MANAGING WAMBERAL BEACH – THE FORGOTTEN TWIN

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Introduction

Following devastation of the NSW coast by severe storms in May-June 1974 and again in 1978, coastal management emerged as a specialised role within the NSW Government (ASCE, 1996). Pivotal was damage to open coast foreshores, particularly Narrabeen-Collaroy on the Sydney northern beaches and Wamberal-Terrigal located on the Central Coast approximately 50km north of Sydney and 60km south of Newcastle. These were already known battlegrounds between the forces of nature and development, with both locations long recognised as erosion "hotspots" with conflict between development pressures and beach use. Similar to Narrabeen Collaroy, Wamberal/Terrigal Beach has been severely affected by coastal erosion over the approximately 100 years since the first subdivision and development. Wamberal experienced severe erosion and loss of residential dwellings in 1974 and 1978.

The June 2016 storm again decimated the beach at both locations. While media coverage of Narrabeen/Collaroy Beach was unprecedented during the most recent storms, similar impacts at Wamberal/Terrigal went largely unnoticed by the media - the forgotten twin. That these severe storms occurred was not surprising. The storm ferocity was less than that of the series of storms in 1974 and again in 1978. With development located in well defined "immediate impact zones", the damage at both locations was both predicted and anticipated. The 1.5 kilometres of beach between the Terrigal Lagoon and Wamberal Lagoon entrances was again severely eroded by high waves and storm tides between the 4th and 6th June 2016. As it tracked from north to south along the NSW coast, the same storm also eroded the central section of Collaroy Beach. At both locations the erosion resulted in the loss of the sandy beach, eroding back to the location of previous erosion events and once again threatening beachfront development. Collaroy and Wamberal are two of the most intensively studied beaches in Australia, yet the community appeared largely unprepared for the inevitable storm outcome.

The response through emergency protection works, evacuations and damage to previously affected properties and newly constructed development in both these high hazard locations, provides an opportunity for lessons to be learned or re-learned. A key question remains "Why were we so unprepared?". At both sites, the impacts of clearly documented hazards were severe, more than 40 years after being identified. This highlights some failure in managing our coastline for the long term and raises questions relating to our future preparedness to cope with changing and possibly more severe conditions (NCCOE 2012). Past failed attempts at fully implementing a coordinated long term protection strategy identify an ongoing and repetitive cycle at both locations.

This paper focusses on storm impacts, discusses examples of failures and successes, discusses the initial post storm responses and identifies ongoing risks at Wamberal/Terrigal.

Plate 1 – Concrete seawall on Wamberal Beach undermined and damaged following June 2016 storms Photo: Coastal Environment, June 15th 2016.

Background

June 2016 storm erosion

A preliminary report detailing the wave and water level conditions during the storms was provided to the Central Coast Council by Manly Hydraulics Laboratory and subsequently to the consultant to assist with their assessment. At the time, the data available had not completed quality control and a more detailed presentation on the storms and their likely recurrence is included in other presentations at this conference. While the wave height and water level measured were not exceptional (less than a 10 year recurrence), the combination and wave approach direction resulted in the erosion of the vegetated foredune at Wamberal by up to 15 metres horizontally and cut an erosion scarp in the dune face from 1 metre to 6 metres high. This erosion severely damaged public amenity and private property. The resulting instability of the beachfront posed an ongoing risk to persons and property, and was susceptible to prevailing weather conditions prior to natural recovery or remediation work being undertaken.

Preliminary risk assessment

To assist the Central Coast Council, a first pass assessment of the beach was undertaken by Coastal Environment Pty Ltd shortly after the storm subsided (Lord, 2016). The objective of this preliminary assessment was to focus efforts in ensuring public safety and rehabilitation of the beach. That assessment was limited by the available data and time. On-site inspections were not possible and the assessment was undertaken from the beachfront at the escarpment base. Further:

- some data relating to individual properties were not readily available, including some foundation conditions, seaward property boundaries and constructed floor levels; and

- Council was aware of the need to ensure roles and responsibilities were understood from a land ownership and liability perspective. With this approach established, Council were keen to restrict immediate remedial work to the public beach area while approaching the individual property owners to undertake clean-up and remediation where the erosion was within the private property boundaries. This proved to be completely or partly the case for most properties.

In the absence of recent and complete engineering data, this preliminary assessment utilised photographic images obtained pre and post storm to assist with interpreting the impacts and risks. It was intended that the report provided could be amended as better information becomes available. It would then serve both as a record of the current storm and recovery process while providing a template for ongoing collation of the necessary data to better manage the coastal issues at Wamberal Beach in the future.

Plate 2 – Five metre high storm erosion escarpment undermined fencing and timber deck on Wamberal Beach. Photo: Coastal Environment, June 15th 2016.

The erosion damage was focussed in the centre of the beach between 21 Pacific Street and north to 97 Ocean View Drive, impacting some 40 properties along approximately 825m of the beach frontage. The damage was more widespread and no less severe than that experienced at Collaroy Beach. As the storm had subsided, no dwellings were initially identified as being at a high immediate risk although some priority, further assessment was recommended. No properties were vacated, pending these more detailed assessments. Many of the more recently constructed dwellings were founded on deep seated piles in accordance with a policy implemented by the Gosford City Council in the early 1990s (Macdonald 2016). These dwellings were not considered at risk of loss or damage as a result of the storms. Five older residences on surface footings and in close proximity to an active escarpment were rated as at

medium risk. This did not mean they were necessarily failing but rather that further geotechnical and engineering investigations were recommended to further understand that risk.

Plate 3 – Eroded escarpment on Wamberal Beach with collapsing structures, voids and suspended rock posed an immediate hazard following June 2016 storms. Photo: Coastal Environment, June 15th 2016.

The erosion escarpment fronting 12 properties was identified as posing a high risk to public safety, in some cases having a steep and unstable slope exposed to a height of 6 metres. Again at these locations a further geotechnical and coastal engineering assessment was recommended prior to remediation works being commenced. A further 24 erosion scarps were classed as a medium risk and requiring some rehabilitation.

Public safety was the immediate council priority and a clean-up of the entire beach frontage was recommended and commenced to remove debris, inappropriate material and illegal or dangerous constructions from the public beach. Where the erosion scarp was considered hazardous, further restriction to access by the public was recommended. Strategies were discussed with Council for stabilising the scarps and preliminary recommendations provided on a "lot by lot" basis for Council consideration and response.

Plate 4A Top: A section of Wamberal Beach erosion post storms, 5/6/2016.
Plate 4B Bottom: Same section of Wamberal Beach pre-storm with seaward cadastral boundary shown.

Recommended response

General clean-up

It is not uncommon for old protection works uncovered at the base of the scarp and possibly outflanked, to add to the dune instability and general hazard to beach users as rock and debris are strewn on the beach and poorly constructed protection fails. Foreign material introduced, whether from the collapse of building and landscaping from above or from exposure of buried posts, collapsed stairs, iron, tyres and glass from below, can not only pose a risk to beach users immediately following the storm but if not removed can result in greater risk of injury in the future when they are gradually exposed on the beach once again or hidden just below the surface out of sight. The first step in rehabilitating the beach is to remove all foreign material from the beach area seaward of the escarpment toe that is inappropriate or may cause a danger. This needs to be done immediately and prior to the sand building up on the beach as the beach recovers.

Such a clean-up also provides the opportunity to remove inappropriate or unapproved structures or protection works from the public beach area. Where it can be established that such works are located on the public beach and outside the private property boundaries, Council needs to carefully consider the issue relating to responsibility and liability should these works be permitted to remain. This issue was addressed in some detail by SCCG in their seawall assessment report (SCCG 2013). Where such unapproved or inappropriate works exist landward of the private property boundary, Council may need to consider what action is appropriate regarding their removal or otherwise.

Slope stability

Public access to the base of the scarp should be restricted with barriers and signage. The community generally do not appreciate the dangers posed by an unstable slope at the back of a beach. It offers an attractive opportunity for children to dig in the base of the sand cliff, or to play in holes in the exposed rock works. The materials embedded in the slope or above (such as concrete foundations, retaining walls, or boulders that may weigh upward of 100kg) can be dislodged without warning. For the more severe locations, an upgrade of the barriers separating the public from the escarpment base, until such time as the beach had recovered and/or the slopes were stabilised was recommended

A steep and unstable erosion scarp may present a safety risk to the public when using the beach. This can result from failure of the slope, which may occur as mass soil movements triggered by rain, water seepage, further erosion of the toe or simply over time. It also depends on the type of material exposed in the scarp which can include sand, soil, rock, debris and rubble. It is not uncommon for the old protection works uncovered at the base of the scarp and possibly outflanked to add to this risk as rock and debris are strewn on the beach and poorly constructed protection fails. In the worst cases unstable slopes may require some mechanical stabilisation of the scarp to reduce that risk. Where the slope is too steep, the options are limited to three practical approaches:

- Firstly, the slope can be artificially flattened (using a long reach excavator, small dozer or similar. This results in a further landward movement of the top of the

slope (escarpment crest) and a seaward movement of the toe and simply speeds up the process that would naturally occur without any intervention. This is not generally acceptable to property owners who do not wish to lose more of their property than they see to be absolutely unavoidable. It may also result in the further loss of landscaping, fencing and in the worst cases undermining of paving, decking or the dwelling on the allotment. This was considered unlikely to be acceptable on any of the private properties at Wamberal and most likely would be limited as an option for the vacant public land only.

- Secondly, the toe of the slope can be armoured and the risk of slippage failure reduced by increasing the loading at the base of the slope (by placing rock or other equally bulky material) and/or reducing the loading at the top (e.g. drainage to reduce water pressures or removal of heavy ground structures such as equipment or dwellings). Again this option is unsuitable at Wamberal Beach as any short term works, sufficient to hold and protect the slope are likely to interfere with the implementation of any future holistic management strategy.
- The third option is through sand placement against the slope through nourishment or beach scraping. This simply speeds up the process of natural beach recovery and has recently been applied by Central Coast Council at other beach locations. It allows the slope to be flattened by building the toe seaward, buries the toe and part of the slope removing any hazards associated with the exposed protection works, and lowers the risk of major slumping of the scarp. The level of the filling against the slope should be as high as practical, with the aim of reaching a minimum level of +5m AHD. The slope to seaward should be as flat as practical but certainly no steeper than 1V:3H to 1V:5H as appropriate. The volume of sand required is substantial. To fill to 5m depth at the back of the beach for example would require a volume of at least 35m^3 to 60m^3 per metre of beach or around 28,000m^3 of sand as a minimum over the 800m length of beach most severely affected at Wamberal. Sand could be sourced from beach scraping as the beach face recovers post storm, or could be imported (from external sources, the lagoon entrances etc.).

For those scarps identified as “high” risk at Wamberal, care was essential when working in close proximity to the base of the slopes. For those 12 properties designated high risk, it was recommended that a further detailed geotechnical and coastal engineering assessment should be undertaken prior to rubbish removal from the face of the slope or any slope stabilisation being commenced.

Stability of the dwellings

Based on the preliminary assessment it did not appear that any dwellings were at high risk of immediate damage following the storm event. However, five dwellings were identified at moderate risk and each of these was an older construction, believed to be on a shallow foundation and located in relatively close proximity to an unstable erosion slope. There were other dwellings where the type of foundation was unclear and should these prove to be on a shallow foundation then the relevant risk would need to be re-assessed.

Each of these “moderate” risk dwellings was likely to lie at present within that zone termed to be the “zone of reduced foundation capacity”. The precise extent of this zone could not be determined without more detailed information on the foundation type and soil stratigraphy. That a dwelling lies within or partially within this zone does not mean that the foundations will fail. That may be a risk should the soil mass move. What it does mean is that the factor of safety relating to the stability of those

foundations is not acceptable for engineering design. It was recommended that as a first step, an on-site inspection of these allotments should be undertaken in conjunction with an appropriate coastal, geotechnical and possibly structural engineer, to assess the structure in situ, to ascertain the nature and proximity of the slope to the dwelling and to look for signs of weakness or pending soil failure. Council was further advised that should further erosion of the scarp occur with large seas or tides, the level of risk to these properties could change quickly.

Post storm activity

Council carried out actions in line with the adopted Wamberal-Terrigal Beach Coastal Erosion Emergency Action Sub-plan. Council viewed its primary responsibility as being the care of public land (the beach) and managing risk to public safety on public land. Immediately actions by Council included:

- dispatch of crews to clear debris from Wamberal Beach to minimise the risk to beach users. Beach crews also undertook ongoing monitoring of the beach and dune escarpment; the erection of 800m of temporary safety fencing adjacent to unsafe dune escarpments at a distance seaward to avoid risk of collapse of ancillary development posing a potential risk to beach users;
- placement of warning signs intermittently along 800m of affected beachfront with a focus on higher risk locations and access/entry points;
- liaising with property owners to outline permissible response under NSW coastal management frameworks;
- building awareness for senior management of the potential risks post storm and suggested approaches going forward;
- capture of visual imagery of storm impacts via drone footage;
- capture of LiDAR imagery to enable assessment of coastal change and assist future management;
- ongoing liaison with NSW Office of Environment & Heritage; and
- ongoing liaison with affected property owners.

The preliminary assessment undertaken by Coastal Environment Pty Ltd provided clear direction on how best to manage risk in the short term. It provided a description of hazards for individual properties and suggested actions. However, complexities arose in land ownership, responsibility and liability.

Local radio, print and television all presented stories in the week following the storm event. Initial coverage in the Central Coast Express Advocate (CCEA) on the 8th June 2016 provided an overview of the storm impacts. The “story” then altered course with a front page article appearing on 10th June 2016 titled “on the edge of catastrophe”. This article stated “T*here are fears Wamberal will become the next Collaroy unless a seawall is urgently built*…”. The article presented quotes from local residents who stated “*This is worse than Collaroy … apart from the lack of swimming pools in the water*,” and “*A lot of the properties are now hanging on a cliff face*.” This article also featured comment from the local Member of Parliament reporting: ““*doing nothing was not an option” and urged the council to move quickly in applying for a slice of the $83.6 million the NSW Government has put on the table. “I strongly recommend the council move on this and move on it quickly,” he said. Wamberal is a historic hot spot and would meet all the criteria for funding. Money is no excuse. We now have the ability to put in a remedy and we should be on the front foot with this. It only gets more expensive every year.”* The corresponding CCEA Facebook page provided interesting

community response with overwhelming opposition to the use of ratepayer funding to protect private beachfront assets.

Following the storms, many beachfront owners have legally commenced the process of design and approval for works. Unfortunately, in contradiction to clear direction and communication from government(s), some property owners are without approval adopting approaches that increase risk in the future to beach users, neighbours and Council. There are numerous incidences of unauthorised works being undertaken at Wamberal Beach following the June storm event. They include construction of private access, footings, pouring of concrete and construction of gabion rock protection works – mostly located on public land.

Some works currently being constructed are substantial. This is of great concern as many:

- are being erected without prior development consent of the consent authority in cases where prior development consent is required;
- are unlikely to meet the requirements of Chapter 6.2 of the Gosford Development Control Plan 2013. Some ancillary structures are seaward of the Coastal Building Line mapped with the DCP. For example, one Gabion revetment is unlikely to comply with normal engineering requirements for a coastal protection structure in this location; and
- are likely to increase risk to the public and neighbours due to design deficiencies.

Plate 5 - Gabion revetment under construction at Wamberal Beach following June 2016 storm erosion.
Photo: T Macdonald, Central Coast Council. September 26th 2016.

Allowing owners to undertake works illegally may further encourage this response, undermining the coastal planning process and creating increased management challenges for council in the future.

Future issues

Council has the responsibility to ensure development activities are undertaken in an appropriate manner and consistent with relevant NSW legislation. Council adopted a Coastal Frontage Development Control Plan (DCP) in December 2015 which now requires development to be founded on deep piles behind a coastal building line. The development controls aim to reduce the risk to private assets and to protect coastal ecosystems. The coastal building line applies an acceptable level of risk and a reasonable balance of competing interests in the coastal zone.

In regard to coastal protective works to reduce the impact of coastal erosion on private land, Council's position was that landowners are responsible for maintenance of their own property. This resulted in a subsequent proliferation of illegal ad hoc coastal protection works which Council is now working to address.

Ongoing beach management

The emergency response adopted following the June 2016 storms did not address the longer term security of development currently landward of Wamberal Beach. They were short term emergency response measures only. Council has over several years pursued the development and implementation of a more robust beach management strategy covering the whole beach. A draft Gosford Beaches Coastal Zone Management Plan (GBCZMP) has been adopted by Council and has been forwarded to the Minister for certification. It is worth noting that the GBCZMP remains committed to a long-term plan for protection at Wamberal Beach. An integrated range of development control measures have been developed to continue managing risk at this location until protection works are in place. The preferred long term management strategy emanating from that process should be pursued as a priority as the risk to development has not passed (Macdonald, 2016).

Ownership, responsibility and liability for beach works

The existence of poorly designed/constructed and unapproved beach protection works and beach access is a common problem faced by local government right around Australia. Much of it is legacy works, leftover from a past era when the likely impacts of protection works on nearby properties and on natural beach processes and beach users was not recognised. Much of it is more recent, constructed by property owners either in an attempt to secure their property against what they perceive to be a threat arising from extreme weather conditions or in an attempt to improve their property value or to secure exclusive beach access. There are issues raised both with works constructed by private individuals on public land and from unauthorised works on private land which subsequently become part of the public beach. These relate to ownership of those works; liability for injury suffered by a third person or damage to property; and responsibility for their removal or ongoing maintenance. These issues are particularly relevant to Wamberal Beach, given the history of erosion and the landmark

Supreme Court ruling relating to liability arising from the loss of the Egger residence in 1978.

These vexed issues were discussed in detail in a report titled “Assessment and Decision Frameworks for Seawall Structures” prepared for the Sydney Coastal Councils Group (SCCG, 2013). That report canvassed the issues relating to such structures and how Local Government may best respond. It provides guidance on the types of structures, the approach to inspection, assessment and recording their performance and the issues of ownership, liability and responsibility they pose. The report included eight recommendations relating to the management of these works which, while framed to apply generally around the Australian coast, remain relevant to both Wamberal and Collaroy beaches. Further details can be obtained from that report. Those recommendations were:

- Councils audit and review the coastal protection structures currently existing along their foreshores and incorporate consideration and management of these into their current asset management register and coastal management plans as appropriate.
- Where council believes that they are not the owner of the structure, measures should be taken to identify the responsible party or owner and to advise them of that decision and their ongoing obligations. Legal advice may be required to assist council to determine this issue.
- For minor structures where no certification or design details are available, councils implement a relevant and ongoing monitoring regime to collate data and to gain a better understanding of their history, construction, current performance and likely future performance in providing the requisite level of protection.
- Structures identified as being ineffective, incompatible with the asset management and coastal management plan or which are dangerous, should be removed.
- Councils review their asset management processes specifically in relation to coastal protection structures of all types, determining their future role and how they are proposed to be managed as climate changes. As appropriate, future maintenance, upgrading and replacement/removal should be addressed.
- Councils identify and address the legal implications relating to ownership, responsibility and liability potentially arising from each structure.
- Where liability issues are identified, council enter into discussions with local residents regarding these issues and potential outcomes. Ideally this should be undertaken within a framework of developing and implementing an overall coastal management strategy for the beach compartment.
- Councils develop and adopt a coastal management plan, which clearly defines the future approach to sustainable management of the beaches and estuary foreshores under their control, identifies permissible activities and works and is conveyed to relevant stakeholders and community to ensure ongoing certainty in the use and management of coastal foreshores to mitigate future coastal hazard risk.

Discussion

The April 2016 storm was severe with isolated impacts and short duration, affecting in particular the two erosion hotspots at Collaroy and Wamberal beaches. The impact at both locations while anticipated was significant. It varied between the two locations. At Collaroy the low back beach resulted in an increased perception of risk from storm inundation in particular. At Wamberal the erosion was wider spread, affecting some 40

properties. The high back beach at Wamberal while reducing the inundation risk exposed both development and the public to high and unstable erosion escarpments. At both locations, none of the residential development affected was unexpected; these properties have been identified as at risk for more than 40 years and/or damaged previously. This was not the storm of the century and similar or more intense events may be anticipated, with increasing frequency as climate changes.

Surprising was the volume of the media response; saturation national coverage of Collaroy Beach while barely acknowledged at Wamberal. The media tone was one of surprise that this was occurring and an initial assumption that this was an event of unprecedented severity ("Stormageddon"). This diverse response reflects the metropolitan location and political climate at Collaroy Beach when contrasted with the location of Wamberal outside the Sydney metropolitan area. This publicity was also significant in driving the outcomes. The emergency response at Collaroy was strong with immediate allocation of emergency resources and funding while at Wamberal it was more measured. While the Government received media accolades for the speed and hands on support at Collaroy, the lingering question remains as to why we were implementing emergency responses in the middle of the night after continually failing to address these long term problems.

Over the past 40 years there is no question that we have made progress in coastal management in NSW. This can be recognised in that no dwellings were actually lost during the storms. This success resulted from detailed definition of the areas at risk with associated timeframes, building controls including setbacks, piled foundations, and elevated floor levels. These efforts have facilitated short term understanding but do not address longer term shoreline recession and rising sea levels. We have seen also improvements in data collection to allow better definition of the hazards, increasing recognition of the need to develop long term management strategies and updates to legislation with a greater focus on solutions. All these continue to be a work in progress.

Storms and severe coastal impacts to development will continue to occur until long term, holistic management strategies are in place which mitigate or avoid those impacts. We cannot just develop, but need to implement viable management strategies that address both the immediate and increasing future risks.

Many things remain undone. Through the inability to implement forward planning that is cognisant of the changing coastal risks, we have failed to minimise the increase in assets at risk at present and into the future, not just at Collaroy and Wamberal but right along the NSW coast. We have had limited success in implementing strategies to address the known hazards over many years, lengthening rather than reducing the list of "hotspots" along the coast. We have increased reliance on emergency response, rather than pursuing sound planning and development controls to minimise impacts on both development and the natural beach environment. This is becoming the management approach of first resort, subsequently facilitating ill-considered and localised protection options to be constructed during and post storm. Such works, which may only provide temporary relief, can transfer adverse impacts alongshore and likely increase risk to beach users.

A longer term view to Coastal Zone Management is required. As reliance on emergency response increases, some areas may no longer be suitable for their current use. Alternatively, their large scale protection may result in loss of the beach amenity

along significant sections of the developed coast and foster a divided community response to funding and land use. It is an opportune time to rethink our past responses and reflect on the direction of coastal management. Do we want to continue increasing expenditure, resource commitment and community angst associated with "unforeseen disasters" and increasing "emergency" management?

Or are holistic, longer term strategies feasible and if so what is blocking them?

Acknowledgements

The authors thank the Central Coast Council for permission to use data gathered in response to the June 2016 storm event. The opinions expressed represent those of either of the authors and are not intended to imply any policy position attributable to the Council.

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