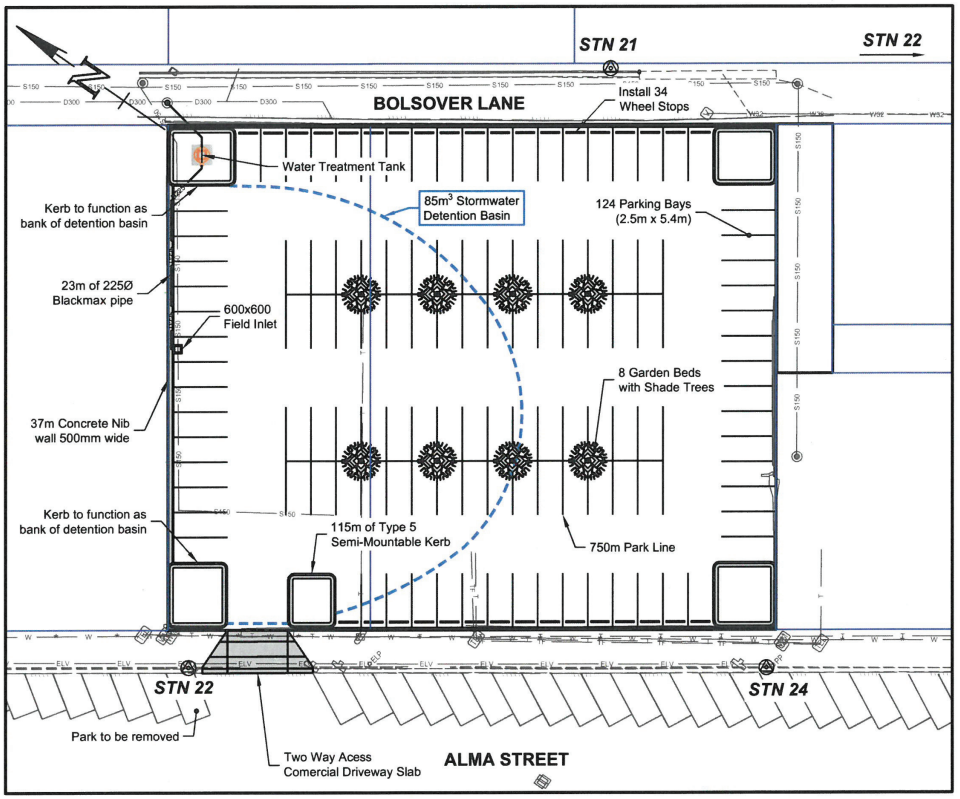
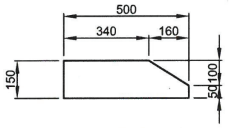
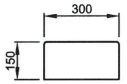


SURVEY STATION CO-ORDINATES				
STATION	EASTING	NORTHING	R.L	DESCRIPTION
20	245661.543	7412311.042	10.357	Screw in Kerb
21	245627.236	7412360.311	10.111	Screw in Conc
22	245554.312	7412360.456	9.475	Screw in Kerb
23	245587.255	7412313.406	9.788	Screw in Kerb
24	245627.010	7412258.918	9.994	PSM 175065

CONTROL LINE 1 SETOUT TABLE					
CHAINAGE	EASTING	NORTHING	RADIUS	LENGTH	BEARING
0.000 60.402	245579.155 245613.815	7412380.334 7412330.867	STRAIGHT	60.402m	144°58'57"



TYPE 5 - SEMI-MOUNTABLE KERB
Scale - 1:20

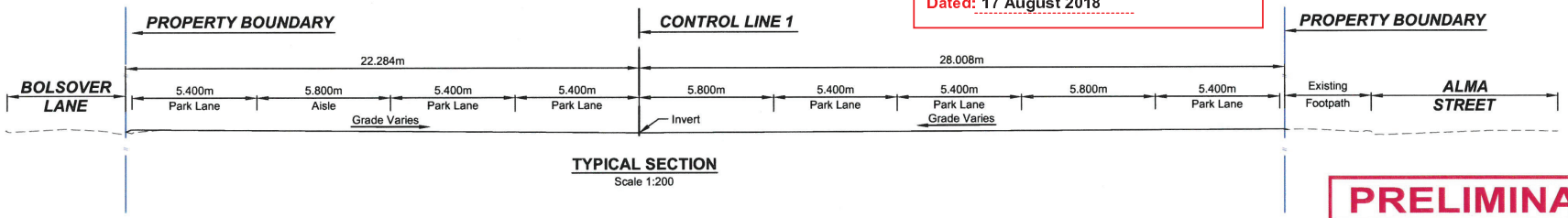


TYPE 11 - FLUSH KERB
Scale - 1:20

NEW PAVEMENT:
2 Coat Bitumen Seal (10mm/7mm Agg)
110mm T2.1 Base Course
Make up Gravel to shape

NOTE:
All Pavement Markings to comply with RRC STD DWG No. R01

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/45-2018
Dated: 17 August 2018



TYPICAL SECTION
Scale 1:200

PRELIMINARY
05/07/2018

Surveyed: VSB	Date: OCT '17			AMENDMENTS DESCRIPTION	DRAWN	APPR'D	DATE	Designed	JWT	JULY '18	WINTERGARDEN CARPARK
Ref Mark: PSM 175065	R.L. 9.994							Checked			ALMA STREET TO BOLSOVER LANE (ROCKHAMPTON CITY)
Datum: Horiz. GDA '94 Vert. AHD		0 5 10m PLAN	1:500					Examined			ROADWORKS CONSTRUCTION
Zone: 56	Survey Book: NS03							Recomm.			OVERALL LAYOUT, tTYPICAL SECTIONS & DETAILS
XREF: 2018-088-00.dwg											
Aux Plans:		SCALES	FULL SIZE A3	A Original Issue	JWT			APPROVAL			Dwg No. 2018-088-01
								RPEQ No _____ DATE _____			Sheet No. 1 of 6
								MANAGER ENGINEERING SERVICES			Job No: C.1076940
											A

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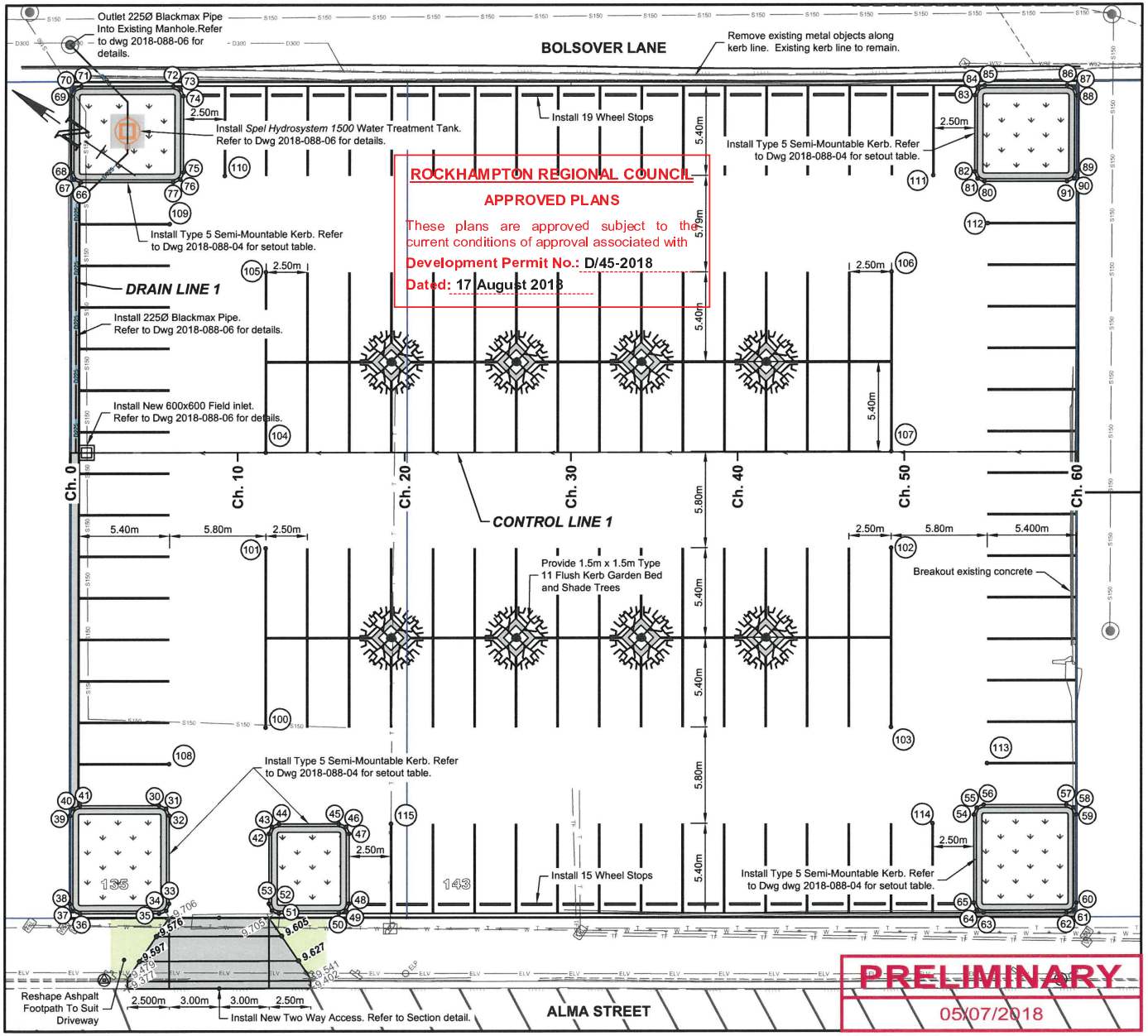


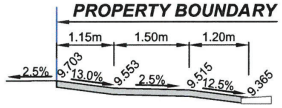
LEGEND

- Asphalt
- Concrete
- Landcaping
- 9.627 Design Level
- +9.541 Existing Level

CONSTRUCTION NOTES:

- Refer to *SPEL Environmental Vertical Tank Installation Guide* for details
- Nib wall to be 20mPa mix with construction joints at 4m spacings
- Refer to CMDG-R-042 for Two Way Access Commercial Driveway Details

TWO WAY ACCESS SETOUT TABLE		
POINT NO.	EASTING	NORTHING
97	245561.325	7412356.974
98	245557.830	7412354.525



TWO ACCESS SECTION DETAIL
Ch. 8.9 (CL1)
Scale 1:100

LINEMARKING SETOUT TABLE		
POINT NO.	EASTING	NORTHING
100	245572.309	7412361.251
101	245581.154	7412367.449
102	245602.672	7412336.737
103	245593.827	7412330.540
104	245585.869	7412370.752
105	245594.749	7412376.974
106	245616.272	7412346.266
107	245607.422	7412340.065
108	245567.185	7412364.743
109	245593.802	7412383.393
110	245598.058	7412382.345
111	245622.445	7412347.539
112	245621.978	7412343.179
113	245595.361	7412324.530
114	245590.512	7412325.164
115	245571.862	7412351.781

Surveyed: VSB Date: OCT '17
Ref Mark: PSM 175065 R.L. 9.994
Datum: Horiz. GDA '94 Vert. AHD
Zone: 56 Survey Book: NS03
XREF: 2018-088-00.dwg
Aux Plans:

SCALES 0 2,5 5m DESCRIPTION 1:250 FULL SIZE A3

AMENDMENTS DESCRIPTION	DRAWN	APPR'D	DATE
A Original Issue	JWT		

Rockhampton Regional Council

Designed	JWT	JULY '18
Checked		
Examined		
Recomm.		

APPROVAL
RPEQ No _____ DATE _____
MANAGER ENGINEERING SERVICES

WINTERGARDEN CARPARK
ALMA STREET TO BOLSOVER LANE (ROCKHAMPTON CITY)
ROADWORKS CONSTRUCTION
GENERAL LAYOUT PLAN

Dwg No. 2018-088-03
Sheet No. 3 of 6
Job No: C.1076940
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STORM WATER MANAGEMENT PLAN

Wintergarden Site Redevelopment – Proposed Carpark

135 & 143 Alma Street, South Rockhampton - Lot 11 RP 602506 & Lot 307 R 1675

Contents

Table of Figures

1.0 Stormwater Management Plan

135 143 Alma Street, South Rockhampton - Lot 11 RP 602506 & Lot 307 R 1675

1.1 Wintergarden Site Redevelopment – Proposed Carpark

DEU Consulting has been engaged by Rockhampton Regional Council (RRC) to prepare a stormwater management plan for a proposed development at 135 & 143 Alma Street, South Rockhampton.

This report will consider both quantity and quality aspects of stormwater management of the development site.

The proposed development is to convert the existing vacant site into a temporary carpark. Ultimately it is envisaged the site will be improved by a multilevel carpark together with some residential uses. The site is located within the Principal Centres Zone in accordance with the Rockhampton Regional Planning Scheme. The proposed use is defined as a Parking Station and triggers an impact assessable MCU application.

Figure 1.1 below identifies both vacant sites that are the subject of this assessment. The sites historically where improved by the wintergarden building. All structures have been removed from the site for over a decade and this has been confirmed considering google maps over previous years. The site has frontage to both Alma Street and Bolsover Lane.

Figure 1.1 – Development Site

2.0 Stormwater Quantity

The site is relatively flat with a slight fall east west towards Alma Street. There is stormwater infrastructure within Bolsover Lane being a number of inlets and 300mm diameter RCPs. The infrastructure shown in Figure 2.1 below that extends up Bolsover Lane and to the north of the development site connects into larger pipework in Fitzroy Street then Bolsover Street ultimately discharging into the Fitzroy River.

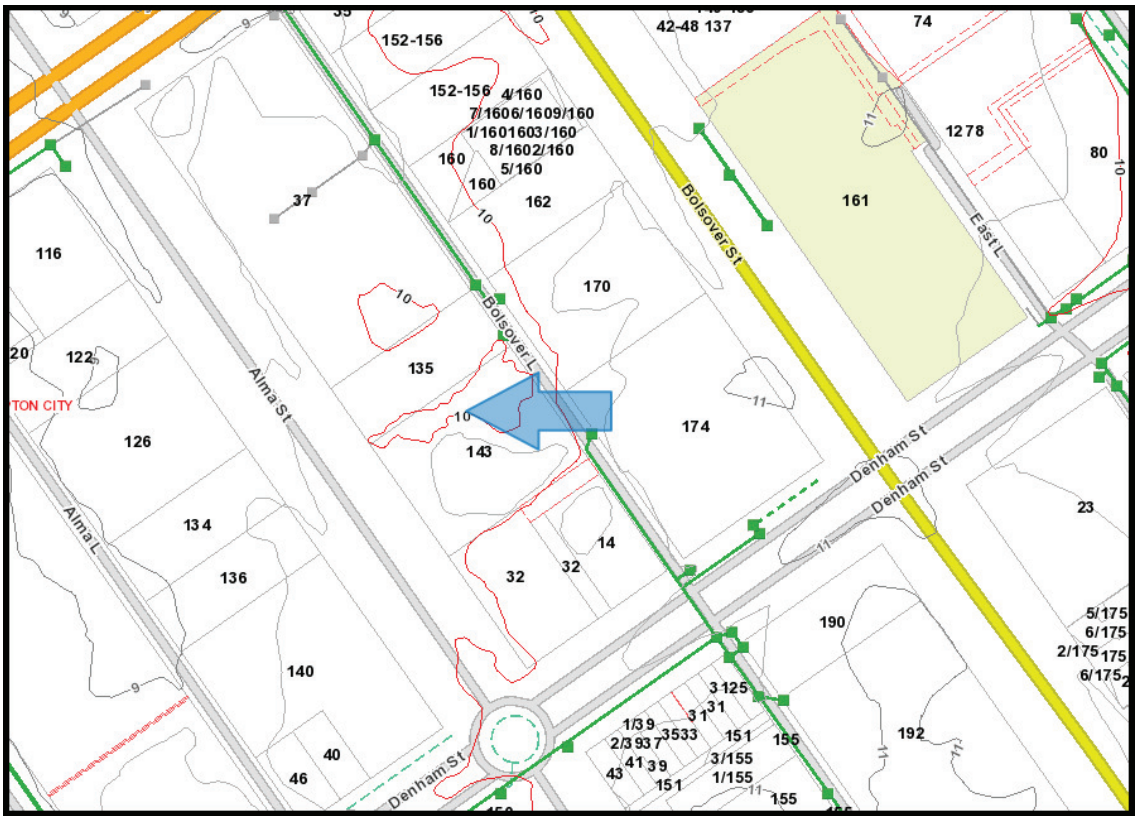


Figure 2.1 – Stormwater Infrastructure and Contours

The overall catchment for the area including this site is in the vicinity of 127 ha. A map of the overall catchment area can be seen in Appendix A. Where the development site is located within the lower third of the overall catchment it would be proposed to discharge the runoff from the post developed scenario without any form of detention / attenuation. However in this instance, without a detention system there would be a noticeable impact on council infrastructure and potential that a major storm event could flood Alma Street.

To establish a lawful discharge of stormwater it is necessary to consider the impacts from the development and pre and post development scenarios to determine peak runoffs associated with both. Further, to understand the current development flow regime and location of discharge and how this may change as a consequence of the development.

The site currently discharges to the verge and ultimately kerb in Alma Street via sheet flow. The site falls slightly towards the North West.

IFD data has been determined from the BOM website using the coordinates of the Alma Street site. Below in Figures 2.2 and 2.3 are the IFD Design Rainfall intensity Chart and IFD Table respectively.

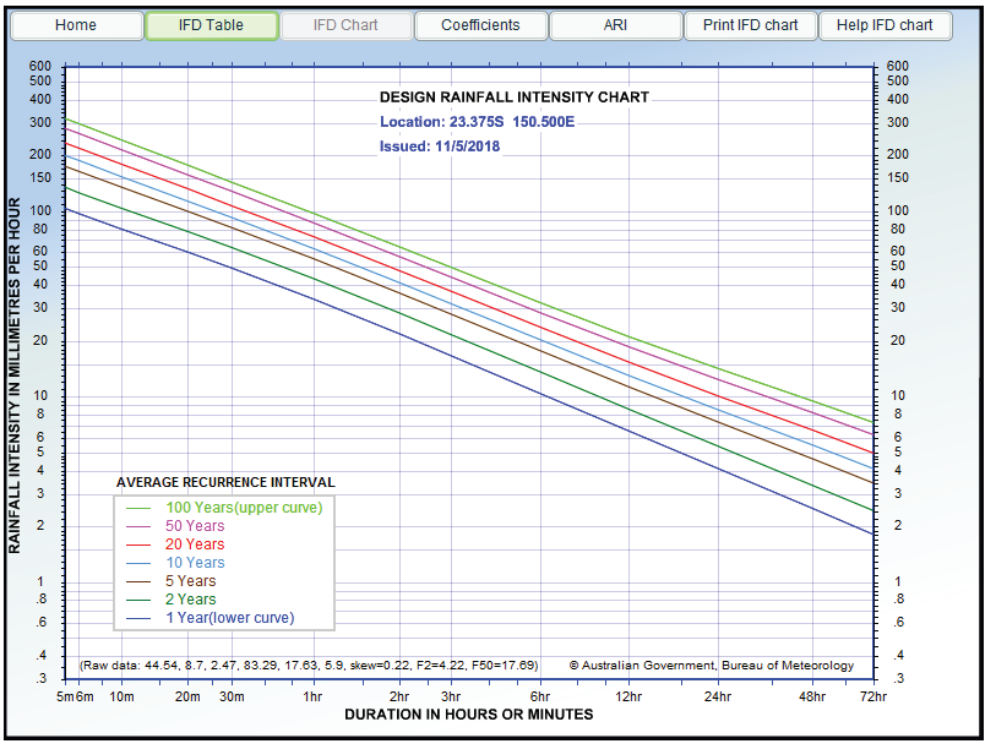
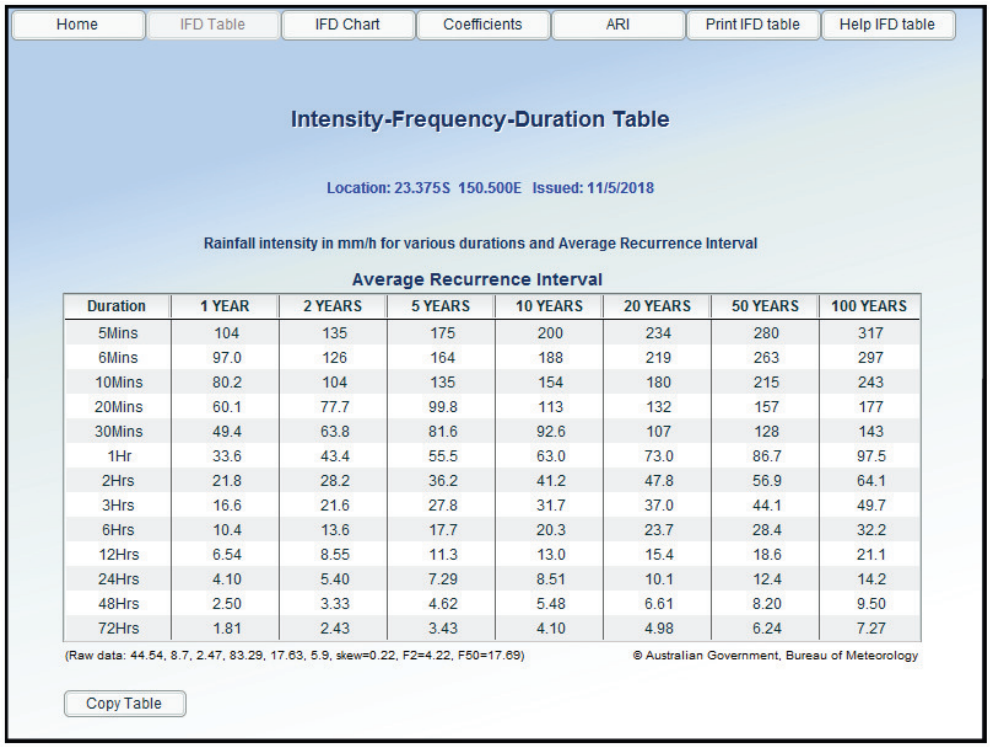


Figure 2.2 – IFD Chart



Duration	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	104	135	175	200	234	280	317
6Mins	97.0	126	164	188	219	263	297
10Mins	80.2	104	135	154	180	215	243
20Mins	60.1	77.7	99.8	113	132	157	177
30Mins	49.4	63.8	81.6	92.6	107	128	143
1Hr	33.6	43.4	55.5	63.0	73.0	86.7	97.5
2Hrs	21.8	28.2	36.2	41.2	47.8	56.9	64.1
3Hrs	16.6	21.6	27.8	31.7	37.0	44.1	49.7
6Hrs	10.4	13.6	17.7	20.3	23.7	28.4	32.2
12Hrs	6.54	8.55	11.3	13.0	15.4	18.6	21.1
24Hrs	4.10	5.40	7.29	8.51	10.1	12.4	14.2
48Hrs	2.50	3.33	4.62	5.48	6.61	8.20	9.50
72Hrs	1.81	2.43	3.43	4.10	4.98	6.24	7.27

Figure 2.3 – IFD Table

2.1 Pre-development

Pre development scenario the site has been examined to determine the flow path length, slope of land and appropriate surface roughness. It was found that the time concentration for overland sheet flow was around 21.8 minutes and the time concentration for an urban catchment under 500 hectares was around 0.8 minutes, so the overall time of concentration was found to be around 23 minutes, however a maximum tc for the pre development scenario of 20mins was adopted. A screen shot of the excel calculations can be found in appendix A.

Time of concentration Calculation	
Overland Sheet Flow	
Sheet Flow Path Length	50 m
Slope of Surface	0.1 %
Horton's surface roughness	0.035
Time of concentration	21.8378
Urban Catchments < 500 ha	
Flow Path Length	15 m
Slope of Surface	0.1%
Type of Terrain	Flat
Velocity	0.3 m/s
Time of concentration	0.83333 min
Total time of concentration	22.67113

Figure 2.4 – Time of concentration calculation

Coefficient of Discharge Calculation	
Development Category	Open space and parks etc
Land Description	Light cover bushland
Soil Permeability	Medium
ARI (years)	100
1 hr ARI 10 rainfall intensity	63 mm/hr
Frequency Factor	1.2
Catchment Area	3000 m^2
10 Yr Coefficient of Discharge	0.7
Coefficient of Discharge	0.84

Figure 2.5 – coefficient of discharge calculations

Figure 2.5 shows the coefficient of discharge calculation, the development area was deemed to be open space and parks with medium soil permeability.

Flow Rate Calculation Pre development		
Catchment Area	0.3	Ha
Time of Concentration	20	min
10 Yr Coefficient of Discharge (C10)	0.7	

Design Storm	Area (Ha)	For calculated tc I (mm/hr) from CMDG	Frequency Factor Fy QUDM (Table 4.5.2)	Coefficient C=Fy*C10	Discharge (m3/sec) Q=CIA/360
Q2	0.3	77.7	0.85	0.595	**0.039**
Q5	0.3	99.8	0.95	0.665	**0.055**
Q10	0.3	113	1	0.7	**0.066**
Q20	0.3	132	1.05	0.735	**0.081**
Q50	0.3	157	1.15	0.805	**0.105**
Q100	0.3	177	1.2	0.84	**0.124**

Figure 2.6 Flow rate calculation

Figure 2.6 shows the flow rate calculation with the time concentration taken from figure 2.4, the catchment area and 10 year coefficient of discharge from figure 2.5 and the rainfall intensity from figure 2.3

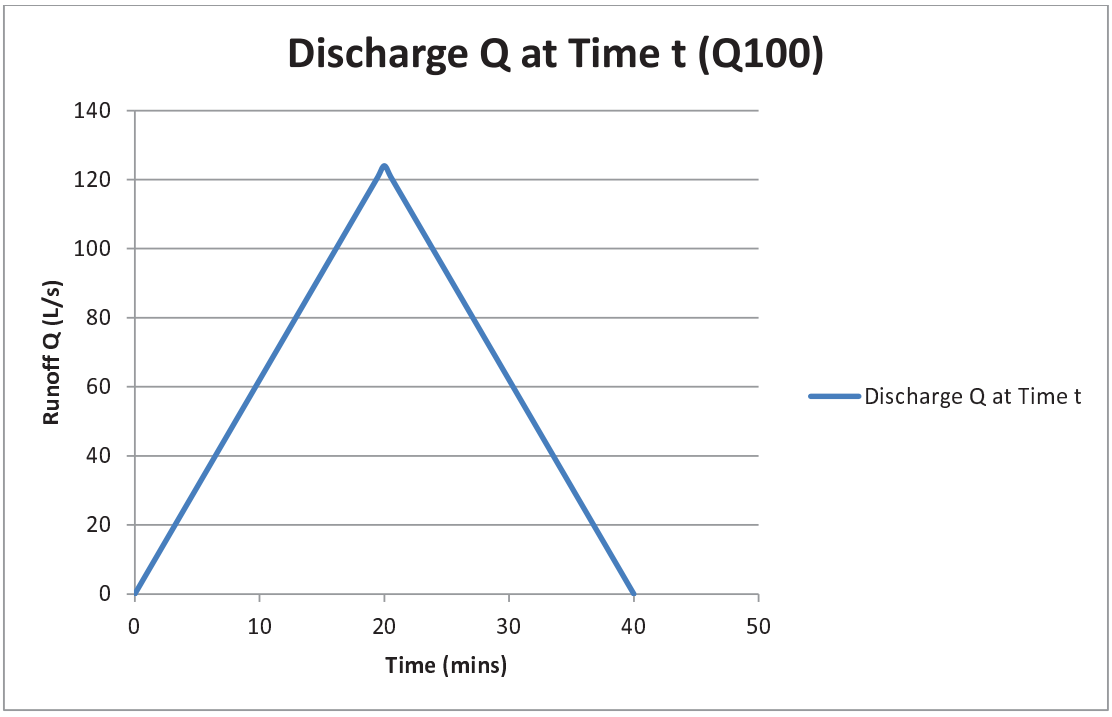


Figure 2.7 – Hydrograph for the pre-development area.

2.2 Post development scenario

Time of concentration Calculation	
Overland Sheet Flow	
Sheet Flow Path Length	50 m
Slope of Surface	0.1 %
Horton's surface roughness	0.015
Time of concentration	9.359056 mins
Urban Catchments < 500 ha	
Flow Path Length	15 m
Slope of Surface	0.1%
Type of Terrain	Flat
Velocity	0.3 m/s
Time of concentration	0.83333 mins
Total time of concentration	10.19239 mins

Figure 2.8 – Time of concentration calculation

Figure 2.8 shows the calculation for time concentration post development. A tc for the post development scenario of 10mins was adopted.

Coefficient of Discharge Calculation	
Development Category	Central Business District
ARI (years)	100
1 hr ARI 10 rainfall intensity	63 mm/hr
Frequency Factor	1.2
Catchment Area	3000 m^2
10 Yr Coefficient of Discharge	0.9
Coefficient of Discharge	1

Figure 2.9 – Coefficient of discharge calculation

Figure 2.9 shows the coefficient of discharge calculation, the development area will be located in the central business district.

Flow Rate Calculation Post development		
Catchment Area	0.3	Ha
Time of Concentration	10	min
10 Yr Coefficient of Discharge (C10)	0.9	

Design Storm	Area (Ha)	For calculated tc I (mm/hr) from CMDG	Frequency Factor Fy QUDM (Table 4.5.2)	Coefficient C=Fy*C10	Discharge (m3/sec) Q=CIA/360
Q2	0.3	104	0.85	0.765	**0.066**
Q5	0.3	135	0.95	0.855	**0.096**
Q10	0.3	154	1	0.9	**0.116**
Q20	0.3	180	1.05	0.945	**0.142**
Q50	0.3	215	1.15	1.035	**0.185**
Q100	0.3	243	1.2	1.08	**0.219**

Figure 2.10 – Flow rate calculation

Figure 2.10 shows the flow rate calculation with the catchment area and the 10 year coefficient of discharge taken from figure 2.9, the time of concentration taken from figure 2.8 and the rainfall intensity taken from figure 2.3.

2.3 Results

Pre development discharge for the DFE (1% AEP) is 0.124m3/s and the post development discharge being 0.219m3/s. This is an increase in discharge of 0.095m3/s or 95l/s. Given the site discharges direct to Alma Street a lawful point of discharge can be demonstrated however a lawful discharge can only be demonstrated where mitigation measures are put in place to ensure a nuisance is not caused in Alma Street.

Mitigation measures can be in the form of detention within the carpark area reducing the peak discharge back to pre development flows and discharging to the kerb via a single pipe outlet.

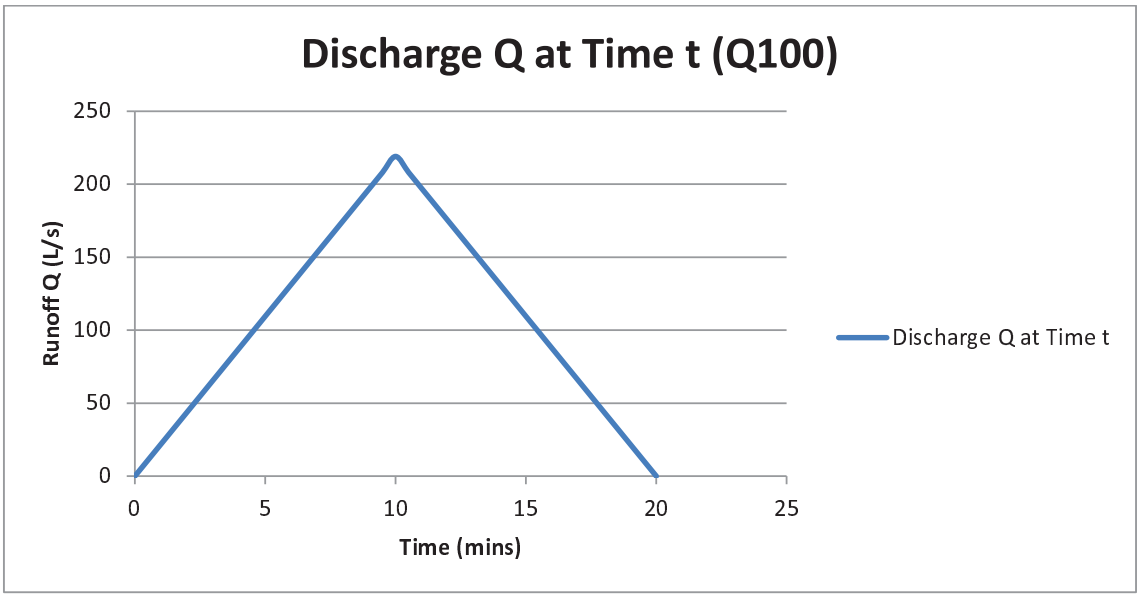


Figure 2.11 – Hydrograph of post development area

Basin Routing Computations for Wintergarden, 5% AEP			
	Outflow	Storage	Level in tank above floor level (m)
Maximum Values	0.0099 m^3/s	53.125 m^3	0.085 mm

Figure 2.12 – Basin routing computations

Figure 2.12 shows the maximum outflow, storage and level in the detention basin.

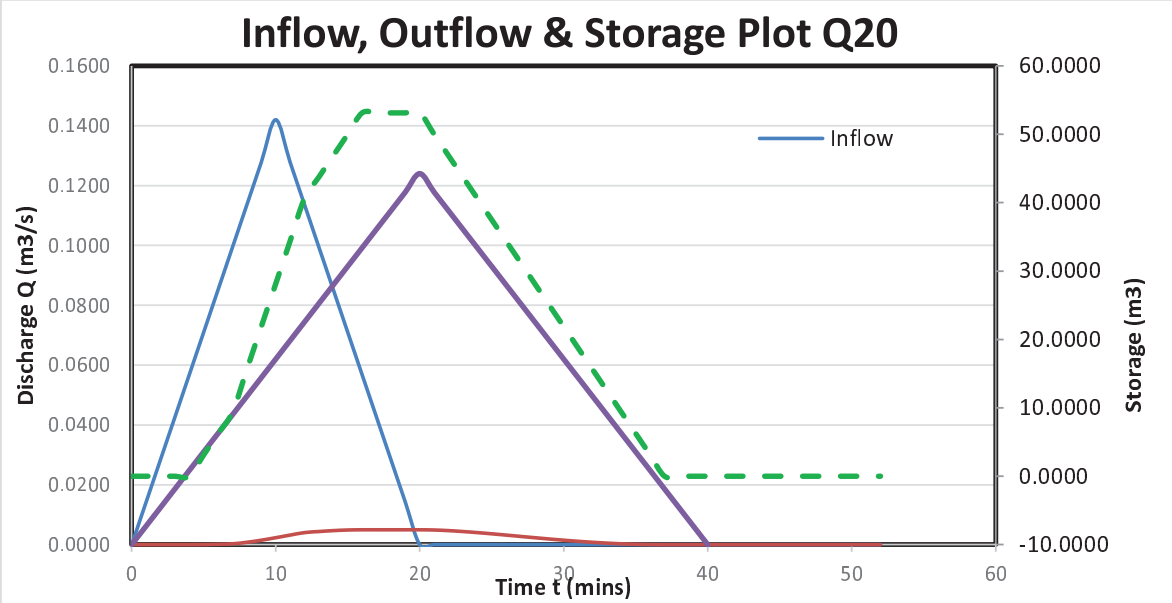


Figure 2.13 – Plot of basin routing computations

Figure 2.13 shows the same main data in figure 2.12 but plotted on a graph to help visualise the data.

When calculating the required storage the discharge was set for a 20 year event instead of 100, to make sure that the discharge off the site is still less than the discharge off the site pre development for a 100 year event, the equation:

$$(Q100_{post} - Q20_{post}) + Qoutflow_{post} < Qoutflow_{pre}$$

This was found to be:

$$219L/s - 142L/s + 5L/s = 83.1L/s < 124L/s$$

The depth of water in the detention basin, for a 20 year event, is 85 mm and the depth of water for a 100 year event is 155 mm. Both depths are less than the QUDM requirement of 200 mm.

Detention in the form of 54m^3 will be required with an outlet of 1 x 90mm pipes to kerb. The detention will have an area of 25m by 25 m and will have a depth of maximum 155 mm in the case of a 100 year event.

3.0 Stormwater Quality Assessment

3.1 Construction Phase

Impacts on receiving waters and surrounding areas will be minimised during the construction phase with measures as outlined in the SMP and the Erosion and Sediment Control Plan in accordance with CMDG drawings (CMDG-D-050 and CMDG-D-051).

3.1.1 Pollutants

Typical pollutants generated during the construction phase of the development are shown below in figure 3.1.

Pollutant	Sources
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts
Sediment	Unprotected exposed soils and stockpiles during earthworks and construction
Hydrocarbons	Fuel and oil spills, leaks from construction equipment
Toxic materials	Cement slurry, asphalt prime, solvents, cleaning agents, wash-waters
p^H altering substances	Acid sulphate soils, cement slurry and wash-waters

Figure 3.1 shows typical pollutants generated during construction

3.1.2 Performance objectives

The objectives are:

- Minimise the amount of sediment entering waterways and stormwater drains;
- Minimise or prevent environmental harm to waterways and associated ecosystems;
- Minimise runoff of sediment laden water from construction site;
- Minimise exposure of soils.

Indicator	Water Quality Objectives
p^H	6.5 – 8.5
Suspended Solids	Annual Mean < 50mg/l
Oils and Grease	No visible films or odour
Litter / Gross Pollutants	No anthropogenic (man-made) materials greater than 5mm in any dimension
Dissolved Oxygen	85 – 110% saturation

Figure 3.2 shows indicators for water quality objectives

3.1.3 Performance objectives

The general requirement of monitoring during the construction phase will be:

- Work activities are restricted to designate construction areas;
- Earthworks and site clearing are undertaken in accordance with an Erosion and Sediment Control Plan;
- Erosion and sediment control devices are to be constructed / installed in accordance with an Erosion and Sediment Control Plan;
- Inspection of sediment fences, erosion and sediment control structures/devices on a weekly basis as well as after any rain event;

- Stormwater discharges from the site are not having any adverse effect on the downstream environment;
- Monitoring and recording of the performance of the drainage control devices;
- Any failure in the stormwater system shall be immediately rectified to prevent uncontrolled discharge from the site;
- Any failure to the stormwater system causing damage to surroundings should implement immediate remedial work to the damaged area.

3.1.4 Responsibility and reporting

- The contractor shall be responsible for monitoring the performance of all drainage control and erosion and sediment control devices;
- Records of any failures to devices should be kept and reported to the Construction Manager;
- Regular inspections of the devices shall be reported to the Construction Manager; and
- Inspections of the devices after any rainfall event shall be reported to the Construction Manager.

3.2 Operational Phase

3.2.1 Pollutants

The key pollutants typically generated during this phase for the entire catchment are shown in figure 3.3.

Pollutant	Sources
Litter / Gross Pollutants	Waste materials, food, food packaging etc
Nutrients (N & P)	Nitrogen, Phosphorus
Hydrocarbons	Fuel and oil spills, leaks, car park
Sediments	Wind deposits and car trails
Surfactants	Detergents, Cleaning agents

Figure 3.3 shows key pollutants typically generated during the operational phase

3.2.2 State Planning Policy Water Quality Objective

Percentage load reduction WQO's presented in Table 4-1 have been adopted from the Queensland State Planning Policy (2017), Part G, Appendix 2, Table B.

	Total Suspended Solids (TSS)	Total Phosphorous (TP)	Total Nitrogen (TN)	Gross pollutants (GP)
Load Reduction Target	85%	60%	45%	90%

Figure 3.4 Water Quality Objectives (SPP 2017).

3.2.3 Proposed Stormwater Treatment

3.2.3.1 Stormwater treatment philosophy

Waterways and other aquatic environments are valued by the community for their social, cultural, economic an environmental benefits. Urban runoff, contaminated with nutrients, sediment and other pollutants adversely impacts theses valued resources. Water Sensitive Urban Design (WSUD) is a holistic approach to the planning and design of urban landscapes that minimises this negative impact. This approach is used on this project to select the treatment options that considers the civil, landscape and ecological aspects of the site. Due to the high utilisation of the subject site, it is proposed that an underground proprietary treatment device be incorporated into the development.

3.2.3.2 Gross pollutant traps

A GPT is a treatment device designed to capture coarse sediment, trash and vegetation matter in stormwater runoff. GPTs are often used as the first treatment element in a treatment train. SPEL Stormsacks will be used within this development. Stormsack is a primary treatment device. This device is located within the filed inlet with the primary purpose of capturing gross pollutants. Refer to Appendix B for typical details.

3.2.3.3 SPEL Hydrosystem

SPEL Hydrosystem is a tertiary treatment device. This device removes inorganic compounds, and substance, such as the nitrogen and phosphorus. The stormwater is treated within the unit by the following processes: sedimentation, filtration, adsorption and precipitation. It is suitable for Heavy Metal, TSS and Nutrient reduction.

The SPEL Hydrosystem uses an up-flow process. This means there is a minimal head drop between the inlet and the outlet. It can efficiently work in flat site requiring only 250mm fall across the device. Flow from this device is discharged to the Alma Street kerb and channel.

Additional information on the SPEL Hydrosystem is included within Appendix C.

3.2.4 MUSIC Modelling

Water quality modelling of the proposed development has been undertaken using the Model for Urban Stormwater Improvement Conceptualisation (MUSIC) Version 6.2, developed by the Cooperative Research Centre for Catchment Hydrology (CRCCH). MUSIC enables the user to conceptualise the transfer of pollutants through a stormwater drainage system and it provides an aid in quantifying the effectiveness of the proposed stormwater quality treatment train. MUSIC only provides quantitative modelling for Total Suspended Solids (TSS), Total Phosphorous (TP), Total Nitrogen (TN) and Gross Pollutants (GP); it does not provide quantitative modelling for other pollutants. Modelling of the commercial development has been undertaken for the mitigated scenario, i.e. the developed site with the proposed SQIDs included. The model extents are defined by the site boundaries, as such the external catchment of the site has not been included in the model. Furthermore, The MUSIC model was set up in accordance with *Water by Design MUSIC Modelling Guidelines (2010)*.

3.2.4.1 Music Model Setup

The input parameters for source node, soil behaviour and pollutant generation characteristics are based on *Table 3.7 and 3.8 of MUSIC Modelling Guidelines Version 1.0 - 2010, Water by Design (2010)*. The details of the catchment / source nodes used in the MUSIC model are shown in figure 3.5 below and clearly illustrated in MUSIC Model Stormwater Catchments.

Catchments	Total Area (Ha)	% impervious
Carpark Area	0.3038	100
Landscape Area	0.0171	0

Figure 3.5 shows details of the catchment / source nodes

3.2.4.2 SPEL Music nodes efficiencies

The proposed stormwater treatment train for this development includes SPEL devices. The SPEL treatment nodes utilised in the MUSIC model have been supplied by SPEL Environmental. The MUSIC nodes treatment efficiencies have been set by SPEL based on field testing undertaken to evaluate their effectiveness. Please refer to SPEL website for the SPEL stormwater treatment train efficiencies report.

3.2.4.3 Music modelling results

The proposed stormwater treatment measures were modelled in MUSIC as a treatment train consisting of SPEL Stormsacks and SPEL Hydrosystem – 1500 Series connected in series. The generic nodes in MUSIC have been modified by SPEL based on Field testing data for their products. Figure 3.6 below shows details of proprietary products modelled in MUSIC.

Catchments	System Used	Total Treatable Flow Rate (L/s)	Number of Units
Carpark and Landscape	Stormsacks (600 X 600)	11.0	2
	Hydrosystem – 1500 Series	16.0	1

Figure 3.6 shows details of proprietary treatment systems as modelled in MUSIC

Figure 3.7 below shows a schematic representation of the model analysed in MUSIC and figure 3.8 below demonstrates that the pollutant load reduction objectives for the site have been achieved, i.e. the treatment methods proposed are adequate.

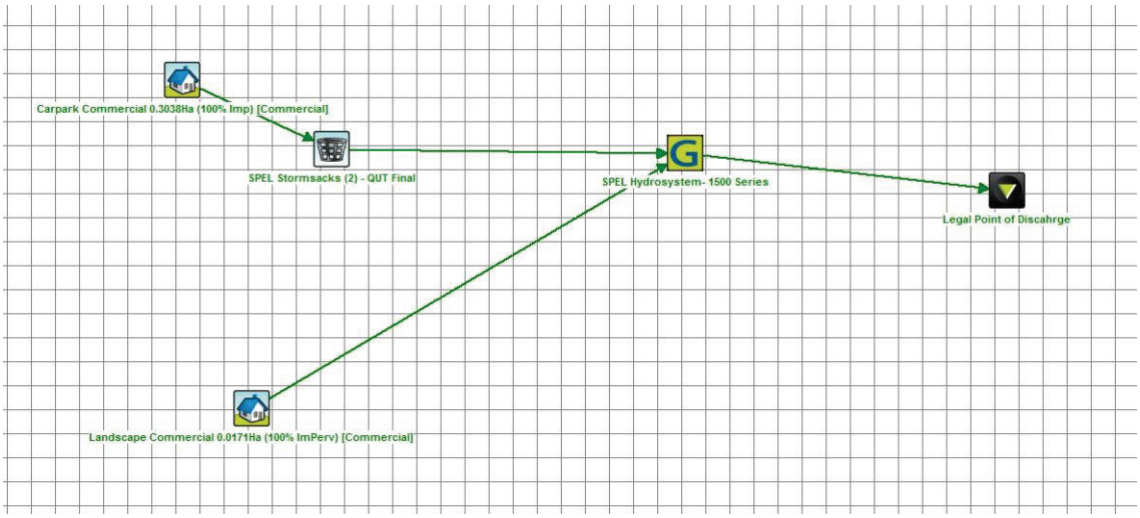


Figure 3.7 shows a schematic representation of the model analysed in MUSIC

	Sources	Residual Load	% Reduction
Flow (ML/yr)	1.78	1.78	0
Total Suspended Solids (kg/yr)	720	108	85
Total Phosphorus (kg/yr)	1.21	0.33	72.8
Total Nitrogen (kg/yr)	5.59	2.16	61.3
Gross Pollutants (kg/yr)	44.9	1.11	97.5

Figure 3.8 demonstrates that the pollutant load reduction objectives for the site have been achieved

Parameter	Required Load Reduction	Music Results Achieved	Objective Achieved
Total Suspended Solids	85.0%	85%	Yes
Total Phosphorus	60.0%	71.80%	Yes
Total Nitrogen	45.0%	61.20%	Yes
Gross Pollutants	90.0%	97.50%	Yes

Figure 3.9 MUSIC model treatment effectiveness

3.2.4.4 Treatment device cost

It is adviced by SPEL Environmental that the indicative cost of the treatment devices (Stormsack X 2 units & Hydrosystem – 1500 Series X 1 unit) including the delivery to the site is approximately $26,580.00 plus GST.

4.0 Conclusions and Recommendations

A Site Based Stormwater Management Plan has been prepared with respect to the proposed car park development. The location of the site is shown on Figure 1.1 and the proposed development site layout is shown in Appendix A.

4.1 Stormwater Quantity

An assessment of the water quantity has resulted in the requirement of an onsite detention basin, which will be in the car park area as surface storage, with a total volume of 53.2m^3. It is proposed to construct a 53.2m^3 of surface storage with 150mm of barrier kerb, within 25m by 25m of surface area. Two (2) 600mm by 600mm field inlets are to be provided with 90mm diameter pipe outlet to mitigate the peak discharge and achieve "no worsening" to surrounding land or infrastructure.

4.2 Stormwater Quality

4.2.1 Construction Phase

An Erosion and Sediment Control Plan aimed at minimising unacceptable impacts during the construction phase will be developed at the Operational Works stage, in accordance with Capricorn Municipal Design Guidelines and Standards aiming to minimise unacceptable impacts to occur during the construction phase.

4.2.2 Operational Phase

A conceptual MUSIC model for the site indicated that the proposed treatment measures will achieve the statutory water quality objectives for the site. The proposed treatment is shown in Appendix B and C.

This Site Based Stormwater Management Plan has demonstrated that adequate stormwater quantity and quality management principles and techniques will be achieved during the construction and operational phases of this development to comply with the Queensland State Planning Policy 2017 and Rockhampton Region Planning Scheme requirements. The methods proposed are considered current best management practice for a development of this type, on this site.

Reference List

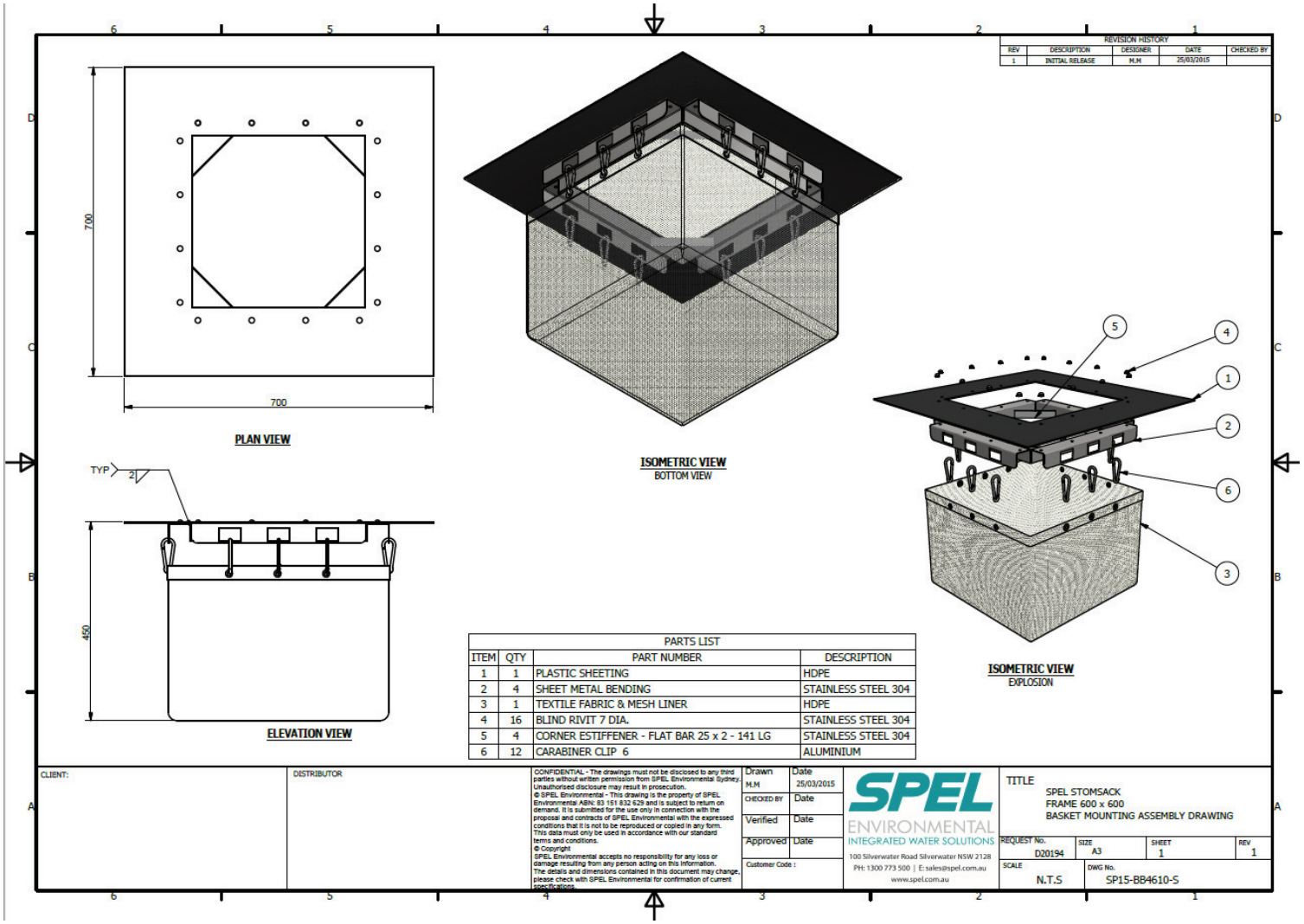
SPEL Environmental integrated water solutions, SPEL Stormsack.pdf

SPEL Environmental integrated water solutions, Hydrosystem 1000.pdf

Appendix A


I want to...
1,269,517.94 m²
174.58 m
136.02 m
363.16 m
150.38 m
146.51 m
238.44 m
219.15 m
194.30 m
114.75 m
837.36 m
230.91 m
309.66 m
206.66 m
156.77 m
199.67 m
194.64 m
163.76 m
478.10 m
211.28 m
176.03 m
97.83 m
WANDAL
THE RANGE
ALLENSTOWN
BERSERKER
Fitzroy Bdge
North St
Canning St
Fitzroy St
George St
Bolsover St
Derby St
William St
Victoria Pde
Quay St
East St
Denham St
Archer St
Alma St
Denison St
Kent St
Campbell St
Murray St
Albert St
Cambridge St
West St
Talford St
Lennox St
Knutsford St
Mansfield St
Bolsy St
Bakara St
Barambah
Bapaume St
Turner Rd
Quarry St
Bethesda
Cousins St
Arnold St
Thurston St
500ft
200m
X:
Y:

Appendix B


REVISION HISTORY
REV | DESCRIPTION | DESIGNER | DATE | CHECKED BY
1 | INITIAL RELEASE | M.M | 25/03/2015
700
700
PLAN VIEW
ISOMETRIC VIEW
BOTTOM VIEW
TYP
2
450
ELEVATION VIEW
5
4
1
2
6
3
ISOMETRIC VIEW
EXPLOSION
PARTS LIST
ITEM | QTY | PART NUMBER | DESCRIPTION
1 | 1 | PLASTIC SHEETING | HDPE
2 | 4 | SHEET METAL BENDING | STAINLESS STEEL 304
3 | 1 | TEXTILE FABRIC & MESH LINER | HDPE
4 | 16 | BLIND RIVIT 7 DIA. | STAINLESS STEEL 304
5 | 4 | CORNER ESTIFFENER - FLAT BAR 25 x 2 - 141 LG | STAINLESS STEEL 304
6 | 12 | CARABINER CLIP 6 | ALUMINIUM
CLIENT:
DISTRIBUTOR
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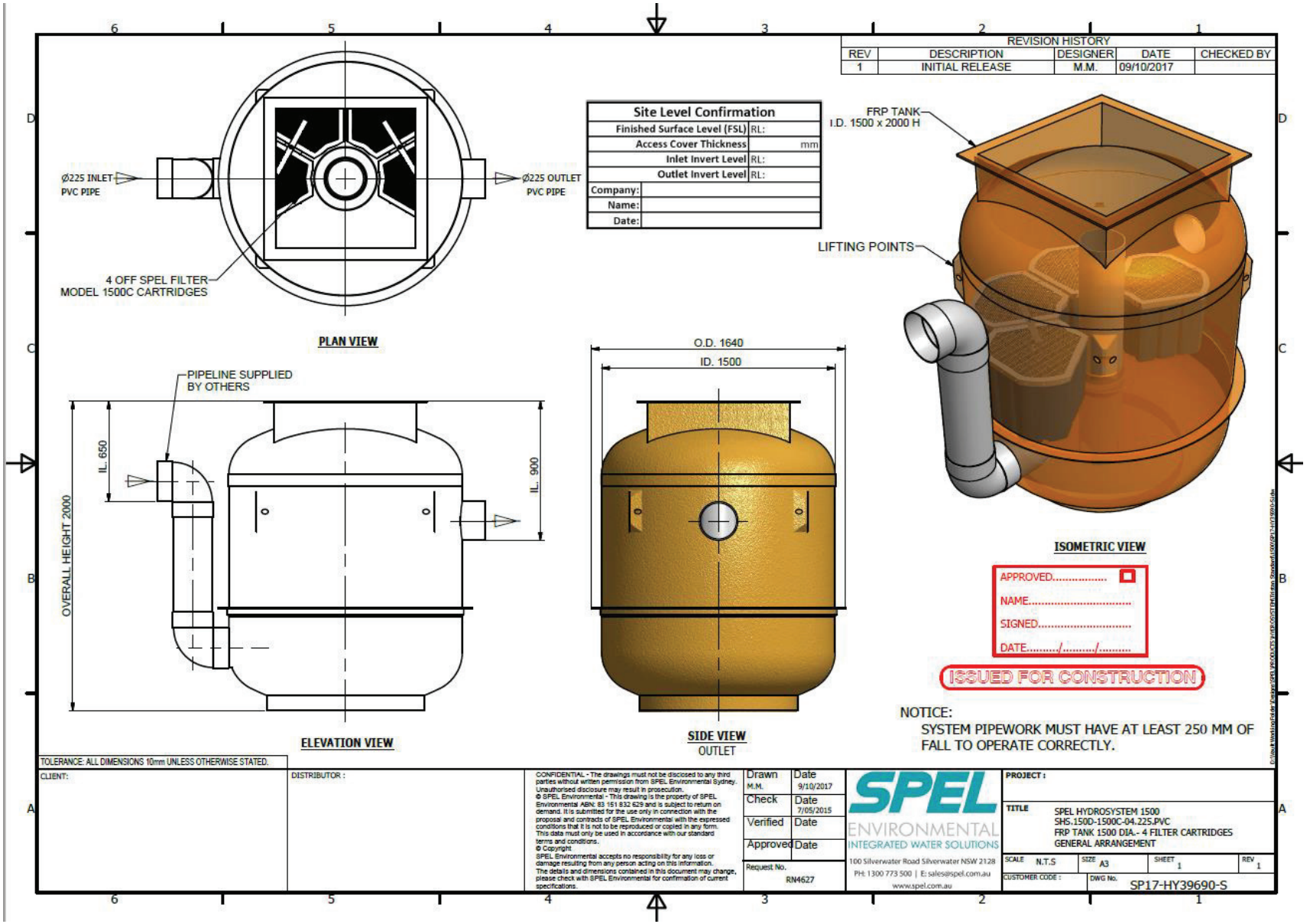
Drawn M.M Date 25/03/2015
CHECKED BY Date
Verified Date
Approved Date
Customer Code :
SPEL ENVIRONMENTAL
INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au
TITLE
SPEL STOMSACK
FRAME 600 x 600
BASKET MOUNTING ASSEMBLY DRAWING
REQUEST No. D20194
SIZE A3
SHEET 1
REV 1
SCALE N.T.S
DWG No. SP15-BB4610-S

Appendix C


REVISION HISTORY
REV | DESCRIPTION | DESIGNER | DATE | CHECKED BY
1 | INITIAL RELEASE | M.M. | 09/10/2017
Site Level Confirmation
Finished Surface Level (FSL) RL:
Access Cover Thickness mm
Inlet Invert Level RL:
Outlet Invert Level RL:
Company:
Name:
Date:
Ø225 INLET PVC PIPE
Ø225 OUTLET PVC PIPE
4 OFF SPEL FILTER MODEL 1500C CARTRIDGES
PLAN VIEW
FRP TANK I.D. 1500 x 2000 H
LIFTING POINTS
ISOMETRIC VIEW
PIPELINE SUPPLIED BY OTHERS
IL. 650
IL. 900
OVERALL HEIGHT 2000
ELEVATION VIEW
O.D. 1640
ID. 1500
SIDE VIEW
OUTLET
APPROVED.....
NAME.....
SIGNED.....
DATE...../...../.....
ISSUED FOR CONSTRUCTION
NOTICE:
SYSTEM PIPEWORK MUST HAVE AT LEAST 250 MM OF FALL TO OPERATE CORRECTLY.
TOLERANCE: ALL DIMENSIONS 10mm UNLESS OTHERWISE STATED.
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Drawn M.M. Date 9/10/2017
Check Date 7/05/2015
Verified Date
Approved Date
Request No. RN4627
SPEL ENVIRONMENTAL INTEGRATED WATER SOLUTIONS
100 Silverwater Road Silverwater NSW 2128
PH: 1300 773 500 | E: sales@spel.com.au
www.spel.com.au
PROJECT :
TITLE
SPEL HYDROSYSTEM 1500
SHS.1500-1500C-04.225.PVC
FRP TANK 1500 DIA.- 4 FILTER CARTRIDGES
GENERAL ARRANGEMENT
SCALE N.T.S
SIZE A3
SHEET 1
REV 1
CUSTOMER CODE :
DWG No. SP17-HY39690-S