



29th of April 2019

Reference: 2019-8832

Andrew Burrow
Secon Consulting Engineers
456 Pulteney Street
Adelaide SA 5000
Email: andrewb@secon.net.au

Dear Mr. Burrow,

**PRELIMINARY STORMWATER DRAINAGE ADVICE FOR DEVELOPMENT AT 1 GLENBURNIE TERRACE,
PLYMPTON**

MLEI have been engaged to assess the implications of a potential development at 1 Glenburnie Terrace, Plympton in relation to the existing adjacent stormwater drainage system and provide a preliminary stormwater drainage assessment based on our findings.

Site Description

The subject site has an approximate area of 1020m². It is bounded to the north and east by Glenburnie Terrace and Gray Street, respectively, and existing residential allotments along the western and southern boundaries. The subject site is relatively flat with the high point being the existing building located central to the lot with a gentle grade of approximately 1.5% towards Glenburnie Terrace.

The existing site consists predominately of an existing residential allotment with surrounding landscaped areas. The existing building currently discharges via a street water table outlet along Glenburnie Terrace, which is in turn captured by the side entry pit located on the north east corner of the site.

Proposed Development

The potential development comprises of a 4-storey apartment with a ground level undercroft car parking area, providing vehicle access onto Glenburnie Terrace.

Adopting the standard stormwater requirements of the City of West Torrens Council the proposal will include the following;

- Stormwater detention system to restrict the post-development 20-year storm event back to the pre-development 20-year storm event. Adopt pre-development runoff coefficient of 0.25.
- Stormwater to be discharged to Glenburnie Terrace kerb and water table.
- Stormwater quality treatment effectiveness to achieve the following:
 - Total suspended solids (TSS) – 80% reduction
 - Total phosphorus (TP) – 60% reduction
 - Total nitrogen (TN) – 45% reduction
 - Total gross pollutants – 90% reduction

Catchment Analysis

Based upon the existing site conditions and the proposed development, MLEI have determined that a total detention volume required for the 1 in 20-year storm event limited to the pre-development flow rate during the 1 in 20-year storm event with an adopted runoff coefficient of 0.25 would be approximately 16,500L. The rainwater detention tank is to be located under the ground level carpark, located downstream of the proposed stormwater treatment unit to prevent silt build up within the tank system.

Music modelling

The industry recognised software package 'MUSIC' by eWater has been used to assess the reduction in pollutants for this development. Unless noted below as an input, the default data from eWater has been used in the assessment.

The treatment train utilises an Enviro Australis 'G' series pollutant trap located under the ground floor carpark area to treat the stormwater runoff.

The following reduction in pollutants were achieved with the inclusion of the proposed treatment train as shown in Figure 1.

Pollutant Type	City of West Torrens requirement	Treatment train effectiveness
Total suspended solids	80%	85%
Total phosphorus	60%	65%
Total nitrogen	45%	45%
Total gross pollutants	90%	90%

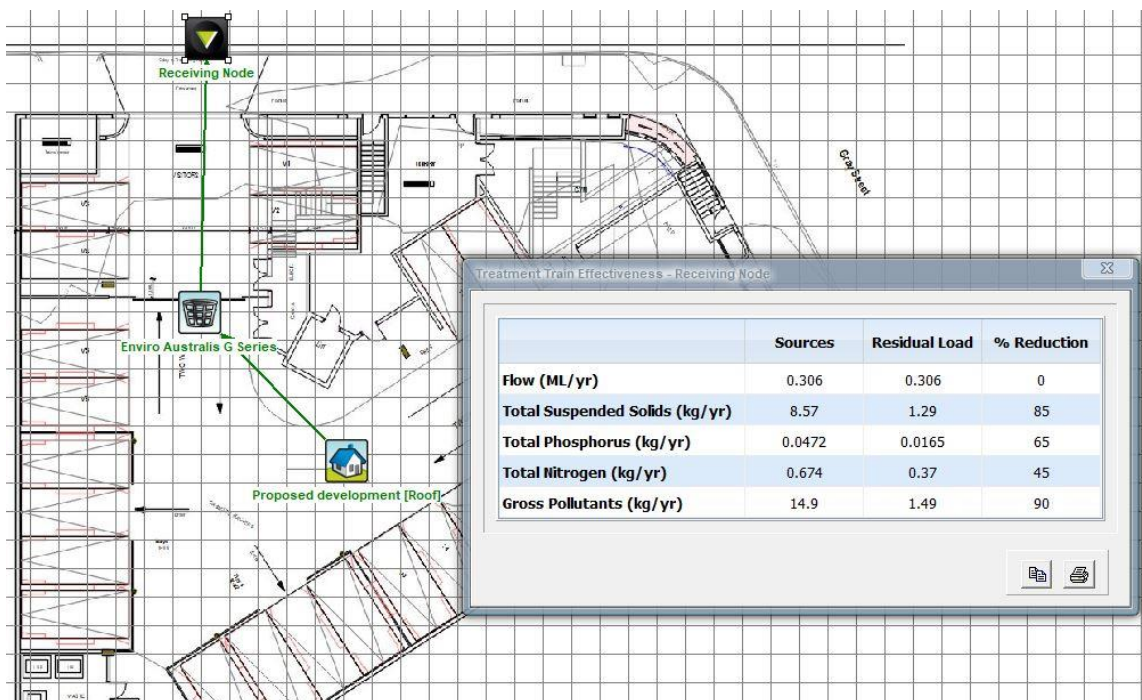


Figure 1 - Proposed treatment train

The achieved reductions are a betterment than the requirements outlined by the City of West Torrens and in the opinion of MLEI is an acceptable solution for this development.

We trust that the preliminary stormwater drainage advice has demonstrated a strategy to ensure the receiving stormwater drainage channel is not adversely affected by the potential development at 1 Glenburnie Terrace, Plympton. If you have any queries regarding this letter, please contact the undersigned on 8231 2832 or by email hpho@mlei.com.au.

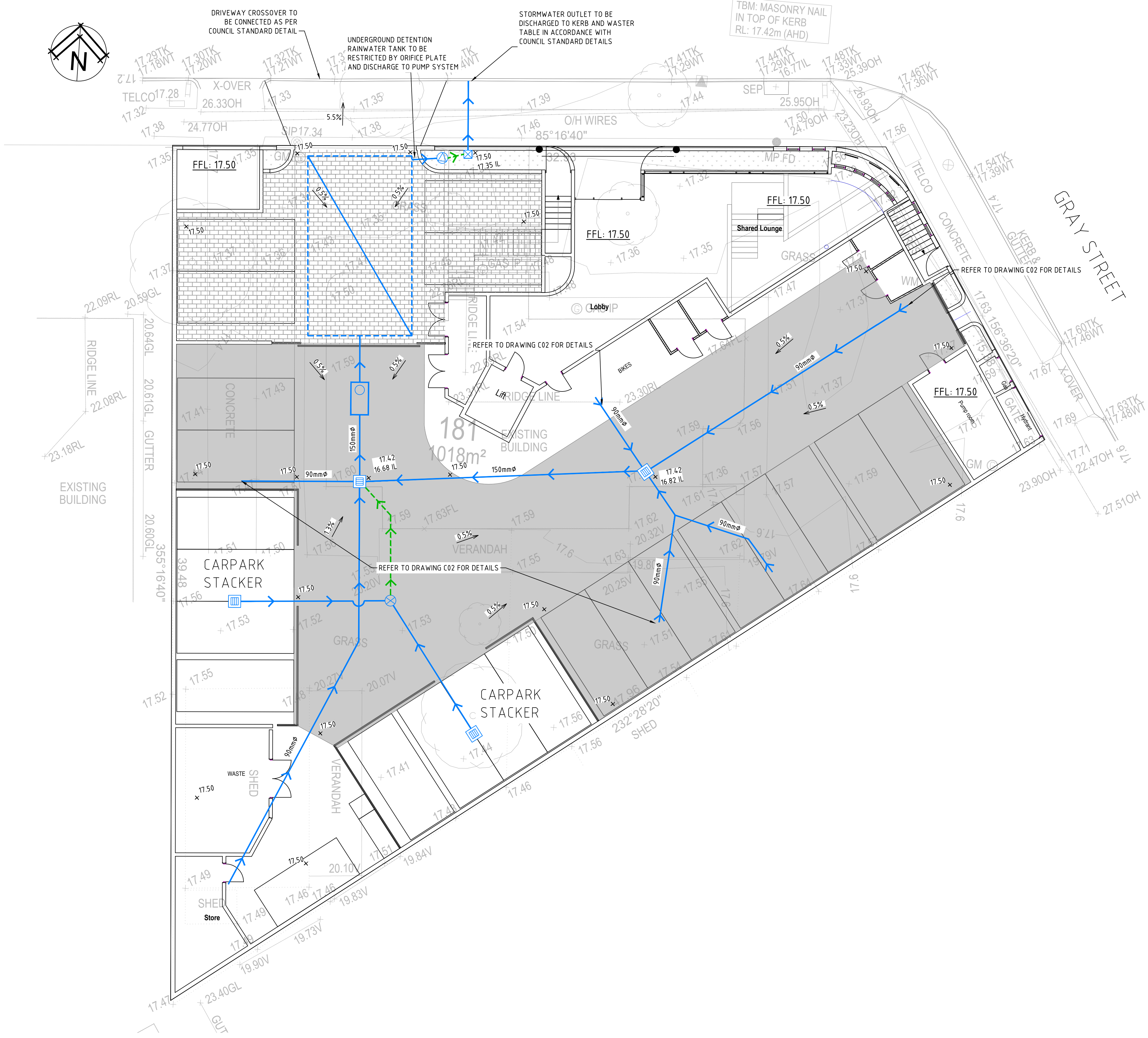
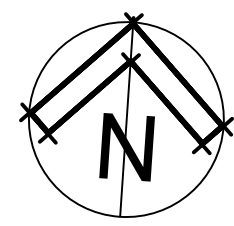
Kind Regards,
MLEI Consulting Engineers

Huy Pho B.E(Civil)
Civil Engineer

Enc:

- *Stormwater management and site works plan*
- *Stormwater calculations*

GLENBURNIE TERRACE



LEGEND


- XX.X% SURFACE GRADE AND DRAINAGE DIRECTION
XX.XX x DESIGN SPOT LEVEL
XX.XX EX x EXISTING SPOT LEVEL
XX.XX TK x EXISTING TOP OF KERB
XX.XX BK x EXISTING BOTTOM OF KERB
XX.XX WT x EXISTING WATERTABLE LEVEL
- BUILDING** EXISTING OR PROPOSED BUILDING IDENTIFICATION
FFL: X.XX FINISHED FLOOR LEVEL
DP O INDICATIVE 90mmØ DOWN PIPE (REFER ARCHITECTURAL DRAWING FOR SPECIFICATIONS)
300 SQ JUNCTION BOX
450 SQ GRATED INLET PIT
SUMP FITTED WITH DUAL PUMP SYSTEM CAPABLE OF A 2.0L/s DESIGN FLOW WITH A BACK-UP POWER SUPPLY TO ACCOUNT FOR PUMP FAILURE. GLOBAL WATER DAP11 PUMP STATION OR APPROVED EQUIVALENT.
SUMP FITTED WITH SINGLE PUMP SYSTEM TO ALLOW DRAINAGE OF CAR STACKERS DURING EMERGENCIES. GLOBAL WATER DAP06 PUMP STATION OR APPROVED EQUIVALENT
RISING MAIN
UPVC STORMWATER PIPE MIN. 0.5% GRADE UNO. SIZE AS SHOWN
- DRIVEWAY PAVING (REFER ARCHITECTURAL DRAWING FOR SPECIFICATIONS)
BLOCK PAVING (REFER ARCHITECTURAL DRAWING FOR SPECIFICATIONS)
LANDSCAPE/GARDEN AREA
ENVIRO AUSTRALIS 'G' SERIES GROSS POLLUTANT TRAP
16,500L UNDERGROUND DETENTION TANK (TO BE TRAFFICABLE)

GENERAL NOTES

- THESE DRAWINGS ARE NOT CADASTRAL PLANS AND MUST NOT BE USED IN DETERMINING PRECISE DETAILS WITH RESPECT TO BOUNDARIES.
- ALL DIMENSIONS AND LEVELS SHALL BE VERIFIED ON SITE.
- SPOIL TO BE STOCKPILED AS DIRECTED BY THE SUPERINTENDENT AND EXCESS NOT USED IS TO BE REMOVED FROM SITE BY CONTRACTOR.
- ANY REQUIRED FILLING OF THE SITE IS TO BE CARRIED OUT IN ACCORDANCE WITH AS1289.
- SITES REQUIRING LEVEL 1 SUPERVISION ARE TO SATISFY AS3789.
- THESE DRAWINGS ARE A SCHEMATIC REPRESENTATION OF SERVICES INFORMATION CONTAINED IN THE SITE SURVEY. OTHER SERVICES MAY EXIST, WHICH WERE NOT KNOWN OR IDENTIFIED AT THE TIME OF SURVEY. THE INFORMATION CONTAINED IN THESE DRAWINGS IS INDICATIVE ONLY, AND REFERENCE SHOULD BE MADE TO THE RELEVANT AUTHORITIES DOCUMENTATION TO CONFIRM ACCURACY AND COMPLETENESS. WHERE INFORMATION IS AVAILABLE, THE SUB-SURFACE SERVICES INSTALLED BY CONTRACTORS OTHER THAN THE AUTHORITIES HAVE BEEN SHOWN, BUT ADDITIONAL UNDOCUMENTED SERVICES MAY BE PRESENT. SHOULD THE CONTRACTOR BELIEVE THAT SUB-SURFACE SERVICES ARE AT RISK OF DAMAGE DURING CONSTRUCTION, THE CONTRACTOR SHOULD NOTIFY THE RELEVANT AUTHORITIES AND ESTABLISH THE EXACT LOCATION OF THE SERVICE.
- FOOTPATHS TO BE LOCALLY REINSTATED WHERE REQUIRED AS A RESULT OF DRIVEWAY CROSSOVER WORKS TO THE SATISFACTION OF COUNCIL.
- THE FINISHED SURFACE SHALL BE EVENLY GRADED BETWEEN DESIGN SURFACE LEVELS.
- EXISTING SITE LEVELS TO BE MAINTAINED WHERE DESIGN LEVELS ARE NOT NOTED.
- 20mm STEPDOWN HAS BEEN ALLOWED FOR, FROM GARAGE TO DRIVEWAY LEVEL.
- PROVIDE CONCRETE PLINTH AT BOUNDARY WHERE REQUIRED UNLESS OTHERWISE SPECIFIED.
- DEMOLISH AND REMOVE ALL EXISTING INSTALLATIONS WHICH ARE TO BE AFFECTED BY NEW WORKS. EXTENT OF DEMOLITION TO BE CONFIRMED ON SITE WITH THE SUPERINTENDENT PRIOR TO WORKS.
- CONTRACTOR TO ADJUST LIDS OF EXISTING SERVICE PITS TO MATCH FINISHED SURFACE LEVEL. PROVIDE HEAVY DUTY COVER IF IN PAVED AREA TO THE REQUIREMENTS OF THE RELEVANT AUTHORITY, IF APPLICABLE. RELOCATE SERVICES AS REQUIRED.
- CONFIRMATION FROM COUNCIL MUST BE OBTAINED FOR THE REMOVAL OF ANY TREES THAT MAY BE OF SIGNIFICANCE.
- ALL STORMWATER DRAINAGE TO BE IN ACCORDANCE WITH AS3500.
- DRIVEWAY CONSTRUCTION TO BE IN ACCORDANCE WITH AS2890 PART 1: OFF-STREET CAR PARKING.
- DRAWINGS TO BE READ IN CONJUNCTION WITH ARCHITECTURAL DRAWINGS AND ANY OTHER ASSOCIATED SERVICES DRAWINGS.
- PROVIDE ADEQUATE PROTECTION OR COVER TO STORMWATER PIPES SUBJECTED TO VEHICULAR LOADING.
- STORMWATER LAYOUT IS INDICATIVE ONLY AND MAY CHANGE TO SUIT SITE CONDITIONS HOWEVER THE INTEGRITY OF THE STORMWATER SYSTEM SHALL BE MAINTAINED AT ALL TIMES.

REVISION			
ISSUE	DATE	DESCRIPTION	INITIAL
A1	29/04/2019	ISSUE FOR APPROVAL	RD
A2	15/05/2019	ISSUE FOR APPROVAL	RD

ISSUED FOR APPROVAL
NOT FOR CONSTRUCTION

**mlei** Consulting Engineers
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452 Pulleney street
Adelaide SA 5000
Telephone (08) 8231 2832
Facsimile (08) 8311 1742
www.mlei.com.au

DRAFTER RD	ENGINEER HP	MANAGER TN
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PROJECT
1 GLENBURNIE TCE,
PLYMPTON

DATE APR 2019	PROJECT NUMBER 2019-8832	DRAWING SCALE 1:100
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DO NOT SCALE FROM THIS DRAWING

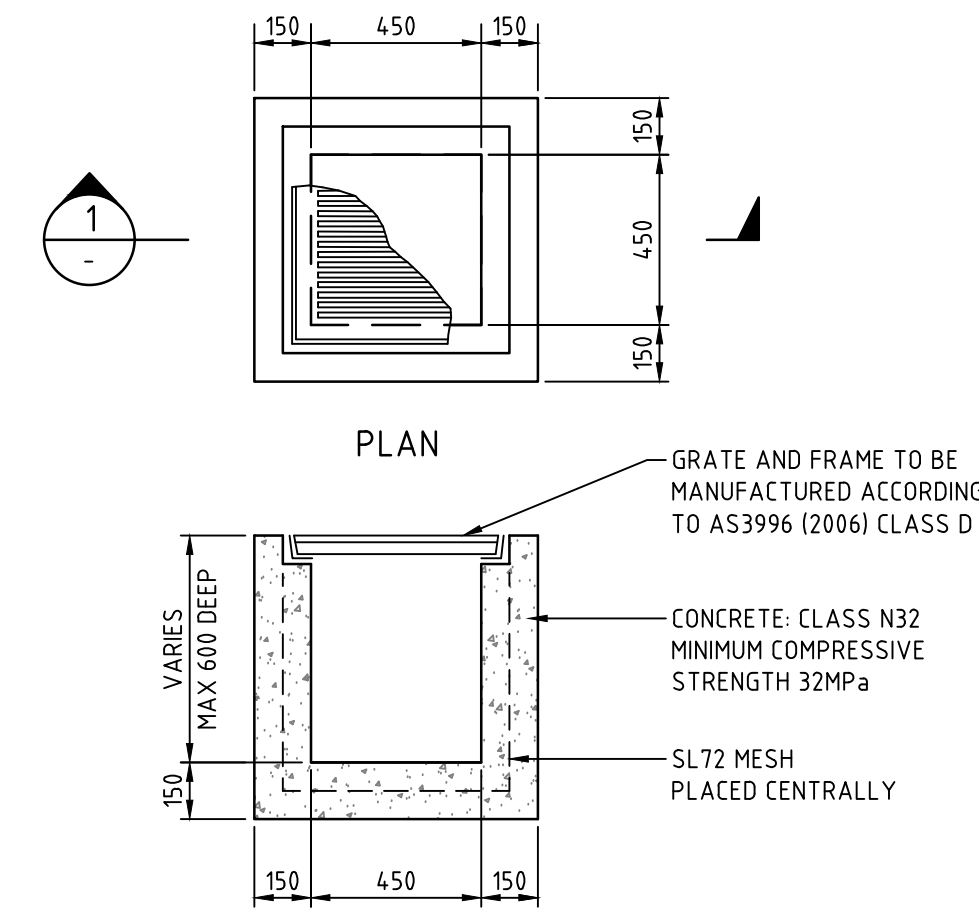
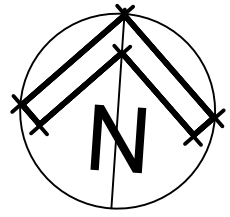
CLIENT
SECON CONSULTING
ENGINEERS

DATE APR 2019	PROJECT NUMBER 2019-8832	DRAWING SCALE 1:100
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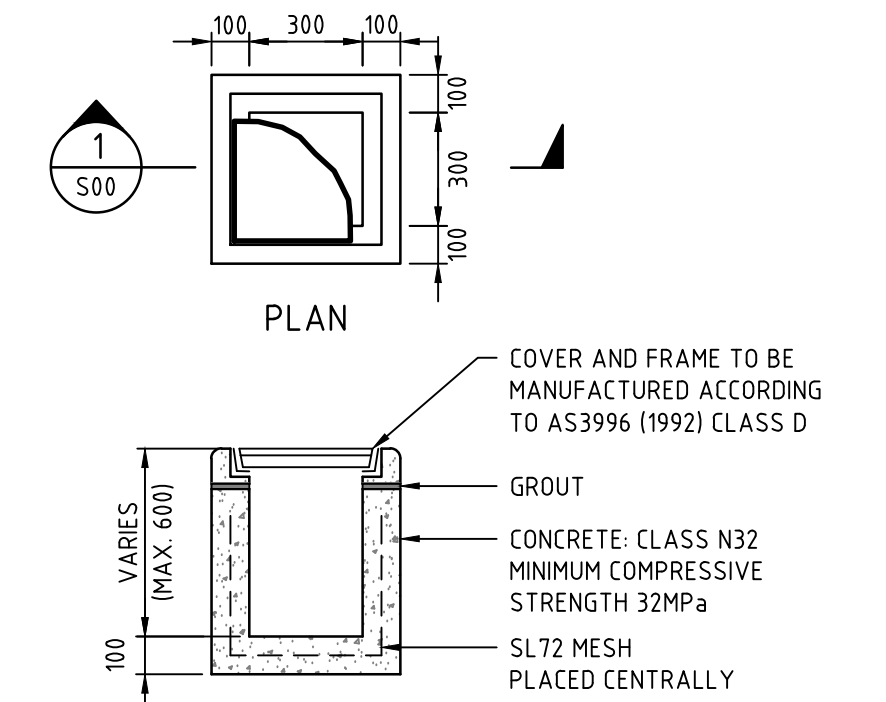
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DRAWING TITLE
STORMWATER MANAGEMENT
AND SITE WORKS PLAN

DRAWING NUMBER C01	SHEET SIZE A1	REV A2
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450 X 450 GRATED INLET PIT
SCALE: 1:20



300x300 JUNCTION BOX
SCALE: 1:20

REVISION			
ISSUE	DATE	DESCRIPTION	INITIAL
A1	29/04/2019	ISSUE FOR APPROVAL	RD

ISSUED FOR APPROVAL
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 Consulting Engineers TALENTED APPROACHABLE RESPONSIVE PIONEERING		
452 Pulteney street Adelaide SA 5000 Telephone (08) 8231 2832 Facsimile (08) 8311 1742 www.mlei.com.au		
DRAFTER RD	ENGINEER HP	MANAGER TN

PROJECT 1 GLENBURNIE TCE, PLYMPTON

CLIENT		
SECON CONSULTING		
ENGINEERS		
DATE	PROJECT NUMBER	DRAWING SCALE
APR 2019	2019-8832	1:100
DO NOT SCALE FROM THIS DRAWING		

DRAWING TITLE		
STORMWATER MANAGEMENT PLAN, LEVEL 1 & DETAILS		
DRAWING NUMBER	SHEET SIZE	REV
C02	A1	A1



Reference: 2019-8832

Project: 1 Glenburnie Tce, Plympton

Checked by: CJG

Designer: HP

Date:

18/04/2019

Index: 1

STORMWATER CALCULATIONS		REF./COMMENT
<p>Adopting the following City of West Torrens stormwater requirements:</p> <ul style="list-style-type: none">- Restrict post-development 20-year storm event back to the pre-development 20-year storm event- Adopt pre-developmen runoff coefficient of 0.25- Stormwater quality treatment effectiveness to achieve the following:<ul style="list-style-type: none">80% reduction in Total suspended solids (TSS)60% reduction in Total phosphorus (TP)45% reduction in Total nitrogen (TN)90% reduction in Total gross pollutants <p>Result:</p> <ul style="list-style-type: none">- Required detention volume of 16,500L- Adopt an Enviro Australis 'G' Series treatment device which achieves the following:<ul style="list-style-type: none">85% reduction in TSS65% reduction in TP45% reduction in TN90% reduction in Total gross pollutants		

STORMWATER CALCULATIONS

REF./COMMENT

Council Requirements

	Pre	Post
ARI (years)	20	20
tc (min)	5	5

Site BOM IFDs

I(10/1) (mm/h)	25
Pre-dev I(20/5) (mm/h)	30
Post-dev I(20/5) (mm/h)	30

BOM IFD

BOM IFD

BOM IFD

Council Specified Pre-Development Runoff Coefficient

Yes	0.25
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Pre-Development Flow

Site Surfaces	Area (m ²)	f
Roof	227.84	1.0
Concrete/Paved/Bitumen	99.84	0.9
Landscaped	690.16	0.1

Pre-Development
Catchment Plan

Total Area = 1017.84 m²
favg = 0.380

C(10/1) = 0.100
C10 = 0.404

C20 = 0.250

ARR Table 14.6

ARI (years)	Frequency Factor, Fy
1	0.8
2	0.85
5	0.95
10	1
20	1.05
50	1.15
100	1.2

1017.84

ARR Eq. 14.12

ARR Eq. 14.11

ARR Eq. 14.13

Pre Development Flow, Qpre = 2.12 L/s

Qpre = 2.12

5.3.2 Rational Method

(a) The Formula

As used in design, the formula of the Rational Method is:

$$Q_Y = 0.278 C_Y \cdot I_{t_c, Y} \cdot A \quad (5.1)$$

where Q_Y = peak flow rate (m³/s) of average recurrence interval (ARI) of Y years

C_Y = runoff coefficient (dimensionless) for ARI of Y years

A = area of catchment (km²)

$I_{t_c, Y}$ = average rainfall intensity (mm/h) for design duration of t_c hours and ARI of Y years.

The value of 0.278 (or 1/3.6) is merely a conversion factor to balance the units used. If area is in hectares instead of km², the conversion factor is 0.00278 (or 1/360).

$$C_{10}^{10} = 0.1 + (0.7 - 0.1) \times (10I_1 - 25)/(70 - 25) \\ = 0.1 + 0.0133 \times (10I_1 - 25) \quad (14.12)$$

$$C_{10} = 0.9 \times f + C_{10}^{10} \times (1 - f) \quad (14.11)$$

$$C_Y = F_Y \cdot C_{10} \quad (14.13)$$

STORMWATER DETENTION CALCULATIONS

REF./COMMENT

Post-Development Flow

Unrestricted Flow: *Runoff considered to be undetained*

Site Surfaces	Area (m ²)	f
Roof	0	1.0
Concrete/Paved/Bitumen	0	0.9
Landscaped	0	0.1

Total Area = 0 m²

favg = 0.000

C10 = 0.100

C20 = 0.105

Unrestricted Post Development Flow, Qun-post = 0.00 L/s

Allowable Flow, Qall = 2.12 L/s

Restricted Flow: *Runoff considered to be detained*

Site Surface	Area (m ²)	f
Impervious	810.64	1.0
Landscaped	207.2	0.1

Total Area = 1017.84 m²

favg = 0.817

C10 = 0.753

C20 = 0.791

Refer to attached detention calculations

Post-Development
Catchment Plan

ARR Eq. 14.11
ARR Eq. 14.13

Qun-post = 0.00

Qall = 2.12

Post-Development
Catchment Plan

ARR Eq. 14.11
ARR Eq. 14.13
C20 = 0.791



Project: 1 Glenburnie Tce, Plympton

Checked by: CJG

Designer: HP

Date: 18/04/2019

Index: 4

STORMWATER DETENTION CALCULATIONS

Detention Calculations

ARI = 20 years

Area = 1017.84 m²

tc = 5 min

C20 = 0.791

Detention Volume Required = 16417 L

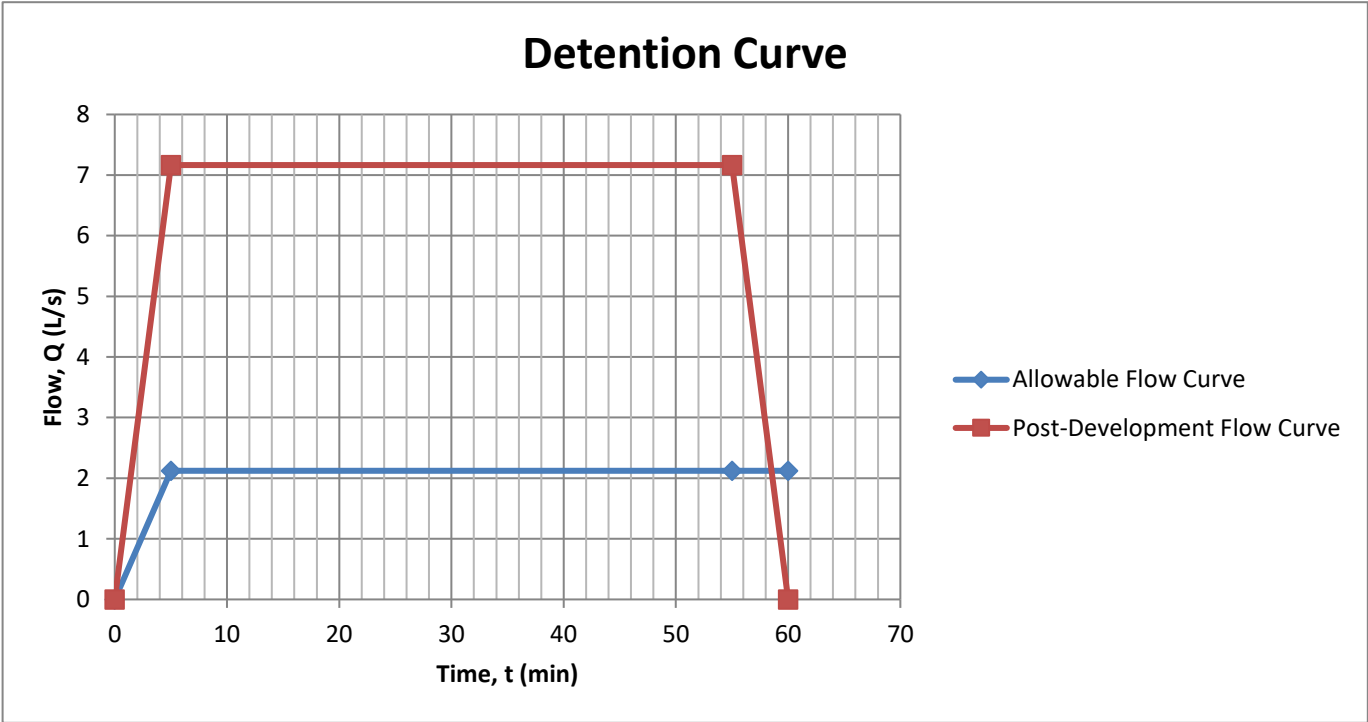
Storm Duration (min)	Intensity (mm/h)	In flow (L/s)	Target Outflow (L/s)	Detention Required (L)
5	120.0	26.8	2.1	7122
6	113.4	25.4	2.1	8074
7	106.8	23.9	2.1	8848
8	100.1	22.4	2.1	9444
9	93.5	20.9	2.1	9864
10	86.9	19.4	2.1	10105
11	83.5	18.7	2.1	10647
12	80.1	17.9	2.1	11097
13	76.8	17.2	2.1	11458
14	73.4	16.4	2.1	11727
15	70.0	15.7	2.1	11906
16	67.9	15.2	2.1	12264
17	65.8	14.7	2.1	12566
18	63.6	14.2	2.1	12810
19	61.5	13.8	2.1	12998
20	59.4	13.3	2.1	13129
21	57.9	13.0	2.1	13383
22	56.4	12.6	2.1	13598
23	55.0	12.3	2.1	13772
24	53.5	12.0	2.1	13907
25	52.0	11.6	2.1	14003
26	50.9	11.4	2.1	14198
27	49.8	11.1	2.1	14364
28	48.8	10.9	2.1	14501
29	47.7	10.7	2.1	14609
30	46.6	10.4	2.1	14688
31	45.9	10.3	2.1	14896
32	45.2	10.1	2.1	15085
33	44.5	10.0	2.1	15255
34	43.8	9.8	2.1	15407
35	43.1	9.6	2.1	15540
36	42.4	9.5	2.1	15654
37	41.7	9.3	2.1	15749
38	41.0	9.2	2.1	15825
39	40.3	9.0	2.1	15883
40	39.6	8.9	2.1	15922
41	38.9	8.7	2.1	15943

42	38.2	8.5	2.1	15944
43	37.5	8.4	2.1	15927
44	36.8	8.2	2.1	15891
45	36.1	8.1	2.1	15837
46	35.7	8.0	2.1	15944
47	35.3	7.9	2.1	16040
48	34.9	7.8	2.1	16125
49	34.5	7.7	2.1	16199
50	34.1	7.6	2.1	16263
51	33.7	7.5	2.1	16316
52	33.3	7.4	2.1	16357
53	32.8	7.3	2.1	16388
54	32.4	7.3	2.1	16408
55	32.0	7.2	2.1	16417
56	31.6	7.1	2.1	16415
57	31.2	7.0	2.1	16402
58	30.8	6.9	2.1	16379
59	30.4	6.8	2.1	16344
60	30.0	6.7	2.1	16299

Maximum Detention Volume (L)	Critical Storm Duration (min)	Peak Inflow (L/s)
16417	55	7.16

Detention Curve Data - Detention volume equal to area between curves

Allowable Flow Curve		Post-Development Flow Curve	
Time (min)	Flow (L/s)	Time (min)	Flow (L/s)
0	0	0	0
5	2.12	5	7.16
55	2.12	55	7.16
60	2.12	60	0





Location

Label: Not provided

Latitude: -34.958 [Nearest grid cell: 34.9625 (S)]

Longitude: 138.5627 [Nearest grid cell: 138.5625 (E)]

IFD Design Rainfall Intensity (mm/h)

Issued: 18 April 2019

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

[FAQ for New ARR probability terminology.](#)

Unit: mm/h ▼

Duration	Annual Exceedance Probability (AEP)						
	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	77.5	88.2	125	154	185	230	269
2 min	67.8	77.1	110	135	162	203	238
3 min	60.5	68.8	97.8	120	144	181	211
4 min	54.8	62.3	88.6	109	131	163	191
5 min	50.2	57.2	81.3	99.8	120	149	174
10 min	36.5	41.5	59.1	72.5	86.9	108	126
15 min	29.3	33.4	47.5	58.4	70.0	87.1	102
20 min	24.9	28.3	40.3	49.5	59.4	74.0	86.3
25 min	21.8	24.8	35.3	43.4	52.0	64.8	75.7
30 min	19.5	22.2	31.6	38.8	46.6	58.0	67.8
45 min	15.1	17.2	24.5	30.1	36.1	45.0	52.6
1 hour	12.6	14.3	20.3	25.0	30.0	37.3	43.6
1.5 hour	9.67	11.0	15.6	19.1	22.9	28.5	33.3
2 hour	8.01	9.09	12.9	15.7	18.8	23.4	27.3
3 hour	6.12	6.94	9.77	11.9	14.2	17.6	20.5
4.5 hour	4.67	5.28	7.40	9.00	10.7	13.2	15.3
6 hour	3.84	4.34	6.05	7.34	8.71	10.7	12.3
9 hour	2.90	3.28	4.54	5.48	6.48	7.89	9.06
12 hour	2.37	2.67	3.68	4.43	5.22	6.32	7.23
18 hour	1.77	1.99	2.72	3.26	3.82	4.59	5.22

Note:

The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.

* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

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GLENBURNIE

TERRACE

GRAY

STREET

D3690

F8369

F20142

2019.04.23 PRE DEVELOPMENT PLAN

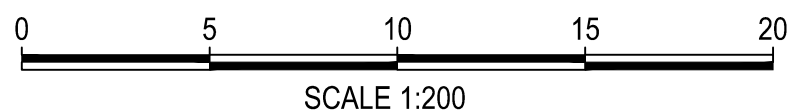
TOTAL SITE AREA, $A_{site} = 1017.84m^2$

TOTAL ROOF AREA, $A_{roof} = 227.84m^2$

TOTAL LANDSCAPE AREA, $A_{land} = 690.16m^2$

TOTAL IMPERVIOUS AREA, $A_{imp} = 99.84m^2$

LEGEND			
<ul style="list-style-type: none"> SURVEY MARK GI NAIL BOLLARD ETSA CONN SIP FIRE HYDRANT FIRE PLUG / STOP VALVE GRATING 	<ul style="list-style-type: none"> BRICK PAVERS WALL BUILDING CENTRE OF CORNICE BANK TOP BANKBOT EDGE BITUMEN EDGE TRACK 	<ul style="list-style-type: none"> GRATING TREE CABLE MARKER TELCO PIT GM GAS METER ICV IRRIGATION TAP SHRUB 	<ul style="list-style-type: none"> SHRUB EDGE TRACK EDGE CONC VERANDAH ROOF LINE WALL EDGE VEGETATION BUILDING GI EDGE GARDEN
<ul style="list-style-type: none"> SPIKE STOBIE SM/H SEWER 	<ul style="list-style-type: none"> SEWER 	<ul style="list-style-type: none"> ETSA METER BORE 	<ul style="list-style-type: none"> SIGN POST WM WATER METER ROAD SIGN LP LIGHT POLE FP FUSE PIT SW IP DP DOWNPIPE
<ul style="list-style-type: none"> FENCE (POST & WIRE) FENCE (GI) UNKNOWN STORMWATER PIPE SEWER WATER ELECTRICAL TELSTRA GAS COMMUNICATIONS 			
<ul style="list-style-type: none"> WT WATERTABLE TK TOP OF KERB EB EDGE OF BITUMEN RL ROOF LEVEL FL FLOOR LEVEL GL GUTTER LEVEL EL EAVE LEVEL TW TOP OF WALL BW BOTTOM OF WALL EC EDGE OF CONCRETE NS NATURAL SURFACE 			



Glenburnie Terrace

2019.04.23 POST DEVELOPMENT PLAN



TOTAL SITE AREA, $A_{site} = 1017.84m^2$

TOTAL IMPERVIOUS AREA, $A_{imp} = 810.64m^2$

TOTAL LANDSCAPE AREA, $A_{land} = 207.20m^2$