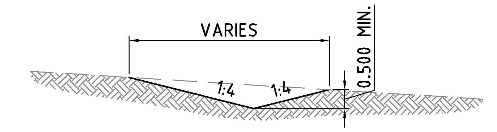
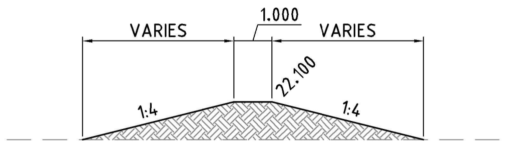
PLOT DATE: 25/11/2019 10:24:03 AM   DRAWING LOCATION: S:\PROJECT RECORDS\19-20\032-19-20\00 CIVIL DESIGN\DWG\SHEET SET\SHEETS\9001 - STORMWATER MANAGEMENT.DWG

LEGEND

- EXISTING BITUMEN SURFACE
- EXISTING SWALE
- EXISTING CHANGE OF GRADE
- PROPERTY FENCE
- EXISTING OVERHEAD POWER LINES
- PROPOSED TOP OF BATTER
- PROPOSED OPEN CHANNEL
- PROPOSED CHANGE OF GRADE
- PROPOSED 175 THK. CONCRETE SLAB WITH SL92 REINFORCEMENT CENTRALLY PLACED
- PROPOSED UNSEALED PAVEMENT 300mm T2.5 ROAD BASE



DIVERSION DRAIN - TYPICAL SECTION
SCALE: 1:100(A1) 1:200(A3)



BUND - TYPICAL SECTION
SCALE: 1:100(A1) 1:200(A3)

ROCKHAMPTON REGIONAL COUNCIL

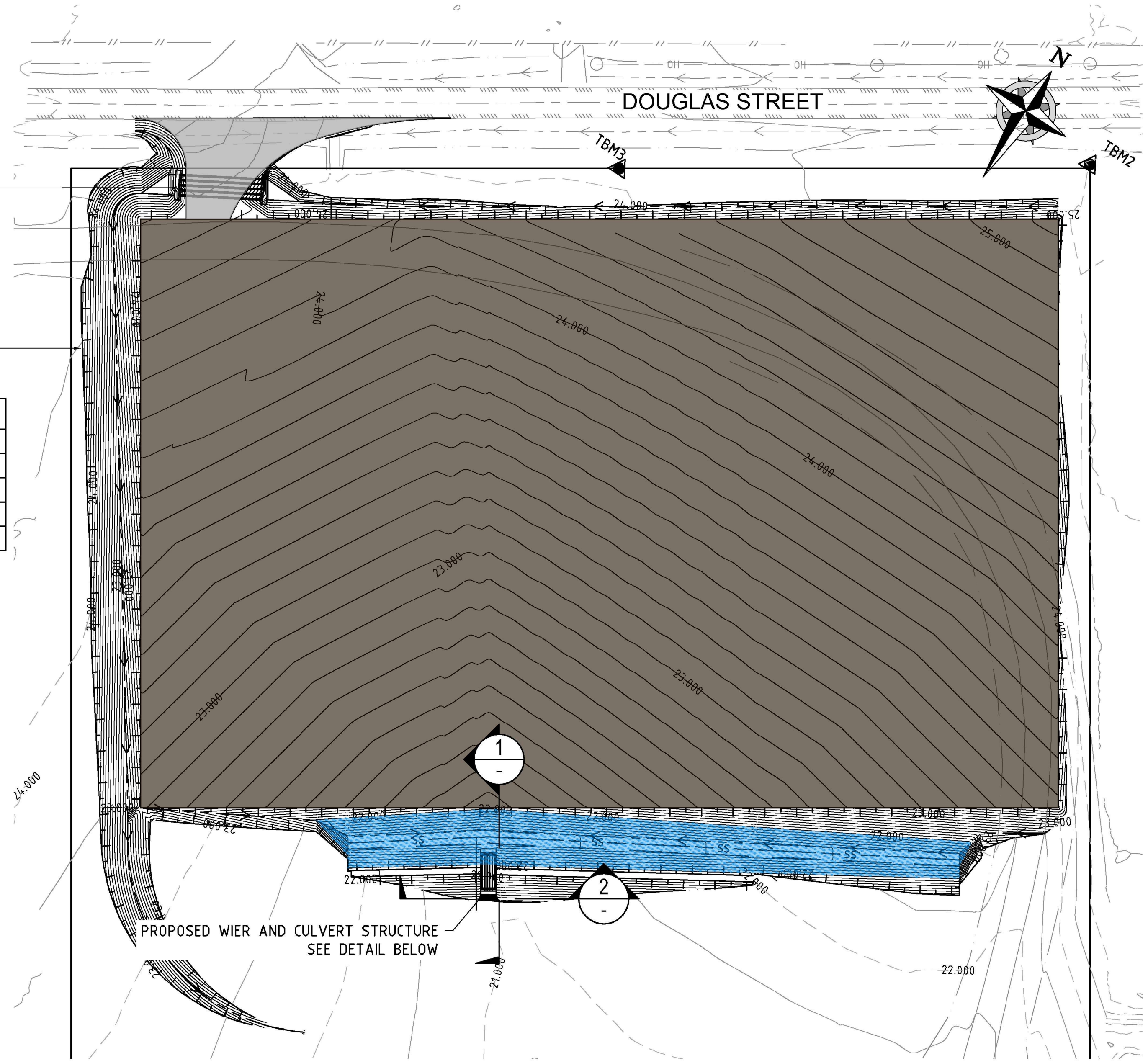
APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

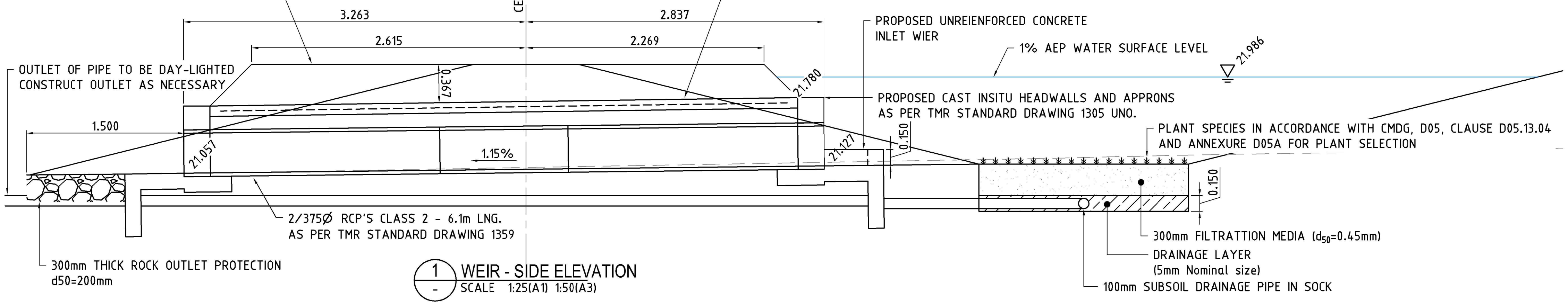
Development Permit No.: D/45-2020

Dated: 18 August 2020

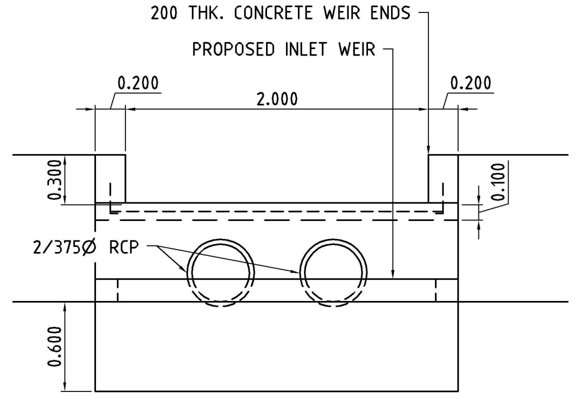
FILTRATION MEDIA PROPERTIES	
FILTER	SANDY LOAM
d_{50}	0.45mm
SATURATED HYDRAULIC CONDUCTIVITY	180mm/hr
TN CONTENT OF FILTER MEDIA	400mg/kg
ORTHOPHOSPHATE CONTENT OF FILTER MEDIA	35mg/kg



PLAN
SCALE 1:500(A1) 1:1000(A3)



1 WEIR - SIDE ELEVATION
SCALE 1:25(A1) 1:50(A3)



2 WEIR - FRONT ELEVATION
SCALE 1:25(A1) 1:50(A3)

ISSUED FOR APPROVAL

SURVEYOR	REV	DATE	REVISION DESCRIPTION	DRAFT	DESIGN
A.S MORCOM SURVEYORS	A		ISSUED FOR APPROVAL	RC	SP

ADDRESS: 120 CONSTANCE AVENUE ROCKYVIEW QLD 4701
CO-ORDINATE DATUM MGA256
HEIGHT DATUM AHDD

	BY	DATE
REVIEWED	M. MATHEV	25.11.19
RPEQ ENG		
RPEQ No:	5141	

CLIENT

SCALE: AS SHOWN

PREPARED BY 0321820

mcmurtrie CONSULTING ENGINEERS

Address: 63 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

CLIENT ROCKY'S OWN TRANSPORT COMPANY
PROJECT PROPOSED TRUCK DEPOT - 162 MIDDLE ROAD, GRACEMERE
TITLE STORMWATER MANAGEMENT
DETENTION BASIN

A1 DRAWING NUMBER 0321820-9001 REVISION A

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/45-2020
Dated: 18 August 2020

AREA SCHEDULE

	PROPOSED SHED GFA	: 441 SQM
	PROPOSED UNCOVERED HARDSTAND	: 297 SQM
	PROPOSED UNSEALED PAVEMENT	:13206 SQM
	PROPOSED UNCOVERED BUNDED SLAB	:297 SQM

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

drawing no: **SK-002**

project no: **GG-035**

project: PROPOSED INDUSTRIAL SHED

drawing title: SITE PLAN

location: LOT N0. 102 RP604012

REVISIONS

REV	DESCRIPTION	DATE
2	PRELIMINARY	31/10/2019
3	PRELIMINARY	02/03/2020
4	PRELIMINARY	04/03/2020
5	PRELIMINARY	05/03/2020
6	PRELIMINARY	15/04/2020
7	PRELIMINARY	26/06/2020
8	PRELIMINARY	20/07/2020
9	PRELIMINARY	22/07/2020

PRELIMINARY SKETCH PLANS:
If the drawings are labelled and issued 'preliminary', below, they are not suitable for Building Application, tender or construction purposes!
The intent of preliminary sketch plans are only for presenting the concept for the specific project to the client as nominated in the title sheet.

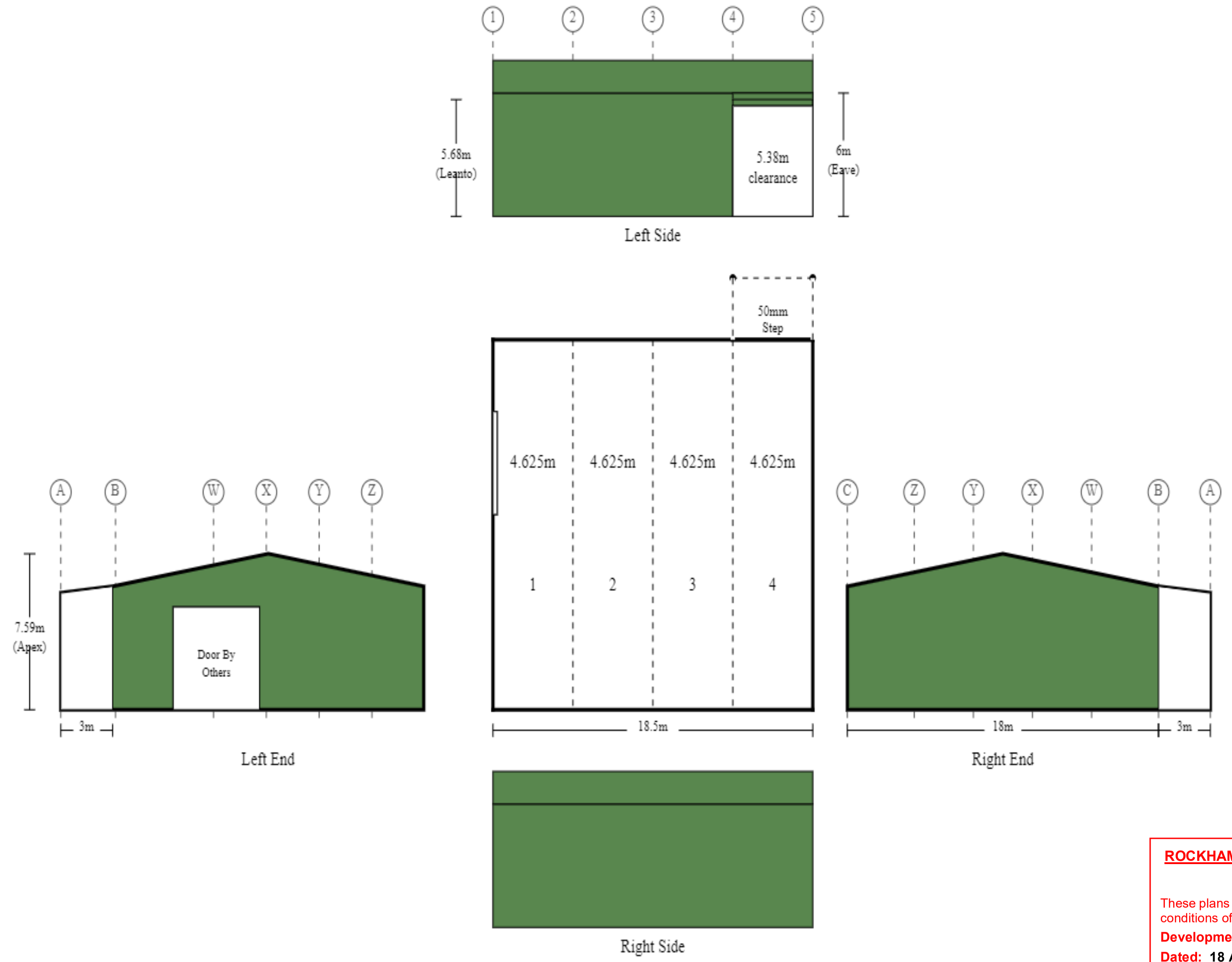
NEVER SCALE OF DRAWINGS, IF IN DOUBT, ASK!

design + architecture Pty. Ltd.
abn: 80167978832
reg no. 4610
www.designaa.com.au design@designaa.com.au

ISSUED FOR
PRELIMINARY

scale 1 : 1000
date JUL 20
drawn AUTHOR
rev 9

C:\Users\Public\PROJECTS\GG-035\DRAWINGS\GG-035 -3.rvt
22/07/2020 3:43:08 PM



ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/45-2020
Dated: 18 August 2020

Purchaser Name: Rockys Own	Building Layout Ref# kitr1912003-1	Seller: THE Shed Company Gladstone Name: Kit Rudolph Phone: (07) 4972 9990 Fax: Email: kit.rudolph@theshedcompany.com.au	THE Shed Company® RESIDENTIAL • RURAL • COMMERCIAL
Site Address:			
Ref # kitr1912003-1 — Print Date: 19/12/19			

25 June 2020

Rockhampton Regional Council
PO Box 1860
Rockhampton QLD 4700

Council Ref: D/45-2020
Our Ref: 032-19-20

Re: DEVELOPMENT APPLICATION D/45-2020 FOR A MATERIAL CHANGE OF USE FOR A TRANSPORT DEPOT – SITUATED AT 162 MIDDLE ROAD, GRACEMERE – DESCRIBED AS LOT 102 ON RP604012, PARISH OF GRACEMERE
Response to Information Request

Dear Sir / Madam,

We refer to the above job and to Council's Information Request dated 13 May 2020 and provide the following responses:

1.0 Engineering requirements

1.1 Please provide further information regarding the number of daily vehicle movements and the type of vehicles associated with the proposal.

MCE Response:

The number of daily movements are as follows - approximately 15 vehicle movements per day of various combinations including Road trains, B-doubles and singles. Up to 2 staff movement per day.

1.2 Council is concerned that vehicles egressing the site will be unable to stay within the sealed portion of Douglas Street. As such, please provide swept paths for the largest vehicle accessing the site relative to the existing pavement width and proposed accesses. It is acknowledged that a basic swept path is shown on Drawing SK-002 however it is not clear what type of vehicle this represents.

MCE Response:

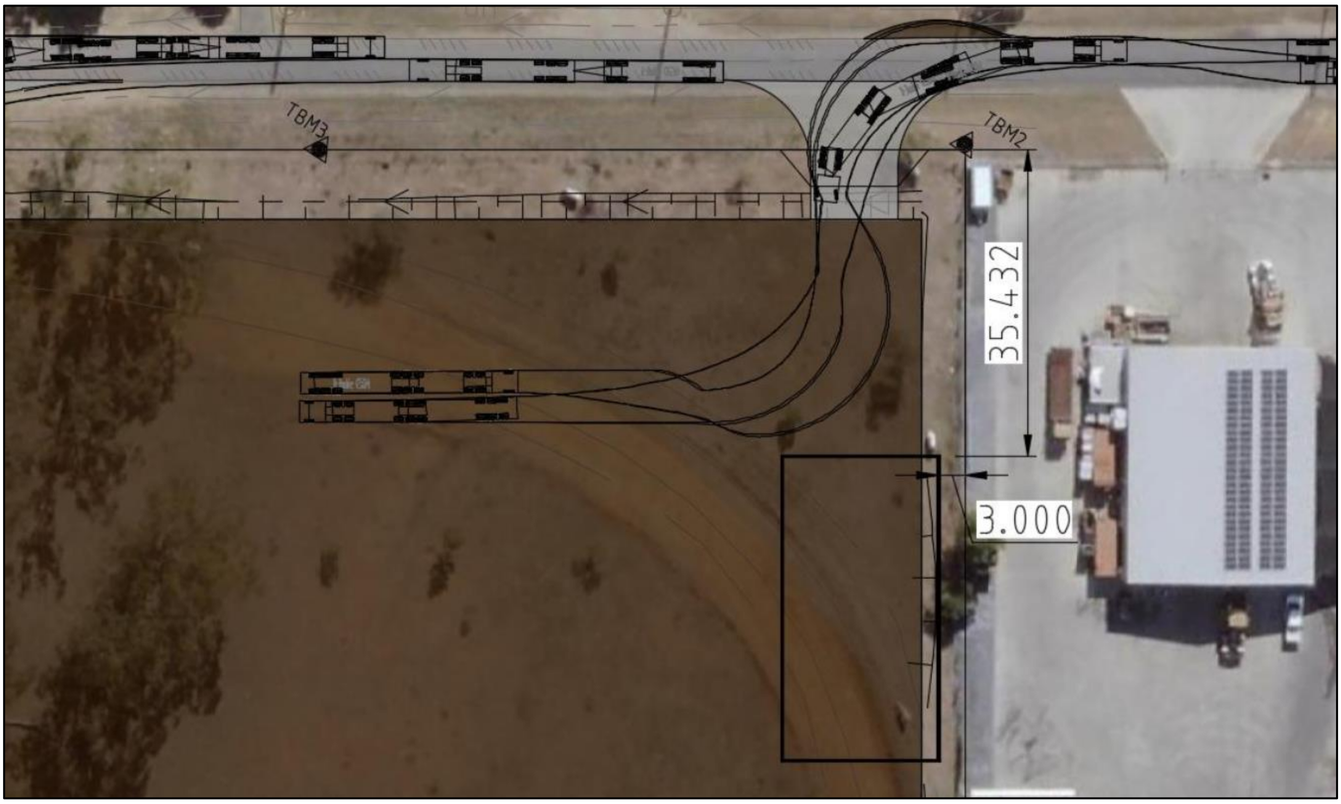
Road Trains will access site at the western access see below for swept paths. Access design to be provided as part of future Operational Works applications.

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/45-2020
Dated: 18 August 2020

ABN 69 958 286 371
P (07) 4921 1780
F (07) 4921 1790
E mail@mcmengineers.com

PO Box 2149
Wandal Q 4700
63 Charles Street
North Rockhampton Q 4701

B doubles will access site at the eastern access, see blow for swept paths. Access design to be provided as part of future Operational Works applications.



1.3 *Please provide further information regarding the diversion of the upstream flows around the site. Council is concerned that any overtopping of this channel will affect the roadway. Please demonstrate that the channel profile is sufficient to contain the upstream flows for the defined storm event (1% Annual Exceedance Probability). The channel should also provide appropriate freeboard in accordance with the Queensland Urban Drainage Manual (QUDM).*

MCE Response:

Refer to attached updates Stormwater Management Plan.

1.4 *The stormwater quality treatment train does not appear to include the building roof or hardstand areas shown on the submitted drawings and has applied a single surfacing type for the entire development. Council has concerns that this approach will not accurately reflect the pollutant loads applicable to the proposal. Please provide an electronic copy of the MUSIC model for the proposal for Council's review.*

MCE Response:

Refer to attached updates Stormwater Management Plan.

We believe the above responses meets Council's requirements and look forward to the approval of this development application.

Yours faithfully,

Chris Hewitt
Principal Engineer

mcmurtrie
CONSULTING ENGINEERS

Stormwater Management Plan

Proposed Truck Depot
Lot 102 on RP604012 - Douglas Street, Gracemere

Prepared For: Rocky's Own Transport Company

Job No. 032-19-20
25 June 2020
Revision B

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Wandal Q 4700
63 Charles Street
North Rockhampton Q 4701

Stormwater Management Plan

Rev.	Description	Signature	RPEQ No	Date
B	Addressing Council RFI			
A	Issued For Operational Works Approval		5141	25/11/19

CONTENTS

Stormwater Management Plan

Proposed Truck Depot

1.0 INTRODUCTION AND APPROACH

1.1. PROJECT OVERVIEW

McMurtrie Consulting Engineers (MCE) have been commissioned by Rocky's Own Transport Company. to undertake a site-based Stormwater Management Plan (SMP) for a proposed truck depot located at Lot 102 on RP604012 - Douglas Street, Gracemere. The aim of this SMP is to demonstrate that the proposed development will comply with Capricorn Municipal Development Guidelines (CMDG), Queensland Urban Drainage Manual (QUDM 2017), Australian Rainfall and Runoff 2019 (ARR'19) and State Planning Policy (SPP 2017).

1.2. METHODOLOGY

The assessment methodology adopted for this SMP is summarised below.

- Broadly identify the contributing catchments to the project.
- Identify Lawful Point of Discharge (LPOD) for the site stormwater runoff.
- Identify the critical storm events and duration for this project
- Estimate peak discharge runoff for pre-development and post-development scenarios.
- Identify potential mitigation and management strategies to ensure no worsening to downstream catchments and infrastructure.
- Assess the stormwater quality treatment requirements for the project.

1.3. DATA SOURCES

The background data used to undertake this assessment were collected from the following sources:

- ARR'19 data hub
    - Rainfall data
    - Design storm ensemble temporal patterns
- Field survey data
- Layout plans
- Pluviograph rainfall data for the 'Rockhampton Aero' station

2.0 SITE CHARCTERISTICS

2.1. SITE LOCATION

The proposed site is located on Lot 102 on RP604012 - Douglas Street, Gracemere. Site details have been summarised within Table 1 and a QLD Globe extract is presented as Figure 1.

Table 1: Site Description

Developer	Property and Location	
	Lot and Property Description	Address
Rocky's Own Transport Company.	Lot 102 on RP604012	162 Middle Road, Gracemere

Figure 1: Site Location **[Image: QLD Globe]**

The proposed site abuts Douglas Street on northern side and shares a common boundary with the adjacent lots on east, south and western sides. Refer Appendix A for proposed site layout.

2.2. TOPOGRAPHY

The existing site is a vacant block and approximately 27520m² in land area. The site consist of bare surface with very light grass cover. The existing site levels range from approximately 25.0m AHD on the northern side along Douglas Street and 20.30m AHD on the southern side along the rear boundary.

3.0 HYDROLOGY ASSESSMENT

3.1. LAWFUL POINT OF DISCHARGE

The existing site surface grades towards the southern boundary to the neighboring lot which will be the Lawful Points of Discharge (LPOD) for the site. The proposed development will not be altering the stormwater discharge characteristics in a manner that may substantially damage third party property, in accordance with QUDM (Section 3.9.1).

3.2. HYDROLOGIC MODELLING

Hydrologic calculations have been undertaken using XPSTORM 2019.1 for pre and post development scenarios. The modelling within XPSTROM environment has been undertaken to estimate the peak discharge for storms up to 1% AEP. Hydrologic modelling has been undertaken using the Laurenson Runoff Routing Method. Laurenson's Method is an industry leading hydrologic routing method that can be used for catchments ranging between 10m² up to 20,000km². The information required to apply Laurenson's Method include:

- Rainfall Intensity Data (obtained from the Bureau of Meteorology 2016 IFD utility)
- Rainfall Temporal Patterns (obtained from the ARR'19 Data Hub)
- Catchment Area (ha)
- Catchment Slope
- Initial and Continuing Infiltration Data
- Catchment Roughness (Manning's 'n')

Given the relatively limited scope of this hydraulic impact assessment a lumped catchment approach, as defined by ARR'19 and shown in Figure 2 below, was applied to the hydrologic review of the site. The lumped approach is suitable for this site given the relative consistency in land use and the ultimate purpose of the model.

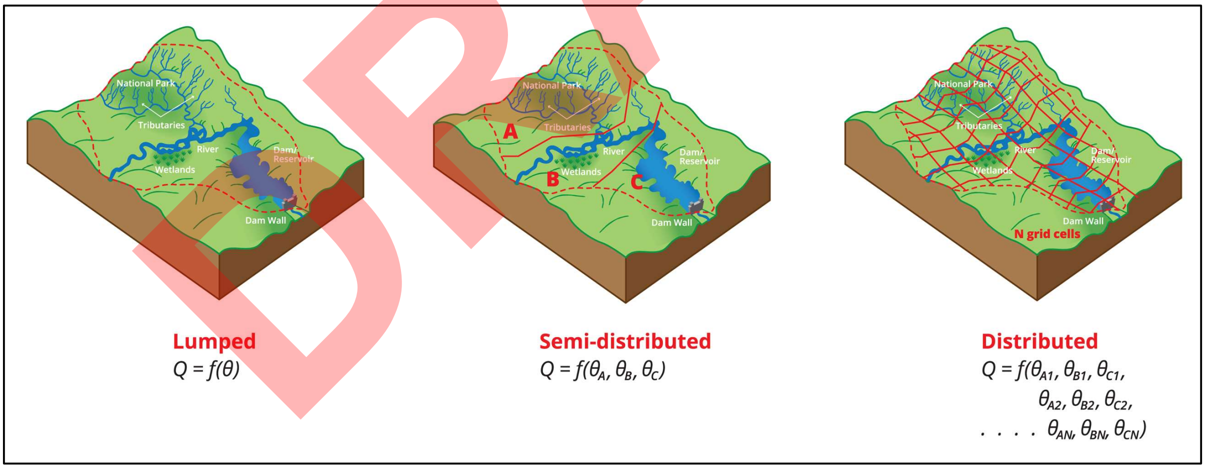


Figure 2: Catchment Analysis Options

Refer Appendix A for catchment boundaries for the site.

3.2.1. CATCHMENT HYDROLOGY PARAMETERS

Table 2 and 3 summarises the input data for the development site in pre-development and post-development conditions.

Table 2: Pre-Development Model Parameters (XP Storm)

Parameter		Existing Site
		Pervious
Area (ha)		2.752
Impervious (%)		0.0
Slope (%)		4.0
Laurenson 'n' (storage non-linearity exponent)		-0.285
Infiltration	Initial Loss (mm/hr)	0.0
	Continuing Loss (mm/hr)	2.5
Manning's Roughness (n)		0.03

Table 3: Post-Development Model Parameters (XP Storm)

Parameter		Vehicle Depot	
		Pervious	Impervious
Area (ha)		1.07	1.682
Impervious (%)		0.0	100
Slope (%)		3.0	2.0
Laurenson 'n' (storage non-linearity exponent)		-0.285	-0.285
Infiltration	Initial Loss (mm/hr)	0.0	0.0
	Continuing Loss (mm/hr)	2.5	0.0
Manning's Roughness (n)		0.030	0.020

Applying no initial losses within the model is consistent with the requirements of both ARR'87 and ARR'19. ARR'19 states that there is no evidence that infiltration losses change with respect to the recurrence interval being modelled and that continuing losses can be applied equally to frequent and rare events. The following Manning's roughness values have been applied to the catchments:

- Pervious 'n' = 0.030 (roughness of sparsely grassed areas)
- Impervious 'n' = 0.020 (roughness of gravel surface)

3.2.2. HYDROLOGY RESULTS

Applying the ARR'19 ensemble temporal patterns to the catchment allowed the identification of the critical duration for the mean minor and major storm event. Below figures are screen shots of Box and Whisker plot taken from XPSTORM software. This plot shows the comparison of storm ensembles for different durations for minor and major storm events.

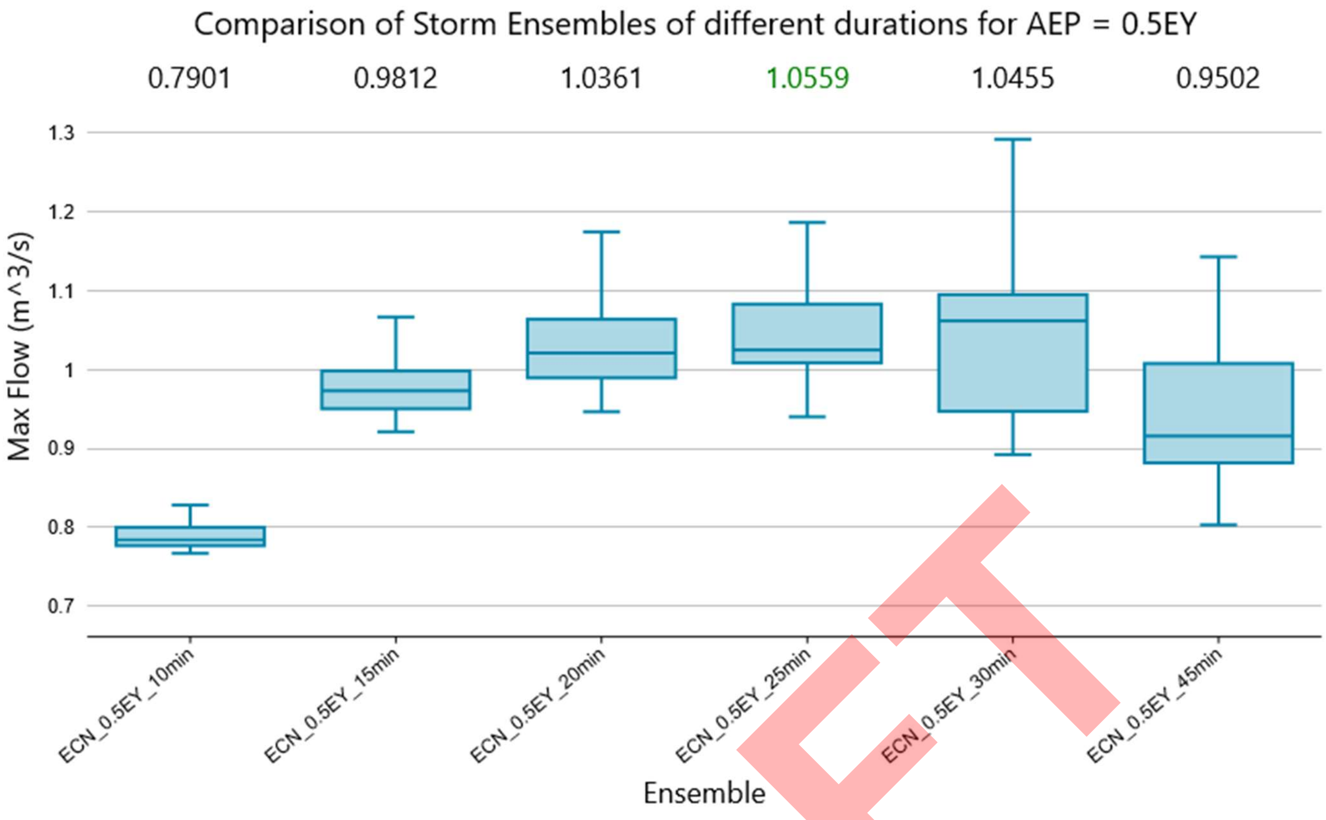


Figure 3: Comparison of Storm Ensembles of different durations for 0.5EY (undeveloped site) (XPSTORM Model)

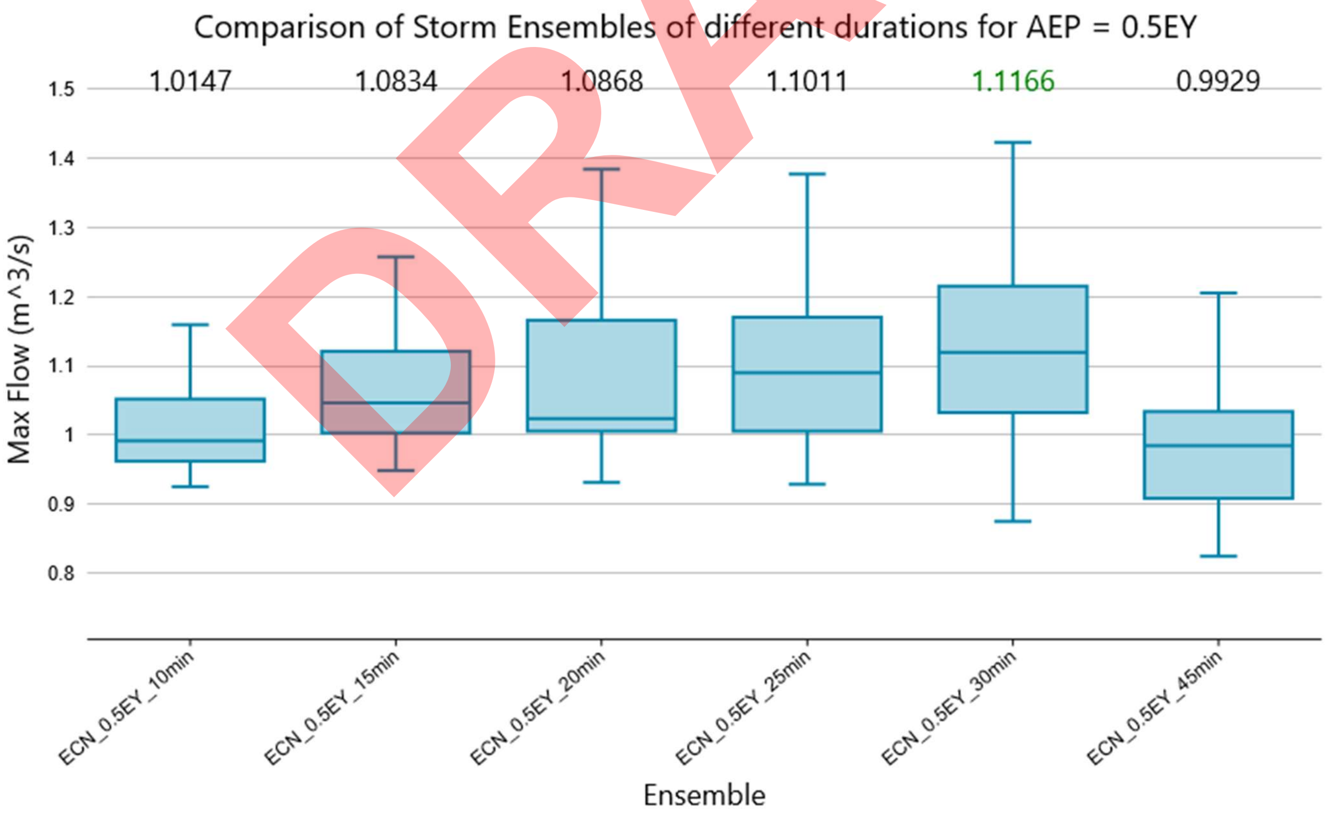


Figure 4: Comparison of Storm Ensembles of different durations for 0.5EY (developed site) (XPSTORM Model)

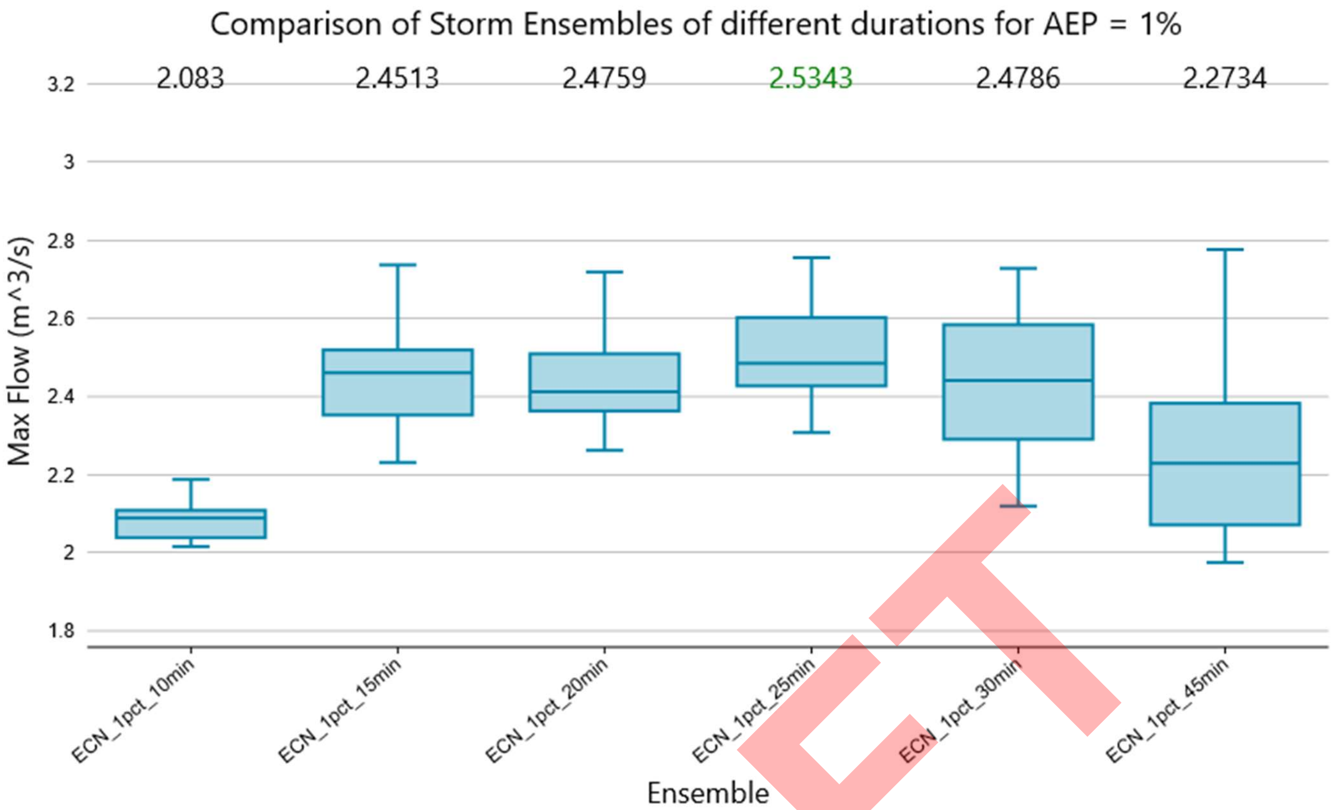


Figure 5: Comparison of Storm Ensembles of different durations for 1% AEP (undeveloped site) (XPSTORM Model)

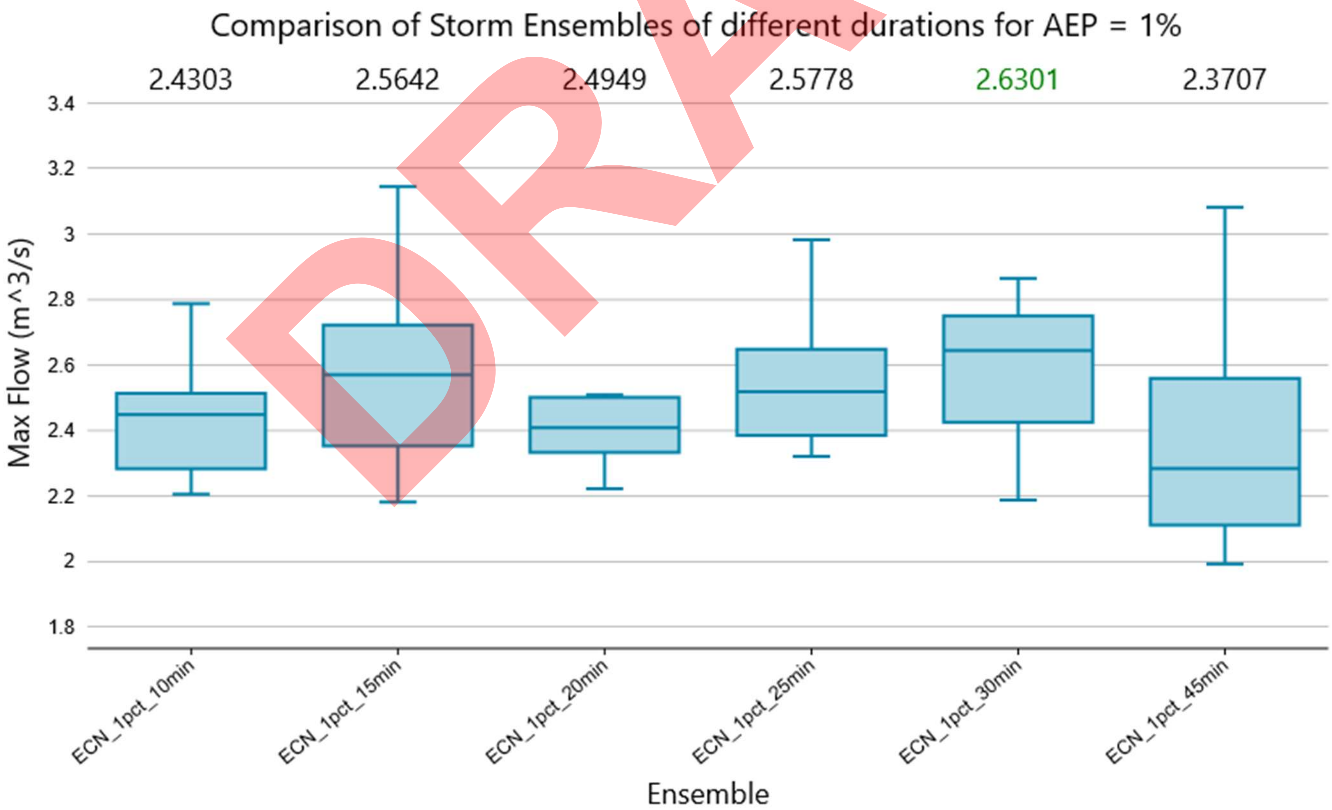


Figure 6: Comparison of Storm Ensembles of different durations for 1% AEP (developed site) (XPSTORM Model)

The results of each of the ensembles are summarised in Table 4. The same storm events are applied to the hydraulic analysis.

Table 4: Critical Storm Events

Annual Exceedance Probability (AEP %)	Critical Storm Event (undeveloped site)	Critical Storm Event (developed site)
39.35% (Minor Event)	0.5EY_25min_6	0.5EY_30min_4
20%	20pct_25min_5	20pct_30min_8
10%	10pct_20min_5	10pct_30min_4
5%	5pct_20min_7	5pct_30min_8
2%	2pct_25min_8	2pct_30min_5
1% (Major Event)	1pct_25min_7	1pct_30min_6

3.2.3. EXTERNAL CATCHMENTS

One external Catchment lies to the northern side of Douglas Street, the runoff from this catchment will be captured in an open channel and diverted down the western boundary of the lot.

Table 5: External Catchment Model Parameters (XP Storm)

Parameter		Existing Site
		Pervious
Area (ha)		3.8
Impervious (%)		10
Slope (%)		1.0
Laurenson ‘n’ (storage non-linearity exponent)		-0.285
Infiltration	Initial Loss (mm/hr)	0.0
	Continuing Loss (mm/hr)	2.5
Manning’s Roughness (n)		0.03

4.0 HYDRAULIC ASSESSMENT

4.1 BACKGROUND

The hydraulic assessment for the site has been carried out using XPSTORM 2019.1. The aim of the hydraulic modelling is to demonstrate that the post-development minor and major storm peak discharge at the LPOD is equal or less than the peak pre-development discharge. This will be achieved by detaining the site runoff within the lot at the rear of the proposed pad to a maximum height of 1m for storm events up to 1%AEP.

4.2 GRACEMERE CREEK FLOOD STORAGE

Mapping provided by Rockhampton Regional Council indicates that in a 1% AEP storm event, floodwaters of Gracemere Creek inundate the property to a flood level of 21.0m AHD. The intended development proposes no earthworks to be conducted below this level. It should also be noted that flooding shown above 21.0m AHD has hydraulic grade and cannot be attributed to Gracemere Creek backwater and is instead assumed to be product of local catchment flow.

Figure 6: Rockhampton Regional Council's - Gracemere Creek Flood Model

4.3 EXTERNAL CATCHMENT DIVERSION

The external catchment is to be routed around the site in a 'V' drain that is 0.5m deep Min. with 25% bank slopes. This channel shall be graded at 1.4% and is assumed to have a manning's roughness of 0.03.

Given this, the calculated mannings capacity of the diversion channel is as follows:

$$Q = \left(\frac{A}{n}\right) R^{2/3} {S_o}^{1/2}$$

$$A = 4 \times 0.5^2 = 1m^2$$

$$P = 2(\sqrt{(0.5^2 + 2^2)}) = 4.123m$$

$$R = \frac{A}{P} = \frac{1}{4.123} = 0.243m$$

$$S_o = \frac{1.4}{100} = 0.014$$

$$Q = \left(\frac{1}{0.03}\right) 0.243^{2/3} 0.014^{1/2} = 1.536m^3/s$$

4.4 DETENTION

The proposed development will require approximately 315m³ of detention volume to ensure no worsening to downstream catchments and infrastructure. A detention basin will be constructed to the rear of the proposed pad, as shown on drawing no 032-19-20-9001, Rev A. The proposed basin will detain the rainfall captured within the lot to maximum height of 1000mm. Outflow from this detained area will be directed towards the low point of the property and onwards to the neighboring lot. The basin outlet structure shall consist of a 2m weir with 2 x 375mm low flow pipe to ensure no adverse impacts on downstream catchments and infrastructure. The detention routing calculations have been performed to ensure sufficient detention volume provided in the bunded area to offset the increase in flow from the post development. Table 5 summarises the peak discharge for different scenarios.

Table 6: Peak Discharge Rate at LPOD

Storm Event (AEP %)	Pre-Development (m^3/s)	Post-Development without Detention (m^3/s)	Post-Development with Detention (m^3/s)				
			2/375mm Low Flow Pipes	2m Weir	Undeveloped Portion (Unmitigated)	Diversion Channel	Total Peak Discharge (ROUTED)
39.35% (Minor Event)	1.020	1.022	0.234	0.000	0.181	0.478	0.888
20%	1.261	1.515	0.283	0.016	0.330	0.608	1.131
10%	1.506	1.563	0.315	0.089	0.289	0.776	1.456
5%	1.823	1.796	0.337	0.161	0.386	0.921	1.738
2%	2.288	1.922	0.341	0.174	0.445	1.049	1.836
1% (Major Event)	2.455	2.774	0.354	0.247	0.551	1.17	2.028

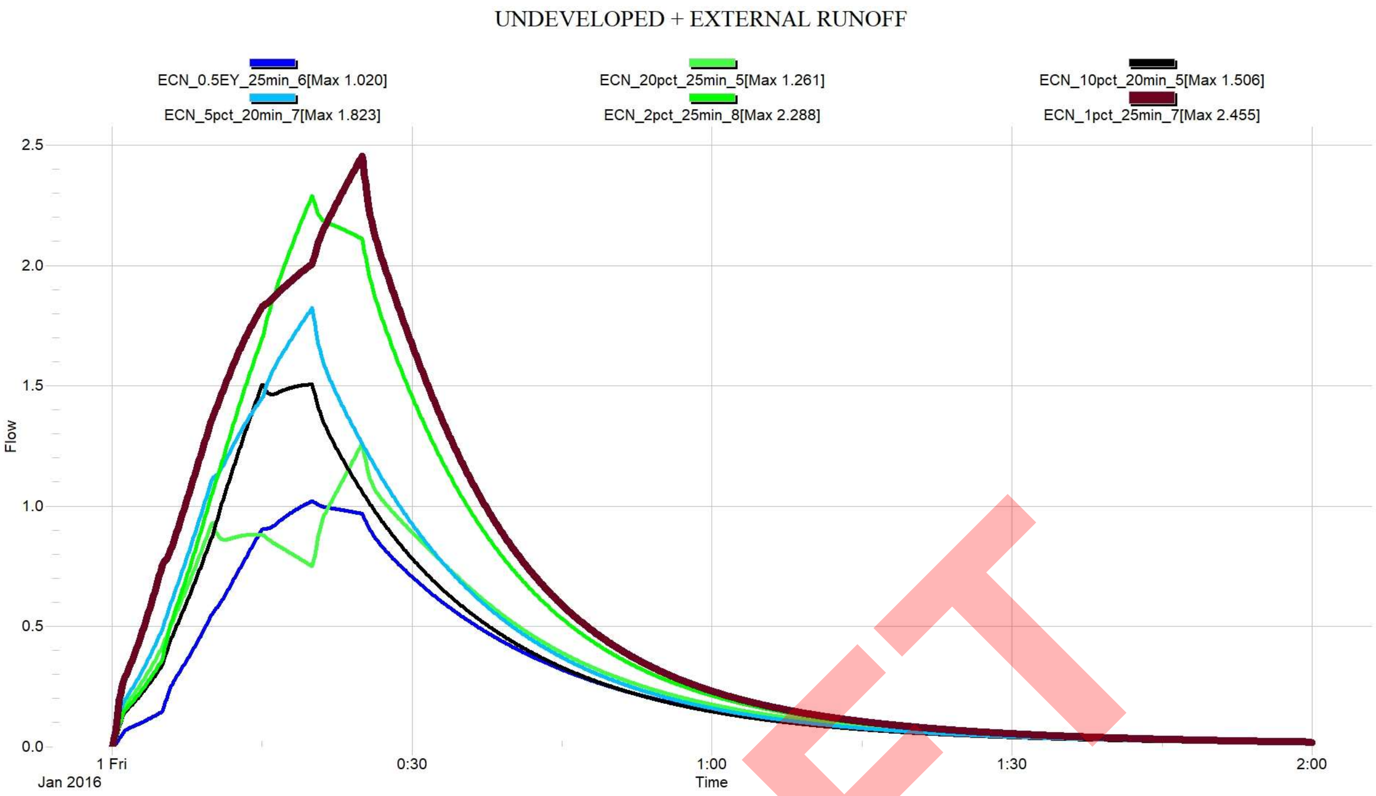


Figure 7: Pre-Development Peak Discharge Rate at LPOD

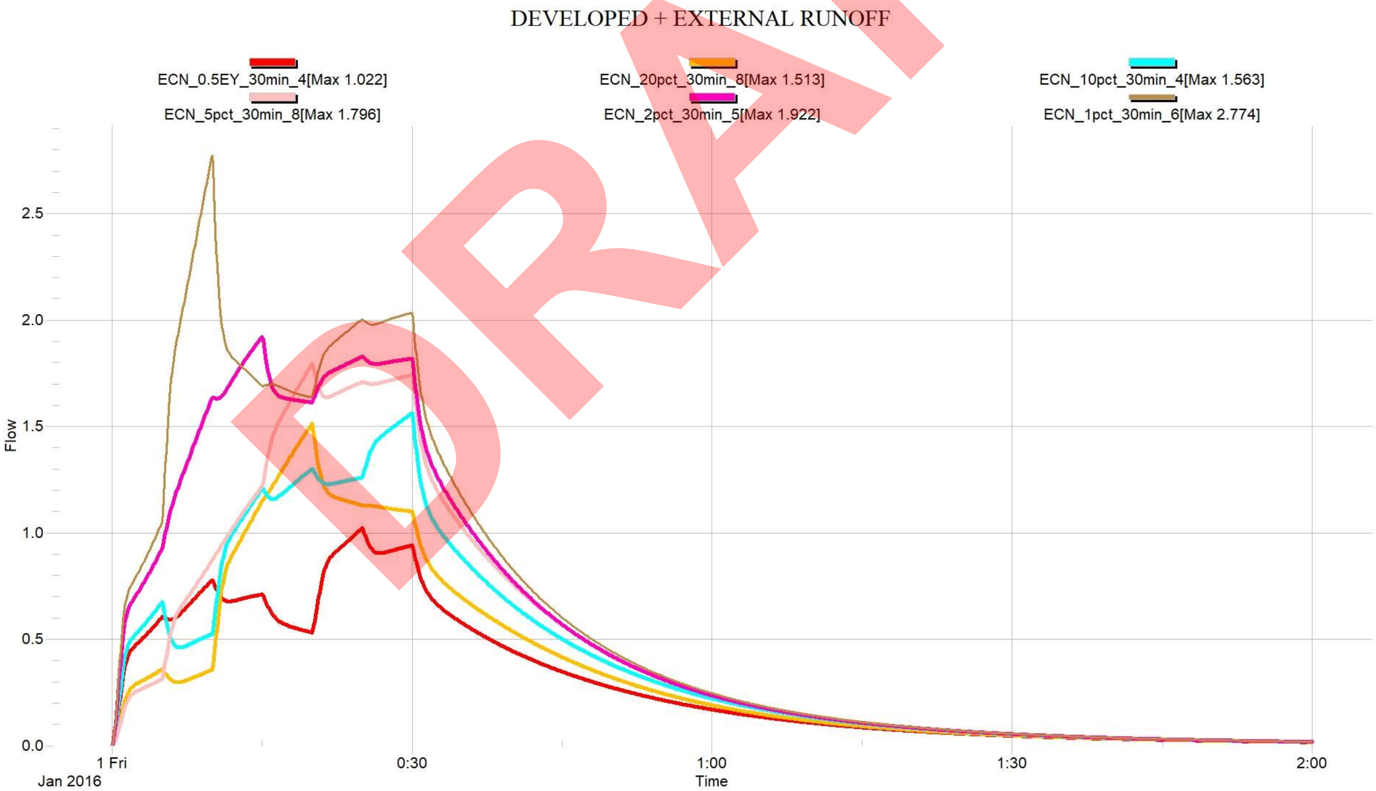


Figure 8: Undetained Post-Development Peak Discharge Rate at LPOD

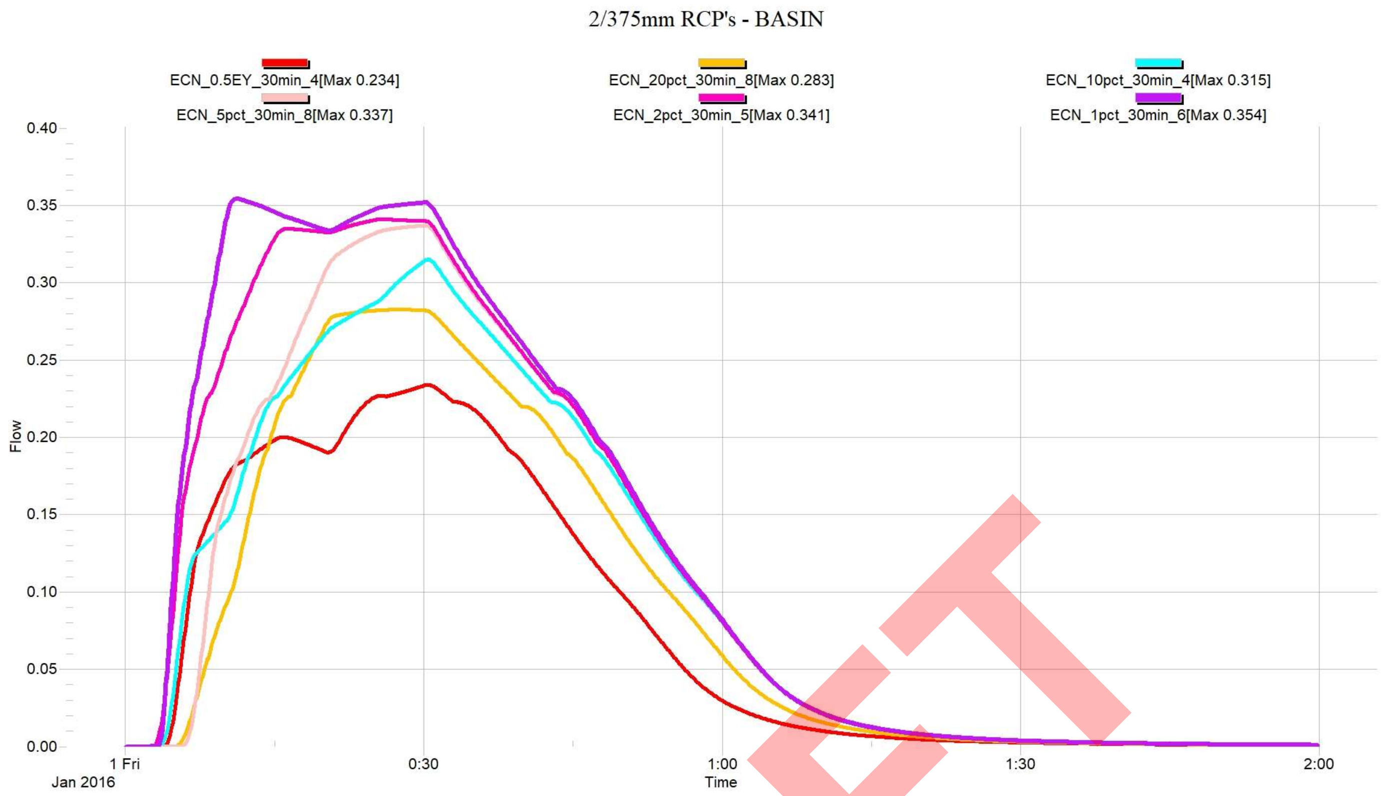


Figure 9: 2/375mm RCP's – Basin Low Flow

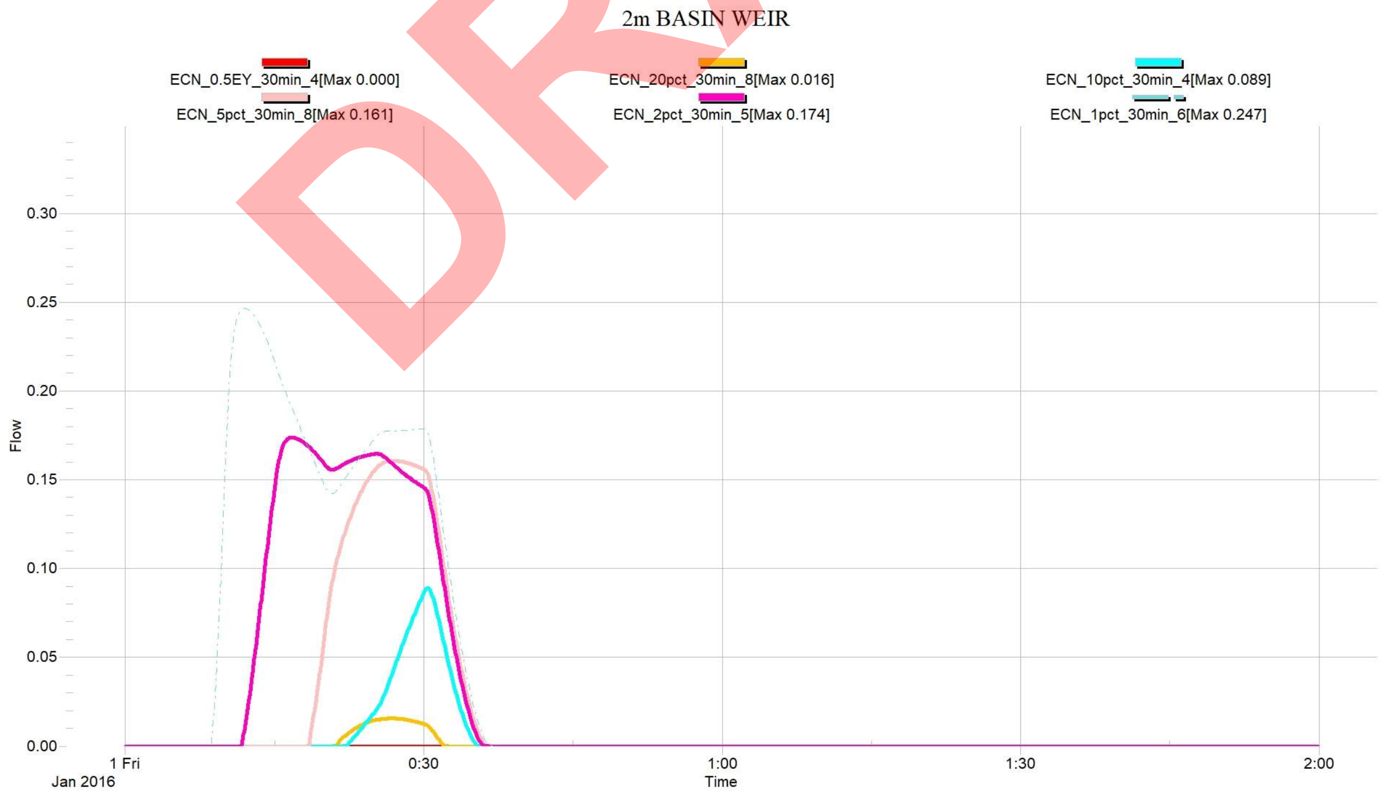


Figure 10: 2m Basin Weir

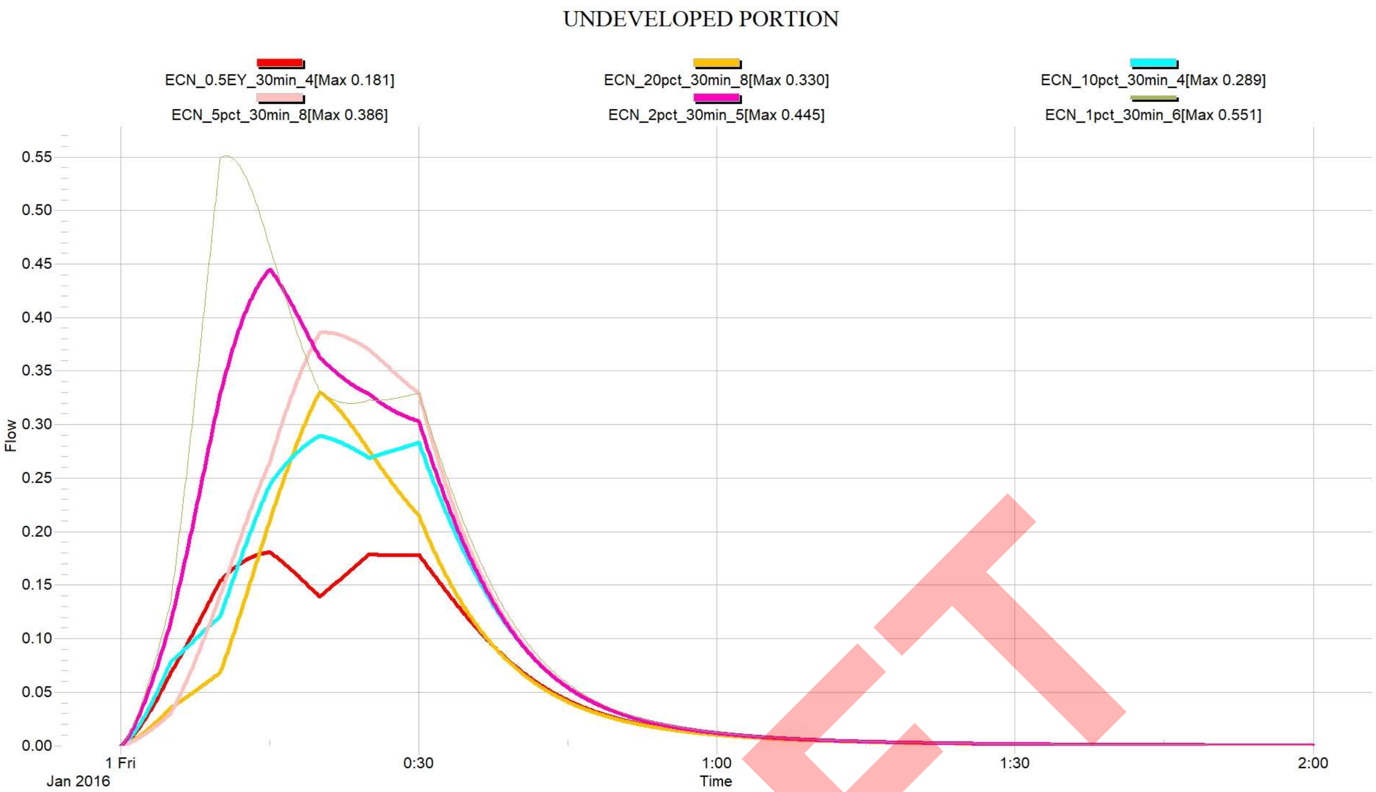


Figure 11: Undeveloped Portion

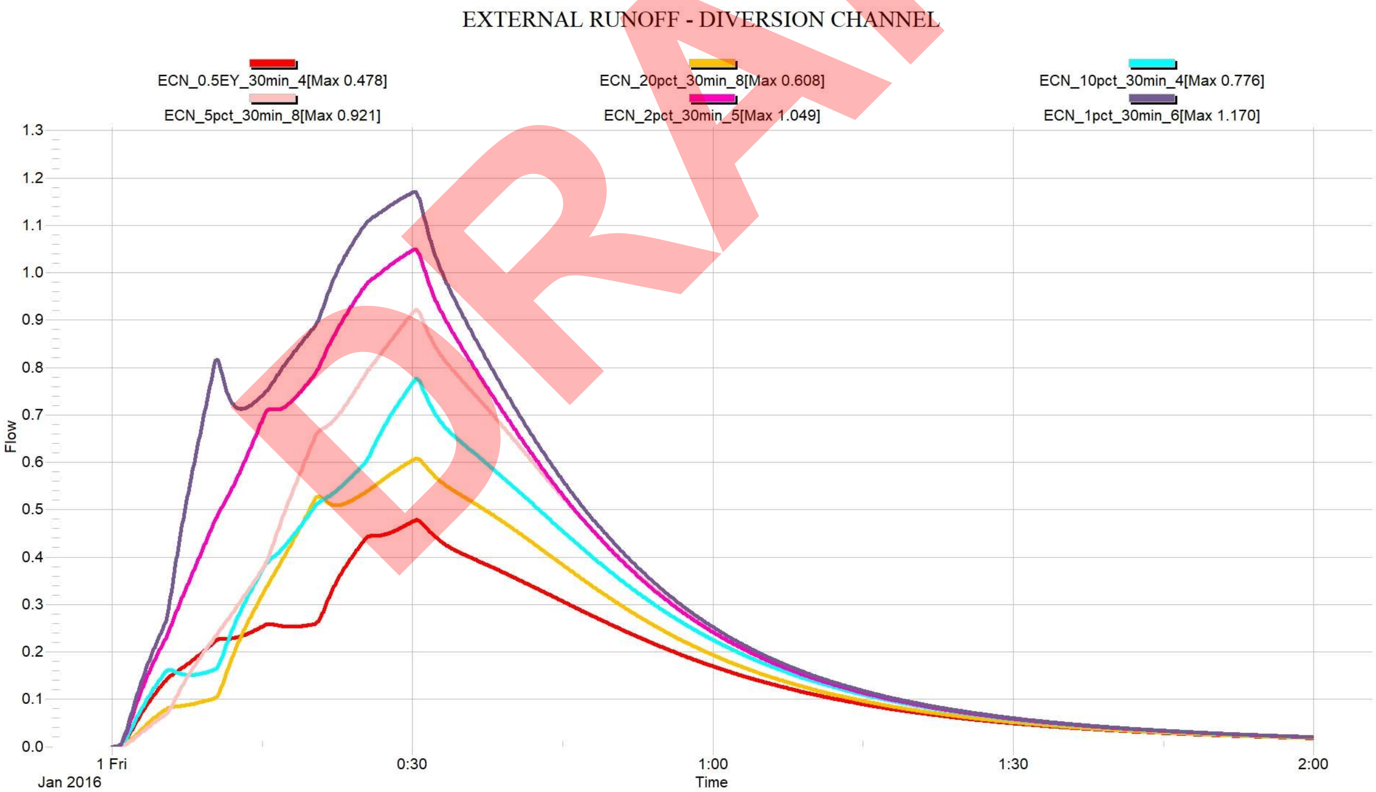


Figure 12: Diversion Channel

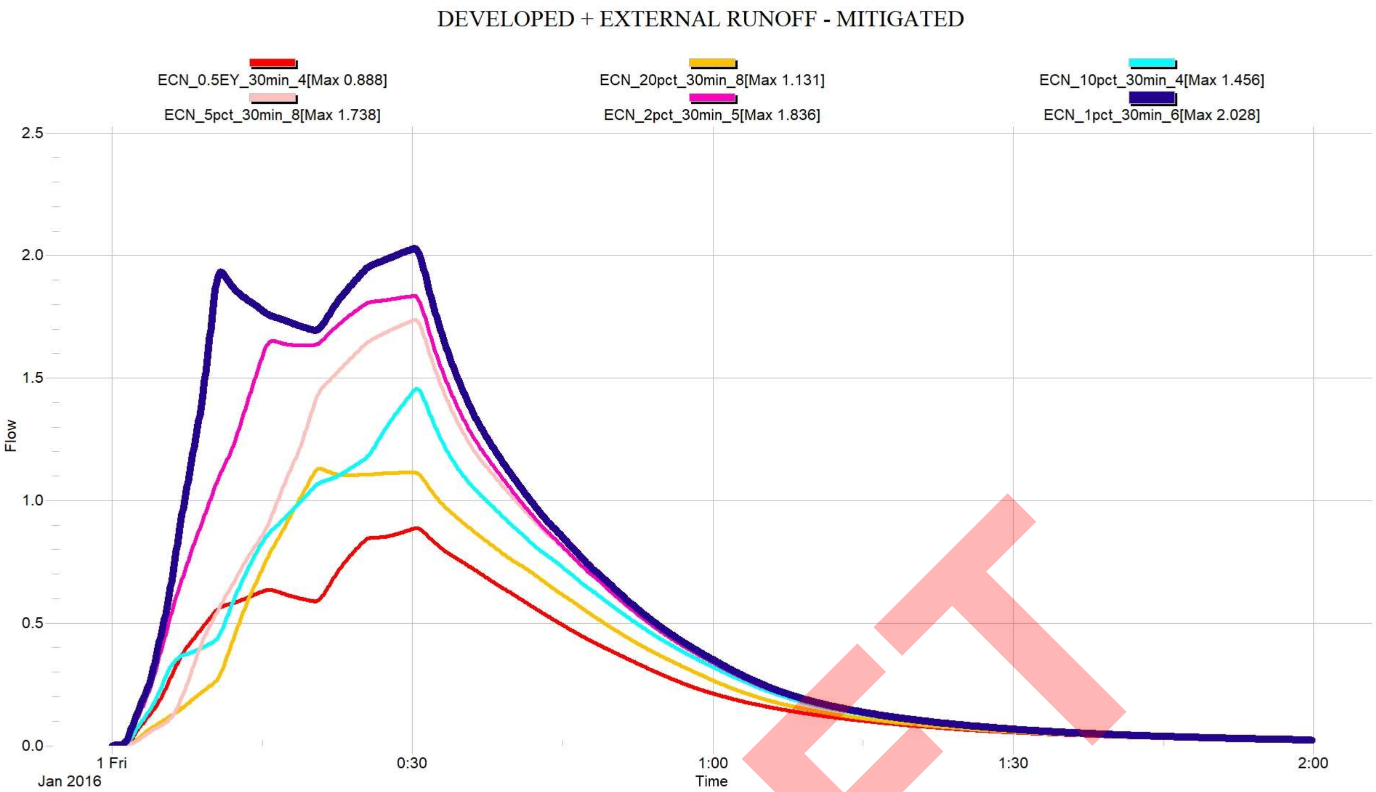


Figure 9: Detained Post-Development Peak Discharge Rate at LPOD

Table 7 summarises detention basin parameters to achieve the target mitigated pre-development flow rates.

Table 7: Detention Basin Parameters

Detention Surface Area (approximate)	**500m²**
Maximum Detention Depth Level from Weir Crest Level	**0.636m**
Detention Volume (approximate)	**310m³**
Outlet Structure	**2 x 375mm RCP with 2m Weir**
Weir Crest Level	**21.780m**
Weir Crest Length	**2m**
Low Flow Pipe Invert Level	**21.144m**

5.0 QUALITY ASSESSMENT

5.1. BACKGROUND

The proposed development will result in an impervious area greater than 25 per cent of the net developable area and therefore will require to satisfy the water quality assessment benchmarks setout in State Planning Policy (July 2017).

The development of the land has the potential to increase the pollutant loads within stormwater runoff and downstream watercourses. During construction phase of the development, disturbances to the existing ground have the potential to significantly increase sediment loads entering downstream drainage systems and watercourses. The operational phase of the development will potentially increase the amount of sediments and nutrients washing from the site.

The following sections describe construction and operational phase controls and water quality modelling of the proposed treatment train in compliance with Council guidelines.

5.2. CONSTRUCTION PHASE

5.2.1. KEY POLLUTANTS

During the construction phase a number of key pollutants have been identified for this development. Table 9 illustrates the key pollutants that have been identified.

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, material off cuts.
Sediment	Exposed soils and stockpiles during earthworks and building works.
Hydrocarbons	Fuel and oil spills, leaks from construction equipment and temporary car park areas.

Table 8: Key Pollutants – Construction Phase

5.2.2. EROSION AND SEDIMENT CONTROLS

Erosion and Sediment Control (ESC) devices employed on the site shall be designed and constructed in accordance with CMDG.

PRE CONSTRUCTION

- Stabilised site access/exit on Douglas Street.
- Sediment fences to be located along the contour lines downstream of disturbed areas.
- Diversion drains to divert clean runoff around the construction site.
- Educate site personnel to the requirements of the Sediment and Erosion Control Plan.

CONSTRUCTION

- Maintain construction access/exit, sediment fencing, catch drains and all other existing controls as required.
- Progressively surface and revegetate finished areas as appropriate.

During construction, all areas of exposed soils allowing dust generation are to be suitably treated. Treatments will include mulching the soil and watering. Road access is to be regularly cleaned to prevent the transmission of soil on vehicle wheels and eliminate any build-up of typical road dirt and tyre dusts from delivery vehicles.

Adequate waste disposal facilities are to be provided and maintained on the site to cater for all waste materials such as litter hydrocarbons, toxic materials, acids or alkaline substances.

5.3. OPERATIONAL PHASE

The following section describes the preliminary design of the Stormwater Quality Improvement Devices (SQID's) that form a treatment train for the operational phase of the development that complies with State Planning Policy 2017 water quality objectives as follows:

- 85% reduction in Total Suspended Sediment (TSS)
- 60% reduction in Total Phosphorus (TP)
- 45% reduction in Total Nitrogen (TN)
- 90% reduction in litter (sized 5 mm or greater)

5.3.1. STORMWATER QUALITY MODELLING

Stormwater Pollutant modelling for the development has been generated using the modelling program 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC), version 6.3, adhering to the prescribed Healthy Land and Water (2018), Water by Design MUSIC Modelling Guidelines Version 3, November 2018. A "Split Catchment" approach has been adopted for this site.

Assumptions associated with the model involve:

- Default routing (No flow routing or translation between nodes);
- No seepage/exfiltration (0 mm/hr);
- Adopted meteorology data from Rockhampton Aero rainfall station – 039083, 6-minute time step from 2000-2010; and
- All other parameters used within the modelling were based on Healthy Land and Water (2018), Water by Design MUSIC Modelling Guidelines Version 3, November 2018.

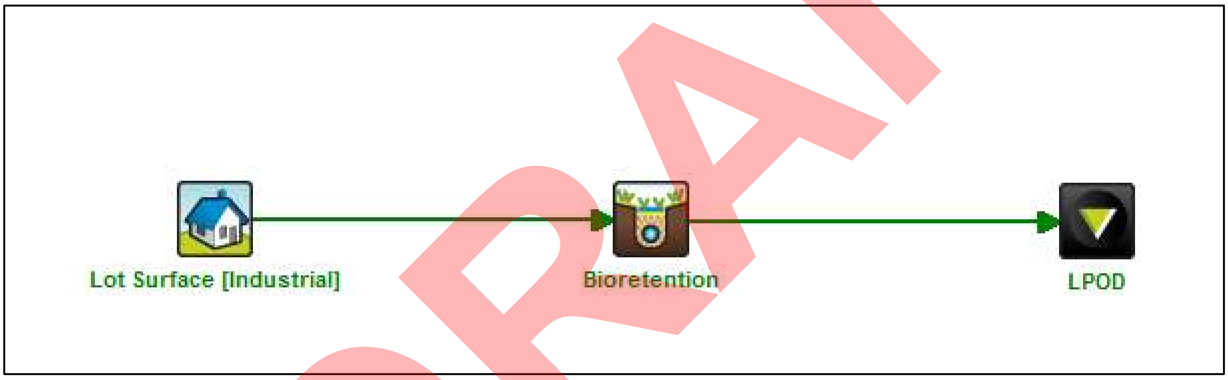


Figure 9: Stormwater Quality Treatment Train

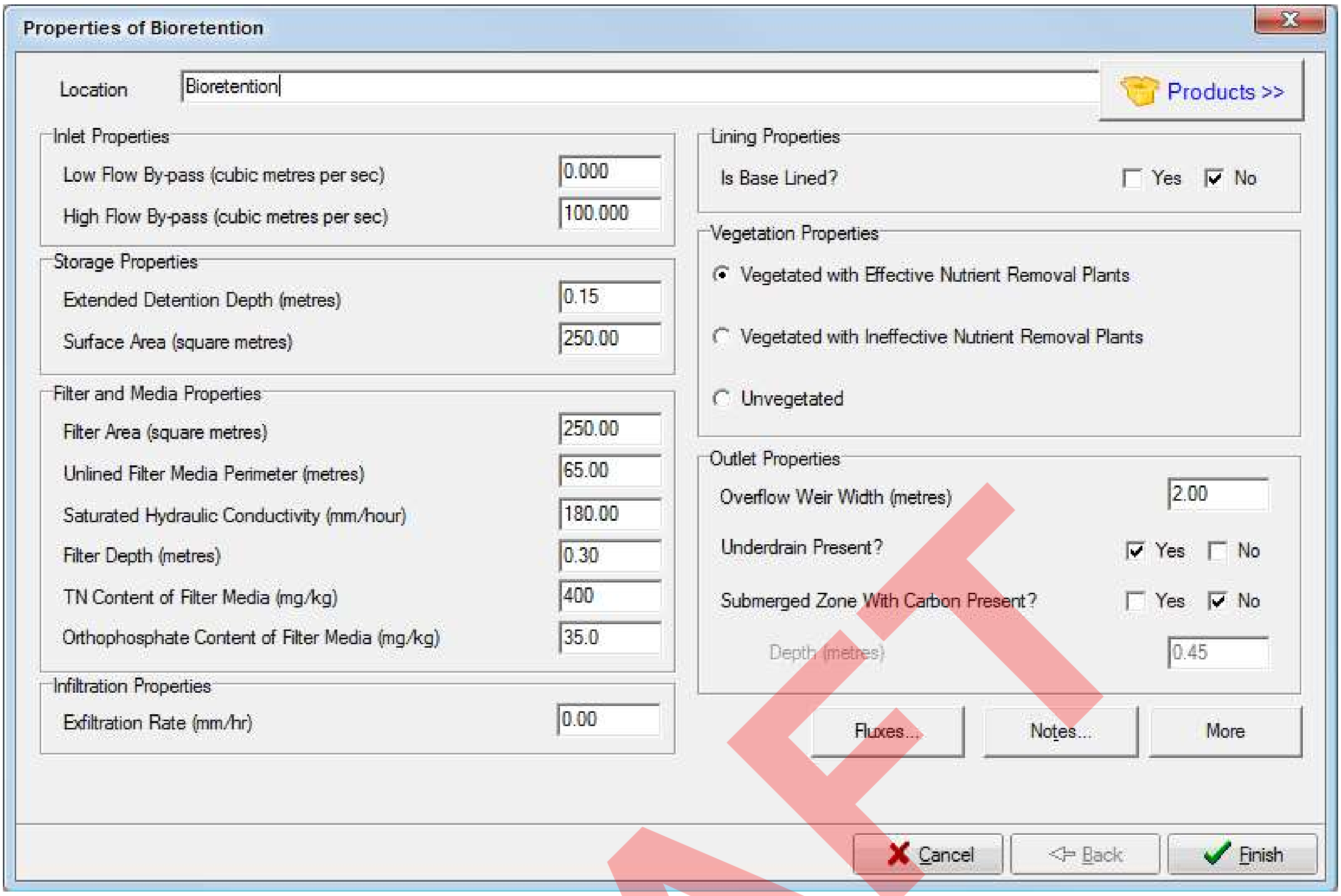
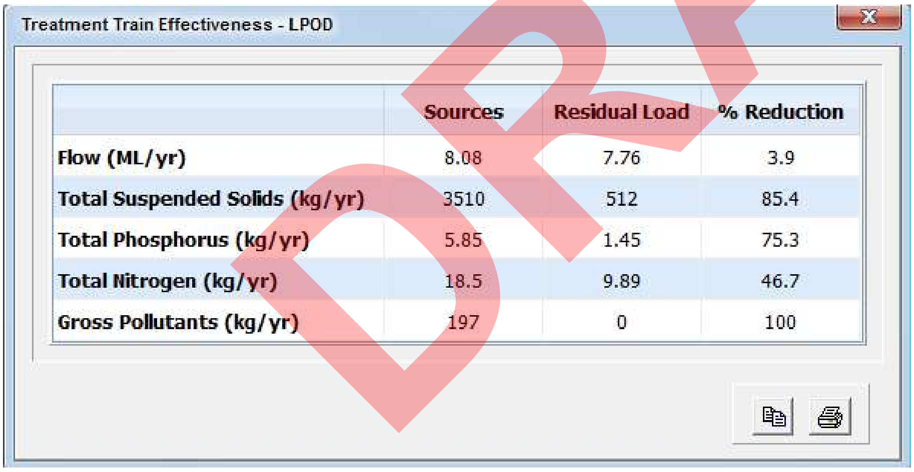


Figure 10: Properties of Bioretention


Treatment Train Effectiveness - LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	8.08	7.76	3.9
Total Suspended Solids (kg/yr)	3510	512	85.4
Total Phosphorus (kg/yr)	5.85	1.45	75.3
Total Nitrogen (kg/yr)	18.5	9.89	46.7
Gross Pollutants (kg/yr)	197	0	100

Figure 11: Stormwater Quality Treatment Train Effectiveness

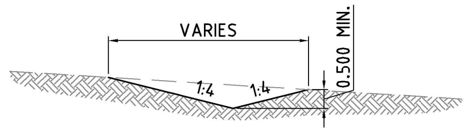
The above treatment train achieves the State Planning Policy water quality benchmarks.

APPENDIX A

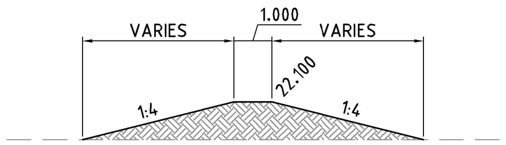
Stormwater Layout Plan

LEGEND

- EXISTING BITUMEN SURFACE
- EXISTING SWALE
- EXISTING CHANGE OF GRADE
- PROPERTY FENCE
- EXISTING OVERHEAD POWER LINES
- PROPOSED TOP OF BATTER
- PROPOSED OPEN CHANNEL
- PROPOSED CHANGE OF GRADE
- PROPOSED 175 THK. CONCRETE SLAB WITH SL92 REINFORCEMENT CENTRALLY PLACED
- PROPOSED UNSEALED PAVEMENT 300mm T2.5 ROAD BASE



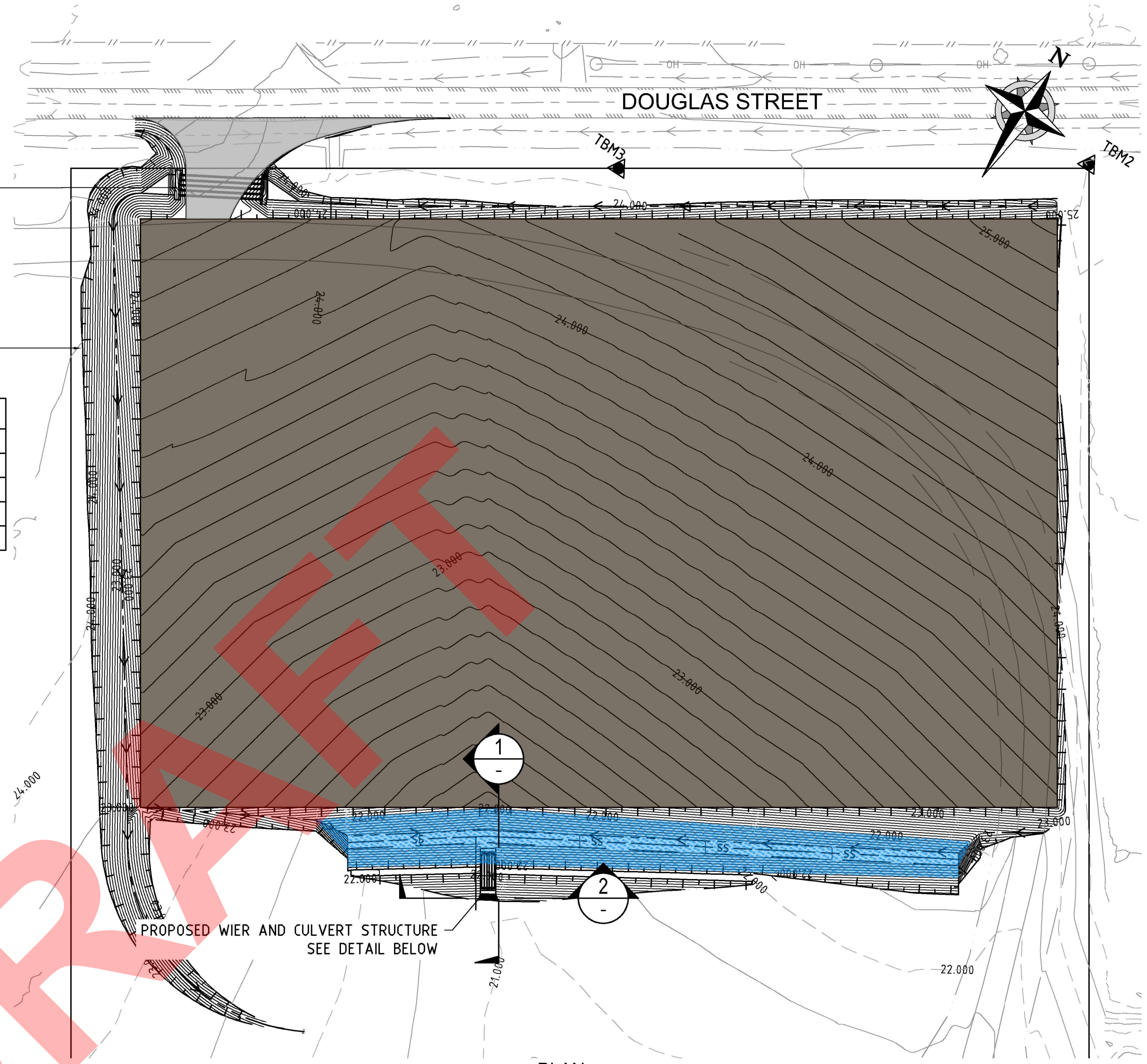
DIVERSION DRAIN - TYPICAL SECTION
SCALE: 1:100(A1) 1:200(A3)



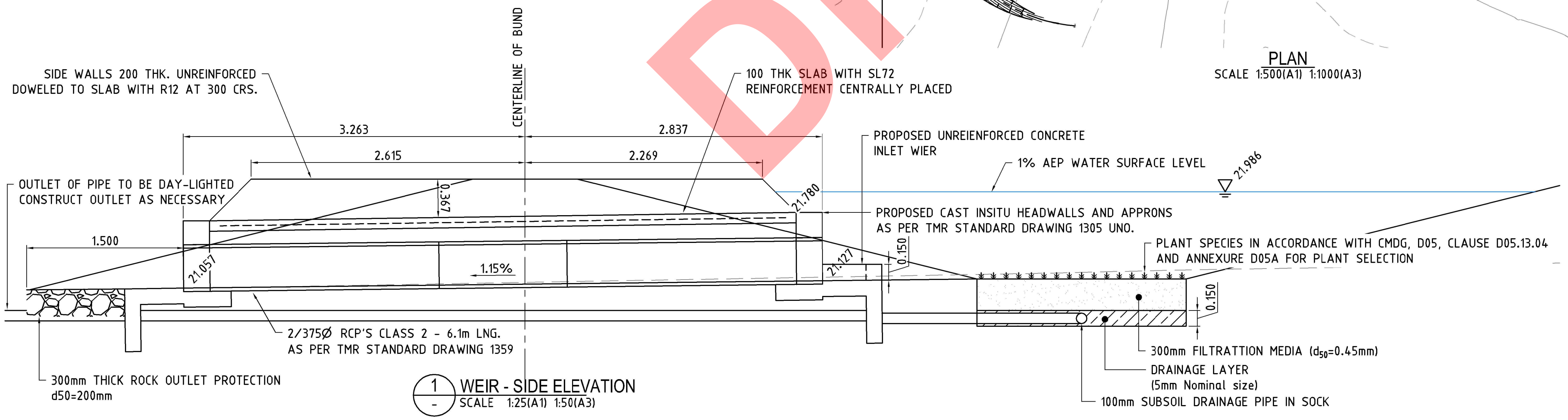
BUND - TYPICAL SECTION
SCALE: 1:100(A1) 1:200(A3)

FILTRATION MEDIA PROPERTIES

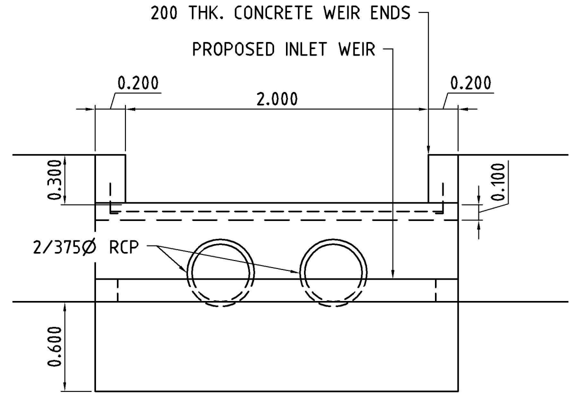
FILTER	SANDY LOAM
d_{50}	0.45mm
SATURATED HYDRAULIC CONDUCTIVITY	180mm/hr
TN CONTENT OF FILTER MEDIA	400mg/kg
ORTHOPHOSPHATE CONTENT OF FILTER MEDIA	35mg/kg



PLAN
SCALE 1:500(A1) 1:1000(A3)



1 - WEIR - SIDE ELEVATION
SCALE 1:25(A1) 1:50(A3)



2 - WEIR - FRONT ELEVATION
SCALE 1:25(A1) 1:50(A3)

ISSUED FOR APPROVAL

SURVEYOR	REV	DATE	REVISION DESCRIPTION	DRAFT	DESIGN
A.S MORCOM SURVEYORS	A		ISSUED FOR APPROVAL	RC	SP

ADDRESS: 120 CONSTANCE AVENUE ROCKYVIEW QLD 4701
CO-ORDINATE DATUM MGA256
HEIGHT DATUM AHDD

	BY	DATE
REVIEWED	M. MATHEV	25.11.19
RPEQ ENG		
RPEQ No:	5141	

CLIENT

SCALE: AS SHOWN

PREPARED BY 0321820

mcmurtrie CONSULTING ENGINEERS
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Fax: (07) 4921 1790

CLIENT ROCKY'S OWN TRANSPORT COMPANY
PROJECT PROPOSED TRUCK DEPOT - 162 MIDDLE ROAD, GRACEMERE
TITLE STORMWATER MANAGEMENT
DETENTION BASIN

A1	DRAWING NUMBER 0321820-9001	REVISION A

PLOT DATE: 25/11/2019 10:24:03 AM