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Coastline Risk Management Report in Relation to 13a Ocean Road Palm Beach

1. INTRODUCTION AND BACKGROUND

At 13a Ocean Road Palm Beach, it is proposed to construct a secondary dwelling and swimming pool elevated on the cliff face above and landward of the existing dwelling. A Development Application (DA) is to be submitted to the former Pittwater Council (now Northern Beaches Council) seeking consent for these works. Given the proximity of the site to Palm Beach[1], 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[2]), 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 investigation, 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 this can be justified as this is the same planning period adopted in the draft "Coastal Zone Management Plan for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)" that was submitted to the Minister for Planning in November 2015 and authored by Mr Horton in previous employment[3].

As the property is potentially affected by coastline hazards, it is also subject to Clauses 5.5 and 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014), and *State Environmental Planning Policy No 71 – Coastal Protection* (SEPP 71), as further addressed herein.

[1] 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 Chapter B3.3 of the Pittwater 21 DCP.
[2] The Pittwater 21 DCP up to Amendment No. 19, which came into effect on 14 November 2015, was considered.
[3] A detailed justification of the suitability of a 60-year design life for infill residential development is provided in that document. 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).

The report author, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 24 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. Mr Horton has prepared Coastline Risk Management Reports for numerous properties along Ocean Road at Palm Beach in recent years.

Mr Horton undertook specific site inspections of the subject property on 6 and 8 June 2016, 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 a total of 23 MacCormick + Associates Architects drawings, namely DA00.01 to 04, 01.01, 01.02, 02.01, 02.02, 03.01 to 05, 04.01 to 03, 06.01 to 04 and 07.01 to 03 (all Revision A and dated 28 July 2016).

A site survey completed by C.M.S Surveyors was also provided, Ref 12212detail and dated 16 February 2016. A geotechnical investigation for the subject property prepared by Douglas Partners (2016) 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.

A view of the property from the seaward side of Ocean Road is provided in Figure 2. A 10m to 12m high shotcrete covered rock face is located landward of the existing dwelling, with a view of this provided in Figure 3.

Based on the site survey provided, ground elevations increase moving east to west from about 5.0m AHD at Ocean Road, 6.0m AHD at the garage, and 7.0m AHD at the base of the rock face. The seaward edge of Ocean Road is located about 19m from the seaward property boundary.

A significant East Coast Low storm peaked over the period from 4 June to 6 June 2016, reaching 6.5m significant wave height from the east direction as measured at the Sydney offshore wave buoy. These large and directly impinging waves (almost reaching the 100-year Average Recurrence Interval significant wave height of 7m from the east) were combined with elevated ocean water levels, significant rainfall, and strong onshore winds in this event.

The photograph in Figure 2 was taken a couple of days after this event, indicating sand overwash on Ocean Road and the extent of wave runup (debris line) on the grass immediately seaward of the retaining wall and garage (reaching a level of about 5.6m AHD).

Figure 1: Location of subject property at Palm Beach

Figure 2: View of subject property on 6 June 2016

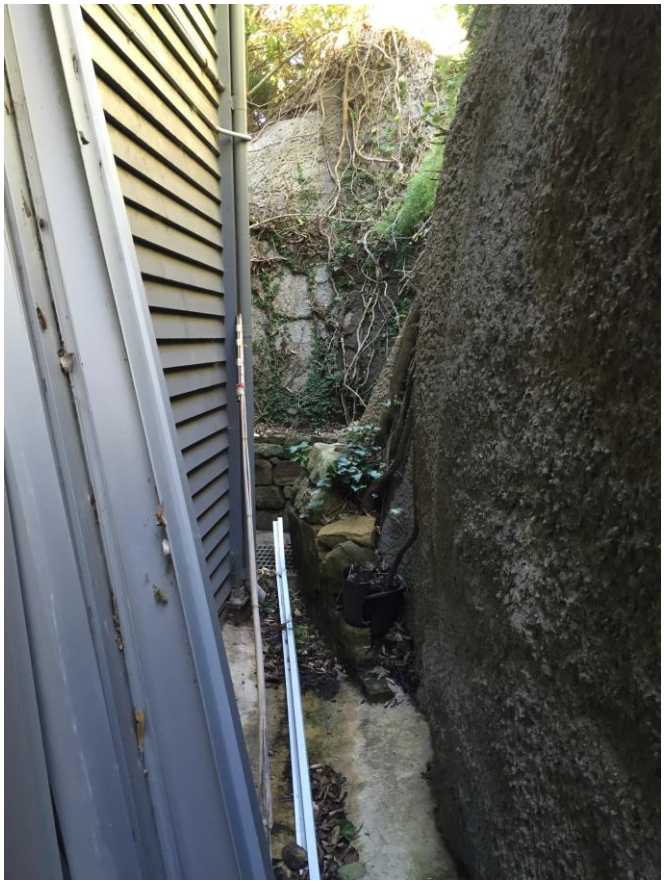


Figure 3: View of rock face at south-western corner of existing dwelling on 8 June 2016

4. SUBSURFACE CONDITIONS

A geotechnical investigation has been completed at the subject property by Douglas Partners (2016). In this report, it was noted that:

- the existing residence was designed to be founded on underlying bedrock; and
- the excavated rock face located landward of the existing development was designed to be stabilised with about 32 permanent rock anchors and dowels, and then protected by a 75mm layer of reinforced shotcrete.

5. PROPOSED DEVELOPMENT

A secondary dwelling and pool are proposed to be constructed above and landward of the existing residence (upslope of the shotcrete rock face), with a minimum habitable floor level of 22.5m AHD, and founded into bedrock based on Douglas Partners (2016). Access to this dwelling is to be via a lift, with a lift shaft to be excavated as a slot into the rock face near the south-western corner of the existing development. The lift shaft is to have a minimum level of 6.8 m AHD, with an entry passageway to the lift extending about 5m into the rock face up a slope of 1:16 (vertical:horizontal) to enable disabled access. The eastern edge of the entry passageway is to have a level of 6.5m AHD.

Modifications are also proposed to the garage, with new internal steps constructed on the western side of the garage adjacent to the lift entry.

6. EROSION/RECESSION COASTLINE HAZARDS

As the proposed development is to be founded on bedrock at a rocky cliff, and the proposed lift entry and shaft is also to be formed in bedrock, traditional 'sandy beach' erosion/recession coastline hazards do not apply to the proposed development at the subject property. Therefore, as they are not relevant to the proposed development, no Coastline Hazard Line nor Coastline Management Line (as per the Coastline Policy) have been defined at the subject property.

Although not part of the proposed DA, it can be noted that with the existing development likely to be founded on bedrock, it is also unlikely to be impacted by erosion/recession coastline hazards (considering a 100-year Average Recurrence Interval storm event occurring over the next 60 years). Furthermore, the likely necessity to maintain Ocean Road and a sewer main seaward of the property would be expected to practically limit the landward extent of erosion/recession that would be realised at the property.

7. COASTAL INUNDATION

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), wave runup could extend into the subject property in a severe storm (100-year Average Recurrence Interval) at present, extending about as far landward as the eastern face of the existing development. At 2050 and 2100, wave runup was projected to extend to the base of the cliff located landward of the existing development in a 100-year Average Recurrence Interval (ARI) storm.

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 5m AHD) would 'fold over' the crest and travel as a sheet flow at shallow depth, spreading out and infiltrating over the landward areas[4]. 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, as was evident in Figure 2 in relation to the June 2016 East Coast Low storm.

Wave runup and coastal inundation are only potential issues for the proposed development at the lift shaft and entry passageway, with the secondary dwelling located well above potential coastal inundation levels. To reduce the risk of damage to the lift from coastal inundation, the passageway to the lift would be sloped upward as discussed in Section 5, with the floor of the shaft at 6.8m AHD. This is considered to be acceptable as long as all electrical and mechanical components of the lift that could be water damaged are located above this level. The fact that the lift shaft is located on the landward side of the existing development would be expected to limit the extent of coastal inundation, with the sloping passageway a precaution to direct any inundation (that does reach this area by flowing around the south side of the existing dwelling), or any overland flow, away from the lift.

A Coastline Planning Level of 6.8m AHD (6.775m AHD to 3 decimal places) has been adopted for the proposed development to match the floor level of the lift shaft, and is considered to be a suitable minimum floor level for a 100 year ARI event occurring over a 60-year design life.

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 founded on bedrock, it is considered to be at an acceptably low risk of damage from coastal erosion/recession over a design life of 60 years. With a lift shaft above 6.8m AHD, the proposed development is considered to be at an acceptably low risk of damage from coastal inundation over a design life of 60 years, as long as all electrical and mechanical components of the lift that could be water damaged are located above this level.

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 interact with erosion, recession or inundation over the design life.

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;

[4] Although there would be limited infiltration into the Ocean Road surface.

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.

Items (a), (g) and (h) apply to the proposed development with a Coastline Planning Level of 6.8m AHD. That is:

- all structures below 6.8m AHD shall be constructed from flood compatible materials;
- all electrical equipment, wiring, fuel lines or any other service pipes and connections must be waterproofed to 6.8m AHD or placed at or above 6.8m AHD; and
- toxic or potentially polluting goods, materials or other products, which may be hazardous or pollute waters during property inundation, shall be stored at or above 6.8m AHD[5].

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, although note that limited sandy material is expected to be excavated.

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.

[5] Where stored as part of the existing development, eg in the garage, it is recommended that these items are stored at least 0.5m above the floor level, ie above 6.5m AHD.

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

For Item (k), only the Coastline Planning Level applies, as the land is not understood to be subject to the provisions of the Flood Risk Management Policy for Development around Pittwater.

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 Clauses 5.5 and 7.5 of *Pittwater Local Environmental Plan 2014* (LEP 2014). Clause 5.5(3)(d) is relevant to coastline risk management, namely that "the proposed development will not:

i) be significantly affected by coastal hazards, or
ii) have a significant impact on coastal hazards, or
iii) increase the risk of coastal hazards in relation to any other land".

As noted in Section 6 and Section 7, the proposed development will not be significantly affected by coastal hazards considering a severe storm (in the order of 100 year ARI) occurring over a design life of 60 years. As noted in Section 8, the proposed development will not have a significant impact on coastal hazards nor increase the risk of coastal hazards in relation to any other land, as it would not be expected to interact with erosion, recession or inundation over the design life.

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 to be founded on rock and elevated at or above the Coastline Planning Level, 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, through being founded on rock. 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 (Ocean Road and a sewer main) would not be expected to be relocated over the design life.

10. STATE ENVIRONMENTAL PLANNING POLICY NO 71 – COASTAL PROTECTION

10.1 Matters for Consideration

As the proposed development is within the Coastal Zone[6], *State Environmental Planning Policy No 71 – Coastal Protection* (SEPP 71) applies. Matters for consideration listed under Part 2 Clause 8 of SEPP 71 have generally been addressed (in principle) previously herein, but are discussed below for completeness.

The matters for consideration listed in Clause 8 of SEPP 71 are as follows:

(a) the aims of this Policy set out in clause 2,
(b) existing public access to and along the coastal foreshore for pedestrians or persons with a disability should be retained and, where possible, public access to and along the coastal foreshore for pedestrians or persons with a disability should be improved,
(c) opportunities to provide new public access to and along the coastal foreshore for pedestrians or persons with a disability,
(d) the suitability of development given its type, location and design and its relationship with the surrounding area,
(e) any detrimental impact that development may have on the amenity of the coastal foreshore, including any significant overshadowing of the coastal foreshore and any significant loss of views from a public place to the coastal foreshore,
(f) the scenic qualities of the New South Wales coast, and means to protect and improve these qualities,
(g) measures to conserve animals (within the meaning of the *Threatened Species Conservation Act 1995*) and plants (within the meaning of that Act), and their habitats,
(h) measures to conserve fish (within the meaning of Part 7A of the *Fisheries Management Act 1994*) and marine vegetation (within the meaning of that Part), and their habitats
(i) existing wildlife corridors and the impact of development on these corridors,
(j) the likely impact of coastal processes and coastal hazards on development and any likely impacts of development on coastal processes and coastal hazards,
(k) measures to reduce the potential for conflict between land-based and water-based coastal activities,
(l) measures to protect the cultural places, values, customs, beliefs and traditional knowledge of Aboriginals,
(m) likely impacts of development on the water quality of coastal waterbodies,
(n) the conservation and preservation of items of heritage, archaeological or historic significance,
(o) only in cases in which a council prepares a draft local environmental plan that applies to land to which this Policy applies, the means to encourage compact towns and cities,
(p) only in cases in which a development application in relation to proposed development is determined:
    (i) the cumulative impacts of the proposed development on the environment, and

[6] As per the map "Coastal Zone, NSW Coastal Protection Act 1979, Greater Metropolitan Region, Map 13".

(ii) measures to ensure that water and energy usage by the proposed development is efficient.

These matters are discussed in turn below.

10.2 Item 8(a) – Aims

For item 8(a), the aims of the policy in Clause 2 are as follows:

(a) to protect and manage the natural, cultural, recreational and economic attributes of the New South Wales coast, and
(b) to protect and improve existing public access to and along coastal foreshores to the extent that this is compatible with the natural attributes of the coastal foreshore, and
(c) to ensure that new opportunities for public access to and along coastal foreshores are identified and realised to the extent that this is compatible with the natural attributes of the coastal foreshore, and
(d) to protect and preserve Aboriginal cultural heritage, and Aboriginal places, values, customs, beliefs and traditional knowledge, and
(e) to ensure that the visual amenity of the coast is protected, and
(f) to protect and preserve beach environments and beach amenity, and
(g) to protect and preserve native coastal vegetation, and
(h) to protect and preserve the marine environment of New South Wales, and
(i) to protect and preserve rock platforms, and
(j) to manage the coastal zone in accordance with the principles of ecologically sustainable development (within the meaning of section 6(2) of the *Protection of the Environment Administration Act 1991*), and
(k) to ensure that the type, bulk, scale and size of development is appropriate for the location and protects and improves the natural scenic quality of the surrounding area, and
(l) to encourage a strategic approach to coastal management.

For aim 2(a), it can be noted that the proposed development is at an acceptably low risk of damage, supporting the economic attributes of the residential land. The development would not interfere with public recreational opportunities on public land.

For aims 2(b) and (c), the proposed development would have no effect on public beach access, which is currently possible seaward of the property.

It is beyond the scope of the investigation herein to consider aims 2(d) and 2(e), which are not coastal engineering matters.

For aim 2(f), the proposed development is setback landward of a road, so would not directly affect beach environments or beach amenity.

For aim 2(g), consideration of coastal vegetation is beyond the scope of the investigation herein.

It is considered that the proposed development is inconsequential to aims 2(h) and 2(i).

For aim 2(j), it can be noted that in section 6(2) of the *Protection of the Environment Administration Act 1991* it is stated that "ecologically sustainable development requires the effective integration of economic and environmental considerations in decision-making

processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

(a) the precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by:
    (i) careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and
    (ii) an assessment of the risk-weighted consequences of various options,
(b) inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations,
(c) conservation of biological diversity and ecological integrity - namely, that conservation of biological diversity and ecological integrity should be a fundamental consideration,
(d) improved valuation, pricing and incentive mechanisms - namely, that environmental factors should be included in the valuation of assets and services, such as:
    (i) polluter pays - that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
    (ii) the users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste,
    (iii) environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems".

The proposed development is in an already developed area and located entirely on private land. That stated, consideration of issues such as biological diversity, which are not coastal engineering matters, is beyond the scope of the investigation reported herein.

For aim 2(k), issues related to bulk etc are not coastal engineering matters and hence not considered herein.

For aim 2(l), it is noted that the proposed development is consistent with consideration of acceptable risk, so Council's strategic approach to coastal management (as has been applied in a Coastal Zone Management Plan for Bilgola and Basin Beach) has been complied with.

10.3 Other Items

For Items 8(b) and 8(c) in Section 10.1, as discussed with regard to aims 2(b) and (c) in Section 10.2, the proposed development would not affect public beach access.

Items 8(d), 8(e), 8(f), 8(g), 8(h) and 8(i) are not coastal engineering matters and hence not considered herein.

For Item 8(j), the proposed development is at an acceptably low risk of damage from coastal processes and coastline hazards for a design life exceeding 60 years. Also, as noted previously, the proposed development is unlikely to have a significant impact on coastal processes and coastal hazards.

Items 8(k) and 8(l) are not coastal engineering matters and hence not considered herein.

For Item 8(m), the proposed development would not be expected to adversely impact on coastal water quality, given the residential land use.

Items 8(n), 8(o) and 8(p) are not coastal engineering matters or not applicable and hence not considered herein.

10.4 Overall Conclusion

The proposed development satisfies the coastal engineering matters for consideration in Clause 8 of SEPP 71 as identified above.

11. CONCLUSIONS

As the proposed development is to be founded on bedrock at a rocky cliff, and the proposed lift entry and shaft is also to be formed in bedrock, traditional 'sandy beach' erosion/recession hazards do not apply.

Wave runup and coastal inundation are only potential issues for the proposed development at the lift shaft and entry passageway. To reduce the risk of damage to the lift from coastal inundation, the passageway to the lift would be sloped upward as discussed in Section 5, with the floor of the shaft at 6.8m AHD. This is considered to be acceptable as long as all electrical and mechanical components of the lift that could be water damaged are located above this level.

The proposed development is consistent with the Coastline Policy, Clauses 5.5 and 7.5 of LEP 2014, and matters for consideration listed under Part 2 Clause 8 of SEPP 71 as outlined.

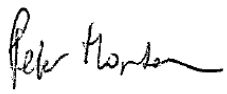
12. REFERENCES

Douglas Partners (2016), *Geotechnical Assessment, Proposed Secondary Residence, 13a Ocean Road, Palm Beach*, Reference 85471.00.R.001.Rev0, 11 July

13. SALUTATION

If you have any further queries, please do not hesitate to contact Peter Horton via email at 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

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