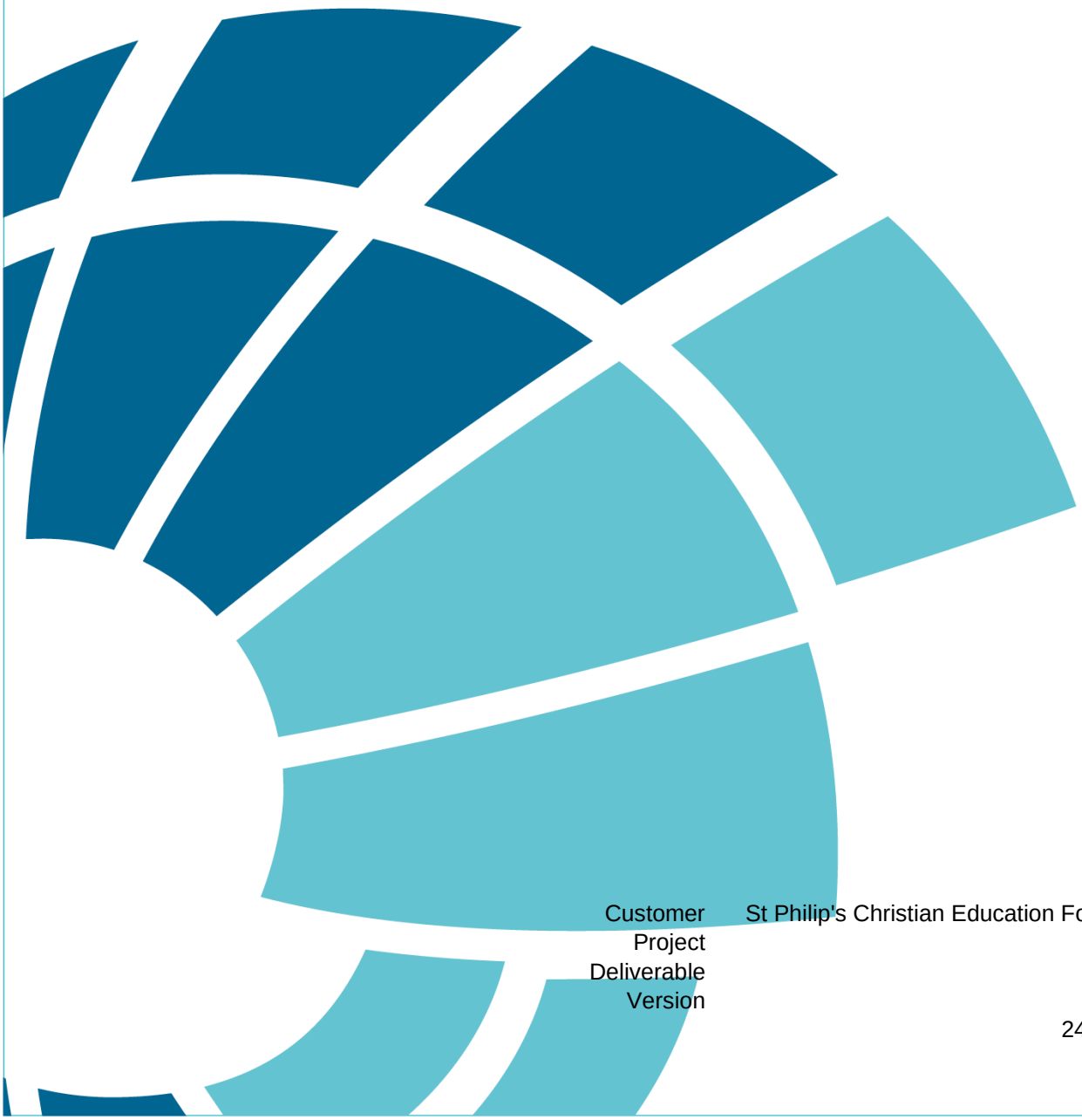
St Philip's Christian College, 10 Lomas Lane, Nulkaba

Updated Flood Emergency Response Plan



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Amendment Record

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02	14 June 2023	Barr Planning	Updated report for client review
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2 Introduction

This Flood Emergency Response Plan (FERP) has been prepared for the proposed development at St Philip's Christian College (SPCC) Cessnock Campus (the "Site") located on the corner of Lomas Lane and Wine Country Drive, Nulkaba NSW. The Site is bounded by Lomas Lane to the north, a rural property with large open space to the south, Wine Country Drive to the west and Black Creek to the east.

The proposed development is located within the Black Creek floodplain and is affected by flooding from the creek. The Site is primarily subject to mainstream flooding in rarer and extreme flood events, with flood depths and extent of inundation increasing in magnitude up to the Probable Maximum Flood (PMF). An assessment of the flood risks for events up to the PMF has been undertaken based on information documented in the 'St Philip's Christian College, 10 Lomas Lane, Nulkaba, Updated Flood Impact Assessment' (BMT, February 2024) referred to as the "Flood Impact Assessment (FIA)".

This report outlines the proposed approach for flood emergency management for the Site, taking into consideration the nature of flooding, proposed development and relevant local and state government policies and guidelines, including the *Flood Risk Management Manual* (NSW Government, July 2023). The report describes the requirements for the proposed buildings, such as required finished floor levels, as well as procedures for flood evacuation, warning systems, signage, and responsibilities of flood wardens in case of flood emergency during school operational phase. It is to be read in conjunction with the FIA for the development.

The development of this FERP has been undertaken in consultation with Cessnock City Council ("Council") and the NSW State Emergency Services (SES) as detailed in Annex B and C.

The principal flood emergency management approach proposed is early school closure if the gauged flood level (based on the on-site water level sensor) reaches a defined trigger level and if the Bureau of Meteorology (BoM) issues a flood warning/forecast based on rainfall and/or creek water level. If early school closure cannot be achieved, the secondary option is evacuation by car and bus prior to inundation of both evacuation routes and buildings. Off-site evacuation is the preferred approach recommended by the SES (achievable for all flood events up to and including the 0.2% AEP event) and shelter in place will only be carried out as a last resort if safe off-site evacuation cannot be carried out (during a PMF event).

The FERP documented in this report reflects the masterplan design as per the FIA. If the masterplan changes in the future or in the detailed design stage, the FERP may need to be further refined to reflect relevant modifications that would affect the FERP. In addition, once the proposed development is completed, a concise operational flood emergency response plan (OFERP) is expected to be developed by the school based on this FERP. The OFERP will examine and provide in-depth details in regard to maintenance and operation of warning systems, placement of signage, evacuation procedures, shelter in place procedures.

3 Description of Proposed Development and Flood Behaviour

3.1 Proposed Development Summary

The proposed development is the upgrade of the school campus located on Site, with the works consisting of the construction of seven (7) new buildings and additions/alterations to six (6) existing buildings for the use of up to 1,732 students. Existing road access to the Site is via Lomas Lane (to the north) which currently has three access points, with an additional access point on Wine Country Drive (along the south-western boundary) proposed as part of the development. The proposed masterplan Site layout is shown in Figure 3.1 and is included Annex A. Figure 3.2 identifies several points of interest (labelled as 'A' to 'I') for the purpose of flood and evacuation timeline assessment.

3.2 Proposed Access Arrangement

Information regarding the proposed access arrangement has been sourced from the traffic report undertaken as part of this project *St Philip's Christian College, Cessnock - Transport and Accessibility Impact Assessment* (Stantec, 2023). The access arrangement is described below:

3.2.1 Lomas Lane (Northern Arrangement)

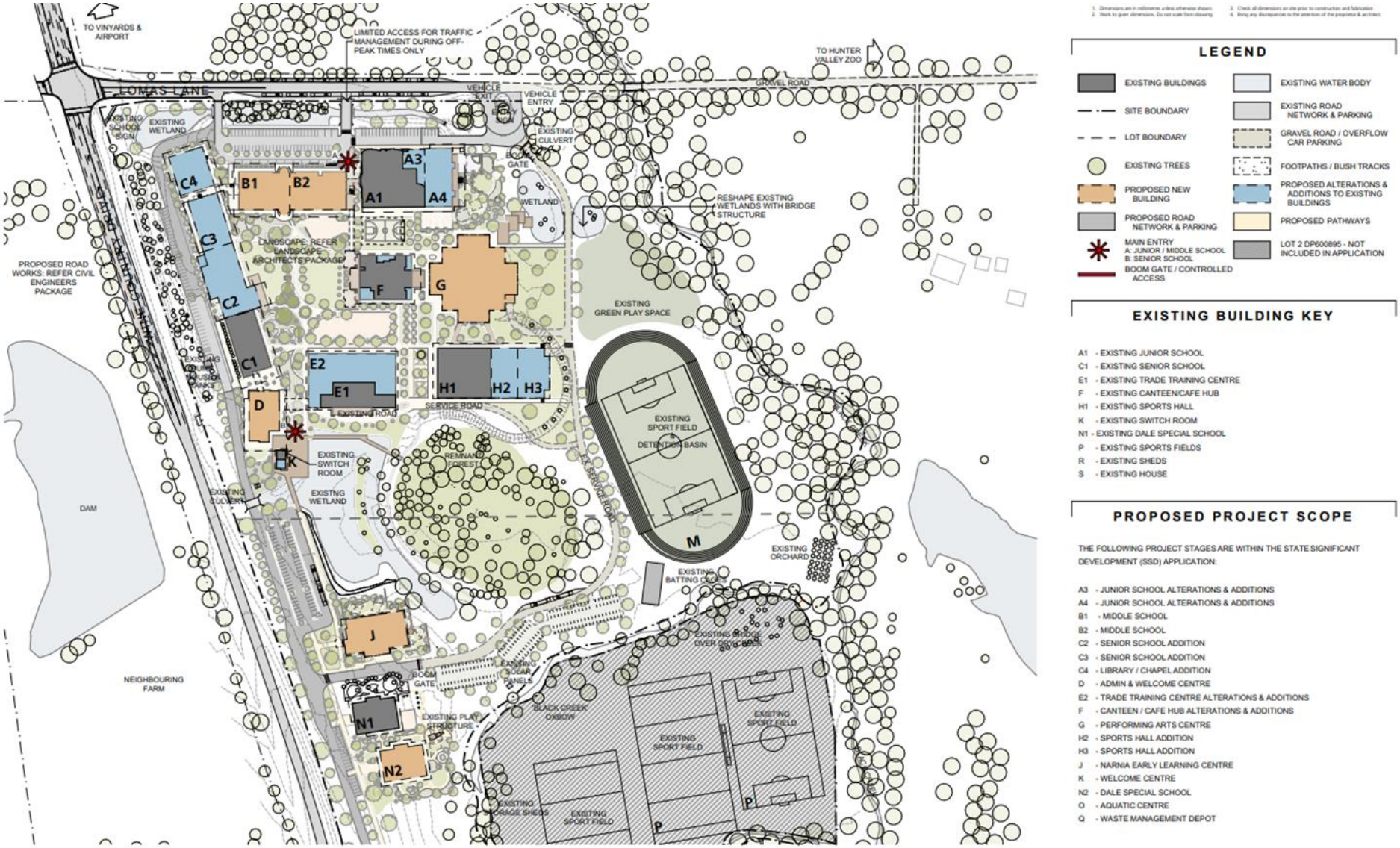
There are three proposed entryways along Lomas Lane:

- An entry for vehicles at the east (herein referred to as the 'NE access' or denoted as C3 in Figure 3.2) that incorporates a bus turnaround bay.
- An exit (egress) for vehicles at the west (herein referred to as the 'NW egress' or denoted as C1 in Figure 3.2) which services the northern set-down and pick-up area for the junior and middle schools.
- A dedicated pedestrian access at the centre (herein referred to as the 'NC access' or denoted as C2 in Figure 3.2). It is understood that the school development proposes to close the existing central access to vehicles during non-emergency situations.

3.2.2 Wine Country Drive (Southern Arrangement)

A new access point is proposed on Wine Country Drive towards the southern end of the site (herein referred to as the southern access or denoted as H in Figure 3.2) that will serve as an alternate entry to and egress from the school. The egress will service the southern set-down and pick-area for the senior school.

It is understood that the entry and egress arrangement (split between the northern and southern access points) has been designed with consideration of existing traffic constraints, such as avoidance of a right turn onto the fast-moving traffic on Wine Country Drive during peak hours.



LEGEND

- EXISTING BUILDINGS
- SITE BOUNDARY
- LOT BOUNDARY
- EXISTING TREES
- PROPOSED NEW BUILDING
- PROPOSED ROAD NETWORK & PARKING
- MAIN ENTRY A: JUNIOR / MIDDLE SCHOOL B: SENIOR SCHOOL
- BOOM GATE / CONTROLLED ACCESS
- EXISTING WATER BODY
- EXISTING ROAD NETWORK & PARKING
- GRAVEL ROAD / OVERFLOW CAR PARKING
- FOOTPATHS / BUSH TRACKS
- PROPOSED ALTERATIONS & ADDITIONS TO EXISTING BUILDINGS
- PROPOSED PATHWAYS
- LOT 2 DP600895 - NOT INCLUDED IN APPLICATION

EXISTING BUILDING KEY

- A1 - EXISTING JUNIOR SCHOOL
- C1 - EXISTING SENIOR SCHOOL
- E1 - EXISTING TRADE TRAINING CENTRE
- F - EXISTING CANTEEN/CAFE HUB
- H1 - EXISTING SPORTS HALL
- K - EXISTING SWITCH ROOM
- N1 - EXISTING DALE SPECIAL SCHOOL
- P - EXISTING SPORTS FIELDS
- R - EXISTING SHEDS
- S - EXISTING HOUSE

PROPOSED PROJECT SCOPE

THE FOLLOWING PROJECT STAGES ARE WITHIN THE STATE SIGNIFICANT DEVELOPMENT (SSD) APPLICATION:

- A3 - JUNIOR SCHOOL ALTERATIONS & ADDITIONS
- A4 - JUNIOR SCHOOL ALTERATIONS & ADDITIONS
- B1 - MIDDLE SCHOOL
- B2 - MIDDLE SCHOOL
- C2 - SENIOR SCHOOL ADDITION
- C3 - SENIOR SCHOOL ADDITION
- C4 - LIBRARY / CHAPEL ADDITION
- D - ADMIN & WELCOME CENTRE
- E2 - TRADE TRAINING CENTRE ALTERATIONS & ADDITIONS
- F - CANTEEN / CAFE HUB ALTERATIONS & ADDITIONS
- G - PERFORMING ARTS CENTRE
- H2 - SPORTS HALL ADDITION
- H3 - SPORTS HALL ADDITION
- J - NARNIA EARLY LEARNING CENTRE
- K - WELCOME CENTRE
- N2 - DALE SPECIAL SCHOOL
- O - AQUATIC CENTRE
- Q - WASTE MANAGEMENT DEPOT

Figure 3.1 Masterplan Layout and Points of Interest

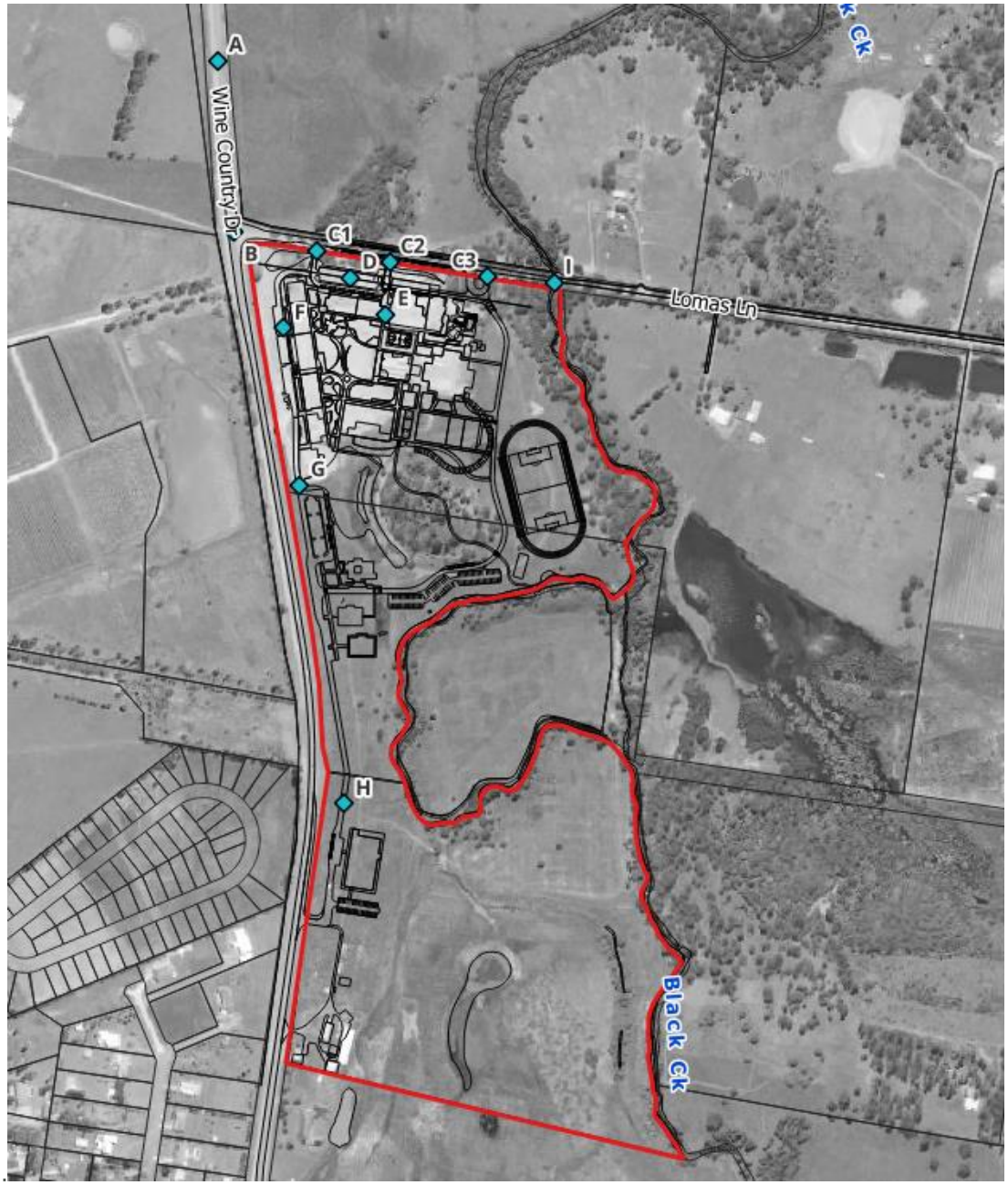


Figure 3.2 Masterplan Layout Overall with Reporting Locations

3.3 Post-Development Flood Conditions

Flood levels (ARR87 Lag 1 approach) applicable to the Site were established as part of the FIA and are provided in Table 3.1. Points of interest are noted on Figure 3.2.

Table 3.1 Peak Flood Levels at Points of Interest

Points of Interest		Peak Flood Level (m AHD)			
ID	Description	1% AEP	0.5% AEP	0.2% AEP	PMF
A	Wine Country Drive north of Site	N/A	N/A	59.1	60.7
B	Intersection of Wine Country Drive and Lomas Lane	N/A	N/A	N/A	60.7
C1	NW Egress	58.2	58.4	58.7	60.7
C2	NC Pedestrian Access	58.2	58.4	58.7	60.7
C3	NE Access	58.3	58.5	58.7	60.8
D	Building B Carpark	N/A	N/A	58.7	60.7
E	School Site	N/A	N/A	N/A	60.8
F	Building C Carpark	N/A	N/A	N/A	60.9
G	Building J Carpark	N/A	N/A	N/A	61.2
H	Wine Country Drive Egress	N/A	N/A	N/A	61.6
I	Black Creek	58.3	58.5	58.7	60.8

The FIA prepared as part of the development submission indicates that the Site is subject to flooding from Black Creek, which first inundates the Site at the field/wetland areas to the south-east and along Lomas Lane at the north-east. PMF depths on-site in the proximity of the proposed building footprints are in the order of 1.2m to 2.5m. High PMF flood depths would also be expected in carparks at the north and south of the Site and along potential egress routes from the Site.

3.3.2 Flood Hazard

The best practice flood risk management approach to flood hazard mapping (AIDR, 2017) classifies the floodplain into the six distinct hazard classifications (“H1” to “H6”) shown in Figure 3.3. These hazard classifications are based on adopted thresholds of flood depth, velocity and depth-velocity product that identify when flood conditions are likely to present a risk to people, vehicles, and buildings. A description of each hazard threshold is provided in Table 3.2.

For all events up to and including the 0.2% AEP, floodwaters are not anticipated to inundate the existing or proposed buildings. However, as shown in Figure 3.4, modelling results indicate that while the area around the buildings would generally remain flood free in a 0.2% AEP event, a flood hazard of ‘H5’ is predicted along the eastern boundary of the Site and along Lomas Lane adjacent to the Black Creek watercourse, which is unsafe for all people and vehicles.

During the PMF event (Figure 3.5), the Site would be fully inundated with “H4” hazards within buildings and “H5” hazards elsewhere. These flood conditions are considered unsafe for all people and vehicles, and proposed buildings to be constructed or alterations and additions to existing buildings would require special engineering design and construction.

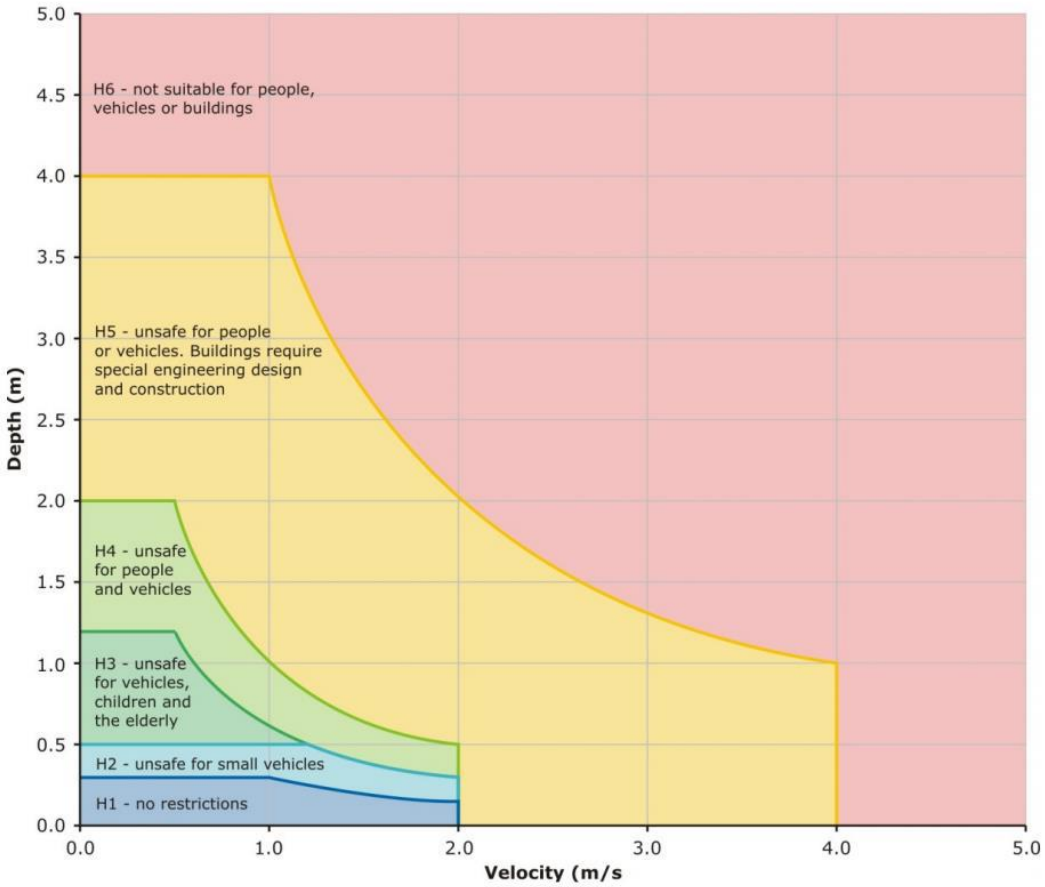


Figure 3.3 Flood Hazard Curves (AIDR, 2017)

Table 3.2 Best Practice Provisional Flood Hazards (AIDR, 2017)

Hazard	Criteria	Description
H1	Depth < 0.3m and Velocity < 2.0m/s and Velocity*Depth ≤ 0.3m²/s	Generally safe for vehicles, people and buildings.
H2	Depth < 0.5m and Velocity < 2.0m/s and Velocity*Depth ≤ 0.6m²/s	Unsafe for small vehicles.
H3	Depth < 1.2m and Velocity < 2.0m/s and Velocity*Depth ≤ 0.6m²/s	Unsafe for vehicles, children and the elderly.
H4	Depth < 2.0m and Velocity < 2.0m/s and Velocity*Depth ≤ 1.0m²/s	Unsafe for vehicles and people.
H5	Depth < 4.0m and Velocity < 4.0m/s and Velocity*Depth ≤ 4.0m²/s	Unsafe for vehicles and people. All building types vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6	Depth > 4.0m OR Velocity > 4.0m/s OR Velocity*Depth > 4.0m²/s	Unsafe for vehicles and people. All building types considered vulnerable to failure.

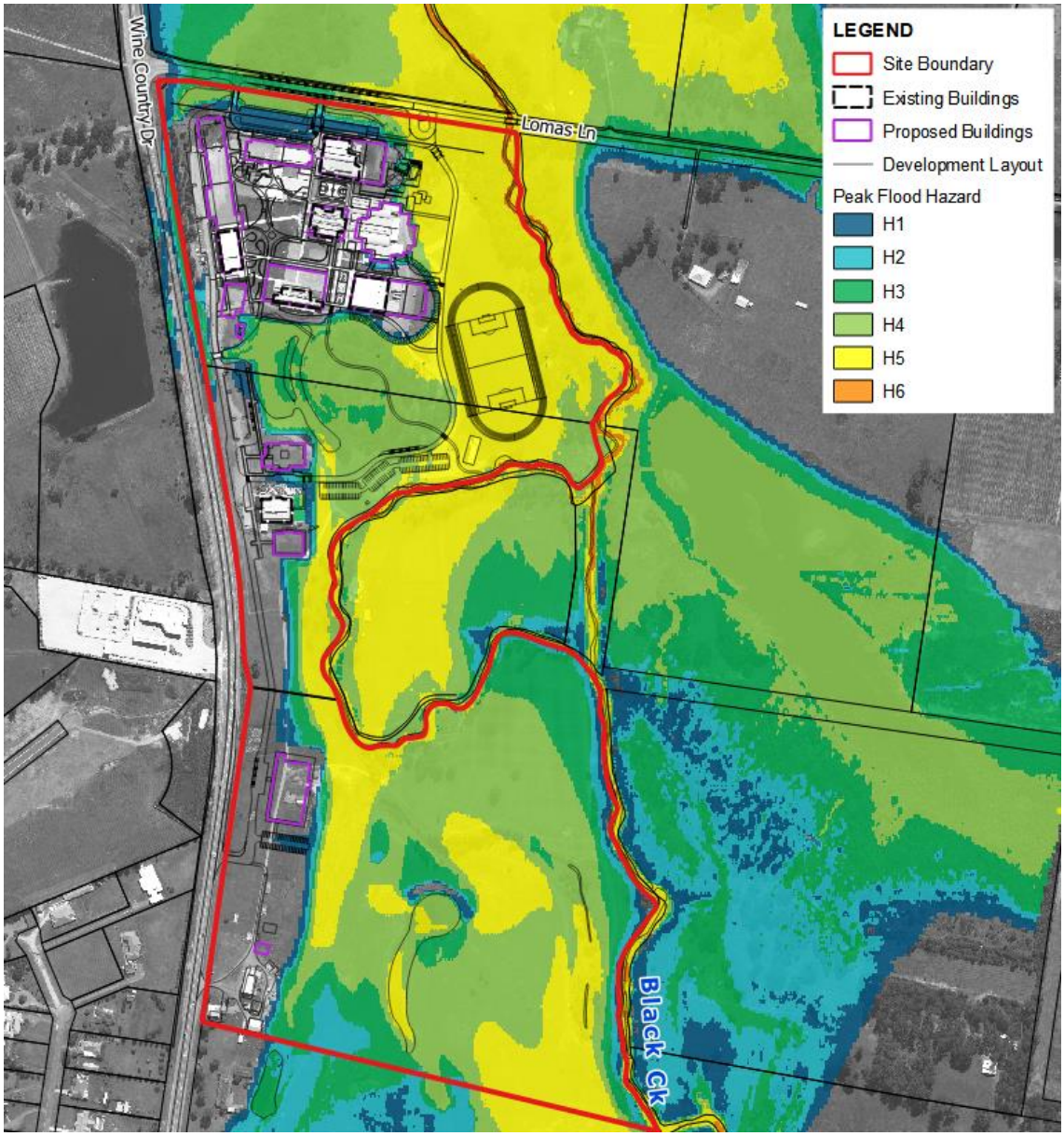


Figure 3.4 Post-development Peak Flood Map - 0.2% AEP Event

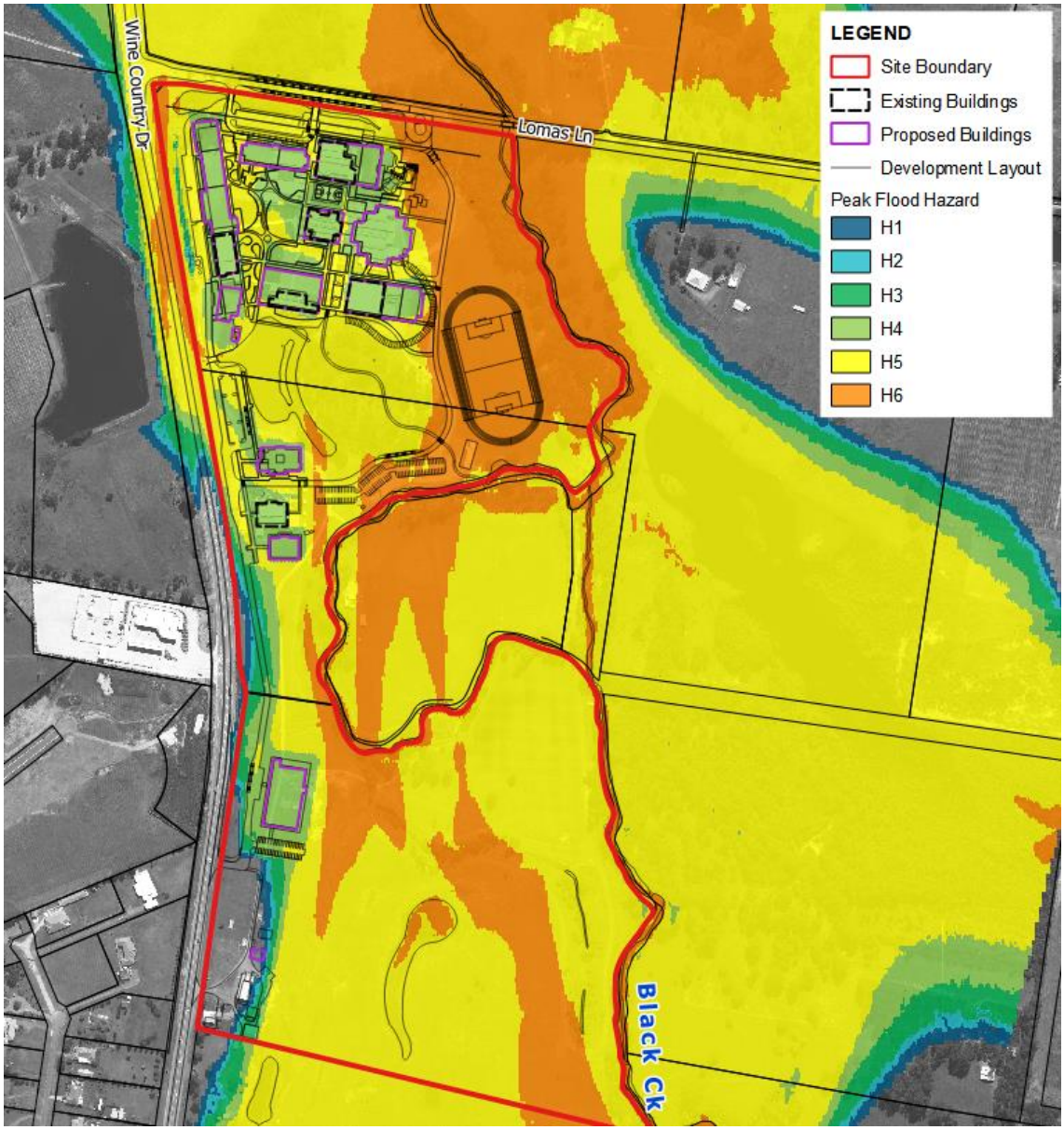


Figure 3.5 Post-development Peak Flood Map – PMF Event

It should be noted that the FIA and this FERP focus primarily on mainstream flooding from Black Creek and not overland flow flooding that could occur on the Site from local catchments. There is also the possibility of stormwater surcharge from the local drainage network on Site which can be caused by blockage during rare flood events or severe storm conditions which is beyond the scope of this assessment. Whilst this FERP does not provide a detailed quantitative assessment of such sources of flooding, given the relatively small drainage area, peak inundation depths are anticipated to be generally shallow, and localised floodwater is expected to recede over a short duration. Notwithstanding, in an event of overland flow flooding or severe blockage conditions, it is advised to avoid the use of inundated areas and to take shelter in school buildings.

3.4 Available Flood Warning Time and Rate of Rise

Flood modelling undertaken as part of the FIA has been used to determine flood behaviour across various points on Site, including available flood warning time, average rate of rise and the duration of flooding. The points of interest are noted in Figure 3.2, with a summary of flood behaviour in the

following sections. Post-development flood behaviour across the Site will be used to identify an appropriate flood emergency management approach, discussed in Section 4.

3.4.1 Locations A and B

The available flood warning time, peak flood level and total inundation duration along Wine Country Drive for the flood events nominated in Table 3.1 are shown in Figure 3.6 to Figure 3.7. Figure 3.6 and Figure 3.7 indicate that for all events up to and including the 0.2% AEP event, the intersection of Wine Country Drive and Lomas Lane (Location B) will remain flood free and that Wine Country Drive to the north of the Site (Location A) will be subject to depths of less than 0.1m in a 0.2% AEP event. In the PMF event, peak flood depths along Wine Country Drive will vary between 1.6m and 1.9m. Based on the PMF event, flooding would occur along Wine Country Drive between 3 and 4 hours following the onset of rain with an average rate of rise of approximately 0.5m/hour.

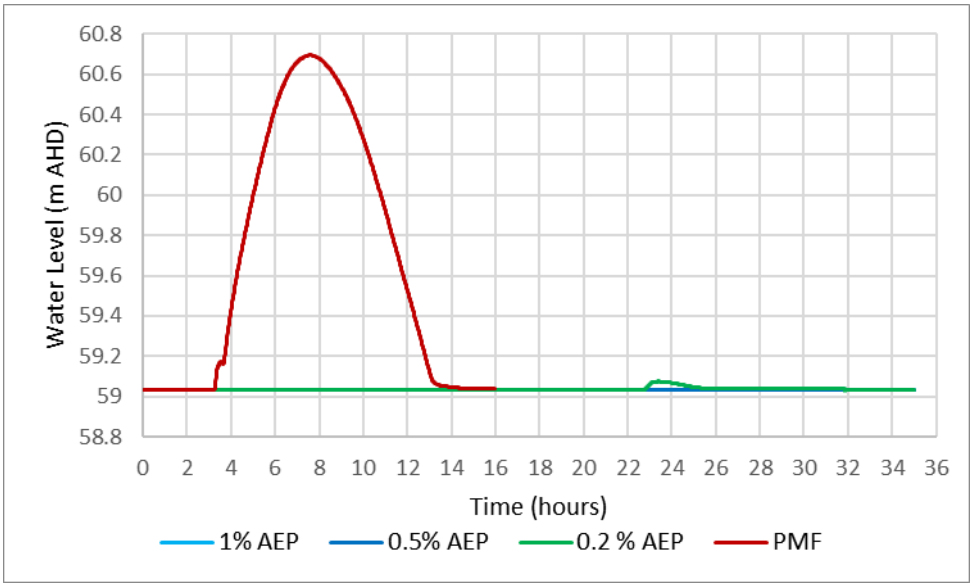


Figure 3.6 Rate of Rise at Wine Country Drive North of Site (Location A)

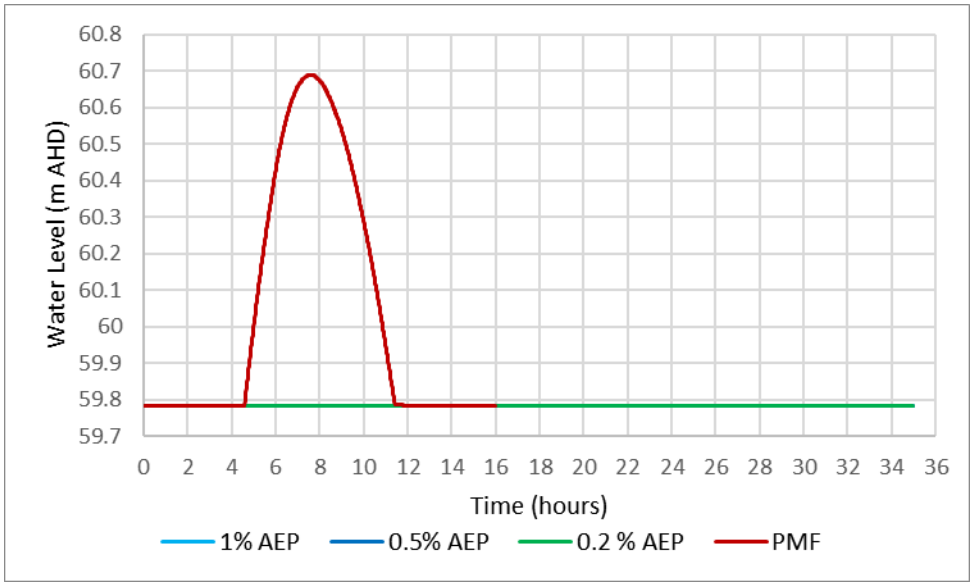


Figure 3.7 Rate of Rise at Intersection of Wine Country Drive and Lomas Lane (Location B)

3.4.2 Locations C1-C3 (Northern Access)

The available flood warning time, peak flood level and total inundation duration along Lomas Lane for the three school access locations nominated in Table 3.1 are shown in Figure 3.8 to Figure 3.10. Additional flood events have been considered for Locations C1-C3 as Lomas Lane is a critical evacuation route.

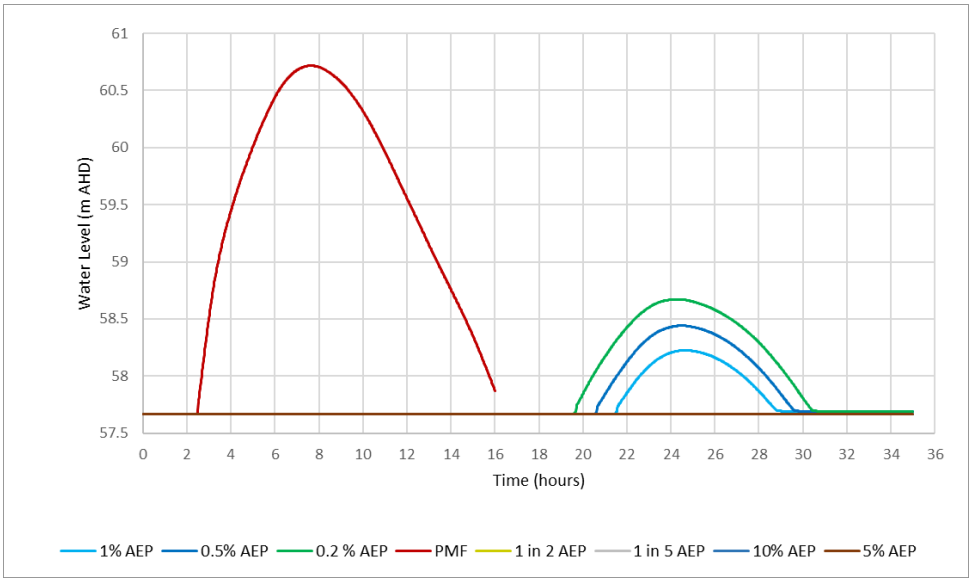


Figure 3.8 Rate of Rise at NW Exit (Location C1)

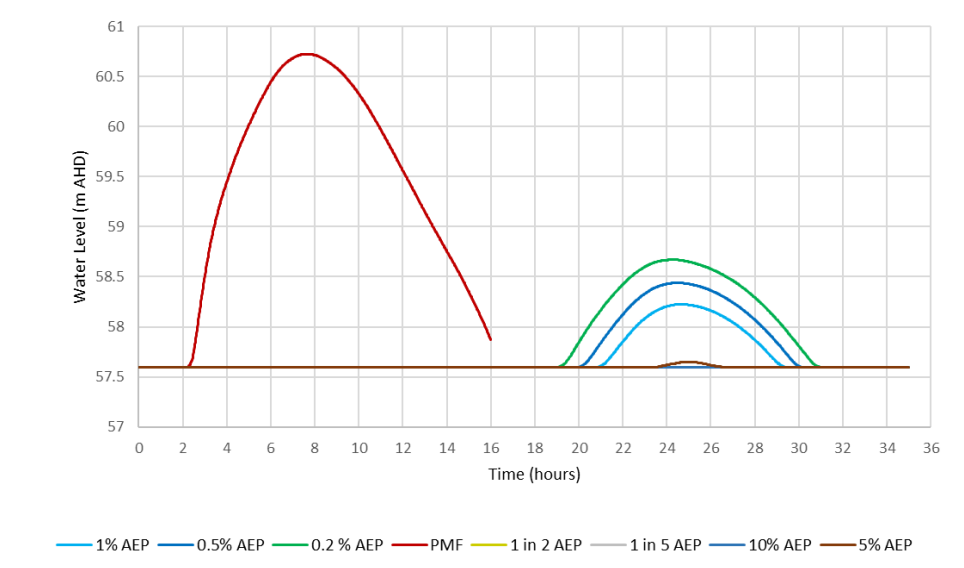


Figure 3.9 Rate of Rise at NC Pedestrian Access (Location C2)

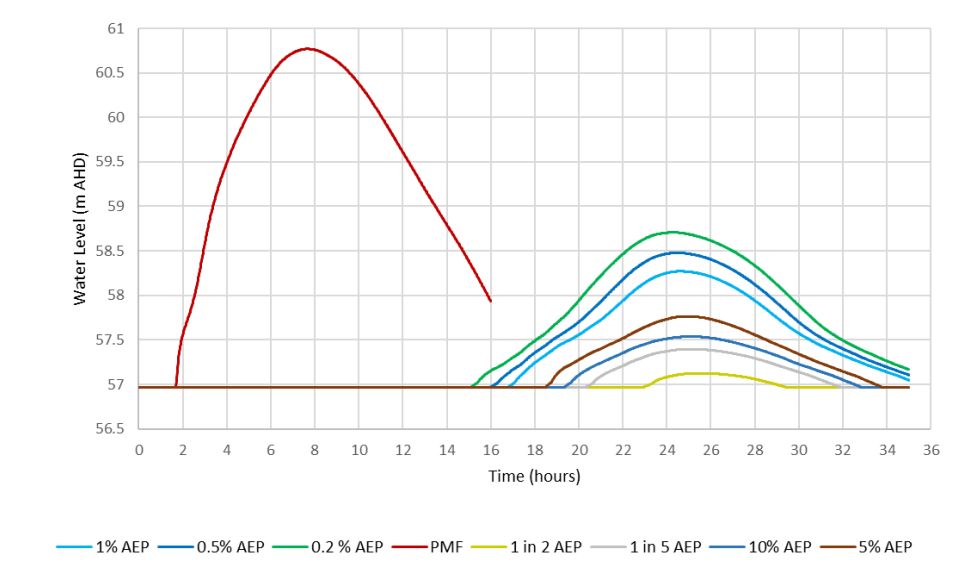


Figure 3.10 Rate of Rise at NE Access (C3)

Figure 3.10 indicates that the NE access point (the proposed bus turnaround bay) will be inundated in the 1 in 2 AEP event to a maximum depth of 0.4m. Access will be cut off from a 18% AEP event, with heavy inundation occurring in all events beyond this point. Figure 3.9 indicates that the NC Pedestrian access will be flood free for all events up to a 5% AEP event with only minor shallow ponding occurring at this point. However, for events rarer than the 1% AEP event, flooding at this access point would exceed 0.6m. Figure 3.8 indicates that the NW Exit will be flood free for all events up to and including the 5% AEP event. For events rarer than the 1% AEP event, flooding at this access point would exceed 0.6m.

In the PMF event, flood depths along Lomas Lane will vary between 3.1m and 3.8m. Based on the PMF event, flooding would occur along Lomas Lane access points between approximately 1 and 2 hours following the onset of rain with an average rate of rise of approximately 1m/hour. It is noted that the PMF event is an extreme event and hence the calculated timelines are deemed conservative. For perspective, for the 1% AEP event, flooding occurs approximately 21 hours following the onset of rain with an average rate rise of 0.2m/hour at the NW Exit (Location C1).

The above information demonstrates that the northern main entry (NE access) has a low level of flood immunity (lower than the 1 in 2 AEP). Hence, the accessibility of this entry point is critical to inform the proposed evacuation timeline.

3.4.3 Main School Site (Locations D-F)

The available flood warning time, peak flood level and total inundation duration at the Main School Site (northern portion) for the flood events nominated in Table 3.1 are shown in Figure 3.11 to Figure 3.13.

Figure 3.11 indicates that the Building B carpark (Location D) will be flood-free for all events up to and including the 0.5% AEP and subject to depths of less than 0.25m in the 0.2% AEP, between 20 to 22 hours following the onset of rain with an average rate of rise of 0.1m/hour. In the PMF event, peak flood depths in the Building B carpark would be in excess of 2m, with flooding occurring approximately 3 hours following the onset of rain with an average rate of rise of 0.55m/hour.

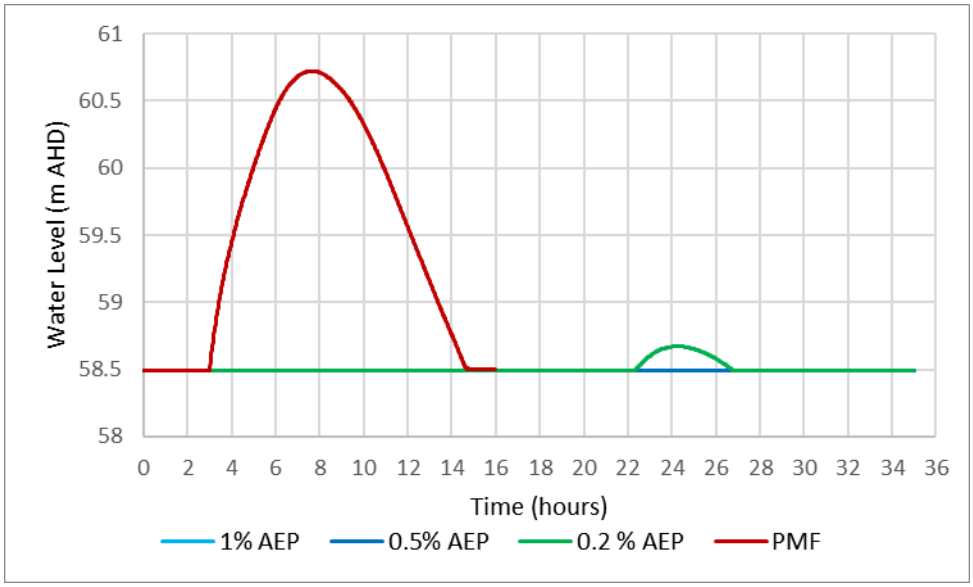


Figure 3.11 Rate of Rise Building B Carpark (Location D)

Figure 3.12 and Figure 3.13 indicate that for all events up to and including the 0.2% AEP event, the Main School Site and carpark adjacent Building C will remain flood free. In the PMF event, peak flood depths at the Main School Site and at the Building C Carpark will vary between 1.6m and 1.8m. Flooding would occur at both locations approximately 4 hours following the onset of rain with an average rate of rise of 0.43m/hour.

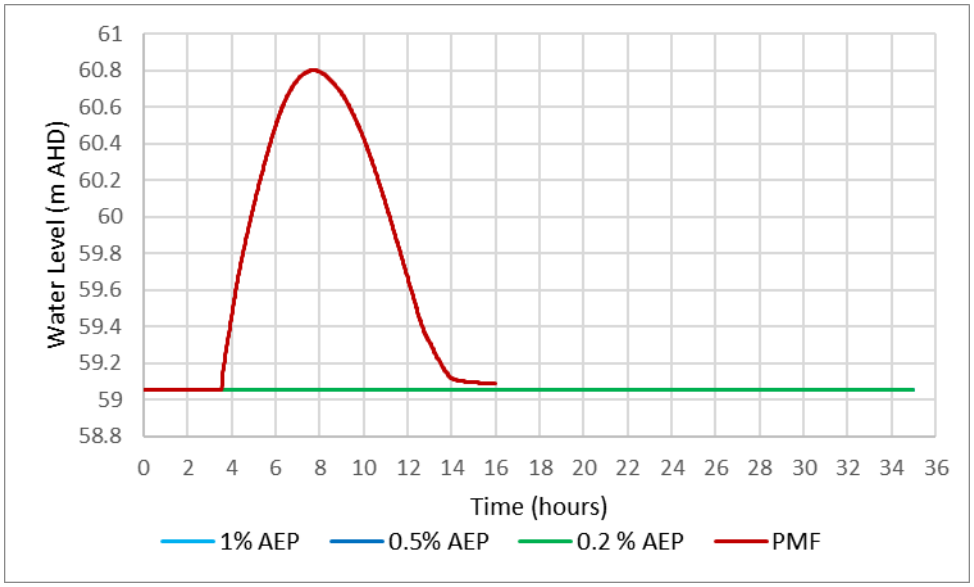


Figure 3.12 Rate of Rise at Main School Site (Location E)

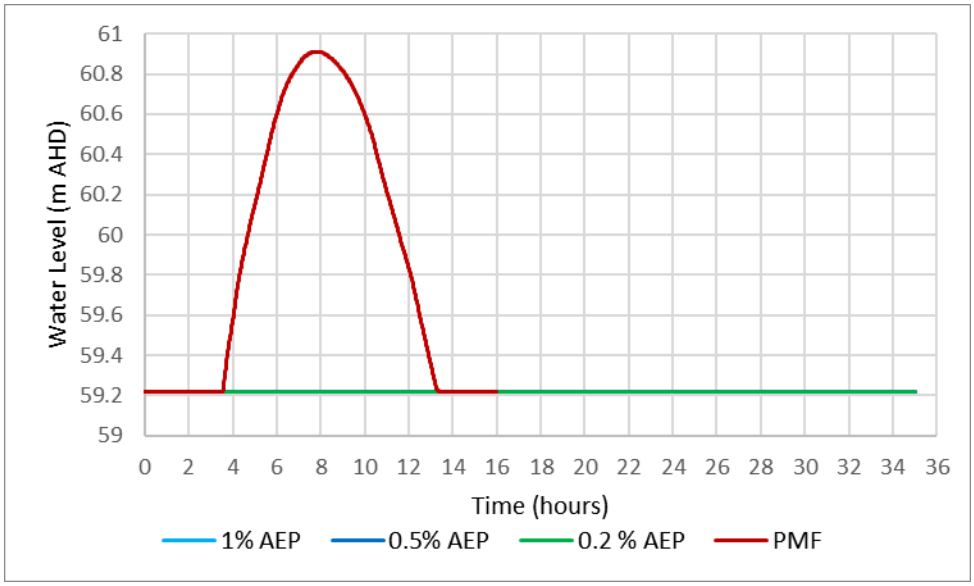


Figure 3.13 Rate of Rise at Building C Carpark (Location F)

3.4.4 Wine Country Drive Southern Access (Locations G-H)

The available flood warning time, peak flood level and total inundation duration at the Building J Carpark and the Wine Country Drive accessway for the flood events nominated in Table 3.1 are shown in Figure 3.14 and Figure 3.15 respectively. Figure 3.14 and Figure 3.15 indicate that for all events up to and including the 0.2% AEP event, the carpark and accessway adjacent Wine Country Drive along the south-west boundary of the Site will remain flood free. In the PMF event, peak flood depths along this boundary vary between 1.8m and 2.0m. Flooding would occur at both locations approximately 3 to 4 hours following the onset of rain with an average rate of rise of 0.43m/hour.

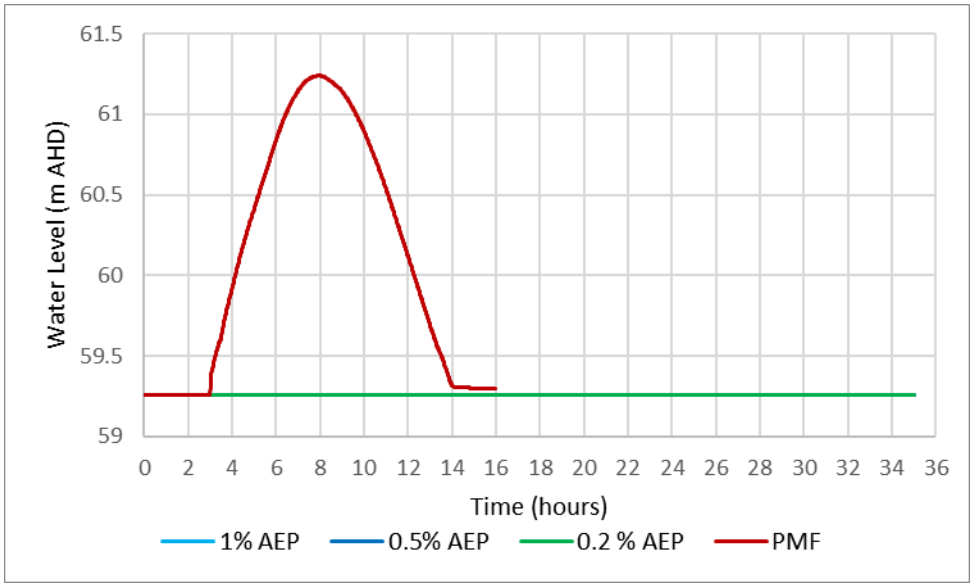


Figure 3.14 Rate of Rise Building J Carpark (Location G)

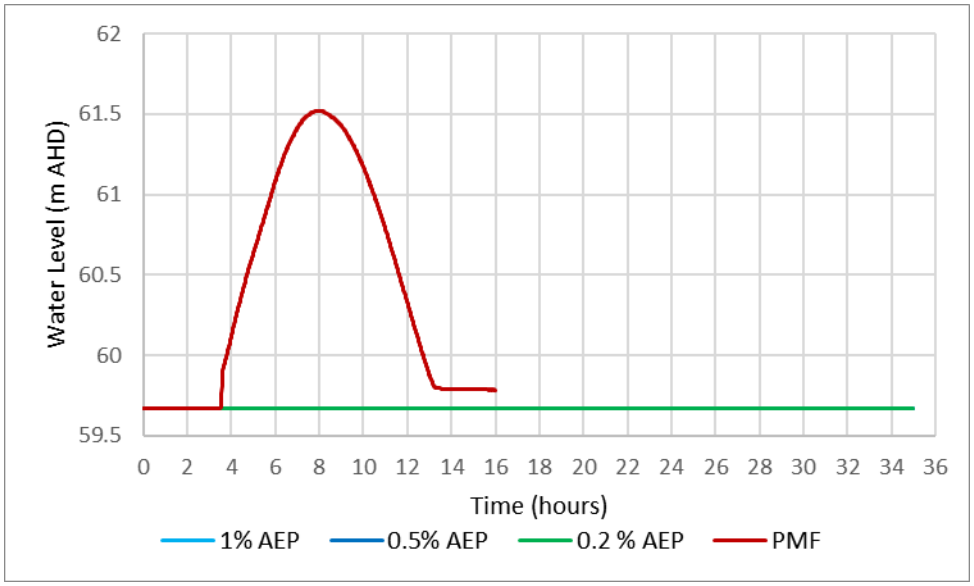


Figure 3.15 Rate of Rise Wine Country Drive Accessway (Location H)

3.4.5 Black Creek (Location I)

The available flood warning time, peak flood level and total inundation duration at Black Creek for the flood events nominated in Table 3.1 is shown in Figure 3.16. Figure 3.16 indicates that for events between 1% AEP and 0.2% AEP peak flood depths in Black Creek will vary between 3.3m and 3.7m. Flooding would occur in Black Creek approximately 6 hours following the onset of rain with an average rate of rise of 0.2m/hour. In the PMF event, peak flood depths at the same location would be approximately 5.8m with flooding occurring approximately 1 hour following the onset of rain with an average rate of rise of approximately 0.62m/hour.

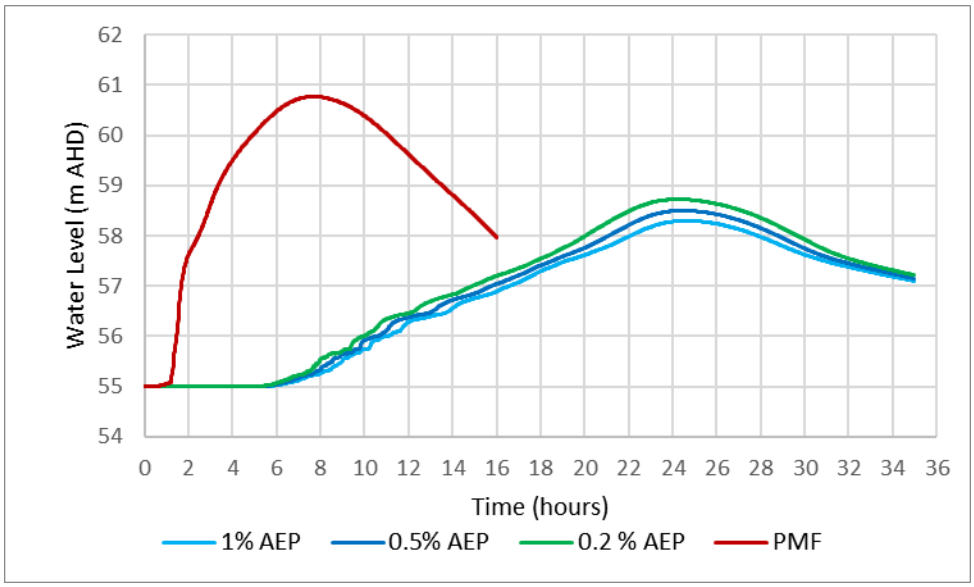


Figure 3.16 Rate of Rise in Black Creek (Location I)

3.4.6 Southern Evacuation Cut-off During PMF

Evacuation cut-off locations during the PMF event near the southern access are shown in Figure 3.17 (labelled as '45', '74', '75' and '76'). Figure 3.18 shows the rate of rise and inundation durations at these cut-off locations. Peak flood depths along this evacuation route vary between 1.8m and 2.0m. Flooding is predicted to occur approximately 3 to 4 hours following the onset of rain in a PMF, with an average rate of rise of 0.42m/hour.

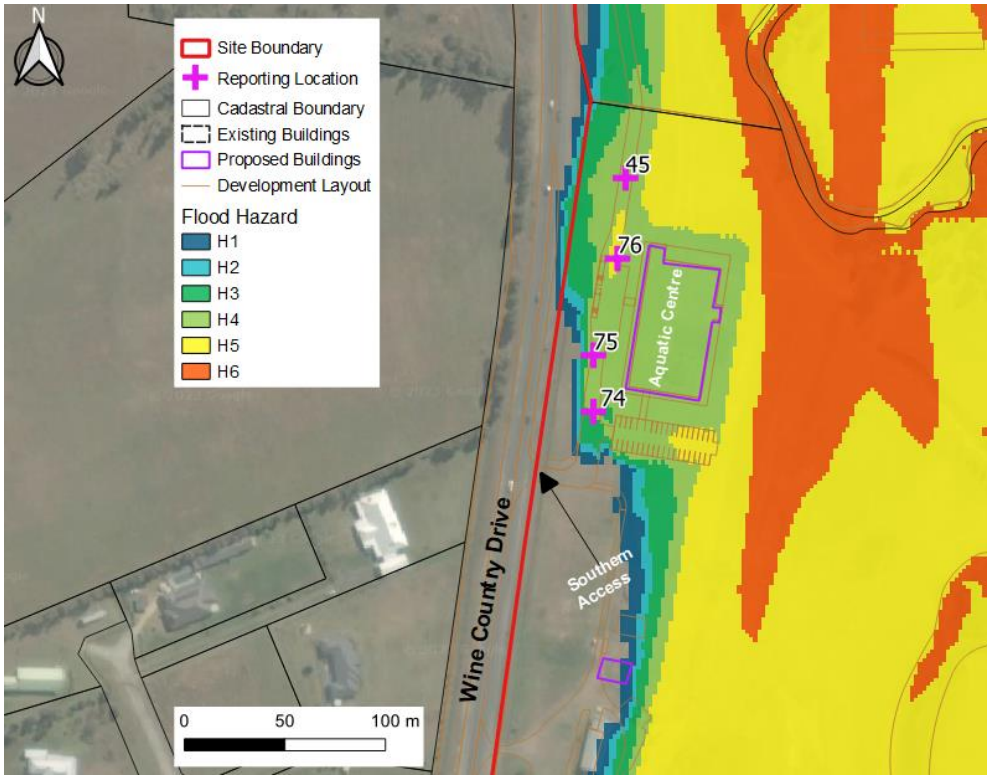


Figure 3.17 Southern Evacuation Route Cut off Locations During PMF Event

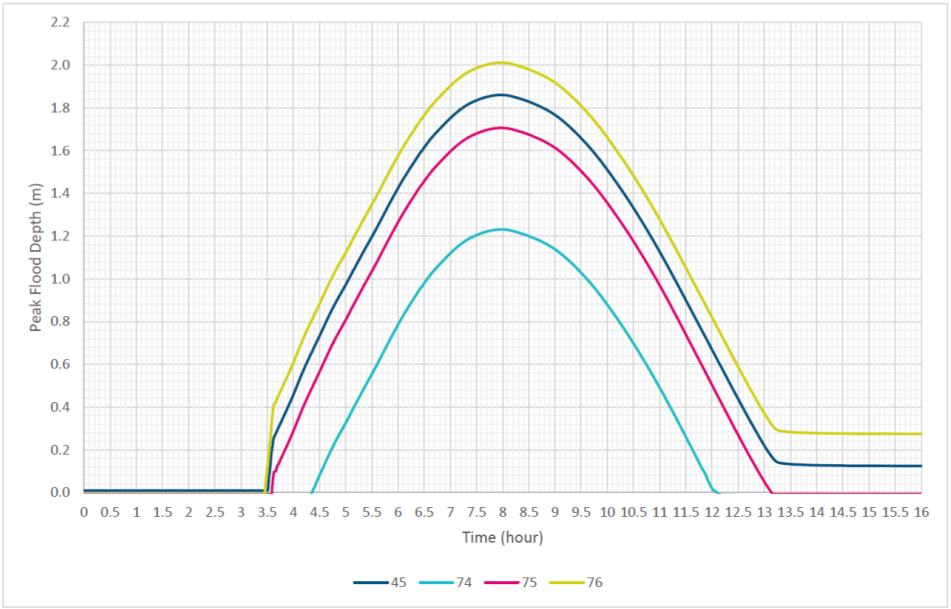


Figure 3.18 PMF Stage Hydrograph (Flood Level vs Time) Along Southern Evacuation Route

3.5 Summary of Flood Behaviour and Available Flood Warning Times

A summary of potential flood depths and flood timing across the locations of interest is included below in Table 3.3. As noted in Figure 3.6 to Figure 3.16 and Table 3.3, the Site will be largely flood free for all events up to and including the 0.2% AEP outside of minor flood depths at Location A and Location D in the 0.2% AEP event. The notable exception is the accessway to the school on Lomas Lane (Location C1-C3) for which flooding is expected to occur for all events between the 1 in 2 AEP and 0.2% AEP event (Refer to Section 5.1.4 for more details). Access points along Lomas Lane (C1, C2 and C3) will be inundated with depths up 1.8m approximately 14 to 19 hours after the onset of rain in the 0.2% AEP event. In the PMF event access points along Lomas Lane will be inundated with depths between 3 to 4m approximately 1.5 to 2 hours after the onset of rain.

The southern access point (Location H) will be flood free for all events up to and including the 0.2% AEP event.

The SPCC site will be flooded in the PMF event for all nominated locations by flood depths of between 0.9m and 2.2m. Flooding would be expected to occur between 3 hours and 4 hours following the onset of rain for this extreme event.

Black Creek would be expected to reach peak depths of between 3.3m and 3.7m for events between the 1% AEP and 0.2% AEP events, and 5.8m in the PMF event. For all events up to and including the 0.2% AEP event, flooding would be expected to occur approximately 5.5 hours from the onset of rain, steadily rising to a peak at approximately 24 hours. In the PMF event, flooding would be expected to occur within 1 hour of the onset of rain, rising to a peak approximately at 8 hours.

Table 3.3 Peak Flood Depths at Points of Interest*

Points of Interest		0.2% AEP Event		PMF Event	
ID	Description	Peak Flood Depth (m)	Onset of flooding after rain (hours)	Peak Flood Depth (m)	Onset of flooding after rain (hours)
A	Wine Country Drive north of Site	0.04	22.8	1.7	3.3
B	Intersection of Wine Country Drive and Lomas Lane	0.00	N/A	0.9	4.6
C1	NW Access	1.00	18.7	3.0	2.1
C2	NC Pedestrian Access	1.16	17.8	3.2	1.9
C3	NE Access	1.80	14.4	3.9	1.6
D	Building B Carpark	0.18	22.4	2.2	3
E	School Site	0.00	N/A	1.7	3.6
F	Building C Carpark	0.00	N/A	1.7	3.6
G	Building J Carpark	0.00	N/A	2.0	3.0
H	Wine Country Drive Accessway	0.00	N/A	1.9	3.5
I	Black Creek	3.70	5.4	5.8	0.8

**Further assessment of locations C1-C3 is provided in the following section.*

3.5.2 Northern Access Points

Access to the school entryways along Lomas Lane will experience inundation more frequently than the remaining areas of the Site. With reference to Figure 3.5, the flood immunity levels of the northern access points (NE, NC and NW) are summarised below:

- The NE access point at the bus turnaround bay will be inundated in the 50% AEP (1 in 2 AEP) event to a maximum depth of 0.2m. The access will be cut off from the 18% AEP (1 in 5 AEP) event.
- The NC pedestrian access and NW exit will be flood free for all events up to and including the 10% AEP event.
- The NC pedestrian access will be inundated in the 5% AEP event to a maximum depth of less 0.05m.
- The NW exit will be flood free for all events up to and including the 5% AEP event.

All the northern exits (NE, NC, and NW) will be inaccessible from the 2% AEP event. Peak flood depths at each location are provided in Figure 3.5 for the 1% AEP event. The above information demonstrates that the northern access points (NE, NC and NW) have relatively low levels of flood immunity when compared to the rest of the Site and hence the flooding behaviour at these points is crucial to the proposed FERP.

Table 3.4 Peak Flood Depth and Warning Times at Northern Access Points

Point of Interest	18% AEP		10% AEP		5% AEP		1% AEP	
	Peak Flood Depth (m)	Onset of flooding after rain (hours)	Peak Flood Depth (m)	Onset of flooding after rain (hours)	Peak Flood Depth (m)	Onset of flooding after rain (hours)	Peak Flood Depth (m)	Onset of flooding after rain (hours)
NW(C1)	0	N/A	0	N/A	0	N/A	0.6	21.4
NC(C2)	0	N/A	0	N/A	0.05	23.6	0.6	20.9
NE(C3)	0.4	20.3	0.6	19.3	0.8	18.5	1.3	16.8

3.6 Regional Evacuation Routes

Regional flood evacuation routes in the Cessnock Local Government Area are set out in the *Cessnock City Local Flood Plan* (SES, 2009). Cessnock is divided into three sectors for the purpose of evacuation during extreme flood events, with the Site falling within the 'Branxton' area. In the event of a dam-failure or other extreme flood event, evacuations from this area are to occur along Wine Country Drive towards Nulkaba. According to Council mapping, flooding behaviour along Wine Country Drive is summarised as follows:

- Wine Country Drive in the south towards Cessnock is flood-free up to the 1% AEP, except at the intersection of Wine Country Drive and Fleming Street where a flood hazard category of “H1” (deemed to be generally safe for people and small vehicles).
- Wine Country Drive in the north towards Rothbury is flood-free up to the 1% AEP event, except at the intersection of Wine Country Drive and Wills Hill Road where a flood hazard category of “H2” (deemed to be unsafe for people and small vehicles).
- Wine Country Drive towards Cessnock is subject to flood inundation during the PMF event for the section between the site and Cessnock.

4 Consideration of Available Flood Emergency Response Strategies

4.1 Existing Flood Emergency Response Plan

The existing SPCC Site is subject to flooding as discussed in Section 3. The below sections outline the existing arrangements that the SPCC management makes during flood events and the existing flood emergency response plan utilised by the SPCC management.

4.1.1 Existing Arrangements During Flood Events

The SPCC management is aware of the potential for flood affectation at the Site. Historically, the Site has been subject to flooding resulting in an evacuation in 2015 and other instances whereby parents were advised of the possibility of flooding and encouraged to keep their children at home.

Current SPCC practice is to observe rising floodwaters in the vicinity of Lomas Lane to trigger evacuation and/or closure of the school. The existing arrangement adopted by the SPCC management during flood events is to visually monitor encroachment of water from Black Creek onto Lomas Lane in combination with the use of the 'Flood Near Me' app, the Cessnock Disaster dashboard and monitoring of weather forecasts. In the event of a flood, the preliminary response plan is to take refuge in the upper floor levels of the existing buildings which are set at or above the PMF level (see Section 4.1.2 below).

4.1.2 Existing SMEC Flood Emergency Response Plan

The existing SPCC Site began construction in 2011. As part of the works a Flood Emergency Response Plan (SMEC, 2011) was developed for the Site, herein referred to as the 'Existing SMEC FERP'.

The Existing SMEC FERP identified several flood-related hazards present at the Site, including:

- The low available effective warning time particularly for the PMF event and lack of an existing flood warning system for the Black Creek catchment;
- The potential for hazardous flood conditions on Site during a flood event; and
- The potential for long duration of flooding.

The Existing SMEC FERP proposed a flood emergency response centred around the extreme PMF event and called for the provision of *"on-site flood refuge for all student and staff"* as the proposed emergency management approach. Specifically, the Existing SMEC FERP required:

- Flood refuge in structurally sound buildings with floor levels set at or above the predicted PMF level;
- Emergency access to flood refuge locations along Wine Country Drive with the minimum access level to be no lower than 0.5m below the PMF level; and
- In the event of a flood, for all staff and students to shelter-in-place in the designated flood refuge buildings until advised by the SES.

It should be noted that the FERP developed herein will supersede the existing SMEC FERP.

4.2 School Closure

As per existing arrangements, school closure prior to flooding remains the preferred initial flood emergency response approach. This would entail closure of the school prior to flooding based on BoM or SES flood warning, rainfall forecast or an on-site water level sensor system. School closure is in line with current SPCC practice, which is to advise parents of possible flooding events the day before or the morning of when they occur and suggest that children be kept at home.

If school closure is not undertaken and minor flooding occurs and flood levels keep rising during school hours, evacuation may be required. Evacuation strategies are outlined in the following sections.

4.3 Evacuation

Should evacuation be required (i.e. closure of the school prior to flooding has not occurred), there are two primary approaches:

- Evacuation off-site (i.e., horizontal evacuation at street level by vehicle before any roads are cut by floodwaters); and
- Shelter-in-place (SIP), where SIP is the movement of occupants to a suitable flood-free location to shelter during a flood event before a site becomes flood-affected (i.e., vertical evacuation or refuge on the site or near the site at an elevation above the PMF level).

4.3.1 Evacuation Off-Site

Initial consideration was given to two off-site evacuation options as outlined below:

- Option 1: School evacuation using the Lomas Lane NE and southern entry points.
  This option will use the southern access point to service evacuation from the southern set-down/pick-up area. To service the northern set-down/pick-area, this option considered the use of the Lomas Lane NE access. As the NE access has a low-level flood immunity (lower than the 1 in 2 AEP event), this option will require school evacuation prior to this access point becoming inundated (the 1 in 2 AEP event) and then completely cut off (the 18% AEP event). This means that evacuation would have to be triggered at a low flood level (smaller than the 63% AEP or 1 in 1 AEP flood event). It is noted that the 63% AEP event could be exceeded multiple times in any given wet season, leading to multiple school evacuations. For this reason, this option has not been selected, and an alternative option that will require relatively less frequent school evacuation has been considered as described as follows.

- Option 2: School evacuation using the Lomas Lane NC and southern entry points.
  Like Option 1, this option will prohibit the use of the Lomas Lane NE access point (as it becomes inundated in the 1 in 2 AEP event) and instead will require the use of Lomas Lane NC pedestrian access for vehicles during a flood emergency to service the northern set-down/pick-up area. As the NC access point is flood-free for all events up to and including the 10% AEP event (with H1 flood hazard in the 5% AEP event), a less frequent evacuation trigger is required which in turn allows for less frequent school evacuations. The southern access point provides flood immunity up to and including the 0.2% AEP (1 in 500 AEP) event. As such, it will be used to service evacuation from the southern set-down/pick-up area and in addition provide evacuation from the northern portion of the Site once Lomas Lane NE and NC access points become inundated.

From the above-stated evacuation options, Option 2 has been adopted as the preferred approach for the following reasons:

- Whilst Option 1 allows the use of the Lomas Lane NE access point, due to potential for inundation in frequent events, an evacuation would likely be required yearly and in some cases multiple times per year.
- Option 2 still allows use of the Lomas Lane NC access point (allowing for egress to occur from the northern set-down and pick-up area) but requires less frequent school evacuation, while using the southern access point as a back-up route as it provides flood immunity up to and including the 0.2% AEP. During a PMF event the internal roads connecting the northern portion of the Site to the southern access point is inundated 3 hours after the initial onset of rainfall.

The principal aim of the adopted evacuation approach is to evacuate the school by vehicle without requiring direct assistance from SES, with students and staff evacuated from the Site and heading to their homes prior to evacuation routes and buildings become inundated. Egress from the Site is via Wine Country Drive either:

- Northbound towards Cessnock Airport, or
- Southbound toward Nulkaba.

The details of the proposed evacuation timings and procedures based on Option 2 are provided in Section 6.4 and Annex F.

Clause 5.21 (2)(c) of the Standard Instrument Local Environmental Plan (LEP) requires that a proposed development must demonstrate that it 'will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood.'

The adopted off-site evacuation for the school is not deemed to adversely affect the capacity of existing evacuation routes for the surrounding area in the event of a flood, for the following reasons:

- The first priority of the proposed approach is school closure the day before a potential flood event occurs, based on BoM's flood warning, rainfall forecast or the on-site water level sensor systems.
- In an event of the above not being achieved (e.g., due lack of forecast or flood warming), the next priority is to evacuate off-site based on BOM's rainfall forecast and/or flood warning prior to a flood event occurring.
- In an event of the above not being achieved (e.g., due lack of forecast or flood warming), the next priority is to evacuate the school based on on-site water level sensor. Evacuation warning will be triggered when the water level reaches the 63% AEP (1 in 1 AEP) level, and an off-site evacuation will be triggered when the water level reaches close to the 18% AEP (1 in 5 AEP) level. These trigger levels are deemed to be conservative and will allow adequate timeline for the school to evacuate prior to potential moderate or major flood events occurring.
- In an event of the above priorities not being achieved (e.g., due to lack of forecast or flood warning, or rapid rate of flood rise), there is a back-up plan to implement an effective SIP plan.

Given the above, it is unlikely that the evacuation of the school will coincide with potential evacuation of the surrounding areas. Thus, the adopted off-site evacuation approach for the school is unlikely to adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood.

4.3.2 Shelter in Place (SIP)

The *Shelter in Place Guideline for Flash Flooding* was recently released by the Department of Planning, Housing and Infrastructure (DPHI, 2024). The guidelines are intended to help Councils and other certifying authorities determine appropriate emergency management strategies in situations where off-site evacuation may not be possible.

The guideline includes lists of SIP considerations and suggested consent conditions, which are summarised along with responses relevant to this assessment in Table 4.1 and Table 4.2 respectively.

Table 4.1 SIP considerations and responses

SIP Consideration	Response
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	The primary emergency strategy of early school closure or off-site evacuation aligns with the emergency management strategies for the area as outlined in the Cessnock LGA Local Flood Emergency Sub Plan (SES, 2022). However, during a PMF event off-site evacuation cannot be achieved and a SIP strategy must be implemented.
2. Has evacuation off-site (the primary emergency management strategy) been investigated and determined to be unachievable	Off-site evacuation has been investigated and is achievable in all flood events except the PMF. Due to the flash flooding and the rapid rate of water rise, off-site evacuation during the PMF cannot be achieved.
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	The development is defined as a 'sensitive and hazardous' land use being an educational establishment. The Site has sufficient SIP buildings which can be adequately designed to withstand the PMF event to accommodate the staff, student and visitor population.
4. Shelter in place for greenfield development is not supported	The Site is not a greenfield development.
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	There is no gauge in the BoM's Flood Warning System within the Black Creek catchment. However, the Wollombi Brook at Wollombi gauge (BOM Number 561169 or AWRC number 210152) is part of the BoM's Flood Warning System and is located on a neighbouring catchment. This gauge is considered to represent similar behaviour to that likely experienced in the Black Creek catchment and provides additional information to assist emergency management planning. This information will assist in off-site evacuation for storms up to and including the 0.2% AEP event. During a PMF event, these existing flood warning systems would not be able to provide sufficient warning time in which off-site evacuation can be achieved. Physical flood depth markers proposed at the Site would provide sufficient time for on-site persons to evacuate to the proposed SIP refuge locations.
6. Can the community effectively be informed of the risks associated with the emergency management strategy	The community can be effectively informed of the risks associated with the emergency management strategy using the Parent App or other parent communication platforms, along with community information and education sessions that can be held to discuss the findings of this FERP.

SIP Consideration	Response
7. Detailed assessment of evacuation off-site (the primary emergency management strategy) to determine that evacuation off-site is not achievable	Detailed assessment of off-site evacuation has been carried out in this FERP and found to not be possible during a PMF event. For all events up to the 0.2% AEP event, off-site evacuation is achievable and recommended.
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 SIP 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)	Flash flooding occurs at the Site only during a PMF event. Flooding and the inundation of key evacuation routes occur less than 6 hours from the commencement of causative rain resulting in the need to SIP during a PMF event. As outlined in Section 6.4.3, the expected time of isolation during the PMF event is approximately 12 hours before access routes are free of inundation and off-site evacuation can take place. The Study Site is subject to high hazard flooding of H5 to H6 in the PMF event. Buildings designated for SIP are located in areas categorised by a flood hazard of H4 to H5 and can be designed to suitably withstand the 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.	SIP will be used as a last resort management strategy only employed during a PMF event. For all storms up to and including the 0.2% AEP event, early school closure or off-site evacuation is recommended. Communication of the Site's emergency management response during a storm event will be conducted via the on-site Flood Wardens. Communication to stakeholders that are not located on-site will be done via the Parent App or other parent communication platforms.
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.	During the SIP phase, secondary risks such as medical emergencies, building fire and other health and wellbeing emergencies may arise. Medical supplies from first aid kits stored above the PMF level and medical training provided to the Fire Wardens can address minor medical emergencies during the SIP phase. The NSW SES, Ambulance NSW, the relevant Health functional area, and the fire agency servicing the area will be consulted by the proponent as part of the OFERP to determine appropriate risk management measures to minimise secondary risks during flooding.

SIP Consideration	Response

Table 4.2 SIP suggestion design criteria and responses

SIP Design Criteria	Response
I. The floor level of the SIP part of the development be above the PMF.	The buildings designated for SIP have areas (finished floor level of first floor between 63.0 - 63.2m AHD) with finished floor levels above the PMF event level (60.5 – 61.5m AHD).
II. Structural soundness for conditions in a PMF event, considering flood and debris forces, be verified by a suitably qualified structural engineer.	A building structural soundness assessment has been carried out and included in Annex G, in which buildings designated for SIP are assessed against the predicted conditions of a PMF event.
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.	Access to the designated SIP buildings will not rely on access to electricity and will have clear markings for all people on site including visitors so they can make their way to the areas of refuge if a SIP strategy is required to be implemented in a PMF flooding event.
IV. Protection from weather and appropriate heating and cooling.	The buildings designated for SIP will provide protection from weather. A generator located above the PMF level will be utilised to maintain electrical supply to power heating and cooling systems.
V. Access to personal hygiene facilities such as a toilet.	Bathrooms will be located above the PMF level and operational with access provided for all of the buildings designated for SIP.
VI. A minimum floor space of 2 m² per person.	Based on a minimum floor space of 2m^2 per person, the buildings (A3, A4, B1, B2, C2, C3 and C4) designated for SIP have total capacity of 2,673 persons, which will accommodate the entire 1,732 student population and 216 staff members, with a surplus capacity of 725 persons for any additional personnel that may be on Site.
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, and a first aid kit with an automated external defibrillator (AED).	Adequate provisions will be available for the anticipated time of isolation (detailed further in Section 6.4.3). Necessary items for self-sufficiency will be stored in the buildings designated for SIP and regularly maintained and updated the designated Flood Wardens.
VIII. Centralised communal shelters may be considered but must be freely accessible internally at all times and externally accessible during events.	The buildings designated for SIP will be freely accessible internally and externally via connecting ‘air-bridges’ between buildings and external stairs during the operational hours of the Site.

SIP Design Criteria	Response
IX. Access is provided to onsite systems that generate power of the SIP location during and after the event for a full range of flood events up to the PMF.	A generator located above the PMF level will be utilised to maintain electrical supply to the SIP buildings.
X. Detail how these requirements will be maintained and enforced for the life of the development.	To be maintained under the OFERP with annual audits to ensure compliance with the FERP.

The SES have also indicated in their response to submission of the previous FERP completed by BMT (see Annex B) that:

- 'Development strategies relying on...sheltering in buildings surrounded by flood water are not equivalent, in risk management terms, to evacuation'.
- 'Sheltering in a building within the flood extent is not safe'.
- 'Development strategies relying on an assumption that mass rescue may be possible where evacuation fails or is not implemented are not acceptable to the NSW SES'.

BMT notes that the probability of SIP being required is remote, and is less than that of a PMF occurring, given that:

- SIP is only required for the PMF.
- It is considered likely that a PMF event would be identified in advance as a major event, resulting in broadcast of severe weather warnings and school closure / off-site evacuation prior to onset.
- The guideline advises that SIP should only occur as a last resort, when off-site evacuation is not achievable. School closure and off-site evacuation remain the primary response strategy for flooding, with SIP only occurring as a last resort.
- In the unlikely event that persons are onsite during a PMF, a SIP approach is the safest (and only) option at this point, regardless of the anticipated 12 hour time of isolation.
- The provision of an additional access which is flood free for events up to and including the 0.2% AEP (1 in 500 AEP) results in an improved outcome for the school when compared to the current scenario.

4.3.3 Evacuation Plan Selection

Should evacuation be required (i.e. closure of the school prior to flooding has not occurred), off-site evacuation is proposed as the principal approach for the school, given that for all events except for the PMF, the site is not impacted by a flash flooding.

SIP is proposed as a backup plan where it cannot be avoided due to unexpected changes in conditions which either made evacuation impossible or provided inadequate warning time (such as in an extremely unlikely scenario of the PMF event). In this case, SIP is deemed suitable for the school for the following reasons:

- The site is flood-free up and including the 1 in 500 AEP event.

- Whilst floodwaters may inundate parts of the ground floor level and potentially enter into stairways, lift shafts and storage units during an extreme flood (such as PMF), future design development is anticipated to minimise opportunities for water ingress through suitable design including waterproofing and physical protection.
- The existing school and proposed development include buildings with floor levels above the PMF level, adequate for the maximum number of occupants. This has been determined by a minimum required floor space of $2m^2$ per person policy (in accordance with the Shelter in Place Guidelines).
  - Based on $2m^2$ per person, Building A3 & A4 ($1,625m^2$) have capacity for 812 persons, Building B1 & B2 ($1,583m^2$) have capacity for 791 persons, and building C2, C3 & C4 ($2,140m^2$) have capacity for 1,070 persons.
  - Buildings A3, A4, B1, B2, C2, C3 and C4 have total capacity of 2,673 persons, which will accommodate the entire 1,732 student population and 216 staff members, with a surplus capacity of 725 persons for any additional personnel that may be on Site.
  - The SIP plan is only enacted if the following measures to close the school / evacuate off-site cannot be achieved.
- The SIP buildings will be structurally safe during floods up to and including the PMF (refer to Annex G for building structural soundness assessment).
- There will be access to on-site systems to provide power, water and sewerage services (to be further assessed during the detailed design phase) during and beyond the event for the full range of flooding.
- The location of storage of food, water and medical emergency for SIP purposes will be above the PMF level and available during and beyond the event for the full range of flooding.
- It is proposed to implement an ongoing education to ensure that the school community is aware of actions to be taken before, during and after SIP and the key triggers that require SIP.

Notwithstanding the above, if closure of the school prior to flooding has not occurred, evacuation-offsite is proposed to be the primary evacuation approach for the school for all events up to and including the 0.2% AEP event.

5 Flood Emergency Response Plan

A Flood Emergency Response Plan (FERP) is required by the school operator to formalise flood evacuation planning with respect to flood intelligence, the flood behaviour presented in this report, and relevant procedures.

The SES recommends that all flood prone properties prepare their own emergency management plans as SES resources are scarce during emergencies and it is often the case that they cannot service all affected parties in case of flood, particularly given mobilisation time. FERP's are used as a guide for flood wardens and other responsible parties nominated in the evacuation approach, with the aim of informing future operators of the appropriate response measures required in the event of a flood. In addition, an Operational FERP (OFERP) will be developed later to include a summary of the actions required in the form of warning systems and signage that are to be displayed at common muster points such as the ground floor entry, stairways, carpark and visible points along the ground floor. The implementation of an auditing system will ensure the SIP strategy for a PMF event is maintained for the life of the development. Maintenance activities will also be nominated in the OFERP to ensure that all emergency management systems are in full working order at all times.

Key elements included in the FERP are outlined in the following sections.

5.1 Emergency Warning Systems

Warning in case of a flood event is required to alert wardens and other people on-site that an extreme flood event may be imminent. Flood levels can rise rapidly, and it is necessary to ensure that sufficient warning time is given so that personnel could implement off-site evacuation effectively and safely. Flood warning system is proposed to include the following:

- BoM's Existing Flood Warning;
- BoM's Rainfall and Severe Storm Forecast; and
- On-site Flood Warning or Water Level sensor
- Physical flood depth markers with rate of rise readings conducted by Wardens.

The above flood warning systems are detailed in the following sections.

5.1.1 BoM's Existing Flood Warning System

Flood warning information such as water levels can be accessed via the BoM webpage as per the following link:

- Flood Warning: http://www.bom.gov.au/nsw/warnings/

The BoM's Flood Warning System should provide effective flood warning to facilitate safe evacuation. While there is no gauge in the BoM's Flood Warning System within the Black Creek catchment, the Wollombi Brook at Wollombi gauge (BOM Number 561169 or AWRC number 210152) is part of the BoM's Flood Warning System. While the Wollombi Brook gauge is located on a neighbouring catchment, it is considered to represent similar behaviour to that likely experienced in the Black Creek catchment and provides additional information to assist emergency management planning. BoM service level specifications for the Wollombi Brook at Wollombi gauge are summarised in Table 5.1 and shown in Figure 5.1. It is noted that BoM has a target warning lead time of 6 hours for minor flood classifications for this flood level gauge.

Table 5.1 Wollombi Brook at Wollombi Flood Warning Gauge Classification Levels

Datum	SES Flood Classification Level		
	Minor	Moderate	Major
Heights in metres	6.7m	8.6m	12.2m

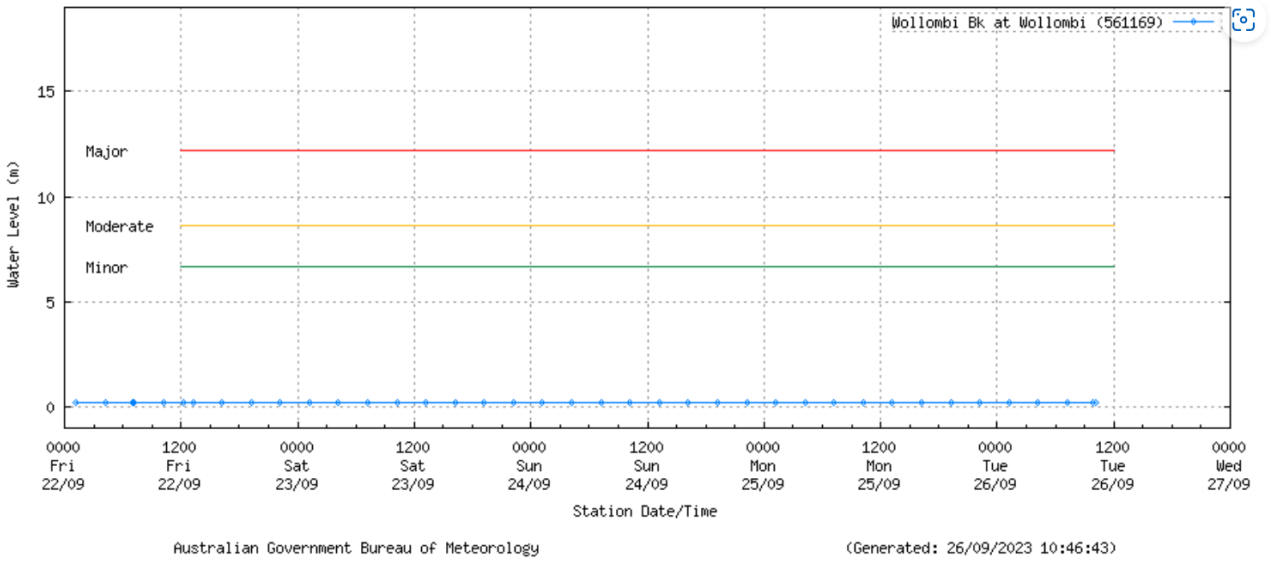


Figure 5.1 BoM's Flood Warning at Wollombi Brook at Wollombi Flood Warning Gauge

BMT understands that a flash flooding warning system for Cessnock might be undergoing development by Council and if this service and/or BoM's flood gauging within Black Creek become available in the future, these should be utilised as part of the FERP for SPCC.

5.1.2 BoM's Rainfall Forecast System

Rainfall forecast information can be accessed via the BoM webpage as per the following links:

- Rainfall Forecast: New South Wales Forecasts (bom.gov.au)
- Weatherzone Rainfall Radar: http://www.bom.gov.au/australia/radar/
- Rainfall Gauge Totals: New South Wales Rainfall and River Conditions (bom.gov.au)
- MetEye: http://www.bom.gov.au/australia/meteye/

Council have recommended observation of the Cessnock Airport AWS gauge (061260), operated by BoM, as the most appropriate means by which to inform potential flooding events at the school. The gauge is located approximately 1.7km north of the Site along Wine Country Drive. Forecast rainfall and storm conditions at the gauge should be used to prepare for the possibility of flooding or to make the decision to close the school prior to opening. Preferably notification of flood warning should be provided prior to the commencement of school day where possible and communicated to any potential students, visitors, carers and staff. Subscription to the BoM to send updates to flood wardens on anticipated heavy rainfall events ahead of time and to enable timely preparation. It Is also proposed to monitor the Severe thunderstorm warning issued by the Bureau of Meteorology in the period prior to rainfall commencing.

5.1.3 Flood Warning Communication

Warning in case of a flood event is required to alert Site occupants that a flood event may be imminent. Flood levels can rise rapidly (particularly during the shorter duration rare and extreme floods) and it is necessary to ensure that sufficient warning time is given so that Site occupants can evacuate safely.

Triggers and notifications are required to alert occupants to evacuate and should include flood warning, flood watch and weather warnings including rainfall intensity notifications from the BoM, Council and the SES. As extreme events are typically very infrequent, a warning system in the form of an audible alarm is considered appropriate to communicate the urgency of the situation. An emergency siren and building Public Address (PA) system that is installed for other emergencies or day-to-day facility use is likely suitable for communicating with building occupants during other building emergencies such as a flood emergency. These emergency warning systems are to be located above the PMF level.

Triggers and notification are required to alert the head warden or others about the need to trigger the building emergency system. Triggers and notifications could be communicated to the head warden and other key personnel using an automated SMS system. Back-up triggers, such as manually read flood markers, may be required to ensure the reliability of the warning system. It is recommended that manually read flood markers be installed at the NE Access on Lomas Lane as a minimum.

5.1.4 On-site Water Level Sensor System

To maximise the available warning time and facilitate an orderly response, it is proposed that a flood warning system be installed on the site. Figure 5.2 shows the nominated locations of the proposed flood level sensor system.

This system is to consist of the following components:

- Water level sensors;
- Monitoring control unit;
- Communications;
- Power supply; and
- Documentation.

The system should be designed by an experienced supplier. Redundancy should be incorporated into the design such that failure of a single item does not result in failure of the overall warning system. The system supplier should also provide appropriate documentation to enable ongoing maintenance and calibration. It is recommended that the SPCC management engages the same system supplier in the ongoing maintenance and calibration of the on-site flood warning system.

It is noted that Council supports the installation of an on-site flood warning system (see Annex C).

In the event there is a malfunction with the water level sensors, it is proposed that physical flood depth markers also be installed at these locations with Wardens trained to detect and report on significant rate of flood water rise to signify an extreme flooding event (PMF). In this scenario a SIP procedure is to be implemented. It should be noted that an extreme event is highly unlikely to occur and for all events up to and including the 0.2% AEP event off-site evacuation can be undertaken via the northern and southern evacuation access points discussed in Section 4.3.1.

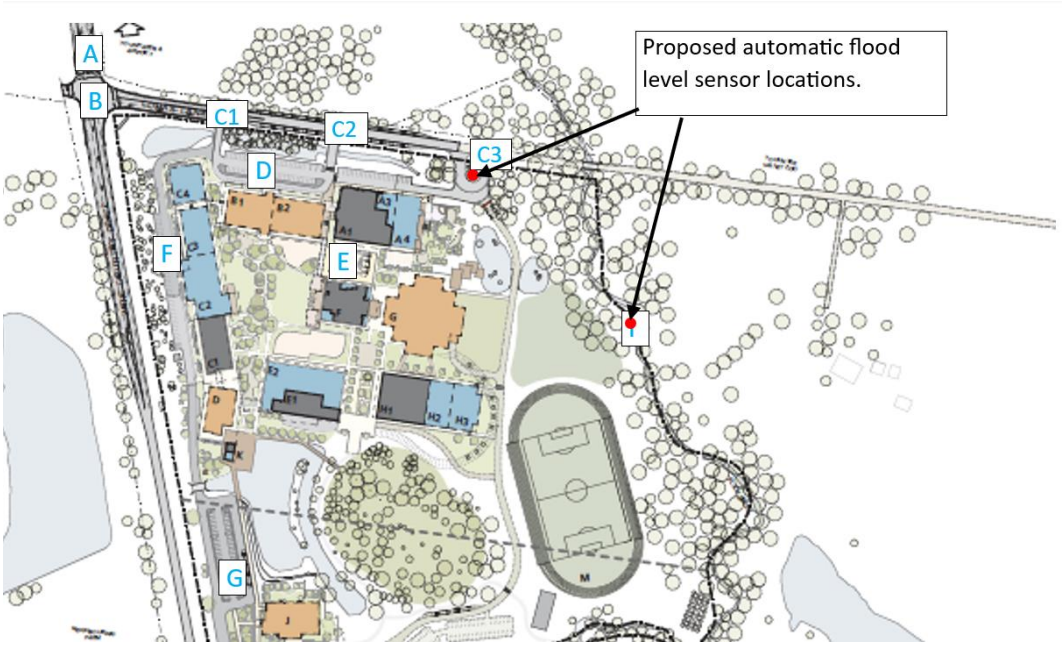


Figure 5.2 Water Level Sensor Locations

The main components of the system are described in the following sections.

Water Level Sensors

Water level sensors are proposed to be installed at the nominated locations denoted as solid red circles in Figure 5.2. Placement of the water level sensor adjacent to the Black Creek waterway is aimed at informing Site occupants of rising floodwaters and (once a nominated level is reached) indicating that evacuation should commence. Placement of the water level sensor along access points on Lomas Lane is aimed at informing Site occupants of when access to Lomas Lane should be closed and that evacuation should occur only via the Wine Country Drive Access Point. The locations have also been chosen based on ease of access and maintenance as well as proximity to the staff offices.

There are a variety of sensors that can be used for this purpose and specific advice should be sought from the suppliers to indicate and confirm the most appropriate hardware. The sensors that are selected should be:

- Reliable – for example, the supplier should be able to demonstrate that the selected sensor has been used in similar installations.
- Stable – the calibration of the sensor should not unduly drift over time or be affected by external factors (such as changes in temperature).

There are a number of ultrasonic, pressure and capacitive sensors available that are able to meet these requirements. However, it is likely that periodic calibration and maintenance of the sensors will still be required. Facilities should be provided to calibrate the sensor (for example, by allowing adjustment to survey levels).

Typically, the sensor housing will be integrated into the surrounds in a discrete manner and protect the sensor from vandalism or other interference. However, easy access for maintenance and calibration should be provided.

Control Unit

To accompany the sensors, a control or measuring unit will be required. This unit will undertake the following functions:

- Making the measurements from the sensors;
- Issuing alerts once the defined thresholds are exceeded;
- Monitoring the power supply;
- Cross-checking the data from the multiple sensors to ensure consistency (and provide warning of a potential malfunction); and
- Periodically polling the communication channels so that key users can be alerted of a system failure.

There are a range of commercially available data loggers that can provide these functions (e.g. Campbell Scientific). The control unit can be co-located with the sensor or installed in a separate housing within the building. In either case the unit should be immune to inundation by floodwater (e.g. by locating the unit above the PMF).

Communications

To communicate the warning to the occupants, the system will need to include a communications facility. Systems or processes will be required to identify and communicate the following events:

- Floodwater exceeding the identified thresholds;
- Sensor disagreements (indicating potential need for recalibration or failure);
- Power supply issues (including loss of primary power supply and low battery levels); and
- Failure of the loggers or communications systems.

This can be integrated into the on-site emergency warning system. It may also be necessary to provide building wardens with more specific detail (for example, by SMS) so that they can co-ordinate an appropriate response. Some aspects, such as the failure of the loggers and communications systems, may require some degree of routine monitoring including confirmation that the system is active when a storm warning is issued.

Power Supply

The flood warning system will require a redundant power supply. Typically, the primary power would be drawn from the electricity grid. However, an independent back-up should be provided to enable the system to continue functioning in the event that power is cut.

Documentation

Accompanying the system design, appropriate documentation of the system should be provided by the system supplier. This documentation should cover:

- System components (including their location within the building);
- Use of the user interfaces;
- Software interfaces (including the use network connections and protocols);
- Wiring diagrams;
- Calibration procedures; and
- System maintenance requirements.

The documentation should be able to be understood by a suitably qualified professional and without requiring reference to additional documents that are not otherwise readily available. Diagrams and other graphics should be provided where appropriate.

Trigger Levels Based on On-site Flood Level Sensor

Evacuation in a safe manner is dependent on warning time and availability of easily identifiable routes. Warning time can be estimated through observation of the rate of rise of floodwaters along Lomas Lane. In the unlikely event that a rapid rise in floodwaters of greater than 2m/hour is observed (refer Figure 5.4), this could indicate the flood behaviour of an extreme event where floodwaters will cut off evacuation routes and inundate the site before there is sufficient time to conduct a full evacuation. In this scenario a SIP plan will be implemented.

For all other events up to the 0.2% AEP event, proposed evacuation off-site is proposed via private vehicles and buses along Wine Country Drive in both northerly and southerly directions, with access via both:

- The southern/Wine Country Drive accessway with marshalling/pickup at the Building J carpark; and
- The northern/Lomas Lane accessway with marshalling/pickup at the Building B carpark.

Confirmation has been provided by the Traffic Engineer (refer Annex E) that evacuation can be accommodated in both locations providing minor modifications are made to the NC Pedestrian Access on Lomas Lane.

Total flood warning time – consisting of the time from when the evacuation trigger level is reached in Black Creek to the time when Wine Country Drive will become inaccessible due to floodwaters – will vary with event rarity. However, as Wine Country Drive is not expected to be overtopped by floodwater until a 0.2% AEP event, this event has been nominated for evacuation assessment[1]. It should be noted although Wine Country Drive is inundated during a 0.2% AEP event at select locations, the proposed southern access point provides flood free access to Wine Country Drive and continued flood free access south towards Nulkaba.

Flood modelling undertaken as part of the FIA indicates that in a 0.2% AEP event, water levels will rise consistently in Black Creek before overtopping the NE access, NC pedestrian access and NW exit points on Lomas Lane. Flood levels would continue to rise beyond this point, completely inundating Lomas Lane. Rising waters would then inundate the western portion of the Site and eventually overtop Wine Country Drive to the north. While the evacuation points along Lomas Lane are inundated, the proposed southern access point will continue to provide flood free access within the Site for off-site evacuation to the south of the Site using Wine Country Drive. The peak flood level at the gauge would be reached approximately 24 hours after the onset of rain and water levels would fall steadily from this point.

The peak flood levels at the proposed gauge location on Black Creek and indicative evacuation timelines for the 0.2% AEP event are shown Figure 5.3 and Table 5.2, respectively. These indicate that there would be 10 and a half hours from the point at which water levels begin to rise in Black Creek prior to the 1 in 2 AEP level being reached. Following this point, water levels would continue to steadily rise until the point at which Wine Country Drive is overtopped approximately 7 to 9 hours later. At this point evacuation routes along Lomas Lane should already be closed. All evacuation should be

[1] The evacuation trigger is based flood levels, not event frequency – the 0.2% AEP is only used here as a means of assessing flood conditions at the trigger level.

redirected to the proposed southern access point (which remains flood free within the Site) providing access to a flood free portion of Wine Country Drive south to Nulkaba.

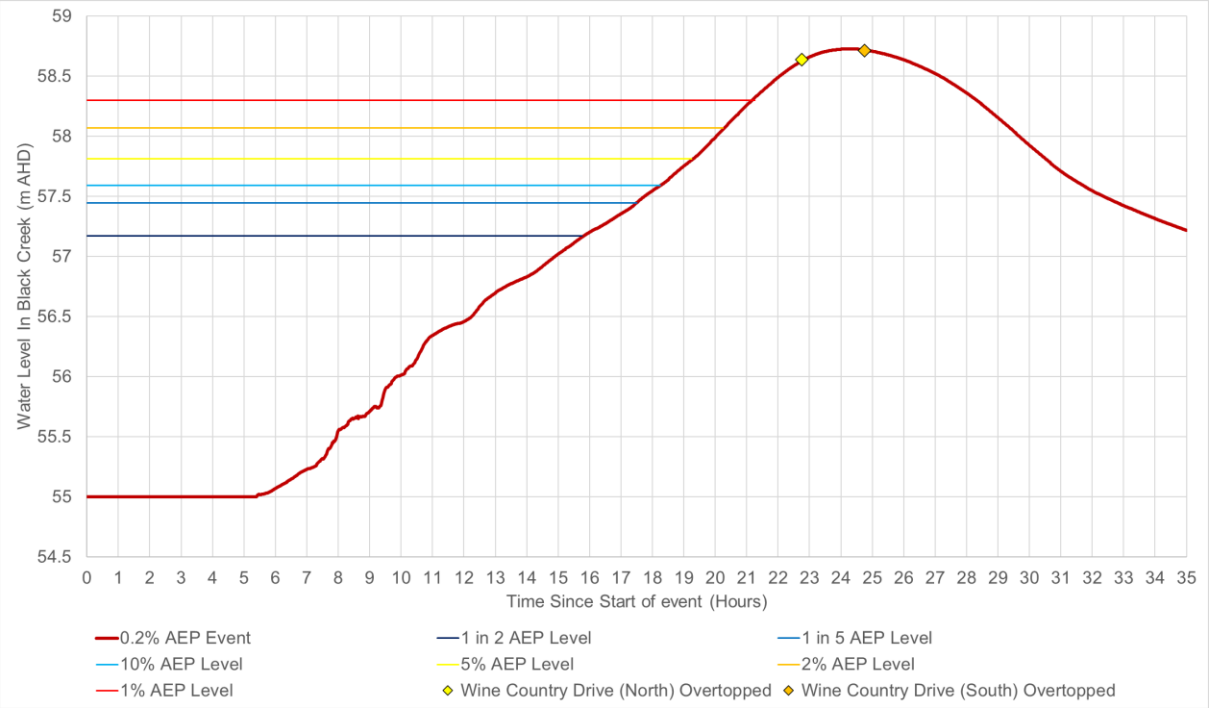


Figure 5.3 Stage (Flood Level vs Time) Hydrograph in Black Creek – 0.2% AEP Event

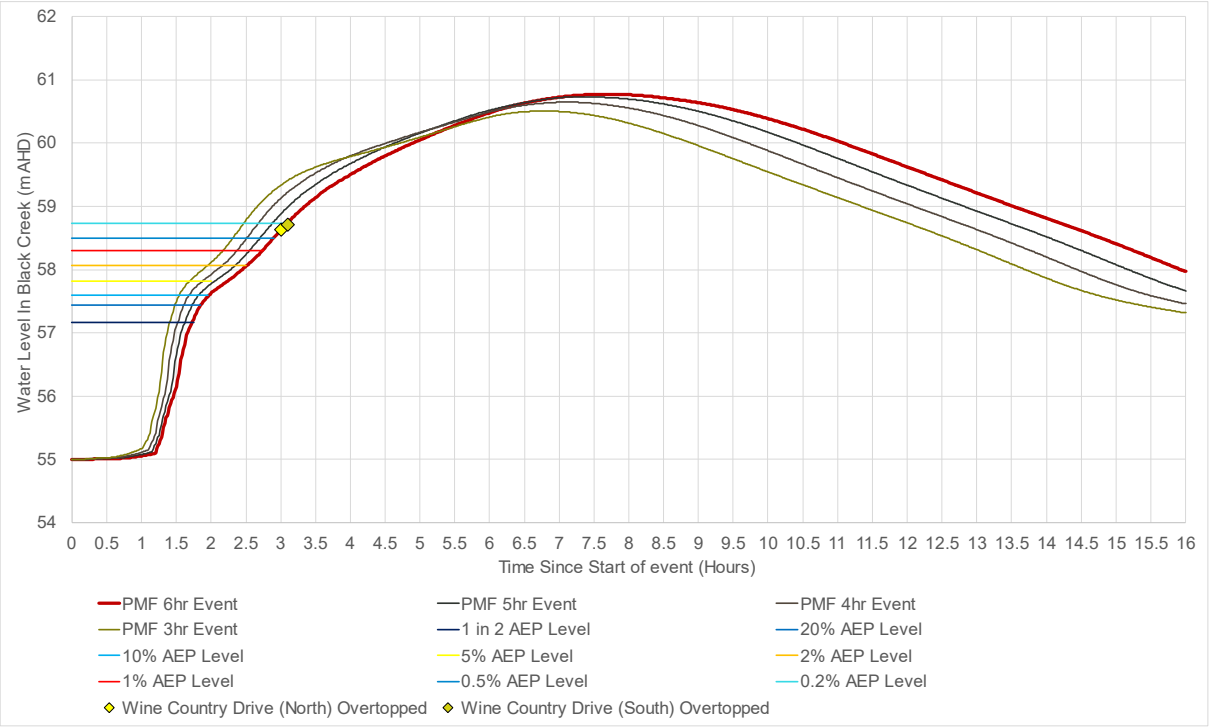


Figure 5.4 Stage (Flood Level vs Time) Hydrograph in Black Creek – PMF Event

Table 5.2 Timing of Inundation in the 0.2% AEP Event

Time from Onset of Rainfall	Inundation Occurrence
5 hours 30 minutes	Water levels begin to rise in Black Creek
15 hour 45 minutes	Water levels in Black Creek reach a 1 in 2 AEP flood level. NE Access inundated
17 hours 30 minutes	Water levels in Black Creek reach a 18% AEP flood level. NE Access closed
18 hours 15 minutes	Water levels in Black Creek reach a 10% AEP flood level
19 hours 15 minutes	Water levels in Black Creek reach a 5% AEP flood level. NC Pedestrian Access inundated.
20 hours 15 minutes	Water levels in Black Creek reach a 2% AEP flood level. Lomas Lane overtopped by floodwaters. NW Exit and NC Pedestrian Access closed.
21 hours 15 minutes	Water levels in Black Creek reach a 1% AEP flood level.
22 hours 45 minutes	Wine Country Drive (north of Lomas Lane) overtopped by floodwaters
24 hours 45 minutes	Wine Country Drive (south of Lomas Lane) overtopped by floodwaters

Under the proposed Option 2 evacuation scenario evacuation will occur along Lomas Lane from both the NC pedestrian access and NW Exit points. Given both of these locations will be flood-free for all events up to an including the 10% AEP event but will be inundated from the 5% AEP event (albeit by low hazard flows) it is recommend that the evacuation threshold level of approximately 57.3m AHD (smaller in magnitude than the 18% AEP event). The timeline calculation indicates that there will be approximately 2.5 hours between the trigger level of 57.3m AHD and the 5% AEP flood level. Once the 5% AEP flood level is reached (trigger for closure of the Lomas Lane access and exit ways), off-site evacuation will be redirected to only the proposed southern access point. Therefore, the above-stated timeline is anticipated to provide:

- Just above 2 hours for evacuation to occur along Lomas Lane prior to floodwaters overtopping this evacuation route; and
- Flood free evacuation up to and including a 0.2% AEP event, using the proposed southern access point in the direction of Nulkaba (south).

Confirmation has been provided by the Traffic Engineer (refer Annex E) that a flood evacuation period of 5 hours (with the first 2 hours able to accommodate access and entry via Lomas Lane) is considered adequate to accommodate full evacuation. In the scenario Lomas Lane evacuation access points are closed and evacuees at the northern section of the Site have not completed full evacuation, they can be redirected via the proposed internal roads to the southern access point which remains flood free up to and including the 0.2% AEP event.

It is noted that the alert and trigger levels are to be based on regional flooding from Black Creek. It is therefore advised to stay tuned to local media outlets or the local SES Centre to get an understanding of flooding and flood emergency situations across the broader area to verify that regional flooding is

taking place. This will assist to minimise the potential for false triggers that may be caused by local catchment flooding.

The current Option 2 evacuation approach sets the evacuation trigger at 57.3m AHD (slightly lower than the 18% AEP event – 57.5m AHD). Under this approach, a student attending high school here for six years could expect that there would be only one to two instances where evacuation of the school might be triggered (note it's much more than likely that events will occur out of school hours, than during school hours). Therefore, there is no significantly increased risk for complacency to undermine the effectiveness of the FERP.

5.1.5 Impact of Shorter Duration Events on Off-Site Evacuation Timing

The 0.2% AEP event has been nominated for off-site evacuation assessment as Wine Country Drive becomes overtopped in this event. The 0.2% AEP event has been assessed based on the critical duration of 36 hours. A sensitivity assessment has been carried out to investigate the effects of shorter duration events and its impact on total flood warning times.

Shown in Figure 5.5, are peak flows within Black Creek for the 0.2% AEP event for durations between 2 hours and 36 hours. Although the shorter duration events reach the peak flood levels with less time in comparison to the critical 36-hour event, they are unable to reach peak flood levels high enough to overtop Wine Country Drive.

Lomas Lane will be significantly impacted by rare storm events with shorter critical durations. The timing of road overtopping and cutoff of main access points along Lomas Lane occurs 12 hours earlier when comparing the 6-hour duration to the 36-hour duration 0.2% AEP event. However, as Wine Country Drive does not get overtopped in events shorter than the 36-hour 0.2% AEP event, evacuation may still proceed via Building J carpark and the proposed southern Wine Country Drive access way.

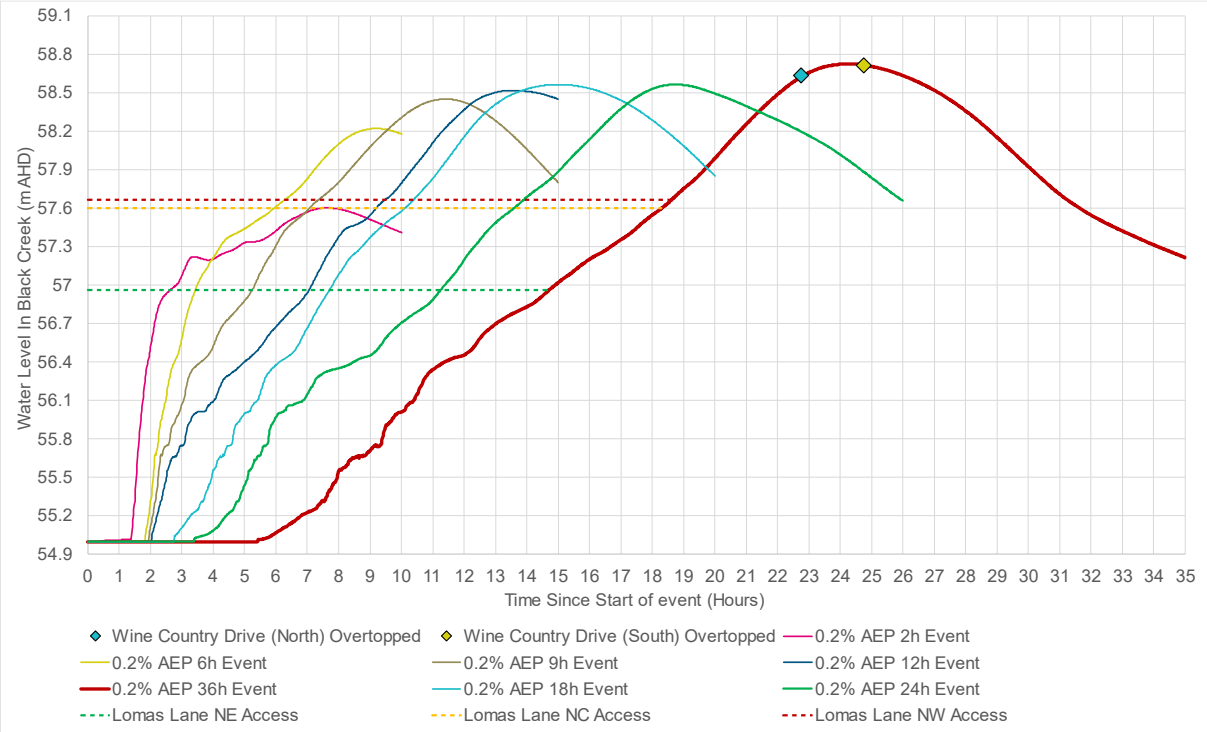


Figure 5.5 Stage (Flood Level vs Time) Hydrograph in Black Creek – 0.2% AEP Event (Short Duration Assessment)

5.2 Structural Soundness

Although the proposed (7) new buildings are not affected by flooding until an event rarer than the 0.2% AEP, given the potential need for emergency SIP facilities the buildings will need to be designed to ensure the structural integrity should not be compromised for all flood events up to and including the PMF event. Buildings must demonstrate structural stability up to the PMF so as to withstand the hydrostatic, hydrodynamic, buoyancy and debris loads of PMF conditions. Verification has been completed by a structural engineer with the report attached in Annex G. Structural integrity of the selected buildings designated for SIP would not be detrimentally affected if subjected to the structural loads commensurate with the PMF event of 1.4m of water depth at a maximum velocity of 4m/s.

In addition, the Cessnock Development Control Plan (2010) outlines the requirement for building additions and renovations (6 proposed additions and renovations to existing buildings) to also be completed in accordance with ‘Fact Sheet 2: Flood Compatible Building Guidelines’.

It is recommended that further assessment/modelling be undertaken at the detailed design or structural verification phase to calculate peak velocities and flood hazards through and around buildings by taking into account the potential effects of blockage due to buildings; this exercise is recommended to be undertaken per stage of development.

5.3 Flood Signage

To accompany the flood warning system, the building should include appropriate signage indicating what actions are to be undertaken in the event of flooding. This should consist of instructions (including direction arrows) that can be interpreted if the flood wardens are not available.

The following signs are recommended:

- Flood depth indicators at visible locations such as the entry to the building;
- Flood depth indicators at locations where water level sensors are installed;
- Entry/exit points to stairwells; and
- Evacuation routes.

An example of the typical signage that might be displayed at key points is given in Figure 5.6

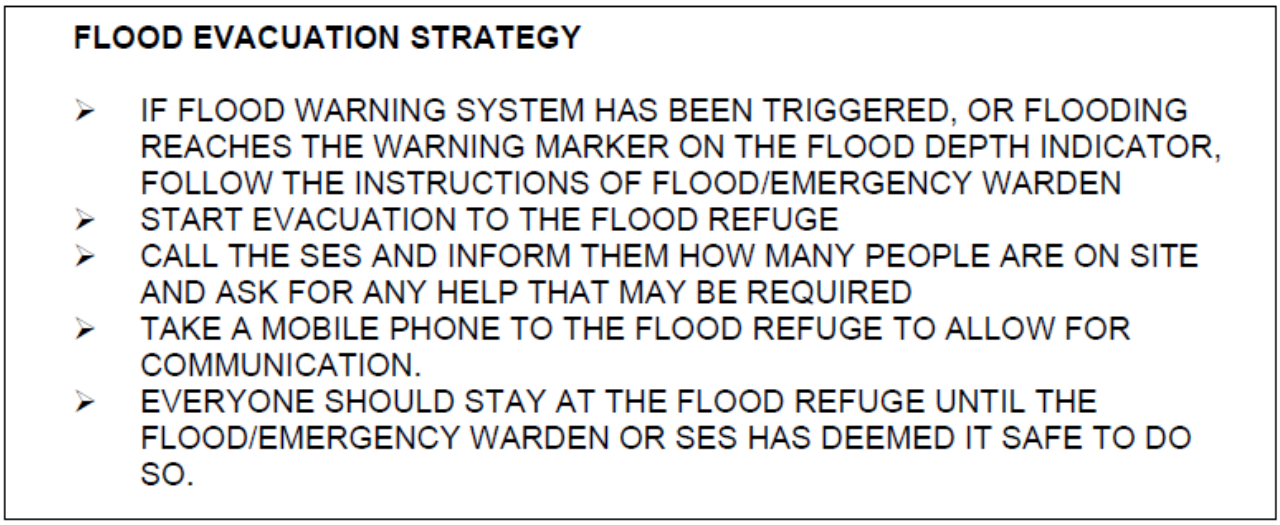


Figure 5.6 Typical Flood Signage

5.4 Consultation with Council and SES

The FERP has been prepared as part of future design development for the SPCC Cessnock Campus Site in consultation with the following stakeholders:

- Department of Planning and Environment (Biodiversity and Conservation Division);
- SES; and
- Cessnock City Council.

The consultation outcome is to develop a management plan which coordinates with the parties which may be involved during the event of a flood evacuation and implements the most suitable evacuation procedures. The feedback received from SES and Council are included in Annex B and Annex C, respectively, with BMT's responses to the feedback also included in Annex D.

5.5 Education

The SPCC Emergency Management Plan requires all occupants to be aware of and adequately trained in emergency response procedures and as such, advocates the implementation of the following training program (listed in Table 5.3) to ensure all occupants receive appropriate training to enable them to act in accordance with this plan. It is anticipated that this plan including necessary training requirements will be reviewed and updated as a result of including the Flood Emergency Management Plan.

Table 5.3 FERP Education Program

Activity	Cycle	Requirements
Emergency Planning Committee Training	ongoing	/ Maintenance of at least one member of the EPC trained in execution of their obligations under AS 3745:2010 (re: emergency preparedness)
Emergency Control Organisation Member Training / Familiarisation	Within one month of commencement then Training Annually	/ Training for all ECO members (primary and alternate) specific to their individual roles / Refresher training following EMP revision
	skills retention 6 monthly	/ This can include exercises and internal training sessions, such as familiarising members with communication systems and other ECO tools.
First Attack Fire Fighting Training (using portable fire-fighting appliances)	Within two days of commencement then 24 monthly	/ Fire extinguisher training where their use is documented within the procedures
Emergency- Control Exercise An evacuation or an exercise consistent with the identified emergencies in the EMP.	AS 3745:10 Annually Best practice Per term	/ All areas of the facility must participate in at least one exercise / All occupants within the exercise area must take part, unless the EPC grants a written exemption prior to the exercise. / The exercise observer must submit a report to the EPC
Facility occupants Training (non-ECO)	Within two days of commencement then Annually	/ General Evacuation Instructions to allow them to respond appropriately to activation of the emergency procedures

6 Flood Emergency Response Procedure

This section describes some of the specific actions to be undertaken in anticipation of a flood event, as well as actions recommended during and after a flood event.

6.1 Overview

The following procedures are proposed as part of the FERP:

- **Priority 1** - Closure of the school prior to flooding based on BoM's flood warning, rainfall forecast or the on-site water level sensor systems. School closure is in line with current SPCC practice, which is to advise parents of possible flooding events the day before or morning prior to commencement of school, if they occur and suggest that children be kept at home.
- **Priority 2 -** Closure of the school if flood warning is issued by BoM or SES during school hours.
- **Priority 3 -** If school closure is not undertaken and minor flooding occurs and flood levels keep rising during school hours, implement an off-site evacuation based on the trigger levels and observation of the rate of rise of floodwaters based on the proposed water level gauge specified in this FERP.
- **Priority 4 -** If the above procedures are not achieved, it is proposed to implement a SIP plan.

6.2 Planning for a flood

Outlined in Table 6.1 below are actions to be followed by SPCC Cessnock Emergency Planning Committee (EPC) and incorporated in the SPCC Emergency Management Plan with a specific chapter on Flooding. The following Table includes recommended review or action timeframes and persons responsible for governance. This table is to be reviewed and updated by the school.

Table 6.1 Flood Planning Actions, Timeframe and Responsibility

Action	Timeframe	Responsibility
Prepare Operational Flood Emergency Response Plan in line with the SES Emergency Business Continuity Plan	Prior to issue of Occupation Certificate of first building approved under SSDA-10360337	SPCC Cessnock Emergency Planning Committee
Prepare the contents of the Emergency Flood Kit(s) and ensure that it is stored on the upper level of buildings nominated as flood refuge buildings. Emergency flood kits are to include the following minimum requirements: First aid kits, water, torch, phone, phone battery pack, standard batteries, sanitizer, plastic bags, antiseptic wipes, food staples (such muesli bars, tinned food) and radio	Prior to issue of Occupation Certificate of first building approved under SSDA-10360337	SPCC Cessnock Emergency Planning Committee

Action	Timeframe	Responsibility
Ensure that the Emergency Management Plan is up to date.	Review annually	Emergency Planning Committee
Check and update contents of flood emergency kit	Every 6 months	Chief warden
Review location or storage of hazardous substances, furniture, equipment and sensitive belongings, and relocate to a flood free area if possible.	Every 6 months	Chief warden
Check communication devices such as internet connections, mobile phone, landline phone or radio. If a device has become inoperable, identify a suitable alternative (such as a back-up device or using the device of someone else in the building).	Every month	Chief warden
Communicate to all students, parents, staff, and visitors of the school the requirements of the Operational FERP, location of the Flood Refuges and discuss the risk of flooding to the site, contact/ communication methods, and actions to take before, during and after a flood event.	On induction to the site. Subsequent training every 12 months	Emergency Planning Committee

6.2.2 Proposed Evacuation Routes and SIP Buildings

Proposed evacuation routes out of the Site are shown in Figure 6.1, with the orange arrows denoting the northern route and the blue arrows denoting the southern route. The proposed internal roads within the Site are flood free up to and including the 0.2% AEP event, connecting the northern portion of the Site to the southern access point. During a PMF event the internal roads connecting the northern portion of the Site to the southern access point is inundated 3 hours after the initial onset of rainfall. As such, SIP is recommended as the last resort strategy in the event that complete early school closure and off-site evacuation cannot be achieved.

Figure 6.1 also outlines as red triangles the proposed future buildings with a second storey available for students and staff to SIP. The buildings marked in Figure 6.1 for shelter in place (A3, A4, B1, B2, C2, C3, C4) have an approximate total floor space of 5,349m^2 with a capacity to shelter 2673 persons. This will accommodate the entire 1732 student population and 216 staff members, with a surplus capacity of 725 persons for any additional personnel that may be on Site. Given that the SIP plan is only enacted

following measures to close the school early, it is expected that only a portion of the total student and staff population would remain on site should a SIP approach be required.

Proposed evacuation routes to potential evacuation centres are shown in Figure 6.2. The current nominated evacuation centre for the evacuation route going northbound along Wine Country Drive is the Cessnock Aerodrome. The evacuation route going southbound along Wine Country Drive will be directed towards Potters Hotel and Brewery along Wine Country Drive (Nulkaba) and Cessnock Hospital. Other nominated evacuation centres include Mount View High School, Mount View Road, Cessnock. While Nulkaba provides a closer location to the Study Site and a shorter evacuation timeframe, Cessnock Hospital is located well above the floodplain in rare and extreme events providing for a safer recommended refuge area.

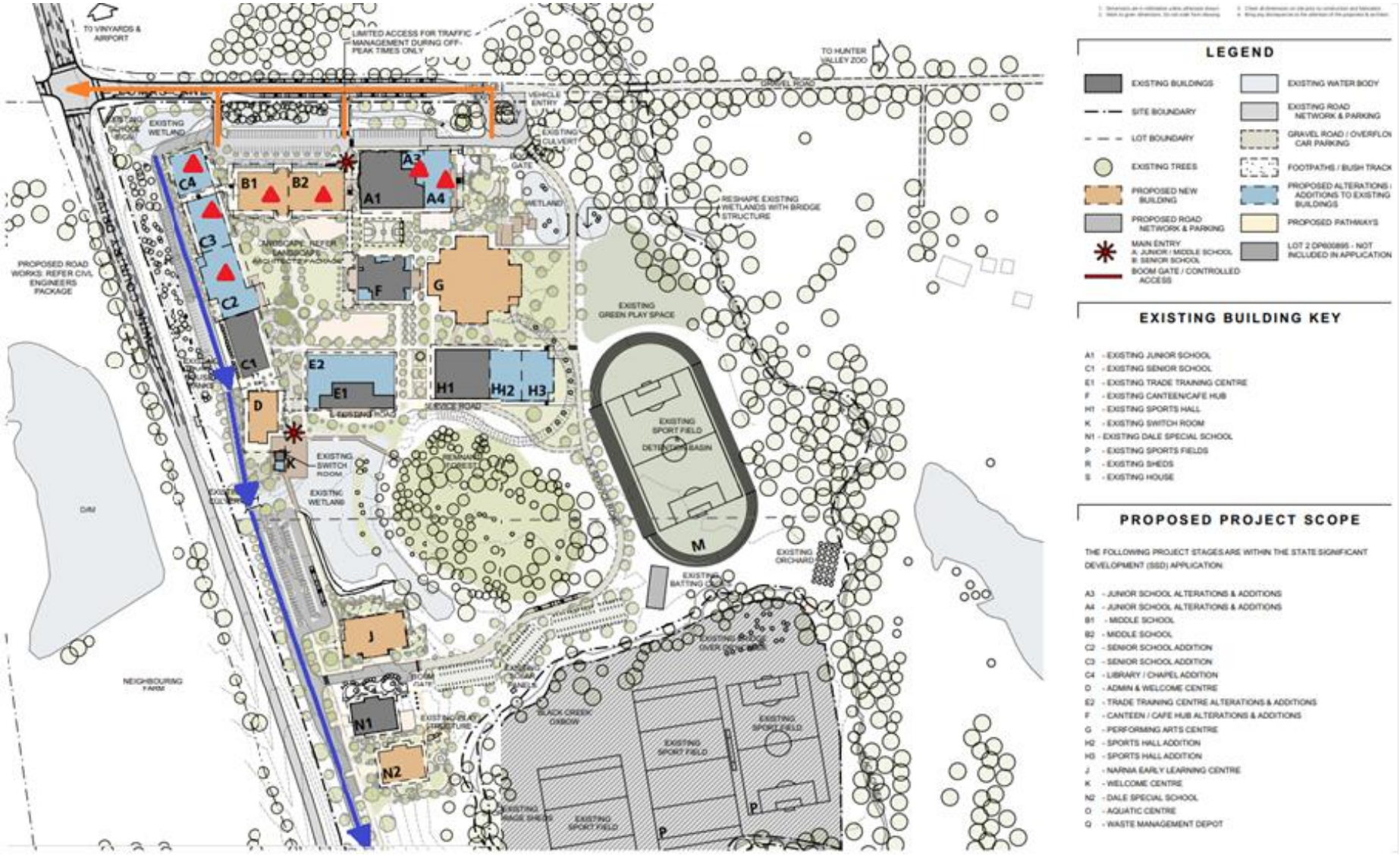


Figure 6.1 Proposed Evacuation Routes and Shelter-Place Buildings

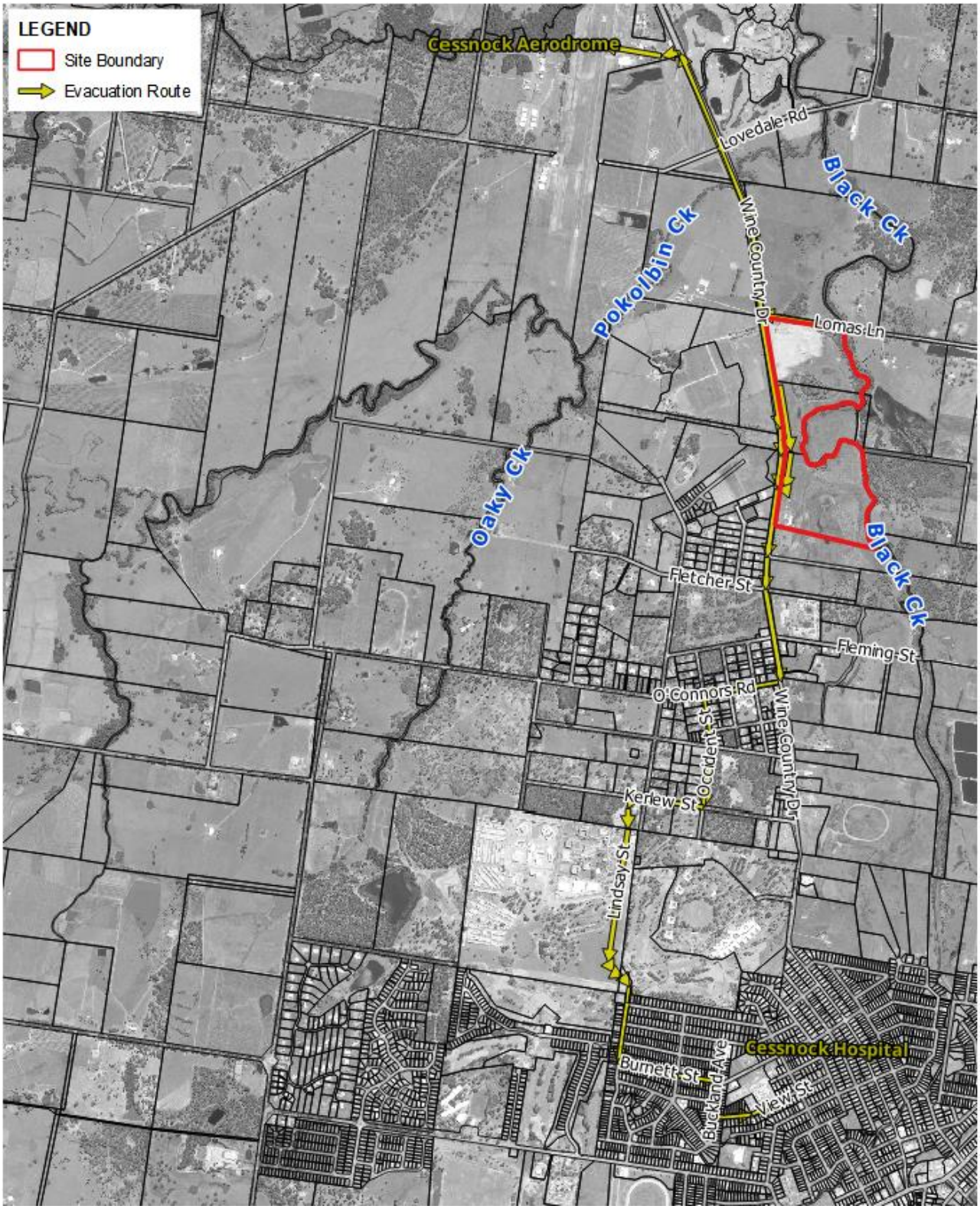


Figure 6.2 Flood Evacuation Route

6.2.3 Provision for Flood Emergency Drills

It is proposed that flood evacuation drills be undertaken, one on the first day of operation each year and a second drill throughout the year. Regular drills will be required of the wardens to ensure the flood/emergency awareness and preparedness of the wardens and employees.

6.2.4 Update of the FERP

The FERP should be updated at regular intervals to account for additional flood information that has been made available (e.g. flood studies or floodplain risk management studies and plans adopted by Council) and for highlighted learnings as a result of the drills or in the event of a flood.

6.3 Before A Flood

6.3.1 Actions, Timeframe and Responsibility Before a Flood Event

Outlined Table 6.2 below are several flood safety actions to be followed by students, staff and visitors on Site prior to a potential flooding event. The following Table includes actions, timeframes and persons responsible for governance. This Table is to be reviewed and updated by the SPCC Cessnock Emergency Planning Committee and incorporated in the SPCC Emergency Management Plan with a specific chapter on Flooding.

Table 6.2 Action, Timeframe and Responsibility Before Flooding

Action	Timeframe	Responsibility
Follow the procedures outlined in the operational FERP to evacuate site, when specified.	On the onset of likely flooding event	Chief Warden
Monitor the site rain and flood gauges, BoM website, ABC radio broadcasts, local emergency services social media pages, and local news outlets for severe thunderstorm warnings.	On the onset of likely flooding event.	Chief Warden
Inspect the property for hazardous substances, furniture, equipment and sensitive belongings, and relocate to another flood free area if possible.	On the onset of a flood event	Chief warden
Identify the needs of vulnerable persons likely to be on-site during the flood emergency (i.e. elderly visitors, disabled, young children).	On the onset of likely flooding event	Administration staff for visitors. Staff of Narnia Early Learning, Junior School and Dale Special School. Wardens for other vulnerable persons.
Ensure that any electrical equipment located below the PMF level is disconnected or isolated from the electricity and gas supplies.	On the onset of likely flooding event	Wardens
Monitor conditions at night and use the cloud-based Student Management System (CRM) to notify parents and staff of school closures. The same system should be used to notify organisers of non-school activities during non-	On the onset of likely flooding event	Chief Warden

Action	Timeframe	Responsibility
school hours to communicate to any community users of school grounds, potential closures and flood warnings.		

6.4 During a Flood

6.4.1 Off-Site Evacuation or SIP Triggers

It is proposed to trigger evacuation based on rainfall forecast, BOM's flood warning, or on-site flood level senor. These are discussed in the following sections.

Off-Site Evacuation Triggers Based on Rainfall Forecast

Major flooding requires a large-scale rainfall situation over the Black Creek. Table 6.3 and Table 6.4 contains design total rainfall depths that can be used as a rough guide to the likelihood of flooding in the catchment.

Table 6.3 Rainfall Trigger Amounts for Off-Site Evacuation based on ARR 1987

Rainfall	Potential Flood Event
72mm in 36 hours	63% AEP or 1 in 1 AEP
124mm in 36 hours	18% AEP or 1 in 5 AEP
173mm in 36 hours	5% AEP or 1 in 20 AEP
230mm in 36 hours	1% AEP or 1 in 100 AEP

Table 6.4 Rainfall Trigger Amounts for Off-Site Evacuation based on ARR 2016

Rainfall	Potential Flood Event
79mm in 36 hours	63% AEP or 1 in 1 AEP
131mm in 36 hours	18% AEP or 1 in 5 AEP
194mm in 36 hours	5% AEP or 1 in 20 AEP
278mm in 36 hours	1% AEP or 1 in 100 AEP
327mm in 36 hours	0.5% AEP or 1 in 200 AEP
393mm in 36 hours	0.2% AEP or 1 in 500 AEP

Off-Site Evacuation Triggers Based on Flood Warning

BoM service level specifications for the Wollombi Brook at Wollombi gauge as summarised and shown in the chart which can be used as a guide to the likelihood of flooding:

- Minor – 6.7m
- Moderate – 8.6m
- Major – 12.2m

It is noted that the flood heights are in metres on the gauge. The zero-gauge datum is 85.719 in metres Australian Height Datum (m AHD). The BoM has a target warning lead time of 6 hours for minor flood classifications at the gauge. BMT understands that a flash warning system for Cessnock might be

undergoing development by Council and if this service and/or BoM's flood gauging within Black Creek become available in the future, these should be utilised as part of the FERP for SPCC.

Parents and caregivers will be kept informed about potential flooding based on BoM's forecast systems described above. SPCC has a cloud-based Student Management System (CRM) which enables the school to communicate/text parents. Much like contacting them to pick up students the same system will be used to advised them to stay away. The school can also communicate via their social platforms and systems such as the Parent App that can push notifications to parents. The same system should be used to notify organisers of non-school activities during non-school hours to communicate to any community users of school grounds, potential closures (i.e. sporting field and the aquatic centre users).

Off-Site Evacuation or SIP Triggers Based on Water Level Sensor

The decision between conducting an off-site evacuation or to SIP will require observation of rising floodwaters to accurately estimate the magnitude of flooding that is likely to occur.

A PMF event can be characterised by rapid rise in floodwaters (in the magnitude of 2m/hr as shown in Figure 5.4) leading up to the evacuation trigger level of 57.3m AHD. Visual confirmation of a PMF event can be achieved if the NC pedestrian access at Lomas Lane is inundated within 1.5 to 2 hrs after the onset of intense rainfall. If the above flood behaviour is observed via the water level monitoring system or by observation from a Warden using physical water depth indicators, off-site evacuation is no longer viable, parents will be notified through the CRM that SIP procedures have commenced and to return home.

In order to not confuse a PMF event with a short duration (i.e. 2 hour, 6 hour) 0.5% AEP event (which similarly has a high initial rate of rise in floodwater of approximately 1m - 2m/hr as shown in Figure 5.5) the NC pedestrian access of Lomas Lane is inundated in approximately 6 to 8 hrs after initial onset of rainfall. Under these flood conditions, off-site evacuation can proceed as prescribed.

Table 6.5 contains triggers for off-site evacuation for a 0.2% AEP (36 hour) event based on the proposed on-site water level sensor. In the event that the flood risk increases, and off-site evacuation (as per Table 6.5) is no longer viable, parents will be notified through the CRM that SIP procedures have commenced and to return home.

Table 6.5 Proposed Triggers and Evacuation Procedures

Recorded Flood Level or Visual inspection	Action
• Flood level reaching 56.9m AHD (approximately 63% AEP event or 1 in 1 AEP flood) and flood level keeps rising. • Flood inundating the bus turnaround bay. • Flood rate of rise is less 0.2m/hr.	- Close or stop using the NE access point and keep monitoring flood level sensor. - Consider closure of school if level is reached outside of regular school hours and a severe storm or flood warning is issued by BoM. - Out of hours monitoring will rely on flood warnings issued by BoM and monitoring by the Chief Warden. Notifications will be relayed to staff and parents via the CRM.
• Flood level reaching 57.3m AHD (smaller in magnitude than the 18% AEP event). • Flood rate of rise is less 0.2m/hr. **Note**: To reach the above trigger level, it would take approximately 2 hours after closure of NE access.	- Trigger school evacuation. - Start using NC access for vehicle entrance and the NW exit to service the northern set-down/pick-up area. - Use the southern access for vehicle entrance and exit to service the southern set-down/pick-up area.

Recorded Flood Level or Visual inspection	Action
• Flood Level reaching 57.5m AHD (18% AEP event) • Flood rate of rise is less than 0.2m/hr. **Note**: Lomas Lane at the intersection of the NC access will be inundated within approximately 3 hours after closure of NE access.	- Close the NC access point. - Continue to be using NW access point.
• Flood level reaching 57.68m AHD (5% AEP event); and • Flood rate of rise is less 0.2m/hr. **Note**: Lomas Lane at the intersection of the NW access would be inundated within approximately 1.0 hour after the closure of NC access.	- Close the NW access point. - Redirect any remainder northern evacuees towards the proposed southern access point. - Keep using the southern access point for vehicle entrance and exit to complete any outstanding evacuations.
In the event that: • Evacuation does not occur in time; • Wine Country Drive is overtopped towards Nulkaba or Cessnock; • If flood rate of rise is greater than 2m/hr and NC pedestrian access is inundated within 2 hours of the onset of intense rainfall; • If there are floodwaters present along the evacuation route; • If the on-site flood sensor failures and there are floodwaters present along evacuation routes. **Notes**: The following flooding conditions can be used as a guide to ascertain the rate of rise of flood, using a PMF rate of rise of 2m/hr: • Lomas Lane at the intersection of NC pedestrian is estimated to be inundated within 1.5 to 2 hours after the onset of intense rainfall, as opposed to 6 to 8 hours in a 0.2% AEP event. • Lomas Lane at the intersection of NC access (having a surface level of 57.5m AHD) would be inundated within 0.5 hour after closure of NE access (compared to 3 hours in case of on a rate of rise of 0.2m/hr). • The building B carpark or marshalling area (having a surface level of 58.5m AHD) would be inundated within 1 hour after closure of NE access (compared to 8 hours in case of on a rate of rise of 0.2m/hr). • The building J carpark marshalling area (having a surface level of 59.25m AHD) would be inundated approximately 1.5 hours after closure of NE access (compared to 12 hours in the case of based on a rate of rise of 0.2m/hr). (It should be noted while building J carpark will have partial inundation with a hazard classification of H1, this does affect the evacuation using the proposed	- Immediately commence SIP proceedings to the upper floors of the nominated buildings.

Recorded Flood Level or Visual inspection	Action
internal roads which lead to the southern access point to Wine Country Drive.)	

The above steps are summarised in Figure 6.3. This basic flow chart identifies the triggers to commence evacuation and shelter in place procedures. This flow chart is to be updated and included in the SPCC Cessnock Emergency Management Plan. A simplified outline of procedures for SIP and off-site evacuation to be provided to school staff and wardens are attached in Annex F.

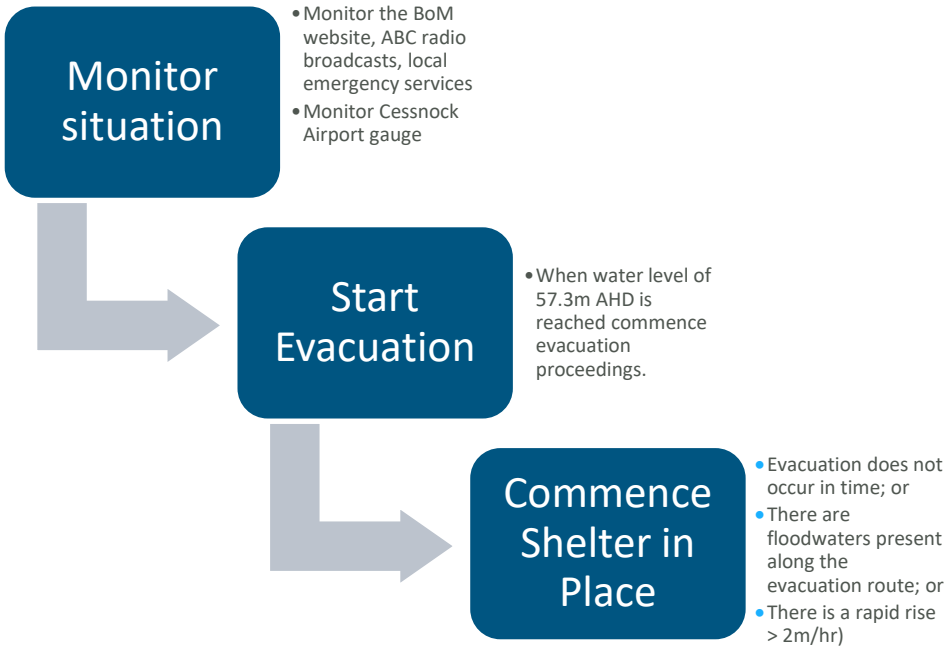


Figure 6.3 Flood Evacuation Flow Chart

6.4.2 Actions, Timeframe and Responsibility

Outlined below in Table 6.7 are key flood safety measures to be followed by students, staff and visitors during a flood or a severe weather event that may lead to flooding. The following Table includes actions, timeframes and persons responsible for governance. This Table is to be reviewed and updated by the SPCC Cessnock Emergency Planning Committee and incorporated in the SPCC Emergency Management Plan with a specific chapter on Flooding.

6.4.3 Shelter-in-place Plan

During a 3-hour PMF event (not critical in peak flood level, but fastest rising event modelled), there is approximately 1 hour and 25 minutes between the initial onset of rainfall and the water levels in Black Creek rising to 57.3m AHD (evacuation trigger level). At this point, floodwaters rising at a rate of 1-2m/hr should trigger the SIP plan instead of an off-site evacuation approach.

At 2 hours 25 minutes after the initial onset of rainfall, water levels in black creek reach 58.7m AHD where water will enter school grounds inundating the road access north of the Building J Carpark (see Figure 6.1) and the area south of the Performing Arts Centre. Therefore, there is approximately 1 hour to move everyone inside SIP buildings.

Priority movement of occupants to designated SIP buildings should be given to occupants in buildings:

- N1, N2 (DALE Special School)
- J (Early Learning Centre)
- O (Aquatic Centre)

Priority is given to occupants in the buildings noted above due to the vulnerable nature of occupants (young children in the Early Learning Centre, children with learning difficulties in DALE Special School) and due to these buildings being located furthest away from the designated SIP buildings. Occupants of these buildings should evacuate to the closest designated SIP buildings (C2 and C3). Table 6.6 outlines the designated SIP buildings assigned to each building throughout the school. It should be noted the designated SIP building allocations should be reviewed and adjusted as necessary at the OFERP stage.

Once all occupants of the school have sheltered in the designated buildings, the expected time of isolation during the PMF event is approximately 12 hours before access routes are free of inundation and off-site evacuation can take place. Due to the extended time of isolation during the PMF event, food and provisions should be transported to the designated SIP buildings from the school's canteen (Building F). A review of this approach and its feasibility should be conducted by the school operators and adjusted as necessary at OFERP stage.

Table 6.6 Shelter-in-place Action Plan

Building	Action	Designated SIP Building
Junior School (Building A)	Occupants of Building A1 to move to the upper floor of Building A3 and A4. Occupants of Building A3 and A4 to move to upper floor.	Building A3 and A4
Middle School (Building B)	Occupants of Building B1 and B2 to move to upper floor.	Building B1 and B2
Senior School (Building C)	Occupants of Building C1 to move to the upper floor of Building C2, C3 and C4. Occupants of Building C2, C3 and C4 to move to upper floor.	Building C2, C3 and C4
Admin & Welcome Centre (Building D and Building K)	Occupants of Building D and K to move to the upper floors of Building B1 and B2.	Building B1 and B2
Trade Training Centre (Building E)	Occupants of Building E1 and E2 to move to the upper floors of Building C4.	Building C4
Canteen and Café (Building F)	Occupants of Building F to move to the upper floor of Building A3.	Building A3
Performing Arts Centre (Building G)	Occupants of Building G to move to the upper floor of Building A4.	Building A4
Sports Hall (Building H)	Occupants of Building H1, H2 and H3 to move to the upper floors of Building B1 and B2.	Building B1 and B2

Building	Action	Designated SIP Building
Narnia Early Learning Centre (Building J)	Occupants of Building J to move to the upper floor of Building C2 and C3.	Building C2 and C3
DALE Special School (Building N)	Occupants of Building N1 and N2 to move to the upper floor of Building C2 and C3.	Building C2 and C3
Aquatic Centre (Building O)	Occupants of Building O to move to the upper floor of Building C2 and C3.	Building C2 and C3
All other buildings, sheds and fields.	All occupants on Site not located in mentioned buildings above to move to the upper floor of Building C2 and C3.	Building C2 and C3

Table 6.7 Timeframe and Responsibility During a Flood Event

Action	Timeframe	Responsibility
Follow the procedures outlined in the operational FERP	On the onset of likely flooding event	Chief Warden and Wardens
Monitor site rain, and flood gauges, the BoM website, ABC radio broadcasts, local emergency services social media pages, and local news outlets for severe thunderstorm warnings.	On the onset of likely flooding event	Chief Warden and Wardens
Monitor local rainfall (in particular the Cessnock Airport gauge), BoM Severe Thunderstorm Warnings and the Black Creek water gauge.	If the 18% AEP (1 in 5 AEP) level of 57.3m AHD is reached commence evacuation proceedings. This should ideally commence prior to the onset of heavy rainfall. If the Black Creek water gauge is approaching the 18% AEP level and/or heavy rain is predicted by BoM prior to school commencement, consider cancelling school.	Chief Warden and Wardens
Listen and respond to directions from emergency services or others with a special responsibility.	On the onset of likely flooding event	Chief Warden
Liaise with emergency services to determine community evacuation point	On the onset of likely flooding event	Chief Warden
Contact bus company to arrange evacuation transport to an evacuation centre nominated by emergency services.	If the 18% AEP (1 in 5 AEP) level of 57.3m AHD is nearing or reached commence evacuation proceedings.	Chief warden/ Wardens
Ensure all staff, students and visitors on-site are informed on the evacuation approach.	On the onset of likely flooding event	Chief Warden Communications Officer
Use Parent App and other parent communication platforms to advise parents of evacuation and request they attend to pick-up children. Students nominated to be evacuated to community evacuation point to be directed to marshalling point	If the 18% AEP (1 in 5 AEP) level of 57.3m AHD is nearing or reached commence evacuation proceedings.	Chief warden Wardens Communications Officer
Evacuate all students, staff and visitors on Site to the Building B and J carparks for marshalling. All students, staff and visitors are to then be evacuated from this location via private vehicles or emergency evacuation buses.	Once evacuation protocol is initiated	Chief warden Wardens Staff

Action	Timeframe	Responsibility
Remain at the evacuation location until advised safe to do so by the SES.		
Cease using NE Lomas Lane access point and keep monitoring flood level sensor. Consider closure of school if level is reached outside of regular school hours and a severe storm or flood warning is issued by BoM.	Flood level reaching 56.9m AHD (approximately 63% AEP event or 1 in 1 AEP flood) and flood level keeps rising.	Chief Warden Wardens
Cease using all Lomas Lane access points. Shut gates to prevent vehicles from using entrances. Use Wine Country Drive southern access point for vehicle entrance and exit to complete any outstanding evacuations	Flood level reaching 57.68m AHD (5% AEP event).	Chief Warden Wardens
In the event that: - Evacuation does not occur in time; - Wine Country Drive is overtopped; - If flood rate of rise is greater than 0.2m/hr and there are floodwaters present along the evacuation route; - If the on-site flood sensor failures and there are floodwaters present along evacuation routes. Note that this is not the recommended option as it presents isolation risks both for occupants and SES personnel, but it is a safer option than attempting to evacuate through potentially hazardous floodwater. If the situation arises where the option is unavoidable, shelter in place until floodwaters have subsided off-Site and are no longer overtopping Wine Country Drive, or until advised safe to do so by the SES.	Lomas Lane at the intersection of NC access (having a surface level of 57.5m AHD) would be inundated within 1 hour after closure of NE access. The building B carpark or marshalling (having a surface level of 58.5m AHD) would be inundated within 2.7 hours after closure of NE access. The building J carpark marshalling area (having a surface level of 59.25m AHD) would be inundated approximately 4 hours after closure of NE access.	Chief Warden
Contents of flood emergency kit is provided and includes a spare phone and battery pack in the event that telephone communication (landlines and internet) are lost. Torches and batteries are provided in the event electricity is lost.	In the event electricity is lost.	Chief Warden

6.5 After A Flood Event

Outlined in Table 6.8 below are a few key flood safety measures to be followed by all staff, students and visitors that are present on site after a flood event has occurred. The following Table includes actions, timeframes and persons responsible for governance. This Table is to be reviewed and updated by the SPCC Cessnock Emergency Planning Committee and incorporated in the SPCC Emergency Management Plan with a specific chapter on Flooding.

Table 6.8 Action, Timeframe and Responsibilities After Flood Events

Action	Timeframe	Responsibility
Check that electrical power and gas has been isolated to all flood affected areas of the building. If electrical systems or appliances (including items such as hot water systems) have become inundated, these should be inspected by a qualified electrician. Gas appliances and any gas bottles to be inspected for safety before use.	Once emergency services have identified it is safe to return to site or instructed to move from sheltering in place	Chief Warden Wardens
Check any flooded areas for safety hazards and structural stability. Flood sensors and alarm system professionally assessed to ensure they are still in working order following event.	Once emergency services have identified it is safe to return to site or instructed to move from sheltering in place	Chief Warden
Review evacuation performance during the flood. Identify any areas for improvement and update flood emergency response plan if required.	Once business has returned to normal.	Chief Warden SPCC Cessnock emergency planning committee

7 Conclusions and Recommendations

This report outlines a flood emergency management approach for the St Philip's Christian College Cessnock Campus Site that has been developed with consideration of the nature of flooding and flood hazard at the Site for events up to the PMF, the proposed building designs and use of the Site, and relevant information contained in applicable floodplain risk management plans.

The development of this FERP has been undertaken in consultation with Cessnock City Council, Department of Planning and Environment (Biodiversity and Conservation Division) and the NSW State Emergency Services (SES).

While the proposed development will result in an increase to the total number of students attending the school, the provision of an additional access which is flood free for events up to and including the 0.2% AEP (1 in 500 AEP) results in an improved outcome for the school when compared to the current scenario.

A set of flood emergency evacuation measures and requirements have been established for implementation with the redevelopment of the Site. The preliminary approach presented in this report is based on details available at this stage of the development planning process and provides a suitable basis for further refinement in future stages as more definitive details are developed. In particular, refinements will be required to address the specific needs of the people expected to use the proposed spaces once further design work has been undertaken and the function and occupants of each space is clarified.

The differing nature of flooding at the Site in rare and extreme events means that multiple emergency management strategies must be considered. In rare events, the potential for both long warning times and potential long isolation periods means school evacuation is the best emergency management procedure.

The proposed flood emergency approach is outline as follows:

- **Priority 1** - Closure of the school prior to flooding based on BoM's flood warning, rainfall forecast or the on-site water level sensor systems. School closure is in line with current SPCC practice, which is to advise parents of possible flooding events the day before they occur and suggest that children be kept at home.
- **Priority 2 -** Closure of the school if flood warning is issued by BoM or SES during school hours.
- **Priority 3 -** If school closure is not undertaken and minor flooding occurs and flood levels keep rising during school hours, implement an off-site evacuation based on the trigger levels based on the proposed water level gauge specified in this FERP.
- **Priority 4 -** If the above procedures are not achieved, it is proposed to implement a SIP plan.

It is proposed to install automatic flood level sensor/s and physical flood depth indicators in Black Creek at the north-east part of the school and along the north-east access point to monitor flooding conditions that will be utilised to set trigger levels for the evacuation once school has commenced or occupants are on-site, as outlined below:

- As the NE entryway (bus turnaround bay) is subject to flooding in the 1 in 2 AEP event, it is proposed to prohibit the use of this entryway when the flood level reaches 56.9m AHD, which is equivalent to the 63% AEP (1 in 1 AEP event).
- It is proposed to trigger school evacuation when the flood level reaches 57.3m AHD, which is equivalent to smaller than the 1 in 5 AEP event. It is proposed to access the site via the north

central (NC) access from Lomas Lane and the southern access from Wine Country Drive. School egress will be via the northwest (NW) exit on Lomas Lane servicing the northern set-down area, and the southern exit on Wine Country Drive servicing the southern set-down area.

- It is proposed to prohibit the use of Lomas Lane entry and exit when the flood level reaches 57.68m AHD, which is equivalent to smaller than the 5% AEP (1 in 20 AEP event). Based on the timeline calculations, there will be approximately 2.5 hours between the trigger level and the 5% AEP flood level. It is anticipated that school evacuation will be completed prior to this flood level is reached. If required, any further outstanding evacuations will be redirected towards the proposed southern access point using the proposed internal roads which remain flood free up to and including the 0.2% AEP event.

In the event that school closure or horizontal evacuation has not been achieved, it is proposed to execute SIP procedures to the school buildings (that have upper floor levels above the PMF level). This method is not the recommended strategy for the Site and only to be implemented in an extreme flooding event where off-site evacuation cannot be safely achieved.

The following are further considerations to be made beyond this report:

- Continual development of the site-specific FERP incorporating updated information available during the detailed design stage of the development process;
- Development of a concise operational flood emergency response plan (OFERP) once the proposed development is completed; and
- Periodic review and revision of OFERP after it is finalised with any newly available flooding information and using highlighted learnings from emergency drills along with flood events.

8 References

- Australian Institute for Disaster Resilience (2017) Australian Disaster Resilience Handbook 7 Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia.
- BMT.2024. St Philip's Christian College, 10 Lomas Lane, Nulkaba Flood Impact Assessment.
- Department of Planning, Housing and Infrastructure (2024) Shelter-in-place guideline for flash flooding.
- NSW Government (2005) NSW Floodplain Development Manual.
- SES. 2009. Cessnock City Local Flood Plan.
- SMEC. 2011. Flood Emergency Response Plan, St Phillips Christian College Nulkaba Campus
- Stantec. 2023. St Philip’s Christian College, Cessnock - Transport and Accessibility Impact Assessment.

Annex A Development Masterplan Layout

SSD APPLICATION

1. Dimensions are in millimetres unless otherwise shown.
2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

LEGEND

- EXISTING BUILDINGS
- SITE BOUNDARY
- LOT BOUNDARY
- EXISTING TREES
- PROPOSED NEW BUILDING
- PROPOSED ROAD NETWORK & PARKING
- MAIN ENTRY
  A: JUNIOR / MIDDLE SCHOOL
  B: SENIOR SCHOOL
- BOOM GATE / CONTROLLED ACCESS
- EXISTING WATER BODY
- EXISTING ROAD NETWORK & PARKING
- GRAVEL ROAD / OVERFLOW CAR PARKING
- FOOTPATHS / BUSH TRACKS
- PROPOSED ALTERATIONS & ADDITIONS TO EXISTING BUILDINGS
- PROPOSED PATHWAYS
- LOT 2 DP600895 - NOT INCLUDED IN APPLICATION

EXISTING BUILDING KEY

A1 - EXISTING JUNIOR SCHOOL
C1 - EXISTING SENIOR SCHOOL
E1 - EXISTING TRADE TRAINING CENTRE
F - EXISTING CANTEEN/CAFE HUB
H1 - EXISTING SPORTS HALL
K - EXISTING SWITCH ROOM
N1 - EXISTING DALE SPECIAL SCHOOL
P - EXISTING SPORTS FIELDS
R - EXISTING SHEDS
S - EXISTING HOUSE

PROPOSED PROJECT SCOPE

THE FOLLOWING PROJECT STAGES ARE WITHIN THE STATE SIGNIFICANT DEVELOPMENT (SSD) APPLICATION:

A3 - JUNIOR SCHOOL ALTERATIONS & ADDITIONS
A4 - JUNIOR SCHOOL ALTERATIONS & ADDITIONS
B1 - MIDDLE SCHOOL
B2 - MIDDLE SCHOOL
C2 - SENIOR SCHOOL ADDITION
C3 - SENIOR SCHOOL ADDITION
C4 - LIBRARY / CHAPEL ADDITION
D - ADMIN & WELCOME CENTRE
E2 - TRADE TRAINING CENTRE ALTERATIONS & ADDITIONS
F - CANTEEN / CAFE HUB ALTERATIONS & ADDITIONS
G - PERFORMING ARTS CENTRE
H2 - SPORTS HALL ADDITION
H3 - SPORTS HALL ADDITION
J - NARNIA EARLY LEARNING CENTRE
K - WELCOME CENTRE
N2 - DALE SPECIAL SCHOOL
O - AQUATIC CENTRE
Q - WASTE MANAGEMENT DEPOT

4347
CD1004
RevK 22.04.24

Proposed Site Plan (North)

St Philip's Christian College Cessnock
10 Lomas Lane, Nulkaba

0m 25 50 75 100 125 1:2500 @A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

SSD APPLICATION

1. Dimensions are in millimetres unless otherwise shown.
2. Work to given dimensions. Do not scale from drawing.
3. Check all dimensions on site prior to construction and fabrication.
4. Bring any discrepancies to the attention of the proprietor & architect.

LEGEND

- EXISTING BUILDINGS
- SITE BOUNDARY
- LOT BOUNDARY
- EXISTING TREES
- PROPOSED NEW BUILDING
- PROPOSED ROAD NETWORK & PARKING
- PROPOSED NEW AREA
- BOOM GATE / CONTROLLED ACCESS
- EXISTING WATER BODY
- EXISTING ROAD NETWORK & PARKING
- GRAVEL ROAD / OVERFLOW CAR PARKING
- FOOTPATHS / BUSH TRACKS
- PROPOSED ALTERATIONS & ADDITIONS TO EXISTING BUILDINGS
- PROPOSED PATHWAYS
- LOT 2 DP600895 - NOT INCLUDED IN APPLICATION

EXISTING BUILDING KEY

A1 - EXISTING JUNIOR SCHOOL
C1 - EXISTING SENIOR SCHOOL
E1 - EXISTING TRADE TRAINING CENTRE
F - EXISTING CANTEEN/CAFE HUB
H1 - EXISTING SPORTS HALL
K - EXISTING SWITCH ROOM
N1 - EXISTING DALE SPECIAL SCHOOL
P - EXISTING SPORTS FIELDS
R - EXISTING SHEDS
S - EXISTING HOUSE

PROPOSED PROJECT SCOPE

THE FOLLOWING PROJECT STAGES ARE WITHIN THE STATE SIGNIFICANT DEVELOPMENT (SSD) APPLICATION:

A3 - JUNIOR SCHOOL ALTERATIONS & ADDITIONS
A4 - JUNIOR SCHOOL ALTERATIONS & ADDITIONS
B1 - MIDDLE SCHOOL
B2 - MIDDLE SCHOOL
C2 - SENIOR SCHOOL ADDITION
C3 - SENIOR SCHOOL ADDITION
C4 - LIBRARY / CHAPEL ADDITION
D - ADMIN & WELCOME CENTRE
E2 - TRADE TRAINING CENTRE ALTERATIONS & ADDITIONS
F - CANTEEN / CAFE HUB ALTERATIONS & ADDITIONS
G - PERFORMING ARTS CENTRE
H2 - SPORTS HALL ADDITION
H3 - SPORTS HALL ADDITION
J - NARNIA EARLY LEARNING CENTRE
K - WELCOME CENTRE
N2 - DALE SPECIAL SCHOOL
O - AQUATIC CENTRE
Q - WASTE MANAGEMENT DEPOT

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CD1005
Revl 22.04.24

Proposed Site Plan (South)

St Philip's Christian College Cessnock
10 Lomas Lane, Nulkaba

0m 25 50 75 100 125 1:2500 @A3

SHAC

Nominated Architect Justin Hamilton (6160) | ABN 32 131 584 846

Annex B SES Responses to Proposed FERP

Our Ref: ID1673
Your Ref: A11230

15 August 2022

Nathan Cheah
Department of Planning and Environment
Locked Bag 5022,
Parramatta NSW 2124

email: nathan.cheah@bmtglobal.com

Dear Nathan,

Re: Flood Emergency Response Plan (FERP) for St Phillip's Christian College Cessnock

I refer to your correspondence dated 18 July 2022 regarding the Flood Emergency Response Plan (FERP) for St Phillip's Christian College Cessnock at 10 Lomas Lane, Nulkaba. The proposed development adds an additional seven buildings and alters six existing buildings for the use of up to 1732 students. The FERP recommends the installation of an on-site flood warning gauge with a trigger of a 20% Annual Exceedance Probability (AEP) flood event for evacuation along Lomas Lane and Wine Country Drive.

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunami in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

It is the preference of NSW SES that all schools follow the application of sound land use planning and flood risk management. This includes site design and stormwater management measures that minimise any risk to the community. Furthermore, schools or sections of schools that are at known risk of flooding or isolation are closed prior to flooding commencing and when there is an indication that flooding is likely, for example, when there is a flood warning.

The NSW SES has reviewed the proposed FERP and the flood risk information (e.g. Local Flood Plan, Flood Studies etc.) available to the NSW SES, noting the proposed development is at risk of flooding in a and the adjacent roads may be cut by floodwaters. In accordance with sections 3.6, A-5, L-5, L-6.9.6 and N-7 of the NSW Floodplain Development Manual, 2005 (the Manual), the NSW SES is opposed to the imposition of development consent conditions requiring private flood evacuation plans rather than the application of sound land use planning and flood risk management. The NSW SES also does not have statutory authority to endorse or

approve flood emergency response plans, which is referred to in the Manual (particularly section N7), however provides the following advice based on the principles outlined in the Manual:

- **The Flood Impact Assessment should consider the full range of flooding, including events up to the Probable Maximum Flood (PMF).** It is noted that the site itself is prone to flooding from Black Creek (page 4 of the Draft FERP and Black Creek Floodplain Risk Management Study and Plan 2015), with high depth and hazard in a PMF (1.2 to 2.5 metres depth). This is unsafe for children, and therefore they must not be exposed to the floods. The Black Creek Floodplain Risk Management Study and Plan does indicate earlier flooding at this site and Wine Country Drive than the 0.2% cited in the FERP. It is recommended that advice is sought from Council regarding any updated flood information available for this site.

- **Risk assessment should have regard to flood warning and evacuation demand on existing and future access/egress routes**. Consideration should also be given to the impacts of localised flooding on evacuation routes. The local and regional road network is prone frequent flooding and would require caregivers to ensure they have adequate time to collect the children prior to the roads becoming flooded. As this age group of students are largely unable to self-evacuate, the evacuation time would require additional travel time required for caregivers to reach the building prior to access becoming affected and proceed to safety. **Evacuation must not require people to drive or walk through flood water**. Therefore, ideally the school would be closed prior to the impact of flooding on the evacuation routes as indicated in the FERP, and preferably prior to the commencement of school for that day.

- **Development strategies relying on deliberate isolation or sheltering in buildings surrounded by flood water are not equivalent, in risk management terms, to evacuation**. Sheltering in a building within the flood extent is not safe, as proposed in of the FERP (section 4.3.2 of the FERP). Sheltering in buildings where entrances and exits may become flooded in the larger floods may result in isolating the children potentially without food or water for several hours or more depending on the weather system/s. Isolation also increases the risk of fire or medical emergencies and likelihood of caregivers entering floodwater to get to their children. It is unrealistic to assume parents or caregivers will not attend the school to pick up children in circumstances of flooding.

- **Development strategies relying on an assumption that mass rescue may be possible where evacuation either fails or is not implemented are not acceptable to the NSW SES**. This may occur if caregivers are unable to safely reach the children during a flood.

It should be noted that gauges can go offline or become damaged or destroyed in severe weather and flooding. This can cause issues when relying on the gauge/s to trigger evacuation at a specific site. In addition, it is unclear as to who will be responsible for installing,

maintaining, and managing the proposed onsite gauge/s and warnings associated with the gauge/s. Gauges that are not maintained properly can cause significant issues.

Please feel free to contact Elspeth O'Shannessy via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours Sincerely

Elspeth O'Shannessy
Planning Coordinator, Emergency Risk Management
NSW State Emergency Service

Our Ref: ID 1796
Your Ref: SSD-10360337

29 November 2022

Prity Cleary
Department of Planning and Environment
Locked Bag 5022
Parramatta NSW 2124

email: prity.cleary@planning.nsw.gov.au
cc: maddy.gunethilake@dpie.nsw.gov.au ; mandy.bramble@member.ses.nsw.gov.au

Dear Prity,

Alterations to St Philip's Christian College Cessnock Campus

Thank you for the opportunity to provide advice on the Alterations to St Philip's Christian College Cessnock Campus, at 10 Lomas Lane, Nulkaba. The proposed development includes road upgrades, construction of 7 new buildings and aquatic centre and alters 6 existing buildings for the use of up to 1700 students.

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunami in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

We refer to our previous letter dated 15 August to bmt global, regarding the Flood Emergency Response Plan (FERP) and notes that our advice has been considered in the revised FERP (page 17 of the Response to Submissions and page 22 of the revised FERP).

The consent authority will need to ensure that the assessment is considered against the relevant Ministerial Section 9.1 Directions, including 4.3 – Flood Prone Land and is consistent with the NSW Flood Prone Land Policy as set out in the NSW Floodplain Development Manual, 2005 (the Manual). Attention is drawn to the following principles outlined in the Manual which are of importance to the NSW SES role as described above:

- **Development should not result in an increase in risk to life, health or property of people living on the floodplain.**

  The site (and existing school location) is impacted by Black Creek flooding, with the main access point from Lomas Lane flooded in a 20% AEP flood event. Alternative access is available up to and including the 5% AEP flood event. The school is subsequently inundated in a PMF, with a large proportion being high hazard (H4 to

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H5) flooding (Flood Impact Assessment). This is unsafe for people and vehicles and the children, staff and other school users and visitors must not be exposed to such flooding.

- **Risk assessment should consider the full range of flooding, including events up to the Probable Maximum Flood (PMF) and not focus only on the 1% AEP flood.**

  The Flood Impact Assessment has included events up to and including the PMF.

- **Risk assessment should have regard to flood warning and evacuation demand on existing and future access/egress routes. Consideration should also be given to the impacts of localised flooding on evacuation routes.**

  The FERP has considered this risk, with access cut as quickly as 3-4 hours. As a low flood island, this puts anyone on site during a significant flood at considerable risk. Re-emphasising the need to close the school prior to the onset of flooding, and prior to the commencement of the school day. This would be particularly challenging on "non-school days" where the proposed school amenities may be used, such as the aquatic centre.

- **In the context of future development, self-evacuation of the community should be achievable in a manner which is consistent with the NSW SES's principles for evacuation.** It should be highlighted that the school has historically been evacuated (e.g. in 2015)**. Future development must not conflict with the NSW SES's flood response and evacuation strategy for the existing community. Evacuation must not require people to drive or walk through flood water.**

- **Development strategies relying on deliberate isolation or sheltering in buildings surrounded by flood water are not equivalent, in risk management terms, to evacuation**.

  The strategy to "shelter in place" has been removed from the revised FERP. We note that an emergency refuge has been proposed above the PMF as a contingency.

- **Development strategies relying on an assumption that mass rescue may be possible where evacuation either fails or is not implemented are not acceptable to the NSW SES.**

  This may occur if evacuation does not occur prior to the onset of flooding.

- **The NSW SES is opposed to the imposition of development consent conditions requiring private flood evacuation plans rather than the application of sound land use planning and flood risk management.**

  NSE SES encourages schools to develop appropriate emergency plans, however in accordance with sections 3.6, A-5, L-5, L-6.9.6 and N-7 of the NSW Floodplain

Development Manual, 2005 (the Manual), the NSW SES is opposed to the imposition of development consent conditions requiring private flood evacuation plans rather than the application of sound land use planning and flood risk management. The NSW SES also does not have statutory authority to endorse or approve flood emergency response plans.

It is noted that the revised FERP involves early closure of the school, prior to the onset of flooding. This is the preferred emergency management strategy to adopted by schools at risk of flooding or isolation. Preferably this should be prior to the school day where possible and communicated to any potential students, visitors, carers and staff. It notes the trigger for evacuation to occur is the 20% AEP, giving the school 2 hours until the main access is lost but alternative access still available. We recommend the AEP trigger is converted to a relative level on the proposed gauge to reduce user error and/or confusion. It is noted that council supports the installation of the gauge. However, we must reinforce that gauges can go offline or become damaged in severe weather and flooding and must be installed and maintained appropriately, with a contingency plan in place.

- **NSW SES is opposed to development strategies that transfer residual risk, in terms of emergency response activities, to NSW SES and/or increase capability requirements of the NSW SES.**

- **Consent authorities should consider the cumulative impacts any development will have on risk to life and the existing and future community and emergency service resources in the future.**

You may also find the following Guidelines available on the NSW SES website useful:

- Reducing Vulnerability of Buildings to Flood Damage

Please feel free to contact Elspeth O'Shannessy via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours Sincerely

Peter Cinque
Senior Manager, Emergency Risk Management
NSW State Emergency Service

Our Ref: ID2492
Your Ref: SSD-10360337

25 June 2024

Adam Flynn
Department of Planning, Housing & Infrastructure
Locked Bag 5022
Parramatta NSW 2124

Via Major Portal

email: adam.flynn@dpie.nsw.gov.au
CC: lisa.ignatavicius1@ses.nsw.gov.au

Dear Adam,

State Significant Development Application for St Philip's Christian College Cessnock Campus

Thank you for the opportunity to provide advice on the amended State Significant Development (SSD) Application for alterations and additions to St Philip's Christian College Cessnock Campus (SPCC) located at 10 Lomas Lane and 210 Wine Country Drive, Nulkaba.

It is understood that the SSD application is for alterations and additions to SPCC Cessnock Campus site including the following:

- Road upgrades to Lomas Lane including a bus bay;
- Road upgrades and access at Wine Country Drive;
- Extension to the junior school building;
- Two new buildings for middle school;
- Extend existing senior school building to include a new chapel and two new senior school buildings;
- New building for administration and welcome centre;
- Extend staff and hospitality building;
- Extend sports hall and performing arts centre building;
- New Pre School and Early Learning Centre 'Narnia';
- Indoor aquatic centre that will service the school and public; and
- Increase in student numbers by up to 1,732[1]. Approximate student population was 1,200 in 2022[2] and 1,470 in 2024[3].

[1] BMT (2024) - St Philip's Christian College Updated Flood Impact Assessment page 13
[2] St Philip's Christian College (2022) – Annual Report 2022 page 49
[3] BMT (2024) - St Philip's Christian College Updated Flood Impact Assessment page 8

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It is understood that the proposed amendment seeks to remove Lot 2 DP 600895 from the SSD application (which includes works on that lot and Black Creek).

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunami in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

It is the preference of NSW SES that all schools follow the application of sound land use planning and flood risk management in accordance with the relevant directions under the *Environmental Planning and Assessment Act 1979*, the Flood Prone Land Policy, the Flood Risk Management Manual 2023 (the Manual) and supporting guidelines. As detailed in the Support for Emergency Management Planning, the **NSW SES is opposed to the imposition of development consent conditions requiring private flood evacuation plans rather than the application of sound land use planning and flood risk management. The NSW SES also does not have statutory authority to endorse or approve flood emergency response plans.**

This proposal may be considered a 'high risk proposal' as determined in the PS 24-001 Planning Circular[4] as it is for a sensitive use (community facilities and vulnerable land use type) development located in a floodway with limited evacuation opportunities. The NSW SES refer to our previous emergency management advice for the SSD Application dated 15 August 2022 and 29 November 2022.

In summary, the NSW SES:

- **Support** the amendment removal of Lot 2 DP 600895 from the SSD application to the SSD Application for alterations and additions to St Philip's Christian College Cessnock Campus (SPCC).
- **Advise** the proposal for an additional 1,732 students[5] from Kindergarten to Year 12 at the St Philip's Christian College Cessnock Campus is likely to result in an increased requirement for government spending on emergency management services and emergency response measures due to the location of the property on land within the extreme flood which has significant flooding constraints, including frequent flash flooding, limited warning for Black Creek and localised road closures impacting evacuation.
- **Emphasise** that shelter in place is not a recommended flood emergency management strategy for this site. Schools or sections of schools that are at known risk of flooding or isolation should be closed prior to flooding commencing and when there is an indication that flooding is likely. The primary strategy for schools in flood-prone areas is early closure of the school and early evacuation of the site prior to the start of the school day if there is risk of flooding or isolation. This is particularly relevant for schools located in areas which become low flood islands, such as this site. Initially access roads close due to flood water and no overland or alternative road access

[4] Department of Planning, Housing and Infrastructure (2024) Planning Circular PS 24-001 page 3
[5] BMT (2024) - St Philip's Christian College Updated Flood Impact Assessment page 13

possible. As flood water continues to rise the site becomes inundated. In addition, sewerage lines and power to the area may be lost. If students remain in the area, they may be trapped, and it may be too dangerous for NSW SES to conduct rescues.

- **Emphasise** that **t**he evacuation routes are cut by localised flash flooding which, in addition to **effective zero warning time for Black Creek**[6], could see evacuation not completed in time. Due to the rapid onset of flood conditions experienced in most parts of the catchment, there is little in the way of warning that can be provided[7]. In addition, children are not able to self-evacuate and require assistance, adding to the required time to evacuate.
- **Acknowledge** and appreciate the submission of updated Flood Impact and Risk Assessment (FIRA)[8] and Flood Emergency Risk Plan (FERP)[9] as requested in our previous advice. This confirms:
    - the site as a low flood island. This presents a significant risk factor that would be best avoided for development due to the difficulties in carrying out large scale evacuation and/or rescue operations.
    - Hydraulic hazards on the site exceed the stability threshold for children[10] in larger flood events.
    - in a 20% AEP Post-development Peak Flood Level access for these proposed locations starts to be cut from the north of the site.
    - the minimum floor level is based on the 1% AEP flood level (including climate change) plus 500mm freeboard. This meets Clause 7.3 of the Cessnock Local Environmental Plan 2011 (LEP) Cessnock Council Flood Planning Concepts Fact Sheet 1[11].

If the proposal progresses, we also recommend**:**

- A risk-based approach for the proposed development site plan to give consideration of the most vulnerable students at least risk, for example locating the special school and early learning centre out of the Cessnock LGA Flood Planning Level with priority for access and egress during flooding.
- Making the buildings as safe as possible. This includes, but is not limited to, building design to withstand the potential flood and debris loadings of the PMF[12] to reduce the potential impact of flooding on the infrastructure. It also includes the provision of a safe refuge above the limit of flooding (PMF) for infill development may be an

[6] Cardno (2016) - Floodplain Risk Management Study and Plan Report Cessnock City Council Cessnock City (Black Creek) page 44.
[7] Ibid page 37.
[8] BMT (2024) - St Philip's Christian College, 10 Lomas Lane, Nulkaba Updated Flood Impact Assessment
[9] BMT (2024) - St Philip's Christian College, 10 Lomas Lane, Nulkaba Updated Flood Emergency Response Plan
[10] NSW Government Department of Planning and Environment (2023) - Flood risk management guideline FB03 Table 2 page 4
[11] Cessnock City Council (202) - Cessnock Council Flood Planning Concepts Fact Sheet 1
[12] Australian Building Codes Board (2019) – ABCB Standard Construction of buildings in flood hazard areas

advantage if the duration of flooding will be very short and the flood depth or velocity is high on or adjacent to the site. A refuge (or refuges) should have the capacity for the total number of occupants (students and staff) and be accessible during extreme flood events from every building location in that location. The success of this strategy will depend on the likely behaviour of people acknowledging school students are a vulnerable population. Building designs which put cars or other property under the refuge area may encourage people to take risks to save these items, and therefore is not preferred for future development that sees an increase in the number of people exposed to the risks.

- Undertaking regular exercising of a school flood emergency response plan, similar to a building fire evacuation drill, with the provision to allow people from lower floors to access refuge areas above PMF. This may also include emergency warning notification (or PA) system to reduce the risks to the school community and any occupants on site. The NSW SES also recommends updating the FERP at regular intervals and whenever additional flood information is available or highlighted during the drills or flood events.
- Considering the Greta and Black Creek Stage Two (Nulkaba to Branxton) Floodplain Risk Management Study and Plan (FRMSP) once it is finalised by Council, which will identify flood risks and hazards and provide suitable actions to manage flood risks in these areas. When available in 2024, flood modelling from this project should be used to update the Flood Emergency Risk Plan (FERP) and Flood Impact and Risk Assessment (FIRA).

Please feel free to contact Gillian Webber via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours sincerely,

Peter Cinque,
Senior Manager, Emergency Risk Assessment
NSW State Emergency Service

Annex C Council Responses to Proposed FERP

Nathan Cheah

From: Phillip Townsend <Phillip.Townsend@cessnock.nsw.gov.au>
Sent: Thursday, 14 July 2022 3:19 PM
To: Nathan Cheah; Jules Bosco
Cc: Kieran Smith; Netsanet Shiferaw
Subject: RE: [External] Flood evacuation plan

Hi Nathan,

Thank you for your contact & opportunity to review the plan. I think BMT have developed a very robust plan.

Please find some high level comments & suggestions for your consideration:

- References are made to various flood extents, e.g. 1% AEP, 5% AEP, 10% AEP (evacuation), 20% AEP (flood warning system activation) etc – suggest inundation mapping be included for some of these more common events to inform the emergency response
- Suggest to clearly identify who invokes this plan – it appears to be via existing (AS3745) ECO arrangements
- Where does this plan fit in terms of other site based emergency plans & is there any crossover or conflict with existing AS3745 evacuation arrangements?
- The recommendation to install a future site based flood warning system is an excellent idea
- Until a FWS is installed, is it worthwhile (where practicable) physically marking various critical flood extent levels within the college grounds to refer to in the plan?
- Due to the size of the Cessnock LGA & the location of the headwaters of the different creek/riverine systems within the LGA, the Cessnock Airport BoM rain gauge might be more appropriate to inform of potential flooding events rather than relying on Wollombi Brook water level gauge data – note that Council is about to install some new water level gauges at a number of locations in the Cessnock Urban Area - this data may not appear on the BoM website but the SES will have access to this information & the data can/will also be used for future flood model calibration

As you could probably appreciate, it might be a little while yet until the SES can respond due to their current operational workload.

Regards,

Phillip Townsend

CESSNOCK CITY COUNCIL

Phillip Townsend | Stormwater Engineer
62-78 Vincent St | PO Box 152 | Cessnock NSW 2325
p 02 4993 4109
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Integrity, Respect, Teamwork, Accountability and Excellence

From: Nathan Cheah <nathan.cheah@bmtglobal.com>
Sent: Thursday, 14 July 2022 11:39 AM
To: Phillip Townsend <Phillip.Townsend@cessnock.nsw.gov.au>; Jules Bosco <Jules.Bosco@cessnock.nsw.gov.au>

Cc: Kieran Smith <Kieran.Smith@bmtglobal.com>; Netsanet Shiferaw <Netsanet.Shiferaw@bmtglobal.com>
Subject: RE: [External] Flood evacuation plan

Thanks @Jules

Hi Phillip,

To help with our enquiry, attached are the draft FERP which we have developed for the SPCC development at Nulkaba and the powerpoint slides which summarise the FERP. DPE has requested that the FERP be developed in consultation with Council and SES and we are hoping to obtain some feedback from Council re: FERP. We have also contacted SES recently but still waiting for the local representative to return our call.

If it suits, we can organise a Teams meeting to go through the FERP with you and our client (SPCC) in attendance. Please let us know.

Thanks for your help.

Regards,

Nathan

Dr Nathan Cheah
Associate Principal Engineer

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From: Jules Bosco <Jules.Bosco@cessnock.nsw.gov.au>
Sent: Thursday, 14 July 2022 10:59 AM
To: Phillip Townsend <Phillip.Townsend@cessnock.nsw.gov.au>
Cc: Nathan Cheah <nathan.cheah@bmtglobal.com>
Subject: [External] Flood evacuation plan

Hi Phillip,
There is a regional planning application for additional development at St Phillip Christian college, Nulkaba and the applicant is requested to compile a flood evacuation plan as part of the application. Nathan would like some guidance on the requirements which also require SES input.
Please could you contact Nathan on 02 9195 1502 or the above email.

Regards

Jules Bosco **Principal Development Engineer**
BEng. Grad.Dip EngSc. MEngSc. MIAust CPEng NER
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18 June 2024

Department of Planning, Industry and Environment
Attention: Adam Flynn

Contact: Peter Giannopoulos
Our Ref: 52 2022 1
Your Ref: SSD-10360337

Dear Adam

Response to Amendment Report EXH-71386459 - SSD-10360337 – 52/2022/1
Description of Development - Additions to Cessnock's St Philip's Christian College

I refer to the abovementioned project, that was referred for comment on the 3 June 2024.

Please find below Council's comments in relation to this matter:

1. Council has previously articulated its concerns in respect to the permissibility of the Aquatic Centre. That the Aquatic Centre may be used in a manner that it will not be ancillary to the school and that it may constitute a 'recreation facility (indoor)' which is prohibited in the zone. Council requests that consideration be given to the characterisation of the development and, if the application is approved, to include enforceable conditions that will ensure the Aquatic Centre is used only as an ancillary component of the school.

2. Council has previously advised of concerns in respect to the flood impacts and the consequential risks to human life an property. Suitable consideration should be given to the assessment of flooding and the application of suitable conditions. It should be noted that the applicant's submission states that Cessnock Council has not adopted clause 5.22 of the standard instrument. This statement is not current and it should be noted that Clause 5.22 of the Cessnock Local Environmental Plan 2011 reads:

   5.22 Special flood considerations
   (1) The objectives of this clause are as follows—
   (a) to enable the safe occupation and evacuation of people subject to flooding,
   (b) to ensure development on land is compatible with the land's flood behaviour in the event of a flood,
   (c) to avoid adverse or cumulative impacts on flood behaviour,
   (d) to protect the operational capacity of emergency response facilities and critical infrastructure during flood events,
   (e) to avoid adverse effects of hazardous development on the environment during flood events.
   (2) This clause applies to—
   (a) for sensitive and hazardous development—land between the flood planning area and the probable maximum flood, and

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(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—

(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.

(4) A word or expression used in this clause has the same meaning as it has in the Considering Flooding in Land Use Planning Guideline unless it is otherwise defined in this clause.

(5) In this clause—
Considering Flooding in Land Use Planning Guideline—see clause 5.21(5).
flood planning area—see clause 5.21(5).
Flood Risk Management Manual—see clause 5.21(5).
probable maximum flood has the same meaning as in the Flood Risk Management Manual.
sensitive and hazardous development means development for the following purposes—

(a) boarding houses….

(f) educational establishments…

3. Council requests that a condition of consent be included to require the payment of a contribution in accordance with Council's contributions plan. Councils standard condition in respect to the requirement for contributions under section 7.12 is:

Cessnock Section 7.12 Levy Development Contributions Plan

A total monetary contribution of $ (insert her amount to the value of 1% of the cost of the development) (Fee Type Code - 499) is to be paid to Council, pursuant to Section 7.12 (cf previous s 94A) of the *Environmental Planning and Assessment Act 1979,* such contribution is to be paid prior to the issue of a Construction Certificate in respect of the proposed development.

i) This condition is imposed in accordance with the provisions of *Cessnock S94A Levy Development Contributions Plan 2017*. A copy of the document is available on Council's website at www.cessnock.nsw.gov.au or maybe inspected at Councils' Customer Services Section, Administration Building, Vincent Street Cessnock.

ii) The amount of contribution payable under this condition has been calculated on the basis of the current rate as at the date of consent and is based on the most recent quarterly Consumer Price Index (CPI) release made available by the Australian Bureau of Statistics (ABS). The CPI index rate is expected to rise at regular intervals and therefore the actual contribution payable is indexed and recalculated at the CPI rate applicable on the day of payment.

CPI quarterly figures are released by the ABS on a date after the indexation quarter and as a guide, these approximate dates are provided below. Indexation quarters from the ABS are as follows:

Indexation quarters	Approx release date

September	Late October
December	Late January
March	Late April
June	Late July

Any party intending to act on this consent should contact Council to determine the indexed amount of contribution on the date of payment.

NOTE: PRIOR TO PAYMENT OF ANY CONTRIBUTIONS, PLEASE CONTACT COUNCIL'S STRATEGIC PLANNING ASSISTANT ON 02 4993 4293 TO OBTAIN AN UP-TO-DATE AMOUNT PAYABLE FIGURE. AT THAT TIME, WE WILL ADVISE HOW YOUR CONTRIBUTIONS CAN BE PAID.

Thank you for the opportunity to contribute to the project. These comments are purposely general in nature, as Council seeks merely to assist with the assessment. If further comments or advice may assist with the assessment, feel free to contact me directly on telephone (02) 4993 4112 or via email peter.giannopoulos@cessnock.nsw.gov.au

Yours faithfully

P Giannopoulos

Peter Giannopoulos
Team Leader Development Services

Annex D BMT Responses to SES and Council

Table D.1. BMT Responses to SES Feedback

SES Comments	BMT Responses
It is the preference of NSW SES that all schools follow the application of sound land use planning and flood risk management. This includes site design and stormwater management measures that minimise any risk to the community. Furthermore, schools or sections of schools that are at known risk of flooding or isolation are closed prior to flooding commencing and when there is an indication that flooding is likely, for example, when there is a flood warning.	The BMT (2024) FIA which was undertaken to support the SSDA of the proposed development demonstrates how flood risks are managed on-site (e.g. with finished floor levels above the flood planning level). Section 5.3 of the FERP describes the procedures for school closure due to a flood event.
The NSW SES has reviewed the proposed FERP and the flood risk information (e.g. Local Flood Plan, Flood Studies etc.) available to the NSW SES, noting the proposed development is at risk of flooding in a and the adjacent roads may be cut by floodwaters. In accordance with sections 3.6, A-5, L-5, L-6.9.6 and N-7 of the NSW Floodplain Development Manual, 2005 (the Manual), the NSW SES is opposed to the imposition of development consent conditions requiring private flood evacuation plans rather than the application of sound land use planning and flood risk management. The NSW SES also does not have statutory authority to endorse or approve flood emergency response plans, which is referred to in the Manual (particularly section N7)	The BMT (2024) FIA which was undertaken to support the SSDA of the proposed development demonstrates how flood risks are managed on-site (e.g. with finished floor levels above the flood planning level). The residual flood risks up to the PMF extreme event are managed as part of the FERP prepared for the proposed development.
The Flood Impact Assessment should consider the full range of flooding, including events up to the Probable Maximum Flood (PMF). It is noted that the site itself is prone to flooding from Black Creek (page 4 of the Draft FERP and Black Creek Floodplain Risk Management Study and Plan 2015), with high depth and hazard in a PMF (1.2 to 2.5 metres depth). This is unsafe for children, and therefore they must not be exposed to the floods. The Black Creek Floodplain Risk Management Study and Plan does indicate earlier flooding at this site and Wine Country Drive than the 0.2% cited in the FERP. It is recommended that advice is sought from Council regarding any updated flood information available for this site.	The BMT (2024) FIA which was undertaken to support the SSDA of the proposed development has considered events up to the PMF. The FERP for the proposed development has been prepared based on the results from the BMT (2024) FIA, which is included as Annex A. Discrepancy in the flood results is discussed in the BMT (2024) FIA report.
Risk assessment should have regard to flood warning and evacuation demand on existing and future access/egress routes. Consideration should also be given to the impacts of localised flooding on evacuation routes. The local and regional road network is prone frequent flooding and would require caregivers to ensure they have adequate time to collect the children prior to the roads becoming flooded. As this age group of students are largely unable to self-evacuate, the evacuation time would require additional travel time	The impact on existing traffic due to the proposed development is documented in the *St Philip's Christian College, Cessnock - Transport and Accessibility Impact Assessment* (Stantec, 2022). Discussion on timing and the feasibility of the evacuation period are presented in Section 5.3 of the FERP, along with procedures for school closure due to a flood event. The FERP does not recommend driving through floodwaters.

SES Comments	BMT Responses
required for caregivers to reach the building prior to access becoming affected and proceed to safety. Evacuation must not require people to drive or walk through flood water. Therefore, ideally the school would be closed prior to the impact of flooding on the evacuation routes as indicated in the FERP, and preferably prior to the commencement of school for that day.	
Development strategies relying on deliberate isolation or sheltering in buildings surrounded by flood water are not equivalent, in risk management terms, to evacuation. Sheltering in a building within the flood extent is not safe, as proposed in of the FERP (section 4.3.2 of the FERP). Sheltering in buildings where entrances and exits may become flooded in the larger floods may result in isolating the children potentially without food or water for several hours or more depending on the weather system/s. Isolation also increases the risk of fire or medical emergencies and likelihood of caregivers entering floodwater to get to their children. It is unrealistic to assume parents or caregivers will not attend the school to pick up children in circumstances of flooding.	Additional comments included in Section 4.1 of the FERP outlining SES response and confirming a shelter-in-place plan is not suitable for any event except where it cannot be avoided due to unexpected changes in conditions which either made evacuation impossible or provided inadequate warning time (such as in the PMF extreme event).
Development strategies relying on an assumption that mass rescue may be possible where evacuation either fails or is not implemented are not acceptable to the NSW SES. This may occur if caregivers are unable to safely reach the children during a flood.	The principal flood emergency management approach as outlined in the FERP is school evacuation prior to evacuation routes and buildings becoming flooded. Additional comments included in Section 4.1 of the FERP outlining SES response and confirming a shelter-in-place plan is not suitable for any event except where it cannot be avoided due to unexpected changes in conditions which either made evacuation impossible or provided inadequate warning time (such as in the PMF extreme event).
It should be noted that gauges can go offline or become damaged or destroyed in severe weather and flooding. This can cause issues when relying on the gauge/s to trigger evacuation at a specific site. In addition, it is unclear as to who will be responsible for installing, maintaining, and managing the proposed onsite gauge/s and warnings associated with the gauge/s. Gauges that are not maintained properly can cause significant issues.	Section 5.2 of the FERP describes the need for redundancy in the system as well as current practice of observing Lomas Lane as the trigger of evacuation (fallback option should the warning system fails). It is recommended that the supplier be responsible for the installation and maintenance of the system, whilst the warnings would be relayed to the flood wardens during a flood emergency.
If the proposal progresses, we also recommend: *• A risk-based approach for the proposed development site plan to give consideration of the most vulnerable students at least risk, for example locating the special school and early learning centre out of the Cessnock LGA Flood Planning Level with priority for access and egress during flooding.*	• It is noted in this report that priority be given to occupants in the buildings with vulnerable occupants, and that the designated SIP building allocations should be reviewed and adjusted as necessary at

SES Comments	BMT Responses
• Making the buildings as safe as possible. This includes, but is not limited to, building design to withstand the potential flood and debris loadings of the PMF to reduce the potential impact of flooding on the infrastructure. It also includes the provision of a safe refuge above the limit of flooding (PMF) for infill development may be an advantage if the duration of flooding will be very short and the flood depth or velocity is high on or adjacent to the site. A refuge (or refuges) should have the capacity for the total number of occupants (students and staff) and be accessible during extreme flood events from every building location in that location. The success of this strategy will depend on the likely behaviour of people acknowledging school students are a vulnerable population. Building designs which put cars or other property under the refuge area may encourage people to take risks to save these items, and therefore is not preferred for future development that sees an increase in the number of people exposed to the risks. *• Undertaking regular exercising of a school flood emergency response plan, similar to a building fire evacuation drill, with the provision to allow people from lower floors to access refuge areas above PMF. This may also include emergency warning notification (or PA) system to reduce the risks to the school community and any occupants on site. The NSW SES also recommends updating the FERP at regular intervals and whenever additional flood information is available or highlighted during the drills or flood events.* *• Considering the Greta and Black Creek Stage Two (Nulkaba to Branxton) Floodplain Risk Management Study and Plan (FRMSP) once it is finalised by Council, which will identify flood risks and hazards and provide suitable actions to manage flood risks in these areas. When available in 2024, flood modelling from this project should be used to update the Flood Emergency Risk Plan (FERP) and Flood Impact and Risk Assessment (FIRA).*	the OFERP stage to ensure these needs are accounted for. • Verification has been completed by a structural engineer with the report attached in Annex G, confirming structural stability up to the PMF so as to withstand the hydrostatic, hydrodynamic, buoyancy and debris loads of PMF conditions. • Advice has been included in this report for update of the FERP at regular intervals to account for additional flood information that has been made available (e.g. flood studies or floodplain risk management studies and plans adopted by Council) and for highlighted learnings as a result of the drills or in the event of a flood. • This report presents an up to date assessment based on latest available information. The Greta and Black Creek Stage Two (Nulkaba to Branxton) FRMSP was not available at the time of writing this report.

Table D.2. BMT Responses to Council Feedback

Council Comments	BMT Responses
References are made to various flood extents, e.g. 1% AEP, 5% AEP, 10% AEP (evacuation), 18% AEP (flood warning system activation) etc – suggest inundation mapping be included for some of these more common events to inform the emergency response	A reference to the BMT (2024) FIA document is provided in Section 2.3. The FIA is now included as Annex A.
Suggest to clearly identify who invokes this plan – it appears to be via existing (AS3745) ECO arrangements	Chapter 5 of the FERP outlines the personnel and responsibilities in carrying out the FERP.

Council Comments	BMT Responses
Where does this plan fit in terms of other site based emergency plans & is there any crossover or conflict with existing AS3745 evacuation arrangements?	The latest FERP will supersede the previous FERP prepared by SMEC (2011). Following recommendation by SES, Council and the Department of Planning, an off-site evacuation approach is recommended in the latest FERP, which is a change from the shelter-in-place plan recommended in the previous FERP.
The recommendation to install a future site based flood warning system is an excellent idea	Added note to Section 5.2.1 indicating Council support.
Until a FWS is installed, is it worthwhile (where practicable) physically marking various critical flood extent levels within the college grounds to refer to in the plan?	Added note to Section 5.2 regarding addition of manually read flood markers at the NE Access on Lomas Lane
Due to the size of the Cessnock LGA & the location of the headwaters of the different creek/riverine systems within the LGA, the Cessnock Airport BoM rain gauge might be more appropriate to inform of potential flooding events rather than relying on Wollombi Brook water level gauge data – note that Council is about to install some new water level gauges at a number of locations in the Cessnock Urban Area - this data may not appear on the BoM website but the SES will have access to this information & the data can/will also be used for future flood model calibration	Added reference to gauge in Section 5.2.2. Added observation of gauge to Section 6.2.

Annex E Traffic Engineering Report

Nathan Cheah

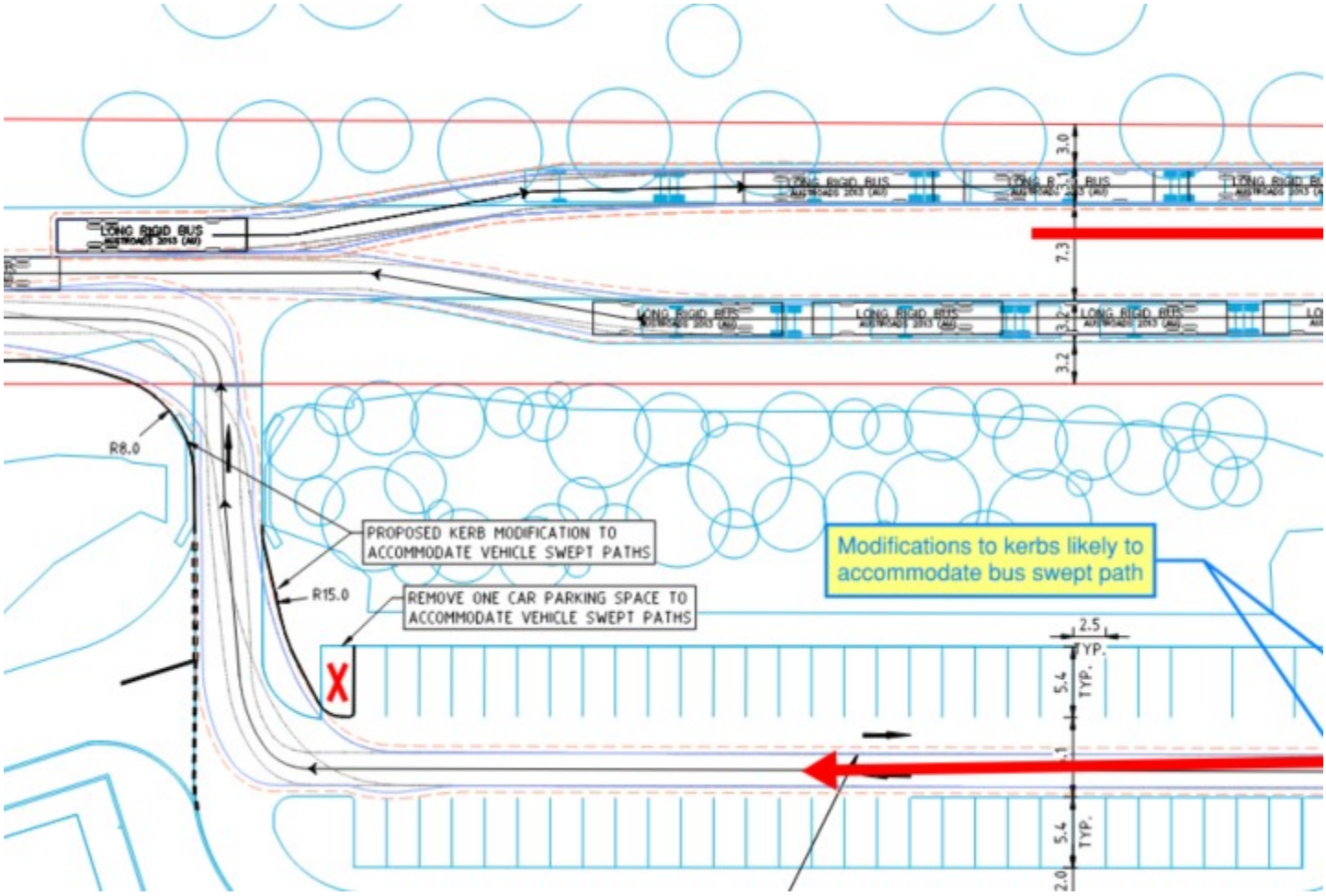
From: Hazell, Rhys <rhys.hazell@stantec.com>
Sent: Friday, 15 July 2022 4:31 PM
To: Rebecca Johnston; Bradley, Carla
Cc: David Price; Katrina Walker; Nathan Cheah
Subject: [External] RE: SPCC Cessnock - Flood Emergency Management Plan - Stantec comments

Hi Rebecca,

Following review of the Flood Emergency Response Plan, we have the following comments from a traffic perspective:

- Minor modifications will be required for the central access to allow buses to turn around, with the bus loop to the east anticipated to be flooded.
    - Subject to swept paths, kerbs to be amended and may potentially result in the loss of one parking space and the marked crossing would likely need to be extended – refer below bus route in red.
    - If buses are part of the FERP, pick-up can be facilitated in the car park – to be managed during evacuation, some cars may be held/block to allow safe passage for pedestrians.
- Bus access can already be accommodated at the WCD access with any pick-up to occur in the car park near the senior school.
- A flood evacuation period of 5 hours is considered adequate to accommodate full evacuation, with the first two hours able to accommodate access and entry via Lomas Lane.
    - With five hours before WCD access/egress is cut off, flood trigger would need to occur before 1pm (assuming after school care finishes at 6pm) otherwise all students would have a planned departure during the evacuation period anyway.

Overall, we are comfortable with the FERP and support from a traffic perspective.



Regards

Rhys Hazell
Senior Principal Transportation Planner

Direct: +61 2 8448 1800
Mobile: +61 431 426 532 or +61 459 952 112
rhys.hazell@stantec.com

Stantec
Level 16, 207 Kent Street
Sydney NSW 2000

From: Rebecca Johnston <rjohnston@barrplanning.com.au>
Sent: 15 July 2022 15:47
To: Hazell, Rhys <rhys.hazell@stantec.com>; Bradley, Carla <carla.bradley@stantec.com>
Cc: David Price <david@spcc.nsw.edu.au>; Katrina Walker <kwalker@barrplanning.com.au>; Nathan Cheah <nathan.cheah@bmtglobal.com>
Subject: FW: SPCC Cessnock - Flood Emergency Management Plan

HI Rhys

Just chasing an update this task for SPCC Cessnock and info needed to finalise the Flood Emergency Evac Plan.

If you could please liaise directly with Nathan Cheah at BTM nathan.cheah@bmtglobal.com, that would be great.

Dr Nathan Cheah
Associate Principal Engineer

Direct: +61 (02) 9195 1502

Regards

REBECCA JOHNSTON
PARTNER & PLANNING MANAGER

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From: Rebecca Johnston
Sent: Thursday, 7 July 2022 4:49 PM
To: Hazell, Rhys <rhys.hazell@stantec.com>
Cc: David Price <david@spcc.nsw.edu.au>
Subject: SPCC Cessnock - Flood Emergency Management Plan [Filed 07 Jul 2022 16:51]

Hi Rhys

Sorry to have missed your call earlier today.

As discussed, a today's meeting with BMT on eth Flood Emergency Management Plan, your input to test the assumptions made by BMT on the evacuation timeframes is required. If you could please provide some analysis based on the known split of travel modes for staff and students, this would assist.

If you could please provide to me by early next week this would be appreciated.

Regards

REBECCA JOHNSTON
PARTNER & PLANNING MANAGER

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THE FUTURE

Annex F Flood Evacuation Summary Table for School Staff

Table F.1. Proposed Triggers for Off-Site Evacuation Procedures

Recorded Flood Level or Visual inspection	Action
• Flood level of 56.9m AHD and rising. • Flood inundating the bus turnaround bay.	- Close or stop using the NE access point and keep monitoring flood level sensor. - Consider closure of school if level is reached outside of regular school hours and a severe storm or flood warning is issued by BoM. - Monitor rate of rise to determine if Shelter in Place (SIP) procedure may be required. - **If SIP is required, abandon Off-Site Evacuation and refer Table F.2. for SIP procedure.** - **If SIP is not required, continue with Off-Site Evacuation steps below.**
• Flood level reaching 57.3m AHD. **Note**: To reach the above trigger level, it would take approximately 2 hours after closure of NE access.	- Trigger school evacuation. - Start using NC access for vehicle entrance and the NW exit to service the northern set-down/pick-up area. - Use the southern access for vehicle entrance and exit to service the southern set-down/pick-up area.
• Flood Level reaching 57.5m AHD. **Note**: Lomas Lane at the intersection of the NC access will be inundated within approximately 3 hours after closure of NE access.	- Close the NC access point. - Continue to be using NW access point.
• Flood level reaching 57.7m AHD. **Note**: Lomas Lane at the intersection of the NW access would be inundated within approximately 1 hour after the closure of NC access.	- Close the NW access point. - Keep using the southern access point for vehicle entrance and exit to complete any outstanding evacuations.
• Flood level reaching 58.6m AHD. **Note**: Wine Country Drive in a northbound direction would be inundated within approximately 5 hours after the closure of NW access.	- Evacuation should be complete. - Any remaining persons to be evacuated should be directed in a southbound direction via Wine Country Drive.
• Flood level reaching 58.7m AHD. **Note**: • Wine Country Drive in a southbound route would be inundated within approximately 7 hours after the closure of NW access.	- Evacuation should be complete. - Any remaining persons still within the school grounds will require to shelter in place.

Table F.2. Proposed Triggers for Shelter in Place (SIP) Procedures

Recorded Flood Level or Visual inspection	Action
• An extreme event requiring SIP procedures can be characterised by rapid rise in floodwaters (in the magnitude of 2m/hr) leading up to the evacuation trigger level of 57.3m AHD. • Visual confirmation of an extreme event can be achieved if the NC pedestrian access at Lomas Lane is inundated within 1.5 to 2 hrs after the onset of intense rainfall. - **Note**: for context, inundation of the NC pedestrian access of Lomas Lane in 7 to 8 hrs after initial onset of rainfall would indicate a shorter duration rare event. This is not an extreme event and does not require SIP. • Monitor for rapid rise in floodwaters in the magnitude of 1m/hr in the hours following the evacuation trigger level of 57.3m AHD. • An extreme event of this magnitude is unlikely to occur. If the above flooding conditions are not observed, proceed with evacuation procedures in Table F.1.	• Immediately commence SIP proceedings to the upper floors of the nominated buildings A3, A4, B1, B2, C2, C3 and C4.

Annex G Building Structural Soundness Assessment

Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

3 September 2024

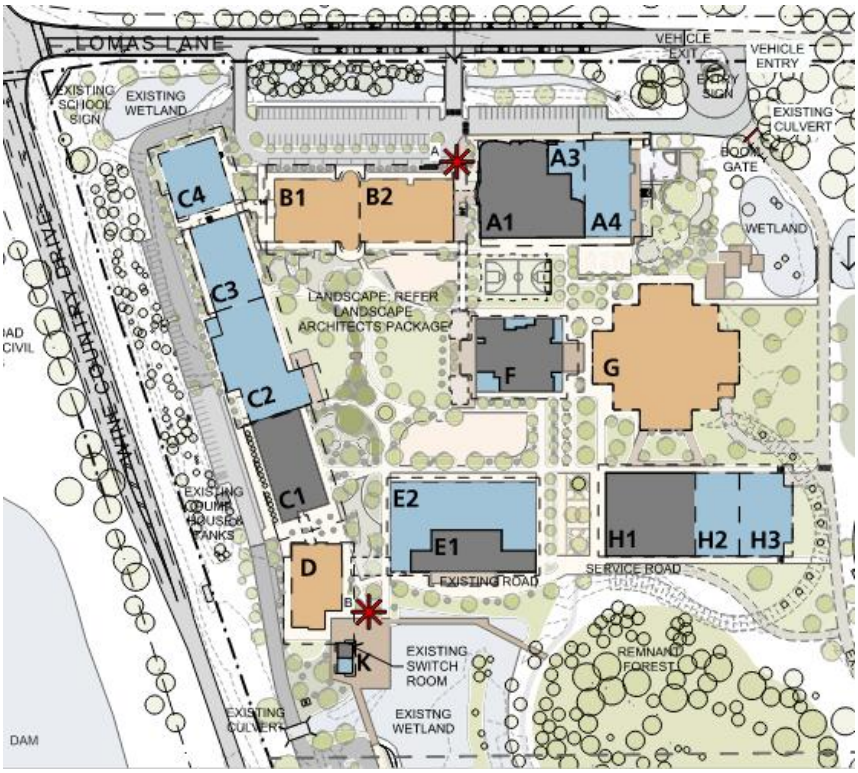
NL201218

Barr Planning
Katrina Walker
92 Young Street
Carrington NSW 2294

Dear Katrina,

Re: SPCC Cessnock – Flood Refuge Assessment

Northrop Consulting Engineers have been engaged by Barr Planning to review the suitability of the new buildings A3, A4, B1, B2, C2, C3 and C4 (see site plan below) being used as flood refuge during the probable maximum flood (PMF) event as defined in the flood emergency response plan by BMT (report A11230-002-09).



Proposed Site Plan

From the FERP report, we understand that to be considered appropriate for flood refuge the buildings will need to be remain structurally adequate during the PMF event, which would constitute a flood hazard level of H5 on the school site with a peak water level at RL60.8m. A H5 hazard is commensurate with flood velocities between 2 to 4 metres per second.

The proposed new buildings are all two-storey structure. The proposed structural system consists of reinforced concrete floor slabs with reinforced concrete columns and walls forming the building frame. The proposed ground floor levels are RL59.4m which correlates to 1.4m of inundation. At this depth

		Date
Prepared by	MA	03/09/2024
Checked by	CK	03/09/2024
Admin	HB	03/09/2024

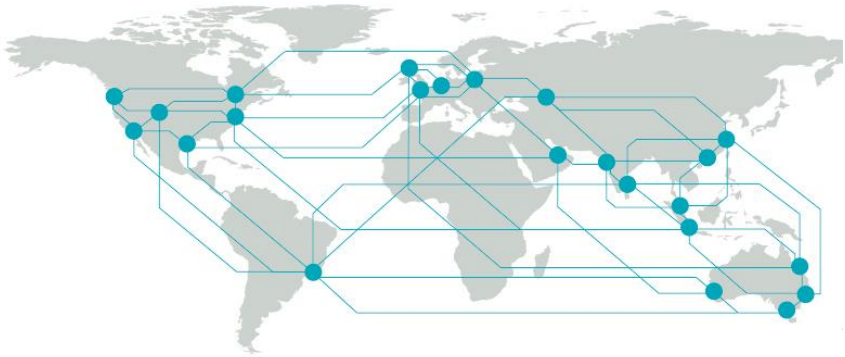
and an upper bound velocity of 4m/s, a reinforced concrete frame building can readily accommodate the structural loads imposed by the hydrostatic and debris actions and we are of the opinion that the structural integrity of these buildings would not be detrimentally affected if subjected to the structural loads commensurate with the PMF event of 1.4 metres of water depth at a maximum velocity of 4m/s.

We trust this meets your requirements, however, do not hesitate to contact us to discuss further.

Yours sincerely,

Matthew Allen
Principal | Structural Engineer
BEng (Civil) MIEAust CPEng NER (Structural)

		Date
Prepared by	MA	03/09/2024
Checked by	CK	03/09/2024
Admin	HB	03/09/2024



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