Attachment to item number 5.1 -

Bushfire Hazard Report; and

Flood Hazard Report

GES

GEO-ENVIRONMENTAL

SOLUTIONS

Proposed Subdivision

40 Erle Street, Carlton River

Bushfire Hazard Report

Applicant: I. R. Woolley.

September 2023, J9272v1

Geo-Environmental Solutions - 29 Kirksway Place, Battery point, Tasmania, 7004.
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Contents

1.0 Introduction

This Bushfire Hazard Report has been completed to form part of supporting documentation for a planning permit application for a proposed subdivision. The proposed subdivision occurs in a Bushfire-prone Area defined by the Tasmanian Planning Scheme -Sorell (the Scheme). This report has been prepared by Mark Van den Berg a qualified person under Part 4a of the *Fire Service Act 1979* of Geo Environmental Solutions Pty Ltd for I. R. Woolley.

The report considers all the relevant standards of Code C13 of the planning scheme, specifically;

- The requirements for appropriate Hazard Management Areas (HMA's) in relation to building areas;
- The requirements for Public and Private access;
- The provision of water supplies for firefighting purposes;
- Compliance with the planning scheme, and
- Provides a Bushfire Hazard Management Plan to facilitate appropriate compliant future development.

Covenants are required to validate this report and bushfire hazard management plan and relate to the maintenance of hazard management areas (see s5.1).

2.0 Proposal

It is proposed that a 6 lot subdivision is developed on the site described as per the proposed plan of subdivision in appendix A. Public access to new lots will be provided by Erle Street, an existing public roadway. The development is proposed to occur as a single stage. All proposed lots are undeveloped.

3.0 Site Description

The subject site comprises private land on one title at 40 Erle Street, Carlton River, FR: 113113/1 (figure 1). The site occurs in the municipality of Sorell, this application is administered through the Tasmanian Planning Scheme -Sorell which makes provision for subdivision. The proposed development occurs within the low-density residential zone.

The site is located within the eastern extent of the Carlton settled area adjacent to the Carlton River estuary, approximately 1.5km north-east of Carlton Bluff (figure 1). The subdivision area is is dominated by grassland as are adjacent lands which are significantly fragmented by residential development. The sites have gentle slopes with a generally southerly aspect, surrounding lands comprise both developed and un-developed areas characterised by a mosaic of grassland vegetation and residential development (figure 2).

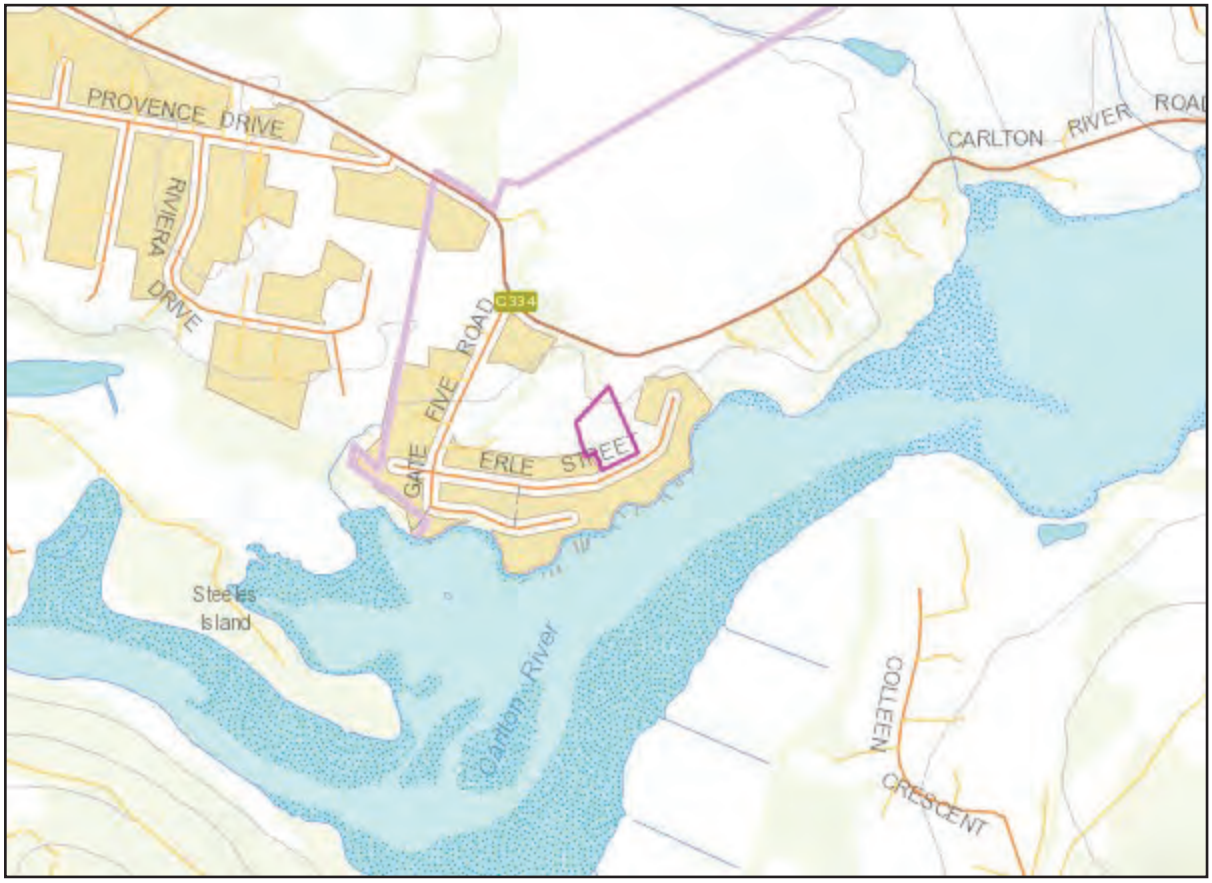


Figure 1. The site in a topographical context, pink line defines the subdivision boundary (approx.).

Figure 2. Aerial photo of the site, pink line denotes the subdivision area (approximate).

4.0 Bushfire Hazard Assessment

4.1 Vegetation

The site and adjacent lands within 100 metres of the proposed building areas carry a mosaic of grassland and Patches of native woodland vegetation significantly fragmented by existing residential developments typical of the southern beaches (figures 3 to 5). Lands to the east and south are fragmented by residential development on small and medium size lots and carry low threat vegetation. The highest risk vegetation occurs to the north and west of the sites and comprises grassland vegetation with regenerating cleared land.

4.2 slopes

The effective slopes in relation to the proposed new lots are gentle (<5 degrees) and are unlikely to have a significant impact on the bushfire attack at the building areas.

Figure 3. Low threat vegetation east of the building area on lots 5 & 6.

Figure 4. Grassland vegetation adjacent and west of lot 3 from the building area on lot 3.

Figure 5. Grassland vegetation adjacent and north of lots 3, 4 and 5 from the building area within lot 4.

4.3 Bushfire Attack Level

An assessment of vegetation and topography was undertaken within and adjacent to the subdivision area. A bushfire attack level assessment as per *AS3959-2018* was completed which has determined setbacks for each building area from bushfire-prone vegetation such that subsequent residential development does not exceed BAL-19 of AS3959-2018 (appendix B). The building areas and bushfire attack level are identified on the BHMP.

5.0 Bushfire Prone Areas Code

Code C13 of the planning scheme articulates requirements for the provision of hazard management areas, standards for access and firefighting water supplies and requirements for hazard management for staged subdivisions.

5.1 Hazard Management Areas

Hazard management areas are required to be established and maintained for all lots, they provide an area around the building within which fuels are managed to reduce the impacts of direct flame contact, radiant heat and ember attack on the site.

5.1.1 Securing hazard management areas

In this circumstance each lot is dependent on adjacent lots (which are part of this subdivision) for bushfire protection. Each lot will have a hazard management area established as part of the subdivision works prior to the sealing of titles. On going maintenance of hazard management areas will be the responsibility of each lot owner. Hazard management areas for each lot are to be secured through a covenant on each title such that the bushfire fuels are prevented from developing and lots are maintained in a minimum fuel

condition. A covenant will be required for any balance land should unplanned staging of the subdivision occur. The covenants will be required to be in place for this report and associated bushfire hazard management plan to be valid.

The Bushfire Hazard Management Plan (BHMP) shows building areas (for habitable buildings) and associated HMA's for each lot, guidance for establishment and maintenance of HMA's is provided below.

The subdivision is to occur as a single stage. Each proposed lot can accommodate a hazard management area with sufficient separation from bushfire-prone vegetation not exceeding the requirements for BAL-19 of AS3959-2018.

5.1.2 Building areas

Building areas for habitable buildings on each lot are shown on the BHMP. Each lot has been assessed and a Bushfire Attack Level (BAL) assigned to it. If future buildings are located within the building area and comply with the minimum setbacks for the lot, the buildings may be constructed to the bushfire attack level assigned to that lot. If associated structures like sheds or other non-habitable buildings exist or are proposed, they do not need to conform to a BAL unless they are within 6 metres of the habitable building.

5.1.3 Hazard Management Area requirements

A hazard management area is the area, between a habitable building or building area and the bushfire prone vegetation which provides access to a fire front for firefighting, is maintained in a minimal fuel condition and in which there are no other hazards present which will significantly contribute to the spread of a bushfire. This can be achieved through, but is not limited to the following strategies;

- Remove fallen limbs, sticks, leaf and bark litter;
- Maintain grass at less than a 100mm height;
- Avoid or minimise the use of flammable mulches (especially against buildings);
- Thin out under-story vegetation to provide horizontal separation between fuels;
- Prune low-hanging tree branches (<2m from the ground) to provide vertical separation between fuel layers;
- Remove or prune larger trees to establish and maintain horizontal separation between tree canopies;
- Minimise the storage of flammable materials such as firewood;
- Maintain vegetation clearance around vehicular access and water supply points;
- Use low-flammability plant species for landscaping purposes where possible;
- Clear out any accumulated leaf and other debris from roof gutters and other debris accumulation points.

It is not necessary to remove all vegetation from the hazard management area, trees and shrubs may provide protection from wind borne embers and radiant heat under some circumstances if other fuels are appropriately managed.

5.2 Public and firefighting Access

5.2.1 Public Roads

There is no proposal for the construction of new public roadways, in this circumstance there are no applicable standards for the construction of new public roads.

5.2.2 Property access (for building compliance)

Property access will be required to be established to access static water supply connection points. For property accesses greater than 30 metres in length, the following design and construction standards apply:

(a) All-weather construction;

(b) Load capacity of at least 20 tonnes, including for bridges and culverts;

(c) Minimum carriageway width of 4 metres;

(d) Minimum vertical clearance of 4 metres;

(e) Minimum horizontal clearance of 0.5 metres from the edge of the carriageway;

(f) Cross falls of less than 3° (1:20 or 5%);

(g) Dips less than 7° (1:8 or 12.5%) entry and exit angle;

(h) Curves with a minimum inner radius of 10 metres;

(i) Maximum gradient of 15° (1:3.5 or 28%) for sealed roads, and 10° (1:5.5 or 18%) for unsealed roads; and

(j) Terminate with a turning area for fire appliances provided by one of the following:

(i) A turning circle with a minimum outer radius of 10 metres;

(ii) A property access encircling the building; or

(iii) A hammerhead “T” or “Y” turning head 4 metres wide and 8 metres long

For property accesses less than 30 metres in length, there are no specific design or construction standards required.

5.3 Water supplies for firefighting (for building compliance)

The subdivision is not serviced by a reticulated water supply. In this circumstance, a static water supply dedicated for firefighting for each building area which is compliant with the specifications of table 1 will be required at the time each individual lot is developed.

Table 1. Specifications for static water supplies for firefighting.

Element		Requirement
A	Distance between building area to be protected and water supply	The following requirements apply: (a) The building area to be protected must be located within 90 metres of the firefighting water point of a static water supply; and (b) The distance must be measured as a hose lay, between the firefighting water point and the furthest part of the building area.
B	Static Water Supplies	A static water supply: (a) May have a remotely located offtake connected to the static water supply; (b) May be a supply for combined use (firefighting and other uses) but the specified minimum quantity of firefighting water must be available at all times; (c) Must be a minimum of 10,000 litres per building area to be protected. This volume of water must not be used for any other purpose including firefighting sprinkler or spray systems; (d) Must be metal, concrete or lagged by non-combustible materials if above ground; and (e) If a tank can be located so it is shielded in all directions in compliance with Section 3.5 of

Element		Requirement
		AS 3959-2018, the tank may be constructed of any material provided that the lowest 400 mm of the tank exterior is protected by: (i) metal; (ii) non-combustible material; or (iii) fibre-cement a minimum of 6 mm thickness.
C	Fittings, pipework and accessories (including stands and tank supports)	Fittings and pipework associated with a fire fighting water point for a static water supply must: (a) Have a minimum nominal internal diameter of 50mm; (b) Be fitted with a valve with a minimum nominal internal diameter of 50mm; (c) Be metal or lagged by non-combustible materials if above ground; (d) Where buried, have a minimum depth of 300mm (compliant with AS/NZS 3500.1-2003 Clause 5.23); (e) Provide a DIN or NEN standard forged Storz 65 mm coupling fitted with a suction washer for connection to firefighting equipment; (f) Ensure the coupling is accessible and available for connection at all times; (g) Ensure the coupling is fitted with a blank cap and securing chain (minimum 220 mm length); (h) Ensure underground tanks have either an opening at the top of not less than 250 mm diameter or a coupling compliant with this Table; and (i) Where a remote offtake is installed, ensure the offtake is in a position that is: (i) Visible; (ii) Accessible to allow connection by firefighting equipment, (iii) At a working height of 450 – 600mm above ground level; and (iv) Protected from possible damage, including damage by vehicles.
D	Signage for static water connections	Signage for static water connections The firefighting water point for a static water supply must be identified by a sign permanently fixed to the exterior of the assembly in a visible location. The sign must: (a) comply with the water tank signage requirements within *Australian Standard AS2304-2011 Water storage tanks for fire protection systems*; or (b) comply with the Tasmania Fire Service Water Supply Guideline published by the Tasmania Fire Service
E	A hardstand area for fire appliances must be provided:	(a) no more than three metres from the firefighting water point, measured as a hose lay (including the minimum water level in dams, swimming pools and the like); (b) no closer than six metres from the building area to be protected; (c) a minimum width of three metres constructed to the same standard as the carriageway; and (d) connected to the property access by a carriageway equivalent to the standard of the property access.

6.0 Compliance

6.1 Planning Compliance

Table 2 summarises the compliance requirements for subdivisions in bushfire prone areas against Code C13 as they apply to this proposal. A planning certificate has been issued for the associated BHMP as being compliant with the relevant standards as outlined below and is in appendix D.

Table 2. Compliance with Code C13 of the Tasmanian Planning Scheme - Sorell

Clause	Compliance
C13.4 Use or development exempt from this code	Not applicable.
C13.5 1 Vulnerable Uses	Not applicable.
C13.5.2 Hazardous Uses	Not applicable
C13.6.1 Subdivision: Provision of hazard management areas	The Bushfire Hazard Management Plan is certified by an accredited person. Each lot within the subdivision has a building area and associated hazard management area shown which is suitable for BAL-19 and BA:12.5 construction standards. Covenants are required for each lot to validate this bushfire hazard management plan and associated bushfire hazard report. The proposal is compliant with the acceptable solution at C13.6.1 A1(b).
C13.6.2 Subdivision: Public and firefighting access	The Bushfire Hazard Management Plan specifies minimum standards for property access consistent with the requirements of table C13.2. There is no

Clause	Compliance
	proposal for public Roadways or fire trails as part of this development. The Bushfire Hazard Management Plan is certified by an accredited person. The proposal is compliant with the acceptable solution at A1, (b) & table C13.2.
C13.6.3 Subdivision: Provision of water supply for firefighting purposes	The Bushfire Hazard Management Plan requires static water supplies to be provided for all lots. The specifications for static water supplies are provided consistent with table C13.5. The proposal is compliant with the acceptable solution at A2, (b) and table C13.5.

6.2 Building Compliance (for future development)

Future residential development may not require assessment for bushfire management requirements at the planning application stage. Subsequent building applications will require demonstrated compliance with the Directors Determination. If future development is undertaken in compliance with the Bushfire Hazard Management Plan associated with this report, a building surveyor may rely upon it for building compliance purposes if it is not more than 6 years old.

7.0 Summary

The proposed development occurs within a bushfire-prone area. The vegetation is classified as grassland, and woodland with the highest risk presented by vegetation to the north of the building areas.

Hazard management areas for each lot are to be secured through a covenant on each title such that the bushfire fuels are prevented from developing and lots are maintained in a minimum fuel condition.

A bushfire hazard management plan has been developed, showing hazard management areas with building areas and construction standards. It also indicates the proposed locations for property access and provides specifications for their construction, along with requirements for the provision of firefighting water supplies.

If future development of an individual lot is proposed and is compliant with all the specifications of the bushfire hazard management plan, it may be relied upon for building compliance purposes. If subsequent development does not comply with all the specifications, a new assessment will be necessary.

8.0 Limitations Statement

This Bushfire Hazard Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and the applicant. To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this report. In preparing this report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible bushfire hazard condition and does not provide a guarantee that no loss of property or life will occur as a result of bushfire. As stated in AS3959-2018 “It should be borne in mind that the measures contained in this Standard cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the degree of vegetation management, the unpredictable nature and behaviour of fire, and extreme weather conditions”. In addition, no responsibility is taken for any loss which is a result of actions contrary to AS3959-2018 or the Tasmanian Planning Commission Bushfire code.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required. No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party

9.0 References

Building Amendment (Bushfire-Prone Areas) Regulations 2014

Directors Determination – Bushfire Hazard Areas, version 1, 6th February 2020

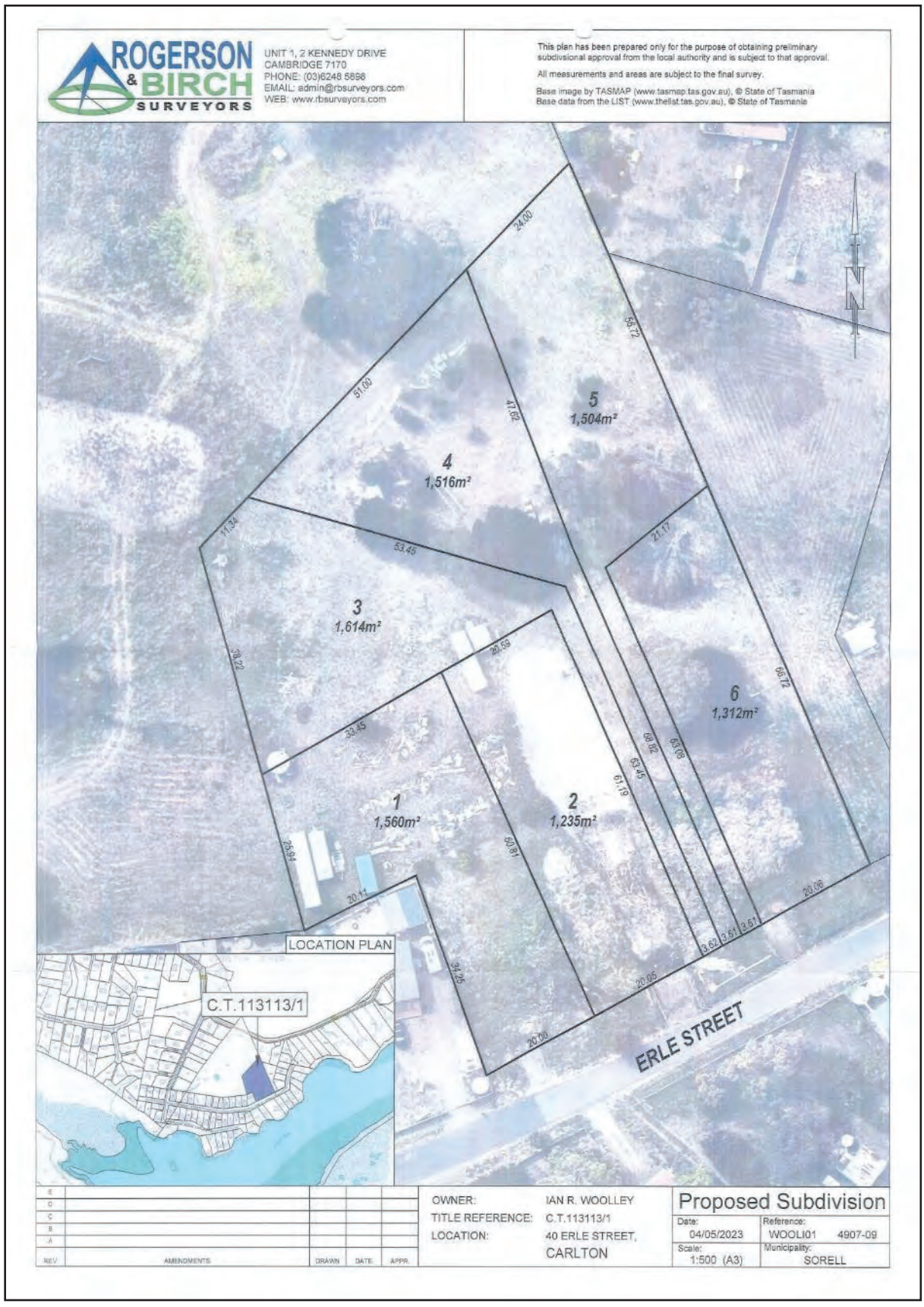
Standards Australia 2018, *Construction of buildings in bushfire prone areas,* Standards Australia, Sydney.

Tasmanian Planning Commission 2017, *Planning Directive No.5.1 – Bushfire prone Areas Code*. Tasmanian Planning Commission, Hobart. 1st September 2017.

The Bushfire Planning Group 2005, *Guidelines for development in bushfire prone areas of Tasmania – Living with fire in Tasmania,* Tasmania Fire Service, Hobart.

Tasmanian Planning Scheme – Sorell, Tasmanian Planning Commission Hobart 2020.

Appendix A - Site Plan



Appendix B – BAL Assessment tables

Table 1. Bushfire Attack Level (BAL) Assessment – ***Lot 1***

Azimuth	Vegetation Classification	Effective Slope	Distance to Bushfire-prone vegetation	Hazard management area width	Bushfire Attack Level
North	Exclusion 2.2.3.2 (e, f)^^	upslope	0 to 40 metres	5 metres	**BAL-12.5**
	Grassland^	upslope	40 to 100 metres		
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East	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 100 metres	5 metres	**BAL-LOW**
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South	Exclusion 2.2.3.2 (e, f)^^	>0 to 5º downslope	0 to >100 metres	8 metres	**BAL-LOW**
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West	Grassland^	flat 0º	0 to 100 metres	14 metres 10 metres	**BAL-12.5** **BAL-19**
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^ Vegetation classification as per AS3959-2018 and Figures 2.4 (A) to 2.4 (H).
* Low threat vegetation as per Bushfire Prone Areas Advisory Note (BHAN) No.1-2014, version 3, 8/11/2017.
^^ Exclusions as per AS3959-2018, section 2.2.3.2, (a) to (f).

*Table 2. Bushfire Attack Level (BAL) Assessment – **Lot 2***

Azimuth	Vegetation Classification	Effective Slope	Distance to Bushfire-prone vegetation	Hazard management area width	Bushfire Attack Level
North	Exclusion 2.2.3.2 (e, f)^^	upslope	0 to 49 metres	5 metres	**BAL-12.5**
	Grassland^	upslope	49 to 63 metres		
	Woodland^	upslope	63 to 100 metres		
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East	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 100 metres	5 metres	**BAL-LOW**
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South	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 100 metres	8 metres	**BAL-LOW**
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West	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 34 metres	5 metres	**BAL-12.5**
	Grassland^	flat 0º	34 to 100 metres		
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^ Vegetation classification as per AS3959-2018 and Figures 2.4 (A) to 2.4 (H).
* Low threat vegetation as per Bushfire Prone Areas Advisory Note (BHAN) No.1-2014, version 3, 8/11/2017.
^^ Exclusions as per AS3959-2018, section 2.2.3.2, (a) to (f).

*Table 3. Bushfire Attack Level (BAL) Assessment – **Lot 3***

Azimuth	Vegetation Classification	Effective Slope	Distance to Bushfire-prone vegetation	Hazard management area width	Bushfire Attack Level
North	Grassland^	upslope	0 to 40 metres	14 metres 10 metres	**BAL-12.5** **BAL-19**
	Woodland^	upslope	40 to 100 metres		
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East	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 100 metres	5 metres	**BAL-LOW**
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South	Exclusion 2.2.3.2 (e, f)^^	>0 to 5º downslope	0 to 100 metres	5 metres	**BAL-LOW**
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West	Grassland^	flat 0º	0 to 100metres	14 metres 10 metres	**BAL-12.5** **BAL-19**
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^ Vegetation classification as per AS3959-2018 and Figures 2.4 (A) to 2.4 (H).
* Low threat vegetation as per Bushfire Prone Areas Advisory Note (BHAN) No.1-2014, version 3, 8/11/2017.
^^ Exclusions as per AS3959-2018, section 2.2.3.2, (a) to (f).

*Table 4. Bushfire Attack Level (BAL) Assessment – **Lot 4***

Azimuth	Vegetation Classification	Effective Slope	Distance to Bushfire-prone vegetation	Hazard management area width	Bushfire Attack Level
North	Grassland^	upslope	0 to 25 metres	14 metres 10 metres	**BAL-12.5** **BAL-19**
	Woodland^	upslope	25 to 85 metres		
	Exclusion 2.2.3.2 (e, f)^^	flat 0º	85 to 100 metres		
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East	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 100 metres	5 metres	**BAL-LOW**
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South	Exclusion 2.2.3.2 (e, f)^^	>0 to 5º downslope	0 to 100 metres	5 metres	**BAL-12.5**
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West	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 15 metres	5 metres	**BAL-12.5**
	Grassland^	flat 0º	15 to 100 metres		
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^ Vegetation classification as per AS3959-2018 and Figures 2.4 (A) to 2.4 (H).
* Low threat vegetation as per Bushfire Prone Areas Advisory Note (BHAN) No.1-2014, version 3, 8/11/2017.
^^ Exclusions as per AS3959-2018, section 2.2.3.2, (a) to (f).

*Table 5. Bushfire Attack Level (BAL) Assessment – **Lot 5***

Azimuth	Vegetation Classification	Effective Slope	Distance to Bushfire-prone vegetation	Hazard management area width	Bushfire Attack Level
North	Grassland^	upslope	0 to 25 metres	14 metres 10 metres	**BAL-12.5** **BAL-19**
	Woodland^	upslope	25 to 85 metres		
	Exclusion 2.2.3.2 (e, f)^^	flat 0º	85 to 100 metres		
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East	Exclusion 2.2.3.2 (e, f)^^	upslope	0 to 100 metres	5 metres	**BAL-LOW**
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	--	--	--		
South	Exclusion 2.2.3.2 (e, f)^^	>0 to 5º downslope	0 to 100 metres	5 metres	**BAL-LOW**
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West	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 57 metres	5 metres	**BAL-LOW**
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^ Vegetation classification as per AS3959-2018 and Figures 2.4 (A) to 2.4 (H).
* Low threat vegetation as per Bushfire Prone Areas Advisory Note (BHAN) No.1-2014, version 3, 8/11/2017.
^^ Exclusions as per AS3959-2018, section 2.2.3.2, (a) to (f).

*Table 6. Bushfire Attack Level (BAL) Assessment – **Lot 6***

Azimuth	Vegetation Classification	Effective Slope	Distance to Bushfire-prone vegetation	Hazard management area width	Bushfire Attack Level
North	Exclusion 2.2.3.2 (e, f)^^	upslope	0 to 55 metres	5 metres	**BAL-12.5**
	Grassland^	upslope	55 to 80 metres		
	Woodland^	upslope	80 to 100 metres		
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East	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 60 metres	5 metres	**BAL-LOW**
	Exclusion 2.2.3.2 (e, f)^^	>0 to 5º downslope	60 to 100 metres		
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South	Exclusion 2.2.3.2 (e, f)^^	>0 to 5º downslope	0 to 100 metres	8 metres	**BAL-LOW**
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West	Exclusion 2.2.3.2 (e, f)^^	flat 0º	0 to 65 metres	5 metres	**BAL-LOW**
	Grassland^	flat 0º	65 to 100 metres		
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^ Vegetation classification as per AS3959-2018 and Figures 2.4 (A) to 2.4 (H).
* Low threat vegetation as per Bushfire Prone Areas Advisory Note (BHAN) No.1-2014, version 3, 8/11/2017.
^^ Exclusions as per AS3959-2018, section 2.2.3.2, (a) to (f).

Appendix C

Bushfire Hazard Management Plan

GES
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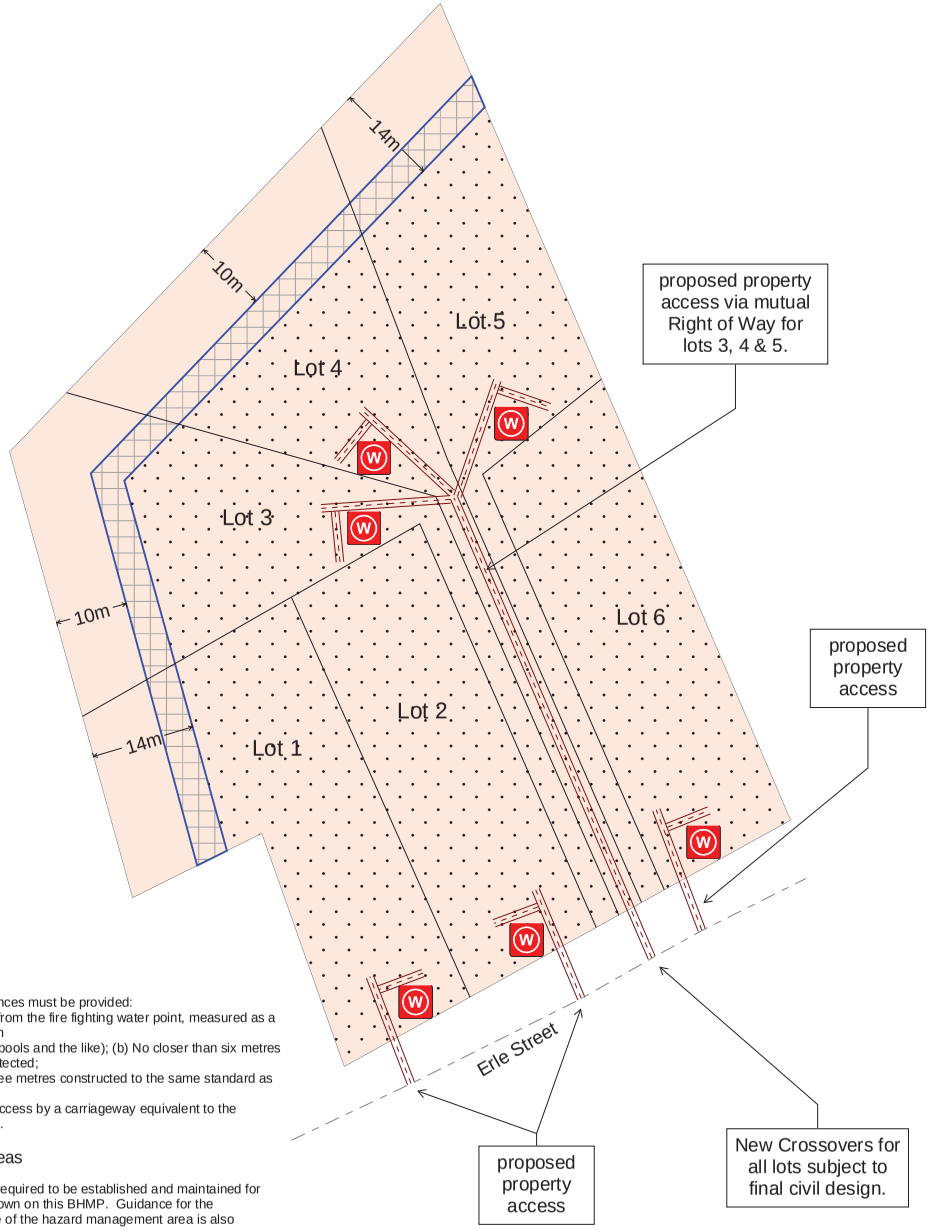
BUSHFIRE HAZARD MANAGEMENT PLAN

Bushfire Hazard Management Plan, 40 Erle Street, Carlton River.
September 2023. J9272v1.
Tasmanian Planning Scheme - Sorell



BAL-12.5 Building Area

BAL-19 Building Area

Hazard Management Area

Static Water Supply Point

Note:
Hazard management areas to be established prior to sealing titles.

Covenants required for each lot to validate this bushfire hazard management plan and associated bushfire hazard report.

Each lot to be managed so that bushfire fuels are prevented from developing and lots are maintained in a minimum fuel condition.

Hazard Management Area

A hazard management area is the area, between a habitable building or building area and the bushfire prone vegetation, which provides access to a fire front for firefighting, which is maintained in a minimal fuel condition and in which there are no other hazards present which will significantly contribute to the spread of a bushfire. This can be achieved through, but is not limited to the following actions;

- Remove fallen limbs, sticks, leaf and bark litter;
- Maintain grass at less than a 100mm height;
- Remove pine bark and other flammable mulch (especially from against buildings);
- Thin out under-story vegetation to provide horizontal separation between fuels;
- Prune low-hanging tree branches (<2m from the ground) to provide (vertical separation between fuel layers;
- Prune larger trees to maintain horizontal separation between canopies;
- Minimise the storage of flammable materials such as firewood;
- Maintain vegetation clearance around vehicular access and water supply points;
- Use low-flammability species for landscaping purposes where appropriate;
- Clear out any accumulated leaf and other debris from roof gutters and other accumulation points.

It is not necessary to remove all vegetation from the hazard management area, trees may provide protection from wind borne embers and radiant heat under some circumstances.

Certification No. J9272

Mark Van den Berg
Acc. No. BFP-108
Scope 1, 2, 3A, 3B, 3C.

Compliance Requirements

Property Access

Property access length is 30 metres or greater; and access is required for a fire appliance to connect to a firefighting water point.
The following design and construction requirements apply to property access:
(a) All-weather construction;
(b) Load capacity of at least 20 tonnes, including for bridges and culverts;
(c) Minimum carriageway width of 4 metres;
(d) Minimum vertical clearance of 4 metres;
(e) Minimum horizontal clearance of 0.5 metres from the edge of the carriageway;
(f) Cross falls of less than 3° (1:20 or 5%);
(g) Dips less than 7° (1:8 or 12.5%) entry and exit angle;
(h) Curves with a minimum inner radius of 10 metres;
(i) Maximum gradient of 15° (1:3.5 or 28%) for sealed roads, and 10° (1:5.5 or 18%) for unsealed roads; and
(j) Terminate with a turning area for fire appliances provided by one of the following:
  (i) A turning circle with a minimum outer radius of 10 metres;
  (ii) A property access encircling the building; or
  (iii) A hammerhead "T" or "Y" turning head 4 metres wide and 8 metres long

Water Supplies for Firefighting

The site is not serviced by a reticulated water supply, therefore a dedicated, static firefighting water supply will be provided in accordance with the following;

A) Distance between building area to be protected and water supply
The following requirements apply:
(a) The building area to be protected must be located within 90 metres of the fire fighting water point of a static water supply; and
(b) The distance must be measured as a hose lay, between the fire fighting water point and the furthest part of the building area.

B) Static Water Supplies
A static water supply:
(a) May have a remotely located offtake connected to the static water supply;
(b) May be a supply for combined use (fire fighting and other uses) but the specified minimum quantity of fire fighting water must be available at all times;
(c) Must be a minimum of 10,000 litres per building area to be protected. This volume of water must not be used for any other purpose including fire fighting sprinkler or spray systems;
(d) Must be metal, concrete or lagged by non-combustible materials if above ground; and
(e) If a tank can be located so it is shielded in all directions in compliance with Section 3.5 of AS 3959-2009, the tank may be constructed of any material provided that the lowest 400 mm of the tank exterior is protected by:
(i) metal;
(ii) non-combustible material; or
(iii) fibre-cement a minimum of 6 mm thickness.

C) Fittings and pipework associated with a fire fighting water point for a static water supply must:
(a) Have a minimum nominal internal diameter of 50mm; (2) Be fitted with a valve with a minimum nominal internal diameter of 50mm;
(b) Be fitted with a valve with a minimum nominal internal diameter of 50mm;
(c) Be metal or lagged by non-combustible materials if above ground;
(d) Where buried, have a minimum depth of 300mm (compliant with AS/NZS 3500.1-2003 Clause 5.23);
(e) Provide a DIN or NEN standard forged Storz 65 mm coupling fitted with a suction washer for connection to fire fighting equipment;
(f) Ensure the coupling is accessible and available for connection at all times;
(g) Ensure the coupling is fitted with a blank cap and securing chain (minimum 220 mm length);
(h) Ensure underground tanks have either an opening at the top of not less than 250 mm diameter or a coupling compliant with this Table; and
(i) Where a remote offtake is installed, ensure the offtake is in a position that is:
(i) Visible;
(ii) Accessible to allow connection by fire fighting equipment,
(iii) At a working height of 450 – 600mm above ground level; and
(iv) Protected from possible damage, including damage by vehicles.

D) Signage for static water connections
The fire fighting water point for a static water supply must be identified by a sign permanently fixed to the exterior of the assembly in a visible location. The sign must comply with the Tasmania Fire Service Water Supply Signage Guideline published by the Tasmania Fire Service

E) Hardstand
A hardstand area for fire appliances must be provided:
(a) No more than three metres from the fire fighting water point, measured as a hose lay (including the minimum
water level in dams, swimming pools and the like); (b) No closer than six metres from the building area to be protected;
(c) With a minimum width of three metres constructed to the same standard as the carriageway; and
(d) Connected to the property access by a carriageway equivalent to the standard of the property access.

Hazard Management Areas

A hazard management area is required to be established and maintained for the life of the building and is shown on this BHMP. Guidance for the establishment and maintenance of the hazard management area is also provided.

Do not scale from these drawings. Dimensions to take precedence over scale. Written specifications to take precedence over diagrammatic representations.	I. R Woolley C/O 40 Erle Street Carlton River, Tas., 7173	C.T.: 113113/1 PID: 1574591	Date: 22/9/2023	Bushfire Hazard Management Plan 40 Erle Street, Carlton River. September 2023. J9272v1. Bushfire Management Report 40 Erle Street, Carlton River. September 2023. J9272v1.	Drawing Number: A01	Sheet 1 of 1 Prepared by: MvdB

Appendix D

Planning Certificate

BUSHFIRE-PRONE AREAS CODE

CERTIFICATE[1] UNDER S51(2)(d) *LAND USE PLANNING AND APPROVALS ACT 1993*

1. Land to which certificate applies

The subject site includes property that is proposed for use and development and includes all properties upon which works are proposed for bushfire protection purposes.

Street address:	40 Erle Street, Carlton River, TAS, 7173.
Certificate of Title / PID:	113113/1

2. Proposed Use or Development

Description of proposed Use and Development:	Subdivision of land resulting in 6 lots
Applicable Planning Scheme:	Tasmanian Planning Scheme - Sorell

3. Documents relied upon

This certificate relates to the following documents:

Title	Author	Date	Version
Plan of Subdivision	Rogerson & Birch	04/05/2023	WOOLI – 1
Bushfire Hazard Report 40 Erle Street, Carlton River. September 2023. J9272v1..	Mark Van den Berg	22/09/2023	1
Bushfire Hazard Management Plan 40 Erle Street, Carlton River. September 2023. J9272v1.	Mark Van den Berg	22/09/2023	1

[1] This document is the approved form of certification for this purpose and must not be altered from its original form.

4. Nature of Certificate

The following requirements are applicable to the proposed use and development:

☐	**E1.4 / C13.4 – Use or development exempt from this Code**	
	Compliance test	**Compliance Requirement**
☐	E1.4(a) / C13.4.1(a)	Insufficient increase in risk

☐	**E1.5.1 / C13.5.1 – Vulnerable Uses**	
	Acceptable Solution	**Compliance Requirement**
☐	E1.5.1 P1 / C13.5.1 P1	***Planning authority discretion required. A proposal cannot be certified as compliant with P1.***
☐	E1.5.1 A2 / C13.5.1 A2	Emergency management strategy
☐	E1.5.1 A3 / C13.5.1 A2	Bushfire hazard management plan

☐	**E1.5.2 / C13.5.2 – Hazardous Uses**	
	Acceptable Solution	**Compliance Requirement**
☐	E1.5.2 P1 / C13.5.2 P1	***Planning authority discretion required. A proposal cannot be certified as compliant with P1.***
☐	E1.5.2 A2 / C13.5.2 A2	Emergency management strategy
☐	E1.5.2 A3 / C13.5.2 A3	Bushfire hazard management plan

☒	**E1.6.1 / C13.6.1 Subdivision: Provision of hazard management areas**	
	Acceptable Solution	**Compliance Requirement**
☐	E1.6.1 P1 / C13.6.1 P1	***Planning authority discretion required. A proposal cannot be certified as compliant with P1.***
☐	E1.6.1 A1 (a) / C13.6.1 A1(a)	Insufficient increase in risk
☒	E1.6.1 A1 (b) / C13.6.1 A1(b)	Provides BAL-19 for all lots (including any lot designated as 'balance'.
0 ☐	E1.6.1 A1(c) / C13.6.1 A1(c)	Consent for Part 5 Agreement

☒	**E1.6.2 / C13.6.2 Subdivision: Public and fire fighting access**	
	Acceptable Solution	**Compliance Requirement**
☐	E1.6.2 P1 / C13.6.2 P1	***Planning authority discretion required. A proposal cannot be certified as compliant with P1.***
☐	E1.6.2 A1 (a) / C13.6.2 A1 (a)	Insufficient increase in risk
☒	E1.6.2 A1 (b) / C13.6.2 A1 (b)	Access complies with relevant Tables

☒	**E1.6.3 / C13.1.6.3 Subdivision: Provision of water supply for fire fighting purposes**	
	Acceptable Solution	**Compliance Requirement**
☐	E1.6.3 A1 (a) / C13.6.3 A1 (a)	Insufficient increase in risk
☐	E1.6.3 A1 (b) / C13.6.3 A1 (b)	Reticulated water supply complies with relevant Table
☐	E1.6.3 A1 (c) / C13.6.3 A1 (c)	Water supply consistent with the objective
☐	E1.6.3 A2 (a) / C13.6.3 A2 (a)	Insufficient increase in risk
☒	E1.6.3 A2 (b) / C13.6.3 A2 (b)	Static water supply complies with relevant Table
☐	E1.6.3 A2 (c) / C13.6.3 A2 (c)	Static water supply consistent with the objective

5. Bushfire Hazard Practitioner

Name:	Mark Van den Berg	**Phone No:**	03 62231839
Postal Address:	29 Kirksway Place Battery Point Tas. 7004	**Email Address:**	mvandenberg@geosolutions.net.au
Accreditation No:	BFP – 108	**Scope:**	1, 2, 3a, 3b & 3c

6. Certification

I certify that in accordance with the authority given under Part 4A of the *Fire Service Act 1979* that the proposed use and development:

☐ Is exempt from the requirement Bushfire-Prone Areas Code because, having regard to the objective of all applicable standards in the Code, there is considered to be an insufficient increase in risk to the use or development from bushfire to warrant any specific bushfire protection measures, or

☒ The Bushfire Hazard Management Plan/s identified in Section 3 of this certificate is/are in accordance with the Chief Officer's requirements and compliant with the relevant **Acceptable Solutions** identified in Section 4 of this Certificate.

Signed:
certifier

Name: Mark Van den Berg

22/09/2023

Certificate Number: J9272

(for Practitioner Use only)

GEOTECH 23-069

ROCK SOLID GEOTECHNICS PTY LTD

4/7/2023

CLIENT:
Mr Ian Woolley 0407098636
Via Rogerson & Birch Surveyors 62485898
kathy@rbsurveyors.com

Peter Hofto
163 Orielton Road
ORIELTON
TAS 7172
0417 960 769
peter@rocksolidgeotechnics.com.au

Geotechnical Assessment - Subdivision of Land at 40 Erle Street, Carlton

This report assesses the onsite wastewater potential of the land designated for a six-lot subdivision at 40 Erle Street, Carlton (Figure 1). It is proposed to subdivide the land into six blocks.

Lot 1	1560m^2
Lot 2	1235m^2
Lot 3	1614m^2
Lot 4	1516m^2
Lot 5	1504m^2
Lot 6	1312m^2

The Sorell Council have requested the following;

- Provide a Site & Soil Evaluation Report in accordance with AS/NZS 1547-2012 detailing the site & soil conditions and the suitability for onsite wastewater disposal.
- Demonstrate compliance with 10.6.3 P2 – of the *Tasmanian Planning Scheme – Sorell* 2022.
    - 10.6.3 P2 states;
      Each Lot, or a lot proposed in a plan of subdivision, excluding for public open space, a riparian or littoral reserve or Utilities, must be capable of accommodating an on-site wastewater treatment system adequate for the future use and development of the land.

For this report, it is reasonable to assume that a likely future use of the proposed Lot is the development of a three-bedroom residence and associated infrastructure.

Each of the proposed Lots can sustain an onsite wastewater system for a single, three-bedroom dwelling.

INVESTIGATION

Field surveys have been completed in 2004, 2006, 2012 and most recently on Friday 30 June 2023. Surveys have encompassed field mapping of geological and geomorphological features and hazards to assess the site for onsite wastewater disposal potential. Test holes were completed across the site utilising a 4WD mounted mechanical auger with 100mm diameter solid flight augers.

The 1:50000 Mines Department Geological Map "Sorell' indicates that the site is underlain by Quaternary aged windblown sands.

The site designated for subdivision is generally south to southeast-facing. The land is generally undulating in profile (Plate 1), with a distinct 'break in slope' running across the base of the lower southeastern portion of the land.

There are no defined drainage lines or drainage channels on the land, although some surface water was observed (on the June 2023 site visit) on the lower southeastern portions of proposed Lots 1, 2, and 6 after recent heavy rains (Plate 2).

There is no evidence of erosion or other geotechnical hazards on the site.

All test holes encountered dry sand to full 2.40m depth (Plate 3).

The site is classified as CLASS 1 (SAND) with respect to wastewater disposal, with an indicative Permeability of >3.0m/day.

Plate 1 – Looking to the northwest at proposed Lots 4 & 5.

Plate 2 – Proposed Lot 6. Looking to the west, with water lying at the base of the block

Plate 2 Deep sand exposed in the partially excavated driveway access cutting.

ONSITE WASTEWATER SUITABILITY

All of the proposed Lots are classified as CLASS 1 (SAND) in accordance with Australian Standard AS1547:2012 and the 2016 Building Act – *Director's Guidelines for Onsite Wastewater Systems*.

The 2016 Building Act – *Director's Guidelines for Onsite Wastewater Systems* defines the minimum area required for Onsite Wastewater Land Application Areas (LAA) depending on the site permeability, the quality of effluent disposal (primary or secondary), and the slope of the land.

50m^2 of LAA is required per bedroom for a Class 1 (SAND) site on these blocks. Therefore, the maximum required LAA for a three-bedroom residence on any of these proposed blocks is 150m^2.

Each of the proposed Lots has adequate available land, and therefore can sustain an onsite wastewater system for a single, three-bedroom dwelling.

The type, size and position of onsite wastewater system will need to be determined by site specific investigation when developing the sites.

The only site restrictions encountered on this site is the observed wet portions of land at the base of proposed Lots 1, 2, & 6 after heavy rain. The portion of these sites adjacent to Erle Street will not be suitable for onsite wastewater disposal. This said, each of these proposed blocks has ample available higher land that is very well suited for wastewater disposal.

Primary treated onsite wastewater systems will be suitable on all of the proposed Lots.

RECCOMENDATIONS

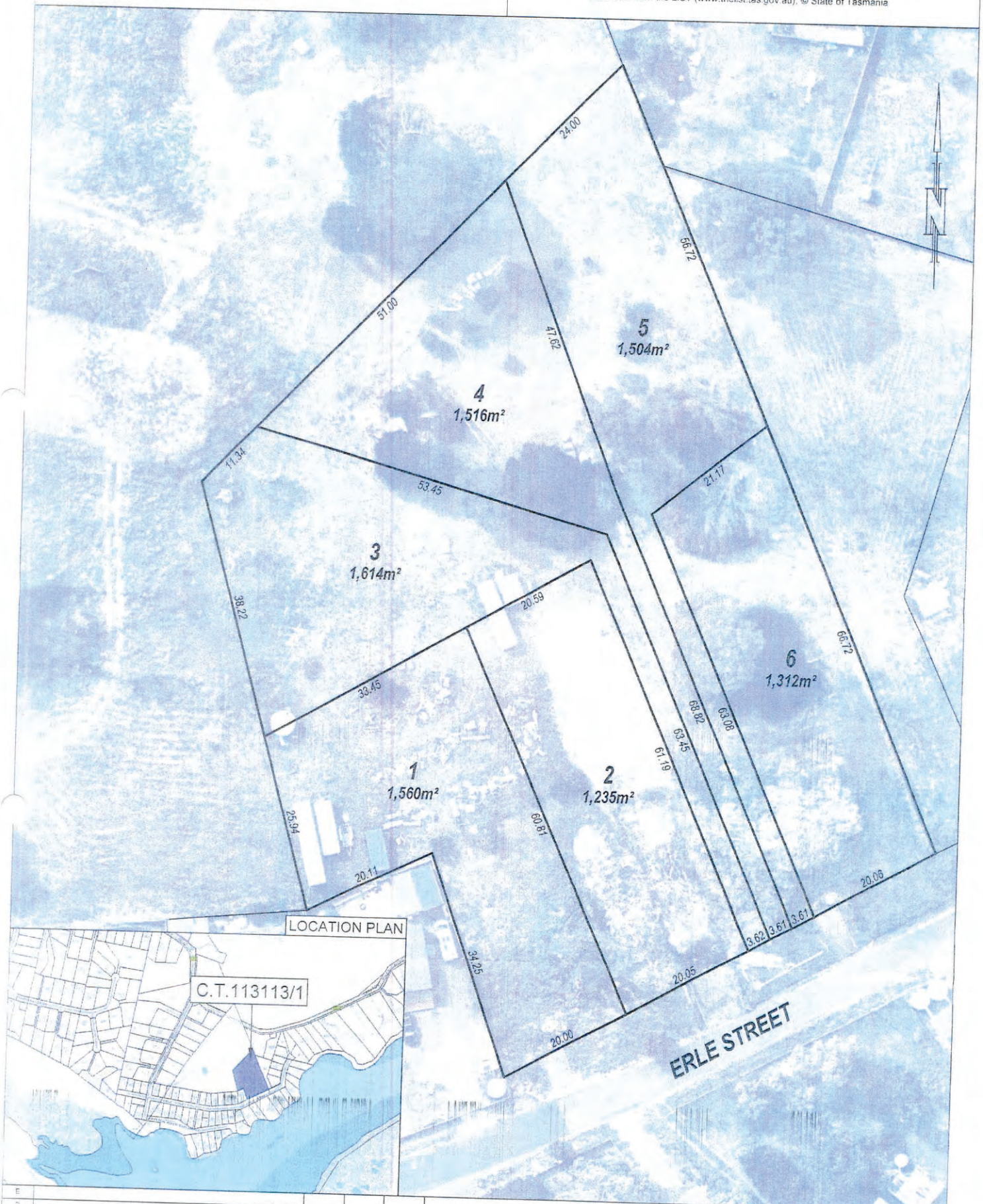
All of the proposed Lots can sustain onsite wastewater systems for single, three-bedroom dwellings, in compliance with the *Tasmanian Planning Scheme – Tasman* 10.6.3 P2.

PETER HOFTO
ROCK SOLID GEOTECHNICS PTY LTD

ROGERSON & BIRCH SURVEYORS
UNIT 1, 2 KENNEDY DRIVE
CAMBRIDGE 7170
PHONE: (03)6248 5898
EMAIL: admin@rbsurveyors.com
WEB: www.rbsurveyors.com

This plan has been prepared only for the purpose of obtaining preliminary subdivsional approval from the local authority and is subject to that approval.

All measurements and areas are subject to the final survey.



REV	AMENDMENTS	DRAWN	DATE	APPR.
E				
D				
C				
B				
A				

OWNER: IAN R. WOOLLEY
TITLE REFERENCE: C.T.113113/1
LOCATION: 40 ERLE STREET, CARLTON

Proposed Subdivision

Date:	Reference:
04/05/2023	WOOLI01 4907-09
Scale: 1:500 (A3)	Municipality: SORELL

SITE AND SOIL EVALUATION REPORT

Soil Category: (as stated in AS/NZS 1547-2000) **1**,...2,...3,...4,...5,...6	Modified Emerson Test Required: No If Yes, Emerson Class No. ....
Measured or Estimated Soil Permeability (m/d):	1.5m/d
Design Loading Rate: (mm/d)	25 mm/day
Geology:	Quaternary sediments.

Slope:	Variable to the SE
Drainage lines / water courses:	Nil
Vegetation:	Grass and mature trees
Site History: (land use)	Vacant block
Aspect:	S/SE
Pre-dominant wind direction:	Northwest to southwest
Site Stability: Will on-site wastewater disposal affect site stability?	No
Is geological advice required?	No
Drainage/Groundwater:	No
Depth to seasonal groundwater (m):	Not encountered
Are surface or sub-surface drains required upslope of the land application area	Site specific design
Water Supply:	
[√] Rainwater Tanks	
Date of Site Evaluation:	2004, 2006, 2012, 2023
Weather Conditions:	Fine

CONDITIONS OF INVESTIGATION

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This report should not be used for submission for Building or Development Application until RSG has been paid in full for its production. RSG accepts no liability for the contents of this report until full payment has been received.

The results & interpretation of conditions presented in this report are current at the time of the investigation only. The investigation has been conducted in accordance with the specific client's requirements &/or with their servants or agent's instructions.

This report contains observations & interpretations based often on limited subsurface evaluation. Where interpretative information or evaluation has been reported, this information has been identified accordingly & is presented based on professional judgement. RSG does not accept responsibility for variations between interpreted conditions & those that may be subsequently revealed by whatever means.

Due to the possibility of variation in subsurface conditions & materials, the characteristics of materials can vary between sample & observation sites. RSG takes no responsibility for changed or unexpected variations in ground conditions that may affect any aspect of the project. The classifications in this report are based on samples taken from specific sites. The information is not transferable to different sites, no matter how close.

It is recommended to notify the author should it be revealed that the sub-surface conditions differ from those presented in this report, so additional assessment & advice may be provided.

FLOOD HAZARD REPORT

40 ERLE STREET – CARLTON RIVER

SORELL COUNCIL (RFI - 7.2023.19.1 1574591)
01 FEBRUARY 2024

TABLE OF CONTENTS

Issuing Office: 117 Harrington Street, Hobart 7000 **JMG Project No. J230959CS**								
Document Issue Status								
Ver.	**Issue Date**	**Description**	**Originator**		**Checked**		**Approved**	
1	01.02.2024	DRAFT ISSUE FOR CLIENT REVIEW	CG		SHF		CJM	

1. Introduction

JMG Engineers & Planners have been engaged to undertake a Flood Hazard Report for the site (40 Erle Street – Carlton River) in order to respond to the Sorell Council RFI (7.2023.19.1 1574591) for the below condition.

1. A flood-hazard report, consistent with the definition provided at clause C12.3.1 of Code 12.0 Flood-Prone Areas Hazard and using current survey information.

2. The property contains various buildings/structures, please confirm if these buildings/structures are to be removed, or alternatively provide detail of their intended use and proposed status.

The study was conducted following the guidelines of the Tasmanian Planning Scheme and the Australian Rainfall and Runoff 2019. It involved assessing hydrological conditions through the Initial and Continuing Losses (IL-CL) model and performing a 2D analysis of unsteady flow using HEC-RAS in order to obtain the range of possible risks at the point of interest.

2. Existing Parameters

The site comprises a total area of 8741m2, characterized by diverse terrain, ranging from a relatively steep and elevated section on the middle portion from south to north of the lot through the proposed access to a flatter expanse bordering the western boundaries with 26 Gate Five Road. The landscape consists primarily of exposed earth, medium-short grass with natural sandy soil and sparse trees along the northern portion of the site. The point of interest in the proposed development lies in two different locations, the southern region, the lowest point from the Erle Road catchments and the northwestern boundary where the proposed Lot 3 features flat terrain, forming a natural pathway for potential flood from the adjacent catchments. The present study will specifically examine the extent of possible flood boundaries during a 1% AEP stormwater event, accounting for an 18.3% climate change factor.

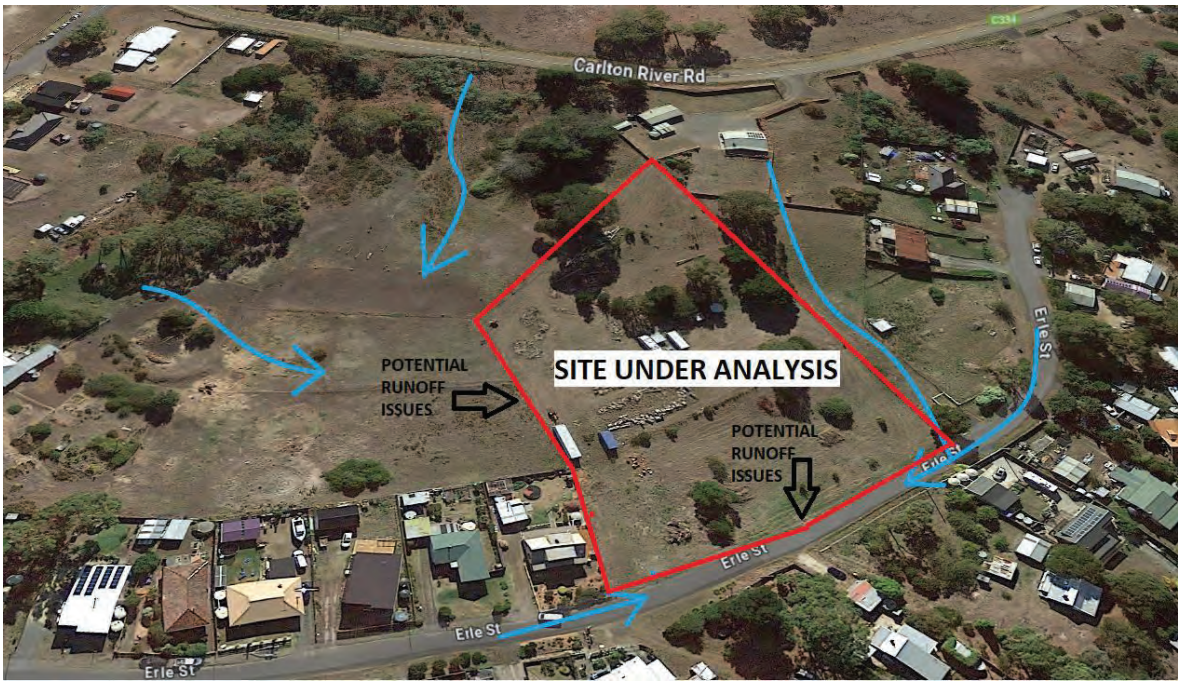


Figure 1: Site Locality Plan and Overland Flow Scheme

3. Catchment Analysis

The catchment surface has been developed from two different sources. A combination of a survey undertaken on 21st September 2023 by Rogerson & Birch Surveyors and a Digital Elevation Model tile, Lidar Image, obtained from Anzlic Committee on Surveying and Mapping (ICSM) – Elvis (Elevation and Depth Foundation Spatial Data) website.

The catchment investigation has been outlined for (4) four distinct contribution basins. Among these, two of them are situated in a mixed residential area at the discharging to the lowest point at the southern site boundary (Catchments 3 & 4). At the same time, two other basins (Catchments 1 and 2) encompass rural conditions due to the large and predominant grassy and sandy soil presented, with runoffs along Erle Street and discharge to Carlton River.

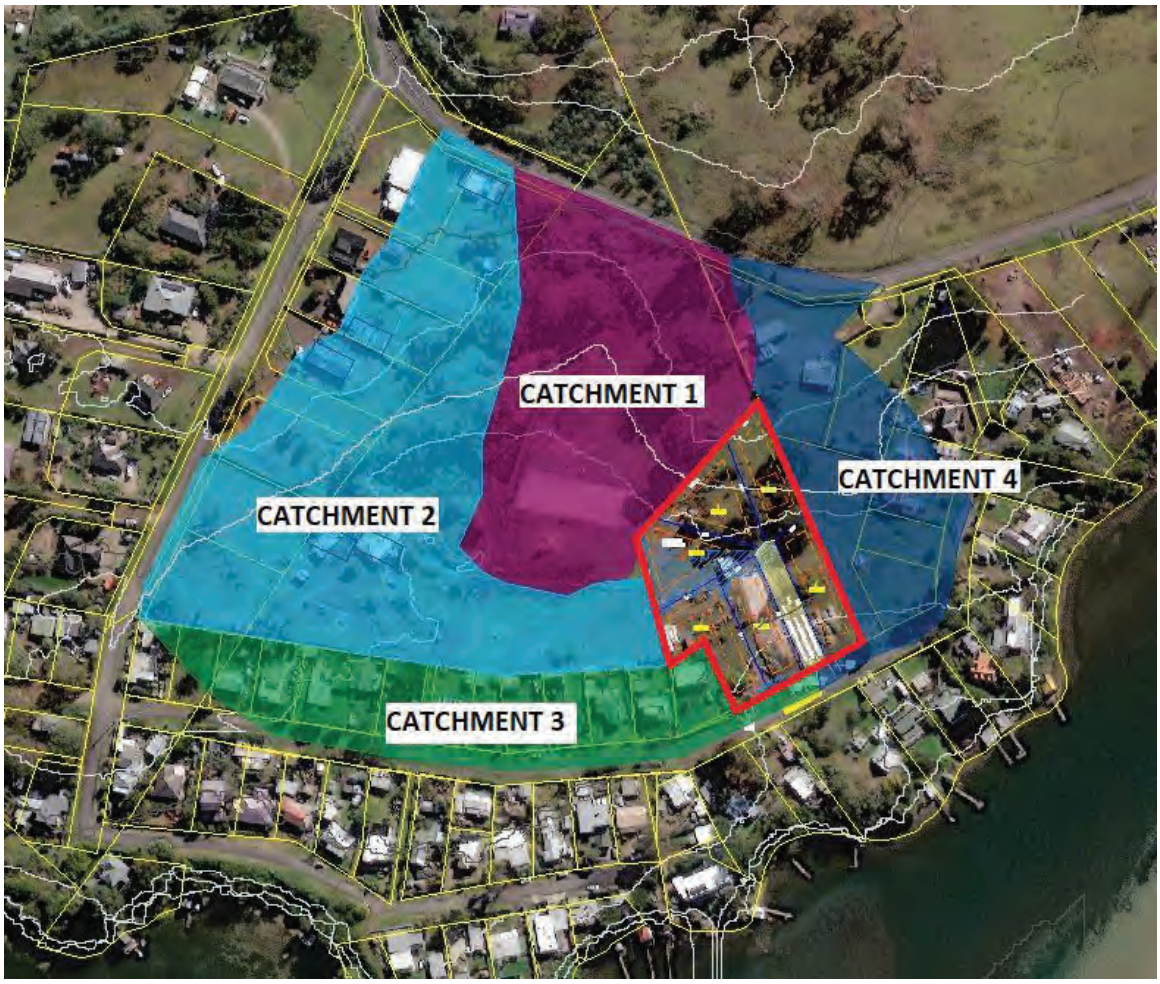


Figure 2: Catchment Arrangement

Table 1: Catchment Parameters (Summary)

Name	Area (ha)	Avg. Slope (%)	Longest Flow Path (m)
Catchment 1	2.10	7.00	180
Catchment 2	2.80	8.00	240
Catchment 3	1.18	4.50	300
Catchment 4	1.08	7.50	200

4. Hydrology

The following flows have been calculated using the hydrological modelling software Watercom DRAINS (DRAINS). All meteorological data (Rainfall IFDs, temporal patterns, rainfall pre-burst data and climate change factors) was extracted from the Australian Rainfall & Runoff (ARR) Data Hub and the Bureau of Meteorology (BOM). These parameters are all region-specific based on the following coordinates:

- Longitude: 147.658 (E)
- Latitude: 42.874 (S)

The ARR Data Hub (which sources information from the Climate Change in Australia Website) provide projections for Interim Climate Change Factors all around the country. However, ARR advises that the design of significant stormwater infrastructure is based on a predicted Climate Change increase in the year 2100, but the Data Hub only provides data up until 2090. The data was extrapolated linearly to determine the factor for the year 2100—a simple yet appropriate extrapolation that best fits the data set.

Table 2: Climate Change, Allowance

Location	Carlton River Tasmania
Representative Concentration Pathway (RCP)	8.5
Year	2090
Factor	3.090 (16.3%)
Year	2100
Factor (Extrapolated)	*18.3%*

The model has been calculated using IL-CL which is the hydrological model more appropriate for rural and mixed areas as per Book 5 – Chapter 3 – 3.5.3 (AR&R 2019).

The IL-CL values were selected based on recommendations from the Data Hub ARR. In this way, 29mm (Initial Loss) and 3.7mm/hr (Continuing Loss) are the values adopted. Additionally, these parameters can be further calibrated to match previous known events or previous models already consolidated and accepted by the local authorities.

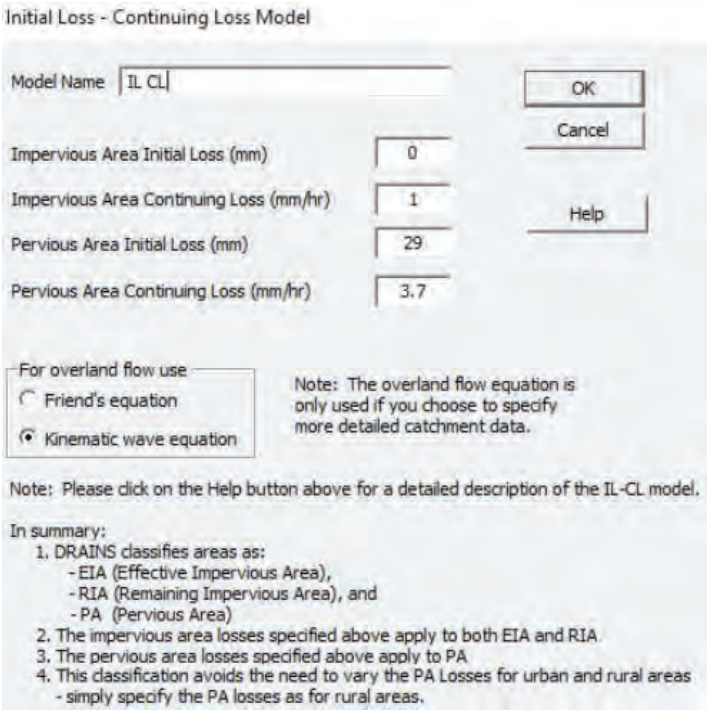


Figure 3: *Screenshot from Drains – Initial and Continuing Loss Model Parameters*

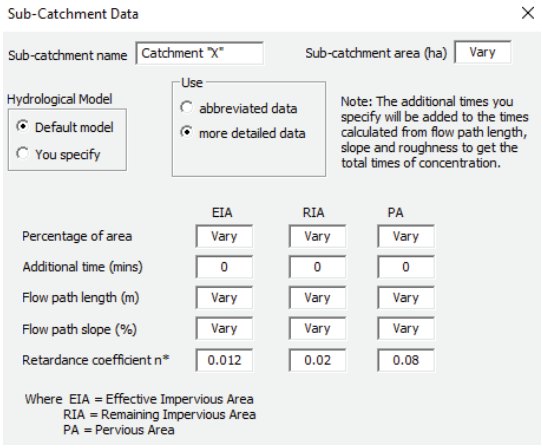


Figure 4: Screenshot from Drains – Catchment Conditions with Retardance Coefficient n*

DRAINS Area Classification:

- Effective Impervious Area (EIA)
- Remaining Impervious Area (RIA)
- Pervious Area (PA)
- Additional Time – "Time in minutes required for the longest water drop's distance to get into the stormwater network."
- Retardance Coefficient n* (refer to Table 3)

*Table 3: Retardance Coefficient n**

Surface Type	*Roughness Coefficient n**
Concrete or Asphalt	0.01-0.013
Bare Sand	0.01-0.016
Gravelled Surface	0.012-0.03
Bare Clay-Loam Soil (eroded)	0.012-0.033
Sparse Vegetation	0.053-0.130
Short Grass Prairie (Veldt or Scrub)	0.10-0.20
Lawns	0.17-0.48

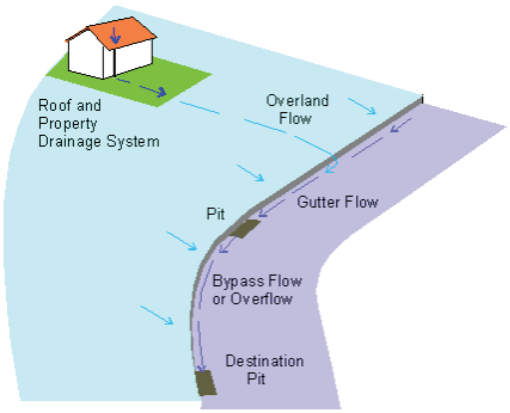


Figure 5: Screenshot from Drains - Overland Flow Schematic

4.1 DRAINS

Drains has been used to calculate the hydrological condition of the model. A node sequence has been set to replicate the catchment contribution conditions.

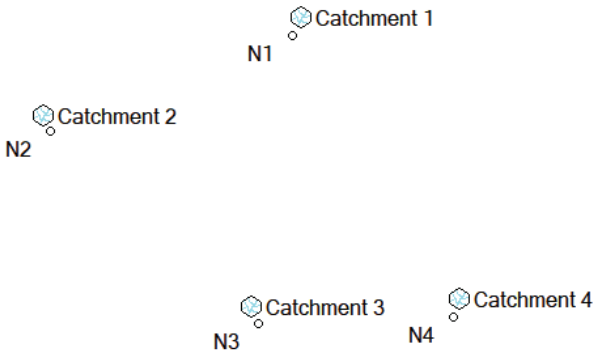


Figure 6: Screenshot from Drains - Catchment and Route Structure

4.2 Drains Results

The proposed stormwater system has been calculated considering the 1% AEP storm event with climate change and not considering any pipe infrastructure capacity. Therefore, the result below has been assumed, conservatively, that 100% of the flow runoff along the surface. The peak flow results are presented in the following figure:

Figure 7: Screenshot from Drains - Overland Flows from the 1% AEP + CC Storm Event

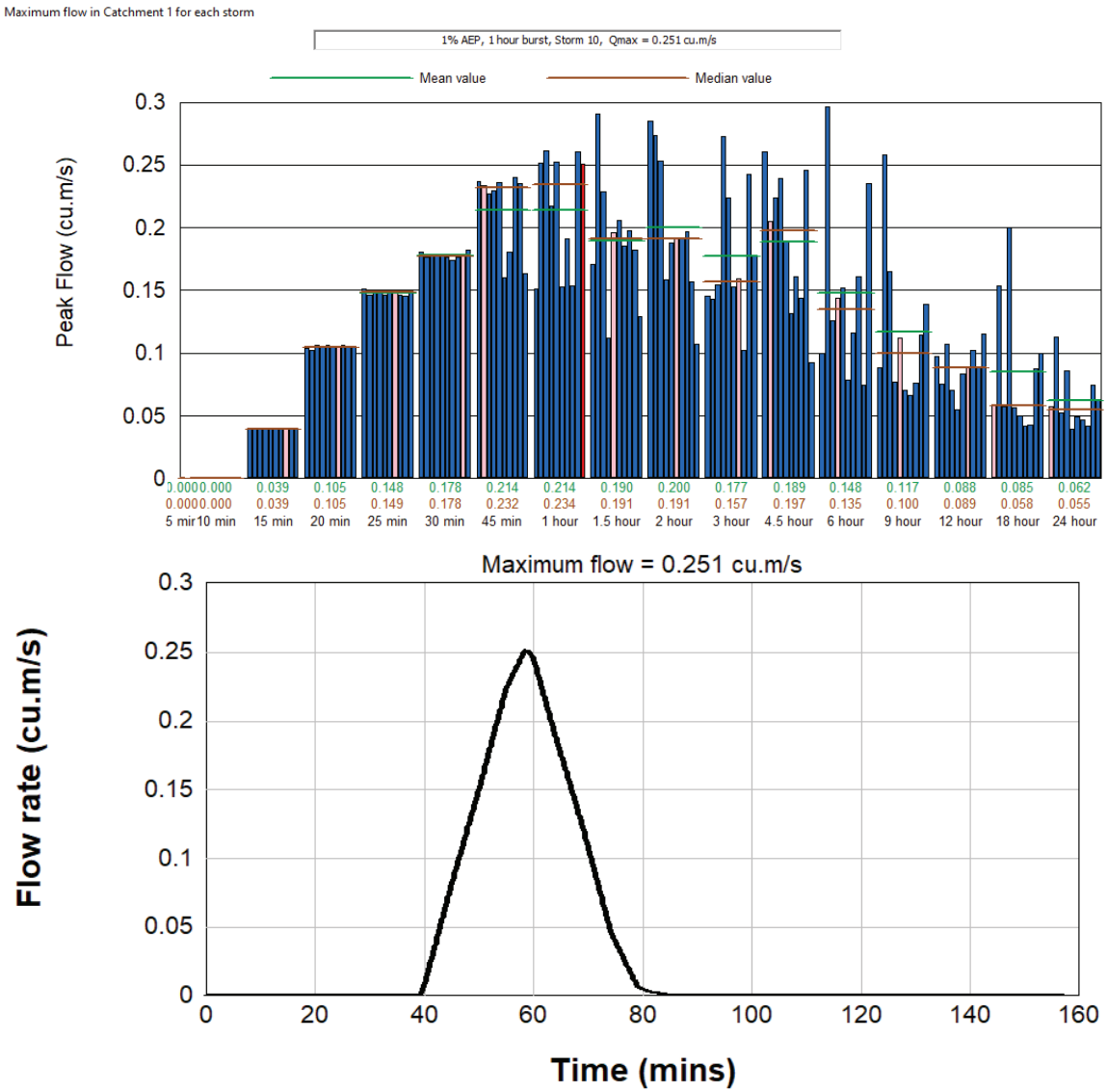
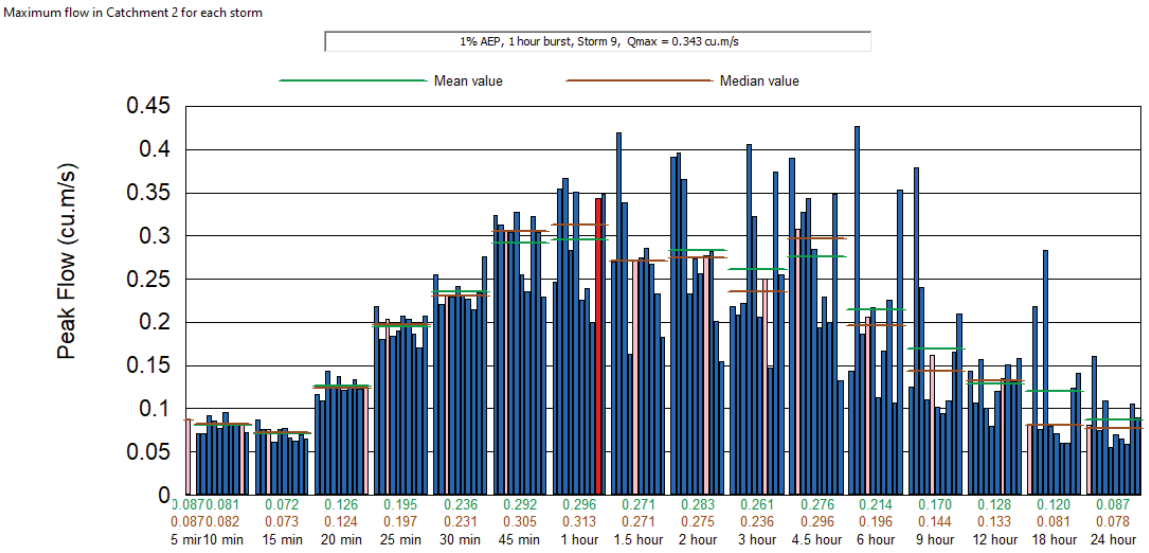


Figure 8: Screenshot from Drains – Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 1)



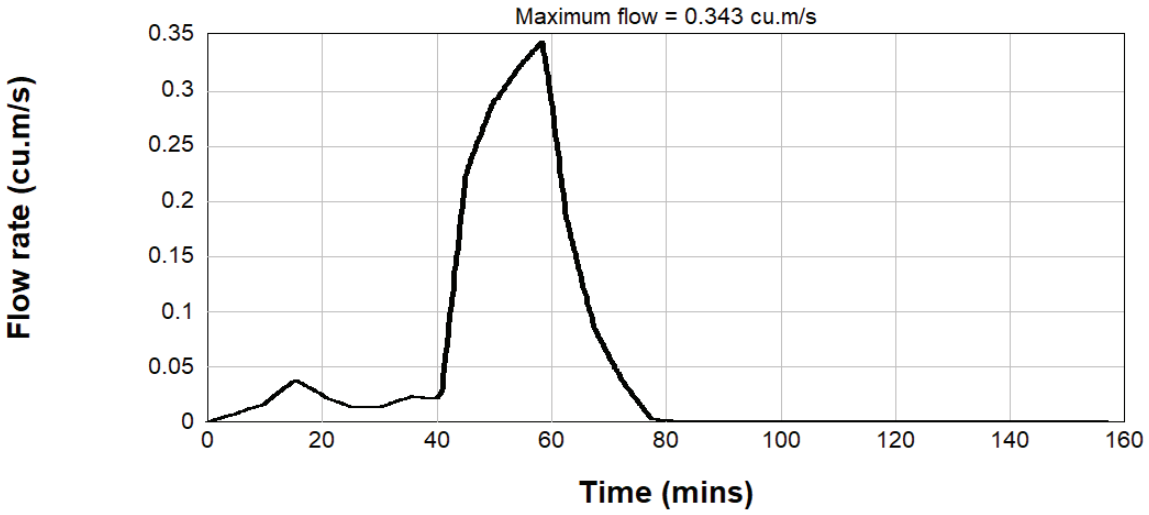


Figure 9: Screenshot from Drains - Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 2)

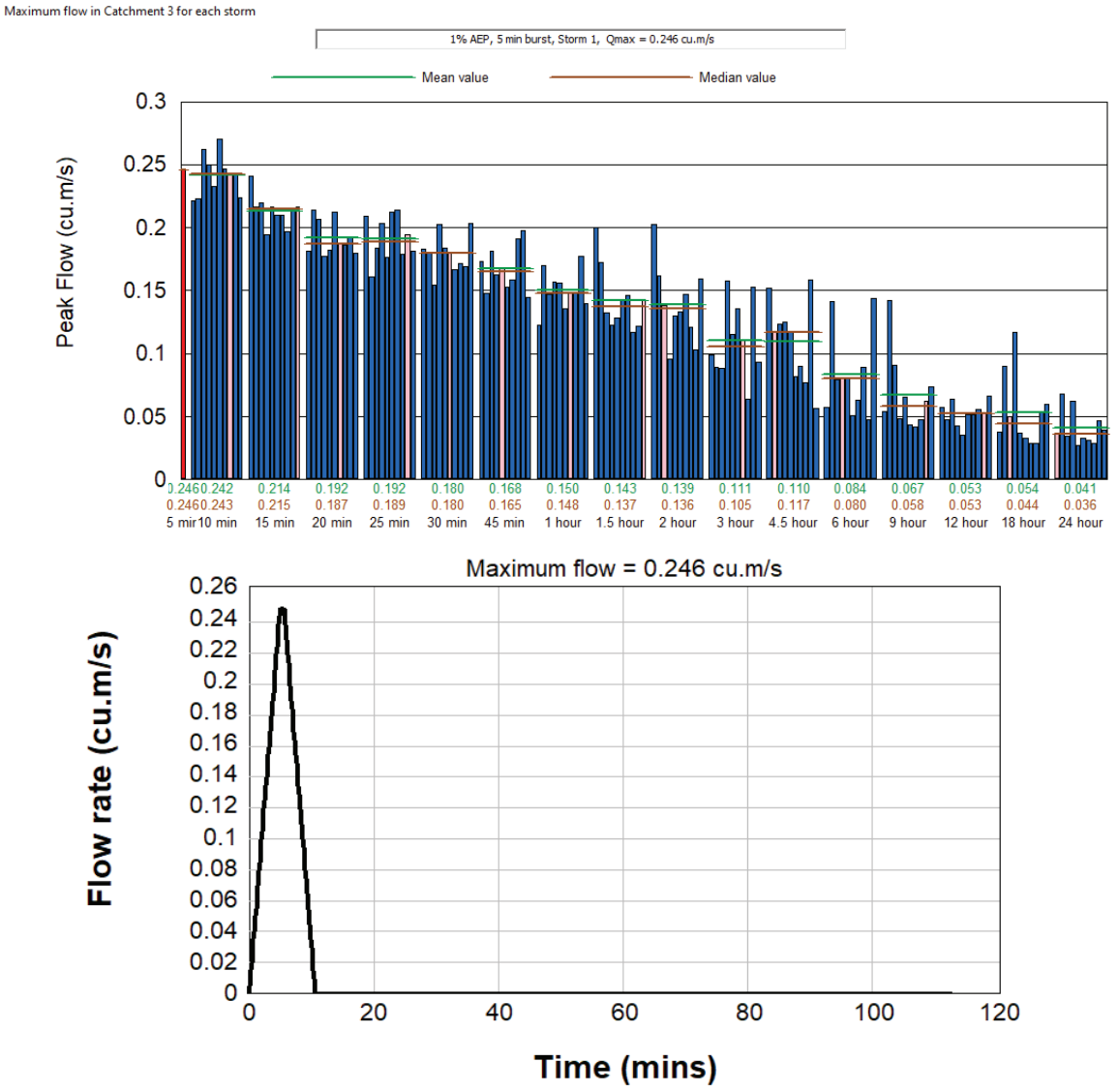
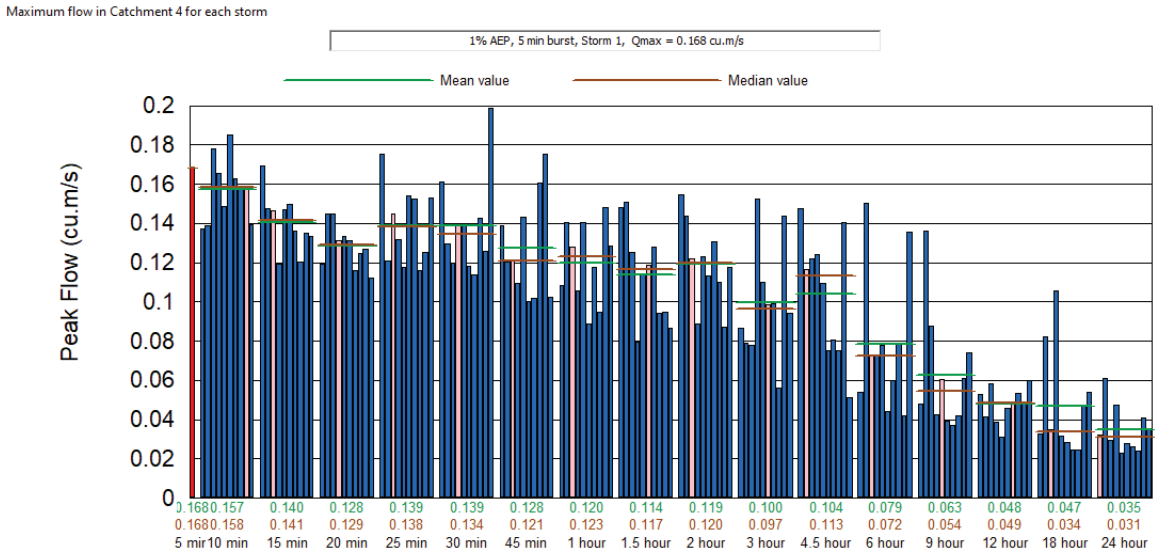


Figure 10: Screenshot from Drains - Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 3)



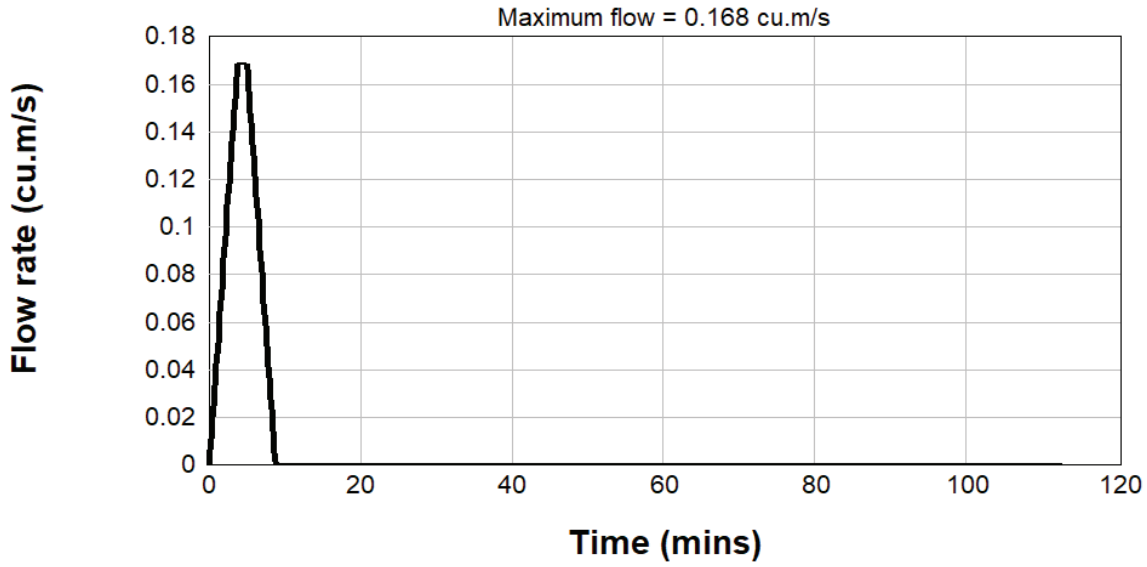


Figure 11: Screenshot from Drains - Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 4)

4.3 HEC-RAS (Overland Flow - 2D Analysis)

A HEC-RAS model has been used to undertake a 2D unsteady flow analysis using the overland hydrograph flow from Figures 8 to 11. The software is an ARR-recognised 2D modelling program, ideal for overland flows, depths, velocities and overland flood extents.

4.4 Surface, Geometry and Flow Boundaries

The analysed surface has been built and considered the parameters described in section 3. In addition, the geometry mesh has been defined as an appropriate region surrounding the watercourse.

The inflow and outflow set a suitable distance upstream and downstream from the target modelling area to ensure that the model has time to stabilise at the upstream end and is not influenced by backwater at the downstream end. Even though the peak flow occurs at the downstream point of each catchment (south and northwestern boundary of the proposed site) the modelling has conservatively assumed the inflow is located upstream of each sub-catchment location.

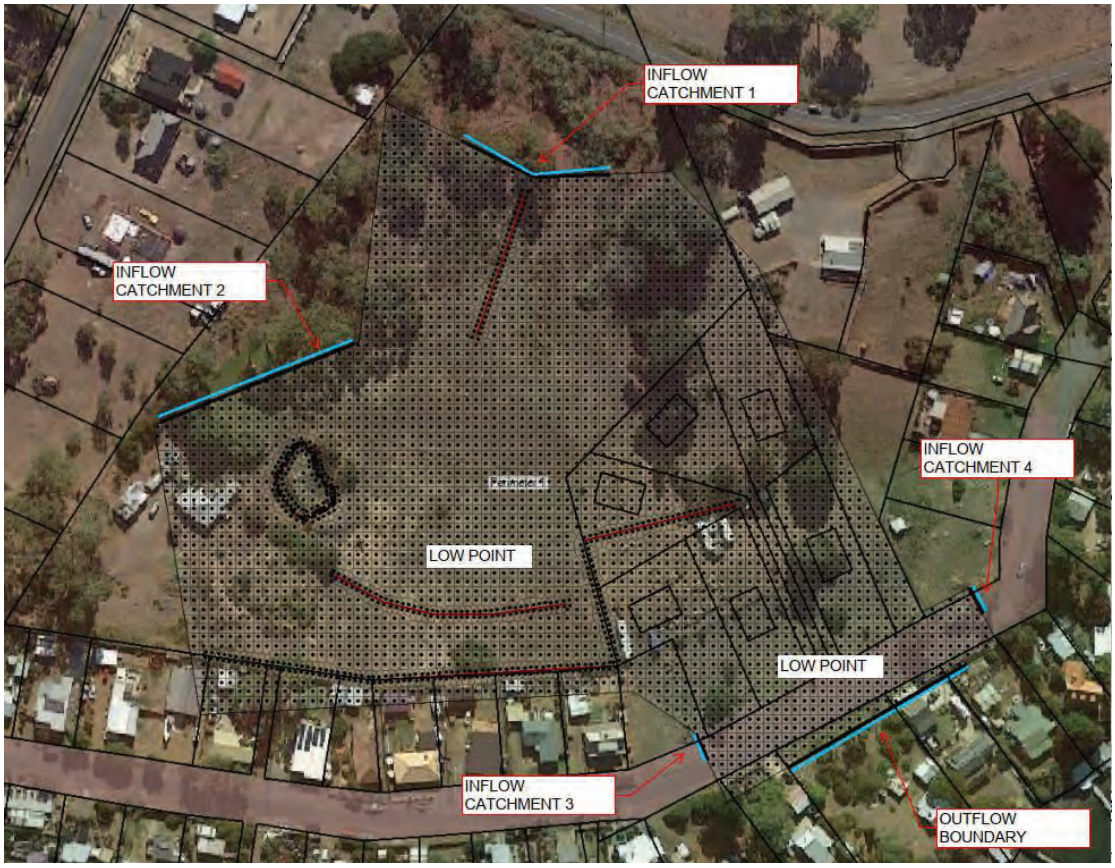


Figure 12: Inflow/Outflow Boundaries Scheme

Lastly, the model considers the following Mannings values:

- Roads and Impervious Surfaces = 0.018
- Landscaping or Vegetation Zones = 0.03

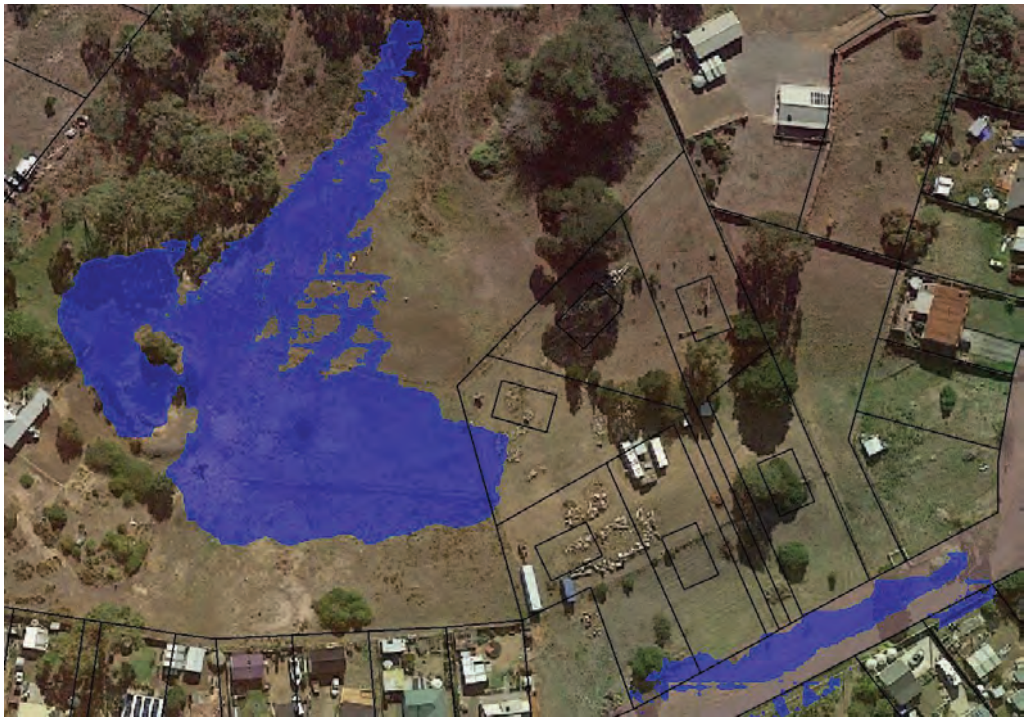


Figure 13: Flood Extents (1% AEP + CC) with ARR Initial and Continuing Losses Parameters

Moreover, the Sorell Council has provided a screenshot of their Flood Hazard layout for the address and vicinity region. As a result, the current analysis can be calibrated to refine and accurately align with the predicted event, ensuring a better match with the Council's Flood Assessment data.

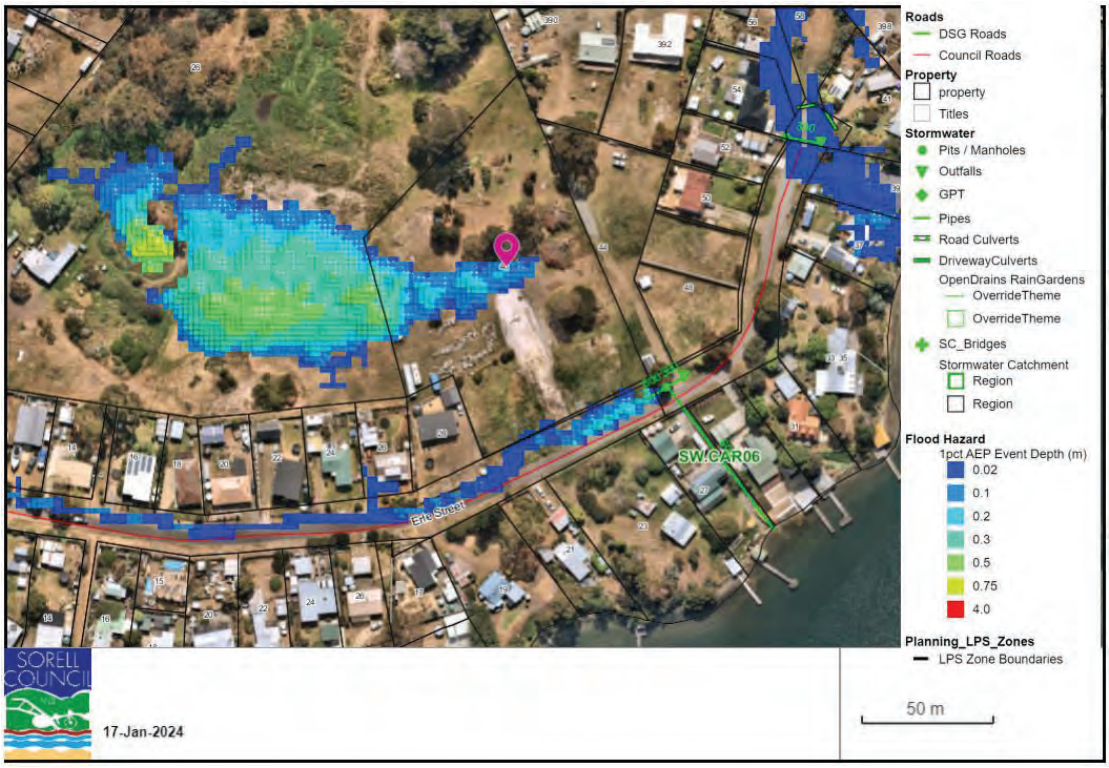


Figure 14: Flood Hazard Map Provided by Shayla Nowakowski – Sorell Council (Customer & Business Support Officer) – 17/01/2024

4.5 Model Adjustment and Calibration

Considering that the initial and continuing losses from ARR – Data Hub are slightly higher for this model, a further investigation has been conducted considering the geological map of the region. It is noticed that the current site presents the conditions below:

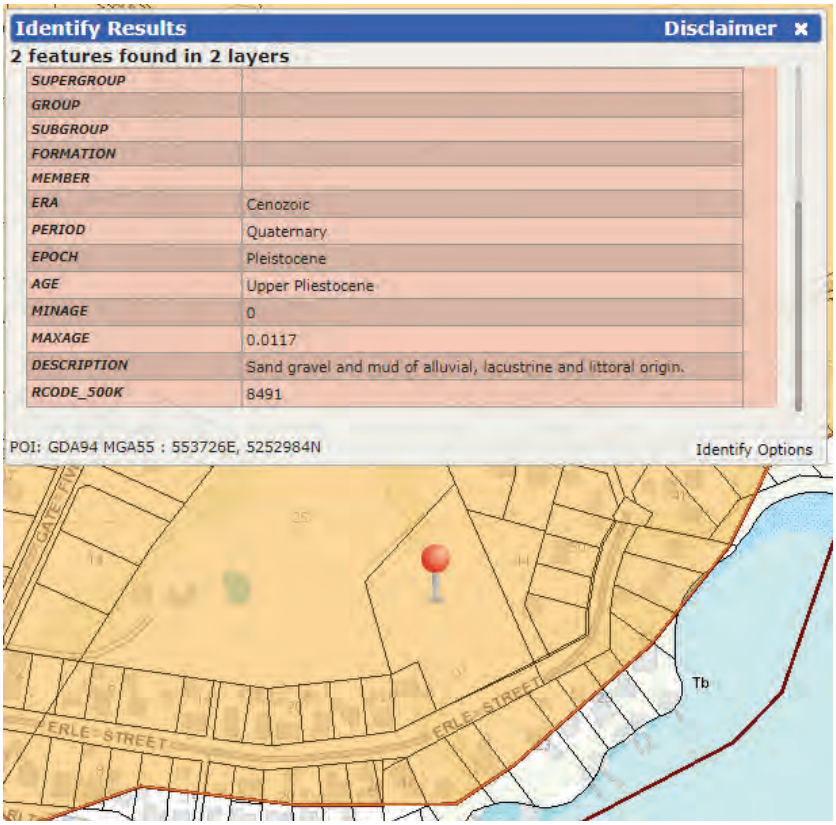


Figure 15: Screenshot (The List) – Geological Polygons 250K (Site Description)

Considering the site has a general layer of sand gravel and mud from littoral origins, it can parallel or correlate these characteristics similarly with (sandy clay) soil. Therefore, new losses are considered based on Figure 16.

Typical Soil Types and Associated Saturate Hydraulic Conductivity

Soil Type	Saturated Hydraulic Conductivity	
	m/s	mm/hr
Coarse Sand	>1 x 10-4	>360
Sand	>5 x 10-5 to 1-10-4	180 to 360
Sandy Loam	1 x 10-5 to 5 x 10-5	36 to 180
Sandy Clay	1 x 10-6 to 1 x 10-5	3.6 to 36
Medium Clay	1 x 10-7 to 1 x 10-6	0.36 to 3.6
Heavy Clay	1 x 10-7	0.0036 to 0.36

Engineers Australia 2006

Figure 16: Screenshot from (Department of Primary Industries – Water Resources, Institute of Municipal (Engineers Australia)

Overall, the new values are lower and are considered as an average of the sandy clay soil type from Figure 16.

Initial Loss: 20mm

Continuing Loss: 2mm/h

Therefore, the adjusted 1% AEP with climate change are:

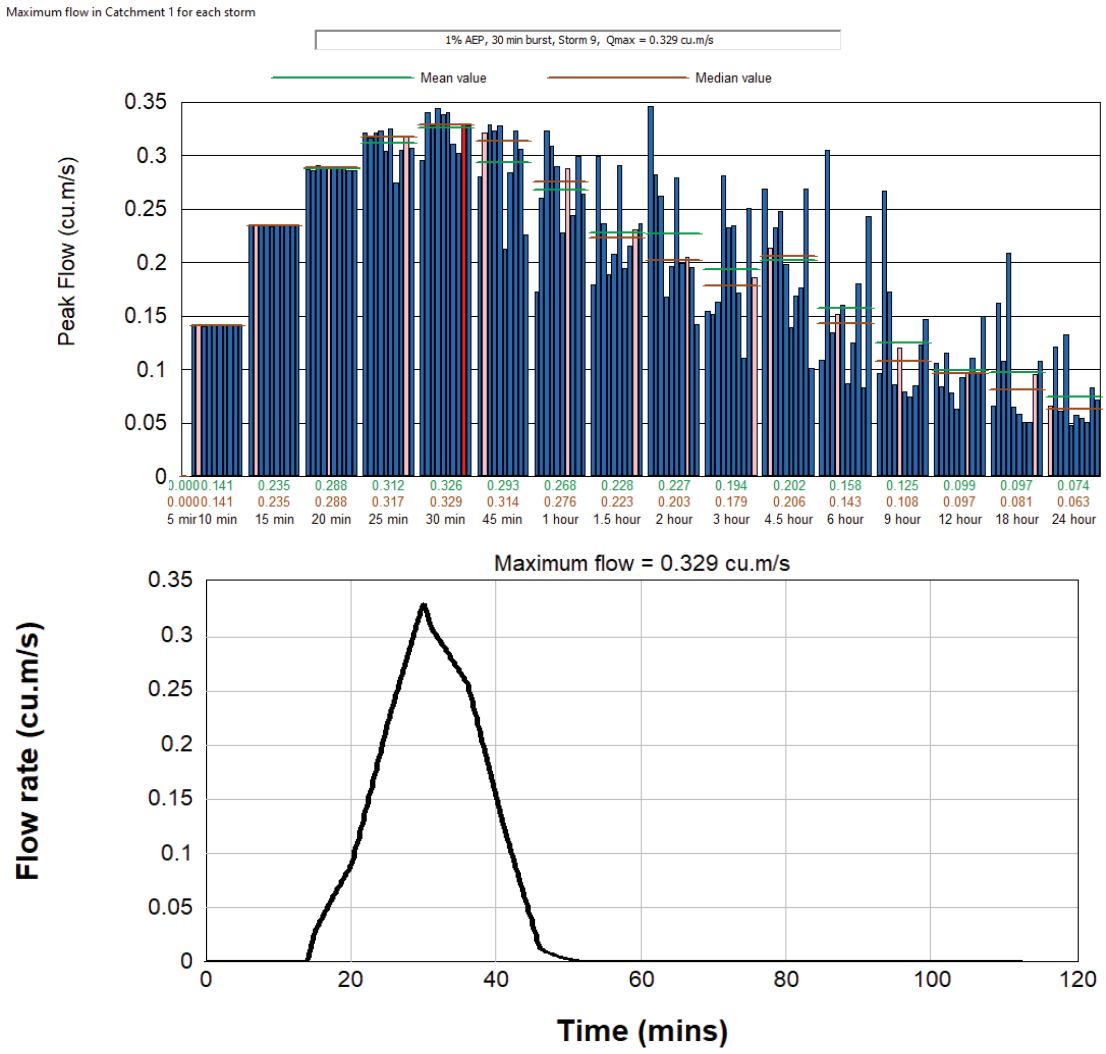


Figure 17: Screenshot from Drains – Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 1 - Calibrated)

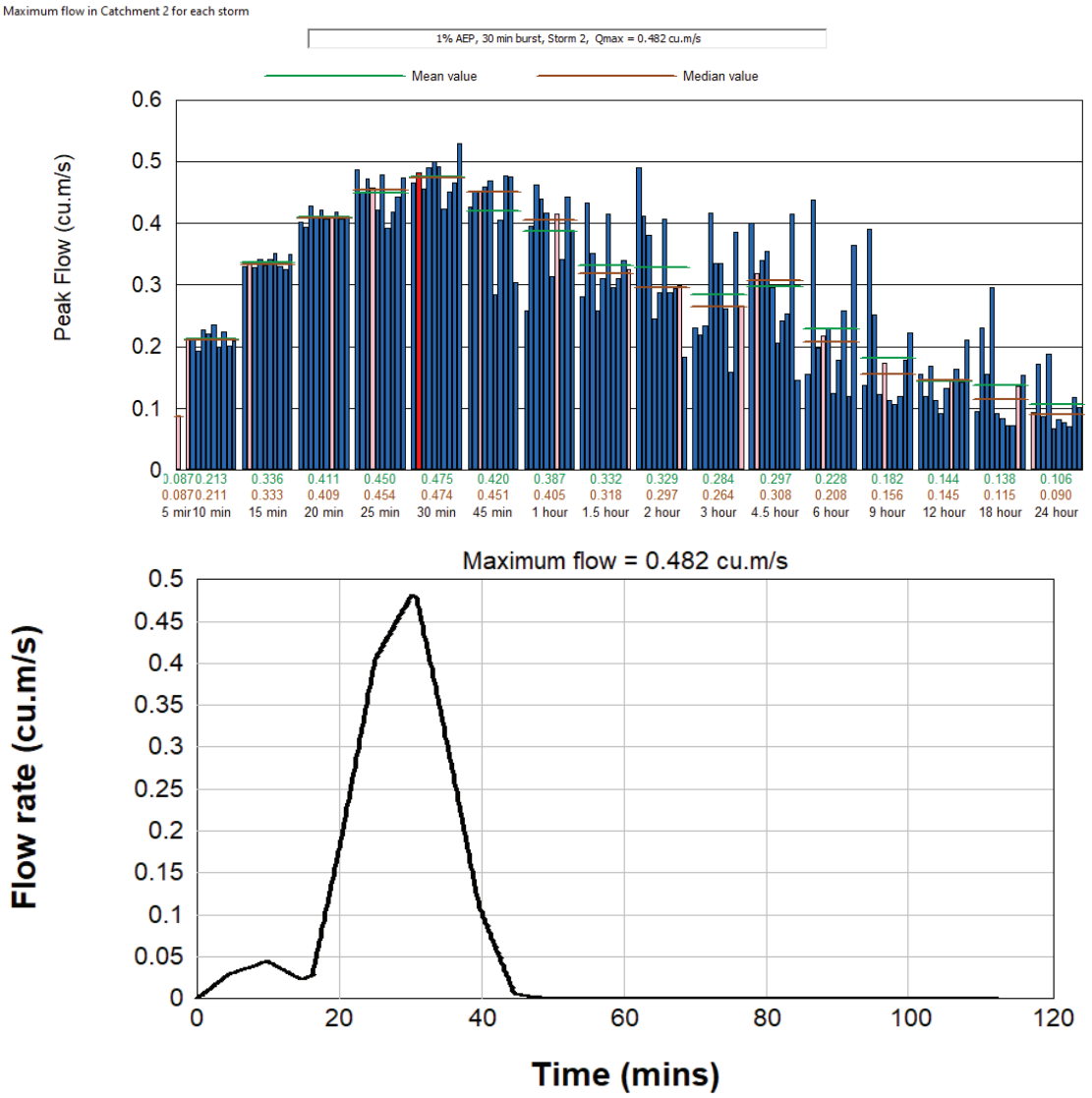
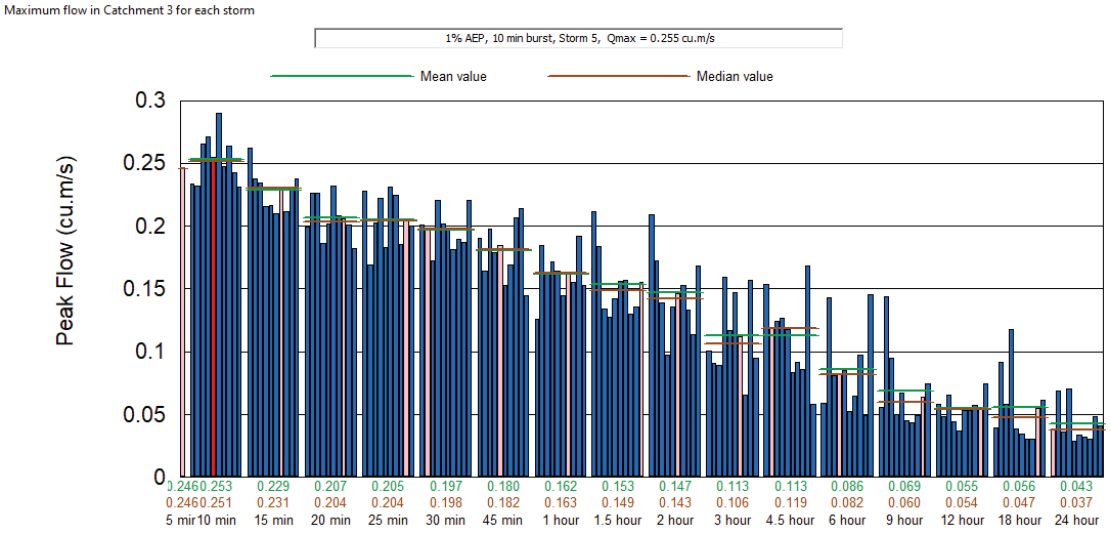


Figure 18: Screenshot from Drains - Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 2 - Calibrated)



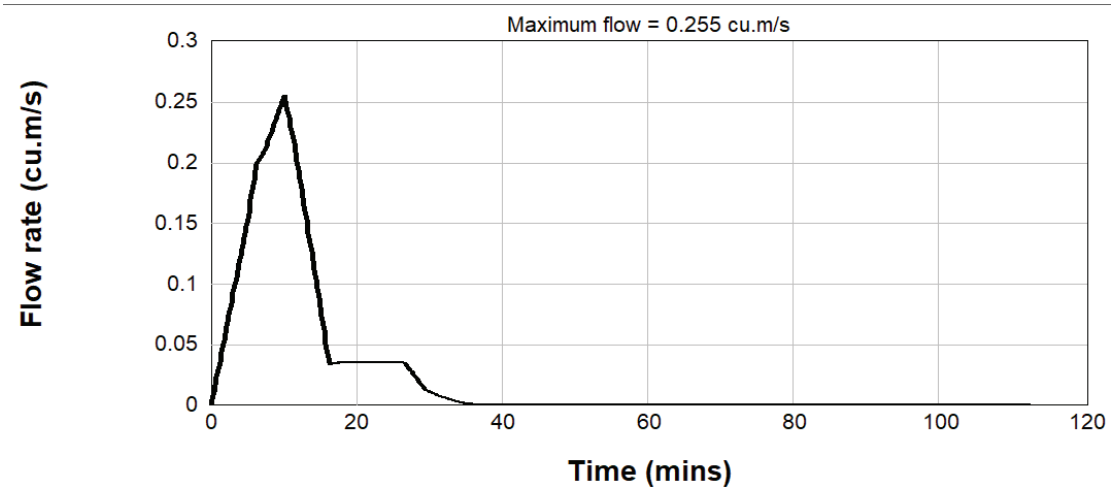


Figure 19: Screenshot from Drains - Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 3 - Calibrated)

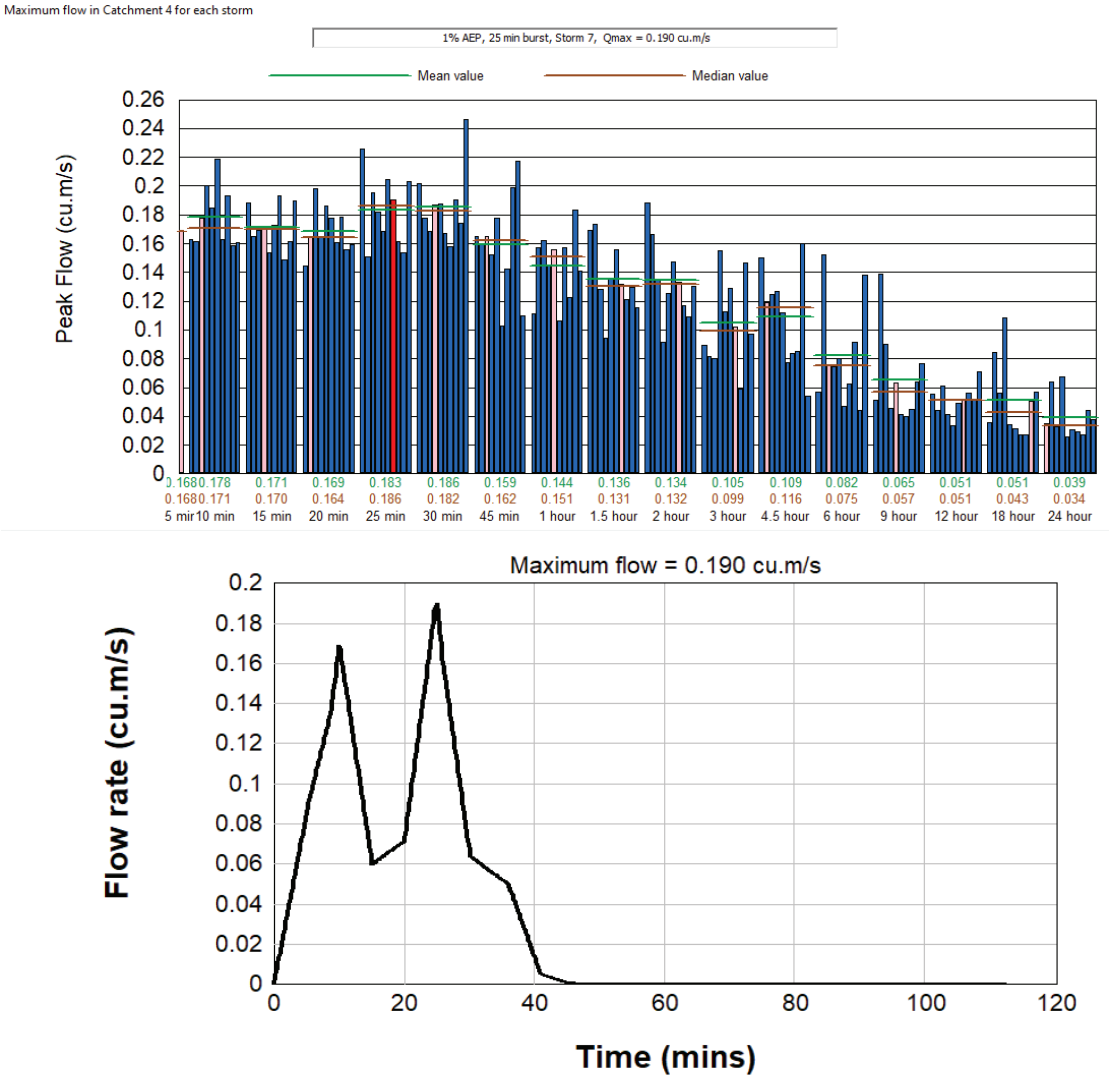


Figure 20: Screenshot from Drains - Ensemble Storm and Peak Flow Rate for the 1% AEP + CC Storm Event (Catchment 4)

Additionally, the 2D analysis on HEC-RAS has been updated with the calibrated peak flows, and the results are below.

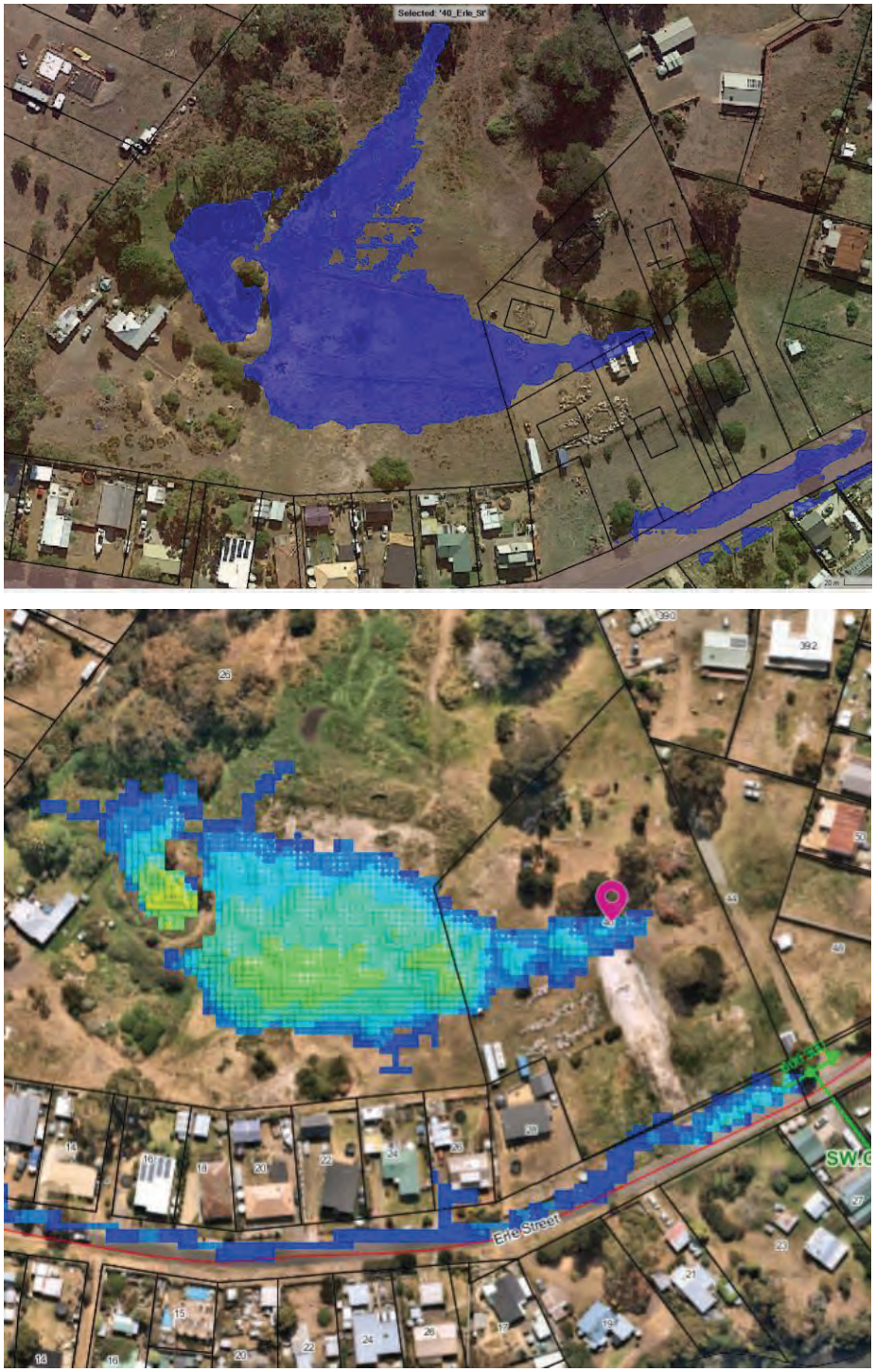


Figure 21: Comparison of the maximum flood extents for the 1% AEP event with Climate Change from HEC-RAS and Sorell Council model

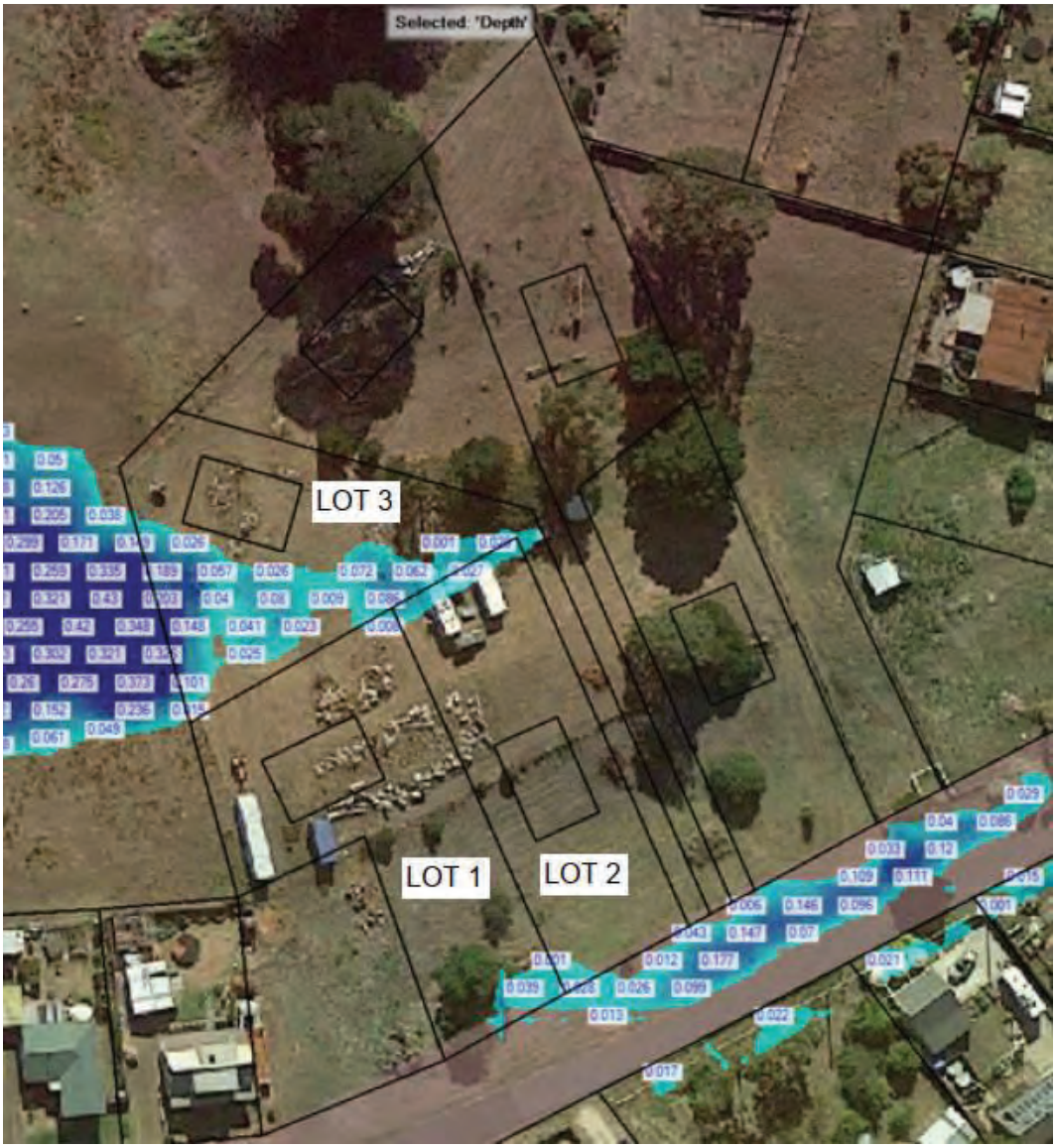


Figure 22: HEC-RAS 2D Analysis – Maximum Depth

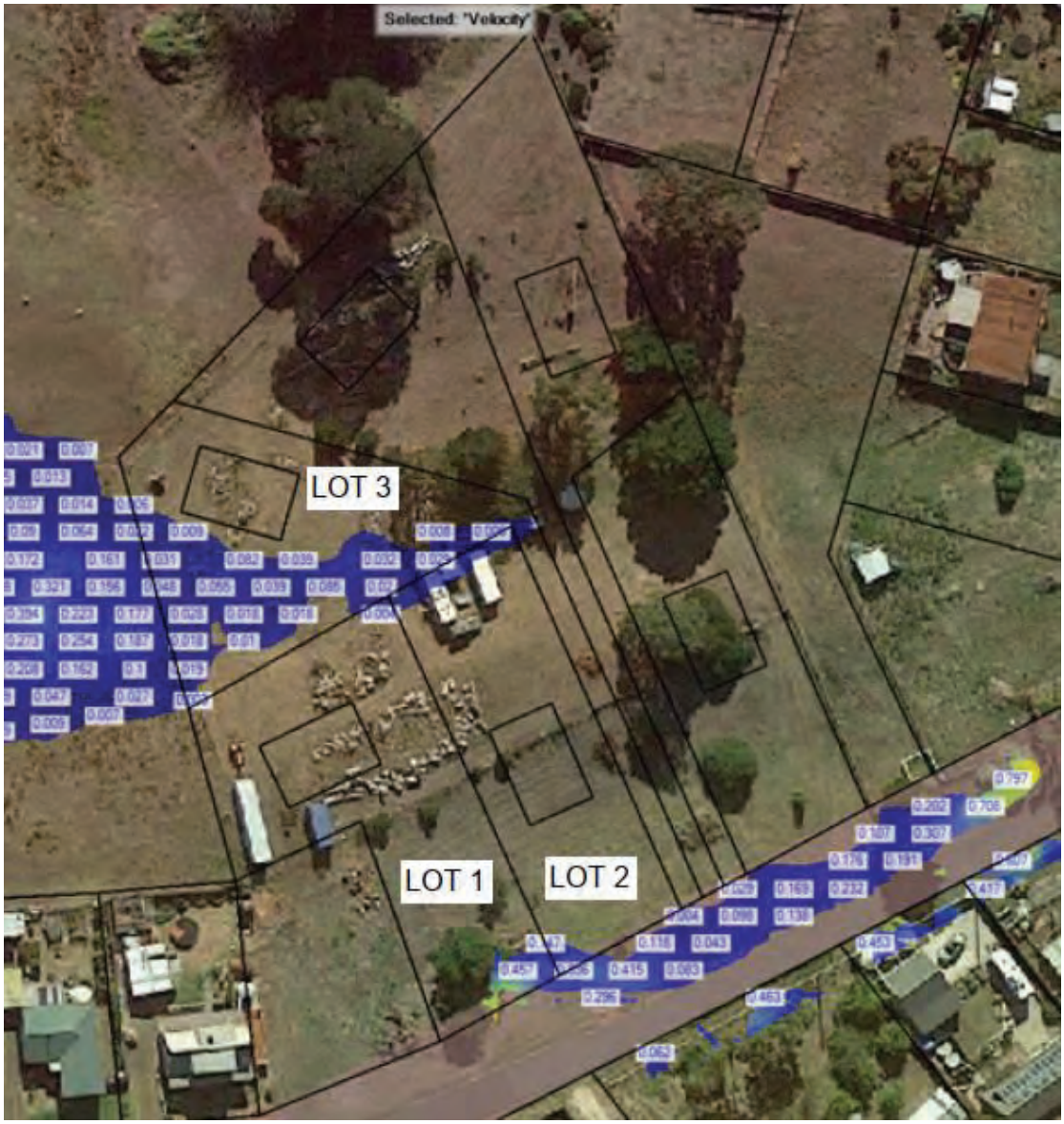


Figure 23: HEC-RAS 2D Analysis – Maximum Velocity

5. Flood Hazard Analysis

Flood Risk Hazard Levels are typically based on inundation depth and flow velocity per the following graphic and table from 'Updating National Guidance on Best Practice Flood Risk Management (D. McLuckie et al., 2014).

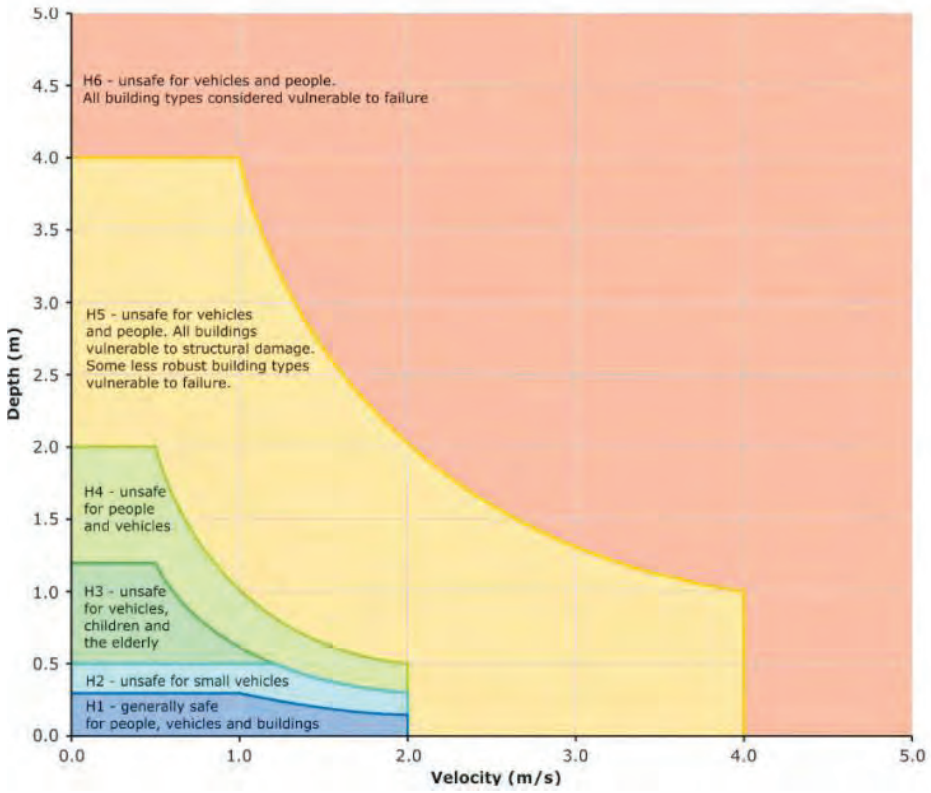


Figure 24: Combined Flood Hazard Curve Classification

In summary, the affected lots are:

Table 4: Maximum Depth and Velocity for Lots under the 1% AEP +CC Flood Extents

	Lot 1	Lot 2	Lot 3
Maximum Depth (*mm*)	40	30	290
Maximum Velocity (*m/s*)	0.60	0.35	0.10
Hazard Level	**H1**	**H1**	**H1**

6. Conclusion and Recommendations

In summary, all the aforementioned lots present no flood boundary extending to the proposed building areas and are considered Hazard Level H1, generally safe for people, vehicles and building and will not cause or contribute to the occurrence of flood on any adjacent land.

Additionally:

- The minimum finish flood level (FFL) for Lot 3 shall be 12.28m AHD to provide 300mm freeboard to the flood level.
- Even the hazard level of H1 at Lot 3 region, is preferable that nobody enters the overland flow path.

7. Management & Actions During / Following Flood Events

Where flood warnings have been issued by the Bureau of Meteorology, this allows preparing for the flooding. This would ideally involve:

- Remove any noticeable or significant obstruction along the cutoff drains at the northern boundary.
- To move any vehicles away from any of the possible affected regions from Figure 21 if safe to do so.
- It is preferable to do not occupy or be in the flood extent regions.

During a flooding event, the property owner or occupant should proceed with the following tasks only if safe to do so:

- Ensure nobody enters the overland flow path.
- Monitor flood extent
- Keep a watch out for items of debris that may get snagged in the flow path and remove them **only if safe to do so**.
- If assistance is required, contact the **SES** on **132 500** in a medical emergency call **000**.
- Assist occupants who may have become saturated if they do not have access to their lots.

After a flooding event, the property owner or occupant should carry out the following tasks:

- Confirm that the flood risk has passed, some storm events may have multiple downpours which could produce repeated flooding.
- If the SES has responded, seek their approval to allow occupants to return to restricted areas.
- Check the overland flow path and perimeter drainage for obvious damage and investigate when safe to do so.
- Ensure people on site are aware that floodwaters can be contaminated with sewage and advise them to wash thoroughly before eating food, etc.

8. References

"Flood Hazard Report 1-3 Lot Subdivision / 3 Gate Five Road, Carlton River Ver. 2 – 31.05.2023"

"Updating National Guidance on Best Practice Flood Risk Management" D. McLuckie et al 2014

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49-51 ELIZABETH STREET, LAUNCESTON (03) 6334 5548
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ROGERSON & BIRCH SURVEYORS

UNIT 1, 2 KENNEDY DRIVE
CAMBRIDGE 7170
PHONE: (03)6248 5898
EMAIL: admin@rbsurveyors.com
WEB: www.rbsurveyors.com

Sorell Council
Development Application: 7.2023.19.1
Plans Reference: P1
Date Received: 4/10/2023

Overlay Legend:

Bushfire-prone Area: Entire Site

Flood-prone Areas:

Development Standards for Subdivision
10.0 Low Density Residential

10.6.1 Lot Design

A1
(a)- Lots 1, 3-5 comply - Min. 1500m²
(i)- Lots 1, 3-5 comply - Contain min. area of 10m x 15m w/ gradient < 1:5
a- Lots 1, 3-5 comply - All required setbacks
b- Lots 1, 3-5 comply - Clear of easements
P1- Lots 2 & 6 comply - Area not less than 1200m²

A2- Lot 1, 2 & 3 comply - Min. 20m frontage
P2- Lot 3 - 5 comply - Min. 3.60m frontage

A3- All lots comply - vehicular access directly from road

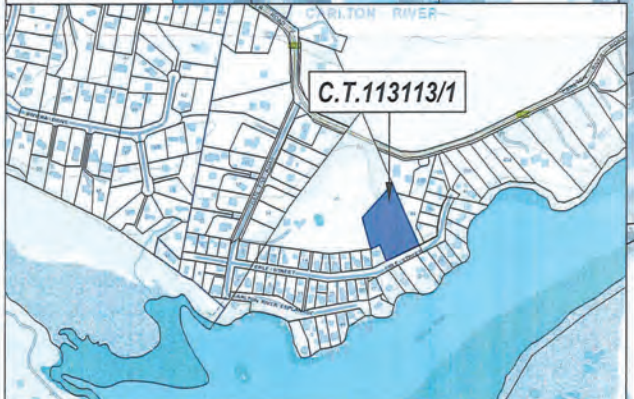
10.6.2 Roads

A4- All lots comply - no new roads

10.6.3 Services

A1- All lots comply - On-site Water collection to be provided
A2- All lots comply - On-site Wastewater to be provided
A3- All lots comply - On-site Stormwater runoff to be provided

LOCATION PLAN



5
1,504m²
4
1,516m²
3
1,614m²
1
1,560m²
2
1,235m²
6
1,312m²

51.00
Setbacks
24.00
58.72
47.62
11.34
53.45
21.17
10m x 15m Min. Compliance Area
38.22
20.59
33.45
66.72
68.85
63.08
63.57
61.19
Proposed Right of Way 3.60 Wide
3.61
25.94
60.81
20.11
34.25
20.06
20.05
20.00
Existing Access
Proposed Access for Lot 3, 4 & 5
ERLE STREET

REV	AMENDMENTS	DRAWN	DATE	APPR.
E				
D				
C				
B				
A				

OWNER: IAN R. WOOLLEY
TITLE REFERENCE: C.T.113113/1
LOCATION: 40 ERLE STREET, CARLTON

Proposed Subdivision

Date:	Reference:
02/10/2023	WOOLI01 4907-09
Scale:	**Municipality:**
1:600 (A3)	SORELL