

The long and short of responding to East Coast Lows: Actions and policy response from two coastal erosion hotspots

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Introduction

Wamberal Beach and Collaroy-Narrabeen Beach are identified as NSW Coastal Erosion Hotspots and have a long history of private properties being impacted by coastal erosion. Due to this long history of properties being threatened by coastal erosion, extensive informal protection in the form of rocks and a range of other materials have been placed during or after coastal storms exist at both beaches. Actions to formalise these informal works have been recommended and adopted by both councils for a number of decades, but not implemented.

Both beaches suffered significant erosion during the June 2016 East Coast Low. With houses facing significant structural damage at Wamberal Beach and evacuated at Collaroy-Narrabeen both Councils were required to make immediate decisions that will have long term impacts on management of coastal hazards and in particular the implementation of coastal protection.

The experience of both Councils is that the immediate threat posed by the June 2016 East Coast Low drove an expectation that recommendations relating to coastal protection would be implemented quickly. However this desire for rapid implementation only emphasises the complexity and difficulties Councils face in implementing long term coastal protection options that protect private properties on beaches in NSW.

History of coastal storms

Wamberal Beach located within the Local Government Area of the Central Coast between Broken Head and Wamberal Point on the Central Coast of NSW, approximately 10km east of the Gosford City CBD.

Coastal investigations show that the foreshores of the Terrigal/Wamberal embayment have experienced a gradual recession over a period of at least sixty years, interspersed with more severe episodes of storm erosion. The identified shoreline recession is ongoing and is gradually exposing the fore dune (and development thereon) to more frequent storm erosion events.

Collaroy-Narrabeen Beach is located within the Local Government Area of the Northern Beaches Council in Sydney's north between Narrabeen Head and Long Reef Headland. Like Wamberal Beach the prevailing offshore wave climate is predominantly from the south-east with wave exposure along the beach increasing to the north.

The Shoreline recession at Collaroy-Narrabeen is considered minor compared to that at Wamberal, with the Collaroy-Narrabeen embayment considered to be a closed sediment compartment. Extensive monitoring over the beach of the last 40 years indicates that the volume of sand in the embayment at any time has remained constant. (PWD 1987)

An aerial view of both beaches is provided in Figures 1 and 2.

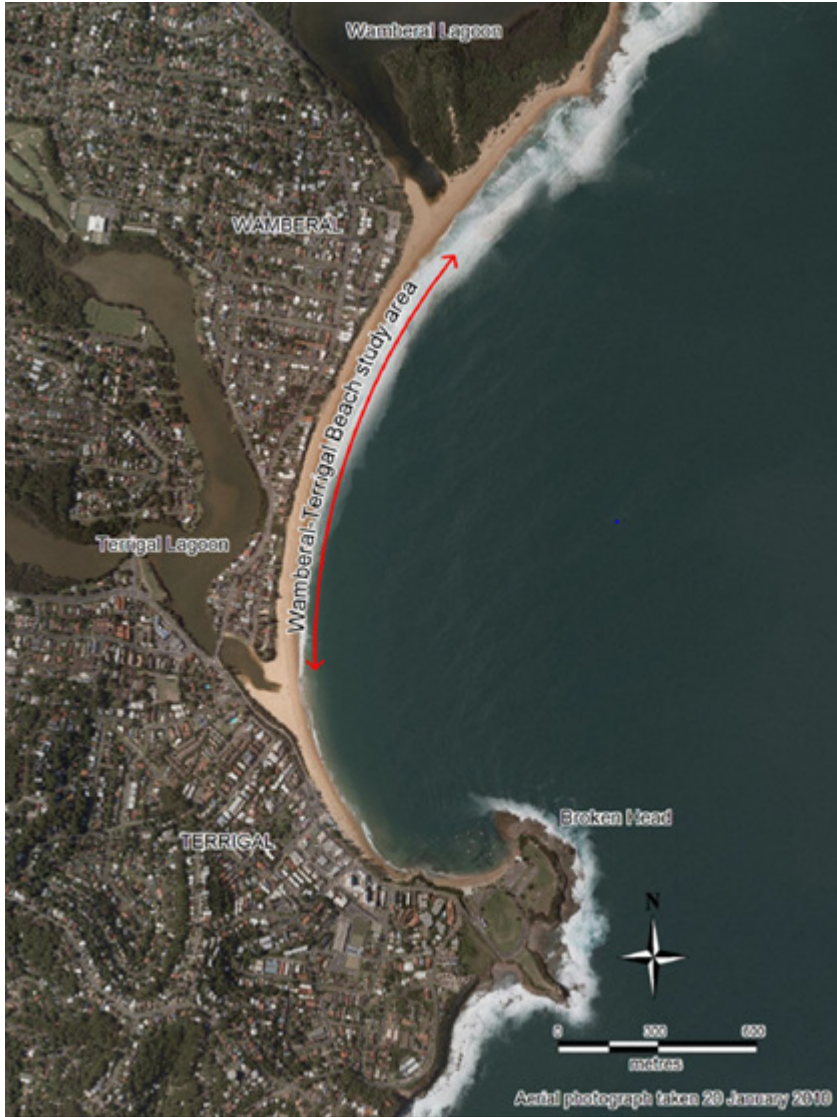


Figure 1: Wamberal/ Terrigal Beach embayment



Figure 2: Collaroy-Narrabeen Beach embayment

Both Wamberal and Collaroy-Narrabeen beaches have been subject to damaging coastal storms in the past, and can be expected to be exposed to such storms at irregular intervals in the future.

To date the most significant storm in terms of damage experienced at both beaches occurred in 1974. 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 such situations beaches are generally 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.

Figures 3 and 4 depict the impacts of historic storm events.



Figure 3: House collapse at Wamberal-Terrigal beach 1978

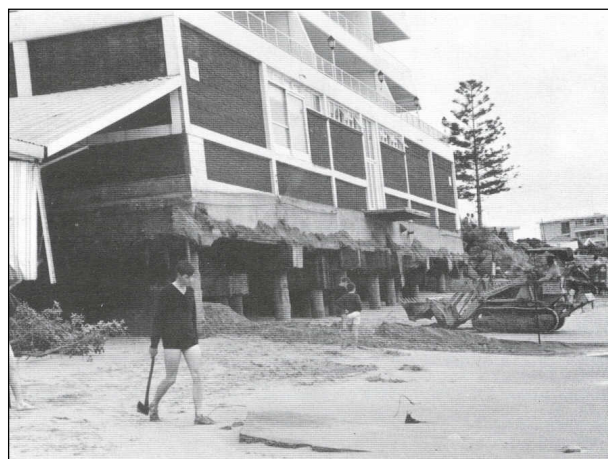


Figure 4: Exposure of "Flight Deck" foundations at Collaroy as a result of 1967 storms

History of coastal protection

Attempts to protect private property from coastal erosion at Wamberal and Collaroy-Narrabeen beaches have resulted in long lengths of both beaches being backed by rock, fill, and other structures placed either during or after coastal storm. These structures are often buried except when exposed by storms.

At Wamberal beach this informal protection was placed primarily the 1960's, 1974 and 1978. While at Collaroy-Narrabeen Beach placement of rocks began in the 1920's, with extensive rock being added in the 1960's, 1970's and up to the late 1990's.

Figures 5 and 6 depict the works as exposed during the June 2016 storm at Wamberal and Collaroy-Narrabeen beaches.

At both locations, the quality of these protection works is variable and generally does not satisfy current design standards. Therefore they cannot be certified by a qualified coastal engineer as providing protection from coastal storms.

Formal coastal protection in the form of a seawall has been identified at both locations as the most effective, reasonable and feasible coastal management option to manage the erosion hazard for many decades. To the extent that extensive design, environmental assessment and community consultation was undertaken at both locations in the late 1990's and early 2000's.

More recently the *Draft Gosford Beaches Coastal Zone Management Plan* adopted by Council in December 2015, submitted to Minister for certification in January 2016 (and awaiting certification at time of storm event) identifies protection as a preferred strategy for Wamberal Beach. The plan identified that funding for this action is come from the beneficiaries.

While the certified *Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach* seeks to allow beachfront development to remain and be re-developed where the risk of damage from coastal processes is acceptably low. For the beach front properties at a high or very high risk of damage from coastal erosion this requires the construction of certified seawalls.

Both of these approaches require the implementation of coastal protection for private property to be driven and implemented by private property owners.

Significantly, proposals for formal coastal protection to be implemented by the council on behalf of residents have failed to be implemented at both locations. The reasons for this relate to heated community debate around desirable management actions as well as issues related to funding and maintenance.



Figure 5: Exposed informal works at Wamberal Beach



Figure 6: Exposed informal works at Collaroy-Narrabeen Beach

Impacts of the June 2016 East Coast Low

Wamberal and Collaroy-Narrabeen Beaches experienced significant erosion during the June 2016 East Coastal Low. This erosion impacted public safety at both beaches and required properties to be evacuated at Collaroy-Narrabeen beach.

Analysis undertaken following the storm estimates that 260,000m³ of sand was lost from Wamberal beach profile (up to 184 m³/m) at Wamberal beach 404,000m³ of sand was lost from the beach profile (up to 228m³/m) at Collaroy-Narrabeen Beach. (Harley 2016)

This loss of sand buffer left an increasing risk that the dune may be eroded should more storms occur at Wamberal Beach. The storm also completely removed all sand in front of the existing protection works at Collaroy-Narrabeen beach exposing the cemented sand layer for extensive sections at South Narrabeen and Collaroy. During and closely after the storm, Central Coast and Northern Beaches Councils had to monitor these situations to ensure that they were not further exacerbated by subsequent high spring tides, even in the absence of severe waves.

Significant sections of the exposed informal protection existing at both had beaches had become displaced during the storm and added further debris to the beach along with other structures such as fences, deck, outdoor furniture and pathways that were destroyed during the storm.

Figures 7,8 and 9 depict impacts of the June 2016 storm event.



Figures 7 and 8: Erosion impacts at Wamberal Beach June 2016



Figure 9: Erosion impacts at Collaroy-Narrabeen June 2016

In response both councils restricted access to damaged access ways or unsafe sections of the beach and began the difficult and ongoing task of identifying as well as removing debris from the beach.

The direct impact of the storm on private properties adjacent to both properties differed.

An assessment of each of properties between the entrances of Terrigal and Wamberal Lagoons was undertaken by a coastal engineer. The assessment was preliminary with the intent to provide further direction on follow up work needed by Council to ensure the safety of the public, re-establish the beach amenity and minimise risk both to and from the private development landward of the beach.

Of the 73 beachfront parcels 68 have been developed for private residential use, including single resident and multi occupancy residences along a beach frontage of 1.5 kilometres. The assessment highlighted that the focus of the erosion was affecting some 40 dwellings along approximately 825m of beach frontage.

Based on this limited preliminary inspection at Wamberal, which was undertaken entirely from the beach itself, no properties required evacuation. However owners were advised to seek their own independent geotechnical and structural assessments to determine the full extent or risk to their land and built assets.

Many of the dwellings present at Wamberal Beach have been constructed prior to the Council introducing its piling policy. It was estimated that 19 of the 68 private dwelling structures had been constructed on piled foundations. Where these were located in proximity to a high erosion escarpment, it was likely that the surface foundations were within an area where the stability of the foundations had been compromised. Five undeveloped parcels are also owned by the NSW Department of Planning and Environment which has created additional challenges.

As the erosion escarpment approached the houses at Collaroy-Narrabeen Beach between Stuart and Ramsay Streets, a rapid assessment of coastal engineering, geotechnical and structural factors indicated that the residents had to be evacuated and the Emergency Sub Plan (WorleyParsons, 2012) was activated.

In the days following the storm an assessment of 51 residential beachfront parcels, including single residential, multi occupancy and high rise apartment blocks, indicated that the erosion caused by the storm had impacted all 51 beachfront parcels along the 1.1 kilometre stretch of beach. While these properties were assessed as being safe for continued habitation it was likely that ongoing elevated water levels and further storms would threaten their structural integrity. As a result regular inspections of these properties were undertaken in the month following the storm.

Policy Response

In response to the storm Central Coast Council have taken a measured approach. Key actions relating to public safety and beach access as identified in the Emergency Action Subplan have been implemented. Actions relating to the review, design and funding of a terminal protection structure for Wamberal Beach are delayed until the *Draft Gosford Beaches Coastal Zone Management Plan* is certified.

Additionally, in regard to coastal protective works, Central Coast Council has maintained the position that landowners are responsible for protection and maintenance of their own property.

This approach has resulted in criticism by the Local State Member and frustration of beachfront owners. In some cases residents have responded by undertaking illegal protection works in an attempt to protect their properties.

In contrast, in response to properties being evacuated Northern Beaches Council committed to supporting residents constructing coastal protection works and resolve a number of issues related to the works in the days following the storm. This included preparation of a concept design and alignment for any works, undertaking an assessment of the proposed works on coastal processes, beach access and beach amenity and identifying the beneficiaries of any works.

Additionally, Northern Beaches Council is attempting to resolve issues beyond its direct control related to land owners consent for works on crown land, private funding for both installation and maintenance of any works and coordinating groups of residents.

Figure 10 outlines the range considerations Councils have in driving the implementation of coastal protection works for private property.

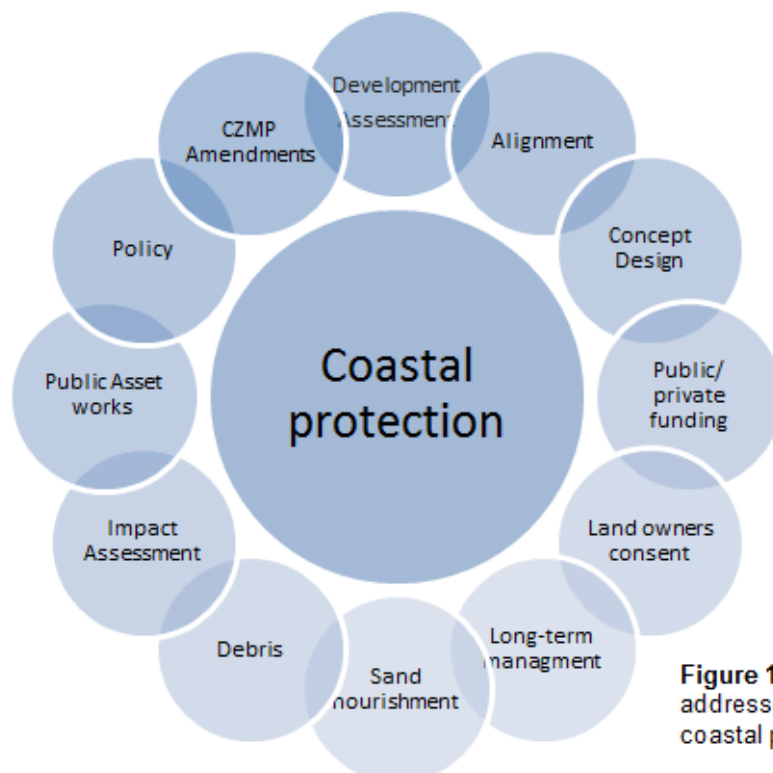


Figure 10: Issues to be addressed when implementing coastal protection.

This approach, while appreciated by most residents is requiring significant investment from Northern Beaches Council in relation to both financial and staff resources. It is also important to note that Northern Beaches Council has been unable to resolve a number of these issues 5 months after the storm despite the best efforts of council staff and the expectation from residents that building of coastal protection works would commence in the months following the storm.

Similarly, Central Coast Council continue to grapple with aspects of ownership, responsibility and liability

The differing approach taken by both Councils highlights a number of issues local government face when trying to implement actions related to coastal protection of private property. These relate to a lack of overarching direction as to how coastal councils especially those with 'hotspot' locations should approve, implement and fund coastal protection works that have been identified as the most desirable solution to manage coastal erosion. In addition, the State based frameworks that Councils operate within make it difficult to implement some solutions in a timely or effective manner despite being acknowledged as hotspots requiring special attention.

Most significantly, the approaches adopted at Wamberal and Collaroy-Narrabeen Beaches prior to the June storm placed the onus for implementing private coastal protection works on private property owners. The evidence at both beaches suggests that coastal protection is only seriously considered and addressed by most residents, following a coastal erosion event. At which point it is often too late.

Discussion

Storms like that of June 2016 drive an expectation that issues relating to coastal protection will be resolved quickly. However the mechanisms and approval pathways to enable a quick solutions do not exist.

This has created frustration amongst property owners and confusion for Councils as to the most appropriate and efficient manner in which to proceed. It has also left both Central Coast and Northern Beaches Councils to consider how best to implement a solution (coastal protection) that is easy to describe but very difficult to achieve.

The experience of both Central Coastal and Northern Beaches Councils is that following a storm Councils have two options.

Option 1, take a measured approach and continue to rely on the planning process in which a number of the issues relating to implementation of coastal protection remain unresolved. This puts the onus on private property owners and historically has not resulted in solutions being implemented.

Alternatively, in option 2, Councils can attempt to work through and resolve the range of issues that will allow coastal protection to be implemented. This has required Northern Beaches Council to take ownership and try to resolve a number of factors that it has not got control over. These include land owners consent when works extend onto Crown Land, financial capacity of residents to pay for works as well as the capacity for groups of residents to work together.

Neither of these is ideal, but coastal councils in NSW, particularly those with coastal erosion hotspots, have very little alternative. Acceptance that coastal protection is the preferred management option to address coastal hazards and associated support for councils to implement this solution is required.

Fundamental to this support is recognition and that the management of coastal erosion hot spots requires an approach in which both councils and the NSW Government partner to resolve the following issues at each hotspot: Such partnership extends beyond providing frameworks, funding and regulatory mechanisms and instead requires a State & Local focus on practical on-ground solutions so that these wicked problems do not persist for decades.

Addressing historic informal protection on public land: Both Wamberal and Collaroy-Narrabeen Beach have extensive informal protection works that have existed on public land for a number of decades. A coordinated approach to clarify the processes for using these works and the footprint they exist within in any long term formal coastal protection solution is required will all public land owners. Ongoing responsibility for the these works needs to established if they are not incorporated in the formal protection solution.

Mechanisms for public authorities to compel coastal protection works to be implemented: Under the current framework Councils can advise and recommend that private property owners protect their properties from coastal hazards but not compel owners to protect their properties. This is the case even at hotspot locations where properties have been identified as being at high risk of impact from coastal hazards.

Mechanisms that enable Councils to compel residents of groups or residents to protect their properties must be established and if not vested in Councils, should at least be subject to Ministerial discretion in accordance with a CZMP or in response to an emergency situation. Such mechanisms could be applied where properties are located at a coastal erosion hotspot, considered to be at high risk of damage from a coastal storm and a certified plan has identified coastal protection as the preferred option.

Provision of funding mechanisms to enable public authorities to build coastal protection works that protect private property and collect the cost of these works from all beneficiaries: Some options exist for councils to collect funds for works undertaken on private land, including special rate variations, however these lack long term certainty, have political consequences and require significant verification by the State before they can be implemented. As a result they have not been utilised to implement coastal protection.

It is clear that funding mechanisms must be revised or created that enable public authorities to build coastal protection works that protect private property and collect the cost of these works from all beneficiaries (e.g. via the Coastal Protection Charge). Such provisions could be outlined in the *Coastal Management Act 2016* and enforced through the *Local Government Act 1993*.

Such mechanisms should also be applied to the maintenance of any works.

In the absence of this support and guidance the current situation will remain. The 2016 East Coast Low demonstrates that the present situation has not resulted in the recommended coastal protection options being implemented.

References

Harley (2016) Harley, Storm demand from Narrabeen to Nambucca: results from rapid response coastal monitoring of the June 2016 ECL, NSW Coastal, Ocean and Port Engineering Panel, August 2016

PWD (1987), Collaroy/Narrabeen Beaches Coastal Process Hazard Definition Study, NSW PWD Coastal Branch, Report No. 87040 Vol. 1, December 1987, 157p.

Warringah Council (2014), Coastal Zone Management Plan for Collaroy-Narrabeen Beach and Fishermans Beach, October

WorleyParsons (2012), *Coastal Erosion Emergency Action Subplan for Beaches in Warringah, Revision*, Final, 9 August, for Warringah Council

WorleyParsons (2015) *Draft Gosford Beaches Coastal Zone Management Plan*, December

