HYDRAULIC DESIGN REPORT

FE-24035 PERFORMANCE SOLUTION REPORT

Document Information

Title	Client	Document Number	Project Manager
647 East Derwent Hwy, Risdon TAS 7015 Performance Solution Report	**Clarence Lifestyle Village**	FE-24035	**Manuri Alwis** *BEng (Hons)* ***Civil Engineer***

Document Initial Revision

REVISION 00	Staff Name	Signature	Date
Prepared by	Manuri Alwis ***Civil Engineer***	[redacted]	20/05/2024
Reviewed by	Ash Perera ***Civil Hydraulic Engineer***		29/05/2024
Authorised by	Max W. Möller ***Principal Hydraulic Engineer***		29/05/2024

Document Revision History

Rev No.	Description	Reviewed by	Authorised by	Date
01	Flow rate summary table	Max W. Möller	Max W. Möller	18/07/2024

© 2024 Flüssig Engineers

This document is and shall remain the property of **Flüssig Engineers**. The document may only be used for the purposes for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form is prohibited.

INTRODUCTION

This report details the stormwater management strategies for the proposed development at 647 East Derwent Hwy, Risdon TAS 7015. The objective of the report is to demonstrate how stormwater runoff will be captured and conveyed from the subject site safely to the receiving drainage network, while considering stormwater quantity management and the incorporation of bioretention basins.

This report should be read in conjunction with the Stormwater Design Proposal by JSA (JSA Reference: 17L99-118-4) dated 24th October 2023, and the Planning Approval Drawings named "17E99-118-A - Civil & Hydraulic – 20231025" dated 25th October 2023.

EXISTING CONDITIONS AND ASSUMPTIONS

The site covers an area of approximately 26,000m². The pre-development site is modelled as 1% impervious and 99% pervious, while the post-development site is modelled as 62% impervious and 38% pervious, as described in the Stormwater Design Proposal by JSA (refer to appendix C).

The stormwater management report is prepared in accordance with the design criteria listed below:

- The stormwater drainage system is designed using Bureau of Meteorology (BOM) published rainfall Intensity Frequency Duration (IFD) data as a minor / major system to accommodate the 1% AEP / 20 min storm events.
- The flow rate of stormwater leaving the site shall be designed so that it does not exceed the pre-developed flow rate for both the minor and major rain events.
- The total site discharges are modelled as described in *Storm Drainage Design in Small Urban Catchments,* a handbook for Australian practice by *Australian Rainfall and Runoff (ARR2019)*, Book 9 – Runoff in Urban Areas.

Stormwater from the site will be routed through the proposed conventional underground drainage system, comprising grated sumps and PVC pipes, coupled with bioretention basins. The runoff from all proposed impervious areas will be directed through the underground pipe network into the bioretention basins.

PERFORMANCE SOLUTION COMPLIANCE

AS 3500.3 – CL 7.10	7.10.1 – Overflow is safe and does not compromise freeboard to habitable spaces.
General	• AS/NZS 3500.3: Part 3 Stormwater Drainage • Australian Rainfall and Run-off Volume 8: Urban Stormwater Management • Australian Runoff Quality – A Guide to Water Sensitive Urban Design • Storm drainage design in small urban catchments: A handbook for Australian practice • Water Sensitive Urban Design (WSUD) Engineering Procedure: Stormwater • Water Services Association of Australia Code (WSAA).

DETENTION DESIGN

Detention calculations for 1% AEP are provided in Appendix B with the following summary:

Detention = 259.2m^3

Permissible Site Discharge (PSD) = 145.88L/s

	Pre-development		Post-development	
Land Use	**Area m²**	**% Total land**	**Area m²**	**% Total land**
Total Pervious	25740	99	9880	38
Total Impervious	260	01	16120	62

As per stormwater management best practices, the post-development allowable site discharge must not exceed the pre-development site discharge. As shown in the figures above, this is exceeded during the 1% AEP 20-minute storm duration, with a PSD of 145.88 L/s from the impervious areas. Therefore, the site must detain the difference using an onsite stormwater detention (OSD) system with a total minimum detention volume of 259.2m³ within the bioretention basins.

BIORETENTION BASIN DESIGN

Current calculation for 5% AEP

In accordance with the Stormwater Design Proposal by JSA (JSA Reference: 17L99-118-4) and planning Approval Drawings the current bioretention basins for 5% AEP as follows.

	Note	Bioretention basin 1	Bioretention basin 2
Current total volume (m^3)	Planning approval drawing DWG NO C03 by JSA	227.0	206.0
Area (m^2)	Planning approval drawing DWG NO C03 by JSA	324.0	294.0
Filter depth (m)	MUSIC model by JSA	0.45	0.45
Calculated total depth (m)	Current total volume (m^3)/ Area (m^2)	0.70	0.70
Calculated extended detention depth (m)	Calculated total depth (m) – Filter depth (m)	0.25	0.25
Calculated current detention volume (m^3)	Calculated extended detention depth (m) X Area (m^2)	81.2	73.7

As per the above calculation, the total current detention volume within bioretention basins is 154.9m^3 for 5% AEP.

Proposed calculation for 1% AEP

According to the 1% AEP calculations, minimum detention required is 259.2m^3. As per above calculations, the total current detention volume available is 154.9m^3. Therefore, to meet the detention requirements for the 1% AEP, an additional 104.3m^3 detention is required.

To meet this demand, an additional extended detention depth of 0.20m is proposed in each bioretention basin. Therefore, each detention basin will be 0.90m deep with 0.45m filter depth and 0.45m proposed extended detention depth. Thus, bioretention basin 1 and bioretention basin 2 required to have proposed detention volume of 146m^3 and 133m^3 respectively totalling 279.0m^3 of total proposed detention volume.

The total proposed detention volume of 279.0m^3 exceeds the minimum required 259.2m^3 for 1% AEP detention calculations as per Appendix B.

	Note	Bioretention basin 1	Bioretention basin 2
Proposed total volume (m^3)	By calculations	292.0	265.0
Area (m^2)	Planning approval drawing DWG NO C03 by JSA	324.0	294.0
Filter depth (m)	MUSIC model by JSA	0.45	0.45
Proposed total depth (m)	Proposed extended detention depth (m) + filter depth (m)	0.90	0.90
Proposed extended detention depth (m)	Additional extended detention depth (m) + Calculated extended detention depth (m)	0.45	0.45
Proposed detention volume (m^3)	Proposed extended detention depth X Area (m^2)	146.0	133.0

PROPOSED BIORETENTION BASIN SUMMARY

Area (m^2) of bioretention basins is kept constant as per Planning Approval Drawings named "17E99-118-A - Civil & Hydraulic – 20231025".

Filter depth (m) is kept constant as per MUSIC modelling on Stormwater Design Proposal by JSA (JSA Reference: 17L99-118-4).

	Bioretention basin 1	Bioretention basin 2
Area (m^2)	324	294
Filter depth (m)	0.45	0.45
Proposed detention depth (m)	0.45	0.45
Proposed total depth (m)	0.90	0.90
Proposed detention volume (m^3)	146	133
Proposed total volume (m^3)	292	265

FLOW RATE & DETENTION SUMMARY

Scenario	Pre-development flow rate (L/s)	Post development flow rate with detention or Permissible Site Discharge (L/s)	Minimum detention required (m^3)	Proposed total volume (Filter & detention volume) (m^3)	Calculation method
5% AEP *(JSA)*	167.00	134.00	N/A	433.00	DRAINS Software
1% AEP *(Flussig Engineers)*	141.37	145.88	259.20	557.00	Structural toolkit Swinburne method

GENERAL MAINTENANCE

To ensure the ongoing operation of all treatment systems, bioretention basins and all treatment devices should be regularly maintained. This includes, but is not limited to, the general maintenance information described below.

Task	Action	Frequency
General Cleaning – gutters, downpipe, filters etc.	Clear all pollutants from storage and device filters, ensure operational	Every 3 months
Specialised cleaning and inspection	Inspect all storage, inflow, and outflow – clean and flush if required. Visually inspect bioretention basin for defects and blockage.	Yearly
Maintenance	Perform detailed inspection and maintenance of basin and associated infrastructure by a qualified person.	Every 5 years

SUMMARY AND CONCLUSIONS

- Detention requirements to be adopted as per design and documentation.
- The designed solution complies with the performance solution design check carried out above.
- The total proposed detention volume of 279.0m^3 exceeds the minimum required 259.2m^3 detention as per calculations on Appendix B.

APPENDIX A

STORMWATER DESIGN DRAWINGS