



COASTAL ZONE MANAGEMENT PLAN FOR COLLAROY-NARRABEEN BEACH AND FISHERMANS BEACH

December 2016

The Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach has been prepared with financial assistance from the NSW Government through its Coastal Management Program. This document does not necessarily represent the opinions of the NSW Government or the Office of Environment and Heritage.

December 2016

EXECUTIVE SUMMARY

Collaroy-Narrabeen Beach and Fishermans Beach are two of Northern Beaches Council's most iconic and significant locations. This Coastal Zone Management Plan (CZMP) for Collaroy-Narrabeen Beach and Fishermans Beach establishes the framework through which both beaches will be managed for current and future generations.

The plan covers the open coast and sandy shoreline of Collaroy-Narrabeen Beach and Fishermans Beach as well as the adjacent public assets and private development. Collaroy-Narrabeen Beach is characterised as having the most highly capitalised shoreline on the Northern Beaches. Development along the beach is also classified as the most at risk in NSW, and third most at risk nationally, from coastal processes. Collaroy-Narrabeen Beach also has a history of ad-hoc emergency protection works being placed during and after coastal storms.

In recognition of the complex issues Council faces in managing Collaroy-Narrabeen Beach and Fishermans Beach, a team of engineers, economists, lawyers, ecologists and town planners were engaged to prepare the CZMP and assist in prioritising management actions.

The overarching objective of the CZMP is to find a balanced and achievable approach that protects and preserves beach environments while limiting the impact of coastal processes on public and private assets. Specifically the plan identifies and prioritises actions that:

- protect and preserve beach environments and beach amenity
- manage current and projected future risks from coastal hazards
- ensure continuing and undiminished public access to beaches, headlands and waterways
- protect or promote the culture and heritage of both beaches.

While recognising the need to protect and preserve the amenity and natural values of Collaroy-Narrabeen Beach and Fisherman Beach, the CZMP also recognises that properties adjoining Collaroy-Narrabeen Beach have been impacted by the severe coastal storms in the past and are presently exposed to coastline hazards including erosion and inundation. In response the CZMP has incorporated an innovative adaptive risk management approach to identify an acceptable level of risk for beachfront properties adjoining Collaroy-Narrabeen Beach and Fishermans Beach.

Management actions, such as beach nourishment and maintenance of public access, have been identified along with planning measures that allow for future development to be permitted without unduly impacting the beach environment. This has resulted in the development of acceptable risk lines to define the minimum setbacks for new development as well as consideration of existing and future coastal protection works.

The plan has been prepared in accordance with the NSW Government *Guidelines for Preparing Coastal Zone Management Plans*. This includes incorporating the NSW Coastal Management Principles articulated in the Guidelines as well as complying with the *NSW Coastal Protection Act 1979* and *NSW Coastal Policy 1997*.

In implementing the CZMP, Council will work constructively with all stakeholders to ensure the significant values of Collaroy-Narrabeen Beach and Fishermans Beach are preserved and protected.

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1. INTRODUCTION

1.1 Background

Collaroy-Narrabeen Beach and Fishermans Beach are two of Northern Beaches Council's most significant natural assets and are highly valued by both residents and visitors to the Northern Beaches. Additionally, Collaroy-Narrabeen Beach and adjacent development are identified as being at particularly high risk from coastal erosion and inundation.

In February 2011, Council was directed by the then (NSW) Minister for Climate Change and the Environment to complete a CZMP for Collaroy-Narrabeen Beach. Fishermans Beach was included in the CZMP as it is located within the same embayment as Collaroy-Narrabeen Beach and it is the only other beach along the former Warringah Council's coastline that has private residential properties immediately adjacent to the beach.

The recorded history of damage from coastal storms differs at Collaroy-Narrabeen Beach compared to Fishermans Beach. Allowance for this has been made in considering the impacts of coastal hazards and application of development controls at both beaches.

Following a major storm event in June 2016 Council reviewed CZMP 2014 and determined that it should be replaced by this Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach dated December 2016 (this CZMP).

This Coastal Zone Management Plan (CZMP) for Collaroy-Narrabeen Beach and Fishermans Beach has been prepared in order to best manage these beaches in a balanced and sustainable manner for current and future conditions. The CZMP covers the open coast and sandy shoreline of Collaroy-Narrabeen Beach and Fishermans Beach as well as the adjacent public land and private development.

1.2 Study Team

In recognition of the complex issues Council faces in managing Collaroy-Narrabeen Beach and Fishermans Beach, a team of engineers, economists, ecologists, lawyers and town planners were engaged to prepare the CZMP and assist in prioritising management actions.

Haskoning Australia Pty Ltd, a company of Royal HaskoningDHV, was engaged by Council to prepare the CZMP in August 2012. Technical information and advice was sought from the following organisations: City Plan (planning), Wilshire Webb Staunton Beattie (legal), Ernst & Young (economics), Eco Logical Australia (ecology), JK Geotechnics (acceptable risk), Coastal Management and Planning (coastal engineering) and Elton Consulting (community engagement).

1.3 Previous Studies on Collaroy-Narrabeen Beach and Fishermans Beach

There have been a significant number studies undertaken to assess the impacts of coastal processes on Collaroy-Narrabeen Beach and Fishermans Beach. Therefore, a good understanding of coastal processes and their impacts on development already exists. Recent studies include:

- Warringah Council (1997), *Collaroy Narrabeen Coastline Management Plan, A Coastline Hazards Policy – Plan of Management*
- WorleyParsons (2009), *Review of Coastline Hazard Lines for Collaroy Narrabeen Beach and Fishermans Beach*

- WorleyParsons (2012a), *Coastal Erosion Emergency Action Subplan for Beaches in Warringah*
- WorleyParsons (2012b), *Coastal Erosion Emergency Action Subplan for Beaches in Warringah, Reference Document*.

The CZMP provides an opportunity to consolidate the existing information and document strategies and actions that are appropriate for the current understanding of coastal management issues, in accordance with existing NSW government guidance, policy and legislation.

1.4 Community Consultation

The community consultation for the CZMP was undertaken in accordance with the *Guidelines for Preparing Coastal Zone Management Plans* (the Guidelines) as per Sections 55E and 55F of the *Coastal Protection Act 1979*.

This included meeting the requirements that CZMPs are to be prepared using a process that involves:

- consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper (section 55E of the *Coastal Protection Act 1979*)
- considering all submissions made during the consultation period. The draft plan may be amended as a result of these submissions (section 55F of the *Coastal Protection Act 1979*).

A draft CZMP was placed on public exhibition from 14 July 2014 to 15 August 2014 with Council accepting submissions up to 1 September 2014. Notification of the public exhibition occurred in the *Manly Daily* on three consecutive Saturdays during the exhibition period. Section 7 and Appendix Q summarise all the consultation activities undertaken in preparing the CZMP.

As a result of the June 2016 storm event, it was clear that properties along Collaroy-Narrabeen beach were under more imminent threat than contemplated during the preparation of the 2014 CZMP. This imminent threat meant that protection works were now likely to have to extend onto public land in order to provide timely protection for property owners. In response, Council revised the CZMP to enable works to be undertaken on public land in certain circumstances and prepared a supporting Council Erosion Policy. The policy and proposed change to allow works on public land were presented to Council and subsequently taken to the community for consultation. Details of the activities undertaken and community response are provided in section 7.

1.5 Coastal Management Principles

The Coastal Management Principles, below, identified in the *Guidelines for Preparing Coastal Zone Management Plans* have been developed by the Office of Environment and Heritage (OEH) to inform strategic considerations in coastal management, including the preparation of CZMPs. These principles have been considered in identifying and evaluating potential coastal management actions within this CZMP.

- Principle 1:** Consider the objects of the *Coastal Protection Act 1979* and the goals, objectives and principles of the *NSW Coastal Policy 1997*
- Principle 2:** Optimise links between plans relating to the management of the coastal zone
- Principle 3:** Involve the community in decision-making and make coastal information publicly available
- Principle 4:** Base decisions on the best available information and reasonable practice; acknowledge the interrelationship between catchment, estuarine and coastal processes; adopt a continuous improvement management approach

- Principle 5:** The priority for public expenditure is public benefit, public expenditure should cost effectively achieve the best practical long-term outcomes
- Principle 6:** Adopt a risk management approach to managing risks to public safety and assets; adopt a risk management hierarchy involving avoiding risks where feasible and mitigation where risks cannot be reasonably avoided; adopt interim actions to manage high risks while long-term options are implemented
- Principle 7:** Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions
- Principle 8:** Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems
- Principle 9:** Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy
- Principle 10:** Support recreational activities consistent with the goals of the NSW Coastal Policy

1.6 Requirements for Preparing Coastal Zone Management Plans

The OEH has prepared *Guidelines for Preparing Coastal Zone Management Plans* (OEH 2013b) and a CZMP must be prepared in accordance with these guidelines as per Section 55D of the *Coastal Protection Act 1979*.

In the Guidelines it is stated that the main purpose of a CZMP is to describe the proposed management actions to be implemented by a council, other public authorities and potentially by the private sector to address priority management issues in the coastal zone over a defined implementation period. These issues include managing risks to public safety and built assets, pressures on coastal ecosystems, and community uses of the coastal zone.

In Appendix P, the requirements of *Guidelines for Preparing Coastal Zone Management Plans* are listed, along with the sections of the CZMP that comply with each requirement. Given that no estuaries are included in the study area, requirements in OEH (2013b) relating to coastal ecosystem estuary health as per Section 4 of that document have not been considered in the preparation of this CZMP.

To assist in understanding the legislative and planning context within which the CZMP will be delivered Appendix H references key legislation and associated guidelines.

1.7 Objectives for Collaroy-Narrabeen Beach and Fishermans Beach

Following stakeholder consultation, four overarching objectives were defined to guide the management of Collaroy-Narrabeen Beach and Fishermans Beach. These objectives were applied in setting the strategic direction of the CZMP as well as in the selection and assessment of management options. They are considered to be consistent with the NSW Coastal Management Principles and OEH *Guidelines for Preparing Coastal Zone Management Plans*.

1. Council seeks to maintain beach amenity and surf quality in the future as its highest priority.
2. 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.
3. Property owners are responsible for protecting their property from the impacts of coastal processes.
4. Council seeks to maintain its own public beachfront and near beachfront assets where the risk of damage from coastal processes can be demonstrated to be acceptably low.*

*Council will resolve the interaction between public land and coastal protection works on private property in the specifications for new or upgraded coastal protection works.

Implementation of the management actions identified in the CZMP will ensure that these objectives are met and that Council achieves a balanced and practical approach to protecting Collaroy-Narrabeen Beach and Fishermans Beach while limiting the impact of coastal processes on public and private built assets. Council recognises the importance of working in a coordinated and constructive manner with key stakeholders including the NSW Government, residents, peak user groups and beach users in implementing the CZMP.

The actions and planning controls relating to private development outlined in the CZMP are intended to apply to all new development on land adjacent to or potentially affected by coastline hazards up to 2100 at Collaroy-Narrabeen Beach and Fishermans Beach.

1.8 Structure of the CZMP

In producing this CZMP a considerable amount of specialist information was produced by the engaged experts. This information has been applied in establishing the management approach articulated in the CZMP. To provide readers with a clear description of the characteristics of Collaroy-Narrabeen Beach and Fishermans Beach, Council's vision for its present and future management, this information has been structured in the following manner:

Volume 1 Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach

This document establishes the strategic direction and management actions Council will apply in managing Collaroy-Narrabeen Beach and Fishermans Beach. It describes the proposed management actions to be implemented that address priority management issues relevant to Collaroy-Narrabeen Beach and Fishermans Beach.

Volume 2 Appendices: Technical Reports and Supporting Information

The appendices contained in Volume 2 collate all the technical information and research undertaken by Haskoning Australia Pty Ltd and the experts utilised in preparing the CZMP.

2. DESCRIPTION OF COLLAROY-NARRABEEN BEACH AND FISHERMANS BEACH

2.1 General Setting

The coastline of the former Warringah Local Government Area (LGA) extends from the entrance of Narrabeen Lagoon in the north, to Queenscliff Head in the south. This includes 8 main sandy beaches (Figure 1), including the beaches covered by the CZMP of Narrabeen Beach, Collaroy Beach, and Fishermans Beach. The continuous sandy beach comprising Collaroy Beach and Narrabeen Beach is denoted as Collaroy-Narrabeen Beach within the CZMP.

A aerial view of the Collaroy-Narrabeen Beach and Fishermans Beach embayment is provided in Figure 2. The suburbs of Narrabeen in the north, and Collaroy in the south, are adjacent to Collaroy-Narrabeen Beach and Fishermans Beach. The suburb of North Narrabeen is located to the north of the Narrabeen Lagoon entrance.

At 3.6km in length, Collaroy-Narrabeen Beach is Sydney's second longest beach. The beach generally faces approximately east, facing east-south-east at the northern end and east-north-east at the southern end. Average wave heights decrease moving south along the beach, mainly due to the sheltering provided by the Long Reef headland and adjacent rock platform.

A rocky headland separates Collaroy-Narrabeen Beach and Fishermans Beach (this headland is not covered by the CZMP).

Fishermans Beach is about 800m long and is strongly curved, facing east north east in the north, and bending to face north moving south. Nearshore rocks are evident at both ends of the beach. Average wave heights at this beach are only about 20% of average wave heights at fully exposed beach areas such as North Narrabeen.

The key Council public assets in the area located landward of Collaroy-Narrabeen Beach include four Surf Life Saving Clubs (North Narrabeen, Narrabeen, South Narrabeen and Collaroy). Along the south-eastern portion of Fishermans Beach, Council public assets include the Long Reef Golf Club clubhouse, car parking areas, a Surf Rescue building, and Long Reef Fishing Club Hut.



Figure 1: Aerial view of the former Warringah LGA coastline



Figure 2: Aerial view of Collaroy-Narrabeen Beach and Fishermans Beach embayment

2.2 Coastal hazards at Collaroy-Narrabeen Beach and Fishermans Beach

To assist in identifying and managing the different levels of exposure to coastal hazards along Collaroy-Narrabeen Beach and Fishermans Beach the area covered by the CZMP has been subdivided into the three areas described below. A detailed discussion of the impacts of coastal hazards for these areas is provided in Section 4 and Appendix I.

Area 1: Collaroy-Narrabeen Beach north of Devitt Street

North of Devitt Street, a well-developed dune with a healthy coverage of dunal vegetation exists seaward of the existing development. While the dune provides some protection from coastal hazards public and private assets north of Devitt Street are expected to be impacted by coastal storms over the long term.

Area 2: Collaroy-Narrabeen Beach south of Devitt Street

South of Devitt Street there is limited dunal vegetation and extensive lengths of (usually buried) protection works. It is this section of Collaroy-Narrabeen Beach where public and private assets adjacent to the beach are most exposed to the impacts of coastal storms.

Area 3: Fishermans Beach

The Fishermans Beach area is relatively sheltered to waves from the south by the Long Reef Headland. Additionally, the potential existence of subsurface stiff clays and rock is likely to limit the extent of erosion compared to a typical sandy beach such as Collaroy-Narrabeen Beach. There is no record of damage to private properties from coastal storms at Fishermans Beach.

2.3 Damage to Development from Coastal Storms

Houses and other development have been destroyed, damaged and threatened by beach erosion at Collaroy-Narrabeen Beach in the past (PWD, 1987). This has included:

- damage to houses at Collaroy in the “great storm of 1920”, likely to be near Fielding Street (Figure 3)
- five houses being wrecked and ten other houses being damaged in March and May 1925 due to “cyclone squall” wind action at Collaroy near Fielding Street
- a report that the “sea came in and took out the back” of Arlington Hall (now Surf Rock Hotel and Collaroy Services Beach Club) in the 1920’s (possibly in April 1927 or June 1928)
- damage to houses at Collaroy in May 1944, with a statement that “nearly every home north of Collaroy surfing beach, where houses are close to the sea, suffered severe damage” in a newspaper report (it was also noted that a wooden retaining wall had been erected as emergency protection)
- two houses being destroyed at Collaroy in June 1945 near Fielding Street, with seven other adjacent houses suffering substantial damage, due to wave impact and undermining
- a house immediately north of Frazer Street and the “Flight Deck” and “Shipmates” unit blocks being undermined at Collaroy in September 1967 (with many other developments threatened, particularly in the Fielding Street to Wetherill Street area)
- several houses at Collaroy-Narrabeen Beach and the foundations of the pool and eastern “Marquesas” unit block being threatened at Narrabeen in May-June 1974

- storm erosion in August 1998 leading to emergency rock protection works being undertaken by Council along the beachfront between Stuart Street and Wetherill Street (from 27 August to 3 September 1998)
- storm erosion in June to July 2007 exposing the rock protection works between Stuart Street and Clarke Street (Figure 4 and Figure 5), and leading to damage to property fences and the undermining and eventual removal of two pine trees at the lot south of Clarke Street (Figure 6).
- storm erosion in June 2016 resulted in significant damage to public and private assets. The 10 properties between Stuart and Ramsey Streets were exacted. All of the existing protection works from Devitt Street to the Collaroy Beach Services Club were exposed and in some sections damaged. The level of erosion resulted in significant loss and both public and private land and lead to extensive beach between emergency works being undertaken along the beach between Devitt Street to the Collaroy Beach Services Club

The only documented report of storm damage at Fishermans Beach was some cut to the beach around the boat ramp in the severe May/June 1974 storms (PWD 1987). This was also noted by Foster et al (1975) who reported that there was some scour of the boat launching ramp south of Anzac Avenue.

Moderate erosion, particularly towards the northern end of the Collaroy-Narrabeen Beach, occurred in June 1978 (PWD, 1987). There was also moderate beach erosion in August 1986, with run up levels of up to 7.3m AHD occurring between Clarke Street and Devitt Street, which was also the strip of greatest erosion (Higgs and Nittim, 1988).

Storms in May 2009 caused dune erosion and damage to beach accessways at North Narrabeen Beach, as shown in Figure 7. Further erosion led to undermining of a lifeguard shed and viewing platform at North Narrabeen in June 2013 which were subsequently relocated by Council using a crane.

Council also engaged a contractor to mechanically 'slump' the relatively steep and high erosion scarps after this June 2013 storm, to reduce risks to public safety from collapsing sand dunes.



Figure 3: Damage to houses at Collaroy Beach in 1920



Figure 4: Exposure of rock protection between Stuart Street and just south of Clarke Street, 28 July 2007



Figure 5: Exposed rock protection between Stuart Street and Wetherill Street, 17 June 2007



Figure 6: Undermining of pine trees at 1184-1186 Pittwater Road Narrabeen, 29 July 2007



Figure 7: Dune erosion at North Narrabeen Beach in May 2009 (looking north)



Figure 8: Example of steep erosion escarpment at North Narrabeen on 29 March 2013

2.4 Existing Protection Works

There is a long history of ad-hoc protection works, generally consisting of rocks, being placed seaward of properties during or closely after coastal storms at Collaroy-Narrabeen Beach. Examples of such works can be seen in Figures 3, 4, and 5. Collaroy-Narrabeen Beach can be divided into two sections based on the proximity of public and private development to the beach and presence of protection works, namely the areas north and south of Devitt Street.

South of Devitt Street there is limited dunal vegetation, and extensive lengths of (usually buried) protection works. North of Devitt Street, development is generally setback further landward and there is typically a well-developed dune with healthy coverage of dunal vegetation seaward of development (with no known protection works in this area).

This two section delineation and the location of known protection works at Collaroy-Narrabeen Beach is depicted in Figure 9, with a closer view of the southern portion of Collaroy-Narrabeen Beach provided in Figure 10.

The location of protection works was derived based on Patterson Britton & Partners (1993), MHL (1999), Patterson Britton & Partners (1999), a survey completed by Byrne & Associates on 26 June and 2 July 2007, and field observations.

The risk of damage to public and private development from coastal erosion has been reduced as a result of past construction of these protection works. These works include:

- a vertical mass gravity sandstone seawall south of Collaroy SLSC
- a stepped concrete and vertical steel sheet pile seawall at Collaroy SLSC
- a vertical mass gravity sandstone seawall at Collaroy Services Beach Club

- sloping rock revetments and some isolated concrete walls along the southern part of Collaroy-Narrabeen Beach (along most of the area south of Devitt Street).

It is evident that there is some form of protective structure at Collaroy-Narrabeen Beach:

- along almost the entire length of beach between Stuart Street and Devitt Street
- from Jenkins Street to Ramsay Street
- from about 20m north of Fielding Street southwards.

That is, south of Devitt Street, the only unprotected sections are likely to be.

- a portion of the lot south of Clarke Street
- between Ramsay Street and Stuart Street (covering 10 lots)
- between about 20m north of Fielding Street and Jenkins Street (that is, the northern portion of the car park north of Collaroy Services Beach Club).

For most of the time, the sloping rock revetments (and lower portions of the vertical walls) are buried under sand, but they can become exposed after erosive storms and are generally subsequently buried by sand as the beach naturally recovers.

While the existing protection works at the southern end of Collaroy-Narrabeen Beach remain in place, erosion and recession would be constrained from progressing landward of the works. Indeed, the works have successfully provided property protection over the last 40 or so years.

However, the protection works are variable in standard, and they may be undersized and/or founded inadequately. Most of the works are not engineer designed nor approved structures, and were generally implemented by various landowners and authorities and constructed from the 1920's onwards, and mostly in the 1960's and 1970's during or immediately after erosion events.

The protection works would generally not satisfy current design standards and cannot be certified by a qualified coastal engineer as providing protection for an appropriate design storm and design life. Also, full details of the protection works are generally unknown or uncertain.

Given this, as well as the potential for larger waves attacking the structures under sea level rise (and more frequent wave attack as the beach width narrows due to shoreline recession associated with sea level rise), future effectiveness of the protection works cannot be guaranteed.

There are beach profile measurements at Collaroy-Narrabeen Beach extending back to the 1940's. It is evident that despite the construction of protection works (since the 1930's at the southern end of the beach, with rock revetments known to be constructed since 1967), the long term average beach shape/width/volume has been relatively stable for the last 70 or so years. This indicates that the presence of protection works has had little impact on the regular cycle of beach erosion and beach recovery at the beach. That is, these buried protection works have not caused significant long term beach recession, contrary to the view of some that protection works always cause loss of beaches.

The long term average beach stability in the Collaroy-Narrabeen Beach and Fishermans Beach embayment is also evidence that the embayment is essentially compartmentalised, with negligible net sand supply or loss.



Figure 9: Delineation of Collaroy-Narrabeen Beach into areas north and south of Devitt Street, without and with known protection works respectively



Figure 10: Location of known protection works at Collaroy-Narrabeen Beach

3. FEATURES OF COLLAROY-NARRABEEN BEACH AND FISHERMANS BEACH

3.1 Natural Landscape

Collaroy–Narrabeen Beach and Fishermans Beach comprise the following natural landscape components:

- an exposed stretch of ocean beach extending northwards from near Collaroy SLSC to the entrance of Narrabeen Lagoon including vegetated dune areas established on the landward edge of the beach just north of Collaroy Services Beach Club and on the northern two thirds of the beach north of Devitt Street
- Fishermans Beach immediately north of Long Reef Headland, a short curving beach relatively sheltered to waves from the south by the headland
- Long Reef Headland at the southern end of Fishermans Beach, consisting of outcropping Narrabeen Group shales and surrounded by a broad intertidal rock platform protected as an Aquatic Reserve under the *Fisheries Management Act 1994*.

3.2 Vegetation Types and Broad Condition

Much of the dune system along Collaroy–Narrabeen Beach and Fishermans Beach has been covered by development, with the vegetated foredune remaining only within a series of fenced dune areas (or bays) between beach accessways at some locations. Four vegetated dune areas are located adjacent to the public car park north of Collaroy Services Beach Club, and 34 vegetated dune areas extend approximately 2 km northwards from Devitt Street to the entrance of Narrabeen Lagoon (Figure 11). There is more limited dune vegetation at Fishermans Beach, with no fenced areas.

The native vegetation within the dune bays is consistent with a Coastal Wattle Heath vegetation community grading into a Spinifex Grassland vegetation community on the seaward edge of the foredune, as mapped and described by Smith and Smith (2005a). Coastal Wattle Heath is an open-heath or closed-heath dominated by *Acacia longifolia* subspecies *sophorae* (Coastal Wattle). *Acacia longifolia* subspecies *sophorae* occurs naturally on dunes on the Northern Beaches and has been planted to assist dune stabilisation (Smith and Smith 2005b).

As noted in Smith and Smith (2005a) the Spinifex Grassland vegetation community supports one threatened plant species, *Chamaesyce psammogeton* (Sand Spurge).

Collaroy–Narrabeen Beach and Fishermans Beach have been mapped as a wildlife corridor in Smith and Smith (2005b) which is a general vegetation linkage along the coastline and around the edge of coastal lagoons.



Figure 11: Location of main vegetated dune areas at Collaroy-Narrabeen Beach

3.3 Fauna Habitat

The dune vegetation at Collaroy-Narrabeen Beach provides foraging and shelter habitat for small bird and reptile species. Small bird activity can be particularly high in the dense shrubby areas.

A large part of Long Reef Aquatic Reserve provides important foraging and roosting habitat for many shorebirds protected as migratory species under both the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as threatened species under the NSW *Threatened Species Conservation Act 1995*. The many recorded numbers of these species is highly significant in the Sydney region, particularly as other important shorebird habitat areas in Sydney have suffered from increased disturbance and/or habitat loss (Straw, 2005).

The entrance of Narrabeen Lagoon and sandy beach environment of Collaroy–Narrabeen Beach and Fishermans Beach also provides potentially suitable foraging habitat for shorebirds such as the endangered Pied Oystercatcher (*Haematopus longirostris*) and, to a lesser extent, the vulnerable Sooty Oystercatcher (*Haematopus fuliginosus*) and the vulnerable migratory Sanderling (*Calidris alba*).

Potential breeding habitat for the endangered migratory Little Tern (*Sterna albifrons*), the critically endangered Beach Stone-curlew (*Esacus neglectus*) and roosting habitat for the vulnerable migratory Sanderling may be found in the dune system at The Gardens Reserve and northwards to the entrance of Narrabeen Lagoon. However, this habitat is highly unlikely to be utilised due to heavy recreational usage on the beach, particularly during the spring-summer breeding season for these birds.

An endangered population of Little Penguin (*Eudyptula minor novaehollandiae*) occurs about 9km south of Collaroy-Narrabeen Beach and Fishermans Beach at Manly, and about 19km north at Lion Island. Any penguins swimming offshore of either Collaroy-Narrabeen Beach or Fishermans Beach could be from either the Manly or Lion Island breeding populations, but the penguins are unlikely to come ashore unless sick or injured.

Potential threats to the habitat values of Collaroy–Narrabeen Beach and Fishermans Beach include:

- loss of habitat for the endangered Sand Spurge and other flora and fauna species through the erosion of the dunes resulting from storms or other disturbance events
- degradation of dune vegetation from rabbit activity and prolific weed invasion in particular the highly invasive coastal weed Bitou Bush
- disturbance to shorebirds foraging and roosting on the Long-Reef intertidal rock platform and foraging on intertidal areas of the beach from recreational use (although it is acknowledged that this threat is difficult to manage on the beach given the high usage by the surrounding large urban population).

Proposed management actions to protect areas with important habitat and biodiversity values are identified in Chapters 6 and 8.

3.4 Aquatic Reserves

Two aquatic reserves have been established in and near the area covered by the CZMP under the NSW *Fisheries Management Act 1994*, namely at Long Reef and Narrabeen Head. The purpose of these reserves is to protect biodiversity and threatened species, and to provide representative samples of diverse marine life for tourism, research and educational roles.

3.4.1 Long Reef Aquatic Reserve

Long Reef Aquatic Reserve was declared in 1980 (Ogden, 2011). It extends from Collaroy rock baths south to Long Reef SLSC, and from mean high water to 100 metres seaward of mean low water (OEH, 2013a), see Figure 12.

Long Reef Aquatic Reserve has been set aside for the protection of marine invertebrates on the rock platforms as well as subtidal marine plants and animals. It is also an important site for marine education (OEH, 2013a).

Regulations stipulating prohibited activities in the Reserve are in the NSW *Fisheries Management (Aquatic Reserves) Regulation 2002*. It is prohibited to take anything from the Reserve except fin-fish by line with externally brought bait or by spear. Strict bag limits apply to both the numbers and sizes of fish species caught. The reserve contains Aboriginal heritage features including a midden.

3.4.2 Narrabeen Head Aquatic Reserve

Narrabeen Head Aquatic Reserve is located immediately north of the area covered by the CZMP and comprises the whole foreshore from the southern end of Turimetta Beach to the rock baths at Narrabeen Head, extending 100m seawards from the mean low water mark (Figure 13).

Due to the close proximity to Narrabeen Lagoon, the combination of estuarine and oceanic influences supports a wide variety of marine life including threatened species. Permissible activities within the reserve include line fishing and spearfishing (subject to normal restrictions) and collection of rock lobster, sea lettuce and bait weed. It is prohibited to collect cunjevoi and all invertebrates, including empty shells. The reserve area has a number of Aboriginal heritage features including shelter caves, art sites, axe grooves and middens (DPI, 2012).



Figure 12: Extent of Long Reef Aquatic Reserve



Figure 13: Extent of Narrabeen Head Aquatic Reserve

3.5 Cultural and Heritage Significance

Prior to European settlement, the Aboriginal people inhabited the local foreshore and headlands on the Northern Beaches. A search of the Office of Environment and Heritage “Aboriginal Heritage Information Management System” (AHIMS) was undertaken in January 2014. This did not indicate that there were any particular Aboriginal objects or Aboriginal Places at Collaroy-Narrabeen Beach or Fishermans Beach.

In 2005 the remains of an aboriginal man, commonly referred to as Narrabeen Man, were unearthed on Ocean Street near the intersection with Octavia Street, Narrabeen. The remains were subsequently removed and the bones radiocarbon dated to around 4000 years old. The remains are currently located at Sydney University’s Shellshear Museum.

Collaroy-Narrabeen Beach and Fishermans Beach are part of Sydney’s northern beaches, considered by Ogden (2011) as “one of the world’s most magnificent stretches of coastline”, and:

“the birthplace of modern Australian beach culture. It is here that Australians witnessed the first ocean bathing, the development of swimsuits, the genesis of the surf life saving movement and the beginning of wave riding. Because of the quality of the surf beaches, many world surfing champions were either raised here or chose to make the area their home at some stage of their career. Some of the world’s best recognised painters, potters, writers, poets, photographers, filmmakers, musicians and architects also call the northern beaches home”.

There are 145 heritage items and heritage conservation areas listed within Schedule 5 of the *Warringah Local Environment Plan 2011*. Heritage items/areas that are in the area covered by the CZMP comprise (moving north to south):

- Narrabeen Fire Station at 9 Ocean Street Narrabeen (2 lots north of Goodwin Street)
- house at 1184-1186 Pittwater Road Narrabeen (lot south of Clarke Street)
- Arlington Amusement Hall (now Surf Rock Hotel and Collaroy Services Beach Club)
- street trees and plaque along eastern side of Pittwater Road between Collaroy Street and Birdwood Avenue
- Collaroy Rock Pool
- the former Collaroy Hospital site at 1 Brissenden Avenue Collaroy
- the Long Reef Fishing Club Hut at Fishermans Beach
- coastal cliffs at Long Reef Headland.

Based on a search of the State Heritage Inventory, there are no items on the State Heritage Register at Collaroy-Narrabeen Beach or Fishermans Beach.

3.6 Community Uses

3.6.1 Surfing

Collaroy-Narrabeen Beach is a popular location for surfing. North Narrabeen in particular is recognised nationally and internationally for the quality of its waves and world class surfers it produces. North Narrabeen Beach was declared a National Surfing Reserve in October 2009. The extent of the Reserve is depicted in Figure 14.

The recognition of North Narrabeen as a surfing reserve was firstly due to the quality and consistency of its waves, described as “the most consistent break on the east coast and probably in Australia” (National Surfing Reserves, 2013). Secondly, it has produced many world class surfers, including Australian and World champions, together with some of the greatest innovations in surfboard design.

A surfing reserve is a dedicated area that is protected for use by the general public and surfing community, recognising sites of environmental, cultural and historic significance in Australian Surf Culture. To date, 24 sites along Australia’s coastline (including 7 in NSW) have been identified for dedication by the National Surfing Reserves organisation in partnership with Crown Lands. In NSW, Crown Lands have moved to legally reserve declared sites as Crown reserves for the public purpose of surfing recreation under the *Crown Lands Act 1989*. This offers legal protection to a national surfing reserve and highlights the significance of the Crown estate in the surfing culture and Australian lifestyle (NSW Crown Lands Division, 2014).

The CZMP identifies a number of actions that aim to maintain or improve surf break quality. These include investigating alternative strategies for the movement and placement of sand from Narrabeen Lagoon entrance clearance operations as well as investigating the use of offshore sand deposits for beach nourishment in response to climate change. A detailed description of these actions is provided in Section 6.



Figure 14: Extent of North Narrabeen National Surfing Reserve

3.6.2 Fishing

Fishing is a popular activity along Collaroy-Narrabeen Beach, which offers rock, inlet and beach fishing options (Short, 2007). Narrabeen Lagoon provides sheltered estuary fishing. The rock platform at North Narrabeen provides rock fishing. Following storm swells, nearshore gutters provide opportunities for beach fishing.

At Fishermans Beach, boats are able to launch from the boat ramp to access offshore areas. Long Reef Headland is used for rock fishing.

3.6.3 Surf Life Saving Clubs

There are four Surf Life Saving Clubs along Collaroy-Narrabeen Beach, comprising North Narrabeen, Narrabeen, South Narrabeen and Collaroy SLSC. These attract significant membership from the local community, with North Narrabeen and Collaroy SLSC being the largest clubs. In addition to regular “nippers” meetings, a variety of competitions are held by the clubs each year including surf boat races, ocean swimming, beach running, board and ski relays, rescue and resuscitation drills and inflatable rescue boat races. These clubs also run training and education courses in first aid and surf life saving skills.

3.6.4 Swimming Clubs

There are two active swimming clubs operating at Collaroy-Narrabeen Beach, namely at the rock pools at North Narrabeen and Collaroy Beach respectively. These comprise the:

- Narrabeen Ladies Amateur Swimming Club, which was established in 1933 and has now evolved into a mixed gender club that holds weekly race meetings between October and March
- the Collaroy Amateur Swimming Club, which was established in 1952 and also holds regular weekend and mid-week meetings between October and March. Club membership is open to all ages and abilities promoting family participation and social swimming.

3.6.5 Other Recreational Activities

The beach, rock pools, lagoon and foreshore reserves within the area covered by the CZMP cater for a wide range of other recreational activities including swimming, sunbathing, picnicking/barbequing, running/exercising, jet skiing, sail boarding, kite surfing and scuba diving.

In annual community surveys of residents undertaken by Council, visiting and swimming at the beach consistently ranks highly as popular activities. Beach usage is highest at Collaroy Beach and North Narrabeen Beach, which are also the most popular locations for families. In addition to the open coast beach areas, sheltered areas within the entrance of Narrabeen Lagoon (between the mouth of Narrabeen Lagoon and the Ocean Street Bridge, and immediately upstream of the Bridge adjacent to Sydney Lakeside Holiday Park) are also extremely popular (particularly amongst families) for swimming, passive recreation, fishing and canoeing.

3.6.6 Beach Usage

There were approximately 3.1 million visits to patrolled beaches in the former Warringah over the 2012 to 2013 swimming season (end of September to end of April) and 3.6 million corresponding visits over the 2013 to 2014 swimming season. Attendances were estimated by lifeguards covering the whole beach including the water, sand and reserve during the hours on duty (generally 9am to 6pm).

3.7 Land Use

3.7.1 Land Tenure

This CZMP deals with all land within the Northern Beaches Local Government Area on or adjacent to Collaroy-Narrabeen Beach and Fishermans Beach that is impacted by coastal processes. This includes privately owned land, land that is owned by Council, Crown land that is managed by Council in its capacity as reserve trust manager and other Crown land. For the purposes of this CZMP any reference to Crown land refers to land to which the Crown Lands Act 1989 applies including any Crown land that is managed by Council in its capacity as reserve trust manager.

3.7.2 Collaroy-Narrabeen Beach

In terms of land use, Collaroy-Narrabeen Beach can be divided into five distinct zones, namely (moving from north to south):

- the Council-owned Birdwood Park and North Narrabeen SLSC area north of Malcolm Street
- a pocket of retail development landward of a Council-owned car park immediately south of Malcolm Street, then residential development between Malcolm Street and Albert Street
- the mainly Council-owned Narrabeen SLSC and open space parkland area (The Gardens Reserve) between Albert Street and Devitt Street
- the extensively developed residential area between Devitt Street and Jenkins Street, which includes the high rise unit blocks “Shipmates” and “Flight Deck” (located immediately south of Ramsay Street), and “Marquesas” (twin towers located just south of Devitt Street)
- the generally Council-owned area south of Jenkins Street, including a car park north of the privately owned Collaroy Services Beach Club; and an open space promenade, car park and parkland surrounding the Council-owned Collaroy SLSC.

The delineation of public (Council and Crown) and private land at Collaroy-Narrabeen Beach is depicted in Figures 15 and 16.

3.7.3 Fishermans Beach

Fishermans Beach can be divided into two zones in terms of land use, namely:

- the mainly residential area north of Anzac Avenue
- the extensive Council-owned open space area south of Anzac Avenue, including Long Reef Golf Course, car parking areas, the Surf Rescue building, and Long Reef Fishing Club Hut.

The delineation of public (Council and Crown) and private land at Fishermans Beach is depicted in Figure 17.

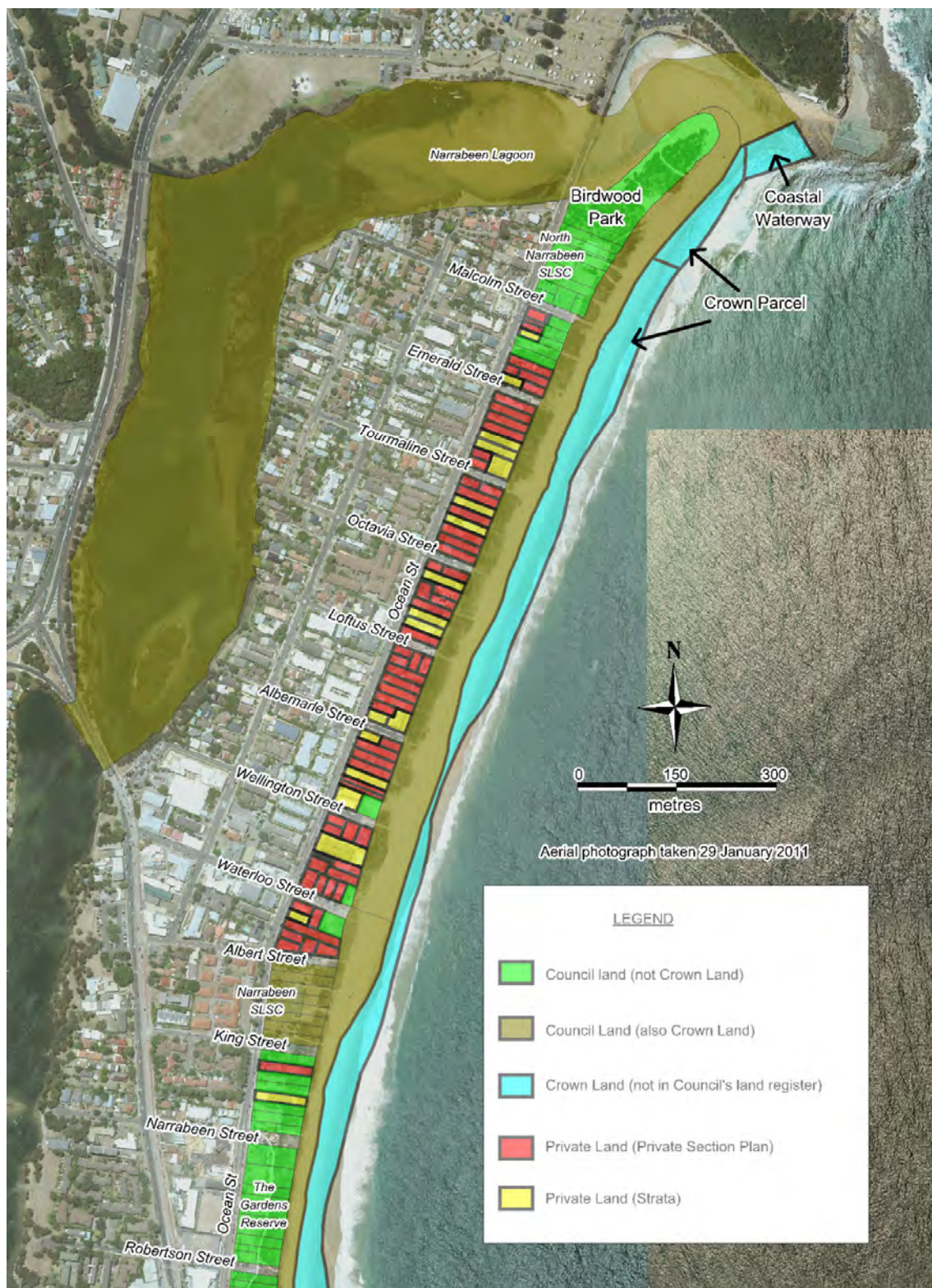


Figure 15: Delineation of public (Council and Crown) and private land at northern half of Collaroy-Narrabeen Beach

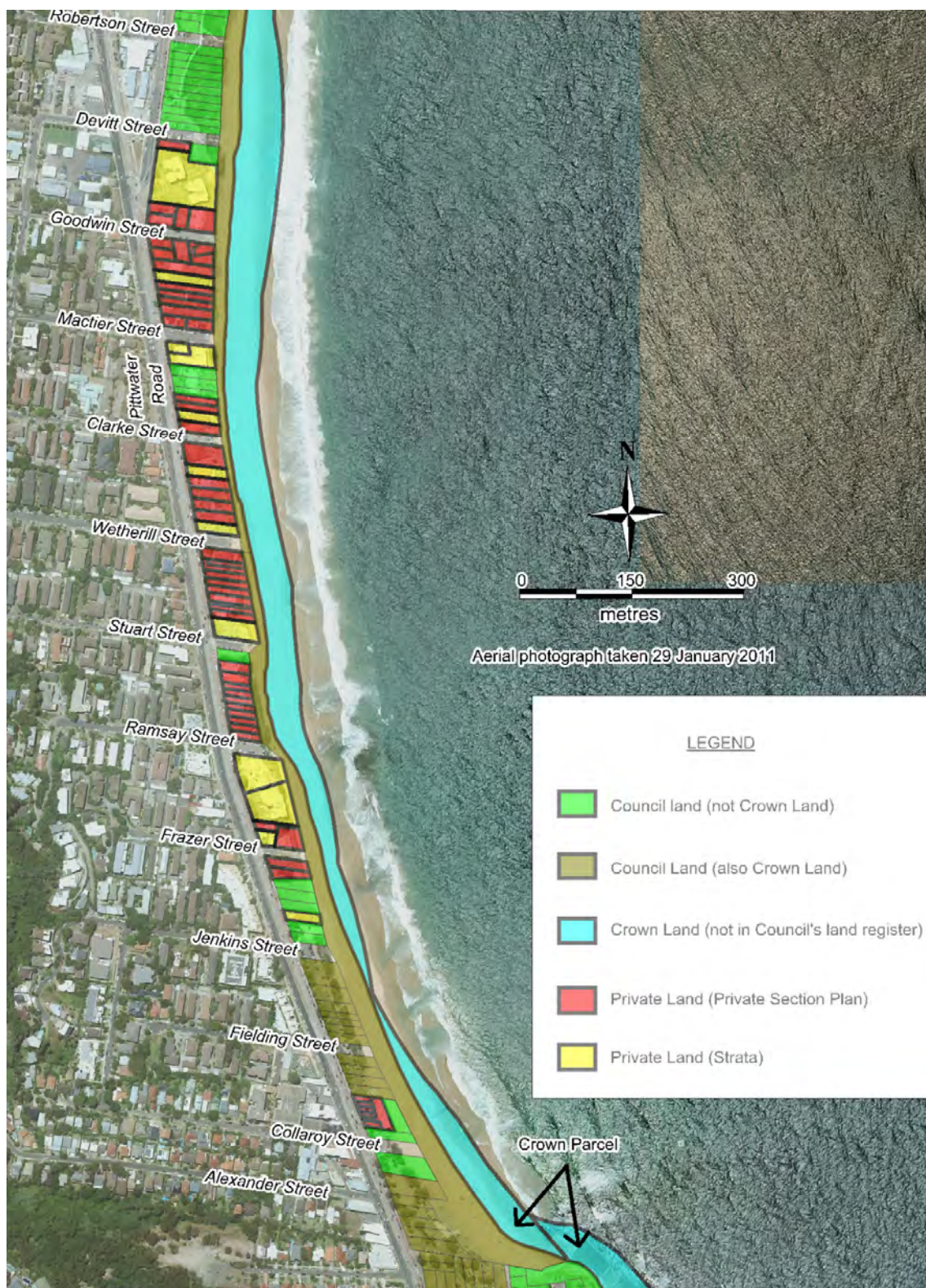


Figure 16: Delineation of public (Council and Crown) and private land at southern half of Collaroy-Narrabeen Beach



Figure 17: Delineation of public (Council and Crown) and private land at Fishermans Beach

3.8 Economic Value

3.8.1 Recreational Value

Beaches act as strong sources of attraction for both Australian residents and domestic and international tourists. Australians have a strong geographical affinity to the coast, with around 50% of residential addresses located within seven kilometres of the coastline, and around 6% in the zone that is less than five metres above mean sea-level and within three kilometres of the coast (Sydney Coastal Councils Group Inc., 2013).

Approximately 1.3 million domestic daytrips taken in the Sydney region in the year ended December 2012 involved visiting the beach. It is likely that these visits represent a desire for recreation opportunities, and also a desire for nature-enhanced cultural activities, such as eating fish and chips on a beach or coastal promenade (Sydney Coastal Councils Group Inc., 2013).

Many residents choose to live in Northern Beaches LGA because of the attractiveness of the coastal area and opportunities to enjoy the beach and beach lifestyle, and would therefore place a high value on beach amenity.

3.8.2 Land Value

At Collaroy-Narrabeen Beach, the 377 beachfront lot addresses had a 1 July 2012 combined unimproved land value of \$239 million, at an average of \$635,000 per address. This average was skewed by the large number of units (which do not get individually valued), with the average unimproved land value per lot address (with 97 lot addresses) being \$2.5 million. The largest unimproved lot land value was \$12.5 million at "Marquesas" (11 Ocean Street Narrabeen) and the smallest was \$1.2 million.

The 2012 combined unimproved beachfront land value of \$239 million at Collaroy-Narrabeen Beach was distributed as follows:

- \$118 million south of Devitt Street (average of \$2.4 million per lot address and \$530,000 per individual address)
- \$121 million north of Devitt Street (average of \$2.6 million per lot address and \$780,000 per individual address).

Including non-beachfront property at potential risk from coastline hazards to 2100 (\$38 million land value at an average of \$1.4 million per lot address and \$725,000 per individual address) the total 2012 land value at Collaroy-Narrabeen Beach was \$278 million at an average of \$2.2 million per lot address and \$646,000 per individual address.

At Fishermans Beach, the 14 beachfront lot addresses had a 1 July 2012 combined unimproved land value of \$61.5 million, at an average of \$4.4 million per address. Including non-beachfront property (\$8.7 million land value at an average of \$2.2 million per address) the total 2012 land value at Fishermans Beach was \$70.2 million at an average of \$3.9 million per address.

3.8.3 Tourism

The extent of tourism travel to Collaroy-Narrabeen Beach and Fishermans Beach is unknown, although it is expected that beach visitation is dominated by local and other Sydney residents. Sydney Coastal Councils Group Inc. (2013) estimated that the average travel cost per visit and per person to Collaroy-Narrabeen Beach was only \$2.90, noting that the beach was frequented by local residents and that many walk or ride to the beach so have zero costs. Approximately 60% of visitors to Collaroy-Narrabeen Beach travelled less than 20 minutes to get there according to the analysis of Sydney Coastal Councils Group Inc. (2013).

3.9 Access to Beaches and Headlands

3.9.1 Vehicular Access

Vehicles are not generally permitted on Collaroy-Narrabeen Beach or Fishermans Beach. Vehicular access to near Collaroy-Narrabeen Beach is available via a number of side streets off Pittwater Road (7 roads) and Ocean Street (8 roads) that form road heads along the beachfront. Street parking is available along Pittwater Road (at non-clearway times) and Ocean Street. Nine public car parks also exist.

The southern end of Collaroy Beach can be accessed via Birdwood Avenue and Beach Road.

Vehicular access to near Fishermans Beach is available via Florence Avenue, Ocean Grove, Anzac Avenue and along the access road to Long Reef Headland adjacent to Long Reef Golf Course. Parking is available at these locations. There are five public car parks adjacent to Fishermans Beach.

3.9.2 Pedestrian Access

North of Devitt Street, pedestrian beach access is provided by a number of walkways through the established dune vegetation. Most of these walkways have been formalised by fencing and typically lead from foreshore reserve areas, road heads, public car parks and (for private use) directly from private property.

Between Devitt Street and the carpark north of Collaroy Services Beach Club, public pedestrian access is via the end of road heads (and also at South Narrabeen SLSC between Mactier Street and Clarke Street). At a number of road heads, beach access has been formalised by the provision of a stairway, which provides effective access after storms when there is a steep back beach erosion escarpment. In other areas access is informal with the beach profile merging with the area around the road head (under “beach full” conditions). There are times after storms when access to the beach is difficult due to a steep erosion escarpment and/or the exposure of rock protection works which are generally relatively steep and can be difficult and dangerous to traverse.

Access from private development south of Devitt Street is also possible under “beach full” conditions when beach levels are similar to lot levels. However, again there are times after storms when access to the beach can be difficult due a steep erosion escarpment and/or the exposure of rock protection works.

Several formal beach access walkways are provided through the dune vegetation established adjacent to the public carpark north of Collaroy Services Beach Club. Further to the south, a seawall and promenade provide access to Collaroy Beach and the Collaroy Rock Pool.

Public pedestrian access to Fishermans Beach can be achieved via a path extending from Collaroy Beach and the northern end of Beach Road along the headland between Collaroy Beach and Fishermans Beach, with stairs at each end, Fox Park, a car park north of Florence Avenue, reserves at the seaward end of Ocean Grove and Anzac Avenue as well as most of the foreshore south-east of Long Reef Golf Club.

Private access from private development at Fishermans Beach is possible by directly walking from properties to the beach.

3.9.3 Headland Access

The North Narrabeen Headland Reserve can be accessed by road from Pearl Place or from a walkway starting from the public car park on the northern side of the lagoon entrance.

The headland south of Collaroy Beach can be accessed via Beach Road or by walking along the foreshore promenade to Collaroy Rock Pool in the north, or via Florence Avenue and stairs in the south.

Vehicular access to Long Reef Headland is provided by a road extending landward of the Long Reef Golf Club clubhouse. The viewing area at the top of the headland can be accessed via a walkway starting from the eastern end of this road, which continues along the cliff line around the perimeter of Long Reef Golf Course to the northern end of Long Reef Beach.

3.9.4 Boating Access

Offshore boating access is provided by an open coast boat ramp at Fishermans Beach, which was repaired and upgraded in 2009.

Boats can also be launched within Narrabeen Lagoon for use within the Lagoon, and NSW Roads and Maritime Services publishes a Boating Map for the area (Map 9a, "Boating Map for Pittwater, Cowan Creek And Narrabeen Lagoon"). The Lagoon entrance is not typically navigable due to breaking waves, strong currents and shallow depths.

3.9.5 Universal Access

The Collaroy Beach foreshore reserve has recently been redeveloped to include an upgraded accessible area as part of the Collaroy Accessibility Precinct project. The universal access features include:

- a 'liberty swing' within the children's playground for wheelchair users
- a 'freewheeler' submersible wheelchair available for public use
- wider parking spaces near the children's playground
- an accessible toilet
- universal access facilities at Collaroy Rock Pool.

3.10 Stormwater Outlets

3.10.1 Collaroy-Narrabeen Beach

There are 8 formalised stormwater drain outlets along Collaroy-Narrabeen Beach. These comprise:

- back beach/dune pipe discharges near Malcolm Street, Tourmaline Street, Albert Street, Goodwin Street, Ramsay Street and Frazer Street
- an outfall into the surf zone near Collaroy Street
- a culvert outlet immediately north of the Collaroy Rock Baths.

At road heads without piped discharges (such as at Emerald Street, Loftus Street, Albemarle Street, Wellington Street, Waterloo Street, Mactier Street, and Wetherill Street), stormwater generally flows towards dunal areas as overland flow and/or ponds at the seaward ends of the roads. Stormwater from the surrounding catchment is also discharged to the ocean via the Narrabeen Lagoon entrance. Photographs of stormwater outlets along Collaroy-Narrabeen Beach are provided in Appendix G

3.10.2 Fishermans Beach

There are 5 main stormwater drain outlets along Fishermans Beach. These are located (moving north-west to south-east) near Fox Park, Florence Avenue, Ocean Grove, Anzac Avenue, and about 40m west of the boat ramp. There is also a minor stormwater outlet at the Surf Rescue building. In addition to the formalised stormwater outlets, unchannelled stormwater flows onto the beach during heavy rainfall, particularly from the ends of various streets (PWD, 1987). Photographs of stormwater outlets along Fishermans Beach are provided in Appendix G.

Some of the existing stormwater outlets located along Collaroy-Narrabeen Beach and Fishermans Beach cause localised scour to beach berm and/or dune areas, localised flooding when outlets are blocked with sand, and can be accessed by the public. Potential upgrade works could include:

- installation of 'duckbill' check valves at outlets to prevent sand ingress
- installation of surcharge pits to mitigate local flooding caused by buried beach outlets
- installation of safety screens on outlets to prevent public access
- diversion of stormwater discharges away from the beach where possible (such as away from Fishermans Beach and into the Long Reef Golf Course wetland area).

These actions have been included in Section 8 and will be incorporated into Council's Stormwater Asset Management Plan.

3.11 Sewerage Infrastructure

There are sewer mains close to Collaroy-Narrabeen Beach and Fishermans Beach which are the responsibility of Sydney Water Corporation (SWC). The risk of damage to this infrastructure depends not only on cross-shore setback (plan proximity to the beach) but also the elevation of the mains (if the assets are at significant depth, such as below typical beach scour levels of -1m AHD, they would be less likely to be damaged in coastal erosion events). Locations where sewer mains are particularly close to the beach (moving north to south) are:

- immediately south of Clarke Street (seaward of residential development)
- between Stuart Street and Ramsay Street (where there are no known protection works, and again seaward of residential development)
- at Frazer Street
- along a small section south of "The Breakers" near Jenkins Street (also including a sewage pumping station)
- between Fielding Street and midway along the Collaroy Services Beach Club
- along almost the entire length of Fishermans Beach north of Anzac Avenue (note that maintenance manhole covers are evident along the beach in this area).

Over the long term, sewer mains in other areas may potentially be at risk of damage from coastal erosion, namely (moving north to south):

- between Emerald Street and Octavia Street at Narrabeen
- between Albemarle Street and Wellington Street at Narrabeen
- midway between Wellington Street and Waterloo Street at Narrabeen
- near Albert Street at Narrabeen
- near Narrabeen Street at Narrabeen
- at Goodwin Street, Narrabeen (note that there are known protection works in this area)
- between Frazer Street and Fielding Street at Collaroy (note that there are known protection works in this area).

Given that sewer mains are located (in plan) within coastline hazard areas, Council will work collaboratively with SWC to encourage the Corporation to undertake further investigations to assess the elevation of the sewer mains and to assess the risk to sewerage infrastructure from coastal erosion/recession. This would enable SWC to manage this risk consistently with the CZMP. SWC may need to consider either protection or relocation of some sewer mains, particularly as long term hazards are realised.

3.12 Other Authority Assets

There may be assets such as electricity cables, water mains, communications cables (such as Telstra and Optus), and gas lines in beachfront areas, but details on these assets have not been investigated as part of this CZMP. Additionally, Pittwater Road, classified as regional road, runs parallel to Collaroy-Narrabeen Beach and Fisherman Beach. The responsibility for these assets lies with the particular asset owners. However, Council will work collaboratively with these asset owners to encourage them to assess the location and elevation of these assets in relation to coastline hazards so that the risk of damage can be determined and managed by these owners consistently with the CZMP. Some assets may need to be protected or relocated by the relevant assets authorities, particularly as long term hazards are realised.

Two submarine telecommunications cables, owned and managed by the Australian Communications and Media Authority, exist at Narrabeen Beach. The two cables, the Australian Japan Cable and Southern Cross Cable connect Australia with Japan and North America respectively. They lie on the sea floor and are protected by the Northern Sydney Protection Zone, under the *Telecommunications Act 1997*, which extends from Narrabeen Beach to 40 nautical miles off-shore. The protection zone limits activities that could damage submarine cables. All actions proposed in the CZMP occur outside the Northern Sydney Protection Zone which extends seaward of the low water mark, or in the case of beach nourishment would not adversely impact the zone.

4. COASTAL PROCESSES AND COASTLINE HAZARDS

This chapter describes the coastal processes and coastline hazards relevant to Collaroy-Narrabeen Beach and Fishermans Beach.

4.1 Coastal Processes

4.1.1 Waves

Offshore Wave Climate

Beach erosion and relatively large wave runup is strongly linked to the occurrence of high wave conditions with elevated ocean water levels. As a result, erosion and runup are more likely to be significant when large waves coincide with a high tide. Most storm waves offshore of Sydney come from the south (48%), with about 26% coming from the south-south-east and 10% from the south-east. That is, 84% of storm waves come from the south to south-east octant (WorleyParsons, 2009). The peak wave height during a 100 year Average Recurrence Interval (ARI) event is predicted to be 8.8m for storm waves coming from the south and 9.3m for storm waves coming from the south-south-east.

Nearshore Wave Climate

As waves approach the shore they may be transformed by the processes of refraction, shoaling, diffraction, attenuation, reflection and breaking. Therefore, the wave height and wave direction of the nearshore wave climate differs from the offshore wave climate, with wave period generally remaining constant.

The relative prominence (offshore extent) of the Long Reef headland provides some sheltering to Fishermans Beach and the southern end of Collaroy Beach from offshore storm waves coming from the dominant south to south east directions. Narrabeen and North Narrabeen are generally fully exposed to the offshore wave climate, but it is recognised that various offshore reefs cause complexities in wave transformation in the study area.

4.1.2 Elevated Water Levels

The main factors which contribute to elevated ocean still water levels on the NSW coast comprise:

- astronomical tide
- storm surge (barometric setup and wind setup)
- wave setup (caused by breaking waves).

Astronomical tide is the regular rise and fall of sea level in response to the gravitational attraction of the sun, moon and planets, and a rotational effect due to the spin of the earth on its axis. Tides along the NSW coastline are semi diurnal, with high and low water approximately equally spaced in time and occurring twice daily (that is, on average, there are two high tides and two low tides in any 24 hour period). There is also significant diurnal inequality in NSW coast tides, a difference in height of the two high waters or the two low waters of each tidal day.

Barometric setup is a localised vertical rise in the still water level due to a reduction in atmospheric pressure. The increase in water level is approximately 0.1m for each 10 hectopascal drop below normal barometric pressure of 1013 hPa (MHL, 1992). Wind setup is the vertical rise in the still water level on the downwind side of a body of water caused by wind stresses on the surface of the water.

Wave setup is defined as the superelevation of the mean water level caused by wave action alone. Individual waves also cause temporary water level increases above the still water level due to the process of wave runup or uprush. In NSW, open coast still water levels (within the wave breaking zone) can increase by up to about 2m above normal levels in storms due to storm surge and wave setup.

Peak 100 year ARI wave setup is estimated to be in the order of 1.3m. Based on modelling completed by WorleyParsons (2009), peak 100 year ARI wave heights reduce to about 75% of fully exposed values south of Fielding Street at Collaroy Beach, and to about 63% at Fishermans Beach (with the fully exposed values applying north of Stuart Street at Collaroy Narrabeen Beach).

The Department of Environment, Climate Change and Water [DECCW] (2010b) estimated that the 100 year ARI still water level offshore of Sydney (excluding wave setup) is 1.44m AHD at present. Including wave setup of 1.3m, the 100 year ARI water level at fully exposed shorelines landward of wave breaking would be about 2.7m AHD. At less exposed areas (such as the southern end of Collaroy Beach, and Fishermans Beach), equivalent elevated water levels would be reduced due to lower wave setup, to about 2.4m and 2.2m respectively.

It is not relevant to map tidal inundation at Collaroy-Narrabeen Beach and Fishermans Beach as per Item 6 of the *Guidelines for Preparing Coastal Zone Management Plans*. This is because water levels of 2.2m to 2.7m AHD are contained within the sandy beach areas, and do not extend landward to developed areas, and mapping these water levels on the beach would not be meaningful.

4.1.3 Wave Runup

Wave runup is site specific, but typically reaches a maximum level of about 8m AHD at beaches on the open NSW coast at present. Higgs and Nittim (1988) found that for a coastal storm that occurred in August 1986, maximum runup levels at Narrabeen Beach were about 7.3m AHD (near Clarke Street), with 4.4m AHD recorded near Fielding Street at Collaroy, and up to 5.3m AHD at Fishermans Beach. It is considered to be reasonable to adopt a 100 year ARI wave runup level of 8m AHD for exposed areas of Collaroy-Narrabeen Beach at present.

At the southern end of Collaroy Beach (south of Fielding Street) and at Fishermans Beach, equivalent runup levels would be lower (WorleyParsons, 2009). A wave runup level of 6m AHD was adopted at these locations.

4.1.4 Coastal Storms

The NSW coastline is subject to intense tropical and non-tropical storms at irregular intervals. Key coastal storms that have affected Collaroy-Narrabeen Beach and Fishermans Beach occurred in 1920, March and May 1925, May 1944, June 1945, September 1967, May-June 1974, August 1998 and June-July 2007. The most significant of these in terms of damage along the coast were the 1974 storms. The May 1974 storm was particularly severe as it was accompanied by the highest water level ever recorded along the NSW coast.

Damaging storms have generally occurred as a closely linked series of storms, rather than being particularly severe storms in isolation. In this way the beach may already be in a depleted state at the time of arrival of the second and subsequent storms. A key factor in the erosiveness of a storm, besides the storm energy, is also the water level occurring during the storm.

The beaches covered by the CZMP have been subject to damaging coastal storms in the past, and can thus be expected to again be exposed to such storms at irregular intervals in the future. These storms are most likely to occur in Autumn and Winter, and are least likely to occur in Summer, but can occur at any time.

4.1.5 Sediment Transport

In the region between where waves break and the shoreline, two natural forms of sediment transport occur, namely longshore sediment movement and onshore/offshore sediment movement. Sediment transport can also occur due to the action of wind. Lagoon entrances (and to a lesser extent stormwater systems) may also contribute sediment to or capture sediment from the beach system. Mechanical forms of sediment transport, namely beach nourishment, beach sediment recycling and beach scraping, also influence sediment transport at Collaroy-Narrabeen Beach and Fishermans Beach. A detailed description of these modes of sediment transport is provided in Appendix I.

4.1.6 Climate Change

Sea Level Rise

The possibility of global climate change accelerated by increasing concentrations of greenhouse gases, the so-called Greenhouse Effect, is widely accepted by the scientific and engineering communities. This is predicted to cause globally averaged surface air temperatures and sea levels to rise.

The *NSW Sea Level Rise Policy Statement* (DECCW, 2009b) was released in October 2009. It included sea level rise planning benchmarks of 0.4m at 2050 and 0.9m at 2100 (both relative to 1990), with the two benchmarks allowing for consideration of sea level rise over different timeframes. The sea level rise planning benchmarks can be used for purposes such as incorporating the projected impacts of sea level rise on predicted flood risks and coastline hazards. However, note that DECCW (2009b) is no longer NSW government policy.

In considering the impacts of sea level rise on acceptable risk to new beachfront development at Collaroy-Narrabeen Beach and Fishermans Beach three sea level rise scenarios were applied. These scenarios were a 95% probability of exceedance, 50% probability of exceedance and a 5% probability of exceedance based on the sea level rise projections outlined in the 5th IPCC Assessment Report with an allowance for regional variation. A detailed discussion of their application is provided in Section 5 and Appendix L.

This approach is considered to be consistent with the advice provided by the NSW Government in April 2014 that Councils are to obtain expert advice in using a range of sea level rise projections as well as document the methodology and approach applied.

Other Climatic Change Considerations

Another potential outcome of climate change is an increase in the frequency and intensity of storm events. Modest to moderate increases in average and maximum cyclone intensities are expected in the Australian region in a warmer world. However, cyclone frequency and intensity are strongly associated with the El Niño/Southern Oscillation (ENSO) phenomenon. How this phenomenon will vary in a warmer world is currently unknown (CSIRO, 2001; CSIRO Marine Research, 2001). The potential for climate change related recession needs to be continually reviewed as more information develops in the scientific community.

4.2 Coastline Hazards

4.2.1 Beach Erosion (Storm Demand)

During storms, large waves, elevated water levels and strong winds can cause severe erosion to sandy beaches. The hazard of beach erosion relates to the limit of erosion that could be expected due to a severe storm or from a series of closely spaced storms (NSW Government, 1990). The following beach erosion (storm demand) values have been applied for Collaroy-Narrabeen Beach and Fishermans Beach.

- 250m³/m north of Frazer Street
- linearly reducing to 200m³/m at Collaroy Services Beach Club
- linearly reducing to 150m³/m south of Collaroy SLSC
- 100m³/m at Fishermans Beach.

4.2.2 Beach Rotation

There is evidence that Collaroy-Narrabeen Beach rotates in response to shifts in the Southern Oscillation Index (SOI). Broadly, accretion occurs at the north end of Collaroy-Narrabeen Beach during El Niño phases (periods of negative SOI) with erosion occurring in the south. During La Niña phases (periods of positive SOI) erosion occurs at the north with accretion occurring at the south end. Allowance for beach rotation has been made in delineation of coastline hazards at Collaroy-Narrabeen Beach. No allowance for beach rotation at Fishermans Beach was included.

4.2.3 Shoreline Recession

The hazard of shoreline recession is the progressive landward shift in the average long term position of the coastline (NSW Government, 1990). Two potential causes of shoreline recession are net sediment loss, and an increase in sea level. The following rates of shoreline recession were applied for Collaroy-Narrabeen Beach and Fishermans Beach in the CZMP:

- a long term recession due to net sediment loss of 0.05m/year at both Collaroy-Narrabeen Beach and Fishermans Beach
- long term recession due to sea level rise of 0.04m/year at Collaroy-Narrabeen Beach and 0.02m/year at Fishermans Beach.

4.2.4 Stormwater Erosion Hazard

During major stormwater runoff events, stormwater that is collected from back beach areas and discharges into coastal waters can cause significant localised erosion to the beach berm. Flow from stormwater pipes and outlets at Collaroy-Narrabeen Beach and Fishermans Beach can also potentially scour the surrounding sand, creating erosion zones. The sand volume eroded from this hazard has been taken into account when defining the position of hazard lines.

4.2.5 Slope Instability

For sandy areas a number of coastline hazard zones can be delineated as shown in Figure 18.

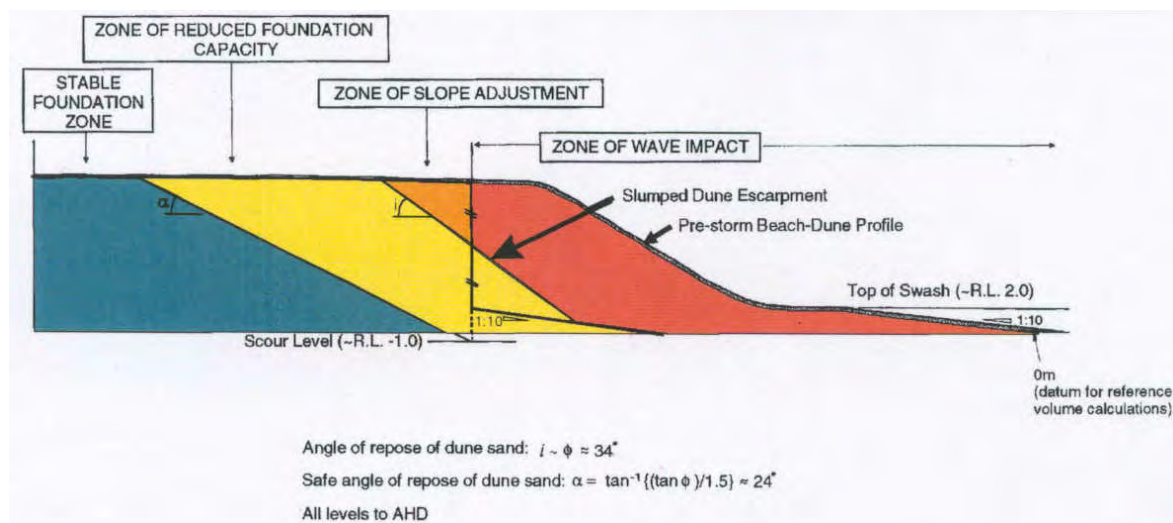


Figure 18: Schematic representation of coastline hazard zones (after Nielsen et al, 1992)

The *Zone of Wave Impact* delineates an area where any structure or its foundations would suffer direct wave attack during a severe coastal storm. It is that part of the beach which is seaward of the beach erosion escarpment.

A *Zone of Slope Adjustment* (ZSA) is delineated to encompass that portion of the seaward face of the beach that would slump to the natural angle of repose of the beach sand following removal by wave erosion of the design storm demand. It represents the steepest stable beach profile under the conditions specified.

A *Zone of Reduced Foundation Capacity* (ZRFC) for building foundations is delineated to take account of the reduced bearing capacity of the sand adjacent to the storm erosion escarpment. Nielsen et al (1992) recommended that structural loads should only be transmitted to soil foundations outside of this zone (i.e. landward or below), as the factor of safety within the zone is less than 1.5 during extreme scour conditions at the face of the escarpment. In general (without the protection of a terminal structure such as a seawall), dwellings/structures not piled and located within the ZRFC would be considered to have an inadequate factor of safety.

Coastline hazard lines for Collaroy-Narrabeen Beach and Fishermans Beach are provided in Appendix I, corresponding to both the position of the landward edge of the ZSA and the landward edge of the ZRFC (defined at present, at 2050, and at 2100).

4.2.6 Coastal Inundation

Coastal inundation is the flooding of coastal lands by ocean waters, which is generally caused by large waves and elevated water levels associated with severe storms. Severe inundation is an infrequent event and is normally of short duration, but it can result in significant damage to both public and private property (NSW Government, 1990).

The components which give rise to elevated still water levels at times of storms have been referred to in Section 4.1.2, namely wind setup, barometric setup, and wave setup. Individual waves cause further temporary water level increases above the still water level due to the process of wave runup or uprush.

Wave runup levels of 6m to 8m AHD are above dune crest levels in parts of Collaroy-Narrabeen Beach and Fishermans Beach, particularly:

- south of Devitt Street at Collaroy-Narrabeen Beach, and in particular south of Stuart Street, with the area surrounding Collaroy SLSC and Collaroy Services Beach Club being particularly vulnerable to coastal inundation as it is generally below 4m AHD
- at Fishermans Beach.

Therefore the potential for occasional wave overtopping and coastal inundation in these areas exists. However, it should be noted that runup levels of 6m to 8m AHD would only be realised if the foreshore was at the runup height or higher. In reality, any waves that overtopped the foreshore would 'fold over' the foreshore crest and travel as a sheet flow at shallow depth, spreading out and infiltrating over landward areas. A significant reduction in the velocity and depth of the runup would be expected within the order of 10m landward from the foreshore crest.

That is, even if a structure (in particular habitable floor level) was below a predicted wave runup level, this does not necessarily imply there would be damage to the structure, as this would depend primarily on the depth of overtopping flow (or flow momentum in immediate foreshore areas), and nature of the construction.

5. RISKS TO PUBLIC SAFETY AND BUILT ASSETS

5.1 Risks to Public Safety

Risks to public safety at Collaroy-Narrabeen Beach and Fishermans Beach may arise at any time for swimmers. To assist in managing these risks, Council Lifeguards patrol Collaroy, South Narrabeen and North Narrabeen Beach seven days a week typically from late September to late April (with Narrabeen Beach only patrolled over this period on weekends, public holidays and during school holidays). Volunteer SLSC patrols also operate in these areas. There are no patrols at Fishermans Beach.

Council advises that swimmers and waders should only enter the water at patrolled locations, and only between the red and yellow flags.

Risks to public safety may also potentially arise both during coastal storms, and after coastal storms (prior to beach recovery).

Large waves and elevated water levels may be a risk to swimmers, surfers and other water users (or those near the water) during storms. Lifeguards have the opportunity to close beaches when conditions are considered to be unsafe during patrol hours.

Risks to public safety can also arise after storms when there may be steep and high erosion escarpments along the beach, and particularly at beach accessways which may make beach access difficult. An action has been included in Section 8 regarding mechanically regrading steep and high erosion escarpments where required, as has been undertaken in the past, to reduce risks to public safety from collapsing sand dunes as the escarpment dries out. These works may typically be required when erosion escarpments are several metres high.

Additionally, an action has been included in Section 8 to ensure sufficient warning signage and barricades are available for use, and to implement these as required to close off damaged and potentially dangerous public beach access points after storm erosion. Signage will be placed both at the top and the bottom of the accessways, since injury can occur by people trying to leave as well as arrive at the beach. Examples of barricading installed by Council are provided in Figures 19 and 20. Natural beach recovery after storms would be expected to eventually restore ease of access after erosion. Beach scraping (discussed below) may also be considered to assist in mechanically accelerating recovery.



Figure 19: Damaged beach accessway at North Narrabeen Beach in May 2009



Figure 20: Barricading installed by Council at North Narrabeen Beach in May 2009

Exposure of existing protection works at the southern end of Collaroy-Narrabeen Beach may also be a risk to public safety if beach users choose to climb on the structures or tunnel into them, due to the potential (for example) for rocks to be dislodged, or for such a beach user to slip, with a risk of injury in both cases. The existing protection works have not generally been designed for beach access, often being relatively steep and with random rock placement, thus making traversing the structures inappropriate. There is also the possibility that exposed rocks could suddenly collapse, posing a risk of injury to any beach users who were adjacent to the protection works.

Council currently manages risks associated with exposed protection works by employing signage, see example in Figure 21, where the sign says “Danger, Keep Clear, Rocks Unstable”. An action has been included in Section 8 regarding erecting barricades and safety signage to discourage people from walking on or near exposed existing protection works.



Figure 21: Example of signage placed by Council to warn public of danger of being in proximity of rocks at Collaroy-Narrabeen Beach

Council has constructed stairway access to Collaroy-Narrabeen Beach over existing protection works at Goodwin Street, Wetherill Street and Stuart Street, to enable safe beach access in these areas at times when existing protection works are exposed.

Landowners are advised not to access the beach seaward of their property if existing protection works are exposed. An action is included in Section 8 that ongoing education of residents on these and other relevant issues is undertaken by Council.

Council also currently manages risks associated with exposed protection works by undertaking beach scraping. An action has been included in Section 8 relating to beach scraping, namely: “undertake

beach scraping after storms to accelerate beach recovery where resources allow, in particular to accelerate the burial of exposed historical protection works and restoration of beach accessways”.

Risks to public safety may also arise during non-storm periods, for example due to foreign objects on the beach or poor water quality. Council currently undertakes beach raking at Collaroy-Narrabeen Beach (Figure 22) to remove litter weekly in the swimming season (early October to the end of April) and every 4 weeks outside this period. Fishermans Beach is not raked due to existence of a rock platform just beneath the sand.



Figure 22: Beach cleaning at Collaroy Beach (from Warringah Council, 2014a)

It is recognised that cleansing the beach of debris and other inappropriate materials may be required at other times (outside the raking cycle), and also at Fishermans Beach (as well as Collaroy-Narrabeen Beach), particularly after storms. Where feasible, Council will remove or order removal of inappropriate objects on the beach, once aware of their presence. Fencing/barricading around inappropriate objects may be necessary until they are removed. A CZMP action that debris and other inappropriate materials is to be removed off the beach as required has been included in Section 8. Seaweed washed up on the beaches is considered to be a natural material and is not removed by Council.

The Collaroy Rock Pool is cleaned once a week in the swimming season and once a fortnight in the non-swimming season. A CZMP action has been included in Section 8 that this continues. Hot humid conditions, high water temperature and a large number of people using the pool with sunscreen applied will affect the water condition. Water may appear green and slimy due to these factors very quickly after cleaning (Warringah Council, 2014b).

OEH administers the Beachwatch program that includes water quality (faecal contamination) monitoring at North Narrabeen and Collaroy as well as Birdwood Park in the Narrabeen Lagoon entrance. OEH (2014a) recommended the following:

- avoid swimming during and at least one day after heavy rain at ocean beaches, and for at least three days at harbour beaches, due to the possibility of pollution from stormwater drains
- avoid swimming near stormwater drains or sewage outfalls
- avoid swimming if you see signs of pollution such as discoloured water, oil or scum on the water, and litter or other debris floating in the water or on the tide line.

Water quality has generally been good at North Narrabeen and Collaroy over the last decade, but the water may be susceptible to pollution after rain.

5.2 Risks to Built Assets

5.2.1 Erosion/Recession

In 2012, a risk assessment for coastal structures was completed, in which a relative risk rating was defined for all coastal structures (public and private). In this risk assessment the proximity to coastline hazards, presence and nature of existing protection works, and presence of piled foundations was considered. Structures that were assessed to be at 'Very High' risk included some Fishermans Beach properties, Collaroy Services Beach Club, and some Collaroy Beach properties between Jenkins Street and Stuart Street.

To assess the appropriate setbacks and controls for future development, a risk assessment was undertaken in preparing the CZMP. This assessment considered the potential impacts of coastal erosion/recession to development on conventional and piled foundations.

The methodology applied in the risk assessment is based on the Australian Geomechanics Society (AGS) procedures for landslide risk management, which were developed over a period of more than a decade via a Working Group of experts, and have been widely applied in geotechnical engineering practice since 2000. The AGS procedures can be considered to be an established, recognised and peer reviewed methodology for defining landslide risk for development assessment.

With modification to be appropriate for "sandy beach" coastal hazards, it was considered that the same principles of the AGS procedures could be applied to define acceptable risk for beachfront development at Collaroy-Narrabeen Beach and Fishermans Beach.

The risk assessment considered the likelihood and extent of coastal erosion/ recession against the likely consequences to development on conventional foundations and development on piled foundations.

Applying the risk matrix below, developed by AGS, the acceptable risk level for new residential development was defined as "low". As identified in AGS (2007a,b) a low level of risk was considered to be acceptable as most informed home owners are likely to be risk adverse and this risk aversion suggests low risk of damage to property is acceptable for domestic dwellings.

Table 1: AGS(2007a,b) risk matrix

Likelihood	Consequence				
	Catastrophic	Major	Medium	Minor	Insignificant
Almost Certain	Very High	Very High	Very High	High	Medium
Likely	Very High	Very High	High	Medium	Low
Possible	Very High	High	Medium	Medium	Very Low
Unlikely	High	Medium	Low	Low	Very Low
Rare	Medium	Low	Low	Very Low	Very Low
Barely Credible	Low	Very Low	Very Low	Very Low	Very Low

As "low" risk can be considered acceptable for the residential structures adjacent to Collaroy-Narrabeen Beach and Fishermans Beach, it follows that:

- the "unlikely" likelihood defines the acceptable risk for new development that is constructed on conventional foundations, this was determined as having "minor" consequences
- the "likely" likelihood defines the acceptable risk for new development that is constructed on piled foundations, as this was determined as having "insignificant" consequences.

The resulting minimum setback acceptable risk lines for new development on conventional foundations and for new development on piled foundations are presented in Figures 23 to 27. The application of these lines in relation to building controls and setbacks is discussed in Section 6.

Compared to methods of defining development setbacks through delineation of coastal hazard lines applied previously along Collaroy-Narrabeen Beach and Fishermans Beach this approach clearly defines the acceptable risk level, includes consideration of the probability of events occurring and allows for certain site specific characteristics to be considered.

At Collaroy-Narrabeen Beach this includes the history of damage to property from coastal storms, the existence of protection works and resilience of piled development compared to development on conventional foundations.

At Fishermans Beach the combination of greater shelter from storm waves provided by Long Reef Headland, reduced storm demand and wave runup as well as the recognition that there has been very limited historical impact to development from coastal erosion have been considered.

In considering the impacts of sea level rise at Collaroy-Narrabeen Beach and Fishermans Beach three sea level rise scenarios were applied. These scenarios were selected based on the sea level rise projections outlined in the 5th IPCC Assessment Report with an allowance for regional variation. The selected scenarios are described below. A design life of 60 years was adopted for all new development, applied in 2014, hence 2074 represents the end of the design life.

- “mild case” estimate of 10% increase in sea level rise (0.02m) above 95% exceedance global mean in study area (that is, 0.27m sea level rise at 2074)
- “best” estimate of 15% increase in sea level rise (0.05m) above median global mean in study area (that is, 0.4m sea level rise at 2074)
- “severe case” estimate of 20% increase in sea level rise (0.09m) above 5% exceedance global mean in study area (that is, 0.54m sea level rise at 2074).

The consequences of coastal erosion/recession were considered for each of these scenarios. It is considered that the sea level rise probabilities and risk based framework applied for the CZMP is more appropriate than the direct adoption of the former sea level rise benchmarks.

A detailed description of the reasoning behind this approach and the methodology applied is provided in Appendix L.



Figure 23: Acceptable risk setback lines determined at northern end of Narrabeen Beach



Figure 24: Acceptable risk setback lines determined near Narrabeen Street to Albemarle Street at southern end of Narrabeen Beach



Figure 25: Acceptable risk setback lines determined from Stuart Street to Robertson Street at Collaroy-Narrabeen Beach (including consideration of existing protection works)



Figure 26: Acceptable risk setback lines determined at southern end of Collaroy Beach (including consideration of existing protection works)



Figure 27: Acceptable risk setback lines determined at Fishermans Beach

The acceptable risk lines in Figure 27 were determined assuming an entirely sandy subsurface and do not take into account the potential presence of stiff clays or rock.

5.2.2 Coastal Inundation

Areas along Collaroy-Narrabeen Beach and Fishermans Beach at particular risk from coastal inundation are:

- south of Devitt Street at Collaroy-Narrabeen Beach, and in particular south of Stuart Street, with the area surrounding Collaroy SLSC and Collaroy Services Beach Club being particularly vulnerable to coastal inundation as it is generally below 4m AHD
- at Fishermans Beach.

5.3 Emergency Action Subplan

A *Coastal Erosion Emergency Action Subplan for Beaches in Warringah* was adopted by Warringah Council in 2012. Due to NSW Government legislative changes, some parts of this document are out of date, and a CZMP action that this document is updated has been included in Section 8.

Some of these changes include that:

- the sand-filled geotextile containers (sandbags) placed under specific conditions and defined as “emergency coastal protection works” (“Part 4c sand/sandbags ECPW”) in WorleyParsons (2012a, b) are now defined as “temporary coastal protection works”
- “temporary coastal protection works” can still only be placed at Collaroy-Narrabeen Beach, but only where buildings are currently vulnerable to erosion (this is taken to mean where existing structures are seaward of the Immediate ZSA).

As per WorleyParsons (2012a, b), it is reiterated that these specific sandbag “temporary coastal protection works” cannot be recommended for use at Collaroy-Narrabeen Beach as they are unlikely to be effective in a severe storm and are difficult to implement in an emergency

6. PROPOSED MANAGEMENT ACTIONS

The CZMP has identified and prioritised management actions that achieve the following outcomes:

- protect and preserve beach environments and beach amenity
- manage current and projected future risks from coastal hazards
- ensure continuing and undiminished public access to beaches, headlands and waterways
- protect or promote the culture and heritage environment.

An initial assessment of all available management actions was undertaken based on a broad consideration of social, economic and environmental factors. In selecting management options a wide range of potential management actions were considered. Options initially considered but not investigated further because they were not deemed realistic or affordable for Collaroy-Narrabeen Beach or Fishermans Beach included: groynes, training walls, artificial headlands, offshore breakwaters and artificial reefs, configuration dredging, planned retreat and property purchase.

Planned retreat was not considered feasible at Collaroy-Narrabeen Beach and Fishermans Beach due primarily to the level of existing development and to the small lot size of the properties. Additionally, while property purchase has been undertaken by Council in the past it is now considered to be a cost-prohibitive management option for Council and not a priority for public expenditure.

Management options deemed to be appropriate for further investigation included, sand recycling and nourishment, dune management, land use planning, the application of development controls and consideration of new or upgraded protection works.

Further discussion on identification and evaluation of CZMP management options is provided in Appendix M, and discussion on financial impacts of potential CZMP management options on stakeholder groups is given in Appendix N. Actions identified as realistic and affordable with acceptable (or positive) environmental and social impacts are discussed below and prioritised in Section 8.

Options development was also informed by workshops held with a diverse team involved in development of this CZMP, comprising coastal engineers, planners, lawyers, economists and ecologists as well as council staff. Feedback received during community engagement activities was also considered in selecting and prioritising actions.

6.1 Actions to Protect and Preserve Beach Environments and Beach Amenity

6.1.1 Beach Environments

The following actions have been identified to protect areas with important habitat/biodiversity values:

- continue the implementation of dune maintenance works including repair of fencing and walkways, stabilisation of blow-outs, ongoing targeted Bitou Bush control and effective rabbit control
- prepare and implement actions to manage the known population of Sand Spurge
- undertake management actions for dune vegetation which address ongoing management issues including weed control and replacement/replenishment planting, monitoring and maintenance of vegetation structure and species diversity for small bird habitat. As part of this, there will be consideration of the maintenance of sight lines to assist Council's Life Guards and Surf Life Savers.

Examples of areas that could be targeted for restoration of dune vegetation include (moving north to south) at and immediately north of Emerald Street, at and immediately north of Tourmaline Street

(although stormwater discharge may make this problematic), immediately south of Albemarle Street, immediately north of Wellington Street, and immediately north of Waterloo Street.

Advice will also be distributed to relevant Council staff that any works involving disturbance to dune vegetation should ensure that:

- areas directly and indirectly impacted are kept to a minimum
- sand removal and deposition works within potential habitat for Sand Spurge are undertaken in accordance with guidelines to protect a Sand Spurge soil seedbank and to trigger germination at a recipient site
- major works occur outside the small bird breeding period (Spring)
- disturbance is minimised to shorebirds foraging or roosting on the Long Reef rock platform and intertidal areas on the beach and Narrabeen Lagoon entrance by ensuring major works are timed outside the migratory shorebird visitation period (late Spring and Summer) and through ongoing public education and enforcement of bans on dogs on beaches and marine invertebrate collection at Long Reef Aquatic Reserve.

6.1.2 Dune Management

Dune management activities will include maintenance of dunes and their vegetative cover at a number of sites. Along Collaroy-Narrabeen Beach, established vegetated dune areas north of Devitt Street will be maintained. In particular the dune at Birdwood Park North Narrabeen, which was raised substantially after the 1974 storms, will be managed in accordance with the North Narrabeen Beach Reserve and Birdwood Park Masterplan.

South of Devitt Street there is little opportunity for dune vegetation to be established due to the proximity of private development to the beach. A buffer of dune vegetation has been established adjacent to the public parking area north of the Collaroy Services Beach Club.

Along Fishermans Beach, dune vegetation is limited, again due to the proximity of private development to the beach (north of Anzac Avenue), and proximity of paths and car parking areas to the beach (south of Anzac Avenue). Existing areas of dune vegetation will be maintained and opportunities taken to increase the coverage of dune vegetation in other areas where possible.

In relation to the North Narrabeen National Surfing Reserve and the dune at Birdwood Park, surfing conditions change naturally as sand is moved offshore in response to storms and onshore in calmer conditions (affecting the amount of sand in offshore bars), and alongshore. The effect that long term recession due to sea level rise would have on surfing conditions has not been investigated.

The Birdwood Park dune has grown over the last few decades and it is considered that this has generally been capturing sand that would have otherwise moved into Narrabeen Lagoon, as opposed to taking sand away from surf breaks.

Council will review management of the dune and opportunities to redistribute sand during planning for the Narrabeen Lagoon entrance clearance works expected in 2016 while maintaining the dune height to mitigate the impacts of coastal hazards.

The Water Research Laboratory (2012) identified that the Birdwood Park dune could be lowered to 7 or 6 m AHD from a coastal erosion perspective. However at a 6 m AHD elevation, wave runup and overtopping during a large storm event could compromise the stability of the remaining dune, increasing risk to public and private assets located to the west of Birdwood Park.

6.1.3 Beach Amenity

A wide sandy beach is attractive to beach users, but will be a challenge to maintain if beaches recede due to sea level rise. The application of beach nourishment is essential to achieving the maintenance of beach amenity in the future. To guide the implementation of moderate beach nourishment the identification of required sand volumes, appropriate sand sources, extraction methods and funding mechanisms is necessary.

Moderate beach nourishment would most economically be achieved by using offshore sand sources (assuming environmental impacts of such works will be demonstrated to be acceptable). Undertaking beach nourishment is consistent with Coastal Management Principles 9 and 10 and has been strongly supported by the community in consultation completed during the CZMP to date. However, Council is unable to implement beach nourishment without the support of the NSW government in:

- modifying the *Offshore Minerals Act 1999*
- providing funding
- taking a coordinating role as nourishment would only be cost effective if it was to be implemented over a wide geographical area covering numerous Council areas.

Beach nourishment is not likely to be necessary for in the order of 20 years, subject to monitoring of beach width. However, an action has been included in Section 8 to liaise with and lobby the NSW Government on legislative and funding issues, and to investigate other sources of funding, in conjunction with other coastal Councils. This action is necessary to progress beach nourishment from concept to completion.

The type of beach nourishment envisaged would aim to maintain the present beach widths into the future, addressing the effects of long term recession due to sea level rise.

Actions currently undertaken by Council namely beach scraping to assist in accelerating the recovery of beach amenity after storms and beach replenishment using sand from Narrabeen Lagoon entrance clearance operations, are also actions that will continue to be implemented to enhance beach amenity.

6.2 Actions to Manage Current and Projected Future Risks from Coastal Hazards

6.2.1 Existing development located adjacent to Collaroy-Narrabeen Beach and Fishermans Beach

The actions and controls outlined below are intended to apply to all new development on land adjacent to Collaroy-Narrabeen Beach and Fishermans Beach. Existing unmodified lawful development under the *Environmental Planning and Assessment Act 1979* and the *Coastal Protection Act 1979* is not controlled by the CZMP.

6.2.2 Erosion/Recession Hazards

Council seeks to allow private landowners to carry out new development on beachfront and near beachfront land where the risk of damage to development from coastal processes can be demonstrated to be acceptably low. This can be achieved through stipulating the following controls for new development.

- minimum setbacks
- piled foundations where required
- 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)

- sufficiently raised ground floor levels
- piling of access to new development where seaward of the minimum setback for development on conventional foundations.

To assist in understanding the impact of these controls to individual properties discussion of their application has been subdivided into the following areas:

- Area 1: Collaroy-Narrabeen Beach north of Devitt Street
- Area 2: Collaroy-Narrabeen Beach south of Devitt Street
- Area 3: Fishermans Beach.

Area 1: Collaroy-Narrabeen Beach north of Devitt Street

Protection works are not considered to be desirable or suitable in this area due to the largely natural frontal dune system, relative position of existing development to the erosion/recession risk and the potential impacts on neighbouring unprotected development. A minimum setback for development with upgraded/new protection works is accordingly not shown north of Devitt Street.

North of Devitt Street at Collaroy-Narrabeen Beach, minimum setbacks are adopted for:

- development on conventional foundations; and
- piled development.

The building setback for development on piled foundations is a fixed 15 metre rear (seaward boundary) setback to achieve a consistent seaward building alignment. This is considered necessary to minimise view loss for surrounding properties and visual impact of structures near the public beach.

The minimum setbacks for this area under the CZMP are shown in Figures 28 and 29.



Figure 28: Minimum setbacks at northern end of Narrabeen Beach



Figure 29: Minimum setbacks near Narrabeen Street to Albemarle Street at southern end of Narrabeen Beach

Area 2: Collaroy-Narrabeen Beach south of Devitt Street

South of Devitt Street at Collaroy-Narrabeen Beach, three minimum setbacks are adopted for:

- development on conventional foundations (without any upgraded/new protection works)
- piled development (without any upgraded/new protection works)
- piled development with upgraded/new protection works.

The building setback for development on piled foundations with new or upgraded coastal protection works (subject to the following variations) incorporates a fixed 15m rear (seaward boundary) setback to achieve a consistent and acceptable seaward building alignment.

Between Wetherill and Stuart streets a fixed 20m rear (seaward boundary) setback applies and between Stuart and Ramsay streets a fixed 10m rear (seaward boundary) setback applies.

These setbacks are considered necessary to prevent development moving so far seaward with construction of protection works so as to impact on:

- equity (for example, view loss for neighbours due to existing building lines)
- beach amenity (for example, visual impact of structures near the public beach)
- available space for construction of protection works on private land
- protection works maintenance (allowing space for plant and equipment to work seaward of development to undertake maintenance on the protection works if required).

The minimum setbacks under the CZMP for this area are shown in Figures 30 and 31.

The implementation of consistent and appropriate protection works on Collaroy-Narrabeen Beach is complex and will require co-ordination of the various property owners, consideration of funding and maintenance mechanisms, and detailed design guidance.

In recognition of this, one of the highest priority actions has been to develop specifications that will inform the application of the CZMP with respect to the assessment of coastal protection works. The specifications will be set out in the Northern Beaches Coastal Erosion Policy ("the Coastal Erosion Policy") The Coastal Erosion Policy and *Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications* will include design standards, alignments and required performance criteria. Additionally, the Coastal Erosion Policy will require that all future private protection works should be, whenever possible, contained on private property.

All works are to be a consistent design standard that provides an appropriate level of protection.

Area 3: Fishermans Beach

Protection works are not considered to be desirable or suitable in this area due to the absence of existing protection works, the role of geotechnical conditions in mitigating the erosion/recession risk and the potential impacts on neighbouring unprotected development.

At Fishermans Beach, a minimum setback will be adopted for development on conventional foundations

However at Fishermans Beach, development may be approved seaward of the "minimum setback for conventional foundations" where geotechnical/coastal engineering advice demonstrates to Council's satisfaction that the proposed structure is at acceptable risk over a 60 year design life having a particular regard to reduced erosion/recession risk from the presence of rock and/or stiff clays. This requires consideration that development seaward of this setback is piled.

The minimum setback under the CZMP for this area is shown in Figure 32.



Figure 30: Minimum setbacks from Stuart Street to Robertson Street at Collaroy-Narrabeen Beach



Figure 31: Minimum setbacks at southern end of Collaroy Beach



Figure 32: Minimum setback for development on conventional foundations at Fishermans Beach

The properties seaward of the minimum setback for development on conventional foundations at Fishermans Beach may potentially be impacted by coastal erosion and inundation at present or over the longer term. Development proposals for properties within this area must:

- be accompanied by geotechnical/coastal engineering advice demonstrating to Council's satisfaction that the proposed structure is at acceptable risk over a 60 year design life having a particular regard to reduced erosion/recession risk from the presence of rock and/or stiff clays. This requires consideration that development seaward of this setback is piled
- demonstrate, to Council's satisfaction, that the impacts on beach amenity and on view lines of nearby properties are acceptable

The minimum rear boundary setback for all properties at Fishermans Beach will be consistent with *Warringah Local Environment Plan 2011*.

6.2.3 Coastal Inundation Hazards

To manage the risk of coastal inundation, controls will be added into Council's development assessment process as appropriate. In developing these inundation controls, it should be recognised that inundation hazards can generally be managed through ensuring minimum structure floor levels and/or maintaining a difference in height between structure floor levels and surrounding land levels (say 0.5m), and/or by applying risk minimisation measures such as:

- i. using construction materials that would not be adversely damaged by inundation, such as concrete floors
- ii. placing electrical equipment, wiring, or any other service pipes and connections that could be damaged by water at a suitably high level
- iii. storing goods or materials that could potentially be water damaged or water polluting at a suitably high level
- iv. using impact resistant construction materials in areas that may be subject to direct wave action
- v. maintaining seawalls seaward of development at a suitably high crest level.

All development applications must include a risk assessment report from a qualified practicing coastal engineer to demonstrate that the proposed development is at an acceptable risk of damage from inundation over a 60 year design life unless the Council confirms that the nature and location of the development does not require such a report.

Additional investigation reports should be submitted assessing the risks and required controls in areas subject to both coastal inundation and catchment flooding, that may apply at the southern end of Collaroy-Narrabeen Beach. This includes areas at risk due to backwater from the ocean impacting the stormwater system, exacerbated due to sea level rise.

6.2.4 Requirements for upgrading or constructing new protection works

The only location where coastal protection works by property owners are considered to be generally suitable (provided they manage any offsite impacts and subject to the requirements of the *Environmental Planning and Assessment Act 1979*), is south of Devitt Street at Collaroy-Narrabeen Beach (Area 2). Protection works at other locations are not desirable or suitable.

Property owners are responsible for protecting their property from coastal erosion and inundation hazards.

Maintenance of any upgraded/new protection works is the responsibility of the owner of the property that is protected by the protection works

To assist in mitigating any impacts of landowner protection works on public beach amenity any upgraded/new works should be built entirely on private property unless it can be demonstrated that this is not appropriate due to site constraints, adverse impact on adjoining private and public properties, or adverse impact on the long-term amenity of the beach and surf zone.

Landowner's Consent from the Department of Primary Industries (Lands) (the Department) will be required for any private protection works that extend onto or under Crown land. The Department has

indicated that private protection works on or under Crown Land will only be granted Landowners consent by the Department where:

- i. Crown Land is being retained and managed in the public interest
- ii. Detailed designs for any planned structures have been provided and assessed as being compatible with the designated Crown reserve purpose
- iii. Works result in a better outcome in terms of public safety, environmental outcomes, beach access and recreational amenity
- iv. Satisfactory arrangements are in place for maintenance over the life of any constructed assets
- v. Evidence can be provided that all other reasonable opportunities to contain protection works on private land have been explored and exhausted.

Consultation with the Department is encouraged prior to the lodgement of any development application which proposes the erection of private protection works on Crown Land. Council will not approve any development application which proposes the erection of private protection works on Crown Land unless the development application is supported by:

- i) Written confirmation from the Department that the proposed coastal protection works meet the criteria set out in points (i) to (v) above
- ii) Landowners consent from the Department

It is noted that landowners may be able to construct specific “temporary coastal protection works” in accordance with Part 4C of the *Coastal Protection Act 1979* to attempt to reduce coastal erosion threats.

6.2.5 Development Applications

In determining a development application for development that requires consent under the *Environmental Planning and Assessment Act 1979*, the Council, as the consent authority, must take into consideration the provisions of the CZMP that are of relevance to that development.

Table 2 outlines the area specific setback requirements under the CZMP referred to in Section 6.2.2 that should be specifically addressed for development of properties adjacent to Collaroy-Narrabeen Beach and Fishermans Beach in the assessment of a development application.

In addition, the development application and its assessment should also address any other relevant CZMP provisions.

Table 2: Area specific setback requirements

Interpretation - Applies to Requirements for Areas 1, 2 and 3	
For the purposes of these provisions a reference to <i>protection</i> works means seawalls or revetments or works of a similar nature. It does not include the placement of sand (including for beach nourishment) or sandbags and sand filled geotextile containers.	
A reference to conventional foundations means strip footings and slabs. In common building standards the bearing capacity of such footings has been determined generally for the case of a horizontal bed.	
A reference to piled foundations means development founded on piles in such a way that the load is transmitted to strata below any possible failure zone or zone of reduced foundation capacity within the dune.	
General Requirements for Areas 1, 2 and 3	
1.	Minimum set back lines identified for Areas 1, 2 and 3, apply to all new development except development that is protection works.

2. A risk assessment report must be prepared by a qualified practising coastal engineer and submitted to Council with the development application except where Council has confirmed in writing that the nature and location of the development does not require such a report.
3. For development on conventional foundations, all parts of the development must be located landward of the 'Setback line for development on conventional foundations'.
4. Should the location of access to new development on conventional foundations be required to be located seaward of the 'Setback line for development on conventional foundations', such access must be constructed on piled foundations.

Requirements for Area 1 - Collaroy – Narrabeen Beach north of Devitt Street

5. Protection works are not considered to be desirable or suitable in this area due to the largely natural frontal dune system, relative position of existing development to the erosion/recession risk and the potential impacts on neighbouring unprotected development..
6. Minimum setback lines for development in this area are shown in Figures 28 and 29 as follows:
 - a) Setback line for development on conventional foundations - the location of this setback line has been set in order to manage risks from coastal hazards.
 - b) Setback line for development on piled foundations - the location of this setback line has been set in order to manage risks from coastal hazards and in order to manage impacts of development on the visual amenity and the maintenance of views for users of the public beach and for occupants of properties adjoining the beach. This setback line is located parallel to and 15 metres landward of the seaward property boundary.
7. Development that is on conventional foundations must not be located seaward of the 'Setback line for development on conventional foundations'.
8. Development that is on piled foundations must not be located seaward of the 'Setback line for development on piled foundations'.
9. Exception may be made for new development at No. 2 Loftus Street, 2 Wellington Street, 9 Albert Street and 81 Ocean Street provided that:
 - the development is piled development, and
 - it can be demonstrated, to Council's satisfaction, that the impacts associated with view loss and visual impact are acceptable.

Requirements for Area 2 - Collaroy – Narrabeen Beach south of Devitt Street

10. Minimum setback lines for development in this area are shown in Figures 30 and 31 as follows:
 - a) Setback line for development on conventional foundations (without any upgraded/new protection works) - the location of this setback line has been set in order to manage risks from coastal hazards.
 - b) Setback line for development on piled foundations (without any upgraded/new protection works) - the location of this setback line has been set to manage risks from coastal hazards.
 - c) Setback line for piled development (with upgraded/new protection works) - the location of this setback line has been set in order to manage risks from coastal hazards and in order to manage impacts of development on the visual amenity and the maintenance of views for users of the public beach and for occupants of properties adjoining the beach. It also recognises the need to allow sufficient site area for the construction and future maintenance of protection works within the site.
11. Development that is on conventional foundations must not be located seaward of the 'Setback line for development on conventional foundations'.
12. Development that is on piled foundations must not be located seaward of the 'Setback line for development on piled foundations' unless the development includes upgraded/new protection works.
13. Development that includes upgraded/new protection works must not be located seaward of the 'Setback line for development (with upgraded/new protection works)'.
14. Exception may be made for new development at the Collaroy Services Beach Club site provided that:

- the development is piled, and
- the development is located within the footprint of the existing building, and
- the development includes upgraded/ new protection works, and
- it can be demonstrated, to Council's satisfaction, that the impacts associated with visual amenity for the public beach reserve is acceptable, and
- the development application is accompanied by geotechnical/coastal engineering advice that demonstrates that the proposed structure is at acceptable risk over a 60 year design life.

Requirements for Area 3 - Fishermans Beach

15. Protection works are not considered to be desirable or suitable in this area due to the absence of existing protection works, the role of geotechnical conditions in mitigating the erosion/recession risk and the potential impacts on neighbouring unprotected development.
16. A Minimum setback line for development in this area is shown in Figure 32 as follows:
 - a) Setback line for development on conventional foundations - the location of this setback line has been set in order to manage risks from coastal hazards.
17. All development must be located landward of the setback line identified in Figure 32 unless:
 - development would not be feasible otherwise, and
 - it is demonstrated, to Council's satisfaction, that the impacts on beach amenity and on view lines of nearby properties are acceptable, and
 - the development application is accompanied by geotechnical/coastal engineering advice demonstrating to Council's satisfaction that the proposed structure is at acceptable risk over a 60 year design life having a particular regard to reduced erosion/recession risk from the presence of rock and/or stiff clays. This requires consideration that development seaward of this setback is piled.

6.2.6 Proposed changes to Warringah Local Environment Plan 2011 and Development Control Plan

Implementation of the area specific setback requirements outlined in section 6.1.6 and other standards or controls in the CZMP will require amendments to Warringah Local Environment Plan 2011 (WLEP 2011) and Development Control Plan 2011 (WDCP 2011). To address this, Section 8 of the CZMP identifies the modification of WLEP 2011 and DCP 2011 as a high priority action for the Council to undertake once the CZMP is adopted. Specific actions include:

- liaise with NSW Department of Planning and Environment to create a local planning clause to enable modification of WLEP 2011 (to ensure new CZMP setbacks and other appropriate controls are stipulated in WLEP 2011)
- modify Section E9 of WDCP 2011.

6.2.7 Planning certificates under Section 149 of the *Environmental Planning and Assessment Act 1979*

On the commencement of the CZMP, Council will issue certificates stipulated under Section 149(2) of the *Environmental Planning and Assessment Act 1979* for land in the coastal zone specifying whether or not the land is affected by the provisions of the CZMP adopted by the Council as a policy that restricts development because of the likelihood of risks arising from coastal hazards (Paragraph 7 of Schedule 4 of the regulations).

A high priority action has also been included in Table 2 of Section 8 to update the information required for a Section 149(2) certificate (Action H2) to reflect modifications of Warringah Local Environmental

Plan 2011 and Warringah Development Control Plan 2011 made after the commencement of the CZMP (Action H1).

6.3 Actions to Ensure Continuing and Undiminished Public Access to Beaches, Headlands and Waterways

At present, no significant issues or impacts to access are expected, beyond risks to public safety following a coastal storm. As noted in Section 5.1 risks to public safety may arise after storms when there may be steep and high erosion escarpments along the beach, and particularly at beach accessways which may make beach access difficult. Actions to address these risks and associated impacts to access include mechanically regrading steep and high erosion escarpments when required and ensuring sufficient warning signage and barricades are available following erosion.

In response to long term recession resulting from sea level rise and any long term recession due to net sediment loss, undertaking beach nourishment would be expected to reduce the frequency that existing protection works were exposed and reduce the likelihood of steep escarpments forming within beach accessways, thus reducing the potential for restricted beach access. Actions to investigate the required sand volumes, appropriate sand sources, extraction methods and funding mechanisms for this action are identified in Section 8.

6.4 Actions to Protect or Promote the Culture and Heritage Environment

With regard to cultural and heritage significance at Collaroy-Narrabeen Beach and Fishermans Beach:

- there are no known Aboriginal objects or Aboriginal Places that need to be protected from coastline hazards
- the beach culture is expected to be maintained if beach nourishment and a review of the opportunities to redistribute sand from the Narrabeen Lagoon entrance clearance works are undertaken
- the heritage items at most potential risk are 1184-1186 Pittwater Road Narrabeen, Arlington Amusement Hall and Long Reef Fishing Club Hut.

The first two locations identified in the third dot point are private property and the responsibility of landowners to maintain (within the constraints of heritage listing). The allowance of upgraded/new protection works south of Devitt Street at Collaroy-Narrabeen Beach, promotes protection of these heritage items.

7. COMMUNITY AND STAKEHOLDER CONSULTATION

7.1 Requirements from Guidelines for Preparing CZMPs

CZMPs are to be prepared using a process that includes consulting with the local community and other relevant stakeholders. The community consultation in preparing the CZMP was undertaken in accordance with the Guidelines as per Sections 55E and 55F of the *Coastal Protection Act 1979*.

This included meeting the requirements that CZMPs are to be prepared using a process that involves:

- consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper (section 55E of the *Coastal Protection Act 1979*)
- considering all submissions made during the consultation period. The draft plan may be amended as a result of these submissions (section 55F of the *Coastal Protection Act 1979*).

The draft CZMP was placed on public exhibition from 14 July 2014 to 15 August 2014 (33 days) with Council accepting submissions up to 1 September 2014. Notification of the public exhibition occurred in the *Manly Daily* on three consecutive Saturdays during the exhibition period.

Table 3 and Appendix Q summarises the issues raised during consultation on the draft CZMP and the resulting amendments to the final CZMP.

Councils are also required to comply with NSW Coastal Management Principle 3 of the *NSW Coastal Policy 1997* and involve the community in decision-making and make coastal information publicly available.

This has been achieved by Council over a number of years through the community consultation activities associated with previous studies on the impacts of coastal processes on Collaroy-Narrabeen Beach and Fishermans Beach. This included extensive engagement in 2011 during development of the *Coastal Erosion Emergency Action Subplan for Beaches in Warringah*. As a result a good understanding of coastal processes and impacts to the beach and development already exists amongst beach users, property owners and other stakeholders.

As a result of the June 2016 storm event, it was clear that properties along Collaroy-Narrabeen beach were under more imminent threat than contemplated during the preparation of the 2014 CZMP. This imminent threat meant that protection works were now likely to have to extend onto public land in order to provide timely protection for property owners. In response, Council revised the CZMP to enable works to be undertaken on public land in certain circumstances and prepared a supporting Council Erosion Policy. The policy and proposed change to allow works on public land were presented to Council. Details of these activities and the community response are provided in Sections 7.2 and 7.3.

7.2 Consultation Activities

Consultation has been undertaken throughout the development of the CZMP with a number of key stakeholder and community groups, which have included:

- NSW Office of Environment and Heritage
- Beachfront landowners
- Surfing groups (including Surfrider Foundation Northern Beaches and North Narrabeen Boardriders Club)
- Surf Life Saving Clubs

- General public (through Public Meetings and a Discussion Paper)
- Mayor and Councillors
- Council Strategic Reference Groups, including the Environmental Conservation and Overall Sustainability Strategic Reference Group (ECOS SRG) and its precursor the Environmental Sustainability SRG
- Coastal Community Committee
- Council staff from various units

Consultation activities undertaken with the above stakeholders included meetings, workshops, presentations and forums.

In the preparation of the draft CZMP, a Discussion Paper covering the key issues for the area was released for comment in March 2013 and used as an important community engagement and consultation tool. Distribution of the Discussion Paper was accompanied by meetings with key stakeholder groups (including beachfront landowners, Surf Life Saving Clubs and surfing groups), a community forum and acceptance of written submissions on the coastal management matters relevant to Collaroy-Narrabeen Beach and Fishermans Beach.

During public exhibition of the draft CZMP the community were invited to participate in its review through:

- A letter and summary document being sent to over 800 home owners and residents adjacent or near to Collaroy-Narrabeen Beach and Fishermans Beach, inviting them to comment on the draft CZMP and outlining opportunities to meet with Council
- Advertising the public exhibition of the draft CZMP in the the Manly Daily on 12, 19, and 26 July
- Posting the draft CZMP and supporting documents on Your Say. Community members on the Council Community engagement and Your Say lists being informed by email that the draft CZMP was on public exhibition. These emails were sent to over 5000 Council residents on the 18 July and 18 August
- During the public exhibition period the Your Say page was viewed over 450 times with the document downloaded over 100 times
- Displays in the Customer Service foyer of the Civic Centre, and all Council libraries
- Meetings with Council community representatives including the Council Coastal Committee (21 July) and ECOS SRG (18 August)
- Three forums specifically for beachfront landowners and residents. Through these meetings over 70 residents or property owners spoke directly with Council staff
- A meeting with representatives from user groups including the North Narrabeen Coalition, Surfrider Foundation Northern Beaches, Surf Lifesaving Northern Beaches and the four surf clubs. These groups advocate for the thousands of people who visit and enjoy Collaroy-Narrabeen Beach and Fishermans Beach annually
- Public information one-on-one sessions offered to all community members to discuss specific aspects of the draft CZMP with Council staff. 15 residents participated in these sessions, often raising issues related to specific properties adjacent to Collaroy-Narrabeen Beach and Fishermans Beach.

Following the June 2016 Storm the following consultation activities were undertaken on the draft Coastal Erosion Policy and revised the CZMP. The community were invited to participate in this review through a number of different ways:

- Letters were sent to over 700 home owners and residents adjacent or near to Collaroy-Narrabeen Beach and Fishermans Beach, inviting them to comment on the draft Policy and outlining opportunities to meet with Council
- Advertising the public exhibition of the draft Policy in the Northern Beaches section of the Manly Daily on 16, 23 and 30 July
- Posting the draft Policy and supporting documents on Your Say Northern Beaches webpage. Community members on the Northern Beaches Council Community engagement register were informed by email that the draft Policy was on public exhibition. These emails were sent to over 5000 Northern Beaches Council residents on the 22 July and 16 August
- During the public exhibition period the Your Say Northern Beaches page was viewed over 1000 times with the draft Policy and related documents downloaded over 310 times
- Displays in all of the Customer Service foyers and at all Council libraries
- Notifications signage at 24 locations at public beaches and Reserves at Collaroy-Narrabeen Beach
- Three forums specifically for beachfront landowners and residents. Through these meetings over 143 residents and property owners spoke directly with Council staff
- A meeting with representatives from user groups including the North Narrabeen Coalition, Surfrider Foundation Northern Beaches, Surf Lifesaving Northern Beaches and the four surf clubs. These groups advocate for the thousands of people who visit and enjoy Collaroy-Narrabeen Beach and Fishermans Beach annually
- Public information drop-in sessions were offered to all community members to discuss specific aspects of the draft Policy with Council staff. More than 110 Northern Beaches residents participated in these sessions. The key issues raised at these sessions related to minimising the public costs associated with protection works, ensuring safe access and use of the beach is reinstated for the summer and for the longer term. The majority of community members were residents of the Northern Beaches but not necessarily of Collaroy-Narrabeen Beach.

7.3 Draft CZMP Submissions

Following public exhibition of the draft CZMP, 26 submissions were received from property owners adjacent to Collaroy-Narrabeen Beach and Fishermans Beach, organisations representing beach users as well as community members from within and outside the Local Government Area.

While some points of contention and clarification were raised in some submissions, overall draft CZMP was considered to be balanced and fair by the majority of people who provided comment. Consistent comments of support for the content and direction of the draft CZMP were provided for following key areas:

- the management objectives
- the proposed actions to maintain and increase beach amenity
- the requirement for coastal protection works south of Devitt Street at Collaroy-Narrabeen Beach
- the proposed management actions.

Based on the comments received on the draft CZMP during public exhibition some amendments have been made. This is consistent with the Guidelines for preparing CZMPs and reflects Council's commitment to incorporate the views of key stakeholders into the final CZMP.

The amendments made do not change the intent or direction of the CZMP. In most cases they clarify Council's position on issues related to beach amenity, management of existing protection works and the level of protection afforded to public assets from coastal hazards.

At Fishermans Beach the amendments made to minimum setback lines for development did require amendment to Figure 32 and the discussion on development requirements. However, these changes do not alter the type or location of development proposed in the draft CZMP.

Two additional actions have been added to the CZMP relating to assisting residents with dune management activities in front of their properties and minimising the impacts of stormwater on both Collaroy-Narrabeen Beach and Fishermans Beach. Both of these actions have been incorporated into the preparation of broader strategies or management plans that Council has already committed to preparing such as the development of a Dune Management Plan for all beaches or the Stormwater Asset Management Plan.

Following public exhibition of the draft Policy and revised CZMP in 2016, 97 written submissions were received representing 253 beach front property owners, organisations representing beach users as well as community members from within and outside the Northern Beaches Local Government Area. There was general support for the proposed amendments. The only request for revision of the amendments came from the Department of Primary Industries (Lands) who requested criteria for Landowners consent be clarified.

Issues raised during public exhibition and how they have been addressed in the final CZMP are outlined in the Table 3.

Table 3: Issues raised during public exhibition of draft CZMP and how they have been addressed in the final.

Topic	Community response	Amendment to final CZMP
Management Objectives for Collaroy-Narrabeen Beach and Fishermans Beach	<p>There was general agreement with the intent of the management objectives outlined in the draft CZMP. Residents and user groups requested the following issues be considered:</p> <ul style="list-style-type: none"> the final CZMP articulate how the objective of seeking to maintain beach amenity into the future would be achieved in response to ongoing development and climate change the objectives in the final CZMP reflect the importance of surf break quality, particularly at North Narrabeen the impact of the objective relating to management of public assets on private property be clarified. 	<p>In response to the issues raised:</p> <ul style="list-style-type: none"> actions including beach nourishment, planning controls that require maintenance of beach amenity and the incorporation of sea level rise scenarios into minimum development setbacks for future development are identified in both the draft and final CZMP and are intended to maintain beach amenity into the future. surf quality has been included in an objective of the final CZMP Council will resolve the interaction between public land and coastal protection works on private property in the specifications for new or upgraded coastal protection works. Council will not undertake actions that compromise the ability of private property owners to protect their property.
Protection of beach amenity	<p>There was consistent support for actions to maintain beach amenity across all submissions and feedback received.</p>	<p>The actions to ensure beach amenity is maintained into the future remain unchanged from the draft to the final CZMP.</p>
Dune management and maintenance	<p>A number of issues were raised by beach user groups in relation to the dune management activities outlined in the draft CZMP these included:</p> <ul style="list-style-type: none"> groups including the North Narrabeen Coalition and Surf rider Foundation Northern Beaches noted their opposition to the North Narrabeen Beach Reserve and Birdwood Park Masterplan objection to the Birdwood Park Dune being managed to a minimum height of 7m AHD the removal of <i>Acacia longifolia</i> subspecies <i>Sophorae</i> along Collaroy-Narrabeen Beach due to its impacts on sightlines and retention of sand within dunes. <p>Additionally, a number of property owners requested that opportunities for residents to assist with dune management seaward of their properties be included in the final CZMP</p>	<p>In response to the issues raised:</p> <ul style="list-style-type: none"> Council will review management of the Birdwood Park dune and opportunities to redistribute sand during planning for the Narrabeen Lagoon entrance clearance works planned for 2016. However dune heights cannot be modified in ways that create an increased risk to public and private assets. an action to identify appropriate species for replacement/ replenishment is identified in action M2 in Table 4 an action to identify opportunities for residents to assist with dune management in front of their properties has been incorporated into action M2 in Table 4

Requirements for new or upgraded protection works	Amongst both property owners and representatives of peak beach user groups the requirement for new or upgraded protection works south of Devitt Street was recognised and the direction provided within the CZMP appreciated. None of the participants at the forums or one-on-one sessions raised an objection to the requirement. Opposition to this requirement was raised in 3 of the 26 written submissions received.	Due to the broad support for this aspect of the draft CZMP during public exhibition it has remained unchanged.
Property owners being responsible for protection of their own properties	The action to develop specifications for new or upgraded protection works was supported. Residents requested the specifications consider the coordination of building new works and that residents be consulted during their development. One submission from a property owner raised an objection to property owners being responsible for the cost of protecting their properties.	The requirement for property owners to be responsible for protection of their own properties has been retained in the final CZMP. Issues such as coordinating construction of protection works, tools to assist the collection of funds and long term maintenance will be addressed in the specifications. Additionally, residents will be consulted in the development of the specifications.
Removal of existing protection works from public land	The statement that “ <i>existing protection works on public land be removed where appropriate</i> ” (pg 56) within the draft CZMP created some confusion during public exhibition with a number of submissions assuming this action would be undertaken by property owners at their expense.	To clarify this issue the text within the final CZMP has been amended to “ <i>opportunities and the actions required for the removal of existing protective works on public land will be investigated within the specifications</i> ” on page 56.
Inclusion of Fishermans Beach within the CZMP	All submissions from Fishermans Beach residents objected to Fishermans Beach being included within the same CZMP as Collaroy-Narrabeen Beach. The primary reason for this was the belief that Fishermans Beach was being considered to have the same erosion and storm damage issues as Collaroy-Narrabeen Beach.	Fishermans Beach has been retained in the final CZMP. The final CZMP has been amended to highlight the different history of storm damage at Fishermans and the different coastal hazard parameters, including storm demand and wave runup, applied at Fishermans Beach compared to Collaroy-Narrabeen Beach.
Identification of minimum setbacks and planning controls at Fishermans Beach	Fishermans Beach residents objected to application of the following minimum setbacks within the draft CZMP: <ul style="list-style-type: none"> • 15m setback for amenity • Piled development setback The submission submitted on behalf of Fishermans Beach residents requested both these lines be removed with future development seaward of the setback for conventional foundations be considered on its merits.	Figure 32 (pg 60) in the final CZMP has been amended with the setback lines for 15m and piled development removed. Future development proposals for properties within this area must: <ul style="list-style-type: none"> • be accompanied by geotechnical/coastal engineering advice demonstrating to Councils satisfaction that the proposed structure is at acceptable risk over a 60 year design life having a particular regard to reduced erosion/recession risk from the presence of rock and/or stiff clays. This requires consideration that development seaward of the setback is piled. • demonstrate to Council's satisfaction, that the impacts on beach amenity and on view lines of nearby properties are acceptable. • The minimum rear boundary setback for all properties at Fishermans

		Beach will be consistent with the setback prescribed in Warringah Local Environment Plan 2011.
Management of public assets	Both property owners and beach users noted their desire that the impact of stormwater on Collaroy-Narrabeen Beach and Fishermans Beach be minimised. Specific sites noted included the stormwater outlets at Fishermans Beach and the end of Ramsay Street.	<p>There are a number of stormwater issues throughout the Northern Beaches and matters relating to risk to life or substantial damage to dwellings are prioritised through Council's stormwater management program over those that result in nuisance flooding or minor environmental impact.</p> <p>Actions identified in the CZMP to reduce the impact of stormwater on Collaroy-Narrabeen Beach and Fishermans Beach will be incorporated into Council's Stormwater Asset Management Plan (Action H7 in Table 3).</p>
Emergency Management Activities	While not directly covered in the draft CZMP, a number of residents requested information on who to contact during a coastal storm and sought clarification on the role of Council and State Government agencies including the State Emergency Service and the Office of Environment and Heritage.	<p>As noted in the draft and final CZMP a Coastal Erosion Emergency Action Subplan for Beaches in Warringah was adopted by Council in 2012. Due to NSW Government legislative changes, some parts of this document are out of date, and a CZMP action that this document is updated has been included in Section 8.</p> <p>Additionally, Council is working with the NSW SES on the Northern Beaches Flood and Coastal Storms Education Strategy. Information about this project will be disseminated to residents adjacent to Collaroy-Narrabeen Beach and Fishermans Beach.</p>
Proposed amendments 2016	<p>Overall broad support. Some respondents noted opposition to amendments to CZMP that allowed protection to extend onto public land.</p> <p>Consultation with the Department of Primary Industries (Lands) confirmed that Landowner's Consent from the Department of Primary Industries (Lands) will be required for any private protection works that extend onto Crown Land. The Department has indicated that private protection works on public land will only be granted Landowners consent by the Department where:</p> <ul style="list-style-type: none"> i. Crown land is being retained and managed in the public interest ii. Detailed designs for any planned structures have been provided and assessed as being compatible with the designated Crown reserve purpose iii. Works result in a better outcome in terms of public safety, environmental outcomes, beach access and recreational amenity 	<p>Proposed amendments modified to reflect requirement for land owners consent.</p> <p>Landowner's Consent from the Department of Primary Industries (Lands) will be required for any private protection works that extend onto Crown Land. The Department has indicated that private protection works on public land will only be granted Landowners consent by the Department where:</p> <ul style="list-style-type: none"> i. Crown land is being retained and managed in the public interest ii. Detailed designs for any planned structures have been provided and assessed as being compatible with the designated Crown reserve purpose iii. Works result in a better outcome in terms of public safety, environmental outcomes, beach access and recreational amenity iv. Satisfactory arrangements are in place for maintenance over the

	<p>iv. Satisfactory arrangements are in place for maintenance over the life of any constructed assets</p> <p>v. Evidence can be provided that all other reasonable opportunities to contain protection works on private land have been explored and exhausted</p> <p>Consultation with the Department is encouraged prior to the lodgement of any development application which proposes the erection of private protection works on Crown Land. Council will not approve any development application which proposes the erection of private protection works on Crown Land unless the development application is supported by:</p> <p>i. Written confirmation from the Department that the proposed coastal protection works meet the criteria set out in points (i) to (v) above</p> <p>ii. Landowners consent from the Department</p>	<p>life of any constructed assets</p> <p>v. Evidence can be provided that all other reasonable opportunities to contain protection works on private land have been explored and exhausted</p> <p>Consultation with the Department is encouraged prior to the lodgement of any development application which proposes the erection of private protection works on Crown Land. Council will not approve any development application which proposes the erection of private protection works on Crown Land unless the development application is supported by:</p> <p>i. Written confirmation from the Department that the proposed coastal protection works meet the criteria set out in points (i) to (v) above</p> <p>ii. Landowners consent from the Department</p>
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8. MANAGEMENT ACTIONS

The recommended management actions identified in Section 6 have been prioritised as follows:

- high (H) priority, see Table 4
- medium (M) priority, see Table 5
- low (L) priority, see Table 6
- ongoing (O) actions (actions that should be undertaken on a regular cycle), see Table 7
- as required (AR) actions (actions that should be undertaken if an event occurs such as severe coastal erosion), see Table 8.

8.1 Sources of Funding for CZMP Actions

A number of Federal Government, NSW Government and Council funding mechanisms are potentially available for both implementing actions outlined in the CZMP and assisting recovery following storm events, see Appendix O. Funding programs are regularly changing and Council will maintain an awareness of appropriate funding opportunities as they arise.

It is proposed that actions identified in the CZMP be funded with assistance from the NSW Coastal Management Program or through application of the Coastal Protection Service Charge set out in Section 496B of the *Local Government Act 1993*.

Actions that may be particularly suitable for NSW Coastal Management Program funding (if application for funding is successful) would include updating or preparing the relevant plans, policies and controls (H1 to H4), further investigation into the extent and management of coastal processes and the maintenance of the beach environment (M1, M2 and L1), and ongoing programs to inform and educate residents (O3 and O4).

The Coastal Protection Service Charge may be utilised in the maintenance and repair of coastal protection works as well as mitigating any impacts (such as replacement of eroded beach sand) of coastal protection works (H6).

The action to undertake beach nourishment to maintain beach amenity (M4) is beyond the financial capacity of Council. Narrabeen Lagoon Entrance Clearance operations have been previously undertaken with funding support from the NSW Floodplain Management Program and Pittwater Council.

A number of actions, such as modifying the Local Environment Plan and Development Control Plan (H1), advocating for and undertaking beach nourishment to maintain beach amenity (M7, L2), and the management of aquatic reserves (R7) involve State Government Agencies. As the role of these agencies in such actions is procedural their written confirmation is not required.

8.2 Implementation, Monitoring and Reporting

The section of Council responsible for coordinating implementation of the CZMP will be Council's Natural Environment and Climate Change Group. Responsibility for monitoring and reviewing implementation of the CZMP will also rest with this Group.

Progress in implementation of the CZMP will be reported on an annual basis (Action O2 in Table 5). This will involve listing all CZMP actions and advising progress on each action. It is also an action (Action O8 in Table 5) to update the CZMP every 10 years (to take account of new data, updated coastline hazards understanding, revised climate change information and changes to legislation).

Table 4: High priority management actions

Action	Description	Issues addressed	Timeframe for completion
H1. Modify Warringah Council Local Environment Plan (LEP) and Development Control Plan (DCP)	<p>Warringah Local Environment Plan 2011</p> <ul style="list-style-type: none"> liaise with NSW Department of Planning and Environment to create a Local planning clause to enable modification of Warringah LEP (to ensure new CZMP setbacks and other appropriate controls are stipulated in LEP) <p>Warringah Development Control Plan 2011</p> <ul style="list-style-type: none"> modify Section E9 of Warringah DCP 	Risk to private development	January 2017 to December 2017
H2. Update Section 149(2) certificates	<ul style="list-style-type: none"> update to reflect modification of planning instruments and properties affected 	Risk to private development	January 2017 to July 2017
H3. Develop policy for development in areas impacted by coastal hazards	<p>Policy to include (but not limited to):</p> <ul style="list-style-type: none"> specification for new and upgraded protection works south of Devitt Street at Collaroy-Narrabeen Beach (such as design standard, alignment and minimum performance criteria for development located landward) and integrate into planning controls preparation of an impact assessment of proposed design and alignment for coastal protection works preparation of a Benefit Distribution Analysis of the proposed coastal protection works 	Risk to private development	July 2016 to December 2016
H4. Clarify permissibility of exempt development in areas impacted by coastal processes	<ul style="list-style-type: none"> liaise with the NSW Department of Planning and Environment to resolve issues associated with exempt development being permissible in areas impacted by coastal processes as a result of <i>State Environmental Planning Policy (Exempt and Complying Development Codes) 2008</i> 	Risk to private development	January 2017 to December 2017
H5. Funding to restore beach amenity	<ul style="list-style-type: none"> investigate funding mechanisms to contribute to restoration of beach amenity adjacent to protection works after storms 	Beach amenity	January 2017 to December 2017
H6. Integrate the management of assets impacted by coastal processes into Council's Assets Management Planning Framework	<ul style="list-style-type: none"> management actions required for assets impacted by coastal processes integrated into the appropriate asset management plans for buildings, roads, stormwater and natural area assets identify and prioritise works to minimise the impacts of stormwater on beaches within the Stormwater Asset Management Plan 	Risk to public infrastructure	January 2017 to December 2017
H7. Community consultation	<ul style="list-style-type: none"> develop and deliver actions to communicate CZMP outcomes 	Community consultation	January 2017 to July 2017

Table 5: Medium priority management actions

Action	Description	Issues addressed	Timeframe for completion
M1. Assess Management of Birdwood Park and Narrabeen Lagoon Entrance	<ul style="list-style-type: none"> investigate opportunities to combine any dune lowering works at North Narrabeen SLSC and Birdwood Park (undertaken in accordance with the adopted Masterplan, and ensuring impacts on coastline hazards are considered) with Narrabeen Lagoon Entrance Clearance operations. investigate alternative strategies for placing sand from Narrabeen Lagoon Entrance onto Collaroy-Narrabeen Beach. 	<p>Risk to private development</p> <p>Risk to public infrastructure</p>	July 2016 to December 2017
M2. Develop Dune Management Plan for all beaches	<p>Plan to include:</p> <ul style="list-style-type: none"> ongoing management actions including weed control and replacement/replenishment planting, monitoring and maintenance of vegetation structure and species diversity for small bird habitat as well as maintenance of sight lines to assist Councils lifeguards and Surf Life Savers actions to manage threatened species including known populations of Sand spurge stabilise blow-outs with dune vegetation (in particular north of Waterloo Street; north of Wellington Street; south of Albemarle Street and at Birdwood Park) increase the coverage of dune vegetation along Fishermans Beach where possible identify activities to assist residents with dune management activities 	Coastal ecosystems	July 2017 to July 2018
M3. Liaise with asset authorities	<ul style="list-style-type: none"> encourage Sydney Water to undertake further investigations to assess the risk to sewerage infrastructure from coastal erosion encourage other asset authorities to accurately define plan location and elevation of other assets (electricity, water, communication, gas) so risk of damage can be assessed provide advice to assist and encourage asset authorities to consider either protection or relocation of these assets, particularly as long term hazards are realised 	Risk to public infrastructure	July 2017 to July 2018

Table 6: Low priority management actions

Action	Description	Issues addressed	Timeframe for completion
L1. Work with other Councils and organisations working on sand sources for beach nourishment	<ul style="list-style-type: none"> liaise with and lobby NSW Government to modify <i>Offshore Minerals Act 1999</i> and secure funding to undertake beach nourishment to maintain beach amenity in future (and investigate other funding sources) liaise with other coastal Councils to ensure coordination and prevent duplication of effort 	Beach amenity	July 2016 to July 2017, and ongoing

L2. Beach nourishment to maintain beach amenity*	<ul style="list-style-type: none"> • undertake investigations to define sand source, extraction method and beach nourishment profile and volumes • complete environmental assessment • secure all necessary approvals and permits • engage dredging contractor to undertake beach nourishment works • all of the above tasks are likely to be undertaken in conjunction with the NSW Government and other Sydney Coastal Councils 	Beach amenity	The timeframe for the completion of this action depends on the outcomes of L2.
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*Council recognises the importance of beach nourishment to protect beach amenity. This action has been given a low priority as it not expected to be required within the next 20 years. The priority of this action will be re-assessed as new information and opportunities for beach nourishment arise.

Table 7: Ongoing management actions

Action	Description	Issues addressed	Frequency
O1. Monitoring beach conditions and forecasts	<ul style="list-style-type: none"> in partnership with research organisations maintain activities to monitor beach conditions and forecasts for storms 	Risk to private development Risk to public infrastructure Public safety Beach amenity	Daily to weekly
O2. Reporting on CZMP progress	<ul style="list-style-type: none"> Through reporting on the delivery of the Council Community Strategic Plan report on progress in implementation of CZMP 	Overall CZMP implementation	Every year
O3. Community consultation	<ul style="list-style-type: none"> develop and deliver actions to communicate CZMP outcomes to beachfront landowners and the wider community 	Community consultation	Every Year
O4. Education of residents	<ul style="list-style-type: none"> ongoing education of residents on coastal hazards, risk to development, risk to public safety and other relevant issues 	Risk to private development Public safety	Every 1 to 2 years
O5. Deliver Northern Beaches Flood and Coastal Storms Education Strategy	<ul style="list-style-type: none"> in coordination with the State Emergency Service deliver actions identified in the Northern Beaches Flood and Coastal Storms Education Strategy to keep affected communities informed before and during a coastal erosion emergency 	Public safety	Every 1 to 2 years
O6. Beach scraping consents, approvals, licences and permits	<ul style="list-style-type: none"> ensure that any necessary consents, approvals, licences and permits are maintained for beach scraping works 	Public safety Beach amenity	Every 1 to 2 years
O7. Narrabeen Lagoon entrance clearance	<ul style="list-style-type: none"> remove sand from entrance and place on Collaroy-Narrabeen Beach as "beach sediment recycling" 	Risk to private development Risk to public infrastructure Public safety Coastal ecosystems Beach amenity	Every 4 to 5 years
O8. Update CZMP**	<ul style="list-style-type: none"> update CZMP to take account of new data, updated coastline hazards understanding, revised climate change information, changes to legislation, etc. 	Overall CZMP implementation	Every 10 years

**This action may be necessary earlier if there are significant legislative changes

Table 8: As required management actions

Action	Description	Issues addressed
AR1. Implement actions identified in <i>Coastal Erosion Emergency Action Subplan for Beaches in Warringah</i> relating to public safety	including: <ul style="list-style-type: none"> ensure sufficient warning signage and barricades are available for use implement signage and barricades as required to close off damaged and potentially dangerous public beach access points after storm erosion 	Public safety
AR2. Monitoring and reporting on storm conditions	<ul style="list-style-type: none"> monitor beach erosion and weather, wave and water level conditions and forecasts during storms within Council's Natural Areas Asset Management Plan report beach condition after each significant storm (describing the storm, extent of erosion/inundation etc., including photographs) 	Risk to private development Risk to public infrastructure Public safety
AR3. Monitoring unauthorised coastal protection works	<ul style="list-style-type: none"> monitor to detect installation of unauthorised works and order removal of works if required 	Beach amenity Public safety
AR4. Opportunistic beach nourishment	<ul style="list-style-type: none"> continue opportunistic beach nourishment when clean sand excavated from building sites becomes available 	Beach amenity
AR5. Dune maintenance	<ul style="list-style-type: none"> continue the implementation of dune maintenance works including repair of fencing and walkways, ongoing targeted Bitou Bush control and effective rabbit control 	Coastal ecosystems Beach access Beach amenity
AR6. Planning for restoration and sediment recycling activities	<ul style="list-style-type: none"> minimise disturbance to shorebirds foraging or roosting on the Long Reef rock platform and intertidal areas on the beach and Narrabeen Lagoon entrance by ensuring major works are timed outside the migratory shorebird visitation period ensure that this advice is distributed to relevant Council staff 	Coastal ecosystems
AR7. Lifeguard services	<ul style="list-style-type: none"> continue to provide lifeguard patrols at Collaroy-Narrabeen Beach 	Public safety
AR8. Regrading of steep escarpments	<ul style="list-style-type: none"> mechanically regrade steep and high erosion escarpments where required, to reduce risks to public safety from collapsing sand dunes 	Public safety
AR9. Restricting proximity to exposed protection works	<ul style="list-style-type: none"> implement signage and barricades as required to restrict public from areas near exposed protection works after storm erosion 	Public safety
AR10. Beach scraping	<ul style="list-style-type: none"> undertake beach scraping after storms to accelerate beach recovery where resources allow, in particular to accelerate the burial of exposed historical protection works and restoration of beach 	Public safety Beach amenity
AR11. Beach raking	<ul style="list-style-type: none"> continue raking of Collaroy-Narrabeen Beach in accordance with Council's procedures 	Public safety Beach amenity

Action	Description	Issues addressed
AR12. Removal of debris off beaches	<ul style="list-style-type: none"> remove debris and other inappropriate materials off the beach as required (where feasible), particularly after storms 	Public safety Beach amenity
AR13. Rock Pool cleaning	<ul style="list-style-type: none"> continue cleaning of Collaroy Rock Pool during swimming and non-swimming seasons accordance with Council's procedures 	Public safety Beach amenity

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