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Coastal Engineering Advice on Long Reef Golf Club Clubhouse Refurbishment for Development Application

1. INTRODUCTION AND BACKGROUND

It is proposed to undertake alterations and additions to the Long Reef Golf Club Clubhouse (the 'site'), for which a Development Application (DA) is to be submitted to Northern Beaches Council. Given the proximity of the site to Fishermans Beach, a coastal engineering assessment is required by Council for the DA, as set out herein.

The report author, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 33 years of coastal engineering experience. He has postgraduate qualifications in coastal engineering, and is a Member of Engineers Australia (MIEAust) 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.

In previous employment, Peter was the main author of the *Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach* prepared for Warringah Council in 2014, and the *Coastal Erosion Emergency Action Subplan for Beaches in Warringah* prepared for Warringah Council in 2012. He has also prepared DA coastal engineering reports at numerous locations along Fishermans Beach over the last few decades. Peter has inspected the area in the vicinity of the site on numerous occasions in the last few decades, including a specific recent inspection of the site on 4 October 2024.

All levels given herein are to Australian Height Datum (AHD). Zero metres AHD is approximately equal to mean sea level at present in the ocean immediately adjacent to the NSW mainland.

2. INFORMATION PROVIDED

Horton Coastal Engineering was provided with 25 architectural drawings (with a cover page, contents page, and Drawing Numbers DA02 to 06, 07A, 07B, 08, 09, 09A, 10 to 15, 19A, 20, 22, 23, 25A, 26B, and 27C) of the proposed development prepared by i2c, various Issues up to P13 and dated up to 2 April 2025. A site survey completed by SurveyPlus (Reference 22445_DET_1A, 7 sheets, Revision A, dated 10 August 2023) was also provided.

3. EXISTING SITE DESCRIPTION

Fishermans Beach is about 800m long, situated immediately north of the prominent Long Reef headland. The site is located adjacent to near the centre of Fishermans Beach, with vertical and oblique aerial views in Figure 1 (with boundary annotations) and Figure 2 respectively. Photographs of the site are provided in Figure 3 to Figure 6, all taken on 4 October 2024.

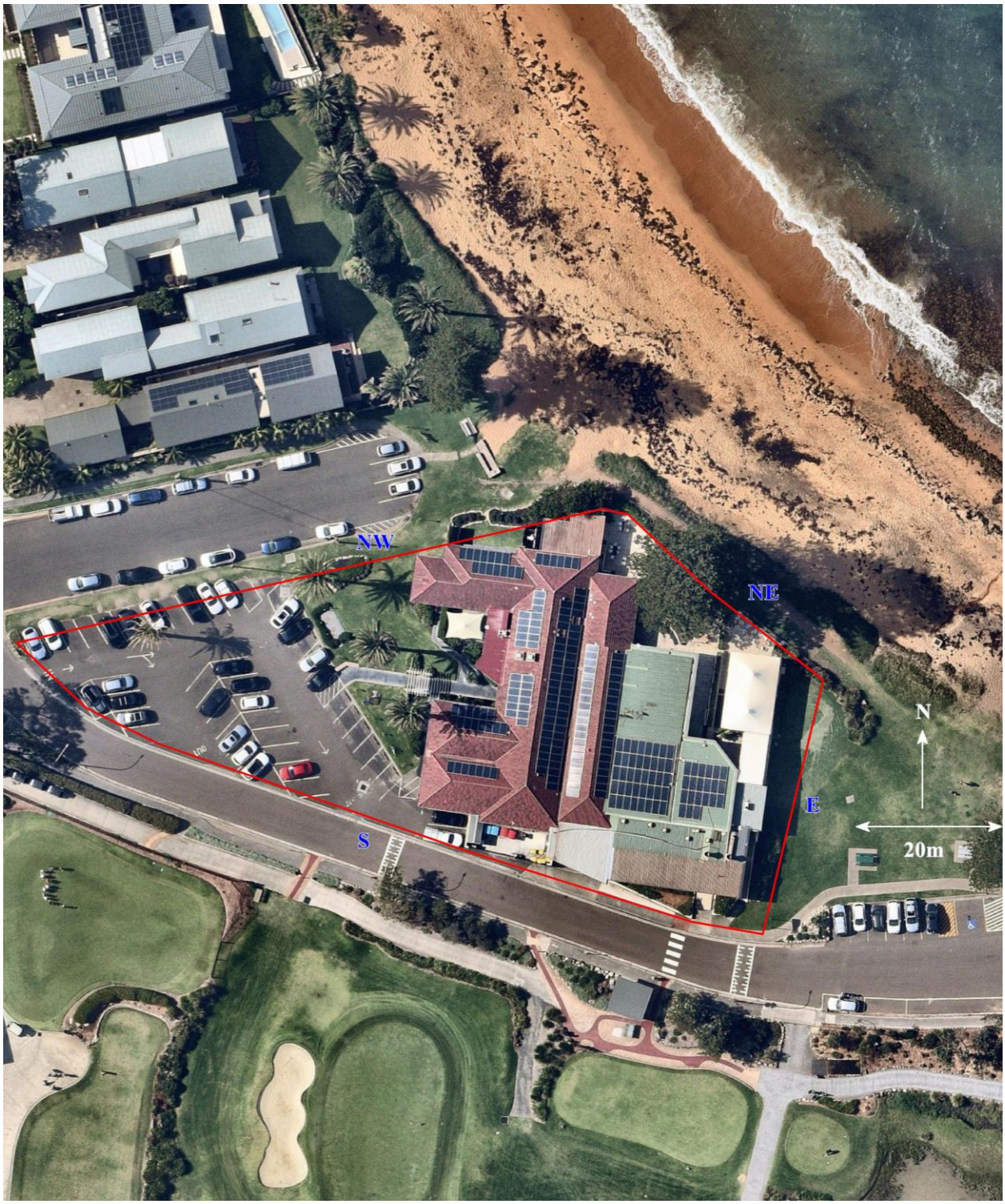


Figure 1: Vertical aerial view of site (approximate red outline) on 4 February 2025, with adopted boundary annotations (for reference) shown in blue

Figure 2: Oblique aerial view of site (at arrow) on 22 July 2024, facing south

Figure 3: View of site from Fishermans Beach, facing south

Figure 4: View of NE corner of site, facing NW

Figure 5: View of eastern edge of site, facing west

Figure 6: View of NW portion of site, facing SSW

Based on the survey, ground elevations along the NE boundary vary between about 5.5m and 5.7m AHD. Seaward of this, there is a public walking track at levels between about 4.2m and 4.8m AHD, generally increasing moving NW. Based on review of aerial photography back to 2009, the sand/vegetation interface seaward of the site is typically located about 5m to 10m seaward of the NE boundary, generally reducing in width moving NW in the last few years.

Ground elevations along the NW boundary vary between about 5.6m and 7.4m AHD, generally increasing moving SW. Ground elevations along the E boundary vary between about 5.2m and 5.4m AHD. Levels in the area surrounding the Norfolk Island pine tree on the NE side of the site are at around 5.8m AHD.

The clubhouse at the site has a variety of existing floor levels. Most of the structure has a finished floor level of 6.47m to 6.49m AHD, with a committee room at the northern tip at 5.74m AHD, storage area on the western side at 6.42m AHD, male showers at 6.51m AHD, pavilion at the NE corner of the site at 5.93m to 5.98m AHD, and a café/lounge to the south of this at 6.35m AHD.

4. PROPOSED DEVELOPMENT

It is proposed to undertake alterations and additions at the site to create a refurbished two-storey clubhouse, with a new upper level. The proposed finished ground floor level is 6.49m AHD, with a garden seating area at the NE corner at about 5.8m AHD. An outline of the proposed development is provided in Figure 9.

It is understood that the garden seating area is to be paved or tiled. This area is currently tiled (see Figure 7), and is essentially to have the same extent as existing.

Figure 7: View of current garden seating area on 4 October 2024, facing WNW

5. SUBSURFACE CONDITIONS

Alliance Geotechnical has completed a limited geotechnical investigation at the site, dated 22 August 2023. This comprised two hand-auger boreholes to 2m depth and three Dynamic Cone Penetrometer (DCP) tests to 2.5m depth.

These tests disclosed sandy fill overlying clayey sand, and then sandy clay at about 3.5m AHD (SE side of site), 5.5m AHD (NW side of site) and 3.9m AHD (NE side of site, inferred from the DCP test).

The area surrounding the site is known to have clay and bedrock at relatively shallow depth. For example, a 2008 geotechnical investigation by Jeffery & Katauskas relating to boat ramp extensions and repairs at Fishermans Beach, about 40m east of the site, found claystone bedrock at about -1m AHD to -2m 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 shown in Figure 8, assuming an entirely sandy (erodible) subsurface. This assumption is likely to be over-conservative based on the sandy clay identified in the geotechnical investigation discussed in Section 5, but would require a more detailed geotechnical investigation to confirm this.

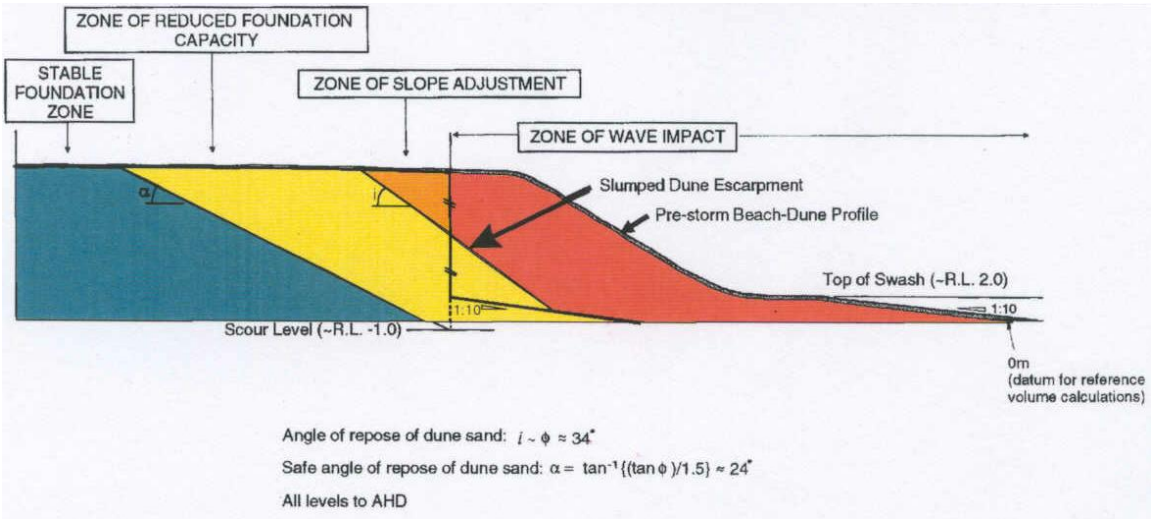


Figure 8: Schematic representation of coastline hazard zones (after Nielsen et al, 1992)

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 (ZSA) 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 the ZRFC (ie landward or below), as the factor of safety within the ZRFC 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.

6.2 Existing Council Hazard Lines

In Figure 9, various coastal hazard lines are depicted at the site, with a roof outline of the proposed development also shown in solid cyan (upper level roof in black), with the seaward edge of a terrace (seaward edge of steps, walls and a ramp) at the NE corner shown as dashed cyan. As noted on Figure 9, a garden seating area is proposed seaward of the terrace and extending to the boundary, extending seaward of the dashed cyan lines and laterally a far as the yellow lines.

The proposed clubhouse has a similar footprint to the existing, except the committee room and female showers at Location A in Figure 9 have been removed from the proposed footprint.

As part of the *Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach* (CZMP), initially completed in 2014 and updated in 2016, coastal hazard lines were delineated at Collaroy-Narrabeen Beach for immediate, 2050 and 2100 planning periods. The CZMP hazard lines (Immediate ZSA, 2050 ZSA and 2100 ZSA) are depicted in Figure 9, with all 3 lines at the landward edge of the ZSA. Note that these hazard lines are conservative as they

assume an entirely sandy subsurface, and because the sea level rise values used to define the lines were upper limit projections.

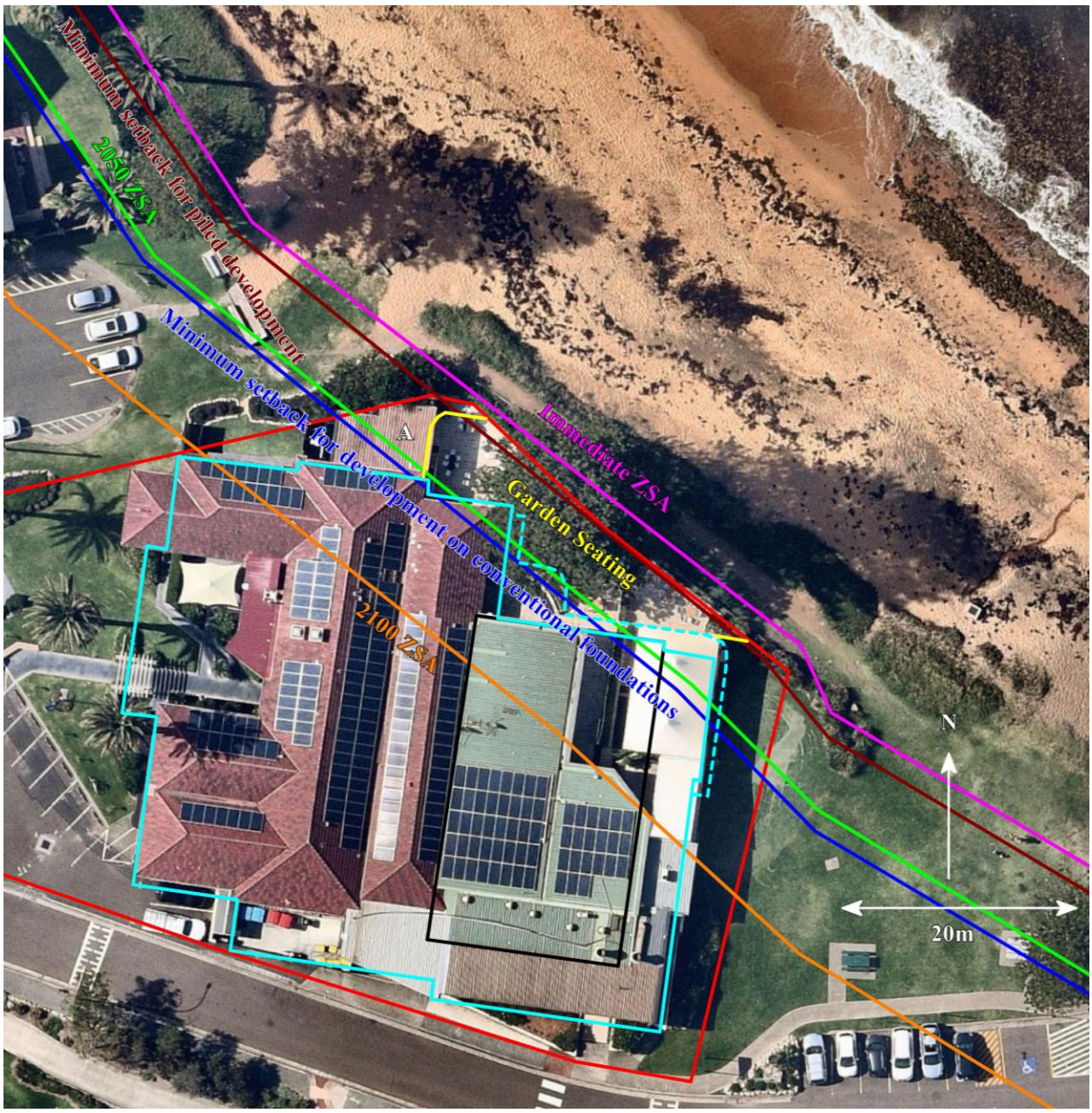


Figure 9: Coastal hazard lines and CZMP setbacks at site, with proposed development outline in cyan (roof solid, seaward edge of terrace dashed), upper level roof in black, and aerial photograph taken on 4 February 2025

It is evident that most of the proposed development is landward of the 2050 ZSA, except for the garden seating area, NE tip of meeting/community room 3, and NE tip of the covered terrace dining area (refer to the architectural drawings for the location of these features).

In the CZMP, two lines defining the required minimum setback for new beachfront development at Fishermans Beach were delineated, including consideration of development on conventional foundations and piled foundations[1], and again assuming an entirely sandy

[1] Conventional foundations include slab-on-ground, strip footings and shallow piers, and can be distinguished from deep piled foundations.

subsurface. These lines are depicted in Figure 9 as the "minimum setback for piled development" and "minimum setback for development on conventional foundations". These lines were developed based on a 60 year design life, which was justified in the CZMP as being appropriate based on consideration of Australian Standards, tax legislation and community expectations.

It is evident in Figure 9 that the entire development is landward of the minimum setback for piled development, except for the NW tip of the garden seating area. Most of the development is landward of the minimum setback for development on conventional foundations, except for the garden seating area, seaward edge of the terrace, NE tip of meeting/community room 3, and NE tip of the covered terrace dining area.

6.3 Foundation Requirements

This section has been written assuming an entirely sandy subsurface. The requirements in this section may be refined if a more comprehensive geotechnical investigation is undertaken as part of detailed design. It is recommended that a consent condition is applied that requires a coastal engineer to review the foundation design prior to the issue of a Construction Certificate.

From a coastal engineering perspective, all parts of the proposed development (including the garden seating area) seaward of the minimum setback for development on conventional foundations shall be founded on piles. It is required that a minimum depth of piling is adopted based on the distance seaward of the minimum setback for development on conventional foundations (with this distance denoted as X herein). That is, pile depths would need to be devised based on ignoring the upper Z metres of soil (assuming it has eroded away), where Z is equal to $X\tan(33)$ based on an angle of repose (Φ) for sand of 33°. Therefore, for example, the upper 3.6m of soil should be ignored in defining the depth of piles at the NE corner of the terrace adjacent to the covered terrace dining area (which is located about 5.5m seaward of the minimum setback for development on conventional foundations)[2]. Note that the maximum Z value does not need to extend below -1m AHD.

As part of detailed design, the structural engineer should allow for sand slumping forces in the seaward direction and wave forces in the landward direction on the piles, as advised by a coastal engineer.

From a coastal engineering perspective, all parts of the proposed development landward of the minimum setback for development on conventional foundations may be founded on conventional foundations. That is, landward of the minimum setback for development on conventional foundations, there are no particular foundation requirements from a coastal engineering perspective, and foundation design can be undertaken based on conventional structural and geotechnical engineering considerations.

That stated, based on geotechnical and structural engineering advice as part of detailed design, it may be necessary to increase pile depths beyond the depths necessary to meet the above requirements, to achieve uniform ground conditions to minimise the risk of differential settlement. It may also be necessary to have piles landward of the minimum setback for development on conventional foundations for the same reason, if required based on geotechnical and structural engineering advice as part of detailed design.

[2] That is, the piles would need to extend a sufficient distance below this 3.6m depth (a sufficient distance below about 2.2m AHD, given that there is a ground level of 5.8m AHD) at this location.

The slight (up to about 1.4m) encroachment of the NW tip of the garden seating area seaward of the minimum setback for piled development is considered to be inconsequential and therefore acceptable, noting that this area is an existing use that is not known to be piled, but is now proposed to be piled.

7. COASTAL INUNDATION COASTAL HAZARDS

In the CZMP, a present day wave runup level of 6m AHD was adopted at Fishermans Beach in the vicinity of the site (which can be taken as a 100 year ARI[3] wave runup level exceeded by 2% of waves), assuming a foreshore at the runup level or higher. Sea level rise may increase this level further, although not likely by the full quantum of sea level rise, as the foreshore is at a level of about 5.8m AHD and below the wave runup level. Severe runup that overtopped the foreshore would 'fold over' the crest and travel as a bore at shallow depth (expected to be less than about 0.5m) for a distance inland.

It is considered to be most appropriate to derive the sea level rise value for the design life from Intergovernmental Panel on Climate Change [IPCC] (2021), which is widely accepted by competent scientific opinion. For a 60 year design life, taking the median exceedance probability and average of the 5 five illustrative scenarios (shared socioeconomic pathways, SSP's[4]) considered in IPCC (2021)[5], and including regional sea level rise variations at Sydney as reported by the Physical Oceanography Distributed Active Archive Center (PO.DAAC), the projected sea level rise from 2010 (the date at which the CZMP wave runup value was determined) to 2085 at Sydney is 0.40m.

Therefore, the 100 year ARI wave runup level is unlikely to exceed 6.4m AHD at the site over the design life, unless the wave runup interacts with a vertical structure, in which case vertical momentum may increase the runup level, but limit its landward propagation.

At the site, with a ground floor level of 6.49m AHD, wave runup in the garden seating area would interact with vertical walls, steps and a ramp. The ramp has been orientated to be oblique to wave action, to minimise the potential for wave runup to flow up onto the ground floor. It is considered that the difference in level of about 0.7m between the garden seating area and ground floor provides an acceptably low risk of wave runup entering the ground floor at that location[6].

It is recommended that the bench seat at the NW corner of the garden seating area is solid and designed to resist wave forces, to act as a trip to wave action flowing towards Meeting/Community Room 2. Meeting/Community Room 1 and 2 have adjacent natural ground at the same level as the floor, but being just above the design wave runup level this is acceptable (refer to the architectural drawings for the location of these rooms).

To reduce coastal inundation risks to acceptable levels:

- the garden seating area and adjacent terrace shall be constructed of materials resistant to inundation (such as tiles);

[3] Average recurrence interval.
[4] Known as representative concentration pathways in the previous IPCC (2013) assessment.
[5] The five illustrative scenarios represent varying projected greenhouse gas emissions, land use changes and air pollutant controls in the future.
[6] As there would be a drop of 0.7m between the floor of Meeting/Community Room 3 and the garden seating area, it may be more appropriate for a window rather than a door to form its northern edge.

- all power points and other electrical items that could be damaged by inundation shall be raised above 6.4m AHD, or waterproofed below this;
- the glass doors on the northern side of the clubhouse shall have toughened and laminated glass such that the glass holds together when shattered, and shall also have conventional weatherproofing features along their base (such as door pan flashing); and
- structural elements exposed to wave action should be designed to resist hydrostatic and wave forces, provided by a coastal engineer as part of detailed design.

In an extreme wave runup event, it is recommended items that could be mobilised by wave action (such as tables and chairs) in the garden seating area are relocated landward to be beyond the wave runup limit, so that they do not become projectiles and/or get damaged.

8. MERIT ASSESSMENT

8.1 *Warringah Local Environmental Plan 2011*

Based on Clause 6.5(3) of the *Warringah Local Environmental Plan 2011* (LEP), "development consent must not be granted unless the consent authority is satisfied that the development:

(a) will not significantly adversely affect coastal hazards, and
(b) will not result in significant detrimental increases in coastal risks to other development or properties, and
(c) will not significantly alter coastal hazards to the detriment of the environment, and
(d) incorporates appropriate measures to manage risk to life from coastal risks, and
(e) avoids or minimises exposure to coastal hazards, and
(f) makes provision for relocation, modification or removal of the development to adapt to coastal hazards and NSW sea level rise planning benchmarks".

Based on Clause 6.5(4), "development consent must not be granted unless the consent authority is satisfied that the foundations of the development have been designed to be constructed having regard to coastal risk".

With regard to Clauses 6.5(3)(a), (b) and (c), the proposed development is unlikely to have a significant impact on coastal hazards or increase the risk of coastal hazards in relation to any other land (or the environment), as it is either located landward of the minimum setback for development on conventional foundations from the CZMP, or would be piled (and suspended above typical coastal processes) in accordance with Section 6.3 herein. The proposed development also thus has an acceptably low risk of being affected by erosion/recession coastal hazards, and Clauses 6.5(3)(d) and (e) are therefore satisfied. Furthermore, if the requirements in Section 7 are followed, the proposed development would have an acceptably low risk of being adversely impacted by coastal inundation.

With regard to Clause 6.5(3)(f), the proposed development has been designed to not be damaged by coastal hazards for an acceptably rare storm and acceptably long design life, rather than relocated or removed. This is consistent with the CZMP.

With regard to Clause 6.5(4), requirements for foundations of the proposed development were outlined in Section 6.3.

8.2 *Warringah Development Control Plan 2011*

Part E9 of the *Warringah Development Control Plan 2011* (DCP)[7] has discussion on "Coastline Hazard". Based on the DCP, the risk of damage from coastal processes is to be reduced through having appropriate beachfront setbacks and foundations. If foundation design is carried out consistent with Section 6.3, the proposed development would be appropriately founded. The proposed setback of the development is generally consistent with the CZMP, with due consideration given of the minimum setback for development on conventional foundations, and minimum setback for piled development (the slight encroachment of the NW tip of the garden terrace area seaward of the minimum setback for piled development was noted as inconsequential in Section 6.3).

Furthermore, based on Part E9 of the DCP, the applicant must demonstrate compliance with the *Northern Beaches Coastal Erosion Policy*, the CZMP and the *Collaroy-Narrabeen Protection Works Design Specifications*. As no protection works are proposed, neither the *Northern Beaches Coastal Erosion Policy* (except as noted below) nor *Collaroy-Narrabeen Protection Works Design Specifications* are generally applicable for the subject DA. As noted above, the proposed setbacks are consistent with the CZMP.

The proposed development has an acceptably low risk of being damaged by coastal erosion/recession and coastal inundation, as outlined previously.

With regard to the *Northern Beaches Coastal Erosion Policy*, as noted above this is mostly focussed on the construction of coastal protection works. However, it can be noted that:

- as per 2(b), the risk of damage to the proposed development from coastal processes is acceptably low; and
- as per 2(d), the proposed development would not adversely impact on adjoining properties or coastal processes.

Therefore, the proposed development complies with the *Northern Beaches Coastal Erosion Policy,* where relevant.

Also, based on the DCP, development must be constructed with a suitable floor level or in a manner that minimises the risk of coastal inundation for severe coastal storms occurring over the next 50 years. This is the case for the proposed development if the requirements outlined in Section 7 are implemented.

8.3 *State Environmental Planning Policy (Resilience And Hazards) 2021*

8.3.1 Preamble

Based on *State Environmental Planning Policy (Resilience and Hazards) 2021*[8] (SEPP Resilience) and its associated mapping, the site is the site is within a "coastal environment area" (see Section 8.3.2) and "coastal use area" (see Section 8.3.3).

[7] Amendment 22 of the DCP was reviewed, which commenced on 1 June 2022.
[8] Encompassing the former *State Environmental Planning Policy (Coastal Management) 2018*.

8.3.2 Clause 2.10

Based on Clause 2.10(1) of SEPP Resilience, "development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

(a) the integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment,
(b) coastal environmental values and natural coastal processes,
(c) the water quality of the marine estate (within the meaning of the *Marine Estate Management Act 2014*), in particular, the cumulative impacts of the proposed development on any of the sensitive coastal lakes identified in Schedule 1,
(d) marine vegetation, native vegetation and fauna and their habitats, undeveloped headlands and rock platforms,
(e) existing public open space and safe access to and along the foreshore, beach, headland or rock platform for members of the public, including persons with a disability,
(f) Aboriginal cultural heritage, practices and places,
(g) the use of the surf zone".

With regard to (a), the proposed works are in a developed area, and would not be expected to adversely affect the biophysical and hydrological (surface and groundwater) environments. Based on review of a Stormwater Management Report prepared by Orion, existing stormwater arrangements are not to be altered. This existing arrangement directs runoff from the clubhouse landward to a golf course irrigation reuse system. This is also beneficial from a coastal engineering perspective, as it avoids erosion due to stormwater runoff on the beach adjacent to the clubhouse.

The proposed development would not be a source of pollution as long as appropriate construction environmental controls are applied, noting that a Sediment and Erosion Control Plan has been included as part of the Civil Engineering Plans provided with the Stormwater Management Report.

Assuming that there is no native vegetation or fauna and their habitats at the site that would be impacted by the works, the proposed works would not be expected to adversely affect the ecological environment. An arboricultural impact assessment and tree protection specification has been prepared as part of the DA.

With regard to (b), the proposed development would not be expected to adversely affect coastal environmental values or natural coastal processes over its design life, as it is at an acceptably low risk of damage from erosion/recession and inundation for an acceptably rare storm and over an acceptably long design life of 60 years.

With regard to (c), the proposed development would not adversely impact on water quality as long as appropriate construction environmental controls are applied. Note also that water quality treatment is incorporated into the grassed swale and dam system as part of the golf course.

With regard to (d), this is not a coastal engineering matter so is not necessarily definitively considered herein. That stated, there are no undeveloped headlands nor rock platforms in proximity to the proposed development, no marine vegetation in the area to be developed, and no known native vegetation of significance at the site. No significant impacts on marine fauna

and flora would be expected as a result of the proposed development, as the development would not be expected to interact with subaqueous areas (except in extreme storms) over the design life.

With regard to (e), the proposed development would not impact on public open space and access to and along the foreshore, generally being entirely within the lease boundary and generally within the existing clubhouse footprint, and not altering current access arrangements.

With regard to (f), a search of the Heritage NSW "Aboriginal Heritage Information Management System" (AHIMS) was undertaken on 15 April 2025. This resulted in no Aboriginal sites nor Aboriginal places being recorded or declared within at least 50m of the site.

With regard to (g), the proposed development is generally entirely within its lease boundary and would not be expected to interact with the surf zone over its design life, except in extreme storms. Fishermans Beach is not generally a surfing location, with surfing breaks located further offshore around Long Reef headland.

Based on Clause 2.10(2) of SEPP Resilience, "development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a) the development is designed, sited and will be managed to avoid an adverse impact referred to in subclause (1), or
(b) if that impact cannot be reasonably avoided—the development is designed, sited and will be managed to minimise that impact, or
(c) if that impact cannot be minimised—the development will be managed to mitigate that impact".

The proposed development has been designed and sited to avoid the adverse impacts referred to in Clause 2.10(1).

8.3.3 Clause 2.11

Based on Clause 2.11(1) of SEPP Resilience, "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 (a)(i), the proposed development would not impact on foreshore or beach access, as discussed previously.

With regard to (a)(ii), (a)(iii) and (c), these are not coastal engineering matters so are not considered herein.

With regard to (a)(iv), there are no particular Aboriginal sites nor Aboriginal places within at least 50m of the proposed development, as noted in Section 8.3.2.

With regard to (a)(v), the nearest environmental heritage items to the proposed development listed in Schedule 5 of the LEP are the house known as "Eight Bells" at 8 Seaview Parade Collaroy, some 70m from the site, and the Fisherman's Hut (including winches and remnant vegetation) about 250m from the site. The proposed development would not be expected to impact on these or more distant heritage items.

With regard to (b), the proposed development has been designed and sited to avoid any potential adverse impacts referred to in Clause 2.11(1).

8.3.4 Clause 2.12

Based on Clause 2.12 of SEPP Resilience, "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".

As noted in Section 8.1, the proposed development would not be expected to give rise to any increased coastal hazard on that land or adjacent land.

8.3.5 Clause 2.13

Based on Clause 2.13 of SEPP Resilience, "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".

The CZMP only operated as a certified coastal management program until 31 December 2023, but has now lapsed. That stated, consistency with the CZMP has been discussed in Section 6.2.

8.3.6 Synthesis

The proposed development satisfies the requirements of *State Environmental Planning Policy (Resilience and Hazards) 2021* for the matters considered herein.

9. CONCLUSIONS

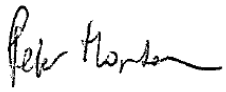
It is proposed to undertake alterations and additions to the Long Reef Golf Club Clubhouse. The foundations of the proposed development should satisfy the requirements described in Section 6.3. The measures outlined in Section 7 are required to be adopted to reduce coastal inundation risks to acceptable levels.

If the requirements outlined in Section 6.3 and Section 7 are followed, the proposed development would be consistent with the coastal engineering requirements listed in Clause 6.5 of *Warringah Local Environmental Plan 2011,* Part E9 of the *Warringah Development Control Plan*, *State Environmental Planning Policy (Resilience and Hazards) 2021*, the CZMP, and the *Northern Beaches Coastal Erosion Policy*.

10. 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