mcmurtrie
CONSULTING ENGINEERS

Stormwater Management Plan

Car Park Development
3 Old Capricorn Highway & 8 McLaughlin Street, Gracemere

Prepared For: Maroon Holdings Pty Ltd

Job No. 028-19-20
19 August 2021
Revision B

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/68-2021
Dated: 9 November 2021

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028-19-20

Stormwater Management Plan

Rev.	Description	Signature	RPEQ No	Date
B	Amended in response to RFI		5141	19/08/21
A	Issued For Approval	Orig. signed	5141	24/03/20

CONTENTS

028-19-20

Stormwater Management Plan

Car Park Development

1.0 INTRODUCTION AND APPROACH

1.1. PROJECT OVERVIEW

McMurtrie Consulting Engineers (MCE) have been commissioned by Maroon Holdings Pty Ltd to undertake a site-based Stormwater Management Plan (SMP) for a proposed carpark. The site is located at 2, 3 Old Capricorn Highway & 8 McLaughlin street Car Park on Lots 1 and 2 on RP606873 and Lot 1 on RP858373.

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 2016), Australian Rainfall and Runoff 2016 (ARR'16) 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'16 data hub
    - Rainfall data
    - Design storm ensemble temporal patterns
- Rockhampton Regional Council GIS data
- Preliminary overall layout plan (completed by Veris)
- Pluviograph rainfall data for the 'Rockhampton Aero' station

2.0 SITE CHARCTERISTICS

2.1. SITE LOCATION

The site is located at 2, 3 Old Capricorn Highway & 8 McLaughlin street on Lots 1 and 2 on RP606873 and Lot 1 on RP 858373, Gracemere. Site details have been summarised within Table 1. The proposed site is located as per **Figure 1** below.

Table 1: Site Description

Registered Owner	Property and Location	
	Lot and Property Description	Address
Maroon Holdings Pty Ltd	Lots 1 and 2 on RP606873 and Lot 1 on RP 858373	2 & 3 Old Capricorn Highway & 8 McLaughlin street, Gracemere

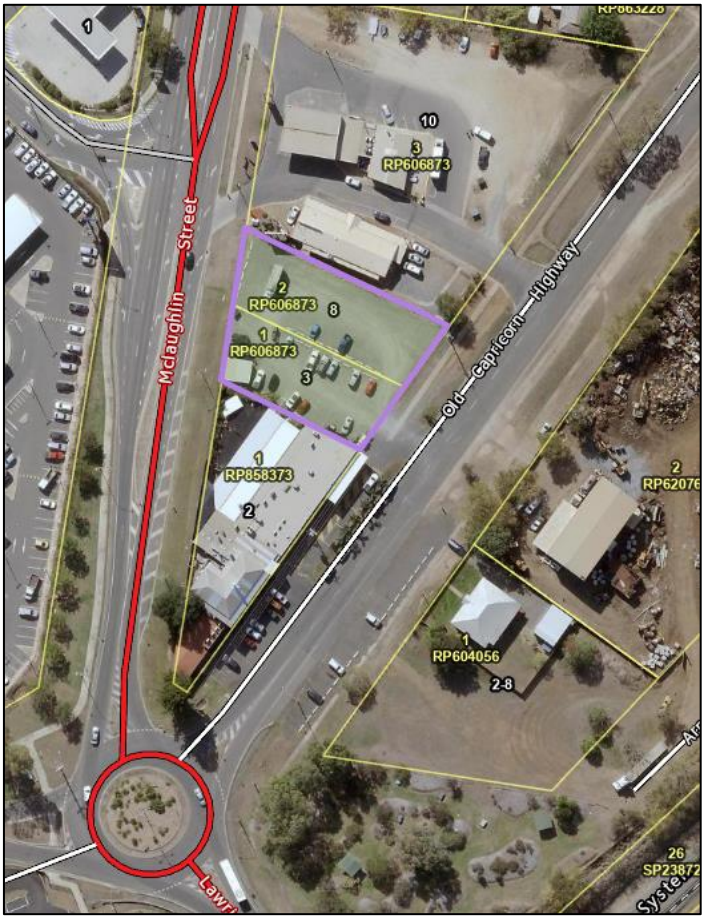

Figure 1: Site Location

The proposed development site is located in the Gracemere area within the Rockhampton Regional Council Local Government Area. The extent of the model is the entirety of Lot 1 & 2 on RP606873 and a portion of Lot 1 RP858373, specifically the area of additional roof as a result of the proposed development (The area between the existing building and the boundary of Lot 1 on RP608873). Model is approximately 0.212 ha in size.

2.2. TOPOGRAPHY

The area is presently occupied by Gracemere Hotel's, unsealed carpark, however for the purpose of this application the pre-development condition will be conservatively adopted as a residence as the site was in 2004 (see below). The site is bounded on the west by McLaughlin Street, the east by Old Capricorn Highway and on the north and south by adjacent lots. Existing ground levels across the site range from RL31.3 in the south western corner to RL28.2 in the south eastern corner.

Figure 2: adopted pre development condition

3.0 HYDROLOGY ASSESSMENT

3.1. LAWFUL POINT OF DISCHARGE

The lot is generally grading towards the low point in the north eastern and ultimately discharging onto Old Capricorn Highway. This point of discharge is under the lawful control of the local government and satisfies the requirements for Lawful Points of Discharge (LPOD) in accordance with QUDM.

Any stormwater volume increase from post development will be detained to ensure there will be no adverse impacts on downstream properties and infrastructure.

3.2. HYDROLOGIC MODELLING

Hydrologic calculations have been undertaken using XPSTORM 2019 V1 for pre and post development scenarios. The modelling within XPSTORM 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'16 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'16 and shown in Figure 3 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.

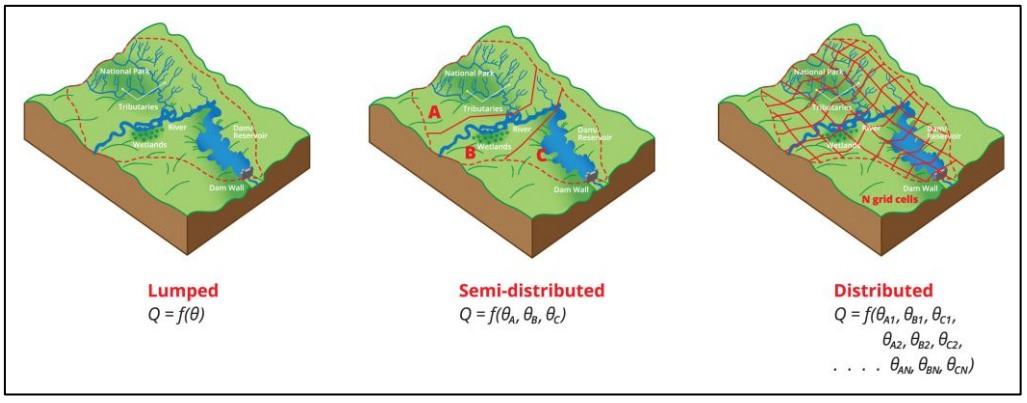

Figure 3: Catchment Analysis Options

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		Grass	Roof	Seal
Area (ha)		0.187	0.025	0.0
Impervious (%)		0.0	100	100
Slope (%)		5	26	5
Laurenson 'n' (storage non-linearity exponent)		-0.285	-0.285	-0.285
Infiltration	Initial Loss (mm/hr)	0.0	0.0	0.0
	Continuing Loss (mm/hr)	1.8	0.0	0.0
Manning's Roughness (n)		0.025	0.016	0.016

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

Parameter		Grass	Roof	Seal
Area (ha)		0.025	0.024	0.163
Impervious (%)		0.0	100	100
Slope (%)		5	26	5
Laurenson 'n' (storage non-linearity exponent)		-0.285	-0.285	-0.285
Infiltration	Initial Loss (mm/hr)	0.0	0.0	0.0
	Continuing Loss (mm/hr)	1.8	0.0	0.0
Manning's Roughness (n)		0.025	0.016	0.016

3.2.2. HYDROLOGY RESULTS

Applying the ARR'16 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.

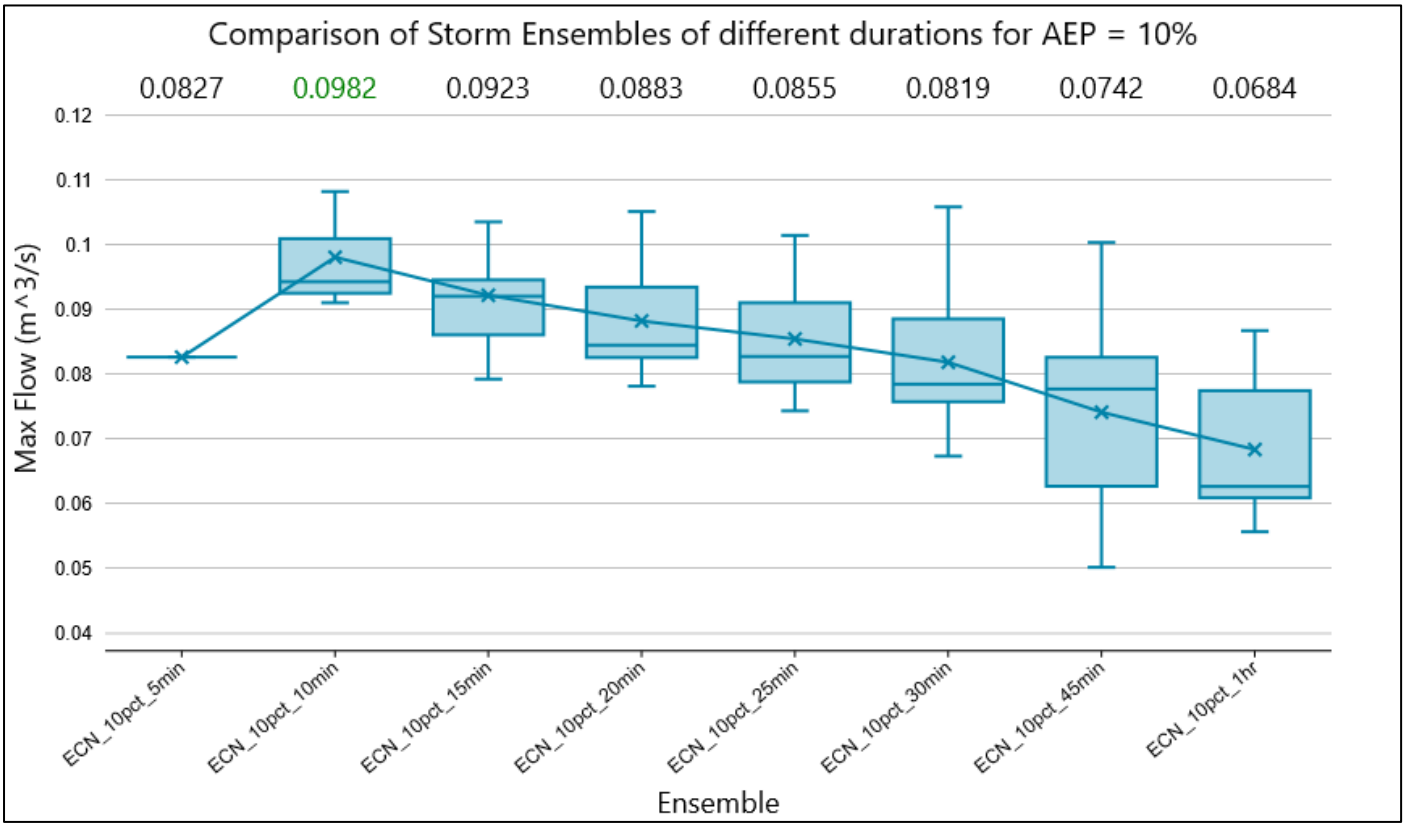

Figure 4: Comparison of Storm Ensembles of different durations for 10% AEP (Pre-development) (XPSTORM Model)

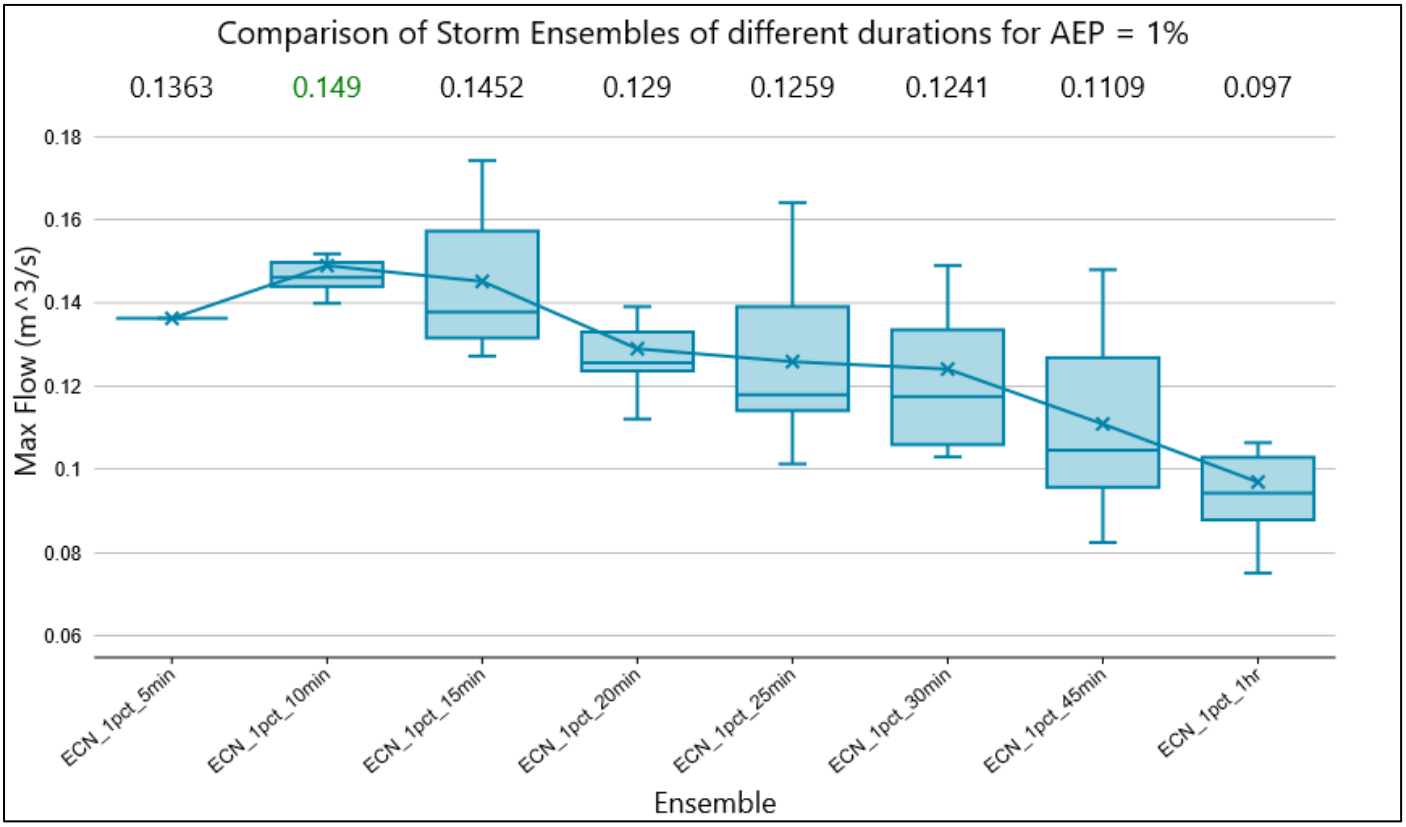

Figure 5: Comparison of Storm Ensembles of different durations for 1% AEP (Pre-development) (XPSTORM Model)

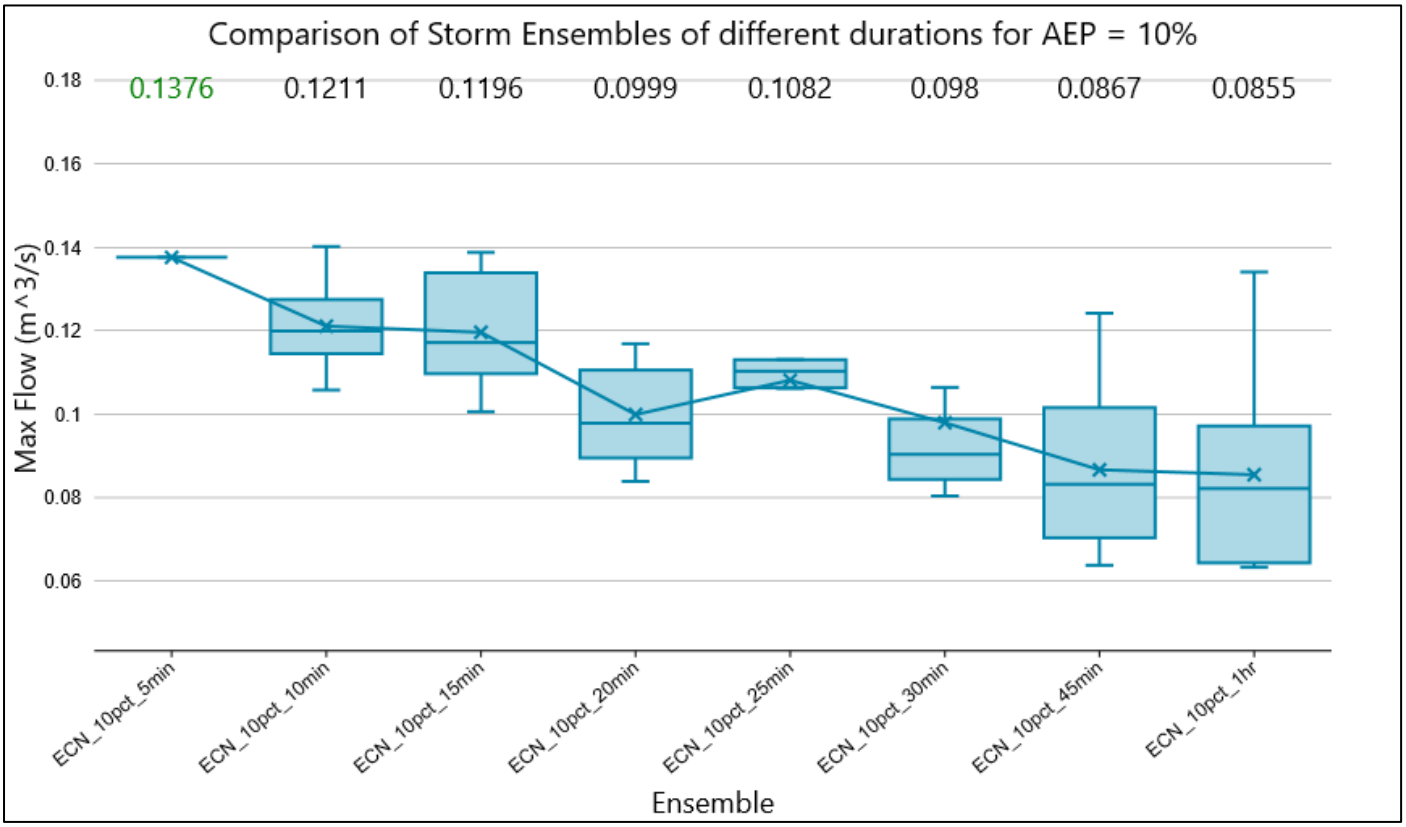

Figure 6: Comparison of Storm Ensembles of different durations for 10% AEP (Post-development) (XPSTORM Model)

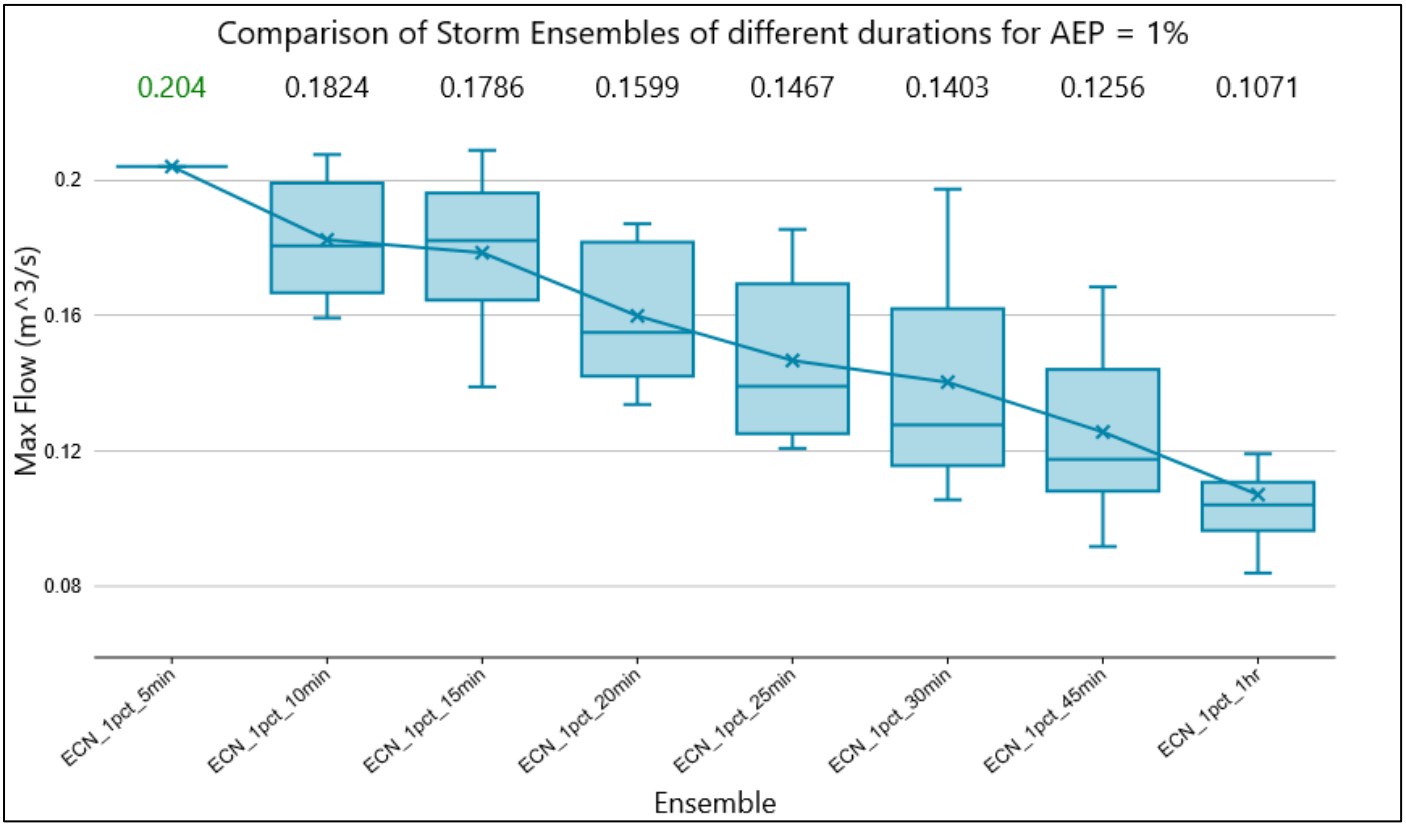

Figure 7: Comparison of Storm Ensembles of different durations for 1% AEP (Post-development) (XPSTORM Model)

The results of each of the ensembles are summarised in Table 4. The same storm events are applied to the hydraulic analysis. Multiple Post-development storms are shown because multiple durations of the unmitigated post development runoff are greater than the peak Pre-development runoff, this means that the mitigation strategy must address multiple durations.

Table 4: Critical Storm Events

Annual Exceedance Probability (AEP %)	Critical Storm Event	
	Pre development	Post development
10% (Minor Event)	10pct_10min_8	10pct_5min_1
		10pct_10min_1
		10pct_15min_9
		10pct_20min_1
1% (Major Event)	1pct_10min_6	1pct_5min_1
		1pct_10min_8
		1pct_15min_10
		1pct_20min_5

3.2.3. EXTERNAL CATCHMENTS

There are no external catchments impacting the subject site the upstream border to the north contains McLaughlin street, which diverts flow away.

4.0 HYDRAULIC ASSESSMENT

4.1 BACKGROUND

The hydraulic assessment for the site has been carried out using XPSTORM 2019 V1. 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. A detention basin will be constructed in the north eastern corner of the lot.

4.2 DETENTION

To ensure no worsening to downstream catchments and infrastructure the proposed development will require approximately 19.82m^3 of detention volume before engaging a 0.5m wide weir, constraining the weir to 0.5m wide is a 150mm high concrete kerb. The total storage when the discharge overtops the kerb crest is an additional 7.86m^3.

The detention basin will utilise a low flow outlet of 2/150dia uPVC pipes.

Refer below table 5 for peak discharge rates at legal point of discharge, the critical duration for the for each recurrence interval for each site condition is highlighted in yellow. The objective of the detention system is to ensure the peak mitigated post development discharge for each AEP is less than that of the Pre-development in accordance with Australian Rainfall and Runoff 2019 Table 9.4.1

Table 5: Peak Discharge Rate at LPOD

Storm Event (AEP %)	Duration	Pre-Development Discharge (m^3/s)	Post-Development Discharge – Unmitigated (m^3/s)	Post-Development Discharge - Mitigated (m^3/s)		
				2 x 150mm pipes	0.5m Weir	Total
10% (Minor Event)	5 mins	0.0827	0.1376	0.092	0.000	0.096
	10 mins	0.0982	0.1211	0.089	0.000	0.091
	15 mins	0.0923	0.1196	0.096	0.000	0.098
	20 mins	0.0883	0.0999	0.090	0.000	0.090
1% (Major Event)	5 mins	0.1363	0.2040	0.114	0.000	0.114
	10 mins	0.1490	0.1824	0.117	0.008	0.125
	15 mins	0.1452	0.1786	0.113	0.000	0.113
	20 mins	0.1290	0.1599	0.105	0.000	0.105

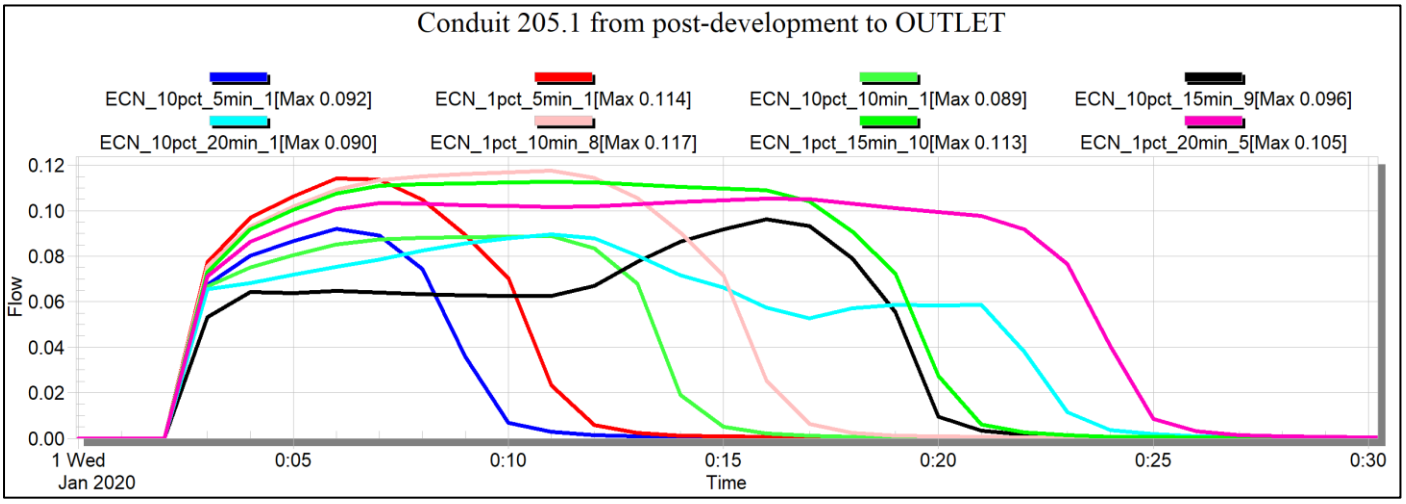

Figure 8: Outflow from Detention Basin – 2 x 150mm pipe outlet

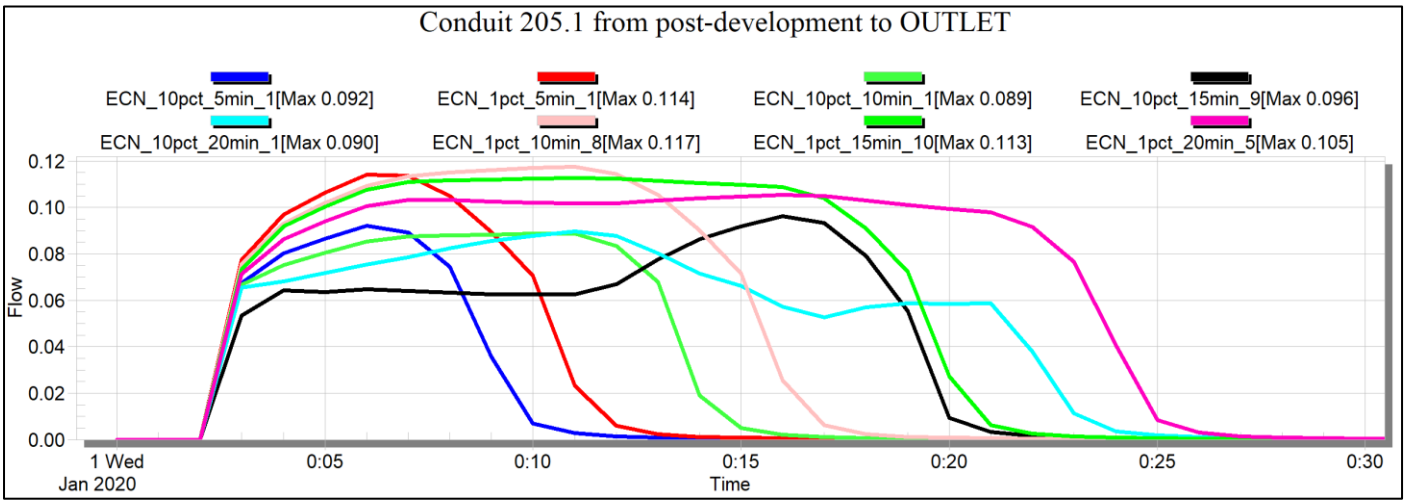

Figure 9: Outflow from Detention Basin – 0.5m Weir

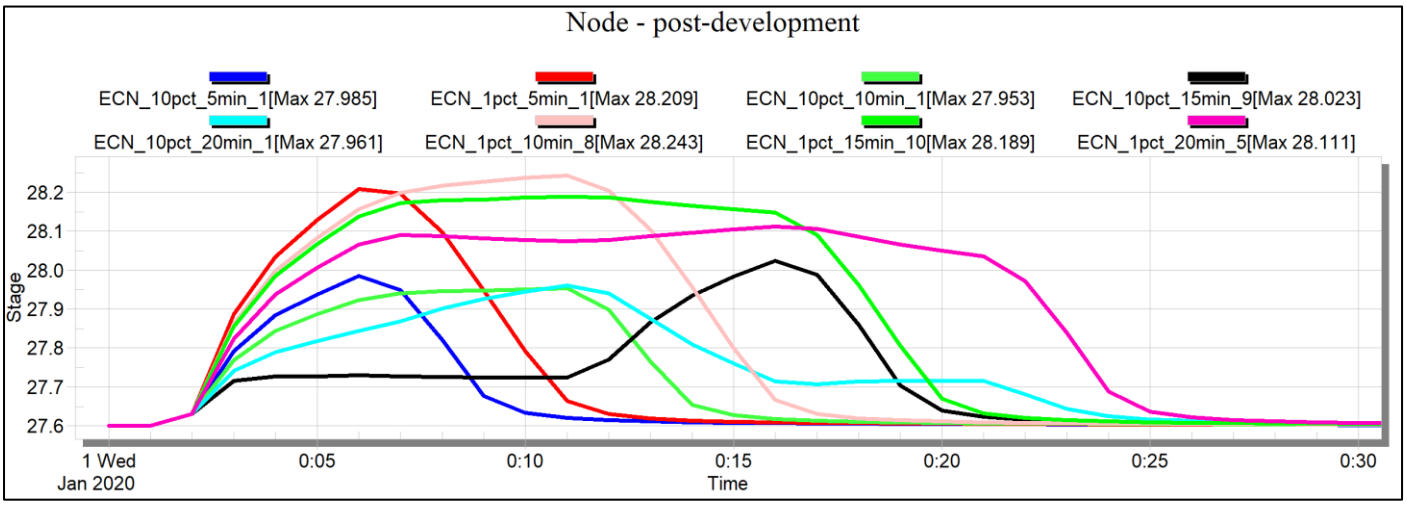

Figure 10: Peak Water Level

Table 6 summarises detention basin parameters to achieve the target mitigated pre-development flow rates.

Table 6: Detention Basin Parameters

Effective Detention Volume (at weir height)	**10.83m³**

Effective Detention volume (at top of kerb height)	**20.38m³**
Base Level	**27.60m**
Weir outlet	**28.20m**
Top of Kerb height	**28.35m**
Peak Water Level in 1% AEP (approximate)	**28.243m**
Peak Water level in 10% AEP (approximate)	**28.023m**
Outlet Structure	**2 x 150mm uPVC with 0.5m Weir**

Outflow from detention basin will be discharged onto Old Capricorn highway.

5.0 QUALITY ASSESSMENT

5.1. BACKGROUND

The proposed development involves a premise 2090m2 in area, therefore is not required to satisfy the water quality assessment benchmarks set out 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 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 7 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 7: 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 Old Capricorn Highway.
- 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.

6.0 CONCLUSION

The following conclusions are drawn based on the above study of the site;

- Post-development runoff will be discharged into a detention basin in the south eastern corner of the lot.
- Outflow from the detention basin will be discharged onto the Old Capricorn Highway road reserve via 2 x 150mm pipes and 0.5m weir.

APPENDIX A

Stormwater Management Plan

LEGEND

- PROPOSED GRASSED AREA n=0.016, A=250m2
- PROPOSED SEALED AREA n=0.016, A=1,630m2
- PROPOSED ROOF AREA n=0.016, A=240m2

MCLAUGHLIN STREET

N

DETENTION BASIN

PONDING EXTENTS AT TOP OF KERB HEIGHT

A
-

2/150Ø uPVC

MS

MS

OLD CAPRICORN HIGHWAY

AREA OF SITE WHICH IS NOT CURRENTLY CONVEYED TO DETENTION BASIN, AT OPERATIONAL WORKS STAGE FINAL DESIGN SURFACE MUST CONVEY RUNOFF FROM THIS CATCHMENT TO DETENTION BASIN.

PLAN
SCALE: 1:125(A1) 1:250(A3)

TOP OF KERB RL 28.35m
WEIR RL 28.20m
EXISTING SURFACE
2/150Ø uPVC
1
2
BASIN RL 27.60m

A
-
SECTION
SCALE 1:50(A1) 1:100(A3)

NOTE:

THIS CONCEPT DESIGN DRAWING HAS BEEN REVIEWED BY THE FOLLOWING OFFICER AND IS DEEMED SUITABLE FOR ITS INTENDED USE I.E. MATERIAL CHANGE OF USE/RECONFIGURATION OF A LOT. NOT ALL DESIGN ELEMENTS HAVE BEEN ASSESSED AGAINST APPLICABLE STANDARDS AS WOULD BE CARRIED OUT FOR A DETAILED DESIGN, AS SOME BASE DATA INCLUDING DETAILED SURVEY WERE NOT A AVAILABLE.

REVIEWING ENGINEER: CHRIS HEWITT
RPEQ NUMBER: 5141
SIGNATURE:
DATE: 19/08/2021

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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

Development Permit No.: D/68-2021

Dated: 9 November 2021

ISSUED FOR APPROVAL

SURVEYOR
A.S. MORCOM SURVEYOR

ADDRESS:
120a CONSTANCE AVE
ROCKHAMPTON QLD 4701

CO-ORDINATE DATUM
MGA 94

HEIGHT DATUM
AHDD

DRAWING No.	REFERENCE DRAWING TITLE	REV	DATE	REVISION DESCRIPTION	DFT	DFT CHK	DES	DES CHK
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		A	24.03.2020	ISSUED FOR APPROVAL	IBB		IBB	

	BY	DATE
REVIEWED		
RPEQ ENG		

RPEQ No:

CLIENT

SCALE: AS SHOWN

PREPARED BY 028-19-20

mcmurtrie CONSULTING ENGINEERS
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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 MAROON HOLDINGS PTY LTD
PROJECT CAR PARK DEVELOPMENT
TITLE STORMWATER MANAGEMENT PLAN

A1

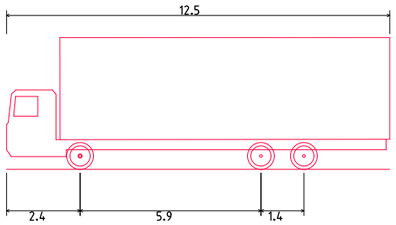
DRAWING NUMBER 0281920-SMP-0001

REVISION B

PLOT DATE: 19/08/2021 9:35:10 AM DRAWING LOCATION: S:\PROJECT RECORDS\19-20\028-19-20\00 CIVIL DESIGN\DWG\INDIVIDUAL DRAWINGS\REF'S\SUPERSEDED\DR_DESIGNSTRINGS SUP.DWG

LEGEND

- PROPERTY BOUNDARY
- PROPOSED LANDSCAPED AREA
- PROPOSED SEALED AREA



OVERALL LENGTH	12.500m
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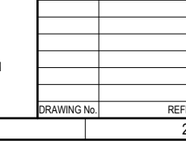
OVERALL BODY HEIGHT	4.300m
MIN BODY GROUND CLEARANCE	0.417m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
CURB TO CURB TURNING RADIUS	12.500m

HEAVY RIGID VEHICLE DETAIL
SCALE: 1:100(A1) 1:200(A3)



OVERALL LENGTH	5.200m
OVERALL WIDTH	1.940m
OVERALL BODY HEIGHT	1.878m
MIN BODY GROUND CLEARANCE	0.272m
TRACK WIDTH	1.840m
LOCK-TO-LOCK TIME	4.00s
CURB TO CURB TURNING RADIUS	8.000m

B99 VEHICLE DETAIL
SCALE: 1:100(A1) 1:200(A3)

ROCKHAMPTON REGIONAL COUNCIL

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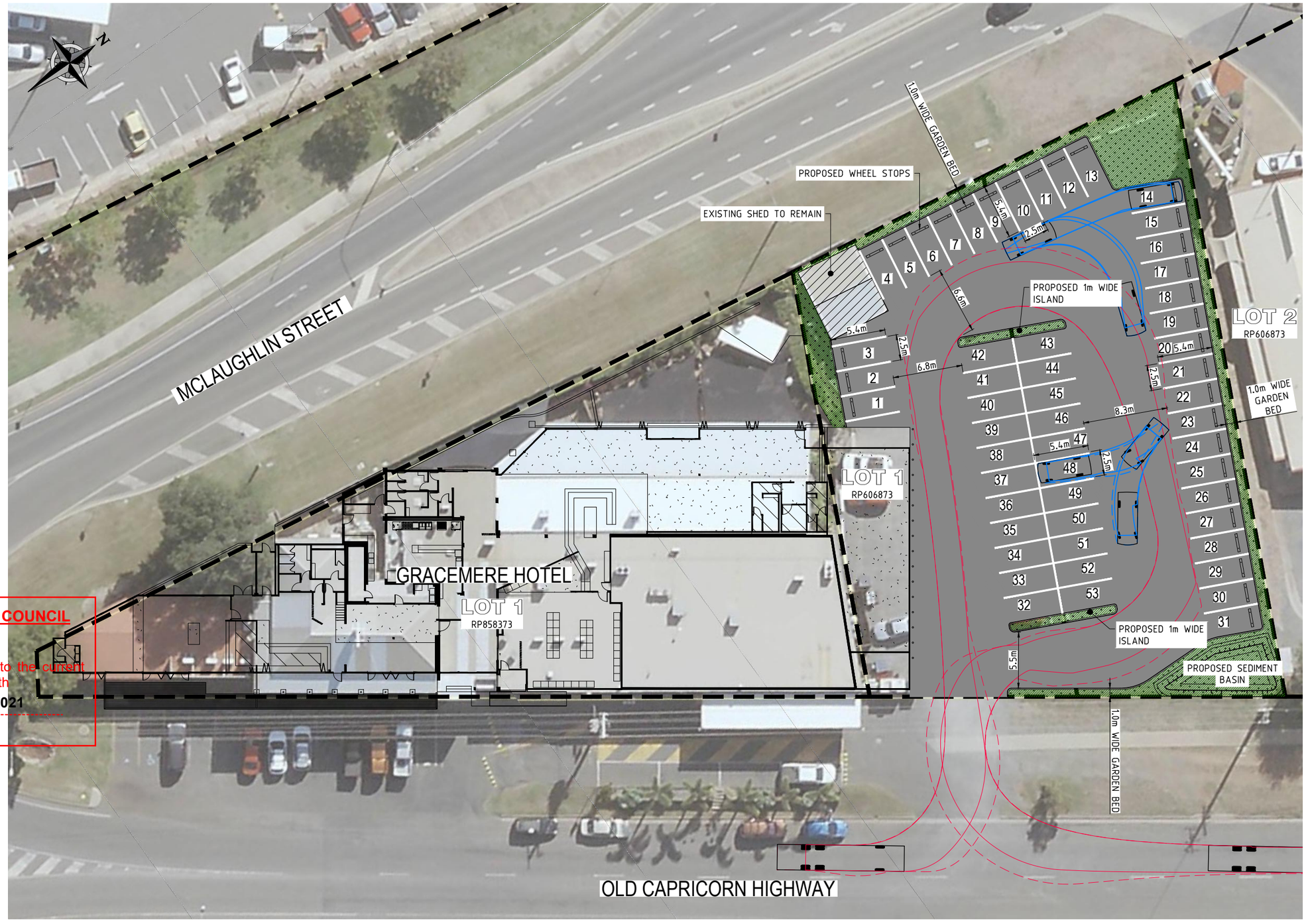
REVIEWING ENGINEER: CHRIS HEWITT
RPEQ NUMBER: 5141
SIGNATURE:
DATE: 19/08/2021



2 0 2 4 6 8 10m
SCALE 1:100 @ A1 SCALE 1:200 @ A3

4 0 4 8 12 16 20m
SCALE 1:200 @ A1 SCALE 1:400 @ A3

LAYOUT PLAN
SCALE 1:200(A1) 1:400(A3)

INFORMATION ONLY

SURVEYOR									
N/A									
ADDRESS:									
CO-ORDINATE DATUM				19.08.2021	SUBMITTED FOR APPROVAL				
HEIGHT DATUM			A	10.03.2020	SUBMITTED FOR INFORMATION	RC	CH	RC	CH
	DRAWING No.	REFERENCE DRAWING TITLE	REV	DATE	REVISION DESCRIPTION	DFT	DFT CHK	DES	DES CHK

	BY	DATE
REVIEWED		
RPEQ ENG		
RPEQ No:		

CLIENT

SCALE: AS SHOWN

PREPARED BY 0281920

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Fax: (07) 4921 1790

CLIENT GAVIN PITTS
PROJECT GRACEMERE HOTEL
TITLE GRACEMERE HOTEL
PRELIMINARY CARPARK LAYOUT
SHEET 1 OF 1

A1 | DRAWING NUMBER 0281920-SK-0001 | REVISION A

DRAWING LOCATION: S:\PROJECT RECORDS\19-20\0281920-19-20\00 CIVIL DESIGN\DWG\INDIVIDUAL DRAWINGS\0281920 - GRACEMERE HOTEL PRELIMINARY CARPARK LAYOUT.DWG
PLOT DATE: 19/08/2021 9:34:23 AM

EXISTING GROUND FLOOR AREA
APPROX 1,160m²

CONVERT COVERED AREA TO INTERNAL
APPROX 200m²

COVERTED KIDS PLAY TO SMOKERS AREA
APPROX 35m²

CONVERTED AREAS
APPROX 235m²

NEW COVERED KIDS AREA / STORE
APPROX 170m²

AMENTIES UNDER EXISTING ROOF
APPROX 10m²

DECK OUTSIDE OF BOUNDARY - Not apart of this Approval
APPROX 55m²

NEW AREAS
APPROX 235m²

NEW CAR PARK
APPROX 1,625m²

DO NOT SCALE DRAWING
ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:

REVISIONS

ROCKHAMPTON REGIONAL COUNCIL
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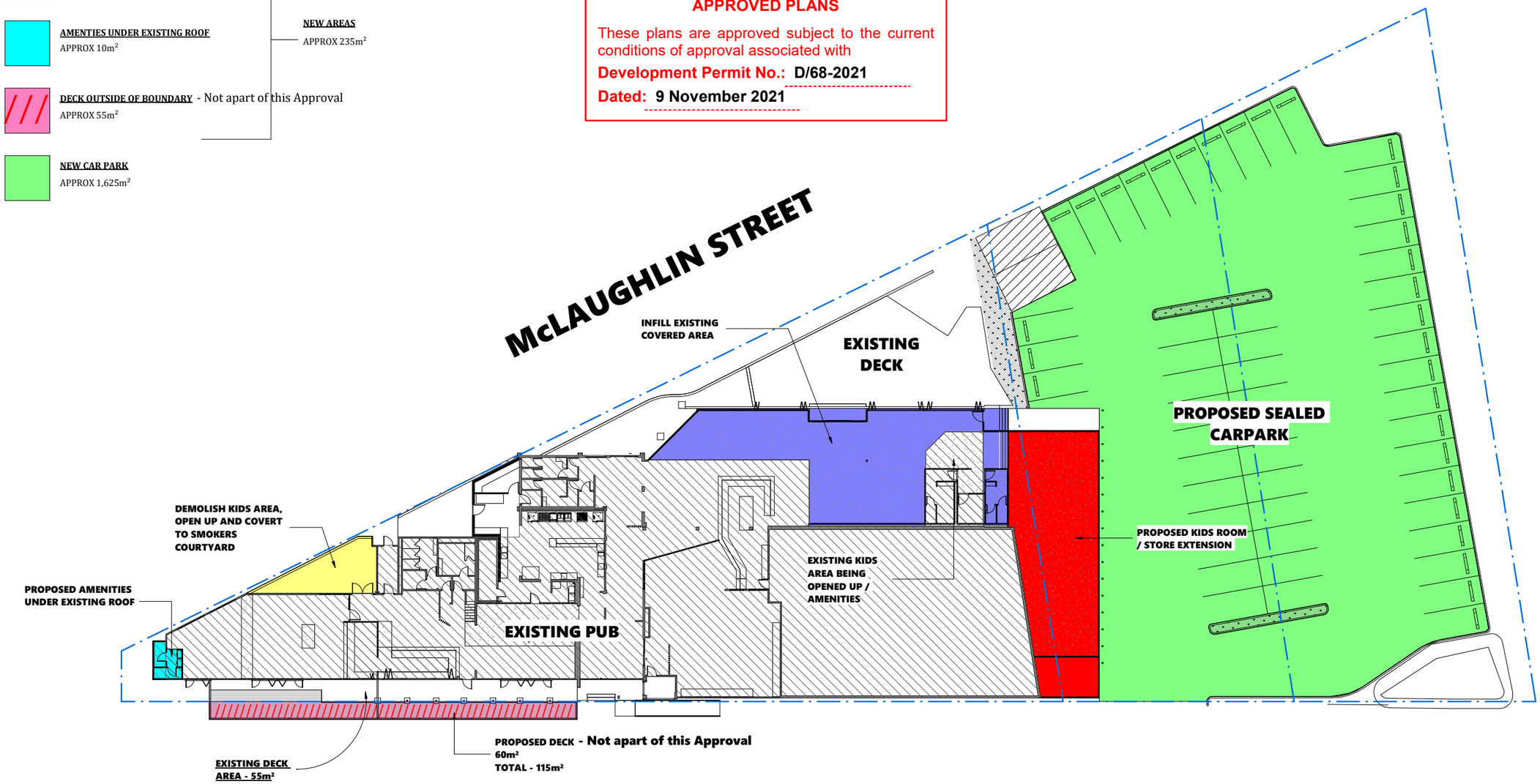
Development Permit No.: D/68-2021
Dated: 9 November 2021



SITE PLAN - AREA'S
1 : 200

/ As amended by Council 21 October 2021

ISSUED FOR
PRELIMINARY

Project Details:
RENOVATION & EXTENSION
LOT 1 McLAUGHLIN ST, GRACEMERE

Drawing Title:
AREA'S

dezignelements BUILDING DESIGNERS
0407 271 336 M
info@dezignelements.com.au E
QBCC No: 1247120 BDAQ No: 0001677

Scale:	As indicated	Rev:
Date:	SEPT 19	
Drawn:	Author	
Project No:	Drawing No:	
19_027	S-08	

13/07/2021 12:40:22 PM

STAGE 1

STAGE 2

DO NOT SCALE DRAWING
ALL DIMENSION IN MILLIMETERS

No:	Description:	Date:

REVISIONS

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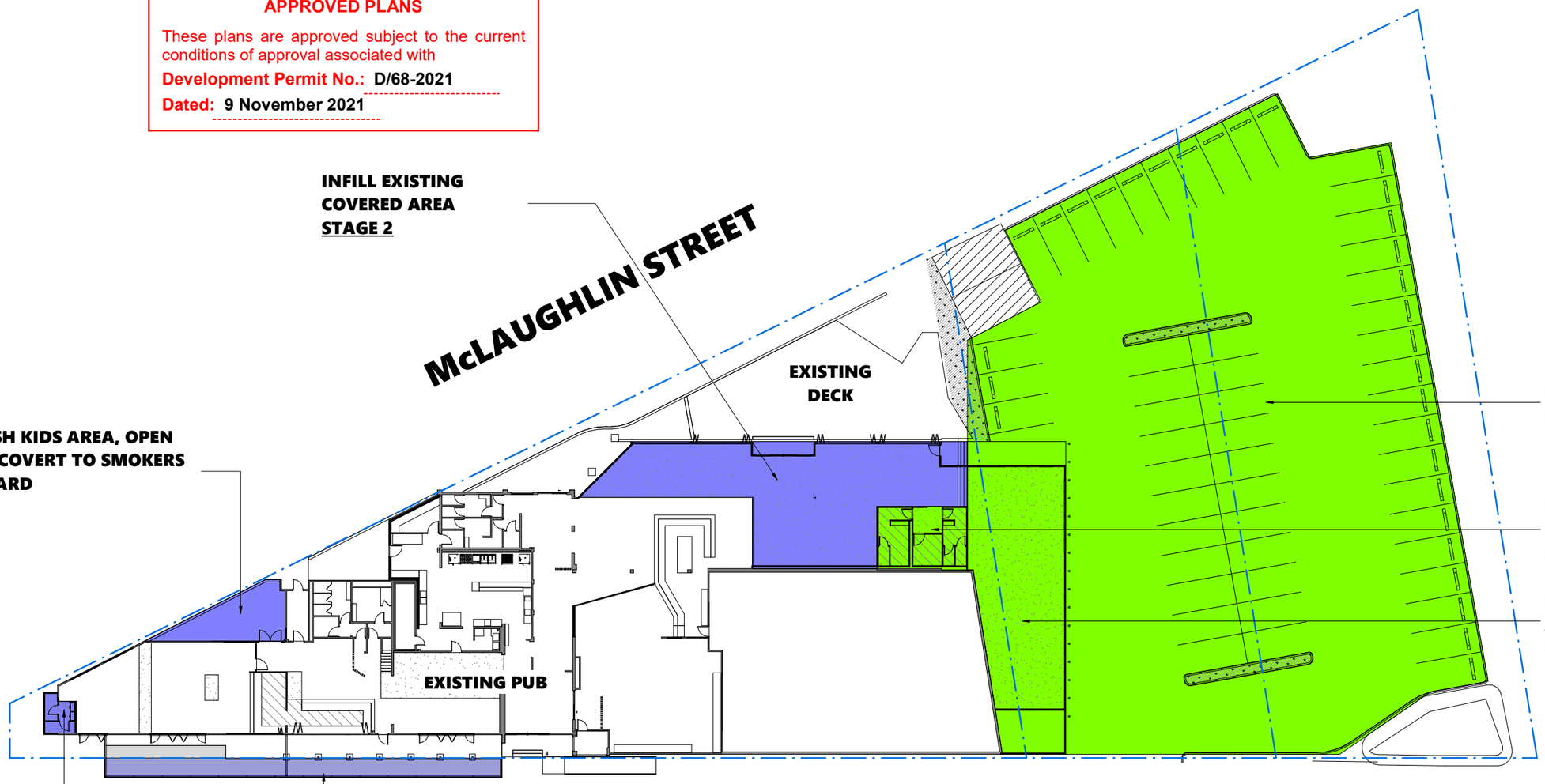
Development Permit No.: D/68-2021

Dated: 9 November 2021



SITE PLAN - STAGES

1 : 200

ISSUED FOR

PRELIMINARY

Project Details:

RENOVATION & EXTENSION

LOT 1 McLAUGHLIN ST, GRACEMERE

Drawing Title:

STAGE PLAN

dezignelements BUILDING DESIGNERS

0407 271 336 M

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QBCC No: 1247120 BDAQ No: 0001677

Scale:	As indicated	Rev:	
Date:	SEPT 19		
Drawn:	Author		
Project No:	Drawing No:		
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