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Coastal Engineering Risk Management Report for 15 Monash Crescent Clontarf

1. INTRODUCTION AND BACKGROUND

It is proposed to undertake alterations and additions to a seawall (coastal protection works) at 15 Monash Crescent Clontarf, as well as alterations and additions to a garage. A Development Application (DA) is to be submitted to Northern Beaches Council for these works. As a seawall is proposed, Council requires that a coastal engineering assessment is completed as part of the DA, as set out herein. Given that the garage is on the landward side of the property, and unlikely to be impacted by coastal processes for an acceptably rare storm over an acceptably long life, the garage is not considered herein.

The report author is Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER]. Peter has postgraduate qualifications in coastal engineering and 29 years of coastal engineering experience, including numerous studies along the Middle Harbour shoreline. He is a Member of Engineers Australia and Chartered Professional Engineer (CPEng) registered on the National Engineering Register. Peter 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. He has inspected the area in the vicinity of the subject property on many occasions in the last decade and beyond, including specific recent inspections of the property on 18 February 2021, 15 July 2021, 29 October 2021 and 1 December 2021.

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 the following:

- three drawings of the proposed works prepared by Mathieson Architects (Drawing Numbers DA.01 to 03), all Revision A and dated 6 October 2021 (DA.01 and DA.03) and 25 October 2021 (DA.02); and
- a site survey by Bee & Lethbridge, reference 3051B and dated 17 January 2022.

3. EXISTING SITE DESCRIPTION

The subject property is adjacent to Clontarf Beach, which in turn is adjacent to the Middle Harbour waterway, with a broad aerial view depicted in Figure 1. As described by Short (2007), Clontarf Beach is a large sandy foreland that has been formed by ocean swell waves transporting sand into Middle Harbour. The property is also exposed to wind-waves, and most exposed to a wind-wave fetch from the south, with a fetch length of about 2.3km. A photograph of the property, taken on 1 December 2021, is provided in Figure 2.

Without a seawall in place, it has been identified in previous studies (such as Mariani et al, 2012) that the subject property could be impacted by coastal erosion/recession in a severe storm, extending further landward over time as the result of long-term beach recession due to sea level rise and net sediment loss.

The existing seawall comprises an upper vertical brick section about 0.7m high, and then a sloping mortared sandstone-faced section about 1.5m high, and then a sandstone footing below about 0.6m high (as determined through excavation) that is generally buried under sand.

Based on the survey provided, the top of the seawall at the property is at about 2.7m AHD, with ground levels landward of the seawall (over a mostly tiled area and some lawn) at about 2.4m AHD. From review of 9 historical profiles in the NSW Beach Profile Database from 1961 to 2018, sand levels adjacent to the seawall are typically at around 1.2m AHD, and vary between about 0.9m and 1.9m AHD over the discrete dates analysed¹. The site survey provided shows sand levels adjacent to the seawall at 0.9m AHD at the southern end and 0.5m AHD at the northern end at the time of the survey. The bottom of the footing would be at -0.2m AHD based on the approximate measurements above, which should be confirmed as part of detailed design.

Adjacent properties (7 properties to the south and 8 properties to the north) generally have vertical seawalls with a similar crest elevation to the subject property. Immediately to the south of the property is a public accessway to the beach with a sloping sandstone block seawall. The alignment of the seawalls at and south of the subject property are generally similar. To the north of the subject property, the seawall alignment is also generally consistent, but kinked more clockwise (looking north) compared to the southern alignment.

The finished ground floor level of the subject dwelling is 2.9m AHD, and it is setback about 7m landward of the seawall. Ground levels increase at the dwelling via two steps and a tiled area about 1.7m wide.

Based on the hydrographic chart AUS 201, offshore seabed levels reduce to about -2.9m AHD at 60m offshore, -5.9m AHD at 80m offshore, and -10.9m AHD at 100m offshore of the property, ultimately lowering to about -26m AHD towards the centre of the waterway.

¹ As measured at the northern end of No. 13, which is the closest profile to the subject property.



Figure 1: Aerial view of subject property at Clontarf on 20 May 2021



Figure 2: View of subject property (at arrow) from foreshore on 1 December 2021, facing NNW

4. PROPOSED DEVELOPMENT

Based on the Mathieson Architects drawings, it is proposed to generally retain the existing seawall, and to build a new seawall slightly further seaward of this existing seawall. New beach access stairs are to be located about 1.5m further north of the existing stairs. The seawall is to be vertical and on the boundary, so with a similar base level to the existing wall, but with a crest level about 0.8m seaward of the existing seawall.

The proposed seawall crest level is 2.7m AHD, which is the same as the existing level. The wall is proposed to comprise core-filled reinforced concrete blocks with a sandstone cladding. A 1m high glass balustrade is proposed above the seawall.

As has recently been undertaken at nearby 9 Monash Crescent Clontarf, it is proposed to construct an additional microfine grout footing for the seawall under the existing seawall footing, by drilling vertically through this existing footing (which is to be retained). This would reduce the risk that the seawall is undermined due to beach scour (lower sand levels) in the future. The required depth of this footing is to be determined as part of detailed design. Partridge Structural has provided input into the DA design concept.

5. DESIGN LIFE

It is considered that a 60-year design life (that is, at 2082) is appropriate for the proposed seawall. This is the same design life as adopted by Northern Beaches Council in gazetted Coastal Zone Management Plans that apply in the Local Government Area, namely the *Coastal*

Zone Management Plan for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale) that was gazetted on 14 July 2017, and the *Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach* that was gazetted on 7 April 2017. Although these studies do not geographically apply at the subject property, they are the only gazetted Coastal Zone Management Plans in the former Northern Beaches Council area, and hence are relevant to consider in the selection of design life.

As justified in these studies, a 60 year life is considered to be appropriate for infill residential development as it is consistent with the design life used in various Australian Standards (eg AS 3600 – Concrete structures), tax legislation, and community expectations.

6. COASTAL PROCESSES

Based on Mariani et al (2012), the 100-year Average Recurrence Interval (ARI) present day water level in the region covering the subject property is reported as 1.5m AHD. This includes the effects of astronomical tide and storm surge, and would be expected to incorporate most of any local wind setup. Swell and wind-wave action can temporarily and periodically increase water levels above this level, particularly in severe storms.

At present at the subject property, Mean High Water is approximately 0.5m AHD and Mean High Water Springs is about 0.6m AHD. The combined astronomical tide and storm surge level for a monthly and bi-annual event is about 1.0m and 1.2m AHD respectively. Corresponding water levels only increase slightly for rarer events, eg 1 year ARI level of 1.24m AHD, 10 year ARI level of 1.34m AHD and 50 year ARI water level of 1.41m AHD (Department of Environment, Climate Change and Water [DECCW] (2010).

It is considered to be most appropriate to directly derive sea level rise values from Intergovernmental Panel on Climate Change [IPCC] (2021), which is widely accepted by competent scientific opinion.

For the proposed design life of 60 years (at 2082), and a median exceedance probability and average of the 5 shared socioeconomic pathways in IPCC (2021), and also regional sea level rise variations at Sydney as reported by the Physical Oceanography Distributed Active Archive Center (PO.DAAC)², the sea level rise projection at 2082 is 0.40m (relative to the average sea level from a 1995-2014 baseline, taken to be at 2005).

Given that the design water level of 1.5m AHD was derived based on data at 2010, the sea level rise should be determined relative to 2010. Watson (2020) found that the rate of sea level rise from satellite altimetry in the SE Australia region was 3.5mm/year from 1992-2019. Applying this rate from 2005 to 2010, the projected sea level rise from 2010 to 2082 at Sydney is 0.38m.

Therefore, the 100 year ARI still water level (in the absence of wave action) at the subject property in 2082 is 1.88m AHD. Wave action would increase water levels further.

Cardno (2009) estimated that the 100 year ARI wave height offshore of the subject property was a significant wave height (average of the highest one-third of waves) of about 0.06m for swell and 0.16m for sea. These values appear to be erroneous. Mariani et al (2012) estimated a combined (offshore swell and local wind forcing) 100 year ARI significant wave height of 0.6m offshore of the subject property, which is considered to be more realistic.

² A NASA Earth Observing System Data and Information System data centre operated by the Jet Propulsion Laboratory in Pasadena, California

Some wave overtopping of the seawall would be expected to occur in the design event at the end of the design life. The Neural Network tool³ that is part of the second edition of the EurOtop manual (van der Meer et al, 2018) was utilised to calculate average wave overtopping rates in a 100 year ARI storm at the proposed seawall at the end of the design life. Ignoring the presence of the glass fence above the seawall, wave overtopping rates were about 2L/s/m. With a glass fence (1m high) in place, wave overtopping reduces to less than 0.1L/s/m, which is considered to be acceptable.

7. RISKS OF DAMAGE TO PROPOSED SEAWALL AND MITIGATION OF THOSE RISKS

As part of detailed structural design of the seawall, it will be necessary to consider the effect of beach scour (lowering of sand levels) on the stability of the seawall. At present, a scour level in the order of -0.3m AHD is considered to be reasonable. However, given that Clontarf Beach appears to have a trend of diminishing sand volume over time, and due to the effects of long-term recession due to sea level rise, it is considered to be reasonable to allow for scour down to -0.8m AHD over the design life. As part of detailed design, the structural engineer should consider the required depth and nature of footing to accommodate this scour.

The seawall should be designed assuming a 0.5m depth of water over the wall, ie a surcharge of 5kPa over the wall backfill. The glass fence should be designed with consideration of wave forces over the design life, and be constructed from toughened and/or laminated glass with appropriate fracture characteristics that present a low hazard when fractured, or preferably such that it holds together when shattered.

As the seawall would be overtopped by waves at times over the design life, and to relieve groundwater pressures, a drainage layer of blue metal or similar (wrapped in geotextile) should be provided landward of the wall, as well as drainage outlets (weepholes) within the seawall (with a geotextile “sock” to prevent soil migration through the outlets).

Given that the seawall may be overtopped by waves at times of severe storms, this may cause erosion of landscaped areas landward of the wall. Reinstatement and repair of these areas may thus be required at times, but this potential damage is not considered to be a concern for overall site or seawall stability.

Materials should be selected that are inundation compatible and suitable for the marine environment. Any concrete structures or components should be generally designed in accordance with the requirements of *Australian Standard AS3600 – Concrete Structures*. The requirements of *Australian Standard AS4997 - Guidelines for the Design of Maritime Structures* should also be considered.

Sandstone suitable for the marine environment should be used as advised by a coastal engineer.

If the recommendations within this Section 7 are followed, the risks of damage to the proposed seawall would be suitably mitigated, and it would have an adequately low risk of failure.

³ Formentin et al (2017) and Zanuttigh et al (2016).

8. MERIT ASSESSMENT

8.1 *Manly Local Environmental Plan 2013*

One of the aims of *Manly Local Environmental Plan 2013* (LEP 2013), as per clause 1.2(2)(f)(iv), is “to protect existing landforms and natural drainage systems and minimise the risk to the community in areas subject to environmental hazards, particularly flooding, bush fires, acid sulfate soils, sea level rise, tsunami and landslip”. The proposed seawall would be at an acceptably low risk of being damaged by coastal processes and hazards (including tsunami) over an acceptably long life, considering projected sea level rise, such that the subject property would have an acceptably low risk of damage (thus providing adequate protection to landforms and minimising the risk to the community).

The subject property is within a foreshore scenic protection area, so Clause 6.9 of LEP 2013 would apply to any future development at the site. In Clause 6.9(3)(c) of LEP 2013 it is stated that “development consent must not be granted to development on land to which this clause applies unless the consent authority has considered the suitability of development given its type, location and design and its relationship with and impact on the foreshore”. Given that the proposed seawall is on a similar alignment to the existing seawall, it would not be expected to impact on the foreshore from a coastal processes perspective.

The proposed seawall is within a foreshore area, so Clause 6.10 of LEP 2013 applies. Based on Clause 6.10(2) of LEP 2013, “development consent must not be granted to development on land in the foreshore area except for the following purposes:

- (a) the extension, alteration or rebuilding of an existing building wholly or partly in the foreshore area,
- (b) the erection of a building in the foreshore area, if the levels, depth or other exceptional features of the site make it appropriate to do so,
- (c) boat sheds, sea retaining walls, wharves, slipways, jetties, waterway access stairs, swimming pools, fences, cycleways, walking trails, picnic facilities or other recreation facilities (outdoors)”.

The proposed seawall (sea retaining wall) is thus permissible in the foreshore area.

Based on Clause 6.10(3) of LEP 2013, “development consent must not be granted under this clause unless the consent authority is satisfied that:

- (a) the development will contribute to achieving the objectives for the zone in which the land is located, and
- (b) the appearance of any proposed structure, from both the waterway and adjacent foreshore areas, will be compatible with the surrounding area, and
- (c) the development will not cause environmental harm such as:
 - i) pollution or siltation of the waterway, or
 - ii) an adverse effect on surrounding uses, marine habitat, wetland areas, fauna and flora habitats, or
 - iii) an adverse effect on drainage patterns, and
- (d) the development will not cause congestion or generate conflict between people using open space areas or the waterway, and
- (e) opportunities to provide continuous public access along the foreshore and to the waterway will not be compromised, and

- (f) any historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the land on which the development is to be carried out and of surrounding land will be maintained, and
- (g) in the case of development for the alteration or rebuilding of an existing building wholly or partly in the foreshore area, the alteration or rebuilding will not have an adverse impact on the amenity or aesthetic appearance of the foreshore, and
- (h) sea level rise or change of flooding patterns as a result of climate change has been considered”.

For Item (a), the subject property is zoned as E3 Environmental Management, for which the objectives in LEP 2013 are as follows:

- to protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values;
- to provide for a limited range of development that does not have an adverse effect on those values;
- to protect tree canopies and provide for low impact residential uses that does not dominate the natural scenic qualities of the foreshore;
- to ensure that development does not negatively impact on nearby foreshores, significant geological features and bushland, including loss of natural vegetation;
- to encourage revegetation and rehabilitation of the immediate foreshore, where appropriate, and minimise the impact of hard surfaces and associated pollutants in stormwater runoff on the ecological characteristics of the locality, including water quality;
- to ensure that the height and bulk of any proposed buildings or structures have regard to existing vegetation, topography and surrounding land uses.

The proposed seawall does not impact on any of these objectives from a coastal engineering perspective.

For Item (b), this is not a coastal engineering matter so is not definitively addressed herein, but it can be noted that the proposed seawall is replacing an existing use to the same crest level.

For Item (c), the proposed development would not cause any significant pollution or siltation of the waterway and would not adversely impact on adjacent areas, if appropriate construction environmental controls are applied. Also, no remnant riparian vegetation is to be removed as part of the proposed works. Therefore, this item is satisfied.

For Item (d), the proposed works would not affect public use of the foreshore and would not cause any conflict with waterway uses, as they are entirely on private property.

For Item (e), the proposed works would not affect public access along the foreshore.

For Item (f), there is no known historic, scientific, cultural, social, archaeological, architectural, natural or aesthetic significance of the land on which the development is to be carried out.

Item (g) is not applicable to the seawall.

For Item (h), sea level rise was considered in Section 6.

8.2 State Environmental Planning Policy (Coastal Management) 2018

8.2.1 Preamble

Based on *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal) and its associated mapping, the subject property is within a “coastal environment area” and “coastal use area”, and is therefore subject to Clause 13 and Clause 14 of SEPP Coastal. However, these clauses do not apply to land within the Foreshores and Waterways Area within the meaning of *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*, which is discussed in Section 8.3.

8.2.2 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 seawall is unlikely to have a significant impact on coastal hazards nor increase the risk of coastal hazards in relation to any other land, as it on a similar alignment to the existing seawall and has the same crest level. The proposed seawall would reduce the risk of coastal hazards at the subject property, as it will have a deeper footing than existing.

8.2.3 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.

8.3 Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005

8.3.1 Preamble

As noted above, the subject property is located within a Foreshores and Waterways Area as per *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005* (SREP 2005), see Section 8.3.3. It is also located within the “Sydney Harbour Catchment” (see Section 8.3.2) and a “Wetlands Protection Area” (see Section 8.3.4) as per SREP 2005.

8.3.2 Sydney Harbour Catchment (Clause 13)

Based on Clause 13 of SREP 2005, “the planning principles for land within the Sydney Harbour Catchment are as follows:

- (a) development is to protect and, where practicable, improve the hydrological, ecological and geomorphological processes on which the health of the catchment depends,
- (b) the natural assets of the catchment are to be maintained and, where feasible, restored for their scenic and cultural values and their biodiversity and geodiversity,
- (c) decisions with respect to the development of land are to take account of the cumulative environmental impact of development within the catchment,
- (d) action is to be taken to achieve the targets set out in *Water Quality and River Flow Interim Environmental Objectives: Guidelines for Water Management: Sydney Harbour and Parramatta River Catchment* (published in October 1999 by the Environment Protection Authority), such action to be consistent with the guidelines set out in

Australian Water Quality Guidelines for Fresh and Marine Waters (published in November 2000 by the Australian and New Zealand Environment and Conservation Council),

- (e) development in the Sydney Harbour Catchment is to protect the functioning of natural drainage systems on floodplains and comply with the guidelines set out in the document titled *Floodplain Development Manual 2005* (published in April 2005 by the Department),
- (f) development that is visible from the waterways or foreshores is to maintain, protect and enhance the unique visual qualities of Sydney Harbour,
- (g) the number of publicly accessible vantage points for viewing Sydney Harbour should be increased,
- (h) development is to improve the water quality of urban run-off, reduce the quantity and frequency of urban run-off, prevent the risk of increased flooding and conserve water,
- (i) action is to be taken to achieve the objectives and targets set out in the *Sydney Harbour Catchment Blueprint*, as published in February 2003 by the then Department of Land and Water Conservation,
- (j) development is to protect and, if practicable, rehabilitate watercourses, wetlands, riparian corridors, remnant native vegetation and ecological connectivity within the catchment,
- (k) development is to protect and, if practicable, rehabilitate land from current and future urban salinity processes, and prevent or restore land degradation and reduced water quality resulting from urban salinity,
- (l) development is to avoid or minimise disturbance of acid sulfate soils in accordance with the Acid Sulfate Soil Manual, as published in 1988 by the Acid Sulfate Soils Management Advisory Committee".

With regard to (a), the proposed seawall will not affect hydrological, ecological and geomorphological processes significantly different to the existing seawall.

Items (b) and (c) are not applicable.

With regard to (d) and (h), the proposed seawall would not adversely impact on water quality as long as appropriate construction environmental controls are applied.

With regard to (e), the functioning of natural drainage systems on floodplains would not be affected by the proposed seawall.

Item (f) is not a coastal engineering matter, but it can be noted that the proposed seawall has a similar alignment and the same crest level as existing.

With regard to (g), the proposed seawall would not affect views of Sydney Harbour.

With regard to (i), the objectives in the *Sydney Harbour Catchment Blueprint* mostly relate to maintenance and enhancement of the natural environment, scenic values and appropriate recreational activities; biodiversity; cultural heritage; and Ecologically Sustainable Development. Catchment targets therein mostly relate to no net loss of threatened ecosystems, habitat or species; achieving appropriate water quality and river flow regimes; business for indigenous communities; and increased community awareness of cultural heritage. These items are either not relevant or unaffected by the proposed seawall.

With regard to (j), there are no riparian corridors nor remnant native vegetation in the vicinity of the proposed seawall.

With regard to (k), urban salinity is not an issue at the subject property.

With regard to (l), acid sulfate soils are not a coastal engineering matter so are not considered herein. That stated, the retention of the existing seawall as proposed would minimise the required excavation for the proposed seawall, which would assist in minimising disturbance of any potential acid sulfate soils.

8.3.3 Foreshores and Waterways Area (Clause 14)

Based on Clause 14 of SREP 2005, “the planning principles for land within the Foreshores and Waterways Area are as follows:

- (a) development should protect, maintain and enhance the natural assets and unique environmental qualities of Sydney Harbour and its islands and foreshores,
- (b) public access to and along the foreshore should be increased, maintained and improved, while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation,
- (c) access to and from the waterways should be increased, maintained and improved for public recreational purposes (such as swimming, fishing and boating), while minimising its impact on watercourses, wetlands, riparian lands and remnant vegetation,
- (d) development along the foreshore and waterways should maintain, protect and enhance the unique visual qualities of Sydney Harbour and its islands and foreshores,
- (e) adequate provision should be made for the retention of foreshore land to meet existing and future demand for working harbour uses,
- (f) public access along foreshore land should be provided on land used for industrial or commercial maritime purposes where such access does not interfere with the use of the land for those purposes,
- (g) the use of foreshore land adjacent to land used for industrial or commercial maritime purposes should be compatible with those purposes,
- (h) water-based public transport (such as ferries) should be encouraged to link with land-based public transport (such as buses and trains) at appropriate public spaces along the waterfront,
- (i) the provision and use of public boating facilities along the waterfront should be encouraged”.

Item (a) is not a coastal engineering matter, but it can be noted that the proposed seawall would not be expected to affect natural assets, being on a similar alignment and with the same crest level as the existing seawall.

With regard to (b), the proposed seawall would not affect public access (it is entirely on private property), and there are no wetlands, riparian lands nor remnant vegetation in its vicinity. It would not affect the adjacent waterway significantly different to the existing seawall.

With regard to (c), the proposed seawall would not affect public access to from waterways differently to the existing seawall, and is entirely on private property.

Item (d) is not a coastal engineering matter, but it can be noted that the proposed seawall has a similar alignment and the same crest level as existing.

Items (e) to (i) are not applicable.

8.3.4 Wetlands Protection Area

In Clause 63 of SREP 2005, various matters to be taken into consideration in relation to any development are listed. Given that the proposed seawall would not be expected to affect the quality of water entering the waterway (as long as appropriate construction environmental controls are applied), and would not affect native vegetation and wildlife, nor habitats for both indigenous and migratory species, nor the surface and groundwater characteristics of the site, nor any wetlands, this clause is satisfied.

8.4 Sydney Harbour Foreshores and Waterways Area Development Control Plan 2005

Based on Chapter 4.17 of the *Sydney Harbour Foreshores and Waterways Area Development Control Plan 2005*, “where seawalls are permitted the following requirements must be met [with numbering added for ease of referencing]:

- i) the development application must address the impact of the seawall on wave and current patterns, potential erosion and the resuspension of contaminants;
- ii) the top of the seawall should be 2.6 metres above ZFD TG (1.675 AHD);
- iii) natural sandstone blocks or sandstone facing over concrete walls are preferable to other materials. Cement rendered masonry wall with integral yellow oxide render of light tone is acceptable. The use of shotcrete or unrendered off form concrete will not be encouraged;
- iv) where existing sandstone seawalls are being extended or upgraded, similar sandstone coursing to match existing walls should be used;
- v) rubble walls should be avoided and, if possible, existing rubble walls replaced; and
- vi) high walls and long unbroken lengths of walls are best avoided. If these already exist, they should be broken by steps or vegetation to relieve their visual monotony”.

With regard to (i), the proposed seawall would not affect wave and current patterns, nor potential erosion nor resuspension of contaminants (if any) significantly different to the existing seawall.

With regard to (ii), the seawall is at the back of the beach and not in the water for most of the time, and needs to be at the level proposed to have acceptable wave overtopping performance. The proposed seawall has the same crest level as existing, with adjacent seawalls having similar crest levels. The existing ground level landward of the seawall is also well above 1.675m AHD and would be subject to erosion if the seawall crest was at that lower level.

With regard to (iii), sandstone facing over a concrete wall is proposed.

With regard to (iv), there is no consistency in the form of adjacent walls.

Item (v) is not applicable.

With regard to (vi), the proposed seawall has a similar alignment and the same crest level as the existing seawall, with access steps.

8.5 Manly Development Control Plan 2013

With regard to Chapter 4.1.4.5 of *Manly Development Control Plan 2013*, no exception is proposed to the Foreshore Building Line, height of buildings is not a consideration, the proposed seawall is to be similar to adjacent seawalls and is not to be used for accommodation,

riparian vegetation would not be affected (as it is absent from the area), and public access would not be affected.

8.6 Coastal Management Act 2016

Based on Section 27 of the *Coastal Management Act 2016*, “development consent must not be granted under the *Environmental Planning and Assessment Act 1979* to development for the purpose of coastal protection works, unless the consent authority is satisfied that:

- (a) the works will not, over the life of the works:
 - (i) unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or
 - (ii) pose or be likely to pose a threat to public safety, and
- (b) satisfactory arrangements have been made (by conditions imposed on the consent) for the following for the life of the works:
 - (i) the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by the presence of the works,
 - (ii) the maintenance of the works”.

For Section 27(a), the works will not ever unreasonably limit public access to or the use of a beach or headland. The proposed works are entirely on private property and will be for the life of the works. The works have been designed to have an acceptably low risk of damage, and therefore pose an acceptably low threat to public safety.

For Section 27(b), the proposed seawall would not be expected to affect the adjacent beach area or adjacent land any differently to the existing seawall, and would not be expected to impact on adjacent land as this already has seawalls. It is therefore not relevant to be applying a requirement for beach or adjacent land restoration at the subject property. Applying a condition for maintenance of the works is a matter for Council.

9. CONCLUSIONS

It is proposed to undertake alterations and additions to a seawall (coastal protection works) at 15 Monash Crescent Clontarf, as well as alterations and additions to a garage. Only the seawall has been considered herein.

If the recommendations in Section 7 are followed, the risks of damage to the proposed seawall would be suitably mitigated, and it would have an adequately low risk of failure.

The proposed development satisfies the requirements of *Manly Local Environmental Plan 2013*, *State Environmental Planning Policy (Coastal Management) 2018*, *Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005*, *Sydney Harbour Foreshores and Waterways Area Development Control Plan 2005*, *Manly Development Control Plan 2013* and Section 27 of the *Coastal Management Act 2016*, for the matters outlined herein.

10. REFERENCES

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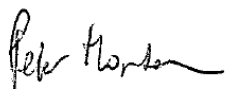
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11. SALUTATION

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



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