

# **FLOOD RESPONSE ASSESSMENT**

## **North Narrabeen Primary School**

Report Prepared for:  
**NSW Department of Education**



Project No. 1803

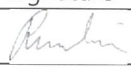
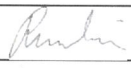
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# Document Verification

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Client Contact	Deborah Ainsley	

	Name	Signature	Issue:	Date
Prepared by	Rod Wiese		A	26/11/15
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Issued by	Rod Wiese			
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## Document History

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Form 1

## **APPENDIX B**

Tsunami Response Plan

# 1.0 INTRODUCTION

## 1.1. Preamble

This Plan has been prepared in support of Development Application for the proposed two demountable buildings in the North of the school site. The plan has been prepared in accordance with Amendment 18 to the Pittwater 21 DCP and Form 1 in located in Appendix A.

The new demountable buildings for the existing school trigger the requirement for a DA due to proximity to the boundary. The Flood Emergency Response Plan has been specifically developed for only these proposed demountable buildings as the remainder of the school is exempt from this Council consideration. However, a Plan for only 2 classrooms would be inappropriate and it is likely that the response developed would apply to the entire school.

## 1.2. Background and Context

North Narrabeen Primary School numerous buildings on approximately 2.4 Ha of land. The majority of the site is relatively flat and at levels of approximately RL 3.8 - 4.34m. The 1% AEP flood level is RL2.9m and PMF is RL 4.9m (Table 6-2 BMT-WBM, 2013). Therefore the majority of school land is above the 1% AEP level. However the area where the proposed demountable buildings are located has ground levels between RL 2 and 3m. The floor levels of the demountables are expected to be above the 1% AEP flood level.

There is no survey of the remaining School grounds. An inspection was undertaken to gauge the depth of flooding expected across the site in a PMF event and determine the buildings that likely have floor levels above the PMF.

Lower Mullet Creek is considered a long duration according to Pittwater LGA Flood Risk to Life Classification Study (Cardno, 2015). This suggests the flood is slow to recede which means stranded people would likely be marooned for a considerable time until the flood waters drop to a level to allow their escape. However, the flood level increases relatively slowly, which allows time to escape from potentially inundated areas prior to the peak occurring.

A Tsunami Response Plan has been previously developed for the School. The essence of this response is to evacuate the school on an announcement. The nominated route is across Mullet Creek to higher ground at Taiyul Road as per Appendix B. It is noted that the level of Mullet Creek Bridge is similar to the level of Garden Street.

It is also acknowledged that the school operates for a 7 hour period on weekdays for approximately 40 weeks of the year. This represents an attendance of approximately 16% for the year excluding after hours activities.



## 2.0 FLOOD RESPONSE

### 2.1. Strategy

Cardno (2015) suggests that the majority of flooding in the municipality has the nature of flash flooding and therefore recommended that in most cases evacuation would not be possible given the likelihood of accidents and subsequent delays. However in this case Mullet Creek is considered a long duration as it is low in the catchment and influenced hydraulically by Narrabeen Lagoon. This gives rise to the potential of evacuation by foot to the west of Mullet Creek assuming the evacuation occurs prior to inundation of Mullet Creek bridge.

Mullet Creek bridge appears to be inundated during the 1% AEP flood event according to the flood mapping examined. Therefore the evacuation command would need to be issued well in advance of the bridge being inundated to allow adequate time for successful evacuation. This will be gauged by common sense by noticing the rising waters in time to issue the evacuation command. It is recognised that this relies on observation and judgement by an unqualified/inexperienced persons given that most people never see flooding events of this magnitude due to the infrequency of occurrence. Therefore both Evacuation and Shelter-in-Place options have been considered below.

### 2.2. Evacuation

Evacuation is preferential to Shelter-in-Place and should be attempted prior to the Mullet Creek bridge being overtopped. No attempts should be made to cross the Mullet Creek bridge if flood waters are above the deck level. It is also strongly recommended that adult supervision is provided on the bridge whilst students are crossing so that:

- i. the pedestrian flow is not compromised by inquisitive students stopping to look at the flood waters and
- ii. a lookout is kept for very large floating debris that may damage the bridge. In this event the students must be evacuated quickly from the bridge and away from the likely point of impact.

If the Emergency Meeting Point was made consistent with the Tsunami Response Plan then the maximum distance from the furthest point in the School is 900m. Travelling at a rate of 3km/hr the total walk time would be 20 minutes. The distance to Garden Street which is located on the other side of Mullet Creek is approximately 450m so students would be beyond the waterway within 10 minutes excluding an allowance for other pedestrian traffic.

The allowance for mass pedestrian traffic has been assessed. Assuming there are approximately 650 people to evacuate walking at 3km/hr and separated by a distance of 2m we can calculate the time to pass a restriction. In this case it is assumed that it is the time taken to join the queue at the furthest point away in the school grounds for conservatism. The School's Principal advised that previous evacuation drills experienced students walking 4 people wide (isles). The time taken for a variety of scenarios is below.

No. of Isles	Queue Time
4	7 minutes
3	9 minutes
2	13 minutes

Assuming the traffic is 2 people wide then the queue time is 13 minutes and at 3 people wide it would be 9 minutes.

The above is likely over conservative as the students will commence their evacuation journey from a variety of areas within the school grounds so the queue will already be quite spread out.

It is likely that all people could be evacuated from the school to Garden Street in less than 30 minutes including queue time and less than 40 minutes to the Emergency Meeting Point.

An evacuation time under 1 hour which allows for a reasonable safety factor is considered quick relative to the timings of these large flood events. However a Shelter-in-Place response is provided below in case there are stranded students and teachers remaining on the school grounds.

## 2.3. Shelter-in-Place

The information below has been prepared in a consistent format to the guideline for Pittwater 21 DCP.

### Land to which this control applies:

7 Jackson Rd  
Warriewood NSW 2102  
Lot 4 DP1018621

### Uses to which this control applies:

Vulnerable

### Outcomes:

Protection of people

### Controls:

The Flood Life Hazard Category Mapping for Pittwater Council undertaken by Cardno (2015) describes the site as H3-H4. According to Figure 6-1 (Cardno, 2015) the PMF is expected to be H2 or H3 driven by the expected depth of water and low velocities suggested by previous modelling to be circa 0.5m/s.

This is classified as a tolerable risk (noted as yellow) and therefore the following controls apply to Vulnerable Uses:

Control	Description
1b	Flood Risk Assessment for Shelter-in-Place
2	Minimum floor equal or above PMF level for the Shelter
3	Floor Space Requirement at 2m <sup>2</sup> per person
4	Accessibility of Shelter-in-Place
5a	Building Stability during the 1% AEP Flood
6b	Serviceability

#### Control 1b

The adjacent existing demountable buildings are expected to have floor levels at RL 4.2 to RL 4.5m. This is considerable above the 1% AEP but lower than the PMF. Refer to details below for Shelter-in-Place assessment.

#### Control 2

From the site inspection there are a number of buildings that are likely to have floor levels above the PMF. Note this was determined by eye as survey was not available. The details are provided in the table below.

Nominated Building	Estimated Area (m <sup>2</sup> )
Block R	330
Block H	300
Block J	450
Block V (upper level only)	500

#### Control 3

The total area of the buildings likely above the PMF level is estimated to be 1,580m<sup>2</sup>. The requirement is 2m<sup>2</sup> per person which equates to 1,300m<sup>2</sup> for 650 persons. Therefore the area available satisfies this requirement.



#### Control 4

The library is a prominent building within the school site and well known to staff and students. It is a logical building to adopt as Shelter-in-Place.

#### Control 5a

The Shelter-in-Place is located above the 1% AEP and therefore no further assessment is required.

#### Control 6b

Council has a number of requirements to satisfy Control 6b. These are described below with the recommended action for each.

Council Requirement	Recommendation
Sufficient clean water for all occupants	Water will be available in the bathrooms of some buildings. The depth of flood water between these building would readily be navigable by an adult walking that would allow distribution of water if required.
Portable radio with spare batteries	Radio is now received on smart phones and it is likely that every adult and a portion of the students will have them.
First Aid Kit	This exists in the building as per school protocols.
Torch with spare batteries	Smart phones have in-built torch feature.
Emergency power	There is no emergency power planned for this event given the low likelihood, little demand for electricity and that the school is only in attendance for approximately 16% of the time.
Practical means of medical evacuation	Walking through the floodwater is likely relatively safe for an adult given the expected depth and velocity. However the broader area beyond the School is expected to be inundated as well so the only means may be by water craft or helicopter at and near the peak of the flood event.

## 3.0 CONCLUSIONS AND RECOMMENDATIONS

The Evacuation option is preferred and likely to be readily implemented in a safe manner with appropriate controls for supervision and prior to inundation of Mullet Creek bridge. The response is also consistent with the current evacuation plan for a Tsunami. Therefore a generic Evacuation Plan similar to the Tsunami Response Plan could be produced to address both emergency situations.

An addition plan for Shelter-in-Place should also be prepared in the event that students cannot be evacuated. The buildings that are likely to have floor levels above the PMF should be indicated on the Flood Response Plan.

Confirming the floor levels on the buildings may give satisfaction to the School or Council however this is not considered a critical task.

It is recommended to accept this assessment to inform the development of a Flood Response Plan for North Narrabeen Primary School.

# APPENDIX A

## Form 1

## 4 Attachment C – Form 1

### FLOOD EMERGENCY RESPONSE PLANNING FOR DEVELOPMENT IN PITTWATER POLICY FORM NO. 1 – To be submitted with Development Application

Development Application for

NSW DEPARTMENT OF EDUCATION  
(Name of Applicant)

Address of site: 7 JACKSON RD, WARRIEWOOD

Declaration made by hydraulic engineer or engineer specialising in flooding/flood emergency response as part of a Flood Risk Emergency Assessment:

I, ROD WIESE on behalf of STORM CONSULTING PTY LTD  
(Insert Name) (Trading or Business/ Company Name)

on this the 26<sup>TH</sup> NOVEMBER 2015 certify that I am a hydraulic engineer or engineer  
(Date)

specialising in flooding/flood emergency response and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least \$2million.

#### Flood Risk Emergency Assessment Details:

Report Title:

.....

Report Date: 26<sup>TH</sup> NOV 2015

Author: ROD WIESE

Author's Company/Organisation: STORM CONSULTING PTY LTD

I: ROD WIESE  
(Insert Name)

Please tick appropriate box (more than one box can be marked)

☒ have prepared the Flood Risk Emergency Assessment referenced on Form 1 in accordance with Council's guidelines and the Flood Emergency Response Planning for Development in Pittwater Policy.

☐ am willing to technically verify that the detailed Flood Risk Emergency Assessment referenced on Form 1 has been prepared in accordance with Council's guidelines and the Flood Emergency Response Planning for Development in Pittwater Policy.

☐ have examined the site and the proposed development in detail and have carried out a risk assessment (which has been attached to this form), and can confirm that:

☐ The addition/dwelling/building is located outside of the extents for Flood Life Hazard Categories H3-H4, H5 and H6 and a Flood Risk Emergency Assessment is not required.

☐ confirm that the results of the risk assessment for the proposed development are in compliance with the Flood Risk Management Policy for Development in Pittwater and a detailed risk assessment is not required for the subject site.



☐ have examined the site and the proposed development/alteration/addition in detail and I am of the opinion (after carrying out a risk assessment) that the Development Application does not require a Flood Risk Emergency Assessment and I have attached the risk assessment to this form.

☐ have reviewed (provide details of Report) the Flood Risk Emergency Assessment previously prepared for this property and can confirm it is up to date and is still current.

**Documentation which relate to or are relied upon in report preparation:**

☒ I am aware that the Flood Risk Emergency Assessment referenced on Form 1, prepared for the abovementioned site is to be submitted in support of a Development Application for this site and will be relied on by Pittwater Council as the basis for ensuring that the Flood Risk Management aspects of the proposed development have been adequately addressed to achieve an "Acceptable or Tolerable Risk" level for the life of the structure, taken as at least 100 years unless otherwise stated and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

**Hydraulic engineer or engineer specialising in flooding/flood emergency response details:**

Signature ..... 

Name ..... R.N. WIESE

Chartered Professional Status .....

Membership No. ....

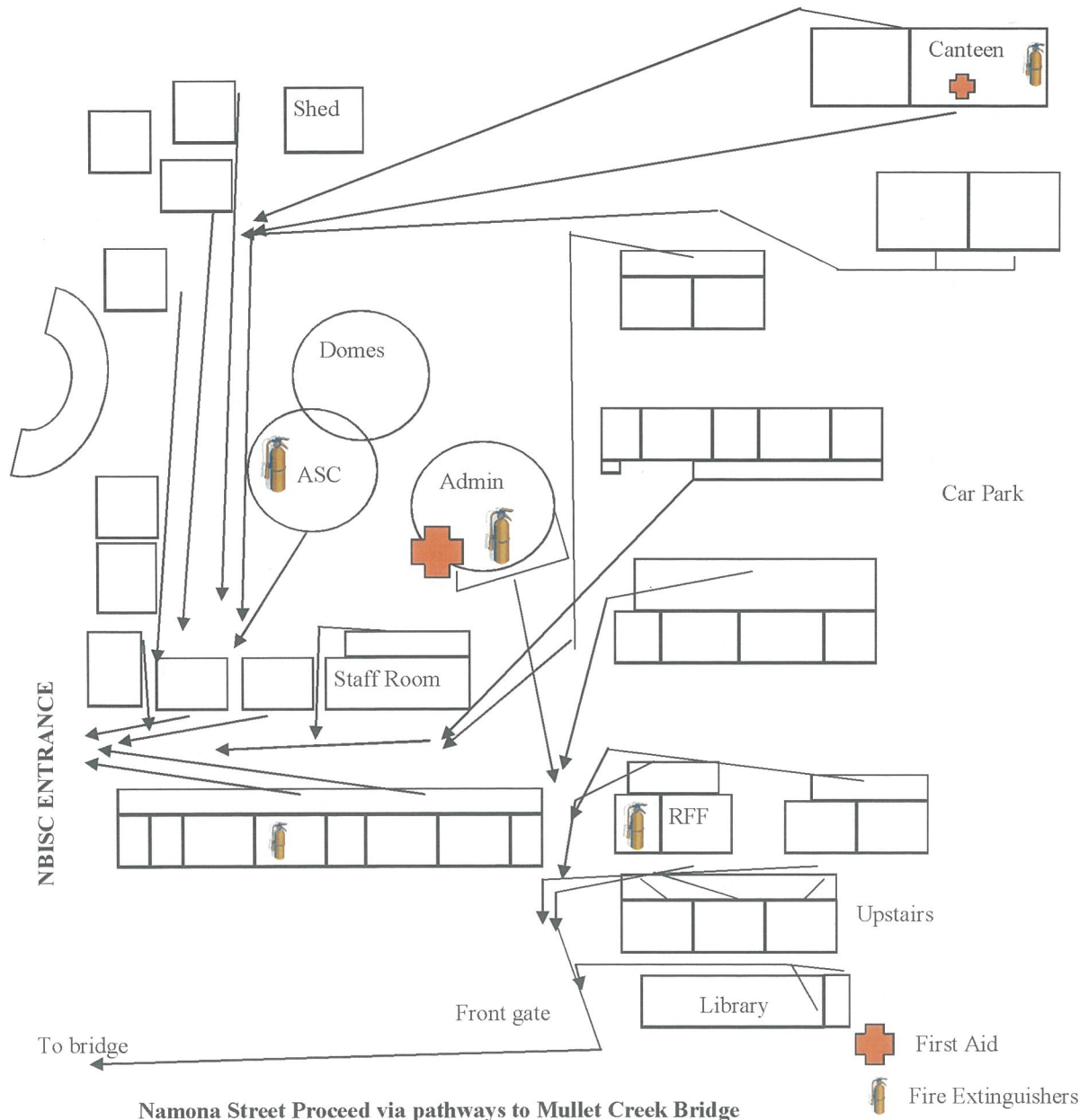
Company ..... STORM CONSULTING PTY LTD

Number of years specialising in flooding/emergency response ..... 22

# APPENDIX B

## Tsunami Response Plan

# NARRABEEN NORTH PUBLIC SCHOOL TSUNAMI — EVACUATION PLAN



## Procedures Tsunami

1. Everyone must evacuate the site **immediately** when the evacuation alarm sounds.
2. The following message will sound
3. "YOUR ATTENTION PLEASE. THIS IS A **TSUNAMI** EVACUATION. LEAVE THE BUILDING. LEAVE THE BUILDING. LEAVE THE BUILDING."
4. Instruct children to leave the classroom in an orderly manner.
5. Check areas such as toilets and store rooms near you as you leave.
6. Take Orange Class Folder.
7. Proceed to cross Mullet Creek Bridge exiting as indicated. Follow map on back to higher ground
9. Await instructions from Principal or Delegate.



## Evacuation Route in case of Tsunami warning.

It is important to cross Mullet Creek as quickly as possible and to move to higher ground.

