
Pittwater Data Services Pty Ltd
ABN 36098815537
165 Darley Street West
Mona Vale, 2103
Mobile: 0422088032
Email: pittwaterdataservices@live.com.au
Our Reference: PDS18012018:58LAGOON:NARR

Mr Justin Sinfield
58 Lagoon Street
North Narrabeen, 2101
18/01/2018

Re: Flood Risk Management Report for 58 Lagoon Street, North Narrabeen

Dear Justin,

EXECUTIVE SUMMARY

- The proposed additions at the *site* involve the construction of storage garage laundry (3.2 to 3.6m AHD) at the lower level and a bedroom ensuite (5.98 m AHD) at the upper level. This addition is adjacent to northern side of the existing dwelling as shown in Figures 4,5 and 6.
- The existing dwelling as shown in Figure 3 is on the fringe of the major floods to the 1AEP and contains floors at three levels (Garage 3.8mAHD, lower Floor 3.42) and upper level 5.81 and 5.98mAHD.
- Narrabeen Lagoon at the *site* Flood Planning Level (FPL) is 3.5 mAHD (3.0 1%AHD +0.5 freeboard). The PMF flood Level is 5 mAHD. The flood flows are across the lower portion of the *site* in a northerly direction at a moderate velocity.
- A standard Matrix Assessment was undertaken of the proposed developed as detailed in Appendix A. In essence the development complies with NBC DCP amendment dated 30th May 2017. The proposal will have insignificant impact on the flooding characteristics in terms of flood heights, velocities and storage for the 1%AHD flood event.
- The Flood Response Planning as detailed in Section 6.0 and Appendix B involves the use of the upper floor level of the existing dwelling as a Shelter-in Place. A medical emergency option is also discussed.

1.0 INTRODUCTION

I refer to your development at 58 Lagoon Street, North Narrabeen (Lot 72 DP 841873) as shown in Figures 4,5 and 6. The Northern Beaches Council has identified the property as High Risk Precinct. Therefore a Flood Risk Management Report (FRMP) of the design, flooding and evacuation process as detailed in the Development Control Plan (DCP) is required.

The following FRMP was undertaken and submitted as part of the required documentation. Note that 58 Lagoon Street, Narrabeen will be referred to as the *site*.

2.0 SITE INSPECTION

A *site* inspection was undertaken on the 19th January 2018 with yourself (owner of the *site*) and Mr Stephen Wyllie. The *site* is located on the eastern side of the Lagoon downstream of the Pittwater Road Bridge as shown in Figure 1. There are several features of the topography of the *site* and its location in the Lagoon that are important to the potential mainstream flooding processes and flood evacuation procedures. These are:

1. The *site* is located on the eastern foreshore, 200 metres downstream of Pittwater Road Bridge.
2. The western boundary of the *site* as shown in Figure 1 is the eastern bank of the Lagoon.
3. The *site* varies in level from 1.2 metre AHD on the western boundary to 7.5 metres AHD on the eastern boundary Figure 3. The lower portion of the allotment will be flooded.
4. The eastern boundary of the *site* is exposed to wind generated waves from the western sector, attenuated ocean tides (astronomical and storm surges) and catchment flood waters.
5. The *site* is within lower reaches of the Lagoon and would experience moderate flood and tidal velocities.
6. There is stable well vegetated bank near the western boundary.

The *site* is exposed to mainstream flooding from the Lagoon during high rainfall events and elevated ocean levels. The Lagoon water level at the *site* can also be controlled by high ocean water level when the entrance to the Lagoon is open. Lagoon under normal astronomical tidal tides experiences a tidal range of approximately up to 0.5metres in the vicinity of the *site*.

3.0 REVIEW OF EXISTING DATA

The *site* was surveyed by CMS Surveyors Pty Ltd Ref CAD File 10729detail dated 11th March 2013. (Figure 3).

The Narrabeen Lagoon flooding processes has been extensively studied by a number of investigations commissioned by then Pittwater and Warringah Councils. The more recent studies are :

1. Narrabeen Lagoon Flood Study September 2013 by BMT WBM (Ref 1).
2. Narrabeen Lagoon Floodplain Risk Management Study and Plan July 2015 (Ref 2).

The recorded flood level data published in these studies is extensive going back to the early 1900's. However many developments such as bridges, drainage pipes etc and occurred over this period affecting the flooding processes. The floods of interest for the *site* are shown in Table 3.1. Note that the flood recorded on the 5th of June 2016 is significant compared to previous events. This event flooded the lower portion of the *site* to the western edge of the existing dwelling (observed Sinfield per comm 2018).

The differences between the peaks immediately upstream of Pittwater and Ocean Road Bridges is approximately 0.1 to 0.2 metres for the 1%AEP equivalent floods.

Table 3.1: Recorded Peak Flood Levels

Date	Location	Flood Level m AHD	Comments
1942	Lagoon	2.70	Location unknown
1953	68 Wimbledon	2.19	observed
1956	78 Wimbledon	2.22	observed
1958	51 Wimbledon	2.04	observed
May 1974	27 Wimbledon	2.0	Highest ocean level recorded over 100years
March 1975	34 Wimbledon	2.18	observed
August 1986	Many sites on Wimbledon Estate	2.2	Observed by PWD staff

August 1998	Pittwater Road Bridge	1.81	Automatic continuous recorded water level data used for model calibration
April 1998	Pittwater Road Bridge	1.9	Automatic continuous recorded water level data used for model calibration
5 th June 2016	Pittwater Road Bridge	2.2	Automatic continuous recorded water level

Generally, with the exception of the 1942 event, the major flood peak levels in the Lagoon over the last 70 years have reached a level of approximately between 2 to 2.2m AHD. The 1998 events were recorded by an official PWD automatic water level gauge recording the rising and falling stages of the floods (hydrograph) as simulated in Figure 1. The hydrograph rate of rise is a process that is important in flood planning during a major event such as the 1%AEP flood. The history of flooding places a perspective on the design events such as the 1%AEP flood.

The recent flood event that occurred on the 5th June 2016 was observed at the *site* and in the immediate area (Sinfield per comm 2018). This has provided an insight into the flood process during a moderate event. However the 1%AEP is approximately a 1 metre higher than this event and the rate of rise may be more rapid.

4.0 RESULTS OF INVESTIGATION

The flood study which is relevant to this report is the GMT WBM 2013 study (Ref 1). The key findings for the 1%AEP and PMF floods that relate to the *site* specifically are:

1. The critical rainfall duration at Pittwater Road Bridge (PRB) is between 9 and 24 hours which equates (based IFD Bureau of Metrology curves) of between 230 to 340 mm of accumulated rainfall over the respective periods. This range of times and rainfall volumes will generate the highest peak water level of approximately 3.0m AHD (1%AEP) at the *site*.
2. The 1%AEP ocean storm surge and associated setup is 1.9m AHD at the *site* as observed at Pittwater Road Bridge during the May 1974 storm (Ref 2).
3. The rate of rise of the flood level between 1.2metres (flooded the western end of the *site* would trigger a high level of awareness) to 2.1 metres AHD (peak 1998 level) is approximately 3 hours as shown in Figure 1. The 1%AEP will be longer approximately 8 hours (Ref 2).
4. The combination of extreme catchment rainfall and ocean levels will result in the same predicted 1%AEP peak levels as the extreme catchment flooding alone. This suggests the dominance of catchment runoff at the *site*. The peak flood level is independent to the ocean tide at the *site*.

5. The 1%AEP is 3.0m AHD and the PMF is 5.0 metres AHD with the latter an extremely rare event which can occur in excess of every 10,000 years.
6. The entire foreshore of the *site* is inundated in a major event as shown in Figure 2 and 3.
7. At a peak flood level (3.0 metres AHD for the 1%AEP) velocities are moderate at the *site* and will flow in a northerly direction as shown in Figure 2. The flood definition of the *site* near the dwelling is considered to be flood fringe.
8. All immediate access routes from the *site* will not be flooded, however some roads leading out of the Narrabeen area are inundated for many hours once flood waters overtop the Lagoon banks. It is recommended not to leave the *site* except in a medical emergency where flood free access to Mona Vale Hospital is available along a route shown in Figure 1.

5.0 IMPACT OF THE ADDITIONS

The existing dwelling and proposed additions as detailed in Figures 4, 5 and 6 have the following features in relation to flood risk and impact on the flooding characteristics of the 1%AEP and higher floods.

1. The existing dwelling is on the fringe of the 1%AEP flood (Figure3).
2. The lowest ground floor is at 3.42m AHD 0.08m below the FPL of 3.5 metres AHD. Other floor levels are all above the FPL and vary from 3.6m to 5.98m AHD. The upper floor level is above the PMF and can be used as a Shelter-in-Place.
3. The garage floor level is 3.8 m AHD (above FPL) and has internal access to the habitable areas of the dwelling.

The proposed additions include the following features:

1. The finished lower floor level is 3.2 to 3.6 metres AHD (partially above FPL). This has been designated a storage area, laundry and garage.
2. The section of the lower floor level laundry and storage will be at 3.2mAHD (below FPL). This area will need to be flood proofed: flood compatible materials and power points at or above the FPL.
3. The foundations will have limited attenuation to the flood waters that inundate this area. That is the foundations need to open areas of between 50 and 75% of the total area of the foundations. Brick piers would suffice as shown in Figure 4.
4. The upper floor level is 5.98m AHD above the PMF.

The proposed additions would have minimal impact on the flooding characteristics of the Lagoon in terms of flood levels, velocities and storage. This area is a flood fringe in the vicinity of the dwelling for floods to 1%AHD.

As required by the DCP the proposed habitable floor levels are to be at or above the Flood Planning Level (FPL) of 3.5metres AHD. This requirement has been met as is the upper floor level of 5.98 m AHD as a Shelter- in- Place which is above the PMF of 5 m AHD.

The assessment matrix for a High Risk Precinct is detailed in Appendix A and the proposed additions meet these requirements.

6.0 FLOOD RISK ANALYSIS

The flooding process at the *site* during an extreme event results in the lower ground floor being inundated, including the northern end of Lagoon Street, one of the exit streets from the *site*. This occurs approximately over a 8 hour period during a 1%AEP event.

The lead up to this event there are a number of flood prediction services available which should be accessed to ensure sufficient planning and action. The sequence of information available are:

1. This report provides information on the flooding processes of the *site* particularly the experience with the recent flood on the 5th June 2016. The residents of the *site* should be aware of this information and key issues should be posted in a visible location: BoM warning process, inundation process of the *site* and an action plan (Appendix B).
2. Severe flood warnings for the Northern Beaches predicted by the Bureau of Meteorology (BoM), should be the trigger to prepare for a potential flooding at the *site*. This information is broadcasted on radio and TV and is available on BoM web site. Typically, rainfall intensities in excess of 10mm/hr over a period of 9 to 24 hrs will generate flooding in the Lagoon and the *site*.
3. A water level approaching 1.2 metres AHD will overtop the western boundary of the *site*. When rain is predicted to continue a major event may occur, particularly if flood warnings continue to be issued by BoM. The periods of spring tides and high ocean waves will also potentially impact on water levels at the *site*, depending on the condition of the entrance (open/closed).
4. As discussed in Section 4, the 1%AEP flood will rise to its peak value in 8 hours. During that time the final preparations should be concluded to secure items on the *site* and ensure the safety of all persons in the dwelling. The lower portion of the *site* should be cleared of any items that can be dislodged flood waters No Access to this area during the flood. These items should be stored above FPL. Vehicles should be moved to higher ground along the *site* driveway.

The access to any flood free haven away from the *site* is not considered viable: considering the rate of rise of the flood levels, general frequency of warnings from BoM, the low levels of surrounding access Roads and the potential traffic issues. As such, the upper floor level is to be adopted as a "Shelter- in-

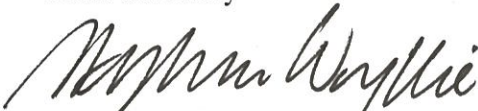
Place' (SiP). In the case of a medical emergency flood free access to Mona Vale Hospital is available along a route as shown in Figure 1.

The basic requirements of a SiP are:

1. The dwelling has access to a floor level at or above the PMF flood peak level of 5 m AHD. The upper floor level is 5.98m AHD.
2. Floor space has to be 2 square metres /person. The design is compliant with these guidelines.
3. Access to the first floor is via a staircase. This is provided.
4. There is a bathroom in the first level and sufficient storage for items that need to be raised above flood levels.
5. Hazardous materials that can be dislodged by floodwaters and should not be stored below PMF flood level.

In conclusion, considering the flooding processes at the *site* the design of the dwelling as detailed in Figures 4,5and 6, it is my opinion the design and this flood evacuation plan will satisfy NBC DCP 21 30th May 2017 requirements as detailed in Appendix A and B.

Yours Sincerely


Stephen Wyllie Bsc(Eng)
Director
18/01/2018

7.0 REFERENCES,

1. Narrabeen Lagoon Flood Study Sept 2013, BMT WBM .
2. Narrabeen Floodplain Risk Management Study and Plan July 2015 Cardno.
3. Pittwater LGA Flood Risk to Life Classification Study Jan 2015 Cardno

FLOODING WARNING

AWARENESS

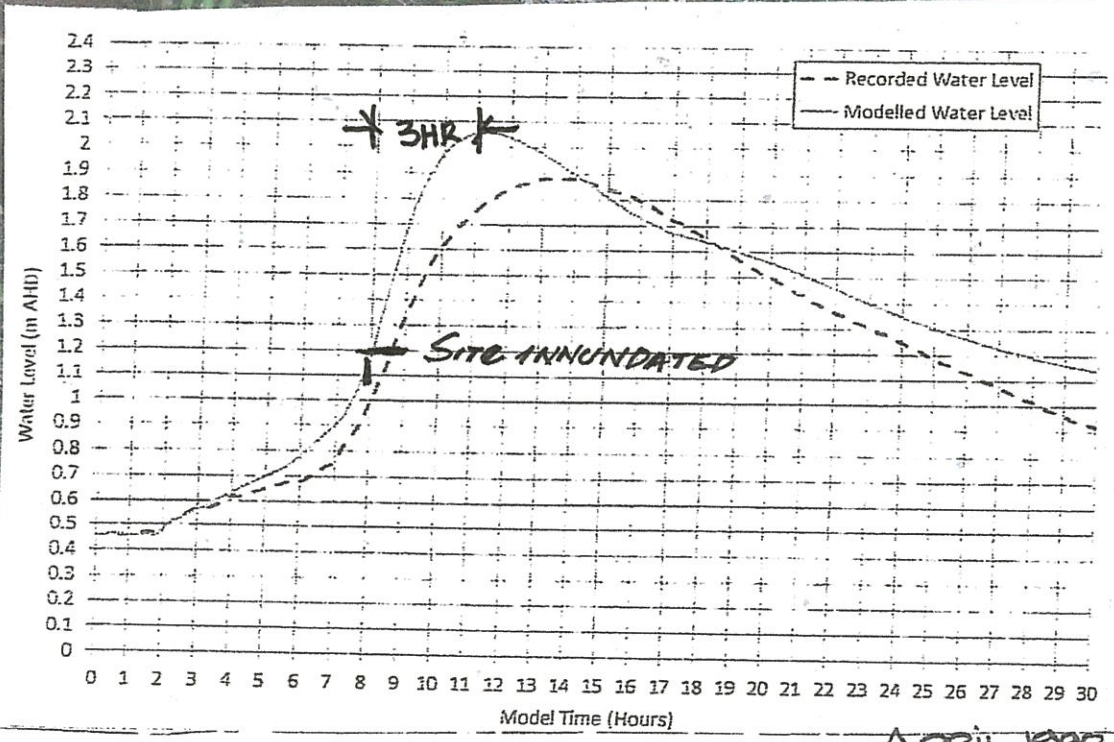
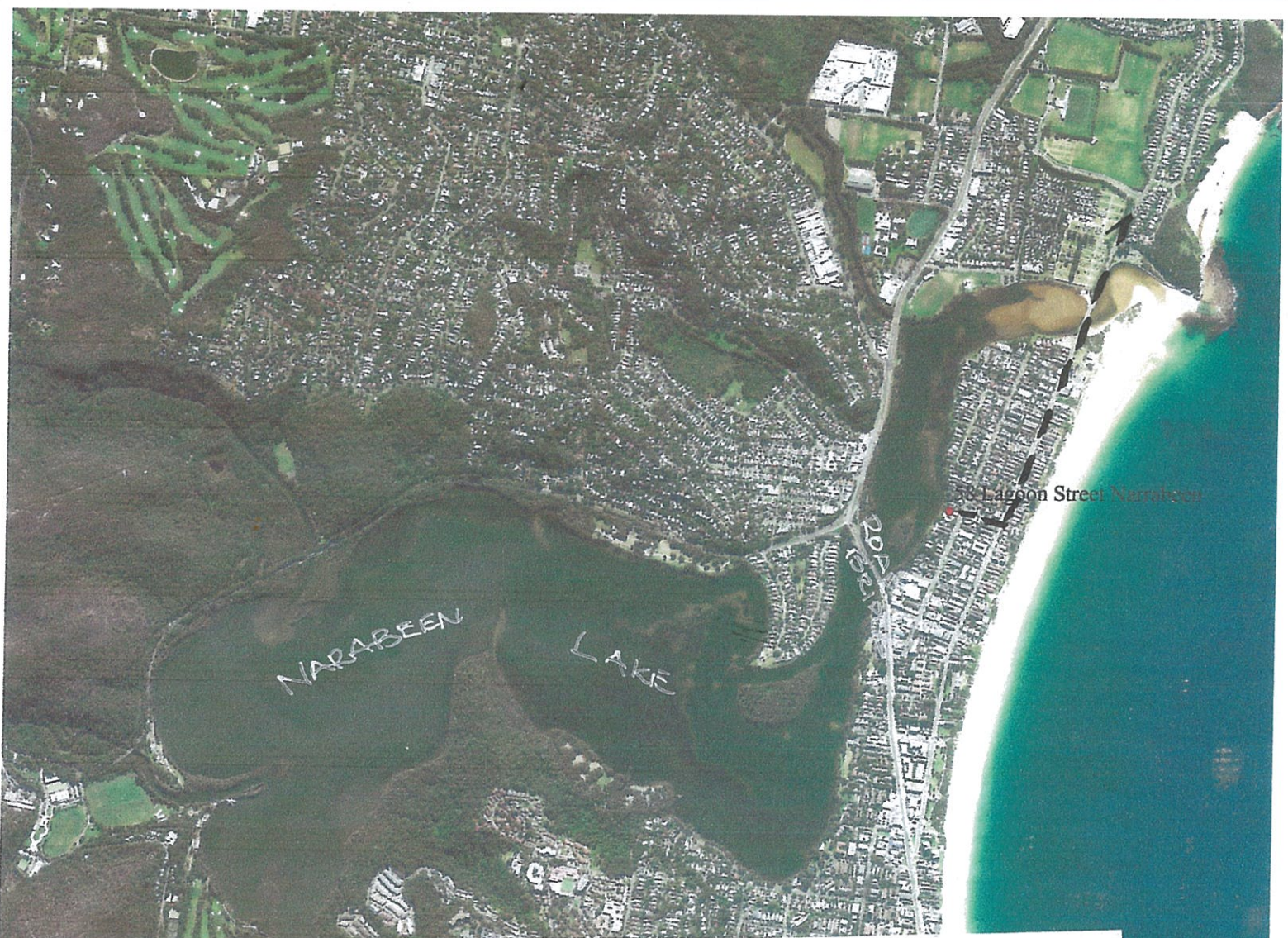
- Heavy rain and Ocean storms predicted by the Bureau of Metrology (BoM) : flood warning /flash flooding for the Northern Beaches.
- Monitor media reports for flood warnings in the Sydney Metropolitan Area.
- Observe local rainfall Lagoon flows at the *site*. Check Predicted Fort Denison Tides.
- Western boundary of *site* overtopped triggers Action Plan.

ACTION **BoM WARNINGS ISSUED**

- Account for all residents and visitors. Inform all residents and visitors of the potential flood situation and this Plan.
- Any items transportable by flood waters move to highest floor level.
- Move vehicles to higher ground on *site* driveway. Move essential items to Upper Floor Level
- Observe inundation of *site* and state of tide.
- Continue to monitor BoM reports and ocean conditions.
- If rainfall is intense and warnings continue evacuate and remain at Upper Floor Level.

POST FLOOD

- Inspect vehicles and *site* generally for safety particularly electrical problems.
- Account for all residents and visitors.
- Monitor BoM reports to ensure no further flood warnings and check on tide predictions.



U/S PITWATER ROAD BRIDGE

APRIL 1998

SOURCE: REFERENCE?

FIGURE 1



19TH JAN 2018 LOOKING WEST

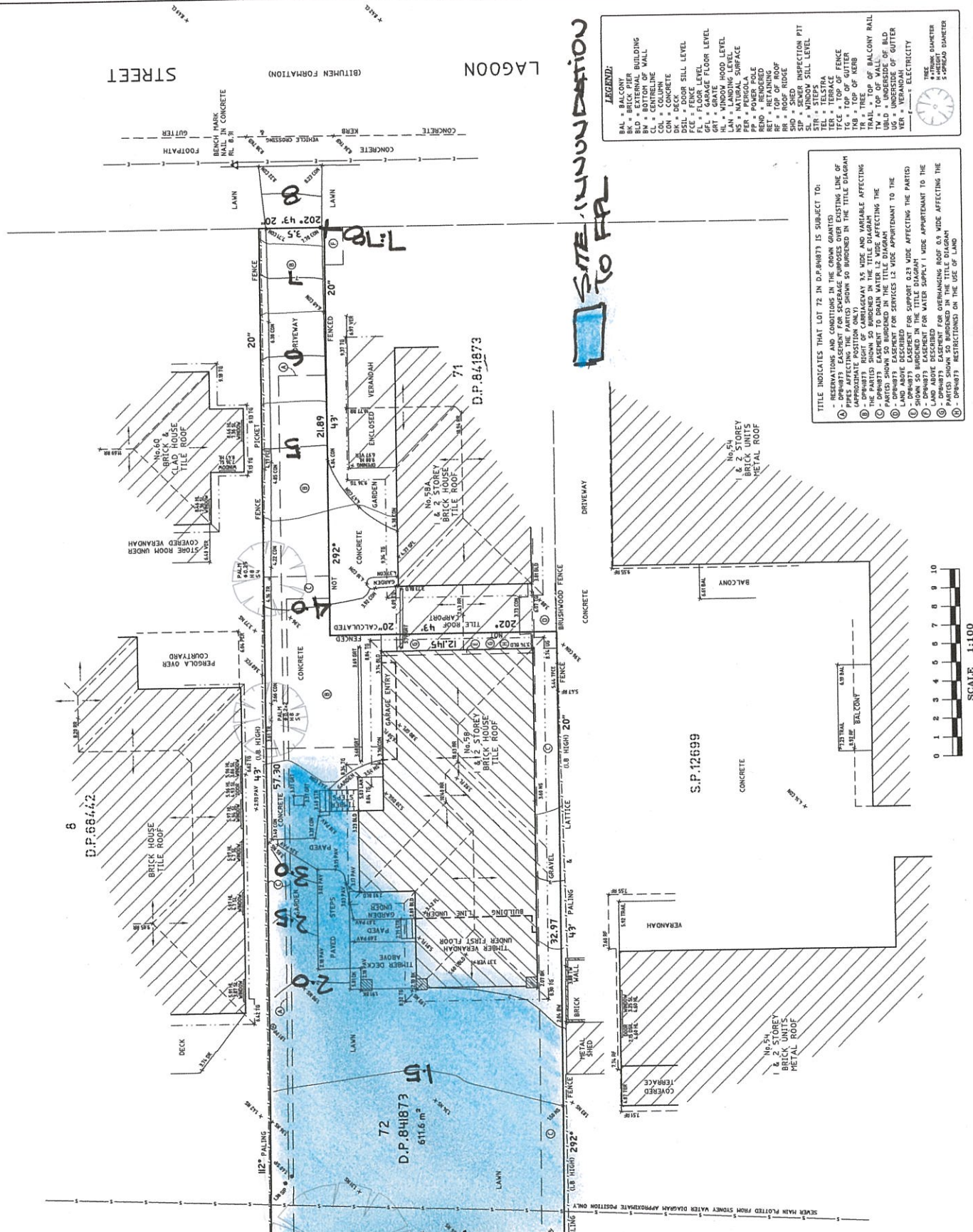


LOOKING EAST

← FLOOD FLOW

FIGURE 2

NARRABEEN S LAGOON



SCALE 1:100

 SITE LUNUDATION
TO FPA

LEGEND:

BA	RAIL	BR	BRICK	PI	PIER
BL	BLACK	BU	BUILDING	CL	CLAY
BN	BOTTOM	CA	CATCH	CM	COMMON
BT	BUTTON	CH	CHIMNEY	CO	CONCRETE
CL	CENTRELINE	CO	CONCRETE	CON	CONCRETE
CO	COMMON	CR	CRACK	CR	CRACK
CR	CRACK	CS	CROSS	CS	CROSS
CS	CROSS	CU	CURB	CU	CURB
CU	CURB	DL	DOWN	DL	DOWN
DL	DOWN	FL	FLOOR	FL	FLOOR
FL	FLOOR	GA	GARAGE	GA	GARAGE
GA	GARAGE	GL	GLASS	GL	GLASS
GL	GLASS	HL	HIGH	HL	HIGH
HL	HIGH	LD	LOAD	LD	LOAD
LD	LOAD	LN	LANDING	LN	LANDING
LN	LANDING	LS	LOW	LS	LOW
LS	LOW	MA	MATERIAL	MA	MATERIAL
MA	MATERIAL	PA	PAVEMENT	PA	PAVEMENT
PA	PAVEMENT	PP	POWER POLE	PP	POWER POLE
PP	POWER POLE	RE	REINFORCED	RE	REINFORCED
RE	REINFORCED	RT	RIGHT	RT	RIGHT
RT	RIGHT	SL	SILL	SL	SILL
SL	SILL	SP	SEWER	SP	SEWER
SP	SEWER	SR	SHOULDER	SR	SHOULDER
SR	SHOULDER	ST	STEP	ST	STEP
ST	STEP	TH	THRESHOLD	TH	THRESHOLD
TH	THRESHOLD	TC	TOP	TC	TOP
TC	TOP	TF	TOP OF FENCE	TF	TOP OF FENCE
TF	TOP OF FENCE	TR	TRE	TR	TRE
TR	TRE	TS	TOP OF SIGN	TS	TOP OF SIGN
TS	TOP OF SIGN	U	UNDER	U	UNDER
U	UNDER	UB	UNDERSIDE OF BLD	UB	UNDERSIDE OF BLD
UB	UNDERSIDE OF BLD	UN	UNDER	UN	UNDER
UN	UNDER	VA	VAN	VA	VAN
VA	VAN	VE	VEHICLE	VE	VEHICLE
VE	VEHICLE	EL	ELECTRICITY	EL	ELECTRICITY

INCHES
DIAMETER
THROAT
HORIZONTAL
DIRECTION
5' DIAMETER



TITLE INDICATES THAT LOT 72 IN D-PARTIES IS SUBJECT TO:

- A - D-PARTIES' EASEMENT FOR SIDEWALKS IN THE SHOWN GRANT(S)
- B - D-PARTIES' EASEMENT FOR SIDEWALK PURPOSES OVER EXISTING LINE OF PIPES
- C - APPROXIMATE POST-EXISTING EASEMENT FOR SIDEWALK PURPOSES OVER EXISTING LINE OF PIPES
- D - EASEMENT FOR CUMULATIVE 3/5 SIDE AND VARIABLE AFFECTING THE PARTIES SHOWN ON SUBSEQUENT IN THE TITLE DIAGRAM
- E - D-PARTIES' EASEMENT FOR SIDEWALK PURPOSES OVER EXISTING LINE OF PIPES
- F - D-PARTIES' EASEMENT FOR SERVICES 1/2 SIDE APPURTENANT TO THE LAND ABOVE DESCRIBED FOR SUPPORT 0.23 VIDE AFFECTING THE PARTIES SHOWN SUBJURED IN THE TITLE DIAGRAM
- G - D-PARTIES' EASEMENT FOR WATER SUPPLY 1/2 SIDE APPURTENANT TO THE LAND ABOVE DESCRIBED FOR SUPPORT 0.23 VIDE AFFECTING THE PARTIES SHOWN SUBJURED IN THE TITLE DIAGRAM
- H - D-PARTIES' EASEMENT FOR OVERHANGING ROOF 6/9 VIDE AFFECTING THE PARTIES SHOWN SUBJURED IN THE TITLE DIAGRAM
- I - D-PARTIES' RESTRICTIONS ON THE USE OF LAND

NOTES

[illegible]

HORIZONTAL DATUM:
CO-ORDINATE SYSTEM: ASSUMED

VERTICAL DATUM:
DATUM: AUSTRALIAN HEIGHT DATUM (AHD)
B.M. ADOPTED: PH 102?
R.L. 9.717 (ORDER L3)
SOURCE: S.C.I.N.S. (7/04/04)

CLIENT: JUSTIN SINFIELD
58 LAGOON STREET,
NARRABEEN NSW 2101

SURVEY PLAN
SHOWING DETAIL & LEVELS
OVER LOT 72 IN D.P.841873
58 LAGOON STREET,
NARRABEEN NSW 2101

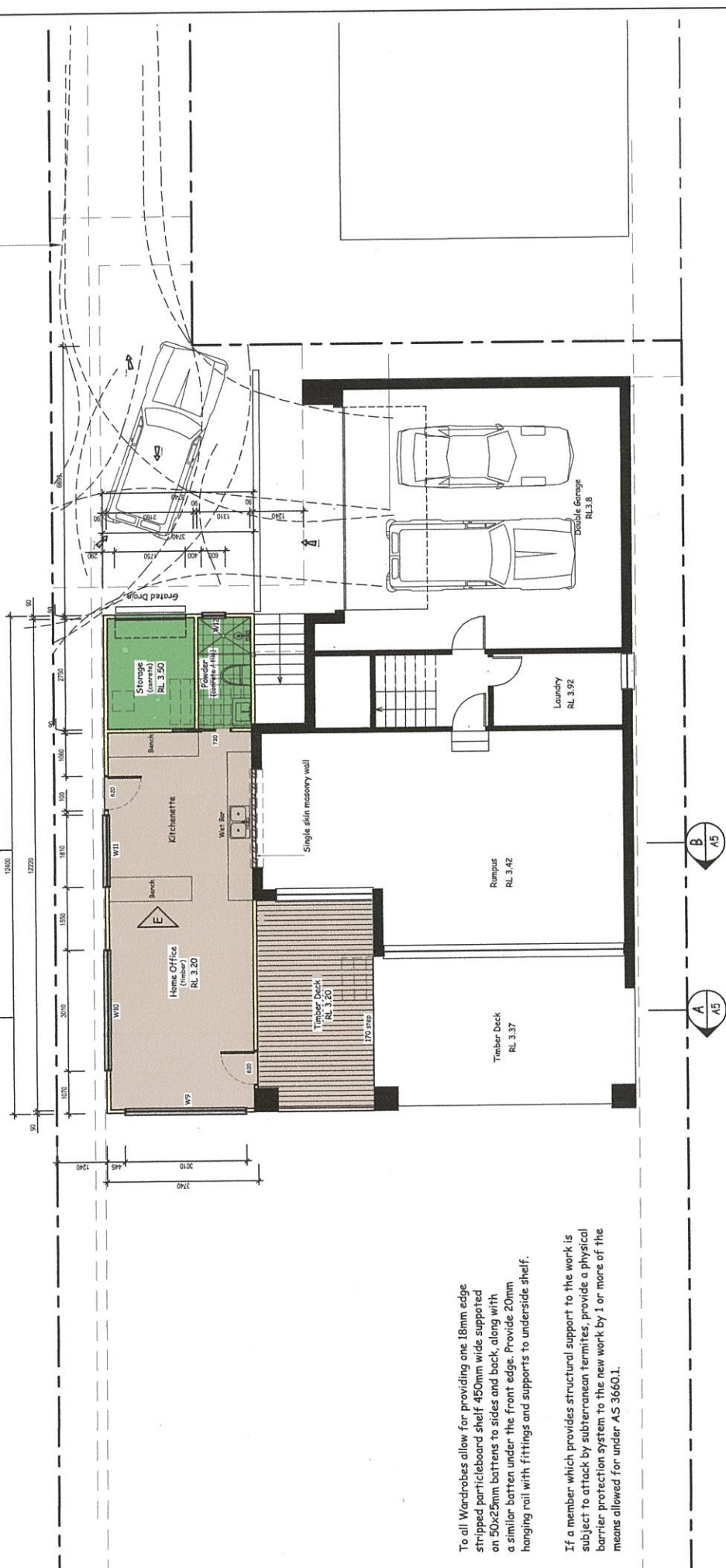
 C.M.S. Surveyors
Pvt Limited

SURVEYOR'S	ACN: 096 240 201 PO Box 403 One Way 1/72 Campbell Avenue, One Way Northcote Vic 3071 Australia See My Website 4032 Telephone: (03) 9971 4822 E-mail: info@one-way.com.au	LGA: WARRINGAH	SHEET 1 OF		APPROVED		DATE OF SURVEY 11/03/13	ISSUE
			SURVEYED	DRAWN	CHECKED	DATE		
			1	1	1	1	1	1
			SCALE		1:1000 AS 1			
			SURVEY INSTRUCTION		10729			
			DRAWING NAME		10729detail			
			CAD FILE		10729detail.dwg			

Figure 3



Standard Turning Circle
for passenger car.



Gross Floor Area = 161.85m²
Timber Deck Area = 39.36m²
Total = 201.21m²

To all Wardrobes allow for providing one 18mm edge stripped particleboard shelf 450mm wide supported on 50x25mm battens to sides and back, along with a similar batten under the front edge. Provide 20mm hanging rail with fittings and supports to underside shelf.

If a member which provides structural support to the work is subject to attack by subterranean termites, provide a physical barrier protection system to the new work by 1 or more of the means allowed for under AS 3660.1.

Date	Amendments
11/11/16	Bench added to Kitchenette
8/8/16	Vehicle turning circles added
24/5/16	Section 96 modifications
22/8/13	Garage mezzanine removed
8/8/13	Dining room window added



47 Townsley Street, Narrabeen, NSW, 2099
ABN 17 751 732 195
Sally mobile : 0414 731 685
Robert mobile : 0413 572 250
e-mail: robert@designanddraft.com.au
http://www.designanddraft.com.au

Justin
SINFIELD

Project: PROPOSED ALTERATIONS & ADDITIONS
58 LAGOON STREET, NARRABEEN
Drawing Title: LOWER FLOOR PLAN

Drawn	Checked	Scale	Date	Job Number	Drawing Number	Rev
R.G.	S.G.	1:100 @ A3	19 JUNE 2013	2-1913	A3	E

FIGURE 5

Gross Floor Area = 184.45m²

3 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

JUSTIN SINFIELD
(Name of Applicant)

Address of site: 58 LAGOON ST, NARRABEEN

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

I, STEPHEN WYLLIE on behalf of PITTWATER DATA SERVICES PTY LTD (PDS)
(Insert Name) (Trading or Business/ Company Name)

on this the 22nd JANUARY 2018 (Date) certify that I am a engineer or

consultant specialising in 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:

FLOOD RISK MANAGEMENT REPORT FOR

Report Date: 18 JANUARY 2018 58 LAGOON ST NARRABEEN

Author: STEPHEN WYLLIE

Author's Company/Organisation: (PDS) PITTWATER DATA SERVICES PTY LTD.

I: STEPHEN WYLLIE
(Insert Name)

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

☒ have followed Councils guidelines for 'Flood Risk Emergency Assessment Report (FREA)'

☒ 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.

☐ 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 *Stephen Wyllie*

Name **STEPHEN WYLLIE**

Chartered Professional Status **FMA**

Membership No. **2417175**

Company **PITTWATER DATA SERVICES PTY LTD**

Number of years specialising in flooding/emergency response **40 years**