Horton Coastal Engineering
Coastal & Water Consulting

Statement of Environmental Effects for Construction of Upgraded Coastal Protection Works at 1190-1196 and 1204 Pittwater Road Narrabeen

prepared by Horton Coastal Engineering Pty Ltd

for the owners of 1190-1196 and 1204 Pittwater Road Narrabeen

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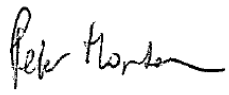

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EXECUTIVE SUMMARY

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 1190-1196 and 1204 Pittwater Road Narrabeen.

Existing protection works extend essentially continuously for 260m north of the subject properties, and 1,300m south of the subject properties (except at 1126-1144 Pittwater Road Collaroy, where a DA has been submitted for construction of new coastal protection works), and have been in place for around 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.

A coastal storm in June 2016 caused some erosion and damage at the subject properties, despite existing protection works being in place at the properties.

Pittwater Road, a State Road, is located to the west of the subject properties. A Crown Reserve, for which Council is the Crown Land Manager, is located seaward (east) of the subject properties.

Upgrading of the protection works at the subject properties needs to be undertaken to reduce the risk of erosion/recession affecting the existing and future residential development to acceptable levels, as well as to reduce potential public safety risks and beach amenity impacts from inadequate works scattering over the beach as a result of coastal storms. The proposed works also have the public benefit of removing protection works entirely off public land, that currently extend about 5m to 10m seaward of the properties.

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

- further erosion and damage at the subject properties;
- ongoing impacts on public beach amenity, including debris on the beach after storms;
- risk to public safety from non-interlocked boulders that could collapse on beach users, as well as from the debris on the beach;
- ongoing diversion of Council and emergency services resources during and after coastal storms;
- restriction on alongshore public access along the beach after coastal storms; and
- eventual damage to Pittwater Road and the services running along it.

As further justification for the proposed works, the works are consistent with the gazetted Coastal Zone Management Plan (CZMP) at Collaroy-Narrabeen Beach.

The proposed coastal protection works comprise a reinforced concrete wall supported on continuous flight auger (concrete) piles, either contiguous piles with plug piles or jet grout, or secant piles. Anchors attached to the wall (and permanently buried landward of it) have been designed to provide support for the wall and piling at times of beach erosion when sand levels lower on the seaward side of the wall, with two anchoring options shown on the Drawings. 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 are located entirely within private property, with the main face of the concrete wall located 0.5m landward of the seaward property boundaries. A maintenance setback 4.5m landward of the concrete wall has been adopted.

The seaward extent of the works has been considerably reduced (by about 5m to 10m) compared to the existing works at and seaward of the subject properties.

There will be no significant change to the area of landscaping at the subject properties as a result of the proposed works.

Based on historical behaviour, it is expected that the proposed piling would be buried under sand for most of the time. From analysis of 24 historical profiles over 80 years since 1941, the proposed piling (had it been constructed) would have been completely buried under sand for all dates. Median beach widths to mean sea level seaward of the proposed works would have been about 54m. Median sand levels against the concrete wall would have been such that 1m of the wall would been exposed under typical conditions.

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 where profiles are truncated at protection works (assuming that beach scraping and beach nourishment is not undertaken). This will occur no differently than the existing situation, and indeed be improved with the removal of rock off Crown Land. Adoption in the CZMP of protection works as the preferred management option south of Devitt Street at Collaroy-Narrabeen Beach is a decision that was made in full recognition of this long-term recession. The proposed works are not creating a new issue that does not already exist, and that cannot be managed through Narrabeen Lagoon entrance clearance operations, beach scraping and beach nourishment (if required). As stated in the *Northern Beaches Coastal Erosion Policy*, these activities are the responsibility of government.

Even with projected long-term recession after 60 years and no beach scraping nor beach nourishment, it is expected that there would still be a median 45m beach width at mean sea level seaward of the proposed works (on average), piling would be completely buried under sand for more than 92% of the time, and about 3m of the wall would be exposed (on average).

Based on Clause 19(1) of *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal), 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 properties should have protection works. In 1993, the protection works alignment adopted at the subject properties extended further seaward. 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) 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 properties was envisaged and authorised by the POM, for a design further seaward than 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 all relevant legislation and environmental planning instruments, namely *State Environmental Planning Policy (Coastal Management) 2018*, Section 27 of the *Coastal Protection Act 1979*, *Warringah Local Environmental Plan 2011*, the *Northern Beaches Coastal Erosion Policy*, *Warringah Development Control Plan 2011*, Section 4.15(1) 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* for the relevant matters considered herein.

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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 1190, 1192, 1194, 1196 and 1204 Pittwater Road Narrabeen. The report comprises a Statement of Environmental Effects consistent with Section 4.15(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) and an Addendum *Review of Beach Width Impacts of Alternative Coastal Protection Works at Collaroy-Narrabeen Beach* (MHL, 2020), which are discussed elsewhere herein.

The proposed coastal protection works design comprises a reinforced concrete wall supported on continuous flight auger (concrete) piles. Either contiguous piles with mass concrete/grout plug piling or jet grouting to fill the gaps between the piles, or secant piling, is required to reduce the risk of soil migration through the piled portion of the seawall. Anchors attached to the wall (and permanently buried landward of it) are required to reduce the risk of the seawall overturning at times of beach scour (low sand levels) on the seaward side of the wall. Further details on the proposed works are provided on the Drawings and in the Coastal Engineering Report submitted as part of the DA documentation.

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 protection works were not carried out, and existing protection works at the subject properties and in adjacent areas remained in place. These existing protection works extend essentially continuously[1] for 260m north of the subject properties to Devitt Street at Narrabeen, and 1,300m south of the subject properties to the Collaroy rock pool (see Figure 3 on page 6).

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 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 about 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 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 author of the report herein, Peter Horton [BE (Hons 1) MEngSc MIEAust CPEng NER], is a professional Coastal Engineer with 28 years of coastal engineering experience. He has postgraduate qualifications in coastal engineering, and is a Member of Engineers Australia

[1] Except at 1126-1144 Pittwater Road Collaroy, located about 280m south of the subject property, where a DA has been approved by Council for construction of new coastal protection works.

(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 coastal protection works 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 properties is outlined, including details on property boundaries and existing protection works;
- in Section 3, a justification for the proposed works is provided as they reduce risk to private development, reduce beach amenity impacts, and are consistent with the CZMP;
- in Section 4, a description of the proposed works is provided, including discussion on proposed components of the works (concrete wall, piling, anchors, maintenance setback), revegetation, the expected appearance of the works, landscaped area calculations, colour and materials schedule, and waste management plan;
- in Section 5, there is discussion on the expected sand levels against the wall, 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 properties 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 properties are generally supported (and also supported at a more seaward alignment than 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 relevant legislation and environmental planning instruments is provided, including *State Environmental Planning Policy (Coastal Management) 2018*, *Coastal Management Act 2016*, *Warringah Local Environmental Plan 2011*, *Northern Beaches Coastal Erosion Policy*, *Warringah Development Control Plan 2011*, Section 4.15(1) 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*; and
- in Section 8, 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

Coastal erosion from a severe East Coast Low storm in June 2016 caused some erosion and damage at the subject properties, despite existing rock boulder (revetment) protection works being in place at and seaward of the properties. This damage included movement of boulders and some slumping of the rock revetment at and seaward of the properties, slumping and scour of lawns and gardens, and proximity of the erosion escarpment adjacent to development (particularly at 1192, placing this development at an inadequate factor of safety).

Pre-storm (6 May 2016[2]) and post-storm (8 June 2016[3]) aerial views of the subject properties are provided in Figure 1 and Figure 2 respectively, along with the location of the proposed works[4]. These Figures also depict the approximate landward[5] and seaward[6] edges of the existing rock boulder protection works at these properties. It is evident that these existing rock works extend about 5m seaward (at 1190-1196) and 7m to 10m seaward with an average of 9m (at 1204) of the properties onto the public beach (Crown Land).

South of the subject properties, at 1172 and 1174-1182 Pittwater Road Narrabeen, DA's have been approved (DA2021/0042 and DA2020/0301 respectively) for construction of coastal protection works to a similar design as the proposed works, which are under construction. South of Wetherill Street, construction has commenced on an approved DA (DA2018/1289) for construction of coastal protection works at 1150-1168 Pittwater Road Collaroy, again of a similar design as the proposed works but with the addition of a rock toe.

At this point in time, Council has not definitively advised what it proposes to construct at the Council road reserves at Clarke Street and Mactier Street, nor at South Narrabeen SLSC, and how these works may be coordinated with the proposed works.

Pittwater Road, a State Road (Main Road, Gazetted Road Number 164), is located to the west of the subject properties. Crown Land is located seaward (east) of the subject properties. Collaroy-Narrabeen Beach is a Crown Reserve, reserved for the purpose of Public Recreation in 1957 and additional purpose of coastal protection in 2018, for which Council is the Crown Land Manager. This Crown Reserve is depicted in Figure 3, 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. The seaward edge of the Reserve is located about 10m seaward of 1190-1196 and 11m-14m seaward of 1204 (that is, the Reserve is about 10m to 14m wide, cross-shore, seaward of the properties).

Collaroy-Narrabeen Beach has existing coastal protection works of some form extending essentially continuously (except at the private properties between Stuart Street and Ramsay Street) from the southern end of the beach (north of Collaroy rock pool and south of Collaroy SLSC) to north of the Marquesas unit block at 11 Ocean Street Narrabeen (at Devitt Street). This is a distance of about 1.7km[7]. Most of the length of these works extends on to Crown Land.

[2] Sourced from Nearmap.
[3] Sourced from UNSW Water Research Laboratory.
[4] An outline of the main face of the works, stairs, and pile capping beam is depicted. A wave return projects 0.5m seaward of the main face of the wall at its crest (not depicted in Figure 1 and Figure 2).
[5] Derived from 1967 and 2016 post-storm aerial photography.
[6] Derived from 2016 post-storm aerial photography and MHL (1999).
[7] Note that new coastal protection works were constructed north of the Beach Club in 2019. The pre-works, not post-works, seaward extent is depicted in Figure 3 (as is also the case for the works under construction at 1150-1168, 1172 and 1174-1182).

Figure 1: Pre-storm (6 May 2016) aerial view of subject properties (black), seaward (blue) and landward (green) edge of existing protection works, and proposed works (red)

Figure 2: Post-storm (8 June 2016) aerial view of subject properties (black), seaward (blue) and landward (green) edge of existing protection works, and proposed works (red)

Figure 3: Extent of proposed (red) and existing (blue) coastal protection works at Collaroy-Narrabeen Beach in relation to Council managed Crown Reserve (green) and Crown Land not in Council's Land Register (yellow), with aerial photograph taken 16 June 2020

As described by the author in the *Coastal Erosion Emergency Action Subplan for Beaches in Warringah*, in June 1945 a severe coastal storm impacted on Collaroy-Narrabeen Beach. This caused 8 houses to be destroyed or severely damaged and later demolished between the present Collaroy Services Beach Club / Collaroy Hotel and Jenkins Street, in the area that now forms the Collaroy Beach car park north of the Club / Hotel[8]. Based on Public Works Department [PWD] (1987), the subject properties did not appear to be particularly affected in this storm. A photograph of erosion at South Narrabeen SLSC, some 21 years later in 1966, is provided in Figure 4[9].

Figure 4: Erosion at South Narrabeen SLSC in 1966

In September 1967, another severe coastal storm impacted on Collaroy-Narrabeen Beach. This mainly affected the area south of the subject properties, with the Flight Deck unit block (at 1114 Pittwater Road Collaroy) being undermined. The erosion escarpment extended into the subject properties in the 1967 storm, with the 1967 scarp position as derived from PWD (1987) similar to the landward edge of existing protection works depicted in Figure 1 and Figure 2[10]. Emergency rock protection works were placed near the seaward boundary of South Narrabeen SLSC and 1204 Pittwater Road as a result of this storm.

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. PWD (1987) noted that erosion did not significantly extend into the subject properties in this storm. However, it is likely that the 1974 erosion would have been limited due to protection works already being in

[8] This area was never redeveloped after the 1945 storm, and was resumed from private to public ownership in February 1946.
[9] Posted by John Relph on the "Lost Manly and the Northern Beaches" Facebook page on 3 July 2016, with the note that it was sourced from Dee Why Library. Note that the house visible on the left of Figure 4 was at 1198 Pittwater Road, and is now demolished and part of the SLSC landholding.
[10] The 1967 scarp is identical to this landward edge of existing protection works line at 1190, 1196, South Narrabeen SLSC, and 1204. At 1192 and 1194, the 2016 scarp was about 1m to 3m landward of the 1967 scarp.

place before the storm, or being placed as emergency protection during the storm. Photographs of limited exposed rock works in 1974 and upgraded rock works in 1975 at 1194-1196 are provided in Figure 5 and Figure 6 respectively, and photographs of rock works being constructed at 1190-1192 in 1975 are provided in Figure 7 and Figure 8 (all photographs courtesy of Don Champion).

Figure 5: Exposure of protection works at 1194 and 1196 Pittwater Road in about 1974

Figure 6: Protection works constructed at 1196 and former 1198 Pittwater Road in about 1975

Figure 7: Rock works being constructed at 1190 and 1192 Pittwater Road in about 1975

Figure 8: Rock works being constructed at 1190 and 1192 Pittwater Road in about 1975

Based on Patterson Britton (2005):

- a rock revetment was constructed (presumably adding to existing rock works) at 1190 and 1192 in 1978. This was noted as having a crest location 5-10m seaward of the buildings at these properties (more likely closer to 5m based on observations after the June 2016 storm), about 1m armour rock dimension, and a foundation on the cemented sand layer at -0.2m AHD. Design drawings for rock revetment works at 1190-1192 prepared by Graham Small and dated 12 June 1975 have been observed, which are considered unlikely to show what was constructed. Those drawings indicated that rock

works had been present on these properties since 1967, and that the erosion escarpment as measured in May 1975 extended back to the seaward face of the 1190 dwelling and 1192 driveway at that time;

- a rock revetment was constructed (presumably adding to existing rock works) at 1196 in 1974-1975. This was noted as having a crest location 10m west of the seaward boundary (more likely closer to 5m based on observations after the June 2016 storm), about 1-2 tonne laterite armour rocks, and was not noted as being founded on the cemented sand layer;
- the 1978 works at 1190-1192, and 1974-1975 works at 1196, meet at 1194 to give coverage to this lot. The revetment crest was noted as being about 5-10m seaward of the dwelling at this property (but more likely closer to 5m based on observations after the June 2016 storm); and
- rock works at 1204 were added to between 1974 and 1978.

An oblique aerial view of the subject properties after the 2016 storm is provided in Figure 9 and Figure 10[11].

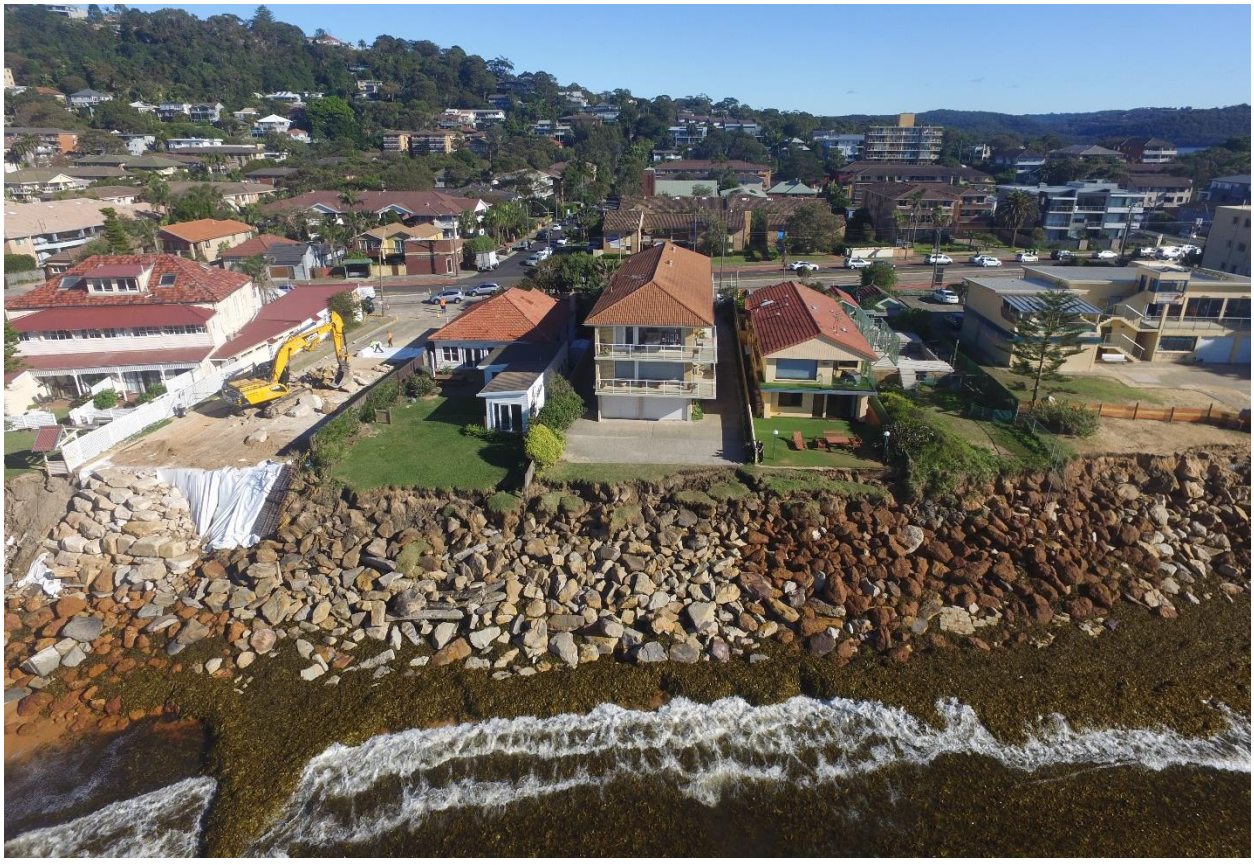

Figure 9: Oblique aerial view of southern portion of subject properties on 10 June 2016 (Clarke Street, 1190, 1192, 1194 & 1196 Pittwater Road and South Narrabeen SLSC left to right)

[11] Sourced from UNSW Water Research Laboratory.

Figure 10: Oblique aerial view of northern portion of subject properties on 10 June 2016 (South Narrabeen SLSC, 1204 Pittwater Road and Mactier Street left to right)

Based on the current condition of the rock revetment protection works at the subject properties, as observed after the June 2016 storm, it can be stated that:

- the revetments do not have a sufficient crest height to fully protect the land behind and limit wave overtopping in severe storms;
- some of the armour rock is undersized, meaning that it can be displaced under severe wave action;
- some boulders have moved, causing the revetments to slump, and exposing land near the revetment crest;
- some boulders have moved, meaning that they are not interlocked appropriately and may be a safety hazard due to the potential for sudden collapse when the revetments are exposed;
- there are not filter layers such as underlayer rock and geotextile under the revetments, nor sufficient layers of primary and secondary armour rock, meaning that soil can be washed out from landward of the revetments in severe storms; and
- the toe level of the revetments may be above the potential beach scour level at some properties, meaning that there is the potential for undermining and collapse of the boulders.

The protection works do not generally satisfy current design standards, and cannot be certified by a qualified coastal engineer as providing protection for an appropriate design storm and design life. Upgrading of the protection works at the subject properties needs to be undertaken to reduce the risk of erosion/recession affecting the existing and future residential development to acceptable levels, as well as to reduce potential public safety risks and beach amenity impacts from inadequate works scattering over the beach as a result of coastal storms.

3. JUSTIFICATION FOR PROPOSED WORKS

As noted in Section 2, upgrading of the protection works at the subject properties needs to be undertaken to reduce the risk of erosion/recession affecting the existing and future residential development to acceptable levels, as well as to reduce potential public safety risks and beach amenity impacts from inadequate works scattering over the beach as a result of coastal storms. The proposed works also have the public benefit of removing protection works entirely off public land.

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 the traditional Immediate coastline hazard line at the subject properties are depicted in Figure 11. All lines are depicted at the landward edge of the Zone of Slope Adjustment (ZSA). It is evident that without protection works (these lines ignore works), it is likely (26% probability) that the subject dwellings would be substantially undermined over the next 60 years or so.

Adopted development setback lines from the CZMP are depicted in Figure 12. It is evident that without upgraded or new protection works, redevelopment of the subject properties would be constrained (except under existing use rights), with the minimum setback for piled development (without protection works) near the seaward face of the 1196 dwelling, and dwellings at numerous other properties located seaward (namely at 1192, 1194 and 1204, with none of these three properties understood to be piled[12]). Without upgraded or new protection works and for development on conventional foundations, redevelopment would not be possible at the properties.

In the June 2016 storm, coastal erosion and wave overtopping caused damage at the subject properties. As soil continues to leak through the existing rock revetments, which do not have secondary armour or filter layers, this would cause a safety risk to residents and progressive failure of these works. The haphazard nature of the existing works has also made resident access to the beach (over the works) unsafe at the properties, and poses a public safety risk due to the potential for boulders to dislodge and fall on beach users.

The erosion and damage in June 2016 not only caused impacts on private development, but also impacts on public beach amenity. These public beach amenity impacts included debris strewn over the beach, and closure of beach access at Clarke Street and Mactier Street (and other access points to the north and south) for several months. Resources of Council and emergency services were also diverted to deal with the immediate storm dangers and subsequent clean up and risk management for several months.

[12] Of the subject properties, only 1196 is understood to be piled.

Figure 11: Coastal erosion/recession likelihood lines and Immediate traditional hazard line at subject properties (proposed works outline in red)

Figure 12: CZMP setback lines at subject properties (proposed works outline in red)

If the proposed works are not constructed (the do-nothing scenario), the following can be expected in future coastal storms:

- further erosion and damage at the subject properties;
- ongoing impacts on public beach amenity, including debris on the beach after storms;
- risk to public safety from non-interlocked boulders that could collapse on beach users, as well as from the debris on the beach;
- ongoing diversion of Council and emergency services resources during and after coastal storms;
- restriction on alongshore public access along the beach after coastal storms; and
- eventual damage to Pittwater Road and the services running along it (as per Figure 11, it is approximately "unlikely"[13] that erosion/recession would extend that far landward by 2074, ignoring protection works).

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 properties).

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 (which includes the area covered by the subject properties):

> "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)"

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. MHL (2020) considered vertical wall designs and found that potential impacts of such works on coastal processes was mostly dependent on their cross-shore alignment within the active beach profile[14]. A sensitivity analysis was completed to further assess the potential cross-shore erosion specifically caused by vertical seawall structures (of the same alignment as proposed) to determine if any additional scour at the toe of a vertical seawall would adversely affect the beach width over a long period of time. No significant long-term effects were found.

[13] About 0.3% probability.
[14] As stated by MHL (2020): "beach width is most affected by the relative cross-shore position of a seawall within the active beach profile and....the seawall make-up [ie whether it is vertical concrete or sloping rock] does not by comparison significantly impact the time that the beach width is impacted following storms".

4. DESCRIPTION OF PROPOSED WORKS

4.1 Nature of Works

The proposed coastal protection works design comprises a reinforced concrete wall supported on continuous flight auger (concrete) piles. Either contiguous piles with mass concrete/grout plug piling or jet grouting to fill the gaps between the contiguous piles, or secant piling, is required to reduce the risk of soil migration through the piled portion of the seawall. Anchors attached to the wall (and permanently buried landward of it) are required to reduce the risk of the seawall overturning at times of beach scour (low sand levels) on the seaward side of the wall. Two anchoring options are shown on the Drawings (hollow bar anchors at 1.5m centres, or deadman continuous flight auger concrete piles at 4m or 5m centres with a connecting concrete beam), and alternative permanent anchor systems such as steel screw piles or grouted and stressed anchors may also be considered subject to approval of the structural and geotechnical engineers.

An aerial view of the location of the proposed works was provided in Figure 1 (pre-storm 2016) and Figure 2 (post-storm 2016). Drawings of the proposed works have been submitted as part of the DA documentation, with design calculations and more detailed descriptions of the works provided in a Coastal Engineering Report that has also been submitted with the DA. 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 S11 can be considered as Section Plans, as per the DA form checklist.

The works are located entirely within private property, with the main face of the concrete wall located 0.5m landward of the seaward property boundaries[15]. At the top of the seawall (which has a crest level of 7.0m AHD) there is a wave return (concrete face that slopes seaward and directs waves seaward to reduce wave overtopping of the wall) that projects 0.5m seaward (not shown in Figure 1 and Figure 2), with the seaward edge of the wave return extending to the seaward property boundaries.

The proposed works will have to link Council's protection works at Clarke Street, South Narrabeen SLSC and Mactier Street. This can be achieved by constructing returns along a portion of the northern and southern boundary of 1204, northern boundary of 1196, and southern boundary of 1190. The length of returns shown on Drawing S02 are the minimum required for structural stability of the proposed works and would be suitable if Council adopted a similar design at Clarke Street, South Narrabeen SLSC and Mactier Street for their upgraded works. If Council does not construct the same design, it may be necessary for Council to extend these returns as part of their works, eg to enable a transition to a sloping structure if they adopted a rock revetment design. If Council adopts similar designs to the subject properties, the subject returns are only required to enable an infill plug at the interface to the adjacent shortened returns[16].

As noted above, the proposed works are entirely within private property. Therefore, the seaward extent of the works has been considerably reduced (about 5m to 10m) compared to the existing works at and seaward of the subject properties.

[15] As per the Drawings, stairs are recessed into the wall (extending landward of this alignment).
[16] At any interface of private works with Council works, a return of some form is required to maintain structural independence (such that they place no load on each other) and to enable plugging of the gap between them.

4.2 Maintenance Setback

A maintenance setback of 4.5m landward of the wall has been adopted, except at the landward edge of stairs, as justified in Section 2 of the Coastal Engineering Report.

4.3 Revegetation

Based on the historical extent of dune vegetation growth seaward of the subject properties (eg, see Figure 1), vegetation is unlikely to establish seaward of the proposed seawall over significant lengths of the subject properties[17]. As shown on the Landscape Plan (Drawing S03) submitted as part of the DA documentation, vegetation would be established landward of the wall. Suitable lawn species include Buffalo or Common couch (*Cynodon dactylon*). Photographs of other 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

- The yellow-flowered Guinea Flower (*Hibbertia scandens*) and the mauve-flowered Beach Morning Glory (*Ipomoea pes-caprae*), which could be used to encourage growth of vegetation descending over the face of the wall, and provide colour and are hardy species (Figure 14);

Figure 14: Guinea Flower (left) and Beach Morning Glory (right)

- Coastal Pigface (*Carpobrotus glaucescens*) and Beach Fan Flower (*Scaevola calendulacea*), that form mats and are typically used for stability and rapid growth in

[17] Only the northern end of 1204 had vegetation growth seaward of the property boundary in Figure 1.

harsh conditions, and could also be used if it was desired to encourage vegetation growth descending over the face of the wall (Figure 15 and Figure 16);

Figure 15: Close (left) and wide (right) views of Coastal Pigface

Figure 16: 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 vegetation cover landward of the wall (Figure 17);

Figure 17: 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 18 and Figure 19).


Figure 18: Coastal Pelargonium (left) and Coastal Correa (right)

Figure 19: Native Rosemary

4.4 Expected Appearance after Works

It is proposed to use a sand-matching colour for the concrete wall as per the current construction projects at 1150-1168, 1172 and 1174-1182 Pittwater Road, so that it blends in with the surrounding beach, and with a minimum Class 3 finish as per *AS 3610 (Formwork for concrete)* such that it is pleasantly formed. The piling below the concrete wall is expected to be buried under sand for most of the time. Photomontages of the works (as applied at 1172 Pittwater Road) after completion are provided in Figure 20 to Figure 23[18]. Discussion on the expected frequency of exposure of the piling, and expected extent of exposure of the concrete wall, is provided in Section 5.

[18] With sand levels being maintained as shown under typical conditions subject to beach nourishment being undertaken over the long term.

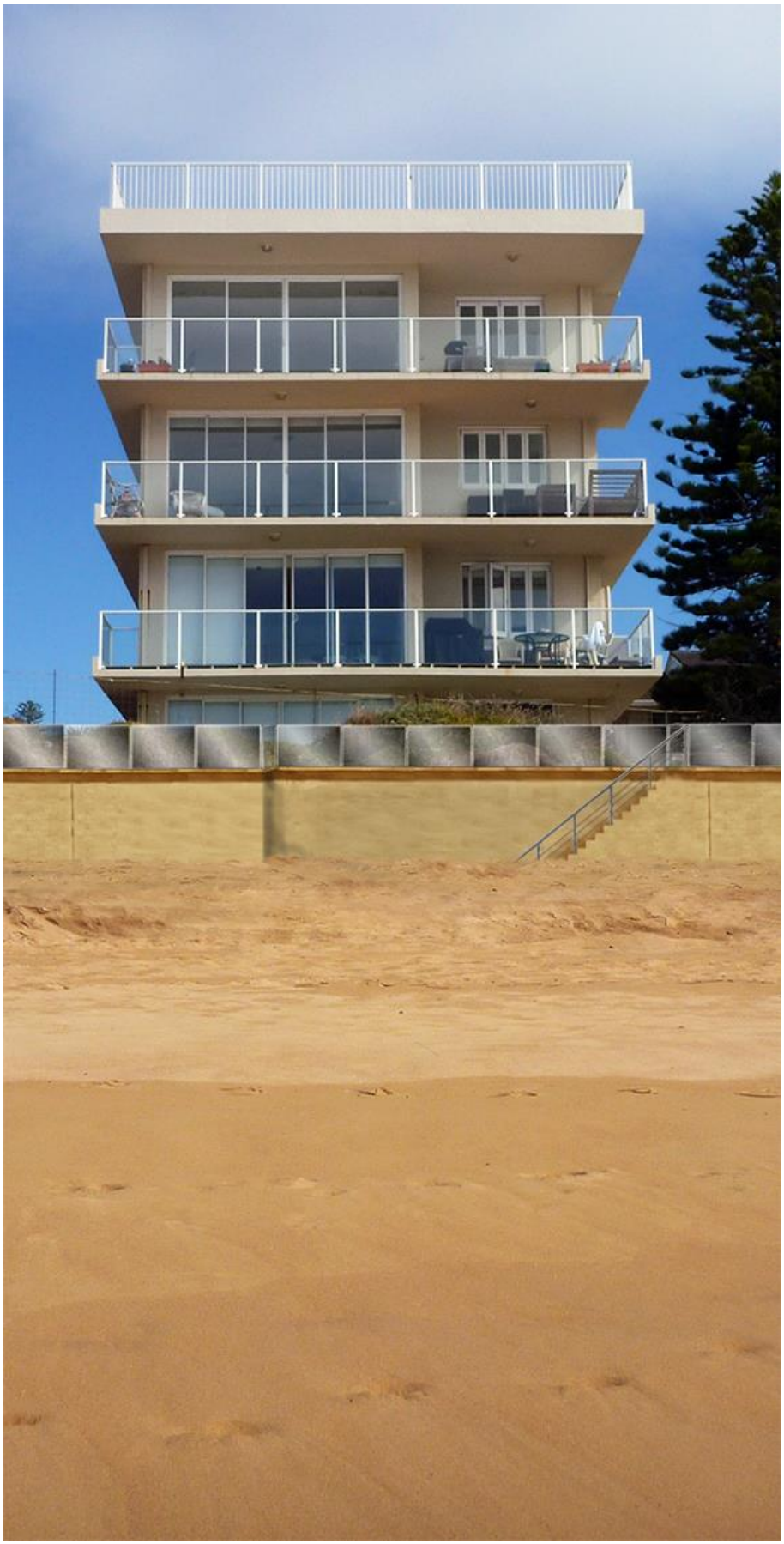

Figure 20: Expected typical appearance of seawall at subject properties after completion of works

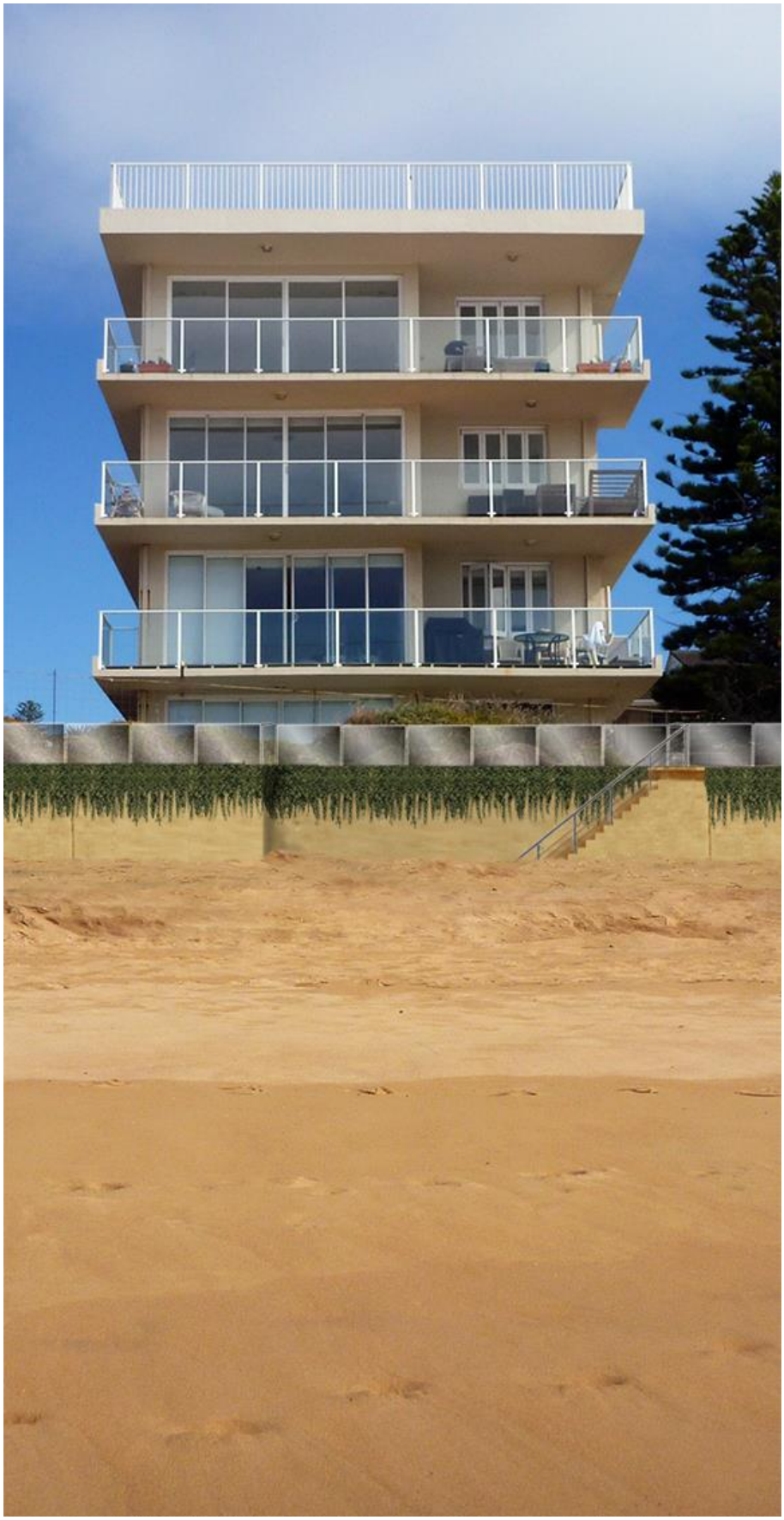

Figure 21: Expected typical appearance of seawall at subject properties after completion of works (with vegetation descending down wall)

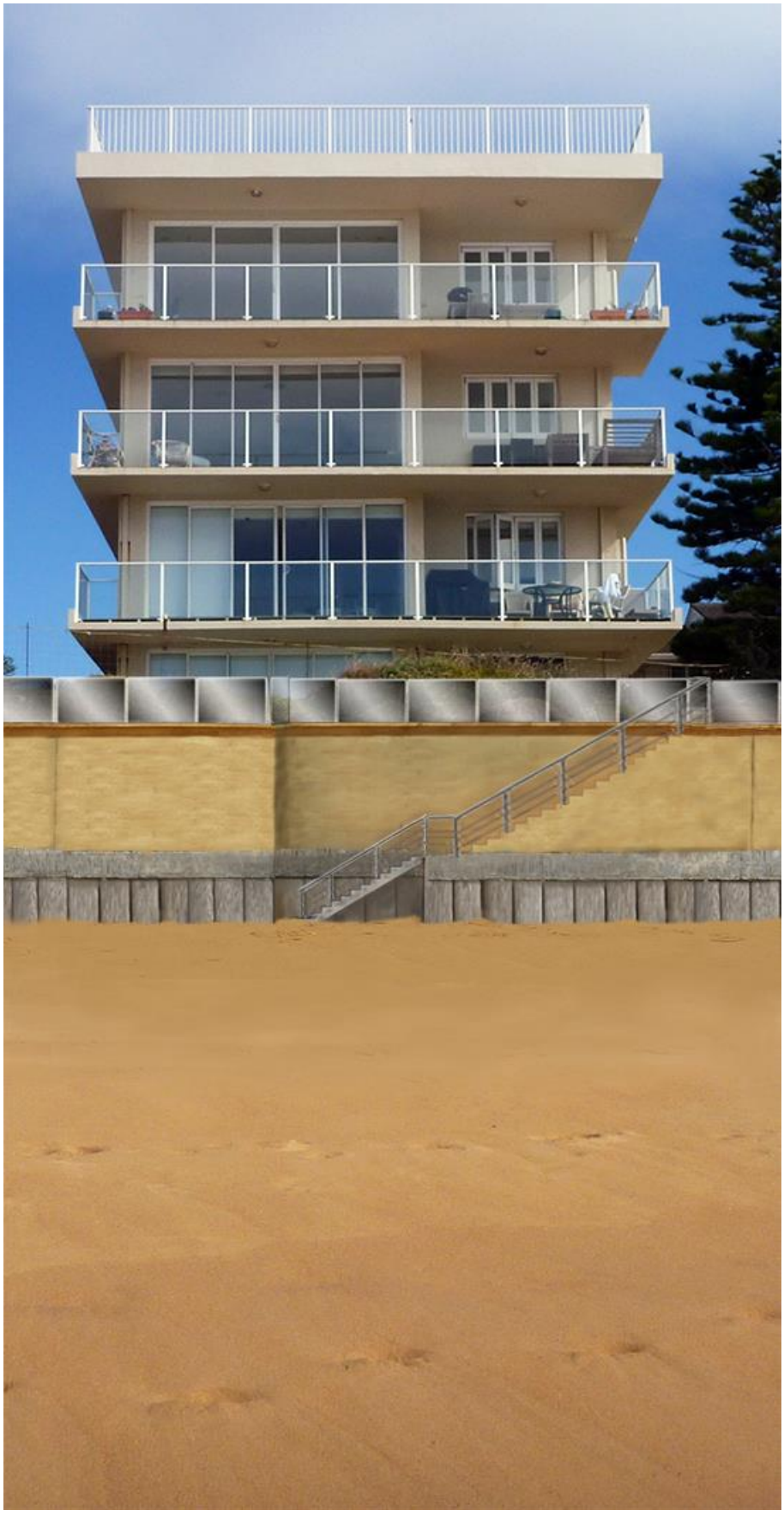

Figure 22: Expected post-storm appearance of seawall at subject properties after completion of works

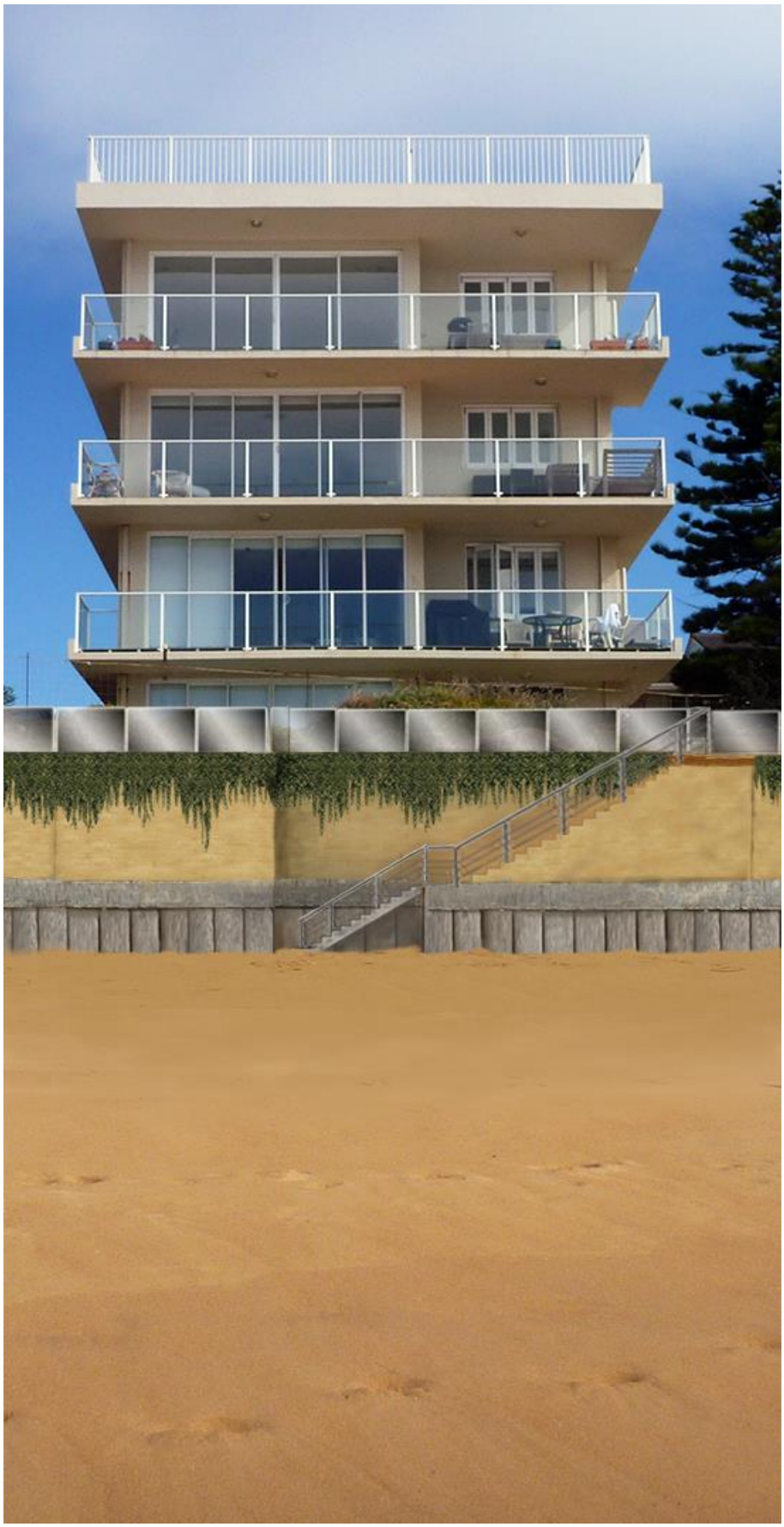

Figure 23: Expected post-storm appearance of seawall at subject properties after completion of works (with vegetation descending down wall)

4.5 Landscaped Area

There will be no significant change to the area of landscaping at the subject properties as a result of the proposed works. The only change is construction of the concrete wall, which forms a hard structure over a width of about 350mm (with the 500mm wave return projection being cantilevered over sand), plus the stairs over a 1.5m width at two locations. This increases the impervious area by about 1.1% of the total area of the subject lots, and reduces the overall landscaped area at the properties from about 32% to 31% (assuming that the existing rock revetment can be treated as a pervious surface, and hence a landscaped area). Based on Part D1 of the *Warringah Development Control Plan 2011,* the required landscaped area is 40%, but this is not an element that can be controlled in the proposed DA.

4.6 Colour and Materials Schedule

As noted in Section 4.4, it is proposed to use a sand-matching colour for the concrete wall, so that in blends in with the surrounding beach, and with a minimum Class 3 finish as per *AS 3610* such that it is pleasantly formed.

4.7 Waste Management Plan

A Waste Management Plan (part of Drawing S04) has been submitted as part of the DA documentation.

As noted on Drawing S04, rubble and other materials or waste 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 temporarily protect the works area from wave action.

Filling of sand adjacent to and seaward of the vertical wall at the completion of the seawall works would be (where possible) by using the native beach sand. This is acceptable as the sand would be seaward of the seawall and would remain available to meet storm erosion demand in future storms. No beach sand shall be used to fill areas landward of the concrete wall, except for sand that was excavated from within the subject properties and stockpiled as part of construction activities.

When placing sand seaward of the seawall at the completion of seawall works, screening is to be undertaken to remove rubble, rock fragments 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. Waste and rubble materials may be buried landward of the concrete wall as agreed by a geotechnical engineer, subject to a waste classification undertaken by a suitably qualified environmental consultant (who is a member of the Australian Contaminated Land Consultants Association Inc). This is consistent with the *Northern Beaches Coastal Erosion Policy*, in which it is stated that:

> "Material that will not enter the beach currently or in the future (e.g. behind a terminal revetment) can be different to adjacent beach material, but as a minimum must be crushed into an aggregate that will enable safe future development of the subject land and not pose an impediment to future protection works and/or maintenance of such works".

5. EXPECTED EXTENT AND FREQUENCY OF EXPOSURE OF CONCRETE WALL AND PILING

5.1 Analysis of Historical Beach Profiles

Based on historical behaviour, it is expected that the proposed piling (which is located below 2.2m AHD) would be buried under sand for most of the time. This can be demonstrated by reviewing historical beach profile data that is available at the subject properties, although it is recognised that the presence of rock works since at least 1967 or 1974 "contaminates" the record in terms of understanding natural sand levels. The historical beach profiles comprise data supplied by the former Office of Environment and Heritage (OEH) 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);
- immediately after the June 2016 storm, on 7 June 2016; and
- six dates after the June 2016 storm (in 2017, 2018, 2019, June 2020, July 2020 and April 2021).

The 2020 dates span a coastal storm that occurred in July 2020, with a pre-storm 22 June 2020 and post-storm 22 July 2020 profile. A total of 24 dates have thus been analysed, from 1941 to 2021 inclusive, which is a period of 80 years.

Cross-sections depicting the 24 historical beach profiles and the seaward edge of the proposed seawall are provided in Figure 24 (for 1204) and Figure 25 (for 1194). The landward edges of these profiles are located at the seaward face of the residential development, which represents zero chainage.

It is evident that for the 24 dates presented and considering the proposed works, had they been constructed:

- the piling would never have been exposed[19];
- median sand levels against the concrete wall would have been at 7.0m AHD at 1204, and 5.7m AHD at 1194 (so zero to 1.8m exposed under median conditions)[19];
- median beach widths to mean sea level seaward of the proposed seawall would have been about 54m at both 1204 and 1194, and beach widths to mean sea level would have exceeded 42m for about 80% of the time[20]; and
- using 2m AHD as a typical high tide wave runup limit, there would have been dry beach seaward of the works at this level for all dates, ignoring the effect of the existing rock works.

[19] Although existing protection works in place since 1967 or 1974 may have artificially raised historical beach profiles compared to how they would adjust in the future with no works in place on Crown Land.
[20] Extrapolating profiles down to 0m AHD as required by continuing at the same slope as the two most seaward points in the profile (correcting as required for flat slopes by using an average beach slope).

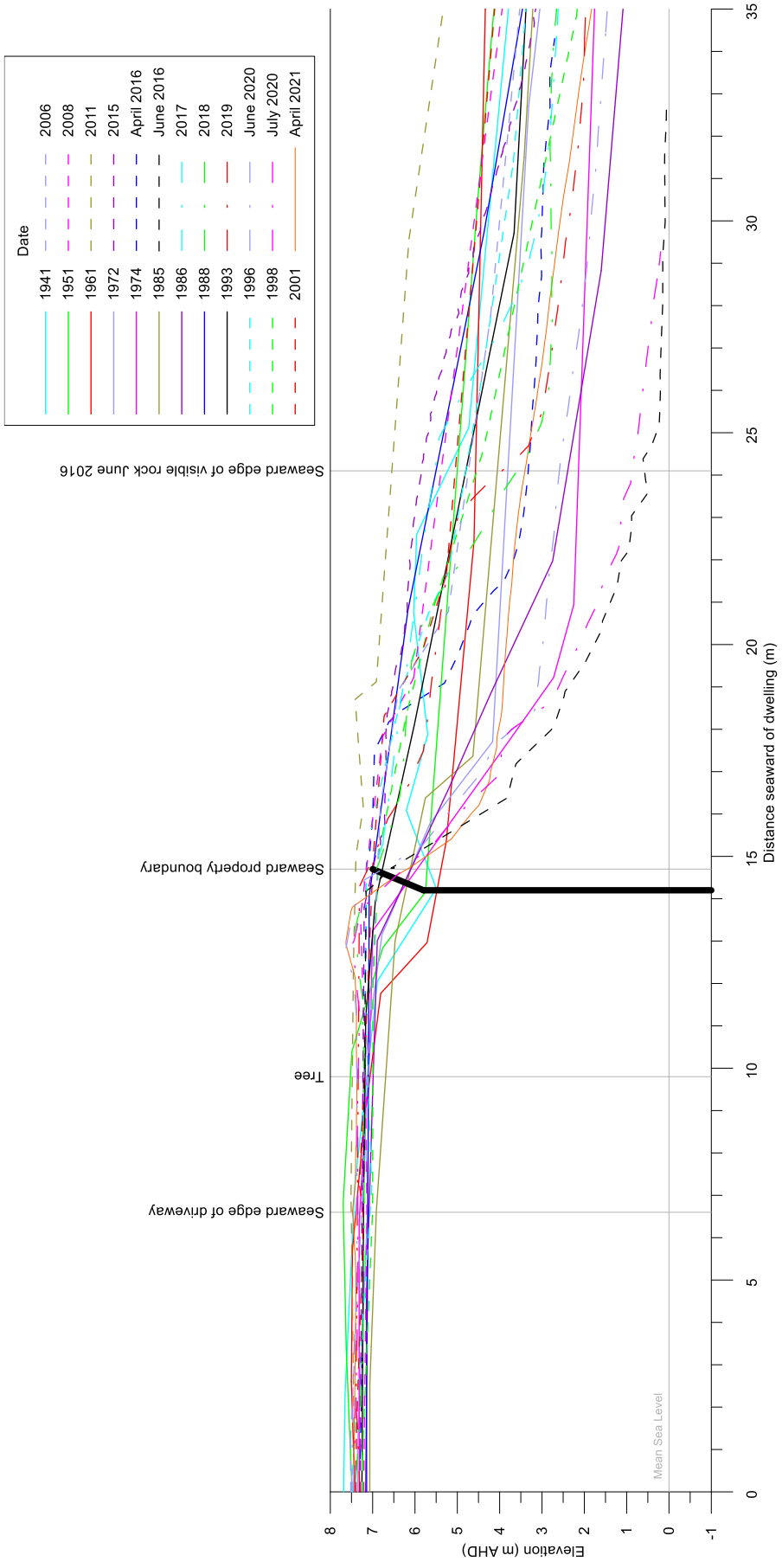

Figure 24: Proposed seawall (thick black outline) at 1204 compared to 24 historical beach profiles

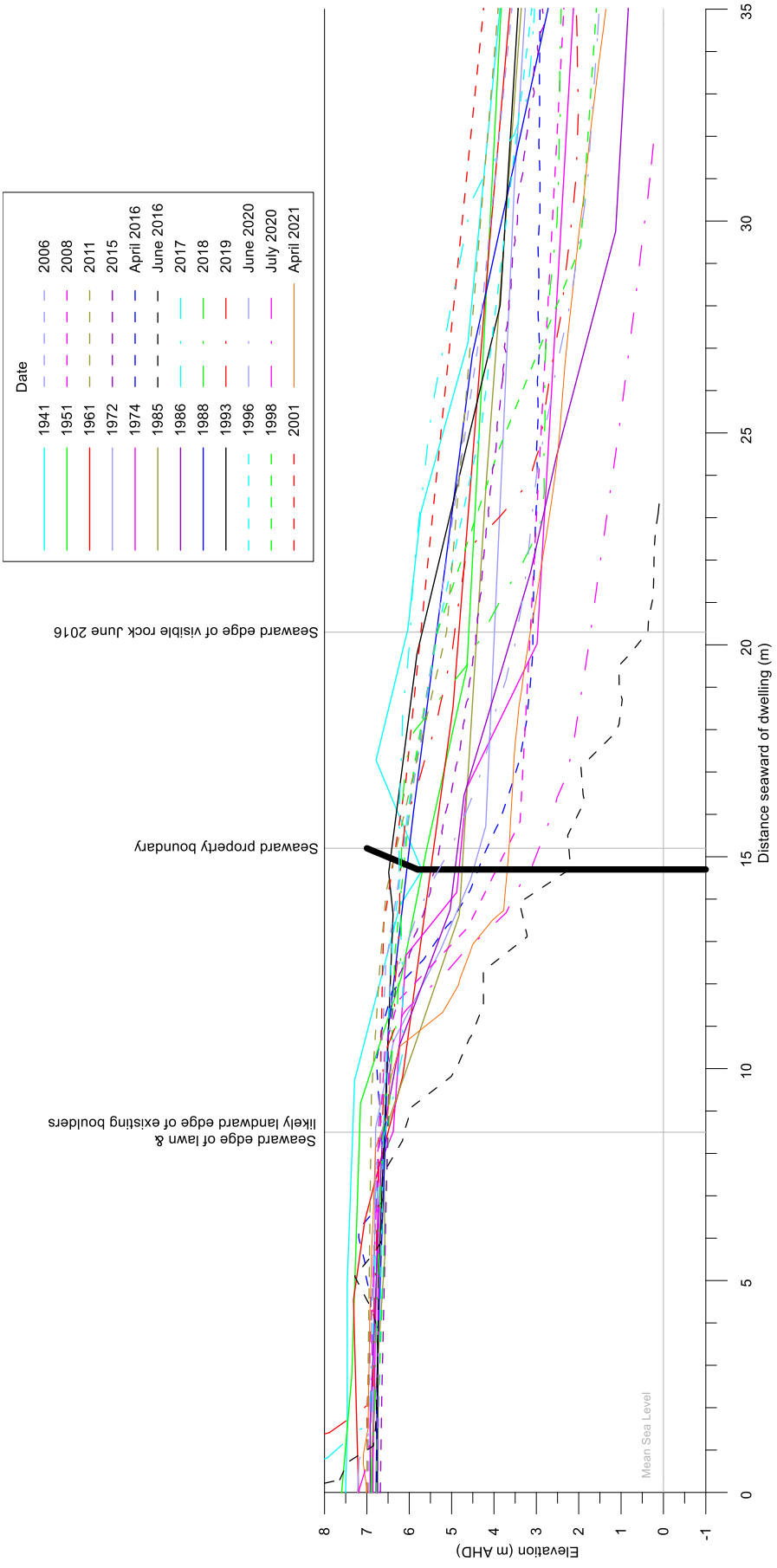

Figure 25: Proposed seawall (thick black outline) at 1194 compared to 24 historical beach profiles

5.2 Effect of Long-Term Recession due to Sea Level Rise

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 where profiles are truncated at protection works (assuming that beach scraping and beach nourishment is not undertaken). This effect is not unexpected, and the adoption in the CZMP and other previous studies (see Section 6) of protection works as the preferred management option south of Devitt Street at Collaroy-Narrabeen Beach is a decision that was made in full recognition that sand volumes would reduce seaward of the protection works as long-term recession due to sea level rise is realised (assuming that beach scraping and beach nourishment is not undertaken). It would be illogical for protection works to be adopted as a management action at a beach, and for a consent authority to then refuse protection works on the basis that long-term recession will reduce sand volumes seaward of the works, when that recession is not caused by the works and will occur irrespective of the works (Horton, 2017).

It is important to recognise that given the extent of existing protection works at the subject properties further seaward than the proposed works, then in the do-nothing scenario there would be a more severe narrowing of beach width as long-term recession is realised. The proposed works are not creating a new issue that does not already exist, and that cannot be managed through Narrabeen Lagoon entrance clearance operations, beach scraping and beach nourishment (if required).

In MHL (2016), it was noted that:

> "With regard to public access arrangements, it is considered that ongoing maintenance of existing access paths, beach scraping, fencing and appropriate signage following storm erosion (consistent with Council's existing practices) are appropriate. Ongoing sand recycling from the lagoon entrance and sand nourishment from suitable building sites, as proposed, are both also strongly supported. Additional large scale sand nourishment by government to mitigate possible beach recession effects associated with projected sea level rise is generally supported as a viable management response should this prove to be necessary".

It is important to recognise that the *Northern Beaches Coastal Erosion Policy* (the *Policy*), which was adopted by Council on 13 December 2016, has absolved landowners from the responsibility to undertake beach scraping or beach nourishment in the future. As outlined in the *Policy*:

- "following a significant erosion event that has the potential to have a short-medium term impact on public use of the beach, Council may undertake beach scraping or other appropriate remedial action to encourage faster beach recovery";
- "Council, the NSW Government and the Federal Government will be responsible for undertaking sand nourishment that is required as a result of sea level rise or in response to extreme storm events where normal beach recovery processes will be impaired because of the extent of the damage".

As noted in the CZMP, beach nourishment is not likely to be necessary to maintain current average beach widths for about 20 years. As stated in the *Policy*, following a storm event, the beach will generally recover naturally and will require little to no intervention. Furthermore, as stated in the CZMP, beach sediment recycling using sand from Narrabeen Lagoon entrance

clearance operations will continue to be implemented by Council to enhance beach amenity. This is also recognised in the *Policy*.

A depiction of historical beach profiles at the subject properties, with the profiles translated landward by 13.5m and raised by 0.45m to approximately account for long term recession due to sea level rise over the 60 year design life (as discussed in Section 6 of the Coastal Engineering Report), is provided in Figure 26 (for 1204) and Figure 27 (for 1194). Of course, in reality these profiles would not be realised landward of the works as the works themselves (and protected backyard landward) would form the future profile at the seaward edge of the subject properties.

It is evident from Figure 26 and Figure 27 that with idealised recession over 60 years (that is, applying profiles receded 60 years into the future):

- the piling would have been at least partially exposed on 2 of the 24 dates at each of these properties;
- the actual time that the piling would have been completely buried would be expected to have been greater than 92%, as beach profile date selection has been skewed by trying to capture post-storm profiles;
- sand levels against the concrete wall would typically have been at 4.2m AHD (so 2.8m exposed);
- median beach widths to mean sea level seaward of the proposed seawall would have been about 47m at 1204 and 43m at 1194, and beach widths to mean sea level would have exceeded 34m for 80% of the time[21]; and
- using 2m AHD as a typical high tide wave runup limit, there would have been dry beach seaward of the works at this level for about 21 of the 24 dates (at least 88% of the time).

If beach scraping and beach nourishment are undertaken in the future then the frequency of exposure of the piling would be reduced, and the median beach width would be increased.

[21] Extrapolating profiles down to 0m AHD as required by continuing at the same slope as the two most seaward points in the profile (correcting as required for flat slopes by using an average beach slope).

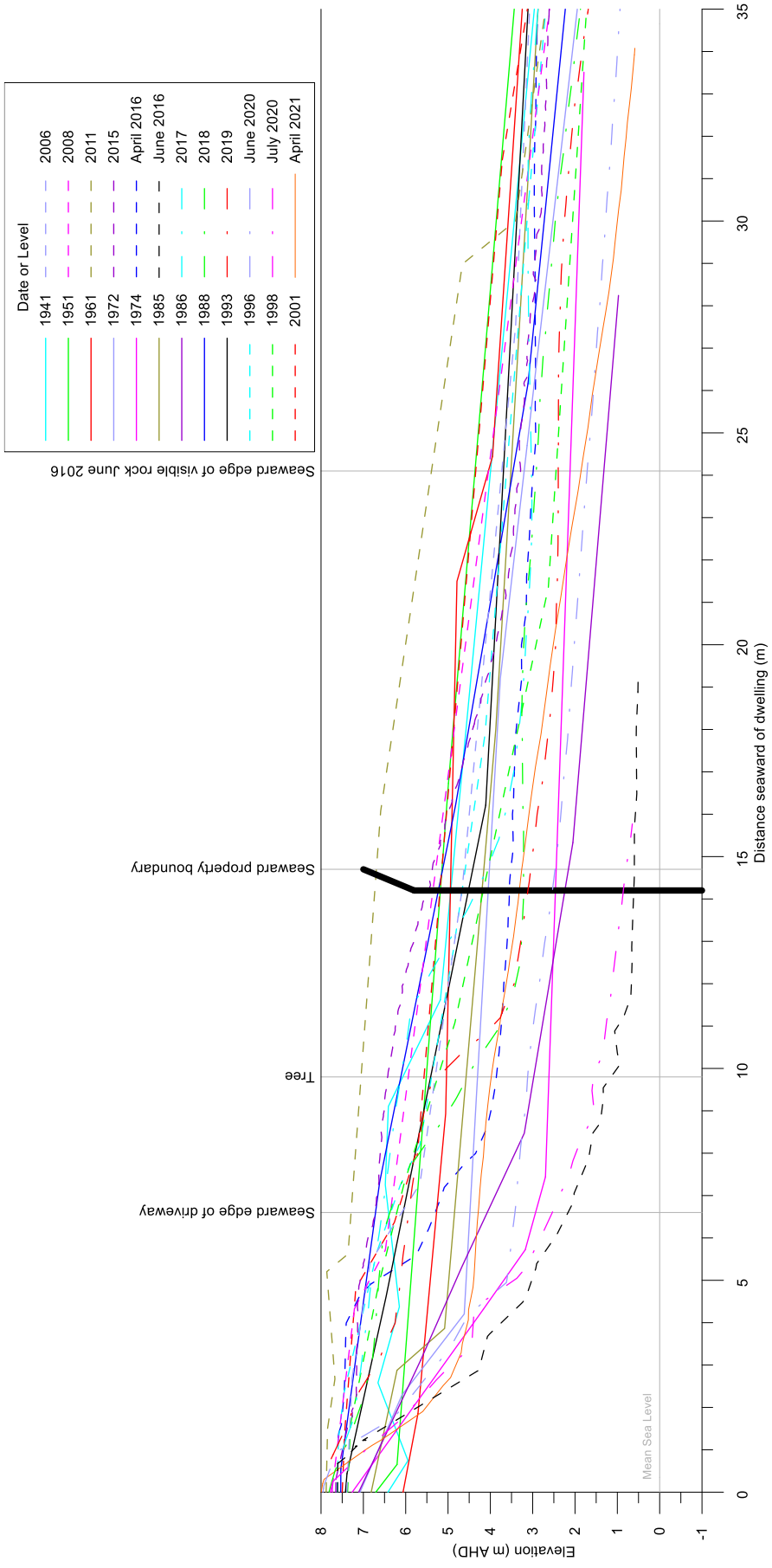

Figure 26: Proposed seawall (thick black outline) at 1204 compared to 24 receded beach profiles

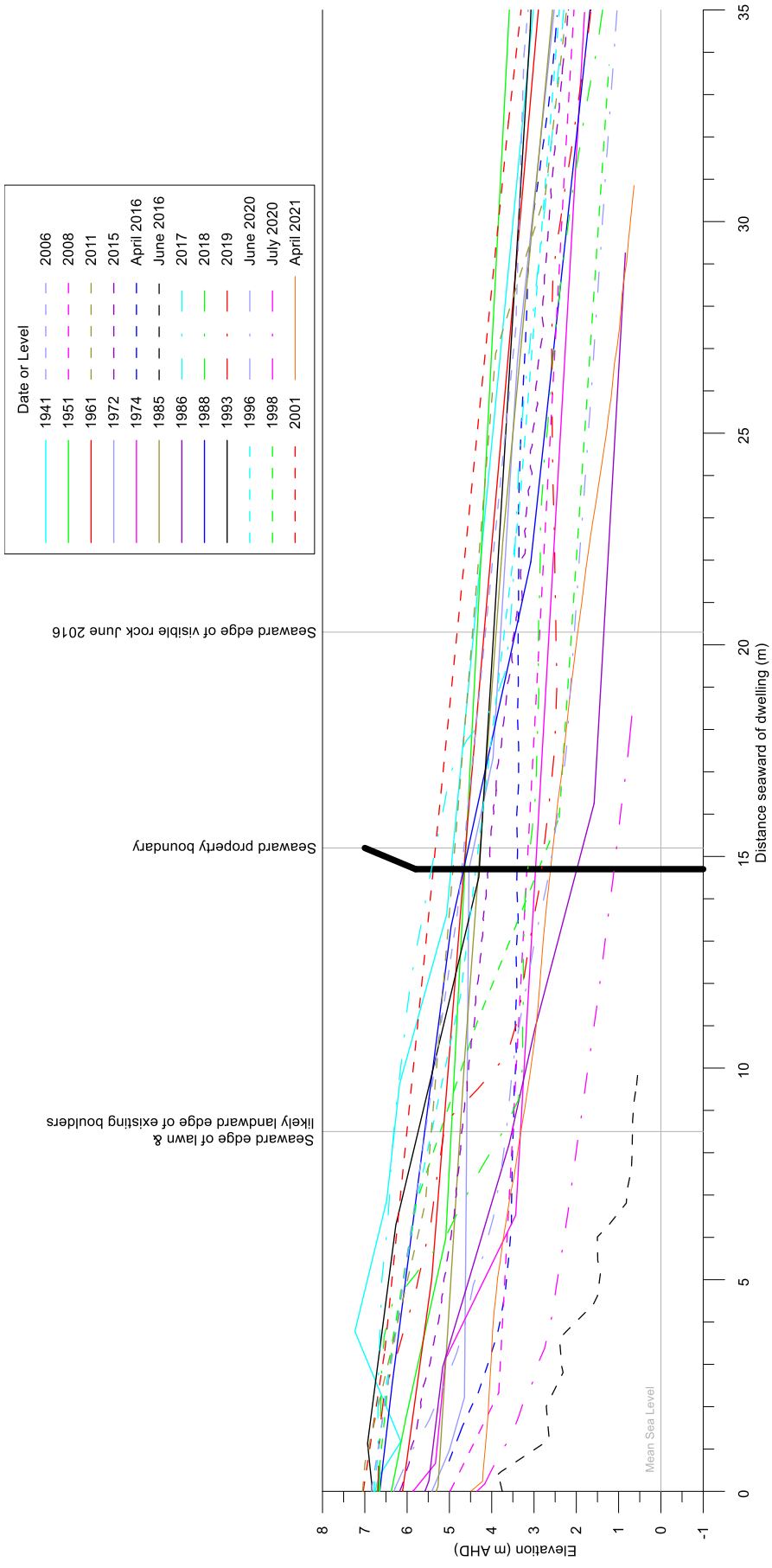

Figure 27: Proposed seawall (thick black outline) at 1194 compared to 24 receded beach profiles

6. PLANNING AND HISTORICAL CONTEXT

6.1 Permissibility of Works

Based on Clause 19(1) of *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal), the proposed works are permissible with consent. Given that the study area has a gazetted CZMP, Northern Beaches Council has the function of determining the DA.

The subject properties are zoned as R2 (Low Density Residential) in *Warringah Local Environmental Plan 2011* (LEP 2011). Coastal protection works are not specifically permitted in this zone. However, SEPP Coastal, as per Clause 7(1), prevails over LEP 2011. Furthermore, non-inclusion of protection works as being permitted in this zone is related to the restrictive nature of the *Standard Instrument -Principal Local Environmental Plan* rather than any deliberate intention of Council to exclude these works[22].

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 Management Act 2016*) as per Department of Primary Industries – Water (2016).

6.4 1985 Coastal Management Strategy

In 1981, a working party was established comprising Warringah Council and Public Works Department (PWD) staff at that time, 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 Local Government Area (LGA), which extended from Freshwater to Palm Beach at that time (thus covering the former Pittwater and Warringah LGA's).

[22] 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 properties, 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 properties should have protection works. That stated, the subject properties already had existing protection works by 1967 or 1974.

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".

At the subject properties, the protection works alignment adopted had the crest of the rock revetment near the seaward boundaries of the subject properties, and the works extending about 15m on to Crown Land. The proposed works have greater public benefit as no portion of the proposed works is on public land, and up to 10m of existing rock is being removed off public land.

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 of 80% 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 properties, which is classified as Natural Area Foreshore. Given that no portion of the proposed works extends on to Crown Land, the POM is not generally applicable herein.

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 (2001a) which defined the alignment and footprint of proposed upgrading works. This had the works extending on to Crown Land at the subject properties, which has been avoided with the proposed works.

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 of 80% 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 protection works at the subject properties was envisaged and authorised by the POM, for works that extended further seaward. 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.

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 RELEVANT LEGISLATION AND ENVIRONMENTAL PLANNING INSTRUMENTS

7.1 Preamble

The proposed works are consistent with all relevant legislation and environmental planning instruments, as outlined in subsequent sections.

7.2 SEPP Coastal

7.2.1 Preamble

Based on *State Environmental Planning Policy (Coastal Management) 2018* (SEPP Coastal) and its associated mapping, the subject properties are within a "coastal environment area" and "coastal use area".

7.2.2 Clause 13

Based on Clause 13(1) of SEPP Coastal, "development consent must not be granted to development on land that is within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on the following:

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

With regard to (a), the proposed works would not be expected to adversely affect the biophysical, hydrological (surface and groundwater) and ecological environments. The works are replacing existing works that extend up to 10m further seaward. Groundwater levels after heavy rainfall may slightly build up landward of the proposed works compared to the existing situation, but this would not be expected to affect adjacent properties, and would have no impact on the subject properties as it would have freely-draining engineered fill in the backyard after the works (plus weepholes through the wall, with design undertaken assuming an elevated groundwater level of 3.5m AHD at the same time as an extreme low tide).

The proposed works are in an already developed area, and would not significantly impact on biological diversity. The works would not be a source of pollution and would not generate significant waste.

With regard to (b), the proposed works would not be expected to adversely affect coastal environmental values or natural coastal processes compared to the existing situation, being a

replacement of existing protection works that extend further seaward. The near-vertical wall would have greater wave reflection than the existing rock revetments, but this would not be expected to adversely impact on coastal processes as the wall is landward (up to 10m, and at least 5m) of the toe of the existing revetment. As per MHL (2020), no significant long-term effects are expected for the proposed seawall (for example, related to additional scour at the toe of the seawall).

The presence of the proposed works would not be expected to result in sustained loss of additional sand from the beach seaward of the works, 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 if beach nourishment is undertaken (and the requirement for nourishment is not a function of the 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 cause a short-term impact on coastal environmental values and beach amenity during the construction period (eg, through noise and some restriction on alongshore beach access), 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 works and will have both contributed to the cost and given approval for the work to proceed on their properties.

Similar to the recent DA modification approval for coastal protection works at 1150-1168 Pittwater Road Collaroy (Mod2020/0626), construction hours of 6:30 am to 7pm (Monday to Friday) and 8am to 6pm on Saturday are sought[23]. It has been found that noise impacts have been minimal during the construction of these works, due to the low noise outputs of the plant and equipment being used, and high levels of background noise due to wave breaking.

With regard to (c), the proposed works would improve water quality compared to the existing situation, as they would significantly reduce the risk of debris and non-sandy materials being eroded on to the beach. No sensitive coastal lakes are located in the vicinity of the proposed works.

By keeping the proposed works separated from the ocean with a bund, any potential water quality impacts would be minimised. Even if the works area was exposed due to wave action, the construction process would be managed to minimise water quality impacts, eg by stockpiling materials that would be deleterious on a beach away from potential wave action.

With regard to (d), the proposed works would not impact marine vegetation, native vegetation and fauna and their habitats (of significance, which are not known to exist at the properties), undeveloped headlands and rock platforms, with none of these items in proximity. The area of the proposed works has generally been unvegetated and has comprised either sand or exposed boulders since the 2016 storm. Therefore, as per nearby investigations for other seawall DA's, there would be no expectation 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.

[23] Under the *Environmental Planning and Assessment (COVID-19 Development – Construction Work Days) Order (No 2) 2021*, it would be possible to extends the hours to 7am on Saturday and 9am to 5pm on Sunday while this order is in place.

No significant impacts on marine fauna and flora would be expected as a result of the proposed works, as the works would not generally be interacting with subaqueous areas. Construction would essentially be carried out above the high water mark, and for this reason would 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.

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.

After construction, the proposed works would have no significant impacts on marine fauna and flora, typically being landward of wave action (see Section 5, subject to beach nourishment being undertaken over the long term), and being further landward than existing works. Indeed, the proposed works offer a better outcome for marine fauna and flora than the existing situation of deleterious materials being washed into the ocean after storms.

With regard to (e), the proposed works improve alongshore beach access compared to the existing situation, with about 5m to 10m of cross-shore width of rock being removed off public land. The proposed works are located entirely on private land so would never restrict public beach access, and greatly improve the safety of access for landowners.

With regard to (f), a search of the former Office of Environment and Heritage "Aboriginal Heritage Information Management System" (AHIMS) was undertaken on 6 July 2021. It was found that there were no Aboriginal sites recorded nor Aboriginal places declared within at least 1km of the subject properties.

With regard to (g), the proposed works are located entirely on private land, so would not affect public use of the surf zone. The proposed works are further landward than the existing works.

Based on Clause 13(2) of SEPP Coastal, "development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

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

The proposed development has been designed and sited to avoid any potential adverse impacts referred to in Clause 13(1).

7.2.3 Clause 14

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

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

With regard to (a)(i), the proposed works are located entirely on private land (so would never restrict public beach access), greatly improve the safety of access for landowners, and improve alongshore beach access compared to the existing situation.

With regard to (a)(ii), the proposed works have a crest elevation matching historical upper dune and backyard levels, so would not be expected to generate adverse overshadowing or wind funnelling. The works would not affect views from public places to foreshores.

With regard to (a)(iii), the proposed works would be a visual improvement to the ad-hoc existing protection works mixed with rubble and debris, particularly at times of lower sand levels, as well as the existing situation of debris and deleterious materials being scattered on the beach after storms. The concrete wall has been designed with a sand-matching colour to blend into the beach landscape, and as per the photomontages in Section 4.4, which would provide a consistent and pleasing finish. It is also possible to grow vegetation over the wall to soften the appearance, as discussed in Section 4.3 and 4.4.

With regard to (a)(iv), as noted in Section 7.2.2, there are no Aboriginal sites recorded nor Aboriginal places declared within at least 1km of the subject properties.

With regard to (a)(v), based on Schedule 5 of *Warringah Local Environmental Plan 2011*, the nearest heritage item to the subject properties is the former house at 1184–1186 Pittwater Road (located south of Clarke Street). The proposed development would not be expected to impact on this property.

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

With regard to (c), the proposed protection works are replacing existing protection works at a location surrounded by existing protection works, so are consistent with the surrounding coastal and built environment. The bulk, scale and size of the proposed works are sufficient to provide adequate protection, and are significantly reduced in footprint and seaward extent compared to the existing works. The proposed works are appropriate for the location, being

consistent in-principle with the CZMP, tying into adjacent protection works, and consistent with the *Collaroy–Narrabeen Beach Coastal Protection Works Design Specifications*.

7.2.4 Clause 15

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

The proposed works are unlikely to have a significant impact on coastal hazards, nor increase the risk of coastal hazards in relation to any other land, compared to the existing situation. The proposed works are further landward than the existing works, and would tie into works in adjacent areas. The proposed works would have a significantly improved effectiveness (that is, improved mitigation of erosion/recession and inundation hazards) compared to the existing works.

7.2.5 Clause 16

Based on Clause 16 of SEPP Coastal, "development consent must not be granted to development on land within the coastal zone unless the consent authority has taken into consideration the relevant provisions of any certified coastal management program that applies to the land".

The CZMP operates as a certified coastal management program, and the proposed works are consistent with the CZMP as discussed in Section 3. 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, which was an aim of the former *State Environmental Planning Policy No 71 – Coastal Protection*. The works are essential to support the economic attributes of the residential land, and the works would not interfere with public recreational opportunities on public land, being entirely within private property.

7.3 Section 27 of the *Coastal Management Act 2016*

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

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

With regard to (a)(i), the proposed works are entirely within private property, so would not ever limit public beach access. The proposed works are significantly further landward than the existing works, thus enhancing public use of the beach compared to the existing situation.

With regard to (a)(ii), the proposed works pose no significant threat to public safety, having been designed to withstand an acceptably rare storm over a 60 year design life, and are far less of a threat to public safety than the do-nothing scenario.

It is understood that Council has been applying time limited consents for recent seawall DA's, to deal with the fact that the "life of the works" in Section 27 of the *Coastal Management Act 2016* is understood to mean "eternity" (that is, beyond the design life of the works). It should be noted that the owners are seeking consent for permanent coastal protection works that are not time limited, and would be dissatisfied with a determination of Council that included a time limited consent condition.

With regard to (b)(i), the beach would be expected to naturally accrete and be restored seaward of the proposed works after storm events, and no differently to the existing situation. Any increased erosion (if any) on the beach would be only short term and not be measurable or significant. 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 (b)(i), there are no end effects (increased erosion on adjacent land) expected as a result of the proposed works, as the proposed works are replacing existing works and tying into adjacent works. Therefore, no conditions of consent are considered to be required in relation to (b)(i).

With regard to (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. 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 works, and advise on required remedial action. Potential maintenance activities are discussed in Section 7.5.3.

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, which is 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 properties, a maximum height of 8.5m above existing ground level applies. The proposed wall is expected to extend about 1m (on average) above historical ground levels at its location, increasing to 3m at the end of the 60 year design life if projected long term recession is realised. Therefore, the proposed works comply with this Clause.

7.4.2 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, this clause applies at the subject properties.

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 reduce the coastal hazards of beach erosion/recession and coastal inundation at the subject properties.

For Item (b), this reduction in risk at the subject properties 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 (or Council's upgraded works would need to link with the proposed works).

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 (which are also located further landward than the existing works). 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, unless beach nourishment is undertaken, as would also occur under the do-nothing scenario. The proposed works would not ever be a constraint to alongshore public beach access, as they are entirely on private property.

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 properties would reduce the risk of coastal hazards impacting on development, and hence reduce the risk of debris entering the beach environment. On this basis, the proposed works enhance the environment, 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 and long design life (60 years), meeting the requirements of 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 properties.

For Item (f), the works could be modified in the future (eg by increasing the crest height) to be able to resist and adapt to more severe conditions than the design storm over the 60-year design life, as required if projected sea level rise is realised beyond that time.

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 design storm over the 60-year design life. To manage this risk, the works are to have deep piling extending well below the scour level, with anchoring support.

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 boundaries of the subject properties are 'right lines', and not ambulatory, as they are 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 28 years of experience and postgraduate qualifications in coastal engineering. The design basis is described in the Coastal

Engineering Report submitted with the DA. The design has been supported by structural engineering and geotechnical engineering expertise.

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

For Item (iv), 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 mechanisms for efficient maintenance could be developed as a condition of consent, eg through easement obligations and bank guarantees. Maintenance is further discussed in Section 7.5.3.

As discussed in Section 7.3 in relation to Section 27(b)(i) of the *Coastal Management Act 2016*, impacts on adjacent properties to the north and south, and impacts on the beach, are not expected as a result of the proposed works, and no different to the existing works (and government has taken on the responsibility for undertaking any future beach nourishment if required, see Section 5). 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, the proposed works will not have a long-term impact on coastal processes in the Collaroy-Narrabeen embayment compared to the do-nothing scenario. The proposed works are further landward than the existing works.

For Item (vii), the proposed works will not have a long-term negative impact on public access to or along the beach. The proposed works are entirely on private property, and further landward than the existing works.

For Item (viii), climate change and sea level rise were considered as part of the design of the proposed works, as discussed in the Coastal Engineering Report. 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, the proposed works will not have a long-term impact on coastal processes in the Collaroy-Narrabeen embayment compared to the do-nothing scenario. The proposed works are entirely on private property and further landward than the existing works.

For Item (ii), given that the proposed works are tying into adjacent protection works, they will not adversely impact on the adjoining (Council) properties at Mactier Street, South Narrabeen SLSC and Clarke Street, with Council committing to upgrading these adjacent works to link with the proposed works. The proposed works are further landward than existing works, so would not affect the long-term amenity of the adjoining beach and surf zone (compared to the existing situation).

For Item (iii), the lower piled portion of the works would be buried under sand and would not be expected to be visible after significant erosion events at present. Over the long term, the frequency of exposure of the piling would increase if beach nourishment is not undertaken (that stated, the piling would be expected to be completely buried for more than 92% of the time considering receded beach profiles 60 years into the future, as discussed in Section 5.2). This would also occur with existing works for the do-nothing scenario, which are further seaward than the proposed works. The concrete wall would blend into the surrounding environment and be of pleasant appearance, so its exposure is not considered to be a concern (any more than permanent exposure of the seawalls at Manly Beach, Dee Why Beach and the southern end of Collaroy Beach are not considered to be a concern).

For Item (iv), the proposed works would be linked to adjacent protection works (or Council's upgraded works would link with the proposed works when completed), and hence would be contiguous and integrated with these adjoining protection works.

For Item (v), the proposed works meet 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. The proposed protection works are entirely on private property and further landward than the existing protection works.

For Item (vii), a 4.5m maintenance setback landward of the concrete wall has been adopted, as justified in Section 2 of the Coastal Engineering Report.

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.

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 works that would not generally be interacting with waves. Any damage to the works that could trigger maintenance can only occur after storm events that expose the wall to wave impact, as per Item (ii).

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

For Item (iii), it is agreed that any repairs to damaged works should be undertaken in a timely manner after storms.

For Item (iv), the works have been designed for a rare event occurring over a 60-year life. It is recognised that the works may need to be engineered 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), a 4.5m maintenance setback landward of the revetment has been adopted, as justified in Section 2 of the Coastal Engineering Report.

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 works footprint, or uncovered seaward of the proposed works as part of construction activities, would not be placed seaward of the proposed wall without the agreement of Council. These materials may also be incorporated into the works (eg, crushed to use as backfill).

The proposed concrete wall is unlikely to require significant maintenance over the design life. That stated, a maintenance setback of 4.5m landward of seawall (and 1m landward of the stairs) has been applied to allow an excavator to track landward of the wall if required. This 4.5m setback would also assist in dissipation of any wave overtopping of the seawall that may occur, prior to reaching dwellings.

Maintenance activities that would be recommended are as follows:

1. Inspection of the wall after significant coastal storms. This would comprise inspection of the seaward side for any concrete wall damage, gap formation in the piling (where visible), and integrity of the weepholes. This would also comprise inspection of the landward side for evidence of the formation of any sinkholes (indicating migration of soil though the wall), wall displacement, and assessment of any wave overtopping damage of the soil surface.
2. Any concrete wall damage is unlikely, with high strength 50MPa concrete and appropriate cover to reinforcement for a 60 year life to be used. Should a significant impact event cause localised damage to the concrete structure exposing reinforcement, the concrete wall should be locally scabbled and patched with an approved repair mortar.
3. Any gap formation in the piling could be addressed through either shotcreting from the seaward side (after excavation of sand for access to the gaps as required), or jet grouting on the landward side (with sand in this case left in place against the gap on the seaward side to act as a "formwork" for the grouting). That stated, the construction procedure would include inspection of the piling for gaps, to minimise the possibility of gaps occurring in the first place. The construction contract terms would be such that there is an incentive for the contractor to take care with the piling to minimise the potential for gaps, as these defects would be their responsibility to correct and would be inspected by the project engineers.
4. If any weepholes were found to be leaking soil they could be filled with concrete. All of the weepholes are not necessary for structural integrity of the wall (the wall has been designed assuming limited drainage, with landward groundwater levels of 3.5m AHD), so some can be sacrificed if the geotextile sock on a weephole failed.
5. Any formation of sink holes on the landward side would be an indication of gap formation in the piling, which could be addressed as per Step 3.
6. Significant displacement of the wall would not be expected, and if it occurred this may be indicative of an anchor failure. To address this issue, it may be necessary to re-drill an anchor, or reinstate a tie beam for the deadman system. That stated, field testing of anchor performance is a hold point in the construction procedure, requiring signoff of the project engineers, thus minimising the possibility of sub-standard anchor performance (embedment in the ubiquitous cemented sand layer also gives greater confidence of anchor capacities being realised). With the deadman system, the tie beam would be visible construction, and would thus be directly assessed for integrity by the project engineers.

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

7.6.1 Part B (Built Form Controls)

There are numerous items in DCP 2011[24] 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. It is understood that a variation to the controls will be supported in these circumstances.

[24] Amendment No. 20 of DCP 2011, effective from 18 January 2021, was considered herein.

The proposed works comply with Part B1 (wall height less than 3m, based on average sand levels at the end of the design life) and Part B3 (side boundary envelope 4m then 45°), but again these items are more applicable to dwellings.

7.6.2 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 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 where they would not be impacted by wave action.

After completion of the proposed works, the risk of erosion within the subject properties would be reduced, thus reducing the risk of debris entering the beach area.

7.6.3 Part D1 (Landscaped Open Space and Bushland Setting)

Part D1 of DCP 2011 was addressed in Section 4.5.

7.6.4 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 sand-coloured concrete wall exposed by about 1m to 3m on average over its design life (see Section 5, subject to beach nourishment being undertaken over the long term), the proposed works would meet the requirements of Part 7 (where applicable), namely:

1. the works will complement the landscape character and public use and enjoyment of the adjoining public open space, blending into the beach sand, being entirely within private property and further landward than existing works, and linking with adjacent protection works;
2. public access to public open space will be maximised, with no works on public land;
4. the works will provide a visual transition between open space (sandy beach) and buildings;
5. the works will protect views to and from public open space;
8. there will be opportunities for casual surveillance of the public open space from the subject residential development; and
9. the works will utilise the concrete wall and backyard landscaping to screen development as required.

7.6.5 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 an acceptably minimised risk of damage, reducing the risk of damage to existing and future proposed development at the subject properties, as well as reducing public safety risks from the existing protection works.

With regard to objective 2, the proposed development would not have an adverse impact on scenic quality, with the sand-coloured concrete wall blending into the surrounding environment, and only an average of 1m exposure of the wall expected at present.

With regard to objective 3, the proposed development would not adversely impact on the coastal processes affecting adjacent land, replacing existing works that are further seaward.

With regard to objective 4, the proposed works are entirely on private property and replacing existing works that are further seaward, so would not impact on beach amenity compared to the existing situation. The proposed works also avoid the current situation of debris entering the beach after storms. Over the long term, beach nourishment would be required to maintain beach amenity, but this is unrelated to the proposed works, which are located further landward than the existing works.

Based on Requirement 2 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 4.15(1) of the *Environmental Planning and Assessment Act 1979*

Based on Section 4.15(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 Planning 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

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and

(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 (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 (a)(ii), this is not applicable.

With regard to (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 (a)(iiia) and (iv), these are not applicable.

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

With regard to (c), the subject properties are subject to coastal erosion, and protection works have formally been envisaged at the properties since at least 1985 (and adopted by Council as a key management measure since at least 1997). The subject properties are thus suitable for the proposed works.

With regard to (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 protection works at the subject properties was subject to community consultation activities.

With regard to (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, the proposed works are entirely on private property, and the works will not interact with the surf zone for most of the time (see Section 5, subject to beach nourishment being undertaken over the long term) and interact less with the surf zone than the existing protection works, thus 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. REFERENCES

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