Flood Emergency Response Plan

The Gables New Primary School

Prepared for SINSW on behalf of NSW Department of Education / 16 April 2025

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Rev	Date	Prepared By	Approved By	Remarks
1	27/09/2024	RC	JM	
2	08/11/2024	RC	JM	Updated following planning comments
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4	22/11/2024	RC	JM	Updated to include client comments
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1.0 Introduction

This Flood Emergency Response Plan (FERP) has been prepared by TTW (NSW) Pty Ltd on behalf of the NSW Department of Education (the Applicant) to assess the potential environmental impacts that could arise from the development of The Gables New Primary School at Lot 301 DP 1287967 on Fontana Drive, Gables (the site).

While the site is subject to inundation via sheet flow during significant rainfall events, the surrounding area and road network is notably impacted, and a response plan is required to address the management of site users during these flood events. The purpose of this FERP is to summarise the flood risks associated with the site, identify preparation measures that should be undertaken to mitigate such risks, and provide an action plan with steps to be completed during a flood event.

This report accompanies a Review of Environment Factors that seeks approval for the construction and operation of a new primary school at the site, which involves the following works:

- Construction of school buildings, including learning hubs, a school hall and an administration and library building.
- Construction and operation of a public preschool.
- Delivery of a sports court and fields.
- Construction of car parking, waste storage and loading area.
- Associated site landscaping and open space improvements.
- Associated off-site infrastructure works to support the school, including (but not limited to) services, driveways and pedestrian crossings.

For a detailed project description, refer to the Review of Environmental Factors prepared by Ethos Urban.

1.1 Site Description

The site is located on Cataract Road, Gables, within The Hills Local Government Area (LGA), approximately 50km northwest of the Sydney CBD and 10km north of the Rouse Hill Town Centre. It comprises one lot, legally described as Lot 301 DP 1287967, that measures approximately 2.2ha in area. The site is bounded by Pennant Way to the north, Cataract Road to the east, Fontana Drive to the west and a vacant lot to the south.

An aerial image of the site is shown at Figure 1.

Figure 1 - Site location and surrounding area (Source: Nearmap, dated 28th August 2024).

1.2 Statement of Significance

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The proposed development is considered to result in low flood risks to people present at the school during a flood event and will not have significant adverse effects on the locality, community and the environment (refer to FIRA completed by TTW and submitted alongside this report);
- Potential flood risks/impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality, community (refer to FIRA completed by TTW and submitted alongside this report).

1.3 REF Reporting Requirements

This FERP has been prepared in accordance with the REF deliverable requirements as presented in Table 1.

Table 1 - Relevant REF Requirements

Item No.	REF Requirement	Relevant Section of Report
15.1	Where the development could alter flood behaviour, affect flood risk to the existing community or expose its users to flood risk provide a flood impact and risk assessment (FIRA) prepared in accordance with the Flood Impact and Risk Assessment – Flood Risk Management Guide LU01, the Flood	A Flood Impact and Risk Assessment (FIRA) has been prepared by TTW and has been submitted alongside this report. The FIRA addresses this item.

	Risk Management Manual 2023, Support for Emergency Management Planning. The scope of the FIRA should be confirmed with the Department prior to undertaking the assessment.	
15.2	Prepare the assessment in accordance with the Standard DCCEEW Flooding Requirements.	This FERP has been prepared in accordance with the Flood Risk Management Manual 2023 and supporting guidelines, including the Support for Emergency Management Planning. Refer to Section 1.4 for a full list of the reference documents.
15.3	Detail design solutions and operation procedures to mitigate flood risk, where required.	The FIRA submitted alongside this report considers design solutions to mitigate flood risk. Refer to the FIRA for more information.
15.4	Any proposed Emergency Management strategy for an area should be compatible with the evacuation strategies identified in The Hills Shire Flood Emergency Sub Plan.	This Flood Emergency Response Plan was produced with reference to the Support for Emergency Management Planning Guide and The Hills Shire Flood Emergency Sub Plan. Refer to Section 1.4 for a full list of the reference documents.

The below table addresses the FERP-related advice raised by the NSW State Emergency Service (NSW SES) issued on 17 April 2024.

Table 2 - Agency Advice

Agency	Advice	Response
NSW SES	We recommend that the SEARs should include a flood assessment detailing: ▪ an assessment of the flood risk up to and including the Probable Maximum Flood (PMF), on the site and access/egress routes. ▪ time to onset, duration, depth, velocity and hydraulic hazard of any flooding	This FERP assesses flood behaviour in the PMF event and the access and egress routes to the site. Time to onset and duration of flooding is discussed in Section 2.3. Depth, velocity and hydraulic hazard is discussed in Section 2.1 of this report and is discussed in more detail in the Flood Impact and Risk Assessment by TTW, submitted alongside this report.

1.4 Reference Documents

The FERP has been prepared with reference to the following:

- Australian Institute of Disaster Resilience (AIDR) Guideline 7-3: Flood Hazard (2017);
- FloodSafe guidelines and the relative FloodSafe Tool Kits;
- J. Wyndham Prince (2012) Water Cycle Management Post Re-Exhibition Strategy Report, 2012.
- NSW Department of Planning and Environment (2025) Shelter-in-place guideline for flash flooding (https://pp.planningportal.nsw.gov.au/draftplans/made-and-finalised/shelter-place-guideline-flash-flooding)
- NSW Department of Planning and Environment (2023) Flood Risk Management Manual https://www.environment.nsw.gov.au/topics/water/floodplains/floodplain-manual;
- NSW Department of Planning and Environment (2023) Support for Emergency Management Planning – Flood Risk Management Guideline EM01;
- NSW Department of Planning, Housing and Infrastructure – Planning Circular PS 24-001, Update on addressing flood risk in planning decisions, 1st March 2024;
- NSW Reconstruction Authority (2024) Hawkesbury-Nepean River Flood Study Overview, June 2024;

- NSW State Emergency Service (SES) Guidelines;
- NSW State Emergency Services (SES) (2024) – Flood Evacuation Routes Hawkesbury-Nepean Valley, https://www.ses.nsw.gov.au/sites/default/files/2024-10/nswses_hnv_flood-evacuation-routes.jpg
- NSW State Emergency Services (SES) (2024) – Hawkesbury-Nepean Valley flood map, https://www.ses.nsw.gov.au/hawkesbury-nepean-floods;
- Rhelm, Catchment Simulation Solutions, NSW Reconstruction Authority (2024) Hawkesbury-Nepean River Flood Study, June 2024;
- The Hills Development Control Plan (DCP) 2012;
- The Hills Local Environmental Plan (LEP) 2019;
- The Hills Shire / NSW SES 'The Hills Shire Flood Emergency Sub Plan', May 2023 https://www.ses.nsw.gov.au/media/5430/the-hills-flood-emerency-sub-plan-vol-1-endorsed-july-2023.pdf;
- The Hills Shire Council Flood Modelling and Stormwater Design Guideline, Revision 1, February 2024; and
- TTW (2024) Flood Impact and Risk Assessment Report for Gables New Primary School, dated 16 April 2025.

1.5 Proposed Site Activity

The site is located within the Gables, a master planned community consisting of a town centre, retail facilities, public primary school, approximately 4,100 dwellings, recreational facilities and associated roads and infrastructure. At the centre of this master plan is a constructed lake and detention basin, providing visual amenity, water quality treatment and flood mitigation functions.

As part of the NSW Government's plan to rebuild essential services, the Gables new primary school will help meet growing enrolment demand for primary school students in Sydney's northwest suburbs, accommodating up to 1,000 students in the Hills Shire LGA. The site was acquired in early 2023 by SINSW through a Voluntary Planning Agreement (VPA) by the developer, Stockland. The latest concept design plan of the proposed school is shown in Figure 2. There are two vehicular access point to the site via Cataract Road in the east, and additional pedestrian access points via Pennant Way and Fontana Drive (refer Figure 3).

The site will accommodate up to 1,000 students in the primary school with 68 staff, members, 60 pre-school student, and 6 pre-school staff members.

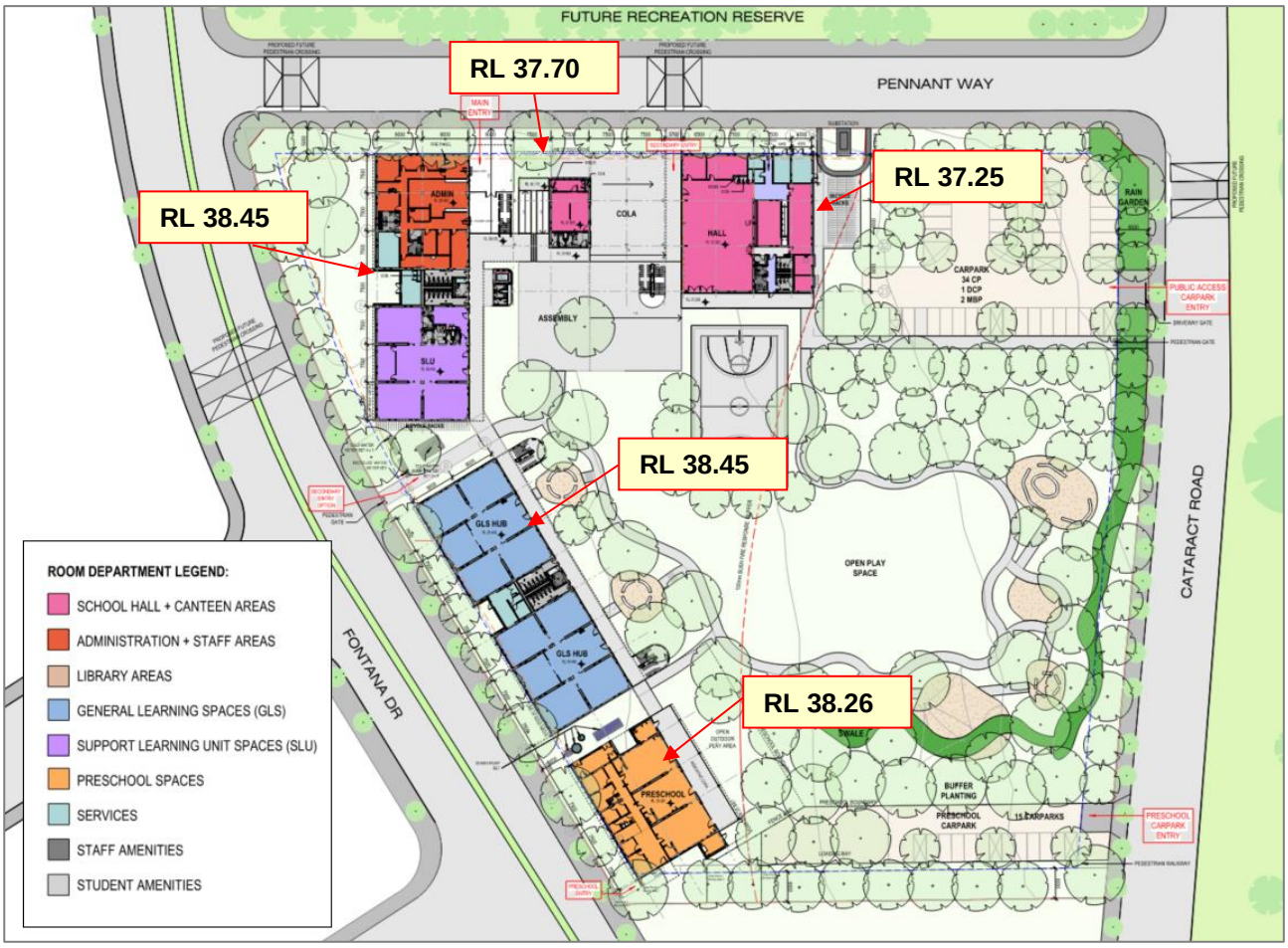

Figure 2 - Latest concept design plan and ground floor levels for the site dated 16 October 2024. Source: Architectus

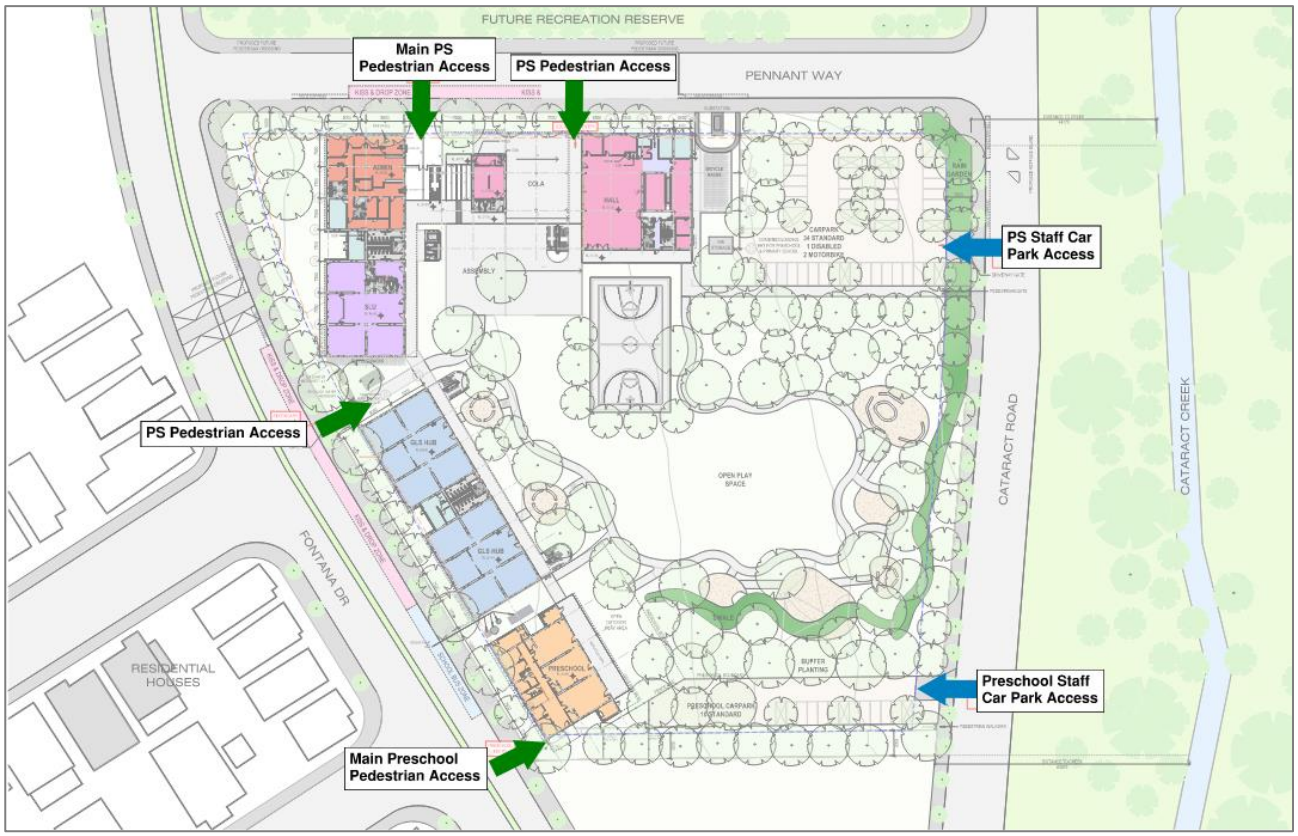

Figure 3 - Proposed site plan and access points (Source: modified from Architectus).

The proposed site activity will also offer the Universal Pre-school and Out of School Hours Care (OSHC). The Universal Pre-school will be run by the Department of Education and will cater to students aged between 3-5 years. The OSHC will typically be run by external/private providers. Exact timings are still to be determined but the OHSC is likely to run from 6:30AM-9:00AM (Before school) and 3.00PM-6:30PM (After school).

There are also proposed weekend activities at the site, including organisations running lessons for the community (sports training and workshops), and presentation events with 20-40 people per session. Weekend activities will typically run between 10:00AM – 4:00PM, with users accessing the site from 9am.

2.0 Flood Behaviour

Stockland, the developer, provided TTW with the latest TUFLOW hydraulic model for The Gables, prepared by Northrop Consulting Engineers in their Dam Break Assessment Report (2019). This has been used as a basis for the flood modelling completed as part of this report.

Northrop's assessment includes an 'Existing' scenario, in which the Gables area is still undergoing development, and an 'Ultimate Developed' scenario which accounts for the future development according to the master plan design of the community. The developed scenario provides a more accurate representation of future flood behaviour in the area as it accounts for increases to the total impervious area and subsequent increases in the discharge rate to the downstream drainage network and waterways that future development in the Gables may produce. The 'Ultimate Developed' model is therefore used in this flood assessment.

The model was updated to include new site survey and design information for the proposed development. The modelling methodology and the flood impact associated with the development are described in detail in the Flood Impact and Risk Assessment Report prepared by TTW (dated 16 April 2025) and submitted together with this FERP.

For the 1% Annual Exceedance Probability (AEP) event, the 30-minute duration storm was adopted as the critical storm duration. For the Probable Maximum Flood (PMF), a range of storm durations from the 15-minute storm up to the 360-minute storm were run. Although the 15-minute storm is critical for the site in the PMF event, this FERP includes an analysis of the critical duration storm and the longer duration storms to determine the maximum potential impact time for the site (i.e. maximum period of inundation).

2.1 Post-Development Flood Depths and Levels

The peak post-development flood levels and depths at the site during the critical 1% AEP and PMF storm events are depicted in Figure 4 and Figure 5, respectively.

Model outputs indicate that the site is subject to some overland flow that is largely generated onsite as a result of the rainfall on grid modelling methodology. Shallow sheet flow is directed across the site to the east and towards the adjacent creek, at low velocities ranging between 0.1 – 0.3 m/s. This increases in concrete areas such as the sports court and car park, peaking at approximately 1.0 m/s. The site is not subject to mainstream flooding from the eastern creek.

While across the wider school site flood depths are generally less than 0.05m in both the 1% AEP and PMF event, pooling of floodwaters is evident along the perimeter of the buildings in the 1% AEP event due to a combination of the coarse model resolution and the proposed cut around the building perimeters. Depths around the buildings generally range between 0.2 – 0.8m in both the 1% AEP and the PMF. These areas of ponding around the proposed school buildings are considered a stormwater management issue and are not considered flooding. These flows should be diverted around the proposed buildings and be considered as part of the civil site grading and stormwater design in the subsequent detailed design phases of the project, to ensure that all proposed buildings will achieve PMF flood immunity.

Flood velocities within the site increase in the PMF event (when compared to the 1% AEP event results), peaking between 1.0 – 1.8 m/s in the proposed car park to the east of the site. While depths within the creek system have increased (when compared to the 1% AEP event results), flows are contained within the riparian corridor and the site is not affected by mainstream flooding in the PMF.

Figure 4 - Flood levels and depths (1% AEP event) – Post Development Conditions

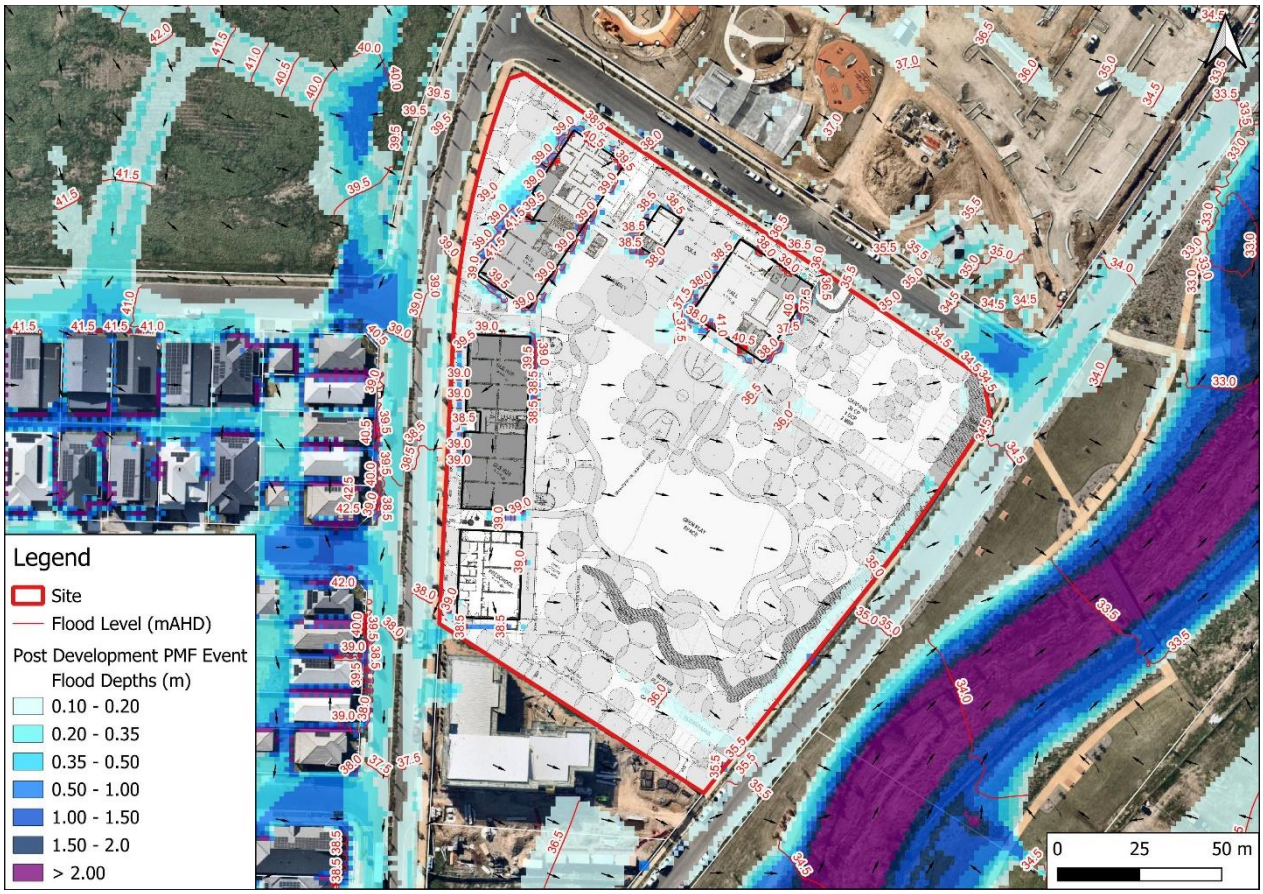

Figure 5 - Flood levels and depths (PMF event) – Post Development Conditions

2.2 Post-Development Flood Hazard

A hazard assessment was conducted using the flood hazard vulnerability curves set out in 'Handbook 7 – Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia' of the Australian Disaster Resilience Handbook Collection (2017).

These curves assess the vulnerability of people, vehicles and buildings to flooding based on the velocity and depth of flood flows. The flood hazard categories are outlined in Figure 6, ranging from a level of H1 (generally safe for people, vehicles and buildings) to H6 (unsafe for vehicles and people, with all buildings considered vulnerable to failure).

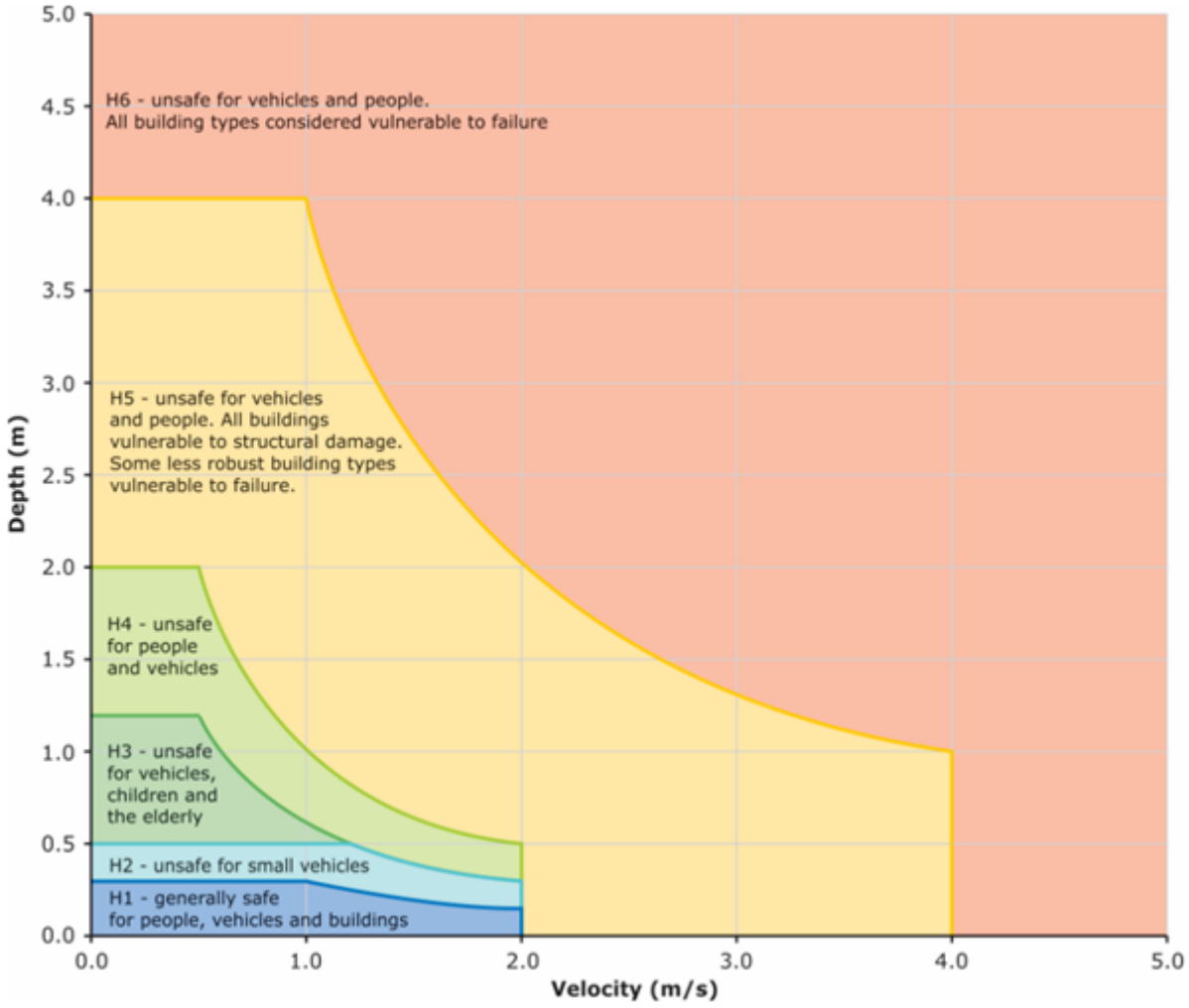

Figure 6 - Flood hazard vulnerability curve (Source: Flood Risk Management Guide FB03 - Flood Hazard, NSW Department of Planning and Environment, 2022)

Figure 7 and Figure 8 present the flood hazard categorisation around the site in post-development conditions in the 1% AEP and PMF events, respectively.

While flood hazard across the site is generally low at H1 in the 1% AEP event, this rises to H2-H3 around the perimeter of the buildings, reaching H4 at the communal hall in the PMF event – although this pooling is considered a stormwater management issue that must be addressed in the civil design stage and not considered as flooding. Flood hazard increases in the PMF event, with hazard ranging from H2-H6 along the building perimeters, remaining at H1 elsewhere due to the shallow nature of the sheet flow. With appropriate civil design in the subsequent detailed design, it is anticipated that such high hazards around the proposed school buildings can be reduced. This should be assessed and confirmed in the subsequent detailed design phase of the project.

Offsite, roads remain trafficable in the 1% AEP with mostly H1 hazard, though this increases substantially in the PMF event with H5 hazard evident along Fontana Drive to the west and along Pennant Way at the northern frontage of the site.

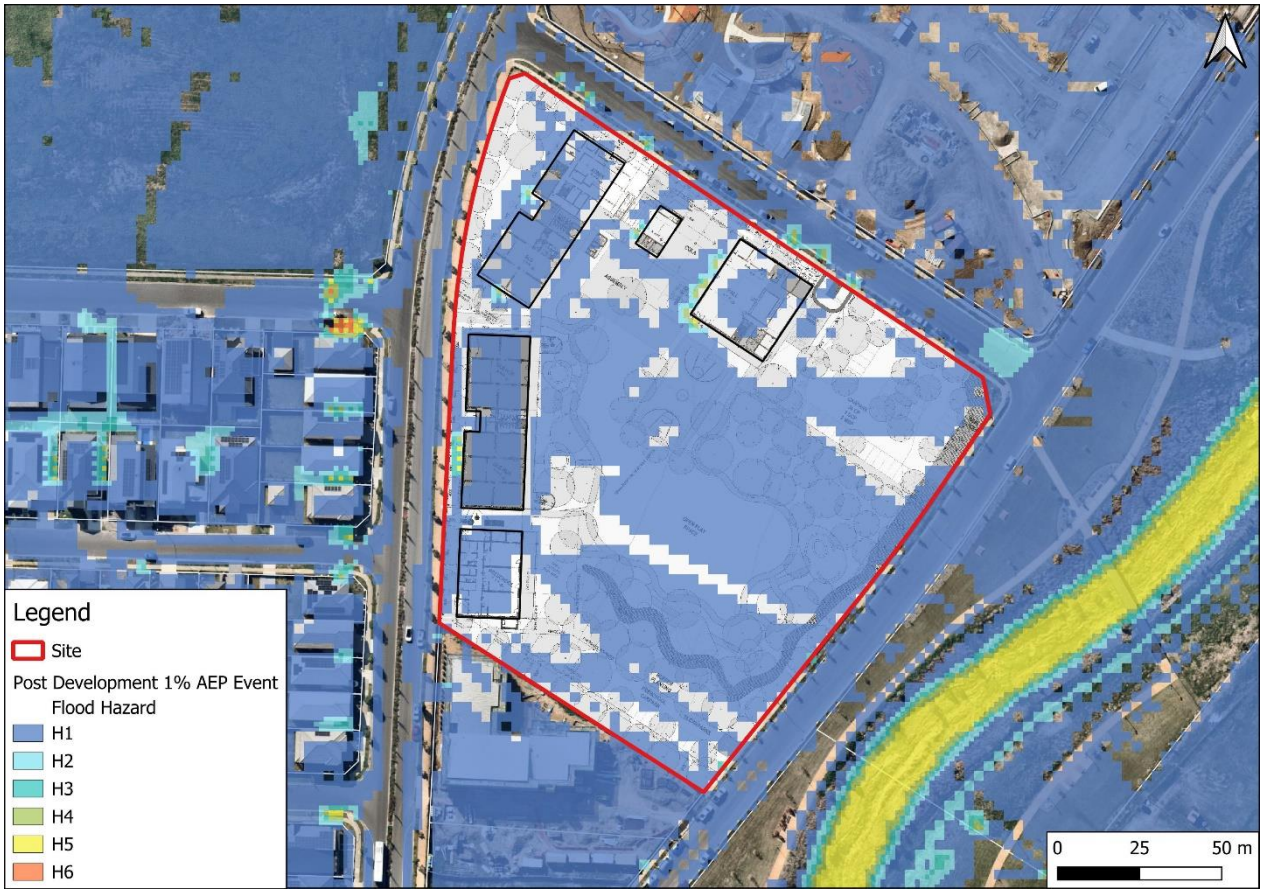

Figure 7 - Flood hazards (1% AEP event) – Post Development Conditions

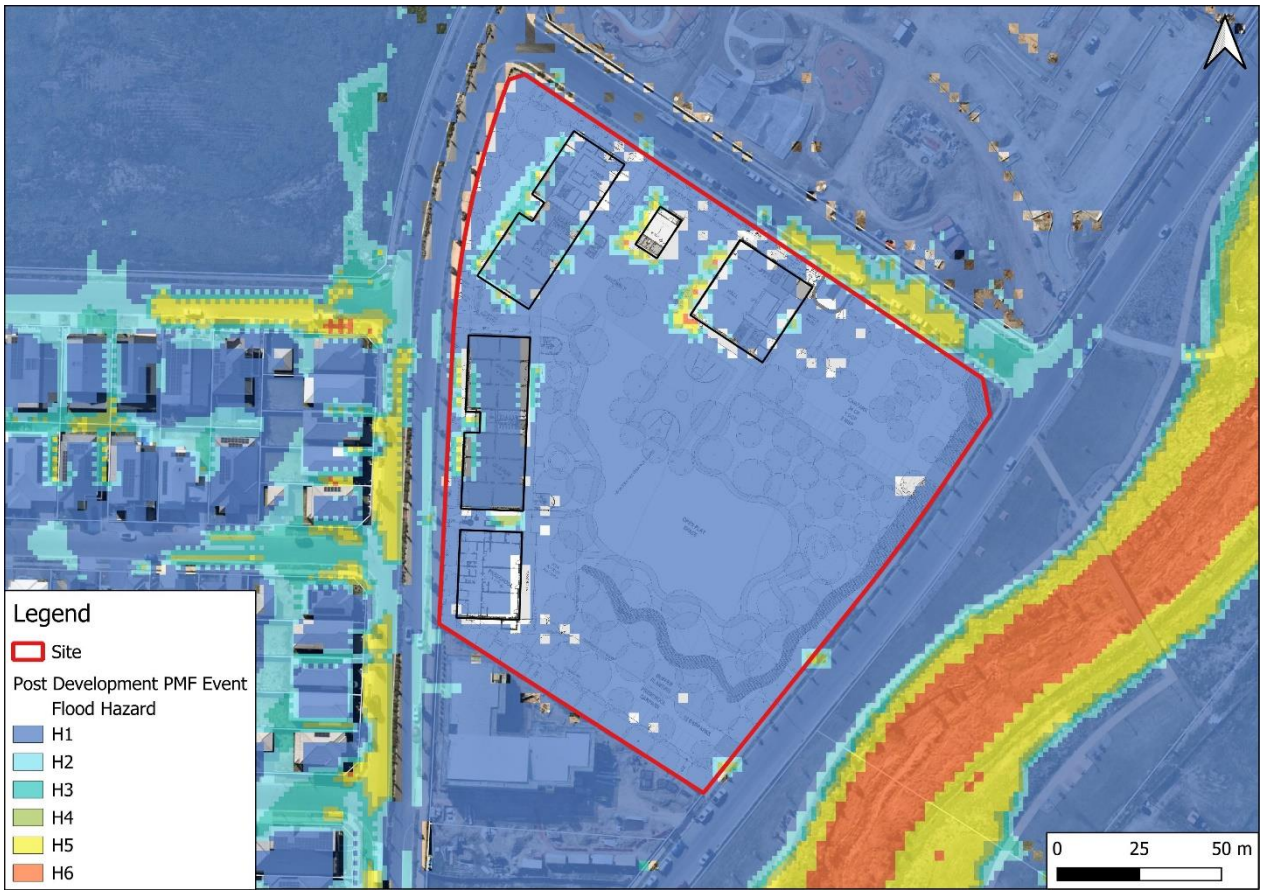

Figure 8 - Flood hazards (PMF event) – Post Development Conditions

2.3 Inundation and Recession Times

Table 3 presents a summary of the inundation and recession times for the critical PMF storm duration (15-minutes). A longer duration event (6 hours) has also been assessed in order to consider the possibility of longer isolation periods.

Due to the ROG modelling methodology, the surrounding roads will always be flood affected in the PMF event, though it is important to consider the flood hazard and whether roads are trafficable. For the purpose of this assessment, the recession time is regarded as the time taken for roads to return to a trafficable, low hazard (H1) state.

The short critical duration for the catchment indicates that roads are unlikely to be isolated for an extended period of time. Analysis indicates that in the critical PMF storm, roads are cut off for approximately 20-30 minutes before returning to trafficable conditions. Under a longer duration 6-hour PMF event, roads remain trafficable for the entire duration.

Table 3 - Time to inundation and recession at the site in PMF storm events

PMF Storm Duration	Time to Inundation (minutes)	Recession Time
15 minutes (Critical duration)	< 10 minutes until flows reach a H5 hazard level at Fontana Drive and Pennant Way.	20 minutes after the onset of the storm, most of the surface flow onsite has dissipated, and Fontana Drive, Pennant Way and Valetta Drive have returned to a trafficable condition. Access and egress are possible via the south on Fontana Drive. Some sections of Red Gables Road north of the site remain at H5 hazard.

		All roads in the vicinity have returned to a trafficable condition 30 minutes after the onset of the storm.
6 hrs (Long duration)	Flood depths and velocity peak approximately one hour after the onset of the storm and remain relatively stable for 3-4 hours, but all roads remain trafficable at H1 hazard for the whole duration of the storm event.	All roads remain trafficable at H1 hazard for the whole duration of the storm event. Flows onsite begin to dissipate after approximately 3 hours.

It should be noted that in all simulated events, the model indicates that there is a low hazard (i.e. H1) route in and out of the site via Cataract Road. However, the model has not fully captured the road corridor along this section of road, and therefore this road cannot be relied upon as a safe egress route for the site. In addition, while this section of Cataract Road is shown to be trafficable, all routes out of the site via this road eventually become impassable in the critical PMF event due to H5 hazard along Red Gables Road, western Cataract Road and southern Fontana Drive.

This is depicted in Figure 9, which shows the flood hazard categorisation for the site and its surrounding area during the critical PMF storm event. This indicates that there is no way in or out of the site in the critical PMF event that does not go through high or medium hazard waters, though floodwaters quickly recede.

While modelling indicates that the bridge over the creek along Fontana Drive is overtopped with hazard reaching H6, the road surface level has not been incorporated into the model, and this instead represents hazard within the creek.

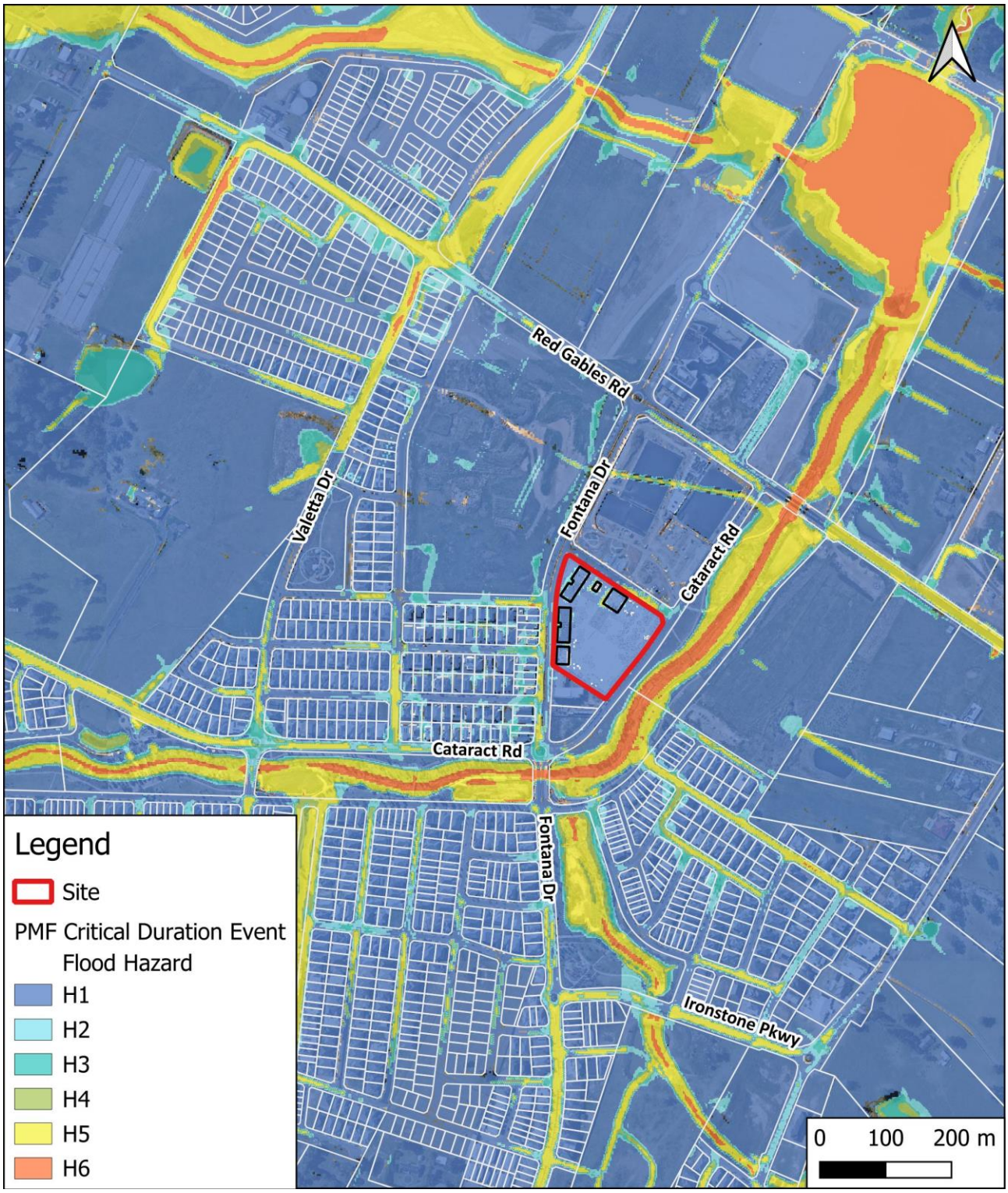

Figure 9 - Flood hazard categorisation for the site and its surrounding area during the critical PMF storm event.

2.4 Hawkesbury-Nepean River Valley Flooding

The Hawkesbury-Nepean Valley has the most significant flood risk exposure in NSW. The Reconstruction Authority (RA) recently completed the 2024 Hawkesbury-Nepean River Flood Study, which is considered the most up-to-date and reliable source of flood information for the Hawkesbury-Nepean River. A new 2-

dimensional hydraulic model (TUFLOW) covering an area of more than 1,500km^2 was developed, which provides detailed flood information for the 190-km length of river, including backwater flooding up the South and Eastern creeks.

The Gables is located within the South Creek sub catchment of the wider Hawkesbury-Nepean Valley. An interactive map of the Hawkesbury-Nepean Valley flood extent was produced based on the findings of this study and is available on the NSW SES website. Mapping indicates that, even in the Probable Maximum Flood event, the Gables site is not impacted by mainstream flooding or backwash from the Hawkesbury-Nepean Valley. The site is therefore outside of the Hawkesbury-Nepean floodplain.

However, as indicated in Figure 10, major roads can become flooded, leading to transport disruptions and potential isolation from certain areas within the catchment. Key roads impacted include Boundary Road to the west of the site, Pitt Town Road to the north, and Windsor Road to the south.

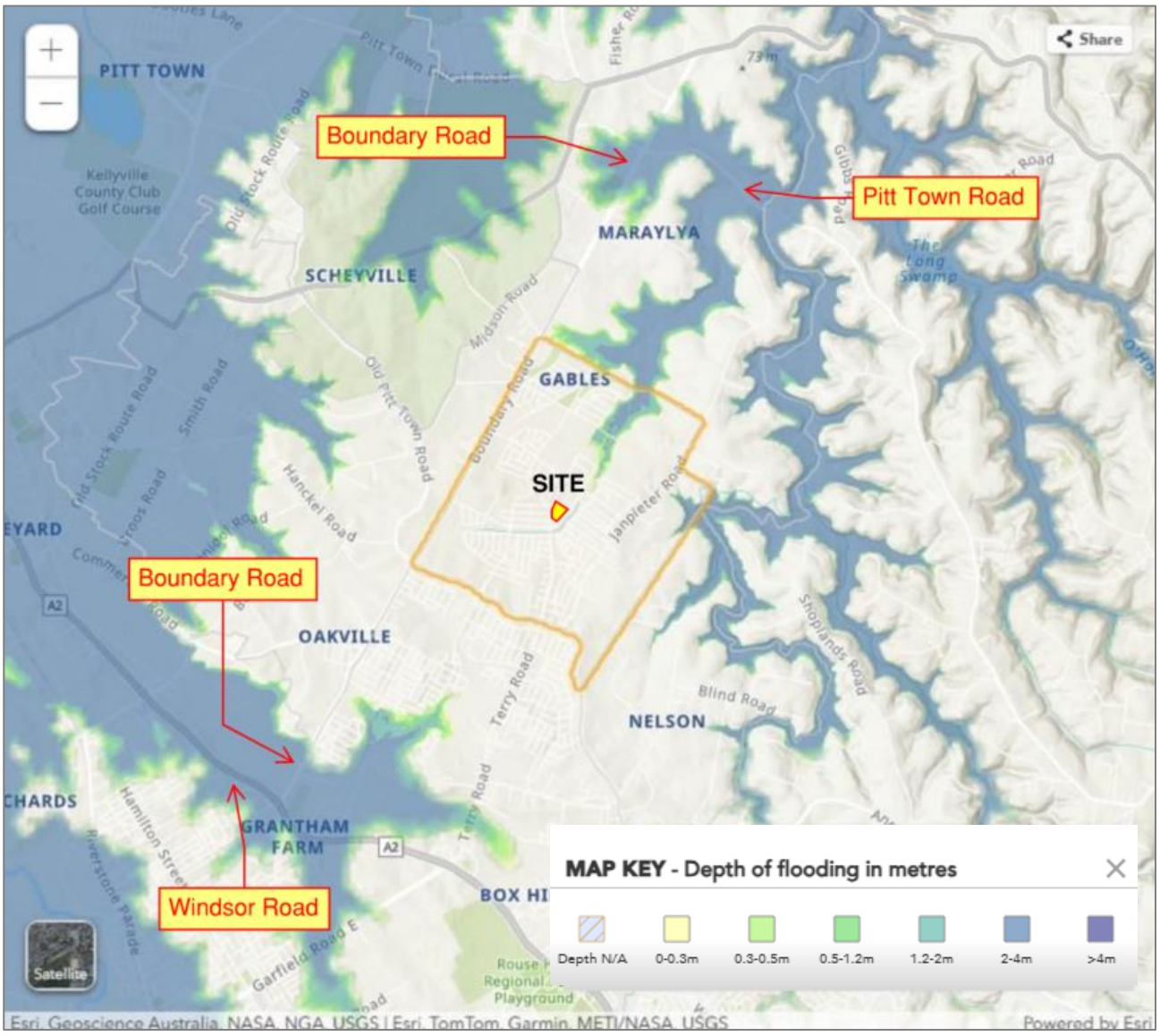

Figure 10 - Hawkesbury-Nepean Valley flood extent in the 'biggest flood possible' i.e. the PMF event (Source: NSW SES, 2024).

Based on the flood study results, NSW SES published the flood evacuation routes that should be taken in the event of a major flood event in the Hawkesbury-Nepean Valley. These routes are shown in Figure 11, with the recommended evacuate route for the Gables site via Old Pitt Town Road to the south, onto Annagrove Road to the southeast before joining the Old Northern Road.

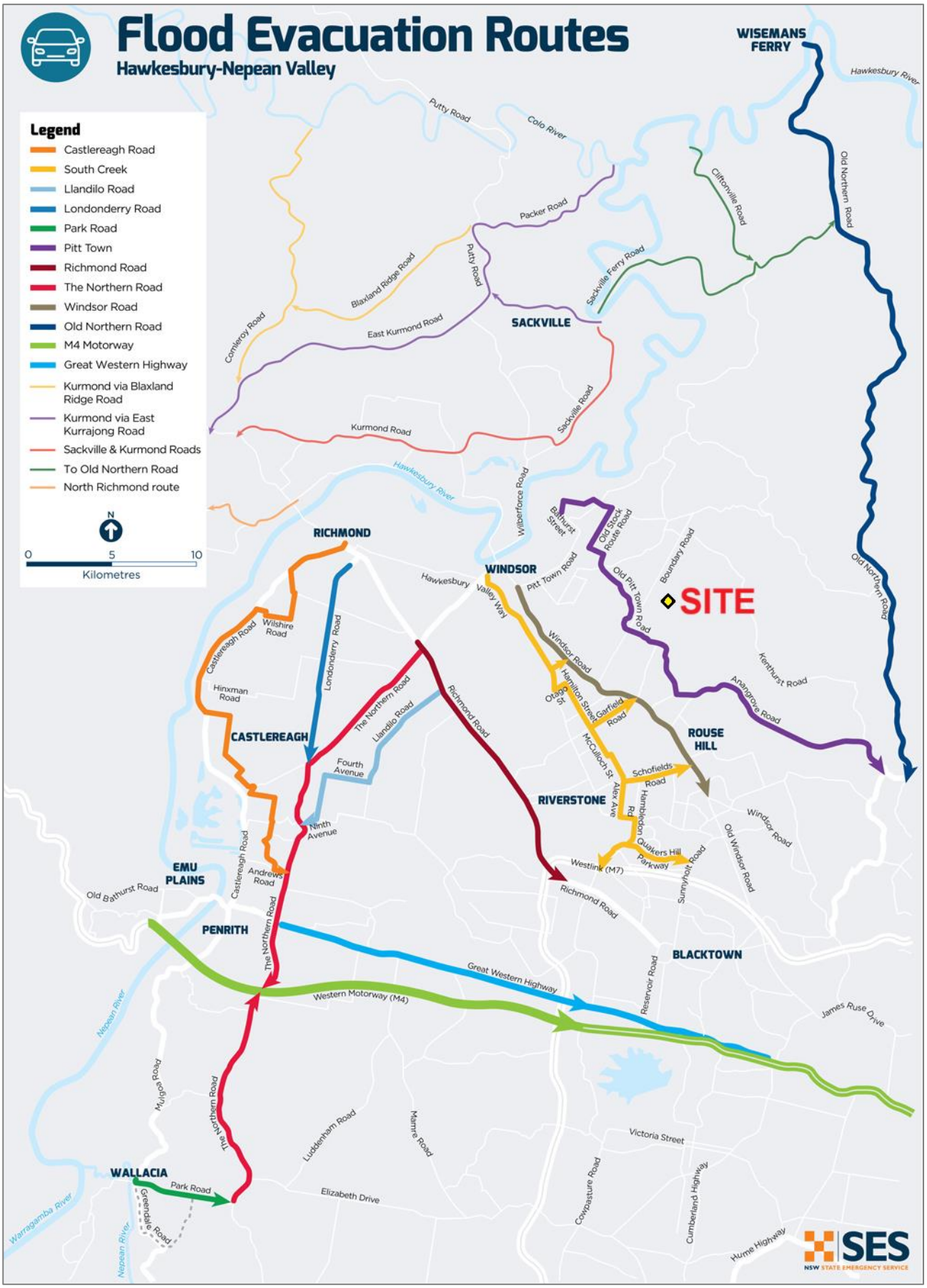

Figure 11 - Flood evacuation routes for Hawkesbury-Nepean Valley (Source: NSW SES, 2024).

3.0 Flood Response Strategy

3.1 Hawkesbury Nepean River Valley Flood Event

Though the site itself is located outside of the Hawkesbury-Nepean PMF extent, roads may be cut off for extended periods of time. Section 5.8.5 of The Hills Shire Council Local Flood Emergency Sub Plan highlights pre-emptive evacuation as a potential flood emergency strategy in The Hills.

Pre-emptive closure of the school is the preferred flood emergency strategy for the school site if there is notification of a Hawkesbury-Nepean River Valley flood event.

In the event of Hawkesbury-Nepean River Valley flooding, there will be sufficient flood warnings and notifications to allow for pre-emptive closure of the site. During the operational phase, the school should be closed in advance of the flood event so children can be safe at home and parents do not have to drive through roads that could become hazardous. An SMS must be sent to staff and parents at the earliest opportunity (once the flood warning is issued by BOM) to ensure no site users enter dangerous road conditions.

3.2 Flash Flooding

3.2.1 Pre-Emptive Closure

Pre-emptive closure of the school is the preferred flood emergency strategy for the school site if advanced warning of a major storm event is received outside of school hours, or where a severe event is forecast several hours in advance.

Although flash flood events are characterised by minimal warning times, there may be advanced notice of the extreme rainfall experienced in a 1% AEP–PMF event. During the operational phase, where there is enough warning prior to school opening hours, the school should be closed in advance of the flood event so children can be safe at home and parents do not have to drive though roads that could become hazardous.

An SMS must be sent to staff and parents at the earliest opportunity (once the severe weather warning is issued by BOM) to ensure no site users enter dangerous road conditions. Any expected visitors of the site should also be informed via SMS if there is a risk of flooding in order to minimise the risk of people entering flood water. This also applies for OSHC and weekend activities.

3.2.2 Shelter-in-Place

While there is often advanced warning time of extreme rainfall events such as those endured in a 1% AEP-PMF event, this cannot be relied upon. Flash flood events are usually characterised by minimal warning times, and pre-emptive closure of the school cannot be accomplished.

Shelter-in-place (SIP) guidance published by the NSW Department of Planning and Environment (DPE) in January 2025 provides considerations that can inform whether SIP is an appropriate response strategy in a flash flood environment, alongside design considerations that should be met. Table 4 outlines the varying factors that must be considered when proposing SIP, and how this site meets the recommendations.

Table 4 - Department of Planning and Environment SIP Guidelines

SIP Guideline	Response
Initial assessment	
1. Does shelter in place align with existing emergency management strategies for the area, as determined through the flood risk management process and by the NSW SES?	While the eastern area adjacent to the site is within a riparian zone, the main flood mechanism impacting the immediate area around the site is flash flooding Pre-emptive closure of the site is recommended when there is notification of a Hawkesbury-Nepean flood event, as this impacts

	main access roads surrounding the site (though not the site itself), which is consistent with the flood response strategy for the Hawkesbury-Nepean River Valley. However, in a flash flood event (unrelated to the Hawkesbury-Nepean River) there is not sufficient warning time to achieve evacuation at the site, as discussed below.
2. Has evacuation off-site (the primary emergency management strategy) been investigated and determined to be unachievable?	With less than 10 minutes from the onset of the critical PMF storm until inundation of the adjoining roads for the proposed school site (refer Table 3), there is little warning time to implement evacuation off-site. As evident in Figure 9, there is no way in or out of the site that does not go through high or medium hazard waters during the critical duration PMF event. NSW SES state that evacuation of a site must not require people to drive or walk through flood water. It is therefore recommended that the school is prepared for a shelter-in-place strategy.
3. Does the development include medical centres, emergency service and community facilities, and sensitive and hazardous land uses, some of which may not be suitable for shelter in place?	While a school is deemed a sensitive activity under the provisions of The Hills Shire Council DCP, the site is protected to the PMF level. It is deemed more hazardous to attempt to evacuate the site once a severe storm event has already commenced, as this would involve moving vulnerable site users from a safe environment into roads of high to medium hazard.
4. Shelter in place for greenfield development is not supported	N/A
5. Whether there is existing government developed flood warning systems that give advanced detailed forecasts of flash flooding to allow sufficient time to evacuate to the proposed refuge locations[2] [2] Flash flood warning systems are not failsafe and should not be the only mechanism to get people to shelter in place.	There is less than 10 minutes from the onset of the critical PMF storm until inundation of the adjoining roads. Flood warning systems and flood forecasting is discussed in more detail in Section 4.0. While there are flood warnings issued by the Bureau of Meteorology and the Australian Warning System, the flashy nature of flooding at the site (and the inherently limited warning time associated with this type of flooding) limits the capacity of NSW SES to issue flood notifications and action statements with sufficient lead time. It is important to note that the warnings outlined in Section 4.0 may not be available or occur with advanced warning.
6. Can the community effectively be informed of the risks associated with the emergency management strategy?	Section 6.1 of this FERP outlines the importance of education and signage in informing site users the flood risks present on site and the flood protocols and procedures involved in the SIP strategy.
Following satisfaction of the above, the following must be assessed:	
7. Detailed assessment of evacuation off-site (the primary emergency management strategy) to determine that evacuation off-site is not achievable	With less than 10 minutes from the onset of the critical PMF storm until inundation of the adjoining roads for the proposed school site (refer Table 3), there is little warning time to implement evacuation off-site. As evident in Figure 9, there is no way in or out of the site that does not go through high or medium hazard waters during the

	critical duration PMF event. NSW SES state that evacuation of a site must not require people to drive or walk through flood water. It is therefore recommended that the school is prepared for a shelter-in-place strategy.
8. The flood behaviour at the site, with consideration of climate change and assessment of the potential maximum duration of isolation up to and including the PMF to identify that: a) flash flooding is the only flood risk present at the site, whether it be from overland flooding, local creek or riverine flooding, and b) the flooding occurs within less than 6 hours from the commencement of causative rain and the duration of shelter in place due to isolation by floodwaters is less than 12 hours from the commencement of rainfall, and c) the development is not subject to high hazard flooding (e.g. floodways, high hazard H5 or H6 areas) or surrounding roadways are not subject to high hazard flooding.[3] [3] Flood Risk Management Guideline FB03 Flood Hazard, DCCEEW, 2023.	Consideration of climate change has been made in Section 5.3 of the Flood Impact and Risk Assessment (FIRA) submitted alongside this FERP. Analysis of the 1% AEP event in the 2090 RCP8.5 scenario found that there was limited impact across much of the site and the surrounding roads, with an uplift between 1-2mm across much of the site. The Probable Maximum Flood has also been assessed, which represents the largest flood event that could conceivably occur at a particular location and is based on the most extreme possible combination of meteorological and hydrological conditions. This represents a more conservative flood level than that of the 1% AEP with climate change. a) Section 2.0 of this FERP outlines the flood behaviour at the site and clarifies that the site is impacted by flash flooding derived from rainfall runoff. The site is not impacted by mainstream flooding derived from the adjacent creek. b) There is less than 10 minutes from the onset of the critical PMF storm until inundation of the adjoining roads for the proposed school site. The duration of isolation is short due to the flashy nature of flooding in the area, with the school only cutoff from access roads for approximately 20-30 minutes in the critical PMF event (Section 2.3). c) The site itself is not subject to high hazard flooding, as indicated in Figure 9, due to the shallow nature of the rainfall runoff. However, there is H5 hazard evident along Fontana Drive to the west and along Pennant Way at the northern frontage of the site. It is deemed more hazardous to attempt to evacuate the site once a severe storm event has already commenced, as this would involve moving vulnerable site users from safe refuge into roads of high hazard.
9. How shelter in place will be: a) used as part of the site's emergency management response, including actions before, during and after sheltering in place, and b) communicated to occupants and visitors of the building and how this communication will be maintained for the life of the development.	a) Section 7.0 of this FERP outlines how SIP will be implemented at the site, including actions before, during and after. b) Section 6.0 outlines how this will be communicated the site users and how this will be maintained.
10. An understanding of the secondary risks and how the proponent proposes they will be managed is outlined in the FIRA. Secondary risks include medical emergencies, building fire, health and wellbeing. a) Table 12 of EM01 should be used to consider whether the risks could be effectively managed.	Secondary emergencies are considered in Section 3.2.3 a) Table 12 of the EM01 notes that for primary and secondary schools, a key consideration for SIP is as follows: '*Where possible, primary and secondary school classrooms should be located above the PMF level. However, at a minimum there should be access to adequate space above the PMF within a day hospital and school building for school students, staff and visitors where the facility is not intended to be evacuated outside the floodplain*.'

	The site is to be set above the PMF, and therefore there is adequate space above this level, making all proposed buildings safe for refuge. Table 12 of the EM01 also notes "*Consider developing a PA system to communicate directions and safety messages to the population in the lead-up to and during a flood to assist in improving the safety of the community*." A PA system has been recommended in Section 4.4 of this FERP.
Design criteria for consideration	
i. the floor level of the shelter in place part of the development be above the PMF, and	Section 6.0 of the FIRA prepared by TTW recommends that the Finished Floor Levels (FFLs) of the proposed buildings should be set at least 200mm above the surrounding ground levels together with drainage system around each building that is designed with sufficient capacity to fully contain the anticipated stormwater runoff for the PMF event. All proposed buildings are therefore to be set above the PMF level and will not experience above-floor inundation provided adequate stormwater management is implemented. As a result, all buildings are safe to shelter in from the ground floor and upwards.
ii. structural soundness for conditions in a PMF event, considering flood and debris forces, be verified by a suitably qualified structural engineer, and	This is also a provision in The Hills Shire Council DCP (Part C Section 6) 'All structures to have flood compatible building components below FPL4 (PMF)'; and 'Applicant to demonstrate that any structure can withstand the forces of floodwater, debris and buoyancy up to and including FPL4 (PMF). An engineer's report may be required.' This has been noted in Section 6.0 of the FIRA prepared by TTW.
iii. area and access to the area does not rely on access to electricity, is self-directing, and have clearly marked internal access for all people on site, including consideration of access for potential occupants and/or visitors	As a school site, access and clearly marked internal access will be achieved.
iv. protection from weather and appropriate heating and cooling	As a school site this will be achieved.
v. access to personal hygiene facilities such as a toilet	As a school site this will be achieved.
vi. a minimum floor space of 2 m² per person	Overall, the site will provide refuge space well over 2sqm per person, based on minimum 60sqm per classroom with 24 students. This is coupled with various communal spaces across the site for addition refuge, including the hall and canteen areas.
vii. items for self-sufficiency that are stored, maintained and are regularly updated in an accessible location above the PMF, including sufficient drinking water and food for occupants, fire extinguishers, radios and torches with spare batteries,	As a school site this will be achieved. Refer Section 6.3 for this recommendation.

	and a first aid kit with an automated external defibrillator (AED)	
viii.	centralised communal shelters may be considered but must be freely accessible internally at all times and externally accessible during events	As a school site this won't be required. In addition to flood-free classrooms, there will also be existing communal spaces available to refuge, including the Hall, the general learning spaces, canteen areas, etc. (refer Figure 2).
ix.	access is provided to onsite systems that generate power of the shelter in place location during and after the event for a full range of flood events up to the PMF	Access to the substation is retained up to (and including) the PMF event.
x.	detail how these requirements will be maintained and enforced for the life of the development.	Flood Emergency Response Plans are 'living documents' which need to be regularly reviewed once the school is operational to ensure they remain appropriate to address the risk to the site, can be practically implemented, and consider changing information and lessons learnt from any floods since the last review. It is recommended that the FERP is reviewed following staff changes, flood drills as well as flood events to ensure that the details remain relevant.

As evident in Figure 9, there is no way in or out of the site that does not go through high or medium hazard waters during the critical duration PMF event. NSW SES state that evacuation of a site must not require people to drive or walk through flood water. It should also be noted that all proposed buildings are to be set above the PMF level and will not experience above-floor inundation provided adequate stormwater management is implemented. As a result, all buildings are safe to shelter in from the ground floor and upwards.

During the shelter-in-place strategy, all staff and students are to remain indoors. The Site Manager must ensure that there are no site users outdoors, including within the car park area. For OSHC and weekend activities, all site users must also move indoors and remain until it is confirmed that the event has passed.

3.2.3 Secondary Emergency

Although shelter-in-place is the emergency response strategy should a severe flash flood event begin without sufficient warning, any decision to shelter-in-place must be accompanied by alternative plans for evacuation in the event of a secondary emergency (e.g. medical or fire) or if some site users refuse to shelter-in-place.

While they should be advised to stay in place (at least until the magnitude of the flood is clearer), if they insist on leaving or if there is a secondary emergency during a flash flood event, the first roads to become trafficable include Cataract Road, Fontana Drive and Valetta Drive which leads to Boundary Road, which was identified as a key evacuation route in the J. Wyndham Prince (2012) Water Cycle Management Post Re-Exhibition Strategy Report (2012). Travel to the north of the site should be avoided due to hazardous floodwaters along Red Gables Road.

As noted in the School Transport Plan prepared by TTW (4 February 2025), emergency vehicles can access both the primary school and pre-school via the vehicle accesses on Cataract Road (refer Figure 12) or alternatively utilise parking along Fontana Drive and enter via the pedestrian access points. Emergency vehicles will access the site wherever and whenever required, which may include using facilities such as the bus zone if safe and legal to do so under Section 307 of the NSW Road Rules.

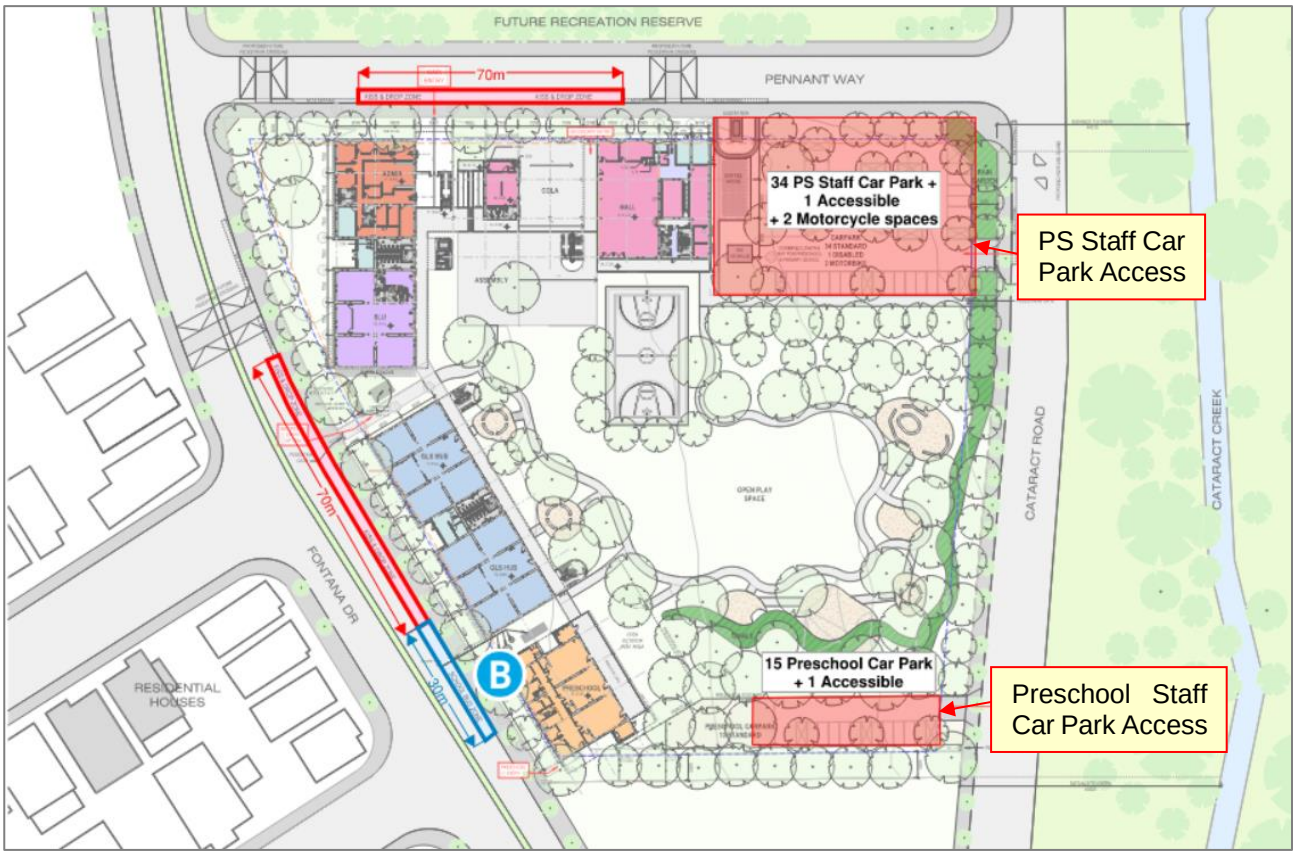

Figure 12 - Proposed site plan including bus zone and kiss and ride along Fontana Drive (Source: modified from Architectus).

4.0 Flood Warnings and Notifications

4.1 Bureau of Meteorology

Severe weather and thunderstorm warnings are issued by the Bureau of Meteorology (BoM). These warnings are continually updated with descriptions of the likely conditions, including predicted extreme rainfall depths. Flood warnings are issued by the BoM when flooding is occurring or is expected to occur in an area. Warnings may include specific predictions of flood depths dependent on real-time rainfall and river level data. These warnings are distributed by BoM to councils, police and the relevant local SES, as well as being available on the BoM website.

- A ***Flood watch*** is issued by the BoM up to four days prior to a flood event. A watch is generally updated daily and may be issued before, during, or after rainfall has occurred.

- ***Flood warnings*** are issued by the BoM when flooding is occurring or expected to occur in a particular area. Warnings may include specific predictions of flood depths dependent on real-time rainfall and river level data. These warnings are distributed to Council, Police, and the relevant local SES, as well as being available on the BoM website, through telephone weather warnings and radio broadcasts.

4.2 NSW SES Australian Warning System

NSW SES has recently implemented the Australian Warning System (AWS) which replaces their previous evacuation orders and warnings system. The AWS is a new national approach to information and 'Calls to Actions' for hazards including flooding. The System uses a nationally consistent set of icons, with three warning levels: Advice, Watch and Act, and Emergency Warning. The flood warnings are described in Figure 13.

Figure 13 - Australian Warning System - Three Warning Levels

The NSW SES utilises a range of sources to build detailed flood intelligence within local communities, including information from flood studies and historical flood data. As part of the transition to the Australian Warning System, the NSW SES has increased flexibility to tailor warnings at the community level, based on the expected consequences of severe weather events.

The Site Manager is responsible for monitoring information from the AWS. Impacted communities will continue to receive flood warnings through the NSW SES website, NSW SES social media channels and by listening to local ABC radio stations. The NSW SES has also developed an all-hazards warning platform, Hazard Watch, to provide an additional channel for communities to access important warning information.

Each warning has three components:

1) **Location and hazard**: The location and the type of hazard impacting the community.
2) **Action statement**: For each warning level there are a range of action statements to guide protective action by the community. These statements evolve as the warning levels increase in severity.

Statements range from ‘stay informed’ at the Advice level, to ‘prepare to evacuate’ at the Watch and Act level, to ‘evacuate now’ in the Emergency Warning level. As the situation changes and the threat is reduced, the level of warning will decrease accordingly.

3) **The warning level**: The severity of the natural hazard event based on the consequence to the community.

4.3 Triggers

The flashy nature of flooding at the site (and the inherently limited warning time associated with this type of flooding) limits the capacity of NSW SES to issue flood notifications and action statements with sufficient lead time. It is important to note that the warnings outlined above may not be available or occur with advanced warning for the school.

To ensure adequate response time, alternative triggers should be monitored, including severe weather warnings, media updates via local radio stations and social media. While the Site Manager is responsible for monitoring information from the AWS, NSW SES recommend that all site users (namely, all staff members (or OSHC and weekend activity workers and wardens) refer to the HazardWatch website and the Hazards Near Me app.

4.4 Emergency Signals

The site should have a Public Announcement (PA) system that can be used by the Site Manager to inform all staff of the chosen response strategy in the event of a flood emergency. This ensures that staff with key responsibilities in the Plan can begin to fulfil their duties without delay.

The PA system should be used alongside SMS and email updates to staff and students to inform them of any severe weather or flood warnings covering the site.

5.0 Flood Response Team

5.1 Staff Responsibilities

In the event of a severe flood, various staff members will be responsible for specific tasks as detailed in Table 5. Before the site is in operation, these roles must be delegated to specific staff members.

It is also important to consider the Out of School Hours Care (OSHC) offered by the proposed activity, which will typically be run by external providers. Roles and responsibilities must be designated to the external personnel that will be onsite during these hours, as it is possible that the regular DoE staff may not be present. It is the responsibility of the School Principal to delegate these roles and tasks appropriately to ensure the staff flood responsibilities can be met even outside of ordinary school hours.

Flood Emergency Response Plans are 'living documents' which need to be regularly reviewed once the school is operational to ensure they remain appropriate to address the risk to the site, can be practically implemented, and consider changing information and lessons learnt from any floods since the last review. Key contact details and the assigned staff members responsible for the implementation of this FERP must also be updated. This FERP must be immediately amended in the event that there in a change in staff.

Table 5 - Staff Flood Responsibilities

Role	Responsibilities
Site Manager	- Decide if pre-emptive closure can occur if warnings are received prior to school opening hours or with several hours' notice - Monitor flood warnings and notifications from BoM and AWS - Monitor BOM lidar and weather in the area of the site - Inform staff and students/parents of flood risk - Coordinate flood SIP drills
First Aid Officer	- Coordinate assistance for less able students and pre-school age children, and staff - Prepare a Flood Emergency Kit that includes a portable radio, torch, spare batteries, first aid materials, emergency contact numbers, candles, waterproof matches, waterproof bags and required medications.
Staff	- Check visitor log and student registers so all site users can be accounted for. - Report missing students or site visitors to Site Manager

5.2 Key Contact Details

In the event of a severe flood, key telephone numbers have been listed in Table 6 below.

Table 6 - Key Contact Numbers

IMPORTANT TELEPHONE NUMBERS	
Site Manager	tba
Deputy Manager	tba
Safety/First Aid Officer	tba
Centre Staff	tba

External Contacts

Police/Ambulance	000
NSW State Emergency Services (SES)	132 500
Fire & Rescue NSW – Box Hill-Nelson	02 9658 9000
Riverstone Police Station	02 9838 2199
Hawkesbury District Hospital	02 4560 5555

6.0 Preparation for Flood Response

6.1 Education and Signage

As part of the preparation for a flood event, all staff and students will be made aware and advised of the flood risks present on site and the flood protocols & procedures via signage. This is also important for any visitors to the site. All staff on site will be made aware of the flood risk (including their management responsibilities) via briefing. This will form part of the mandatory site inductions that all staff must undertake prior to commencing work. A copy of this FERP which includes emergency response procedures will be made available at communal areas within the site as well as the main office.

The OSHC external providers must also be made aware of flood risk and their management responsibilities, as well as those responsible for the proposed weekend activities. Completion of site induction and safety training for existing and new staff is the responsibility of the Site Manager.

Depth markers can also be implemented along the western wall of the proposed school buildings to demonstrate the estimated 1% AEP and PMF depths, ensuring that site users are aware of the potential risks of flooding at the site.

6.2 Flood Drills

It is recommended that flood drills be held by staff annually to ensure all staff workers (including OSHC providers and those in charge of weekend activities) and students are familiar with the sound of the alert and their subsequent flood response actions. It is the responsibility of the Site Manager to ensure that evacuation drills are organised and that any issues with these drills are attended to, and if necessary, rerun.

These drills are required to test the suitability of the plan, identify gaps and to provide staff the opportunity to put into practice their specific responsibilities. If issues arise, this plan should be reviewed and updated. The Site Manager will also ensure that all site drills are recorded in an appropriate records book and any non-conformities reported and responded to.

6.3 Flood Emergency Kit

A Flood Emergency Kit should be prepared prior to a flood event taking place and regularly checked to ensure that supplies within the kit are sufficient and in working condition. This check could occur after the evacuation drill takes place to provide a regular schedule. The Kit should include:

- Radio with spare batteries;
- Torch with spare batteries;
- First aid kit and other medicines;
- Candles and waterproof matches;
- Waterproof bags;
- A copy of the Site Emergency Management Plan; and
- Emergency contact numbers.

This Emergency Kit should be stored in a waterproof container, and it is the responsibility of the Site Manager to make sure that this kit is maintained and available during an emergency.

The NSW Shelter-in-place guideline recommends items for self-sufficiency that are stored, maintained and are regularly updated in an accessible location, including sufficient drinking water and food for occupants, fire extinguishers, radios and torches with spare batteries, and a first aid kit with an automated external defibrillator (AED).

7.0 Flood Response Actions

The flood response actions are outlined in Table 7.

Table 7 - Flood Emergency Response Actions for the site

Flood Emergency Response Plan	
Flood Warning and Notification Procedures	**Evacuation and Refuge Protocols**
1) Weather forecast predicts significant rainfall event in the area or BoM issues a **FLOOD WATCH** or NSW SES issue a yellow "**ADVICE**" warning 	The following actions must be undertaken by the Site Manager: 1) Notify all staff, site users and parents of the flood watch via SMS and email and confirm availability of relevant staff to assist with emergency actions if required. 2) Ensure the emergency kit is ready to use. 3) Listen to the local radio station for updates on forecasted flood heights and timings. Monitor updates on social media and NSW SES platform Hazard Watch. 4) Ensure staff are familiar with their responsibilities.
2) Flash flooding is reported in the media / via visual observation or BoM issues a **FLOOD WARNING** or NSW SES issue an amber "**WATCH AND ACT**" or red "**ACT NOW**" warning 	If the flood event is not anticipated to impact the site (either directly or indirectly), the **Site Manager** is to continue hourly check-ins and postpone high risk activities (e.g. unnecessary deliveries etc.). If flood event is anticipated to impact the site, the **Site Manager** must undertake the following actions: • **For life-threatening emergencies phone 000 immediately.** **If outside of operational school hours (including outside of the OSHC hours or proposed weekend activities) or where several hours of notice has been given:** • Implement pre-emptive closure of school/cancel proposed weekend activities. Send SMS to staff and parents to inform them and advise them of closure. **If during school hours (or during OSHC hours, or during weekend activities) or where warning time is deemed insufficient:** • An alert and warning message should be broadcast over the PA system confirming a significant flood event, notifying all students and staff to begin **shelter-in-place** procedures. • Ensure no one is outdoors. • Send SMS to parents, advising them of SIP strategy and asking them not to travel to school. • Direct all students and staff to shelter in their classrooms. Unnecessary movement between buildings should be avoided. Staff must check student registers and complete a headcount to ensure all site users are accounted for. Site visitors should be directed to the nearest communal area (i.e. hall, canteen area). • The **Site Manager** is to follow any action statements provided via the AWS. **NOTE: Avoid driving or walking through floodwaters. These are the main causes of death during flooding.**
3) Visual observation shows flood is receding or the alert has been downgraded by the relevant authorities and any flood event that occurred has passed. 	• The **Site Manager** is to confirm floodwater has subsided below the ground level and that there is no ponding within the site. • Flooded areas are to remain off limits until ponding has cleared. Site is to be inspected by the **Site Manager** if required. Once it has been confirmed that the water level has reduced to a suitable level, and if determined safe, the **Site Manager** may announce that staff and students no longer need to shelter-in-place.

8.0 Limitations and Revision of the Flood Emergency Response Plan

This FERP only addresses the shelter-in-place strategies during extreme flooding events for students and staff within the site itself and is considered a guide only. It does not cover students and staff individual safe travel arrangements to the site or when their safe travel arrangements may be disrupted by flooding and/or road closures. In addition, this FERP is based on the currently available information for the proposed site, and must be updated following the detailed design stage, prior to the site becoming operational. Flood Emergency Response Plans are 'living documents' which need to be regularly reviewed once the school is operational to ensure they remain appropriate to address the risk to the site, can be practically implemented, and consider changing information and lessons learnt from any floods since the last review.

It is the NSW Department of Education & Communities' responsibility to ensure this FERP is current and updated as necessary to be in line with relevant standards, directorate, legislation, and the Regional's State Emergency Management Plan to ensure the health, safety and welfare of all staff, students and others.

9.0 Mitigation Measures and Recommendations

Project Stage *Design (D)* *Construction (C)* *Operation (O)*	**Mitigation Measures**	**Relevant Section of Report**
D	This FERP is based on the currently available information for the proposed site, and must be updated following the detailed design stage, prior to the site becoming operational.	*N/A*
D	Sufficient drainage provisions should be provided around each proposed building within the site to fully contain and divert anticipated stormwater runoff away from the building for all events up to and including the PMF event. The site must be protected above the PMF.	*Section 2.0*
O	Delegate Staff Responsibilities so all staff are aware of their specific roles flood response actions.	*Section 5.0, Section 7.0*
O	Education and signage - As part of the preparation for a flood event, all staff and students will be made aware and advised of the flood risks present on site and the flood protocols & procedures via signage.	*Section 6.1*
O	Flood drills - It is recommended that flood drills be held by staff annually to ensure all staff workers and students (including all presents for after-hours activities) are familiar with the sound of the alert and their subsequent flood response actions.	*Section 6.2*
O	Flood emergency kit - A Flood Emergency Kit should be prepared prior to a flood event taking place and regularly checked to ensure that supplies within the kit are sufficient and in working condition.	*Section 6.3*

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