WALLBRIDGE GILBERT AZTEC

Humby Consulting

Lot 104 & 105 Port Elliot Rd, Middleton

STORMWATER MANAGEMENT PLAN

Project No. WGA220181
Doc No. WGA220181-RP-CV-0002
Rev. C
12 August 2022

Revision History

Rev	Date	Issue	Originator	Checker	Approver
A	25/07/2022	Draft	RD	SA	SA
B	8/08/2022	Final	RD	SA	SA
C	12/08/2022	Minor Changes	RD	SA	SA

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

Wallbridge Gilbert Aztec (WGA) has been engaged to prepare a Stormwater Management Plan (SMP) for the rezoning of deferred urban land to residential (neighbourhood zone).

The subject land is located on Port Elliot Rd and abuts Basham Beach Rd to the west, Mindacowie Tce to the East and a rail corridor to the South. Refer Figure 1.1 for site locality plan.

This report documents the stormwater management strategy and general stormwater principles to inform the rezoning and subsequent urban development.

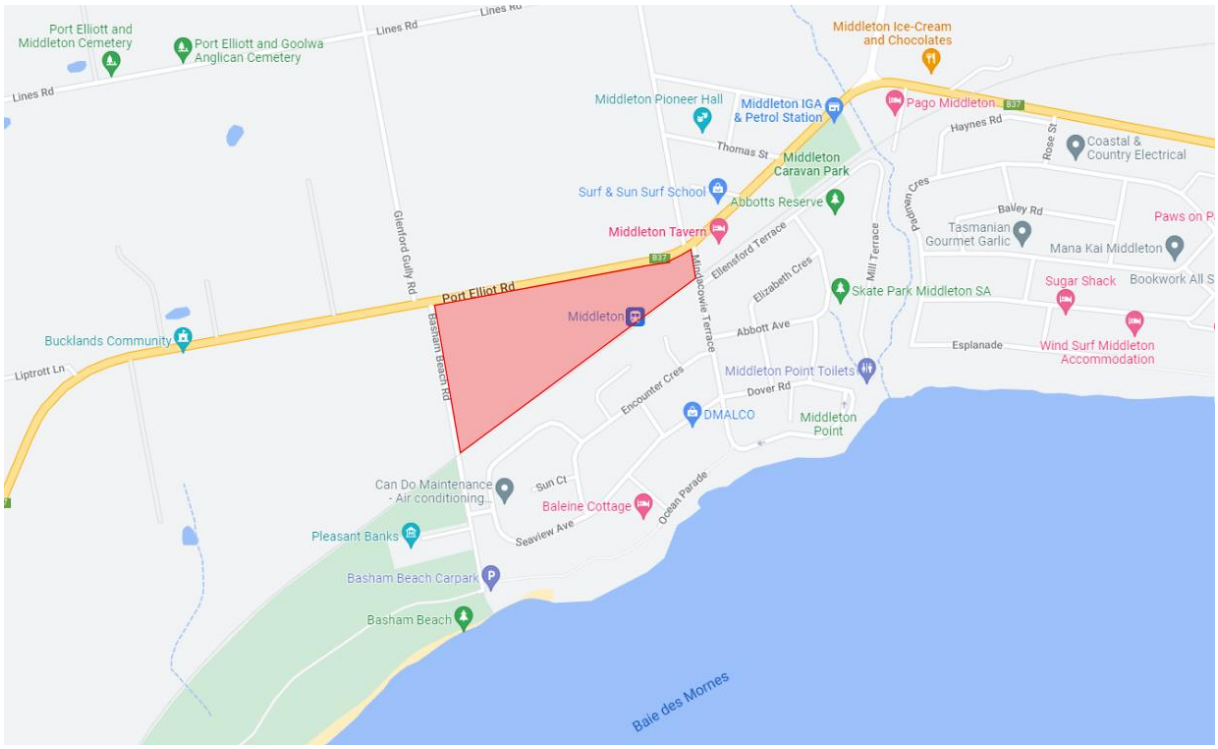


Figure 1.1: Site Locality Plan

2 EXISTING CONDITIONS

2.1 EXISTING SITE

The development site area shown in Figure 2.1 has a total area of approximately 9 ha. Currently, this area is predominately cropped land. The land naturally grades towards the south at a grade of approximately 2%. Surface runoff occasionally accumulates along the railway corridor as this is a level contour. The coastline is approximately 400 m south of the site.

2.2 EXISTING STORMWATER NETWORK

Alexandrina Council (Council) advised that there is currently no suitable stormwater infrastructure near the site available to receive drainage from the development. Council's preference is for development runoff to be transferred via a new drain and discharged to sea via a new outfall structure.

Figure 2.1: Site Aerial Image

3 STORMWATER MANAGEMENT REQUIREMENTS

3.1 STAKEHOLDER REQUIREMENTS

3.1.1 Alexandrina Council

Council provided the following advice regarding stormwater management requirements on 25 May 2022:

- **On-Site Detention Requirements**

  On-site detention not required if stormwater system is catered for 20 years. Smaller system with detention basin option can be assessed, however, the development would need to detain 100-year post to 10-year pre in this instance.

- **Stormwater Quality Requirements**

  Meet EPA water quality improvement targets noting EPA and DEW may have additional requirements regarding discharge to ocean.

  Council also advised that Water Sensitive Urban Design (WSUD) is becoming a maintenance issue. Therefore, achieving targets via a new Gross Pollutant Trap (GPT) would be a better outcome than WSUD for Council.

- **Finished Floor Level Requirements**

  Finished floor level to be above adjacent roadway typically 250-300 mm above road centreline.

3.1.2 Environmental Protection Authority

The Environment Protection Authority (EPA) advised that the following water quality treatment reduction targets of the typical urban average annual load should be met:

- Total Suspended Solids (TSS) 80%
- Total Phosphorus (TP) 60%
- Total Nitrogen (TN) 45%

Previous EPA advice is provided below which should also be met by the development:

- Retention of litter greater than 50mm for flows up to a 3-month Average Recurrence Interval (ARI) peak flow
- No visible oils for flows up to a 3-month ARI peak flow
- Compliance to Environment Protection Policy (Water Quality) 2015, under the Environment Protection Act, 1993.

Based on the EPP Water Quality (2015) for freshwater environments, the listed pollutant concentrations will be used as the limiting targets in the stormwater discharge. These are based on the general water quality criteria listed EPP (2015) and are listed below for reference.

- Total Phosphorous = 0.5 mg/L
- Total Nitrogen = 5 mg/L
- Suspended Sediment = 20 mg/L.

3.1.3 Department of Environment and Water

The Department of Environment and Water (DEW) provided the following information over the phone regarding stormwater management requirements on 19 May 2022:

> *It's important to know 'Mean High Water Mark' (MHWM) relative to the outfall structure and choose suitable rock size. Scour and erosion prevention is most important. Rock at the outfall to break up the energy and minimise this is required. Sizing of rock shouldn't be too small (e.g., 100 mm), as rocks will wash away. However, 1 m rock is too big. Needs to be somewhere in between. If waves are far above scour apron, then 300 mm is likely OK. But if not far off, and waves lap against it, then rock size likely >300 mm. Objective is to ensure rocks don't move.*
>
> *Non return flap valve can be used. Alternatively, a duck bill rubber valve can also be used.*

3.1.4 References

The stormwater approach for the proposed development site adopts the design standards, principles and practices covered by the following recognised references:

- EPA Environment Protection Act 1993, (Water Quality) Policy 2015 (WQ EPP 2015)
- Alexandrina Council Design Guidelines for the Provision of Infrastructure and Other Assets (December 2008)
- WSUD Engineering Procedures – Stormwater (2005)
- Australian Runoff Quality, Engineers Australia (2006); and Water Sensitive Urban Design - Greater Adelaide Region Technical Manual (Dec 2010).

4 STORMWATER QUANTITY MANAGEMENT

4.1 STORMWATER MANAGEMENT CRITERION

Per correspondence with Council, there are two options regarding stormwater management:

- **Option 1: System Without On-Site Detention**
  Sized to accommodate 20-year (5% AEP) storm.

- **Option 2: System With On-Site Detention**
  Sized to detain 100-year (1% AEP) post to 10-year (10% AEP) pre.

4.2 STORMWATER TRANSFER METHOD

As per Council's advice and preference, it is proposed that the development runoff would be transferred via a new drain and discharged to sea via a new outfall structure. The new drain alignment is proposed to be within Mindacowie Tce. The drain vertical and horizontal alignment will be confirmed at detailed design.

4.3 PRE AND POST CONDITIONS

The calculated and nominated pre and post site drainage parameters are as follows:

- Development catchment area = 8.85 ha
- External catchment area = 0 ha
- 10% AEP Pre-Development Runoff Coefficient = 0.1
- 1% AEP Post-Development Runoff Coefficient = 0.55
- Time of Concentration calculation method: The Kinematic Wave Equation
- Pre-Development Manning's Roughness Coefficient = 0.07
- Post-Development Manning's Roughness Coefficient = 0.04
- 10% AEP Pre-Development Time of Concentration = 35 mins
- 1% AEP Post-Development Time of Concentration = 36 mins
- 5% AEP Post-Development Time of Concentration = 41 mins

- Pre-development 10% AEP storm event flow rate = 87 L/s.

4.4 OPTION 1: SYSTEM WITHOUT DETENTION

4.4.1 Internal System Sizing

The 20-year (5% AEP) internal stormwater system will be sized at detailed design.

4.4.2 Transfer Drain Sizing

A DRAINS model was prepared to size the transfer drain required to accommodate a 20-year (5% AEP) storm. From the modelling, it is recommended for the transfer RCP diameter to be between 600-750 mm. Other key outcomes from calculations and modelling include:

- Post-development 5% AEP storm event flow rate = 474 L/s
- Critical storm duration = 25min event.

Refer to Appendix A for the Concept Plan and Appendix C for DRAINS model and results output.

4.5 OPTION 2: SYSTEM WITH DETENTION

4.5.1 Internal System Sizing

The 10-year (10% AEP) internal stormwater system will be sized at detailed design.

4.5.2 Transfer Drain and Detention Basin Sizing

A DRAINS model was prepared to calculate the minimum detention volume, outlet controls and transfer drain required. To detain 100-year (1% AEP) post to 10-year (10% AEP) pre, the DRAINS model indicated the following minimum requirements:

- Detention basin volume = 3.05 ML
- Transfer drain = DN375
- Orifice size = 230 mm.

Other key outcomes from calculations and modelling include:

- Post-development 1% AEP storm event flow rate = 86 L/s
- Critical storm duration = 6hr event.

The detention basin area is estimated to be approximately 3,050 m^2 (assuming 1 m depth). Based on current estimate, the basin may be required to take up the entire eastern reserve. The detention basin shape and footprint will be confirmed at detailed design.

Refer to Appendix C for DRAINS model and results output.

5 STORMWATER QUALITY MANAGEMENT

5.1 STORMATER MANAGEMENT CRITERION

Per correspondence with Council, the development site must achieve the EPA water quality reduction targets. It is preferrable that this is achieved via a new GPT.

5.2 GPT SIZING

GPTs are primarily designed to remove gross pollutants from stormwater and can play an integral role in reducing pollution in urbanised catchments that discharge into waterways.

To ensure water quality reduction targets are achieved, the GPT must be adequately sized. The treatable flow rate is the maximum flow that a GPT can treat to achieve the desired pollutant capture criteria for a particular development. Greater flows will bypass the unit. Typically, GPTs should be designed to treat the 1-in-3-month ARI flow.

The post-development 3-month (4 EY) flow was calculated to be approximately 66 L/s. Therefore, the GPT for the development must have a treatable flow rate of at least 66 L/s.

5.3 VEGETATED SWALE

A vegetated swale is also proposed to be provided along southern boundary of the reserve between pipework to assist in treatment. The swale will be planted with reeds which would become a feature on the edge of the park.

6 SUMMARY

The development will need to manage stormwater runoff by either of the following two options:

- **Option 1: System Without On-Site Detention**
  Sized to accommodate 20-year (5% AEP) storm.

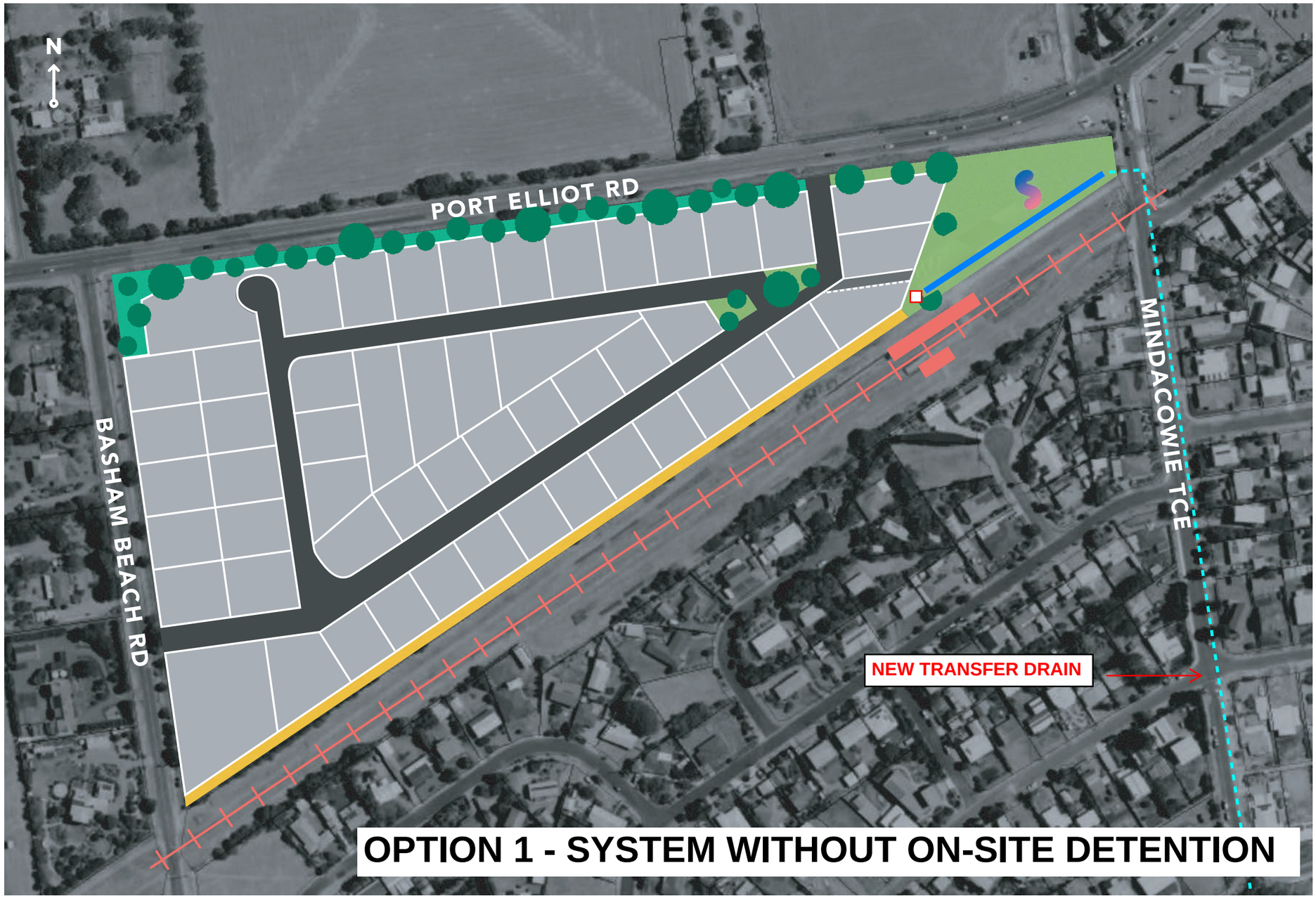
- **Option 2: System With On-Site Detention**
  Sized to detain 100-year (1% AEP) post to 10-year (10% AEP) pre.

The preference by the client is Option 1. This is to ensure the reserve is usable and provides amenity to the community.

- To accommodate 20-year (5% AEP) storm (Option 1), the DRAINS model indicated that the transfer drain diameter should be between 600-750 mm.
- The internal stormwater system for either option will be sized at detailed design.
- Stormwater quality treatments include:
  - One GPT with treatable flow rate of at least 66 L/s
  - A vegetated swale will also be provided in the reserve between pipework to assist in treatment.
- Stormwater runoff will be transferred via a new drain installed within Mindacowie Tce to a new outfall structure. The drain vertical and horizontal alignment will be confirmed at detailed design.
- The outfall structure should be designed in accordance with DEW requirements ensuring suitable erosion and scour protection. The design should also minimise visual intrusion with consideration to the surrounding natural environment.

APPENDIX A

Proposed Concept Plan



LEGEND

- Allotment
- Easement
- Road
- Reserve
- Vegetated Screening
- Bicycle/Walking Reserve
- Playground
- Vegetated Swale
- Trees
- Train Platform
- Train Track
- GPT

Proposed Concept Plan

Middleton Rezoning

LOT 104 PORT ELLIOT RD &
LOT 105 MINDACOWIE TCE

52 Allotments

March 2022
Scale 1:3000

HUMBY CONSULTING

APPENDIX B

Stormwater Calculations

Time of Concentration - Kinematic Wave

PRE-DEVELOPMENT FLOW		
L	264	*m*
n	0.07	
S	0.0219	*m/m*

10% AEP		
I	35.40	*mm/hr*
tc	30.2	*mins*
	0.0	

tc	30.2	mins
1% AEP	35.4	mm/hr

10% AEP PRE-DEVELOPMENT FLOW RATE

C	0.10	
I	35.40	
A	8.85	
Q 10%	0.09	m3/s
Q 10%	87.03	L/s

POST-DEVELOPMENT FLOW			
L	555	*m*	
n	0.04		
S	0.0090	*m/m*	0.9%

1% AEP		
I	60.50	*mm/hr*
tc	35.5	*mins*
	0.0	

tc	35.5	mins
1% AEP	60.5	mm/hr

1% AEP POST-DEVELOPMENT FLOW RATE (W/OUT DISCHARGE CONTROL)

C	0.55	
I	60.50	
A	8.85	
Q 1%	0.82	m3/s
Q 1%	816.99	L/s

POST-DEVELOPMENT FLOW		
L	555	*m*
n	0.04	
S	0.0090	*m/m*

4 EY		
I	7.38	*mm/hr*
tc	82.3	*mins*
	0.0	

tc	82.3	mins
1% AEP	7.4	mm/hr

3-MONTH ARI POST-DEVELOPMENT FLOW FOR GPT SIZING

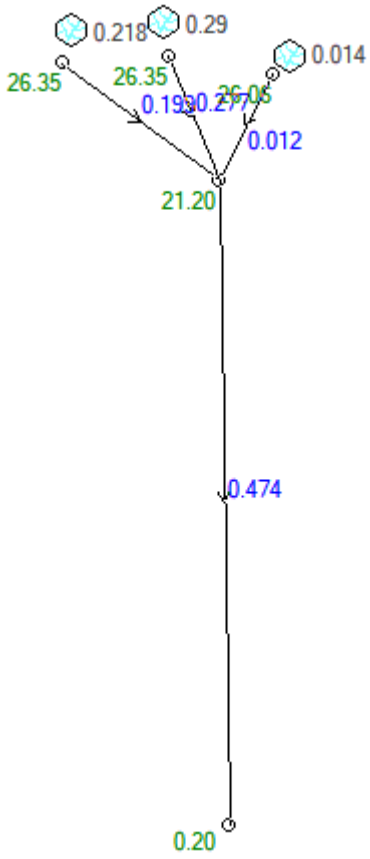
Method: BOM IFD

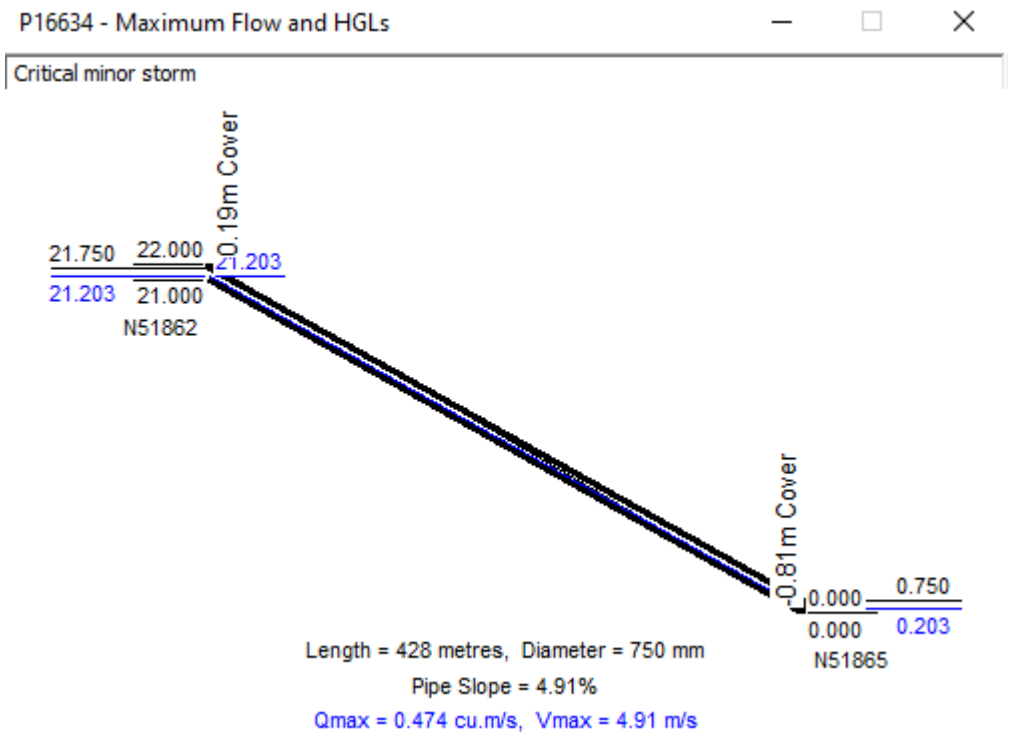
C	0.37	
I	7.38	
A	8.85	
Q 3 month	0.07	m3/s
Q 3 month	66.44	L/s

APPENDIX C

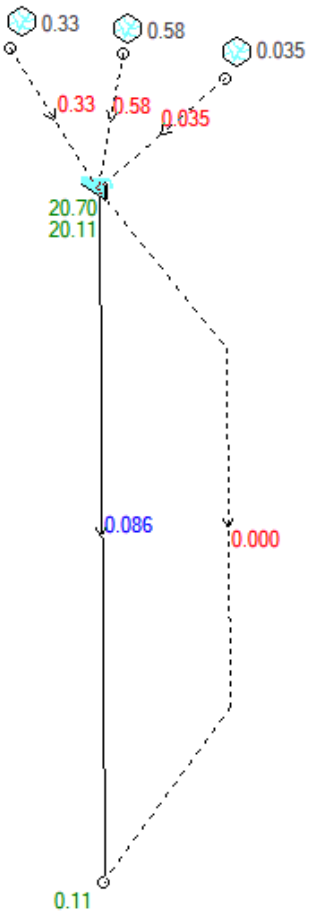
DRAINS Model Results

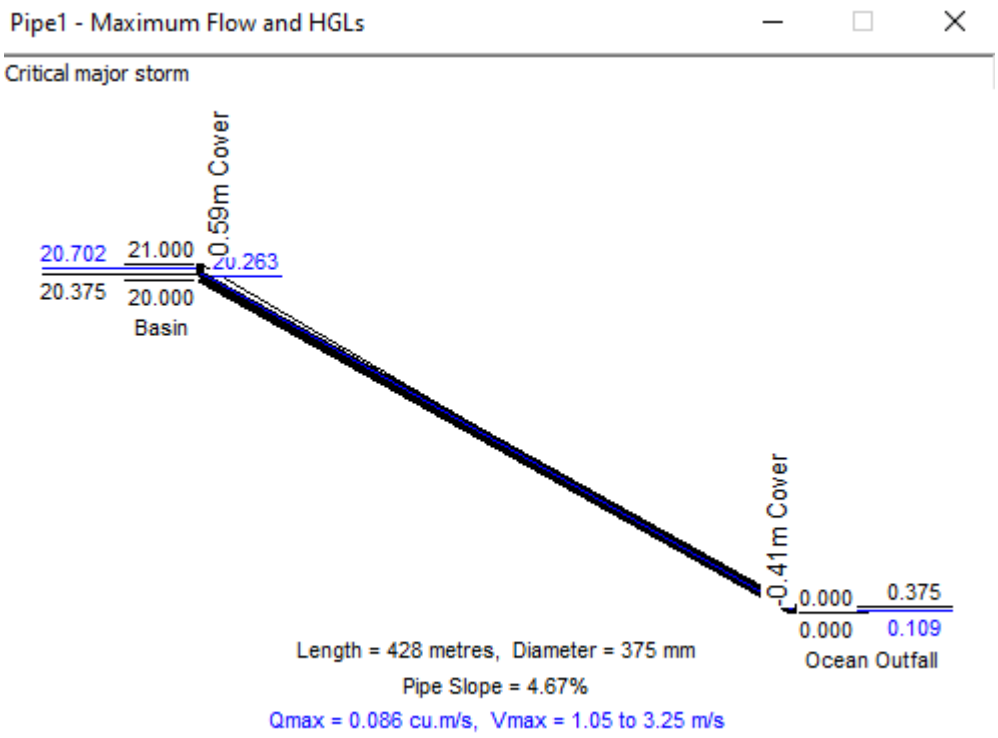
DRAINS RESULTS – OPTION 1 – 5% AEP STORM EVENT





DRAINS RESULTS – OPTION 2 – 1% AEP STORM EVENT





Robbie Dixon
CIVIL ENGINEER

Telephone: 08 8223 7433

Email: rdixon@wga.com.au

ADELAIDE
60 Wyatt St
Adelaide SA 5000
Telephone: 08 8223 7433
Facsimile: 08 8232 0967

MELBOURNE
Level 2, 31 Market St
South Melbourne VIC 3205
Telephone: 03 9696 9522

PERTH
634 Murray St
West Perth WA 6005
Telephone: 08 9336 6528

DARWIN
Suite 7/9 Keith Ln
Fannie Bay NT 0820
Telephone: 08 8941 1678
Facsimile: 08 8941 5060

WHYALLA
1/15 Darling Tce
Whyalla SA 5600
Phone: 08 8644 0432

WALLBRIDGE GILBERT AZTEC
www.wga.com.au
adelaide@wga.com.au