Attachment 6 – Infrastructure Services Report

Ardill Payne & PARTNERS

ENGINEERS PLANNERS SURVEYORS ENVIRONMENTAL PROJECT MANAGEMENT

INFRASTRUCTURE SERVICES REPORT

Proposed Masterplan Amendments
Emmanuel Anglican College

Horizon Drive
Ballina

For Emmanuel Anglican College

November 2021

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0	First Issue
1	Updated based on Client comments and revised drawings
2	

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Abbreviations

This report uses the following abbreviations.

Abbreviation	Abbreviated Term
ADWF	Average Dry Weather Flow
APP	Ardill Payne & Partners
AS	Australian Standards
BCA	Building Code of Australia
BDCP	Ballina Development Control Plan 2012
BSC	Ballina Shire Council
DA	Development Application
DCP	Development Control Plan
DEM	Digital Elevation Model
DFL	Design Floor Level
DSP	Development Servicing Plan
EAC	Emmanuel Anglican College
EP	Equivalent Population
ET	Equivalent Tenement
FPL	Flood Planning Level
LPOD	Legal Point of Discharge
MPC	Multipurpose Centre
MSB	Main Switchboard
NRLG	Northern Rivers Local Government
PID	Peak Instantaneous Demand
RT	Rainwater Tank
SMP	Stormwater Management Planning
SPS	Sewer Pump Station
WSA	Water Services Association

1. INTRODUCTION

Ardill Payne and Partners has been engaged to investigate engineering services for the proposed masterplan amendment at Emmanuel Anglican College, Horizon Drive, Ballina. EAC is located at Lot 10 in DP 1001995 and is known as No. 62 Horizon Drive, West Ballina.

The EAC site has a total area of 5.94 ha and was acquired in 1999 for constructing schools and educational facilities. The development of EAC has been performed in different stages since the original approval. This staged development has been undertaken with revisions and additions to the original development plan. The last significant development at the college was construction of a Multipurpose Centre, associated driveway and carparks in 2020 to 2021. An extension of the learning centre is currently under construction.

An aerial view of the EAC Site is shown in **Figure 1.1**.

Figure 1.1: Aerial view of Emmanuel Anglican College

The proposed masterplan amendment consists of construction of additional school buildings at five locations shown in **Figure 1.2**. The figure on the full extent of the site is provided in **Attachment 1**. The development proposal for Stage 14 includes:

- Stem and Digital Technology Centre – Containing 12 classrooms plus breakout area and integrated staff offices
- Endeavour Hub – Additions to an existing educational establishment comprising an Endeavour Hub building and associated landscaping within the Junior School, Occupation in 2024
- One-classroom extension to Early Learning Centre, Occupation ASAP
- Collaboration Centre – Containing 6 junior classrooms, Occupation in 2025
- Performing Art Centre – Containing the Performance Centre along with 4 Drama/Music classrooms, Occupation in 2027

In addition to the above buildings, the works include upgrades to the existing vehicular access, bus bay and car parking supply.

Figure 1.2: Location of the proposed developments

This report outlines the proposal for managing the development stormwater, water supply and sewage disposal. The report also outlines the Ballina Shire Council advices regarding the site construction levels with flooding considerations.

The report has been prepared with consideration of the condition of the site existing services, and the BSC notes in Engineering section of the pre lodgement meeting dated 21th September 2021.

2. STORMWATER

2.1 History

The first SMP for construction of the college was issued in 1999 by Bill Payne and Associates (BPA). This proposal was adopted by Council as part of the initial consent. The design divided the site into a series of catchments with site discharge points being at the north eastern and south western extremities. The design recognised the site constraints of slope and tidal effected discharges. The concept solution was to provide low ARI event storms conveyance in pipework with higher events surcharging pits and moving slowly to discharge points via swales and overland flow paths. The swales were unlined and acted as detention and conveyance elements. An isolated detention and treatment pond was located at the end of the northern end discharge.

Following a series of changes proposed to the development an updated SMP was prepared by Newton Denny Chappelle in 2014 and approved. The NDC proposal involved applying additional detention volumes per stage based a direct comparison of local additional impervious area and associated flow rates. This approach provided a simple solution to a change in Masterplan density. However, it did not take into account the original design concept of site wide detention capacity and downstream discharge behaviour nor the final sites impervious area. Therefore, this process overstated in some cases the site discharge created by the change in impermeable area. Buildings discharging directly to the Horizon Drive stormwater system did not have the benefit of the previously approved on-site detention. Isolated detention systems may have been appropriate for these cases.

2.2 Stormwater System Performance

The original and amended concept for the NE flowing catchments has worked very well and the north-east detention pond has been rarely full. Buried PVC pipework flowing to the north-east pond has historically been partially full even after storm events. These pipes have recently been relaid to improve the drainage condition.

The southern discharge point had been previously closed by the construction of Riverbend Drive. This dammed the southern point of the site resulting in the large storage events witnessed over many years. This has now been rectified by completion of a culvert installation in the SW corner of the site under Riverbend Drive. Regrading works to direct overland flow toward the culvert has also been completed.

2.3 Discharge Points

This stormwater management plan proposes to follow the north-east and south-west discharge concept as per the original 1999 strategy. The discharge points are shown in the proposed SMP drawing in **Attachment 2**.

2.3.1 South-West Discharge Point

APP has analysed the south-west discharge as part of upgrading the drainage at the sports field and installing the existing culvert under Riverbend Drive. APP found the south-west discharge went into a tidal drain which was also connected to a floodplain and finally to Emigrant Creek. More detail regarding this analysis is available in APP letter dated 19.10.2020 to Council.

A portion of the drain is now replaced with new pipework by Council as part of the River Street upgrade. The flow from the site forms a small part of a larger catchment flowing to the downstream floodplain to the west of Riverbend development.

This discharge point remains sensitive to additional flows and as such a generous detention volume has been proposed for the proposed Performing Art Centre and Digital Technology Centre which will flow to this discharge point.

2.3.2 North-East Discharge Point

Previous assessments of the receiving system shows that the north-east discharge has similar fluvial properties except there is a more defined channel leading to Fishery Creek and the northern catchments have the benefit of the on-site detention provided by the existing swales and storage areas. The pipework coming up Horizon Drive is tidal. APP has measured tidal fluctuations to 500mm. Flows can be very slow due to blockages in downstream drains north of Horizon Drive.

For this discharge point installing additional onsite detention for the proposed development is not warranted. In addition, the hydraulic modellings show that the existing basin at the north-east can keep the developed site flows well under the pre-development numbers. The supporting modelling results are provided in **Section 2.5** of the report.

2.4 Proposed Management Strategy

Runoff from the proposed development will be distributed between the north-east and south-west discharge points. The proposed management plan is shown in **Attachment 2**. The proposed SMP for each of the proposed buildings is summarised below:

- Stormwater from Performing Art Centre will discharge to a garden area with at least 100m^2 surface area for quality treatment. The garden surcharge will be directed to the existing stormwater system within Horizon Drive.

  The building roof water will be connected to 26kL detention volume provided within a rainwater tank(s) for mitigation. Discharge from the RT will be limited by installing a 100mm orifice plate on the tank discharge pipe.

- Stormwater from Stem and Digital Technology Centre will be directed to a minimum 100m^2 garden area for quality treatment. The garden surcharge will be directed to the existing swale along the sports field. The swale is extended to the existing culvert crossing at the south-west outlet.

  The stormwater discharges will be mitigated by connecting the building roof water to 30kL detention volume provided in the proposed rainwater tank(s). Discharge from the RT will be limited by installing a 100mm orifice plate on the tank discharge pipe.

- Stormwater from Collaboration Centre will be directed to the proposed garden with minimum 100m^2 area for quality treatment. The garden surcharge will be captured into a new inlet pit located at the garden and piped from the inlet pit to the site existing stormwater system flowing to the north-east discharge point.

  The increased peak discharges from the building will be mitigated within the existing stormwater basin at the north-east discharge point.

- Stormwater from Endeavour Centre will be directed to the proposed 50m^2 garden area for quality treatment. The garden surcharge will be captured into a new inlet pit located at the garden and piped from the inlet pit to the site existing stormwater system flowing to the north-east discharge point. The increased peak discharges from the building will be mitigated in the existing stormwater basin at the north-east discharge point.

- The proposed extension of Early Learning Centre incorporates less than 100m^2 roof water only. The extended roof will be connected to the building existing roof water system. Stormwater quality and quantity modelling shows that the overall stormwater treatment and mitigation rate will meet the targets and with consideration of the small increase in impervious areas at this building provision of further treatment/mitigation will not be required.

2.5 Flow Mitigation

The detention requirements for the proposed development have been computed by setting up DRAINS models for the site additional impervious areas. In this regard:

- Endeavor Hub, Collaboration Centre and extension of Early Learning Centre will discharge to the existing stormwater detention basin at the site north-east corner. The catchment discharging to this basin has been

modelled in DRAINS and shown that the existing basin can continue to mitigate the flows to less than the pre development case.
The areas and impervious rates of the north-east catchment used in the DRAINS model are shown in **Table 2.1**.

Table 2.1: Surfaces and Impervious rates of the site catchment flowing to north-east discharge point

Surface	Pre development	Existing	Post Development
Vegetated	24,484m^2	12,872m^2	10,079m^2
Hardstand	0	1,736m^2	3,287m^2
Roof	0	9,876m^2	11,118m^2
Total	24,484m^2	24,484m^2	24,484m^2

Note: *Post Development Case include discharge from Collaboration Centre, Endeavour Centre*

The DRAINS modelling shows that the post development discharges from the basin will remain less than the discharges in a pre-development greenfield case with zero impervious area. The modelling details are provided in **Attachment 2** of the report.

Table 2.2: North-East catchment flows in different conditions and events - Mitigation effect of existing detention basin

ARI (yrs)	Pre development	Existing	Post Development
5	0.555 m^3/s	0.491 m^3/s	0.508 m^3/s
20	0.833 m^3/s	0.811 m^3/s	0.823 m^3/s
100	1.07 m^3/s	0.989 m^3/s	1.01 m^3/s

- Increased Flows from construction of Performing Arts Centre and Stem & Digital Technology Centre will be mitigated by directing these buildings roof water to 26kL and 30kL rainwater tanks respectively. DRAINS modelling shows that the proposed detention volumes will reduce the post development peak discharges from these buildings to much less than the existing case. The pre and post development condition of Performing Arts Centre and Stem & Digital Technology Centre are modelled in DRAINS based on the surfaces and impervious rates shown in **Table 2.3** and **Table 2.4**. The data for the other buildings in the tables are for information only.

Table 2.3: Surfaces and Impervious rates of areas where the proposed buildings will be located – Existing Case

Building	Existing Case		
	Total	% Impervious	Existing Content
Stem and Digital Technology Centre	1451	40	Sheds and Demountable Building
Endeavour Hub	397.7	10%	Mainly Open Space
Early Learning Centre Extension	95	0	Open Space
Collaboration Centre	1035	80	Sports Courts and Sheds
Performing Art Centre	1763	55	Temporary Buildings
Total	4741.7	50.2	

Table 2.4: Surfaces and Impervious rates of proposed buildings – Post Development Case

Building	Post Development Case					
	Roof	% Impervious	Ground	% Impervious	Total	% Impervious
Stem and Digital Technology Centre	902	100	549	95	1451	98.1
Endeavour Hub	281.3	100	116.4	80	397.7	94.1
Early Learning Centre Extension	95	100	0	100	95	100.0
Collaboration Centre	520	100	515	95	1035	97.5
Performing Art Centre	1085	100	678	30	1763	73.1
Total	2883.3		1858.4		4741.7	88.4

2.6 Quality Treatment

Stormwater discharge from the site will need to meet Council's quality treatment objectives. The load based pollutant reduction objectives of stormwater quality treatment are outlined in Council's *'DCP Chapter 2, Section 3.9.3'* as follows:

- 80% reduction in total suspended solids (TSS).
- 60% reduction in total phosphorus (TP).
- 45% reduction in total nitrogen (TN).
- 90% reduction in litter / gross pollutants (GP).

The above objectives will be achieved by implementing stormwater quality improvement measures as part of the site stormwater management plan. To demonstrate sufficiency of the proposed treatment train, the site was modelled using MUSIC computer software. The model included the proposed buildings footprint only and was setup based on the surface areas and impervious rates shown in **Table 2.4**.

The BSC 'MUSIC Link' was used in setting up the model to ensure the model parameters are in accordance with the Council requirements. The proposed garden areas for stormwater treatment were included in the model as bio-retentions with no filter and no underdrain pipes.

The proposed stormwater treatment train has been shown on APP drawing C02, **Attachment 2** 'Proposed Stormwater Plan'. The MUSIC model setup is shown in **Attachment 2**. The results for each catchment and for the whole EAC site are provided in **Table 2.5**.

Table 2.5: Site Pollutant Reductions

Catchment	Pollutant	Post Developed	Post Developed with Treatment	% Reduction	Target %
Discharge to North -East	Flow (ML/yr)	2.47	2.2	10.9	N/A
	Total Suspended Solids (kg/yr)	520	87.7	83.1	N/A
	Total Phosphorus (kg/yr)	1.36	0.39	71.3	N/A
	Total Nitrogen (kg/yr)	7.85	4.28	45.6	N/A
	Gross Pollutants (kg/yr)	56.8	3.74	93.4	N/A
Discharge to South - West	Flow (ML/yr)	4.93	4.57	7.1	N/A
	Total Suspended Solids (kg/yr)	1040	105	89.9	N/A
	Total Phosphorus (kg/yr)	2.72	0.675	75.2	N/A
	Total Nitrogen (kg/yr)	15.6	8.25	47	N/A
	Gross Pollutants (kg/yr)	108	0	100	N/A
Site Total	Flow (ML/yr)	7.4	6.78	8.4	N/A
	Total Suspended Solids (kg/yr)	1560	193	87.6	80
	Total Phosphorus (kg/yr)	4.08	1.06	73.9	60
	Total Nitrogen (kg/yr)	23.4	12.5	46.5	45
	Gross Pollutants (kg/yr)	165	3.74	97.7	90

As shown the proposed stormwater quality treatment train achieves all the pollution reduction objectives and therefore provides an acceptable level of treatment for the site.

3. SEWER

The site is being serviced by two sewer pump stations pumping to BSC gravity pits in Westland Drive. The location of the site pump stations and their catchments are shown in **Attachment 2**.

As shown in **Attachment 3** the Performing Art Building will be connected to the pump station located next to the existing play court (PS2). The rest of the proposed development will be connected to PS1.

Development of EAC will potentially increases the number of the students. Therefore, a review of the capacity of the onsite pump stations was necessary to ensure enough pumping capacity for the site potential additional sewer load was available.

3.1 EAC Future Sewer Loads

The projection of the number of staff and students at EAC with consideration of the proposed developments is shown in **Table 3.1**. The table also calculates the site sewer loads. The sewer load calculation is based on the numbers and guidelines in WSA 02 and NRLG D12.

Table 3.1: Sewer load calculation for predicted number of EAC students and staff

Year	Students	Staff	Total	EP per Unit	Total EP	Total (kL/d)	PWWF (kL/day)	PWWF (L/s)
2021	794	93	887	0.2	177.4	42.6	127.7	3.9
2022	843	100	943	0.2	188.6	45.3	135.8	4.2
2023	884	104	988	0.2	197.6	47.4	142.3	4.4
2024	915	108	1023	0.2	204.6	49.1	147.3	4.5
2025	962	113	1075	0.2	215	51.6	154.8	4.8
2026	1002	119	1121	0.2	224.2	53.8	161.4	5.0
2027	1032	124	1156	0.2	231.2	55.5	166.5	5.1
2028	1054	129	1183	0.2	236.6	56.8	170.4	5.3
2029	1074	134	1208	0.2	241.6	58.0	174.0	5.4
2030	1104	139	1243	0.2	248.6	59.7	179.0	5.5
2031	1114	144	1258	0.2	251.6	60.4	181.2	5.6

Regarding the sewer load calculations in the above table:

- EP per Unit: Table A1 of WSA assigns 0.2 EP sewer load to each student or staff in educational facilities.
- Total (kL/d): NRLG Design Specification D12 assigns 240L/d to each EP.

- PWWF (L/s): In assessing the instantaneous PWWF, it is considered that almost all the school sewer is generated within 9 hours on any day. This is a conservative assumption as the storage capacity provided within the pump wells allow pumping outside of the school hours.

The minimum acceptable design flow for a SPS is equivalent to PWWF. The last column of **Table 3.1** shows that provision of 5.6 L/s pumping capacity for the site is necessary.

The EAC two existing SPSs are currently running each with rate of 4L/s (8L/s when the two pump stations work simultaneously). As such upgrading the pump stations for the proposed development will not be necessary. More detail regarding the site SPSs is provided in **Section 3.2** of the report.

3.2 Onsite Pump Stations

The site two sewer pump stations are similar. The SPSs locations and catchments are shown in **Attachment 2**. The SPSs important levels and dimensions are shown in **Figure 3.1**. The figure is prepared by Compass Consulting. Based on the available information:

- Each Pump Station capacity: 4 litres per second for 12 metres pumping head
- Emergency storage at the pump well: estimated to be at least 3.5m^3 above the pump start level

Most of the future buildings will be connected to SP1. This arrangement is acceptable as:

- MPC, the site major recent building development was just recently connected to SP2 already increasing the load of this pumps station.
- The capacity of both pump stations exceeds the site sewer loads and small difference of their load will be acceptable.

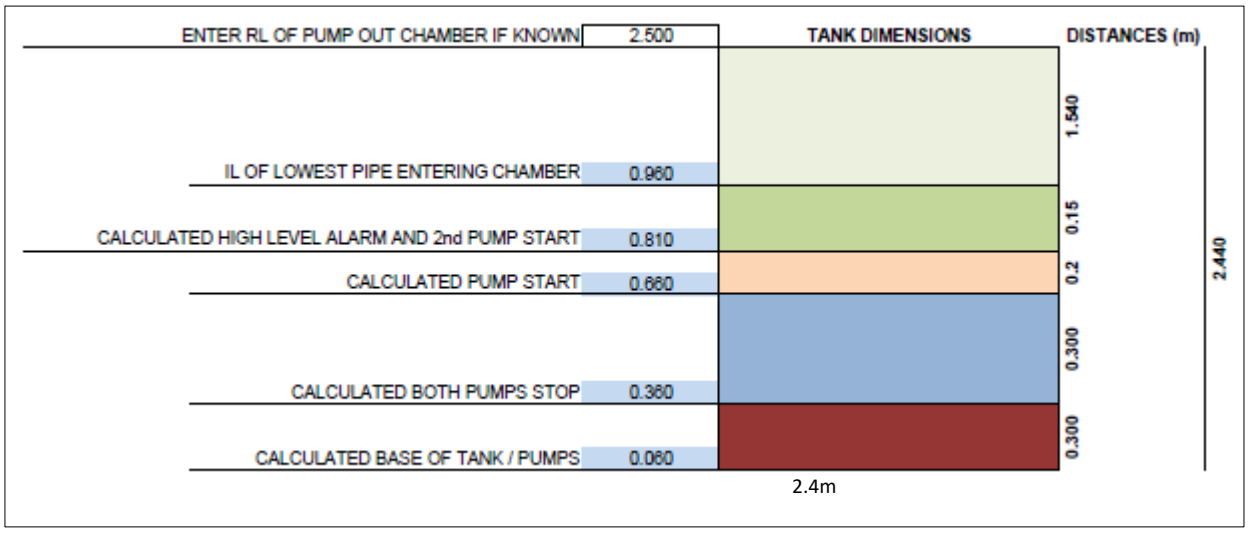


Figure 3.1: Site Pumps Stations details provided by Compass Consulting

3.3 Capacity of Public Sewage System

The site is connected to the BSC pump station SP2112 through the existing gravity main at Westland Drive. The SP2112 specification is provided to us by BSC to assess the condition of the pump station and ensure sufficient capacity for the proposed development is available.

The provided information regarding SP2112 including data from the operation of the pump station in March 2021 wet period is shown in **Attachment 2**. Based on this information:

- The pump station is equipped to two KSB Amarex Model KRT E80-250 /74UG-S 7.5 KW 2900RPM 255mm Impeller being able to pump 15.9 L/s at their current installation point.
- Observed ADWF flow at the pump station is 125.4 kL/day equal to 1.45 L/s.
- Observed PWWF at the pump station is 1007.4 kL/day equal to 11.66 L/s.

Council data shows that the March wet weather increased inflows to SP 2112 was pumped by in average 8 pump starts per hour which does not represent a concerning condition. WSA 04 relates the number of pump starts to the pump catchment dry weather flow (Appendix D of WSA 04-2005).

With the SP2112 ADWF being approximately 8 times less than PWWF, the average number of pump starts in dry weather will be close to one per hour which is lower than the numbers used for pump station design.

Table 3.1 shows the post development PWWF flow from EAC in 2031 will be 1.7 L/s higher than the existing flow. This increases the SP2112 PWWF from currently 10.13 L/s to 11.83 L/s. However, unless the reserved capacity of the SPS is assigned to other upcoming developments in the catchment, the inflow to the SPS will remain lower than the SPS pumping capacity.

In summary, we do not anticipate any restrictions from the site internal and external sewer systems in regards to the proposed development.

4. WATER SUPPLY

4.1 Potable

A 100mm diameter water main runs across the site from Horizon drive to the existing school buildings. The future buildings will tap into this facility.

4.2 Recycled

BSC requested that the proposed buildings wherever contain plumbing are connected to recycled water. As such provision of a recycled water for Stem and Digital Technology Centre and Performing Art Centre will be necessary.

The recycled main runs along the River Street frontage to the site, which would be the proposed connection point. With consideration of the construction order and available space, connection to the recycled main can be allocated at the site frontage with River Street adjacent to the potable water meters and extended across the sports field to future buildings. Connections for possible irrigation of the sports field can be provided from the recycled water.

The connection size will be reviewed at the detailed design stage by the building hydraulic consultants.

5. FLOODING

The site is located within the Richmond River floodplain and the site flooding can be sourced from Emigrant Creek and/or Richmond River. A large-scale view of the floodplain representing the flooding extent in a 100 year CC2050 design event including the information regarding the flood levels in the area is shown in **Figure 5.1**.

Figure 5.1: Richmond River Q100 CC2100 flood plain in vicinity to South Precinct

BSC has advised that the proposed buildings must be located on a fill pad with elevations not less than 2.2m AHD. As shown in Figure 5.1, this is equivalent to 100 year ARI CC 2050 flood levels.

We note that Chapter 2b of DCP 2012 for Floodplain Management Plan allows a concession to the fill pad level based on 50-year ARI CC2050 flood levels with Council's agreement. With consideration of lower fill levels at certain areas of the site in proximity to the proposed buildings, this concession may be applicable to EAC site.

New buildings will need to have Finished Floor Level of 500mm above Flood Planning Level to provide the necessary freeboard (Section 3.14 of Chapter 2b). The site 100-year ARI CC2050 FPL is 2.2m AHD so a minimum DFL of 2.7m AHD should be acceptable. Currently BSC has requested a minimum DFL of 2.8m AHD to be applied.

6. GEOTECHNIC

Various geotechnical investigations have been undertaken across the site. The first geotechnical investigation was undertaken by Coffey in 1999. The most recent geotechnical investigations were performed by Shaw Urquhart Consulting for development of the MPC building. The investigation consisted of a multiple boreholes and cone penetration tests with results provided in reports dated 7th November 2018 and 25th July 2019.

The general outcomes of the previous geotechnical studies are consistent and describe the site subsurface condition by deep, soft, and alluvial clay deposits with expected settlements due to filling works beyond a certain level and general building loads.

Dependant on building scale, construction materials and connection with existing buildings the construction and foundation techniques will vary. Historically the site has utilised a mixture of slab on ground construction during early stages, elevated lightweight floor systems in later stages and piling of larger buildings (Multi-Purpose Centre) with satisfactory results. It is expected that the future construction would employ similar construction techniques.

Additional geotechnical testing may be required once building methodology is better known and will be engaged as required.

7. Traffic

The proposed development has been assessed by Rytenskild Traffic Engineers.

8. POWER

Peter Eustace and Associates advises that A Padmount transformer is located on the EAC ground close to the science block. Power is reticulated from the transformer to the site Main Switchboard installed in science block via underground conduit.

The proposed buildings power supply will be provided via underground conduit from the site MSB to the switchboard of each building. It is understood that existing padmount transformer has spare capacity to cater for the additional power demand. This is to be confirmed at the detailed design stage.

9. COMMUNICATIONS

Existing Communication hub (campus distributor) is located inside science block. Underground communication conduit will be provided from the science block to the proposed buildings.

10. Scope of Engagement

This report has been prepared by Ardill Payne & Partners (APP) at the request of Emmanuel Anglican College for assessment of the required additions to the existing infrastructure for servicing the proposed developments at Emmanuel Anglican College and is not to be used for any other purpose or by any other person or corporation.

This report has been prepared from the information provided to us and from other information obtained as a result of enquiries made by us. APP accepts no responsibility for any loss or damage suffered howsoever arising to any person or corporation who may use or rely on this document for a purpose other than that described above.

APP declares that it does not have, nor expects to have, a beneficial interest in the subject project.

To avoid this advice being used inappropriately it is recommended that you consult with APP before conveying the information to another who may not fully understand the objectives of the report. This report is meant only for the subject site/project and should not be applied to any other.

11. ATTACHMENTS

Attachment 1	Pre and Post Development Layout Plans
Attachment 2	Stormwater Modellings and Management Plan
Attachment 3	Sewer services Drawings

ATTACHMENT 1

Attachment 1: Drawings

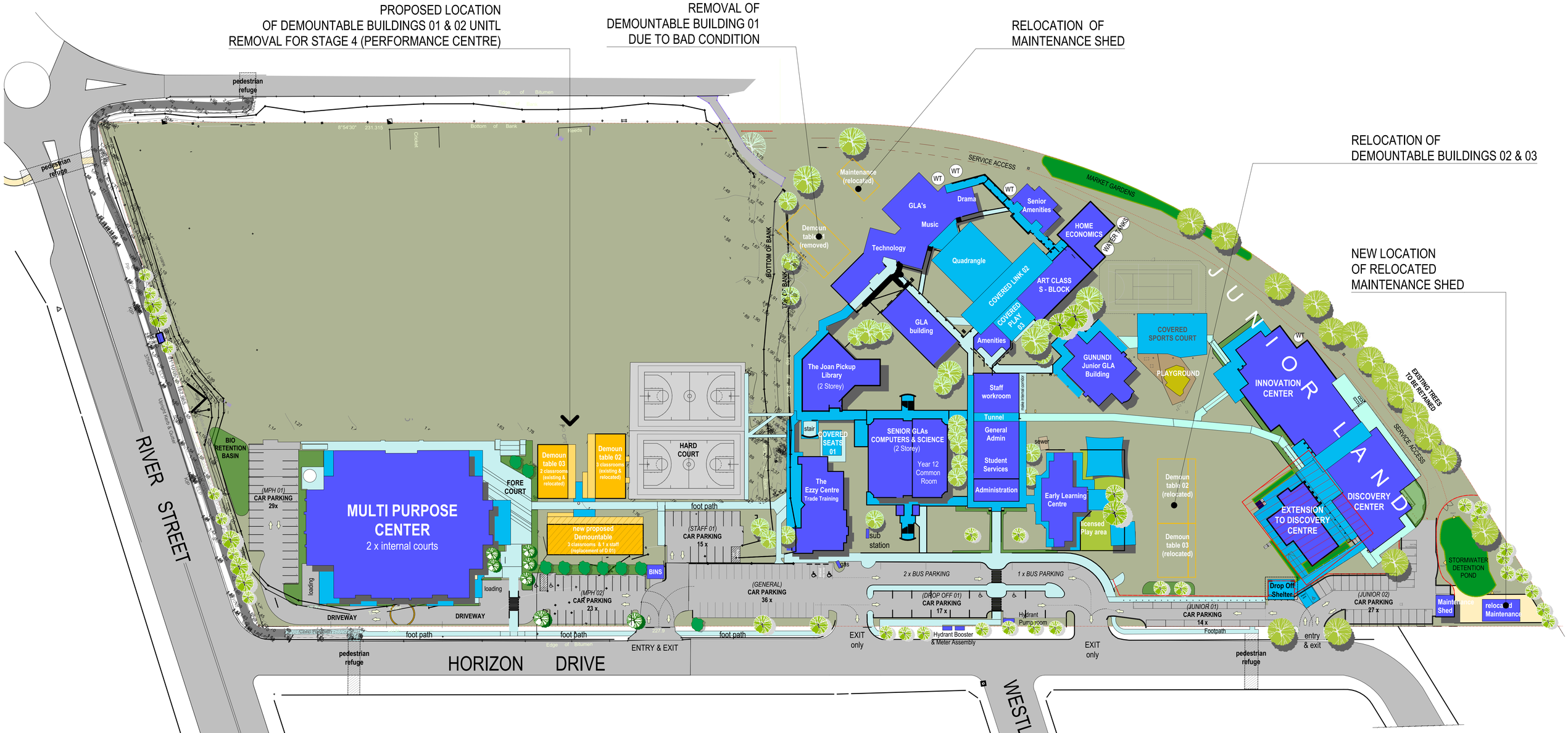
PROPOSED LOCATION
OF DEMOUNTABLE BUILDINGS 01 & 02 UNITL
REMOVAL FOR STAGE 4 (PERFORMANCE CENTRE)

REMOVAL OF
DEMOUNTABLE BUILDING 01
DUE TO BAD CONDITION

RELOCATION OF
MAINTENANCE SHED

RELOCATION OF
DEMOUNTABLE BUILDINGS 02 & 03

NEW LOCATION
OF RELOCATED
MAINTENANCE SHED



EXISTING

- Existing Building
- Pedestrian Walkways
- Covered Walkways and Shaded Spaces
- Under Construction
- Temporary Building location during construction of Stage 1

CAR PARKING

CURRENT

MPH 01	- 29no.
MPH 02	- 23no
STAFF 01	- 15no
DROP OFF 01	- 17no
CAR PARK GENERAL	- 36no
JUNIOR 01	- 14no
JUNIOR 02	- 27no.
TOTAL	**- 161no**
plus BUS BAYS	- 3 no.

EMMANUEL ANGLICAN COLLEGE

INTERIM MASTER PLAN

0 5 10 15 20 30 40 50

9.00°

PROPERTY DESCRIPTION
LOT 10
DP 1001995
SHIRE OF BALLINA

MASTER
NOT FOR CONSTRUCTION

11/11/2021

RAUNIK design group
architects
master planners
interior designers

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Member Australian Institute of Architects

NOTES
- Confirm all dimensions and levels on site before commencing work
- Figured dimensions shall take precedence over scaled dimensions

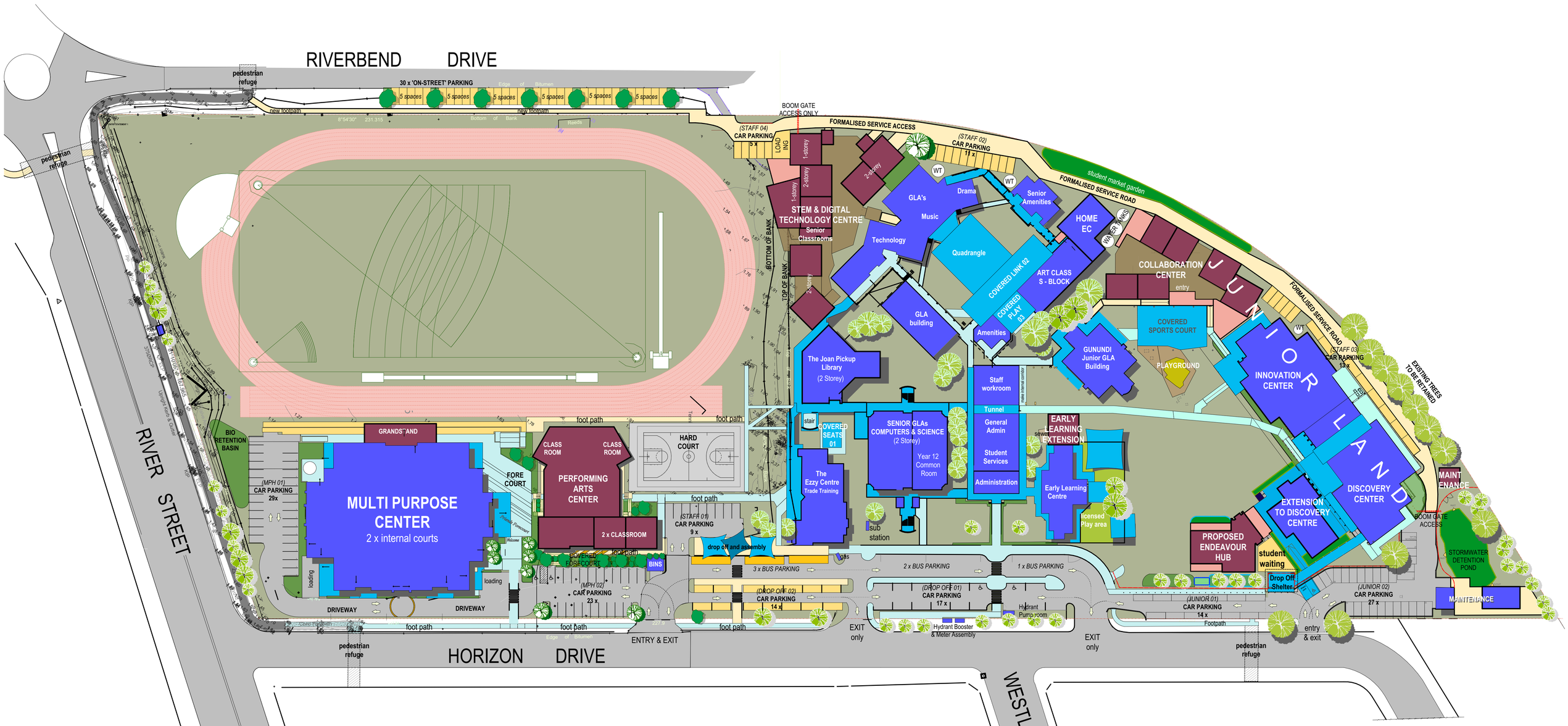
REV	DATE	BY	DESCRIPTION
A	19-01-21	CT	for townplanning review
B	29-01-21	CT	for BGA submission
C	25-02-21	CT	for client review
D	12-03-21	CT	for Development application
E	30-04-21	CT	for Development application
F	**18-10-21**	**CT**	**parking location amendments**

PROJECT
MASTER PLAN
62 HORIZON DRIVE, BALLINA, NSW, 2478
for
EMMANUEL ANGLICAN COLLEGE

INTERIM SITE PLAN - STAGE 1

SCALE	DATE	ARCHITECT
AS SHOWN @ A1	11/11/2021	CT

PROJECT NUMBER: 17281-102_REV F
PAGE NUMBER



EXISTING

- Existing Building
- Pedestrian Walkways
- Covered Walkways and Shaded Spaces

PROPOSED

- Future Building
- Internal Breakout space
- Proposed Outdoor Recreation
- Future Pathways, Roadway & Carpark

CAR PARKING

CURRENT		COMPLETED	
MPH 01	- 29no.	MPH 01	- 29no.
MPH 02	- 23no	MPH 02	- 23no
STAFF 01	- 15no	STAFF 01	- 9no
DROP OFF 01	- 17no	DROP OFF 01	- 17no
CAR PARK GENERAL	- 36no	DROP OFF 02	- 14no
JUNIOR 01	- 14no	JUNIOR 01	- 14no
JUNIOR 02	- 27no.	JUNIOR 02	- 27no.
		STAFF 02	- 11no
		STAFF 03	- 13no.
		STAFF 04	- 5no.
TOTAL	**- 161no**	**TOTAL**	**- 162no**
plus BUS BAYS	- 3 no.	plus BUS BAYS	- 6 no.
		RIVERBEND DR	- 30no

EMMANUEL ANGLICAN COLLEGE

PROPOSED LONG TERM MASTER PLAN

0 5 10 15 20 30 40 50

9.00°

PROPERTY DESCRIPTION
LOT 10
DP 1001995
SHIRE OF BALLINA

MASTER
NOT FOR CONSTRUCTION

11/11/2021

RAUNIK design group
architects
master planners
interior designers

61 7 5531 6430 **P**
61 7 5531 6424 **F**
architects@raunikdesign.com.au **E**
www.raunikdesign.com.au **W**

44 Ashmore Road Bundall Qld 4217
PO Box 7404 GCMC QLD 9726

ABN 12 887 885 845

Registered NSW 11433

Member Australian Institute of Architects

NOTES
- Confirm all dimensions and levels on site before commencing work
- Figured dimensions shall take precedence over scaled dimensions

REV	DATE	BY	DESCRIPTION
T	27-04-21	CT	for Endeavour Hub BGA application
U	30-04-21	CT	for Development application
P	29-06-21	CT	for Prelodgement meeting
Q	18-10-21	CT	parking location amendments
R	09-11-21	CT	parking location amendments
S	**11-11-21**	**CT**	**parking location amendments**

PROJECT
MASTER PLAN

62 HORIZON DRIVE, BALLINA, NSW, 2478

for
EMMANUEL ANGLICAN COLLEGE

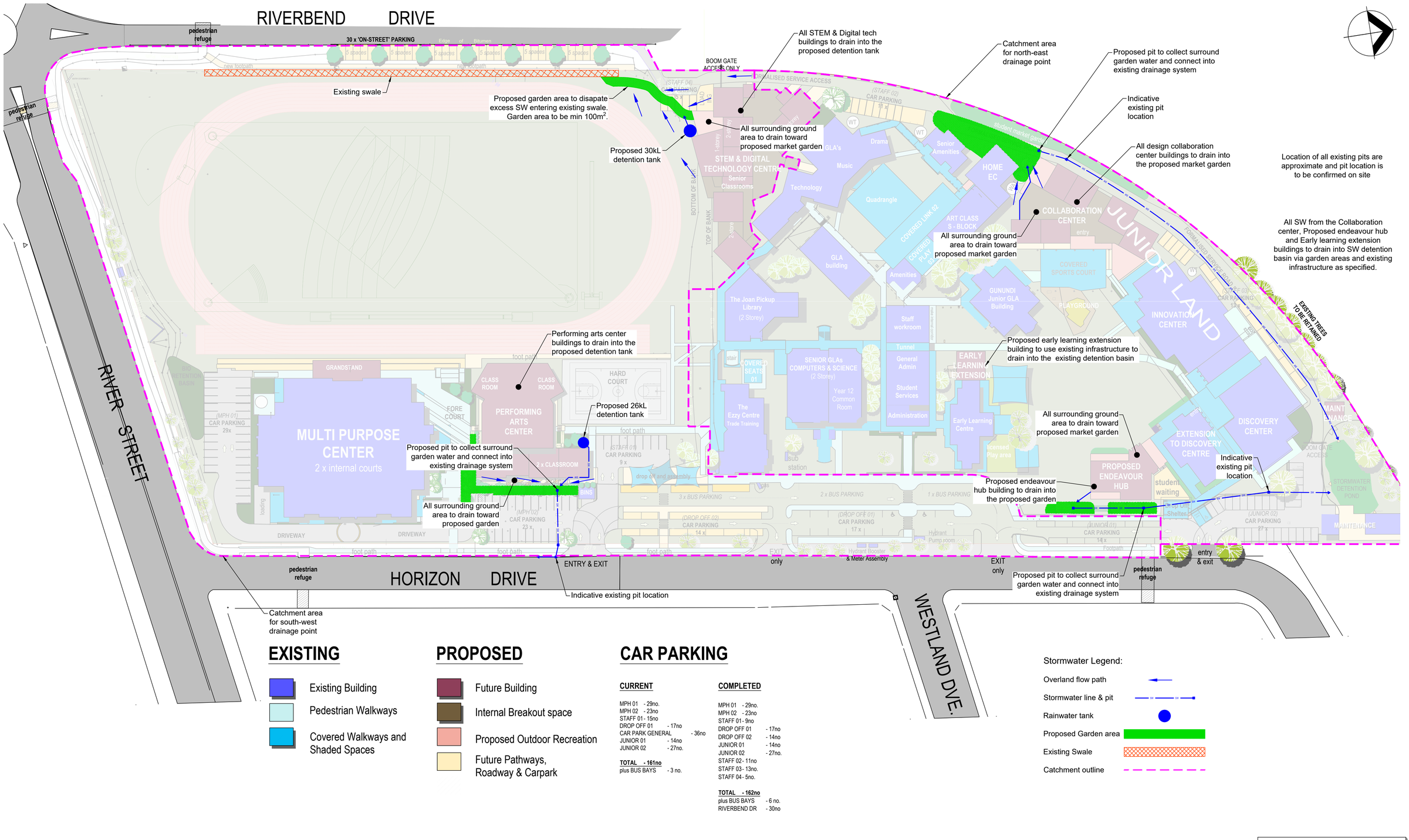
LONG TERM MASTER PLAN

SCALE	DATE	ARCHITECT
AS SHOWN @ A1	11/11/2021	CT

PROJECT NUMBER
17281-103_REV S

ATTACHMENT 2

Attachment 2: Stormwater Modellings and Management Plan



EXISTING

- Existing Building
- Pedestrian Walkways
- Covered Walkways and Shaded Spaces

PROPOSED

- Future Building
- Internal Breakout space
- Proposed Outdoor Recreation
- Future Pathways, Roadway & Carpark

CAR PARKING

CURRENT

MPH 01	- 29no.
MPH 02	- 23no
STAFF 01	- 15no
DROP OFF 01	- 17no
CAR PARK GENERAL	- 36no
JUNIOR 01	- 14no
JUNIOR 02	- 27no.
TOTAL	**- 161no**
plus BUS BAYS	- 3 no.

COMPLETED

MPH 01	- 29no.
MPH 02	- 23no
STAFF 01	- 9no
DROP OFF 01	- 17no
DROP OFF 02	- 14no
JUNIOR 01	- 14no
JUNIOR 02	- 27no.
STAFF 02	- 11no
STAFF 03	- 13no.
STAFF 04	- 5no.
TOTAL	**- 162no**
plus BUS BAYS	- 6 no.
RIVERBEND DR	- 30no

Stormwater Legend:

- Overland flow path
- Stormwater line & pit
- Rainwater tank
- Proposed Garden area
- Existing Swale
- Catchment outline

This plan is NOT to be used for construction purposes unless it carries the approval stamp of the local authority.

Issue	Date	Description	App'd
C	2/12/2021	Amended Architectural Plans	RB
B	25/11/2021	Existing Swale location amended	PG
A	15/11/2021	Original Issue	PG

Client: Emmanuel Anglican College

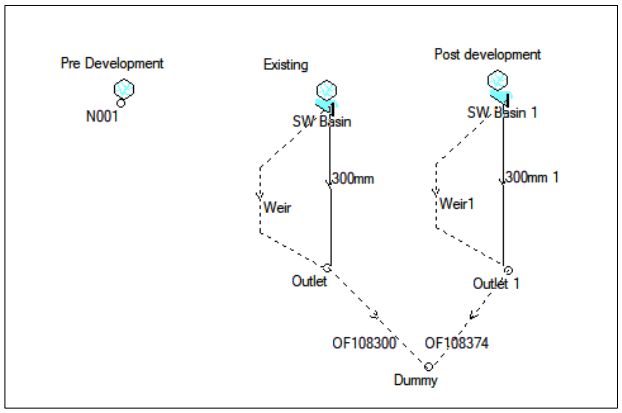
Project: Emmanuel Anglican College, Ballina, NSW 2473

Title: Stormwater Management Plan

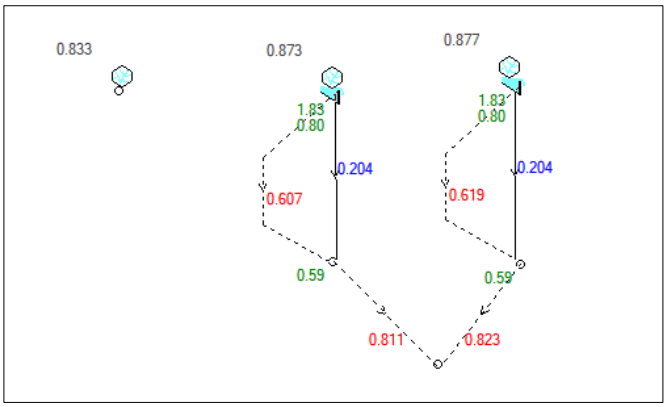
ARDILL PAYNE & Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
GUNNEDAH 285 Conadilly Street Ph. 02 6742 9955
A.B.N. 51 808 558 977 e-mail: info@ardillpayne.com.au

Design	PG	Scale	Not to scale
Drawn	EMR		
Checked	PG	Datum	
Approved	RB	Drafting File	5001_SWMP.dwg
Date	15/11/2021	Design File	
Job No.	5001	Dwg No.	SMP01
		Issue	C

DRAINS Modelling Details for Site Catchment Flowing to North-East Discharge Point

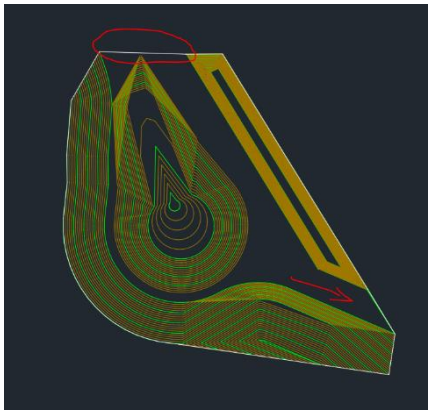


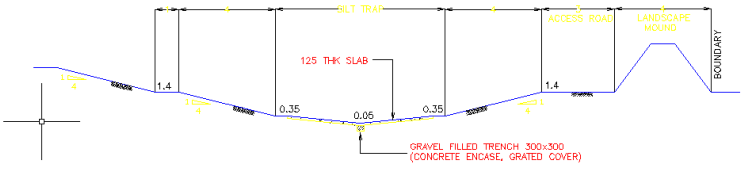
Model layout

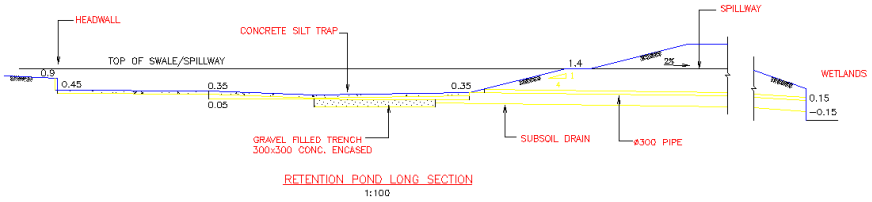


Results for 20 year ARI Event

5001 (EAC) - Basin Elevation Levels	
Level (m AHD)	Area (m2)
0	0
0.1	0
0.2	0
0.3	4.63
0.4	18.51
0.5	41.64
0.6	76.15
0.7	89.39
0.8	102.89
0.9	116.65
1	130.68
1.1	144.96
1.2	159.51
1.3	174.32
1.4	189.39
1.5	357.66
1.6	376.76
1.7	395.92
1.8	415.39
1.9	435.17
2	455.26
2.1	475.65
2.2	496.35
2.3	517.38
2.4	538.7
2.5	560.33

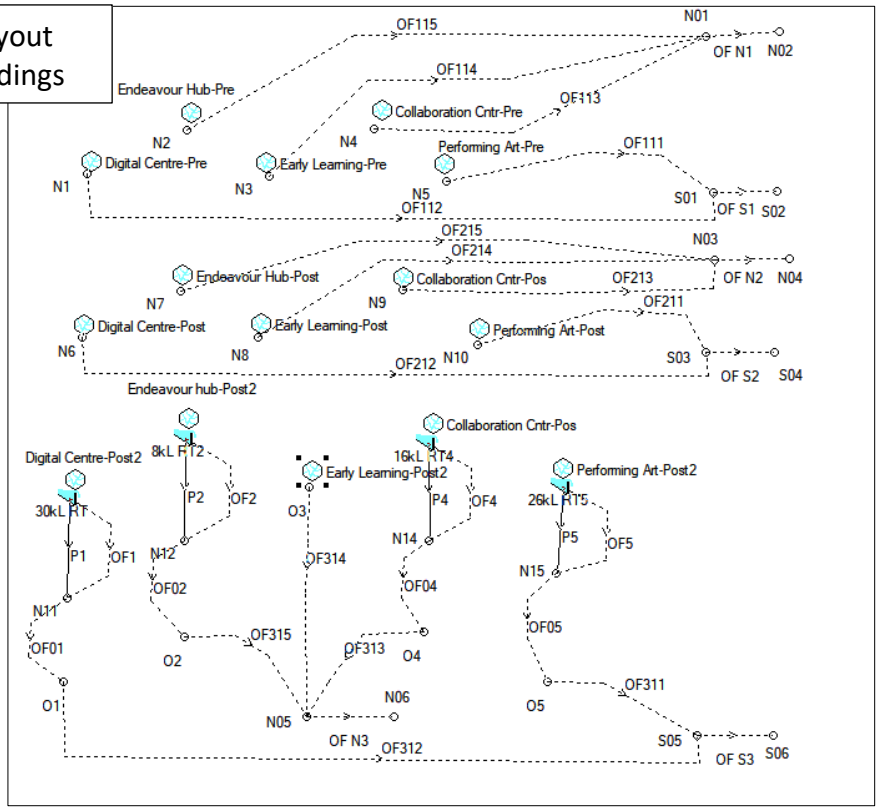




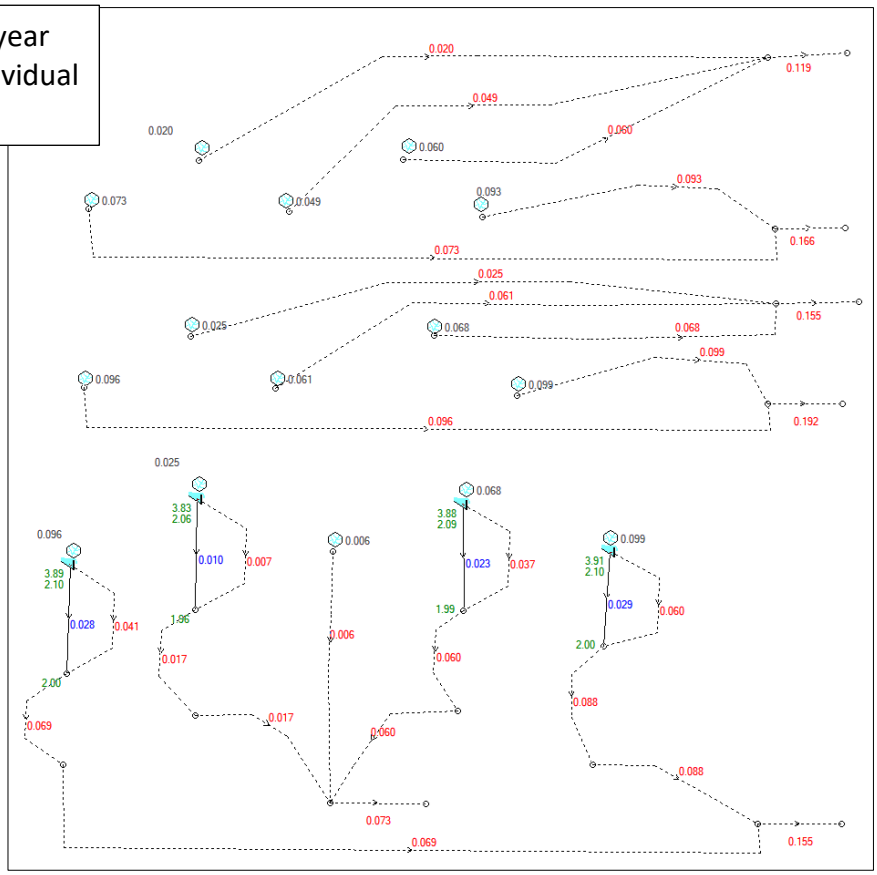


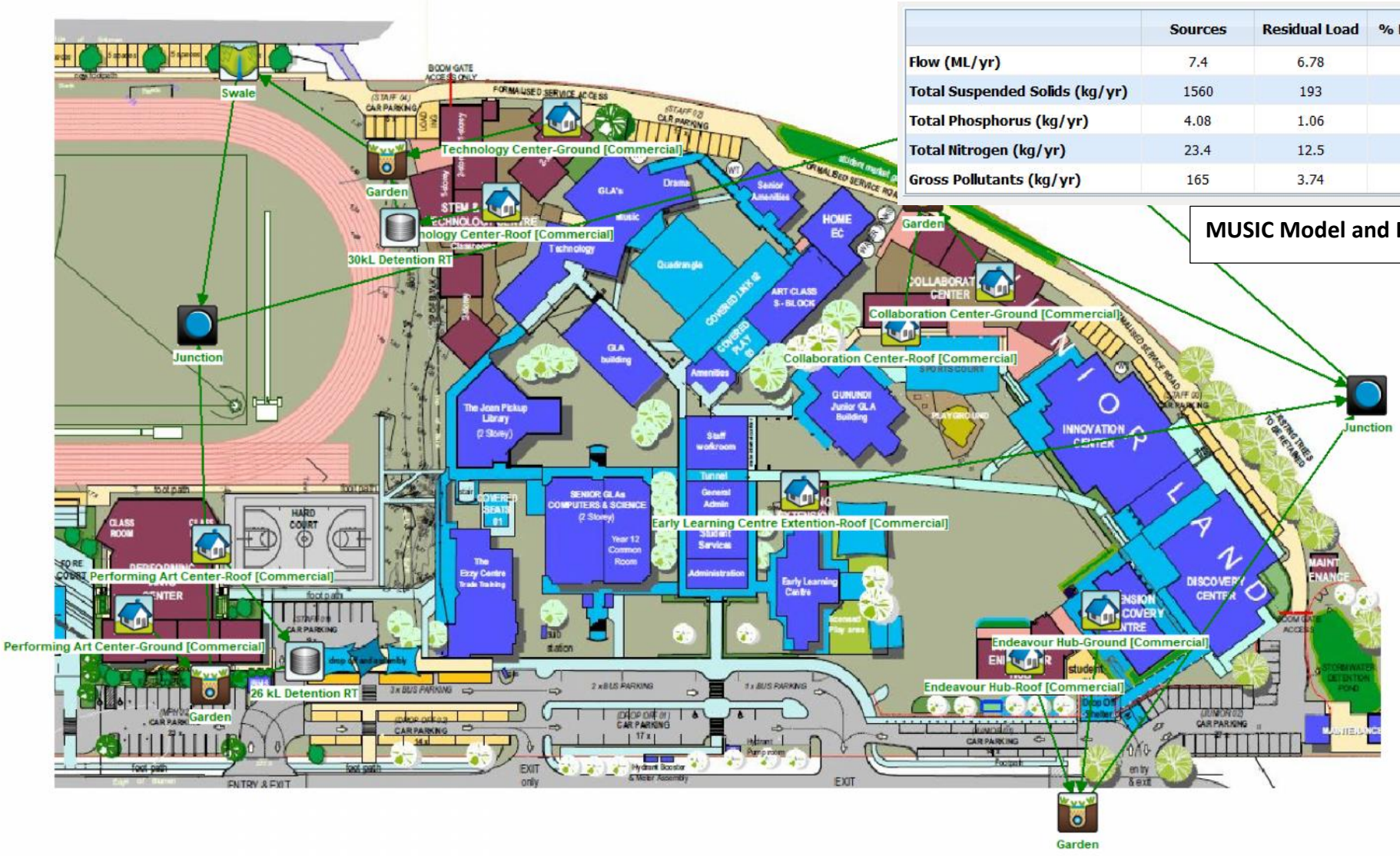
Existing Detention Basin

DRAINS Model Layout for Individual Buildings



DRAINS Model 20 year ARI Results for Individual Buildings





	Sources	Residual Load	% Reduction
Flow (ML/yr)	7.4	6.78	8.4
Total Suspended Solids (kg/yr)	1560	193	87.6
Total Phosphorus (kg/yr)	4.08	1.06	73.9
Total Nitrogen (kg/yr)	23.4	12.5	46.5
Gross Pollutants (kg/yr)	165	3.74	97.7

MUSIC Model and Results

MUSIC-*link* Report

Project Details		Company Details	
Project:	EAC Stage 14 Development	**Company:**	APP
Report Export Date:	5/11/2021	**Contact:**	Parham Ghasemzadeh
Catchment Name:	MUSIC	**Address:**	45 River St, Ballina
Catchment Area:	0.154ha	**Phone:**	02 6686 3280
Impervious Area*:	96.81%	**Email:**	parhamg@ardillpayne.com.au
Rainfall Station:	58131 ALSTONVILLE		
Modelling Time-step:	6 Minutes		
Modelling Period:	1/01/1985 - 1/01/1995 11:54:00 PM		
Mean Annual Rainfall:	1772mm		
Evapotranspiration:	1444mm		
MUSIC Version:	6.3.0		
MUSIC-link data Version:	6.34		
Study Area:	Ballina Shire Council		
Scenario:	BSC Development		

* takes into account area from all source nodes that link to the chosen reporting node, excluding Import Data Nodes

Treatment Train Effectiveness		Treatment Nodes		Source Nodes	
Node: Junction	**Reduction**	**Node Type**	**Number**	**Node Type**	**Number**
Flow	10.9%	Bio Retention Node	4	Urban Source Node	9
TSS	83.3%	Swale Node	1		
TP	71.4%	Rain Water Tank Node	2		
TN	45.9%				
GP	93.4%				

Comments

All used parameters are within the range

Passing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Bio	Garden	Exfiltration Rate (mm/hr)	None	None	0.2
Bio	Garden	Exfiltration Rate (mm/hr)	None	None	0.2
Bio	Garden	Exfiltration Rate (mm/hr)	None	None	0.2
Bio	Garden	Exfiltration Rate (mm/hr)	None	None	0.2
Bio	Garden	Extended detention depth (m)	None	1	0.2
Bio	Garden	Extended detention depth (m)	None	1	0.2
Bio	Garden	Extended detention depth (m)	None	1	0.2
Bio	Garden	Extended detention depth (m)	None	1	0.2
Bio	Garden	Filter depth (m)	0.3	0.7	0.5
Bio	Garden	Filter depth (m)	0.3	0.7	0.5
Bio	Garden	Filter depth (m)	0.3	0.7	0.5
Bio	Garden	Filter depth (m)	0.3	0.7	0.5
Bio	Garden	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Garden	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Garden	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Garden	Hi-flow bypass rate (cum/sec)	None	None	100
Bio	Garden	Orthophosphate Content in Filter (mg/kg)	None	None	50
Bio	Garden	Orthophosphate Content in Filter (mg/kg)	None	None	50
Bio	Garden	Orthophosphate Content in Filter (mg/kg)	None	None	50
Bio	Garden	Orthophosphate Content in Filter (mg/kg)	None	None	50
Bio	Garden	PET Scaling Factor	2.1	2.1	2.1
Bio	Garden	PET Scaling Factor	2.1	2.1	2.1
Bio	Garden	PET Scaling Factor	2.1	2.1	2.1
Bio	Garden	PET Scaling Factor	2.1	2.1	2.1
Bio	Garden	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Garden	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Garden	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Garden	Saturated Hydraulic Conductivity (mm/hr)	50	200	200
Bio	Garden	Total Nitrogen Content in Filter (mg/kg)	None	None	800
Bio	Garden	Total Nitrogen Content in Filter (mg/kg)	None	None	800
Bio	Garden	Total Nitrogen Content in Filter (mg/kg)	None	None	800
Bio	Garden	Total Nitrogen Content in Filter (mg/kg)	None	None	800
Rain	26 kL Detention RT	% Reuse Demand Met	None	None	0
Rain	30kL Detention RT	% Reuse Demand Met	None	None	0
Receiving	Receiving Node	% Load Reduction	None	None	8.4
Receiving	Receiving Node	GP % Load Reduction	90	None	97.7
Receiving	Receiving Node	TN % Load Reduction	45	None	46.7
Receiving	Receiving Node	TP % Load Reduction	60	None	74
Receiving	Receiving Node	TSS % Load Reduction	80	None	87.6
Swale	Swale	Base Width (m)	1	None	1

Only certain parameters are reported when they pass validation

Node Type	Node Name	Parameter	Min	Max	Actual
Urban	Collaboration Center-Ground	Area Impervious (ha)	None	None	0.049
Urban	Collaboration Center-Ground	Area Pervious (ha)	None	None	0.002
Urban	Collaboration Center-Ground	Total Area (ha)	None	None	0.052
Urban	Collaboration Center-Roof	Area Impervious (ha)	None	None	0.052
Urban	Collaboration Center-Roof	Area Pervious (ha)	None	None	0
Urban	Collaboration Center-Roof	Total Area (ha)	None	None	0.052
Urban	Early Learning Centre Extention-Roof	Area Impervious (ha)	None	None	0.01
Urban	Early Learning Centre Extention-Roof	Area Pervious (ha)	None	None	0
Urban	Early Learning Centre Extention-Roof	Total Area (ha)	None	None	0.01
Urban	Endeavour Hub-Ground	Area Impervious (ha)	None	None	0.009
Urban	Endeavour Hub-Ground	Area Pervious (ha)	None	None	0.002
Urban	Endeavour Hub-Ground	Total Area (ha)	None	None	0.012
Urban	Endeavour Hub-Roof	Area Impervious (ha)	None	None	0.028
Urban	Endeavour Hub-Roof	Area Pervious (ha)	None	None	0
Urban	Endeavour Hub-Roof	Total Area (ha)	None	None	0.028
Urban	Performing Art Center-Ground	Area Impervious (ha)	None	None	0.020
Urban	Performing Art Center-Ground	Area Pervious (ha)	None	None	0.047
Urban	Performing Art Center-Ground	Total Area (ha)	None	None	0.068
Urban	Performing Art Center-Roof	Area Impervious (ha)	None	None	0.109
Urban	Performing Art Center-Roof	Area Pervious (ha)	None	None	0
Urban	Performing Art Center-Roof	Total Area (ha)	None	None	0.109
Urban	Technology Center-Ground	Area Impervious (ha)	None	None	0.052
Urban	Technology Center-Ground	Area Pervious (ha)	None	None	0.002
Urban	Technology Center-Ground	Total Area (ha)	None	None	0.055
Urban	Technology Center-Roof	Area Impervious (ha)	None	None	0.09
Urban	Technology Center-Roof	Area Pervious (ha)	None	None	0
Urban	Technology Center-Roof	Total Area (ha)	None	None	0.09

Only certain parameters are reported when they pass validation

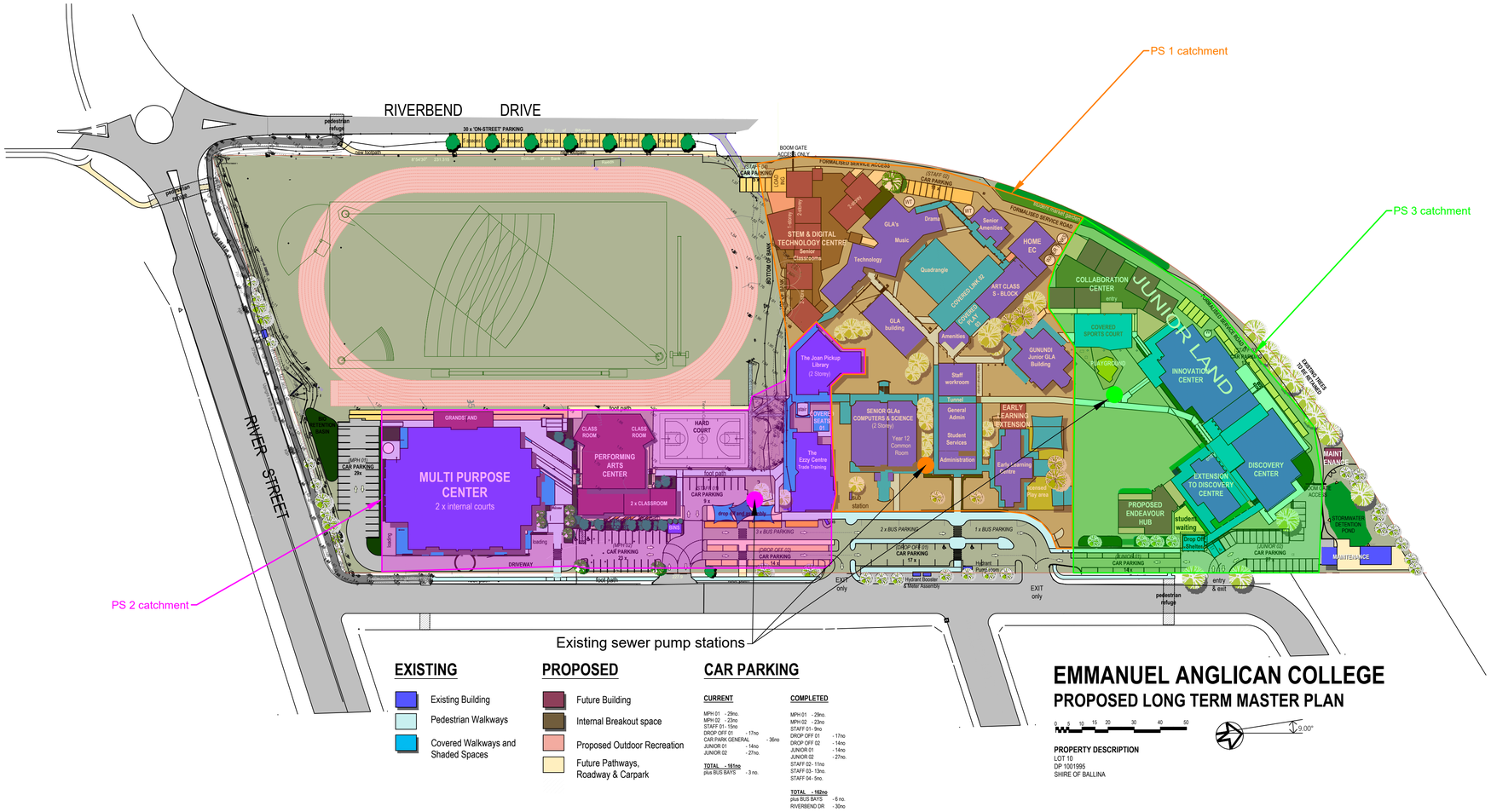
Failing Parameters

Node Type	Node Name	Parameter	Min	Max	Actual
Swale	Swale	Bed slope	0.01	0.04	0.001
Urban	Collaboration Center-Ground	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Collaboration Center-Roof	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Early Learning Centre Extention-Roof	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Endeavour Hub-Ground	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Endeavour Hub-Roof	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Performing Art Center-Ground	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Performing Art Center-Roof	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Technology Center-Ground	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31
Urban	Technology Center-Roof	Baseflow Total Phosphorus Standard Deviation (log mg/L)	0.5	0.5	0.31

Only certain parameters are reported when they pass validation

ATTACHMENT 3

Attachment 3: Sewer Calculations and Designs



EXISTING

- Existing Building
- Pedestrian Walkways
- Covered Walkways and Shaded Spaces

PROPOSED

- Future Building
- Internal Breakout space
- Proposed Outdoor Recreation
- Future Pathways, Roadway & Carpark

CAR PARKING

CURRENT

MPH 01 - 29no.
MPH 02 - 23no
STAFF 01- 15no
DROP OFF 01 - 17no
CAR PARK GENERAL - 36no
JUNIOR 01 - 14no
JUNIOR 02 - 27no.

TOTAL - 161no
plus BUS BAYS - 3 no.

COMPLETED

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EMMANUEL ANGLICAN COLLEGE
PROPOSED LONG TERM MASTER PLAN

0 5 10 15 20 30 40 50

9.00°

PROPERTY DESCRIPTION
LOT 10
DP 1001995
SHIRE OF BALLINA

This plan is NOT to be used for construction purposes unless it carries the approval stamp of the local authority.

0 100 Table of millimetres 200 300 400 500 600 700 780

Issue	Date	Description	App'd
B	2/12/2021	Amended Architectural Plans	RB
A	11/11/2021	Original Issue	PG

Client: Emmanuel Anglican College

Project: Emmanuel Anglican College
Ballina, NSW 2473

Title: Proposed pump station location & catchment area

ARDILL PAYNE & Partners
ENGINEERS PLANNERS SURVEYORS
ENVIRONMENTAL PROJECT MANAGEMENT
BALLINA 45 River Street Ph. 02 6686 3280
GUNNEDAH 285 Conadilly Street Ph. 02 6742 9955
A.B.N. 51 808 558 977 e-mail: info@ardillpayne.com.au

Design	PG	Scale	1:1000 @ A1, 1:2000 @ A3
Drawn	EMR		0 10 20 30 40 50
Checked	PG	Datum	
Approved	RB	Drafting File	5001 - Copy 17281-103_REV P LONG
Date	11/11/2021	Design File	TERM MASTER PLAN_Pump_Catchments.dwg
Job No.	5001	Dwg No.	SK01
		Issue	B

S:\01 Jobs\5000-5099\5001 EAC\Stage 14 - Masterplan Expansion\05 Drawings\01 Civil\01 Current\5001 - Copy 17281-103_REV P LONG TERM MASTER PLAN_Pump_Catchments.dwg, 2/12/2021 4:40:19 PM, AutoCAD PDF (General Documentation).pc3

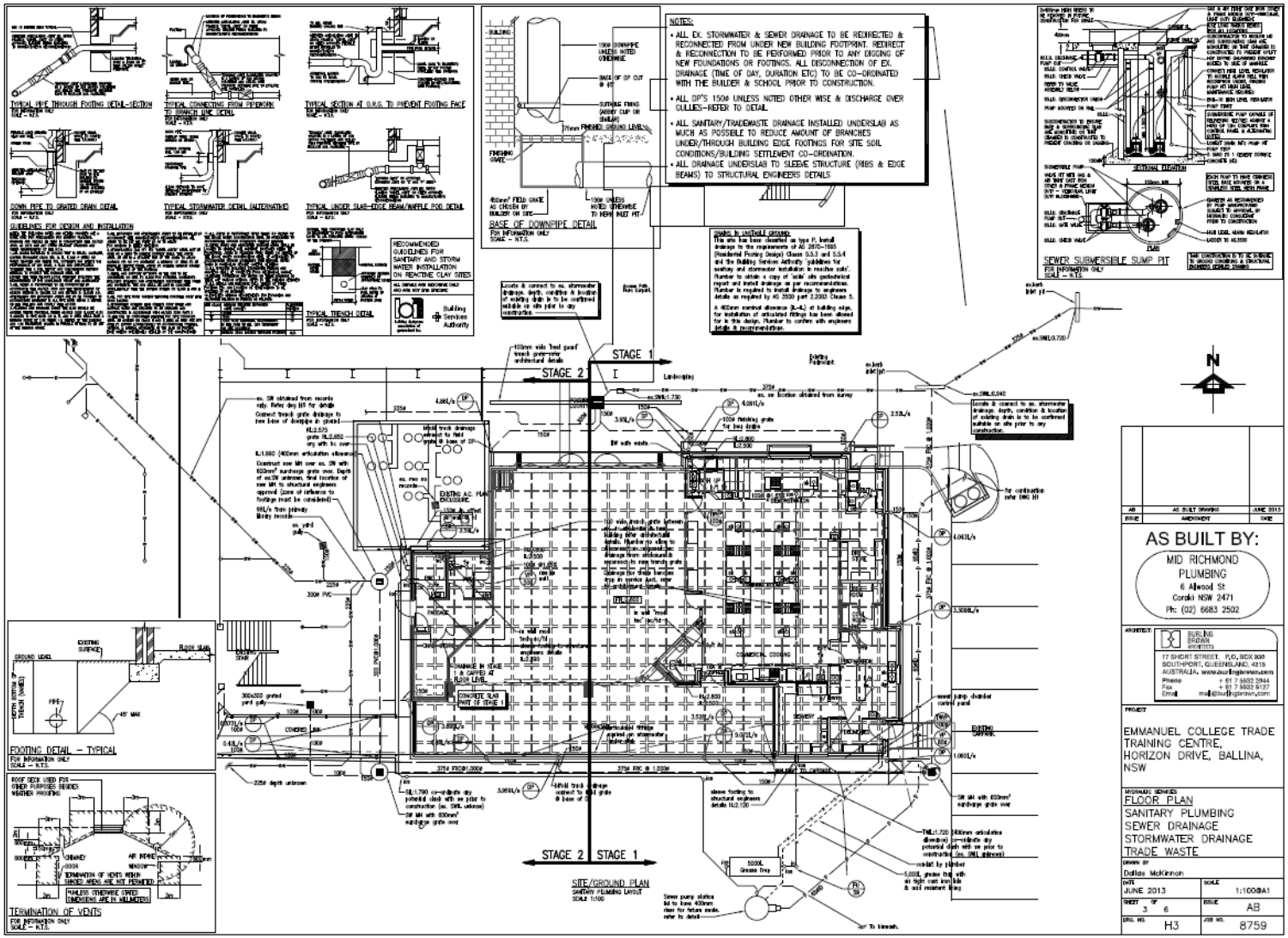
SP2112 - Westlands Rd - Observed peaking factors (over 24 hour period)										
Date	18/03/2021	19/03/2021	20/03/2021	21/03/2021	22/03/2021	23/03/2021	24/03/2021		12/01/2020	13/01/2020	14/01/2020
Rainfall @ Ballina WWTP	42.2	28.0	4.0	40.6	123.8	34.2	20.6		4.5	3.5	6.5
# starts Pump 1	99	95	87	66	81	87	84		43	41	42
# starts Pump 2	99	95	87	65	81	87	85		42	41	43
Total starts for day	198	190	174	131	162	174	169		85	82	85
Average starts per hour	8.3	7.9	7.3	5.5	6.8	7.3	7				
Pump 1 Run hours	3.4	3.5	3.1	8.7	8.1	6.5	4.4		0.98	1.05	1.04
pump 2 run hours	3.6	3.6	3.2	8.9	7.9	6.2	4.7		1.12	1.21	1.17
Total run hours	7	7.1	6.3	17.6	16	12.7	9.1		2.1	2.26	2.21
Observed pump flow rate	15.9 l/s										
Observed PWWF (kL/day)	400.7	406.4	360.6	**1007.4**	915.8	726.9	520.9				
Observed PWWF (l/s - average over 24 hours)				11.66							
Observed ADWF (kL/day)				**125.4**					120.2	129.4	126.5
Observed peaking factor				**8.04**							

BSC Information Regarding public sewer pump station SP2112

Sewer loading EXCLUDING Emmanuel College Current and Masterplan scenarios		
Current ET in Catchment	251	ET
EP per std dwelling	2.18	persons
Equivalent Population	547.18	persons
Adopted ADWF contribution	200	L/EP/Day
ADWF	109.44	kL/d
Observed Peaking Factor	8	xADWF
PWWF	875.5	kL/d
PWWF	10.13	l/s
Add in Emmanuel College current scenario		
Emmanuel ADWF	14.08	kL/d
Peaking factor	4	xADWF
Emmanuel PWWF	56.32	kL/d
Emmanuel PWWF	1.74	L/s over 9 hour day
ADWF incl Emmanuel current	**123.52**	**kL/d**
PWWF incl Emmanuel current	**931.8**	**kL/d**
PWWF incl Emmanuel current	11.87	l/s

BSC Information Regarding public sewer pump station SP2112 - Continued

Dimensions		
Wet Well		
Int. Diameter	1.8	m
Flood (top RL)	2.19	m AHD
TWL	-3.95	m AHD
BWL	-4.7	m AHD
Discharge RL (delivery pipe)	0.99	m AHD
Discharge RL (final MH)	0.55	m AHD
Rising Main		
Diameter	150	DN150
Material	Class 12 uPVC	
Length	592	m



EAC Pump Stations Specification