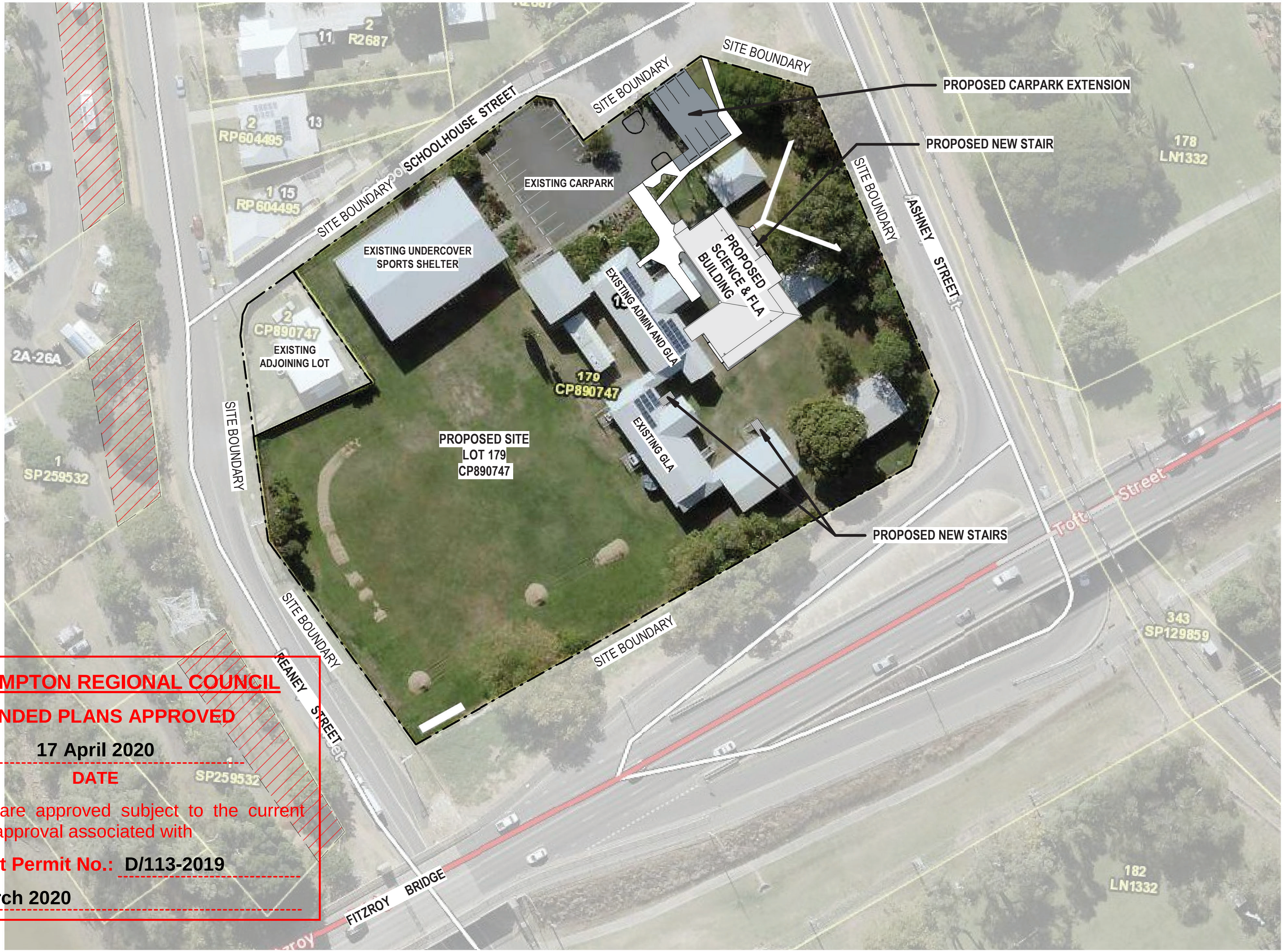

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17 April 2020

DATE

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Development Permit No.: D/113-2019

Dated: 4 March 2020

drawing title:
LOCALITY PLAN

drawing no: SK-001 project no: KI-001

project: **A3 DRAWING** NOTED SCALES RELATE TO A3 DRAWINGS
NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

location:
19 REARNEY STREET,
BERSERKER, ROCKHAMPTON

client:
KINGSLEY CHRISTIAN
COLLEGE

REVISIONS

REV	DESCRIPTION	DATE
6	PRELIMINARY	02/03/2020
8	PRELIMINARY	09/03/2020
11	BUILDING APPROVAL	31/03/2020

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rev 11

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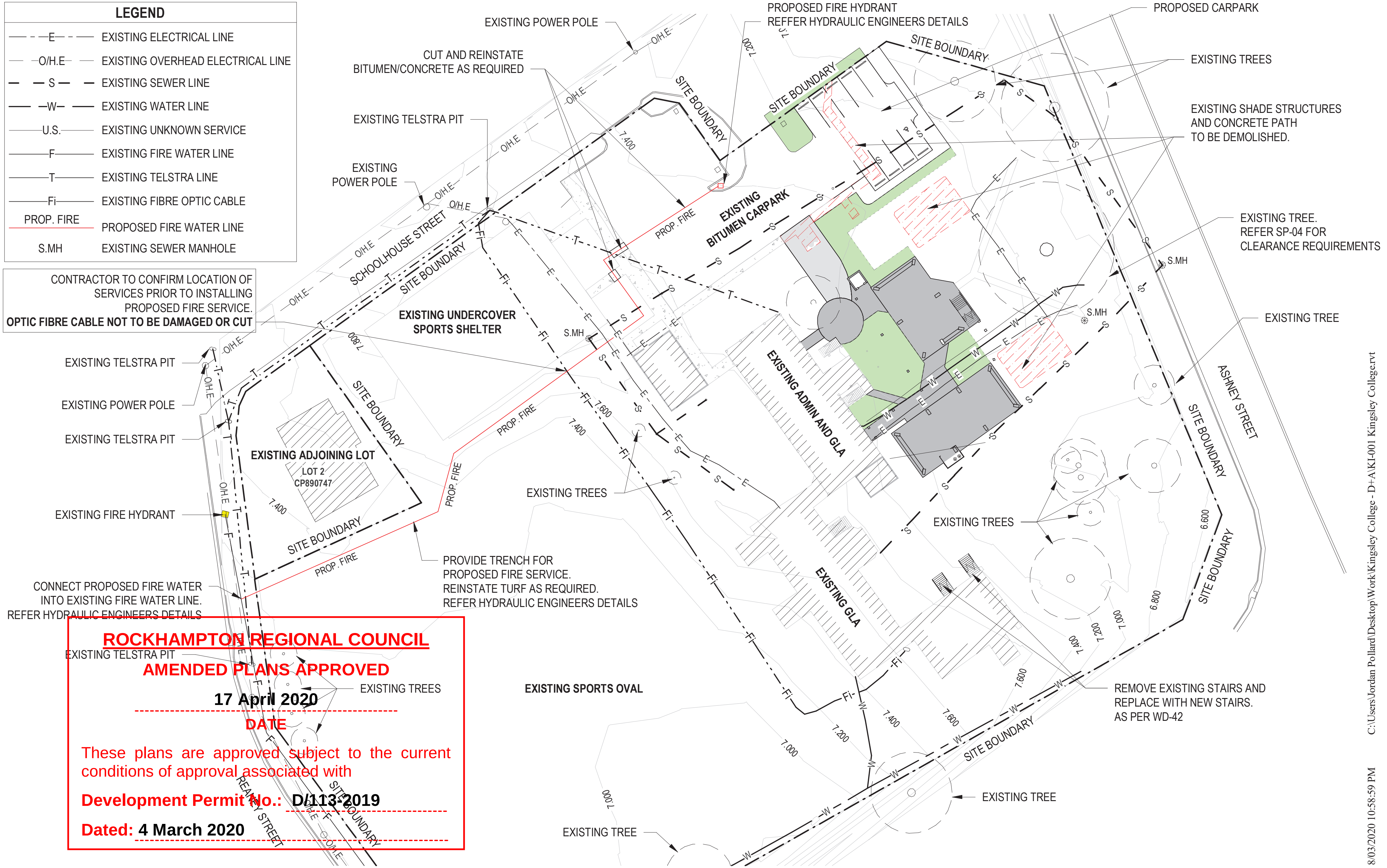

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drawing title:

OVERALL SITE PLAN

drawing no: SP-02

project no: KI-001

project: BGA 2019 / 2020

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location: 19 REANEY STREET, BERSEKER, ROCKHAMPTON

client: KINGSLEY CHRISTIAN COLLEGE

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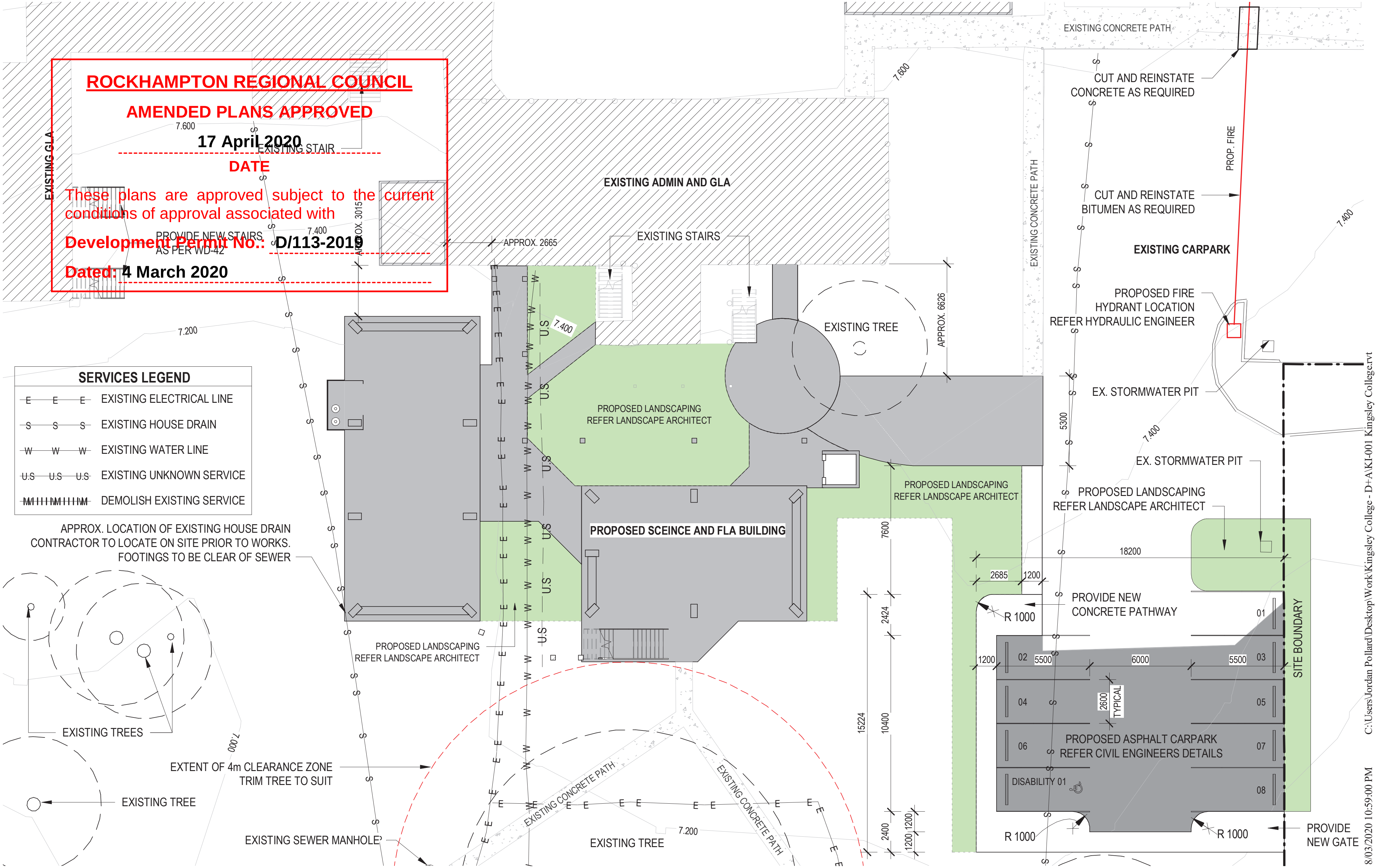

drawing title:
PROPOSED SITE PLAN

drawing no: SP-04

project no: KI-001

project: BGA 2019 / 2020

A3 DRAWING — NOTED SCALES RELATE TO A3 DRAWINGS

location: 19 REANEY STREET, BERSEKER, ROCKHAMPTON

client: KINGSLEY CHRISTIAN COLLEGE

REVISIONS

REV	DESCRIPTION	DATE
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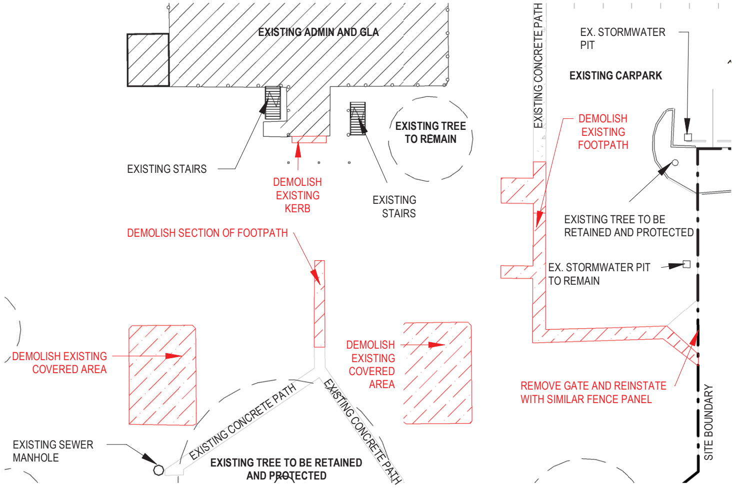
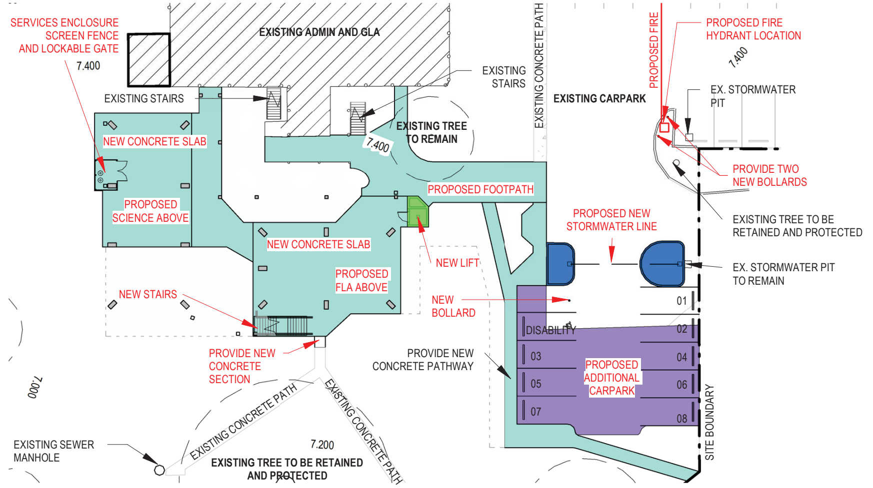


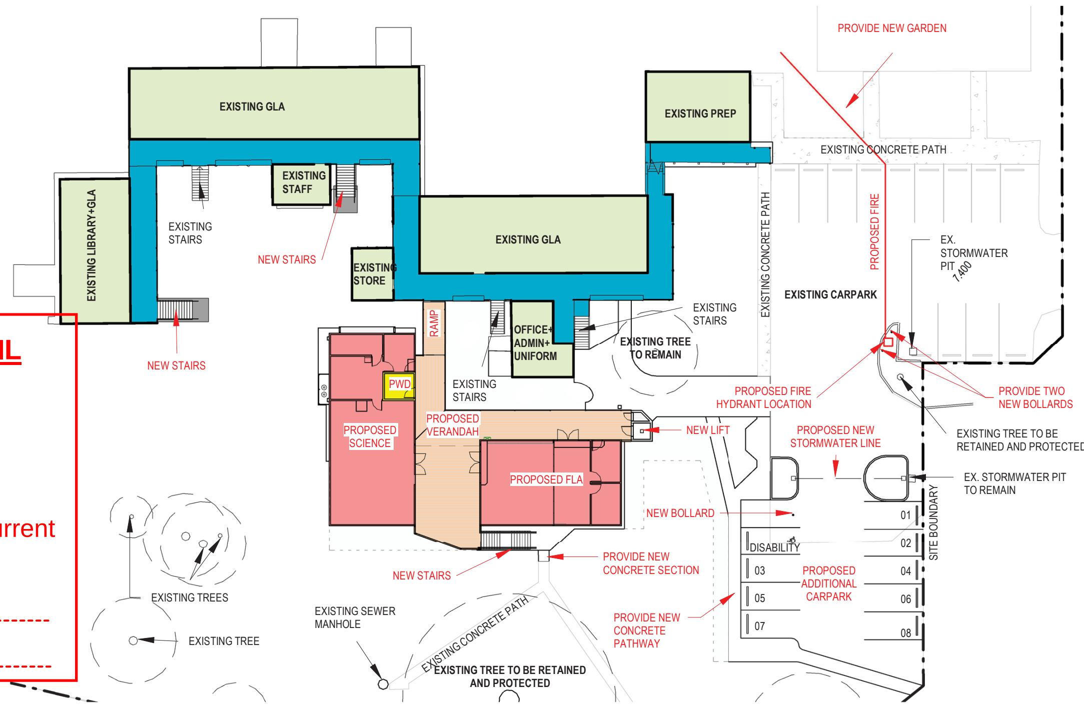
1. EXISTING GROUND FLOOR AREA 1:500



2. PROPOSED GROUND FLOOR AREA 1:500

GROUND FLOOR AREA SCHEDULE

DEDUCTION	CONCRETE TO BE DEMOLISHED	:176.4 SQM
	CARPARK LANDSCAPE	: 25.7 SQM
	TOTAL	**:202.1 SQM**
ADDITION	PROPOSED CONCRETE SLAB+PATH	:484.1SQM
	PROPOSED ADDITIONAL CARPARK	:171.5 SQM
	TOTAL	**:655.6 SQM**



FIRST FLOOR AREA SCHEDULE

EXISTING	EXISTING FIRST FLOOR GFA	: 574.2 SQM
	EXISTING VERANDAH	:245.5 SQM
	TOTAL	**:819.7 SQM**
ADDITION	PROPOSED VERANDAH	: 140 SQM
	PROPOSED FIRST FLOOR GFA	:243.6 SQM
	PROPOSED PWD GFA	:8 SQM
	TOTAL	**:391.6 SQM**

TOTAL SITE AREA: 12636 SQM

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17 April 2020

DATE

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Dated: 4 March 2020

3. PROPOSED FIRST FLOOR AREA 1:500

drawing title:
FLOOR AREA SCHEDULE

drawing no: SK-002 project no: KI-001

project: A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS
NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

location:
19 REARNEY STREET, BERSERKER, ROCKHAMPTON

client:
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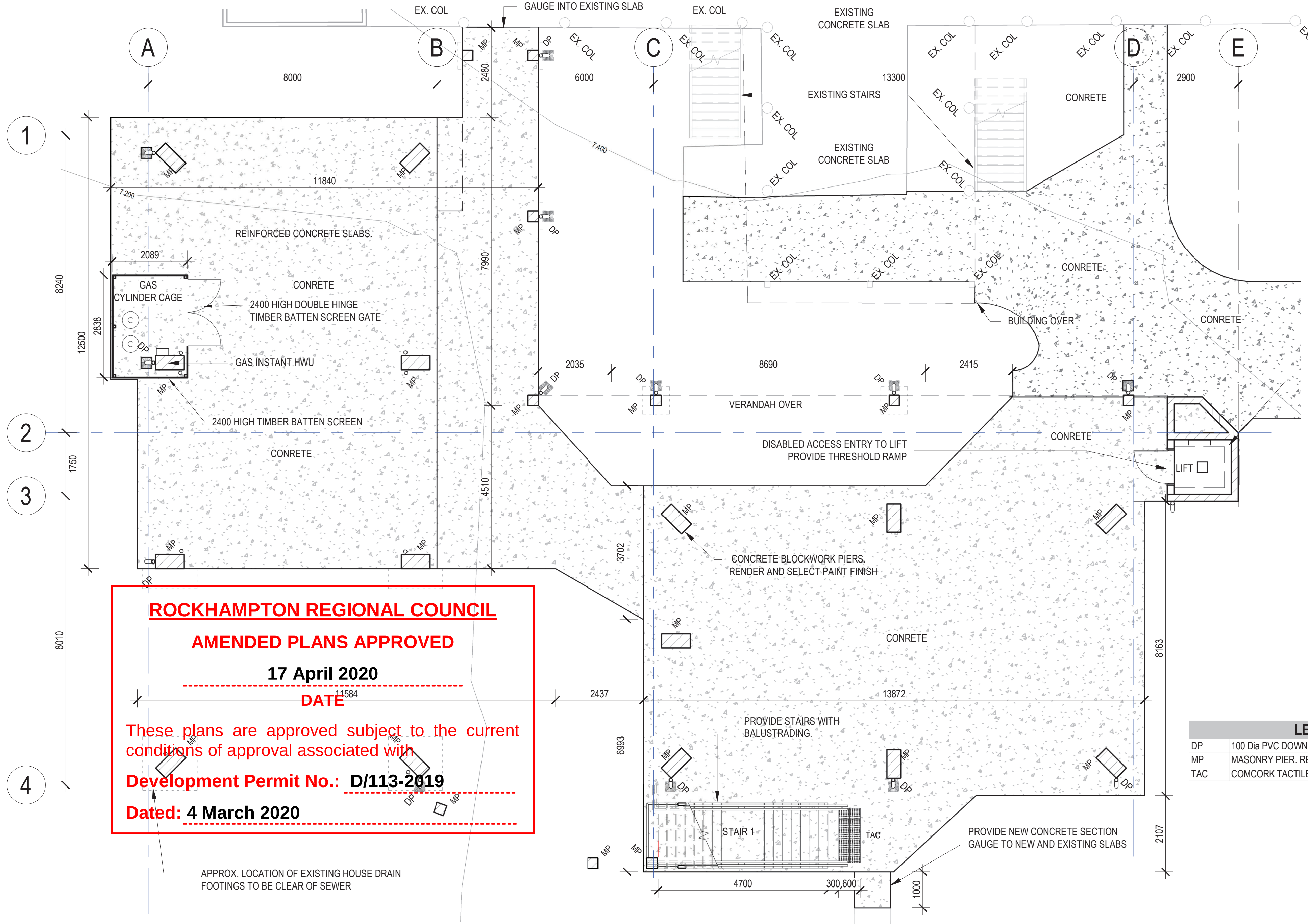

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LEGEND	
DP	100 Dia PVC DOWNPIPE
MP	MASONRY PIER. REFER STRUCT. ENGINEER
TAC	COMCORK TACTILE INDICATOR

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drawing title:
GROUND FLOOR PLAN

drawing no: SK-003 project no: KI-001

project: A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS
NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

location:
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client:
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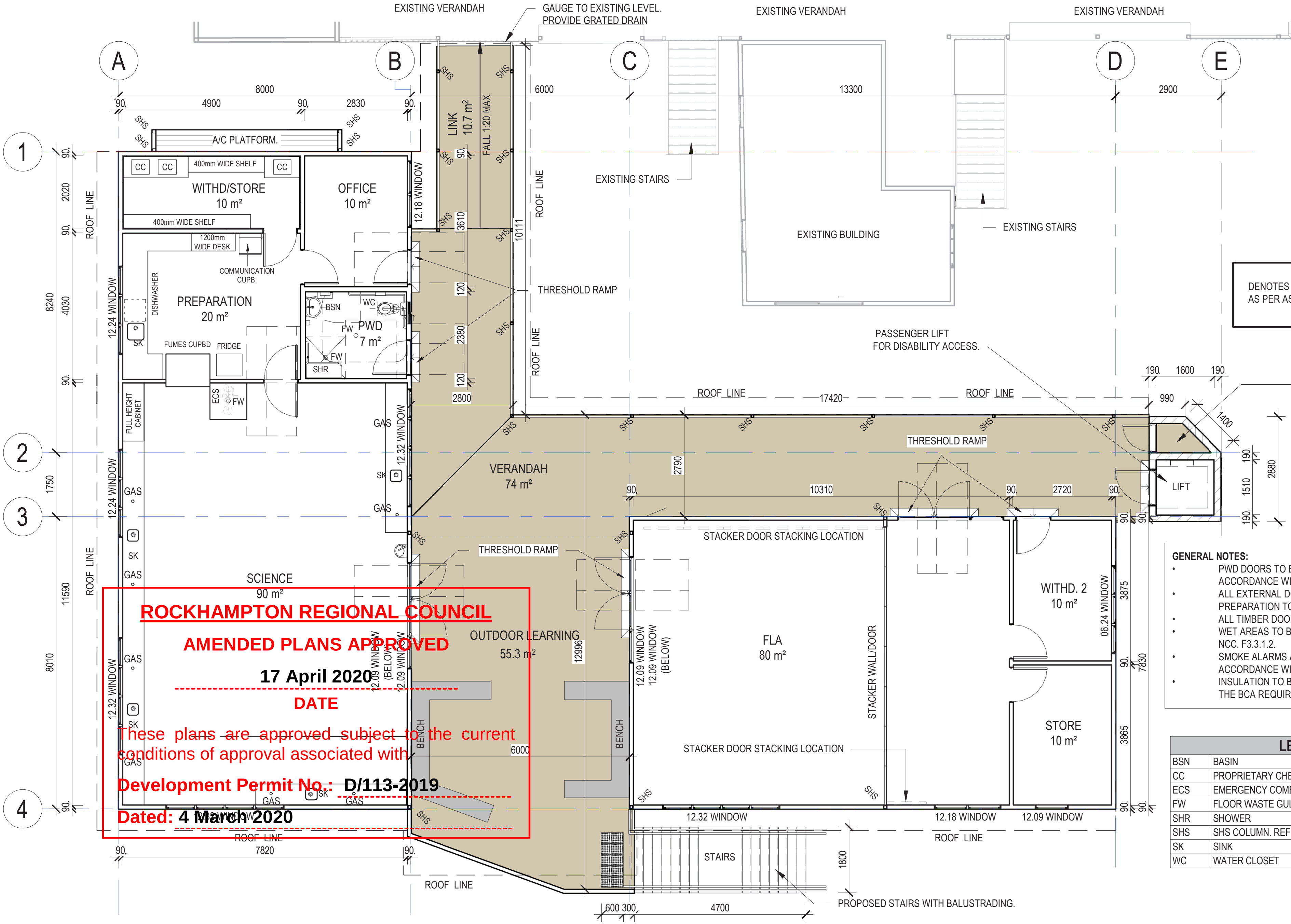

DENOTES CIRCULATION SPACE.
AS PER AS 1428.1.

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GENERAL NOTES:

- PWD DOORS TO BE FITTED WITH LIFT OFF HINGES IN ACCORDANCE WITH NCC. F3.8.3.3.
- ALL EXTERNAL DOORS AND DOOR FROM SCIENCE TO PREPARATION TO BE DISABLED COMPLIANT.
- ALL TIMBER DOORS TO HAVE GLASS VIEWING PANEL.
- WET AREAS TO BE WATERPROOFED IN ACCORDANCE WITH NCC. F3.1.1.2.
- SMOKE ALARMS AND EXIT SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH REGULATIONS
- INSULATION TO BE INSTALLED IN CEILING AND WALLS PER THE BCA REQUIREMENTS..

LEGEND	
BSN	BASIN
CC	PROPRIETARY CHEMICAL CABINET
ECS	EMERGENCY COMBINATION EYEWASH AND SHOWER
FW	FLOOR WASTE GULLY
SHR	SHOWER
SHS	SHS COLUMN. REFER STRUCT. ENGINEER
SK	SINK
WC	WATER CLOSET

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drawing title:
LEVEL 1 FLOOR PLAN

drawing no: SK-004 project no: KI-001

project: NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location: 19 REARNEY STREET, BERSERKER, ROCKHAMPTON

client: KINGSLEY CHRISTIAN COLLEGE

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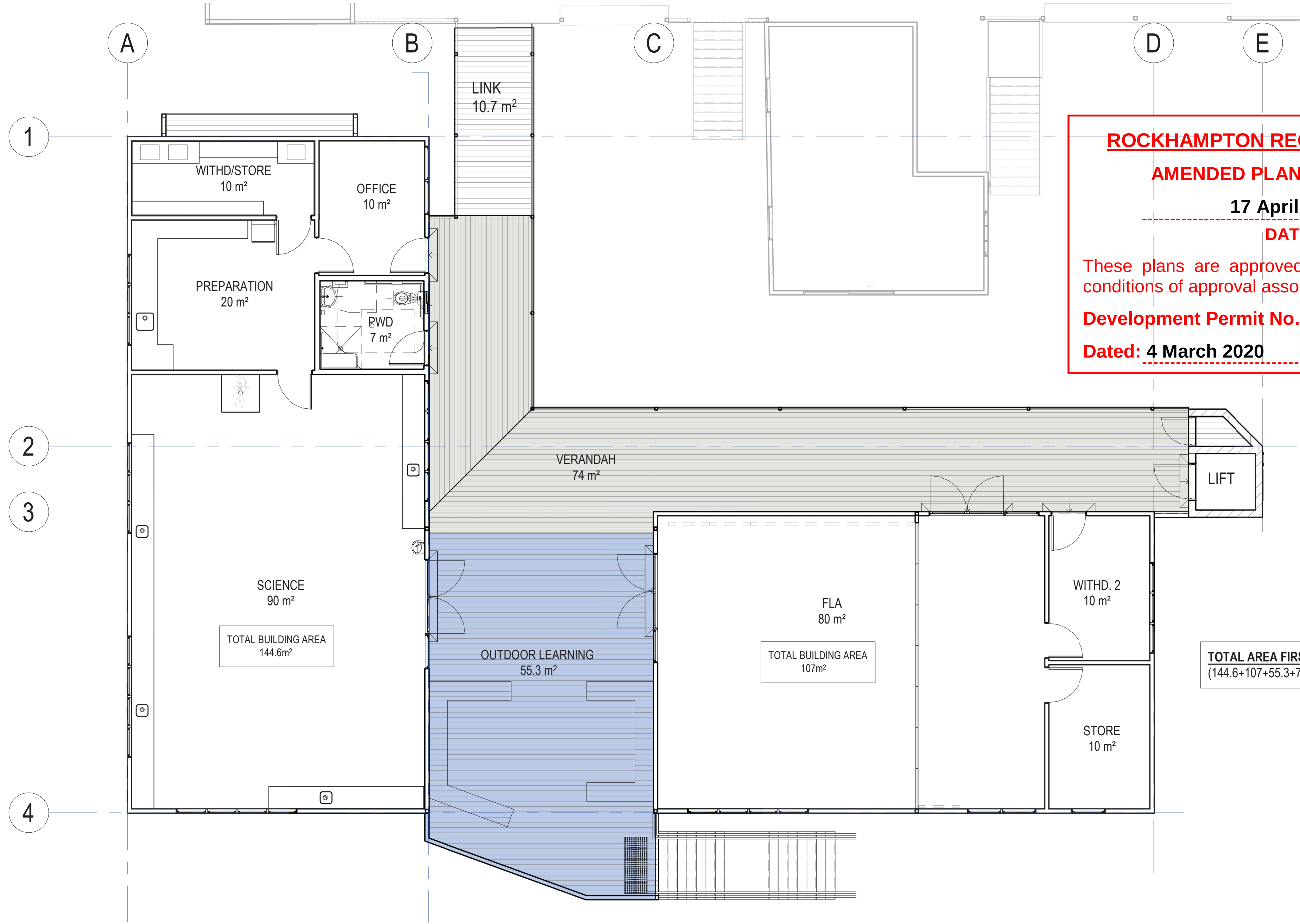

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TOTAL AREA FIRST FLOOR AREA: 391.6 SQM
(144.6+107+55.3+74+10.7)

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31/03/2020 10:00:27 AM

drawing title:
FIRST FLOOR AREAS

drawing no: SK-005 project no: KI-001

project: NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location: 19 REARNEY STREET, BERSERKER, ROCKHAMPTON

client: KINGSLEY CHRISTIAN COLLEGE

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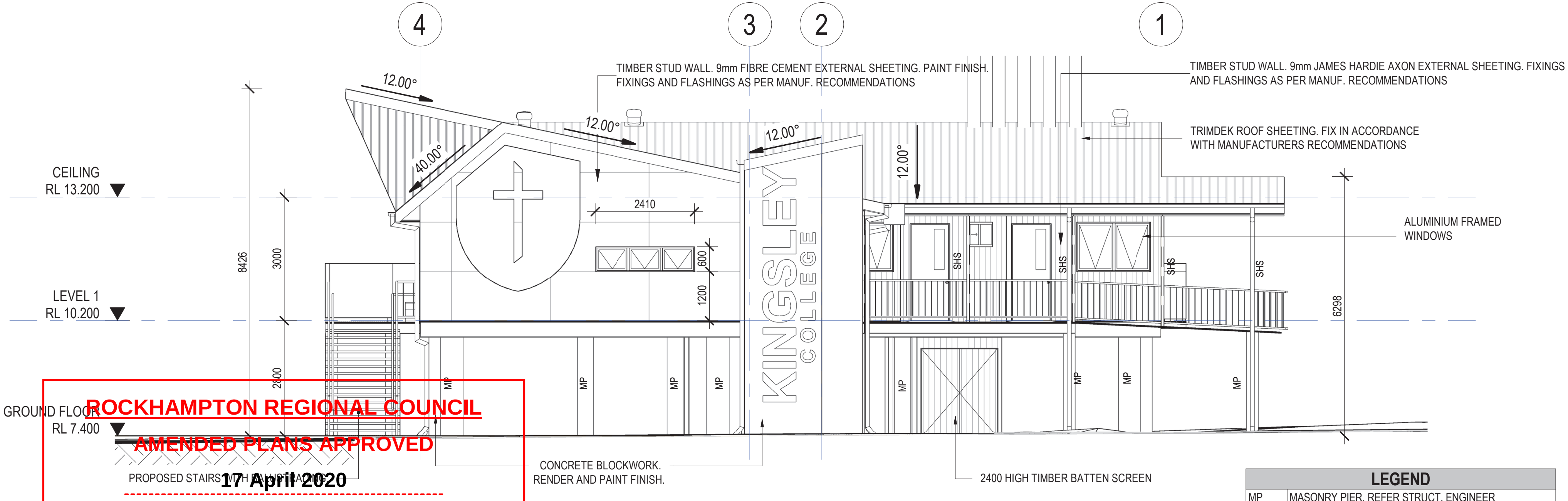

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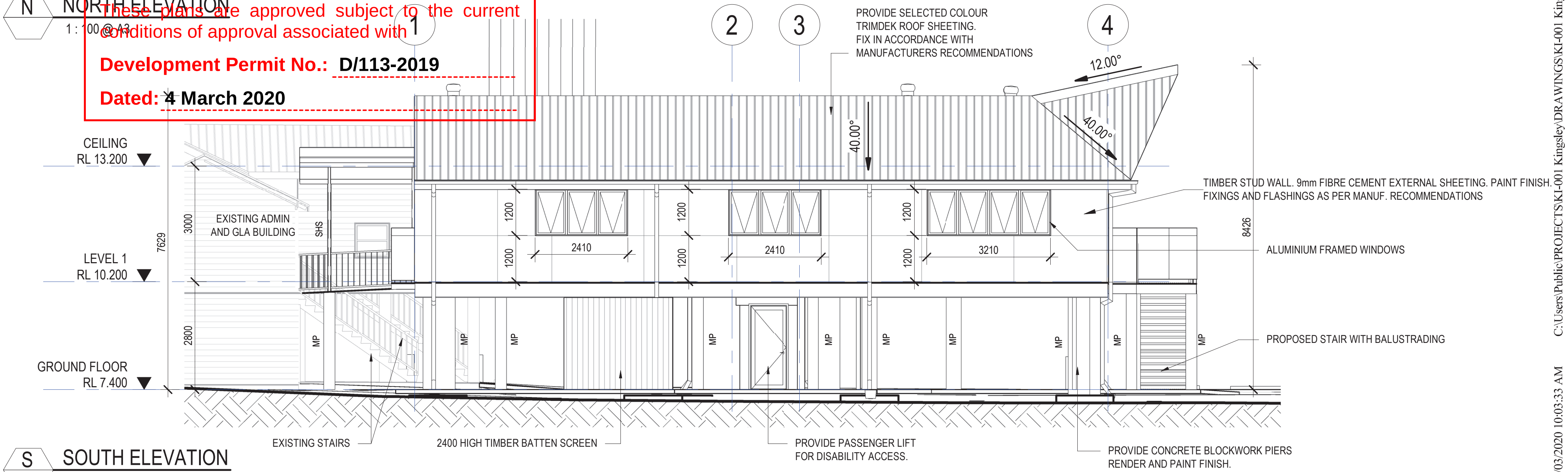
LEGEND	
MP	MASONRY PIER. REFER STRUCT. ENGINEER
SHS	SHS COLUMN. REFER STRUCT. ENGINEER

N NORTH ELEVATION
1 : 100 @ A3



S SOUTH ELEVATION
1 : 100 @ A3

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drawing title:
ELEVATIONS

drawing no: SK-006 project no: KI-001

project: **A3 DRAWING** NOTED SCALES RELATE TO A3 DRAWINGS
NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

location:
19 REARNEY STREET, BERSERKER, ROCKHAMPTON

client:
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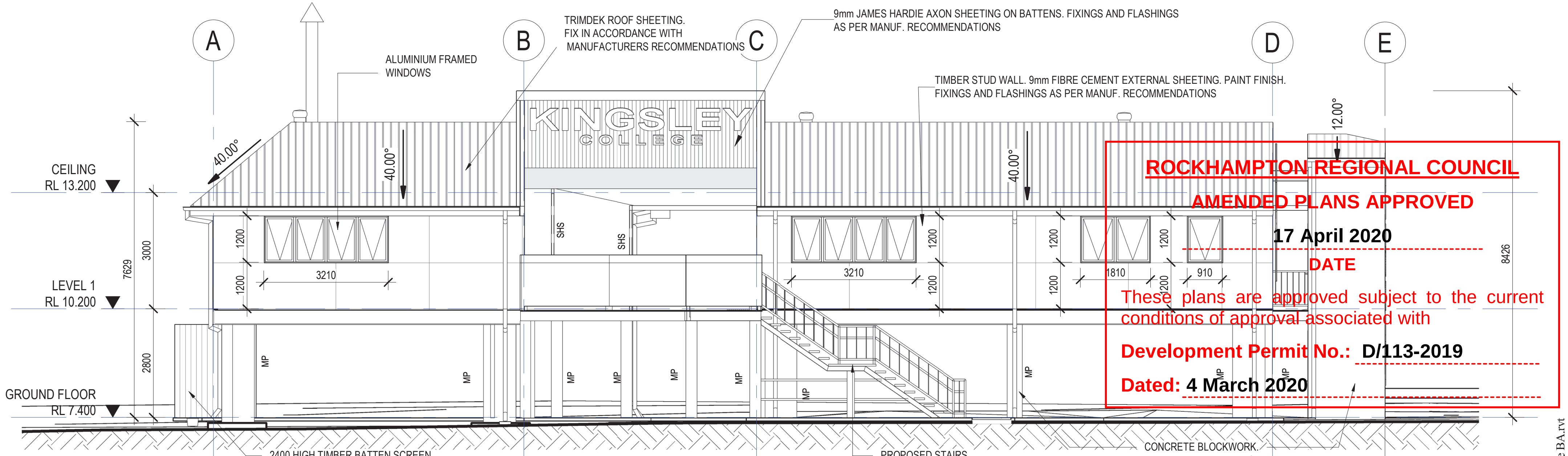

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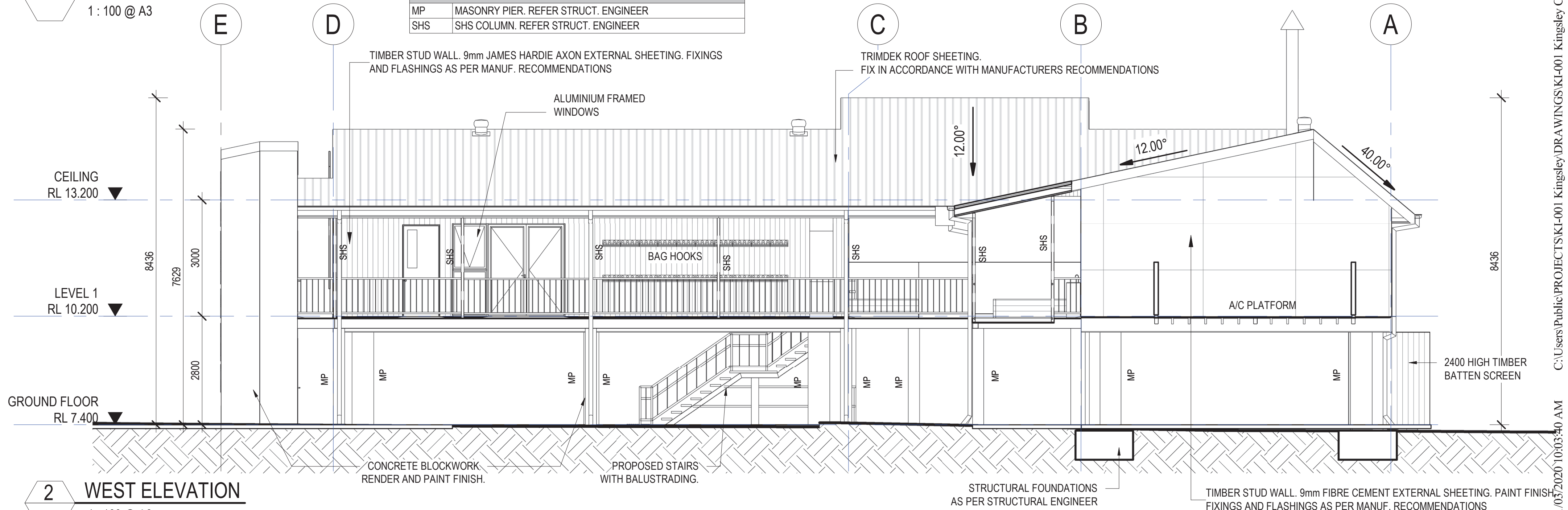
1 EAST ELEVATION

1 : 100 @ A3

LEGEND-

MP	MASONRY PIER. REFER STRUCT. ENGINEER
SHS	SHS COLUMN. REFER STRUCT. ENGINEER



2 WEST ELEVATION

1 : 100 @ A3

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drawing title:
ELEVATIONS

drawing no: SK-007 project no: KI-001

project: A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

location: 19 REARNEY STREET, BERSERKER, ROCKHAMPTON

client: KINGSLEY CHRISTIAN COLLEGE

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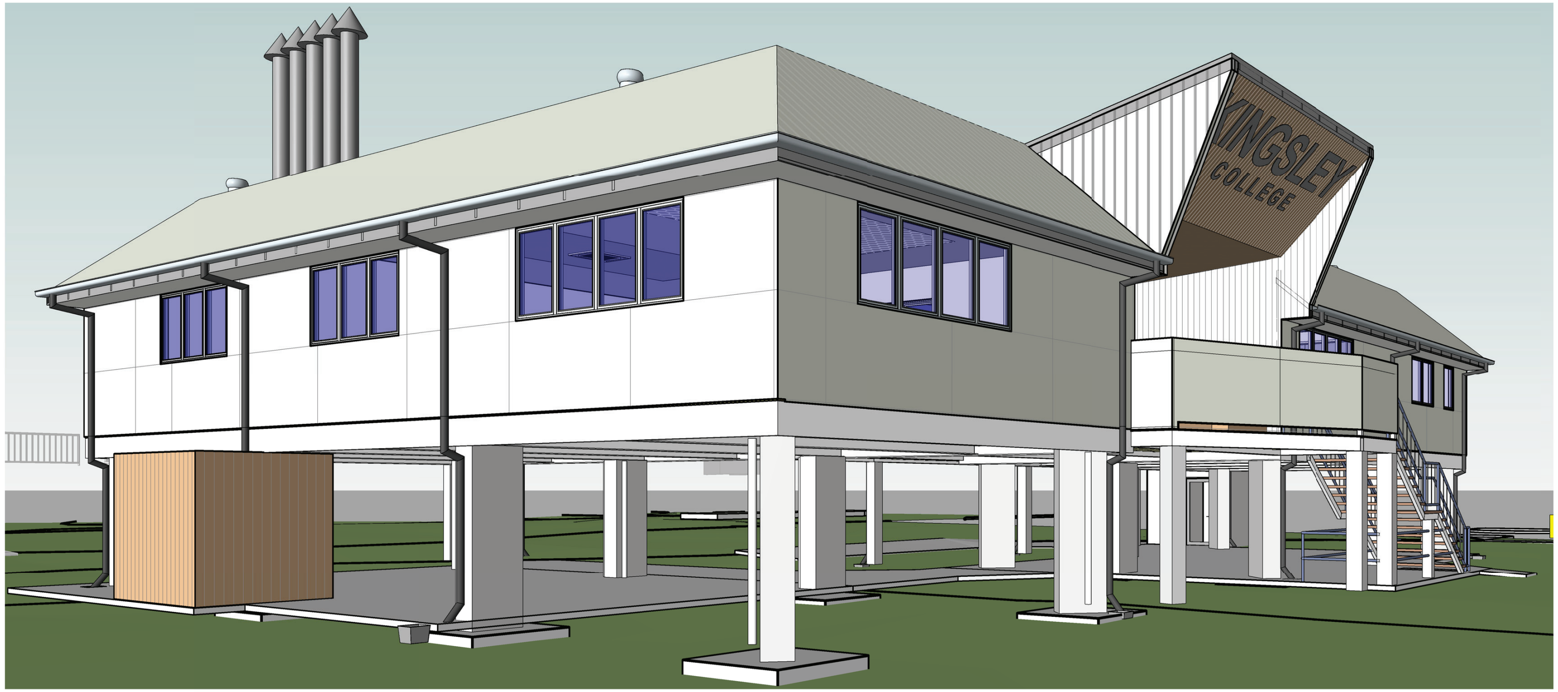

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drawing title:

3D VIEWS

drawing no: SK-008 project no: KI-001

project: NEW CLASSROOM BLOCK AND ASSOCIATED WORKS

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location: 19 REARNEY STREET, BERSERKER, ROCKHAMPTON

client: KINGSLEY CHRISTIAN COLLEGE

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date MAR 20

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rev 11

mcmurtrie
CONSULTING ENGINEERS

Stormwater Management Plan

Proposed additional structure
2 Schoolhouse Street, Berserker

Prepared For: Kingsley College

Job No. 036-19-20
22 November 2019
Revision A

ROCKHAMPTON REGIONAL COUNCIL
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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

Stormwater Management Plan

Rev.	Description	Signature	RPEQ No	Date
A	Issued For Approval		5141	22.11.19

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Stormwater Management Plan

Proposed Additional Structure

1.0 INTRODUCTION AND APPROACH

1.1. PROJECT OVERVIEW

McMurtrie Consulting Engineers (MCE) have been commissioned by Kingsley College to undertake a site-based Stormwater Management Plan (SMP) for a proposed vehicle depot located at 2 Schoolhouse St, Berserker, on Lot 179 on CP890747.

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 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 Data Hub
    - Rainfall data
    - Design storm ensemble temporal patterns
- Field survey data
- Layout plans (completed by Design + Architecture)
- Pluviograph rainfall data for the 'Rockhampton Aero' station

2.0 SITE CHARCTERISTICS

2.1. SITE LOCATION

The proposed site is located on Lot 179 on CP890747, at 2 Schoolhouse St, Berserker. 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
Kingsley College	Lot 179 on CP890747	2 Schoolhouse Street, Berserker

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

The proposed the site abuts Reaney Street on the South-Eastern side, Schoolhouse Street on the North-West side, Ashney Street on the North-East side, Toft Street to the South-East side and shares a common boundary with an adjacent lot to the West.

2.2. TOPOGRAPHY

The existing site school and has approximately 12,630m² in land area. The site consists of areas with very light grass cover, buildings and asphalt. The existing site has a crest 8.00m AHD running North-West roughly dividing the lot in half. The South-Western boundary level is approximately 7.30m AHD and the North-Eastern boundary is approximately 7.10m AHD.

3.0 HYDROLOGY ASSESSMENT

3.1. LAWFUL POINT OF DISCHARGE

The location of the proposed additional structure grades towards the North Eastern corner of the lot. This point is under the lawful control of the local government and satisfies the Lawful Points of Discharge in accordance with QUDM.

3.2. HYDROLOGIC MODELLING

Hydrologic calculations have been undertaken using XPSTORM 2019 V1 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 10m^2 up to 20,000km^2. 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 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.

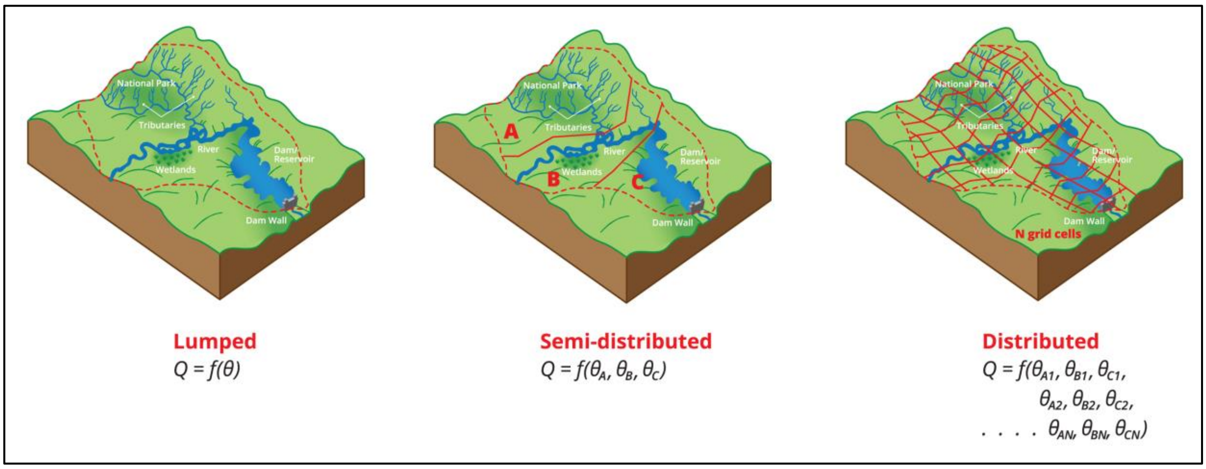


Figure 2: Catchment Analysis Options

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. The only Area under consideration is the area to be converted from grass to roof.

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

Parameter		Existing Site
		Pervious
Area (ha)		0.032
Impervious (%)		0.0
Slope (%)		1.0
Laurenson 'n' (storage non-linearity exponent)		-0.285
Infiltration	Initial Loss (mm/hr)	0.0
	Continuing Loss (mm/hr)	1.7
Manning's Roughness (n)		0.025

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

Parameter		Roof
		Impervious
Area (ha)		0.032
Impervious (%)		100
Slope (%)		26.8
Laurenson 'n' (storage non-linearity exponent)		-0.285
Infiltration	Initial Loss (mm/hr)	0.0
	Continuing Loss (mm/hr)	0.0
Manning's Roughness (n)		0.014

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' = 0.025 (grass material)
- Impervious 'n' = 0.014 (roof 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.

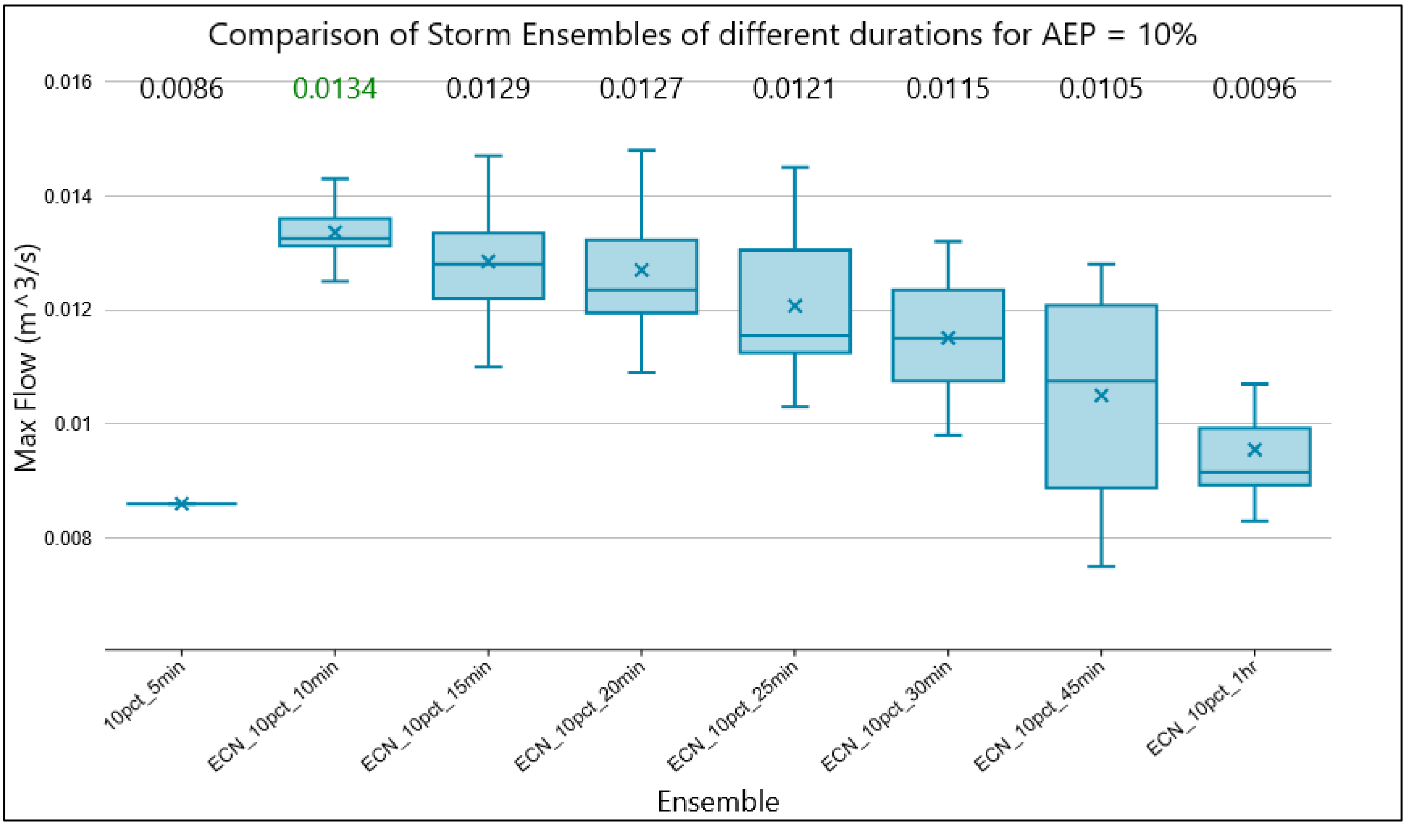


Figure 3: Comparison of Storm Ensembles of different durations for 10% AEP pre-development (XPSTORM Model)

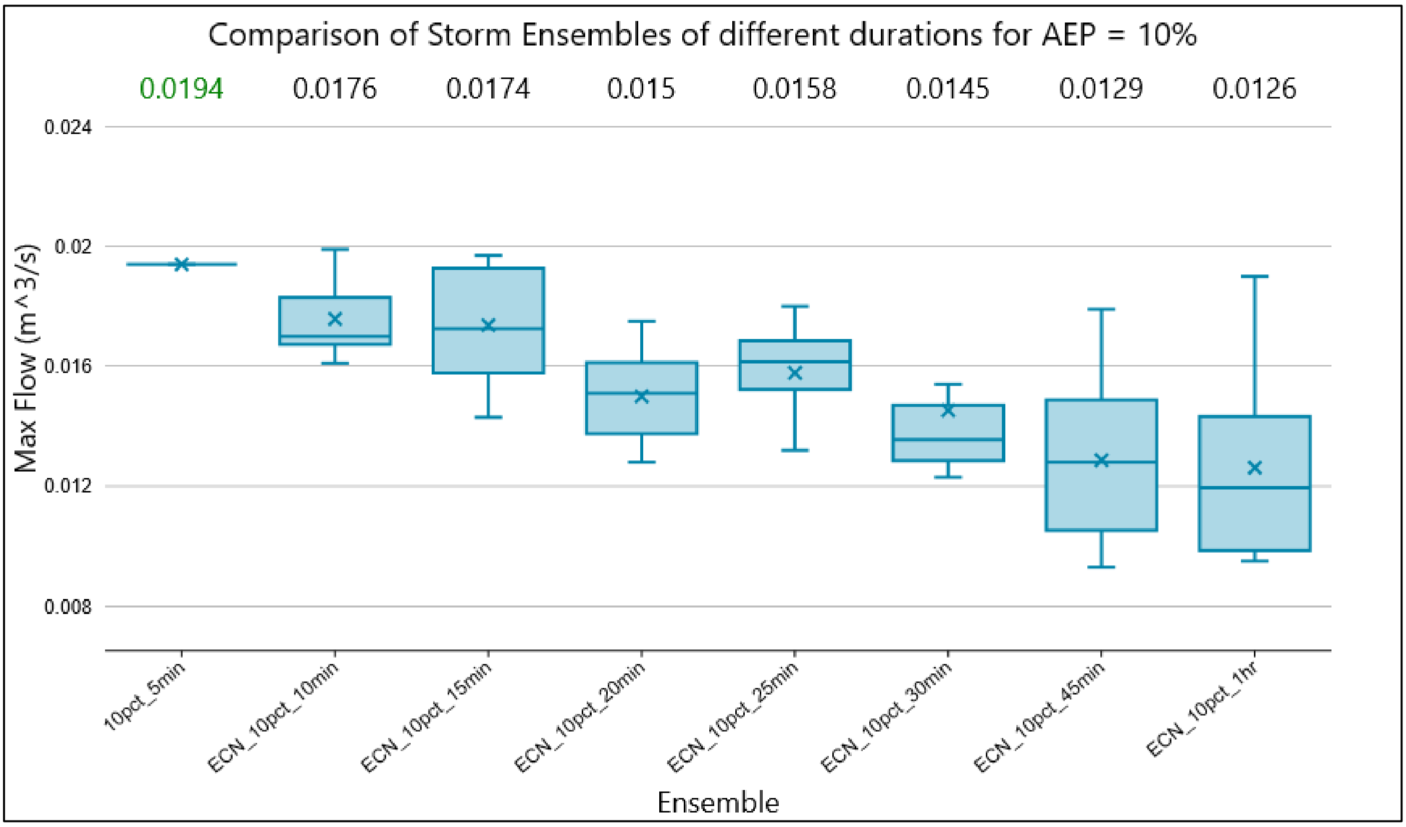


Figure 4: Comparison of Storm Ensembles of different durations for 10% AEP post-development (XPSTORM Model)

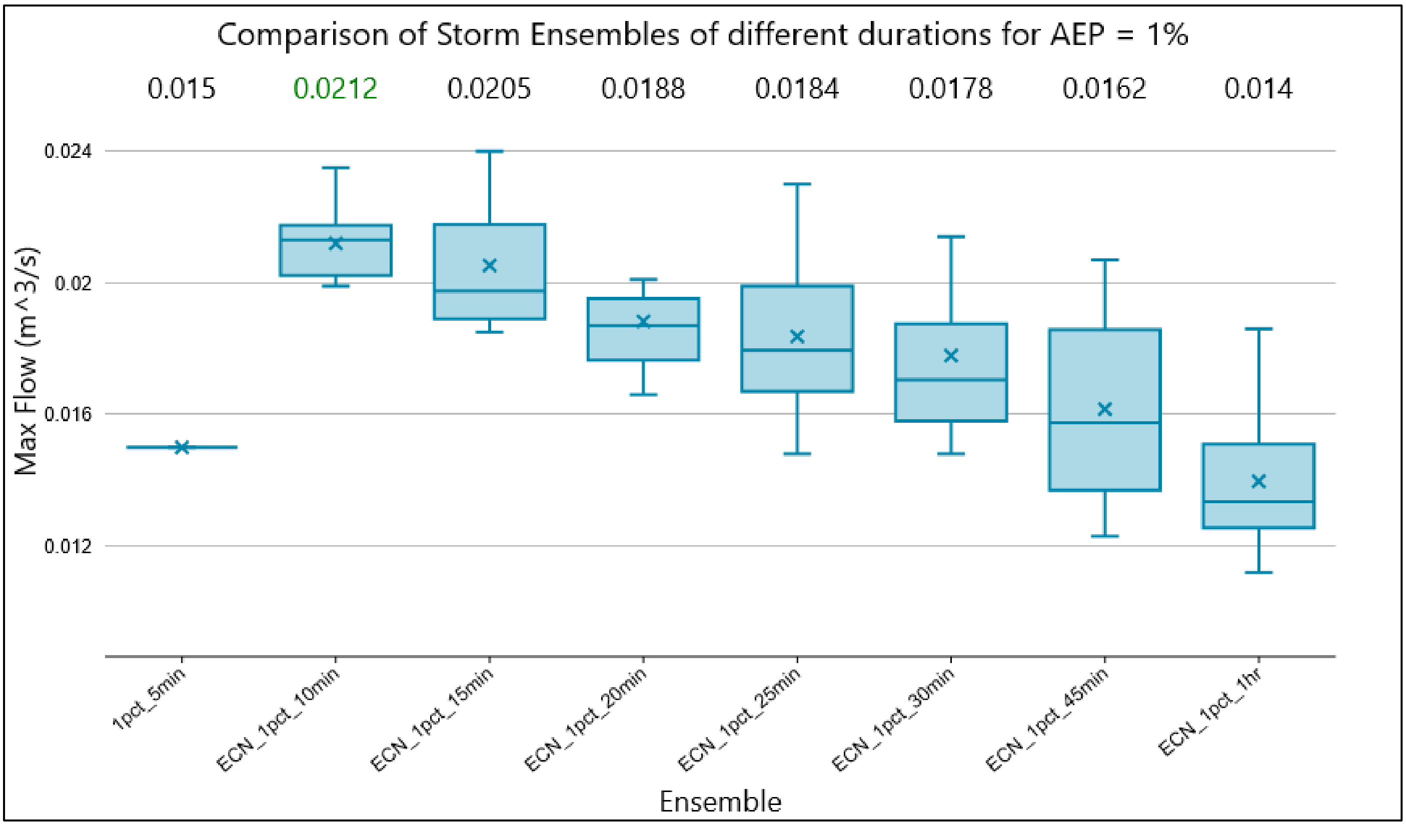


Figure 5: Comparison of Storm Ensembles of different durations for 1% AEP pre-development (XPSTORM Model)

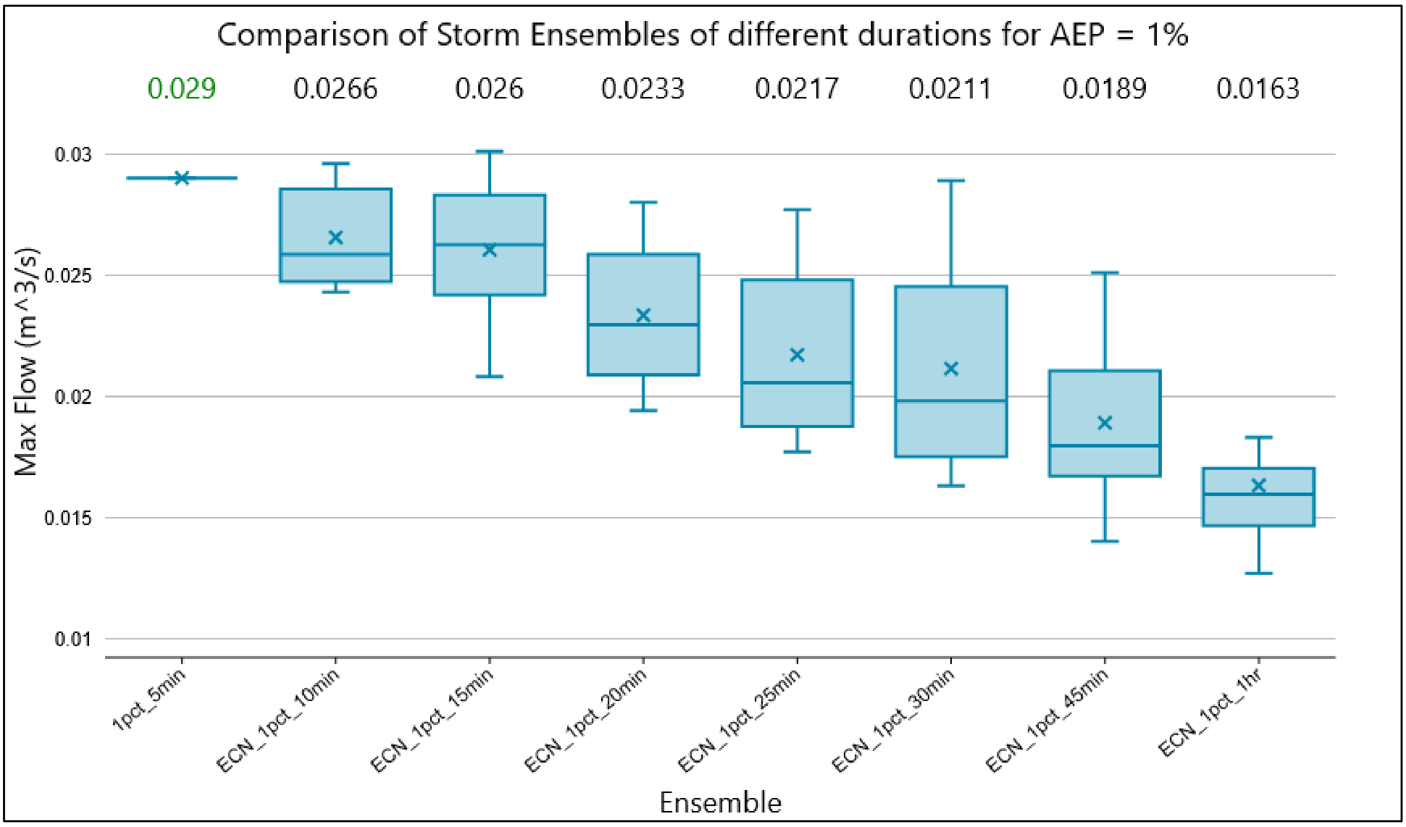


Figure 6: Comparison of Storm Ensembles of different durations for 1% AEP post-development (XPSTORM Model)

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

Table 4: Critical Storm Events

Annual Exceedance Probability (AEP %)	Critical Storm Event	
	Pre-development	Post-development
63%	63pct_15min_6	63pct_5min
50%	50pct_15min_6	50pct_5min
20%	20pct_10min_5	20pct_5min
10% (Minor event)	10pct_10min_8	10pct_5min
5%	5pct_10min_8	5pct_5min
2%	2pct_10min_2	2pct_5min
1% (Major Event)	1pct_10min_2	1pct_5min

3.2.3. EXTERNAL CATCHMENTS

There are no external catchments impacting the subject site based on the surface grading surrounding the site.

4.0 HYDRAULIC ASSESSMENT

4.1 BACKGROUND

The hydraulic assessment for the site has been carried out using XPSTORM 2019 V1.1. 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 utilizing a detention tank to restrict the flow off of the roof of the proposed structure for all storm events up to and including 1% AEP.

4.2 DETENTION

The proposed development will require approximately 1.5m^3 of detention volume to ensure no worsening to downstream catchments and infrastructure. The table will outlet onto the natural ground surface through a singular 40mm low flow outlet at the base of tank. Water will flow overland to the LPOD to the East. Table 5 summarises the peak discharge for different scenarios.

Table 5: 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)
63%	0.006	0.010	0.005
50%	0.007	0.011	0.006
20%	0.011	0.015	0.008
10% (Minor event)	0.013	0.018	0.010
5%	0.015	0.020	0.013
2%	0.017	0.024	0.015
1% (Major Event)	0.019	0.027	0.018

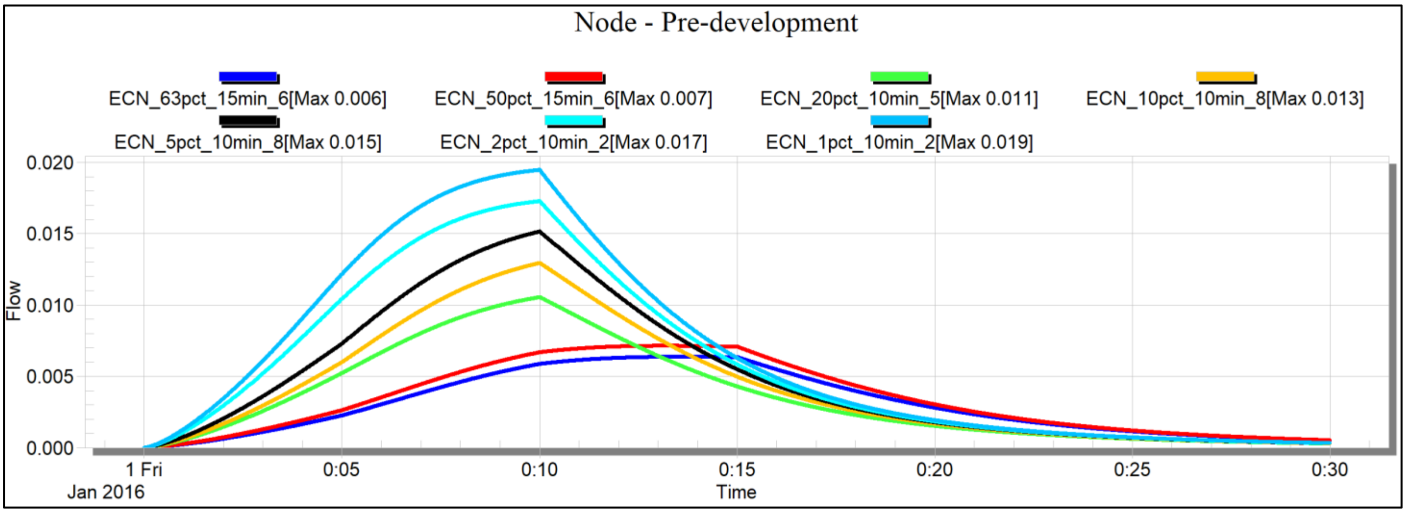


Figure 7: Pre-Development Peak Discharge Rate at LPOD

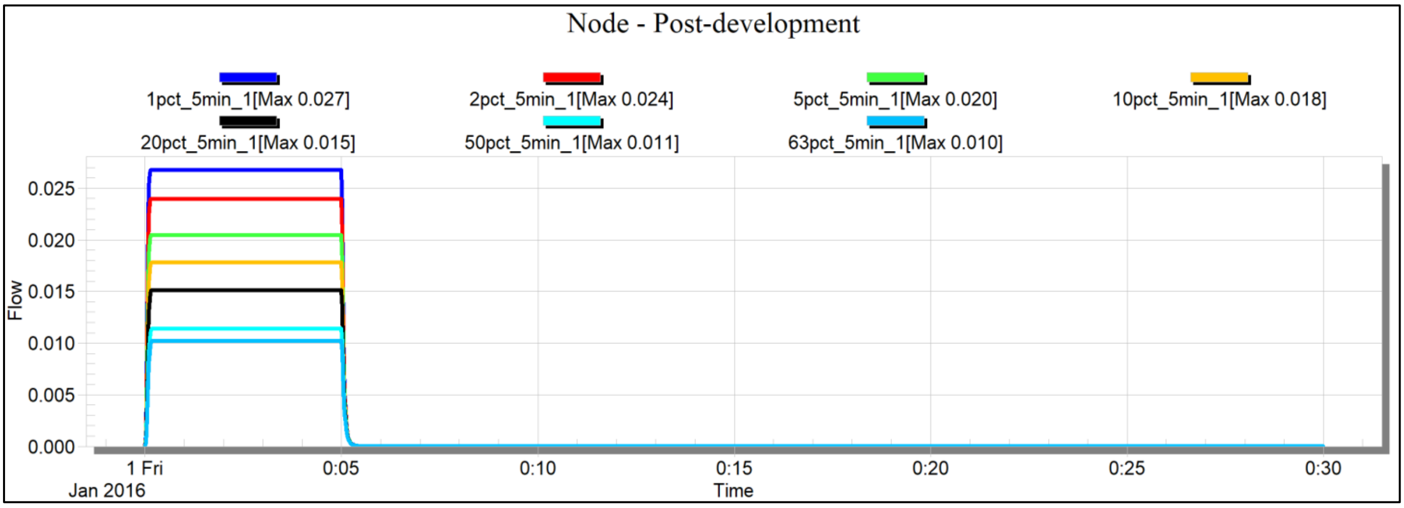


Figure 8: Unmitigated Post-Development Peak Discharge Rate at LPOD

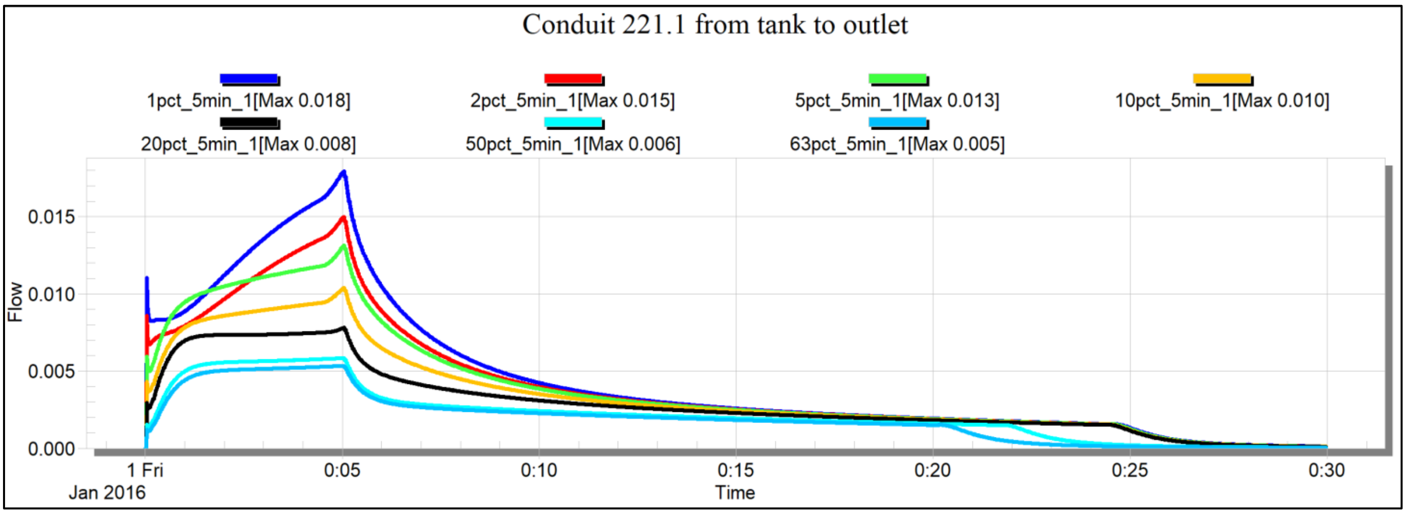


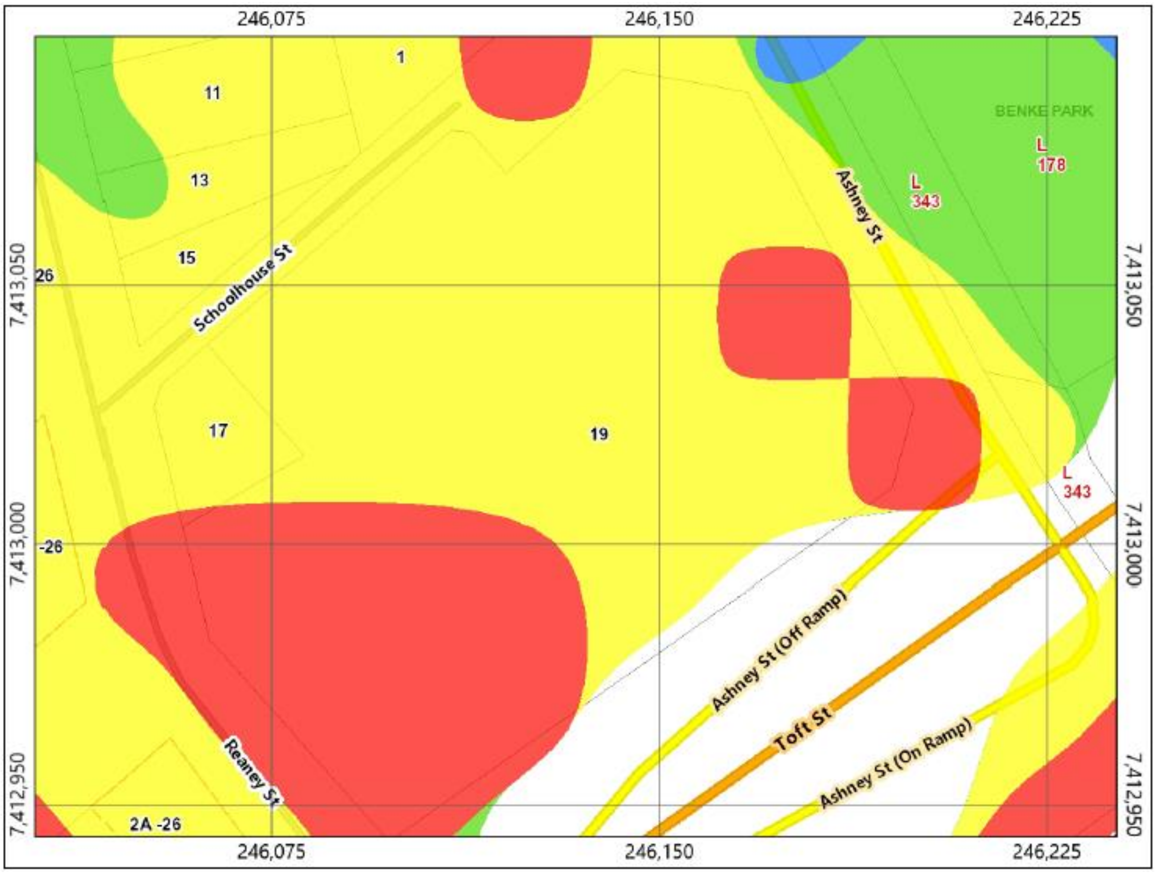
Figure 9: Roof water tank mitigation strategy

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

Table 6: Detention Basin Parameters

Total tank height	**1.62m**
Detention Volume (approximate)	**1.5m³**
Outlet Structure	**40mm outlet.**

Majority of development site is in high flood hazard zone (refer below image, yellow hatch). The floor level of the proposed building and the tank will be on posts, 2.4m above the natural surface level. Therefore the development will not constrict the passage of flow passing through the site or impact available flood storage on site. This development involves minimal earthworks which will not impact on flow velocities or flood levels on adjoining properties.



5.0 QUALITY ASSESSMENT

5.1. BACKGROUND

The proposed development will result in an impervious 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 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 Schoolhouse 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. Roofwater from the proposed development will be discharged onto existing grassed area. It is assumed that the grassed area and the natural ground depression up to LPOD can be treated as natural grass swales.

Following assumptions are made within the model:

- 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 Healthy Land and Water (2018), Water by Design MUSIC Modelling Guidelines Version 3, November 2018.

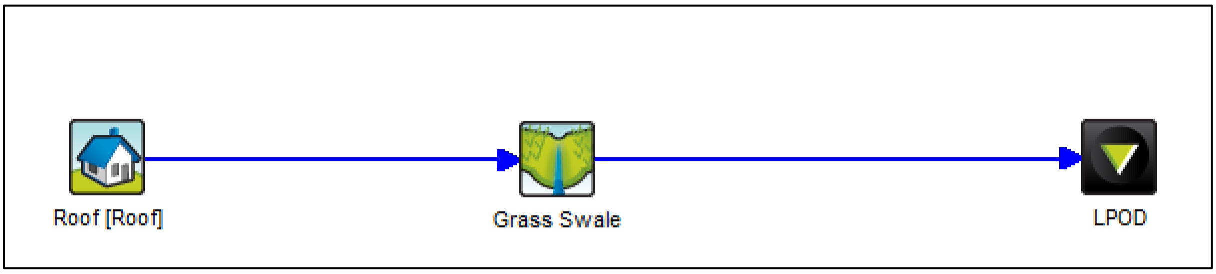


Figure 10: Stormwater Quality Treatment Train

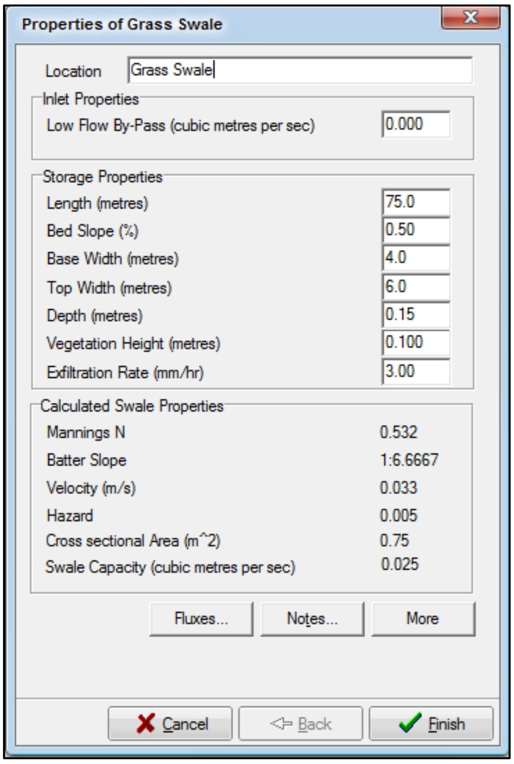
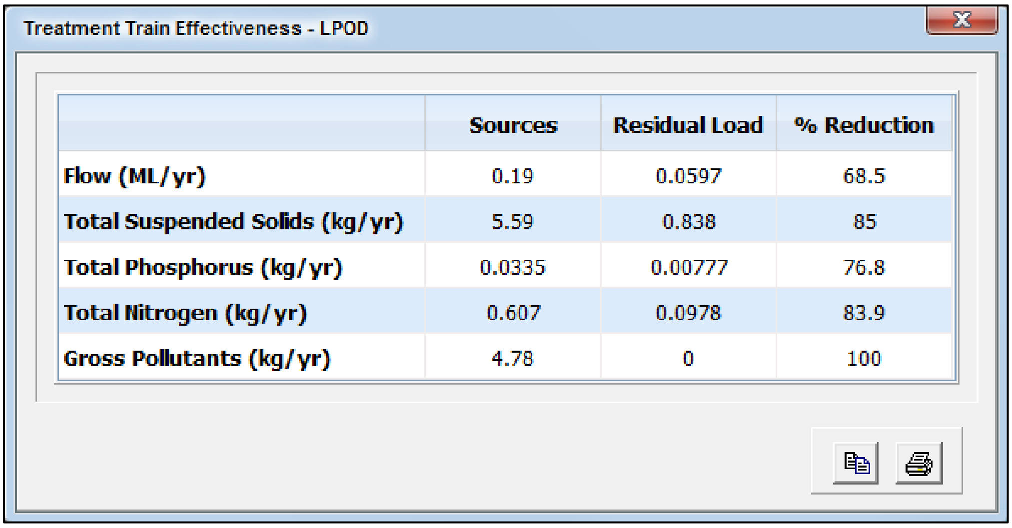


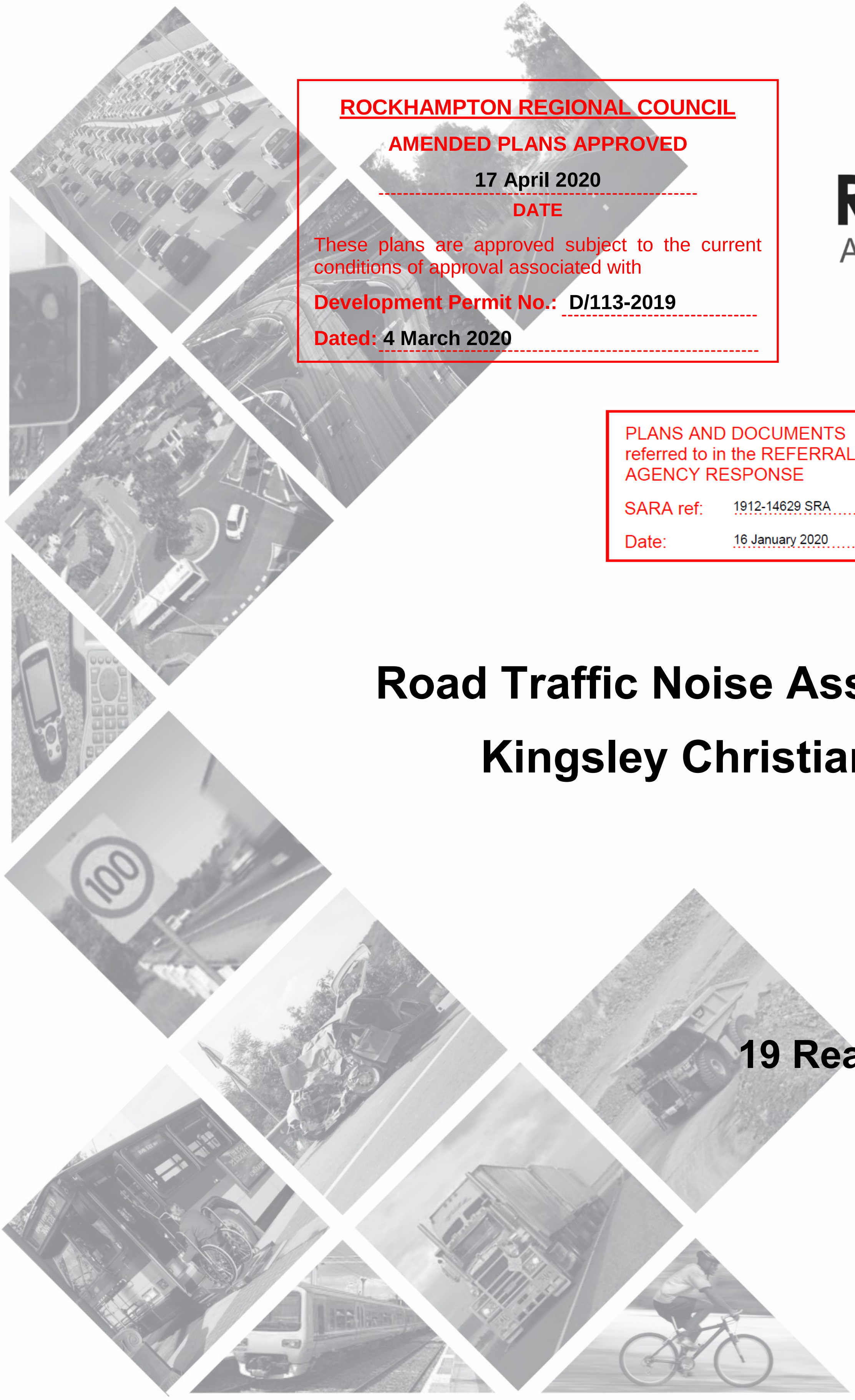
Figure 11: Properties of Grass Swale


Treatment Train Effectiveness - LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.19	0.0597	68.5
Total Suspended Solids (kg/yr)	5.59	0.838	85
Total Phosphorus (kg/yr)	0.0335	0.00777	76.8
Total Nitrogen (kg/yr)	0.607	0.0978	83.9
Gross Pollutants (kg/yr)	4.78	0	100

Figure 12: Stormwater Quality Treatment Train Effectiveness

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



ROCKHAMPTON REGIONAL COUNCIL

AMENDED PLANS APPROVED

17 April 2020

DATE

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

Development Permit No.: D/113-2019

Dated: 4 March 2020

RoadPro ACOUSTICS

PLANS AND DOCUMENTS referred to in the REFERRAL AGENCY RESPONSE

Queensland Government

SARA ref: 1912-14629 SRA

Date: 16 January 2020

Road Traffic Noise Assessment

Kingsley Christian College

19 Reaney Street

Berserker

Report 1282R1-R0

7 November 2019

Document Control

Report 1282R1-R0

Version History:

Version	Date	Prepared by	Reviewed by	Description / nature of amendments
Draft 1	06-Nov-19	JC	JC	Initial draft
Revision 0	7-Nov-19	JC	JC	Final report

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1 Introduction

RoadPro Acoustics was engaged by Kingsley Christian College to assess potential road traffic noise impacts on a proposed extension for Kingsley College at 19 Reaney Street, Berserker (the Site). The Site location is shown in **Figure 1**, and proposed site layout is shown in **Figure 2**. Plans are provided in **Appendix A**.

Figure 1: Site Location ("A") – 19 Reaney Street, Berserker

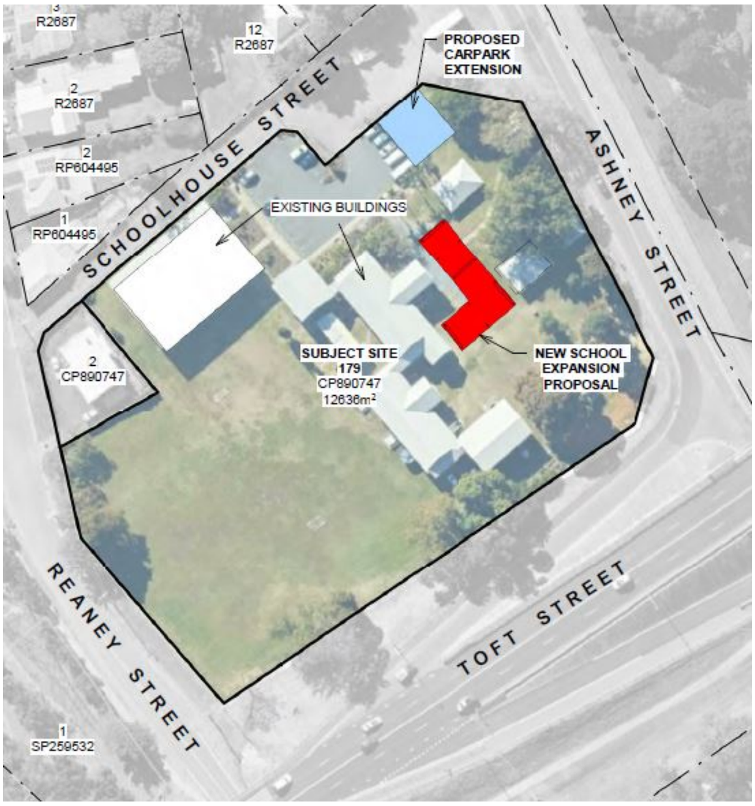


Figure 2: Site layout - 19 Reaney Street, Berserker

The proposal involves the addition of a new building that will incorporate a science teaching room and a flexible learning area (FLA). Several ancillary rooms will be included in the building (office, prep room and "withdrawal" room).

2 Noise Criteria

2.1 Road Traffic Noise

1.1.1 State Development Assessment Provisions

The *State Development Assessment Provisions* are consistent with development throughout Queensland and are applicable to this assessment. The DTMR conditions for development reflect the SDAP (v2.0) as follows:

*"**PO23** Development involving an accommodation activity or land for a future accommodation activity minimises noise intrusion from a state-controlled road or type 1 multi-modal corridor in habitable rooms.*

***AO23.1** A noise barrier or earth mound is provided which is designed, sited and constructed to meet the following external noise criteria at all facades of the building envelope:*

≤60 dB(A) L_{10} (18 hour) façade corrected (measured L_{90} (8 hour) free field between 10pm and 6am ≤40 dB(A))

≤63 dB(A) L_{10} (18 hour) façade corrected (measured L_{90} (8 hour) free field between 10pm and 6am >40 dB(A))

in accordance with chapter 7 integrated noise barrier design of the Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, Department of Transport and Main Roads, 2013.

Note: To demonstrate compliance with the acceptable outcome, it is recommended that a RPEQ certified noise assessment report is provided, prepared in accordance with the State Development Assessment Provisions Supporting Information – Community Amenity (Noise), Department of Transport and Main Roads, 2013.

If the building envelope is unknown, the deemed-to-comply setback distances for buildings stipulated by the local planning instrument or relevant building regulations should be used.

In some instances the design of noise barriers and mounds to achieve the noise criteria above the ground floor may not be reasonable or practicable. In these instances, any relaxation of the criteria is at the discretion of the Department of Transport and Main Roads.

OR all of the following acceptable outcomes apply:

***AO23.2** Buildings which include a habitable room are setback the maximum distance possible from a state-controlled road or type 1 multi-modal corridor.*

AND

***AO23.3** Buildings are designed and oriented so that habitable rooms are located furthest from a state-controlled road or type 1 multi-modal corridor.*

AND

***AO23.4** Buildings (other than a relevant residential building or relocated building) are designed and constructed using materials which ensure that habitable rooms meet the following internal noise criteria:*

≤35 dB(A) Leq (1 hour) (maximum hour over 24 hours).

Statutory note: Noise levels from a state-controlled road or type 1 multi-modal corridor are to be measured in accordance with AS1055.1–1997 Acoustics – Description and measurement of environmental noise.

Note: To demonstrate compliance with the acceptable outcome, it is recommended that a RPEQ certified noise assessment report is provided, prepared in accordance with the State Development Assessment Provisions Supporting Information – Community Amenity (Noise), Department of Transport and Main Roads, 2013.

Habitable rooms of relevant residential buildings located within a transport noise corridor must comply with the Queensland Development Code MP4.4 Buildings in a transport noise corridor, Queensland Government, 2015. Transport noise corridors are mapped on the DA mapping system."

The building is not for residential purposes, and the occupied floors are elevated. The exterior noise criteria are therefore not applicable.

Internal design noise levels provided in *AS2107: 2016 Acoustics – Recommended design sound levels and reverberation times for building interiors* are reproduced in **Table 1**.

Table 1: Internal design sound levels from AS2107: 2016

Type of occupancy/activity	Design sound level ($L_{Aeq,T}$) Range
Educational Buildings	
Office areas	40 to 45
Laboratories-	
Teaching	35 to 45
Working	45 to 50
Teaching spaces/single classroom	
Open plan teaching spaces	35 to 45
Primary school	35 to 45

Where the noise level impacting on a façade is predicted to result in internal noise levels exceeding the maximum recommended design sound levels in **Table 1**, construction categories specified in AS 3671-1989 *Acoustics - Road traffic noise intrusion - Building siting and construction* are applied as follows:

Category 1. *Standard construction; openings, including open windows and doors may comprise up to 10% of the exposed facade. TNR of approximately 10 dB(A) is expected.*

Category 2. *Standard construction, except for lightweight elements such as fibrous cement or metal cladding or all-glass facades. Windows, doors and other openings must be closed. TNR of approximately 25 dB(A) is expected.*

Category 3. *Special construction, chosen in accordance with Clause 3.4. Windows, doors and other openings must be closed. TNR between 25 and 35 dB(A) is expected.*

Category 4. *TNR greater than 35 dB(A) is required; special acoustic advice should be sought.*

3 Measurements

Noise measurements were carried out at the site from 14th October 2019 to 16th October 2019. The location was selected for its exposure to road traffic on the surrounding roads, and its proximity to the proposed new school building.

The measurements were carried out using a Norsonic (Serial number 1392811) recording “fast” response “A” frequency weighted sound levels at 60-minute intervals, with the microphone at a height of 4.6 m. The instrument was checked for calibration prior to and post-measurement using a 94 dB acoustic signal at 1000 Hz, and drift in calibration remained within ±0.5 dB.

Weather conditions for the duration of the survey were monitored via the Rockhampton Airport Bureau of Meteorology station and were generally suitable for noise monitoring throughout the measurement period.

The noise monitoring locations and summarised measured data are shown in **Figure 3**, **Figure 4** and **Table 1** respectively. The full dataset of measurements is shown as charts in **Appendix B**.

Figure 3: Noise Logger - 19 Reaney Street, Berserker

Figure 4: Noise logger location ML1

Noise levels from 13:00 to 15:00 on Tuesday 15th October appeared to be spurious, and it was assumed the $L_{Aeq(1\ hour)}$ road traffic noise level during this period would be approximately 61 dB(A), consistent with the other observed road traffic noise levels during school hours.

Table 2 Measured road traffic noise levels

	Measured Road Traffic Noise Levels, dB		
	$L_{A10(18\ hour)}$	$L_{A90(8\ hour)}$	School hours $L_{Aeq(1\ hour)}$
Mon 14 Oct 19 (part)	57.2	44.2	
Tues 15 Oct 19	60.8	44.0	61.1
Wed 16 Oct 19 (part)	62.1		60.8
AVERAGE	**60.8**	**44.1**	**61.0**

The measured road traffic noise levels indicate that the $L_{A10(18\ hour)}$ is numerically equivalent to the $L_{Aeq(1\ hour)}$ during school hours. Therefore, the model-calculated $L_{A10(18\ hour)}$ results can be applied directly to assess the $L_{Aeq(1\ hour)}$.

4 Road Traffic Noise Assessment

4.1 CoRTN Model Verification

The CoRTN algorithm was used to calculate the present road traffic noise levels at the noise logger location.

Traffic volume and heavy vehicle composition data for Toft Street (bridge) were sourced from the 2018 TMR traffic cenus shown in **Table 3**. Traffic volumes for Ashney Street were estimated with the assistance of Rockhampton Regional Council.

The terrain heights used were 0.5 m contours interpolated from a 5 m grid spot height LIDAR dataset sourced from Geoscience Australia.

Table 3 Traffic count data – QLD Government SPP Interactive Mapping Tool

Roadway	Year	AADT	% HV
Toft Street	2018	33,613	6.82

The average vehicle speed was assumed to be 50 kph. The road surfaces are dense graded asphalt. Traffic volumes for the current and future design years are shown in **Table 4**. Note that nil, or negligible traffic growth was assumed due to the relatively congested roadway and intersection with Bridge Street.

Table 4 Traffic volumes – current and design year

Roadway	Year	AADT	% HV
Toft Street	2019	33,613	6.82
	2030	33,613	6.82
Ashney Street	2019	4,000	2.0
	2030	4,000	2.0
Toft Street off-ramp	2019	2,000	2.0
	2030	2,000	2.0

The calculated $L_{A10(18\ hour)}$ road traffic noise level at the logger location is shown in **Table 5**.

Table 5: Measured and Calculated Present $L_{A10(18\ hour)}$ Road Traffic Noise

Measured Noise Level	Predicted Noise Level	Difference
60.8	65.8	+5.0

The calculated present-day noise levels exceed the measured noise levels by 5 dB(A). It is expected that this is due to the heavy congestion in the area during peak hours, and the presences of the traffic signals at Bridge Street.

A 5 dB(A) reduction was applied to the model-calculated noise levels.

Figure 5: Model scenario

5 Noise Attenuation

5.1 External Noise

External noise criteria do not apply to the proposal.

5.2 Internal Noise

The model was used to calculate the external road traffic noise levels at points on the façade of the proposed new building corresponding to the internal rooms, at a receiver height 1.5 m above the upper floor level.

The predicted external noise levels and corresponding required Construction Category in accordance with AS 3671-1989 *Acoustics - Road traffic noise intrusion - Building siting and construction* was determined as shown in **Table 6**. Noise contours are provided in **Appendix C**.

Table 6: AS 3671 Construction noise categories

Receptor	$L_{Aeq(1\ hour)}$ External	$L_{Aeq(1\ hour)}$ Internal Required	TNR Required	AS3671 Noise Cat.
Prep SE	63	45	18	Category 2
Prep SW	61	45	16	Category 2
Office SW	57	45	12	Category 2
Science SE	64	45	19	Category 2
Science NE	64	45	19	Category 2
FLA NE	62	45	17	Category 2
FLA NW	55	45	10	Category 2
FLA SW	55	45	10	Category 2
Office NW	53	45	8	Category 1

The results in **Table 6** indicate that significant increases in road traffic noise would be required before Category 3 assessment was triggered for any of the rooms.

Category 1 and Category 2 construction require the following:

Category 1. *Standard construction; openings, including open windows and doors may comprise up to 10% of the exposed facade. TNR of approximately 10 dB(A) is expected.*

Category 2. *Standard construction, except for lightweight elements such as fibrous cement or metal cladding or all-glass facades. Windows, doors and other openings must be closed. TNR of approximately 25 dB(A) is expected.*

The proposed construction materials are:

- Roof/ceiling – sheet metal roof with plasterboard ceiling internally and bulk insulation in the cavity. Estimated Rw 38,
- Walls – fibre cement sheeting to outside and plasterboard to inside on 90 mm timber studs with bulk insulation in the wall cavity. Estimated Rw 35.
- Floor – 200 mm thick concrete slab

Due to the lightweight nature of the proposed construction, it is recommended that externa walls facing Toft Street and Ashney Street (south-east and north-east) are clad with minimum 9 mm thick fibre cement sheeting. The same walls should have an internal lining of minimum 13 mm thick plasterboard (with bulk insulation in the cavity as per the original specification).

It is further recommended that internal reverberation control is included in the final design plans in the form of carpet and/or acoustically absorbent tiles on the underside of the plasterboard ceiling.

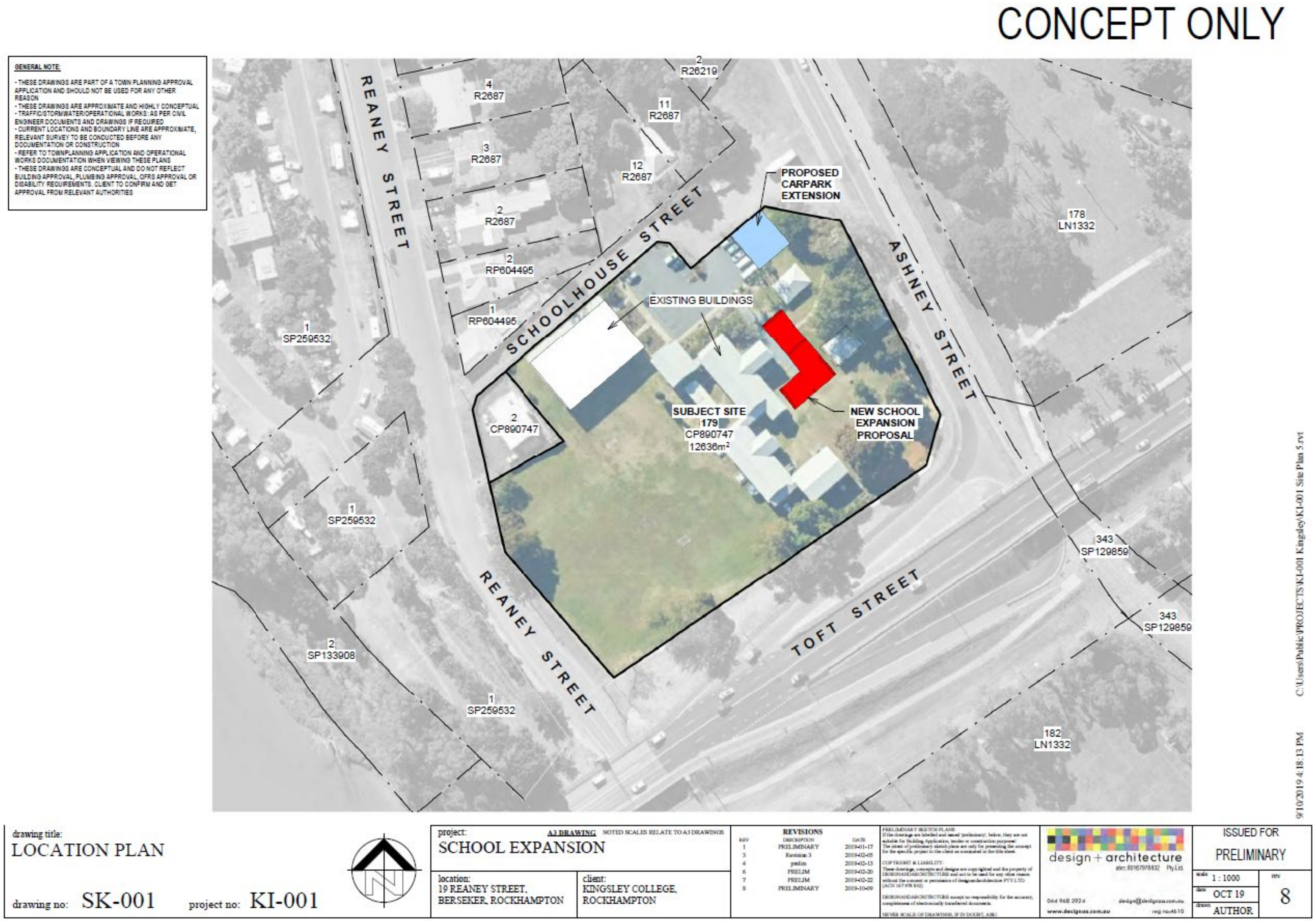
6 Conclusion and Summary of Recommendations

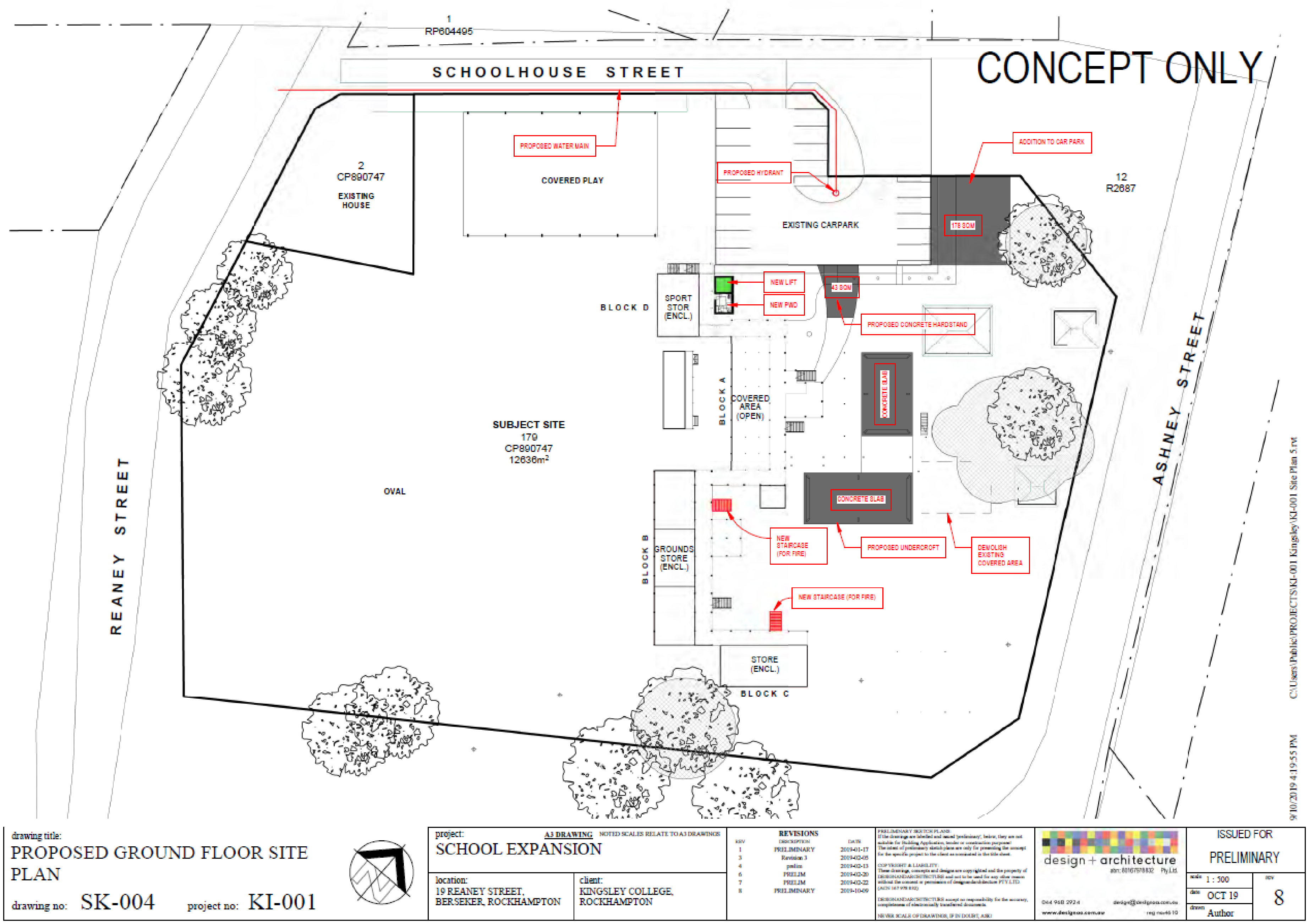
RoadPro Acoustics was engaged by Kingsley Christian College to assess potential road traffic noise impacts on a proposed new teaching building at 19 Reaney Street, Berserker.

It was determined that the building facades generally require AS 3671 Category 2 construction. Due to the lightweight nature of the proposed building construction, some minor upgrades to some wall construction has been recommended to ensure that the internal noise criteria will be achieved. The Site could be exposed to significant increases in road traffic noise and still achieve the recommended internal noise levels.

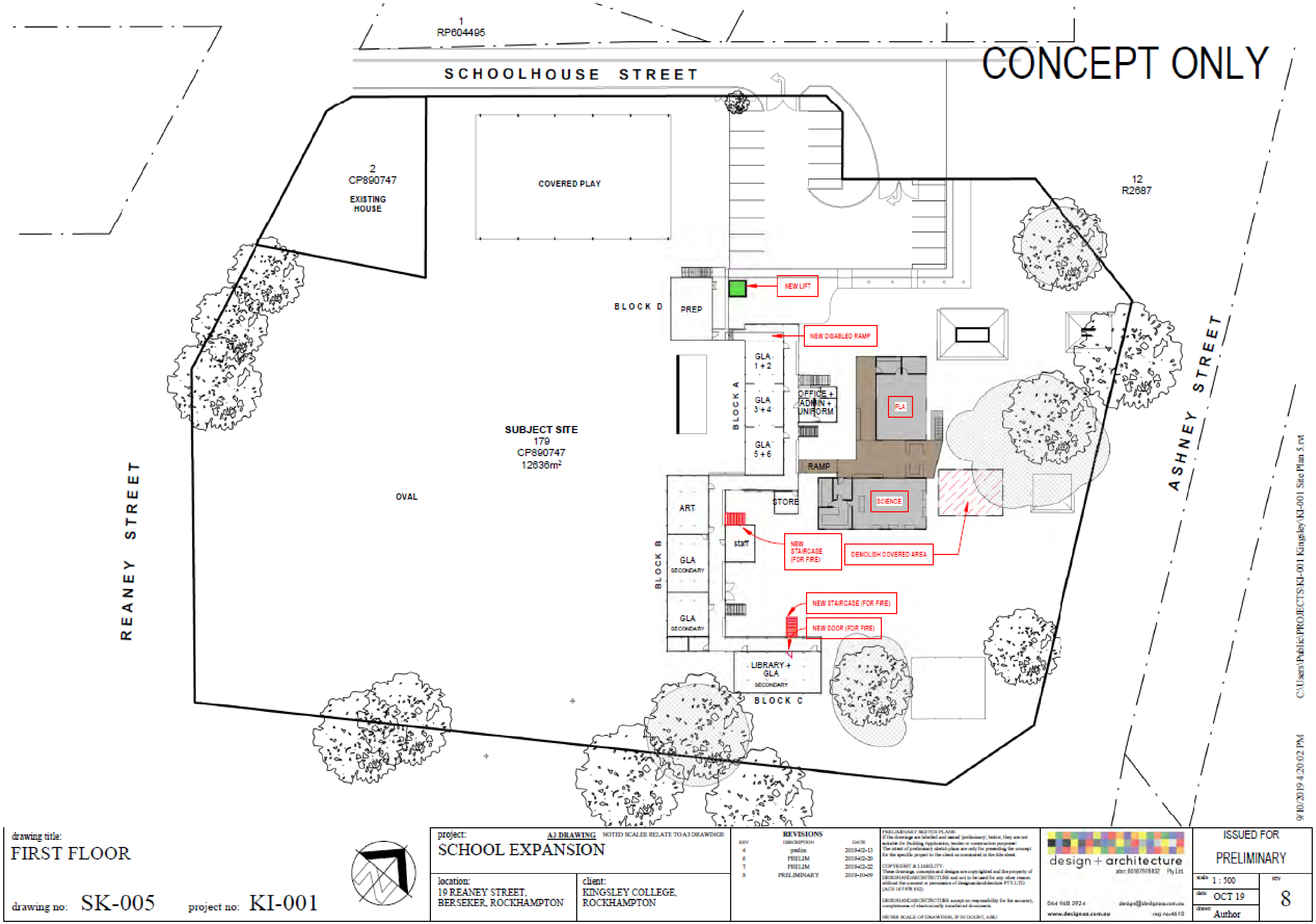
It is the view of RoadPro Acoustics that the Site is suitable for the proposed use, subject to the recommendations made in this report.

Appendix A – Proposal Plans





1
RP604495
SCHOOLHOUSE STREET
CONCEPT ONLY
PROPOSED WATER MAIN
COVERED PLAY
2
CP890747
EXISTING HOUSE
PROPOSED HYDRANT
ADDITION TO CAR PARK
12
R2687
EXISTING CARPARK
178 SQM
NEW LIFT
NEW PWD
43 SQM
PROPOSED CONCRETE HARDSTAND
BLOCK D
SPORT STOR (ENCL.)
BLOCK A
COVERED AREA (OPEN)
CONCRETE SLAB
SUBJECT SITE
179
CP890747
12636m²
OVAL
REANEY STREET
ASHNEY STREET
CONCRETE SLAB
BLOCK B
GROUNDS STORE (ENCL.)
NEW STAIRCASE (FOR FIRE)
PROPOSED UNDERCROFT
DEMOLISH EXISTING COVERED AREA
NEW STAIRCASE (FOR FIRE)
STORE (ENCL.)
BLOCK C
drawing title:
PROPOSED GROUND FLOOR SITE PLAN
drawing no: SK-004
project no: KI-001
project:
SCHOOL EXPANSION
A3 DRAWING
location:
19 REANEY STREET, BERSEKER, ROCKHAMPTON
client:
KINGSLEY COLLEGE, ROCKHAMPTON
REVISIONS
design + architecture
ISSUED FOR
PRELIMINARY
scale 1 : 500
date OCT 19
drawn Author
rev 8


CONCEPT ONLY
1
RP604495
SCHOOLHOUSE STREET
2
CP890747
EXISTING HOUSE
COVERED PLAY
12
R2687
NEW LIFT
BLOCK D
PREP
NEW DISABLED RAMP
GLA 1 + 2
GLA 3 + 4
GLA 5 + 6
BLOCK A
OFFICE + ADMIN + UNIFORM
FLA
RAMP
SUBJECT SITE
179
CP890747
12636m²
OVAL
ART
STORE
SCIENCE
staff
NEW STAIRCASE (FOR FIRE)
DEMOLISH COVERED AREA
BLOCK B
GLA SECONDARY
GLA SECONDARY
NEW STAIRCASE (FOR FIRE)
NEW DOOR (FOR FIRE)
LIBRARY + GLA SECONDARY
BLOCK C
REANEY STREET
ASHNEY STREET
drawing title:
FIRST FLOOR
drawing no: SK-005
project no: KI-001
project:
SCHOOL EXPANSION
A3 DRAWING
NOTED SCALES RELATE TO A3 DRAWINGS
location:
19 REANEY STREET, BERSEKER, ROCKHAMPTON
client:
KINGSLEY COLLEGE, ROCKHAMPTON
REVISIONS
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PRELIMINARY
1 : 500
OCT 19
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Author

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drawing title:
3D VIEWS

drawing no: SK-008 project no: KI-001

project: A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS
SCHOOL EXPANSION

location:
19 REANEY STREET,
BERSEKER, ROCKHAMPTON

client:
KINGSLEY COLLEGE,
ROCKHAMPTON

REVISIONS

REV	DESCRIPTION	DATE
6	PRELIM	2019-02-20
7	PRELIM	2019-02-22
8	PRELIMINARY	2019-10-09

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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.

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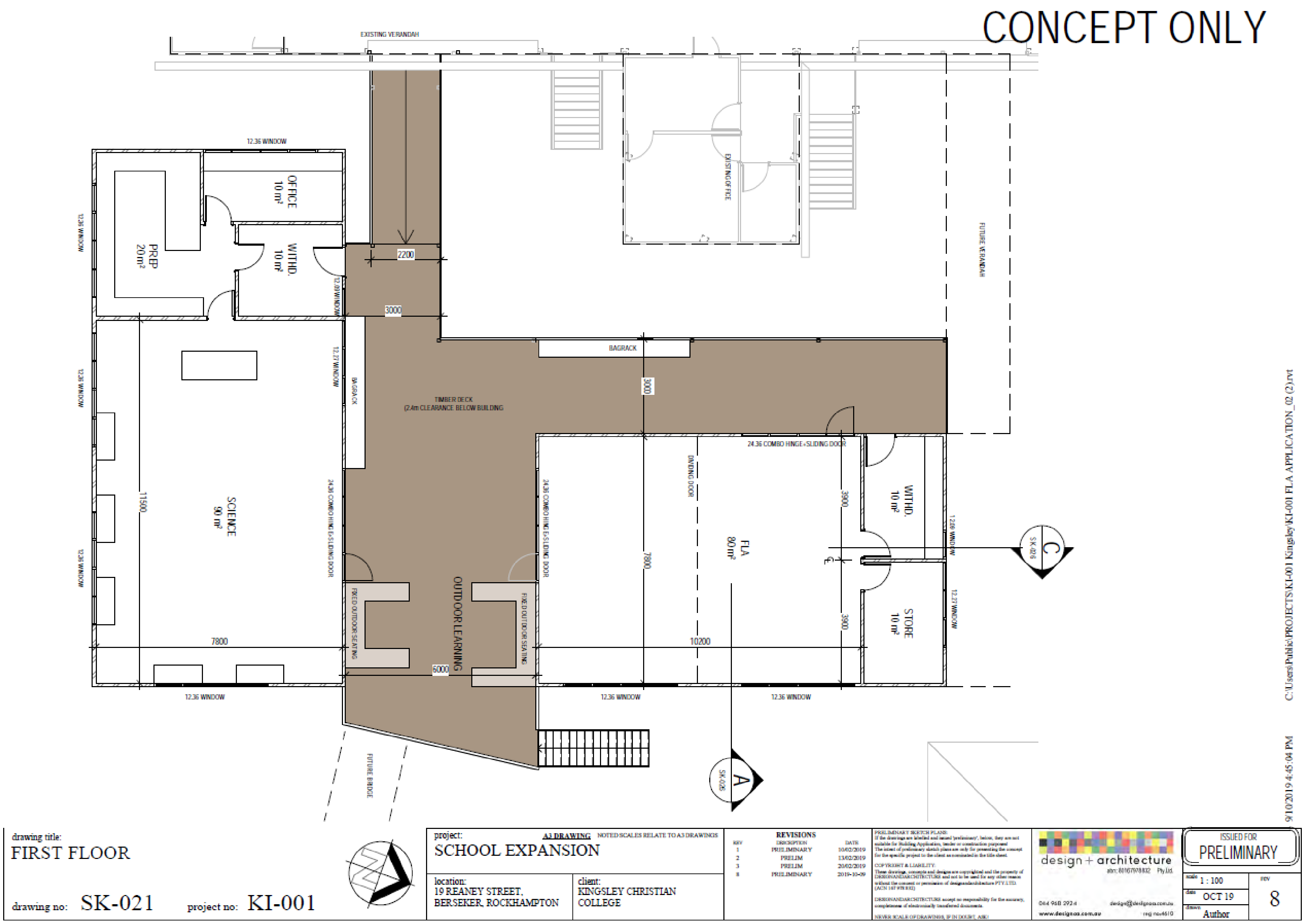
scale

date OCT 19

drawn Author

rev 8


CONCEPT ONLY
EXISTING VERANDAH
OFFICE 10 m²
PREP 20 m²
WITHD. 10 m²
SCIENCE 90 m²
TIMBER DECK (2.4m CLEARANCE BELOW BUILDING)
BAGRACK
OUTDOOR LEARNING
FIXED OUTDOOR SEATING
FLA 80 m²
WITHD. 10 m²
STORE 10 m²
DIVIDING DOOR
24.36 COMBO HINGE+SLIDING DOOR
EXISTING OFFICE
FUTURE VERANDAH
FUTURE BRIDGE
12.36 WINDOW
2200
3000
6000
7800
10200
11500
3900
drawing title:
FIRST FLOOR
drawing no: SK-021
project no: KI-001
project:
SCHOOL EXPANSION
A3 DRAWING
location:
19 REANEY STREET, BERSEKER, ROCKHAMPTON
client:
KINGSLEY CHRISTIAN COLLEGE
REVISIONS
1 PRELIMINARY 10/02/2019
2 PRELIM 13/02/2019
3 PRELIM 20/02/2019
8 PRELIMINARY 2019-10-09
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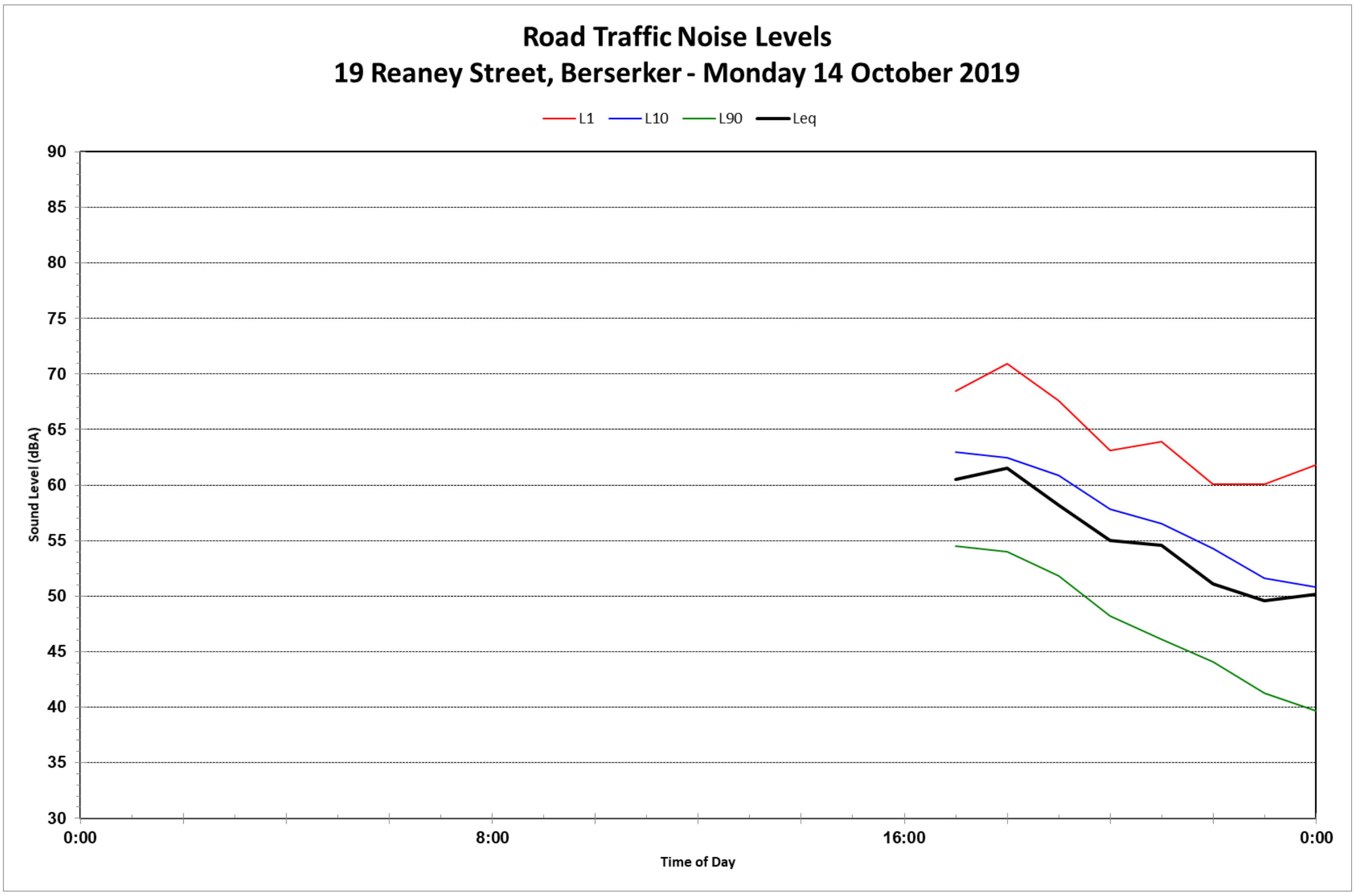
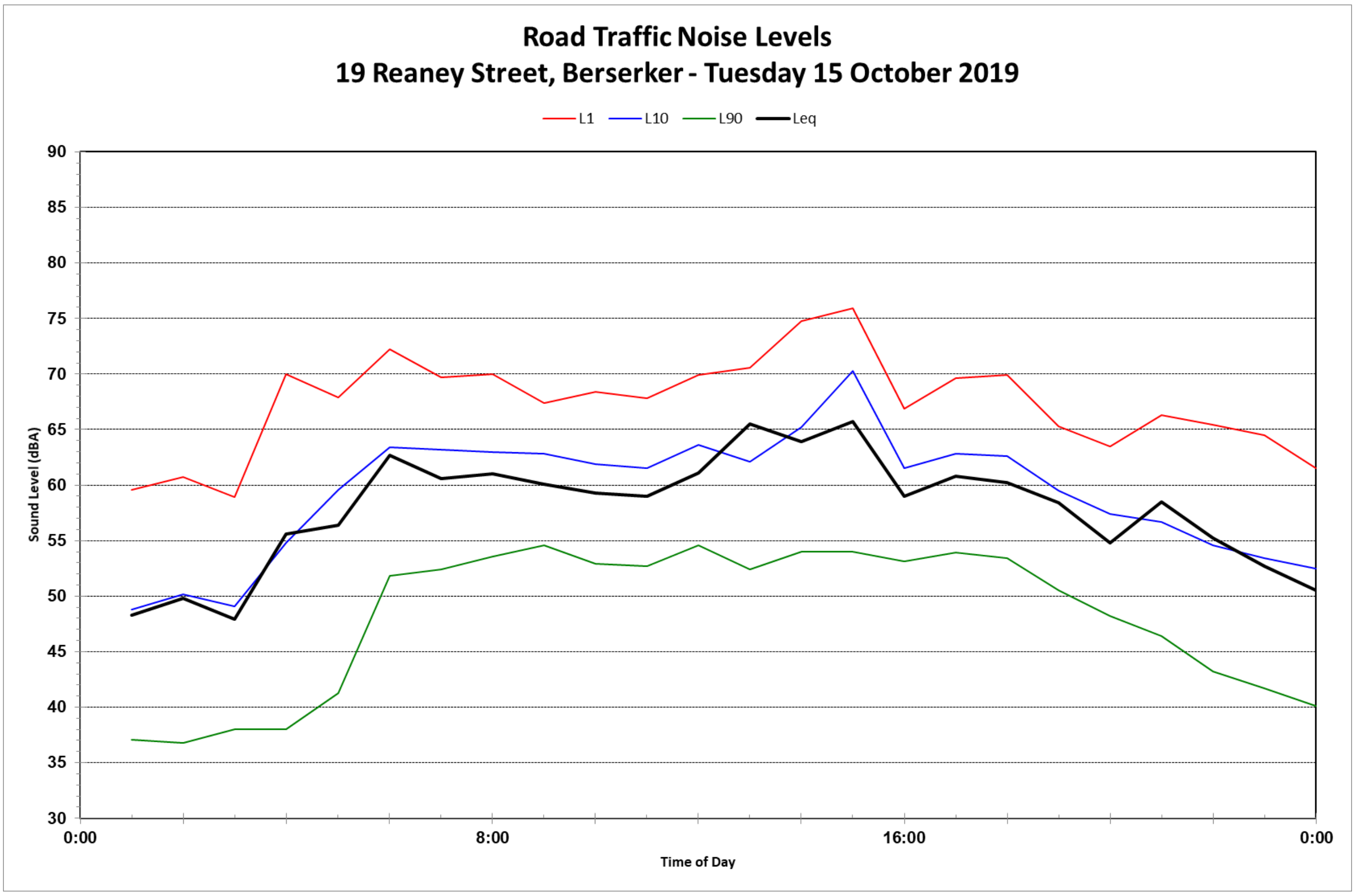
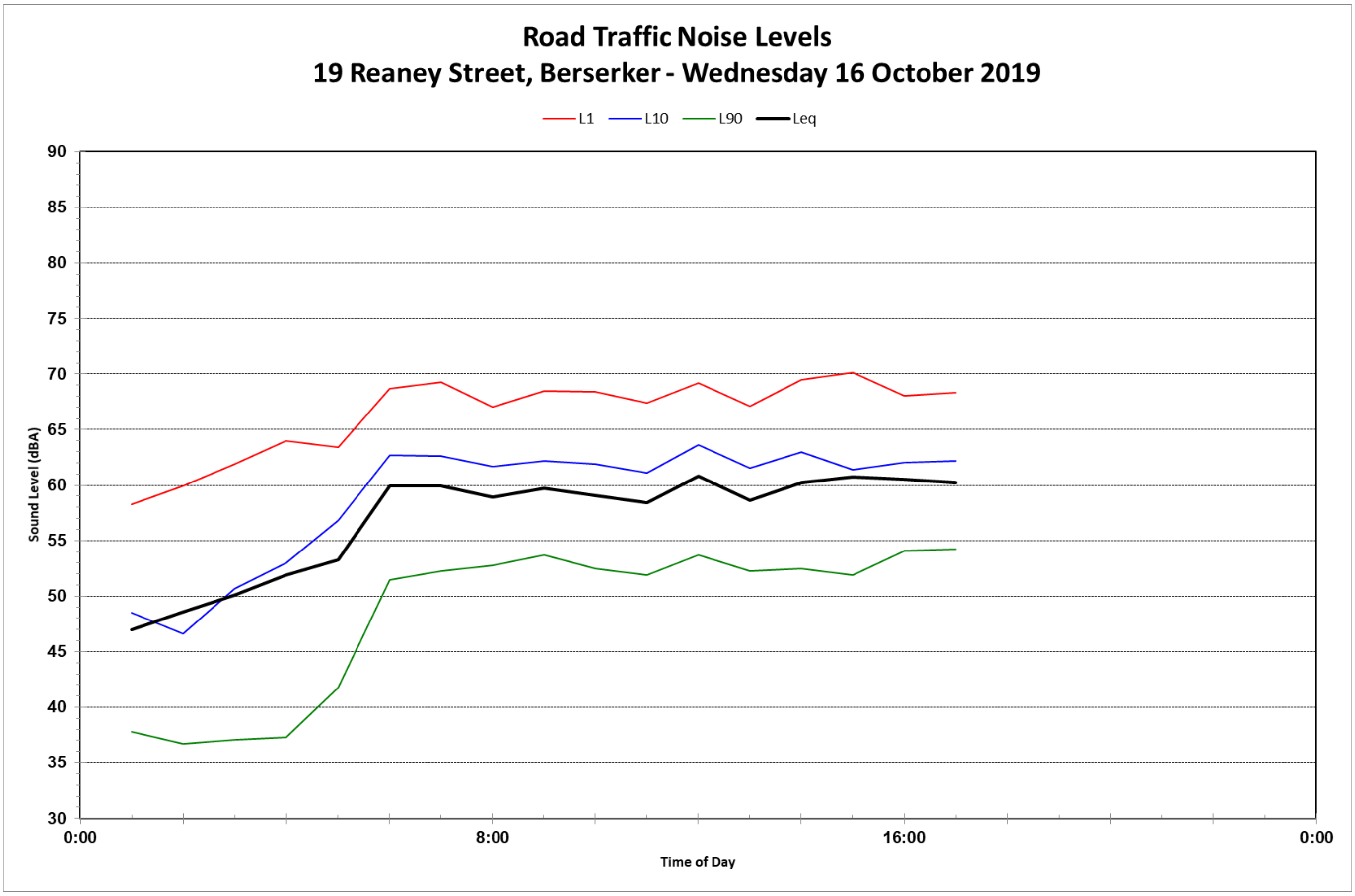
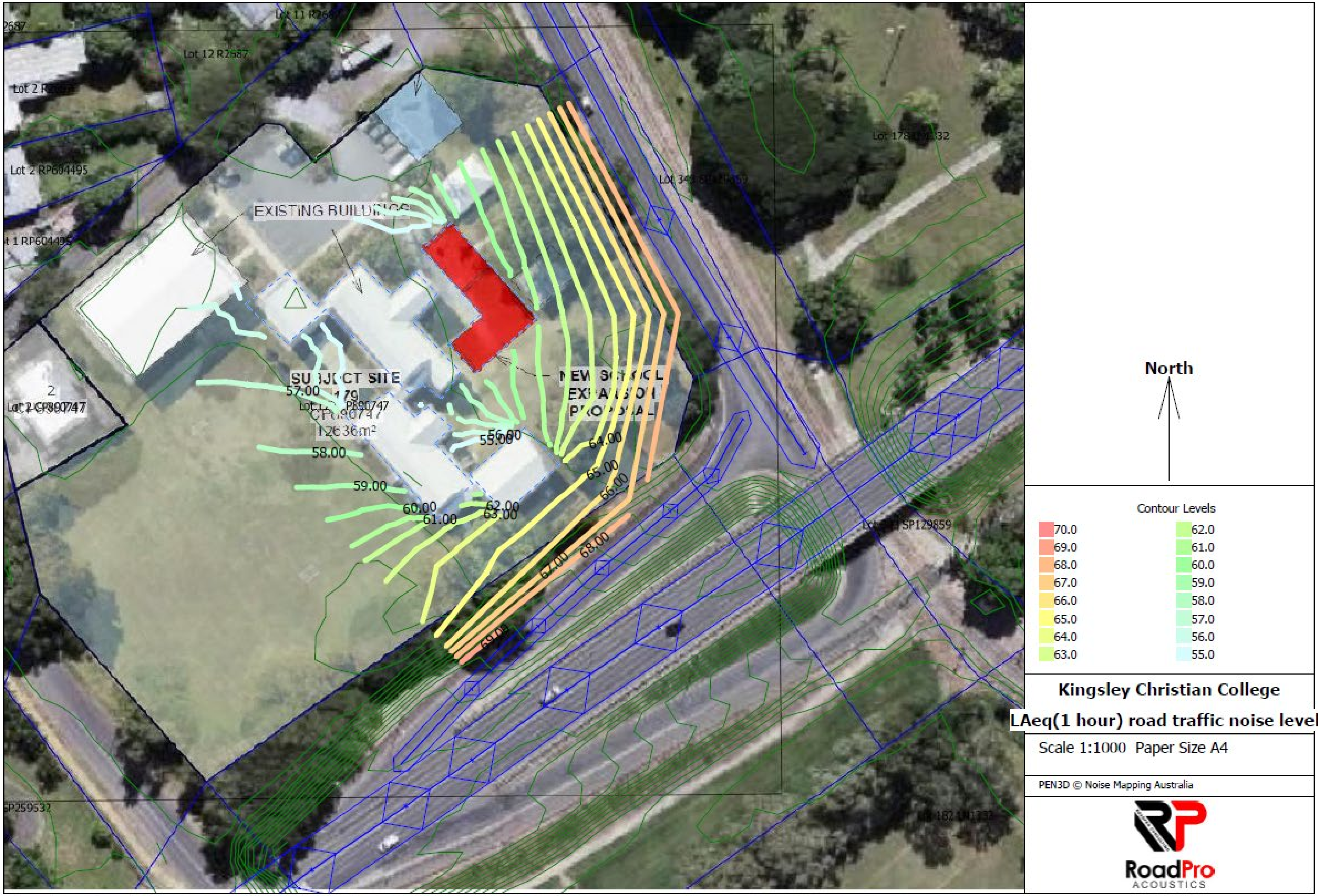
Appendix B – Noise Charts






Road Traffic Noise Levels
19 Reaney Street, Berserker - Wednesday 16 October 2019
L1
L10
L90
Leq
Sound Level (dBA)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
8:00
16:00
0:00
Time of Day

Appendix C – Road Traffic Noise Contours



Stormwater Management Plan

Proposed additional structure
2 Schoolhouse Street, Berserker

Prepared For: Kingsley College

PLANS AND DOCUMENTS referred to in the REFERRAL AGENCY RESPONSE

SARA ref: 1912-14629 SRA

Date: 16 January 2020

Job No. 036-19-20
22 November 2019
Revision A

ABN 69 958 286 371
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E mail@mcmengineers.com

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

Stormwater Management Plan

Rev.	Description	Signature	RPEQ No	Date
A	Issued For Approval		5141	22.11.19

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Stormwater Management Plan

Proposed Additional Structure

1.0 INTRODUCTION AND APPROACH

1.1. PROJECT OVERVIEW

McMurtrie Consulting Engineers (MCE) have been commissioned by Kingsley College to undertake a site-based Stormwater Management Plan (SMP) for a proposed vehicle depot located at 2 Schoolhouse St, Berserker, on Lot 179 on CP890747.

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 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 Data Hub
    - Rainfall data
    - Design storm ensemble temporal patterns
- Field survey data
- Layout plans (completed by Design + Architecture)
- Pluviograph rainfall data for the 'Rockhampton Aero' station

2.0 SITE CHARCTERISTICS

2.1. SITE LOCATION

The proposed site is located on Lot 179 on CP890747, at 2 Schoolhouse St, Berserker. 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
Kingsley College	Lot 179 on CP890747	2 Schoolhouse Street, Berserker

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

The proposed the site abuts Reaney Street on the South-Eastern side, Schoolhouse Street on the North-West side, Ashney Street on the North-East side, Toft Street to the South-East side and shares a common boundary with an adjacent lot to the West.

2.2. TOPOGRAPHY

The existing site school and has approximately 12,630m² in land area. The site consists of areas with very light grass cover, buildings and asphalt. The existing site has a crest 8.00m AHD running North-West roughly dividing the lot in half. The South-Western boundary level is approximately 7.30m AHD and the North-Eastern boundary is approximately 7.10m AHD.

3.0 HYDROLOGY ASSESSMENT

3.1. LAWFUL POINT OF DISCHARGE

The location of the proposed additional structure grades towards the North Eastern corner of the lot. This point is under the lawful control of the local government and satisfies the Lawful Points of Discharge in accordance with QUDM.

3.2. HYDROLOGIC MODELLING

Hydrologic calculations have been undertaken using XPSTORM 2019 V1 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 10m^2 up to 20,000km^2. 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 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.

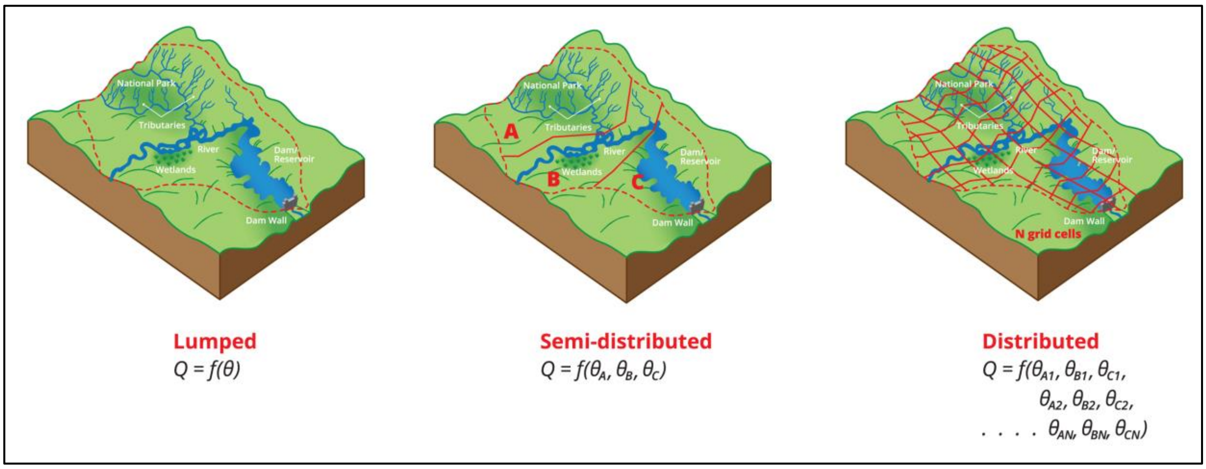


Figure 2: Catchment Analysis Options

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. The only Area under consideration is the area to be converted from grass to roof.

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

Parameter		Existing Site
		Pervious
Area (ha)		0.032
Impervious (%)		0.0
Slope (%)		1.0
Laurenson 'n' (storage non-linearity exponent)		-0.285
Infiltration	Initial Loss (mm/hr)	0.0
	Continuing Loss (mm/hr)	1.7
Manning's Roughness (n)		0.025

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

Parameter		Roof
		Impervious
Area (ha)		0.032
Impervious (%)		100
Slope (%)		26.8
Laurenson 'n' (storage non-linearity exponent)		-0.285
Infiltration	Initial Loss (mm/hr)	0.0
	Continuing Loss (mm/hr)	0.0
Manning's Roughness (n)		0.014

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' = 0.025 (grass material)
- Impervious 'n' = 0.014 (roof 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.

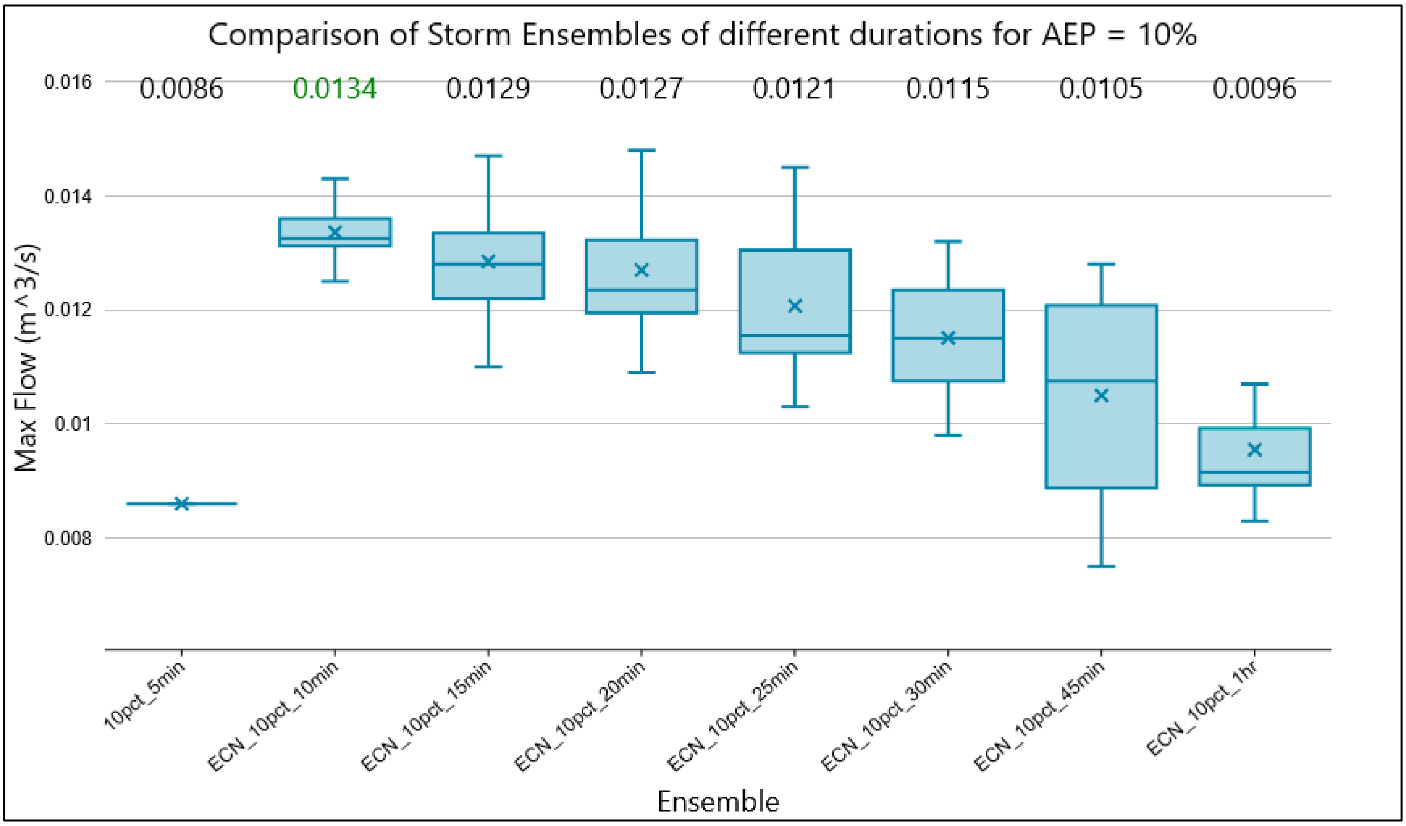


Figure 3: Comparison of Storm Ensembles of different durations for 10% AEP pre-development (XPSTORM Model)

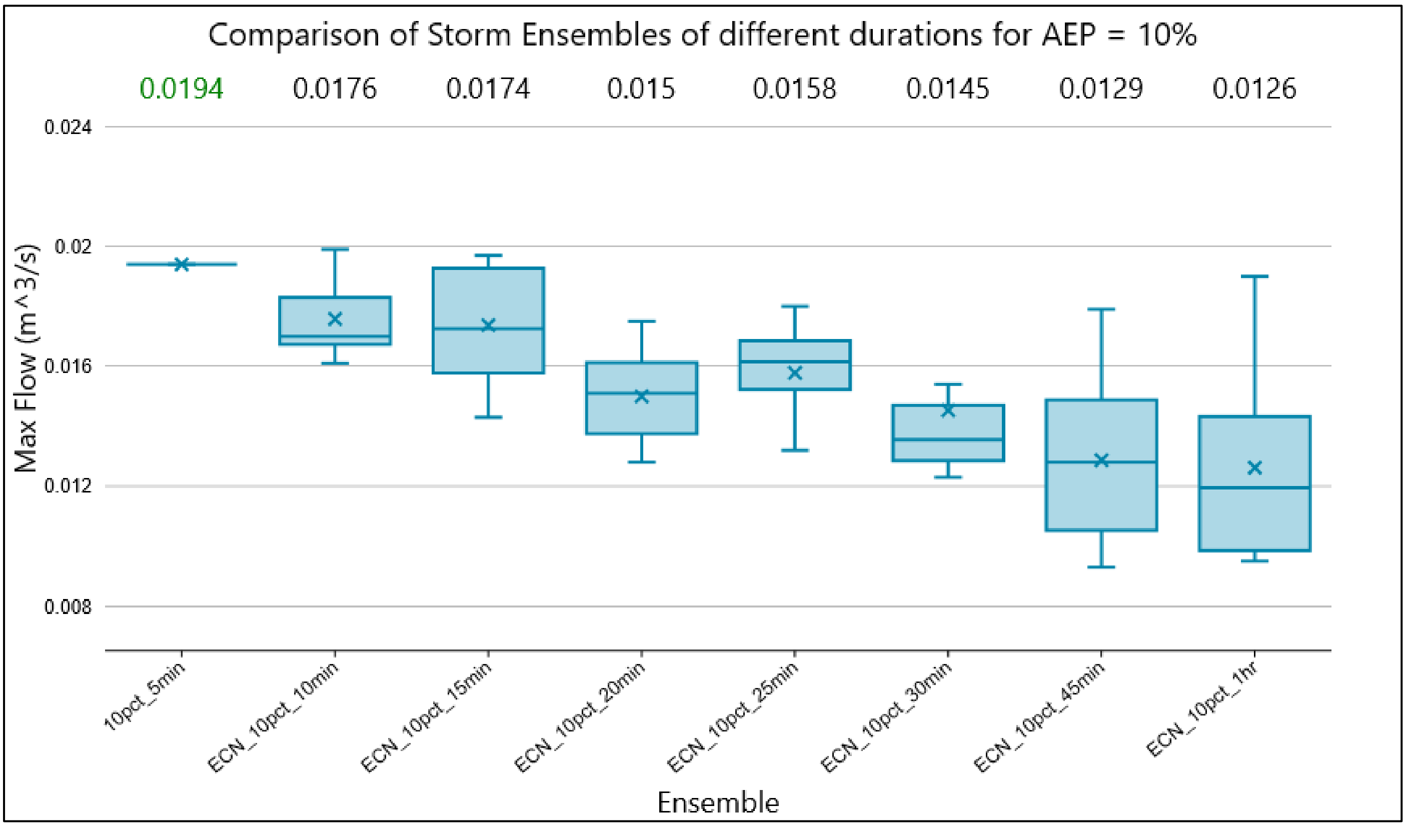


Figure 4: Comparison of Storm Ensembles of different durations for 10% AEP post-development (XPSTORM Model)

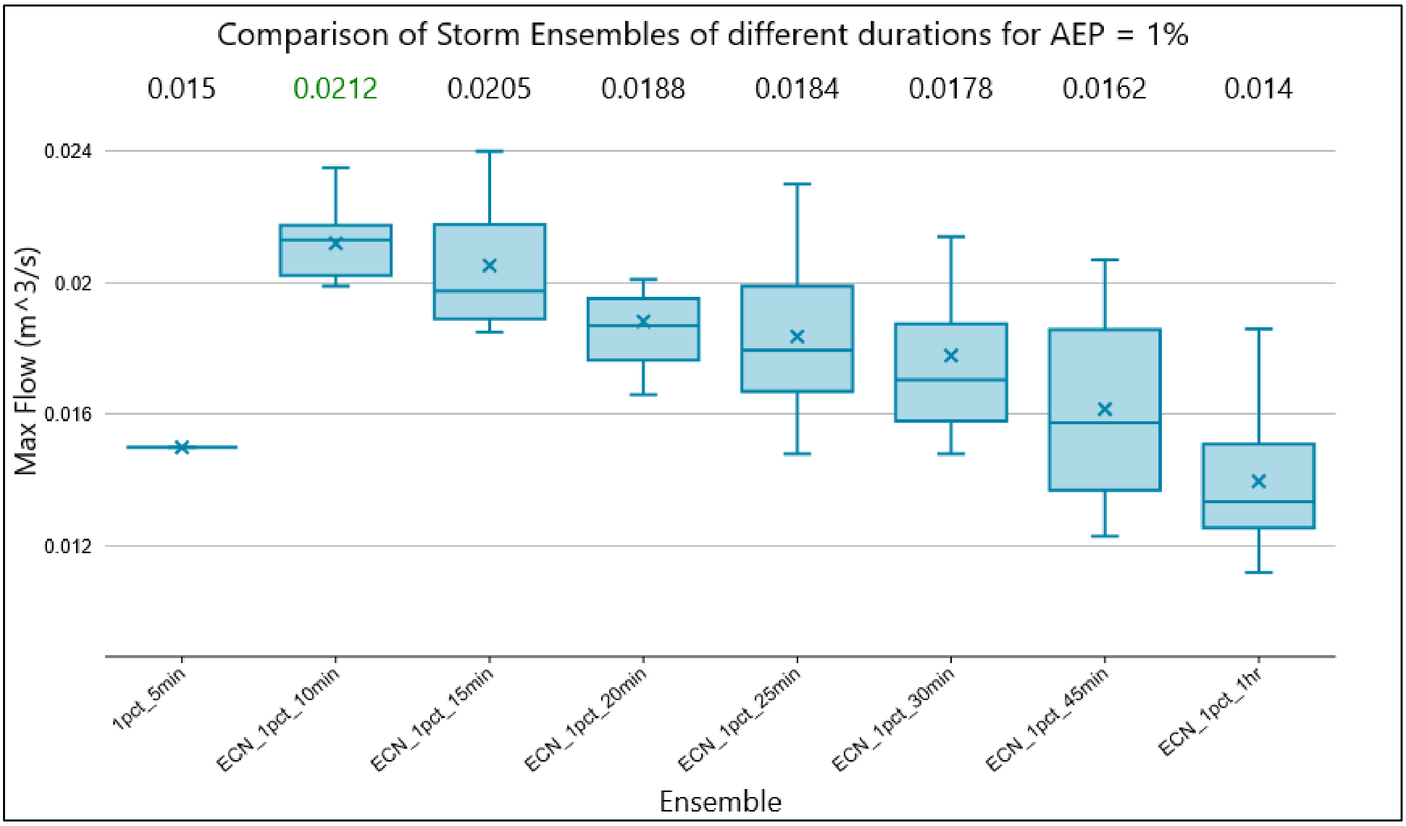


Figure 5: Comparison of Storm Ensembles of different durations for 1% AEP pre-development (XPSTORM Model)

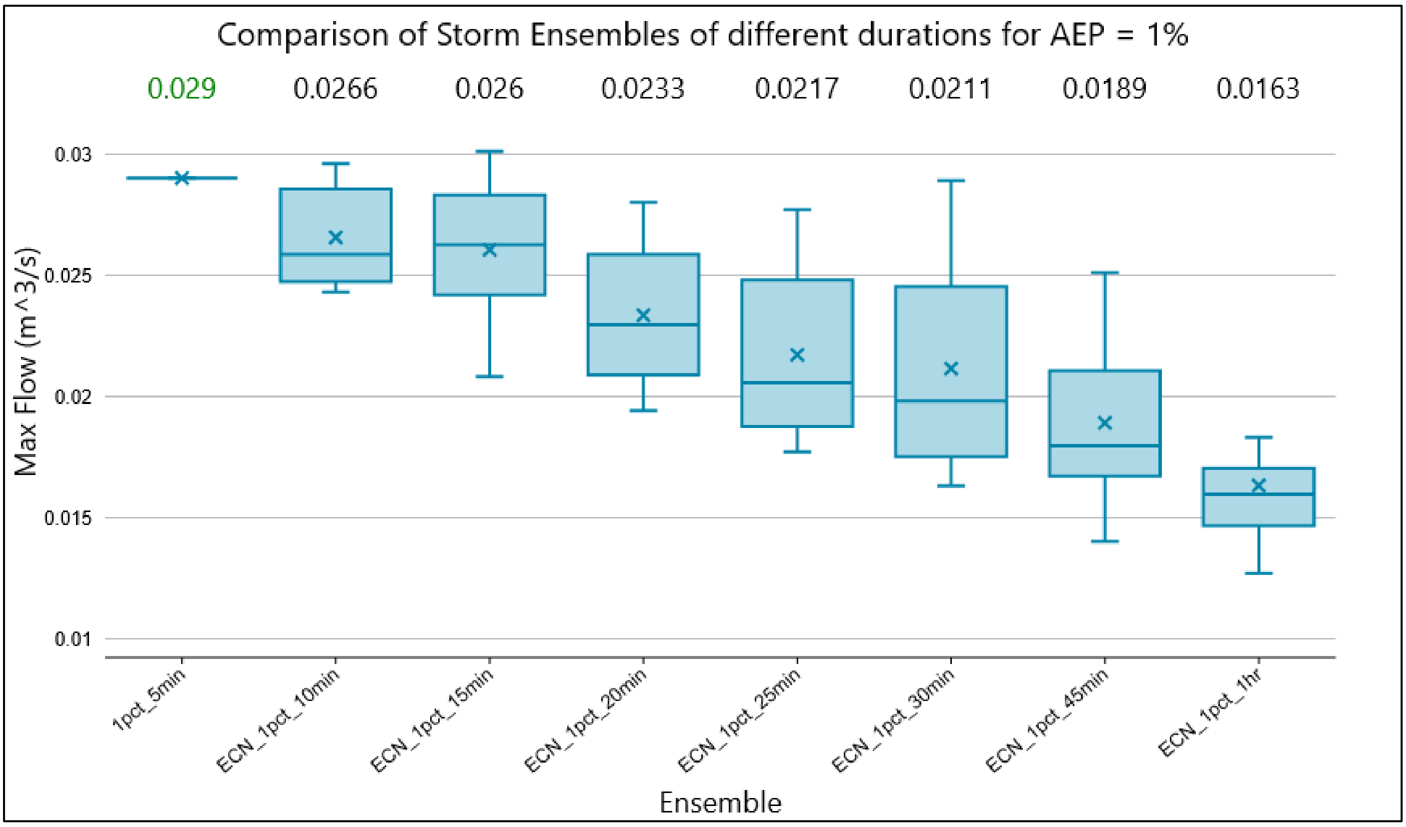


Figure 6: Comparison of Storm Ensembles of different durations for 1% AEP post-development (XPSTORM Model)

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

Table 4: Critical Storm Events

Annual Exceedance Probability (AEP %)	Critical Storm Event	
	Pre-development	Post-development
63%	63pct_15min_6	63pct_5min
50%	50pct_15min_6	50pct_5min
20%	20pct_10min_5	20pct_5min
10% (Minor event)	10pct_10min_8	10pct_5min
5%	5pct_10min_8	5pct_5min
2%	2pct_10min_2	2pct_5min
1% (Major Event)	1pct_10min_2	1pct_5min

3.2.3. EXTERNAL CATCHMENTS

There are no external catchments impacting the subject site based on the surface grading surrounding the site.

4.0 HYDRAULIC ASSESSMENT

4.1 BACKGROUND

The hydraulic assessment for the site has been carried out using XPSTORM 2019 V1.1. 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 utilizing a detention tank to restrict the flow off of the roof of the proposed structure for all storm events up to and including 1% AEP.

4.2 DETENTION

The proposed development will require approximately 1.5m^3 of detention volume to ensure no worsening to downstream catchments and infrastructure. The table will outlet onto the natural ground surface through a singular 40mm low flow outlet at the base of tank. Water will flow overland to the LPOD to the East. Table 5 summarises the peak discharge for different scenarios.

Table 5: 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)
63%	0.006	0.010	0.005
50%	0.007	0.011	0.006
20%	0.011	0.015	0.008
10% (Minor event)	0.013	0.018	0.010
5%	0.015	0.020	0.013
2%	0.017	0.024	0.015
1% (Major Event)	0.019	0.027	0.018

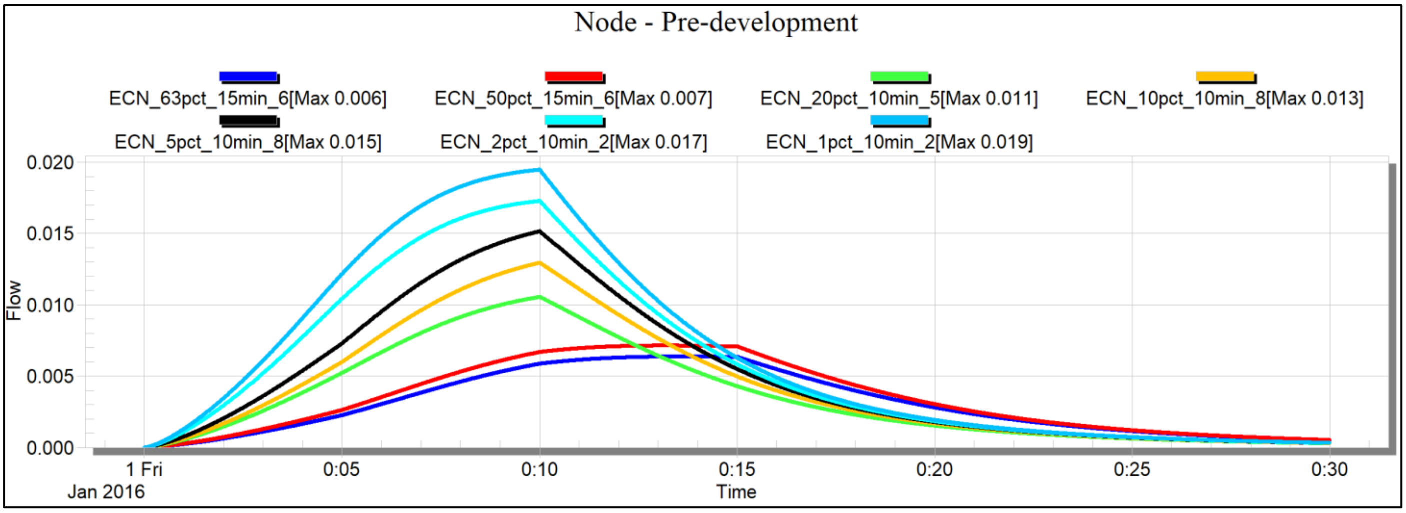


Figure 7: Pre-Development Peak Discharge Rate at LPOD

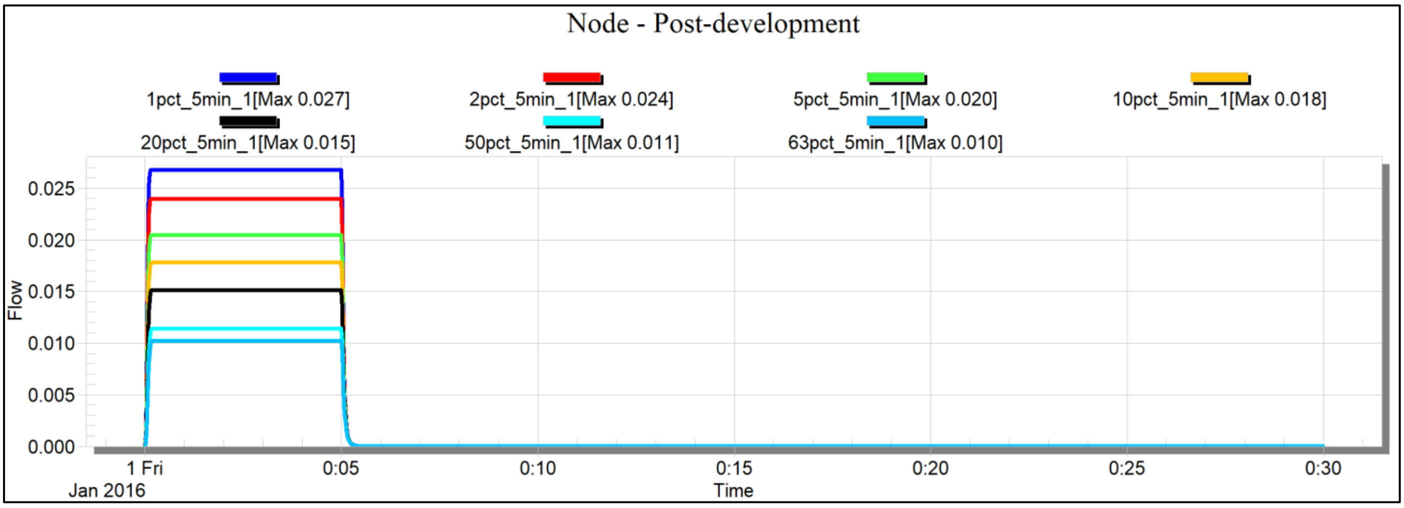


Figure 8: Unmitigated Post-Development Peak Discharge Rate at LPOD

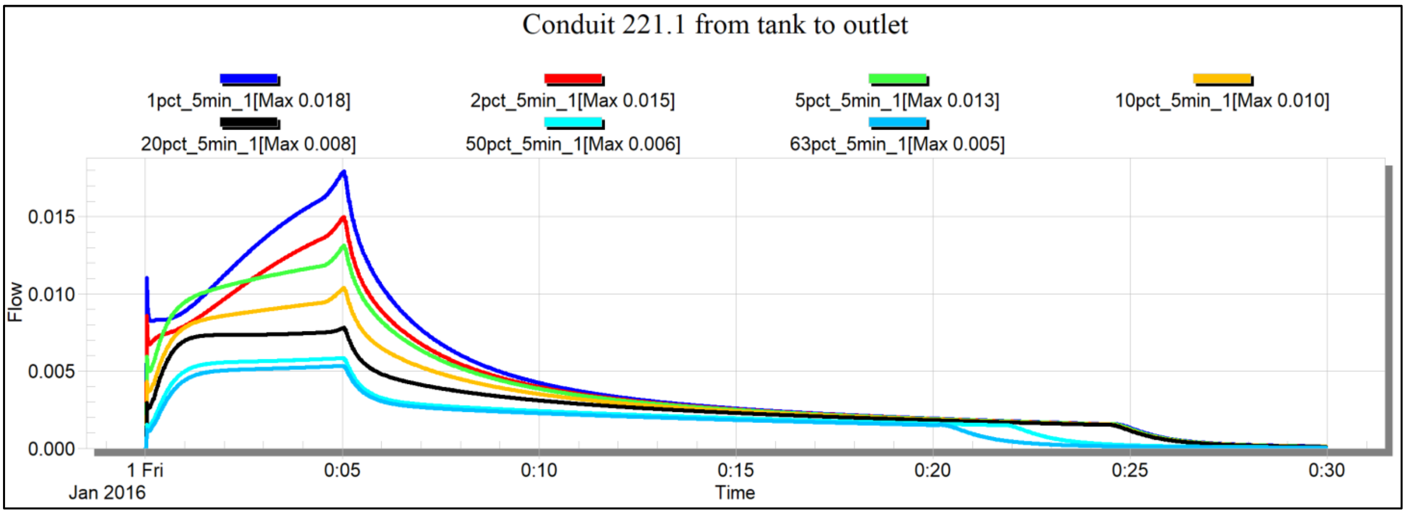


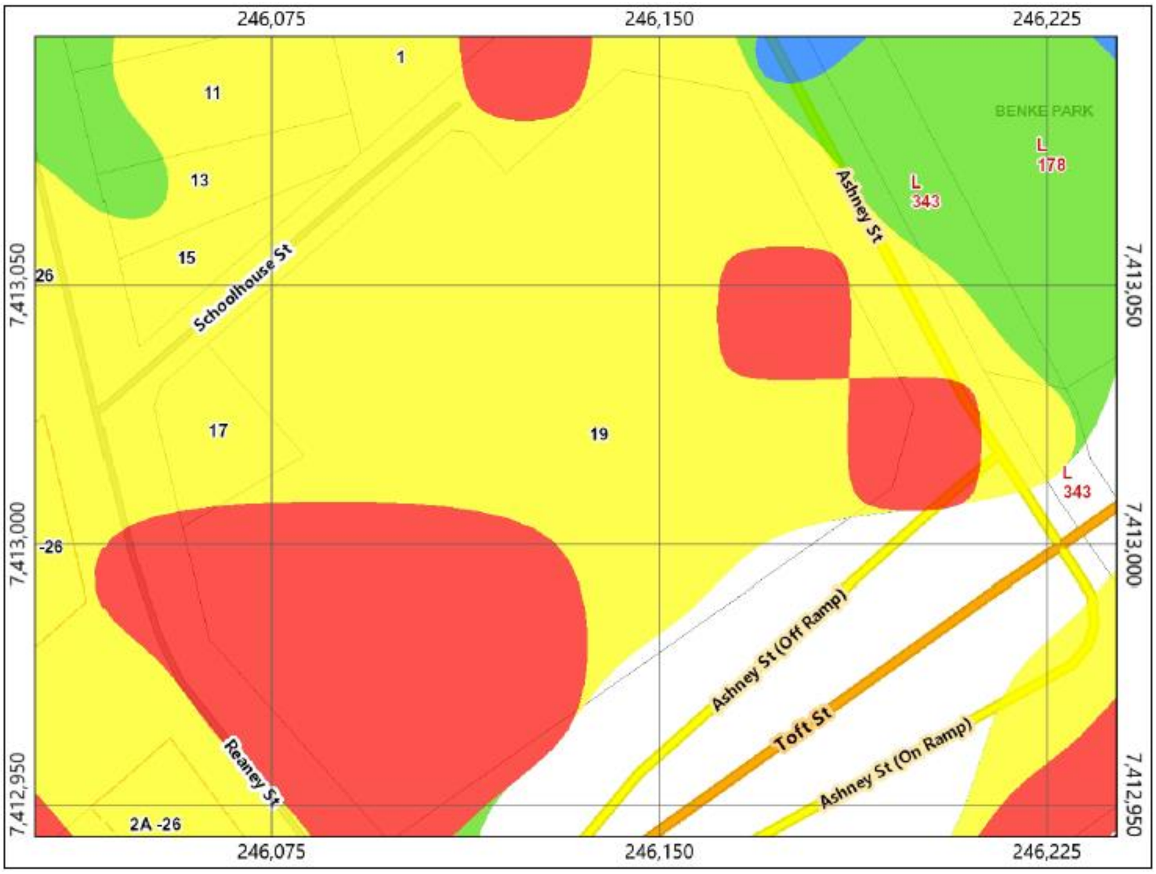
Figure 9: Roof water tank mitigation strategy

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

Table 6: Detention Basin Parameters

Total tank height	**1.62m**
Detention Volume (approximate)	**1.5m³**
Outlet Structure	**40mm outlet.**

Majority of development site is in high flood hazard zone (refer below image, yellow hatch). The floor level of the proposed building and the tank will be on posts, 2.4m above the natural surface level. Therefore the development will not constrict the passage of flow passing through the site or impact available flood storage on site. This development involves minimal earthworks which will not impact on flow velocities or flood levels on adjoining properties.



5.0 QUALITY ASSESSMENT

5.1. BACKGROUND

The proposed development will result in an impervious 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 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 Schoolhouse 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. Roofwater from the proposed development will be discharged onto existing grassed area. It is assumed that the grassed area and the natural ground depression up to LPOD can be treated as natural grass swales.

Following assumptions are made within the model:

- 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 Healthy Land and Water (2018), Water by Design MUSIC Modelling Guidelines Version 3, November 2018.

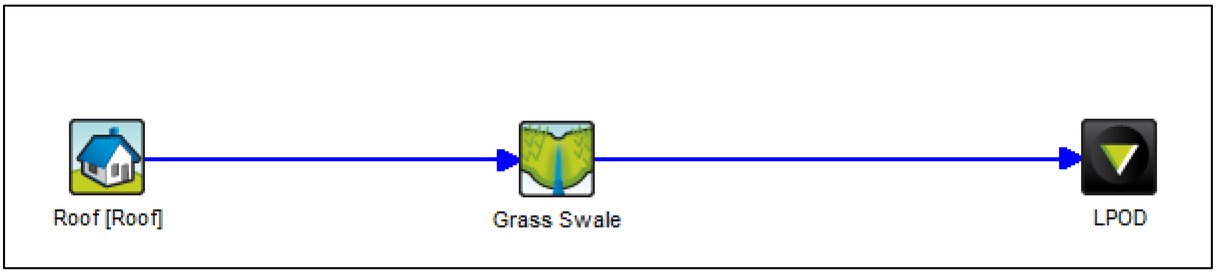


Figure 10: Stormwater Quality Treatment Train

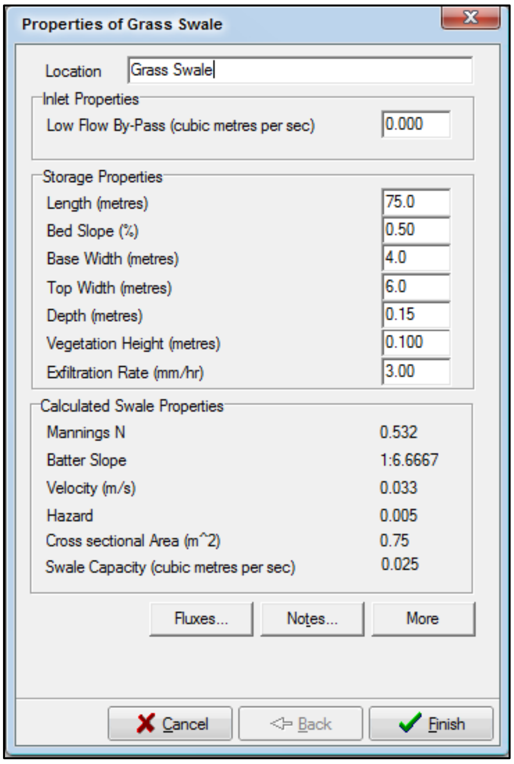
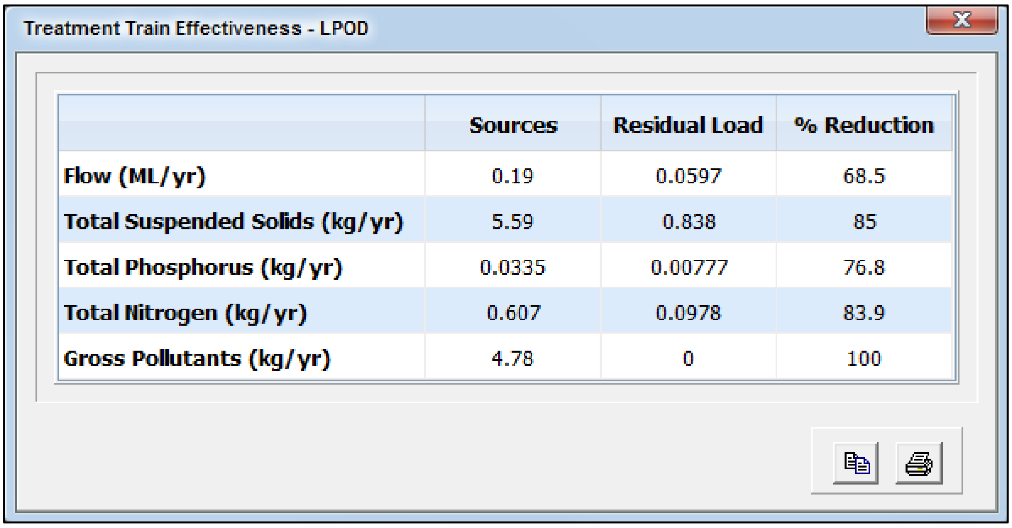


Figure 11: Properties of Grass Swale


Treatment Train Effectiveness - LPOD

	Sources	Residual Load	% Reduction
Flow (ML/yr)	0.19	0.0597	68.5
Total Suspended Solids (kg/yr)	5.59	0.838	85
Total Phosphorus (kg/yr)	0.0335	0.00777	76.8
Total Nitrogen (kg/yr)	0.607	0.0978	83.9
Gross Pollutants (kg/yr)	4.78	0	100

Figure 12: Stormwater Quality Treatment Train Effectiveness

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