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KFH ref. R.26008.001.02
Your ref. 2109

25 May 2026

Van Osgood
PO Box 181
Bermagui
NSW, 2546
Australia

RE: Flood Impact and Risk Assessment for the Proposed Ferndale Lane, Wolumla Valley Estate Development

Dear Van

This Flood Impact and Risk Assessment (FIRA) has been prepared to support Stage 1 of the proposed residential subdivision Development Application at Ferndale Lane, Wolumla. The assessment addresses matters raised by Bega Valley Shire Council (BVSC) and peer review comments provided by Rhelm and has been prepared in accordance with Flood Risk Management Guideline LU01: Flood Impact and Risk Assessment.

The hydraulic model associated with the adopted Wolumla Creek Flood Study (2025) has been updated to incorporate the proposed development design surface to inform a quantitative assessment of flood behaviour, including flood levels, velocities, hazard, and afflux.

The Flood Impact and Risk Assessment (FIRA) is provided below.

Please feel free to contact myself or Sudam Wanigatunga if you required any further information.

Yours Faithfully

A handwritten signature in blue ink, appearing to read "B. Caddis", is positioned above the printed name.

Ben Caddis
Principal Flood Engineer

1 Introduction

This Flood Impact and Risk Assessment (FIRA) has been prepared by Kingfisher Hydro to support Stage 1 of the Development Application for the proposed residential subdivision at Ferndale Lane, Wolumla, within the Bega Valley Shire local government area.

The assessment responds to a Request for Information (RFI) issued by Bega Valley Shire Council, as well as peer review comments provided by Rhelm (March 2026). The report has been prepared in accordance with the Flood Risk Management Guideline LU01: Flood Impact and Risk Assessment published by the NSW Department of Climate Change, Energy, the Environment and Water (2023), and addresses the requirements of:

- Bega Valley Local Environmental Plan 2013 (BVLEP 2013);
- Bega Valley Development Control Plan (BVDCP 2024); and
- Bega Valley Shire Council Development Design Specification D5 Stormwater Drainage Design – (AUS-SPEC 2002)

Flood behaviour in the study area is described in the *Wolumla Creek Flood Study (2025)*, prepared by Rhelm and adopted by Bega Valley Shire Council. This study provides the basis for understanding existing flood conditions and forms the foundation for the hydraulic modelling and impact assessment undertaken for the proposed development.

The purpose of this FIRA is to assess the potential impacts of the proposed development on flood behaviour and to evaluate the associated risks to people, property, and the surrounding environment. The assessment considers the existing flood regime, the likely changes arising from the proposed subdivision, and the suitability of the development with respect to relevant floodplain risk management principles and planning controls.

The hydraulic model associated with the adopted *Wolumla Creek Flood Study (Rhelm, 2025)* has been provided by Bega Valley Shire Council. Detailed hydraulic modelling and quantitative assessment of flood behaviour, including flood levels, velocities, hazard, and afflux, have therefore been undertaken for the existing and developed conditions. Developed case modelling has been completed based on the design surface provided by OCRE on 29 April 2026 (*2109_tin_total_20260429.tin*).

The findings presented herein are intended to demonstrate a structured and compliant approach to the ongoing evaluation of flood risk for the proposed development.

2 Background

The proposed subdivision layout is illustrated on OCRE Drawing 2109-P01GA (General Arrangement) (refer to Figure 2.1). The site is characterised by three defined overland flowpaths which generally drain in a westerly direction, crossing Ferndale Lane and discharging to Frogs Hollow Creek, located approximately 300 m to the west.

Two of the overland flowpaths merge near the western boundary at Ferndale Lane, where an existing farm dam is located. These flow paths are referred to by OCRE as the Northern and Southern Floodways within the site and are shown in Figure 2.2.

The upstream catchment of the Northern Floodway includes an off-site contributing area of approximately 9 hectares, incorporating existing residential areas along Scott Street, Bega Street, Momsen Street, and Philip Street. Runoff from this catchment enters the site in the vicinity of Bega Street.

The third overland flowpath is located to the south of the Northern and Southern Floodways and is referred to as the Road 11 Flowpath, reflecting its alignment with the proposed Road 11 corridor. This corridor is intended to function as a key drainage conveyance path through the development.

The proposed development is situated in the upper reaches of the Frogs Hollow Creek catchment. As such, the site represents a headwater environment where local drainage features and overland flow paths dominate flood behaviour. Flooding at the site is therefore primarily influenced by short-duration, high-intensity rainfall events and local catchment response, rather than riverine flooding or flooding from backwater influence. This context is an important consideration in assessing potential flood impacts and downstream implications of the proposed development.

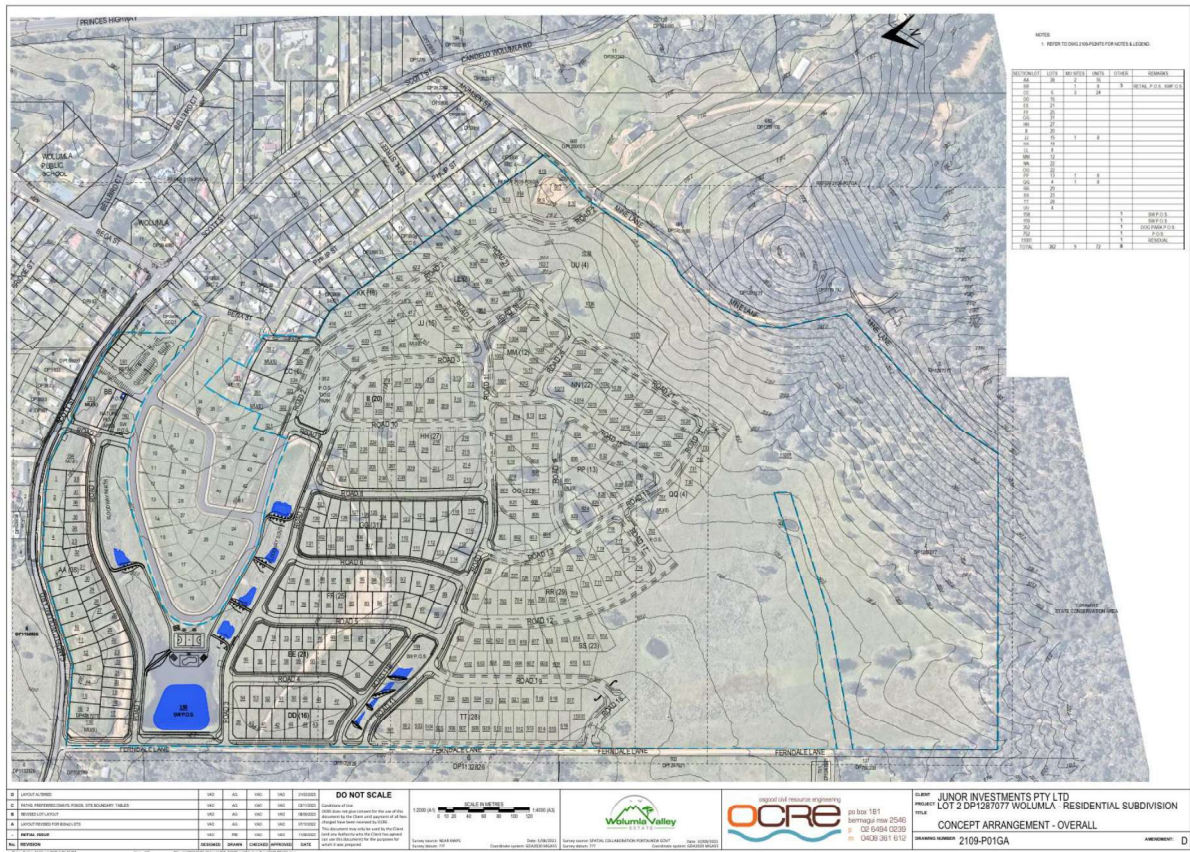


Figure 2-1 Proposed subdivision layout

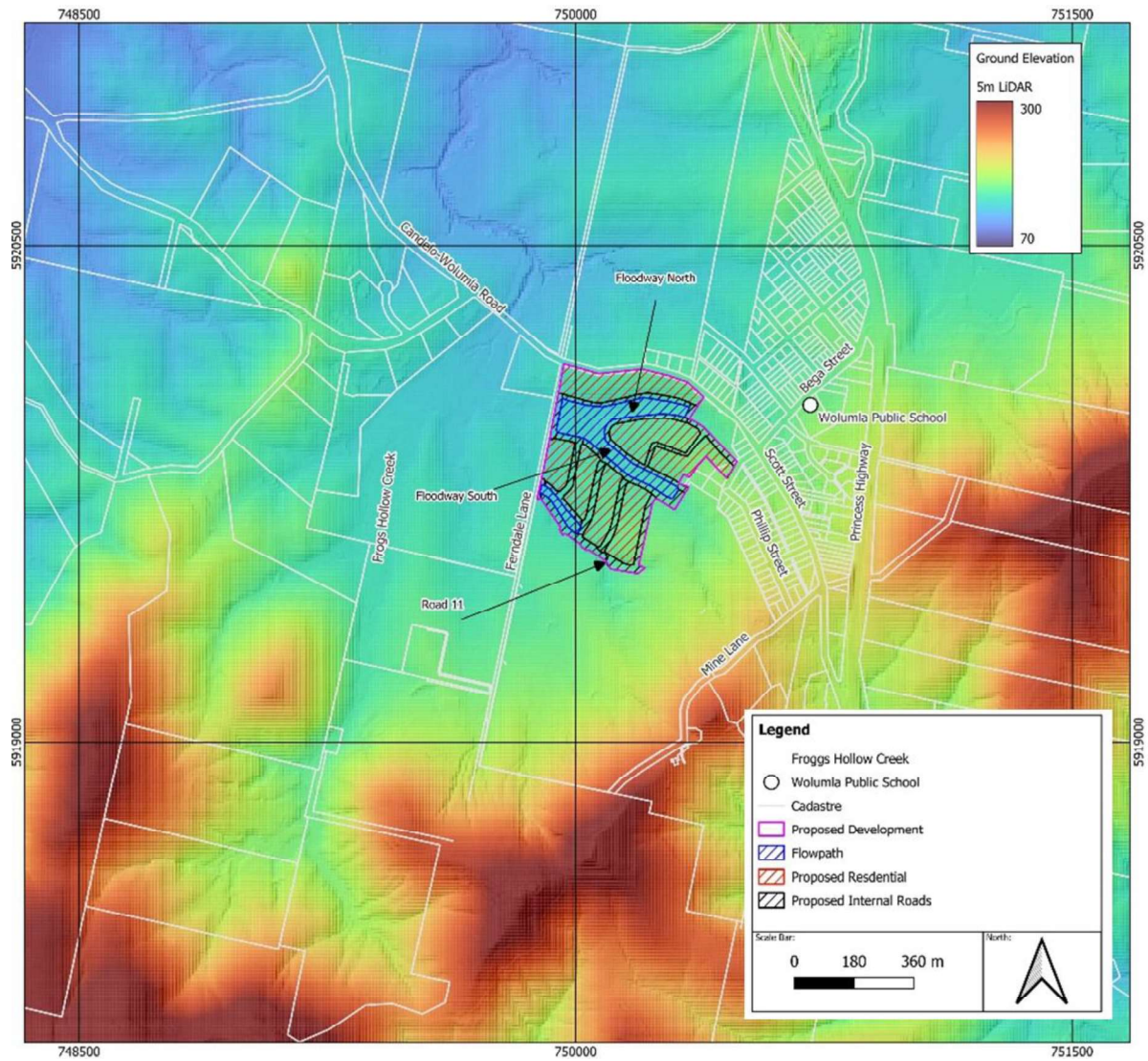


Figure 2-2 Site and Surrounds

3 Existing Flood Behaviour

3.1 Overview and data sources

This section is based on available information, including peak flood depth and hazard grids extracted from the adopted flood study, review of the flood model and consideration of local environmental conditions. The proposed subdivision layout has been overlaid onto these datasets to inform an understanding of flood behaviour relative to the development (refer to attached Maps A-1 to A-8).

3.2 Catchment and flow path characteristics

Flooding within the site is characterised by local runoff processes within the upper reaches of the Frogs Hollow Creek catchment. Site topography is defined by overland flow paths, including the Northern and Southern Floodways, and the Road 11 Flowpath, which convey flows in a westerly direction toward Ferndale Lane and downstream receiving environments.

Due to the relatively steep topography, flood flows are typically well confined within these flow paths, with limited overbank inundation. The Northern Floodway, which includes an upstream contributing catchment of approximately 9 hectares, represents a key inflow to the site and remains an active flow path across all modelled events, including the Probable Maximum Flood (PMF). Similar behaviour is seen for the Southern Floodway and the Road 11 Flowpath.

3.3 Flood depth and extent

Review of the available depth grids indicates that, during the 1% AEP event, flood depths along the Northern Floodway are generally shallow, typically ranging from 0 to 0.3 m. Increased depths are observed in the vicinity of the existing farm dam near Ferndale Lane, where depths reach approximately 0.7 m during the 1% AEP event.

For more extreme events, including the 0.2% AEP and PMF, flood depths within the dam area increase to approximately 0.8 m and 0.9 m respectively. Upstream of the dam, flood extents remain largely confined within the defined channel, reflecting efficient flow conveyance associated with the site's gradient. Across the broader site, inundation outside of defined channels is generally limited, with only shallow flow depths indicated where overland flow occurs.

3.4 Flood hazard

Flood hazard mapping from the adopted *Wolumla Creek Flood Study (Rhelm, 2025)* indicates that, under existing conditions, the majority of the site is subject to low hazard (H1) during both the 1% AEP and 0.2% AEP events. Areas of increased hazard are generally confined to defined flowpaths and the vicinity of the existing farm dam, where greater depths and flow velocities occur.

For the PMF event, hazard within the flowpaths typically ranges from H1 to H3, with isolated localised areas of higher hazard (up to H4) identified, particularly within the Road 11 Flowpath

and at the Ferndale Lane crossing. These higher hazard areas correspond to zones of concentrated flow and increased depth.

3.5 Ferndale Lane and local hydraulic controls

Ferndale Lane represents a key hydraulic control within the study area, located downstream of the confluence of the Northern and Southern Floodways and immediately downstream of the existing farm dam. At this location, flood depths across the road corridor are generally shallow during the 1% AEP event, typically on the order of 0.1 m or less. A localised area of increased depth is identified, where depths reach approximately 0.5 m during the 1% AEP event and up to approximately 0.6 m during the 0.2% AEP and PMF events.

Immediately east of Ferndale Lane, outside the road reserve and downstream of the farm dam, a distinct ponding area is evident. In this location, flood depths are estimated to reach approximately 0.9 m during the 1% AEP event, increasing to around 1.0 m for the 0.2% AEP event and up to approximately 1.1 m during the PMF. This behaviour suggests localised storage and potential flow constriction associated with the road crossing and downstream drainage conditions.

In the vicinity of the Road 11 Flowpath downstream of its crossing at Ferndale Lane, flood behaviour is generally characterised by shallow inundation (less than 0.1 m), with an isolated area of increased depth (approximately 0.6 m) within the defined channel.

3.6 Climate Change

Climate change impacts have been considered based on findings presented in the *Wolumla Creek Flood Study (Rhelm, 2025)*. While the adopted hydraulic model has been provided by Bega Valley Shire Council, the climate change inflow datasets and associated model inputs required to simulate the climate change scenarios were not supplied. Accordingly, climate change impacts have not been independently modelled as part of this assessment.

The following discussion is therefore based on documented results and interpretations presented in the adopted flood study report.

The adopted study indicates that, within the upper reaches of the catchment, including the Wolumla township and the subject site at Ferndale Lane, the impact of climate change on flood behaviour is relatively minor. Reported increases in peak flood levels are generally less than 0.1 m under the 2100 scenario. This limited sensitivity is attributed to the steep topography and well-defined flowpaths, which promote efficient flow conveyance and limit floodplain storage.

The study further notes that climate change scenarios do not result in significant changes to flood extents within the upper catchment. Flooding remains largely confined to existing flowpaths, with no substantial activation of new flowpaths or redistribution of flows. As such, the existing flood function within the vicinity of the site is expected to remain broadly consistent under future climate conditions.

Greater impacts associated with increased rainfall intensity are reported further downstream within the Frogs Hollow Creek system, particularly at major confluences. However, these effects are not expected to extend upstream to the subject site and are therefore not expected to influence local flood behaviour at the development location.

Based on the findings of the adopted study, climate change is not anticipated to materially alter flood behaviour or hazard classifications within the site under existing conditions.

3.7 Summary

Flooding within the site is characterised by concentrated flow within defined drainage channels, with limited overbank inundation due to the relatively steep topography. Localised ponding and increased flood depths occur in the vicinity of the existing farm dam and downstream of Ferndale Lane, which act as key hydraulic controls.

Flood hazard across the majority of the site is low (H1), with higher hazard areas confined to drainage channels within each active flowpath.

Hydraulic modelling of the developed case confirms that the site is not affected by downstream backwater influence, with flooding remaining primarily driven by local runoff processes rather than regional riverine flooding.

Based on the findings of the adopted *Wolumla Creek Flood Study (Rhelm, 2025)*, climate change is expected to have a relatively minor influence on flood behaviour within the upper catchment, including the subject site. Projected increases in flood levels are small and do not result in significant changes to flood extent, flowpaths, or hazard under existing conditions. While more pronounced impacts are observed further downstream, these do not extend to the site.

4 Proposed Development

4.1 Development Layout

The proposed Stage 1 development comprises a residential subdivision at Ferndale Lane, Wolumla, as illustrated on OCRE Drawing 2109-P01GA (General Arrangement) (refer to Figure 2.1). The subdivision layout includes a network of residential lots, internal roads, and associated infrastructure designed to service the development.

The layout has been developed with consideration of the existing site topography and drainage features, including the defined flowpaths traversing the site. The subdivision design incorporates the Northern and Southern Floodways and the Road 11 Flowpath. These features represent the primary flowpaths through the site and are intended to be retained as part of the development's drainage framework.

In particular, the Road 11 corridor is designed to function as a key drainage conveyance path, accommodating stormwater runoff from both the development and upstream contributing catchments.

Stage 1 of the development was modelled using the adopted *Wolumla Creek Flood Study (Rhelm, 2025)* hydraulic model. The design surface provided by OCRE on 29 April 2026 (2109_tin_total_20260429.tin) was incorporated into the model, together with two upgraded culvert crossings comprising:

- 3 × 1500 × 600 RCBCs at the outlet of the main floodway/gully system adjacent to the basin (between Road 1 and Road 3); and
- 5 × 1200 × 450 RCBCs at the outlet culvert crossing beneath Ferndale Lane between Road 11 and Road 11B.

In addition, Manning's roughness values within the Stage 1 development area were updated to reflect the proposed land use conditions. Manning's *n* values adopted in the model include 0.016 for roads, 0.05 for flowpaths, and 0.10 for residential areas (R2 – Low Density Residential, based on the proposed development areas identified within the Master Structure Plan).

The developed hydraulic model setup is shown in Figure 4-1.



Figure 4-1 Hydraulic Model Setup (Proposed Developed)

4.2 Previous Stormwater and Flood Assessment (OCRE, 2025)

A Stormwater and Flood Assessment was prepared by OCRE dated 12 November 2025 in support of Development Application 2023.351 (*Wolumla Valley Estate – Stage 1 and Concept Master Plan*), in response to a Request for Information issued by Bega Valley Shire Council.

The assessment describes XP Storm modelling to simulate stormwater runoff and overland flow behaviour within the proposed development, with analysis focused on the 1% AEP event and supplementary results for the 20% AEP event. Model inputs, including hydrological parameters and impervious fractions, are consistent with AUS-SPEC 2002 requirements, and are detailed in Drawing 2109-P50SW, reproduced below as Figure 4-2.

Results indicate that overland flow conditions within the development are generally associated with low flood hazard (H1) for the 1% AEP event in accordance with AIDR (2017) flood hazard classification. Higher hazard conditions are confined to defined flowpaths, including the Northern Floodway (up to H4) and Southern Floodway (generally up to H2), which function as primary conveyance paths and are not intended for residential development.

The OCRE assessment states that the 1% AEP event is not expected to encroach onto proposed residential lots or adjacent properties, based on XP Storm modelling of local stormwater behaviour. This conclusion reflects the minor/major system drainage performance as required under AUS-SPEC 2002.

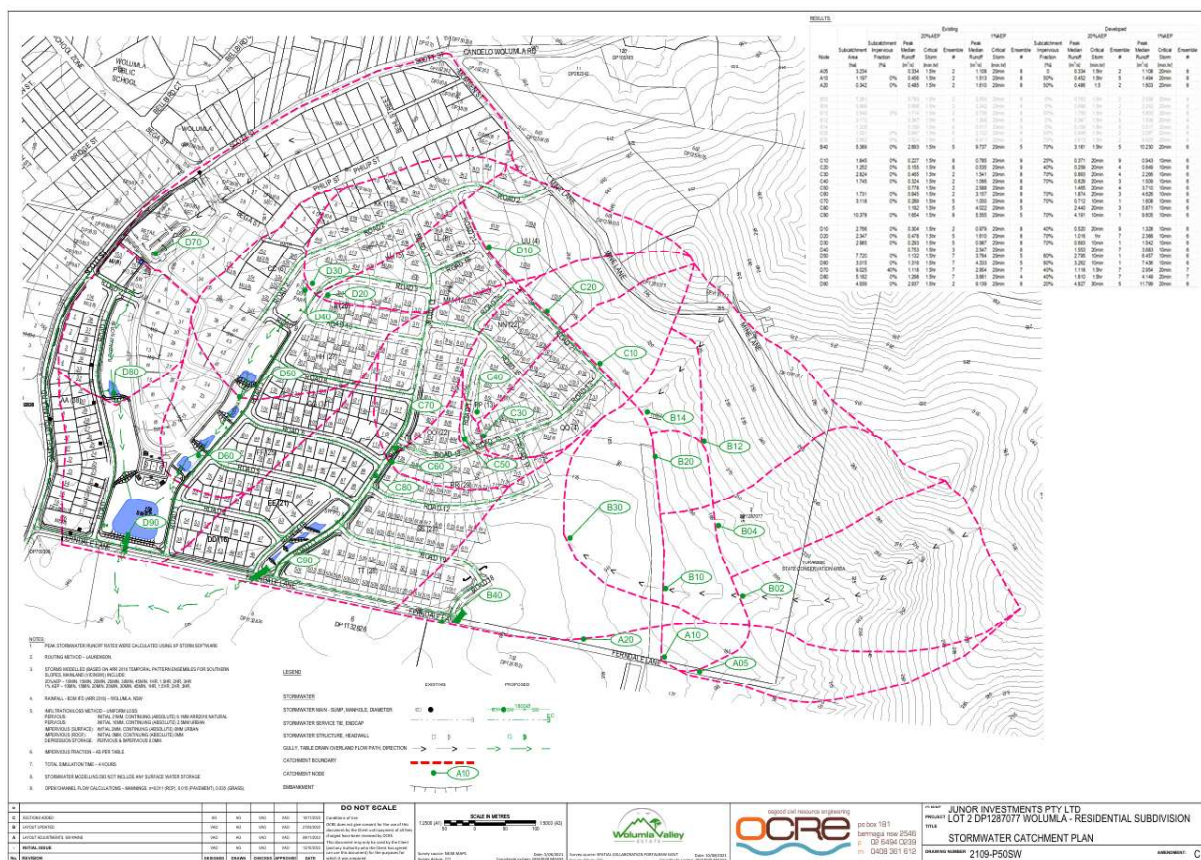


Figure 4-2 Stormwater catchment plan (Drawing 2109-P50SW)

4.3 Developed case flood conditions

The layout of the proposed subdivision aims to maintain existing flowpaths as follows:

- Northern and Southern Floodways to convey runoff from upstream areas, and collect discharge from the adjacent urban footprint; and
- Along the Road 11 Flowpath, the 20% AEP flows will be contained within the piped drainage network (minor system), with the balance of flows contained within the road reserve (major system). Towards Ferndale Lane, all flows will discharge to the Road 11 Flowpath reserve.

Stormwater modelling presented by OCRE (2025) demonstrates compliance with the minor/major stormwater drainage design concept of AUS-SPEC 2002.

During events larger than the 1% AEP event (e.g. the 0.2% AEP and PMF events described in Section 3), a larger component of overland flow occurs. However, the proposed road alignments and associated floodway reserves have been designed to replicate the existing runoff patterns, and no adverse flood impacts or new drainage paths are predicted under developed conditions.

The location of the development within the headwaters of the Frogs Hollow Creek catchment means runoff in all events is characterised by local overland flow processes rather than riverine flooding. The site is not affected by downstream backwater conditions from the receiving environment.

Climate change assessments presented in the adopted *Wolumla Creek Flood Study (Rhelm, 2025)* indicate minimal influence on 1% AEP flood behaviour due to the headwater location of the site. PMF modelling and mapping indicate generally low hazard conditions that are not expected to affect the trafficability of roads within the subdivision or adversely impact community safety.

4.4 Flood impacts

Flood impact results for the 1% AEP, 0.2% AEP, and PMF events are presented in Maps B-1 to B-3. Flood hazard and depth results, with depths less than 0.1 m filtered consistent with the existing condition outputs provided, are presented in Maps C-1 to C-6.

Flood impact assessment indicates neutral to beneficial outcomes associated with the proposed culvert upgrades and developed case conditions. At the upgraded culvert crossing near the basin adjacent to Road 11, reductions in flood levels of approximately 0.01 m to 0.06 m are predicted along Ferndale Lane during the 1% AEP event. Immediately downstream of the culvert, a localised increase in flood level of approximately 0.02 m is predicted within a single model grid cell along the flow path toward Frogs Hollow Creek. This increase is considered negligible and highly localised. With the exception of this isolated increase, flood levels generally remain consistent with or lower than existing conditions.

Similar flood behaviour is predicted for the 0.2% AEP event. No adverse downstream flood impacts are evident, with the exception of the same localised single-grid-cell increase of approximately 0.02 m immediately downstream of the culvert. Reductions in flood levels of up to 0.05 m are also predicted along Ferndale Lane near the upgraded culvert crossing.

Under PMF conditions, reductions in flood levels along Ferndale Lane extend further north of the upgraded culvert. Minor localised increases in flood levels of up to approximately 0.015 m are predicted immediately south of the culvert location. However, flood hazard at this location remains classified as H1 under PMF conditions, representing low hazard conditions considered safe for people, vehicles, and children. Predicted flood depths within these areas range between approximately 0.01 m and 0.08 m, representing extremely shallow inundation depths that do not pose a significant flood risk or hazard.

At the upgraded culvert crossing adjacent to the basin between Road 1 and Road 3, reductions in flood levels of up to approximately 0.1 m are predicted along Ferndale Lane during both the 1% AEP and 0.2% AEP events. These reductions are attributed to the increased culvert capacity and the upstream basin/pond storage system incorporated into the developed case design.

A small number of isolated increases in flood level of up to approximately 0.1 m are predicted immediately adjacent to Ferndale Lane within single model grid cell. However, predicted flood depths within these areas remain shallow, generally approximately 0.04 m during the 1% AEP event and approximately 0.1 m during the PMF event. Flood hazard classifications within these areas remain H1, including during the PMF event, indicating low hazard conditions and no significant risk to public safety.

Overall, the developed case modelling indicates no material adverse flood impacts relative to existing conditions. Flood behaviour across the site and along Ferndale Lane generally remains unchanged or improved under developed conditions.

It is noted that flood impact results within the proposed development footprint may show both positive and negative impacts depending on whether the developed ground levels are increased or decreased relative to existing conditions. As a result, apparent increases in flood levels within these areas are not necessarily representative of adverse flood behaviour but rather reflect local changes in terrain elevation associated with the proposed development design surface. Accordingly, interpretation of flood impacts within the Stage 1 development area should be undertaken with consideration of the modified design surface.

4.5 Management of flood risk

Flood risk has been assessed through detailed hydraulic modelling of the developed case scenario. The subdivision layout retains the key drainage corridors, including the Northern and Southern Floodways and the Road 11 Flowpath, maintaining the primary overland flow conveyance paths through the site. Residential development is located outside mapped floodway areas, minimising potential flood exposure and adverse hydraulic impacts.

The site is located within the upper reaches of the Frogs Hollow Creek catchment and is not influenced by downstream riverine backwater effects. Hydraulic modelling indicates that flooding is primarily driven by local rainfall-runoff processes and remains generally confined to the defined drainage corridors, including during extreme events up to the PMF. The developed case modelling demonstrates that no adverse flood impacts are predicted across the broader developable areas of the site.

4.5.1 Flood free egress / shelter in place

Finished floor levels within the proposed development are set a minimum of 0.5 m above the 1% AEP flood level. Hydraulic modelling indicates that no proposed residential lots or properties are adversely affected by flood inundation under the assessed design flood events. The developed case mapping indicates that flood-free access is achievable for the majority of the site.

In the unlikely event that flood-free egress is constrained under extreme PMF conditions, the elevated nature of the site and the confinement of flooding to drainage corridors provide suitable conditions for consideration of shelter-in-place refuge areas.

4.5.2 Reliable egress

Hydraulic modelling indicates that, following the proposed culvert upgrades, Ferndale Lane remains trafficable from the proposed development near Road 11 northward along Ferndale Lane to Candelo-Wolumla Road and continuing toward Scott Street. Flood hazard along this evacuation route remains within the H1 hazard classification, including during PMF conditions.

The proposed development therefore maintains reliable egress under both design flood and extreme flood events, with flood impacts generally confined to the defined drainage corridors and away from the primary access route.

4.5.3 Evacuation strategy consistency

The proposed development is consistent with key flood evacuation principles, maintaining access toward Wolumla township via Scott Street under design flood conditions. The layout avoids high hazard areas and supports safe and orderly evacuation. Alignment with any formal evacuation strategy will be confirmed during detailed design in consultation with relevant authorities.

4.5.4 Raising road egress

The subdivision layout provides a connected internal road network that generally follows the natural topography and avoids flood-prone areas, supporting rising road egress from allotments toward external evacuation routes.

4.6 Appropriateness of development

Based on this assessment, the proposed development is considered appropriate for the site. Flooding is largely confined to defined drainage corridors, with the majority of the developable area remaining unaffected, including during extreme events up to the PMF. The subdivision layout responds to these constraints by avoiding high hazard areas and maintaining key flow paths, while supporting safe access and evacuation.

Residual flood risk is limited to localised areas associated with flow conveyance corridors. The developed case modelling indicates that the proposed development does not result in adverse upstream or downstream flood impacts, as it does not obstruct incoming flow paths and generally maintains existing drainage patterns across the site. Accordingly, flood constraints do not present a significant limitation to the proposed development.

The proposed development is not expected to adversely affect the environment, including causing erosion, sedimentation, or impacts to riparian vegetation or channel stability, as key drainage corridors are retained.

5 Compliance

For ease of reference for Council, compliance is summarised here according to the tabulated format of the Rhelm peer review.

Table 5-1 Compliance with Flood Risk Management Guideline LU01: Flood Impacts and Risk Assessment

Requirements	Demonstration of compliance
Consideration of the full range of flood events	This FIRA has considered the 20%, 1% and 0.2% AEP and PMF events.
Definition of existing flood behaviour	Refer to Section 3
Definition of developed flood behaviour	Refer to Section 4
Management of flood risks	Refer to Section 4.5
The appropriateness of the development for the location based on the flood constraints of the land	Refer to Section 4.6
Consideration of climate change	Refer to Section 3.6
Address the requirements of relevant planning instruments.	

Table 5-2 Compliance with BVLEP 5.21 Requirements

Requirements	Demonstration of compliance
Development consent must not be granted to development on land the consent authority considers to be within the flood planning area unless the consent authority is satisfied the development— (a) is compatible with the flood function and behaviour on the land, and (b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and (c) will not adversely affect the safe occupation and efficient evacuation of	(a) Refer to Section 4.5 and Section 4.6 (b) Refer to Section 4.4 and Section 4.6 (c) Refer to Section 4.5 (d) Refer to Section 4.5 (e) Refer to Section 4.6

people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and (d) incorporates appropriate measures to manage risk to life in the event of a flood, and (e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	
In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters— (a) the impact of the development on projected changes to flood behaviour as a result of climate change, (b) the intended design and scale of buildings resulting from the development, (c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood, (d) the potential to modify, relocate or remove buildings resulting from development if the surrounding area is impacted by flooding or coastal erosion.	(a) Refer to Section 3.6 (b) Refer to Section 4.4 (c) Refer to Section 4.5 (d) Matters relating to the potential to modify, relocate or remove buildings in response to flood or erosion risk are addressed in Section 4.4 to 4.6 of this report. These sections demonstrate that flood risk is localised to defined drainage corridors and does not present a constraint requiring building relocation or removal.

Table 5-3 Compliance with BVLEP 5.22 Requirements

Requirements	Demonstration of compliance
(2) This clause applies to— (a) for sensitive and hazardous development—land between the flood planning area and the probable maximum flood, and (b) for development that is not sensitive and hazardous development—land the consent authority considers to be land that, in the event of a flood, may—	Refer to Section 4.5

(i) cause a particular risk to life, and (ii) require the evacuation of people or other safety considerations.	
(3) Development consent must not be granted to development on land to which this clause applies unless the consent authority has considered whether the development— (a) will affect the safe occupation and efficient evacuation of people in the event of a flood, and (b) incorporates appropriate measures to manage risk to life in the event of a flood, and (c) will adversely affect the environment in the event of a flood.	Refer to Section 4.4, 4.5 and 4.6

Table 5-4 Compliance with BVDCP 2024 Control

Requirements	Demonstration of compliance
5.8.1.1 General Requirements All new subdivision or major development applications must include the impact of 0.9m sea level rise.	A 0.9 m sea level rise scenario is not expected to have a material influence on the site. The site is located within the upper reaches of the Frogs Hollow Creek catchment and is not influenced by downstream tidal or estuarine backwater effects. Flood behaviour is governed by local rainfall–runoff processes rather than coastal or sea level conditions.
5.8.1.2 Requirements for development at or below Flood Planning Level - Buildings and structures will be designed and constructed with appropriate water-resistant materials. - Building foundations will be designed by a suitably qualified geotechnical engineer to be suitable for grounds with potentially reduced bearing capacity under flood conditions. - Development must comply with the principles of ecologically sustainable	The proposed development has been designed having regard to the Flood Planning Level requirements. The subdivision layout is located outside mapped floodways and areas of significant flood affectation, with flooding confined to defined drainage corridors. Flood-free access to the public road network is generally achievable based on the current layout, with access routes

development taking into account floodplain ecology and integrity. • Any fill or excavation must be minimised and must not adversely affect neighbouring properties or the overall flood behaviour and flood storage volume. • Development in areas designated as flood storage is not permitted unless it can be demonstrated that there will be no decrease in net flood storage available on the site. • All development applications must demonstrate that the proposed structure can withstand the force of floodwater, debris and buoyancy through a report prepared by a suitably qualified and experienced engineer. • All habitable rooms within residential development must be at or above the flood planning level. • Flood free access is required for all dwellings, caravan parks, schools, hospitals, and other public building. • No excavated underground car parking in commercial and industrial development is permitted on land at or below the flood planning level. Ground floor parking is however appropriate. • All development applications for industrial and commercial development must be supported by a flood emergency plan. Appropriate warning and advisory signage must be prominently visible at entry/exit points.	maintained outside mapped floodway areas. The proposed development does not result in a reduction in flood storage capacity or an adverse change in flood behaviour within the site or surrounding areas. Where required, future development will incorporate appropriate flood emergency management measures consistent with the scale and nature of the use.
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6 Conclusion

The Flood Impact and Risk Assessment (FIRA) demonstrates that the proposed subdivision has been designed with regard to the existing flood constraints of the site, based on the adopted *Wolumla Creek Flood Study (Rhelm, 2025)* and supporting hydraulic modelling.

Flood mapping and hydraulic modelling indicate that flooding is primarily confined to defined drainage corridors, with the majority of the site characterised by low flood hazard conditions. The proposed subdivision layout responds appropriately to these constraints by locating development outside higher hazard areas and maintaining key flow conveyance paths.

Assessment of local stormwater behaviour indicates that overland flow can be appropriately managed within the proposed drainage network and road reserve flow paths, consistent with the findings of the OCRE modelling and the peer review comments provided by Rhelm.

The site's location within the upper catchment of Frogs Hollow Creek, together with the absence of downstream backwater influence identified in both the adopted flood study and developed case modelling, confirms that flooding is predominantly driven by local rainfall-runoff processes rather than regional riverine flooding.

Climate change considerations presented within the adopted flood study indicate only minor increases in flood levels within the upper catchment, with no significant change to flood extents or primary flow paths affecting the site.

Hydraulic modelling of the developed case indicates no significant adverse flood impacts, with flood behaviour generally unchanged or improved across the study area. Any increases in flood level are minor, highly localised, and generally confined to isolated model grid cells adjacent to upgraded culvert crossings. No increase in flood risk to surrounding properties is predicted.

The developed case modelling confirms that the proposed development remains appropriate for the site. Flooding remains largely confined to defined drainage corridors, with the majority of the developable area remaining unaffected, including during extreme events up to the PMF. Residual flood risk is limited to localised areas associated with flow conveyance corridors. The proposed development does not obstruct incoming flow paths and generally maintains existing drainage patterns across the site, resulting in no material adverse upstream or downstream flood impacts.

Hydraulic modelling further indicates that key access and evacuation routes remain trafficable and within low hazard classifications during the assessed flood events, including PMF conditions. Accordingly, flood constraints do not present a significant limitation to the proposed development.

The development is not expected to adversely affect the surrounding environment, including through erosion, sedimentation, or impacts to riparian vegetation or channel stability, as key drainage corridors are retained within the subdivision layout.



Legend

- Wolumla Public School
- ▭ Proposed Development
- Cadastre

Scale Bar: 0 100 200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise
2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project: **Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development**

Client: Consultant:

Ref: **26008.002.A (007)** Revision: **A**

Map Title: **1% AEP Peak Flood Depths
(Existing Conditions)**

Date: **20 May 2026** Map Number: **A-1**



Legend

- Wolumba Public School
- Proposed Development
- Cadastral

Scale Bar: 0 100 200 m

North:

Notes

- All dimensions are in meters unless specified otherwise
- All mapping in MGA55 GDA2020 (EPSG: 7855)

Project: Flood Impact Risk Assessment
Ferndale Lane Wolumba Valley Estate Development

Client:
Consultant:

Ref: 26008.003.A (007)	Revision: A
Map Title: 0.2% AEP Peak Flood Depths (Existing Conditions)	
Date: 20 May 2026	Map Number: A-2



Legend

- Wolumba Public School
- Proposed Development
- Upgraded Culverts
- Cadastre

Scale Bar: 0 100 200 m

North:

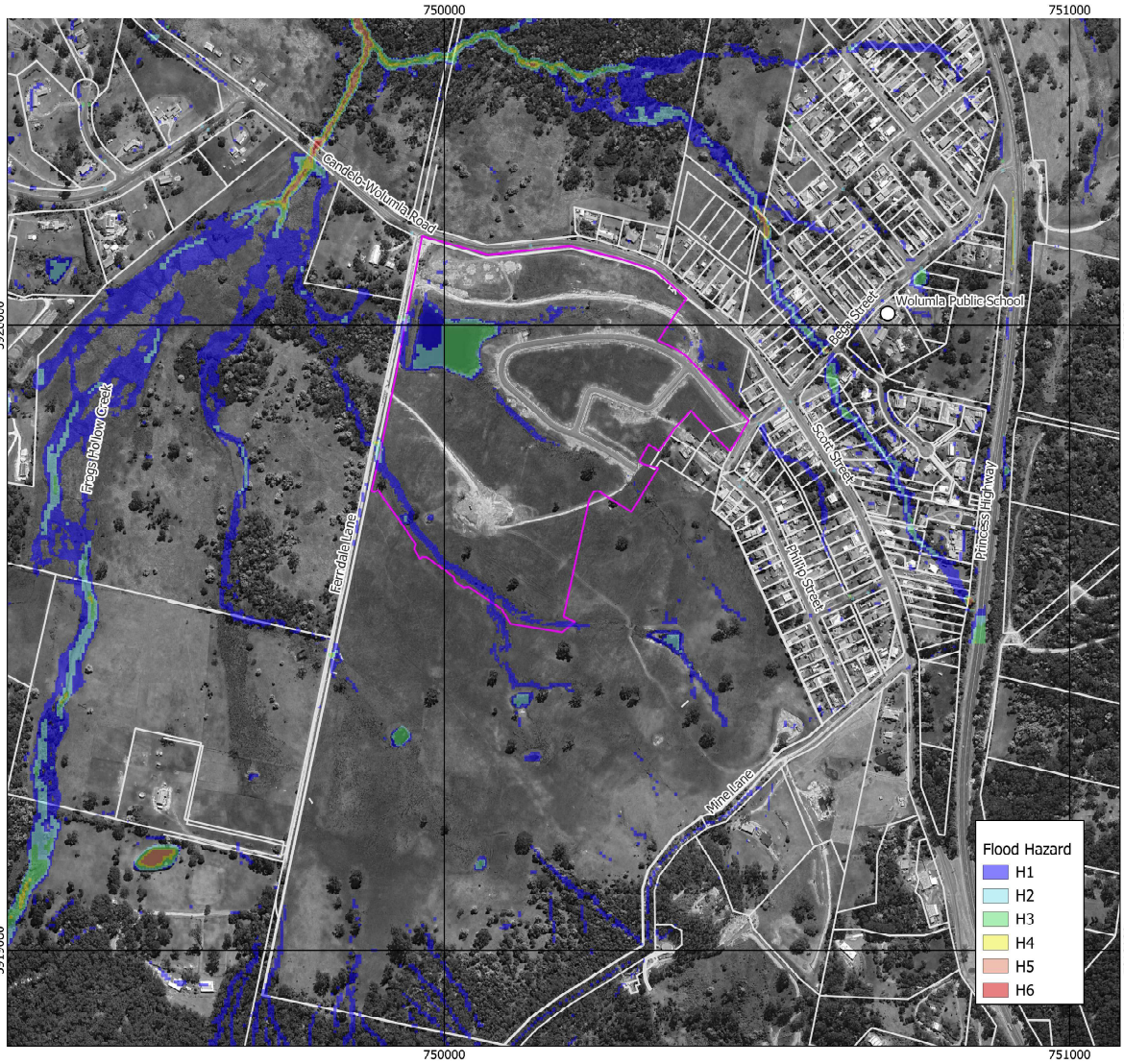
Notes

- All dimensions are in meters unless specified otherwise
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Project: Flood Impact Risk Assessment
Ferndale Lane Wolumba Valley Estate Development

Client:
Consultant:

Ref: 26008.004.A (007)	Revision: A
Map Title: PMF Peak Flood Depths (Existing Conditions)	
Date: 20 May 2026	Map Number: A-3



Legend

- Wolumla Public School
- Proposed Development
- Cadastre

Scale Bar:
0 100 200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise
2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:
Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development

Client:

optimal civil resource engineering

Consultant:

KINGFISHER
HYDRO

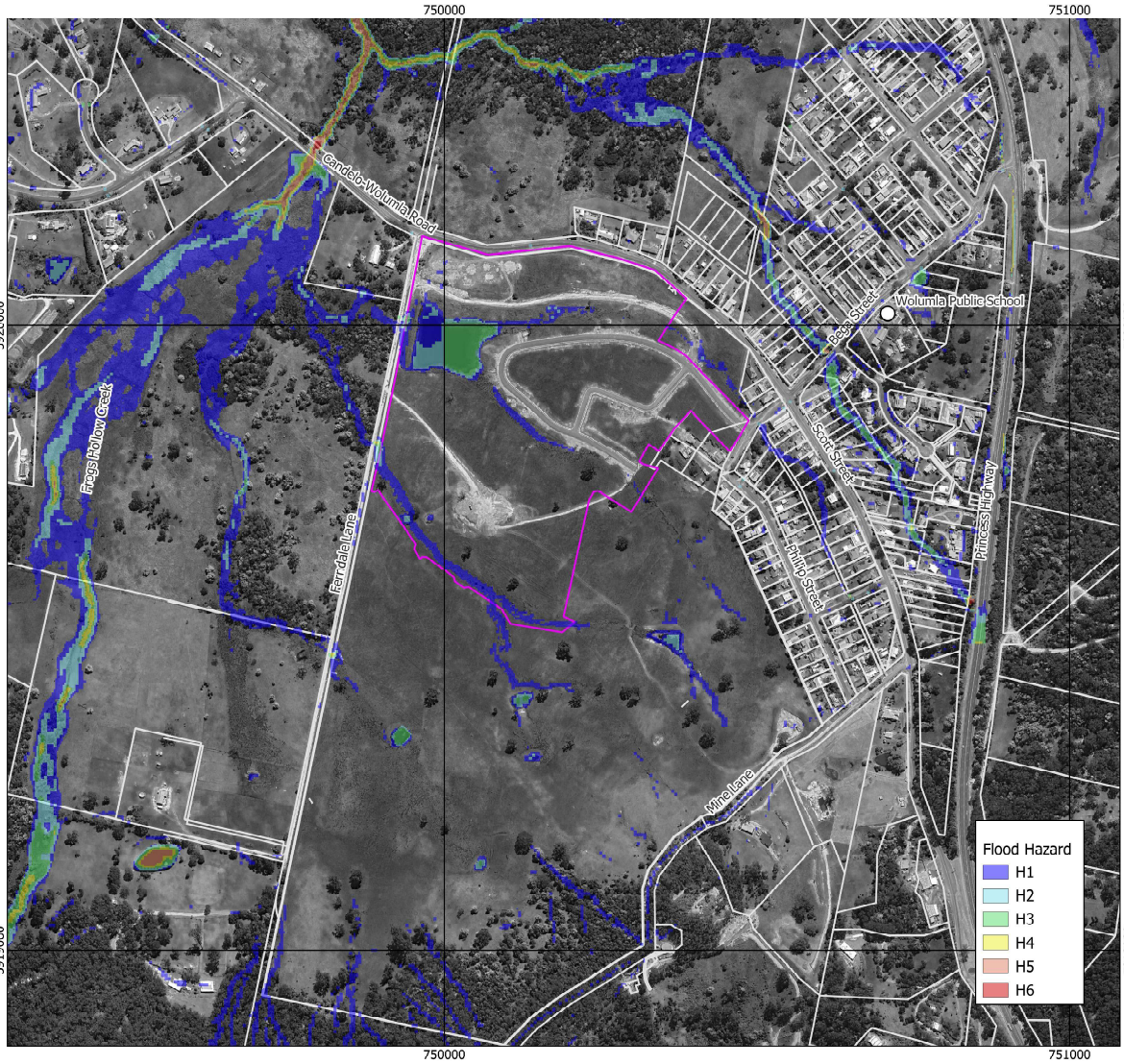
Ref:
26008.005.A (007)

Revision:
A

Map Title:
1% AEP Peak Flood Hazard
(Existing Conditions)

Date:
20 May 2026

Map Number:
A-4



Legend

- Wolumba Public School
- Proposed Development
- Cadastre

Scale Bar:
0 100 200 m

North:

Notes

- All dimensions are in meters unless specified otherwise
- All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:**Flood Impact Risk Assessment
Ferndale Lane Wolumba Valley Estate
Development**

Client:

Consultant:

optimal civil resource engineering

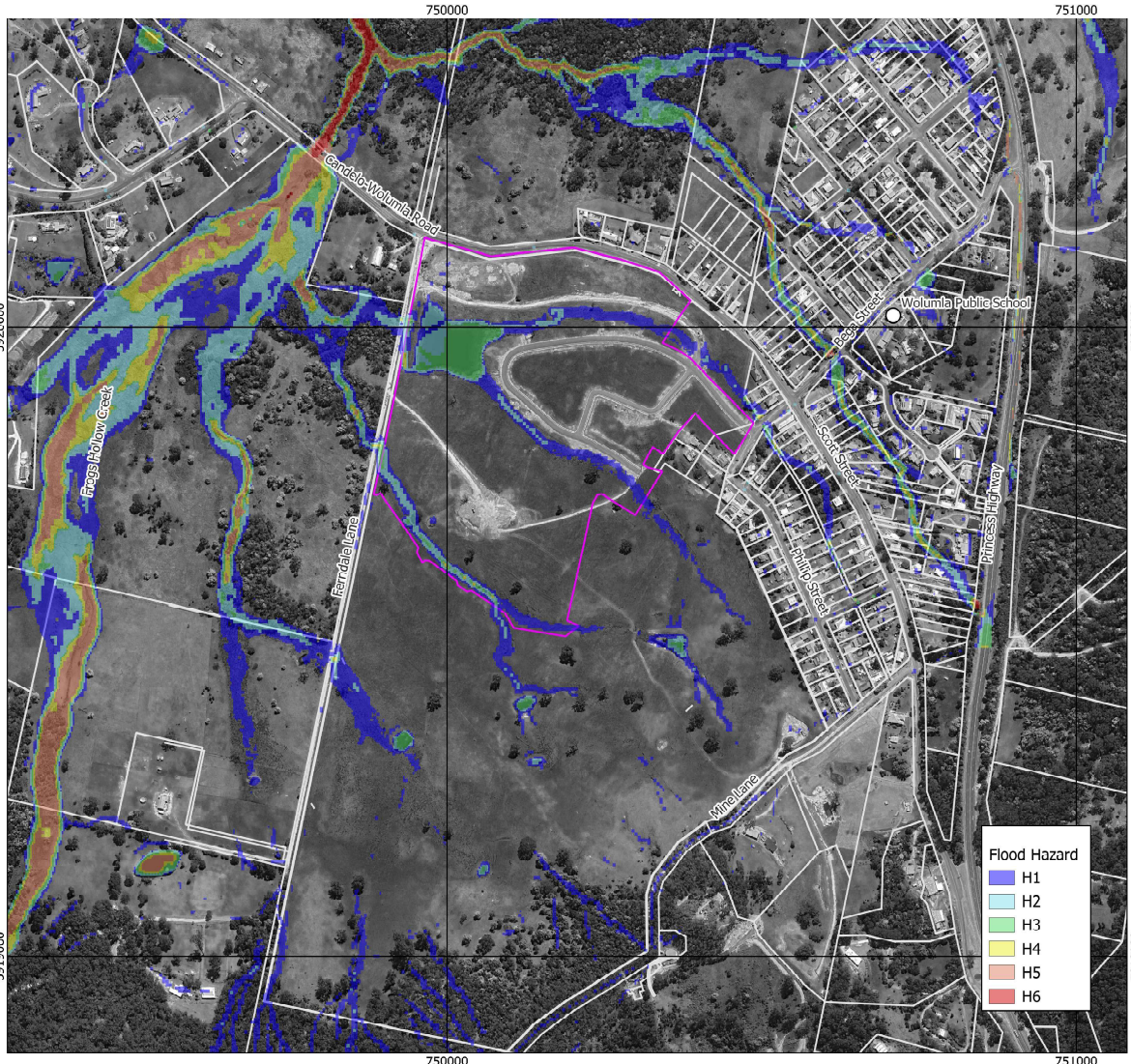
Ref:**26008.006.A (007)**

Revision:**A**

Map Title:**0.2% AEP Peak Flood Hazard
(Existing Conditions)**

Date:**20 May 2026**

Map Number:**A-5**



Legend

- Wolumba Public School
- Proposed Development
- Cadastre

Scale Bar:
0 100 200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise
2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:
Flood Impact Risk Assessment
Ferndale Lane Wolumba Valley Estate
Development

Client:

optimal civil resource engineering

Consultant:

KINGFISHER
HYDRO

Ref:
26008.007.A (007)

Revision:
A

Map Title:
PMF Peak Flood Hazard
(Existing Conditions)

Date:
20 May 2026

Map Number:
A-6

Flood Hazard

- H1
- H2
- H3
- H4
- H5
- H6



Legend

Froggs Hollow Creek

Wolumla Public School

Proposed Development

Upgraded Culverts

Cadastral

Scale Bar:

0

100

200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise

2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:

Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development

Client:


OCRE
resource and resource engineering


KINGFISHER
HYDRO

Ref:

26008.010.A (012-007)

Revision:

A

Map Title:

1% AEP Flood Impacts

Date:

20 May 2026

Map Number:

B-1

Flood Impacts (m)

< -0.20

-0.20 - -0.10

-0.10 - -0.05

-0.05 - -0.03

-0.03 - -0.01

-0.01 - 0.01

0.01 - 0.03

0.03 - 0.05

0.05 - 0.10

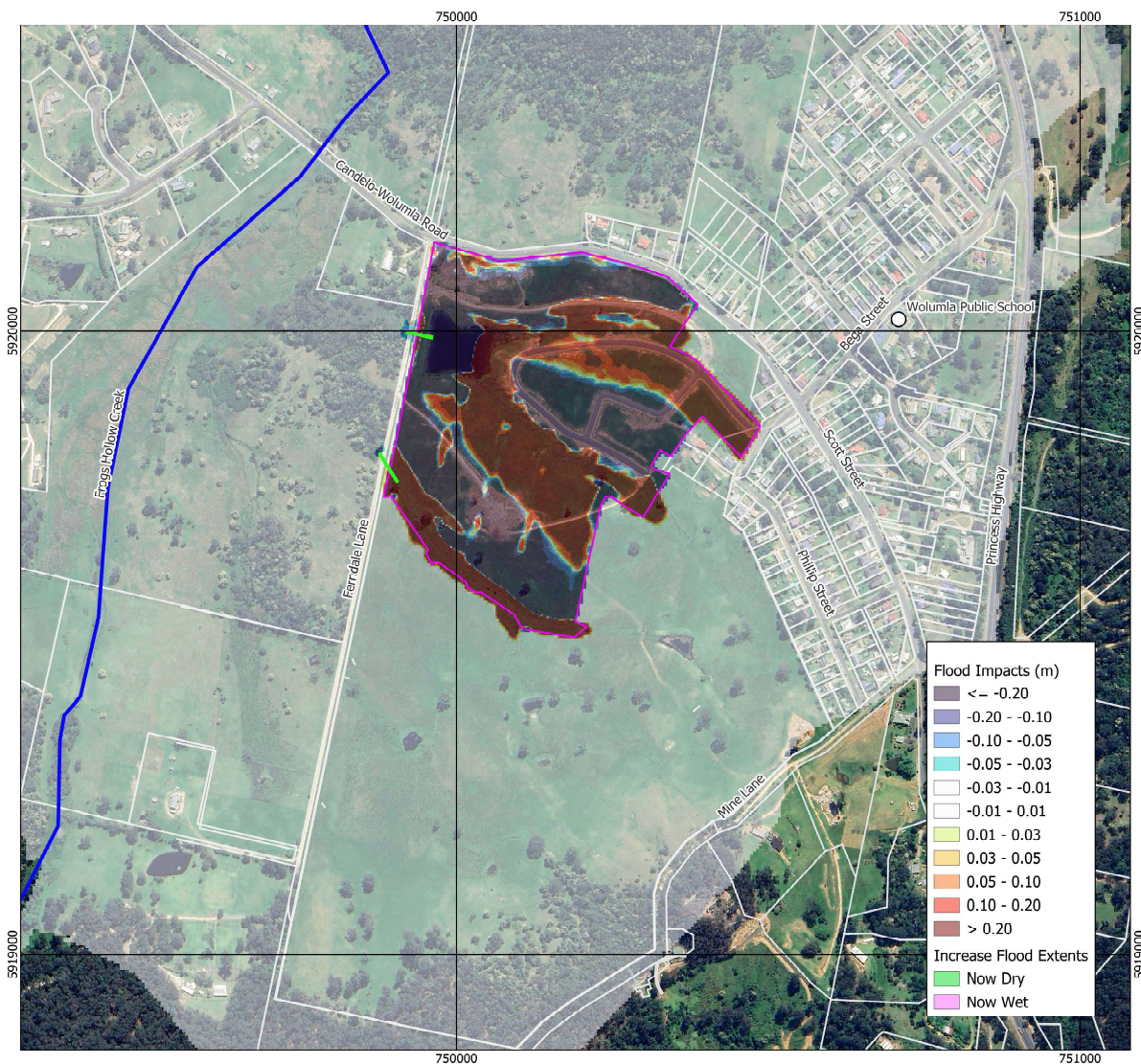
0.10 - 0.20

> 0.20

Increase Flood Extents

Now Dry

Now Wet



Legend

- Froggs Hollow Creek
- Wolumla Public School
- Proposed Development
- Upgraded Culverts
- Cadastre

Scale Bar:

0100200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise
2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:

Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development

Client:

Consultant:

Ref:**26008.011.A (012-007)**

Revision:**A**

Map Title:

0.2% AEP Flood Impacts

Date:**20 May 2026**

Map Number:**B-2**



Legend

Froggs Hollow Creek

Wolumla Public School

Proposed Development

Upgraded Culverts

Cadastral

Scale Bar:

0

100

200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise

2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:

**Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development**

Client:

 OCRE
regional civil resource engineering

 KINGFISHER
HYDRO

Ref:

26008.012.A (012-007)

Revision:

A

Map Title:

PMF Flood Impacts

Date:

20 May 2026

Map Number:

B-3

Flood Impacts (m)

< -0.20

-0.20 - -0.10

-0.10 - -0.05

-0.05 - -0.03

-0.03 - -0.01

-0.01 - 0.01

0.01 - 0.03

0.03 - 0.05

0.05 - 0.10

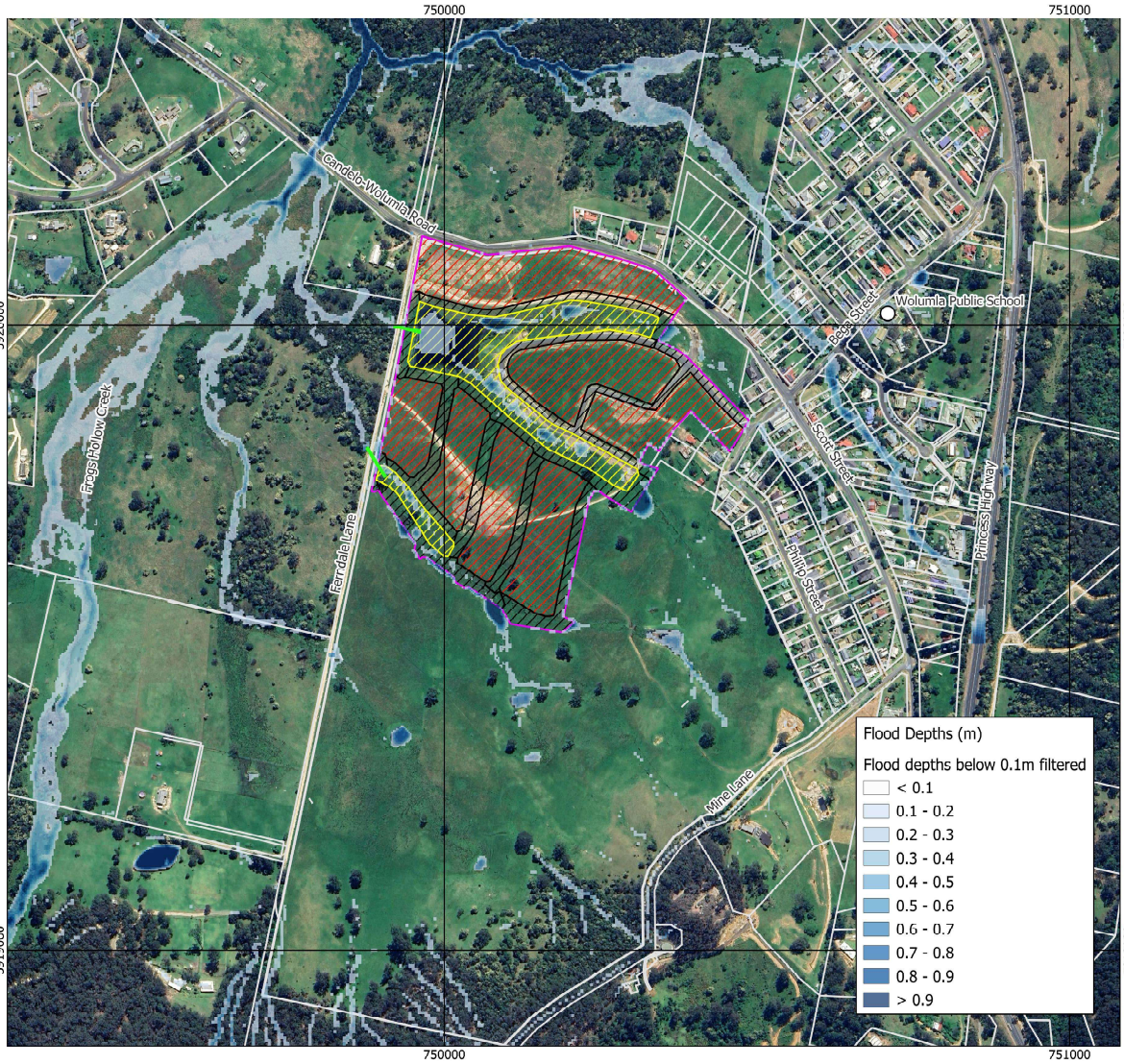
0.10 - 0.20

> 0.20

Increase Flood Extents

Now Dry

Now Wet



Legend

- Wolumla Public School
- Proposed Development
- Upgraded Culverts
- Cadastral
- Proposed Internal Roads
- Flowpath
- Proposed Residential

Scale Bar: 0 100 200 m

North:

Notes

- All dimensions are in meters unless specified otherwise
- All mapping in MGA55 GDA2020 (EPSG: 7855)

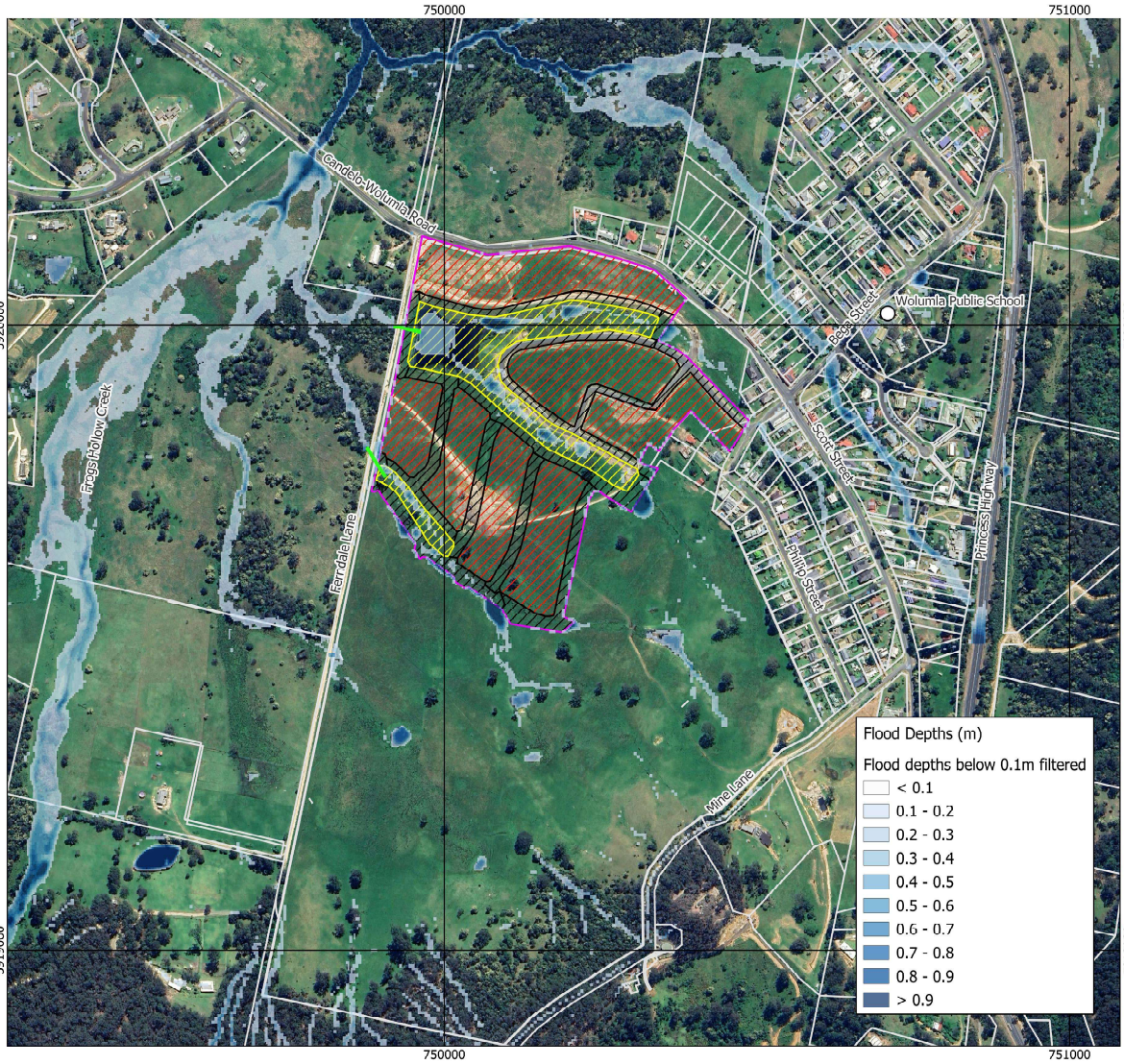
Project: Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate Development

Client: **Consultant:**

Ref: 26008.013.A (012) **Revision:** A

Map Title: 1% AEP Peak Flood Depths (Developed Conditions)

Date: 20 May 2026 **Map Number:** C-1



Legend

- Wolumla Public School
- Proposed Development
- Upgraded Culverts
- Cadastral
- Proposed Internal Roads
- Flowpath
- Proposed Residential

Scale Bar: 0 100 200 m

North:

Notes

- All dimensions are in meters unless specified otherwise
- All mapping in MGA55 GDA2020 (EPSG: 7855)

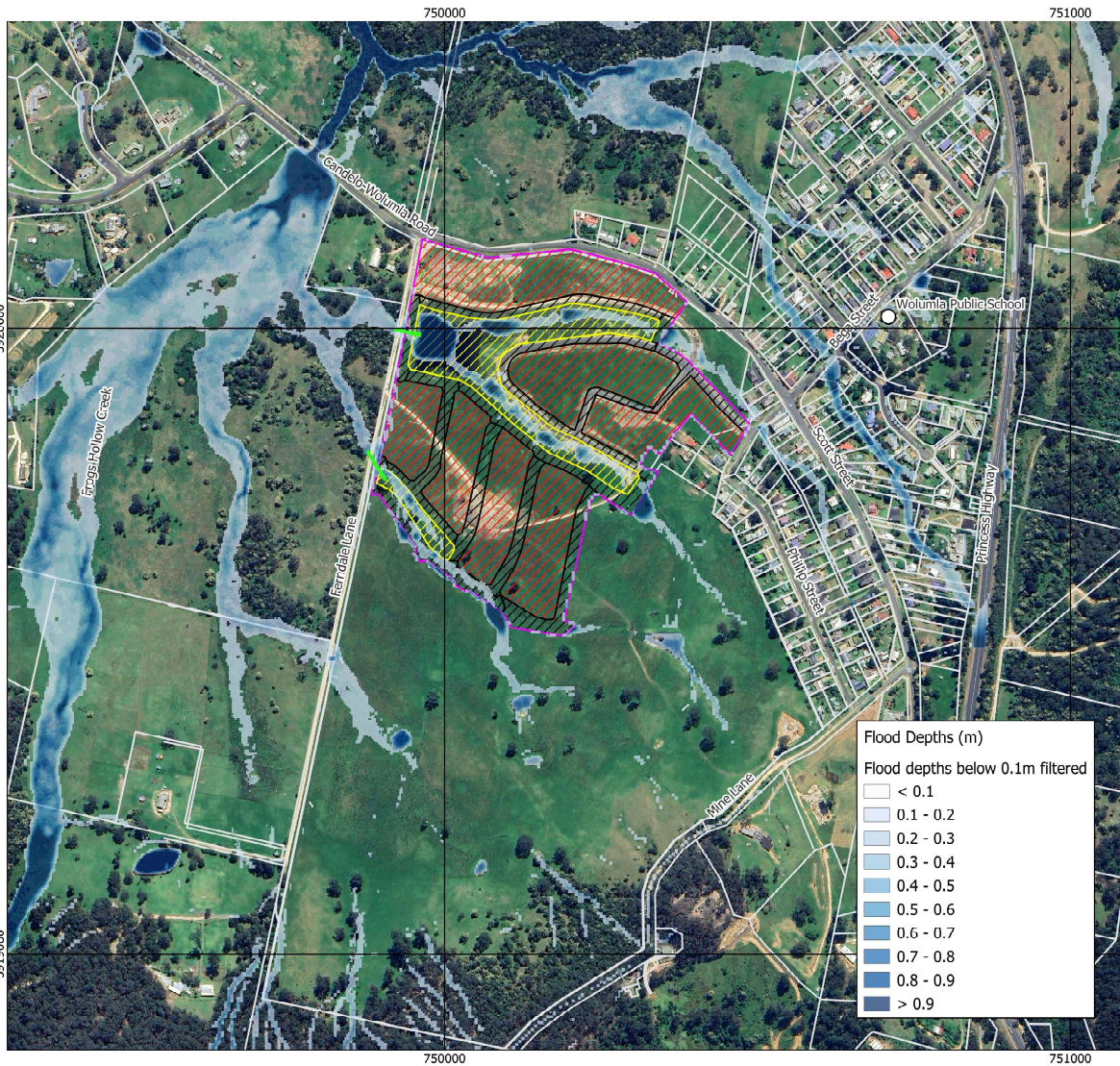
Project: Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate Development

Client: **Consultant:**

Ref: 26008.014.A (012) **Revision:** A

Map Title: 0.2% AEP Peak Flood Depths (Developed Conditions)

Date: 20 May 2026 **Map Number:** C-2



Legend

- Wolumla Public School
- Proposed Development
- Upgraded Culverts
- Cadastral
- Proposed Internal Roads
- Flowpath
- Proposed Residential

Scale Bar:
0 100 200 m

North:

- Notes**
1. All dimensions are in meters unless specified otherwise
 2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:**Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development**

Client:

Consultant:

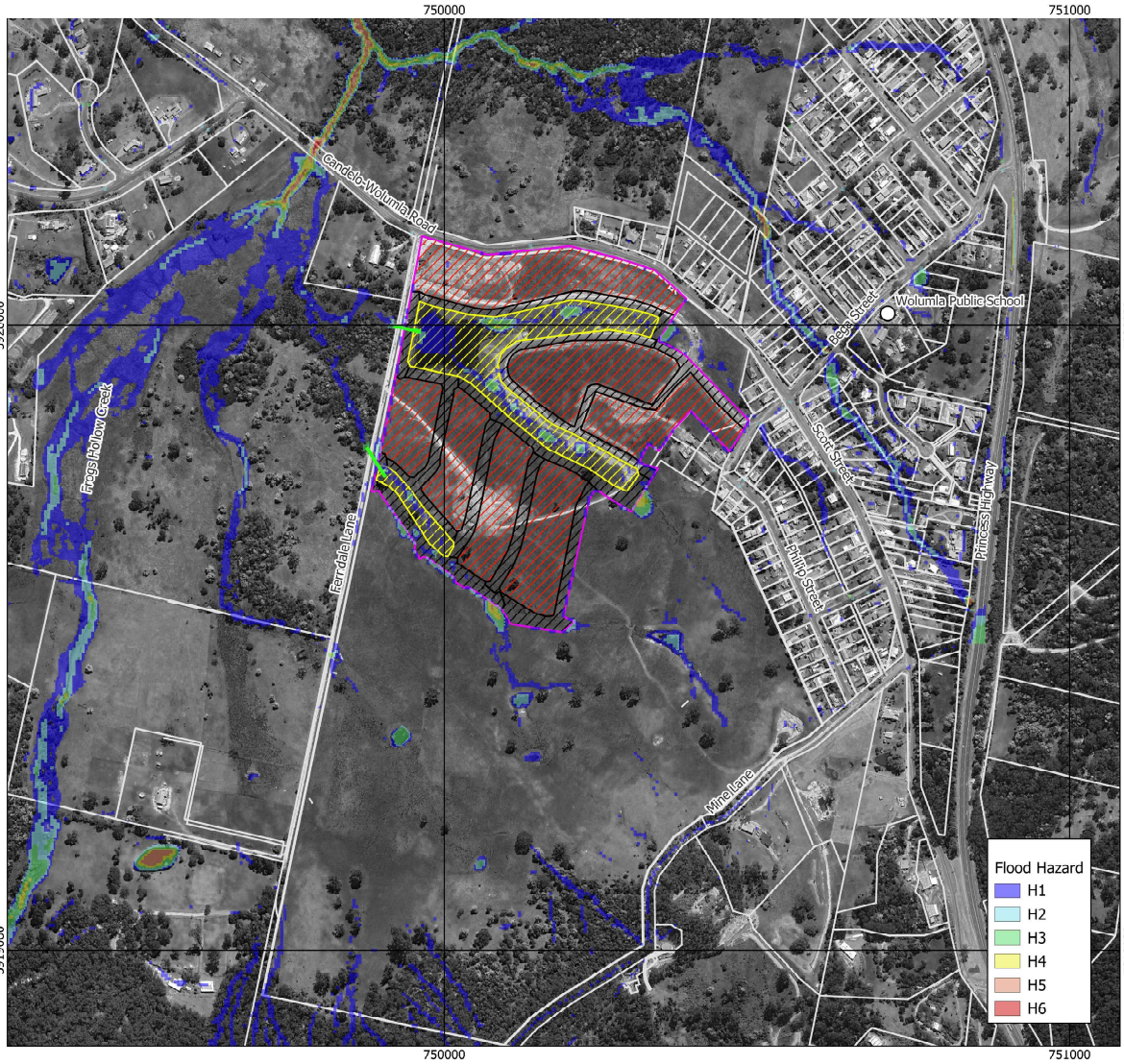
Ref:**26008.015.A (012)**

Revision:**A**

Map Title:**PMF Peak Flood Depths
(Developed Conditions)**

Date:**20 May 2026**

Map Number:**C-3**



Legend

- Wolumla Public School
- Proposed Development
- Upgraded Culverts
- Cadastre
- Proposed Internal Roads
- Flowpath
- Proposed Residential

Scale Bar: 0 100 200 m

North:

Notes

- All dimensions are in meters unless specified otherwise
- All mapping in MGA55 GDA2020 (EPSG: 7855)

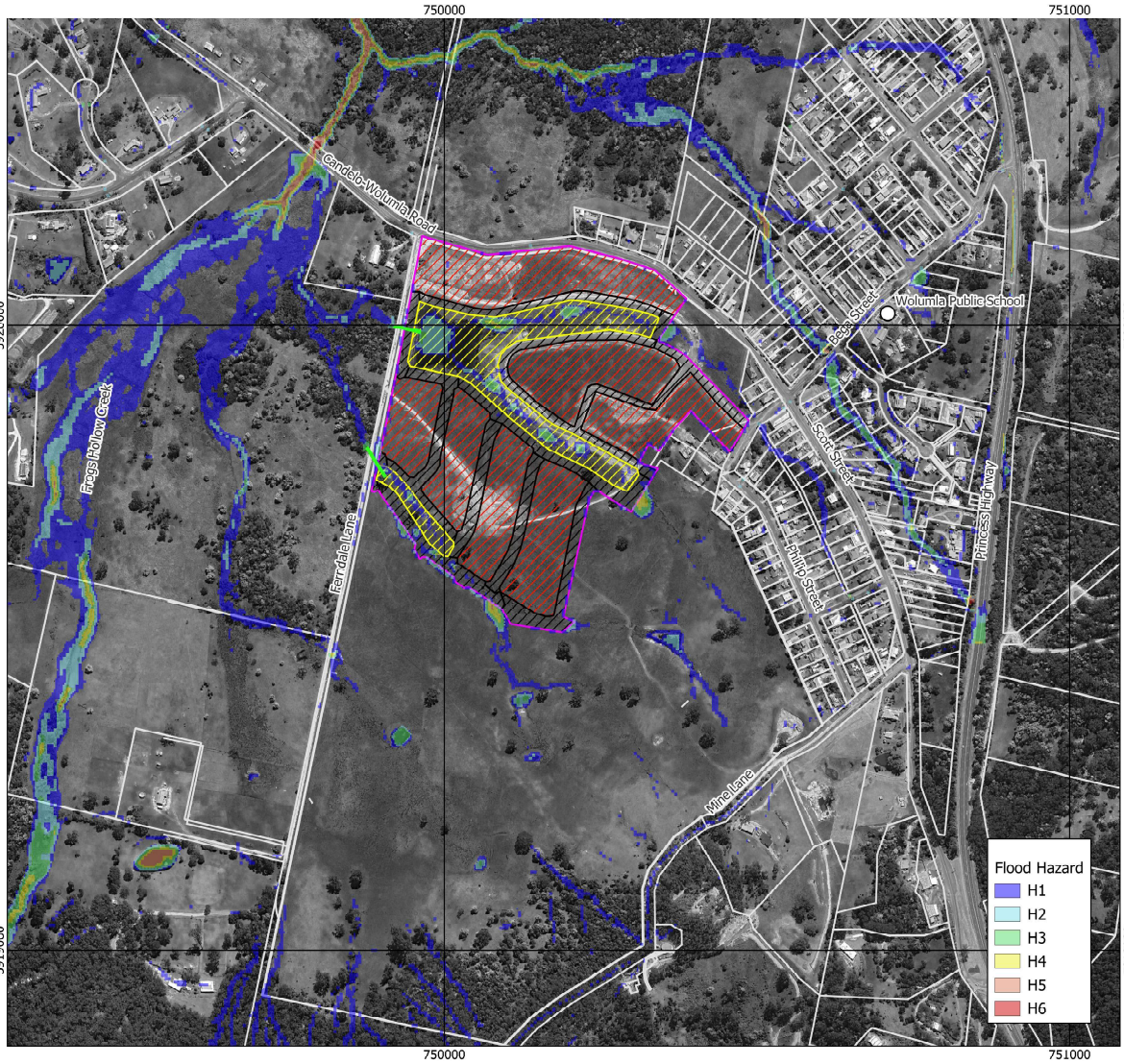
Project: Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate Development

Client: **Consultant:**

Ref: 26008.014.A (012) **Revision:** A

Map Title: 1% AEP Peak Flood Hazard (Developed Conditions)

Date: 20 May 2026 **Map Number:** C-4



Legend

Wolumla Public School

Proposed Development

Upgraded Culverts

Cadastre

Proposed Internal Roads

Flowpath

Proposed Residential

Scale Bar:

0

100

200 m

North:

Notes

1. All dimensions are in meters unless specified otherwise

2. All mapping in MGA55 GDA2020 (EPSG: 7855)

Project:

**Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate
Development**

Client:

Consultant:

Ref:

26008.015.A (012)

Revision:

A

Map Title:

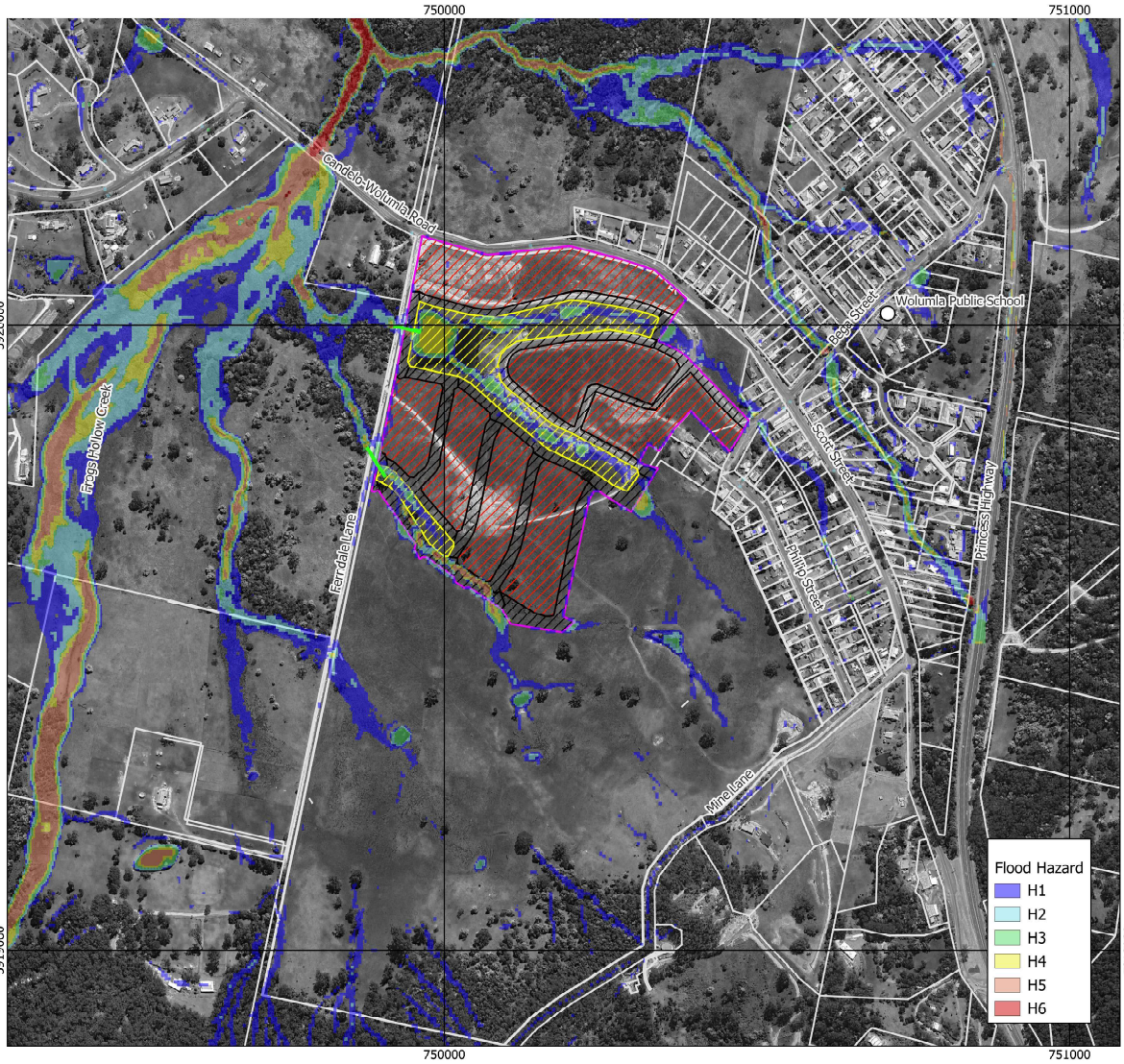
**0.2% AEP Peak Flood Hazard
(Developed Conditions)**

Date:

20 May 2026

Map Number:

C-5



Legend

- Wolumla Public School
- Proposed Development
- Upgraded Culverts
- Cadastre
- Proposed Internal Roads
- Flowpath
- Proposed Residential

Scale Bar: 0 100 200 m

North:

Notes

- All dimensions are in meters unless specified otherwise
- All mapping in MGA55 GDA2020 (EPSG: 7855)

Project: Flood Impact Risk Assessment
Ferndale Lane Wolumla Valley Estate Development

Client: **Consultant:**

Ref: 26008.016.A (012)	Revision: A
Map Title: PMF Peak Flood Hazard (Developed Conditions)	
Date: 20 May 2026	Map Number: C-6