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14 February 2019

## **Coastline Risk Management Report for 17 Ocean Road Palm Beach**

### **1. INTRODUCTION AND BACKGROUND**

At 17 Ocean Road Palm Beach, it is proposed to demolish the existing residence and rebuild a new single-storey residence. A Development Application (DA) is to be submitted to Northern Beaches Council seeking consent for these works. Given the proximity of the site to Palm Beach<sup>1</sup>, a coastal engineering assessment is required by Council. Specifically, any DA for the property must be carried out in accordance with the "Coastline Risk Management Policy for Development in Pittwater" (Appendix 6 of the Pittwater 21 DCP<sup>2</sup>), hereafter denoted as the "Coastline Policy". Based on the Coastline Policy, a Coastline Risk Management Report is required as part of a DA, as provided herein.

In the report herein, all 11 items (namely a to k) listed in Clause 9.3 of the Coastline Policy are addressed where appropriate. As required, completed Forms 1 and 1(a) as given in the Coastline Policy are also attached. In the Coastline Policy, it is noted that a planning period (design project life) of 100 years should be adopted unless otherwise justified. A 60-year planning period has been considered herein, and can be justified as being the same planning period adopted in the "Coastal Zone Management Plan (CZMP) for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)"<sup>3</sup>, which although in a different location to the subject property is another open coast beach in the same former Council area, and would be expected to have a similar planning paradigm.

A detailed justification of the suitability of a 60-year design life for infill residential development is provided in the CZMP. In summary, a design life of 40 to 60 years is used in numerous Australian Standards relevant to residential construction, and the cost of new residential development is amortised for tax purposes over 40 years based on Subdivision 43-25 of the *Income Tax Assessment Act 1997*, so a 60-year design life is considered to be reasonable and conservative (particularly given the relative frequency at which beachfront property at Palm Beach is redeveloped).

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<sup>1</sup> Specifically, the subject property is located within a coastline (beach) hazard area designated on Pittwater Council's Development Control Plan (DCP) Map MDCP016 "Land Identified as Beach Management on the Coastlines Hazard Map 97-003". This is referenced in the "Coastline Risk Management Policy for Development in Pittwater".

<sup>2</sup> The Pittwater 21 DCP up to Amendment No. 24, which came into effect on 20 October 2018, was considered herein.

<sup>3</sup> This CZMP was certified by the Minister for the Environment on 30 June 2017, and gazetted on 14 July 2017, and authored by Peter Horton in previous employment.

As the property is potentially affected by coastline hazards, it is subject to Clause 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014). *State Environmental Planning Policy (Coastal Management) 2018* also applies at the property, as addressed herein.

The report author, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 26 years of coastal engineering experience. He has postgraduate qualifications in coastal engineering, and is a Member of Engineers Australia and Chartered Professional Engineer (CPEng) registered on the National Engineering Register. He is also a member of the National Committee on Coastal and Ocean Engineering (NCCOE) and NSW Coastal, Ocean and Port Engineering Panel (COPEP) of Engineers Australia. Peter has prepared Coastline Risk Management Reports for numerous properties along Ocean Road at Palm Beach in recent years, including a recent DA for the subject property that was submitted in December 2017.

Peter Horton undertook a specific site inspection of the subject property on 5 May 2017, and has inspected the area in the vicinity of the property regularly over the last 10 years.

Note that all levels given herein are to Australian Height Datum (AHD). Zero metres AHD is approximately equal to mean sea level at present.

## **2. INFORMATION PROVIDED**

Horton Coastal Engineering was provided with three The Design Section Architects drawings, namely DA-01, 02 and 03 (all dated January 2019).

A site survey completed by Veris was also provided, Drawing Number DETL-001/A and dated 13 April 2017. A geotechnical investigation for the subject property prepared by Douglas Partners (2017) was provided, as discussed in Section 4.

## **3. EXISTING SITE DESCRIPTION**

The sandy Palm Beach is about 2.3km long, formed between the rocky Barrenjoey Head in the north and Little Head in the south. The subject property is located on the landward (western) side of Ocean Road towards the southern end of the beach, with an aerial image provided in Figure 1. At this location, the shoreline is sheltered (by Little Head) to some degree from the dominant south to south-east storm swells that occur in Sydney, but is fully exposed to waves from the east and north-east.

In the vicinity of the property, a public car park extends about 15m seaward of Ocean Road, and then there is a grassy area about 8m wide (as visible at the site inspection). A view of the property from this grassy area is provided in Figure 2, with a view from the beach provided in Figure 3. As evident in Figure 3, a stormwater pipe discharges on to the beach to the NE of the property. Sewer mains and water mains are located in the area between the property and Ocean Road.

Based on the site survey provided, ground elevations increase moving east to west from about 4.3m AHD at Ocean Road, 4.4 to 5.1m AHD at the seaward property boundary (levels increasing moving north), 5.3 to 5.6m AHD at the seaward face of the existing house (levels increasing moving north), and 6.4 to 7.1m AHD at the landward property boundary (levels increasing moving north). The seaward edge of Ocean Road is located about 22m to 28m from the seaward property boundary.



**Figure 1: Location of subject property at Palm Beach**





**Figure 2: View of subject property from seaward of car park on 5 May 2017**



**Figure 3: View of subject property from beach on 5 May 2017**



#### **4. SUBSURFACE CONDITIONS**

A geotechnical investigation has been completed at the subject property by Douglas Partners (2017), mainly for the purpose of determining groundwater levels. In this report, it was noted that at the single location investigated (just east of the concrete driveway at the NW side of the property, with a surface level of 6.2m AHD), the subsurface was sandy (very loose to 1.6m depth, then loose to medium dense to 4.2m depth, and then medium dense clayey sand to 5.5m depth).

#### **5. PROPOSED DEVELOPMENT**

A new single-storey dwelling is proposed to be constructed over a generally similar footprint as the existing residence. The finished floor level is to be 6.4m AHD, with a paved parking slab on the NW side at 6.3m AHD.

#### **6. EROSION/RECESSION COASTLINE HAZARDS**

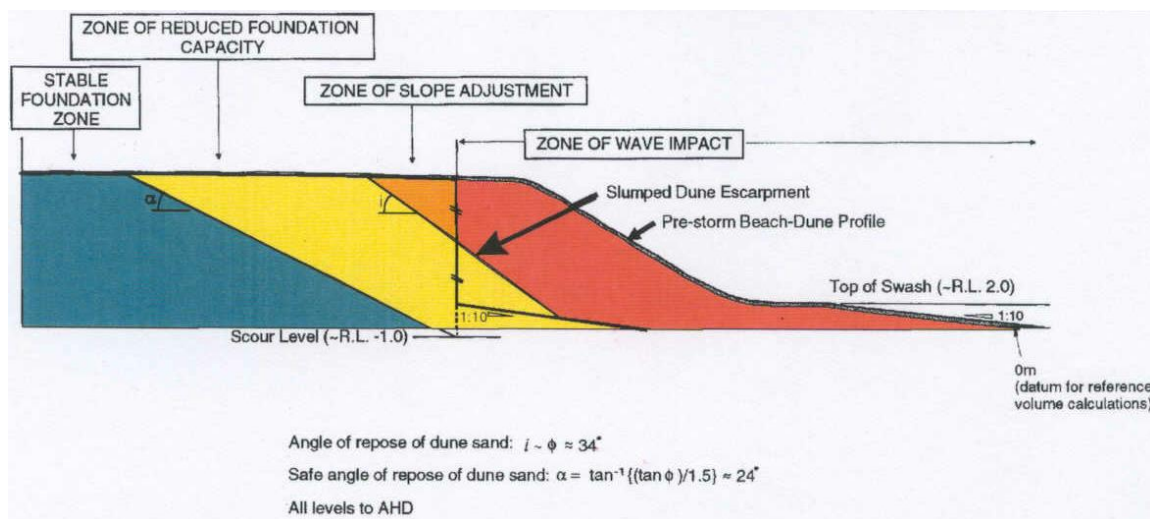
##### **6.1 Generic Explanation of Hazard Zones**

Nielsen et al (1992) has delineated various coastline hazard zones as discussed below and depicted in Figure 4, assuming an entirely sandy (erodible) subsurface above -1m AHD. This assumption is reasonable based on the limited investigation of Douglas Partners (2017), although their investigation was towards the landward end of the subject property and only went down to 0.7m AHD.

The *Zone of Wave Impact (ZWI)* delineates an area where any structure or its foundations would suffer direct wave attack during a severe coastal storm. It is that part of the beach which is seaward of the beach erosion escarpment.

A *Zone of Slope Adjustment* is delineated to encompass that portion of the seaward face of the beach that would slump to the natural angle of repose of the beach sand following removal by wave erosion of the design storm demand. It represents the steepest stable beach profile under the conditions specified.

A *Zone of Reduced Foundation Capacity (ZRFC)* for building foundations is delineated to take account of the reduced bearing capacity of the sand adjacent to the storm erosion escarpment. Nielsen et al (1992) recommended that structural loads should only be transmitted to soil foundations outside of this zone (ie landward or below), as the factor of safety within the zone is less than 1.5 during extreme scour conditions at the face of the escarpment. In general (without the protection of a terminal structure such as a seawall), dwellings/structures not piled and located within the ZRFC would be considered to have an inadequate factor of safety.



**Figure 4: Schematic representation of coastline hazard zones (after Nielsen et al, 1992)**

## 6.2 Existing Council Hazard Lines

Based on the draft "Coastline Hazard Definition and Climate Change Vulnerability Study" prepared for Pittwater Council and dated 3 July 2012 (denoted as the "Hazard Study" herein), coastline hazard lines in the vicinity of the subject property for Immediate, 2050 and 2100 planning periods are as depicted in Figure 5, for lines at the landward edge of the ZSA (solid lines) and ZRFC (dashed lines).

It is evident that the proposed development is entirely landward of the 2100 ZRFC. Based on the Coastline Policy, it is required to define a Coastline Hazard Line (CHL) and Coastline Management Line (CML)<sup>4</sup>. For practical purposes the CHL and CML can be considered to be at the position of the 2100 ZRFC, noting that this is particularly conservative for a 60 year design life that applies at 2079. That is, the proposed development is landward of the CHL and CML.

## 6.3 Foundation Requirements

Given that the proposed development is located landward of the 2100 ZRFC, there are no particular foundation requirements for the proposed development from a coastal engineering perspective. That is, foundation design can be undertaken based on conventional structural and geotechnical engineering considerations.

<sup>4</sup> In the Coastline Policy it is recommended that the CML be defined to be 10m landward of the CHL, unless otherwise justified.



**Figure 5: Coastline hazard lines in vicinity of subject property from Hazard Study, with outline of proposed development (roof) shown**



## **7. COASTAL INUNDATION**

Based on the Hazard Study, wave runup would not be expected to extend into the subject property in a severe storm (100-year Average Recurrence Interval [ARI]) at present or at 2050, but would be expected to do so by 2100.

Wave runup levels at Palm Beach in a severe storm may exceed 8m AHD, particularly taking sea level rise into account over the next 60 years. However, these theoretical runup levels would only be realised if the foreshore level was at the runup height or higher. In reality, any waves that overtopped the foreshore seaward of the subject property (at a level of about 4m to 5m AHD) would 'fold over' the crest and travel as a sheet flow at shallow depth, spreading out and infiltrating over the landward areas<sup>5</sup>. There is the expectation of a significant reduction in the velocity and depth of the runup within the order of 10m from the foreshore crest. A conservative landward limit to wave runup at 2079 (for a 100 year ARI storm) is considered to be at a level of 6.4m AHD (at which point it has zero depth). A Coastline Planning Level of 6.4m AHD can be adopted.

In reality, the fencing on the seaward and northern boundaries (which is solid to a height of 600mm), plus the steps up to the lawn seaward of the dwelling (from 6.0 to 6.35m AHD) would be expected to reduce the extent of runup to seaward of the dwelling for the 100 year ARI storm at 2079. That stated, this fencing and steps do not need to be relied upon for the proposed development to be at an acceptably low risk of oceanic inundation, as it has a sufficiently raised floor level at 6.4m AHD.

It is recommended that ground levels slope down from the dwelling towards Ocean Road. It may be necessary to provide an outlet through the seaward fence to allow any oceanic inundation that overtops this fence to drain.

Refer to a separate report and drawings by Acor Consultants on overland flow flooding and stormwater issues.

## **8. CONTROLS IN PITTWATER 21 DCP**

Based on Section B3.3 of Pittwater 21:

- development must be designed and constructed to ensure that every reasonable and practical means available is used to remove risk to an acceptable level for the life of the development; and,
- the development must not adversely affect or be adversely affected by coastal processes nor must it increase the level of risk for any people, assets and infrastructure in the vicinity due to coastal processes.

With the proposed development landward of the 2100 ZRFC, and a sufficiently elevated floor level of 6.4m AHD, the development is considered to be at an acceptably low risk of damage from coastal erosion/recession and coastal inundation over a design life of 60 years.

The proposed development would not be expected to increase the level of risk for any people, assets or infrastructure in the vicinity due to coastal processes, as it would not be expected to

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<sup>5</sup> Although there would be limited infiltration into the Ocean Road surface. However, there are stormwater pits near the intersection of Ocean Road and Palm Beach Road.



interact with erosion/recession over the design life, nor redirect inundation to adjacent properties.

Based on Section 8.1(i) of the Coastline Policy:

- a) all structures below the Coastline Planning Level shall be constructed from flood compatible materials;
- b) all development must be designed and constructed so that it will have a low risk of damage and instability due to wave action and/or oceanic inundation hazards;
- c) all development and/or activities must be designed and constructed so that they will not adversely impact on surrounding properties, coastal processes or the amenity of public foreshore lands;
- d) all uncontaminated dune sand excavated during construction operations shall be returned to the active beach zone as approved and as directed by Council;
- e) wherever present, remnant foredune systems shall be appropriately rehabilitated and maintained for the life of the development to stabilise an adequate supply of sand (as determined by a coastal engineer) that is available to buffer erosion processes and/or minimise the likelihood of oceanic inundation;
- f) all vegetated dunes, whether existing or created as part of coastal protection measures shall be managed and maintained so as to protect the dune system from damage both during construction of the development and as a result of subsequent use during the life of the development;
- g) all electrical equipment, wiring, fuel lines or any other service pipes and connections must be waterproofed to the Coastline Planning Level;
- h) the storage of toxic or potentially polluting goods, materials or other products, which may be hazardous or pollute waters during property inundation, will not be permitted below the Coastline Planning Level;
- i) for existing structures, a tolerance of up to minus 100mm may be applied to the Coastline Planning Level in respect of compliance with these controls;
- j) building heights must not exceed 8.0 metres above the Coastline Planning Level or 8.5 metres above existing ground level, whichever is higher; and,
- k) where land is also subject to the provisions of the Flood Risk Management Policy for Development around Pittwater, the higher of the Coastline Planning Level and Flood Planning Level shall apply.

For Item (a), this is noted, and could be achieved with the use of reinforced concrete and other materials resistant to inundation.

For Item (b), it has been noted previously that the proposed development has an acceptably low risk of damage and instability due to wave action (erosion/recession) and oceanic inundation (wave runup) hazards

For Item (c), it has been noted previously that the proposed development would not be expected to adversely impact on surrounding properties or coastal processes.

For Item (d), any excess suitable excavated sand can be placed on the active beach as may be required by Council, as directed by Council.

For Items (e) and (f), there are no vegetated dunes that are part of the existing or proposed development, so these Items do not apply.

Items (g) and (h) do not apply at the proposed dwelling as wave runup would not be expected to reach the dwelling for the design event.

Item (j) is a matter for the architect to confirm.

For Item (k), refer to a separate report by Acor Consultants on overland flow flooding issues.

In conclusion, the proposed development is consistent with the Coastline Policy matters considered above.

## **9. LEP 2014 MATTERS**

As noted in Section 1, the property is subject to Clause 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014). In Clause 7.5(3) of LEP 2014 it is stated that development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:

- a) is not likely to cause detrimental increases in coastal risks to other development or properties, and
- b) is not likely to alter coastal processes and the impacts of coastal hazards to the detriment of the environment, and
- c) incorporates appropriate measures to manage risk to life from coastal risks, and
- d) is likely to avoid or minimise adverse effects from the impact of coastal processes and the exposure to coastal hazards, particularly if the development is located seaward of the immediate hazard line, and
- e) provides for the relocation, modification or removal of the development to adapt to the impact of coastal processes and coastal hazards, and
- f) has regard to the impacts of sea level rise, and
- g) will have an acceptable level of risk to both property and life, in relation to all identifiable coastline hazards.

The proposed development satisfies Items (a) and (b) as described previously. Risk to life is not a significant issue for the proposed development as per Item (c).

With regard to Item (d), the proposed development is landward of the 2100 ZRFC and wave runup would not be expected to reach the development for the design event, so is likely to avoid or minimise adverse effects from the impact of coastal processes and the exposure to coastal hazards, including consideration of the impacts of sea level rise as per Item (f). It has an acceptably low risk of damage as per Item (g).

With regard to Item (e), the proposed development has been designed to not be damaged by coastline hazards rather than relocatable. This is considered to be reasonable given the low risk of damage to the development and fact that public assets located seaward of the development (such as Ocean Road) would not be expected to be relocated over the design life.

## **10. STATE ENVIRONMENTAL PLANNING POLICY (COASTAL MANAGEMENT) 2018**

### **10.1 Preamble**

Based on *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal) and its associated mapping, the subject property is within a “coastal use area”.



## 10.2 Clause 14

Based on Clause 14(1) of SEPP Coastal, “development consent must not be granted to development on land that is within the coastal use area unless the consent authority:

- (a) has considered whether the proposed development is likely to cause an adverse impact on the following:
  - (i) existing, safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
  - (ii) overshadowing, wind funnelling and the loss of views from public places to foreshores,
  - (iii) the visual amenity and scenic qualities of the coast, including coastal headlands,
  - (iv) Aboriginal cultural heritage, practices and places,
  - (v) cultural and built environment heritage, and
- (b) is satisfied that:
  - (i) the development is designed, sited and will be managed to avoid an adverse impact referred to in paragraph (a), or
  - (ii) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
  - (iii) if that impact cannot be minimised—the development will be managed to mitigate that impact, and
- (c) has taken into account the surrounding coastal and built environment, and the bulk, scale and size of the proposed development”.

With regard to Clause (a)(i), the proposed development will not affect public beach access.

Clauses (a)(ii) and a(iii) are not coastal engineering matters so are not considered herein.

With regard to (a)(iv), based on a search of the Office of Environment and Heritage “Aboriginal Heritage Information Management System” (AHIMS) on 14 February 2019, there are no particular Aboriginal objects or Aboriginal Places within at least 200m of the subject property.

With regard to (a)(v), there are no heritage items in the immediately vicinity of the property listed in Schedule 5 of *Pittwater Local Environmental Plan 2014*. The closest heritage items are the change room and toilets located a minimum of 45m seaward and south from the property, and Norfolk Island Pines within the road reserve at least 25m from the property (to the south). The proposed development would not be expected to impact on these items.

With regard to (b), the proposed development has been designed and sited to avoid any potential adverse impacts referred to in Clause 14(1) for the matters considered herein.

Clause (c) is not a coastal engineering matter so is not considered herein.

## 10.3 Clause 15

Based on Clause 15 of SEPP Coastal, “development consent must not be granted to development on land within the coastal zone unless the consent authority is satisfied that the proposed development is not likely to cause increased risk of coastal hazards on that land or other land”.

The proposed dwelling development is unlikely to have a significant impact on coastal hazards or increase the risk of coastal hazards in relation to any other land over its design life, as it is

located landward of the 2100 ZRFC and the wave runup limit for a 100 year ARI storm occurring over the design life.

#### **10.4 Clause 16**

Based on Clause 16 of SEPP Coastal, “development consent must not be granted to development on land within the coastal zone unless the consent authority has taken into consideration the relevant provisions of any certified coastal management program that applies to the land”. No certified coastal management program applies at the subject property.

#### **10.5 Overall Conclusion**

The proposed development satisfies the coastal engineering matters for consideration in SEPP Coastal as identified above.

### **11. CONCLUSIONS**

With the proposed development landward of the 2100 ZRFC, and wave runup not expected to reach the development for the design event, the development is considered to be at an acceptably low risk of damage from coastal erosion/recession and coastal inundation over a design life of 60 years. The proposed development is consistent with the Coastline Policy, Clause 7.5 of LEP 2014, and *State Environmental Planning Policy (Coastal Management) 2018* as outlined.

### **12. REFERENCES**

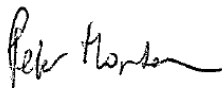
Douglas Partners (2017), *Investigation Summary Report, Project No. 85929.00, Project: Groundwater Assessment*, 9 May

Nielsen, AF; Lord, DB and HG Poulos (1992), “Dune Stability Considerations for Building Foundations”, *Australian Civil Engineering Transactions*, Institution of Engineers Australia, Volume CE34, No. 2, June, pp. 167-173

### **13. SALUTATION**

If you have any further queries, please do not hesitate to contact Peter Horton via email at [peter@hortoncoastal.com.au](mailto:peter@hortoncoastal.com.au) or via mobile on 0407 012 538.

Yours faithfully  
HORTON COASTAL ENGINEERING PTY LTD



Peter Horton  
Director and Principal Coastal Engineer

This report has been prepared by Horton Coastal Engineering Pty Ltd on behalf of and for the exclusive use of Mr Richard Crookes and The Design Section Architects (the client), and is subject to and issued in accordance with an agreement between the client and Horton Coastal Engineering Pty Ltd. Horton Coastal Engineering Pty Ltd accepts no liability or responsibility whatsoever for the report in respect of any use of or reliance upon it by any third party. Copying this report without the permission of the client or Horton Coastal Engineering Pty Ltd is not permitted.

*Coastline Risk Management Policy for Pittwater Form No. 1 and Form No. 1(a) are attached overleaf*



COASTLINE RISK MANAGEMENT POLICY FOR PITTWATER

FORM NO. 1 – To be submitted with Development Application

Development Application for Richard Crookes  
Name of Applicant  
Address of site 17 Ocean Road Palm Beach

**Declaration made by a Coastal Engineer as part of a Coastal Risk Management Report**

I, Peter Horton on behalf of Horton Coastal Engineering Pty Ltd  
(Insert Name) (Trading or Company Name)

on this the 14 February 2019  
(date)

certify that I am a Coastal Engineer as defined by the Coastline Risk Management Policy for Pittwater 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 \$2 million.

I have:

**Please mark appropriate box**

- ☒ Prepared the detailed Coastal Risk Management Report referenced below in accordance with the Pittwater Council Coastline Risk Management Policy
- ☐ Am willing to technically verify that the detailed Coastal Risk Management Report referenced below has been prepared in accordance with the Pittwater Council Coastline Risk Management Policy
- ☐ Have examined the site and the proposed development/alteration in detail and, as detailed in my report, am of the opinion that the Development Application only involves Minor Development/Alterations or is sited such that a detailed coastal hazard analysis or risk assessment is not required.
- ☐ Provided the coastal hazard analysis for inclusion in the Coastal Risk Management Report

**Coastal Risk Management Report Details:**

Report Title: Coastline Risk Management Report for 17 Ocean Road Palm Beach

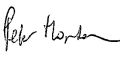
Report Date: 14 February 2019

Author: Horton Coastal Engineering Pty Ltd

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

See Section 2 and Section 12 of report

I am aware that the above Coastal Risk Management Report, prepared for the above mentioned 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 coastal risk management aspects of the proposed development have been adequately addressed to achieve an acceptable risk management 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.

Signature .....  .....  
Name ..... **Peter Horton** .....  
Chartered Professional Status..... **MIEAust CPEng NER** .....  
Membership No. .... **452980** .....



## COASTLINE RISK MANAGEMENT POLICY FOR PITTWATER

### FORM NO. 1(a) - Checklist of Requirements for Coastal Risk Management Report for Development Application or Part 5 Assessment

Development Application for Richard Crookes  
Name of Applicant  
Address of site 17 Ocean Road Palm Beach

*The following checklist covers the minimum requirements to be addressed in a Coastal Risk Management Report. This checklist is to accompany the Coastal Risk Management Report and its certification (Form No. 1).*

#### Coastal Risk Management Report Details:

Report Title: Coastline Risk Management Report for 17 Ocean Road Palm Beach  
Report Date: 14 February 2019  
Author: Horton Coastal Engineering Pty Ltd

#### Please mark appropriate box

- ☒ Comprehensive site mapping conducted Survey provided as per Section 2  
(date)
- ☐ Mapping details presented on contoured site plan to a minimum scale of 1:200 (as appropriate)  
Figure 5 is considered to be sufficient
- ☐ Subsurface investigation required
- ☐ No Justification .....
- ☒ Yes Date conducted Refer to Douglas Partners (2017)
- ☒ Impact by and upon coastal processes identified
- ☒ Coastal hazards identified
- ☒ Coastal hazards described and reported
- ☒ Risk assessment conducted in accordance with Council's Policy
- ☐ Adequacy of existing coastal protection measures assessed and certified (not applicable)
- ☒ Opinion has been provided that the design can achieve the risk management criteria in accordance with Council's Policy provided that the specified conditions are achieved.

☒ Design Life Adopted:

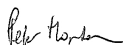
☐ 100 years

☒ Other ..... **60 years (as justified)** .....  
specify

☒ Development Controls as described in the Pittwater Coastline Risk Management Policy have been specified

☒ Additional actions to remove risk where reasonable and practical have been identified and included in the Coastal Risk Management Report.

I am aware that Pittwater Council will rely on the Coastal Risk Management Report, to which this checklist applies, as the basis for ensuring that the coastal risk management aspects of the proposal have been adequately addressed to achieve an acceptable risk management level for the life of the structure, taken as at least 100 years unless otherwise specified, and justified in the Report and that reasonable and practical measures have been identified to remove foreseeable risk.

Signature ..... 

Name ..... **Peter Horton** .....

Chartered Professional Status..... **MIEAust CPEng NER** .....

Membership No. .... **452980** .....