Memorandum

To: Fast-Track Expert Panel

From: Pranil Wadan - Director, Flowstate Consulting LP

Date: 29 Jan 2026

Subject: Peer Review: Updated Flood Modelling, Assessment, and FEMP Suitability

Revision: 1.1

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1 Executive Summary

This memorandum serves as a peer review of the updated Flood Assessment (ACH Consulting, Rev F) and Flood Emergency Management Plan (FEMP, Rev 3.1).

While it is acknowledged that the updated modelling results differ from preliminary data previously reviewed by Healthy Waters, this peer review confirms that the updated assessment remains acceptable and appropriate.

The variances are primarily driven by the inclusion of necessary security infrastructure (impervious walls), updated earthworks design and the inclusion of survey of Oratia Stream embankments (by CKL) along with an alternative indicative plan layout/design. These updates provide a more conservative and robust representation of risk, confirming that the site is safe for occupation and that off-site effects are manageable.

This memorandum has been prepared in accordance with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note (2023).

2 Key Variances in Updated Modelling

The updated modelling provides a more conservative and realistic representation of the flood risk by incorporating specific design and topographical refinements. These variances are detailed below:

2.1 Inclusion of Impervious Walls

Previous modelling assumed a high degree of permeability through the site and was based on a bulk concept. The updated model now accurately reflects the operational requirements of a courthouse by including impervious walls along the western and southern facades. These impervious walls represent a necessary and realistic design baseline.

2.2 Updated Stream Banks (Survey Data)

The terrain data used in the model has been upgraded from generic Council GIS LiDAR to a site-specific topographical survey.

- The model utilises a "CKL survey of the Oratia Stream embankments" combined with LIDAR for the wider catchment. This provides a higher level of accuracy regarding channel capacity and overtopping thresholds compared to the original model.

2.2 Earthworks Design Integration

The updated model no longer relies on a high level earthworks design but incorporates a more refined proposed earthworks design prepared by Holmes.

- The model includes the "lowering of ground level by approximately 150 mm – 200 mm" through the centre of the property to increase on-site storage capacity and improved conveyance; this was undertaken to reduce the impact of the impervious walls that are now incorporated and reduce impact on the floodplain.

2.3 Inclusion of Specific Conveyance Channels

Specific engineered channels have been modelled to manage the flow around and under the building, specifically on the South and West sides.

- **Southern Side:** A 5 m wide rectangular channel is modelled along the southeastern boundary to direct Edmonton Road overflow to the building's under-croft opening,,.
- **Western Side:** A 2 m wide channel along the western boundary which expands to 5.6 m has been included to manage flows from Alderman Drive,.
- These channels are critical mitigation features that direct water away from the most sensitive areas of the building and towards the discharge point at the Oratia Stream.

2.4 Inclusion of an "Alternative Indicative Layout"

The assessment now compares the "As-Lodged" indicative plan set against an alternative indicative plan set that is enabled by the NOR conditions.

The alternative indicative plan set features a smaller building footprint at the north-western corner compared to the As-Lodged design.

- This reduction provides a greater cross-sectional area for flow at the critical exit point of the site. It significantly reduces the downstream impact on Falls Park (22 Alderman Drive) to a minor 20 mm - 30 mm rise, compared to the 50mm–80mm rise seen in the As-Lodged design.

3 Suitability of the FEMP

The Flood Emergency Management Plan (FEMP) has been updated to align with the revised flood modelling. This has clarified the timing of flood onset and enabled a more defined and reliable safety strategy. These changes are summarised as follows:

3.1 Shelter in Place

Flood modelling indicates that overtopping of Oratia Stream at Alderman Drive does not occur until approximately 13 hours and 20 minutes into the storm event, with peak flooding across the site occurring at approximately 14 hours and 10 minutes. This extended warning period allows for evacuation to occur where appropriate.

In the event that evacuation is not possible or conditions deteriorate, the Shelter in Place strategy provides a safe alternative, with occupants able to remain within the building as documented in the FEMP.

3.2 Finished Floor Level (FFL) compliance

The proposed minimum Finished Floor Level (FFL) of 8.58 m RL (NZVD2016) has been set to achieve full compliance with flood protection requirements, including the mandatory 300 mm freeboard above the 1 percent AEP flood level specified in the Auckland Council Stormwater Code of Practice.

This level is based on the conservative design parameters of the as lodged indicative plan set. However, the alternative indicative plan set which incorporates a reduced building footprint and more refined earthworks, provides improved hydraulic conveyance and results in lower peak Water Surface Elevations across the site.

While the designation condition retains the 8.58 m RL FFL to address all potential scenarios, modelling demonstrates that adoption of the alternative indicative plan set reduces peak flood levels. As a result, the effective freeboard achieved on site exceeds the minimum 300 mm requirement.

This confirms that the 8.58 m RL threshold provides a strong safety margin and demonstrates the improved flood performance and risk reduction delivered through the alternative indicative plan set design refinements.

The freeboard allowance confirms that staff and visitors will remain dry and safe within the building during a 1 percent AEP event, supporting the Shelter in Place approach outlined in the updated FEMP.

3.3 Active management measures

The FEMP now includes clearly defined activation triggers, including the Orange Heavy Rain Warning. It also provides clarity around the operation of the mechanical flood barrier, which incorporates a fail-safe free-swinging mechanism to prevent blockages; this is reinforced and captured in condition 17 of the proposed NOR conditions.

4 PC120 Assessment

Auckland Council's planning memorandum dated 22 January 2026 requested clarification of flood hazard classification under the Plan Change 120 (PC120) framework.

In response, ACH Consulting have prepared flood hazard risk plots (Appendix A), these plots adopt the PC120 hazard classification matrix (Table E36.3.1B.1), classifying hazards as Low, Medium, High, and Very High based on both the depth and depth multiplied by velocity criterion.

Consistent with Healthy Waters' recommendations, hazard classifications have been derived from the site-specific ACH Consulting HEC-RAS model. This provides a more accurate representation of hydraulic behaviour under both the "as lodged" and "alternative" scenarios.

The site-specific modelling confirms the presence of areas classified as High and Very High flood hazard within the site. The implications of these results are considered below in relation to the PC120 policy framework, particularly Policies E36.3.30B (avoidance) and E36.3.30D (tolerable risk).

4.1 Very High flood hazard

The updated hazard plots identify the primary overland flow path and the under-croft area beneath the building as Very High Flood Hazard Areas.

While Policy E36.3.30B generally seeks to avoid new development within very high hazard areas, the proposed design manages this risk through vertical separation. No habitable or vulnerable activities are located at ground level within the hazard area. Flood flows are confined to the unoccupied under-croft and engineered conveyance channels, while the occupied floor level is elevated above the hazard.

The finished floor level of 8.58 m RL is located within a low-hazard environment and provides a minimum of 300 mm freeboard above the 1 percent AEP flood level.

4.2 High flood hazard

The hazard mapping indicates that external pedestrian and vehicle access routes, including driveways and ramps, fall within High Flood Hazard classifications during the peak 1 percent AEP event. This confirms that evacuation along the eastern boundary would be viable as it sits within a low risk hazard for both the “as lodged” and “alternative” scenarios.

Accordingly, while evacuation from the site is possible along the eastern boundary where there is low hazard risk, the proposal does not soley rely on evacuation as the primary risk management response. Instead, flood risk can also be managed through the Shelter in Place approach, as documented in the FEMP. Overall, although flood hazard exists across parts of the site, the building functions as a dry refuge, enabling occupants to remain safely above flood levels for the duration of the event should evacuation not be appropriate.

5 Conclusion

The updated flood modelling and FEMP represent a conservative, "worst-case" analysis that accounts for the specific security needs of a courthouse. While the results show higher upstream water levels than earlier high-level concepts, these effects impact an area of existing high hazard and do not introduce new or unmanageable risks.

The PC120 hazard assessment supports that flood risk to people is appropriately managed. The results demonstrate that, despite the presence of high and very high hazard areas within the site, the combination of building elevation, vertical separation, engineered conveyance, and operational controls within the FEMP provides an effective and coherent risk management framework.

The adoption of the alternative indicative plan set scenario effectively balances the operational needs of the courthouse with the management of downstream flood risks, rendering the effects manageable and the proposal suitable for approval.

Appendix A
PC120 Flood Hazard Plots

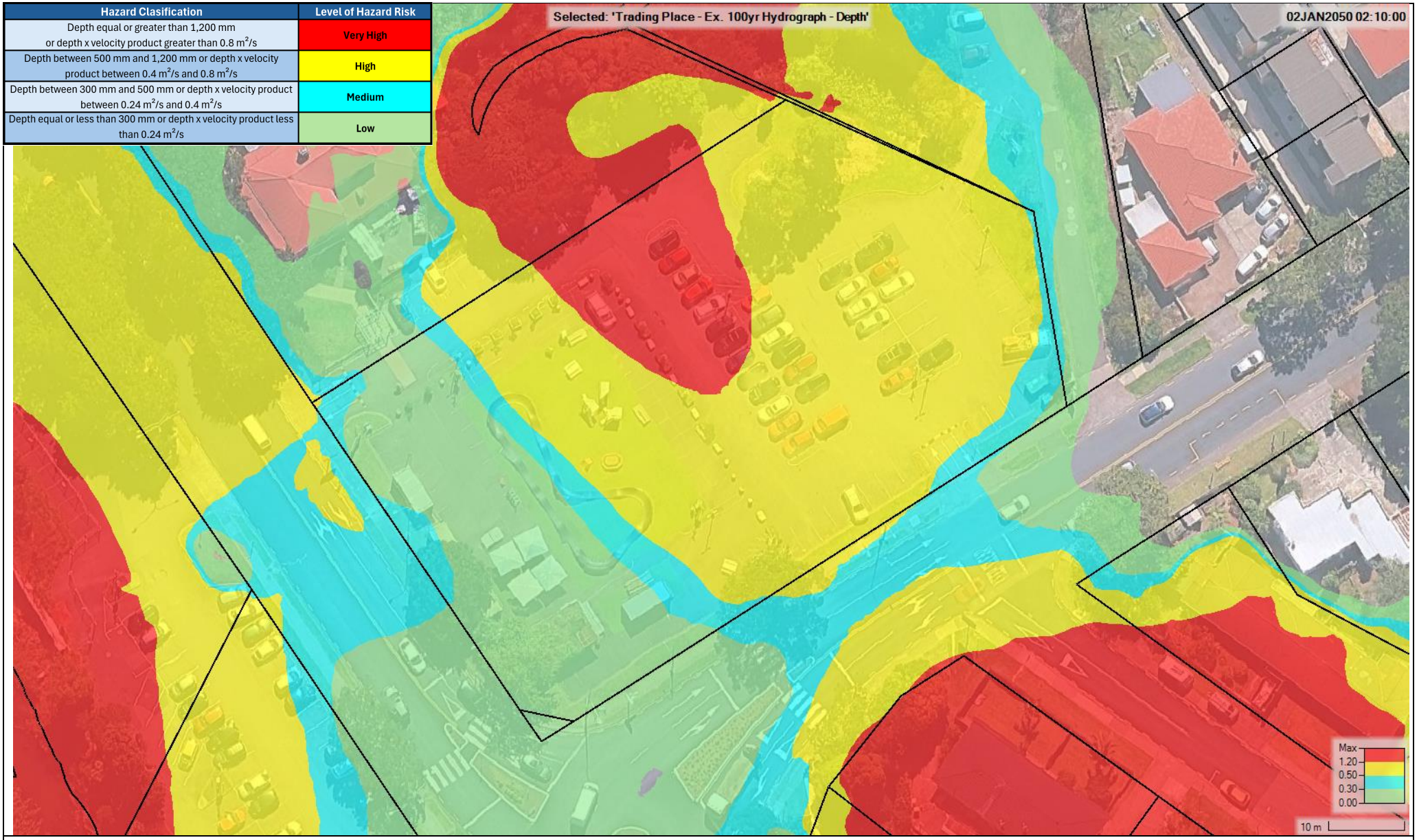

Figure 41: Pre-Development Depth Hazard Classification (Peak Flood – 14 hrs 10 mins)

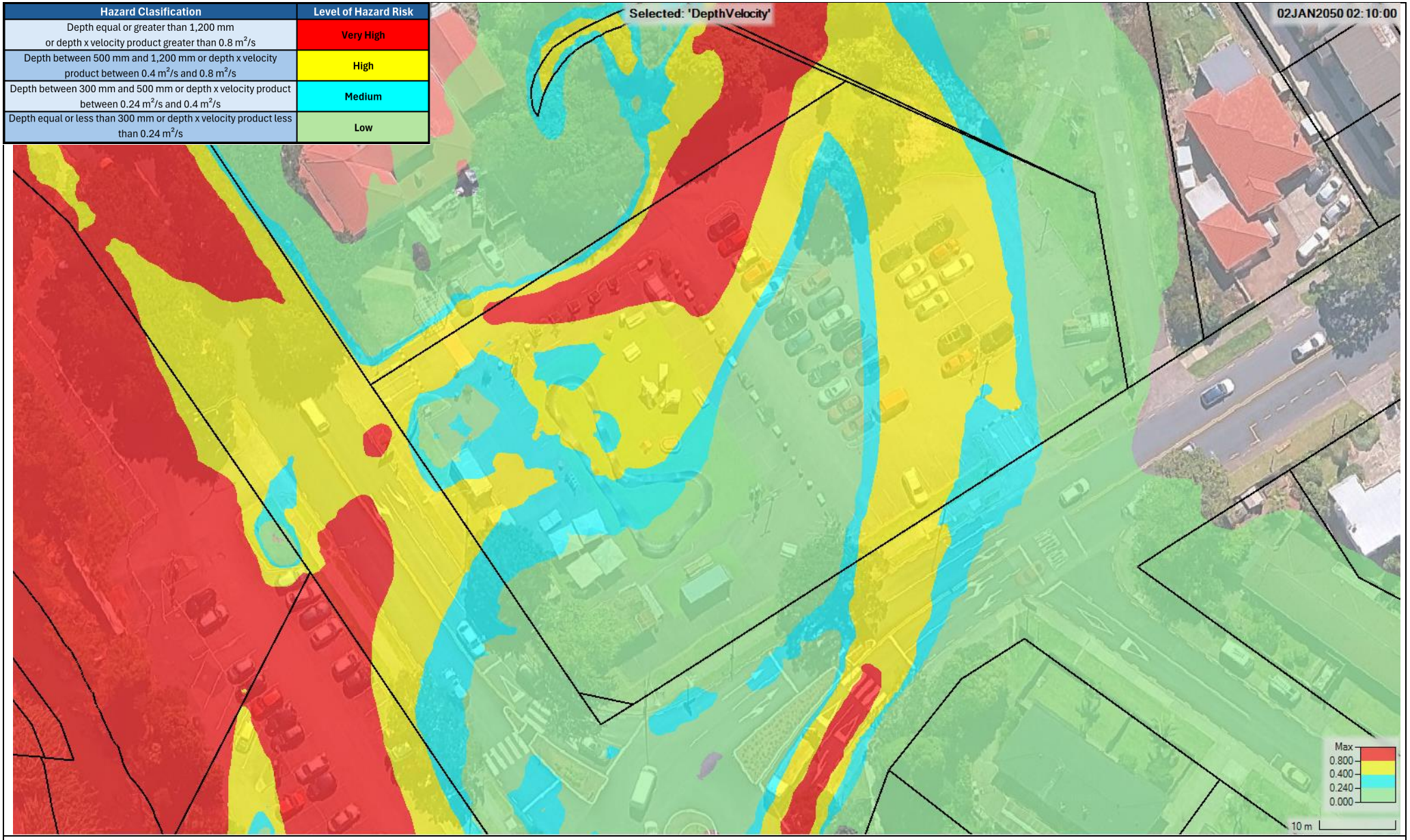

Figure 42: Pre-Development Depth Velocity Product Hazard Classification (Peak Flood – 14 hrs 10 mins)

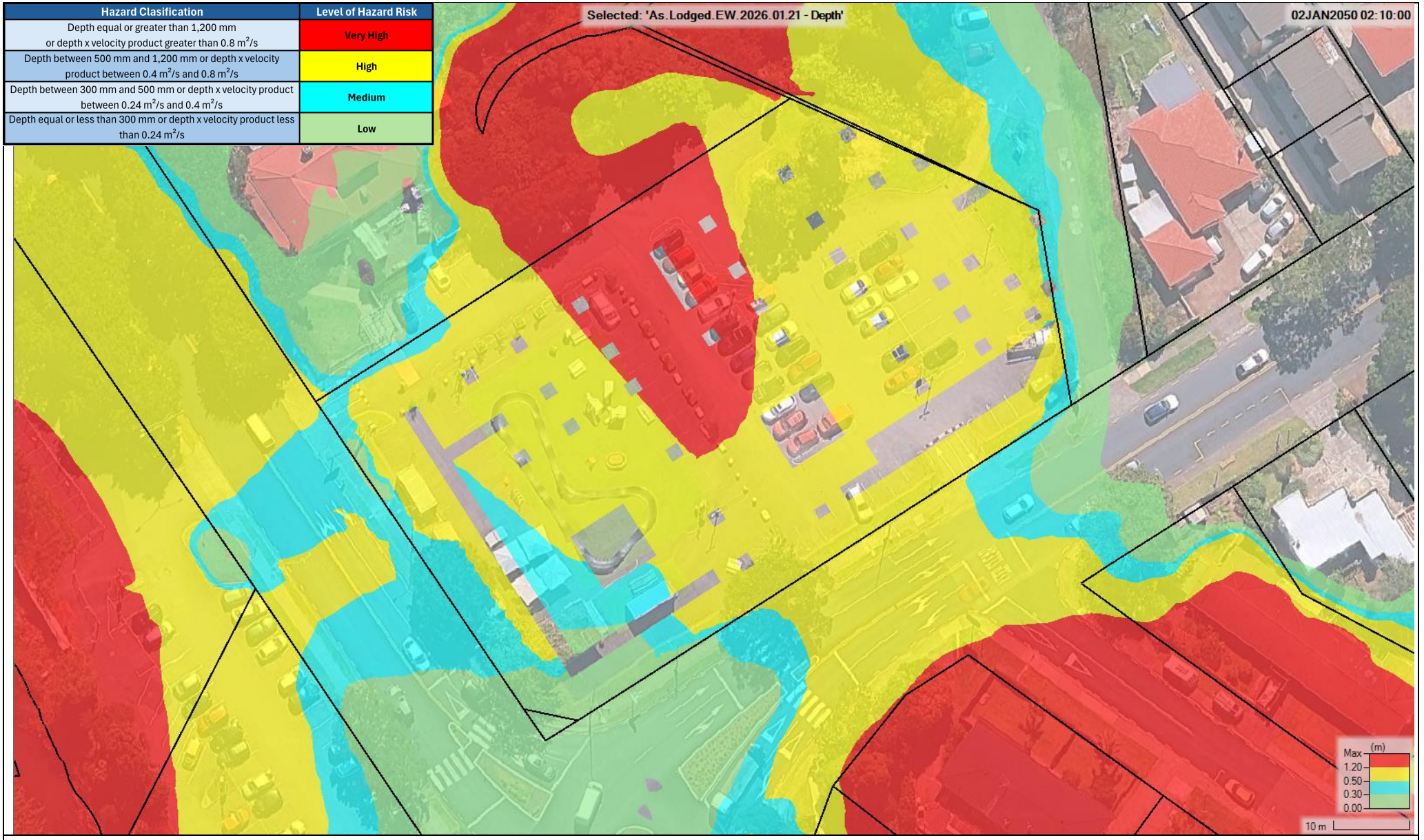

Figure 43: As-Lodged Depth Hazard Classification (Peak Flood – 14 hrs 10 mins)

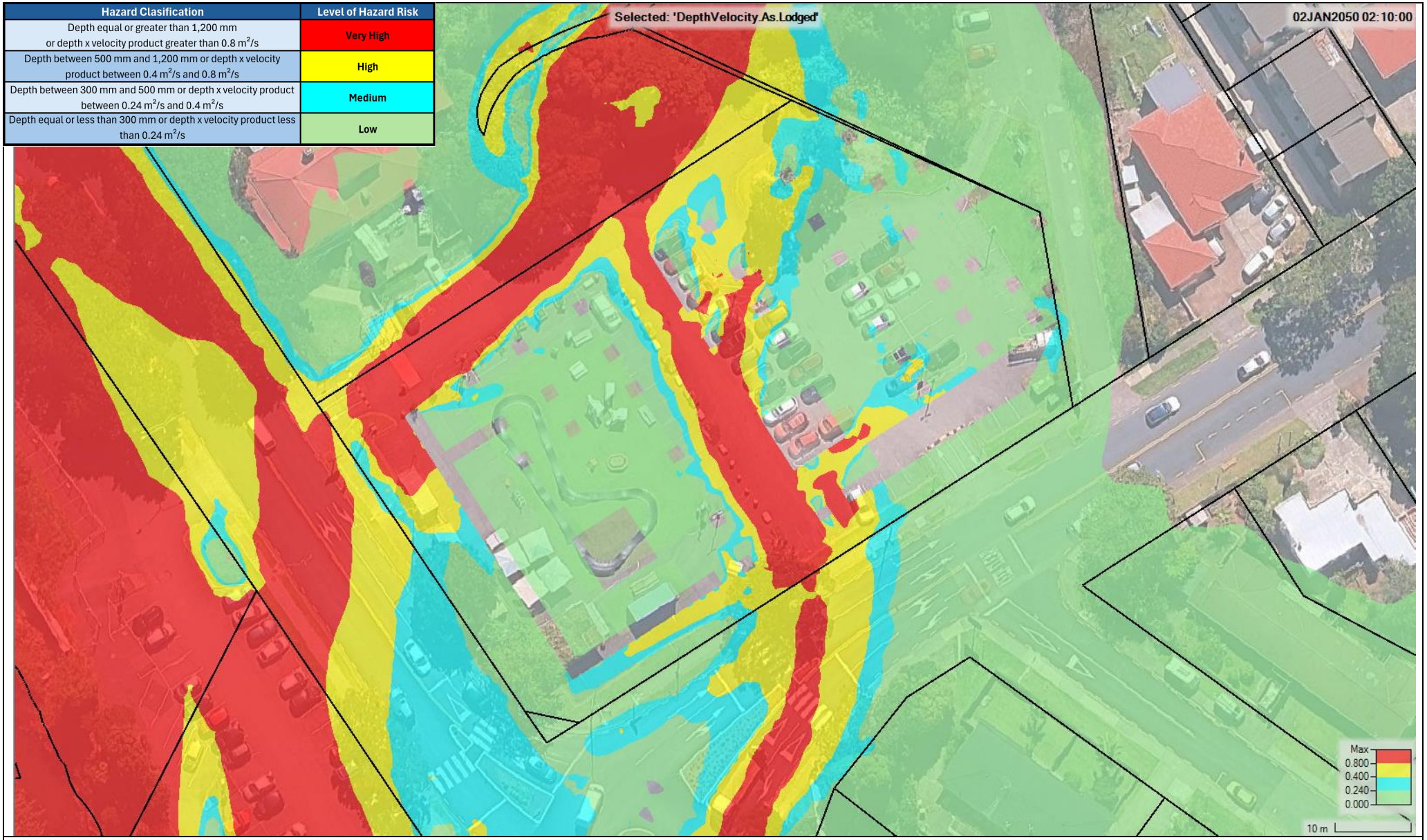

Figure 44: As-Lodged Depth Velocity Product Hazard Classification (Peak Flood – 14 hrs 10 mins)

Hazard Clasification	Level of Hazard Risk
Depth equal or greater than 1,200 mm or depth x velocity product greater than 0.8 m^2/s	Very High
Depth between 500 mm and 1,200 mm or depth x velocity product between 0.4 m^2/s and 0.8 m^2/s	High
Depth between 300 mm and 500 mm or depth x velocity product between 0.24 m^2/s and 0.4 m^2/s	Medium
Depth equal or less than 300 mm or depth x velocity product less than 0.24 m^2/s	Low

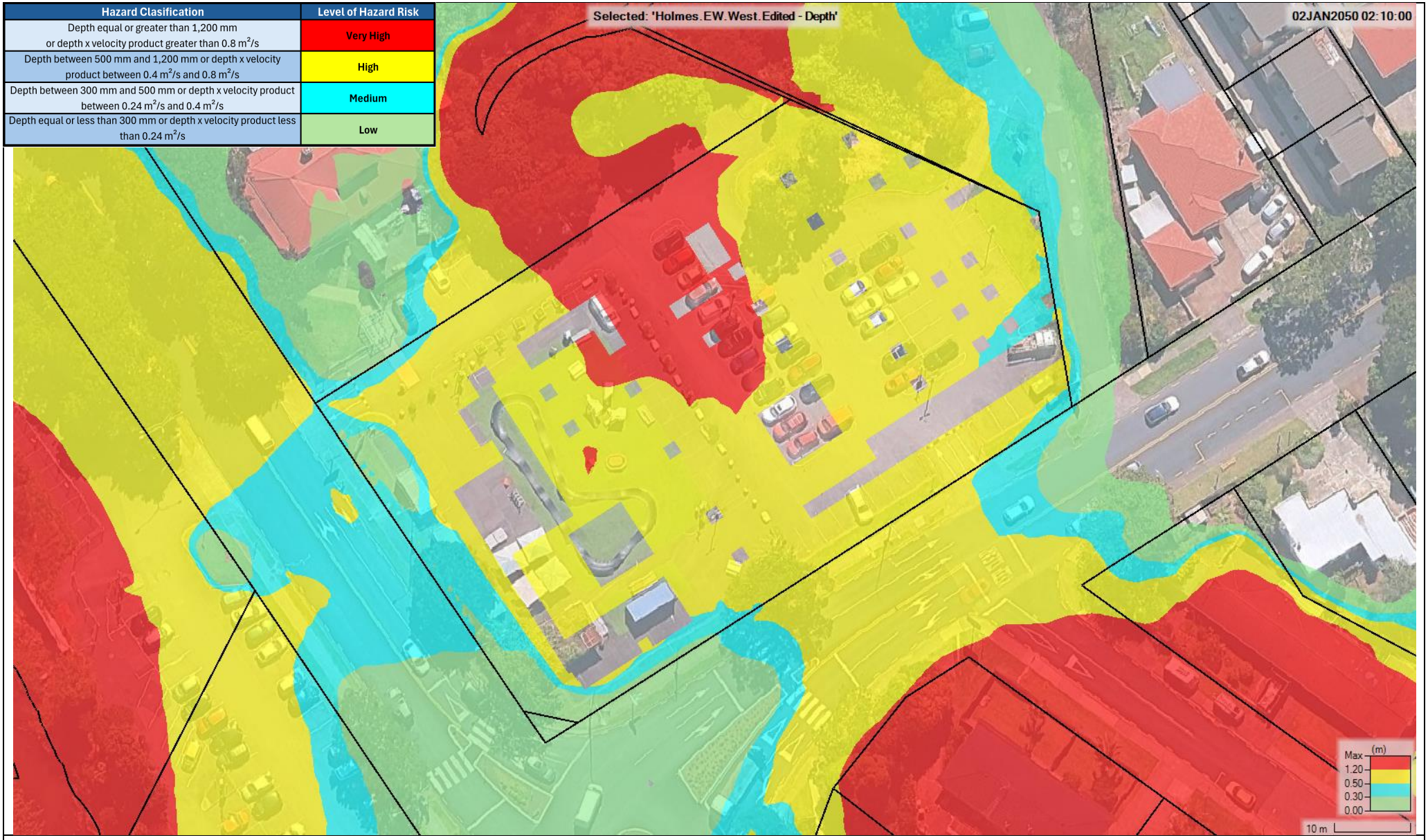

Figure 45: Alternative Solution Depth Hazard Classification (Peak Flood – 14 hrs 10 mins)

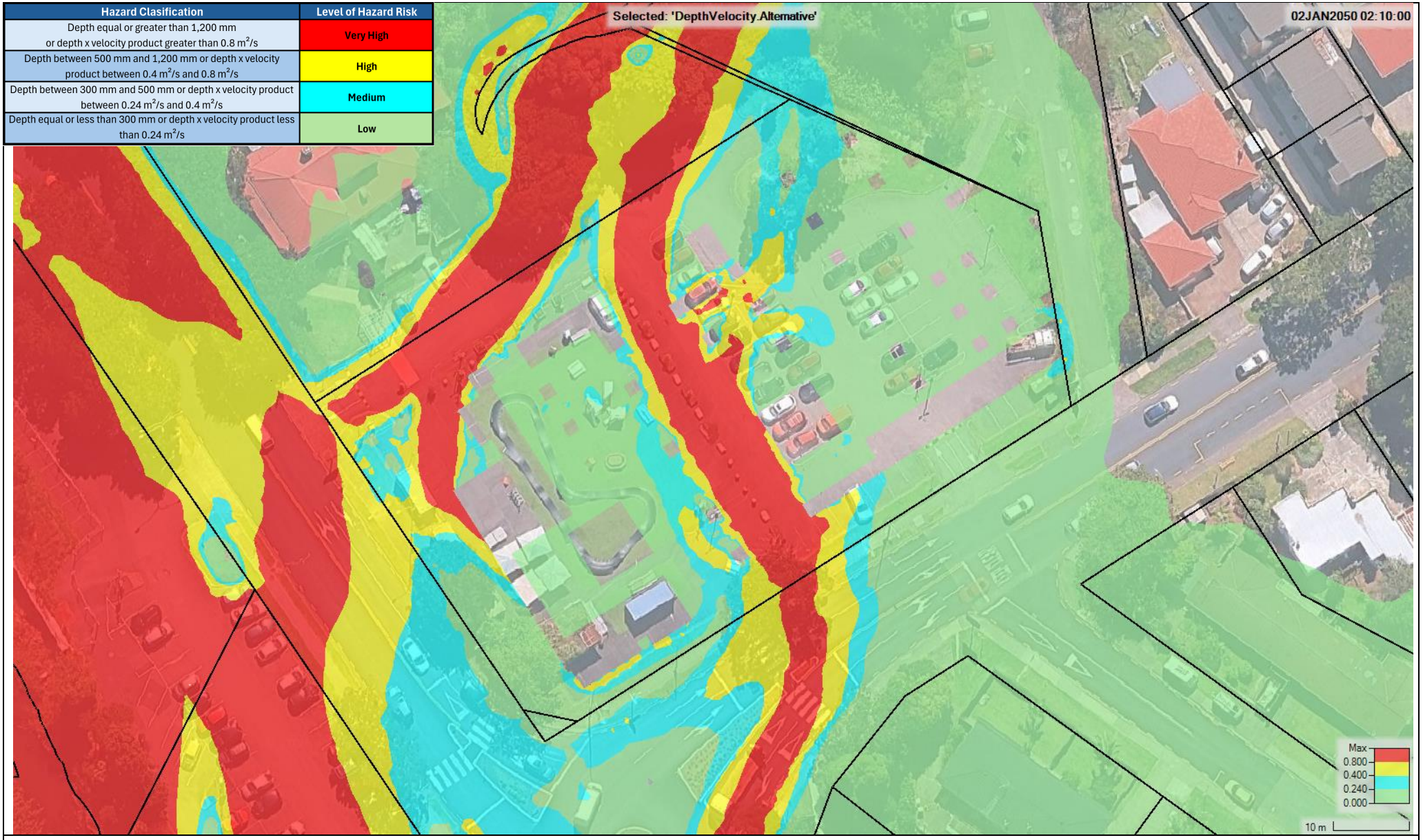

Figure 46: Alternative Solution Depth Velocity Product Hazard Classification (Peak Flood – 14 hrs 10 mins)

Tab 1

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QUALIFICATIONS & AFFILIATIONS

Bachelor of Engineering (Civil), University of Auckland, 2008

Chartered Professional Engineer (Water engineering) (CPEng)

International Professional Engineer (IntPE(NZ))

Chartered Member (Member (Water engineering), Engineering New Zealand (CMEngNZ)

Certified Independent Hearings Commissioner

Certificate in Company Direction & Governance

SUITABILITY FOR THE ROLE

Pranil is an experienced civil engineer and Chartered Professional Engineer with more than eighteen years working across the three waters sector. He has led technical teams delivering stormwater, wastewater and water supply solutions for large and complex land development programmes. His experience includes providing expert evidence for Environment Court proceedings and Boards of Inquiry.

Pranil has built a strong track record in the planning, design and review of three waters infrastructure for both greenfield and brownfield development. His skills cover stormwater management, network design, flood modelling, flood hazard analysis and overland flow path assessment. He also brings capability in GIS drafting, basic programming and flood mapping.

This technical foundation supports consistent delivery across a broad range of projects including modelling assessments, structure planning, residential intensification and commercial development. Pranil works closely with multidisciplinary engineers and maintains long standing relationships with key stakeholders as developments move from concept design to delivery.

He worked directly with infrastructure management and technical leads to co-ordinate design, staging and delivery across the programme.

EXPERIENCE

Stormwater Management

Hydrological & hydraulic modelling (stormwater, wastewater, water, river).

Model reviews

Validation (gauge & radar data)

System performance

Flood risk assessment

Issue identification

Option analysis

Infrastructure planning

Technical peer reviews

Civil design

Project management

Catchment planning

Geospatial analysis

WORK HISTORY

Flowstate Consulting

Director – 2025 - Present

WOODS

General Manager - 2022 - 2025
Technical Director - 2022 - 2025
Principal Engineer - 2019 - 2022
Senior Associate - 2017 - 2019
Senior Engineer - 2012 - 2017

AECOM NZ Ltd

Civil Engineer - 2008 - 2012

Auckland Regional Council

Student Engineer - 2006 - 2007

KEY PROJECTS

- **Riverhead Plan Change (PC100) - Fletcher Residential Living / Riverhead Landowner Group (2025)**
- **Karaka Road Plan Change (PC121) - Fisher & Paykel Healthcare (2022 - present)**
- **Remuera Precinct Plan Change (PC104) - Fletcher Residential Living**
- **Wellsford north plan change (PC92) - Wellsford Wielding Club.**
- **Drury East & Drury Centre Plan Changes (PC48 & PC49) - Fulton Hogan & Kiwi Property, 2018 - Present**
- **Sleepyhead estate Development - Ohinewai - Ambury properties Ltd, 2019 – 2022**
- **Wesley College (Paerata Rise) - Grafton Downs Ltd, 2015 - 2020,**
- **Wainui East (Milldale) - Fulton Hogan, 2014 - 2025**
- **Northcote Development - Kainga Ora (Formerly HLC) , 2017 - 2019**
- **Long Bay Development - Todd Property, 2012 - 2018**

PUBLICATIONS

- **Construction of Low Impact Design Solutions at Long Bay, Water NZ - South Pacific - Stormwater Conference 2013**
- **Creating Resilient Communities; Understanding and Defining Flood Risk, Water NZ Modelling Symposium 2023**
- **Create more resilient communities, anticipating impacts of climate change, Water NZ Stormwater Conference 2023**
- **Harmony in Brownfield Revitalisation: A holistic nature-based approach, Water NZ Stormwater Conference 2024**
- **Nature Based Solutions - An Interdisciplinary Approach and Lessons Learnt, Water NZ**