Job Number: *240038*
Date: *10 December 2024*

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Re: 101 North Steyne– Flood Assessment Report

This report provides a flood assessment of proposed development at 101 North Steyne, Manly. The proposed development consists of a 5-storey residential apartment building with a basement car park. The site lies in an area of Manly with overland flow, in the Northern Beaches Council Local Government Area. This flood risk assessment describes flood behaviour in the vicinity of the site, before assessing the development's compliance with Manly Development Control Plan. The assessment finds that the development meets the flood-related requirements set out by Council, including not impacting existing flood behaviour and having entry points that meet the Flooding Planning Level requirements, including use of a flood gate used at the basement entry.

Background

The subject site is located at 101 North Steyne, which is bounded by North Steyne Road to the east and Pine Lane to the west. The lot is approximately 636m ^{2} with a rectangular shape of 42 m length east to west and 15 m width north to south. The site is flat with elevations in the vicinity of 5-6 mAHD. There is a gradual slope from east to west. The wider area has similar elevations of around 4-7 mAHD and does not concentrate to a creek or watercourse. The nearest watercourse (besides the ocean) appears to be Manly Lagoon some 0.6 km to the north of the site. The site location is shown on Image 1.

Relevant previous studies and policies to this assessment are:

- Manly Local Environmental Plans (LEP), 2013;
- Manly Development Control Plans (DCP), 2013;
- Manly to Seaforth Flood Study Flood Study Report (FS), (Cardno, 2019)
- Council's Comprehensive Flood Information Report (CFIR), 2024.

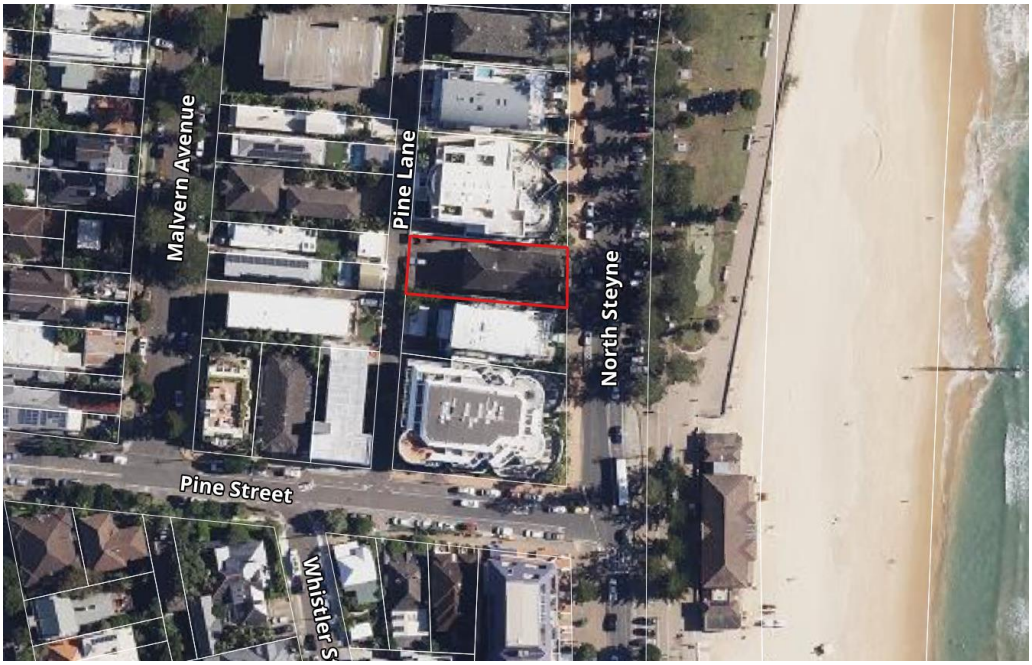


Image 1: Locality map

Manly to Seaforth FS, (Cardno, 2019)

The Northern Beaches LGA Flood Study was undertaken by Cardno in 2019. The Flood Study defines overland flow conditions across a ~ 11 km^2 largely residential area that drains either into Middle Harbour, North Harbour, or the Tasman Sea. The study assessed flooding by establishing a SOBEK/XP-RAFTS hydrologic/hydraulic modelling system, calibrated to historical flood events, and then used to run a series of design flood events. This modelling system was not used by the current assessment as the information in Council's Flood Information Report was sufficient for assessment purposes.

Existing Flood Behaviour

Flood study condition at the site for the existing conditions were extracted from the CFIR and Council's Flood Information Report for the site. Flood maps are extracted from the latter.

As Image 2 indicates, the site has limited flood affectation with only shallow overland flooding in the 1% AEP event, at the western boundary of the site in Pine Lane. Image 2 shows North Steyne at the east is effectively flood-free at the site, in the 1% AEP. The following flood information are tabulated at points 1 and 2 in Image 2:

- At 1, 1% AEP flood level of 5.97 mAHD, depth of 0.19 m, velocity of 0.13 m/s
- At 2, 1% AEP flood level of 5.97 mAHD, depth of 0.18 m, velocity of 0.16 m/s

There is therefore a flat, shallow area of ponding at the rear of the property. There is no indication of a flowpath in the mapping of the depths and velocities. There is minimal scaling in the Probable Maximum Flood, which reaches 6.20 mAHD at the same location. Flood behaviour is typical of an urban area with

limited catchment where shallow runoff accumulates on roadways when the pit and pipe capacity is exceeded during exceptionally heavy rainfall.

These conditions of shallow depths and low velocities have implication on the definition of the Flood Planning Level (FPL) as the DCP states:

"A reduced freeboard will be considered on its merits for properties impacted by peak flood depths less than 0.3m and velocity depths less than 0.3m2/s. The reduced freeboard must be appropriately justified in a Flood Management Report prepared by a suitably qualified professional."

Based on our assessment of the flood behaviour, the reduced freeboard is justified at this site. Council agreed with the reduced freeboard being appropriate in the pre-DA meeting. Consequently, the FPL for the site is 6.27 mAHD, which is equal to 1% AEP water level plus 0.3 m freeboard.

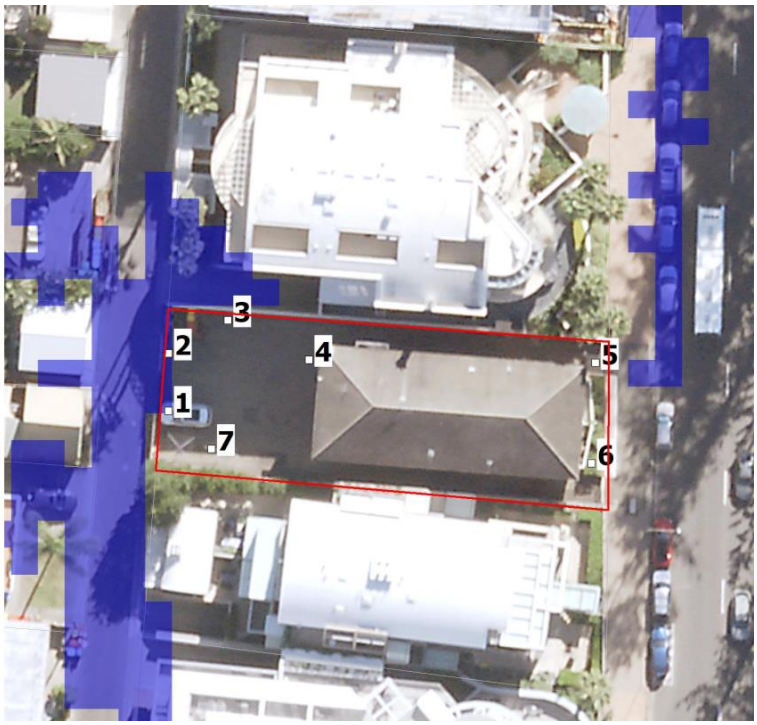


Image 2: 1% AEP flood extent (blue)

Flood Function/Hydraulic Categories

Hydraulic Categories refers to the classification of floodwaters into three categories: floodway, flood storage and flood fringe. These categories help to describe the nature of flooding across the floodplain and aid planning when assessing developable area. According to the Australian Emergency management Handbook 7, these three categories can be defined as:

- Floodway – the areas where a significant proportion of the floodwaters flow and typically align with defined channels. If these areas are blocked or developed, there will be significant redistribution of flow and increased flood levels across the floodplain. Generally, floodways have deep and/or fast moving floodwaters.

- Flood storage – areas where, during a flood, a significant proportion of floodwaters extend into, water is stored and then recedes after a flood. Significant filing or development in these areas may increase flood levels nearby; and
- Flood fringe – areas that make up the remainder of the flood extent. Development in these areas are unlikely to alter flood behaviour in the surrounding area.

As per Image 3, the site is adjacent to area of 'flood fringe' but the site itself is not shown as having any hydraulic category.

Image 3: 1% AEP Flood Hydraulic Categories

Proposed Development

The development proposed in the subject site is to replace the existing three-story masonry building with open carparking space with a five-story building having a garage in the basement. Access to the garage is from Pine Lane north-western corner of the property and there are six entries to the building around the ground floor perimeter. The entrances are shown on Image 4 below with entrances 7 and 8 being the basement entry.

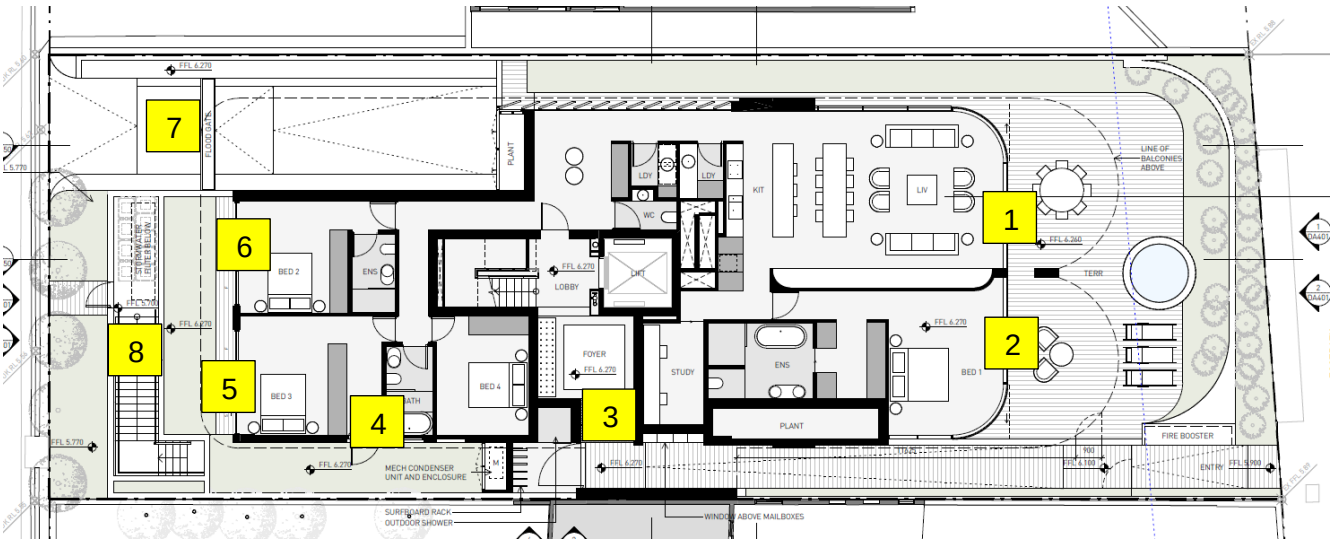


Image 4: Ground floor plan with entrances marked

Flood Planning Levels

Flood planning levels are set out in Council DCP. As previously described, the FPL for the site is the 1% AEP + 0.3 m freeboard. This applies to all building entrances, basement car park entrances, and any other openings such as vents that connect to the basement. The three points where an FPL applies are shown on Image 4 above. Table 1 shows the FPLs at each.

Table 1: Proposed development entrances summary

Entrances	1% AEP level (mAHD)	FPL	Proposed Level	Meets FPL requirement
1	5.97	6.27	6.27	Yes
2	5.97	6.27	6.27	Yes
3	5.97	6.27	6.27	Yes
4	5.97	6.27	6.27	Yes
5	5.97	6.27	6.27	Yes
6	5.97	6.27	6.27	Yes
7 – Basement Garage	5.97	6.27	5.97 crest level and flood gate to 6.27	Yes with flood gate
8 – Basement stairs	5.97	6.27	6.27	Yes

All liveable floors and their accesses are above the FPL. For the basement vehicle entrance, an automatic flood gate would provide protection to basement inundation. Council supported use of a flood gate in the pre-DA meeting of 17 October 2024.

Flood Impact Assessment

Development in the LGA is required to ensure it does not adversely impact existing flood behaviour. Impacts can arise from development obstructing or diverting flow, or removing flood storage from a floodplain area. In areas of flow conveyance and flood storage, the relevant flood model is used to determine the impacts. At the subject site, development does not have the potential to impact flood behaviour. There is no floodway or flood storage area and the inundation of the actual site is minimal. Model assessment was not deemed necessary and this approach was confirmed with Council's engineer.

Compliance with DCP controls

Northern Beaches LGA is subject to a number of LEPs and DCPs that were established for the former LGAs that Northern Beaches LGA became representative of. From those plans, Manly LEP (2013) and Manly DCP (2013) are the most appropriate for setting flood planning controls for the specific location of the site.

Given that the development is for 'Residential Use' and that the site falls, partially, within 'Medium Risk' precinct categorisation, Table 2: DCP Compliance below checks development compliance with Manly DCP requirements for such criteria.

Table 2: DCP Compliance

Item No.	Controls	GRC comment
A. Flood Effects Caused by Development		
A1	Development shall not be approved unless it can be demonstrated in a Flood Management Report that it has been designed and can be constructed so that in all events up to the 1% AEP event: a) There are no adverse impacts on flood levels or velocities caused by alterations to the flood conveyance; and b) There are no adverse impacts on surrounding properties; and c) It is sited to minimise exposure to flood hazard. Major developments and developments likely to have a significant impact on the PMF flood regime will need to demonstrate that there are no adverse impacts in the Probable Maximum Flood.	Complies. The development would not cause any adverse impacts on flooding. See flood impact assessment section above.
A2	Development shall not be approved unless it can be demonstrated in a Flood Management Report that in all events up to the 1% AEP event there is no net loss of flood storage. Consideration may be given for exempting the volume of standard piers from flood storage calculations. If Compensatory Works are proposed to balance the loss of flood storage from the development, the Flood Management Report shall include detailed calculations to demonstrate how this is achieved.	Complies. The Site will not result in any loss of flood storage.
B. Building Components and Structural Soundness		

B1	All buildings shall be designed and constructed with flood compatible materials in accordance with "Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas", Hawkesbury-Nepean Floodplain Management Steering Committee (2006).	Complies. The building itself is located above the 1% AEP flood level and the lot is shown as not flooded in Council mapping.
B2	All new development must be designed and constructed to ensure structural integrity up to the Flood Planning Level (FPL), taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Where shelter-in-place refuge is required, the structural integrity for the refuge is to be up to the Probable Maximum Flood level. Structural certification shall be provided confirming the above.	Complies. The development will not be inundated in a 1% AEP. Depths and velocities in adjacent areas are negligible in regards to structural integrity.
B3	All new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed and/or located above the Flood Planning Level. All existing electrical equipment and power points located below the Flood Planning Level within the subject structure must have residual current devices installed that turn off all electricity supply to the property when flood waters are detected.	To be confirmed at construction certificate stage when the location of power points, wiring etc. is determined. This appears readily achievable given the minimal flood affectation.
C. Floor Levels		
C1	New floor levels within the development shall be at or above the Flood Planning Level (FPL).	Complies See Flood Planning Levels section. Building entries comply, basement entry does not (see control D6).
C3	All new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event. For suspended pier/pile footings: a) The underfloor area of the dwelling below the 1% AEP flood level is to be designed and constructed to allow clear passage of floodwaters, taking into account the potential for small openings to block; and b) At least 50% of the perimeter of the underfloor area is of an open design from the natural ground level up to the 1% AEP flood level; and c) No solid areas of the perimeter of the underfloor area would be permitted in a floodway	Complies See flood impact assessment section of report

C4	A one-off addition or alteration below the Flood Planning Level of less than 30 square metres (in total, including walls) may be considered only where: a) it is an extension to an existing room; and b) the Flood Planning Level is incompatible with the floor levels of the existing room; and c) out of the 30 square metres, not more than 10 square metres is below the 1% AEP flood level. This control will not be permitted if this provision has previously been utilised since the making of this Plan. The structure must be floodproofed to the Flood Planning Level, and the Flood Management Report must demonstrate that there is no net loss of flood storage in all events up to the 1% AEP event.	Not applicable
C6	Consideration may be given to the retention of an existing floor level below the Flood Planning Level when undertaking a first floor addition provided that: a) it is not located within a floodway; and b) the original foundations are sufficient to support the proposed final structure above them. The Flood Management Report must include photos and the structural certification required as per Control B2 must consider whether the existing foundations are adequate or should be replaced; and c) none of the structural supports/framing of existing external walls of are to be removed unless the building is to be extended in that location; and d) the ground floor is floodproofed.	Not applicable – building is to be completely replaced
D. Car Parking		
D1	Open carpark areas and carports shall not be located within a floodway.	Complies. No open carpark is proposed.
D2	The lowest floor level of open carparks and carports shall be constructed no lower than the natural ground levels, unless it can be shown that the carpark or carport is free draining with a grade greater than 1% and that flood depths are not increased.	Complies. No open carpark or carport is proposed
D3	Carports must be of open design, with at least 2 sides completely open such that flow is not obstructed up to the 1% AEP flood level. Otherwise it will be considered to be enclosed. When undertaking a like-for-like replacement and the existing garage/carport is located on the street boundary and ramping is infeasible, consideration may	Complies. As above

	be given for dry floodproofing up to the 1% AEP flood level.	
D4	Where there is more than 300mm depth of flooding in a car park or carport during a 1% AEP flood event, vehicle barriers or restraints are to be provided to prevent floating vehicles leaving the site. Protection must be provided for all events up to the 1% AEP flood event	Complies. As above
D5	Enclosed Garages must be located at or above the 1% AEP level	Complies. No enclosed garage proposed
D6	All enclosed car parks (including basement carparks) must be protected from inundation up to the Flood Planning Level. All access, ventilation, driveway crests and any other potential water entry points to any enclosed car parking shall be above the Flood Planning Level. Where a driveway is required to be raised it must be demonstrated that there is no net loss to available flood storage in any event up to the 1% AEP flood event and no impact on flood conveyance through the site. Council will not accept any options that rely on electrical, mechanical or manual exclusion of the floodwaters from entering the enclosed carpark	Complies As described, basement protected by ramped entry and a flood gate.
E. Emergency Response		
E1	If the property is affected by a Flood Life Hazard Category of H3 or higher, then Control E1 applies and a Flood Emergency Assessment must be included in the Flood Management Report. If the property is affected by a Flood Life Hazard Category of H6, then development is not permitted unless it can be demonstrated to the satisfaction of the consent authority that the risk level on the property is or can be reduced to a level below H6 or its equivalent. If the property is flood affected but the Flood Life Hazard Category has not been mapped by Council, then calculations for its determination must be shown in the Flood Management Report, in accordance with the "Technical Flood Risk Management Guideline: Flood Hazard", Australian Institute for Disaster Resilience (2012). Where flood-free evacuation above the Probable Maximum Flood level is not possible, new development must provide a shelter-in-place refuge where: a) The floor level is at or above the Probable Maximum Flood level; and b) The floor space provides at least 2m2 per person where the flood duration is long (6 or more	Complies Site is only affected by H1 hazard category in the PMF event; requirements in this item are not applicable

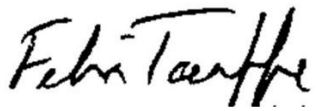
	hours) in the Probable Maximum Flood event, or 1m2 per person for less than 6 hours; c) It is intrinsically accessible to all people on the site, plainly evident, and self-directing, with sufficient capacity of access routes for all occupants without reliance on an elevator; and d) It must contain as a minimum: sufficient clean water for all occupants; portable radio with spare batteries; torch with spare batteries; and a first aid kit Class 10 classified buildings and structures (as defined in the Building Codes of Australia) are excluded from this control. In the case of change of use or internal alterations to an existing building, a variation to this control may be considered if justified appropriately by a suitably qualified professional. Note that in the event of a flood, occupants would be required to evacuate if ordered by Emergency Services personnel regardless of the availability of a shelter-in-place refuge.	
F. Fencing		
F1	Fencing, (including pool fencing, boundary fencing, balcony balustrades and accessway balustrades) shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. At least 50% of the fence must be of an open design from the natural ground level up to the 1% AEP flood level. Less than 50% of the perimeter fence would be permitted to be solid. Openings should be a minimum of 75 mm x 75mm.	Complies Site in not in a floodway and no open carpark is proposed; no flow obstruction is expected.
G. Storage of Goods		
G1	Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.	Complies Bins room not proposed in flood affected area
H. Pools		
H1	Pools located within the 1% AEP flood extent are to be in-ground, with coping flush with natural ground level. Where it is not possible to have pool coping flush with natural ground level, it must be demonstrated that the development will result in no net loss of flood storage and no impact on flood conveyance on or from the site.	Complies No pool proposed within 1% AEP flood extent

	All electrical equipment associated with the pool (including pool pumps) is to be waterproofed and/or located at or above the Flood Planning Level. All chemicals associated with the pool are to be stored at or above the Flood Planning Level.

Conclusions

A flood assessment has been carried out for proposed development at 101 North Steyne, Manly. The site is located in an area of Manly with overland flow and has minor flood affectation on the west side of the lot. The assessment concluded that proposed development will have no impact on existing flood behaviour. It also found that entry levels are sufficiently high to meet the Flood Planning Level. Other flood planning controls have been met by the design.

Yours sincerely,



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