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Dated: 20 December 2021

no amendment date **DA APPROVAL**

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20/10/2021 OUR REF. 032-21-22

REPORT



PROJECT

57 Elphinstone Street Townhouses

CLIENT

Pure Projex

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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

Development Permit No.: D/143-2021

Dated: 20 December 2021



DOCUMENT CONTROL

Rev.	Description	Signature	RPEQ No.	Date
Α	Draft			12/10/2021
В	Final	agt:#	05141	20/10/2021

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1 INTRODUCTION

McMurtrie Consulting Engineers (MCE) have been engaged by Pure Projex to provide an assessment of a number of elements with regards to the proposed multi dwelling development of 57 Elphinstone Street, Berserker. The proposed development consists of 4 townhouses and 2 studio apartments and is located on Lot 4 on RP601093. Further details can be found on the layout drawing in Appendix B.

2 TRAFFIC

The site is located on Elphinstone Street approximately 37m from the Musgrave Street intersection. Musgrave Street is under the jurisdiction of the Department of Transport and Main Roads (DTMR). Elphinstone Street would be considered a Minor Urban Collector road and is under the control of Rockhampton Regional Council (RRC). Figure 1 shows the proposed development site location.



Figure 1 Proposed Site Location

Musgrave Street and Elphinstone Street is a signalised intersection under the control of DTMR and the latest traffic counts provided by DTMR are from 2014. These counts have been included as in Appendix A.

In accordance with *Guide to Traffic Generating Developments version 2.2* the Weekday peak hour vehicle trips = 0.4-0.5 per dwelling for medium residential flat buildings. There are 6 units which results in an estimated peak traffic of 3 vehicles per hour. Comparing this to the 2014 traffic count on Elphinstone Street at the Musgrave Street intersection of 488

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vehicles per hour (10% of the 4876 total traffic), the increase from the proposed development is 0.6%. Consequently, the impact on traffic from the development considered to be negligible. This assessment is conservative as no allowance has been made for traffic growth since 2014.

Visibility is good at the proposed access, refer to site photographs Figure 2 and 3 below.



Figure 2 – Looking East along Elphinstone Street



Figure 3 – Looking West along Elphinstone Street

The proposed site development layout is as per Figure 4 below with access on to Elphinstone Street.



Figure 4 Proposed Development



3 **STORMWATER**

A stormwater management report has been prepared and is attached in Appendix B. The following conclusions have been extracted from the report:

- Post-development runoff routed through an internal drainage network, with crests and sags to allow ponding for additional storage of at least 5.1m³.
- Outflow from the stormwater network will be discharged directly into the Elphinstone Street stormwater pit, the legal point of discharge, via 2x90mm diameter uPVC pipes (at an invert level of approximately 14.0m AHD) and a 5.5m driveway serving as a weir.
- There will be no stormwater quality strategy adopted for the operational phase of the development in accordance • with the requirements of the State Planning Policy (July 2017).

SEWER CONNECTION 4

Rockhampton Regional Council's online mapping portal shows that there is an existing 150mm diameter Earthenware sewer that intersects the site from West to East and is shown in Figure 5. RRC have stated that the existing connection for the site appears to be located on the western boundary. This connection is likely to be a standard 100mm diameter, which is potentially suitable as the connection point for the proposed development. This will need to be confirmed during the detailed design phase.



Figure 5 – Rockhampton Region Council Services



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5 WATER CONNECTION

The standard house connection likely to be present at 57 Elphinstone Street from the previous single residence is 20mm. This will not be adequate for the proposed development and will need to be upgraded to 40mm (size to be confirmed by a hydraulic engineer during detailed design phase).

Rockhampton Regional Council's online mapping portal shows that there is an existing 250mm diameter MPVC watermain within the road on Elphinstone Street and is shown in Figure 5. This 250mm MPVC watermain is the current supply point and will be used for the new/ upgraded connection. RRC has been contacted to confirm that this is appropriate. The upgrade works will need to be carried out by Fitzroy River Water via a private works contract.

6 ACCESS DRIVEWAY

The site currently has access on to Elphinstone Street via an 3m long cut out in the kerb at the Eastern end of the frontage. The development requires the access to be relocated to Western end of the frontage. A power pole is present on the boundary, 1m clearance is required between the pole and the driveway based on Ergon guidelines. An existing stormwater inlet is present within the footprint of the new driveway. The proposed solution is to remove the inlet and install a grated lid on the existing chamber. The grate will have a lower inlet capacity and a high risk of blockage. RRC generally require no negative impacts to the stormwater system. At this stage, it is proposed to relocate the inlet to a new chamber constructed online of the existing 375mm diameter RCP east of the existing location. This can be discussed further with RRC or additional options investigated during the detailed design phase. Refer to Figure 4 or drawings 0002 in Appendix B for details.

The new driveway will be a 5.5m wide residential standard driveway constructed in accordance with CMDG requirements and standard drawing CMDG-R-041. The existing driveway will be removed and replaced by Type 1 barrier kerb in accordance with CMDG standard drawing CMDG-R-060.

7 RECOMMENDATIONS

- Traffic The impact on traffic from the development is considered to be negligible.
- Stormwater management Stormwater is to be collected within the site and discharged to Elphinstone Street via 2 no. 90mm uPVC pipes during minor storm events or over the proposed driveway during major storm events. The concrete carpark is to be graded with crest and sag points to provide 5.1m3 of above ground storage.
- Sewer connection A new manhole to be constructed online of existing 150mm Earthenware sewer that intersects the site.
- Water connection The water supply to the site is to be upgrade via a larger sized connection to the 250mm MPVC watermain in Elphinstone Street.
- Access Driveway New driveway to be constructed on Elphinstone Street. Existing stormwater inlet is to be relocated 10m East onto new chamber and grated lid to be installed on existing chamber.

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Appendix A – Musgrave Street and Elphinstone Street Intersection Traffic Count

Count Tally Sheet



LOCATION: Musgrave Street & Elphinstone Street ROAD No: 196 (Int 1915 @ Tdist 2.709Km) DATE: Thu, 27/02/14 TIME: 06:00 - 18:00



DATE 20/10/2021



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Appendix B – Stormwater Management Report and Drawings



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REPORT TYPE

STORMWATER MANAGEMENT



PROJECT

57 Elphinstone Street Townhouses Lot 4 RP601093, Berserker Queensland

CLIENT

Pure Projex

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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1. INTRODUCTION AND APPROACH

1.1. PROJECT OVERVIEW

McMurtrie Consulting Engineers (MCE) have been commissioned by Pure Projex to undertake a site-based Stormwater Management Plan (SMP) for a proposed townhouse development which is located on Lot 4 on RP601093. 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
- Survey and preliminary site layout from Rockhampton Regional Council
- Pluviograph rainfall data for the 'Rockhampton Aero' station.



2. SITE CHARACTERISTICS

2.1. SITE LOCATION

The proposed site is located on Lot 4 on RP601093. Site details have been summarised within Table 1 and a QLD Globe extract is presented as Figure 1.

Developer	Property and Location		
	Lot and Property Description	Address	
Rockhampton Regional Council	Lot 4 RP601093	57 Elphinstone Street, Berserker	

Table 1: Site Description



Figure 1: Site Location

The proposed site abuts Elphinstone Street on the Southern side. It shares a common boundary with the adjacent lots on West, North and East sides.

2.2. TOPOGRAPHY

The existing site is a vacant lot that is currently used as a carpark. The site is flat and covered in light grass. The existing site levels range from approximately 15.6m AHD at the Northern end to 15.2m AHD at the Southern end.



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3. HYDROLOGY ASSESSMENT

3.1. LAWFUL POINT OF DISCHARGE

The existing site surface grades towards Elphinstone Street at the southern end of the site. The existing road and kerb in Elphinstone Street is the Lawful Point of Discharge (LPOD) for the site. The flows from the site then enter the below ground stormwater system via the existing inlet in the kerb of Elphinstone Street directly outside the development site.

Post development discharge will be assessed to ensure that there will be no adverse impacts on downstream properties and infrastructure. A desktop study and a site visit of the surrounding properties suggests that runoff is not directed on the development site. 176, 180 and 184 Musgrave Street discharge to Musgrave Street via kerb outlets and runoff from 59 Elphinstone Street reaches the kerb in Elphinstone Street via overland flow paths within the site of number 59. Based on this the no external catchments are considered relevant to this development.

3.2. HYDROLOGIC MODELLING

Hydrologic calculations have been undertaken using XPSTORM 2020.1 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'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 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 Site Layout.

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3.2.1 CATCHMENT HYDOLOGY PARAMETERS

Table 2 and 3 summarise the input data for the development site in pre-development and post-development conditions. Table 4 summarises the input data for the external catchment.

		Existing site			
Par	Parameter		Gravel driveway	Roof	
Are	ea (ha)	0.0683	0.0182	0.0106	
Impei	rvious (%)	0.0	50	100	
Slope (%)		0.7	0.7	41	
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)	2.5	2.5	0.0	
Manning's Roughness (n)		0.030	0.020	0.022	

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

Parameter		Developed site			
		Garden	Concrete Pavement	Roof	
Are	ea (ha)	0.0188	0.0409	0.0374	
Impei	rvious (%)	0.0	100	100	
Slope (%)		0.7	0.7	41	
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)	2.5	0.0	0.0	
Manning's Roughness (n)		0.060	0.013	0.022	

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

Applying no initial losses within the model is consistent with the requirements of both ARR'87 and ARR'16. ARR'16 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.

PROJECT 57 Elphinstone Street Townhouses Pure Projex



Applying the ARR'16 ensemble temporal patterns to the catchments allowed the identification of the critical duration for the mean minor (10% AEP) and major storm (1% AEP) events. The below figures are screen shots of Box and Whisker plot taken from XPSTORM software. These plots show the comparison of storm ensembles for different durations for minor and major storm events.



Figure 3: Comparison of Storm Ensembles of different durations for pre-development 1% AEP (XPSTROM Model)



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



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



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



Annual Exceedance	Critical Storm Event		
Probability (AEP %)	Pre-development	Post development	
		10pct_10min_3	
	10pct_20min_5	10pct_15min_2	
100/(Minor Event)		10pct_20min_5	
10% (Minor Event)		10pct_25min_3	
		10pct_30min_2	
		10pct_45min_2	
		1pct_10min_3	
	1pct_15min_2	1pct_15min_2	
1% (Major Event)		1pct_20min_9	
		1pct_25min_1	
		1pct_30min_9	

Table 4: Critical Storm Events



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4. HYDRAULIC ASSESSMENT

4.1. BACKGROUND

The hydraulic assessment for the site has been carried out using XPSTORM 2020.1. 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 utilising the concrete road area within the development as above ground storage.

4.1. DETENTION

To ensure no worsening to downstream catchments and infrastructure the proposed development will require a minimum of approximately 5.1m³ of detention volume before engaging a 5.5m wide weir, defined as the driveway apron on Elphinstone Street. The maximum depth of water at any point on the site has been limited to 55mm in the 1% AEP event. The drainage network within the site will consist of multiple gully inlets located in sag points designed to capture and locally detain storm flows. Details of the concept drainage can be found on the drawings in Appendix A.

The flows from the site will discharge via a low flow outlet consisting of twin 90mm diameter uPVC pipes connecting into the existing stormwater chamber in Elphinstone Street in front of the driveway.

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.



Figure 7: Discharge to LPOD for pre-development 10% and 1% AEP critical storms (XPSTORM Model)



Figure 8: Discharge to LPOD for post-development (unmitigated) 10% and 1% AEP critical storms (XPSTORM Model)



Figure 9: Peak flow through 2x90 uPVC pipes (mitigated) for post-development 10% and 1% AEP critical storms (XPSTORM Model)



Figure 10: Flow over weir (mitigated) for post-development 10% and 1% AEP critical storms (XPSTORM Model)

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Figure 11: Flow level at weir (mitigated) for post-development 10% and 1% AEP critical storms (XPSTORM Model)

Storm Event (AEP %)	Duration	Pre- Development Mean Discharge (m ³ /s)	Post-Development Mean Discharge – Unmitigated (m³/s)	Post-Development Discharge - Mitigated (m³/s)		
				2x90mm pipes	5.5m Weir	Total
10% (Minor Event)	10 mins	0.0313	0.0439	0.029	0	0.029
	15 mins	0.0332	0.0438	0.029	0	0.029
	20 mins	0.0337	0.0395	0.029	0	0.029
	25 mins	0.0320	0.0404	0.029	0	0.028
	30 mins	0.0316	0.0384	0.029	0	0.029
	45 mins	0.0285	0.0345	0.029	0	0.028
1% (Major Event)	10 mins	0.0513	0.0673	0.029	0.014	0.043
	15 mins	0.0539	0.0675	0.029	0.018	0.047
	20 mins	0.0509	0.0600	0.029	0.015	0.044
	25 mins	0.0512	0.0585	0.029	0.012	0.041
	30 mins	0.0492	0.0573	0.029	0.015	0.044

Table 5: Peak Discharge Rate at LPOD



5. QUALITY ASSESSMENT

5.1. BACKGROUND

The proposed development involves construction of residential units on a subject site of 1000m². State Planning Policy (July 2017) states that water quality assessment benchmarks for MCU are for premises 2500m² or greater. Therefore, the operational phase of the development is not required to be assessed.

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 sediment and nutrients washing from the site.

The following sections describe construction phase controls.

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 6 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 6: Key Pollutants – Construction Phase

5.2.2 EROSION AND SEDIMENT CONTROLS

PRE-CONSTRUCTION

- Stabilised site access/exit.
- 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. CONCLUSION

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

- Post-development runoff routed through an internal drainage network, with crests and sags to allow ponding for additional storage of at least 5.1m³.
- Outflow from the stormwater network will be discharged into Elphinstone Street stormwater pit, the legal point of discharge, via 2x90mm diameter uPVC pipes and a 5.5m driveway serving as a weir.
- There will be no stormwater quality strategy adopted for the operational phase of the development in accordance with the requirements of the State Planning Policy (July 2017).

PROJECT 57 Elphinstone Street Townhouses Pure Projex DATE 20.10.2021



7. APPENDIX A

- Drawing 0001 Pre-development Layout
- Drawing 0002 Proposed Layout









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