Horton Coastal Engineering
Coastal & Water Consulting

Statement of Environmental Effects for Construction of Upgraded Coastal Protection Works at "Flight Deck", 1114 Pittwater Road Collaroy

Prepared by Horton Coastal Engineering Pty Ltd

for the Owners of Strata Plan No. 1977

Issue A

21 September 2017

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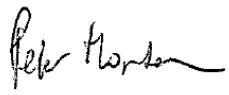

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EXECUTIVE SUMMARY

The report herein comprises a Statement of Environmental Effects as part of a Development Application (DA) to Northern Beaches Council for construction of upgraded coastal protection works at and slightly seaward of 1114 Pittwater Road Collaroy (known as "Flight Deck"). It also supports an application to the Department of Industry – Lands & Forestry for Landowner's Consent, as the works are proposed to slightly extend on to Crown Land at Collaroy Beach (only by up to 2m further than the existing works).

Existing protection works extend essentially continuously for 900m north of the subject property (assuming that a DA for new coastal protection works at 1126-1144 Pittwater Road Collaroy is approved), and 700m south of the subject property, and have generally been in place for 40 to 50 years. These existing works would be expected to remain in place and be upgraded over time, with no known legal mechanism by which a government authority can force their removal. Impacts are thus assessed herein relative to the scenario of existing protection works remaining.

The existing protection works immediately adjacent to the subject property extend on to Crown Land by about 2m to 3m. Most of the 900m length of existing protection works beach north of the subject property also extends on to Crown Land.

A coastal storm in June 2016 caused some damage at the subject property. The proposed works are necessary to reduce the risk of coastal erosion damage to existing and future development at the subject property. Without effective protection works, it is almost certain (greater than 95% probability) that the Flight Deck tower will be substantially undermined over the next 60 years or so.

If the proposed works are not constructed, the following can be expected in future coastal storms:

- further erosion and damage at the subject property;
- impacts on public beach amenity, with boulders and other non-sandy materials strewn on the beach after coastal storms;
- diversion of Council and emergency services resources during and after coastal storms; and
- eventual damage to Pittwater Road.

As further justification for the proposed works, the works are consistent with the CZMP.

The proposed coastal protection works are a sloping rock revetment, adding a layer of 'oversized' primary armour on top of the existing revetment. There is discussion in a separate Coastal Engineering Report on how the proposed works are consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*.

The works extend alongshore over the beach frontage of Flight Deck, extending cross-shore up to 2m seaward of the existing works. The existing rock revetment extends to or just seaward of the subject property on to Crown Land (average extent on to Crown Land of about 0.5m). As the proposed works comprise placement of additional rock over the existing revetment, to provide toe support to these additional works it is necessary for the toe rock to be placed on Crown Land. The additional toe rock would have an inconsequential effect on the exposure of rock on public land, being buried under sand for almost all of the time. The 2m seaward

extension in works footprint is consistent in alignment to coastal protection works in surrounding areas that extend on to Crown Land by about 2m to 3m.

After completion of the rock works, the revetment is to be covered with sand and revegetated. Typical species that may be planted include Beach Spinifex, Coastal Pigface, Beach Fan Flower, Coastal Wattle, Coastal Banksia, Coastal Pelargonium, Coastal Correa and Native Rosemary. There will be no change to the area of landscaping at the subject property as a result of the proposed works.

Based on historical behaviour, it is expected that the proposed rock works would be buried under sand for most of the time. From analysis of 19 historical profiles over 76 years since 1941, the proposed revetment (had it been constructed) would have been buried under sand on public land for 18 of the 19 dates, that is 95% of the dates. Typical beach widths to mean sea level seaward of the proposed revetment would have been about 60m.

It is recognised that long term recession due to projected sea level rise is expected to translate beach profiles upward and landward, thus reducing average beach widths over the long term. Given that there are existing protection works, this will occur irrespective of whether the proposed protection works are constructed or not. The proposed works are not creating a new issue in this regard, and do not significantly alter the potential exposure of the revetment compared to the existing situation. Even with projected long-term recession over 60 years and no beach scraping and beach nourishment, it is expected that there would typically be about 45m beach width at mean sea level seaward of the proposed works.

Based on Clause 129A(1) of *State Environmental Planning Policy (Infrastructure) 2007*, the proposed works are permissible with consent. The proposed works are not integrated development, as this does not apply at open coast beach areas.

From 1985, it was established by the NSW Government and Council that the subject property should have upgraded protection works. In the 1997 *Collaroy Narrabeen Coastline Management Plan*, selective reconstruction of existing seawalls and infilling of gaps was adopted as a management strategy, consistent with the proposed works.

The 2002 *Coastal Lands Plan of Management* (POM) covers the Crown Land seaward of the subject property, which is classified as Natural Area Foreshore. In the *Local Government Act 1993*, the objectives of this area include "to maintain the foreshore as a transition area between the aquatic and the terrestrial environment". The proposed works are considered to be consistent with the use of the foreshore as a transition area between the erodible beach environment and protected terrestrial private development areas.

The POM specifically authorises any works required to implement any part of the 1997 *Collaroy Narrabeen Coastline Management Plan*. On this basis, construction of protection works at the subject property was envisaged and authorised by the POM, for a similar design and alignment as the subject DA. It is also reasonable to state that actions in the current CZMP (which contains a desired outcome of continuous protection works along the southern 1.7km of Collaroy-Narrabeen Beach), given that it supersedes the 1997 Plan, are implicitly authorised by the POM.

The proposed works are consistent with *State Environmental Planning Policy (Infrastructure) 2007*, *State Environmental Planning Policy No 71—Coastal Protection*, Section 55M of the *Coastal Protection Act 1979*, *Warringah Local Environmental Plan 2011*, the *Northern Beaches*

Coastal Erosion Policy, *Warringah Development Control Plan 2011*, Section 79C of the *Environmental Planning and Assessment Act 1979*, Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*, and the *Collaroy-Narrabeen Protection Works Assessment Checklist*.

The 2m additional seaward extent of the works (compared to existing) is consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications* and impact assessment within the *Collaroy-Narrabeen Beach Coastal Protection Assessment*.

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1. INTRODUCTION

The report herein has been prepared as part of a Development Application (DA) to Northern Beaches Council for construction of upgraded coastal protection works at and slightly seaward of 1114 Pittwater Road Collaroy (known as "Flight Deck"). It has also been prepared to support an application to the Department of Industry – Lands & Forestry for Landowner's Consent, as the works are proposed to slightly extend on to Crown Land at Collaroy Beach (only by up to 2m more than the existing extent).

The report comprises a Statement of Environmental Effects consistent with Section 79C(1) of the *Environmental Planning and Assessment Act 1979*. An overarching environmental assessment of coastal protection improvement works along Collaroy-Narrabeen Beach and their expected impacts on coastal processes and beach amenity relative to the present situation has been provided in the *Collaroy-Narrabeen Beach Coastal Protection Assessment* (Manly Hydraulics Laboratory [MHL], 2016), which is referenced elsewhere herein.

In assessing potential impacts of the proposed works herein, impacts have been compared to the "do-nothing scenario". This scenario would be realised if the proposed upgraded protection works were not carried out, and existing protection works at the subject property and in adjacent areas remained in place. These existing protection works comprise:

- the full beach frontage of the subject property itself (distance of about 62m);
- the adjacent property ("Shipmates", at 1122 Pittwater Road Collaroy) and Ramsay Street road reserve to the north, and also extending seaward of 1126 and 1128 Pittwater Road Collaroy (limited works at these two properties) to the north of Ramsay Street (total distance of about 70m);
- proposed protection works at 1126-1144 Pittwater Road Collaroy (distance of about 110m)[1];
- works extending essentially continuously for about 700m north of 1144 Pittwater Road Collaroy, to Devitt Street at Narrabeen, and
- works extending essentially continuously for about 700m south of the subject property to the Collaroy rock pool[2] (see Figure 9 on page 11).

It is important to note that existing protection works in adjacent areas would not only be expected to remain in place, but also to be upgraded (including new works constructed at 1126-1144 Pittwater Road Collaroy) over the next year or so as development applications are submitted to Council and assuming that development consent is obtained.

It is also important to note that there is no known legal mechanism by which a government authority can force the removal of these existing protection works, which at most locations have been in place for 40 to 50 years (since 1967 or 1974). Therefore, even if an ideological position was developed in the future that was contrary to the current position in the *Collaroy-Narrabeen Beach and Fishermans Beach Coastal Zone Management Plan* (that encourages construction of protection works south of Devitt Street at Collaroy-Narrabeen Beach, and essentially mandates these works to allow residential development to be redeveloped at

[1]There are no or limited protection works at 1126-1144 Pittwater Road Collaroy, but a DA has been submitted to Council to construct new coastal protection works at these properties. Once these works are constructed (assuming consent is obtained), there will be continuous protection works extending from north of Flight Deck to Devitt Street at Narrabeen, a distance of about 900m.

[2] Although it is recognised that some areas along this 700m length have a low standard of protection, particularly between 1096 Pittwater Road Collaroy and The Collaroy Hotel.

acceptable risk), namely a position that would mandate retreat over protection, such retreat could not be realised in practice due to the presence of these existing works. Therefore, the "do-nothing scenario" as defined herein has existing protection works remaining in place and being upgraded as required. Impacts are thus assessed herein relative to the scenario of existing protection works remaining.

The subject property at 1114 Pittwater Road Collaroy has a legal description of SP 1977, with a survey prepared by a registered surveyor submitted as part of the DA documentation. The Applicant for the proposed works is Horton Coastal Engineering Pty Ltd, with signed owners consent (from the Flight Deck Owners) in the required form for a Strata Title submitted as part of the DA documentation.

It is recognised that landowner's consent will need to be obtained from the Shipmates owners to the north (for permission to tie into the existing protection works there, and potential temporary construction of a sand bund on that land), owners of 1112 Pittwater Road Collaroy to the south (for permission to tie into the existing protection works there, and potential temporary construction of a sand bund on that land), and owners of 1 Frazer Street Collaroy further south (for potential temporary construction of a sand bund on that land). This consent will be sought after DA submission, but it is noted that the activities requiring consent are not expected to have any impact on these properties, and in the long term would improve the level of protection at the properties (particularly at the adjacent Shipmates and 1112 properties). That is, it is considered that there should be no concern from these owners in giving consent. Tying into adjacent protection works may require consent of the adjacent owners as rock is a variable dimension product, and some rock (however slightly) may extend on to their land, or some rock may need to be moved on their land to give a good interlock. The contractor would be required to ensure that the works tie in adequately with these adjacent areas as agreed by a coastal engineer, such that there would no negative impacts on these areas.

As part of the DA process, a Pre-Lodgement Meeting (PLM2017/0030) with Northern Beaches Council was held on 3 April 2017. In the meeting minutes, Council noted that they were supportive of the proposal in concept.

The author of the report herein, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 25 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 (NER). 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 Horton was the lead author of the following reports:

- *Review of Coastline Hazard Lines for Collaroy Narrabeen Beach and Fishermans Beach*, completed for the then Warringah Council in July 2009;
- *Coastal Erosion Emergency Action Subplan for Beaches in Warringah*, that was certified by the NSW Minister for the Environment on 1 May 2012 and gazetted in *NSW Government Gazette* No. 90 of 7 September 2012; and
- *Collaroy-Narrabeen Beach and Fishermans Beach Coastal Zone Management Plan* (CZMP), that was certified by the NSW Minister for Planning on 10 March 2017 and gazetted in *NSW Government Gazette* No. 46 of 7 April 2017.

Peter has completed numerous coastal engineering assessments for Development Applications at Collaroy-Narrabeen Beach, for development on both public and private land. He also has recent experience in designing and supervising the construction of rock revetments at Collaroy-Narrabeen Beach and other locations along the NSW open coast.

The report herein is set out as follows:

- in Section 2, the geographical setting of the subject property is outlined, including details on property boundaries, Crown Land, and existing protection works;
- in Section 3, a justification for the proposed works is provided in terms of reducing risk to private development, reducing beach amenity impacts, not impacting on public beach access, and being consistent with the CZMP;
- in Section 4, a description of the proposed works is provided, including discussion on proposed components of the works (additional layer of primary armour over the rock revetment, maintenance setback, dune vegetation), the expected appearance of the works (with rock buried under sand and covered by dune vegetation for most of the time), landscaped area calculations, colour and materials schedule, and waste management plan;
- in Section 5, there is discussion on the expected frequency of exposure of the proposed works, based on both historical behaviour and projected future long-term recession due to sea level rise;
- in Section 6, the planning and historical context for the proposed protection works at the subject property is provided, including details on the permissibility of the works, Statement of Environmental Effects requirements, how the works are not integrated development, how protection works at the subject property are generally supported (and also supported at the general alignment proposed) in a number of previous studies completed from 1985 onwards, and how the proposed works are consistent with the *Coastal Lands Plan of Management* and CZMP;
- in Section 7, a merit assessment of the proposed works against key legislation is provided, including *State Environmental Planning Policy (Infrastructure) 2007*, *State Environmental Planning Policy No 71—Coastal Protection*, Section 55M of the *Coastal Protection Act 1979*, *Warringah Local Environmental Plan 2011*, the *Northern Beaches Coastal Erosion Policy*, *Warringah Development Control Plan 2011*, Section 79C of the *Environmental Planning and Assessment Act 1979*, Schedule 1 of the *Environmental Planning and Assessment Regulation 2000*, and the *Collaroy-Narrabeen Protection Works Assessment Checklist*;
- in Section 8, the particular merit-assessment requirements of the Department of Industry – Lands & Forestry are addressed; and
- in Section 9, references are listed.

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. GEOGRAPHICAL SETTING

In June 2016, a coastal storm caused some movement of boulders in a rock revetment forming existing protection works at Flight Deck, as well as damage to a beach access pathway and loss of a garden area and vegetation (including trees) that had been formed over the crest of the revetment. Pre-storm (4 January 2014[3]) and post-storm (10 June 2016[4]) aerial views of the subject property are provided in Figure 1 and Figure 2 respectively, with an oblique post-storm aerial view in Figure 3[4]. A June 2016 photograph of the damaged access pathway is in Figure 4.

Protection works at and surrounding the subject property (at Ramsay Street, Shipmates, Flight Deck and 1 Frazer Street) were constructed in 1967 as an emergency response to coastal storms, with further bolstering of the works at Ramsay Street as an emergency response to the June 2016 storm. Works at 1 Frazer Street were upgraded with additional armour rock placement in December 2015 and August 2016, extending on to 1112 Pittwater Road in the 2016 works. The current seaward extent of the rock revetments at and surrounding Flight Deck, as visible post-storm in 2016, is depicted in Figure 5.

It is evident in Figure 5 that the existing rock revetments at 1 Frazer Street, 1112 Pittwater Road and Shipmates extend about 2m to 3m seaward of the private property boundaries on to Crown Land (with the revetment at Flight Deck extending about 0.5m seaward of the seaward property boundary, on average). At Ramsay Street, the extent of rock on to Crown Land is up to about 17m[5], although the rock is actually further landward than the areas south to Frazer Street, due to the kink in the seaward boundary north of Shipmates.

Construction of Flight Deck was completed in February 1966[6]. In September 1967, some 17 months later, storms eroded a 5m depth of sand at Flight Deck, exposing the piled foundations (Figure 6, Figure 7)[7]. As a result, the foundations of Flight Deck and the adjacent Shipmates unit block to the north were protected by emergency dumping of hundreds of tonnes of fill and construction of a rock revetment, with a view after completion of the works (sometime between 1969 and 1974) provided in Figure 8.

In May-June 1974, the most severe coastal storm recorded to have impacted on the Sydney region occurred. This caused severe erosion at Collaroy-Narrabeen Beach, with particular damage between Clarke Street and Devitt Street (including exposure of the basement car park and pool at Marquesas) and at the entrance to Narrabeen Lagoon. In reporting on this storm, there was no damage recorded at Flight Deck by PWD (1987), with only scattered sections of the rock revetment noted as being visible.

Since 1974, the rock revetment at Flight Deck has periodically been partially exposed due to coastal erosion, eg in 1978 (PWD, 1987) and 1988 (Patterson Britton, 1993). However, prior to the June 2016 storm, it is understood to have been completely buried under sand since around 2002.

[3] Sourced from NSW Imagery Web Service (Land and Property Information).
[4] Sourced from UNSW Water Research Laboratory.
[5] With works at Ramsay Street further extended on to Crown Land after the date of the 10 June 2016 aerial photograph in Figure 5.
[6] "Key milestone for Flight Deck", *Manly Daily*, 13 February 2016, page 15.
[7] Note that the sand level was up to the concrete slab protruding from the centre of the building as visible in Figure 6 and Figure 7 prior to the storm. The undermining extended about 4m on the southern side of the building and 1.5m on the northern side (PWD, 1987).

Figure 1: Pre-storm (2014) aerial view of subject property (magenta) and surrounding lots

Figure 2: Post-storm (2016) aerial view of subject property (magenta) and surrounding lots

Figure 3: Oblique aerial view of Flight Deck on 10 June 2016

Figure 4: Damaged beach access path and revetment at Flight Deck on 23 June 2016

Figure 5: Current seaward extent of rock revetments at and surrounding Flight Deck

Figure 6: Exposure of Flight Deck foundations and damage to surrounding areas on 4 September 1967, as a result of a coastal storm (from Public Works Department [PWD], 1985)

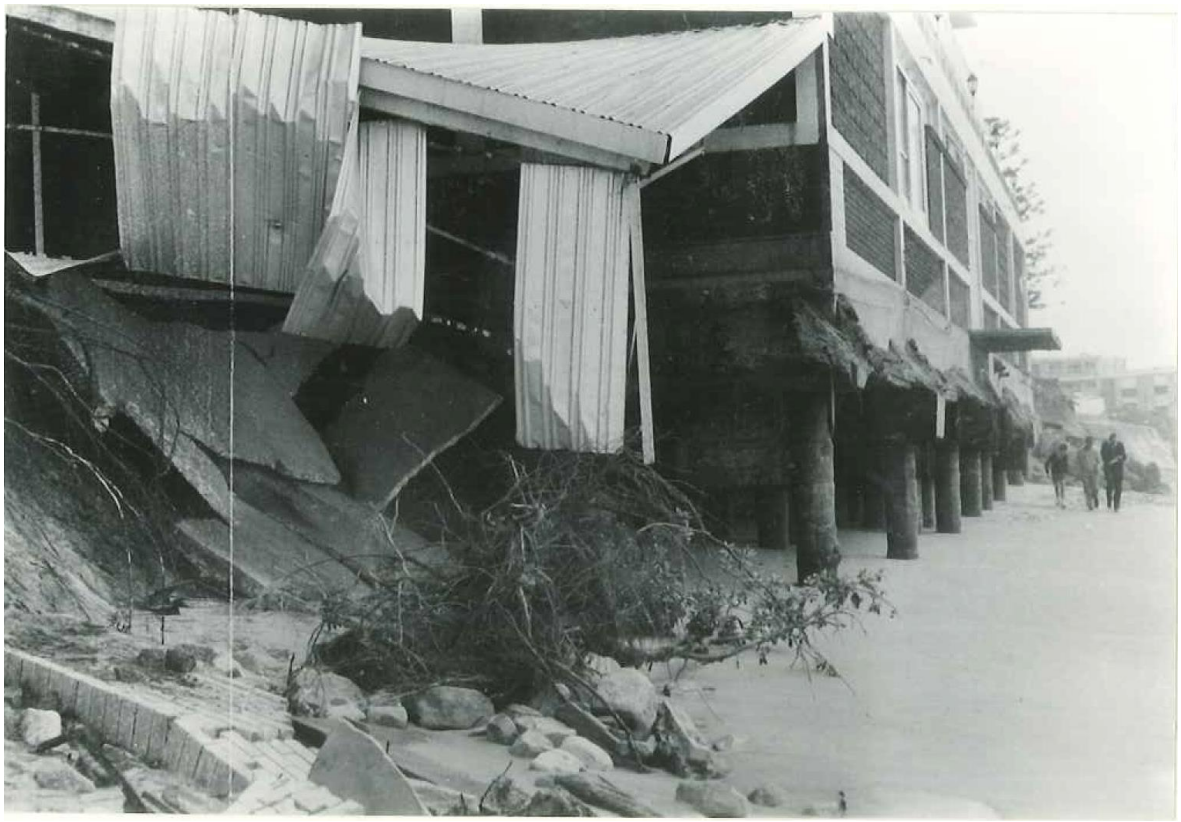

Figure 7: Exposure of Flight Deck foundations and damage to surrounding areas on 4 September 1967, as a result of a coastal storm (from PWD, 1987)

Figure 8: View of protection works at Flight Deck around 1969-1974 (supplied by Mr Don Champion)

Pittwater Road, a State Road (Main Road, Gazetted Road Number 164), is located to the west of the subject property. Crown Land is located seaward (east) of the subject property. Collaroy-Narrabeen Beach is a Crown Reserve, reserved for the purpose of Public Recreation in 1957, for which Council is the Trustee. This Crown Reserve is depicted in Figure 9, with its landward edge forming the seaward boundary of private property where the Reserve is adjacent to private property. The seaward edge of the Reserve is at the Mean High Water Mark, adjacent to Crown Land that is not in Council's Land Register.

Except at the 10 private properties (1126-1144 Pittwater Road Collaroy) located between Stuart Street and Ramsay Street, Collaroy-Narrabeen Beach has existing coastal protection works of some form extending essentially continuously from the southern end of the beach (north of Collaroy rock pool and south of Collaroy SLSC) to north of the Marquesas unit blocks at 11 Ocean Street Narrabeen (at Devitt Street). This is a distance of about 1.7km (Figure 9). In Figure 9, where the extent of existing protection works (blue) cuts into Crown Reserve (green), existing works are on Crown Land. Most of the length of existing protection works extends on to Crown Land.

Figure 9: Extent of existing coastal protection works at Collaroy-Narrabeen Beach (blue) in relation to Council managed Crown Reserve (green) and Crown Land not in Council's Land Register (yellow)

3. JUSTIFICATION FOR PROPOSED WORKS

Based on the current condition of the revetment at Flight Deck as observed after the June 2016 storm, it can be stated that:

- the revetment does not have a sufficient crest height to limit wave overtopping in severe storms;
- some of the armour rock is undersized, meaning that boulders can be displaced under severe wave action;
- some rocks may have moved, causing the revetment to slump, and exposing land near the revetment crest (soil visible in this area may also be a topping layer over rock); and
- there are not filter layers such as underlayer rock and geotextile under the revetment, meaning that soil can be washed out from landward of the revetment in severe storms.

The existing revetment is thus not adequate to meet the standard specified in the *Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications* (hereafter denoted as "the *Specifications*").

The proposed works are therefore necessary to reduce the risk of coastal erosion damage to existing and future development at the subject property. Based on the CZMP, coastal erosion/recession likelihood lines (over a 60-year planning period, that is at 2074 as the lines were originally developed in 2014) and traditional coastline hazard lines (Immediate, 2050 and 2100) at the subject property are depicted in Figure 10. All lines are depicted at the landward edge of the Zone of Slope Adjustment (ZSA) and ignore the effect of the existing protection works in limiting the extent of erosion in a coastal storm.

Note that the likelihood lines were defined probabilistically, using a design life of 60 years. The probability associated with each likelihood line is listed in Table 1. For example, the "possible" line position represents the extent of erosion that would be expected as having a 0.05% probability of occurring in any year, or a 3% probability of occurring over the next 60 years, assuming that the existing protection works at the property failed to limit erosion.

Table 1: Probabilities of likelihood lines defined in CZMP

Descriptor	Annual Exceedance Probability	Cumulative probability of event occurring over design life
Almost Certain	5%	95%
Likely	0.5%	26%
Possible	0.05%	3%
Unlikely	0.005%	0.3%
Rare	0.0005%	0.03%

The Immediate Hazard Line in Figure 10 is the predicted extent of erosion if the 100-year Average Recurrence Interval (ARI) storm occurred today and the existing protection works at the property failed to limit erosion. The 2050 and 2100 lines are corresponding extents at these years in the future respectively.

It is evident that without effective protection works, it is almost certain (greater than 95% probability) that the Flight Deck tower will be substantially undermined over the next 60 years or so, and it is likely (26% probability) that the tower would be completely undermined over that period. The 100-year ARI storm, if it occurred at present, would also completely undermine the tower (again assuming ineffective protection works).

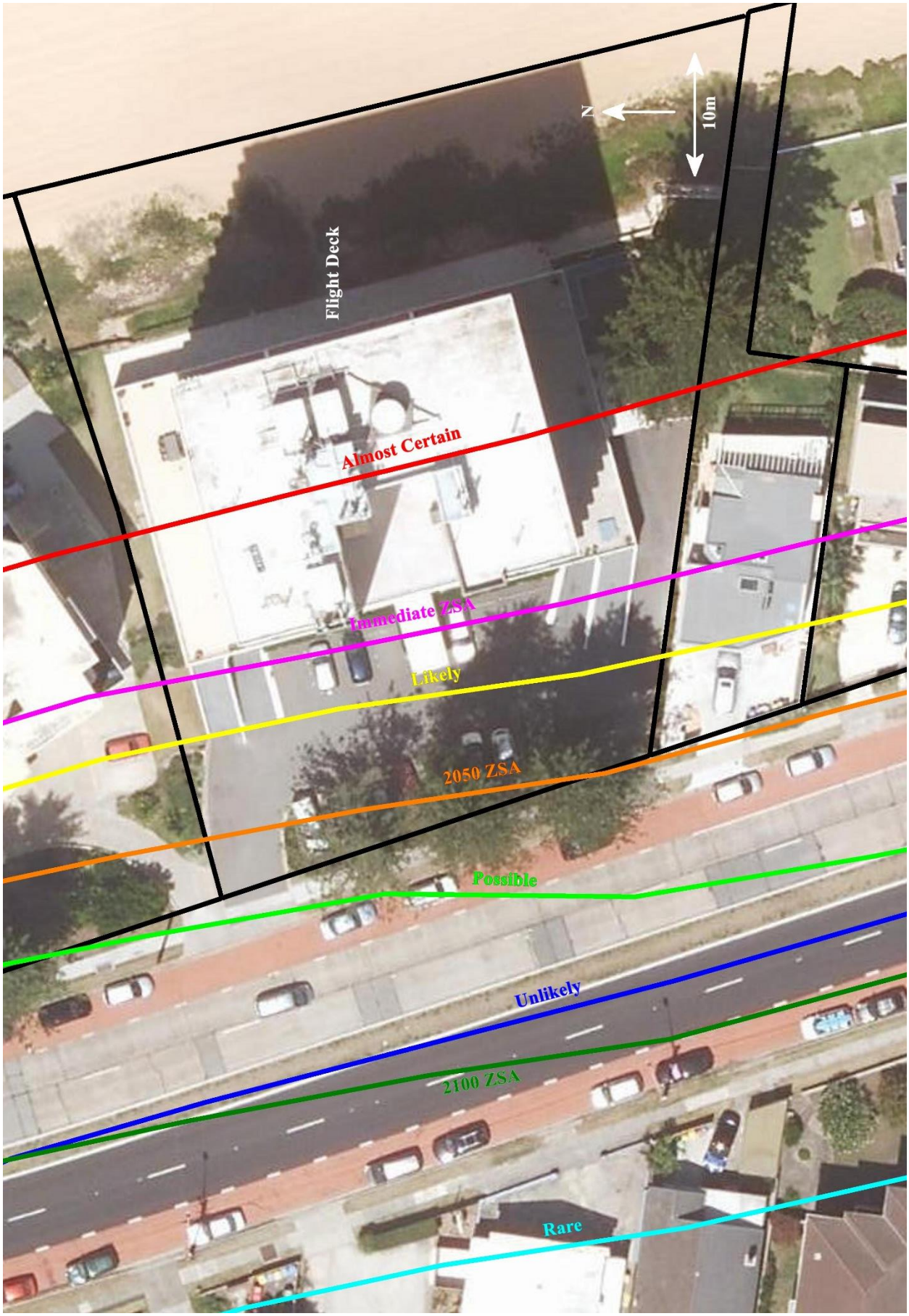

Figure 10: Coastal erosion/recession likelihood lines and traditional hazard lines at subject property

Adopted development setback lines from the CZMP are depicted in Figure 11. It is evident that without upgraded protection works, redevelopment of Flight Deck is unlikely to be feasible (except under existing use rights), with the minimum setback for piled development (without protection works) landward of the existing tower.

It is thus evident that upgrading of protection works is necessary to allow future significant redevelopment at Flight Deck, and also to reduce the risk of damage to existing development to acceptably low levels.

Upgrading of the existing protection works at Flight Deck is not only necessary to protect private development, but also to reduce potential impacts on public beach amenity. If the Flight Deck revetment is not upgraded, such impacts may occur in a severe storm, with boulders and other non-sandy materials displaced on to the public beach. In such a situation, resources of Council and emergency services may also be diverted to deal with the immediate storm dangers and subsequent clean up and risk management.

It is obviously far more preferable to upgrade the existing works than relying on the existing sub-standard works. If the proposed works are not constructed (the do-nothing scenario), the following can be expected in future coastal storms:

- erosion and damage at the subject property, with land potentially lost around the tower, which could be a significant impact on the use of the land and access to the tower;
- impacts on public beach amenity, with boulders and other non-sandy materials strewn on the beach after coastal storms;
- diversion of Council and emergency services resources during and after coastal storms; and
- eventual damage to Pittwater Road.

As further justification for the proposed works, the protection works as proposed are consistent with the CZMP. A fundamental paradigm of the CZMP, which has been certified by the NSW Minister for Planning and gazetted in April 2017, was allowing private development to remain and be redeveloped at Collaroy-Narrabeen Beach based on consideration of acceptable risk, with protection works (along with minimum setbacks and piling of foundations) being a key means for landowners to meet the acceptable risk criteria in the area south of Devitt Street (which includes the subject property).

Objective 2 of the CZMP (in Section 1.7) was "Council seeks to allow property owners to carry out new development on beachfront and near beachfront land adjacent to Collaroy-Narrabeen Beach and Fishermans Beach where the risk of damage to development from coastline hazards can be demonstrated to be acceptably low".

As stated in Section 6.2.2 of the CZMP, the above objective can be achieved through stipulating the following control (amongst others) for new development:

> "new or upgraded protection works where required south of Devitt Street at Collaroy-Narrabeen Beach (where environmental impacts of such works can be demonstrated to be acceptable)", which includes the area covered by the subject property.

Figure 11: CZMP setback lines at subject property

4. DESCRIPTION OF PROPOSED WORKS

4.1 Rock Revetment

The proposed works comprise coastal protection works in the form of a sloping rock revetment, adding a layer of 'oversized' primary armour on top of the existing revetment. Prior to placing the additional rock, gaps in the existing rock armour would be filled with new armour, and existing rock would be removed and repositioned as required. An aerial view of the proposed works footprint is depicted in Figure 12. The upgrade would not involve any significant alteration to the existing works (except filling in any low or undersized areas, as noted above).

Drawings of the proposed works (Drawings S01 to S04, S10 and S20) have been submitted as part of the DA documentation, with design calculations and a more detailed description of the works provided in a separate Coastal Engineering Report. There is also discussion in the Coastal Engineering Report on how the proposed works are consistent with the *Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications*. Drawing S02 can be considered as a Site Analysis Plan, while Drawings S10 and S20 can be considered as Section Plans, as per the DA form checklist.

The proposed works extend alongshore over the beach frontage of Flight Deck, extending cross-shore up to 2m seaward of the existing works. The existing rock revetment extends to or just seaward of the subject property on to Crown Land (average extent on to Crown Land of about 0.5m). As the proposed works comprise placement of additional rock over the existing revetment, to provide toe support to these additional works it is necessary for the toe rock to be placed on Crown Land. To avoid this, it would be necessary to remove the entire existing revetment and install a new revetment, which was considered to be unnecessary from a risk perspective, and would require substantial rehandling of rock and greater disruption to the beach. The additional toe rock would have an inconsequential effect on the exposure of rock on public land, being buried under sand for almost all of the time, and indeed the upgrading works would reduce the potential for rock and other non-sandy materials to be scattered on the public beach after coastal storms.

This 2m extension is consistent in alignment to coastal protection works in surrounding areas. Adjacent properties at Shipmates and 1 Frazer Street have existing rock extending on to Crown Land by about 2m and 3m respectively, with the alignment of the proposed revetment consistent with these locations. In the *Specifications*, it is stated that "the seawall shall be located as far landward as practicable to minimise impact on coastal processes and beach amenity, and shall be located fully on private land wherever feasible", and "tolerance for any further seaward extension to be nominally 2m". Consistent with the *Specifications*, the proposed works are located as far landward as possible (without having the greater impact of having to rebuild the works), with the seaward extension being up to 2m, and being the minimum necessary to provide toe support to the proposed works.

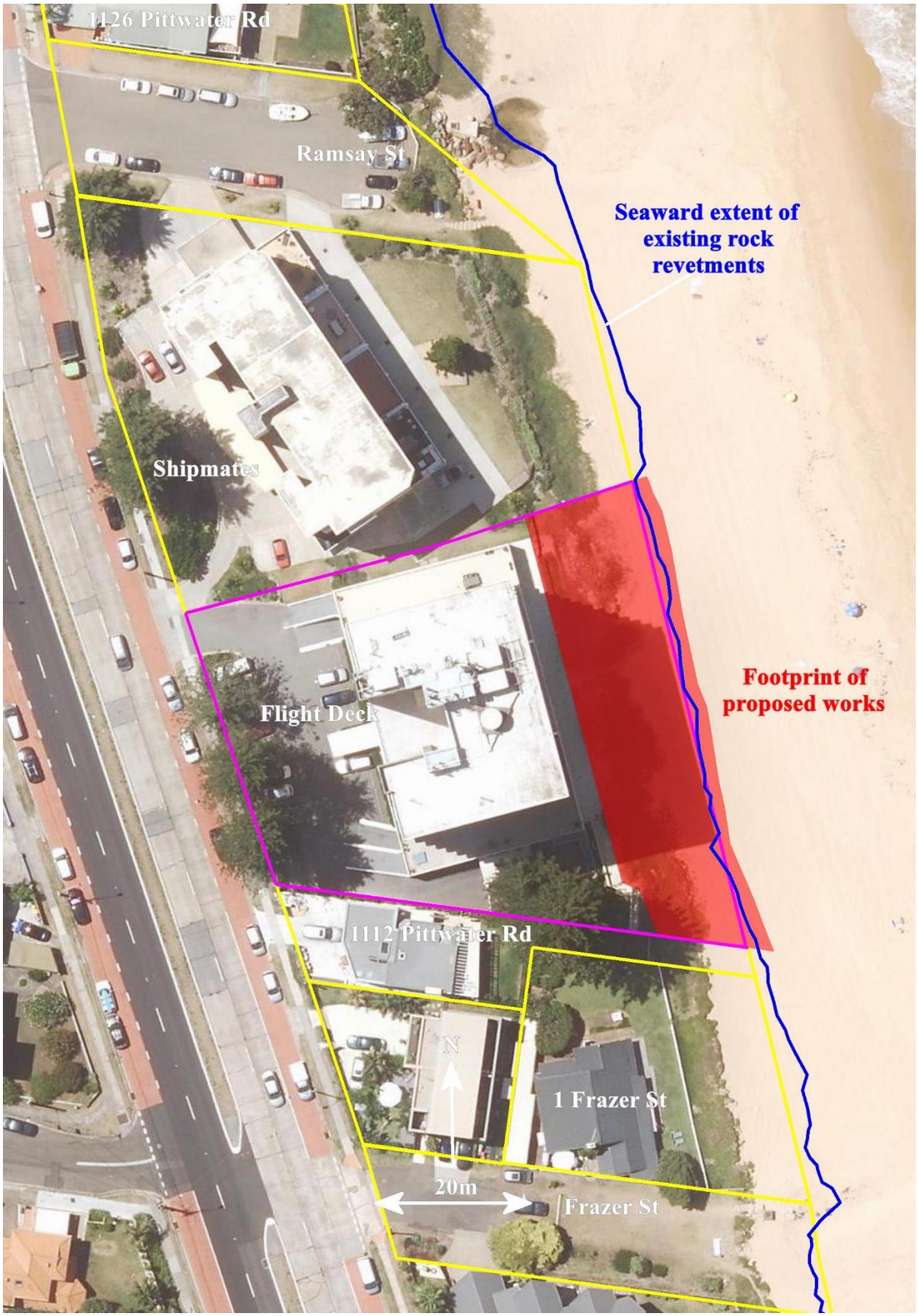

Figure 12: Footprint of proposed works overlaid on 2014 aerial photograph

4.2 Stairs

Beach access stairs are proposed over the rock revetment, extending to the seaward property boundary. These stairs do not extend seaward of the property, so as not to interfere with alongshore public beach access.

4.3 Maintenance Setback

As discussed in the Coastal Engineering Report, the minimum recommended maintenance setback (in the *Specifications*) to the landward edge of the revetment of 5m cannot be achieved. This means that any required revetment maintenance would have to be undertaken from the beach after storms. This is considered to be acceptable given that the Flight Deck building is on deep piled foundations, there is unlikely to be any emergency requirement for immediate post-storm maintenance, and the rock mass was selected to minimise the potential damage in the design storm (with design for a 500-year ARI event).

4.4 Dune Vegetation

After completion of the rock works, the revetment is to be covered with sand and revegetated, as discussed in the Revegetation Report and shown on the Landscape Plan (Drawing S03) submitted as part of the DA documentation. Photographs of typical species that may be planted are provided below, comprising:

- Beach Spinifex (*Spinifex sericeus*), the most successful native sand trapping plant along the Australian east coast (Figure 13);

Figure 13: Close (left) and wide (right) views of Beach Spinifex

- Coastal Pigface (*Carpobrotus glaucescens*) and Beach Fan Flower (*Scaevola calendulacea*), that form mats and are typically used for stability and rapid growth in harsh conditions, and grow well over rocky areas, making them suitable species to cover the upper revetment (Figure 14 and Figure 15);

Figure 14: Close (left) and wide (right) views of Coastal Pigface

Figure 15: Beach Fan Flower

- Coastal Wattle (*Acacia longifolia var. sophorae*) and Coastal Banksia (*Banksia integrifolia*), which are native species with relatively deep roots so as to generally assist in stabilising the sand over the revetment (Figure 16);

Figure 16: Coastal Wattle (left) and Coastal Banksia (right)

- Coastal Pelargonium (*Pelargonium australe*), Coastal Correa (*Correa alba*) and Native Rosemary (*Westringia fruticosa*), which are typically used for rapid growth in harsh conditions (Figure 17 and Figure 18). Coastal Pelargonium is also suitable in planter boxes, along with Flannel flower (*Actinotus helianthi*), see Figure 18 for the latter

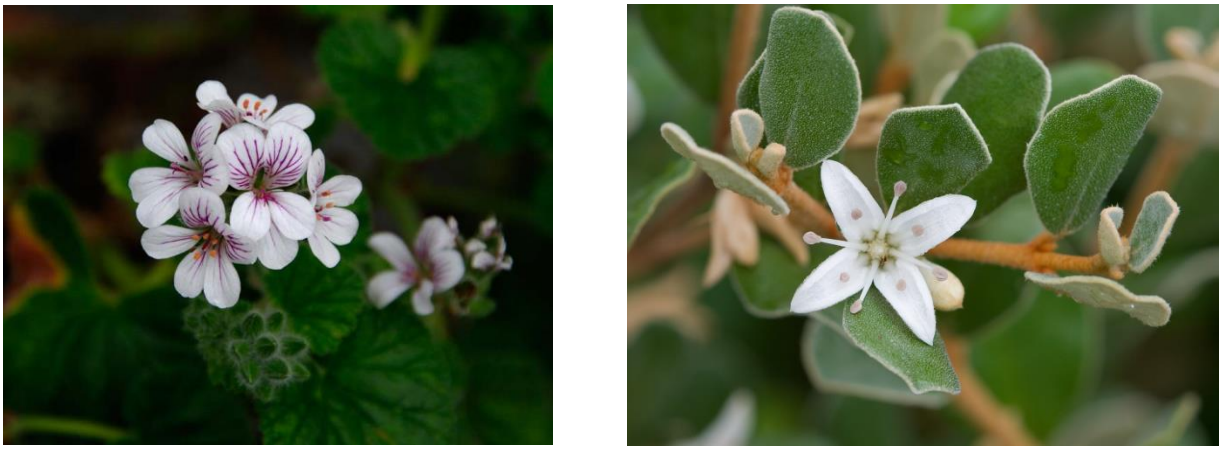

Figure 17: Coastal Pelargonium (left) and Coastal Correa (right)

Figure 18: Native Rosemary (left) and Flannel flower (right)

4.5 Expected Appearance after Works

The rock works are expected to be buried under sand for most of the time, with the appearance of the area being similar to how it has looked in the past for the most of the time (Figure 19, Figure 20)[8]. Discussion on the expected frequency of exposure of the proposed rock works is provided in Section 5.

[8] Over the long term, it is expected that beach nourishment would need to be undertaken to maintain the same frequency of exposure of the revetment as in the past. However, this exposure is unrelated to the proposed works, and would occur in much the same manner if the proposed works were not undertaken (except with more risk that boulders would be dislodged and end up on the beach if the proposed works are not undertaken).

Figure 19: Expected appearance of subject property after completion of works and growth of vegetation (view from south)

Figure 20: Expected appearance of subject property after completion of works and growth of vegetation (view from north)

4.6 Landscaped Area

There will be no change to the area of landscaping at the subject property as a result of the proposed works. The rock revetment itself is more pervious than a sandy surface, and can be treated as a pervious surface (that is, the entire area of works is a landscaped area).

Based on the methodology outlined in Part D1 of the *Warringah Local Environmental Plan 2011,* the approximate current landscaped area at the subject property (980m^2) is about 34% of the total lot area (2,850m^2). This is less than the desired 40%, but cannot be altered by undertaking the proposed works.

4.7 Colour and Materials Schedule

The rock revetment is to comprise basalt rock imported from a suitable quarry. Basalt is generally more durable, and is denser (density about 2,650kg/m^3) than the alternative of using sandstone rock (density about 2,200kg/m^3). That is, for a given dimension, basalt has a greater mass than sandstone. Furthermore, based on hydraulic stability considerations under wave action, given that the required rock mass is inversely proportional to the cube of its submerged density, the required mass of sandstone for a given design event is 2.2 times larger than for basalt.

With the required primary armour basalt rock mass being 3.0 tonnes (as described in the Coastal Engineering Report), for sandstone the required rock mass would be 6.6 tonnes. Sandstone of this mass would be difficult to source from a quarry, difficult to transport, and difficult to place, making basalt more appropriate to use.

An example of the appearance of basalt rock is provided in Figure 21, as evident at a rock revetment at 1 Frazer Street Collaroy in August 2016. The rock revetment at the subject property will only be visible after severe storms, being buried under sand for most of the time[9].

[9] Subject to beach nourishment being undertaken over the long term (see Section 5), although not exposed significantly more often than if the proposed works were not undertaken.

Figure 21: Example of the appearance of darker basalt rock (upper 3-4 rocks in photograph), overlying sandstone (lower 1-2 rocks)

4.8 Waste Management Plan

A Waste Management Plan (Drawing S04) was submitted as part of the DA documentation. The source of rock for the revetment would be a suitable quarry, in the mass fractions specified on the Drawings. This would be expected to comprise clean and discrete solid boulders, without significant fine materials.

As noted on Drawing S04, rubble and other materials that would be unsuitable on a beach are to be separated and stockpiled where encountered during excavation. Otherwise, excavated material would be expected to comprise clean sand that could be used to form a bund to protect the works area from wave action.

Filling of sand over the revetment at the completion of the rock works would be (where possible) by using the native beach sand. This is acceptable as the sand would be filling the voids in the rock armour and remain available to meet storm erosion demand in future storms.

When placing sand over the revetment at the completion of rock works, screening is to be undertaken to remove rubble and other materials that would be unsuitable on a beach. Any waste materials shall be disposed of at an appropriate waste management facility off site, although this would be expected to be limited.

5. EXPECTED FREQUENCY OF EXPOSURE OF PROPOSED ROCK WORKS

Based on historical behaviour, it is expected that the proposed rock works would be buried under sand for most of the time over the design life. This can be demonstrated by reviewing historical beach profile data that is available at the subject property. This data comprises:

- photogrammetric data supplied by the Office of Environment and Heritage for 17 dates before the June 2016 storm (in 1941, 1951, 1961, 1972, 1974, 1985, 1986, 1988, 1993, 1996, 1998, 2001, 2006, 2008, 2011, 2015, and April 2016);
- drone survey data purchased from the UNSW Water Research Laboratory that was collected immediately after the June 2016 storm, on 10 June 2016; and
- land contours derived from the survey submitted as part of the DA documentation, that was undertaken on 1 March 2017.

A centrally located cross-section at the subject property depicting the proposed protection works, and beach profiles for the 19 dates listed above (with 17 dates before the June 2016 storm, and 2 after) is provided in Figure 22. In Figure 22, not all profile dates extend to the 70m distance (upper limit on the x- axis), generally due to the profiles ending at an elevation above 0m AHD[10], as well as narrower profiles for some dates (in particular, the June 2016 post-storm profile). In Figure 23, the same information as in Figure 22 is presented, except that all profiles (where above 0m AHD) are extended down to 0m AHD based on continuing the profile at the same slope as the lowest previous 2 data points.

It is evident that for the 19 dates presented and considering the existing revetment, and proposed revetment (had it been constructed):

- the existing and proposed revetment would have been at least partially exposed on only 2 dates[11] (June 2016 and 2017)[12], and fully exposed on only 1 date (June 2016);
- the existing and proposed revetment would have been exposed on public land for only 1 date (June 2016);
- although the existing and proposed revetment would have been exposed above about 2.5m AHD in 2017, there would have been about 30m subaerial beach width from the visible revetment to mean sea level at that time (beach scraping could have reduced the extent of revetment exposure further);
- the existing and proposed revetment would have been completely buried under sand below 3m AHD for 17 of the 19 dates, that is 90% of the dates;
- the actual time that the existing and proposed revetment would have been completely buried under sand below 3m AHD would be expected to have been greater than 90%, as photogrammetric date selection was skewed by trying to capture post-storm profiles (eg in 1974 and June 2016). Over the period from 1941 to present, some 76 years, the proposed revetment would probably have only been exposed below 3m AHD for about 1-2 years, or 2% of the time; and
- typical beach widths to mean sea level seaward of the proposed revetment would have been about 60m, and would have exceeded 30m for all dates except June 2016.

[10] With 1951 ending at 1.3m AHD, 1961 at 1.2m AHD, 1972 at 1.1m AHD, 1974 at 1.3m AHD, 1985 and 1986 at 0.7m AHD, 1988 at 0.8m AHD, 1993 at 0.3m AHD, 1996 at 1.1m AHD, 1998 at 0.8m AHD, 2001 at 0.2m AHD, 2006 at 0.8m AHD, and 2008 at 0.6m AHD.
[11] Note that the theoretical exposure of the upper revetment for all dates is not a meaningful measure of future exposure, as crest ground levels (covering the revetment) are to be raised as part of the proposed works, and are expected to be maintained (except after severe storms) as they are well above typical wave action.
[12] With some minor exposure around 3m to 4m AHD possible in 1996 and 1998.

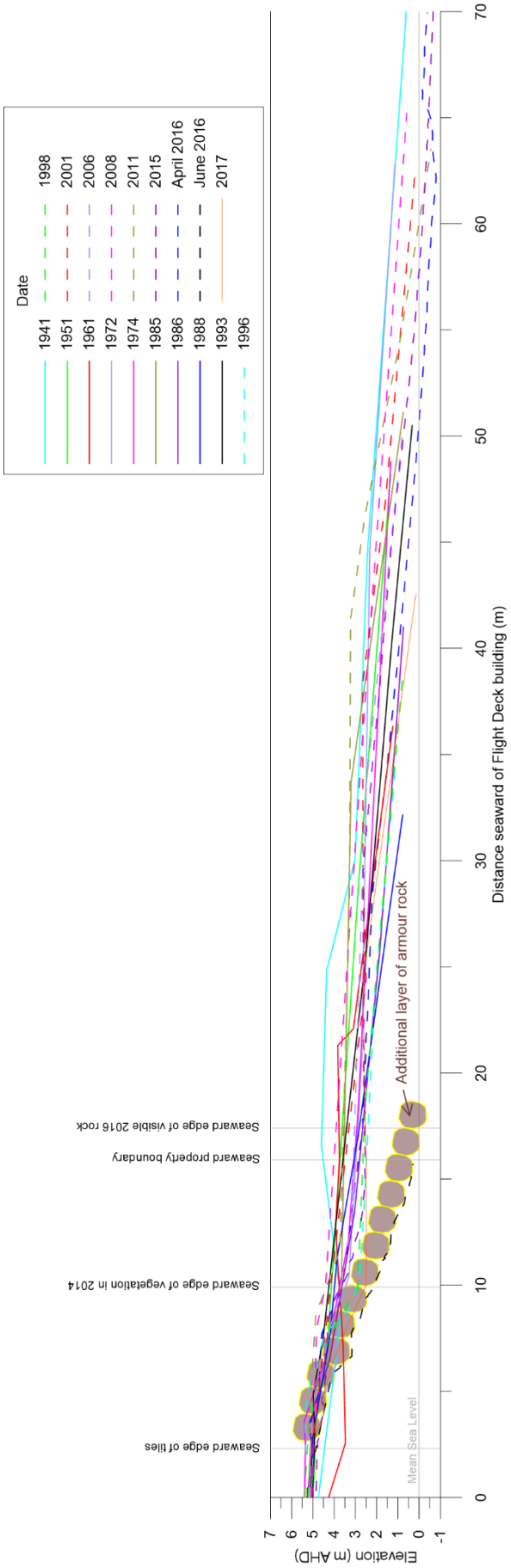

Figure 22: Proposed protection works at Flight Deck compared to 19 historical beach profiles

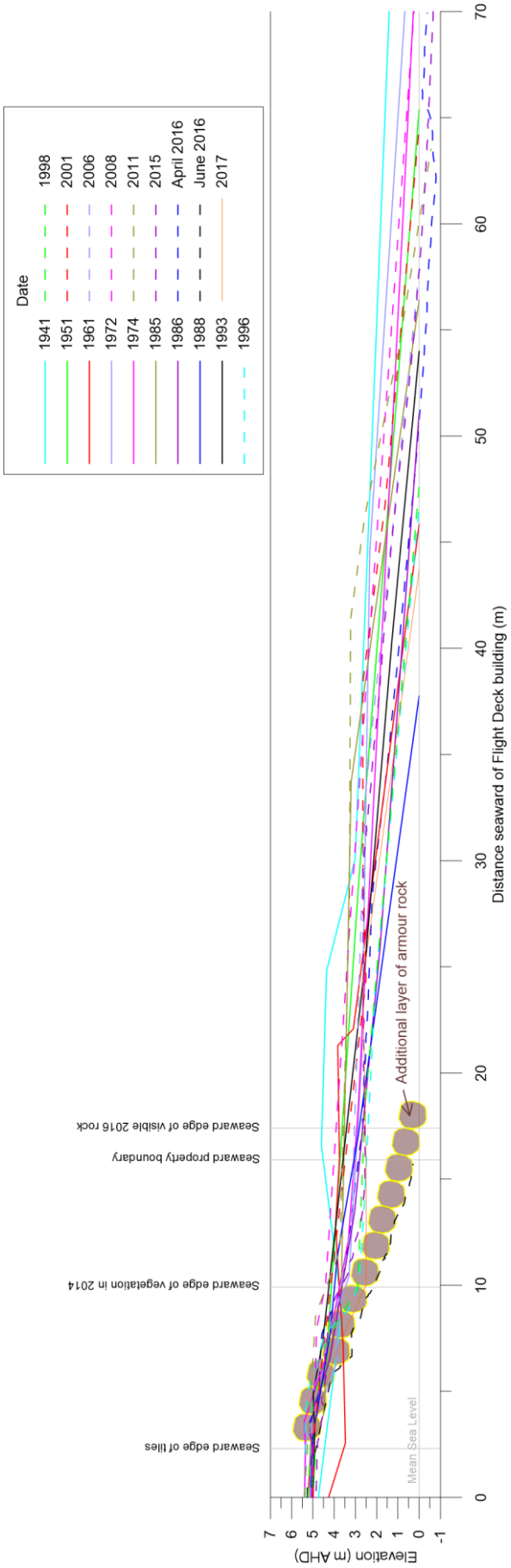

Figure 23: Proposed protection works at Flight Deck with extended historical beach profiles

It is recognised that long term recession due to projected sea level rise is expected to translate beach profiles upward and landward, thus reducing average public beach widths over the long term. Given that there are existing protection works, this will occur irrespective of whether the proposed protection works are constructed or not[13]. The proposed works are not creating a new issue in this regard, and do not significantly alter the potential exposure of the revetment compared to the existing situation.

A depiction of historical beach profiles as per Figure 23, but with the beach profiles translated landward by 13m to approximately account for long term recession over the 60-year design life (as discussed in the Coastal Engineering Report), is provided in Figure 24. Of course, in reality these profiles would not be realised landward of the works, as the works themselves would form the future profile over the seaward portion of the subject property. Also note that the June 2016 profile was not receded, as it represents the upper face of the existing protection works.

It is evident from Figure 24 that the lower portion of the revetment would be expected to be generally covered by sand in 60 years (at 2077). Of the 19 profiles depicted in Figure 24:

- 15 profiles would not expose the revetment below 2m AHD (17 profiles in the existing situation);
- 5 profiles would not expose the revetment below 3m AHD (the same as in the existing situation); and
- 1 profile would not expose the revetment below 4m AHD (the same as in the existing situation).

There would typically be about 45m beach width at mean sea level at 2077 based on the receded profiles in Figure 24, and at least 15m width except for one date (receded June 2016).

If beach scraping and beach nourishment is undertaken in the future, then the frequency of exposure of the revetment would be reduced, although it is reiterated that exposure of the existing revetment will occur irrespective of whether the proposed works are undertaken, and any need for these future activities is thus unrelated to the proposed works.

With the crest elevation of the protection works being raised, and the upper portion of the works seemingly visible in Figure 22, Figure 23 and Figure 24, it is important to note that it is expected that a higher dune level will be formed over the upgraded works than the existing works. As noted in Footnote 11 on page 24, these higher levels are expected to be maintained (except after severe storms) as they are well above typical wave action, and the raised revetment would provide a platform for these higher levels (with the revetment also occupying what was formerly a sand volume, and hence allowing the displaced sand volume as an additional volume above it).

[13] Also, this will only occur assuming that beach scraping and beach nourishment is not undertaken. As noted in MHL (2016) and the *Northern Beaches Coastal Erosion Policy*, these activities are the responsibility of government, and not landowners.

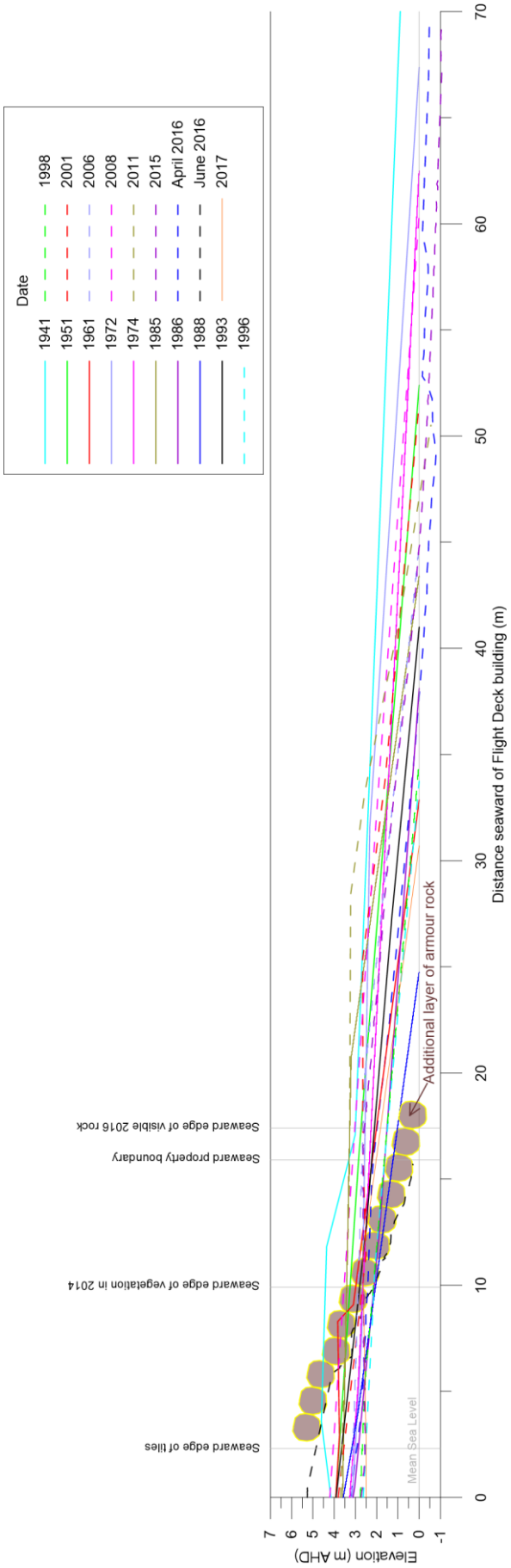

Figure 24: Proposed protection works at Flight Deck with receded historical beach profiles

6. PLANNING AND HISTORICAL CONTEXT

6.1 Permissibility of Works

Based on Clause 129A(1) of *State Environmental Planning Policy (Infrastructure) 2007* (SEPP Infrastructure), the proposed works are permissible with consent. Therefore, Part 4 of the *Environmental Planning and Assessment Act 1979* applies to the works. Given that the study area has a gazetted CZMP, Northern Beaches Council has the function of determining the DA.

The subject property is zoned as R2 (Low Density Residential) in *Warringah Local Environmental Plan 2011* (LEP 2011). The beach seaward of the subject property is zoned as RE1 (Public Recreation). Coastal protection works are not specifically permitted in these zones. However, SEPP Infrastructure prevails over LEP 2014. Furthermore, non-inclusion of protection works as being permitted in these zones is considered to be related more to the restrictive nature of the *Standard Instrument -Principal Local Environmental Plan* rather than any deliberate intention of Council to exclude these works[14].

6.2 Statement of Environmental Effects Requirements

As set out herein, a Statement of Environmental Effects is required to accompany the DA for the proposed protection works. Based on the *Environmental Planning and Assessment Regulation 2000*, this Statement of Environmental Effects must include consideration of the environmental impacts of the development, how the environmental impacts of the development have been identified, and the steps to be taken to protect the environment or to lessen the expected harm to the environment.

6.3 Integrated Development

The proposed works are not considered to be integrated development as:

- no reclamation is being carried out in a waterway (the works are in an area that will usually be buried under sand) in relation to the *Fisheries Management Act 1994*; and
- the works are not a controlled activity based on the *Water Management Act 2000*, as this does not apply to this open coast beach area (which is covered by the *Coastal Protection Act 1979*) as per Department of Primary Industries – Water (2016).

6.4 1985 Coastal Management Strategy

In 1981, a working party was established comprising then Warringah Council and Public Works Department (PWD) staff, with the aim of integrating Council's management and planning with coastal engineering advice to produce an overall strategy for coordination of beach reserves management and identification of areas of the coastal zone that required specific development controls (PWD, 1985).

This resulted in the completion of an investigation by PWD (1985) in which coastline management strategies were developed for the beaches and headland areas of the entire Warringah Shire Council LGA (which at that time extended from Freshwater to Palm Beach, thus covering the former Pittwater and Warringah LGA's).

[14] This anomaly is common to many Local Government Areas where coastal protection works are considered to be appropriate through the CZMP process, including the *Gosford Local Environmental Plan 2014* applying to Wamberal Beach, and the *Pittwater Local Environmental Plan 2014* applying to Bilgola Beach and Basin Beach.

Between Flight Deck and Devitt Street at Collaroy-Narrabeen Beach, which includes the subject property, PWD (1985) recommended that there was development of a revetment (seawall) policy covering the full length. This was to specify revetment design criteria, alignment, typical cross section details and maintenance in the event of storm damage. That is, from 1985 it was established by the NSW Government and Council that the subject property should have upgraded protection works.

6.5 Patterson Britton (1993) Study

Patterson Britton & Partners (1993) concluded that the most suitable coastline management option at Collaroy-Narrabeen Beach was likely to be upgrading of seawalls combined with moderate beach nourishment. It was noted that "encroachment of the seawall onto public land was unavoidable taking into account the required toe level of the seawall to prevent undermining, the thickness of the armour and underlayer required for hydraulic stability, the crest levels, and the seawall slopes accepted in normal practice".

6.6 1997 Coastline Management Plan and Subsequent 1999-2001 Studies

The *Collaroy Narrabeen Coastline Management Plan, A Coastline Hazards Policy – Plan of Management* was documented by Warringah Council (1997). Coastline management strategies and actions that were adopted included surveying and assessing existing seawalls, and selective reconstruction of existing seawalls and infilling of gaps. The proposed works are generally consistent with that Plan.

Studies relating to surveying and assessing existing seawalls and design of seawall upgrades were completed by MHL (1999), Patterson Britton & Partners (1999), Jeffery and Katauskas (2000), and Patterson Britton & Partners (2001a, b). The Patterson Britton (2001a) study is considered further in Section 6.7.

In Warringah Council (1997), funding for design and environmental assessment works was envisaged to be entirely public (Council and NSW Government), with the construction works funded 50% by affected beachfront residents (through a Special Rate Levy) and 50% by Council and the State Government combined. Far more onerous landowner funding requirements are expected to apply to the proposed works.

6.7 Coastal Lands Plan of Management

The *Coastal Lands Plan of Management* (POM), adopted 24 September 2002, covers all public open space located on or adjacent to the former Warringah Council coastline. The POM thus covers the Crown Land seaward of the subject property, which is classified as Natural Area Foreshore.

As discussed in the POM, this Natural Area Foreshore categorisation has no statutory force, only having a statutory basis on Community Land, although as stated in the POM "Council has in-principle support for applying categories to Crown Lands as [a] method of showing management intent from the Department of Land and Water Conservation". In Section 36N of the *Local Government Act 1993*, the core objectives for management of community land categorised as foreshore are:

(a) to maintain the foreshore as a transition area between the aquatic and the terrestrial environment, and to protect and enhance all functions associated with the foreshore's role as a transition area, and
(b) to facilitate the ecologically sustainable use of the foreshore, and to mitigate impact on the foreshore by community use.

The proposed works are considered to be consistent with the use of the foreshore as a transition area between the erodible beach environment and protected terrestrial private development areas.

The POM refers to finalisation of an investigation into a seawall upgrade proposal as part of a Master Plan for Collaroy-Narrabeen Beach within that document. At that time, a design study had been completed by Patterson Britton (2001) which defined the alignment and footprint of proposed upgrading works. This had the works at the subject property extending over a footprint consistent with the proposed DA, with the expectation of the addition of a layer or two of primary armour.

A Statement of Environmental Effects (Halliburton KBR, 2002) for these works, based on this 2001 design, was also prepared prior to completion of the POM. It was recognised at that time that the 2001 design would be entirely within private property for only 30% of the 1km length of works, with 70% of the length extending on to Crown Land (as per the existing situation, with the 2001 design not causing any increase in the extent of works on Crown Land).

In Halliburton KBR (2002), funding for construction of the protection works was envisaged to be 50% from the State Government, 30% from Council and 20% from the affected beachfront residents. Far more onerous landowner funding requirements are expected to apply to the proposed works.

Within the POM, there is specific reference and reinforcement of the actions in Warringah Council (1997), as discussed in Section 6.6, and specifically: "in respect of the Collaroy Narrabeen Coastline Management Plan this plan [the POM] specifically authorises:

- any works required to implement any part of such Plans;
- the granting of any easements or the acquisition of easements in order to facilitate any works or the maintenance of any works under such plans;
- the imposition or acquisition of any Positive or Restrictive Covenants which may be necessary".

That is, construction of upgraded protection works at the subject property was envisaged and authorised by the POM, for a similar design and footprint as the subject DA. It is also reasonable to state that actions in the current CZMP (which contains a desired outcome of continuous protection works along the southern 1.7km of Collaroy-Narrabeen Beach), given that it supersedes Warringah Council (1997), are implicitly authorised by the POM.

6.8 Coastal Zone Management Plan (CZMP)

As noted in Section 1, the *Collaroy-Narrabeen Beach and Fishermans Beach Coastal Zone Management Plan* (CZMP) has been certified by the NSW Minister for Planning and was gazetted in the *NSW Government Gazette* in April 2017. As noted in Section 3, the proposed works are consistent with the CZMP. See Section 3 for further discussion on how the CZMP provides in-principle support for the proposed works.

7. MERIT ASSESSMENT OF PROPOSED WORKS AGAINST KEY LEGISLATION

7.1 SEPP Infrastructure

As the consent authority and based on Clause 129A(3) of SEPP Infrastructure, the Council must take the following matters into consideration:

(a) the provisions of any coastal zone management plan applying to the land,
(b) the matters set out in clause 8 of *State Environmental Planning Policy No 71—Coastal Protection* (SEPP 71), and
(c) any guidelines for assessing and managing the impacts of coastal protection works that are issued by the Director-General for the purposes of this clause and published in the Gazette.

With regard to (a), as discussed in Section3 and Section 6.8, the proposed works are consistent with the CZMP. MHL (2016) also considered that upgraded protection works south of Devitt Street at Collaroy-Narrabeen Beach were in general compliance with the requirements of the CZMP.

With regard to (b), SEPP 71 is considered in Section 7.2.

With regard to (c), no such guidelines have been issued.

7.2 SEPP 71

7.2.1 Matters for Consideration

As the proposed development is within the Coastal Zone[15], SEPP 71 applies. 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,

[15] As per the map "Coastal Zone, NSW Coastal Protection Act 1979, Greater Metropolitan Region, Map 14".

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

These matters are discussed in turn below.

7.2.2 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 works are consistent with Council's gazetted CZMP. As part of the CZMP process, management options were subject to community consultation and assessed based on cost benefit analysis (economic), environmental (natural) and social (cultural/recreational) aspects. Therefore, by definition, the adopted CZMP action of protection works over the southern portion of Collaroy-Narrabeen Beach supports (on balance) the natural, cultural, recreational and economic attributes of the NSW coast. The

works are essential to support the economic attributes of the residential land, and the works would not significantly interfere with public recreational opportunities on public land, being buried under sand for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term, but not exposed significantly more than the existing protection works either way).

For aims 2(b) and (c), the proposed works would not affect cross-shore public beach access, with the nearest access locations at Ramsay Street and Frazer Street. With regard to alongshore beach access after storms when beach widths have narrowed, the proposed works would not significantly restrict such access in a different way to the existing situation with existing protection works. As stated in the *Policy*, following a storm event, the beach will generally recover naturally and will require little to no intervention.

For aim 2(d), as noted in the CZMP, a search of the Office of Environment and Heritage "Aboriginal Heritage Information Management System" (AHIMS) was undertaken in January 2014. This did not indicate that there were any particular Aboriginal objects or Aboriginal Places at Collaroy-Narrabeen Beach.

For aim 2(e), the proposed works would be buried under a vegetated sand dune for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term, but not exposed significantly more than the existing protection works either way). After storms, the short-term exposure of the rock revetment would be consistent with the exposure of the existing rock revetment. Compared to the do-nothing scenario, this would be an improvement in visual amenity, as there would be far less likelihood of undersized rock and debris scattered on the beach (related to the Flight Deck works) after storms.

For aim 2(f), the proposed works would cause a short-term impact on beach amenity (eg through noise and some restriction on alongshore beach access) during the construction period, which is unavoidable. As the impacts are short-term and localised they can be accepted. The residents most exposed to the increased noise levels during construction will be benefiting from the security to development offered by the proposed revetment and will have both contributed to the cost and given approval for the work to proceed on their property.

To reduce the noise impacts during construction, working hours for plant and equipment would be restricted (as per the *NSW Interim Construction Noise Guideline*) to between 7am and 6pm from Monday to Friday, and 8am to 1pm on Saturday. No work would be undertaken on Sundays or public holidays.

The presence of the proposed works would not result in sustained loss of additional sand from the beach seaward of the revetment, consistent with historical behaviour at locations with protection works along Collaroy-Narrabeen Beach. The proposed works would have no long-term impact on beach amenity whether beach nourishment is undertaken or not (and the requirement for nourishment is not a function of the proposed works, but a function of long term recession due to sea level rise occurring, which will occur independently of the proposed works and at a rate completely unrelated to the works). The proposed works would not impact on beach amenity (in terms of beach width) differently to the existing situation with existing protection works. The upgraded works can be considered to be an improvement in beach amenity compared to the existing situation, where undersized rock and soil layers may be scattered over the beach after severe coastal storms without upgrading.

For aim 2(g), it can be noted that native coastal vegetation is limited in the vicinity of the subject property, with most of the vegetation seaward of the Flight Deck tower eroded in the June 2016 storm. A Flora and Fauna report submitted with the DA found no evidence of any threatened or endangered NSW coastal species listed in the *Environment Protection and Biodiversity Conservation Act 1999*, or threatened Species and ecological communities listed in the *Threatened Species Conservation Act 1995*, in the vicinity of the proposed works.

For aim 2(h), there would be no significant impacts on marine fauna and flora as result of the proposed works, as they would not generally be interacting with subaqueous areas. Construction would essentially be carried out above the mean high water mark, and for this reason will not directly impact on fish or their habitat. A small area of beach and dune face that birds may visit would not be available during construction, but there would be ample area to the north and south of the works for birds to access, should existing anthropogenic disturbances at these locations allow that access.

For aim 2(i), no rock platforms are located within about 730m of the subject property, and hence the proposed works will have no impact on rock platforms.

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:
    (iii) polluter pays - that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement,
    (iv) 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,
    (v) 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 works are in an already developed area with existing protection works, and would not significantly impact on biological diversity. The works would not be a source of

pollution and would not generate significant waste. The proposed works are consistent with the CZMP, which is an effective integration of economic and environmental considerations. Therefore, the proposed works are consistent with the principles of ecologically sustainable development.

For aim 2(k), the type, bulk, scale and size of the proposed development is appropriate for the location, being consistent in-principle with the CZMP, being upgraded protection works that already exist, tying into adjacent protection works, and consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*. Restoration of a vegetated dune over the proposed works will improve the natural scenic quality of the surrounding area, as will the upgraded rock works (when exposed) compared to the current situation where undersized rock can be scattered over the public beach.

For aim 2(l), the proposed works are consistent with the CZMP, which documents Council's strategic approach to coastal management, and has been certified by the NSW Government.

7.2.3 Items 8(b) and 8(c)

For Items 8(b) and 8(c) in Section 7.2.1, as discussed with regard to aims 2(b) and 2(c) in Section 7.2.2, the proposed works would not affect cross-shore public beach access, and would not significantly affect alongshore beach access compared to the existing situation.

7.2.4 Item 8(d)

For Item 8(d) in Section 7.2.1, as discussed with regard to aim 2(k) in Section 7.2.2, the type, location and design of the proposed works is appropriate, being consistent in principle with the CZMP, being upgraded protection works that already exist, tying into adjacent protection works, and consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*.

7.2.5 Item 8(e)

For Item 8(e) in Section 7.2.1, the proposed works would not overshadow the coastal foreshore any differently to a natural dune, and would not affect the extent of views from public places.

7.2.6 Item 8(f)

For Item 8(f) in Section 7.2.1, as discussed with regard to aims 2(e) and 2(k) in Section 7.2.2, the proposed works would be buried under a vegetated sand dune for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term), and not exposed significantly more than the existing protection works. After storms, the short-term exposure of the rock revetment would be consistent with the exposure of the existing revetment. Compared to the do-nothing scenario, this would be an improvement in visual amenity, as there would be far less likelihood of undersized rock and debris scattered on the beach (related to the Flight Deck works) after storms.

7.2.7 Item 8(g)

For Item 8(g) in Section 7.2.1, as discussed with regard to aim 2(g) in Section 7.2.2, no vulnerable nor endangered plant species are likely to be affected by the proposed works.

As discussed with regard to aim 2(h) in Section 7.2.2, a small area of beach and dune face that birds may visit would not be available during construction, but there would be ample area to the north and south of the works for birds to access.

There would be some invertebrate fauna habitat removed during the construction process as the upper layer of the beach sand is excavated, stockpiled and replaced. The impact of this is comparable with natural erosion events and accretion cycles and it is not considered that this would result in significant ongoing impacts.

The proposed works are not likely to have a significant effect on threatened species.

7.2.8 Item 8(h)

For Item 8(h) in Section 7.2.1, as discussed with regard to aim 2(h) in Section 7.2.2, there would be no significant impacts on marine fauna (including fish) and flora as result of the construction of the proposed works, although note that there are no areas of marine flora in the vicinity of the proposed works, being a dynamic beach environment. By keeping the proposed works separated from the ocean with a sand bund during construction, any potential impacts would be minimised. Even if the works area was exposed due to wave action, the nature of the armour rock would be such that it would not be mobile unless wave action was severe.

After construction, the proposed works would have no significant impacts on marine fauna and flora, being buried under sand for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term, but not exposed significantly more than the existing protection works). Indeed, the proposed works offer a better outcome for marine fauna and flora than the existing situation of soil layers potentially being washed into the ocean after storms.

7.2.9 Item 8(i)

For Item 8(i) in Section 7.2.1, there are no wildlife corridors in the proposed works area.

7.2.10 Item 8(j)

For Item 8(j) in Section 7.2.1, the proposed works have been designed to resist severe wave action and beach erosion for a suitably rare storm (500-year ARI for the additional primary armour layer) and long design life (60 years), consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*. Coastal processes and coastal hazards may cause some damage to the revetment in more severe storms than the design event, but a rock revetment is relatively accommodating of this and could most likely be repaired with a top up or repositioning of rock after the storm event.

The proposed works would not result in the loss of additional sand from the beach seaward of the structure. The beach will naturally recover after storms and the revetment will again be covered by sand. The proposed works would have no 'end effects' given that they would tie into adjacent protection works, and would not exacerbate any potential existing end effects north of Devitt Street caused by the length of protection works to the south.

Carley et al (2013) have described potential mechanisms for end effects (additional erosion) adjacent to protection works, namely:

1. landward entrapment of sand (truncation of the active beach);
2. where protection works protrude seaward of the shoreline, updrift impoundment of wave-driven littoral sediment resulting in a deficit (and hence erosion) on the downdrift beach;
3. wave reflection and turbulence at structure ends;
4. rip currents at structure ends; and
5. oblique wave reflection off the protection works.

Such end effects generally have the potential to apply at the ends of works where there are no adjacent protection works, and sandy materials. These end effects do not apply to the proposed works, as the works would connect into existing upgraded works to the south, and existing works at Shipmates to the north. The proposed protection works at Flight Deck:

- do not significantly alter the landward entrapment of sand compared to the existing works (as per Item 1 above);
- do not protrude significantly seaward compared to the existing or adjacent works, so would not cause significant updrift impoundment of sediment (as per Item 2 above);
- would not significantly alter wave reflection and turbulence at the structure ends compared to the existing works (as per Item 3 above);
- would not cause rip currents to form at the structure ends, as is the existing situation (as per Item 4 above); and
- would not alter any potential for oblique wave refection compared to the existing situation (as per Item 5 above).

The only situation in which the proposed works would influence the potential for erosion at Shipmates would be if the wave direction was from the east or south of east, which is the most likely direction. In this situation, the proposed works would tend to act as a partial “shadow”, reducing erosion at the southern end of Shipmates. For wave directions north of east, Shipmates would be relying on its own works, and the proposed works at Flight Deck would not influence and would be inconsequential to any erosion at Shipmates

The proposed works would thus not cause an adverse impact on the existing Shipmates protection works, nor increase the risk of damage from coastal erosion at Shipmates (note also that the Shipmates tower is piled). The proposed works should reduce the risk of damage from coastal erosion at Shipmates, as they would provide some reinforcement of protection adjacent to the southern end of that property for most wave directions.

The executive of Shipmates has made the decision to not proceed with upgraded protection works at this time. The risks of damage from coastal erosion at Shipmates (as documented in the CZMP for example) have thus been accepted by the executive of Shipmates, and any consequences of that decision in terms of future damage to that property in coastal storms (until upgraded works are constructed) are thus the responsibility of the executive of Shipmates to deal with. The executive of Flight Deck would have preferred to work with Shipmates to construct protection works over both properties (and approached Shipmates to work collaboratively on upgraded protection works), as the lack of upgraded works at Shipmates increases the risk of damage to the Flight Deck property at its northern end, and potential maintenance requirements at this location.

7.2.11 Item 8(k)

For Item 8(k) in Section 7.2.1, the proposed works have been situated as far landward as possible for the nominated design, and at a consistent alignment to protection works at adjacent areas. The proposed works would be buried under sand for most of the time (based on historical behaviour), see Section 5 (subject to beach nourishment being undertaken over the long term, but not exposed significantly more than the existing protection works). Therefore, the potential for conflict between land-based and water-based coastal activities has been reduced as far as practicable.

7.2.12 Item 8(l)

For Item 8(l) in Section 7.2.1, as discussed with regard to aim 2(d) in Section 7.2.2, there are no known Aboriginal objects or Aboriginal Places at Collaroy-Narrabeen Beach.

7.2.13 Item 8(m)

For Item 8(m) in Section 7.2.1, the impact of the proposed works on water quality would be similar to the effect on marine flora and fauna as discussed in Section 7.2.8 (that is, insignificant). Also, note that excavated beach sand generally has a low potential for dust generation due to its relatively coarse grain size.

7.2.14 Item 8(n)

For Item 8(n) in Section 7.2.1, there are no items of heritage, archaeological or historic significance that would be affected by the proposed works. As discussed in the CZMP, there are no heritage items in the vicinity of the subject property.

7.2.15 Items 8(o) and 8(p)

Items 8(o) and 8(p) in Section 7.2.1 are not applicable to the proposed works.

7.2.16 Overall Conclusion

The proposed works satisfy the matters for consideration in Clause 8 of SEPP 71 as identified above.

7.3 Section 55M of the *Coastal Protection Act 1979*

Based on Section 55M of the *Coastal Protection Act 1979*, consent must not be granted 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.

With regard to 55M(a)(i), issues relating to beach access (and hence beach use) have been considered in Section 7.2.2 with regard to aims 2(b) and 2(c), and in Section 7.2.3. The proposed works would not affect cross-shore public beach access, and would not significantly affect alongshore beach access compared to the existing situation.

With regard to 55M(a)(ii), the proposed works pose no significant threat to public safety, having been designed to withstand a severe storm over an appropriate design life, and are less of a threat to public safety than the do-nothing scenario.

With regard to 55M(b)(i), the beach would be expected to naturally accrete and be restored seaward of the proposed works after storm events, and it is considered that any increased erosion (if any) on the beach would be only short term and not be measurable or significant, and would not be different to the existing situation. If any mechanical intervention is desired to accelerate beach recovery, Council has resolved that it would undertake beach scraping (see Section 5).

Further with regard to 55M(b)(i), there are no end effects (increased erosion on adjacent land) expected as a result of the proposed works, as discussed in Section 7.2.10. Therefore, no conditions of consent are considered to be required in relation to 55M(b)(i).

With regard to 55M(b)(ii), the subject landowners recognise that they would be responsible for maintaining the proposed works, and it is in their best interests to maintain the works. It would be appreciated if there was the opportunity to review and discuss any imposed conditions of consent with Council in this regard.

To maintain the proposed works, it would be necessary for a suitably qualified and experienced coastal engineer to undertake an inspection after severe storms that expose the revetment, and advise on required remedial action. Any rocks that had moved would be appropriately repositioned.

The owners would be willing to consider Council taking responsibility for maintenance of the revetment, and providing a contribution to Council for this purpose in the form of an annual coastal protection service charge as per Section 496B, 553B, 606A, 606B, and 606C of the *Local Government Act 1993*.

7.4 *Warringah Local Environmental Plan 2011* (LEP 2011)

7.4.1 Clause 4.3

Clause 4.3 of LEP 2011 relates to building heights, more applicable to dwellings than protection works. That stated, based on Clause 4.3(2), the height of a building on any land is not to exceed the maximum height shown for the land on the Height of Buildings Map. At the subject property, a maximum height of 8.5m above existing ground level applies. The proposed works will extend about 1m above the existing works. Therefore, the proposed works comply with this Clause.

7.4.2 Clause 5.5

Development within the coastal zone is considered in Clause 5.5 of LEP 2011. The objectives in Clause 5.5(1) of LEP 2011 are as follows:

(a) to provide for the protection of the coastal environment of the State for the benefit of both present and future generations through promoting the principles of ecologically sustainable development;
(b) to implement the principles in the NSW Coastal Policy.

For objective (a), ecologically sustainable development was addressed in Section 7.2.2 in relation to aim 2(j). For objective (b), the principles of the NSW Coastal Policy have already been addressed herein as follows:

- Clause 5.5(b)(i): "protect, enhance, maintain and restore the coastal environment, its associated ecosystems, ecological processes and biological diversity and its water quality" – see Section 7.2.2 in relation to aim 2(g), and Section 7.2.13;
- Clause 5.5(b)(ii): "protect and preserve the natural, cultural, recreational and economic attributes of the NSW coast" – see Section 7.2.2 in relation to aim 2(a);
- Clause 5.5(b)(iii): "provide opportunities for pedestrian public access to and along the coastal foreshore" – see Section 7.2.2 in relation to aims 2(b) and 2(c), and Section 7.2.3;
- Clause 5.5(b)(iv): "recognise and accommodate coastal processes and climate change" – see Section 7.2.10, and also note that climate change (in particular, sea level rise[16]) was considered as part of the proposed works design life of 60 years;
- Clause 5.5(b)(v): "protect amenity and scenic quality" – see Section 7.2.2 in relation to aims 2(e) and 2(k), Section 7.2.5, and Section 7.2.6;
- Clause 5.5(b)(vi): "protect and preserve rock platforms, beach environments and beach amenity" – see Section 7.2.2 in relation to aims 2(f) and 2(i);
- Clause 5.5(b)(vii): "protect and preserve native coastal vegetation" – see Section 7.2.2 in relation to aim 2(g);
- Clause 5.5(b)(viii): "protect and preserve the marine environment" - see Section 7.2.2 in relation to aim 2(h);
- Clause 5.5(b)(ix): "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" - see Section 7.2.2 in relation to aim 2(k), and Section 7.2.4;
- Clause 5.5(b)(x): "ensure that decisions in relation to new development consider the broader and cumulative impacts on the catchment" – see discussion on Clause 2(f) overleaf;
- Clause 5.5(b)(xi): "protect Aboriginal cultural places, values and customs" – see Section 7.2.2 in relation to aim 2(d), and Section 7.2.12; and
- Clause 5.5(b)(xii): "protect and preserve items of heritage, archaeological or historical significance" – see Section 7.2.14.

In Clause 5.5(2) and 5.5(3) of LEP 2011, it is noted that development consent must not be granted unless the consent authority has considered various matters that have been considered generally verbatim in Section 7.2 in relation to SEPP 71. Specifically:

- Clauses 2(a) and 3(a), regarding public access, were addressed in Section 7.2.2 in relation to aims 2(b) and 2(c), and in Section 7.2.3;
- Clause 2(b)(i), regarding compatibility of any land-based and water-based coastal activities, was addressed in Section 7.2.11;

[16] Other potential climate change impacts (if any), such as altered storminess and wave directions, are not reliably projected at this point in time and cannot therefore be accounted for.

- Clause 2(b)(ii) regarding the development location, and Clause 2(b)(iii) regarding the "bulk, scale, size and overall built form design", was addressed in Section 7.2.2 in relation to aim 2(k), and in Section 7.2.4;
- Clause 2(c), regarding overshadowing and views, was addressed in Section 7.2.5;
- Clause 2(d), regarding visual amenity and scenic qualities, was addressed in Section 7.2.2 in relation to aims 2(e) and 2(k), and in Section 7.2.6;
- Clause 2(e)(i), regarding native coastal vegetation and existing wildlife corridors, was addressed in Section 7.2.2 in relation to aim 2(g), and in Section 7.2.9;
- Clause 2(e)(ii), regarding rock platforms, was addressed in Section 7.2.2 in relation to aim 2(i);
- Clause 2(e)(iii), regarding water quality, was addressed in Section 7.2.13;
- Clause 2(e)(iv), regarding native fauna and flora, was addressed in Section 7.2.2 in relation to aims 2(g) and 2(h), and in Section 7.2.7 (for terrestrial areas) and Section 7.2.8 (for marine areas); and
- Clause 3(d), regarding coastal hazards, was addressed in Section 7.2.10.

For Clause 2(f), regarding "the cumulative impacts of the proposed development and other development on the coastal catchment", it can be noted that the proposed works are at the downstream edge of the catchment, would not significantly affect water quality, are in an area with existing protection works, and link to adjacent areas with protection works. The cumulative impact of upgrading of protection works is desirable to achieve a consistent level of protection, and to prevent outflanking risks and potential end effects. The continuous protection of the area surrounding and including the subject property has been envisaged since at least 1985.

The only unique items in Clauses 5.5(2) and (3) of LEP 2011 compared to SEPP 71 are in Clause 5.5(3) as follows, namely "development consent must not be granted to development on land that is wholly or partly within the coastal zone unless the consent authority is satisfied that:

(b) if effluent from the development is disposed of by a non-reticulated system, it will not have a negative effect on the water quality of the sea, or any beach, estuary, coastal lake, coastal creek or other similar body of water, or a rock platform;
(c) the proposed development will not discharge untreated stormwater into the sea, or any beach, estuary, coastal lake, coastal creek or other similar body of water, or a rock platform".

5.5(3)(b) is not applicable to the proposed works, which do not include effluent disposal facilities.

With regard to 5.5(3)(c), stormwater management at the subject property is unaltered compared to the existing situation, where stormwater from the roof and driveway is directed to the gutter at Pittwater Road (and ultimately into Council's pit and pipe stormwater network at Frazer Street). The proposed works will not have an adverse effect on stormwater quality, nor increase stormwater run-off quantity. Rainfall that falls on the proposed works will drain through the works towards the beach.

7.4.3 Clause 6.5

Coastline hazards are considered in Clause 6.5 of LEP 2011, although this is generally in relation to construction of dwellings and the like, rather than protection works. Based on Clause 6.5(2) of LEP 2011, Clause 6.5 applies at the subject property.

Based on Clause 6.5(3) of LEP 2011, "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) 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".

For Item (a), the proposed works will significantly reduce the coastal hazards of beach erosion/recession and coastal inundation at the subject property.

For Item (b), this reduction in risk at the subject property would not be to the detriment of the adjacent properties to the north and south, that also have protection works. The proposed works would link with these adjacent works, and the adjacent works would be bolstered by this linkage.

As has been demonstrated from review of historical beach profile data at Collaroy-Narrabeen Beach extending back to 1941, sand that is eroded off the beach in coastal storms (caused by large waves and elevated water levels) returns to the subaerial beach in calmer conditions after storms, such that there is no long-term trend of recession at the beach. That is, extensive existing protection works do not adversely affect the sediment budget of the beach, and the same can be expected for the proposed works relative to the existing situation. Therefore, the proposed works would not be expected to cause detrimental increases in coastal risks at locations seaward of the works.

Long term recession due to sea level rise will reduce beach widths (on average) over time, although the proposed works will not significantly alter this issue compared to the existing protection works.

For Item (c), the proposed works will not significantly alter the processes of erosion/recession (except for limiting their magnitude), nor alter subsequent beach recovery. This reduction in erosion/recession at the subject property would reduce the risk of coastal hazards impacting on development, and hence reduce the risk of undersized rock and soil layers entering the beach environment. On this basis, the proposed works enhance the environment compared to the existing situation, rather than being detrimental.

For Item (d), the proposed works have been designed to resist severe wave action and beach erosion for a suitably rare storm (500-year ARI) and long design life (60 years), consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*. Therefore, the works explicitly incorporate appropriate measures to manage risk to life from coastal risks.

For Item (e), the proposed works avoid or minimise exposure to coastal hazards, significantly reducing the coastal hazards of beach erosion/recession and coastal inundation at the subject property.

For Item (f), the works could be modified in the future (eg by adding armour rock at the crest, or larger armour) to be able to resist and adapt to more severe conditions than the 500-year ARI design storm over the 60-year design life, as required if projected sea level rise is realised.

Based on Clause 6.5(4) of LEP 2011, "development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the foundations of the development have been designed to be constructed having regard to coastal risk". This clause is more applicable to dwellings than protection works, but it can be noted that the foundation (toe) of the proposed works has been designed with consideration of the risk of scour and undermining for the 500-year ARI design storm over the 60-year design life. To manage this risk, the works are to be founded on a cemented sand layer (with resistance to scour) and have a large toe rock in each section (as per the Drawings) to continue to provide support to the revetment even if some toe settlement occurs.

7.5 *Northern Beaches Coastal Erosion Policy*

7.5.1 Supporting Information

Based on Part 6(c) of the *Northern Beaches Coastal Erosion Policy*, the following information shall be supplied with a DA for coastal protection works:

(i) "Survey identifying the location of all relevant property boundaries with respect to the proposed works including the location of the eastern boundary having regard to any erosion and accretion processes;
(ii) Certification that the works set out in the application are supported by appropriately experienced and qualified specialists in the field of coastal engineering;
(iii) In the case of an application dealing with multiple properties, that an enforceable agreement from all owners has been obtained to fund and construct the works as a single contiguous project;
(iv) A mechanism to ensure appropriate protections for Council and the public in the event that the applicant cannot complete the works in a timely professional manner (e.g. bank guarantee in favour of Council in the event of non-compliance or failure to complete the works);
(v) Appropriate mechanisms that allow for the efficient maintenance, funding of offsets for any adverse impacts on adjacent properties and/or the public beach and any renewal of the works as required by or on behalf of the benefiting property owner/s;
(vi) An assessment demonstrating that the development does not have a long-term impact on coastal processes in the Collaroy-Narrabeen embayment;
(vii) An assessment demonstrating that the development does not have a long-term impact on public access to or along the beach;
(viii) An assessment of the impact of climate change and sea level rise on the development and the adjoining beach environment; and
(ix) Demonstration that the works are consistent with the CZMP and this policy".

For Item (i), a survey has been submitted as part of the DA documentation, including property boundaries. The seaward boundary of the subject property is a right line, and not ambulatory, as it is not related to a Mean High Water Mark position.

For Item (ii), Horton Coastal Engineering Pty Ltd provides certification that the works set out in the application are supported by appropriately experienced and qualified specialists in the field of coastal engineering, namely Peter Horton, who has 25 years of experience and postgraduate qualifications in coastal engineering. The design basis is described in the Coastal Engineering Report submitted with the DA.

For Item (iii), it is believed that such an enforceable agreement could be developed as a condition of consent.

For Item (iv), it is believed that such a bank guarantee or similar could be developed as a condition of consent, and most likely tied to the enforceable agreement in Item (iii).

For Item (v), it is believed that a mechanism for efficient maintenance could be developed as a condition of consent, eg through payment by landowners into a fund that could be used to pay for any maintenance required. It is recommended that Council develops a condition that requires landowners to engage a coastal engineer to inspect the works and assess if maintenance is required whenever the works are exposed by a storm event, as notified by Council (that is, Council has the opportunity to set the requirement for an inspection to be undertaken). Maintenance is further discussed in Section 7.5.3.

As discussed in Section 7.3 in relation to Section 55M(b)(i) of the *Coastal Protection Act 1979*, impacts on adjacent properties to the north and south, and impacts on the beach, are not expected as a result of the proposed works. Therefore, no funding of offsets for any adverse impacts on adjacent properties and/or the public beach is considered to be required.

It would be appreciated if there was the opportunity to review and discuss any imposed conditions of consent with Council in regard to Items (iii), (iv) and (v) above.

For Item (vi), given the extent of existing protection works at the subject property and adjacent areas, the proposed works will not have a long-term impact on coastal processes in the Collaroy-Narrabeen embayment compared to the do-nothing scenario.

For Item (vii), the proposed works will not have a long-term negative impact on public access to or along the beach. As discussed in Section 7.2.2 with regard to aims 2(b) and 2(c), and in Section 7.2.3 and 7.3, the proposed works would not affect cross-shore public beach access, and would not significantly affect alongshore beach access compared to the existing situation.

For Item (viii), climate change and sea level rise was considered as part of the design of the proposed works, as discussed in Section 7.4.2 in relation to Clause 5.5(b)(iv). The impact of sea level rise on the adjoining beach environment was considered in Section 5.

For Item (ix), demonstration that the works are consistent with the CZMP has been provided in Section 3 and Section 6.8. Demonstration that the works are consistent with the *Northern Beaches Coastal Erosion Policy* is provided herewith in Section 7.5.

7.5.2 Design and Construction

Based on Part 4(c) of the *Northern Beaches Coastal Erosion Policy*, "all protection works shall be designed and constructed:

(i) to ensure the long-term coastal processes of the Collaroy-Narrabeen Beach embayment are maintained;
(ii) to ensure that the presence of the works will not adversely impact on adjoining private and public properties, or adversely affect the long-term amenity of the adjoining beach and surf zone;
(iii) such that the works are only visible temporarily during and after significant erosion events;
(iv) to be contiguous, similar and integrated with adjoining protection works constructed in the embayment;
(v) to a consistent design standard that provides an appropriate level of protection from coastal erosion for affected properties;
(vi) to ensure public access is not adversely impacted by any new protection works;
(vii) to ensure access for ongoing maintenance of the works; and
(viii) in accordance with the minimum criteria outlined in the *Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications*".

For Item (i), given the extent of existing protection works at the subject property and adjacent areas, the proposed works will not have a long-term impact on coastal processes in the Collaroy-Narrabeen embayment compared to the do-nothing scenario.

For Item (ii), given that the proposed works are tying into adjacent protection works, they will not adversely impact on adjoining properties to the north and south. The proposed works will not adversely affect the long-term amenity of the adjoining beach and surf zone compared to the existing situation.

For Item (iii), the works would be buried under sand and would only be expected to be visible after significant erosion events at present. Over the long term, the frequency of exposure of the works would increase if beach nourishment is not undertaken, which is a government responsibility. However, the proposed works would not significantly alter the potential exposure of the revetment compared to the existing situation.

For Item (iv), the proposed works would be linked to adjacent rock protection works and hence would be contiguous, similar and integrated with these adjoining protection works, although it is recommended that the works at Shipmates be upgraded by those owners to achieve a consistent standard.

For Item (v), the proposed works are consistent with the design standard in the *Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications*, which is being consistently applied for works along the beach.

For Item (vi), the proposed works will not adversely impact on public access to or along the beach. As discussed in Section 7.2.2 with regard to aims 2(b) and 2(c), and in Section 7.2.3 and 7.3, the proposed works would not affect cross-shore public beach access, and would not significantly affect alongshore beach access compared to the existing situation.

For Item (vii), maintenance setback issues were discussed in Section 4.2.

For Item (viii), the minimum criteria outlined in the *Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications* have been met, as discussed in the Coastal Engineering Report[17].

7.5.3 Maintenance

Based on Part 11(a) of the *Northern Beaches Coastal Erosion Policy*, "it is the responsibility of the Principal Asset Owner to ensure the coastal protection works are maintained in a manner that ensures the ongoing level of design performance. This includes but is not limited to:

(i) undertaking a routine series of inspections;
(ii) undertaking condition inspections following a significant erosion event;
(iii) ensuring works are renewed in a timely manner such that the design level of protection is not threatened;
(iv) ensuring works are upgraded as required in response to changes in impacts associated with frequency or intensity of storm events or sea level rise associated with climate change;
(v) ensuring suitable access is retained to the works so that ongoing maintenance can be implemented by private and/or public owners; and
(vi) ensuring compliance with all requirements of any development consent that permitted the erection or modification of the works".

For Item (i), it is considered to be unnecessary to undertake routine inspections of a rock revetment that is generally buried under sand. Any damage to the revetment that could trigger maintenance can only occur after storm events that expose it, as per Item (ii).

For Item (ii), it is agreed that condition inspections following significant erosion events should be undertaken, as discussed in Section 7.3.

For Item (iii), it is agreed that any repairs to damaged works should be undertaken in a timely manner after storms, preferably before any rocks that had moved had been covered again by sand. As discussed in Section 7.3, the owners would be willing to consider Council taking responsibility for maintenance of the revetment, and providing a contribution to Council for this purpose in the form of an annual coastal protection service charge.

For Item (iv), the works have been designed for a 500-year ARI event occurring over a 60-year life. It is recognised that the works may need to be upgraded in the future to provide a suitably low risk of damage beyond this life or if sea level rise increases at a faster rate than projected (or if other climate change effects increase the risk level).

For Item (v), maintenance setback issues were discussed in Section 4.2.

For Item (vi), this is noted.

Based on Part 11(b) of the *Northern Beaches Coastal Erosion Policy*, "existing protection works (e.g. loose rock or geobags) that are not incorporated into permanent protection works shall be removed by the Principal Asset Owner for the permanent works". Any loose rock over the

[17] Except with "over-design" of the additional armour to "compensate" for the retention of the existing revetment with its undersized armour and potential non-graded filter layers.

revetment footprint, or uncovered seaward of the proposed works as part of construction activities, would be incorporated into the revetment as agreed by a coastal engineer.

7.6 *Warringah Development Control Plan 2011* (DCP 2011)

7.6.1 Part B (Built Form Controls)

There are numerous items in DCP 2011 more applicable to dwellings, such as setbacks and wall heights. The proposed works do not comply with side setbacks (900mm) and rear setbacks (6.0m) as per Part B5 and B9 respectively of DCP 2011, given that the works are required to protect the entire beach frontage and have an alignment dictated by the position of existing and adjacent protection works. As discussed as part of the PLM, a variation to the controls will be supported in these circumstances.

The proposed works comply with Part B1 (wall height less than 7.2m) and Part B3 (side boundary envelope 4m then 45°), but again these items are more applicable to dwellings.

7.6.2 Part C4 (Stormwater)

As noted in Section 7.4.2, stormwater management at the subject property is unaltered compared to the existing situation, and therefore Part C4 of DCP 2011 is not applicable, and there is no requirement to prepare a Stormwater Management Plan.

7.6.3 Part C5 (Erosion and Sedimentation)

An Erosion and Sedimentation Control Plan has been provided as part of the Drawings (Drawing S04) in relation to Part C5 of DCP 2011. Sandy beach materials are naturally subject to erosion and accretion cycles, and excavation of such materials does not require any erosion and sedimentation controls. Sandy material entering the ocean is a natural process that does not need to be (and cannot be) prevented seaward of the works.

The main form of erosion and sedimentation control proposed for the works area is construction of a sand bund seaward of the works, as shown on Drawing S04. In addition, materials that would be deleterious if washed into the ocean will need to be stockpiled landward of the existing revetment.

After completion of the proposed works, the risk of erosion within the subject property would be substantially reduced, thus substantially reducing the risk of undersized rock and soil layers entering the beach area.

7.6.4 Part D1 (Landscaped Open Space and Bushland Setting)

Part D1 of DCP 2011 was addressed in Section 4.6.

7.6.5 Part E7 (Development on Land Adjoining Public Open Space)

Part E7 of DCP 2011 discusses development on land adjoining public open space. As the transition from private land to public land will be a rock revetment buried under a vegetated sand dune for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term, and not significantly altered compared to the existing situation), the proposed works will meet the requirements of Part E7 (where applicable), namely:

1. the works will complement the landscape character and public use and enjoyment of the adjoining public open space, consistent with adjacent areas, appearing as a vegetated dune for most of the time, and linking with existing protection works and of a similar appearance as these adjacent works (and the existing works at the subject property) when exposed;
2. public access to public open space will be maximised, with only the toe of the works on public land (at a depth rarely exposed) and at a consistent alignment to adjacent areas;
4. the works will provide a visual transition (vegetated dune for most of the time) between open space (sandy beach) and the Flight Deck tower;
5. the works will not affect views to and from public open space;
8. there will be opportunities for casual surveillance of the public open space from the unit block; and
9. the works will utilise landscaping to (partially) screen development.

7.6.6 Part E9 (Coastline Hazard)

Part E9 of DCP 2011 is applicable to the proposed works. The objectives listed in Part E9 are as follows:

1. to minimise the risk of damage from coastal processes and coastline hazards for proposed buildings and works along Collaroy Beach, Narrabeen Beach and Fishermans Beach;
2. to ensure that development does not have an adverse impact on the scenic quality of Collaroy, Narrabeen and Fishermans Beaches;
3. to ensure that development does not adversely impact on the coastal processes affecting adjacent land; and
4. to retain the area's regional role for public recreation and amenity.

With regard to objective 1, the proposed works would achieve a minimised risk of damage, reducing the risk of damage to existing and future proposed development at the subject property.

With regard to objective 2, the proposed development would not have an adverse impact on scenic quality, as discussed in Section 7.2.2 in relation to aims 2(e) and 2(k), and Section 7.2.6.

With regard to objective 3, the proposed development would not adversely impact on the coastal processes affecting adjacent land, tying into adjacent protection works as discussed in Section 7.2.10.

With regard to objective 4, the proposed works are upgrading existing works. This upgrading would enable faster restoration of alongshore public beach access after storms, as it would reduce the risk of the current situation occurring of undersized rock entering the beach after storms.

Based on Requirement 2 of Part E9 of DCP 2011, "the applicant must demonstrate compliance with the *Northern Beaches Coastal Erosion Policy*, the *Coastal Zone Management Plan* and the *Collaroy-Narrabeen Protection Works Design Specifications* (as amended from time to time)". This has been demonstrated in previous sections and other DA documents, namely:

- Section 7.5 for the *Northern Beaches Coastal Erosion Policy*;
- Section 3 and Section 6.8 for the CZMP; and

- in the Coastal Engineering Report for the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*.

7.7 Section 79C of the *Environmental Planning and Assessment Act 1979*

Based on Section 79C(1) of the *Environmental Planning and Assessment Act 1979*, in determining a DA, a consent authority is to take into consideration such of the following matters as are of relevance to the development the subject of the DA:

(a) the provisions of:
  (i) any environmental planning instrument, and
  (ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and
  (iii) any development control plan, and
  (iv) any planning agreement that has been entered into under section 93F, or any draft planning agreement that a developer has offered to enter into under section 93F, and
  (v) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and
  (vi) any coastal zone management plan (within the meaning of the *Coastal Protection Act 1979*), that applies to the land to which the DA relates,
(b) the likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality,
(c) the suitability of the site for the development,
(d) any submissions made in accordance with this Act or the regulations,
(e) the public interest

With regard to 79C(a)(i), *Warringah Local Environmental Plan 2011* has been considered in Section 7.4, and the proposed works were found to be consistent with this.

With regard to 79C(a)(ii), this is not applicable.

With regard to 79C(a)(iii), *Warringah Development Control Plan 2011* has been considered in Section 7.6, and the proposed works were found to be consistent with this.

With regard to 79C(a)(iv) and (v), these are not applicable.

With regard to 79C(a)(vi), the proposed works are consistent with the CZMP, as outlined in Section 3 and Section 6.8.

With regard to 79C(b), environmental impacts have been considered in previous sections. There are no significant long term environmental impacts on flora and fauna from the proposed works. The proposed works would limit the social and economic impacts of property loss at the subject property in severe coastal storms.

With regard to 79C(c), the subject property is subject to coastal erosion, has had protection works in place since 1967, and upgraded protection works have formally been envisaged at the property since at least 1985 (and adopted by Council as a key management measure since at least 1997). The subject site is thus suitable for the proposed works.

With regard to 79C(d), no submissions have been made in relation to the proposed works as they have not yet been publicly notified. However, it can be noted that the gazetted CZMP, which envisaged upgraded protection works at the subject property, was subject to community consultation activities.

With regard to 79C(e), the proposed works are not contrary to the public interest. With residential development to remain at Collaroy-Narrabeen Beach, it is important that this is at an acceptably low risk of being damaged, so the proposed works are essential to achieve this. Sand will continue to come and go off Collaroy-Narrabeen Beach, and the works will be buried under sand for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term, and not significantly altered compared to the existing situation), minimising the public impact.

7.8 Schedule 1 of *Environmental Planning and Assessment Regulation 2000*

All items listed as information and documents to be included in a DA in Schedule 1 of *Environmental Planning and Assessment Regulation 2000* have been submitted as part of the subject DA.

7.9 Collaroy-Narrabeen Protection Works Assessment Checklist

All items listed in the *Collaroy-Narrabeen Protection Works Assessment Checklist* have been considered herein.

8. REQUIREMENTS OF DEPARTMENT OF INDUSTRY – LANDS & FORESTRY

8.1 Matters to be Addressed

Landowner's Consent from the Department of Industry – Lands & Forestry (Lands) is required for any private protection works that extend onto or under Crown land. As noted in the CZMP and the *Northern Beaches Coastal Erosion Policy*, Lands has indicated that private protection works on or under Crown Land will only be granted Landowner's consent where:

1. Crown Land is being retained and managed in the public interest;
2. detailed designs for any planned structures have been provided and assessed as being compatible with the designated Crown reserve purpose;
3. works result in a better outcome in terms of public safety, environmental outcomes, beach access and recreational amenity;
4. satisfactory arrangements are in place for maintenance over the life of any constructed assets; and
5. evidence can be provided that all other reasonable opportunities to contain protection works on private land have been explored and exhausted.

These 5 items are responded to in turn below.

8.2 Item 1 – Public Interest

As demonstrated in Section 5, the proposed works would be buried under sand for most of the time. Crown Land seaward of the subject property would therefore be available for public use for most of the time. After storms when subaerial beach widths narrow and the proposed works are exposed, this would be at a similar alignment to adjacent protection works, and only up to 2m seaward of the existing protection works. This 2m further seaward extent is at such a depth that the rock on Crown Land would rarely be exposed, with 19 historical profiles over 75 years only indicating one occasion when this would have occurred, in June 2016, with rock in this area covered again by sand within days after the storm.

8.3 Item 2 – Crown Reserve Purpose

Detailed designs have been provided in the Drawings, with detailed calculations provided in the Coastal Engineering Report (both submitted with the DA).

Collaroy-Narrabeen Beach is a Crown Reserve (No. 79606), reserved for the purpose of Public Recreation on 17 May 1957. Council is the Trustee for this land as noted in NSW Government Gazette No. 68 of 27 June 1997.

The proposed works are consistent with the general intent of Council and the NSW Government since at least 1985, and specifically consistent with consideration of works at the subject property extending on to Crown Land (the Crown Reserve), since:

- from 1985, it was established by the NSW Government and Council that the subject property should have upgraded protection works (see Section 6.4);
- the *Collaroy Narrabeen Coastline Management Plan* adopted in 1997 contained a strategy of selective reconstruction of existing seawalls and infilling of gaps (see Section 6.6), with the design study resulting from this action having the expectation of the addition of a layer or two of primary armour at Flight Deck (see Section 6.7);

- the *Coastal Lands Plan of Management* (POM), applying to the Crown Land seaward of the subject property, specifically endorses any works required to implement the *Collaroy Narrabeen Coastline Management Plan* (see Section 6.7);
- the POM used a "Natural Area Foreshore" classification on the Crown Land, which is a transition area as per the *Local Government Act 1993*, with the proposed works considered to be consistent with the use of the foreshore as a transition area between the erodible beach environment and protected terrestrial private development areas, as it is now (see Section 6.7); and
- the proposed works are consistent with the CZMP (see Section 3 and Section 6.8).

That is, construction of upgraded protection works at the subject property was envisaged and authorised by the POM, for a similar design and alignment as the subject DA. Furthermore, the reserve purpose in the POM was as a transition area that is considered to be consistent with construction of protection works. Therefore, the proposed works can be considered to be compatible with the designated Crown reserve purpose as enunciated in the POM.

8.4 Item 3 – Outcomes

As noted in Section 3, if the proposed works are not constructed then there would be ongoing impacts on public beach and recreational amenity (including undersized rock and soil layers on the beach after storms). Furthermore, the proposed works would not significantly affect alongshore beach access compared to the existing situation, with the works consistent in alignment to adjacent existing protection works.

It is a better outcome for public safety, environmental outcomes, beach access and recreational amenity for the upgraded works to be constructed, rather than leaving the inadequate existing protection works in place in the do-nothing scenario.

8.5 Item 4 – Maintenance

This item applies based on Section 55M(b)(ii) of the *Coastal Protection Act 1979*, as discussed in Section 7.3, Section 7.5.1, and Section 7.5.3. The subject landowners recognise that they would be responsible for maintaining the proposed works, and it is in their best interests to maintain the works.

8.6 Item 5 – Containing Works on Private Land

With regard to Item 5, the only way that protection works could be entirely within the subject property would be if they were essentially rebuilt. As discussed in Section 4.1, this is unnecessary from a risk perspective, and would require substantial rehandling of rock and greater disruption to the beach. Furthermore, this would provide no net benefit in terms of alongshore public beach access, with existing protection works at adjacent areas already extending on to Crown Land by 2m to 3m.

Therefore, even if the proposed works were somehow entirely on private land, this would provide no advantage in terms of improved alongshore beach access, which is already constrained by adjacent protection works that are further seaward.

The proposed design makes the best use of existing protection works to minimise the overall environment impact of the construction works, while being at a consistent alignment to adjacent areas such that there would be no advantage in the works being further landward.

The 2m additional seaward extent of the works is consistent with the *Specifications* and impact assessment within the *Collaroy-Narrabeen Beach Coastal Protection Assessment* (MHL, 2016). That is, there is no expected impact from the proposed works on coastal processes or beach amenity, compared to the existing situation. The proposed works alignment has been generally accepted by Council as part of the PLM process.

9. REFERENCES

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