lawful point of discharge is maintained.

	standards in the Infrastructure design planning scheme policy.	
	AO3.3 Development obtains a lawful point of discharge in compliance with the standards in the Infrastructure design planning scheme policy.	
	AO3.4 Where on private land, all underground stormwater infrastructure is secured by a drainage easement.	
PO4 Development provides a stormwater management system which has sufficient capacity to safely convey run-off taking into account increased run-off from impervious surfaces and flooding in local catchments.	**AO4.1** Development provides a stormwater conveyance system which is designed to safely convey flows in compliance with the standards in the Infrastructure design planning scheme policy. **AO4.2** Development provides sufficient area to convey run-off which will comply with the standards in the Infrastructure design planning scheme policy.	**Complies with AO4.1 and AO4.2** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. Detention has been included within Stage 1 to mitigate increased runoff and ensure that a lawful point of discharge is maintained.
PO5 Development designs stormwater channels, creek modification works, bridges, culverts and major drains to protect and enhance the value of the waterway corridor or drainage path for fauna movement.	**AO5** Development ensures the design of stormwater channels, creek modifications or other infrastructure, permits terrestrial and aquatic fauna movement.	**N/A**
PO6 Development ensures that location and design of stormwater detention and water quality treatment: a. minimises risk to people and property; b. provides for safe access and maintenance; c. minimises ecological impacts to creeks and waterways.	**AO6.1** Development locates stormwater detention and water quality treatment: a. outside of a waterway corridor; b. offline to any catchment not contained within the development. **AO6.2**	**Complies with AO6.1** N/A **Complies AO6.2** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. Detention has been included within Stage 1 to mitigate increased runoff and ensure that a lawful point of discharge is maintained.

	Development providing for stormwater detention and water quality treatment devices are designed in compliance with the standards in the Infrastructure design planning scheme policy.	
PO7 Development is designed, including any car parking areas and channel works to: a. reduce property damage; b. provide safe access to the site during the defined flood event.	**AO7.1** Development (including any ancillary structures and car parking areas) is located above minimum flood immunity levels in Table 9.4.9.3.B, Table 9.4.9.3.C, Table 9.4.9.3.D, Table 9.4.9.3.E and Table 9.4.9.3.F. Note—Compliance with this acceptable outcome can be demonstrated by the submission of a hydraulic and hydrology report identifying flood levels and development design levels (as part of a site-based stormwater management plan). **AO7.2** Development including the road network provides a stormwater management system that provides safe pedestrian and vehicle access in accordance with the standards in the Infrastructure design planning scheme policy.	**AO7.1** **N/A** **Complies/Can Comply AO7.2** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. An internal stormwater pipe network is proposed to convey minor flows with major flows to be contained within road reserves. It is considered reasonable that a condition be place on the development approval to ensure that detailed designs are provided for the internal road network to demonstrate compliance with QUDM depth and velocity provisions for safety.
PO8 Development designs stormwater channels, creek modification works and the drainage network to protect and enhance the environmental values of the waterway corridor or drainage path.	**AO8.1** Development ensures natural waterway corridors and drainage paths are retained. **AO8.2** Development provides the required hydraulic conveyance of the drainage channel and floodway, while maximising its potential to maximise environmental benefits and minimise scour. Editor's note—Guidance on natural channel design principles can be found in the Council's publication Natural channel design guidelines. **AO8.3** Development provides stormwater outlets into waterways, creeks, wetlands and overland flow paths with energy dissipation to minimise scour in compliance	**N/A**

	with the standards in the Infrastructure design planning scheme policy.	
	AO8.4 Development ensures that the design of modifications to the existing design of new stormwater channels, creeks and major drains is in compliance with the standards in the Infrastructure design planning scheme policy.	
PO9 Development is designed to manage run-off and peak flows by minimising large areas of impervious material and maximising opportunities for capture and re-use.	**AO9** No acceptable outcome is prescribed.	**Complies Overall Outcomes of Code** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy and will achieve the overall objectives of the Code.
PO10 Development ensures that there is sufficient site area to accommodate an effective stormwater management system. Note—Compliance with the performance outcome should be demonstrated by the submission of a site-based stormwater management plan for high-risk development only.	**AO10** No acceptable outcome is prescribed.	**Complies PO10** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. The proposed stormwater quality management measures have been included within land to be dedicated to Council.
PO11 Development provides for the orderly development of stormwater infrastructure within a catchment, having regard to the: a. existing capacity of stormwater infrastructure within and external to the site, and any planned stormwater infrastructure upgrades; b. safe management of stormwater discharge from existing and future up-slope development; c. implication for adjacent and down-slope development.	**AO11.1** Development with up-slope external catchment areas provides a drainage connection sized for ultimate catchment conditions that is directed to a lawful point of discharge. **AO11.2** Development ensures that existing stormwater infrastructure that is undersized is upgraded in compliance with the Infrastructure design planning scheme policy.	**Complies AO11.1** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. It is proposed that flows from upstream catchment be collected and conveyed to a lawful point of discharge. **Complies AO11.2** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. Detention has been included to mitigate increased runoff from Stage 1 and ensure that a lawful point of discharge is maintained, therefore not increasing peak flow to existing infrastructure.
PO12	**AO12.1**	**Complies PO12**

Development provides stormwater infrastructure which: a. remains fit for purpose for the life of the development and maintains full functionality in the design flood event; b. can be safely accessed and maintained cost effectively; c. ensures no structural damage to existing stormwater infrastructure.	The stormwater management system is designed in compliance with the Infrastructure design planning scheme policy. **AO12.2** Development provides a clear area with a minimum of 2m radius from the centre of an existing manhole cover and with a minimum height clearance of 2.5m.	A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. The proposed stormwater management measures have been designed to be fit for purpose and mitigate safety risks.
PO13 Development ensures that all reasonable and practicable measures are taken to manage the impacts of erosion, turbidity and sedimentation, both within and external to the development site from construction activities, including vegetation clearing, earthworks, civil construction, installation of services, rehabilitation, revegetation and landscaping to protect: a. the environmental values and water quality objectives of waters; b. waterway hydrology; c. the maintenance and serviceability of stormwater infrastructure. Note—The Infrastructure design planning scheme policy outlines the appropriate measures to be taken into account to achieve the performance outcome.	**AO13** No acceptable outcome is prescribed.	**Can Comply via Conditions** It is considered reasonable that conditions be placed on the development approval to require the preparation of an Erosion and Sediment Control Plan to address construction phase management.
PO14 Development ensures that: a. unnecessary disturbance to soil, waterways or drainage channels is avoided; b. all soil surfaces remain effectively stabilised against erosion in the short and long term.	**AO14** No acceptable outcome is prescribed.	**Can Comply via Conditions** It is considered reasonable that conditions be placed on the development approval to require the preparation of an Erosion and Sediment Control Plan to address construction phase management.
PO15 Development does not increase:	**AO15** No acceptable outcome is prescribed.	**Can Comply via Conditions** It is considered reasonable that conditions be placed on the development approval to require the preparation of an Erosion and Sediment Control Plan to address construction phase management.

a. the concentration of total suspended solids or other contaminants in stormwater flows during site construction; b. run-off which causes erosion either on site or off site.		
Section B—Additional performance outcomes and acceptable outcomes which apply to high-risk development, being one or more of the following: a. a material change of use for an urban purpose which involves greater than 2,500m^2 of land that: i. will result in an impervious area greater than 25% of the net developable area; or ii. will result in 6 or more dwellings. b. reconfiguring a lot for an urban purpose that involves greater than 2,500m^2 of land and will result in 6 or more lots; c. operational work for an urban purpose which involves disturbing greater than 2,500m^2 of land.		
PO16 Development ensures that the entry and transport of contaminants into stormwater is avoided or minimised to protect receiving water environmental values. Note—Prescribed water contaminants are defined in the *Environmental Protection Act 1994*. Note—Compliance with the performance outcome should be demonstrated by the submission of a site-based stormwater management plan for high-risk development only.	**AO16** Development provides a stormwater management system which is designed in compliance with the standards in the Infrastructure design planning scheme policy.	**Complies with AO16** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. A single bioretention basin for treatment of the proposed development extent. The basin includes a bioretention filter area of 210 m^2 which has been sized to achieve the specified load-based reduction targets.
PO17 Development ensures that: a. the discharge of wastewater to a waterway or external to the site is avoided; or b. if the discharge cannot practicably be avoided, the development minimises wastewater discharge through re-use, recycling, recovery and treatment. Note—The preparation of a wastewater management plan can assist in demonstrating achievement of this performance outcome. Editor's note—This code does not deal with sewerage which is the subject of the Wastewater code.	**AO17** No acceptable outcome is prescribed.	**N/A**

Section C—Additional performance outcomes and acceptable outcomes for assessable development for a material change of use or reconfiguring a lot		
PO18 Development protects stormwater infrastructure to ensure the following are not compromised: a. the long term infrastructure for the stormwater network in the Long term infrastructure plans; b. the existing and planned infrastructure for the stormwater network in the Local government infrastructure plan; c. the provision of long term, existing and planned infrastructure for the stormwater network which: i. is required to service the development or an existing and future urban development in the planning scheme area; or ii. is in the interests of rational development or the efficient and orderly planning of the general area in which the site is situated. Editor's note—A condition which requires a proposed development to keep permanent improvements and structures associated with the approved development clear of the area of long term infrastructure, may be imposed.	**AO18** Development protects stormwater infrastructure in compliance with the following: a. for long term infrastructure for the stormwater network, the Long term infrastructure plans; b. for existing and planned infrastructure for the stormwater network, the Local government infrastructure plan; c. the standards for stormwater drainage in the Infrastructure design planning scheme policy.	**Complies AO18** A stormwater management plan has been prepared for the site in accordance with the infrastructure design planning scheme policy. Detention has been included to mitigate increased runoff form Stage 1 and ensure that a lawful point of discharge is maintained, therefore not increasing peak flow to existing infrastructure.
PO19 Development provides for the payment of extra trunk infrastructure costs for the following: a. for development completely or partly outside the priority infrastructure area in the Local government infrastructure plan; b. for development completely inside the priority infrastructure area in the Local government infrastructure plan involving:	**AO19** No acceptable outcome is prescribed.	**N/A**

i. trunk infrastructure that is to be provided earlier than planned in the Local government infrastructure plan; ii. long term infrastructure for the stormwater network which is made necessary by development that is not assumed future urban development; iii. other infrastructure for the stormwater network associated with development that is not assumed future urban development which is made necessary by the development. Editor's note—The payment of extra trunk infrastructure costs for development completely inside the priority infrastructure area in the Local government infrastructure plan is to be worked out in accordance with the Charges Resolution. Editor's note—See section 130 Imposing Development conditions (Conditions for extra trunk infrastructure costs) of the *Planning Act 2016*.		

Table 9.4.9.3.B—Categories of flood planning levels

Flooding type(1)	**Minimum design floor or pavement levels (m AHD)(2) (refer to Table 9.4.9.3.C for assignment of these categories)**				
	Category A	**Category B**	**Category C**	**Category D**	**Category E**
Waterway(A) or open channel	1% AEP flood level + 500mm	1% AEP flood level + 300mm	1% AEP flood level	1% AEP flood level	5% AEP flood level
Overland flow flooding(B)	2% AEP flood level +500mm	2% AEP flood level +300mm	2% AEP flood level	2% AEP flood level	5% AEP flood level

Notes—

(1) Where the site is subject to more than one type of flooding that is overland flow flooding, creek or waterway flooding or river flooding, the minimum flood immunity level is the highest level determined from these sources.

(2) Where flood levels are not available from Council's Floodwise Property Report such as overland flow flooding, the applicant will need to engage a suitably qualified Registered Professional Engineer Queensland with expertise in undertaking flood studies to estimate the relevant flood level.

Note (A) A waterway, including any indicated on the planning scheme maps, is defined as any element of a river, creek, stream, gully or drainage channel, including the bed and banks, typically with a catchment area greater than 30ha.

Note (B) Overland flow flooding usually occurs when the capacity of the underground piped drainage system is exceeded and/or when the overland flow path is blocked. Localised overland flow paths generally traverse along roadways, and in the older established areas, through private properties within existing low points and gullies. A localised overland flow path is not characterised by well-defined bed and banks and the contributing catchment is generally less than 30ha.

Note—A flood event with an AEP of 1% is the equivalent of a 100 year ARI flood event.

Note—A flood event with an AEP of 2% is the equivalent of a 50 year ARI flood event.

Note—A flood event with an AEP of 5% is the equivalent of a 20 year ARI flood event.

Note—The flood immunity level in some older inner-city areas is often controlled by local ponding.

Table 9.4.9.3.C—Flood planning level categories for development types

BCA building classification(1)	**Development types and design levels, assigned design floor or pavement levels**	**Category Refer to Table 8.2.11.3.L**
Class 1—4	Habitable room	Category A
	Non-habitable room including patio and courtyard	Category B
	Non-habitable part of a Class 2 or Class 3 building excluding the essential services(2) control room	Category B
	Parking located in the building undercroft of a multiple dwelling	Category C
	Carport(4), unroofed car park; vehicular manoeuvring area	Category D
	Essential electrical services(2) of a Class 2 or Class 3 building only	Category A(6)
	Basement parking entry(3)	Category C + 300mm
Class 5,	Building floor level	Category C

Class 6, or Class 8	Garage or car park located in the building undercroft(3)	Category C
	Carport(4) or unroofed car park	Category D
	Vehicular access and manoeuvring areas	Category D
	Basement parking entry(3)	Category C
	Essential electrical services(2)	Class 8 — Category C(6) Class 5 & 6 — Category A(6)
Class 7a	Refer to the relevant building class specified in this table	
Class 7b	Building floor level	Category C
	Vehicular access and manoeuvring area	Category D
	Essential electrical services(2)	Category C
Class 9	Building floor level	Category A
	Building floor level for habitable rooms in Class 9a or 9c where for a residential care facility	0.2% AEP flood
	Garage or car park located in the building undercroft(3)	Category C
	Carport(4) or unroofed car park	Category D
	Vehicular access and manoeuvring areas	Category D
	Essential electrical services(2)	Category A
Class 10a	Car parking facility	Refer to the relevant building class specified in this table
	Shed(5) or the like	Category D
Class 10b	Swimming pool	Category E
	Associated mechanical and electrical pool equipment	Category C

	Other structures	Flood immunity standard does not apply

Notes—

(1) Refer to the Building Code of Australia for definitions of building classifications.

(2) Essential services include any room used for fire control panel, telephone PABX, sensitive substation equipment including transformers, low voltage switch gear, high-voltage switch gear, battery chargers, protection control and communication equipment, low voltage cables, high-voltage cables and lift controls.

(3) Basement car parks must be suitably waterproofed and all air vents, air-conditioning ducts, pedestrian access and entry and exit ramps at the car park entrance have flood immunity in accordance with this table.

(4) A shelter for a motor vehicle, which has a roof and one or more open sides, and which can be built against the side of a building.

(5) A slight or rough structure built for shelter and storage; or a large strongly built structure, often open at the sides or end.

(6) Where essential services are proposed in a basement below the specified flood planning level, the flood immunity of all air vents, air-conditioning ducts, pedestrian access, lift shafts and entry/exit ramps at the basement entrance and any other openings into that basement must conform to Category A for Residential development, and the relevant basement entry level of all other uses. This will require a waterproof basement design to prevent floodwaters entering the basement to ensure flood immunity.

Note—A flood event with an AEP of 2% is the equivalent of a 50 year ARI flood event.

Note—A flood event with an AEP of 0.2% is the equivalent of a 500 year ARI flood event.

Note—Where a building has a combination of uses that includes a component of class 2, 3 or 9, the essential services for that building shall comply with the requirements of the building class with the greatest flood immunity requirement.

Note—Use classes for residential development also include basement storage.

Table 9.4.9.3.D—Flood planning levels for a new road

Flooding type(1)	**Minimum design levels at the crown of the road (m AHD) (2)**	
	Residential development	**Industrial or commercial development**
Waterway(A) or open channel	1% AEP flood level	2% AEP flood level
Overland flow flooding(B)	2% AEP flood level	2% AEP flood level

Notes—

(1) Where the site is subject to more than 1 type of flooding, the minimum flood planning level is the highest level determined from these sources. It should be noted that the flooding planning level in some older areas is often controlled by local ponding.

(2) Where flood levels are not available from Council's Floodwise Property Report, such as overland flow flooding, the applicant will need to engage a suitably qualified Registered Professional Engineer Queensland with expertise in undertaking flood studies to estimate the relevant flood level.

Note (A) A waterway including any indicated on the planning scheme maps is defined as any element of a river, creek, stream, gully or drainage channel, including the bed and banks typically with a catchment area greater than 30ha.

Note [(B)] Overland flow flooding usually occurs when the capacity of the underground piped drainage system is exceeded and/or when the overland flow path is blocked. Localised overland flow paths generally traverse along roadways, and in the older established areas, through private properties within existing low points and gullies. A localised overland flow path is not characterised by well-defined bed and banks and the contributing catchment is generally less than 30ha.

Note—A flood event with an AEP of 1% is the equivalent of a 100 year ARI flood event.

Note—A flood event with an AEP of 2% is the equivalent of a 50 year ARI flood event.

Note—A flood event with an AEP of 5% is the equivalent of a 20 year ARI flood event.

Table 9.4.9.3.E—Flood planning levels for essential community infrastructure

Type of essential community infrastructure	Minimum design levels
Emergency services	0.2% AEP flood
Emergency services, where for an emergency shelter	0.5% AEP flood
Emergency services, where for police facilities	0.5% AEP flood
Hospital and health care service, where associated with a hospital	0.2% AEP flood
Community facility where involving storage of valuable records or items of historic or cultural significance (e.g. galleries and libraries)	0.5% AEP flood
State-controlled roads Major or minor electricity infrastructure not otherwise listed in this table Utility installation where for rail transport services Air service Telecommunications facility	No specific recommended level but development proponents should ensure that the infrastructure is optimally located and designed to achieve suitable levels of service, having regard to the processes and policies of the administering government agency.
Power stations (as defined in the *Electricity Act 1994*) or renewable energy facility.	0.2% AEP flood
Major electricity infrastructure where a major switch yard	0.2% AEP flood
Substations	0.5% AEP flood
Utility installation where for a sewage treatment plant	DFE
Utility installation where for a water treatment plant	0.5% AEP flood

Note—A flood event with an AEP of 0.2% is the equivalent of a 500 year ARI flood event.

Note—A flood event with an AEP of 0.5% is the equivalent of a 200 year ARI flood event.

Table 9.4.9.3.F—Flood planning levels for reconfiguring a lot

Flooding type(1)	**Minimum lot levels (m AHD)(2)**	
	Residential	**Other than residential**
Waterway(A) or open channel	1% AEP flood level + 300mm	1% AEP flood level
Overland flow flooding(B)	1% AEP flood level + 300mm	2% AEP flood level

Notes—

(1) Where the site is subject to more than one type of flooding, the minimum flood immunity level is the highest level determined from these sources.

(2) Where flood levels are not available from Council's Floodwise Property Report such as overland flow flooding, the applicant will need to engage a suitably qualified Registered Professional Engineer Queensland with expertise in undertaking flood studies to estimate the relevant flood level.

Note (A) A waterway including any indicated on the planning scheme maps is defined as any element of a river, creek, stream, gully or drainage channel, including the bed and banks typically with a catchment area greater than 30ha.

Note (B) Overland flow flooding usually occurs when the capacity of the underground piped drainage system is exceeded or when the overland flow path is blocked. Localised overland flow paths generally traverse along roadways, and in the older established areas, through private properties within existing low points and gullies. A localised overland flow path is not characterised by well-defined bed and banks and the contributing catchment is generally less than 30ha.

Note—A flood event with an AEP of 1% is the equivalent of a 100 year ARI flood event.

Note—A flood event with an AEP of 2% is the equivalent of a 50 year ARI flood event.

8.2.11 Flood overlay code

Performance outcomes	Acceptable outcomes	Provided Outcome
Section C—If for assessable development other than for a dwelling house		
PO5 Development is located and designed to: (a) minimise the risk to people from flood hazard on the site; (b) minimise flood damage to the development and contents of buildings up to the defined flood event; (c) provide suitable amenity; (d) minimise disruption to residents, recovery time and the need to rebuild structures after a flood event up to and including the defined flood event.	**AO5.1** Development complies with the flood planning levels specified in Table 8.2.11.3.D. Note—If located in an area with no Council-derived flood levels such as an overland flow path, a Registered Professional Engineer Queensland with expertise in undertaking flood studies is to derive the applicable flood level and certify that the development meets the required flood planning levels in Table 8.2.11.3.D. The study is to demonstrate that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	**Complies with AO5.1** The proposed development complies with the flood planning levels specified in Table 8.2.11.3.D. The FFL for the new construction has been set above the DFE of RL 5.4 m AHD. The FFL is also set above the peak overland flow flood depth in the 2% AEP of RL 4.75 m AHD.
	AO5.2 Development is: (a) not located in the: (i) Brisbane River flood planning area 1, 2a, or 2b sub-categories; (ii) Creek/waterway flood planning area 1 or 2 sub-categories; (iii) Overland flow flood planning area sub-category; or (b) only located in these sub-categories if a Registered Professional Engineer	**Complies with AO5.2** A 'Flooding and Stormwater Management Plan' (FSMP) has been prepared by Colliers International Engineering & Design Pty Ltd (dated 16 October 2026, Council Application reference: A006494916). Results of the modelling by Colliers included within the FSMP indicate that during a major 1% AEP event for the ultimate development scenario, overland flows are fully contained within the neighbourhood spine road to the

	Queensland with expertise in undertaking flood studies certifies that: (i) the development design, siting and any mitigation measures will ensure the development is structurally adequate to resist hydrostatic, hydrodynamic and debris impact loads associated with flooding up to the defined flood event; and (ii) the risk to people is managed to an acceptable level.	east of the site and do not encroach on the subject site.
PO6 Development involving essential electrical services or a basement storage area is suitably located and designed to ensure public safety and minimise flood recovery and economic consequences of damage during a flood.	**AO6.1** Development ensures that: (a) all areas containing essential electrical services comply with the flood planning levels in Table 8.2.11.3.D; or (b) if a basement contains essential electrical services or a private basement storage area, the basement is a waterproof structure with walls and floors impermeable to the passage of water with all entry points and services located at or above the relevant flood planning level in Table 8.2.11.3.D. Note—A basement storage area does not include a bike storage room, change room, building maintenance storage and non-critical electrical services.	**N/A**

	AO6.2 Development involving a basement that relies on a pumping solution to manage floodwater ingress or for dewatering after a flood provides a secondary pump system with a backup power source for the pump.	**N/A**
PO7 Development does not directly or indirectly create a material adverse impact on flood behaviour or drainage on properties that are upstream, downstream or adjacent to the development.	**AO7.1** Development: (a) does not block, or divert floodwaters for any area affected by creek/waterway or overland flow flooding, excluding storm-tide flooding and Brisbane River flooding sources; or (b) does not result in a material increase in flood level or hydraulic hazard on upstream, downstream or adjacent properties. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	**Complies with AO7.1** A 'Flooding and Stormwater Management Plan' (FSMP) has been prepared by Colliers International Engineering & Design Pty Ltd (dated 16 October 2026, Council Application reference: A006494916). Results of the modelling by Colliers included within the FSMP indicate that during a major 1% AEP event for the ultimate development scenario, overland flows are fully contained within the neighbourhood spine road to the east of the site and do not encroach on the subject site.
	AO7.2 Development retains existing overland flow paths and does not rely wholly on piped solutions to manage major flows.	**Complies with AO7.1** A 'Flooding and Stormwater Management Plan' (FSMP) has been prepared by Colliers International Engineering & Design Pty Ltd

		(dated 16 October 2026, Council Application reference: A006494916). Results of the modelling by Colliers included within the FSMP indicate that during a major 1% AEP event for the ultimate development scenario, overland flows are fully contained within the neighbourhood spine road to the east of the site and do not encroach on the subject site.
	AO7.3 Development which creates a new overland flow path or significantly modifies an existing overland flow path via earthworks does not materially worsen hydraulic hazard on the site from existing conditions. Note—Compliance with this acceptable solution can be demonstrated by the submission of a flood study by a Registered Professional Engineer of Queensland with expertise in undertaking flood studies demonstrating that the development and engineering design methods conform to the principles within the Flood planning scheme policy and the Infrastructure design planning scheme policy.	**N/A**

PO8 Development for filling or excavation in an area affected by creek/waterway flooding does not directly, indirectly or cumulatively cause any material increase in flooding or hydraulic hazard or involve significant redistribution of flood storage from high to lower areas in the floodplain. Note—This can be demonstrated by undertaking earthworks in compliance with the Compensatory earthworks planning scheme policy. Note—This part of the code applies to all development other than a dwelling house and any secondary dwelling which involves filling or excavation, whether or not the development application comprises a separate development application for operational work involving filling or excavation.	**AO8** Development ensures that no filling or excavation greater than 100mm is located in the Creek/waterway flood planning area 1, 2 or 3 sub-categories if contained in the 5% AEP flood extent of any Creek/waterway flood planning area sub-category for which no waterway corridor has been mapped in the Waterway corridors overlay.	**N/A** The site is not affected by creek/waterway flooding.
PO9 Development ensures that the building and site design: (a) maintains the conveyance capacity of existing overland flow paths and creek/waterways; (b) ensures floodwaters and flood debris can pass predominantly unimpeded under a structure or	**AO9.1** Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub-category: (a) complies with the minimum building undercroft clearance requirements in Table 8.2.11.3.E;	**N/A**

building to minimise property or building damage, including for a flood larger than the defined flood event; (c) mitigates flood impacts by ensuring that filling, excavation and location of services are designed to allow for the conveyance of floodwater across the site. Note—The Flood planning scheme policy provides guidance on relevant considerations in determining minimum undercroft clearances and treatment of ground level in undercroft areas where floodwater conveyance is required underneath development.	(b) not located directly above any part of a waterway corridor as mapped in the Waterway corridors overlay.	
	AO9.2 Development involving a building undercroft in the Creek/waterway flood planning area sub-categories or the Overland flow flood planning area sub category: (a) has a ground level within the undercroft area that is free draining; (b) does not involve excavation below ground level of more than 300mm within the undercroft area.	**N/A**
PO10 Development for vulnerable uses, difficult to evacuate uses or assembly uses optimises vehicular access and efficient evacuation from the development to parts of the road network unaffected by flood hazard, in order to: (a) protect safety of users and emergency services personnel; (b) support efficient emergency services access and site	**AO10** Development for vulnerable uses, difficult to evacuate uses or assembly uses: (a) is not isolated in any event up to the relevant flood planning level specified in Table 8.2.11.3.L; or (b) has direct vehicle access to a critical route or interim critical route in the Critical infrastructure and movement network overlay for evacuation in a flood; or	**N/A**

evacuation with consideration to the scale of development. Note—A flood risk assessment may be required to address the performance outcomes or acceptable solutions which deal with evacuation and isolation arrangements, and the ability to take refuge. The Flood planning scheme policy provides information for undertaking flood risk assessments.	(c) can achieve vehicular evacuation to a suitable flood-free location. Note—A suitable flood-free location is of a size and nature sufficient to provide for the size and characteristics of the population likely to need evacuation to that area.	
PO11 Development has access which, having regard to hydraulic hazard, provides for safe vehicular and pedestrian movement and emergency services access to adjoining roads.	**AO11.1** Development provides an access or driveway into the site which is: (a) trafficable during the defined flood event; (b) not located in the Creek/waterway flood planning area 1 sub-category; (c) not located in the Overland flow flood planning area sub-category if the hydraulic hazard is unsafe in the defined flood event; (d) the access or driveway is not inundated by a 10% AEP flood.	**Complies with AO11.1** Access to the site is proposed off Rochdale Road which based on Council flood mapping is flood immune.
	AO11.2 Development located in the Creek/waterway flood planning area 1, 2, 3 or 4 sub-categories locates any disabled access in the highest part of the site. Note—explanation of hydraulic hazard provided in the Flood planning scheme policy.	**N/A** The site is not affected by creek/waterway flooding.

PO12 Development involving a new road, a bridge or culvert is designed to minimise impacts to flood behaviour, minimise disruption to traffic during a flood and allow for emergency access.	**AO12** Development involving a new road complies with the flood planning levels in Table 8.2.11.3.F.	**Complies with AO12** The proposed internal road is not located within a flood affected area based on Council flood mapping.
PO13 Development for pedestrian and cyclist paths: (a) provides a suitable level of trafficability; (b) manages the impacts of flooding on asset life and ongoing maintenance costs; (c) balances route availability with recreational and transport connectivity benefits to the city.	**AO13.1** Development for cyclist and pedestrian facilities other than on public roads, including those traversing through a park and adjacent to a watercourse and overland flow path, are located above the 39% AEP (2 year ARI) flood immunity from all flooding sources. Note—If the site is subject to more than one type of flooding, the requirement that affords the greatest level of protection will apply.	**N/A**
	AO13.2 All new on-road cyclist and pedestrian facilities comply with the flood planning levels and trafficability standards for the applicable category of road in Table 8.2.11.3.F or Table 8.2.11.3.K.	**N/A**

PO14 Development which increases the residential population within the Brisbane River flood planning area sub-categories minimises the risk to people in all flood events with consideration to flood hazard, including warning time.	**AO14** Development in the Brisbane River flood planning area sub-categories in areas where the residential flood level is greater than 12.8m AHD involving: (a) an increase in the number of residential dwellings; or (b) additional residential lots is not subject to an unsafe hydraulic hazard in the 0.2% AEP flood event. Note—Explanation of a hydraulic hazard is provided in the Flood planning scheme policy.	**N/A**

Additional performance outcomes and acceptable outcomes for reconfiguring a lot		
PO17 Development locates and designs all lots resulting from reconfiguring a lot to: a. minimise the risk to people from flood hazard; b. minimise damage to property from flood hazard; c. facilitate safe and efficient evacuation. Note— • Consideration of all floods up to the probable maximum flood is relevant to minimising the risk to people. • Flood warning time is not considered sufficient in the Creek/waterway planning area sub-categories or the Overland flow flood planning area sub-category.	**AO17.1** Development creating new lots is identified in Table 8.2.11.3.I as suitable within the relevant flood planning area. **AO17.2** Development provides for reconfiguring a lot design that achieves a road and lot layout which: a. provides trafficable vehicular egress for evacuation during a defined flood event; b. optimises hazard-free movement away from sources of flood hazard within the development. Note—Further advice on road and lot layout is contained in the Flood planning scheme policy. **AO17.3**	**Complies with AO17.2** All proposed lots will be located outside Brisbane River and Creek flood planning areas. Results of the modelling by Colliers included within the FSMP indicate that during a major 1% AEP event for the ultimate development scenario, overland flows are fully contained within the neighbourhood spine road to the east of the site and do not encroach on the subject site.

• Filling above the flood planning level for a flood event greater than the defined flood event cannot be assumed to mitigate the flood hazard.	Development which creates a new residential lot in an area subject to Brisbane River flooding, if the 1% AEP flood level is greater than 12.8m AHD is not subject to a hydraulic hazard greater than 0.6m^2/s DV or 0.6m deep in a 0.2% AEP flood. Note—Refer to the Flood planning scheme policy for further explanation on the 0.2% AEP flood.	**Complies with AO17.3** All are located outside the Brisbane River Flood planning area.
PO18 Development involving reconfiguring a lot: a. minimises the risk to people from flood hazard; b. creates safe evacuation routes or avoids isolation of the development during a flood greater than the defined flood event; c. minimises damage to property and services; d. provides lots and roads that are not frequently flooded or subject to nuisance ponding or seepage; **e.** ensures lots created for park or private open space minimise the risk to people from flood hazard and are fit for purpose; **f.** provides a lot that is not substantially burdened by flood mitigation infrastructure.	**AO18.1** Development involving reconfiguring a lot ensures: a. all lots comply with the flood planning levels in Table 8.2.11.3.J; b. a new road complies with the flood planning levels in Table 8.2.11.3.F.	**Compiles with AO18.1** All proposed lots will be located outside Brisbane River and Creek flood planning areas. Results of the modelling by Colliers included within the FSMP indicate that during a major 1% AEP event for the ultimate development scenario, overland flows are fully contained within the neighbourhood spine road to the east of the site and do not encroach on the subject site. Minimum pad levels for Lots 23 and 24 locate adjacent to the neighbourhood spine road have been nominated to comply with Table 8.2.11.3.J.
	AO18.2 Development involving reconfiguring a lot creating more than 6 residential lots or a lot for industry ensures the flood planning levels of a dedicated road fronting the development or providing primary access within 200m of the development: a. complies with Table 8.2.11.3.K; or b. has acceptable trafficability in accordance with the requirements in the Flood	**Complies with AO18.2** Access is proposed off Rochdale Road which is flood immune.

	planning scheme policy and the Queensland Urban Drainage Manual. Note—The Flood planning scheme policy contains supporting information about trafficability on existing roads and serviceability during floods.	**N/A**
	AO18.3 Development protects the conveyance of flood hazard area by providing an easement over the: a. 2% AEP flood extent for overland flow flooding; b. 1% AEP flood extent for creek/waterway flooding.	

Appendix B

Stormwater Management Catchment Plans

DATE: 13.11.26
PROJECT No. : BC-26073
DRAWING No. : DWG-100
REVISION No. : A

CONCEPTUAL STORMWATER MANAGEMENT DESIGN DRAWINGS

470 ROCHEDALE ROAD, ROCHEDALE

for

470 ROCHEDALE LAND PTY LTD

Project No: BC-26073

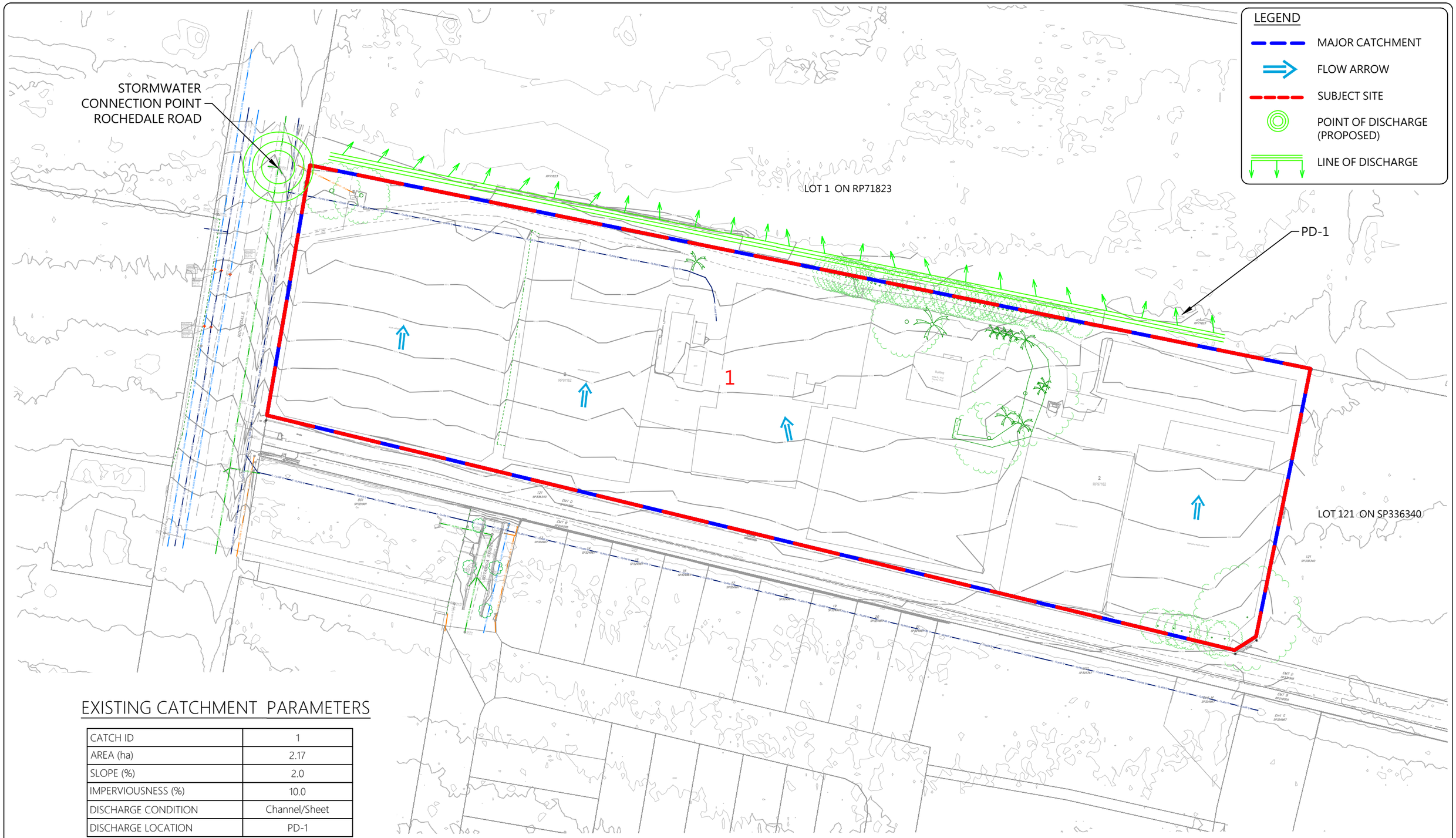
November 2026



Site Location

BIOME Consulting Pty Ltd
Unit 30201, Southport Central Tower 3,
9 Lawson St, Southport QLD 4215
PO Box 3469, Australia Fair, Southport
O 07 5532 7779
M 0415 935 222
E brad@BIOMEconsulting.com.au
W www.BIOMEconsulting.com.au
ABN 86 166 087 476

SCHEDULE OF DRAWINGS	
Drawing No.	Drawing Title
DWG - 100	LOCALITY AND DRAWING INDEX PLAN
DWG - 200	EXISTING CATCHMENT PLAN
DWG - 201	DEVELOPED CATCHMENT PLAN
DWG - 300	OPERATIONAL CONTROL PLAN



EXISTING CATCHMENT PARAMETERS

CATCH ID	1
AREA (ha)	2.17
SLOPE (%)	2.0
IMPERVIOUSNESS (%)	10.0
DISCHARGE CONDITION	Channel/Sheet
DISCHARGE LOCATION	PD-1

DATE
13.11.26
PROJECT No. :
BC-26073
DRAWING No. :
DWG-200
REVISION No. :
A

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT
DRAWING TITLE
EXISITNG CATCHMENT PLAN
CLIENT
470 ROCHEDALE LAND PTY LTD
ADDRESS:
470 ROCHEDALE ROAD, ROCHEDALE

DRAFTED BY :	*DESIGNED BY :*	*CHECKED BY:*	*PAPER SIZE :*	*SCALE :*
AK	AK	BC	A3	1:1000

APPROVED FOR AND ON BEHALF OF BIOME CONSULTING PTY LTD
ACN 166 087 476
RPEQ No. :

VER.	DESCRIPTION	APPR.	DATE
A	ORIGINAL ISSUE		13.11.26

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M 0415 935 222
E brad@BIOMEconsulting.com.au
ABN 86 166 087 476

ORIGINAL SCALE BEFORE REDUCTION
10 0 10 20 30 40 50
1 : 1000 (FULL SIZE) (metres)
CERTIFIED BY
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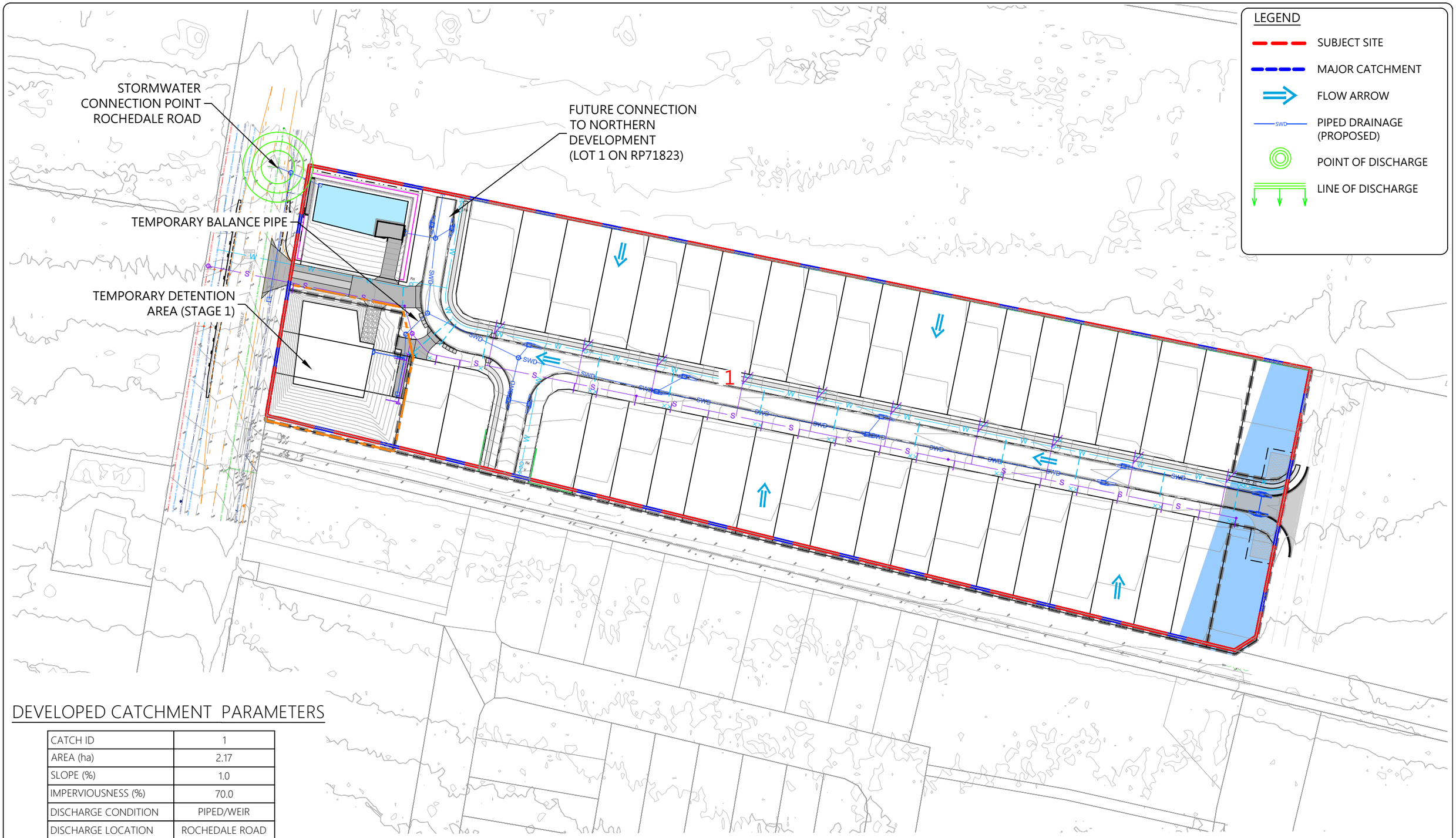

DEVELOPED CATCHMENT PARAMETERS

CATCH ID	1
AREA (ha)	2.17
SLOPE (%)	1.0
IMPERVIOUSNESS (%)	70.0
DISCHARGE CONDITION	PIPED/WEIR
DISCHARGE LOCATION	ROCHEDALE ROAD

DATE
13.11.26

PROJECT No. :
BC-26073

DRAWING No. :
DWG-201

REVISION No. :
A

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT

DRAWING TITLE
DEVELOPED CATCHMENT PLAN

CLIENT
470 ROCHEDALE LAND PTY LTD

ADDRESS:
470 ROCHEDALE ROAD, ROCHEDALE

DRAFTED BY :	DESIGNED BY :	CHECKED BY:	PAPER SIZE :	SCALE :
AK	AK	BC	A3	1:1000

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A	ORIGINAL ISSUE		13.11.26

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ABN 86 166 087 476

ORIGINAL SCALE BEFORE REDUCTION
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1 : 1000 (FULL SIZE) (metres)

CERTIFIED BY

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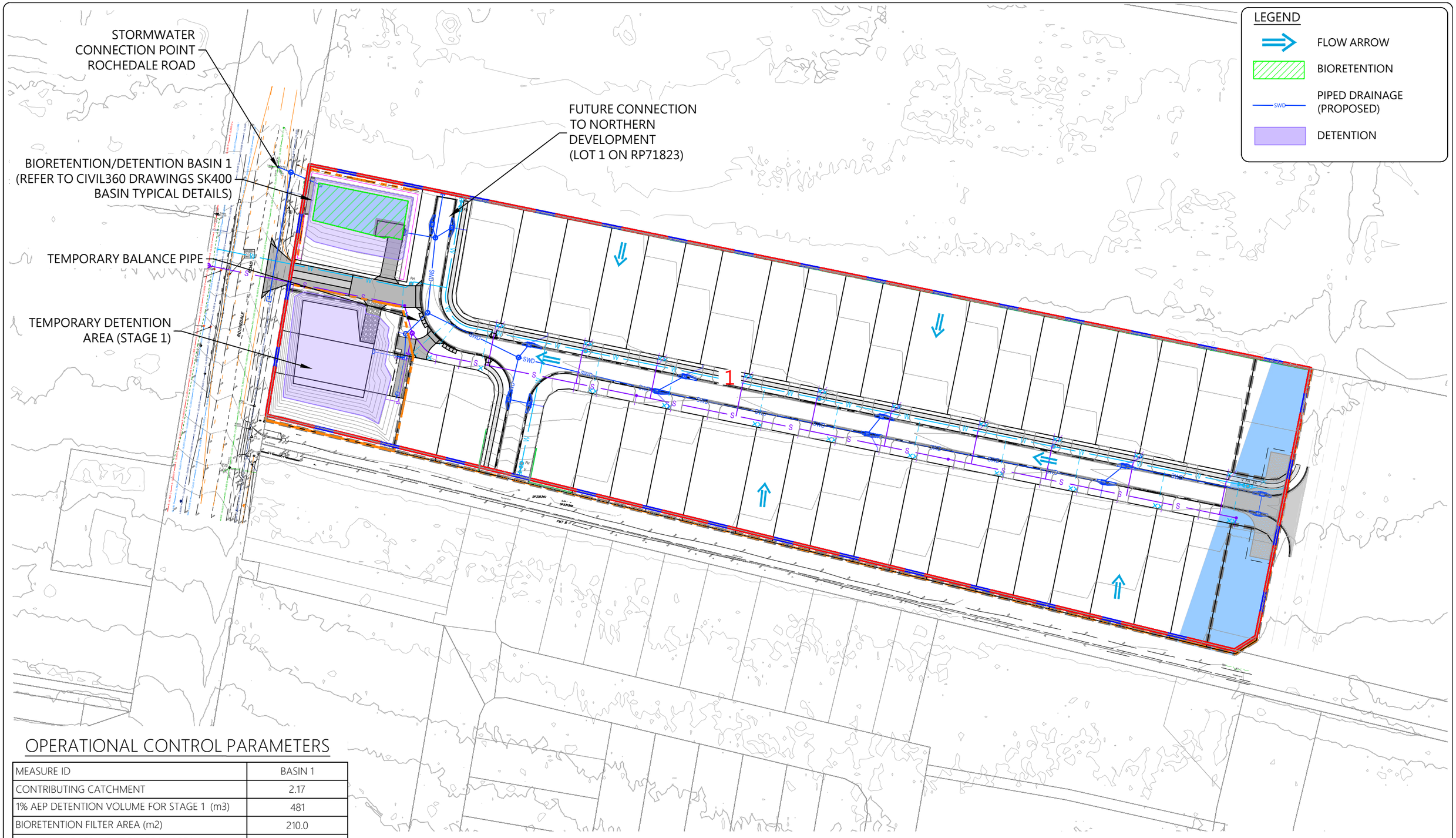

OPERATIONAL CONTROL PARAMETERS

MEASURE ID	BASIN 1
CONTRIBUTING CATCHMENT	2.17
1% AEP DETENTION VOLUME FOR STAGE 1 (m3)	481
BIORETENTION FILTER AREA (m2)	210.0
MIN. COARSE SEDIMENT FOREBAY AREA (m2)	30.0

DATE
13.11.26

PROJECT No. :
BC-26073

DRAWING No. :
DWG-300

REVISION No. :
A

PROJECT
PROPOSED RESIDENTIAL DEVELOPMENT

DRAWING TITLE
OPERATIONAL CONTROL PLAN

CLIENT
470 ROCHEDALE LAND PTY LTD

ADDRESS:
470 ROCHEDALE ROAD, ROCHEDALE

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VER.	DESCRIPTION	APPR.	DATE
A	ORIGINAL ISSUE		13.11.26

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ABN 86 166 087 476

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10 0 10 20 30 40 50

1 : 1000 (FULL SIZE) (metres)

CERTIFIED BY

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Appendix C

Arise at Rochedale – Stage 16 External Stormwater (by Peak Urban)

ARISE AT ROCHEDALE - STAGE 16
EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD, ROCHEDALE
FOR 'ROCHEDALE C4 PTY LTD'

DRAWING LIST

20-0102-500	COVER PLAN
DRAINAGE	
20-0102-501	GENERAL NOTES
20-0102-502	EXTERNAL DRAINAGE LAYOUT PLAN
20-0102-503	EXTERNAL STORMWATER CATCHMENT LAYOUT PLAN
20-0102-504	EXTERNAL TRUNK STORMWATER LONGITUDINAL SECTIONS SHEET 1 OF 2
20-0102-505	EXTERNAL TRUNK STORMWATER LONGITUDINAL SECTIONS SHEET 2 OF 2
20-0102-506	EXTERNAL TRUNK STORMWATER CALCULATIONS TABLE SHEET 1 OF 2
20-0102-507	EXTERNAL TRUNK STORMWATER CALCULATIONS TABLE SHEET 2 OF 2
20-0102-508	EXTERNAL TRUNK STORMWATER STRUCTURE DETAILS
20-0102-509	EXTERNAL NON-TRUNK STORMWATER STRUCTURE DETAILS
20-0102-510	EXTERNAL NON-TRUNK STORMWATER LONGITUDINAL SECTIONS
20-0102-511	EXTERNAL NON-TRUNK STORMWATER CALCULATIONS TABLE



LOCALITY PLAN
SCALE 1:2500 (A1)
SCALE 1:5000 (A3)

PROJECT INFORMATION SUMMARY:
AREA OF SITE = 1.73 ha
RP DESCRIPTION LOT 2 ON RP 181371 LOT 3 ON RP 181371
DATUM LEVEL AND LOCATION P.S.M. 123701 RL 87.568 AHD LOCATED ON ROCHEDALE ROAD TOWARDS MILES PLATTING ROAD
LOCAL AUTHORITY: BRISBANE CITY COUNCIL
COUNCIL REFERENCE NUMBER: A005364788

NOTE:
THESE DRAWINGS ARE TO BE READ IN CONJUNCTION WITH:
- VEGETATION MANAGEMENT PLAN
- APPROVAL NALL PERMIT
- LANDSCAPE ARCHITECT'S PLANS
- ELECTRICAL, COMMUNICATIONS AND GAS CONSULTANT'S PLANS
- SEDIMENT AND EROSION HAZARD ASSESSMENT
- SAFETY IN DESIGN REPORT

BRISBANE CITY COUNCIL

APPROVED PLAN
Brisbane City Council
15/01/2021

APPROVED PLAN ONLY REFERS TO:
- ☐ Earthworks
- ☑ Stormwater
- ☑ Roadworks
- ☐ Traffic Functional Layout
- ☐ Traffic Signals
- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

NEIGHBOURING PROPERTY CONSENT
This approval does not authorise or give permission to enter onto, under or over any neighbouring private properties to survey or carry out any works without any prior consultation or without the prior consent of the relevant land or property owner(s).
(This includes but is not limited to any works for: built to boundary walls; any construction (eg. retaining walls) within neighbouring buildings structural zones, boundary fences; temporary rock anchoring; or crane over-sail.)

Received
05-01-21
BCC DS

BRISBANE CITY COUNCIL

REPAIR DAMAGE TO COUNCIL INFRASTRUCTURE
If at any time during the construction phase of the approved development, damage to the existing kerb and channel, footpath or roadway creates unsafe, unreasonable and/or not fit for purpose conditions as assessed by Council, the contractor is to carry out repairs as directed by Asset Services.

BRISBANE CITY COUNCIL

ADDITIONAL BCC PERMITS
Obtain all relevant BCC Permits or Certificates of Assessment as may be required by the conditions of the Development Permit or BCC Local Laws, including:
Temporary Lane / Road Closures
Permit to Occupy Road (Work Zones)
Permit to Work on Council Property

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	11.12.20	KP	KP	DRAWING LIST UPDATED
3	04.01.21	KP	KP	DRAWING LIST UPDATED

DRAWN: KP
DESIGN: ST
STATUS: **NOT FOR CONSTRUCTION**
APPROVED: SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:2500 1:5000 50 0 50 100 A1 A3

CLIENT: **ROCHEDALE C4 PTY LTD**

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER**
520 & 538 ROCHEDALE ROAD
ROCHEDALE

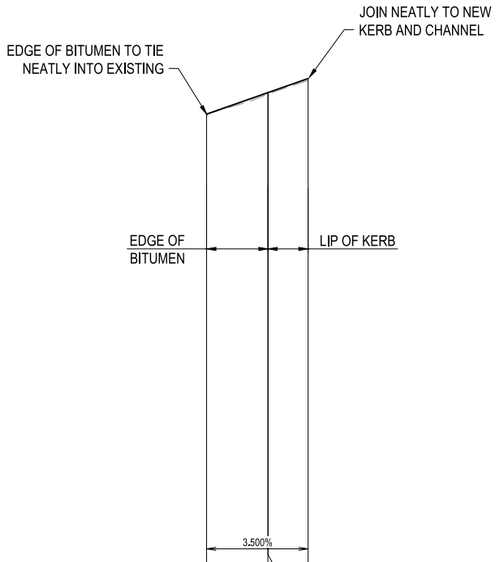
DRAWING TITLE: **COVER PLAN**

PROJECT No.	DRAWING No.	REVISION
20-0102	500	3

ASSUMED			CBR TESTING)		
ROAD	ROAD CLASSIFIC		B BASE	SURFACING	TOTAL DEPTH
ROCHEDALE ROAD	SUBURBAN R		50mm	225mm ASPHALT	375mm

BRISBANE CITY COUNCIL
NOT PART OF THIS APPROVAL
Pavement design is subject to CBR testing on-site and must be submitted to BCC Development Services Engineering Compliance Officer for approval prior to commencement of work.

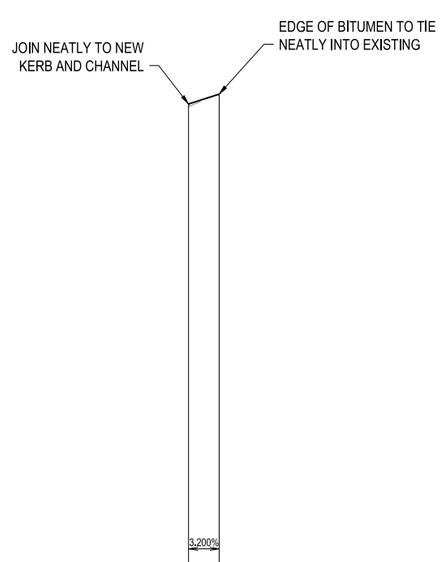
NOTE: THIS PAVEMENT DESIGN IS PRELIMINARY ONLY. THE CONTRACTOR SHALL SUPPLY THE SUPERINTENDENT WITH SUBGRADE TEST RESULTS NECESSARY FOR FINAL PAVEMENT DESIGN



DATUM RL 60.0

CUT (-) / FILL	-0.000		0.052	0.052	0.060					
EDGE OF BITUMEN LEVEL / LIP LEVEL	75.378		76.078	76.079	76.536					
EXISTING SURFACE	75.378		76.026	76.028	76.475					
CHAINAGES	0.000		20.000	20.027	33.078					
HORIZONTAL CURVES										

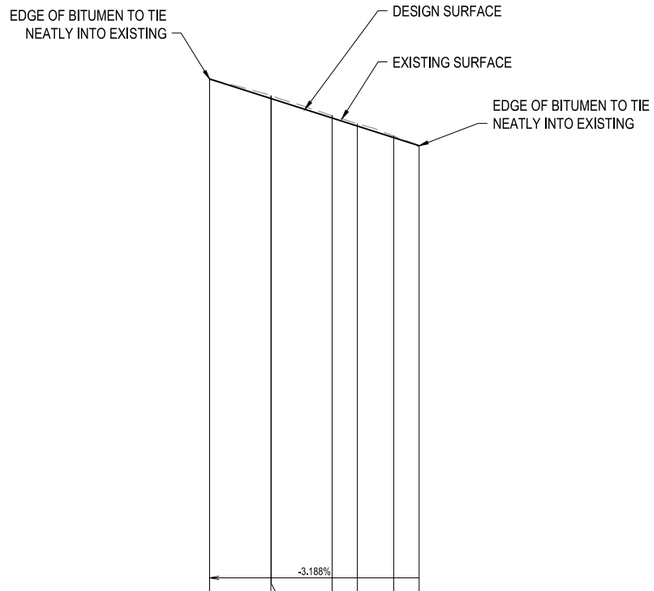
ROAD WIDEN 01



DATUM RL 62.0

CUT (-) / FILL	0.094		0.000							
EDGE OF BITUMEN LEVEL	77.714		78.034							
EXISTING SURFACE	77.620		78.034							
CHAINAGES	0.000		10.000							
HORIZONTAL CURVES										

ROAD WIDEN 02



DATUM RL 61.0

CUT (-) / FILL	0.000		-0.097	-0.096	-0.079	-0.079	-0.056	-0.000		
EDGE OF BITUMEN LEVEL	78.472		77.834	77.828	77.196	76.935	76.559	76.293		
EXISTING SURFACE	78.472		77.931	77.924	77.276	77.015	76.615	76.293		
CHAINAGES	0.000		20.000	20.186	40.000	48.186	60.000	68.334		
HORIZONTAL CURVES										

ROAD WIDEN 03

BRISBANE CITY COUNCIL
APPROVED PLAN
Brisbane City Council
15/01/2021
APPROVED PLAN ONLY REFERS TO:
- ☐ Earthworks
- ☑ Stormwater
- ☑ Roadworks
- ☐ Traffic Functional Layout
- ☐ Traffic Signals
- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

BRISBANE CITY COUNCIL
AMENDED IN RED
15/1/2021

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL

Received
02/12/2020
BCC DS

DRAWN: KP
DESIGN: MH
STATUS: **NOT FOR CONSTRUCTION**
APPROVED: SCOTT THOMAS RPEQ 04618
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:1000 10 0 10 20 30 40 50 A1
1:2000 A3
HORIZONTAL
1:100 2 1 0 2 4 A1
1:200 A3
VERTICAL

CLIENT: **ROCHEDALE C4 PTY LTD**

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16**
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: **ROCHEDALE ROAD WIDENING LONGITUDINAL SECTIONS**

PROJECT No.	DRAWING No.	REVISION
20-0102	111	1

APPROVED PLAN
Brisbane City Council
15/01/2021

BRISBANE CITY COUNCIL

APPROVED PLAN ONLY REFERS TO:

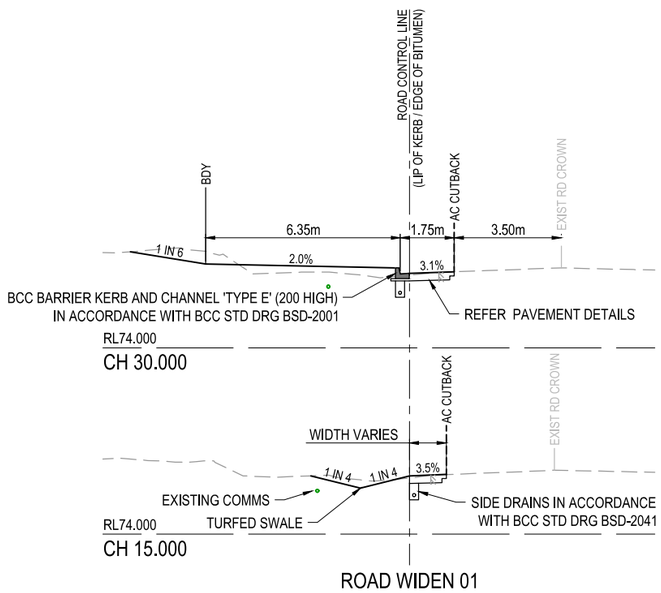
- ☐ Earthworks
- ☑ Stormwater
- ☑ Roadworks
- ☐ Traffic Functional Layout
- ☐ Traffic Signals
- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

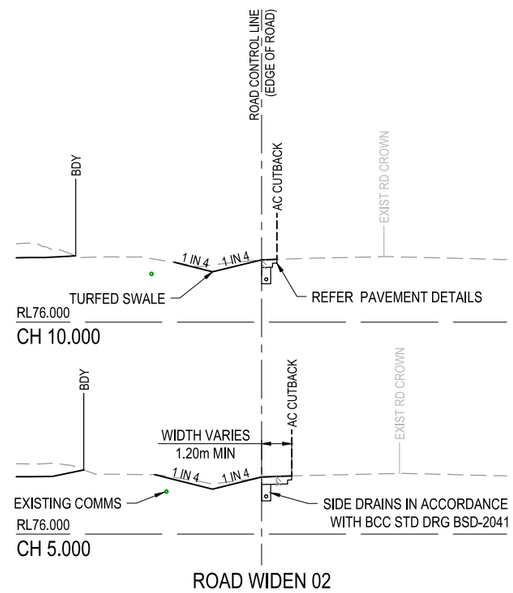
BRISBANE CITY COUNCIL

PAVEMENT CROSSFALL
Additional AC resurfacing may be required to ensure that a standard 2.5% crossfall is achieved on both the new and existing pavement.

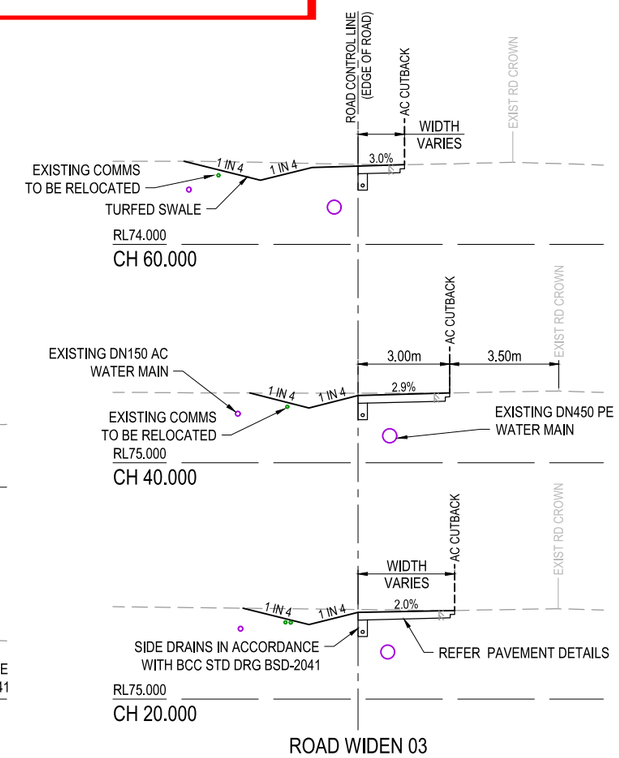
NOTE -
LOCATION AND DEPTH OF ALL EXISTING SERVICES IN THIS AREA TO BE CONFIRMED PRIOR TO CONSTRUCTION



ROAD WIDEN 01



ROAD WIDEN 02



ROAD WIDEN 03

ROAD WIDENING NOTE -
NOTWITHSTANDING THE PROPOSED FSL'S SHOWN ON THE LONGITUDINAL SECTION, CONTRACTOR TO ENSURE ALL ROAD CROSSFALL GRADES BETWEEN 2% (MIN) AND 3.5% (MAX)

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	MPG	ORIGINAL ISSUE - FOR APPROVAL
2	09.11.20	KP	KP	MINOR AMENDMENTS AS PER COUNCIL'S REQUEST

Received
02/12/2020
BCC DS

DRAWN: KP
DESIGN: ST
STATUS: **NOT FOR CONSTRUCTION**
APPROVED: SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:100 1 0 1 2 3 4 5 A1
1:200 A3

CLIENT: **ROCHEDALE C4 PTY LTD**

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16**
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: **ROCHEDALE ROAD WIDENING CROSS SECTIONS**

PROJECT No.	DRAWING No.	REVISION
20-0102	112	2

GENERAL NOTES:

1. THE CONTRACTOR SHALL SUPPLY ALL LABOR, MATERIALS, PLANT AND EQUIPMENT TO CONSTRUCT THE WORKS AS DOCUMENTED AND STRICTLY IN ACCORDANCE WITH THE RELEVANT AUTHORITY STANDARDS, SPECIFICATIONS AND REQUIREMENTS.
2. THE EXISTING SERVICES THAT ARE SHOWN ON THE DRAWINGS ARE PROVIDED FOR INFORMATION PURPOSES ONLY. NO RESPONSIBILITY IS TAKEN BY THE SUPERINTENDENT OR THE PRINCIPAL FOR INFORMATION THAT HAS BEEN SUPPLIED BY OTHERS, OR ANY EXISTING SERVICES THAT MAY BE PRESENT NOT SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL VERIFY THE POSITION OF ANY UNDERGROUND SERVICES WITHIN THE AREAS OF WORKS AND SHALL BE RESPONSIBLE FOR MAKING GOOD ANY DAMAGE THERETO. ANY ALTERATION WORKS TO SERVICES WILL BE CARRIED OUT ONLY BY THE SERVICE OWNER AUTHORITY UNLESS APPROVED OTHERWISE.
3. ALL CONSTRUCTION ACTIVITIES UNDERTAKEN SHALL COMPLY WITH CURRENT WORKPLACE HEALTH AND SAFETY REQUIREMENTS AND LEGISLATION.
4. PRIOR TO COMMENCING WORK, THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL RELEVANT LOCAL AUTHORITY PERMITS.
5. THE CONTRACTOR SHALL NOT COMMENCE THE DEMOLITION OF ANY EXISTING BUILDINGS AND/OR STRUCTURES WITHOUT APPROVAL FROM THE SUPERINTENDENT.
6. THE CONTRACTOR SHALL APPLY INDUSTRY BEST PRACTICE SO WORKS SHALL NOT DISTURB OR AFFECT NEARBY RESIDENTS EITHER BY DUST, NOISE, FLOODING OR DISCONNECTION OF SERVICES. CONTRACTOR TO ENSURE THAT ACCESS AND SERVICES TO EXISTING PROPERTIES ARE AVAILABLE AT ALL TIMES.
7. THE CONTRACTOR SHALL VERIFY LEVELS OF EXISTING SERVICE CROSSINGS AND CONNECTION POINTS PRIOR TO COMMENCEMENT OF WORKS AND NOTIFY SUPERINTENDENT OF ANY DISCREPANCIES BETWEEN ACTUAL AND PROPOSED DESIGN LEVELS.
8. THESE ENGINEERING DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE APPROVED VEGETATION MANAGEMENT PLAN, WHERE APPLICABLE. WHEN IN DOUBT, ALL EXISTING TREES ARE TO REMAIN UNLESS DIRECTED OTHERWISE.
9. HOLD POINT: ONCE THE BASE OF MANHOLES, INSPECTION PITS, GULLIES AND FIELD INLETS FOR STORMWATER DRAINAGE AND SEWER RETICULATION HAVE BEEN POURED, CONSTRUCTION SHALL ONLY RE-COMMENCE ONCE THE SUPERINTENDENT AND/OR ENGINEER HAVE INSPECTED THE WORKS.
10. THE CONTRACTOR SHALL NOTE DURING THE COURSE OF THE WORKS WHEN JOINT INSPECTIONS WITH THE AUTHORITY AND THE SUPERINTENDENT ARE REQUIRED. THESE INCLUDE PRE-STARTS, SUBGRADES, PRE-SEALS, CLEARING, AND OTHER SUCH INSPECTIONS AS NOMINATED IN THE APPROVAL AND THE SPECIFICATIONS. THE CONTRACTOR SHALL ENSURE NO WORKS PROCEED PAST THE INSPECTION POINT UNTIL THE JOINT INSPECTION HAS BEEN SUCCESSFULLY COMPLETED.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING A SAFE MOVEMENT OF TRAFFIC AND THE PROTECTION OF PERSON AND PROPERTY THROUGH AND AROUND THE SITE. THE CONTRACTOR IS RESPONSIBLE FOR ALL TRAFFIC MANAGEMENT INCLUDING THE DESIGN, CONSTRUCTION, MAINTENANCE AND REMOVAL OF TEMPORARY ROADWAYS, DETOURS, SIGNS, LIGHTS AND BARRIER AS REQUIRED STRICTLY IN ACCORDANCE WITH THE RELEVANT AUTHORITY REQUIREMENTS.

BULK EARTHWORKS NOTES

1. NOTWITHSTANDING THE EXTENTS OF CUTTING AND FILLING SHOWN ON DRAWINGS, THE SUPERINTENDENT RESERVES THE RIGHT TO ADJUST THE FINISHED SURFACE LEVELS AND EARTHWORKS EXTENTS THROUGH WRITTEN DIRECTION.
2. THE CONTRACTOR SHALL UNDERTAKE ALL CLEARING USING INDUSTRY BEST PRACTICE INCLUDING CONSIDERATION OF FAUNA RELOCATION.
3. THE CONTRACTOR SHALL UNDERTAKE ALL EARTHWORKS IN ACCORDANCE WITH AS3798-2007 AND LOCAL AUTHORITY REQUIREMENTS. LEVEL 1 SUPERVISION IS REQUIRED.
4. THE CONTRACTOR SHALL CONSIDER LOADS GENERATED BY THE EARTHWORKS OPERATIONS SO AS TO AVOID DAMAGE TO ALL PIPES, SERVICES AND STRUCTURES.
5. THE EARTHWORKS DRAWINGS ARE TO BE READ IN CONJUNCTION WITH THE PROJECT'S SEDIMENT AND EROSION CONTROL PLAN, WHERE APPLICABLE.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PLANNING, DESIGN, CERTIFICATION, IMPLEMENTATION AND MAINTENANCE OF AN EROSION AND SEDIMENT CONTROL PLAN THAT IS COMPLIANT WITH THE INTERNATIONAL EROSION CONTROL ASSOCIATION (IECA) GUIDELINE 'BEST PRACTICE EROSION AND SEDIMENT CONTROL' AND RELEVANT COUNCIL POLICIES.

ROADWORKS AND DRAINAGE NOTES

1. ALL WORKS SHALL BE IN ACCORDANCE WITH THE RELEVANT AUTHORITY'S STANDARD DRAWINGS, METHODS AND SPECIFICATIONS.
2. NOTWITHSTANDING THE EXTENTS OF CUTTING AND FILLING SHOWN ON DRAWINGS, THE SUPERINTENDENT RESERVES THE RIGHT TO ADJUST THE FINISHED SURFACE LEVELS AND EARTHWORKS EXTENTS THROUGH WRITTEN DIRECTION.
3. NEW CONSTRUCTION SHALL BE NEATLY JOINED TO EXISTING FORMATION. WHERE REQUIRED, THE EXISTING FORMATION SHALL BE SAW CUT IN ACCORDANCE WITH IPWEAQ STD DRG RS-170. LEVELS AND GRADIENTS AT CONNECTIONS WITH EXISTING WORKS MAY BE VARIED AS REQUIRED TO ACHIEVE A SMOOTH CONNECTION.
4. THE CONTRACTOR SHALL UNDERTAKE ALL EARTHWORKS IN ACCORDANCE WITH AS3798-2007 AND LOCAL AUTHORITY REQUIREMENTS. LEVEL 1 SUPERVISION IS REQUIRED.
5. THE CONTRACTOR SHALL SUPPLY THE SUPERINTENDENT WITH THE SUBGRADE TEST RESULTS NECESSARY FOR ALL PAVEMENT DESIGN.
6. THE CONTRACTOR SHALL ENSURE A MINIMUM OF 75mm TOPSOIL TO ALL VERGE AND BATTER AREAS (AND STABILISATION AS ORDERED)
7. ALL STORMWATER DRAINAGE MATERIALS, BEDDING, JOINTING AND STEP IRON REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE RELEVANT AUTHORITIESS STANDARD DRAWINGS, METHODS AND SPECIFICATIONS.
8. THE STORMWATER PIPE CLASSES HAVE BEEN DESIGNED FOR SERVICE LOADS ONLY. THE CONTRACTOR SHALL ASSESS THE SUITABILITY OF MACHINERY USED ON SITE AND THE ANTICIPATED CONSTRUCTION LOADS, AND UPGRADE THE PIPE CLASSES IF NECESSARY IN ACCORDANCE WITH AS3725-2007.
9. THE TERM D_{50} DOCUMENTED ON THE DRAWINGS, IN RELATION TO ROCK ARMORING, CORRESPONDS TO THE REQUIRED MEDIAN DIAMETER OF THE PLACED ROCKS. THE ROCKS USED SHALL NOT VARY IN SIZE BY +/- 30% OF THE PROPOSED D_{50} SIZE.
10. ANY ROAD SAFETY IMPLICATIONS ASSOCIATED WITH PROXIMITY OF DRAINAGE INFRASTRUCTURE TO ROAD PAVEMENT TO BE ASSESSED BY A RPEQ DURING CONSTRUCTION AND MITIGATED AS NECESSARY WITH CONSULTATION BY COUNCIL

Received
05-01-21
BCC DS

BRISBANE CITY COUNCIL
APPROVED PLAN
Brisbane City Council
15/01/2021
APPROVED PLAN ONLY REFERS TO:
- ☐ Earthworks
- ☑ Stormwater
- ☑ Roadworks
- ☐ Traffic Functional Layout
- ☐ Traffic Signals
- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	04.01.21	KP	KP	AMENDED AS PER COUNCIL'S RFI

DRAWN: KP
DESIGN: ST
STATUS: NOT FOR CONSTRUCTION
APPROVED: SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE

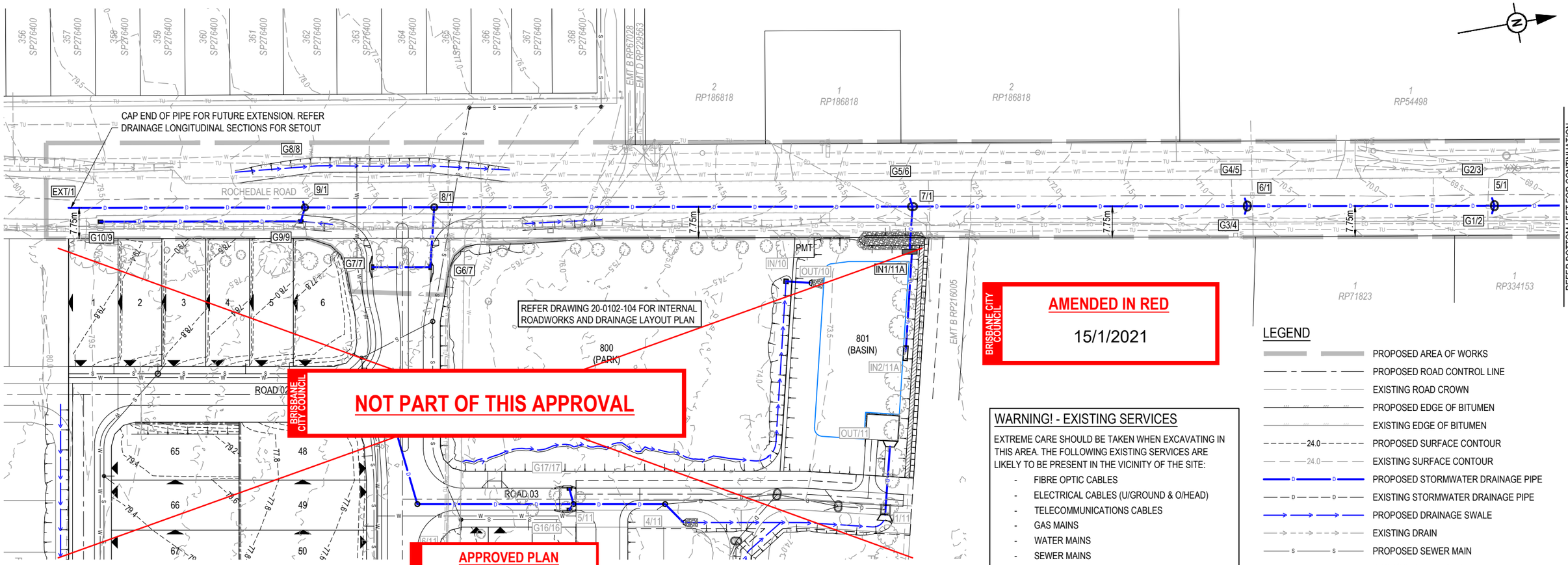
CLIENT: ROCHEDALE C4 PTY LTD

ASSOCIATED CONSULTANT: WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: ARISE AT ROCHEDALE
STAGE 16
EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: GENERAL NOTES

PROJECT No.	DRAWING No.	REVISION
20-0102	501	2



BRISBANE CITY COUNCIL

NOT PART OF THIS APPROVAL

BRISBANE CITY COUNCIL

AMENDED IN RED

15/1/2021

LEGEND

- PROPOSED AREA OF WORKS
- PROPOSED ROAD CONTROL LINE
- EXISTING ROAD CROWN
- PROPOSED EDGE OF BITUMEN
- EXISTING EDGE OF BITUMEN
- PROPOSED SURFACE CONTOUR
- EXISTING SURFACE CONTOUR
- PROPOSED STORMWATER DRAINAGE PIPE
- EXISTING STORMWATER DRAINAGE PIPE
- PROPOSED DRAINAGE SWALE
- EXISTING DRAIN
- PROPOSED SEWER MAIN
- PROPOSED WATER MAIN
- EXISTING WATER MAIN
- EXISTING TRUNK WATER MAIN
- EXISTING ELECTRICAL CABLE O/H
- EXISTING TELECOMMUNICATIONS CABLE U/G
- EXISTING TREE TO REMAIN - REFER VMP
- EXISTING TREE TO BE REMOVED - REFER VMP

WARNING! - EXISTING SERVICES

EXTREME CARE SHOULD BE TAKEN WHEN EXCAVATING IN THIS AREA. THE FOLLOWING EXISTING SERVICES ARE LIKELY TO BE PRESENT IN THE VICINITY OF THE SITE:

- FIBRE OPTIC CABLES
- ELECTRICAL CABLES (U/GROUND & O/HEAD)
- TELECOMMUNICATIONS CABLES
- GAS MAINS
- WATER MAINS
- SEWER MAINS

THE CONTRACTOR SHOULD CONTACT THE SERVICE PROVIDER FOR FURTHER INFORMATION AND SATISFY THEMSELVES OF ANY SPECIFIC TREATMENT OR REQUIREMENTS.

NOTE:

ROAD SURFACE RESTORATION OVER PROPOSED DRAINAGE IN ROCHEDALE ROAD TO BE IN ACCORDANCE WITH BCC STD DRG BSD-2042. TRENCH BACKFILL IS TO CONFORM TO BSD-8011.

Received

05-01-21

BCC DS

APPROVED PLAN

Brisbane City Council

15/01/2021

APPROVED PLAN ONLY REFERS TO:

- ☐ Earthworks
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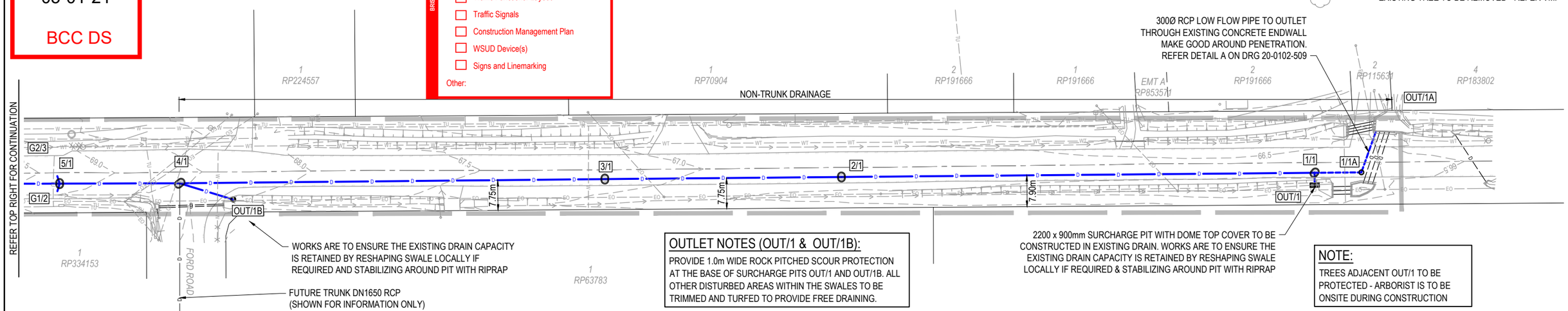
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

NOTE:

ACCESS TO EXISTING PROPERTIES ALONG ROCHEDALE ROAD TO BE MAINTAINED DURING CONSTRUCTION



300Ø RCP LOW FLOW PIPE TO OUTLET THROUGH EXISTING CONCRETE ENDWALL MAKE GOOD AROUND PENETRATION. REFER DETAIL A ON DRG 20-0102-509

WORKS ARE TO ENSURE THE EXISTING DRAIN CAPACITY IS RETAINED BY RESHAPING SWALE LOCALLY IF REQUIRED AND STABILIZING AROUND PIT WITH RIPRAP

FUTURE TRUNK DN1650 RCP (SHOWN FOR INFORMATION ONLY)

OUTLET NOTES (OUT/1 & OUT/1B):

PROVIDE 1.0m WIDE ROCK PITCHED SCOUR PROTECTION AT THE BASE OF SURCHARGE PITS OUT/1 AND OUT/1B. ALL OTHER DISTURBED AREAS WITHIN THE SWALES TO BE TRIMMED AND TURFED TO PROVIDE FREE DRAINING.

2200 x 900mm SURCHARGE PIT WITH DOME TOP COVER TO BE CONSTRUCTED IN EXISTING DRAIN. WORKS ARE TO ENSURE THE EXISTING DRAIN CAPACITY IS RETAINED BY RESHAPING SWALE LOCALLY IF REQUIRED & STABILIZING AROUND PIT WITH RIPRAP

NOTE:

TREES ADJACENT OUT/1 TO BE PROTECTED - ARBORIST IS TO BE ONSITE DURING CONSTRUCTION

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	21.10.20	KP	KP	NOTE UPDATED
3	09.11.20	KP	KP	AMENDED AS PER COUNCIL'S REQUEST
4	02.12.20	KP	KP	AMENDED AS PER COUNCIL'S REQUEST
5	11.12.20	KP	KP	AMENDED AS PER COUNCIL'S RFI
6	04.01.21	KP	KP	AMENDED AS PER COUNCIL'S RFI

DRAWN: KP

DESIGN: ST

STATUS: **NOT FOR CONSTRUCTION**

APPROVED: SCOTT THOMAS RPEQ 04618

S. Thomas

FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN DEVELOPMENT ENGINEERS + ADVISORS

ENQUIRIES@PEAKURBAN.COM.AU

SCALE: 1:500 / 1:1000 — 10 5 0 10 20 — A1 / A3

CLIENT: **ROCHEDALE C4 PTY LTD**

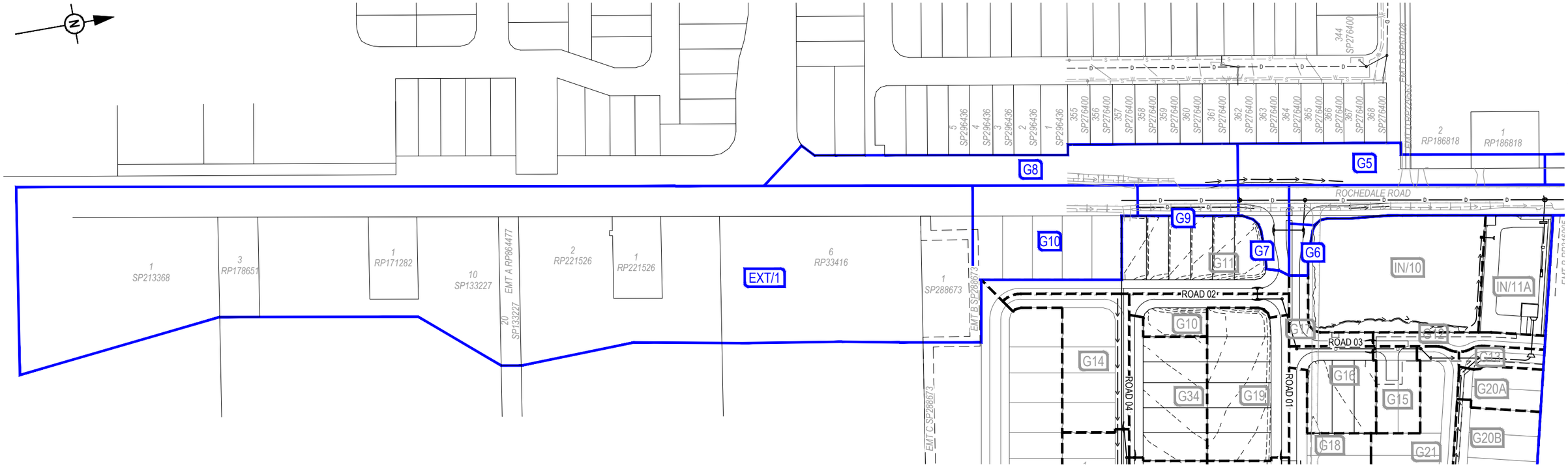
ASSOCIATED CONSULTANT: WOLTER CONSULTING GROUP PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER**

520 & 538 ROCHEDALE ROAD ROCHEDALE

DRAWING TITLE: **EXTERNAL DRAINAGE LAYOUT PLAN**

PROJECT No.	DRAWING No.	REVISION
20-0102	502	6



LEGEND

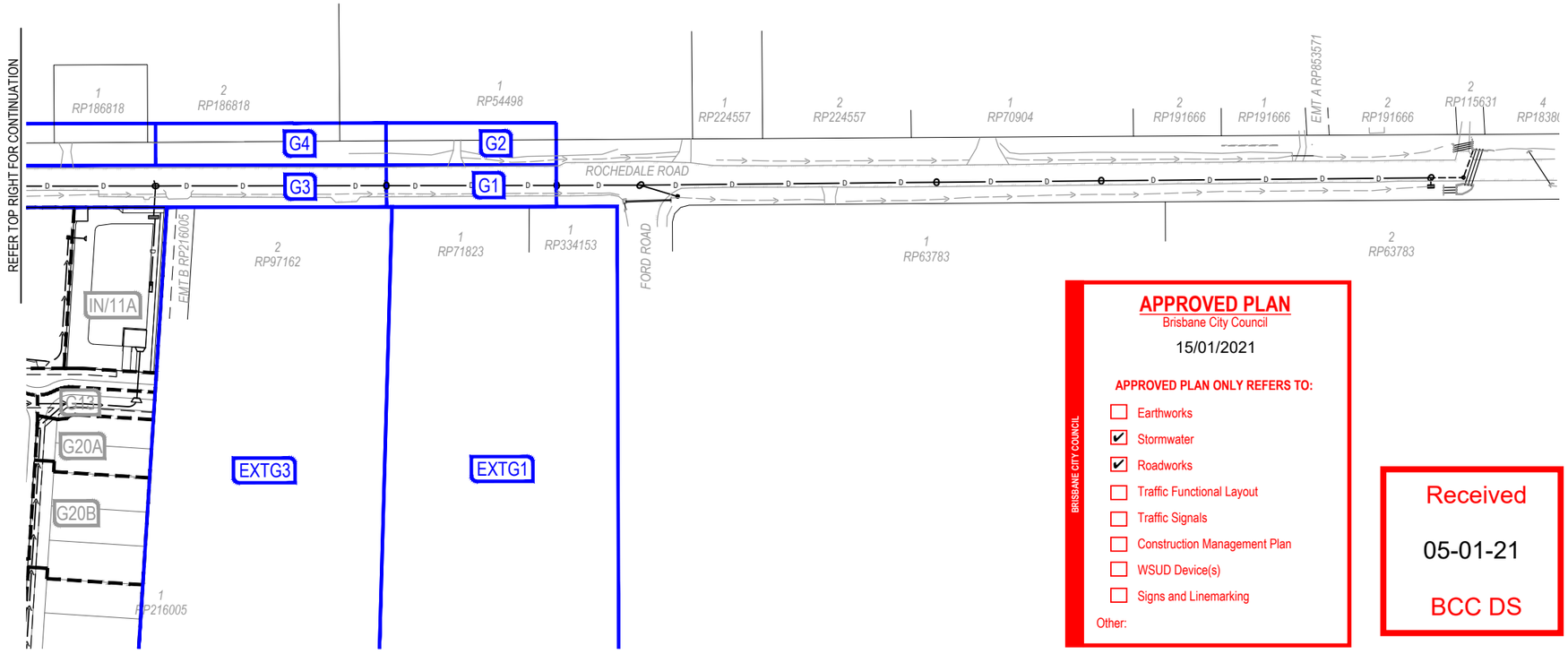
- 1 — CATCHMENT NAME
- CATCHMENT BOUNDARY
- 1 — INTERNAL CATCHMENT NAME
- INTERNAL CATCHMENT BOUNDARY
- PROPOSED STORMWATER DRAINAGE PIPE
- EXISTING STORMWATER DRAINAGE PIPE
- PROPOSED SWALE DRAIN
- EXISTING SWALE DRAIN
- 24.0 — PROPOSED SURFACE CONTOUR
- 24.0 — EXISTING SURFACE CONTOUR

REFER DRAWING 20-0102-502 FOR DRAINAGE STRUCTURE LABELS

REFER DRAWINGS 20-0102-117 TO 124 FOR INTERNAL STORMWATER DRAINAGE

CATCHMENT AREAS

NAME	AREA (ha)
EXT/1	4.687
G1	0.094
G10	0.364
G2	0.095
G3	0.334
G4	0.128
G5	0.281
G6	0.027
G7	0.077
G8	0.399
G9	0.077
EXTG1	2.900
EXTG3	2.300



APPROVED PLAN
Brisbane City Council
15/01/2021

APPROVED PLAN ONLY REFERS TO:

- ☐ Earthworks
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- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

Received
05-01-21
BCC DS

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1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	04.01.21	KP	KP	AMENDED AS PER COUNCIL'S REQUEST

DRAWN: KP
DESIGN: ST
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APPROVED: SCOTT THOMAS RPEQ 04618
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE: 1:1000 / 1:2000 — A1 / A3

CLIENT: ROCHEDALE C4 PTY LTD

ASSOCIATED CONSULTANT: WOLTER CONSULTING GROUP PH (07) 3666 5200

PROJECT NAME: ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD ROCHEDALE

DRAWING TITLE: EXTERNAL STORMWATER DRAINAGE CATCHMENT LAYOUT PLAN

PROJECT No.	DRAWING No.	REVISION
20-0102	503	2

APPROVED PLAN
Brisbane City Council
15/01/2021

APPROVED PLAN ONLY REFERS TO:

- [ ] Earthworks
- [x] Stormwater
- [x] Roadworks
- [ ] Traffic Functional Layout
- [ ] Traffic Signals
- [ ] Construction Management Plan
- [ ] WSUD Device(s)
- [ ] Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

STORMWATER STRUCTURE NOTE:

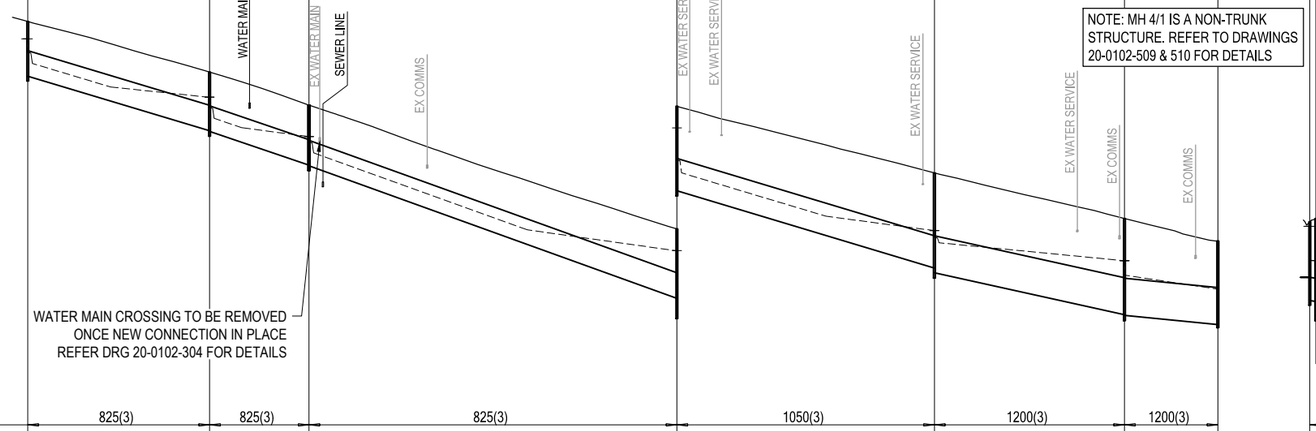
STANDARD ROUND MANHOLES LESS THAN 3.0m DEEP:
CONSTRUCT IN ACCORDANCE WITH THE LOCAL AUTHORITY STANDARDS.

STANDARD ROUND MANHOLES 3.0m > 5.3m DEEP:
CONSTRUCT IN ACCORDANCE WITH TMR STD DRAWINGS 1307 AND 1308.

STANDARD ROUND MANHOLES GREATER THAN 5.3m DEEP:
SHALL BE STRUCTURALLY DESIGNED (CERTIFIED) AND CONSTRUCTED BY CONTRACTOR ON A CASE BY CASE BASIS.

ROUND EXTENDED (900mm MAX) MANHOLES:
CONSTRUCT IN ACCORDANCE WITH PEAK URBAN STD DRAWINGS S-101 & S-102.

RECTANGULAR STRUCTURE (SPECIAL):
SHALL BE STRUCTURALLY DESIGNED (CERTIFIED) AND CONSTRUCTED BY CONTRACTOR ON A CASE BY CASE BASIS.



NOTE: MH 4/1 IS A NON-TRUNK STRUCTURE. REFER TO DRAWINGS 20-0102-509 & 510 FOR DETAILS

PROVIDE BLANKING PLATES TO ALL FUTURE GULLY CONNECTIONS TYPICAL

Received
05-01-21
BCC DS

STRUCTURE NAME	EXT/1	9/1	8/1	7/1	6/1	5/1	4/1	G1/2	5/1	G2/3	5/1	G3/4	6/1	G4/5	6/1	G5/6	7/1
STRUCTURE DESCRIPTION	STD FIELD INLET (NO APRON) TYPE 2 - 900mm x 600mm	STD MANHOLE 1350mm DIAMETER REFER DETAIL	STD MANHOLE 1350mm DIAMETER	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	STD MANHOLE 1500mm DIA EXTENDED 900mm REFER DETAIL	FUTURE STD TYPE A GULLY - LIP IN LINE 3.6m LINTEL - ON GRADE	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	FUTURE STD TYPE A GULLY - LIP IN LINE 3.6m LINTEL - ON GRADE	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	FUTURE STD TYPE A GULLY - LIP IN LINE 3.6m LINTEL - ON GRADE	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	FUTURE STD TYPE A GULLY - LIP IN LINE 3.6m LINTEL - ON GRADE	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	FUTURE STD TYPE A GULLY - LIP IN LINE 3.6m LINTEL - ON GRADE	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL
PIPE SIZEmm (Class)		825(3)	825(3)	825(3)	1050(3)	1200(3)	1200(3)		750(3)		375(3)		750(3)		375(3)		375(3)
PIPE GRADE %		3.00%	3.40%	3.60%	3.00%	2.21%	1.00%		1.50%		1.00%		1.50%		1.00%		1.00%
PIPE SLOPE 1 in X		33.33	29.41	27.78	33.33	45.33	100.00		66.67		99.99		66.67		100.02		100.00
FULL PIPE FLOW VELOCITY (m/s)		2.76	3.12	3.20	3.64	3.35	3.99		2.52		1.57		2.13		1.69		1.26
PART FULL FLOW VELOCITY (m/s)		4.87	5.25	5.40	5.86	5.47											
DATUM RL	62.0				58.0												
WATER LEVEL IN STRUCTURE	79.087	77.183	75.897	72.181	68.832	67.759	66.974	68.973	67.850	68.148	67.850	69.900	68.832	69.693	68.832	72.528	72.181
HYDRAULIC GRADE LEVEL	79.087 / 78.699	77.178 / 76.900	75.897 / 75.777	72.172 / 71.186	68.832 / 68.666	67.850 / 67.380	66.974	68.973 / 67.870	67.850 / 67.380	68.148 / 68.022	67.850 / 67.380	69.900 / 68.846	68.832 / 68.666	69.693 / 69.547	68.832 / 68.666	72.528 / 72.185	72.172 / 71.186
PIPE FLOW (Cumecs)		1.500	1.694	1.740	3.177	3.830	4.570		1.131		0.085		0.957		0.115		0.139
DEPTH TO INVERT	1.785	1.914	1.934 / 1.958	1.978 / 2.262	2.755 / 3.102	3.255 / 3.137	3.157 / 2.729	2.571	2.706	1.494	1.410	2.693	2.804	1.467	1.410	1.471	1.410
INVERT LEVEL OF DRAIN	77.867	76.088	76.068 / 74.965	74.945 / 70.625	70.132 / 67.612	67.459 / 66.091	66.071 / 65.767	66.552	66.522	67.838	67.818	67.940	67.910	69.324	69.304	71.497	71.477
DESIGN SURFACE LEVEL	79.652	78.002	76.923	72.887	70.714	69.228	68.496	69.123	69.228	69.332	69.228	70.633	70.714	70.791	70.714	72.968	72.887
SETOUT	E: 2472.792 N: 7124.060	E: 2482.874 N: 7182.492	E: 2488.390 N: 7214.463	E: 2508.794 N: 7332.716	E: 2523.077 N: 7415.493	E: 2533.616 N: 7476.591	E: 2538.744 N: 7506.605	E: 2535.402 N: 7475.692	E: 2533.616 N: 7476.591	E: 2531.631 N: 7476.342	E: 2533.616 N: 7476.591	E: 2524.864 N: 7414.594	E: 2523.077 N: 7415.493	E: 2521.093 N: 7415.244	E: 2523.077 N: 7415.493	E: 2506.810 N: 7332.468	E: 2508.794 N: 7332.716
RUNNING CHAINAGE	0.000	59.295 / 59.295	32.443 / 91.738	120.000 / 211.738	84.000 / 295.738	62.000 / 357.738	30.449 / 388.187	0.000	1.977 / 1.977	0.000	2.001 / 2.001	0.000	1.978 / 1.978	0.000	2.000 / 2.000	0.000	1.999 / 1.999
LINE		1							2		3		4		5		6

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	11.09.20	KP	KP	MINOR AMENDMENTS
3	11.11.20	KP	KP	NOTES ADDED AS PER COUNCIL'S REQUEST
4	04.01.21	KP	KP	AMENDED AS PER COUNCIL'S RFI
5	14.01.21	KP	KP	MINOR AMENDMENTS

DRAWN: KP
DESIGN: ST
STATUS: **NOT FOR CONSTRUCTION**
APPROVED: SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:1000 10 0 10 20 30 40 50 A1
1:2000 A3
HORIZONTAL
1:100 2 1 0 2 4 A1
1:200 A3
VERTICAL

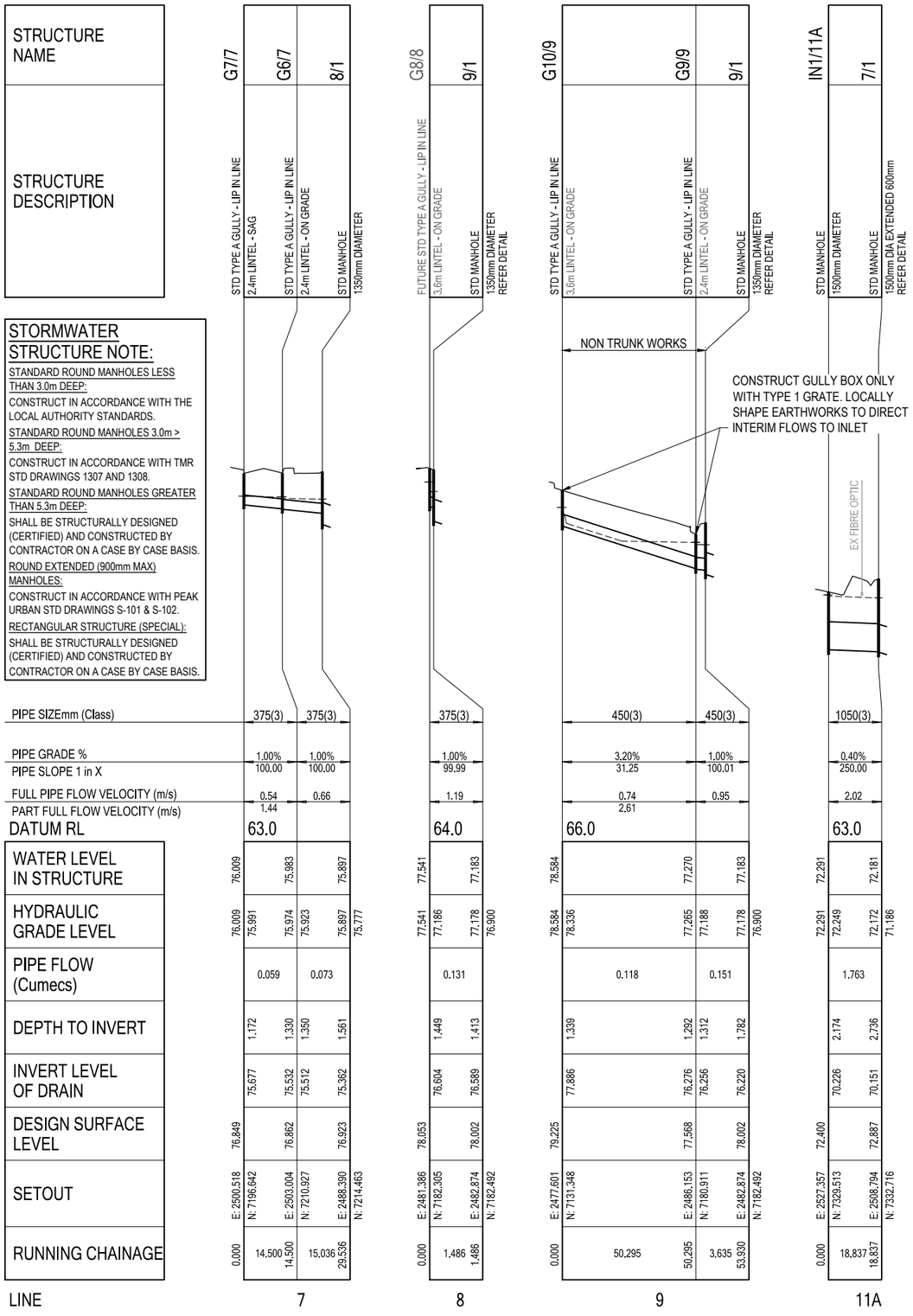
CLIENT: **ROCHEDALE C4 PTY LTD**

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER**
520 & 538 ROCHEDALE ROAD ROCHEDALE

DRAWING TITLE: **EXTERNAL TRUNK STORMWATER LONGITUDINAL SECTIONS SHEET 1 OF 2**

PROJECT No.	DRAWING No.	REVISION
20-0102	504	5



STORMWATER STRUCTURE NOTE:

STANDARD ROUND MANHOLES LESS THAN 3.0m DEEP:

CONSTRUCT IN ACCORDANCE WITH THE LOCAL AUTHORITY STANDARDS.

STANDARD ROUND MANHOLES 3.0m > 5.3m DEEP:

CONSTRUCT IN ACCORDANCE WITH TMR STD DRAWINGS 1307 AND 1308.

STANDARD ROUND MANHOLES GREATER THAN 5.3m DEEP:

SHALL BE STRUCTURALLY DESIGNED (CERTIFIED) AND CONSTRUCTED BY CONTRACTOR ON A CASE BY CASE BASIS.

ROUND EXTENDED (900mm MAX) MANHOLES:

CONSTRUCT IN ACCORDANCE WITH PEAK URBAN STD DRAWINGS S-101 & S-102.

RECTANGULAR STRUCTURE (SPECIAL):

SHALL BE STRUCTURALLY DESIGNED (CERTIFIED) AND CONSTRUCTED BY CONTRACTOR ON A CASE BY CASE BASIS.

APPROVED PLAN
Brisbane City Council
15/01/2021

BRISBANE CITY COUNCIL

APPROVED PLAN ONLY REFERS TO:

- [ ] Earthworks
- [x] Stormwater
- [x] Roadworks
- [ ] Traffic Functional Layout
- [ ] Traffic Signals
- [ ] Construction Management Plan
- [ ] WSUD Device(s)
- [ ] Signs and Linemarking

Other:

Received
05-01-21
BCC DS

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5	04.01.21	KP	KP	AMENDED AS PER COUNCIL'S RFI
6	14.01.21	KP	KP	MINOR AMENDMENTS

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PEAKURBAN
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SCALE
1:1000 10 0 10 20 30 40 50 A1
1:2000 HORIZONTAL A3
1:100 2 1 0 2 4 A1
1:200 VERTICAL A3

CLIENT: ROCHEDALE C4 PTY LTD

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME
ARISE AT ROCHEDALE
STAGE 16
EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE
EXTERNAL TRUNK STORMWATER
LONGITUDINAL SECTIONS
SHEET 2 OF 2

PROJECT No.	DRAWING No.	REVISION
20-0102	505	6

LOCATION					TIME			SUB-CATCHMENT RUNOFF						INLET DESIGN							DRAIN DESIGN														HEADLOSSES								PART FULL		DESIGN LEVELS							
						tc	I	C10	C	A	C*A	+CA	Q					Qg	Qb		tc	I	+CA	Qt	Qm	Qs	Qp	L	S		V	T			V2/2g	Ku	hu	Kl	hl	Kw	hw	Sf	hf		Vp							
DESIGN ARI	STRUCTURE No.	DRAIN SECTION	SUB-CATCHMENTS CONTRIBUTING	LAND USE	SLOPE OF CATCHMENT	SUB-CATCHMENT TIME OF CONC.	RAINFALL INTENSITY	10yr RUNOFF CO-EFFICIENT	CO-EFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT AREA	SUM OF (C * A)	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	ROAD GRADE AT INLET	MINOR FLOW ROAD CAPACITY	INLET TYPE	FLOW INTO INLET	BYPASS FLOW	BYPASS STRUCTURE No.	CRITICAL TIME OF CONC.	RAINFALL INTENSITY	TOTAL (C * A)	MAJOR TOTAL FLOW	MAJOR SURFACE FLOW CAPACITY	MAJOR SURFACE FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE / BOX DIMENSIONS (CLASS)	FLOW VELOCITY FULL (PIPE GRADE VELOCITY)	TIME OF FLOW IN REACH	STRUCTURE CHART No.	STRUCTURE RATIOS FOR 'K' VALUE CALCULATIONS	VELOCITY HEAD	U/S HEADLOSS COEFFICIENT	U/S PIPE STRUCT. HEADLOSS	LAT. HEADLOSS CO-EFFICIENT	LAT. PIPE STRUCT. HEADLOSS	W.S.E. CO-EFFICIENT	CHANGE IN W.S.E	PIPE FRICTION SLOPE	PIPE FRICTION HEADLOSS (L * Sf)	DEPTH	VELOCITY	OBVERT LEVELS	DRAIN SECTION H.G.L	UPSTREAM H.G.L	LAT. H.G.L	W.S.E.	SURFACE OR K&C INVERT LEVEL	STRUCTURE No.
yrs					%	min	mm/h			ha	ha	ha	l/s	l/s	%	l/s		l/s	l/s		min	mm/h	ha	l/s	l/s	l/s	l/s	m	%	mm	m/s			m		m		m	m	m	m	m	m	m	m	m	m	m	m	m	
10 50	G10/9	G10/9 to G9/9	G10			10.00 10.00	167 227	0.86 0.86	0.86 0.99	0.364 0.364	0.313 0.360	0.313 0.360	145 227	145	1.26	0	5	118 (UNLOCKED	27 0)	G9/9	10.00 10.00	167 227	0.313 0.360	227			118 (Pipe flow=	50.295 Grate flow)	3.20	450(3)	0.74 (3.20)	0.84			Qg 0.118 Qo 0.118 Do 450 CHRT 32: Vo2/2gDo 0.06 H/Do 0.00 Kg side flow 8.88 end flow 6.59	0.028	8.88	0.248			8.88	0.248	0.17	0.086	0.147	2.61	78.336 76.726	78.336 77.265	78.584		78.584	79.225	G10/9
10 50	G9/9	G9/9 to 9/1	G10;G9			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.077 0.077	0.068 0.077	0.068 0.077	41 62	68	9.59	0	4	49 (UNLOCKED	19 0)	G7/7	10.84 10.84	161 220	0.381 0.437	267			151 (Pipe flow=	3.635 Sum upstr	1.00	450(3)	0.95 (1.79)	0.06			Qg 0.037 Qo 0.151 Do 450 Angle 71 Chart 43 S/Do 2.5 chartdeg Du/Do 1.00 K0 1.35 K0.5 1.93 Qu/Qo 0.75 Cg 0.57 K 1.68 S/Do 2.5 K0 1.35 K0.5 1.93 K 1.68 S/Do 2.0 K0 1.41 K0.5 2.25 K 1.89	0.046	1.68	0.077	Interp val for S/Do 2.5 Kw 1.78 CHART 42 S/Do 2.5 K0 1.25 K0.5 1.82 K 1.58 S/Do 2.0 K0 1.35 K0.5 2.10 K 1.78 Interp val for S/Do 2.25 Ku 1.58		1.78 atten flows)	0.082	0.28	0.010			76.706 76.670	77.188 77.178	77.265		77.270	77.568	G9/9
10 50	EXT/1	EXT/1 to 9/1	EXT/1			17.00 17.00	134 184	0.86 0.86	0.86 0.99	4.687 4.687	4.031 4.640	4.031 4.640	1500 2372	1500 FLOW	2.54 WIDTH/DEPTH	1500 0.300Dp m	31S.3	1500 (UNLOCKED	0 0)		17.00 17.00	134 184	4.031 4.640	2372			1500 (Pipe flow=	59.295 Grate flow)	3.00	825(3)	2.76 (4.67)	0.36				0.388	1.00	0.388			1.00	0.388	1.04	0.620	0.460	4.87	78.699 76.920	78.699 77.178	79.087		79.087	79.652	EXT/1
10 50	G7/7	G7/7 to G6/7	G7			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.077 0.077	0.068 0.077	0.068 0.077	41 62	59 FLOW	0.05 WIDTH/DEPTH	305 0.015Dp m	13S.125	59 (UNLOCKED	0 0)	G6/7	5.00 5.00	215 291	0.068 0.077	62			59 (Pipe flow=	14.500 Grate flow)	1.00	375(3)	0.54 (1.59)	0.24			Qg 0.059 Qo 0.059 Do 375 CHRT 32: Vo2/2gDo 0.04 H/Do 0.00 Kg side flow 9.65 end flow 6.94 Part full downstream pipe	0.015	1.00	0.018	Upstream HGL 76.009 below outlet pipe obv 76.052 Set Kp to 1		1.00	0.018	0.11	0.017	0.151	1.44	76.052 75.907	75.991 75.974	76.009		76.009	76.849	G7/7
10 50	G6/7	G6/7 to 8/1	G7;G6			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.027 0.027	0.024 0.027	0.024 0.027	14 22	14	0.05	0	4	14 (UNLOCKED	0 0)	G3/4	5.24 5.24	212 286	0.092 0.104	83			73 (Pipe flow=	15.036 Sum upstr	1.00	375(3)	0.66 (1.59)	0.25			Qg 0.014 Qo 0.073 Do 375 Angle 86 Chart 47 S/Do 2.5 chartdeg Du/Do 1.00 K0 1.92 K0.5 2.12 Qu/Qo 0.81 Cg 0.47 K 2.02 S/Do 2.0 K0 2.44 K0.5 2.40 K 2.42 S/Do 1.5 K0 2.67 K0.5 2.58 K 2.63	0.022	2.29	0.051	Interp val for S/Do 1.26 Kw 2.73 CHART 46 S/Do 2.0 K0 2.04 K0.5 1.92 K 1.98 S/Do 1.5 K0 2.09 K0.5 2.31 K 2.19 Interp val for S/Do 1.26 Ku 2.29		2.73 atten flows)	0.060	0.17	0.026			75.887 75.737	75.923 75.897	75.974		75.983	76.862	G6/7
10 50	G8/8	G8/8 to 9/1	G8			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.399 0.399	0.351 0.399	0.351 0.399	210 323	210	3.00	0	5	131 (UNLOCKED	79 0)	G5/6	5.00 5.00	215 291	0.351 0.399	323			131 (Pipe flow=	1.486 Grate flow)	1.00	375(3)	1.19 (1.59)	0.02			Qg 0.131 Qo 0.131 Do 375 CHRT 32: Vo2/2gDo 0.19 H/Do 0.55 Kg side flow 4.91 end flow 4.04	0.072	4.91	0.355			4.91	0.355	0.56	0.008			76.979 76.964	77.186 77.178	77.541		77.541	78.053	G8/8
10 50	9/1	9/1 to 8/1	G10;G9;EXT/1;G8														26				17.36 17.36	133 182	4.763 5.476	2768			1694 (Pipe flow=	32.443 Sum upstr	3.40	825(3)	3.12 (4.98)	0.17			Qo 1.694 Do 825 Routine 3.2 Join Pipes: G8/8 and EXT/1 Vel1 0.734 Vel2 2.785 Eq Dia 863 Angle 183 Flow 1.570 Routine 2.1 CHART 53 Du/Do 1.0 Qu/Qo 0.93 Kw=Ku= 0.53 Combined pipes in line case	0.496	0.56	0.278	Join Pipes: Eqv G8/8 & EXT/1 and G9/9 Vel1 2.684 Vel2 0.782 Eq Dia 920 Angle 177 Flow 1.694 CHART 50 Du/Do1.12 alpha 0 K'w 0.05 Vu 2.55 WSE 0.35 Ku 0.68 Kw 0.71 Interpolated Ku= 0.56 Kw= 0.57		0.57 atten flows)	0.283	1.33	0.433	0.477	5.25	76.900 75.797	76.900 75.897	77.178		77.183	78.002	9/1
10 50	8/1	8/1 to 7/1	G7;G6;G10;G9;EXT/1; G8														26				17.53 17.53	133 182	4.855 5.580	2821			1740 (Pipe flow=	120.000 Sum upstr	3.60	825(3)	3.20 (5.12)	0.63			Qo 1.740 Do 825 Routine 2.2 CHART 53 Du/Do 1.0 Qu/Qo 0.97 Kw=Ku= 0.22 Combined pipes in line case Join Pipes: G6/7 and 9/1	0.522	0.23	0.120	Vel1 3.170 Vel2 0.412 Eq Dia 845 Angle 177 Flow 1.740 CHART 50 Du/Do1.02 alpha 0 K'w 0.05 Vu 3.10 WSE 0.23 Ku 0.40 Kw 0.45 Interpolated Ku= 0.23 Kw= 0.23		0.23 atten flows)	0.120	1.41	1.687	0.477	5.40	75.777 71.457	75.777 72.172	75.897		75.897	76.923	8/1
10 50	G5/6	G5/6 to 7/1	G5			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.281 0.281	0.247 0.281	0.247 0.281	148 227	226	2.77	0	5	139 (UNLOCKED	87 0)	G4/5	5.00 5.00	215 291	0.247 0.281	227			139 (Pipe flow=	1.999 Grate flow)	1.00	375(3)	1.26 (1.59)	0.03			Qg 0.139 Qo 0.139 Do 375 CHRT 32: Vo2/2gDo 0.22 H/Do 0.83 Kg side flow 4.24 end flow 3.56	0.081	4.24	0.343			4.24	0.343	0.63	0.013			71.872 71.852	72.185 72.172	72.528		72.528	72.968	G5/6
10 50	IN1/11A	IN1/11A to 7/1															27				30.00 30.00	103 142	4.470 4.470	1763			1763 (Pipe flow set by	18.837 user)	0.40	1050(3	2.02 (2.00)	0.16				0.208	0.20	0.042			0.20	0.042	0.41	0.077			71.280 71.205	72.249 72.172	72.291		72.291	72.400	IN1/11A
10 50	7/1	7/1 to 6/1	G7;G6;G10;G9;EXT/1; G8;G5														27				30.16 30.16	103 142	9.572 10.331	4075			3177 (Pipe flow=	84.000 Sum upstr	3.00	1050(3	3.64 (5.47)	0.38			Qo 3.177 Do 1050 Flow 8/1 made eqv grate flow Flow G5/6 made eqv grate flow Angle 90 Chart 47 S/Do 2.5 chartdeg Du/Do 1.00 K0 1.92 K0.5 2.12 Qu/Qo 0.55 Cg 0.92 K 2.11 S/Do 2.5 K0 1.92 K0.5 2.12 K 2.11 S/Do 2.0 K0 2.44 K0.5 2.40 K 2.40 Interp val for S/Do 2.39 Kw 2.17 CHART 46 S/Do 2.5 K0 1.82 K0.5 1.71 K 1.72 S/Do 2.0 K0 2.04 K0.5 1.92 K 1.93 Interp val for S/Do 2.39 Ku 1.76 K vals above for stepped pipes as grate flow grate flow decreased by 1.347 from 8/1 Routine 2.2 CHART 48 Du/Do 0.79 Qu/Qo 0.42 K 1.43	0.675	1.46	0.986	d/Do 2.0 chrt Qg/Qo 0.02 Kg 0.01 d/Do 1.5 chrt Qg/Qo 0.02 Kg 0.01 d/Do 1.00 Interp value Kg 0.01 Ku=Kw= 1.45 Combined pipes in line case Join Pipes: IN1/11A and 8/1 Vel1 2.521 Vel2 2.036 Eq Dia 1327 Angle 128 Flow 3.110 CHART 33 Angle 0 S/Do 2.5 Du/Do 1.26 Qg/Qo 0.02 K 0.29 S/Do 1.20 cor 0.03 Ku 0.32 Kw 0.32 Interpolated Ku= 1.45 Kw= 1.45 K vals step pipes as pipe flow Ku 1.45 Kw 1.45 Averaged Ku 1.46 Kw 1.47		1.47 atten flows)	0.995	1.33	1.115	0.628	5.86	71.186 68.666	71.186 68.832	72.172		72.181	72.887	7/1
10 50	LG3/4	LG3/4 to G3/4				12.00 12.00	155 212		0.86 0.99	2.300 2.300	1.978 2.277	1.978 2.277	852 1341								12.00 12.00	155 212	1.978 2.277	1341			852																										LG3/4
10 50	G3/4	G3/4 to 6/1	G3			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.334 0.334	0.294 0.334	0.294 0.334	176 270	176	0.33	0	5	146 (UNLOCKED	30 0)	G1/2	12.00 12.00	155 212	2.272 2.611	1538			957 (Pipe flow=	1.978 Sum upstr	1.50	750(3)	2.13 (3.10)	0.02			Qg 0.957 Qo 0.957 Do 750 CHRT 32: Vo2/2gDo 0.31 H/Do 0.20 Kg side flow 4.56 end flow 3.86	0.231	4.56	1.054			4.56	1.054	0.71	0.014			68.696 68.666	68.846 68.832	69.900		69.900	70.633	G3/4
10 50	G4/5	G4/5 to 6/1	G4			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.128 0.128	0.113 0.128	0.113 0.128	67 103	155	2.05	0	5	115 (UNLOCKED	39 0)	G2/3	5.00 5.00	215 291	0.113 0.128	103			115 (Pipe flow=	2.000 Grate flow)	1.00	375(3)	1.05 (1.59)	0.03			Qg 0.115 Qo 0.115 Do 375 CHRT 32: Vo2/2gDo 0.15 H/Do 0.00 Kg side flow 6.96 end flow 5.48 Part full downstream pipe	0.056	1.00	0.146	Upstream HGL 69.593 below outlet pipe obv 69.699 Set Kp to 1		1.00 atten flows)	0.146	0.43	0.009	0.223	1.69	69.699 69.679	69.547 69.527	69.693		69.693	70.791	G4/5
10 50	6/1	6/1 to 5/1	G7;G6;G10;G9;EXT/1; G8;G5;G3;G4														27				30.54 30.54	102 141	11.957 13.070	5119			3830 (Pipe flow=	62.000 Sum upstr	2.21	1200(3	3.35 (5.14)	0.31			Qo 3.830 Do 1200 Flow G4/5 made eqv grate flow Routine 2.1 CHART 48 Du/Do 0.88 Qu/Qo 0.82 K 0.29 d/Do 2.0 chrt Qg/Qo 0.01 Kg 0.01 d/Do 1.5 chrt Qg/Qo 0.01 Kg 0.01 d/Do 1.00 Interp value Kg 0.01 Ku=Kw= 0.30 Combined pipes in line case Join Pipes:	0.572	0.29	0.166	7/1 and G3/4 Vel1 3.633 Vel2 1.425 Eq Dia 1213 Angle 169 Flow 3.776 CHART 33 Angle 0 S/Do 2.5 Du/Do 1.01 Qg/Qo 0.01 K 0.26 S/Do 1.13 cor 0.02 Ku 0.28 Kw 0.28 Interpolated Ku= 0.29 Kw= 0.29 K vals above for stepped pipes as grate flow		0.29 atten flows)	0.166	0.94	0.581	0.710	5.47	68.666 67.298	68.666 67.850	68.832		68.832	70.714	6/1

APPROVED PLAN
Brisbane City Council
15/01/2021

APPROVED PLAN ONLY REFERS TO:

- [ ] Earthworks
- [x] Stormwater
- [x] Roadworks
- [ ] Traffic Functional Layout
- [ ] Traffic Signals
- [ ] Construction Management Plan
- [ ] WSUD Device(s)
- [ ] Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

Received
05-01-21
BCC DS

REV	DATE	DESIGN	DRAWN	REVISION
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	11.09.20	KP	KP	CALCULATIONS TABLE UPDATED
3	04.01.21	KP	KP	CALCULATIONS TABLE UPDATED

DRAWN: KP
DESIGN: ST
STATUS: NOT FOR CONSTRUCTION
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S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

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DEVELOPMENT ENGINEERS + ADVISORS
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SCALE

CLIENT: ROCHEDALE C4 PTY LTD

ASSOCIATED CONSULTANT: WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: ARISE AT ROCHEDALE
STAGE 16
EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: EXTERNAL TRUNK STORMWATER CALCULATIONS TABLE SHEET 1 OF 2

PROJECT No. 20-0102
DRAWING No. 506
REVISION 3

LOCATION					TIME			SUB-CATCHMENT RUNOFF						INLET DESIGN							DRAIN DESIGN															HEADLOSSES								PART FULL		DESIGN LEVELS							
						tc	I	C10	C	A	C*A	+CA	Q					Qg	Qb		tc	I	+CA	Qt	Qm	Qs	Qp	L	S		V	T			V2/2g	Ku	hu	Kl	hl	Kw	hw	Sf	hf		Vp							
DESIGN ARI	STRUCTURE No.	DRAIN SECTION	SUB-CATCHMENTS CONTRIBUTING	LAND USE	SLOPE OF CATCHMENT	SUB-CATCHMENT TIME OF CONC.	RAINFALL INTENSITY	10yr RUNOFF CO-EFFICIENT	CO-EFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT AREA	SUM OF (C * A)	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	ROAD GRADE AT INLET	MINOR FLOW ROAD CAPACITY	INLET TYPE	FLOW INTO INLET	BYPASS FLOW	BYPASS STRUCTURE No.	CRITICAL TIME OF CONC.	RAINFALL INTENSITY	TOTAL (C * A)	MAJOR TOTAL FLOW	MAJOR SURFACE FLOW CAPACITY	MAJOR SURFACE FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE / BOX DIMENSIONS (CLASS)	FLOW VELOCITY FULL (PIPE GRADE VELOCITY)	TIME OF FLOW IN REACH	STRUCTURE CHART No.	STRUCTURE RATIOS FOR 'K' VALUE CALCULATIONS	VELOCITY HEAD	U/S HEADLOSS COEFFICIENT	U/S PIPE STRUCT. HEADLOSS	LAT. HEADLOSS CO-EFFICIENT	LAT. PIPE STRUCT. HEADLOSS	W.S.E CO-EFFICIENT	CHANGE IN W.S.E	PIPE FRICTION SLOPE	PIPE FRICTION HEADLOSS (L * Sf)	DEPTH	VELOCITY	OBVERT LEVELS	DRAIN SECTION H.G.L	UPSTREAM H.G.L	LAT. H.G.L	W.S.E.	SURFACE OR K&C INVERT LEVEL	STRUCTURE No.
yrs					%	min	mm/h			ha	ha	ha	l/s	l/s	%	l/s		l/s	l/s		min	mm/h	ha	l/s	l/s	l/s	l/s	m	%		m/s	min			m		m		m		m	%	m	m	m/s	m	m	m	m	m	m	
10 50	LG1/2	LG1/2 to G1/2				12.00 12.00	155 212		0.86 0.99	2.900 2.900	2.494 2.871	2.494 2.871	1074 1691								12.00 12.00	155 212	2.494 2.871	1691			1074																										LG1/2
10 50	G1/2	G1/2 to 5/1	G1			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.094 0.094	0.083 0.094	0.083 0.094	50 76	80	0.62	0	5	80 (UNLOCKED	0 0)		12.00 12.00	155 212	2.577 2.965	1746		(Pipe flow=	1131 Sum upstr	1.977 atten flows)	1.50	750(3)	2.52 (3.10)	0.01		Qg 1.131 Qo 1.131 Do 750 CHRT 32: Vo2/2gDo 0.43 H/Do 0.74 Kg side flow 3.41 end flow 3.05	0.324	3.41	1.103			3.41	1.103	0.99	0.020			67.308 67.278	67.870 67.850	68.973		68.973	69.123	G1/2
10 50	G2/3	G2/3 to 5/1	G2			5.00 5.00	215 291	0.88 0.88	0.88 1.00	0.095 0.095	0.084 0.095	0.084 0.095	50 77	89	1.81	0	5	85 (UNLOCKED | 5 0)		5.00 5.00	215 291	0.084 0.095	77		(Pipe flow= | 85 Grate flow)	2.001	1.00	375(3)	0.77 (1.59)	0.03		Qg 0.085 Qo 0.085 Do 375 CHRT 32: Vo2/2gDo 0.08 H/Do 0.00 Kg side flow 8.36 end flow 6.32 Part full downstream pipe	0.030	1.00	0.126	Upstream HGL 68. pipe obv 68.213 Set Kp to 1	148 below outlet	1.00	0.126	0.23	0.005	0.184	1.57	68.213 68.193	68.022 68.002	68.148		68.148	69.332	G2/3
10 50	5/1	5/1 to 4/1	G7;G6;G10;G9;EXT/1; G8;G5;G3;G4;G1;G2														27				30.85 30.85	101 140	14.618 16.130	6273		(Pipe flow=	4570 Sum upstr	30.449 atten flows)	1.00	1200(3	3.99 (3.46)	0.13		Qo 4.570 Do 1200 Flow G2/3 made eqv grate flow Routine 2.1 CHART 48 Du/Do 1.00 Qu/Qo 0.83 K 0.70 d/Do 2.0 chrt Qg/Qo 0.01 Kg 0.01 d/Do 1.5 chrt Qg/Qo 0.01 Kg 0.01 d/Do 1.08 Interp value Kg 0.01 Ku=Kw= 0.70 Combined pipes in line case Join Pipes:	0.811	0.58	0.470	6/1 and G1/2 Vel1 3.354 Vel2 1.668 Eq Dia 1368 Angle 169 Flow 4.530 CHART 83 Angle 0 S/Do 2.5 Du/Do 1.14 Qg/Qo 0.01 K 0.25 S/Do 1.25 cor 0.01 Ku 0.26 Kw 0.26 Interpolated Ku= 0.58 Kw= 0.58 K vals above for stepped pipes as grate flow	0.58	0.470	1.33	0.406			67.278 66.974	67.380 66.974	67.850		67.850	69.228	5/1

APPROVED PLAN
Brisbane City Council
15/01/2021
APPROVED PLAN ONLY REFERS TO:
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- ☐ Traffic Signals
- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

Received
05-01-21
BCC DS

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	11.09.20	KP	KP	CALCULATIONS TABLE UPDATED
3	04.01.21	KP	KP	CALCULATIONS TABLE UPDATED

DRAWN: KP
DESIGN: ST
STATUS: NOT FOR CONSTRUCTION
APPROVED: SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE

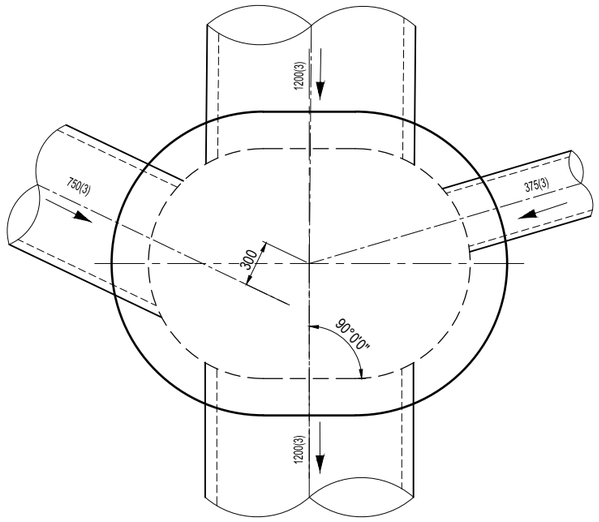
CLIENT: ROCHEDALE C4 PTY LTD

ASSOCIATED CONSULTANT: WOLTER CONSULTING GROUP
PH (07) 3666 5200

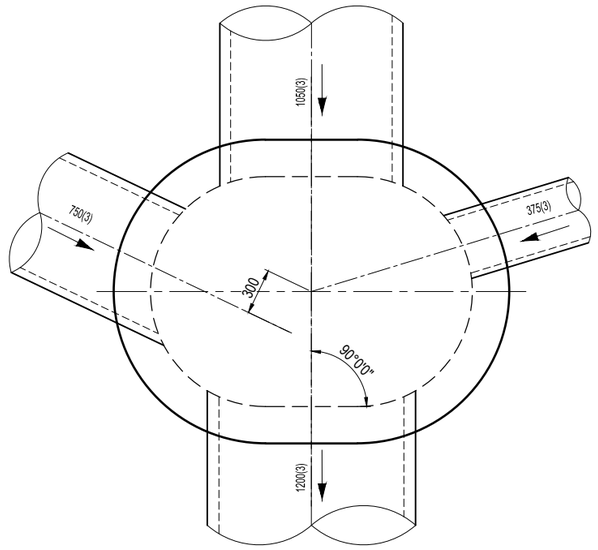
PROJECT NAME: ARISE AT ROCHEDALE
STAGE 16
EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: EXTERNAL TRUNK STORMWATER CALCULATIONS TABLE SHEET 2 OF 2

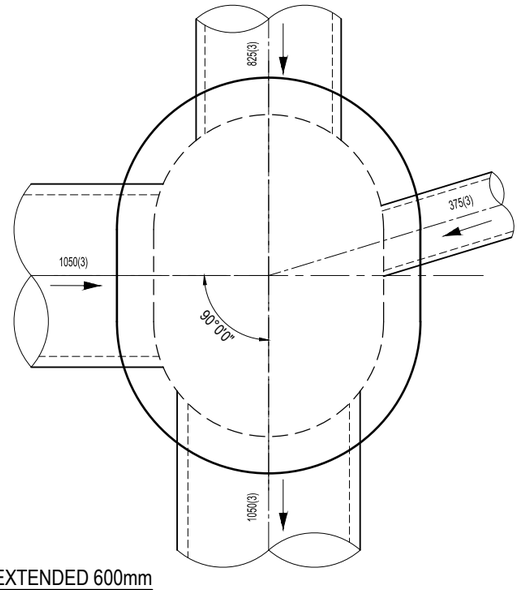
PROJECT No.	DRAWING No.	REVISION
20-0102	507	3



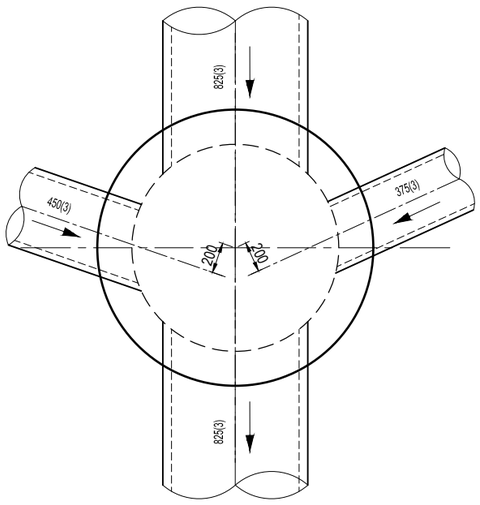
5/1 - 1500mm EXTENDED 600mm
1:20 (A1)
1:40 (A3)



6/1 - 1500mm EXTENDED 600mm
1:20 (A1)
1:40 (A3)



7/1 - 1500mm EXTENDED 600mm
1:20 (A1)
1:40 (A3)



9/1 - 1350mm
1:20 (A1)
1:40 (A3)

APPROVED PLAN
Brisbane City Council
15/01/2021

BRISBANE CITY COUNCIL

APPROVED PLAN ONLY REFERS TO:

- [ ] Earthworks
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- [ ] Traffic Functional Layout
- [ ] Traffic Signals
- [ ] Construction Management Plan
- [ ] WSUD Device(s)
- [ ] Signs and Linemarking

Other:

Received
05-01-21
BCC DS

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	02.12.20	KP	KP	AMENDED AS PER COUNCIL'S REQUEST
3	11.12.20	KP	KP	AMENDED AS PER COUNCIL'S RFI
4	04.01.21	KP	KP	STRUCTURE DETAILS FOR MH 5/1 AND 6/1 AMENDED

DRAWN: KP
DESIGN: ST

STATUS: **NOT FOR CONSTRUCTION**

APPROVED
SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:20 0.2 0 0.2 0.4 0.6 0.8 1 A1
1:40 A3

CLIENT: **ROCHEDALE C4 PTY LTD**

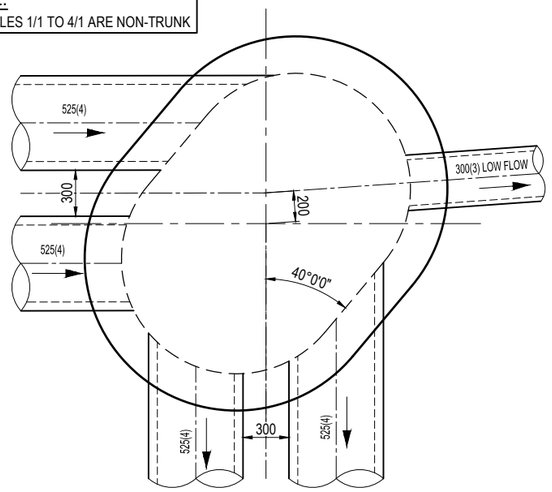
ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER**
520 & 538 ROCHEDALE ROAD
ROCHEDALE

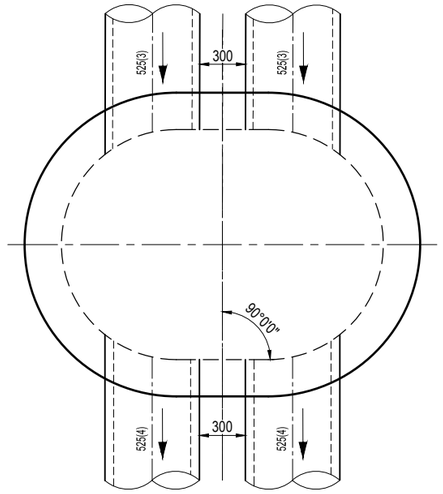
DRAWING TITLE: **EXTERNAL TRUNK STORMWATER STRUCTURE DETAILS**

PROJECT No.	DRAWING No.	REVISION
20-0102	508	4

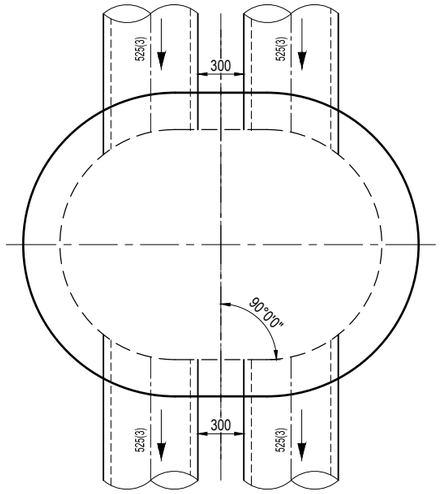
NOTE:
MANHOLES 1/1 TO 4/1 ARE NON-TRUNK



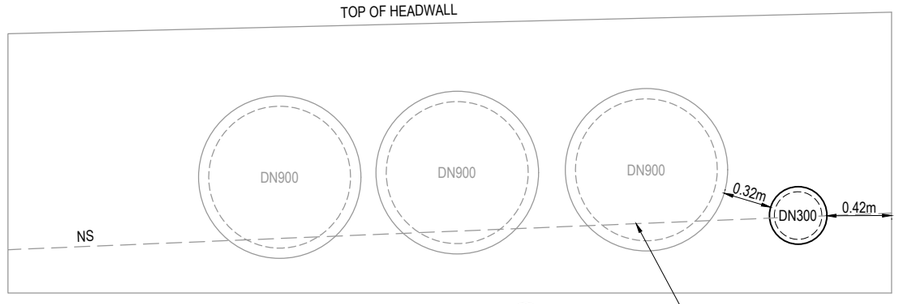
1/1 - 1500mm EXTENDED 600mm
1:20 (A1)
1:40 (A3)



2/1 - 1500mm EXTENDED 600mm
1:20 (A1)
1:40 (A3)



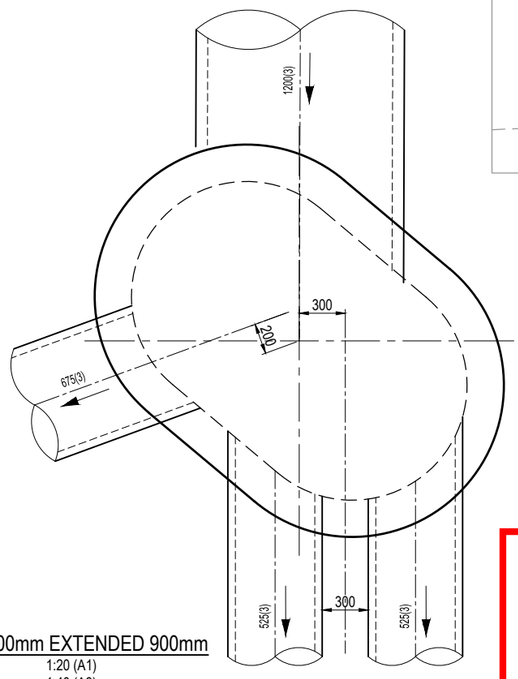
3/1 - 1500mm EXTENDED 600mm
1:20 (A1)
1:40 (A3)



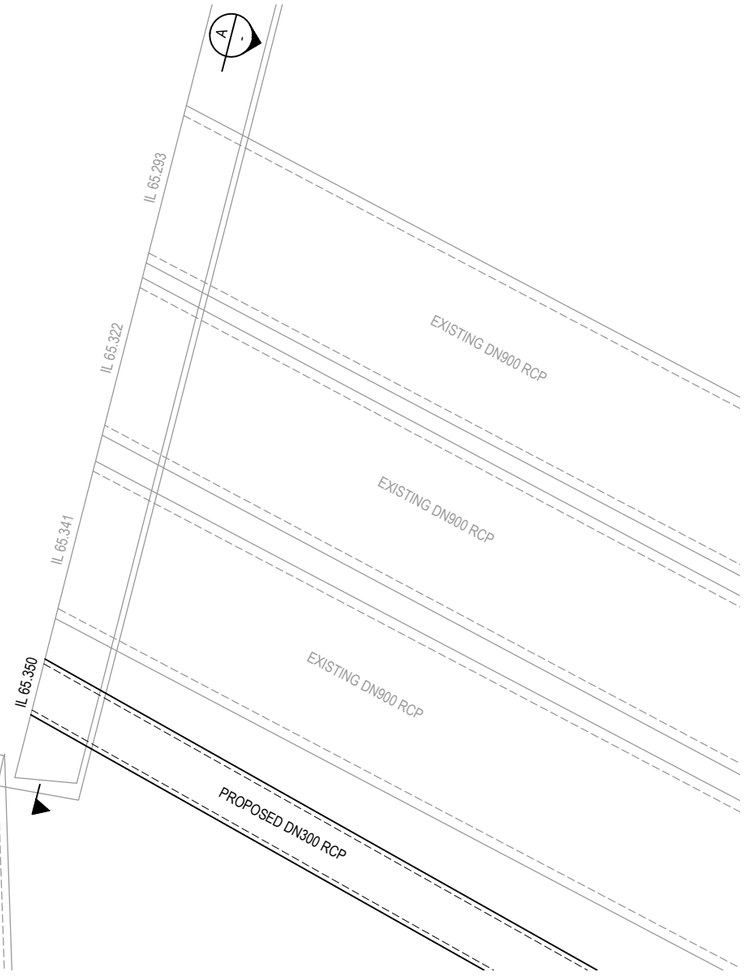
SECTION A
SCALE 1:20 (A1)
SCALE 1:40 (A3)

DRAIN INVERT LEVEL 65.314

BUILT UP SEDIMENTATION IN EXISTING DRAIN TO BE CLEANED OUT TO PROVIDE FREE DRAINING TO ALL PIPES NEW AND EXISTING



4/1 - 1500mm EXTENDED 900mm
1:20 (A1)
1:40 (A3)



DETAIL A
SCALE 1:20 (A1)
SCALE 1:40 (A3)

Received
05-01-21
BCC DS

BRISBANE CITY COUNCIL

APPROVED PLAN
Brisbane City Council
15/01/2021

APPROVED PLAN ONLY REFERS TO:

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- ☐ Signs and Linemarking

Other:

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	31.07.20	KP	KP	ORIGINAL ISSUE - FOR APPROVAL
2	09.11.20	KP	KP	AMENDED AS PER COUNCIL'S REQUEST
3	11.12.20	KP	KP	AMENDED AS PER COUNCIL'S RFI
4	04.01.21	KP	KP	STRUCTURE NAME AMENDED

DRAWN: KP
DESIGN: ST
STATUS: NOT FOR CONSTRUCTION
APPROVED: SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:20 0.2 0 0.2 0.4 0.6 0.8 1 A1
1:40 A3

CLIENT: ROCHEDALE C4 PTY LTD

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME
ARISE AT ROCHEDALE
STAGE 16
EXTERNAL STORMWATER
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE
EXTERNAL
NON-TRUNK STORMWATER
STRUCTURE DETAILS

PROJECT No.	DRAWING No.	REVISION
20-0102	509	4

STRUCTURE NAME	4/1	3/1	2/1	1/1	OUT/1	1/1	1/1A	OUT/1A	4/1	OUT/1B
STRUCTURE DESCRIPTION	STD MANHOLE 1500mm DIA EXTENDED 900mm REFER DETAIL	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	2200mm x 900mm SURCHARGE PIT WITH DOME TOP COVER	STD MANHOLE 1500mm DIA EXTENDED 600mm REFER DETAIL	STD MANHOLE 1050mm DIAMETER	OUTLET THROUGH EXISTING ENDWALL	STD MANHOLE 1500mm DIA EXTENDED 900mm REFER DETAIL	1050mm DIA MANHOLE SURCHARGE PIT WITH DOME TOP COVER
PIPE SIZEmm (Class)	525(3) x 2	525(3) x 2	525(4) x 2	525(4) x 2		300(3)	300(3)		675(3)	
PIPE GRADE %	0.10%	0.10%	0.10%	0.15%		0.15%	0.15%		-5.00%	
PIPE SLOPE 1 in X	1000.02	1000.04	999.97	666.73		666.54	666.68		-20.00	
FULL PIPE FLOW VELOCITY (m/s)	1.19	1.19	1.26	1.26					1.34	
PART FULL FLOW VELOCITY (m/s)										
DATUM RL	55.0					55.0			55.0	
WATER LEVEL IN STRUCTURE	67.610	67.004	66.763	66.239	66.060	65.405	65.367	65.650	68.217	68.000
HYDRAULIC GRADE LEVEL	67.610 / 67.392	67.000 / 66.978	66.760 / 66.735	66.219 / 66.073	66.060	65.405 / 65.405	65.367 / 65.367	65.650	68.138 / 68.046	68.000
PIPE FLOW (Cumecs)	0.500	0.500	0.500	0.500		0.000	0.000		0.486	
DEPTH TO INVERT	2.749	1.513 / 1.527	1.173 / 1.193	1.139	1.159 / 0.256	1.159	1.202 / 1.222	1.467	2.749	1.346
INVERT LEVEL OF DRAIN	65.747	65.639 / 65.625	65.565 / 65.545	65.425	65.405 / 65.400	65.405	65.387 / 65.367	65.350	65.747	66.456
DESIGN SURFACE LEVEL	68.496	67.152	66.738	66.564	65.656	66.564	66.589	66.817	68.496	67.900
SETOUT	E: 2538.744 N: 7506.605	E: 2556.189 N: 7612.998	E: 2565.950 N: 7672.199	E: 2585.471 N: 7790.600	E: 2588.538 N: 7790.094	E: 2585.471 N: 7790.600	E: 2587.402 N: 7802.313	E: 2577.807 N: 7807.717	E: 2538.744 N: 7506.605	E: 2545.135 N: 7519.267
RUNNING CHAINAGE	0.000	107.813 / 107.813	60.000 / 167.813	119.999 / 287.812	3.108 / 290.920	0.000	11.869 / 11.869	11.012 / 22.881	0.000	14.183 / 14.183
LINE		1					1A			1B

EX WATER MAIN

EX TRUNK WATER MAIN

BOLT DOWN LIDS TO MANHOLES
1/1, 2/1, 3/1 AND 4/1

STORMWATER STRUCTURE NOTE:

STANDARD ROUND MANHOLES LESS THAN 3.0m DEEP:
CONSTRUCT IN ACCORDANCE WITH THE LOCAL AUTHORITY STANDARDS.

STANDARD ROUND MANHOLES 3.0m > 5.3m DEEP:
CONSTRUCT IN ACCORDANCE WITH TMR STD DRAWINGS 1307 AND 1308.

STANDARD ROUND MANHOLES GREATER THAN 5.3m DEEP:
SHALL BE STRUCTURALLY DESIGNED (CERTIFIED) AND CONSTRUCTED BY CONTRACTOR ON A CASE BY CASE BASIS.

ROUND EXTENDED (900mm MAX) MANHOLES:
CONSTRUCT IN ACCORDANCE WITH PEAK URBAN STD DRAWINGS S-101 & S-102.

RECTANGULAR STRUCTURE (SPECIAL):
SHALL BE STRUCTURALLY DESIGNED (CERTIFIED) AND CONSTRUCTED BY CONTRACTOR ON A CASE BY CASE BASIS.

APPROVED PLAN
Brisbane City Council
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- [ ] Construction Management Plan
- [ ] WSUD Device(s)
- [ ] Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

Received
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BCC DS

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	04.01.21	KP	KP	ORIGINAL ISSUE - FOR APPROVAL

DRAWN: KP
DESIGN: ST

STATUS: **NOT FOR CONSTRUCTION**

APPROVED
SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE
1:1000 / 1:2000 HORIZONTAL 10 0 10 20 30 40 50 A1 A3
1:100 / 1:200 VERTICAL 2 1 0 2 4 A1 A3

CLIENT: **ROCHEDALE C4 PTY LTD**

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER**
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: **EXTERNAL NON-TRUNK STORMWATER LONGITUDINAL SECTIONS**

PROJECT No.	DRAWING No.	REVISION
20-0102	510	1

LOCATION					TIME			SUB-CATCHMENT RUNOFF						INLET DESIGN							DRAIN DESIGN													HEADLOSSES										PART FULL		DESIGN LEVELS							
						tc	I	C10	C	A	C*A	+CA	Q					Qg	Qb		tc	I	+CA	Qt	Qm	Qs	Qp	L	S		V	T			V2/2g	Ku	hu	Kl	hl	Kw	hw	Sf	hf		Vp							
DESIGN ARI	STRUCTURE No.	DRAIN SECTION	SUB-CATCHMENTS CONTRIBUTING	LAND USE	SLOPE OF CATCHMENT	SUB-CATCHMENT TIME OF CONC.	RAINFALL INTENSITY	10yr RUNOFF CO-EFFICIENT	CO-EFFICIENT OF RUNOFF	SUB-CATCHMENT AREA	EQUIVALENT AREA	SUM OF (C * A)	SUB-CATCHMENT DISCHARGE	FLOW IN K&C (INC. BYPASS)	ROAD GRADE AT INLET	MINOR FLOW ROAD CAPACITY	INLET TYPE	FLOW INTO INLET	BYPASS FLOW	BYPASS STRUCTURE No.	CRITICAL TIME OF CONC.	RAINFALL INTENSITY	TOTAL (C * A)	MAJOR TOTAL FLOW	MAJOR SURFACE FLOW CAPACITY	MAJOR SURFACE FLOW	PIPE FLOW	REACH LENGTH	PIPE GRADE	PIPE / BOX DIMENSIONS (CLASS)	FLOW VELOCITY FULL (PIPE GRADE VELOCITY)	TIME OF FLOW IN REACH	STRUCTURE CHART No.	STRUCTURE RATIOS FOR 'K' VALUE CALCULATIONS	VELOCITY HEAD	U/S HEADLOSS COEFFICIENT	U/S PIPE STRUCT. HEADLOSS	LAT. HEADLOSS CO-EFFICIENT	LAT. PIPE STRUCT. HEADLOSS	W.S.E CO-EFFICIENT	CHANGE IN W.S.E	PIPE FRICTION SLOPE	PIPE FRICTION HEADLOSS (L * Sf)	DEPTH	VELOCITY	OBVERT LEVELS	DRAIN SECTION H.G.L	UPSTREAM H.G.L	LAT. H.G.L	W.S.E.	SURFACE OR K&C INVERT LEVEL	STRUCTURE No.
yrs					%	min	mm/h			ha	ha	ha	l/s	l/s	%	l/s		l/s	l/s		min	mm/h	ha	l/s	l/s	l/s	l/s	m	%	mm	m/s	min			m		m		m		m	%	m	m	m/s	m	m	m	m	m	m	
2 50	L4/1	L4/1 to 4/1				30.90 30.90	69 140						0 0								30.90 30.90	69 140	0.000 0.000	0			986																										L4/1
2 50	4/1	4/1 to 3/1				0.00 0.00	151 291										27				0.000 0.000	0			500 (Pipe flow= Sum upstream flows)	107.813 Additional flow: -0.486 cumecs	0.10	525(3) x 2	1.19 (0.62)	1.51		Qo 0.500 Do 742 CHRT 32: Vo2/2gDo 0.14 H/Do 2.18 Kg side flow 3.02 end flow 2.69	0.072	3.02	0.218			3.02	0.218	0.36	0.392			66.265 66.157	67.392 67.000	67.610		67.610	68.496	4/1
2 50	3/1	3/1 to 2/1				1.51 1.51	151 291										27				-0.601 -0.601	-486			500 (Pipe flow= Sum upstr	60.000 atten flows)	0.10	525(3) x 2	1.19 (0.62)	0.84		Qo 0.500 Do 742 CHART 50 Du/Do1.00 alpha 0 K'w 0.05 Vu 1.16 WSE 0.03 Ku 0.31 Kw 0.36	0.072	0.31	0.022			0.36	0.026	0.36	0.218			66.143 66.083	66.978 66.760	67.000		67.004	67.152	3/1
2 50	2/1	2/1 to 1/1				2.35 2.35	151 291										27				-0.601 -0.601	-486			500 (Pipe flow= Sum upstr	119.999 atten flows)	0.10	525(4) x 2	1.26 (0.61)	1.59		Qo 0.500 Do 742 CHART 50 Du/Do1.00 alpha 0 K'w 0.05 Vu 1.16 WSE 0.03 Ku 0.31 Kw 0.35	0.081	0.31	0.025			0.35	0.028	0.43	0.516			66.047 65.927	66.735 66.219	66.760		66.763	66.738	2/1
2 50	1/1	1/1 to OUT/1				3.94 3.94	151 291										27				-0.601 -0.601	-486			500 (Pipe flow= Sum upstr	3.108 atten flows)	0.15	525(4) x 2	1.26 (0.75)	0.04		Qo 0.500 Do 742 CHART 50 Du/Do1.00 alpha 90 K'w 0.30 Vu 1.16 WSE 0.17 Ku 1.80 Kw 2.05	0.081	1.80	0.146			2.05	0.166	0.43	0.013			65.907 65.902	66.073 66.060	66.219		66.239	66.564	1/1
2 50	1/1	1/1 to 1/1A				0.00 0.00	151 291										27				0.000 0.000	0			0 (Pipe flow= Grate	11.869 flow)	0.15	300(3)	0.00 (0.53)	0.20			0.000	0.20	0.000			0.20	0.000	0.00	0.000			65.705 65.687	65.405 65.387	65.405		65.405	66.564	1/1
2 50	1/1A	1/1A to OUT/1A				0.20 0.20	151 291										24				0.000 0.000	0			0 (Pipe flow= Grate	11.012 flow)	0.15	300(3)	0.00 (0.53)	0.18			0.000	0.20	0.000			0.20	0.000	0.00	0.000			65.667 65.650	65.367 65.350	65.367		65.367	66.589	1/1A
2 50	4/1	4/1 to OUT/1B				30.90 30.90	69 140										27				1.250 1.250	486			486 (Pipe flow set by user)	14.183	-5.00	675(3)	1.34 (0.00)	0.18			0.092	1.00	0.092			1.87	0.171	0.32	0.046			66.426 67.135	68.046 68.000	68.138		68.217	68.496	4/1

APPROVED PLAN
Brisbane City Council
15/01/2021

APPROVED PLAN ONLY REFERS TO:

- ☐ Earthworks
- ☑ Stormwater
- ☑ Roadworks
- ☐ Traffic Functional Layout
- ☐ Traffic Signals
- ☐ Construction Management Plan
- ☐ WSUD Device(s)
- ☐ Signs and Linemarking

Other:

BRISBANE CITY COUNCIL

Received
05-01-21
BCC DS

REV	DATE	DESIGN	DRAWN	REVISION DETAILS
1	04.01.21	KP	KP	ORIGINAL ISSUE - FOR APPROVAL

DRAWN: KP
DESIGN: ST

STATUS: **NOT FOR CONSTRUCTION**

APPROVED
SCOTT THOMAS RPEQ 04618
S. Thomas
FOR AND ON BEHALF OF PEAKURBAN PTY LTD

PEAKURBAN
DEVELOPMENT ENGINEERS + ADVISORS
ENQUIRIES@PEAKURBAN.COM.AU

SCALE

CLIENT: **ROCHEDALE C4 PTY LTD**

ASSOCIATED CONSULTANT
WOLTER CONSULTING GROUP
PH (07) 3666 5200

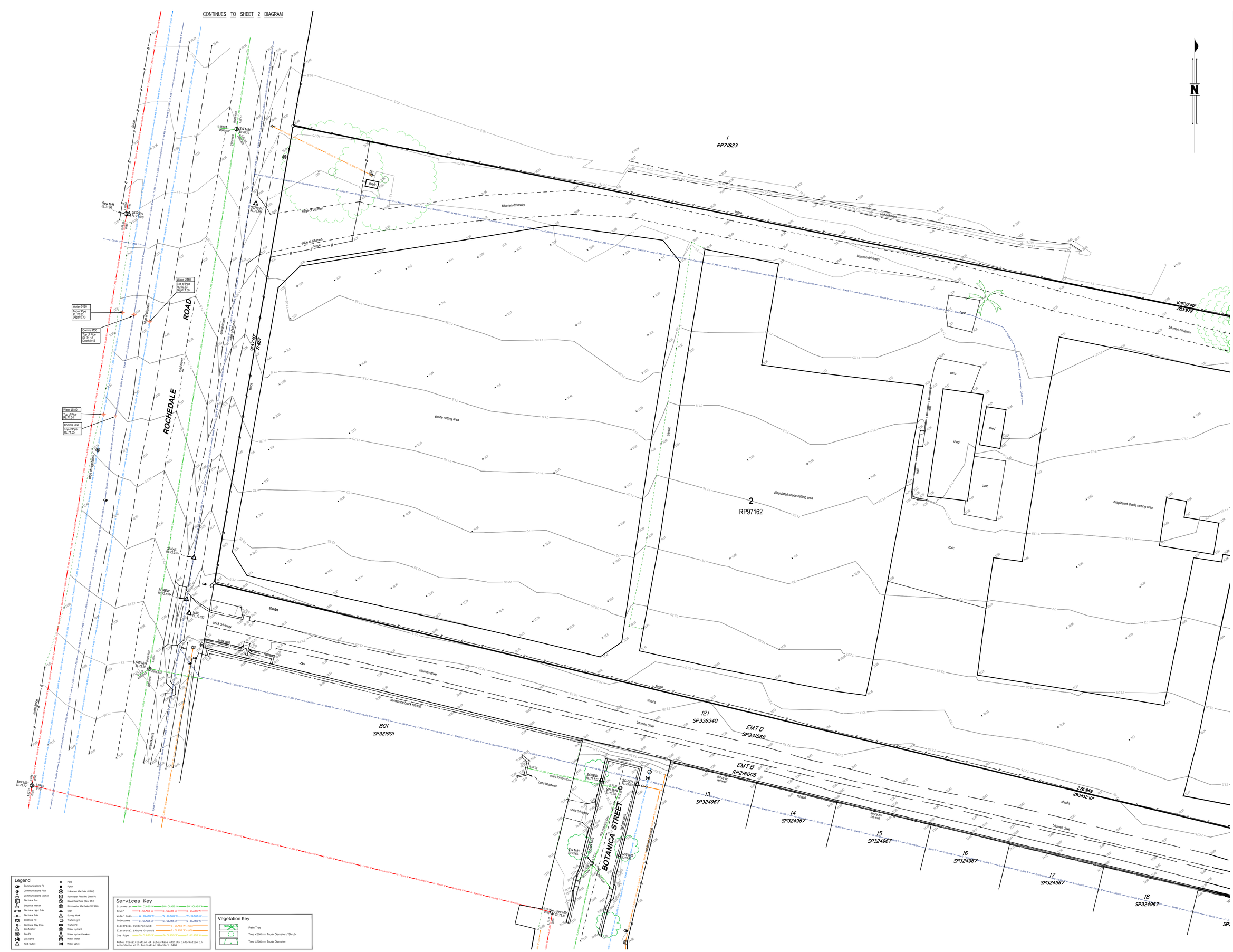
PROJECT NAME: **ARISE AT ROCHEDALE STAGE 16 EXTERNAL STORMWATER**
520 & 538 ROCHEDALE ROAD
ROCHEDALE

DRAWING TITLE: **EXTERNAL NON-TRUNK STORMWATER CALCULATIONS TABLE**

PROJECT No.	DRAWING No.	REVISION
20-0102	511	1

Appendix D

Site Survey



Notes:

This plan is prepared for Keylin Group from a combination of field survey and existing records for the purpose of design and should not be used for any other purpose.

The title boundaries as shown hereon have been determined from minimum connections to survey marks placed by others and then from measurements by others, the verification of which does not form part of this survey. This survey shows site contours and features only. It does not guarantee the position of boundary pegs, if found. The position of fence lines, retaining walls and other features is indicative only and should not be relied upon as depicting the boundary lines.

Only visible surface features of underground services on or adjacent to the site have been located by field survey.

If not able to be so located, known services have been plotted from the records of relevant authorities where available and have been noted accordingly on this plan. Where such records either do not exist or are considered inadequate, a notation has been made hereon.

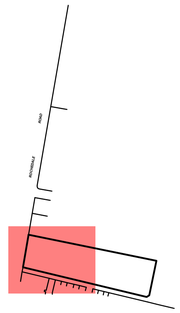
The Position of underground services on this drawing are indicated by a single line. Care should be exercised as services may occupy a considerably wider corridor than that indicated on this drawing. Users should be aware during excavation or construction that services may exist for which there is no record.

Prior to construction commencing, it is the clients responsibility:

- to accurately locate and/or expose any non visible services.
- to determine whether title encumbrances will prevent or limit development, and
- to check on the local authority's definition of Natural Ground Level.

Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed location of all services.

The contours shown are from field survey. These contours should not be used for Natural Ground Level as defined by the local authority planning Scheme for the purposes of determining building heights.



SHEET LOCATION DIAGRAM

Scale: N.T.S

REV	DESCRIPTION	DATE	DRAWN	CHECKED	APPROVED
C	Additional pothole data added	21/09/26	FM	BDG	LEH
B	Initial issue to client	20/07/26	KMJ	BDG	LEH
A	Initial issue to client	17/07/26	CL	BDG	LEH

Client:	Keylin Group
Plan Type:	Contour & Detail Survey
Project:	470 Rochedale Road, Rochedale
RPD:	Lot 2 on RP97162
Locality:	Rochedale
Local Authority:	Brisbane City Council
Meridian:	RP216005
Height Datum:	AHD D
Height Origin:	PM123712 RL:68.642m
Scale:	1:250 (A1)
Contour Intervals:	0.25m
Surveyed:	SBP - 13/07/26
Drawn:	CL - 17/07/26
Checked:	BDG - 17/07/26

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Plan Ref:

7516-0002-C

Sheet 1 of 2



DIAGRAM

Scale 1:200

CONTINUES TO SHEET 1

Notes:

This plan is prepared for Keylin Group from a combination of field survey and existing records for the purpose of design and should not be used for any other purpose.

The title boundaries as shown hereon have been determined from minimum connections to survey marks placed by others and then from measurements by others, the verification of which does not form part of this survey. This survey shows site contours and features only. It does not guarantee the position of boundary pegs, if found. The position of fence lines, retaining walls and other features is indicative only and should not be relied upon as depicting the boundary lines.

Only visible surface features of underground services on or adjacent to the site have been located by field survey.

If not able to be so located, known services have been plotted from the records of relevant authorities where available and have been noted accordingly on this plan. Where such records either do not exist or are considered inadequate, a notation has been made hereon.

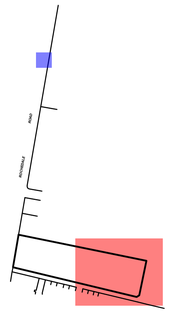
The Position of underground services on this drawing are indicated by a single line. Care should be exercised as services may occupy a considerably wider corridor than that indicated on this drawing. Users should be aware during excavation or construction that services may exist for which there is no record.

Prior to construction commencing, it is the clients responsibility:

- to accurately locate and/or expose any non visible services.
- to determine whether title encumbrances will prevent or limit development, and
- to check on the local authority's definition of Natural Ground Level.

Prior to any demolition, excavation or construction on the site, the relevant authority should be contacted for possible location of further underground services and detailed location of all services.

The contours shown are from field survey. These contours should not be used for Natural Ground Level as defined by the local authority planning Scheme for the purposes of determining building heights.



SHEET LOCATION DIAGRAM

Scale: N.T.S

REV	DESCRIPTION	DATE	DRAWN	CHECKED	APPROVED
C	Additional service data added	21/09/26	FM	BDG	LEH
B	Initial issue to client	20/07/26	KMJ	BDG	LEH
A	Initial issue to client	17/07/26	CL	BDG	LEH

Client:	Keylin Group
Plan Type:	Contour & Detail Survey
Project:	470 Rochedale Road, Rochedale
RPD:	Lot 2 on RP97162
Locality:	Rochedale
Local Authority:	Brisbane City Council
Meridian:	RP216005
Height Datum:	AHD D
Height Origin:	PM123712 RL:68.642m
Scale:	1:250 (A1)
Contour Intervals:	0.25m
Surveyed:	SBP - 13/07/26
Drawn:	CL - 17/07/26
Checked:	BDG - 17/07/26

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Plan Ref:

7516-0002-C

Sheet 2 of 2

Legend

- Communications Pit
- Communications Pillar
- Communications Marker
- Electrical Box
- Electrical Marker
- Electrical Light Pole
- Electrical Pole
- Electrical Pit
- Electrical Stay Pole
- Gas Marker
- Gas Pit
- Gas Valve
- Kerb Outlet
- Pole
- Pylon
- Unknown Manhole (U MH)
- Rockwater Field Pit (RW FP)
- Sewer Manhole (Sew MH)
- Stormwater Manhole (SW MH)
- Sign
- Survey Mark
- Traffic Light
- Traffic Pit
- Water Hydrant
- Water Hydrant Marker
- Water Meter
- Water Valve

Services Key

Stormwater	SW - CLASS W	SW - CLASS W	SW - CLASS W
Sewer	S - CLASS W	S - CLASS W	S - CLASS W
Water Main	W - CLASS W	W - CLASS W	W - CLASS W
Telecomms	C - CLASS W	C - CLASS W	C - CLASS W
Electrical (Underground)	E - CLASS W - (UG)		
Electrical (Above Ground)	E - CLASS W - (AG)		
Gas Pipe	G - CLASS W	G - CLASS W	G - CLASS W

Note: Classification of subsurface utility information in accordance with Australian Standard 5488

Vegetation Key

- Palm Tree
- Tree <200mm Trunk Diameter / Shrub
- Tree >200mm Trunk Diameter

Appendix E

ARR Data Hub Summary Output

Generated: 27 October 2026

Data Hub Version: 2026v1

Australian Rainfall & Runoff Data Hub - Results

Input Data

Input Type	Point
Longitude	153.127
Latitude	-27.572
Centroid Used	True Centroid

Selected Datasets

Storm Losses	Median Preburst Depths and Ratios
Temporal Patterns	Climate Change Adjusted IFD Datasets
Default IFD Depths	

Storm Losses

Burst Loss = Storm Loss - Preburst

ID	19671.0
Storm Initial Losses (mm)	14.0
Storm Continuing Losses (mm/h)	1.7

Layer Info

Time Accessed	27 October 2026 07:31AM
Version	2016_v1
Note	These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

Temporal Patterns

code	ECnorth
Label	East Coast North

Layer Info

Time Accessed	27 October 2026 07:31AM
Version	2016_v2

Default IFD Depths

Default Current (2030) Baseline

min (h) \AEP(%)	**63.2**	**50.0**	**39.35**	**20.0**	**18.13**	**10.0**	**5.0**	**2.0**	**1.0**	**0.5**	**0.2**	**0.1**	**0.05**
5 (0.08)	11.9	13.0	13.9	16.0	16.3	18.9	21.6	25.5	28.4	31.9	37.3	41.7	46.2
10 (0.17)	19.6	21.6	23.2	27.2	27.7	30.7	35.1	40.8	45.1	50.8	59.0	65.8	72.9
15 (0.25)	25.0	27.6	29.8	35.1	35.8	39.7	44.6	51.9	57.3	64.3	74.9	83.5	92.6
20 (0.33)	28.9	32.0	34.7	41.1	42.0	46.8	51.9	60.4	66.9	75.1	87.5	97.5	108
25 (0.42)	32.0	35.5	38.5	45.9	46.9	52.4	58.4	67.3	74.7	84.1	98.0	109	121
30 (0.5)	34.5	38.4	41.7	49.8	50.9	57.1	63.9	73.3	81.4	91.7	107	119	132
45 (0.75)	40.1	44.7	48.7	58.6	60.0	67.8	76.6	87.9	97.3	110	128	143	159
60 (1.0)	44.1	49.1	53.7	64.9	66.4	75.5	85.9	99.6	110	124	145	162	181
90 (1.5)	49.3	55.0	60.3	73.4	75.2	86.2	98.9	116	130	147	171	191	213
120 (2.0)	53.1	59.3	65.2	79.7	81.8	94.1	109	129	145	164	191	214	237
180 (3.0)	59.0	66.0	72.8	89.5	92.0	107	124	149	169	191	222	248	275
270 (4.5)	65.6	73.7	81.5	101	104	121	142	172	197	222	258	287	318
360 (6.0)	71.0	80.0	88.7	110	114	133	157	191	220	246	286	318	352
540 (9.0)	79.7	90.3	101	126	130	153	181	222	256	287	333	370	409
720 (12.0)	86.8	98.8	110	139	144	170	202	247	286	319	371	412	456
1080 (18.0)	98.5	113	126	163	166	199	236	288	333	373	434	483	535

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
1440 (24.0)	114	132	145	190	192	233	277	338	388	437	510	568	630
1800 (30.0)	123	143	156	208	208	255	303	372	427	488	573	644	719
2160 (36.0)	131	153	166	222	221	273	326	402	462	532	627	707	793
2880 (48.0)	144	168	181	246	243	304	365	450	520	601	713	806	908
4320 (72.0)	161	188	203	279	273	346	417	517	599	692	824	934	1050
5760 (96.0)	172	201	217	298	293	371	448	557	647	742	885	1000	1130
7200 (120.0)	179	209	226	309	305	386	466	579	673	770	917	1040	1180
8640 (144.0)	185	213	233	315	313	392	473	588	685	781	931	1050	1190
10080 (168.0)	188	216	238	317	319	393	476	588	685	783	932	1060	1190

Time Accessed	27 October 2026 07:31AM
Datasets	Envelope {QRA SEQ IFD (2025), Limb IFD (2020) - BoM Resolution}
Native Baseline	QRA SEQ IFD (2025) scaled from 2010 baseline Limb IFD (2020) - BoM Resolution scaled from 2002 for duration < 1440 or 1961-1990 for duration >= 1440
ΔT	QRA SEQ IFD (2025): 0.5 (from native baseline) 1.2 (from 1961-1990 baseline) Limb IFD (2020) - BoM Resolution: 0.7 for duration < 1440 or 1.2 for duration >= 1440 (from native baseline) 1.2 (from 1961-1990 baseline)
Note	For most designs you should consider how IFD will change over the design life.

Default Historical (1961-1990) Baseline

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	10.0	11.0	11.7	13.5	13.8	15.9	18.2	21.5	23.9	26.9	31.5	35.2	39.0
10 (0.17)	16.6	18.2	19.6	22.9	23.4	25.9	29.6	34.4	38.1	42.8	49.8	55.5	61.5
15 (0.25)	21.0	23.3	25.1	29.6	30.2	33.5	37.6	43.7	48.3	54.3	63.2	70.4	78.1
20 (0.33)	24.4	27.0	29.2	34.7	35.4	39.5	43.8	50.9	56.4	63.4	73.8	82.3	91.3
25 (0.42)	27.0	30.0	32.5	38.7	39.5	44.2	49.3	56.8	63.0	70.9	82.6	92.2	102
30 (0.5)	29.1	32.4	35.1	42.0	42.9	48.2	53.9	61.8	68.7	77.3	90.3	101	112
45 (0.75)	33.8	37.7	41.1	49.4	50.6	57.2	64.6	74.1	82.1	92.6	108	121	134
60 (1.0)	37.2	41.4	45.3	54.7	56.0	63.7	72.5	84.0	92.8	105	123	137	152
90 (1.5)	42.2	47.0	51.6	62.7	64.3	73.7	84.6	99.4	111	125	146	164	182
120 (2.0)	45.9	51.2	56.3	68.8	70.6	81.3	93.9	111	125	142	165	185	205
180 (3.0)	51.5	57.6	63.6	78.1	80.3	93.1	108	130	148	167	194	217	240
270 (4.5)	57.9	65.0	72.0	89.1	91.7	107	125	152	174	196	228	253	280
360 (6.0)	63.1	71.0	78.8	98.1	101	118	139	170	195	219	254	283	312
540 (9.0)	71.4	80.8	90.1	113	116	137	162	199	229	257	298	331	366
720 (12.0)	78.1	88.9	99.4	125	129	153	181	223	257	288	334	371	411
1080 (18.0)	89.3	103	115	148	151	180	214	261	301	338	394	438	485
1440 (24.0)	104	120	132	173	174	212	252	308	353	398	464	517	574
1800 (30.0)	112	130	142	189	189	232	276	339	389	444	522	586	655
2160 (36.0)	119	139	151	202	201	249	297	366	421	484	571	644	722

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
2880 (48.0)	131	153	165	224	221	277	332	410	473	547	649	734	827
4320 (72.0)	147	171	184	254	249	315	380	471	545	630	750	850	959
5760 (96.0)	157	183	197	271	266	338	408	507	589	676	806	913	1030
7200 (120.0)	163	190	206	281	278	351	424	527	613	701	835	946	1070
8640 (144.0)	168	194	212	287	285	357	431	535	624	711	848	960	1080
10080 (168.0)	171	197	217	289	290	358	433	535	624	713	849	962	1080

Time Accessed	27 October 2026 07:31AM
Datasets	Envelope {QRA SEQ IFD (2025), Limb IFD (2020) - BoM Resolution}
Native Baseline	QRA SEQ IFD (2025) scaled from 2010 baseline Limb IFD (2020) - BoM Resolution scaled from 2002 for duration < 1440 or 1961-1990 for duration >= 1440
ΔT	QRA SEQ IFD (2025): -0.7 (from native baseline) 0 (from 1961-1990 baseline) Limb IFD (2020) - BoM Resolution: -0.5 for duration < 1440 or 0 for duration >= 1440 (from native baseline) 0 (from 1961-1990 baseline)
Note	For most designs you should consider how IFD will change over the design life.

Median Preburst Depths and Ratios

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

min (h) \AEP(%)	50.0	20.0	10.0	5.0	2.0	1.0
30 (0.5)	2.5 (0.064)	5.2 (0.104)	6.9 (0.120)	8.3 (0.130)	8.6 (0.117)	8.9 (0.109)
60 (1.0)	3.1 (0.064)	6.8 (0.104)	9.1 (0.120)	11.2 (0.130)	11.6 (0.117)	12.0 (0.109)
90 (1.5)	3.5 (0.063)	13.6 (0.186)	20.1 (0.233)	26.2 (0.264)	18.0 (0.155)	12.1 (0.093)
120 (2.0)	2.5 (0.041)	13.3 (0.168)	20.3 (0.216)	26.9 (0.247)	23.0 (0.179)	20.4 (0.141)
180 (3.0)	4.1 (0.062)	16.0 (0.178)	23.7 (0.222)	31.0 (0.250)	29.5 (0.198)	28.4 (0.168)

min (h) \AEP(%)	50.0	20.0	10.0	5.0	2.0	1.0
360 (6.0)	7.7 (0.097)	19.0 (0.172)	26.4 (0.199)	33.7 (0.215)	61.4 (0.321)	82.5 (0.376)
720 (12.0)	5.5 (0.056)	20.1 (0.144)	29.9 (0.176)	39.4 (0.196)	61.7 (0.249)	78.9 (0.276)
1080 (18.0)	5.1 (0.045)	15.2 (0.093)	21.8 (0.110)	28.2 (0.120)	52.6 (0.182)	71.5 (0.215)
1440 (24.0)	4.7 (0.035)	9.1 (0.048)	12.1 (0.052)	14.9 (0.054)	40.7 (0.120)	60.0 (0.155)
2160 (36.0)	0.0 (0.000)	5.1 (0.023)	8.5 (0.031)	11.8 (0.036)	27.9 (0.069)	39.9 (0.086)
2880 (48.0)	0.0 (0.000)	1.9 (0.008)	3.2 (0.010)	4.4 (0.012)	20.7 (0.046)	32.9 (0.063)
4320 (72.0)	0.0 (0.000)	0.5 (0.002)	0.9 (0.002)	1.2 (0.003)	10.3 (0.020)	17.1 (0.029)

Layer Info

Time Accessed	27 October 2026 07:31AM
Version	2018_v1 (ratios)
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged. The future (2030) baseline default IFD depths were used to calculate the preburst depths. Durations shorter than 60 minutes use the 60 minute preburst ratio applied to the default IFD depth for the duration listed.

Climate Change Adjusted IFD Datasets

BoM IFD Depths (2030 Baseline - SSP1)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	11.0	12.4	13.8	17.0	17.3	20.2	23.1	27.2	30.3	34.1	39.8	44.6	49.4
10 (0.17)	18.0	20.4	22.8	27.8	28.4	32.8	37.5	43.6	48.2	54.2	63.1	70.3	77.9
15 (0.25)	23.0	26.1	28.9	35.4	36.1	41.6	47.6	55.4	61.2	68.7	80.0	89.2	98.9
20 (0.33)	26.6	30.2	33.5	41.0	41.8	48.3	55.4	64.5	71.4	80.3	93.5	104	116
25 (0.42)	29.5	33.4	37.1	45.6	46.6	53.8	61.7	71.9	79.8	89.8	105	117	130
30 (0.5)	31.8	36.1	40.1	49.4	50.3	58.2	67.0	78.3	87.0	98.0	114	127	141

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
45 (0.75)	37.1	42.2	46.8	57.9	59.1	68.6	79.1	93.1	104	117	137	153	170
60 (1.0)	41.0	46.6	51.6	64.1	65.4	76.3	88.3	104	117	132	154	172	192
90 (1.5)	46.1	52.3	58.0	72.5	73.9	86.5	101	120	135	152	178	199	221
120 (2.0)	49.9	56.7	62.9	78.8	80.3	94.4	110	131	149	168	196	219	243
180 (3.0)	56.1	63.9	70.8	89.1	90.9	107	125	152	171	193	225	251	278
270 (4.5)	63.4	72.2	80.2	101	103	122	143	174	197	222	258	288	318
360 (6.0)	69.5	79.4	88.1	112	114	135	159	193	220	247	286	318	352
540 (9.0)	79.9	91.4	101	129	132	157	186	225	257	288	334	372	411
720 (12.0)	88.4	101	113	144	147	175	207	252	289	323	375	417	462
1080 (18.0)	102	118	131	169	173	207	245	299	342	384	446	497	550
1440 (24.0)	114	131	146	189	193	232	276	337	386	436	508	566	628
1800 (30.0)	123	142	158	207	211	254	302	371	426	486	571	642	717
2160 (36.0)	130	152	169	221	227	273	325	401	461	530	625	705	790
2880 (48.0)	143	168	185	245	251	303	363	449	518	599	711	804	905
4320 (72.0)	161	187	208	278	284	345	416	516	597	690	821	931	1050
5760 (96.0)	172	200	222	297	303	370	447	555	645	740	882	1000	1130
7200 (120.0)	178	208	231	308	314	384	464	577	671	767	914	1040	1170
8640 (144.0)	184	212	236	314	320	391	472	586	683	778	928	1050	1180
10080 (168.0)	187	216	240	316	322	392	474	586	683	781	930	1050	1180

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.2 (from native baseline) 1.2 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2030 Baseline - SSP2)

min (h) \AEP(%)	**63.2**	**50.0**	**39.35**	**20.0**	**18.13**	**10.0**	**5.0**	**2.0**	**1.0**	**0.5**	**0.2**	**0.1**	**0.05**
5 (0.08)	11.0	12.4	13.8	17.0	17.4	20.2	23.2	27.3	30.4	34.2	40.0	44.7	49.5
10 (0.17)	18.1	20.5	22.8	27.9	28.5	32.9	37.6	43.8	48.4	54.4	63.3	70.5	78.2
15 (0.25)	23.1	26.1	29.0	35.5	36.2	41.7	47.8	55.6	61.4	68.9	80.3	89.5	99.2
20 (0.33)	26.7	30.3	33.6	41.2	42.0	48.5	55.6	64.7	71.7	80.5	93.8	105	116
25 (0.42)	29.6	33.5	37.2	45.8	46.7	53.9	61.8	72.1	80.1	90.1	105	117	130
30 (0.5)	31.9	36.2	40.2	49.5	50.5	58.4	67.2	78.5	87.3	98.3	115	128	142
45 (0.75)	37.2	42.3	46.9	58.1	59.2	68.8	79.3	93.4	104	118	137	154	170
60 (1.0)	41.2	46.7	51.8	64.3	65.6	76.5	88.6	105	117	132	155	173	193
90 (1.5)	46.2	52.5	58.2	72.7	74.1	86.8	101	120	135	153	178	199	222
120 (2.0)	50.0	56.8	63.1	79.0	80.5	94.6	110	132	149	169	196	220	244
180 (3.0)	56.2	64.0	71.0	89.3	91.1	107	126	152	171	193	225	251	279
270 (4.5)	63.6	72.4	80.4	102	104	122	144	174	198	223	259	288	319
360 (6.0)	69.7	79.5	88.3	112	115	135	160	193	220	247	287	319	353
540 (9.0)	80.1	91.5	102	129	133	157	186	225	258	289	334	372	411
720 (12.0)	88.6	102	113	144	147	175	207	253	289	324	376	418	462

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
1080 (18.0)	103	118	131	170	173	207	246	300	343	384	447	498	551
1440 (24.0)	114	132	146	190	193	232	276	338	387	436	509	567	630
1800 (30.0)	123	143	158	207	212	254	303	372	427	487	572	643	718
2160 (36.0)	131	152	169	222	227	273	326	401	462	531	626	706	792
2880 (48.0)	144	168	185	246	251	304	364	450	519	600	712	805	907
4320 (72.0)	161	188	208	279	284	345	417	517	598	691	823	932	1050
5760 (96.0)	172	201	223	297	304	371	447	556	646	741	884	1000	1130
7200 (120.0)	179	208	231	308	315	385	465	578	672	769	916	1040	1170
8640 (144.0)	184	213	237	315	320	392	473	587	684	780	930	1050	1180
10080 (168.0)	188	216	240	317	322	393	475	587	684	782	931	1060	1180

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.2 (from native baseline) 1.2 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2030 Baseline - SSP3)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	11.0	12.4	13.8	17.0	17.4	20.2	23.2	27.3	30.4	34.2	40.0	44.7	49.6

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
10 (0.17)	18.1	20.5	22.8	27.9	28.5	32.9	37.6	43.8	48.4	54.4	63.3	70.5	78.2
15 (0.25)	23.1	26.2	29.0	35.5	36.2	41.8	47.8	55.6	61.4	69.0	80.4	89.6	99.3
20 (0.33)	26.7	30.3	33.6	41.2	42.0	48.5	55.6	64.7	71.7	80.6	93.8	105	116
25 (0.42)	29.6	33.5	37.3	45.8	46.7	54.0	61.9	72.2	80.1	90.2	105	117	130
30 (0.5)	32.0	36.2	40.2	49.6	50.5	58.5	67.2	78.6	87.3	98.3	115	128	142
45 (0.75)	37.3	42.4	47.0	58.1	59.3	68.9	79.4	93.5	104	118	137	154	170
60 (1.0)	41.2	46.7	51.8	64.4	65.7	76.6	88.6	105	117	133	155	173	193
90 (1.5)	46.2	52.5	58.2	72.7	74.1	86.8	101	120	135	153	179	200	222
120 (2.0)	50.1	56.9	63.1	79.1	80.6	94.7	111	132	149	169	197	220	244
180 (3.0)	56.3	64.1	71.0	89.3	91.2	107	126	152	172	193	225	252	279
270 (4.5)	63.6	72.4	80.4	102	104	122	144	174	198	223	259	289	319
360 (6.0)	69.7	79.6	88.4	112	115	135	160	193	220	247	287	319	353
540 (9.0)	80.1	91.6	102	129	133	157	186	225	258	289	335	373	412
720 (12.0)	88.6	102	113	144	148	175	207	253	290	324	376	418	463
1080 (18.0)	103	118	131	170	173	207	246	300	343	385	447	498	551
1440 (24.0)	114	132	146	190	193	233	276	338	387	437	509	567	630
1800 (30.0)	123	143	158	207	212	255	303	372	427	487	573	643	719
2160 (36.0)	131	153	169	222	227	273	326	402	462	531	626	707	792
2880 (48.0)	144	168	185	246	251	304	364	450	519	600	712	805	907

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
4320 (72.0)	161	188	208	279	284	346	417	517	598	691	823	933	1050
5760 (96.0)	172	201	223	297	304	371	448	556	646	742	884	1000	1130
7200 (120.0)	179	208	231	308	315	385	465	578	673	769	916	1040	1170
8640 (144.0)	184	213	237	315	320	392	473	587	685	780	930	1050	1180
10080 (168.0)	188	216	240	317	323	393	475	587	685	782	931	1060	1180

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.2 (from native baseline) 1.2 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2030 Baseline - SSP5)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	11.1	12.6	14.0	17.3	17.6	20.5	23.5	27.7	30.8	34.6	40.5	45.3	50.2
10 (0.17)	18.3	20.7	23.1	28.3	28.9	33.3	38.1	44.3	49.0	55.1	64.1	71.4	79.2
15 (0.25)	23.4	26.5	29.4	35.9	36.7	42.3	48.4	56.3	62.2	69.9	81.4	90.7	101
20 (0.33)	27.1	30.7	34.0	41.7	42.5	49.1	56.3	65.5	72.6	81.6	95.0	106	118
25 (0.42)	30.0	33.9	37.7	46.4	47.3	54.6	62.7	73.1	81.1	91.3	106	119	132
30 (0.5)	32.3	36.7	40.7	50.2	51.2	59.2	68.1	79.6	88.4	99.6	116	129	144
45 (0.75)	37.7	42.9	47.6	58.8	60.0	69.7	80.4	94.7	106	119	139	156	173

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
60 (1.0)	41.7	47.3	52.5	65.2	66.5	77.5	89.7	106	119	134	157	175	195
90 (1.5)	46.8	53.1	58.9	73.6	75.0	87.8	102	122	137	155	181	202	224
120 (2.0)	50.6	57.5	63.8	79.9	81.4	95.7	112	133	151	171	199	222	247
180 (3.0)	56.8	64.7	71.7	90.2	92.1	108	127	154	173	195	228	254	282
270 (4.5)	64.2	73.1	81.2	103	105	123	145	176	200	225	261	291	322
360 (6.0)	70.3	80.3	89.1	113	116	136	161	195	222	249	289	322	356
540 (9.0)	80.7	92.3	102	130	134	159	188	227	260	291	337	376	415
720 (12.0)	89.3	102	114	145	149	177	209	255	292	326	379	421	466
1080 (18.0)	103	119	132	171	174	209	248	302	345	387	451	502	555
1440 (24.0)	115	133	147	191	194	234	278	340	390	440	513	571	634
1800 (30.0)	124	144	159	209	213	256	305	374	430	490	577	647	724
2160 (36.0)	131	154	170	223	229	275	328	404	465	535	631	711	798
2880 (48.0)	145	169	187	247	253	306	367	453	523	604	717	811	914
4320 (72.0)	162	189	210	281	286	348	420	520	602	696	828	939	1060
5760 (96.0)	173	202	224	299	306	373	451	560	651	747	890	1010	1140
7200 (120.0)	180	210	233	310	317	388	468	582	677	774	922	1050	1180
8640 (144.0)	186	214	239	317	323	394	476	591	689	785	937	1060	1190
10080 (168.0)	189	218	242	319	325	395	478	591	689	788	938	1060	1190

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Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.3 (from native baseline) 1.3 (from 1961-1990 baseline)
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BoM IFD Depths (2050 Baseline - SSP1)

min (h) \AEP(%)	**63.2**	**50.0**	**39.35**	**20.0**	**18.13**	**10.0**	**5.0**	**2.0**	**1.0**	**0.5**	**0.2**	**0.1**	**0.05**
5 (0.08)	11.4	12.8	14.3	17.6	18.0	20.9	24.0	28.3	31.4	35.3	41.3	46.2	51.2
10 (0.17)	18.7	21.2	23.6	28.9	29.5	34.0	38.9	45.3	50.0	56.3	65.4	72.9	80.8
15 (0.25)	23.8	27.0	30.0	36.7	37.4	43.2	49.4	57.5	63.5	71.3	83.0	92.6	103
20 (0.33)	27.6	31.3	34.7	42.6	43.4	50.1	57.5	66.9	74.1	83.3	97.0	108	120
25 (0.42)	30.6	34.6	38.5	47.3	48.3	55.8	64.0	74.6	82.8	93.2	109	121	135
30 (0.5)	33.0	37.4	41.6	51.2	52.2	60.4	69.5	81.2	90.3	102	119	132	147
45 (0.75)	38.5	43.8	48.6	60.0	61.3	71.2	82.1	96.6	108	122	142	159	176
60 (1.0)	42.6	48.3	53.6	66.5	67.9	79.1	91.6	108	121	137	160	179	199
90 (1.5)	47.6	54.1	60.0	75.0	76.4	89.5	104	124	140	158	184	206	229
120 (2.0)	51.5	58.5	64.9	81.4	82.9	97.4	114	136	153	174	202	226	251
180 (3.0)	57.8	65.8	72.9	91.7	93.6	110	129	156	176	198	231	258	287
270 (4.5)	65.1	74.2	82.4	104	106	125	147	179	203	228	265	296	327
360 (6.0)	71.3	81.4	90.4	115	117	138	163	198	225	253	293	327	361
540 (9.0)	81.8	93.6	104	132	136	161	190	230	263	295	342	381	421
720 (12.0)	90.5	104	115	147	151	179	212	258	295	331	384	427	472
1080 (18.0)	105	120	134	173	176	211	250	306	349	392	456	508	562

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
1440 (24.0)	116	134	149	193	197	237	282	344	394	445	518	578	641
1800 (30.0)	125	145	161	211	216	259	308	379	435	496	583	655	732
2160 (36.0)	133	155	172	226	231	278	332	409	470	541	638	719	807
2880 (48.0)	146	171	189	250	256	309	371	458	528	611	725	820	924
4320 (72.0)	164	191	212	284	289	352	425	526	609	704	838	950	1070
5760 (96.0)	175	204	227	303	309	378	456	566	658	755	900	1020	1150
7200 (120.0)	182	212	236	314	321	392	474	589	685	783	933	1060	1200
8640 (144.0)	188	217	241	321	326	399	482	598	697	794	947	1070	1210
10080 (168.0)	191	220	245	323	328	400	484	598	697	797	949	1070	1210

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.4 (from native baseline) 1.4 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2050 Baseline - SSP2)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	11.7	13.2	14.8	18.2	18.5	21.6	24.7	29.1	32.4	36.5	42.6	47.7	52.9
10 (0.17)	19.3	21.8	24.3	29.8	30.4	35.1	40.1	46.7	51.6	58.0	67.5	75.2	83.4

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
15 (0.25)	24.6	27.9	30.9	37.8	38.6	44.5	51.0	59.3	65.5	73.5	85.7	95.5	106
20 (0.33)	28.5	32.3	35.8	43.9	44.8	51.7	59.3	69.0	76.4	85.9	100	112	124
25 (0.42)	31.5	35.7	39.7	48.8	49.8	57.5	66.0	77.0	85.4	96.1	112	125	139
30 (0.5)	34.1	38.6	42.9	52.9	53.9	62.3	71.7	83.8	93.1	105	122	136	151
45 (0.75)	39.7	45.2	50.1	61.9	63.2	73.4	84.6	99.7	111	126	146	164	182
60 (1.0)	43.9	49.8	55.3	68.6	70.0	81.6	94.5	112	125	141	165	184	206
90 (1.5)	49.0	55.7	61.8	77.1	78.6	92.1	107	128	144	162	189	212	235
120 (2.0)	52.9	60.1	66.7	83.6	85.1	100	117	139	158	178	208	232	258
180 (3.0)	59.2	67.4	74.7	94.0	95.9	113	132	160	181	203	237	265	294
270 (4.5)	66.6	75.9	84.3	106	109	128	151	183	208	234	272	302	334
360 (6.0)	72.9	83.2	92.4	117	120	141	167	202	230	259	300	334	369
540 (9.0)	83.5	95.5	106	135	138	164	194	235	269	301	349	388	429
720 (12.0)	92.2	106	118	150	153	182	216	263	301	337	391	435	481
1080 (18.0)	106	122	136	176	180	215	255	311	356	399	464	517	572
1440 (24.0)	118	136	151	197	200	241	286	350	401	452	527	588	652
1800 (30.0)	127	148	164	215	219	264	314	385	442	505	593	666	744
2160 (36.0)	135	158	175	230	235	283	338	416	478	550	649	732	821
2880 (48.0)	149	174	192	255	260	315	377	466	538	622	738	834	940
4320 (72.0)	167	194	216	289	294	358	432	535	619	716	852	966	1090

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5760 (96.0)	178	208	231	308	315	384	464	576	669	768	916	1040	1170
7200 (120.0)	185	216	240	319	326	399	482	599	697	797	949	1080	1220
8640 (144.0)	191	220	245	326	332	406	490	608	709	808	964	1090	1230
10080 (168.0)	194	224	249	328	334	407	492	608	709	810	965	1090	1230

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.7 (from native baseline) 1.7 (from 1961-1990 baseline)
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BoM IFD Depths (2050 Baseline - SSP3)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	12.0	13.5	15.1	18.6	18.9	22.0	25.3	29.8	33.1	37.3	43.6	48.7	54.0
10 (0.17)	19.7	22.3	24.9	30.4	31.1	35.8	41.0	47.7	52.7	59.3	69.0	76.8	85.2
15 (0.25)	25.1	28.5	31.6	38.7	39.4	45.5	52.1	60.6	66.9	75.2	87.5	97.6	108
20 (0.33)	29.1	33.0	36.6	44.9	45.8	52.9	60.6	70.5	78.1	87.8	102	114	126
25 (0.42)	32.2	36.5	40.6	49.9	50.9	58.8	67.4	78.6	87.3	98.2	114	128	142
30 (0.5)	34.8	39.4	43.8	54.0	55.0	63.7	73.2	85.6	95.1	107	125	139	155
45 (0.75)	40.6	46.2	51.2	63.3	64.6	75.0	86.5	102	114	128	150	168	186
60 (1.0)	44.9	50.9	56.5	70.1	71.5	83.4	96.6	114	128	144	169	188	210

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
90 (1.5)	50.0	56.8	63.0	78.7	80.2	93.9	109	130	146	165	193	216	240
120 (2.0)	53.9	61.2	68.0	85.1	86.8	102	119	142	161	182	212	236	263
180 (3.0)	60.3	68.6	76.1	95.6	97.6	115	135	163	184	207	241	269	299
270 (4.5)	67.7	77.1	85.7	108	110	130	153	186	211	237	276	307	340
360 (6.0)	74.0	84.5	93.8	119	122	143	169	205	234	262	304	339	375
540 (9.0)	84.7	96.8	107	137	140	166	197	238	272	305	354	394	435
720 (12.0)	93.4	107	119	152	156	185	219	267	305	341	396	441	488
1080 (18.0)	108	124	138	178	182	218	258	315	360	404	470	523	579
1440 (24.0)	120	138	153	199	202	244	290	354	406	458	534	595	660
1800 (30.0)	129	150	166	217	222	267	317	390	447	511	600	674	753
2160 (36.0)	137	160	177	232	238	286	342	421	484	557	657	741	830
2880 (48.0)	151	176	194	258	263	319	382	472	544	629	746	844	951
4320 (72.0)	169	197	219	292	298	362	437	542	627	725	863	978	1100
5760 (96.0)	181	210	233	312	319	389	469	583	677	777	927	1050	1180
7200 (120.0)	187	219	243	323	330	404	488	606	705	806	960	1090	1230
8640 (144.0)	193	223	248	330	336	411	496	615	718	818	975	1100	1240
10080 (168.0)	197	227	252	332	338	412	498	615	718	820	976	1110	1240

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline

ΔT	1.8 (from native baseline) 1.8 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2050 Baseline - SSP5)

min (h) \AEP(%)	**63.2**	**50.0**	**39.35**	**20.0**	**18.13**	**10.0**	**5.0**	**2.0**	**1.0**	**0.5**	**0.2**	**0.1**	**0.05**
5 (0.08)	12.4	14.0	15.6	19.2	19.6	22.8	26.2	30.8	34.3	38.6	45.1	50.4	55.9
10 (0.17)	20.4	23.1	25.8	31.5	32.2	37.1	42.4	49.4	54.6	61.4	71.4	79.5	88.2
15 (0.25)	26.0	29.5	32.7	40.0	40.8	47.1	53.9	62.7	69.3	77.8	90.6	101	112
20 (0.33)	30.2	34.2	37.9	46.4	47.4	54.7	62.7	73.0	80.9	90.9	106	118	131
25 (0.42)	33.4	37.8	42.0	51.6	52.7	60.9	69.8	81.4	90.3	102	119	132	147
30 (0.5)	36.0	40.8	45.4	55.9	57.0	65.9	75.8	88.6	98.5	111	129	144	160
45 (0.75)	42.0	47.8	53.0	65.5	66.9	77.7	89.5	105	118	133	155	173	192
60 (1.0)	46.4	52.7	58.5	72.6	74.1	86.3	100	118	132	149	175	195	218
90 (1.5)	51.6	58.7	65.0	81.2	82.8	97.0	113	134	151	171	199	223	248
120 (2.0)	55.5	63.1	70.0	87.7	89.4	105	123	146	165	187	218	244	271
180 (3.0)	61.9	70.5	78.2	98.3	100	118	138	167	189	213	248	277	307
270 (4.5)	69.5	79.1	87.9	111	113	133	157	190	216	243	283	315	349
360 (6.0)	75.8	86.5	96.1	122	125	147	174	210	240	269	312	347	384
540 (9.0)	86.6	99.0	110	140	144	170	201	244	279	312	362	403	445
720 (12.0)	95.5	109	122	155	159	189	223	272	312	349	405	450	498
1080 (18.0)	110	126	141	182	185	222	263	321	367	412	480	534	591

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
1440 (24.0)	122	141	156	203	206	249	295	361	414	467	544	606	673
1800 (30.0)	131	152	169	222	226	272	324	397	456	520	612	687	768
2160 (36.0)	139	163	181	237	243	292	348	429	494	567	669	755	846
2880 (48.0)	154	179	198	263	268	325	389	481	554	641	761	860	969
4320 (72.0)	172	200	223	298	304	369	445	552	639	739	879	996	1120
5760 (96.0)	184	215	238	318	325	396	478	594	690	792	945	1070	1210
7200 (120.0)	191	223	247	329	336	411	497	618	719	822	979	1110	1250
8640 (144.0)	197	227	253	336	342	418	505	627	731	833	994	1130	1270
10080 (168.0)	200	231	257	339	345	420	508	627	731	836	995	1130	1270

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	2.1 (from native baseline) 2.1 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2090 Baseline - SSP1)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	11.4	12.9	14.4	17.7	18.1	21.0	24.1	28.4	31.6	35.5	41.5	46.5	51.5
10 (0.17)	18.8	21.3	23.7	29.0	29.6	34.2	39.1	45.5	50.3	56.5	65.7	73.2	81.2

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
15 (0.25)	24.0	27.2	30.1	36.9	37.6	43.4	49.6	57.8	63.8	71.6	83.4	93.0	103
20 (0.33)	27.8	31.5	34.9	42.8	43.6	50.4	57.8	67.2	74.5	83.7	97.5	109	121
25 (0.42)	30.7	34.8	38.7	47.6	48.5	56.0	64.3	75.0	83.2	93.6	109	122	135
30 (0.5)	33.2	37.6	41.8	51.5	52.5	60.7	69.8	81.6	90.7	102	119	133	147
45 (0.75)	38.7	44.0	48.8	60.3	61.6	71.5	82.5	97.1	108	122	143	160	177
60 (1.0)	42.8	48.5	53.8	66.9	68.2	79.5	92.0	109	122	138	161	179	200
90 (1.5)	47.9	54.4	60.3	75.3	76.7	89.9	105	124	140	158	185	207	230
120 (2.0)	51.7	58.8	65.2	81.7	83.3	97.8	114	136	154	174	203	227	252
180 (3.0)	58.0	66.0	73.2	92.1	94.0	111	130	157	177	199	232	259	288
270 (4.5)	65.4	74.5	82.7	104	107	126	148	179	204	229	266	297	328
360 (6.0)	71.6	81.7	90.7	115	118	138	164	198	226	254	294	328	362
540 (9.0)	82.1	93.9	104	133	136	161	191	231	264	296	343	382	422
720 (12.0)	90.7	104	116	148	151	179	212	259	296	332	385	428	474
1080 (18.0)	105	121	134	173	177	212	251	306	350	393	457	509	563
1440 (24.0)	117	134	149	194	197	237	282	345	395	446	520	579	643
1800 (30.0)	125	146	161	212	216	260	309	380	436	497	585	656	734
2160 (36.0)	133	156	173	226	232	279	333	410	472	542	640	721	809
2880 (48.0)	147	171	189	251	257	310	372	459	530	613	727	822	926
4320 (72.0)	165	192	213	285	290	353	426	528	611	706	840	952	1070

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5760 (96.0)	176	205	227	304	310	379	457	568	660	757	903	1020	1150
7200 (120.0)	183	213	236	315	322	393	475	590	687	785	935	1060	1200
8640 (144.0)	188	217	242	322	327	400	483	599	699	796	950	1080	1210
10080 (168.0)	192	221	245	324	329	401	485	599	699	799	951	1080	1210

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	1.5 (from native baseline) 1.5 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2090 Baseline - SSP2)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	12.9	14.6	16.3	20.0	20.5	23.8	27.3	32.2	35.8	40.2	47.0	52.6	58.3
10 (0.17)	21.3	24.1	26.9	32.9	33.5	38.7	44.3	51.5	56.9	64.0	74.5	83.0	92.0
15 (0.25)	27.1	30.8	34.1	41.8	42.6	49.1	56.2	65.4	72.2	81.2	94.5	105	117
20 (0.33)	31.5	35.6	39.5	48.4	49.4	57.1	65.4	76.1	84.4	94.8	110	123	137
25 (0.42)	34.8	39.4	43.8	53.9	55.0	63.5	72.8	84.9	94.2	106	124	138	153
30 (0.5)	37.6	42.6	47.3	58.3	59.4	68.8	79.1	92.4	103	116	135	150	167
45 (0.75)	43.8	49.8	55.3	68.3	69.7	81.0	93.4	110	123	139	161	181	200
60 (1.0)	48.4	55.0	61.0	75.7	77.3	90.1	104	123	138	156	182	203	227

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
90 (1.5)	53.7	61.0	67.6	84.4	86.0	101	117	140	157	178	207	232	257
120 (2.0)	57.6	65.4	72.6	91.0	92.7	109	127	152	172	194	226	253	281
180 (3.0)	64.1	72.9	80.9	102	104	122	143	173	195	220	257	286	318
270 (4.5)	71.6	81.6	90.6	114	117	138	162	196	223	251	292	325	359
360 (6.0)	78.0	89.1	98.9	125	128	151	179	216	247	277	321	357	395
540 (9.0)	89.0	102	113	144	148	175	207	250	286	321	372	414	457
720 (12.0)	98.0	112	125	159	163	194	229	280	320	358	416	462	511
1080 (18.0)	113	130	144	186	190	228	270	329	376	422	491	547	605
1440 (24.0)	125	144	160	208	211	254	302	370	424	478	557	620	689
1800 (30.0)	134	156	173	227	232	278	331	407	467	533	626	703	786
2160 (36.0)	143	167	185	242	248	299	356	439	505	581	685	773	866
2880 (48.0)	157	184	203	269	275	332	398	492	567	656	779	881	992
4320 (72.0)	176	205	228	305	311	378	456	565	654	756	900	1020	1150
5760 (96.0)	188	220	244	325	332	406	490	608	707	811	967	1100	1240
7200 (120.0)	196	228	253	337	344	421	509	632	735	841	1000	1130	1280
8640 (144.0)	202	233	259	344	350	428	517	642	749	853	1020	1150	1300
10080 (168.0)	205	236	263	347	353	430	519	642	749	855	1020	1150	1300

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline

ΔT	2.4 (from native baseline) 2.4 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2090 Baseline - SSP3)

min (h) \AEP(%)	**63.2**	**50.0**	**39.35**	**20.0**	**18.13**	**10.0**	**5.0**	**2.0**	**1.0**	**0.5**	**0.2**	**0.1**	**0.05**
5 (0.08)	14.7	16.6	18.5	22.8	23.3	27.1	31.0	36.6	40.7	45.7	53.5	59.8	66.3
10 (0.17)	24.2	27.4	30.5	37.3	38.1	44.0	50.3	58.6	64.7	72.8	84.7	94.3	105
15 (0.25)	30.9	35.0	38.8	47.5	48.4	55.9	63.9	74.4	82.1	92.3	107	120	133
20 (0.33)	35.8	40.5	44.9	55.1	56.2	64.9	74.4	86.6	95.9	108	125	140	155
25 (0.42)	39.6	44.8	49.8	61.2	62.5	72.2	82.8	96.5	107	121	141	157	174
30 (0.5)	42.7	48.4	53.8	66.3	67.6	78.2	89.9	105	117	132	153	171	190
45 (0.75)	49.8	56.7	62.8	77.7	79.3	92.1	106	125	140	157	184	206	228
60 (1.0)	55.1	62.5	69.3	86.1	87.8	102	119	140	157	177	207	231	258
90 (1.5)	60.4	68.6	76.1	95.0	96.8	113	132	157	177	200	233	261	290
120 (2.0)	64.3	73.1	81.1	102	104	122	142	169	192	217	252	282	313
180 (3.0)	71.0	80.8	89.6	113	115	135	159	192	216	244	284	317	352
270 (4.5)	78.7	89.6	99.6	126	128	151	178	216	245	276	321	357	395
360 (6.0)	85.3	97.4	108	137	140	165	195	237	270	303	351	391	432
540 (9.0)	96.7	111	123	156	160	190	225	272	311	349	404	450	497
720 (12.0)	106	122	135	173	177	210	248	303	346	388	450	500	553
1080 (18.0)	121	139	155	201	205	245	291	354	405	455	529	589	652

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
1440 (24.0)	134	155	171	223	227	273	324	397	455	512	597	666	739
1800 (30.0)	144	167	185	243	248	299	355	436	501	572	672	755	843
2160 (36.0)	153	179	198	260	267	321	382	471	542	623	735	829	930
2880 (48.0)	169	197	218	288	295	357	427	528	609	704	836	945	1060
4320 (72.0)	189	220	245	327	333	406	489	606	702	811	966	1090	1230
5760 (96.0)	202	236	261	349	357	435	525	653	758	870	1040	1180	1330
7200 (120.0)	210	245	272	362	370	452	546	679	789	903	1080	1220	1380
8640 (144.0)	216	250	278	370	376	460	555	689	803	915	1090	1240	1390
10080 (168.0)	220	254	282	372	379	461	558	689	803	918	1090	1240	1390

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	3.3 (from native baseline) 3.3 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

BoM IFD Depths (2090 Baseline - SSP5)

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5 (0.08)	16.4	18.5	20.6	25.4	25.9	30.2	34.6	40.7	45.3	51.0	59.6	66.7	73.9
10 (0.17)	27.0	30.5	34.0	41.6	42.5	49.0	56.1	65.3	72.1	81.1	94.4	105	117

min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
15 (0.25)	34.4	39.0	43.2	52.9	54.0	62.3	71.3	82.9	91.5	103	120	134	148
20 (0.33)	39.9	45.2	50.1	61.4	62.6	72.3	82.9	96.5	107	120	140	156	173
25 (0.42)	44.1	49.9	55.6	68.3	69.7	80.4	92.2	108	119	134	157	175	194
30 (0.5)	47.6	54.0	60.0	73.9	75.3	87.1	100	117	130	147	171	190	212
45 (0.75)	55.6	63.1	70.0	86.6	88.4	103	118	139	156	175	205	229	254
60 (1.0)	61.4	69.7	77.3	95.9	97.9	114	132	156	175	198	231	258	287
90 (1.5)	66.7	75.8	84.0	105	107	125	146	173	195	221	258	288	320
120 (2.0)	70.6	80.2	89.0	112	114	134	156	186	210	238	277	310	344
180 (3.0)	77.4	88.1	97.7	123	125	148	173	209	236	266	310	346	384
270 (4.5)	85.2	97.1	108	136	139	164	193	234	265	299	347	387	428
360 (6.0)	92.0	105	117	148	151	178	211	255	291	326	378	421	466
540 (9.0)	104	119	132	168	172	204	241	292	334	374	434	483	533
720 (12.0)	113	130	145	184	189	224	265	324	370	414	481	535	592
1080 (18.0)	129	148	165	214	218	261	309	377	431	484	563	627	694
1440 (24.0)	142	164	182	236	241	290	344	421	482	544	634	707	785
1800 (30.0)	153	178	197	258	264	317	377	463	532	607	713	801	895
2160 (36.0)	163	190	210	276	283	340	406	500	575	662	780	880	987
2880 (48.0)	179	209	231	306	313	379	454	560	646	748	887	1000	1130
4320 (72.0)	201	234	260	347	354	431	519	644	745	861	1030	1160	1310

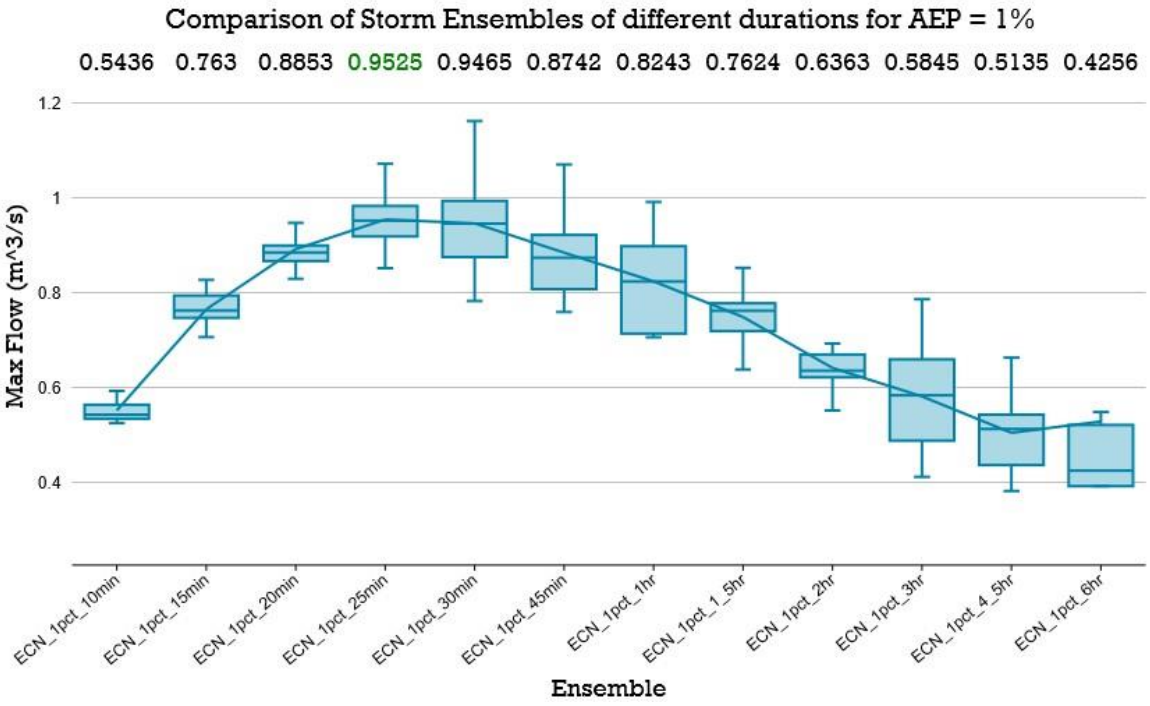
min (h) \AEP(%)	63.2	50.0	39.35	20.0	18.13	10.0	5.0	2.0	1.0	0.5	0.2	0.1	0.05
5760 (96.0)	215	250	277	370	379	462	558	693	805	924	1100	1250	1410
7200 (120.0)	223	260	288	384	392	480	580	720	838	958	1140	1290	1460
8640 (144.0)	230	265	295	392	399	488	589	731	853	972	1160	1310	1480
10080 (168.0)	234	269	299	395	402	489	592	731	853	975	1160	1310	1480

Time Accessed	27 October 2026 07:31AM
Native Baseline	Scaled from 1961-1990 baseline
ΔT	4.1 (from native baseline) 4.1 (from 1961-1990 baseline)
Note	Adjusted from the native baseline in line with ARR V4.2 Book 1 Chapter 6. Adapted from BoM IFD data. Used under CC BY 4.0. See About page for full attribution.

Appendix F

1 % AEP Box and Whisker Plots for Modelled Durations

Catchment 1 (Site)



Appendix G

Rational Method Model Validation

The Rational Method has been relied upon to validate the flows reported within *xpstorm* for both the pre and post development cases. In accordance with QUDM 2016 Section 4, the Rational Method provides a simple means of estimating peak discharge and is therefore considered suitable for validation purposes. Equation 4.2 from QUDM has been relied upon.

$$Q_y = (C_y \,.\, {}^{t}I_y \,.\, A)/360$$

where:

Q_y	=	peak flow rate (m^3/s) for annual exceedance probability (AEP) of 1 in '*y*' years
C_y	=	coefficient of discharge for AEP of 1 in '*y*' years
A	=	area of catchment (ha)
${}^{t}I_i$	=	average rainfall intensity (mm/h) for a design duration of '*t*' hours and an AEP of 1 in '*y*' years
t	=	the nominal design storm duration as defined by the time of concentration (t)

Coefficient of Discharge

Based on the infiltration characteristics of the internal and external catchments, the following discharge coefficients have been calculated using the method presented within Book 8 of Australian Rainfall and Runoff (1998) and based on Equation 4.3 from QUDM (2016).

$$C_y = F_y \,.\, C_{10}$$

where:

C_y	=	coefficient of discharge for AEP of 1 in '*y*' years
F_y	=	frequency factor for AEP of 1 in '*y*' years
C_{10}	=	10 year discharge coefficient value for Tables 4.5.3 and 4.5.4 of QUDM

Fraction impervious (f_i) values for the existing and developed catchments were derived from aerial photography, survey and development plans, respectively. Using these values, and the local ${}^{1}I_{10}$ (1 hour rainfall intensity for the 10 year ARI) value sourced from BOM, the C_{10} for each catchment was determined and utilised to calculate the runoff coefficients for each nominated event. The fraction impervious and coefficient of discharge values for the nominated AEP's for the existing case and developed case are contained within Tables G.1 and G.2, respectively.

Table G.1 Coefficient of Discharge – Existing Case

Catchment ID		f_i	C_2	C_5	C_{10}	C_{20}	C_{50}	C_{100}
Internal	1	0.10	0.61	0.68	0.72	0.76	0.83	0.86

Table G.2 Coefficient of Discharge – Developed Case

Catchment ID		f_i	C_2	C_5	C_{10}	C_{20}	C_{50}	C_{100}
Internal	1	0.70	0.71	0.80	0.84	0.88	0.97	1.00

Time of Concentration

The time of concentration (t_c) for each catchment was calculated in accordance with Section 4.6 of QUDM (2016).

A standard inlet time of concentration of 5 min has been adopted within the relevant developed catchments as per Table 4.6.2 of QUDM.

The time of concentration (t_c) for the overland flow length within the undeveloped catchments and the relevant developed catchments was estimated using Friend's Equation for overland flow (QUDM Section 4.6.6).

$$t_c = (107nL^{0.333})/S^{0.2}$$

where:

t_c	=	Time of concentration (min)
n	=	Horton's roughness value (estimated using QUDM Table 4.6.5)
L	=	Overland sheet flow path length (m)
S	=	Slope (%)

For channel flow, times where estimated using Manning's equation as provided in the Technical notes for Figure 4.6 of QUDM, shown below:

$$t_c = 0.025L/S^{0.5}$$

where:

t_c	=	Time of concentration (min)
L	=	Length of gutter flow (m)
S	=	Slope (%)

Tables G.3 and G.4 below present the parameters relied upon to calculate the time of concentration (t_c) to the discharge point of each catchment (site's PD) for the existing and developed case, respectively.

Table G.3 t_c Parameters – Existing Case

Parameter	Internal
	1
Standard Inlet Time	
t_c (min)	-
Sheet Flow	
Flow Length (m)	120
Horton's Roughness Value	0.04
Slope (%)	2.0
t_c (min)	18.3
TOTAL t_c (min)	**18.3**

Table G.4 t_c Parameters – Developed Case

Parameter	Internal
	2a
Standard Inlet Time	
t_c (min)	5
Pipe Flow	
Flow Length (m)	260
Velocity (m/s)	1.0
Slope (%)	1.0
t_c (min)	4.3
TOTAL t_c (min)	**9.3**

Rainfall Intensity

Based on the calculated t_c for each catchment, Intensity-Frequency-Duration data (IFD) has been obtained from the Bureau of Meteorology for nominated AEP's and the existing and

developed cases are presented in Tables G.5 and G.6, respectively. It is noted that IFD data has been adjusted to account for climate change (refer to Section 3.3)

Table G.5 Rainfall Intensity (mm/h) – Existing Case

Catchment ID		I_2	I_5	I_{10}	I_{20}	I_{50}	I_{100}
Internal	1	109.1	131.7	146.5	163.2	189.9	210.1

Table G.6 Rainfall Intensity (mm/h)– Developed Case

Catchment ID		I_2	I_5	I_{10}	I_{20}	I_{50}	I_{100}
Internal	1	142.9	170.1	189.9	217.1	253.0	280.0

Peak Discharge

Based on the above parameters, estimates of the expected peak discharge generated for the site's existing and developed catchments for nominated AEP's have been calculated, and are presented in Tables G.7 and G.8, respectively.

Table G.7 Peak Discharge (m^3/s) – Existing Case

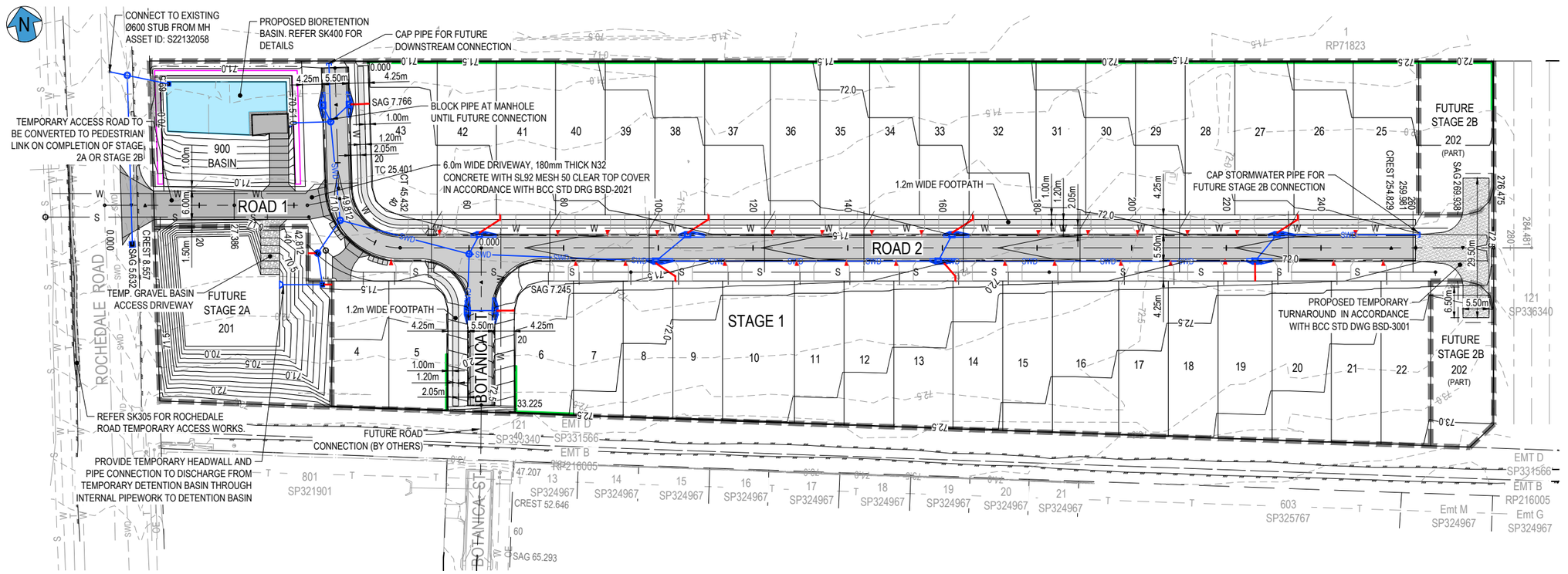
Catchment ID		Annual Exceedance Probability (AEP)					
		39.3% (2 yr ARI)	18.1% (5 yr ARI)	9.5% (10 yr ARI)	4.9% (20 yr ARI)	2% (50 yr ARI)	1% (100 yr ARI)
Internal	1	0.40	0.54	0.63	0.73	0.93	1.08

Table G.8 Peak Discharge (m^3/s) – Developed Case

Catchment ID		Annual Exceedance Probability (AEP)					
		39.3% (2 yr ARI)	18.1% (5 yr ARI)	9.5% (10 yr ARI)	4.9% (20 yr ARI)	2% (50 yr ARI)	1% (100 yr ARI)
Internal	1	0.61	0.81	0.95	1.14	1.45	1.66

Appendix H

Basin Design Drawings (by Civil360)



LAYOUT STAGE 1

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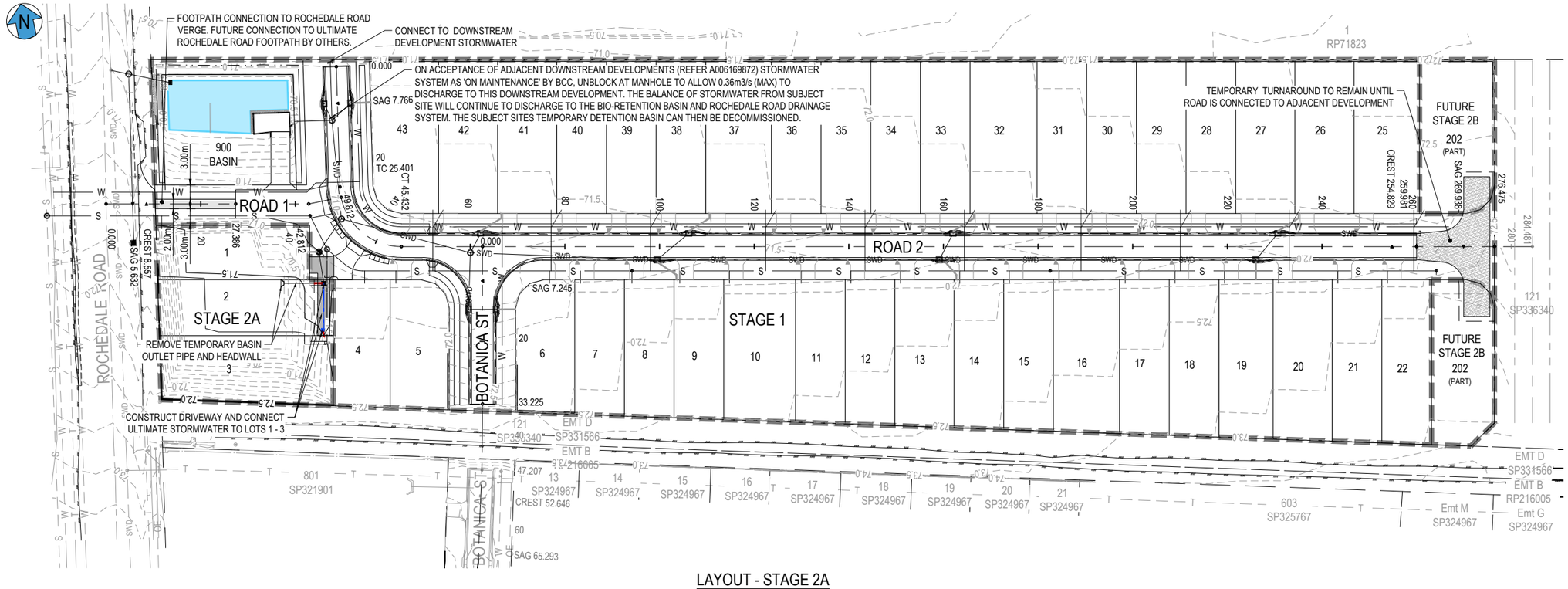

LAYOUT - STAGE 2A

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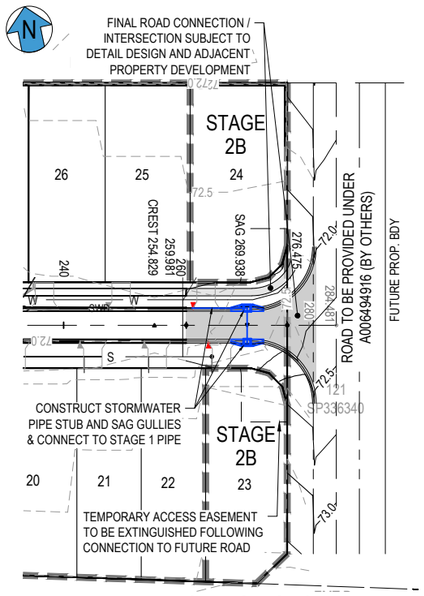

LAYOUT - STAGE 2B

SCALE 1:500

LEGEND

- 73.0 — FINISHED SURFACE CONTOURS
- STAGE BOUNDARY
- PROPOSED SLEEPER RETAINING WALL
- PROPOSED CONCRETE SLEEPER RETAINING WALL
- SWD — PROPOSED STORMWATER
- PROPOSED KERB & CHANNEL
- PROPOSED EDGE OF BITUMEN
- PROPOSED CIVIL PAVEMENT
- PROPOSED DRIVEWAY
- PROPOSED FOOTPATH
- INDICATIVE DRIVEWAY (BY OTHERS)
- PROPOSED Ø150 ROOFWATER CONNECTION TO STORMWATER PIT
- BCC KERB ADAPTOR AND 125 x 75 RHS ACROSS FULL VERGE (BSD-8114)
- S — PROPOSED SEWER MAIN
- W — PROPOSED WATER MAIN
- PROPOSED EASEMENT
- ADJACENT BOUNDARY
- 77.0 — EXISTING SURFACE CONTOURS (0.5m INTERVAL)
- SWD — EXISTING STOMWATER DRAINAGE
- W — EXISTING WATER
- S — EXISTING SEWER
- OE — EXISTING ELECTRICITY OVERHEAD
- E — EXISTING UNDERGROUND ELECTRICITY
- T — EXISTING TELSTRA
- EXISTING EDGE OF BITUMEN
- EXISTING FENCE
- EXISTING KERB

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C	PRELIMINARY ISSUE	AS	MT	10.11.26
D	ISSUE FOR APPROVAL	AS	MT	12.11.26

SCALE
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STATUS: ISSUE FOR APPROVAL

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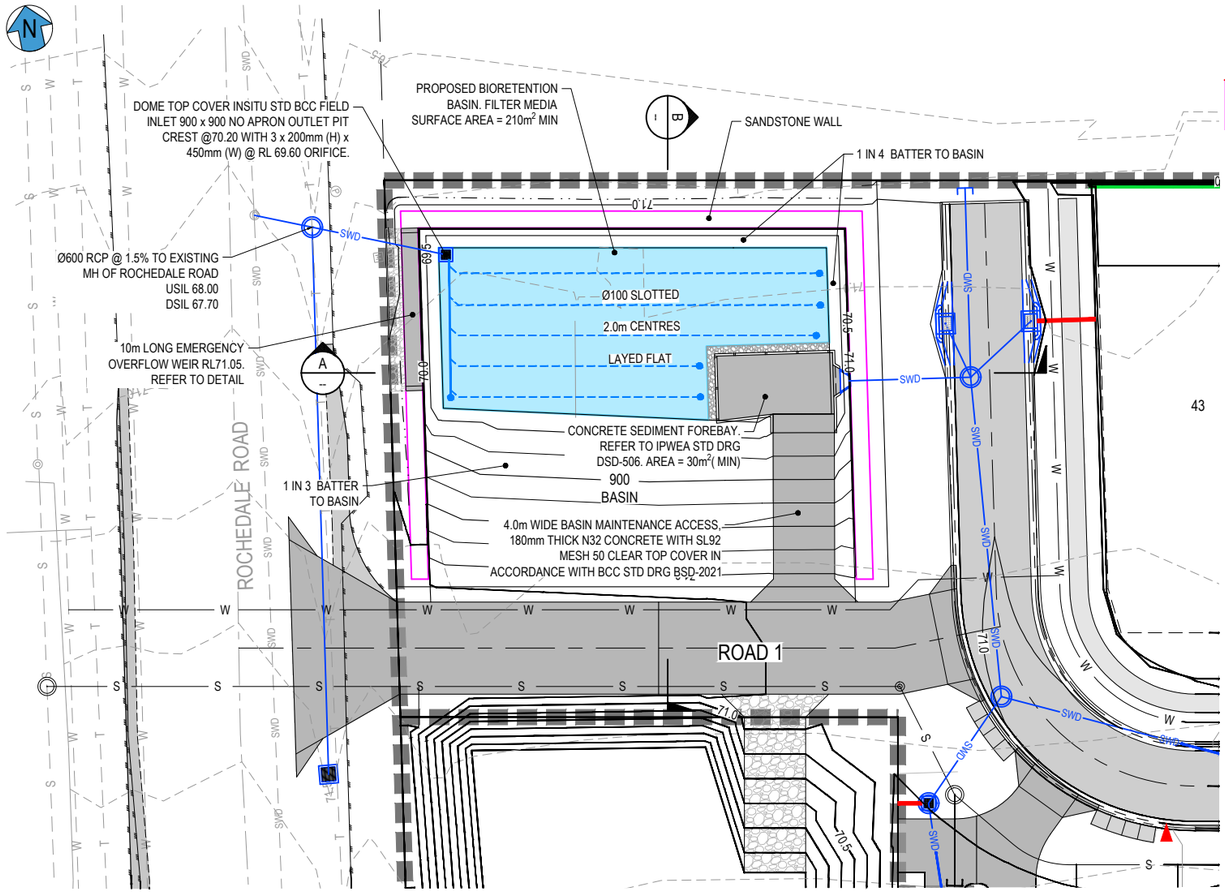
2026083	SK300	D



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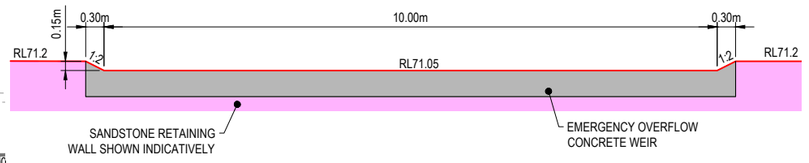
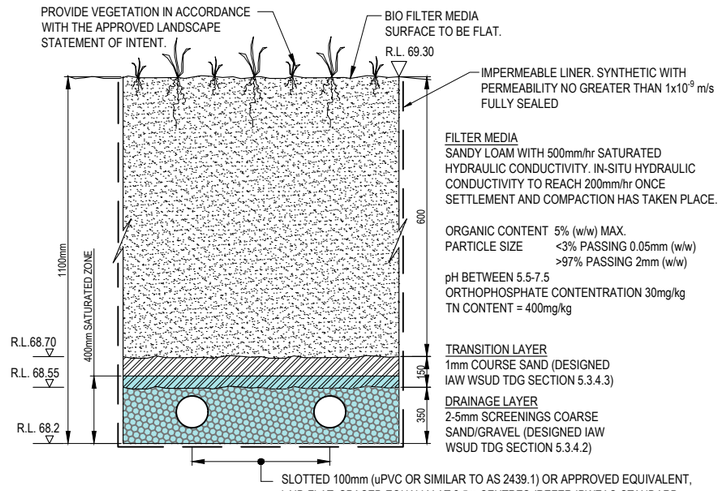


DETENTION BASIN EMERGENCY OVERFLOW WEIR TYPICAL SECTION
SCALE 1:50

LEGEND

- 73.0 — DESIGN SURFACE CONTOURS (0.25m INTERVAL)
- PROPOSED CONCRETE SLEEPER RETAINING WALL
- PROPOSED CONCRETE SLEEPER RETAINING WALL
- SWD — PROPOSED STORMWATER
- PROPOSED KERB & CHANNEL
- PROPOSED CIVIL PAVEMENT
- PROPOSED DRIVEWAY
- PROPOSED FOOTPATH
- SUB-SOIL DRAIN AND FLUSHING POINT
- S — PROPOSED SEWER MAIN
- W — PROPOSED WATER MAIN
- PROPOSED EASEMENT
- ADJACENT BOUNDARY
- 77.0 — EXISTING SURFACE CONTOURS (0.25m INTERVAL)
- SWD — EXISTING STOMWATER DRAINAGE
- EXISTING KERB

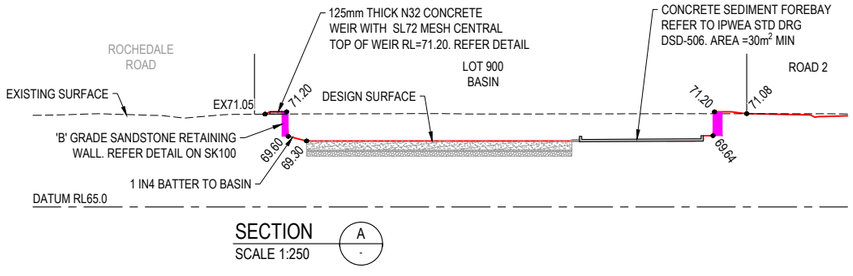


TYPICAL BIORETENTION (TYPE 1 SATURATED) MEDIA CROSS SECTION
N.T.S.

NOTE:
BIO-RETENTION LAYER DESIGN IS TO BE IN ACCORDANCE WITH WSUD BIORETENTION TECHNICAL DESIGN GUIDELINES

BIO-RETENTION BASIN
SURFACE LEVEL: RL. 69.30
FILTER MEDIA SURFACE AREA (MIN) = 210m²
TOP OF BUND: RL. 71.20

DETENTION - INTERIM STAGE 1
MIN STORAGE VOLUME = 481m3 EXCLUDES 300mm BIO-BASIN EXTENDED DETENTION DEPTH.



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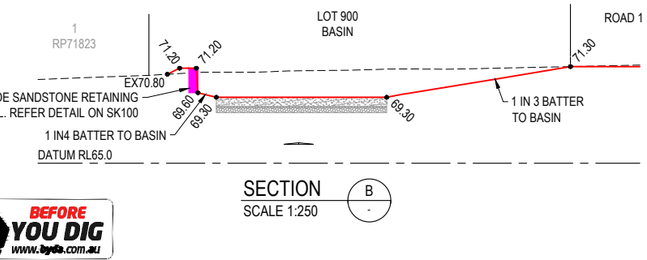

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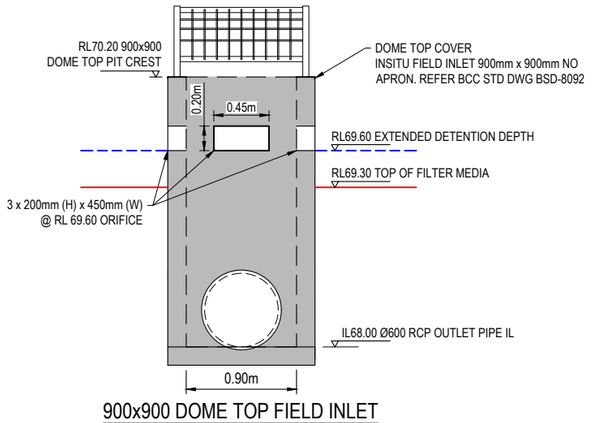

900x900 DOME TOP FIELD INLET
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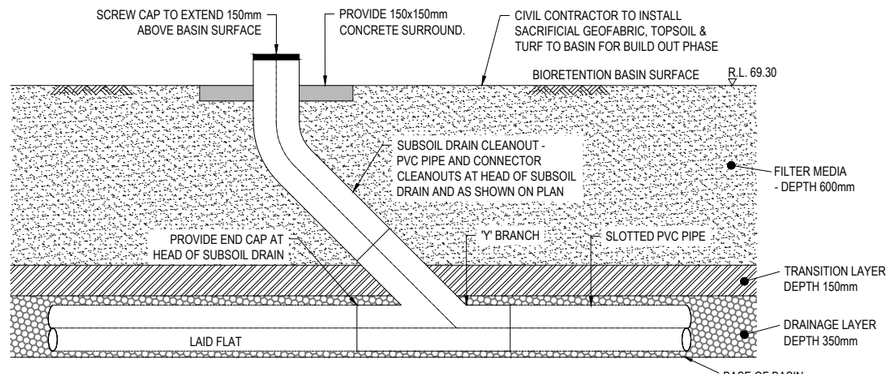

BIORETENTION BASIN SUBSOIL DRAIN CLEANOUT
N.T.S.

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SCALE
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1 : 400 A3

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