Jimmys Beach CZMP

Appendix B - Review of Management Options

APPENDIX B REVIEW OF MANAGEMENT OPTIONS

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1 REVIEW OF MANGEMENT OPTIONS

The currently adopted management strategy for Jimmys Beach is beach nourishment to protect The Boulevarde and residential development along Jimmys Beach. A number of options were examined during preparation of the CZMP to determine if alternate management strategies can increase the efficiency, cost-effectiveness and certainty of protecting property, while maintaining beach amenity into the future. The following management strategies have been reviewed in Sections 1.1 to 1.3 ;

- Current Beach Nourishment Strategy,
- On-Demand Sand Pumping – installation of a pumping system to deliver nourishment from a pipeline and reduce ongoing costs,
- Alternate options - a number of general coastal zone management options are discussed in relation to strategies raised by stakeholders during community consultation, and
- Development controls.

These management strategies are then summarised in *Table 3* with estimated costs (capital & maintenance) and advantages/disadvantages of each option provided.

1.1 Beach Nourishment Options

A recent study assessing practical options for future ongoing nourishment at Jimmys Beach determined that the best option for ongoing nourishment should involve smaller and more frequent campaigns to avoid out-of-equilibrium beach alignments that promote rapid erosion to return to a more natural alignment. Larger scale over nourishment creating these beach profiles are rapidly re-profiled by waves and any additional effective erosion buffer is lost. Based on historical rates of erosion and accretion, the ideal nourishment strategy would involve placement of approximately 10,000m^3 of sand onto the Jimmys Beach 'null point' every 6 months (BMT WBM 2012).

The outcome of the *Sand Nourishment Assessment* (BMT WBM 2012) favoured hydraulic pumping of sand using a hopper arrangement. Both the Winda Woopa/Lower Myall River entrance sand spit and Yacaaba sandwave would be suitable sites for a hopper, although the greater in-situ supply of sand at Winda Woopa would favour this site over Yacaaba. The Sand Shifter may also be a preferred option subject to further detailed investigations and based on the assumption that it does not encounter regular blockages. Both options will be discussed further in Section 1.1.2 .

The two potential sand sources for beach nourishment at Winda Woopa and Yacaaba were assessed for suitability based on their grain size characteristics. It was found that the sand source at Yacaaba is more suitable as the grain size characteristics of this source are more compatible with those of the native beach sand than the source at Wind Woppa. Due to the greater percentage of fines at Winda Woppa increased volumes of nourishment would be required (SMEC 2013). However, although historically there has been considerable accretion on the Yacaaba sandwave, the rate of recovery of the sand shoal following recent dredging works has been slow. Morphology modelling also flags future recovery of extraction areas as an issue, which questions the viability of this location as a long-term sustainable source for nourishment sands (BMT WBM 2012). Before committing to any permanent infrastructure it would be recommended to undertaken monitoring and field trials.

1.1.1 Current Beach Nourishment Strategy

Historically beach nourishment has taken place in two forms, 1) Small scale emergency works (<10,000m^3), and 2) Larger scale operations (>10,000m^3 to 100,000m^3). The smaller scale emergency works are typically undertaken and funded by Great Lakes Council (GLC) using land based plant. As larger scale operations involving dredging exceed the financial capacity of council there has been a reliance upon external funding (typically from NSW Government). *Figure 1* shows a larger scale beach nourishment campaign in progress with a dredge pipeline delivering nourishment sand to Jimmys Beach.

Figure 1 Beach Nourishment works at Jimmys Beach

*Table **1*** provides a summary of known beach nourishment works (and locations where specified) sourced from available literature and other information. The estimated nourishment volumes presented in *Table **1*** are based on a range of sources of variable reliability, with actual volumes difficult to determine particularly in the case of emergency beach nourishment.

Table 1 Summary of available data on nourishment volumes

Year	Volume (m^3)	General Nourishment Location	Sand Source	Source of Information
1984	43,000	-	Paddy Mars Bar	PBP 2005
1987	20,000	Vicinity of Guya Street	Paddy Mars Bar	PBP 2005
1988	80,000	Fishermans Walk to Gemalla Street	Western Corrie Island Channel	Watson 1997
1992	48,000	Kururma Crescent to Gemalla Street	Northern Corrie Island Channel	PBP 2005
1995	69,000	Kururma Crescent to Gemalla Street	Paddy Mars Bar	PBP 2005
1998	100,000	-	Western Corrie Island Channel	PBP 2005
1998 -2008	100,000[1]	Emergency nourishment (Jacabba Street to Gemalia Street)	Terrestrial stockpiles mainly 'Dead Mans' area	GLC 2011a
2007	6,000	Emergency nourishment area (Jacabba Street to Gemalia Street)	-	Vila-Concejo et al (2008)
2008	50,000	-	Sandwave adjacent to Yacaaba Head. Permanent pipeline used	Vila-Concejo et al (2010)
2009	10,000	-	Unknown	Vila-Concejo et al (2010)
2010	5,000[2]	Beach nourishment area (Jacabba Street to Gemalia Street)	Corrie Channel	Tattersalls Lander
2010	23,000[3]	Beach nourishment area (Jacabba Street to Gemalia Street)	Yacaaba sandwave	Tattersalls Lander
2011	5,000	Emergency nourishment area (Jacabba Street to Gemalia Street)	'Dead Mans' sand dune (emergency works)	BMT WBM (2012)
2012	9,000	Emergency nourishment area (Jacabba Street to Gemalia Street)	'Dead Mans' sand dune (emergency works)	BMT WBM (2012)

1. This estimate appears to be based on the number of emergency nourishment interventions and the estimated volume of a typical emergency intervention and is subject to considerable uncertainty.
2. This estimate is based on the volume of the dump truck hoppers used in the works and the number of trips made.
3. This estimate (rounded up from 22,982m^3) was provided by Rob King (Principal) from the dredging contractor (National Dredging Services) who undertook the 2010 works (pers. comm. Bob Lander)

Based on the information presented in *Table **1***, it is estimated that a total of approximately 550,000 m^3 (568,000 m^3 with some uncertainty) of sand has been placed on Jimmys Beach, at a total estimated cost of approximately \$3.2 million. This gives an annual average beach nourishment volume of approximately 21,000 m^3, delivered and placed at an average cost of \$5.80/ m^3. This makes no allowance for cost escalation, based on more recent works a cost of approximately \$15/m^3 would be considered more realistic. Recent small scale emergency works have been undertaken by GLC at cost of about \$70,000-\$80,000 per annum for 5,000-9,000m^3 (giving a cost rate of \$10-\$15/m^3). Recent larger scale works involving dredging have been in the order of $600,000 - $700,000 per campaign and have removed some 30-50,000m^3 (giving a cost rate of $15-20/m^3) (BMT/WBM2012).

Based on annual beach nourishment of 20,000m^3/yr (10,000m^{3}every 6 months) the cost to continue nourishment has been estimated at between $364,500 (Yacaaba) to $387,900 (Winda Woppa) subject to sand source (BMT/WBM 2012). This exceeds the likely amount available under council budgets (approximately $100,000 based on emergency works) and would require supplementary annual funding external sources. Noting that cost estimates were based on the assumption that council would outsource all elements of the work except project management, should council choose to supply plant and labour some reductions in cost could be achieved.

1.1.2 On-Demand Sand Pumping

Given the current method for beach nourishment requires uncertain externally funded work to supplement small scale emergency works undertaken and funded by Great Lakes Council (GLC), alternative options were explored to reduce ongoing costs. A recent study assessing options for future ongoing nourishment at Jimmys Beach stated that the best long-term option for low ongoing operational costs was on-demand hydraulic pumping of sand (WBM BMT 2012). Hydraulic transfer of sand from one area of the beach compartment to another is a suitable solution at Jimmys Beach as it provides a flexible system that largely works in with the natural system. The most cost effective options were;

- Onshore pumping unit consisting of an integrated slurry pump and hopper unit (**Hopper**), and
- Sand Shifter offshore sand bypass system (**Sand Shifter**)

Winda Woppa (Lower Myall River) provides a closer pumping distance than the Yacaaba sandwave (approximately 2.1 km compared with 2.7 km). There is however an existing pipeline from Yacaaba to Jimmys Beach that may be able to be utilised to offset some of the cost differential between the two options. Yacaaba is also a more compatible sand source so less additional overfilling will be required. For the purpose of this investigation it is deemed that both options will cost similar amounts, the reduced distance of pumping from Winda Woppa will be offset by use of an existing pipeline and more compatible sand at Yacaaba. These options should however be investigated further before committing to either site.

Pumping has added benefits over traditional trucking used for current small scale works. It minimises disruptions to public amenity and beach access (see *Figure 2*) while minimising the impacts to public infrastructure including roads. Delivery by pipe also allows material to be discharged directly to the location requiring minimal profiling works.

Figure 2 Sand being pumped onto beach Burleigh, Queensland Australia

Hopper

Beach nourishment using a hopper system involves conventional earthmoving equipment to excavate nourishment material from the source. The nourishment material is deposited into the hopper which has an integrated slurry pump that mixes the sand with water from a separate water supply pump to form the slurry. The slurry is then pumped through a pipeline to the nourishment site. Subject to pumping distances a booster pump can be required along the pipeline.

A tracked mobile hopper such as the *Slurrytrack* (CGC Dredging) would enable the hopper to be located at the material source so earthmoving equipment can directly fill the hopper. *Figure 3* shows a Slurrytrack unit in operation using an excavator to fill the hopper directly. Nourishment volumes of approximately 20,000m^3/yr would be within this type of hoppers operating range with other systems at Mandurah and Dawesville transporting volumes in the order of 100,000m^3/yr. Examples of the hopper system used in nourishment projects include;

- Mandurah, Western Australia (100,000m^3/yr),
- Dawesville, Western Australia (100,000m^3/yr), and
- Port Geographe, Western Australia.

Figure 3 Tracked mobile hopper pumping unit operating in Dawesville, Western Australia

The Hopper system would be suitable for either source at Winda Woppa or Yacaaba sandwave. If the Yacaaba sandwave was used as the source it is likely that an existing pipeline between Jimmys Beach and the Yacaaba sandwave could be utilised. A 300mm pipeline is consistent with the pipe sizes generally used for this type of pumping and nourishment operation.

Sand Shifter

The Sand Shifter is a proprietary system developed by Slurry Systems Marine Pty Ltd. The Sand Shifter unit is a single structure that acts as a sand recovery and transport system (see *Figure 4*). The unit is based on a fluidising principle that allows sand to be recovered from below the seabed. The fluidising system on the Sand Shifter comprises a fluidising pipe below an inverted channel and barrier that both traps and creates a sand-water slurry. The principle is that the slurry is less dense than the surrounding material and so is displaced by this surrounding material and is forced up into the inverted channel. Once contained in the inverted channel the slurry is then pumped along a pipeline to the nourishment site (with additional booster pumps onshore as required).

Figure 4 Typical Sand Shifter Unit Configuration (source: Slurry Systems Marine)

Generally Sand Shifter units are installed in a configuration parallel to the shore because the onshore-offshore sediment transport through wave and storm action is generally considered greater than longshore sediment transport. It is believed that sand transport volumes in the order of approximately 20,000 m^3/annum would be within this unit's typical operating range, which is similar to the operations at the Noosa River, Queensland.

As the Sand Shifter removes sand from the recovery location, it becomes self burying and can be buried up to 8 m deep. As this burying occurs, a basin or 'crater' forms around the buried unit, thereby attracting sand deposition under the influence of waves and tidal currents, which increases the efficiency of the unit.

Specific examples of projects utilising permanent Sand Shifter installations include:

- Noosa, Queensland (30,000 to 40,000 m^3/yr); and
- Port of Portland, Victoria.

Slurry System Marine Pty Ltd offers the option of trial installations with Noosa originally being a trial system. Photographs showing a working example of a Sand Shifter unit in operation at Noosa are shown in *Figure 5*. Trials have also taken place at Lakes Entrance, Victoria and Point Cartwright/ Mooloolah River, Queensland. These trial systems can be set up with diesel pumps with land side equipment consisting of a water tank and two shipping containers for pumps and control equipment. This type of trial system could be suitable for either Winda Woppa or Yacaaba.

Figure 5 The Noosa trial Sand Shifter unit sourcing sand from the shore (left) and onshore booster pumps and pipework (right)

One consideration that needs to be taken into account with the Sand Shifter is that the fluidising jets and other components of the unit are prone to marine growth and potentially blockages. There are extensive seagrass beds in the region which could lead to blockages. Thus the unit may need to be recovered on a periodical basis for maintenance, which may require access by a crane or similar leading to much higher overall maintenance costs.

Comparison of Hopper and Sand Shifter

The *Sand Nourishment Assessment* (BMT WBM 2012) concluded that "*taking into consideration the social, environmental and financial factors, the preferred nourishment option is a fixed hopper on Winda Woppa spit, with sand loaded manually into the hopper by GLC staff for hydraulic transport to Jimmys Beach"*.

BMT WBM (2012) provided a cost estimate for various methods of hydraulic beach nourishment at Jimmy Beach with the Hopper and Sand Shifter options summarised in *Table* **2** below. It was found the Sand Shifter option has the lowest annual recurrent cost if there is no requirement for equipment recovery. However given the unknown frequency that the Sand Shifter equipment may need to be recovered for maintenance and blockages there is a high chance of significant cost escalation. Also, if the loading and spreading of material was carried out by GLC staff and plant for the Hopper arrangement the annual cost would be reduced to approximately $100,000 based on an expected operational life for the system of 20 years.

Table 2 Comparison of cost estimates for selected methods of beach nourishment

Description	Hopper	Sand Shifter
Capital costs	$1.69 M	$1.76 M
Annual costs	$182,500#	$104,000*
Total after 5 years	$2.6 M	$2.28
Total after 10 years	$3.52 M	$2.8
Total after 20 years	$5.34 M	$3.84 M

If GLC plant and staff can be used to load hopper may be possible to reduce cost.

* Cost is subject to typical maintenance. Cost escalation could be considered for higher levels of maintenance due to equipment recovery and blockages.

The *Sand Nourishment Assessment* (BMT WBM 2012) considered a number of options so did not explore the preferred options in sufficient detail to make a final decision to proceed with the preferred option of a fixed hopper on Winda Woppa spit. A further detailed feasibility assessment for an on-demand beach nourishment system should be undertaken to provide a detailed technical investigation of the hopper system and its viability.

Given the potential cost benefits of a Sand Shifter system, if the issues associated with blockages and recovering equipment from such a remote location can be overcome, further consideration of this option should also be given in the detailed feasibility assessment.

Piling and Lightweight Removable Construction.

Whilst beach nourishment will provide a buffer it will not provide ultimate guaranteed protection to houses from extreme events. To complement the beach nourishment management option, houses in the coastal risk area should have piled footings or be lightweight removable construction.

1.1.3 Review of Nourishment

Beach profile monitoring should take place over the next 5 to 10 years measuring pre and post storm beach profiles. The beach profile monitoring should be used assess the performance of the nourishment program and adjust annual beach nourishment volumes accordingly.

If in the longer term the beach nourishment program is not providing suitable enough buffer then complementary options such as a groynes or a seawall as discussed below in Section 1.1.4 may be considered.

1.1.4 Alternative Options

Through community consultation there were a number of suggestions for alternative coastal zone management options to either be considered as stand-alone options or in conjunction with beach nourishment. These included;

- Artificial Reef / Offshore wave buffer / Removable geobag structure,
- Groynes
- ShoreGro/ Dewatering,
- Seawall (vertical piled, rock wall, retaining wall, sheetpiles, rocks) to protect road and beach nourishment,
- Breakwater included as part of a marina development,

Whilst these options may have been successfully applied to other coastlines, the dynamic and individual nature of the coastal environment requires that options be carefully considered to determine if they will achieve the desired outcomes. Each of these options will be discussed in more detail and assessed for practicality at Jimmys Beach.

Artificial Reef / Offshore Wave Buffer

Recent reviews of artificial reefs have shown that the majority of these structures had no significant accretionary impact on the shoreline alignment compared to the predicted morphological responses. In some cases negative impacts and loss of sediment can even be caused by the structure blocking the seaward directed bed return flow and diverting it longshore creating erosion shoreward of the structure (DHI/SMEC 2014).

Artificial reefs are very sensitive to conditions and even when extensive modelling and testing has taken place they have not performed as expected. They are only suitable for small tidal ranges, are sensitive to sea level rise and offer limited protection during storm events. Due to the requirement for offshore construction they are relatively expensive for the protection they can provide. Considering all of the above factors, unless significant complementary benefits can be provided from multipurpose uses (diving / fish habitat / surfing), an artificial reef would not be deemed suitable for application at Jimmys Beach due to the high potential for variable performance.

The structure could be constructed of Geotextile Sand Containers (GSC) to provide removability should the structure not perform as expected. However although there is the perception that GSC structures can be easily removed, this is not generally true in practice and a significant budget would need to be allocated for the activity. Pratte's Reef in California (a trial reef that was constructed from GSC's for $550,000) failed to produce the desired outcomes and was removed. The cost to remove Pratte' reef was $551,000, essentially the same cost as the construction (DHI/SMEC 2014). It should also be noted that in all cases where GSC's have been used in construction of artificial reefs, failures of containers have occurred, which would lead to further variability in performance.

Artificial reefs can provide potential for beneficial use in beach protection in certain instances. However, given the potential variability in performance, should only be implemented if significant budget can be allocated to monitoring and providing alternate protection should they not perform as expected. Hence they have not been considered further for application at Jimmys Beach.

Groynes

Groynes are structures that extend from the shore into the active zone of littoral drift transport. They do not directly counter erosion, only transferring the processes to other locations. Groynes block longshore transport, so can be used to trap sand on the up-drift side of the groyne. This can be beneficial in some cases but negative in others as it does negatively impact on the down-drift side.

Groynes do not directly prevent offshore sand transport by waves and currents. In some cases they even exacerbate the development of rip currents during storm events causing more sand to be transported offshore. Consequently at this stage groynes have not been explored further as a coastal zone management option for Jimmys Beach.

Groynes may be considered as a complementary option to beach nourishment if nourishment alone is proving to be too expensive and benefit can be seen from reducing longshore drift. Amenity and swimmer safety issues would have to be addressed and beach nourishment would still need to be used to manage offshore storm losses.

Dewatering/ShoreGro

Beach dewatering consists of artificially lowering the groundwater table of the beach, with its proponents suggesting that this results in enhanced infiltration losses during uprush/backwash cycles while promoting sediment deposition at the beach face.

A prototype system was implemented in Dee Why Beach, NSW (Davis *et al.,* 1991) with monitoring of the site concluding that there was no discernible reduction of beach erosion due to the system. A recent review of 19 beach dewatering systems around the world determined that approximately half had either negligible effects on shoreline stabilisation or monitoring results were inconclusive. Beach dewatering systems are susceptible to storm damage and do not provide adequate protection from storm erosion (Mariani et al 2013). As such, dewatering systems are not considered appropriate at Jimmys Beach as a coastal zone management option.

Seawall

The highly reflective nature of a seawall can exacerbate erosion in front of a wall resulting in loss of beach amenity. To address potential loss of beach amenity as it is an important community value it is recommended that a seawall option only be considered in combination with beach nourishment and dune construction as per options discussed in Section 1.1.3

A seawall would extend from Kururma Crescent to near the eastern end of The Boulevarde with return walls at either end. It would protect The Boulevarde and properties behind it in the event that the primary defence of beach nourishment and constructed dune system had not been adequately maintained at the time of a severe erosion event. The seawall would be located as far landward as possible to limit the influence on coastal and dune processes. To minimise the interaction between the seawall and coastal processes (and hence frequency of exposure), a vertically piled structure is recommended on an alignment as far landward as possible, i.e. on the southern side of The Boulevarde roadway. A sheet pile wall can be considered as a similar alternative to the vertical piled wall proposed.

A rock structure as an alternative wall construction type would extend further seaward thus reducing valuable beach width and become exposed more often. Therefore a wall with minimum width is considered the most appropriate potential option for Jimmys Beach.

For a length of approximately 700m along the foreshore a seawall would cost in the order of $3.5 million to construct. As beach amenity is considered a valuable asset for the community and hence a seawall would need to be in conjunction with beach nourishment it is not at this stage considered as an alternative option. More regular on demand beach nourishment should first be implemented and a seawall only considered as a complementary option should beach nourishment not provide suitable management of the coastal risk and assets are deemed necessary to be maintained.

Breakwater as part of marina development

Many stakeholders found that the quiet nature of Jimmys Beach was one of its biggest assets and felt development should be limited. A marina development would not be in keeping with this so this option has not been considered further.

1.2 Environmental Considerations for 'Built' Options

1.2.1 Potential Environmental Impacts

Beach Nourishment Options

The beach nourishment options involve relocating sand from within the same compartment so should not interfere with overall sediment transport processes. There would be minor, localised, temporary impacts where sand was removed for beach nourishment.

An Environmental Impact Assessment (EIA) should be undertaken to support approval applications for extraction of sand at Winda Woopa and/or Yacaaba sandwave. Approvals should incorporate transport of sand by both trucking and hydraulic pumping, with hydraulic pumping expected to reduce potential impacts.

Seawall

A seawall would arrest the continued recession of the foreshore and storm erosion, however it is likely to exacerbate erosion of the beach seaward of the structure and result in scour at each end of the structure during erosion events. This would result in adverse visual, recreational use and public access impacts. An example of a partially exposed vertically piled seawall following severe erosion at Kingscliff Beach is shown in *Figure 6*. Note the dumped rock at the end of the wall to prevent scour of the adjacent unprotected dune.

When considering construction of any seawall the impacts should be assessed in accordance with the DECCW (2010a), *Draft guidelines for assessing the impacts of seawalls*.

Under Section 55M of the *Coastal Protection Act 1979*,a consent authority for a seawall development must be satisfied that adequate arrangements have been made to restore a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by the presence of the seawall. This is in addition to consideration of matters under Section 79C of the *Environmental Planning and Assessment Act 1979*.

Under amendments to the Infrastructure SEPP, consent authorities will also be required to consider matters listed in clause 8 of *State Environmental Planning Policy No 71 Coastal Protection*. These requirements include the need to consider the likely impacts of coastal processes and coastal hazards on a seawall and any likely impacts of the seawall on coastal processes and coastal hazards.

As such, to support the construction of a seawall at Jimmys Beach, evidence would be required to demonstrate the need for a seawall and measures provided to mitigate the potential impacts of a seawall. Therefore any proposed seawall structure would require, complementary ongoing beach nourishment campaign to mitigate potential erosion exacerbation due to reflection and scour. An Environmental Impact Assessment (EIA) would need to be undertaken to support an application for approval to construct a seawall.

Figure 6 Cudgen Headland SLSC Seawall, Kingscliff Beach, northern NSW

1.2.2 Environmental Approvals

State Environmental Planning Policy Infrastructure 2007

Under *State Environmental Planning Policy (SEPP) Infrastructure 2007*, Clause 129, development for the purpose of foreshore management activities (which includes coastal protection works such as revetments and beach nourishment) may be carried out by, or on behalf of, a public authority without consent on any land. This includes construction works, routine maintenance works, emergency works, and environmental management works. In the case of work that does not require consent, Clause 228 of the *Environmental Planning and Assessment (EP&A) Regulation 2000* lists factors that must be taken into account. This includes any impact on coastal processes and coastal hazards, including those under projected climate change conditions.

1.3 Development Controls

1.3.1 NSW Coastal Planning Guideline

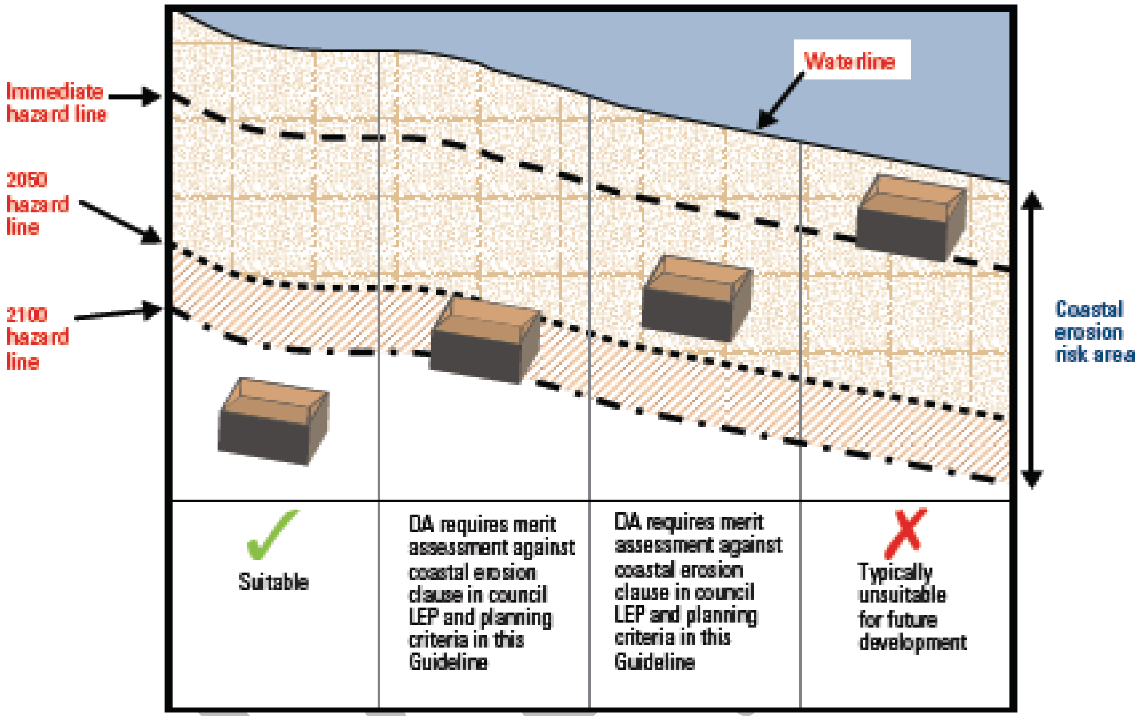
The *NSW Coastal Planning Guideline: Adapting to Sea Level Rise* (DoP 2010), as adopted by Council, sets out strategies that could be employed to address coastal hazards including:

- configuring the development site layout to minimise exposure to coastal risks e.g. ensuring that buildings and infrastructure are placed in low risk areas on the site and provide open space and landscaping between buildings and areas of higher hazard risk

- constructing buildings or structures that are easily decommissioned, disassembled or relocatable either onsite or offsite as required
- providing for safe exit routes during storm events.

It should be noted that in some instances a site may be deemed unsuitable for further development, as illustrated in the guideline and reproduced in *Figure 7*. Time and/ or 'trigger' limited development consent conditions could be applied to allow ongoing sustainable use of coastal areas until such time as coastal risks threaten life and property.

Figure 7 Coastal Hazard Planning Areas and DA Assessment



1.3.2 Great Lakes Local Environmental Plan (LEP) 2014

The *Standard Instrument—Principal Local Environmental Plan* commenced in 2007 and is the current template for all NSW LEPs. The *Great Lakes LEP 2014* adopts the following standard LEP clauses and additional specific controls relating to Jimmys Beach – Winda Woppa.

- Clause 3.3 which excludes development in environmentally sensitive areas, such as coastal waters, from being exempt or complying development. The LEP 2014 also includes lands within 100 m of coastal waters and coastal lakes as environmentally sensitive areas.

- Clause 5.5 which relates to implementation of the principles of the *NSW Coastal Policy*, matters to be considered in the assessment of proposed development in the coastal zone including visual, beach amenity, public access and ecological impacts. In addition consent should not granted unless the consent authority is satisfied that the development would not be significantly affected by coastal hazards, or have a significant impact on coastal hazards, or increase the risk of coastal hazards in relation to any other land.

- Clause 5.7 which requires consent for development below mean high water mark.

- Clause 7.18 of the LEP 2014 is specific to residential development at Winda Woppa and states that development consent must not be granted on land identified as “Development Restricted Area” (see *Figure 8*) on the Winda Woppa Coastal Development Map unless;

a) a development will be situated on a lot with an area not less than 450 square metres, and

b) the development will not involve the erection of more than 2 dwellings on that lot, and

c) the development will comprise a single building, and

d) the gross floor area of at least one dwelling will not exceed 60 square meres.

Figure 8 Development Restriction Area – Great Lakes LEP 2014

Clause 7.4 which applies to land identified as “Coastal Risk” on the Coastal Risk Planning Map (see *Figure 9*) and requires the consent authority to consider a number of matters including whether the development is likely to be adversely affected by coastal hazards, alter coastal processes to the detriment of the environment and increase the risk to other development. It also requires measures to mitigate risks to life, as well as structures by making provision for relocation, modification or removal.

Figure 9 Coastal Risk Planning Area – Great Lakes LEP 2014

1.3.3 Great Lakes Development Control Plan

Under the DCP 2014, Winda Woppa (which is within the Hawks Nest locality) is to be *recognised as a particularly sensitive area with new development being sensitively designed to take into account potential coastal erosion hazards, sea level rise and flooding.* In addition, *development is to be limited to low scale and low density housing designed to fit within this scenic area and to be protected from natural hazards.*

The Development Control Plan (DCP) 2014 also contains the following provisions in relation to coastal development.

Chapter 3 Character Statements (3.3.1.2 Hawks Nest Additional Low Density Residential Character Statement)

"Development at Winda Woppa is to be limited to low scale and low density housing developments designed to fit within this scenic area and to be protected from natural hazards."

Chapter 4 Environmental Considerations (4.3 Sea Level Rise and Coastal Erosion)

"Objectives - To ensure people and assets are safeguarded from risks associated with sea level rise and coastal erosion."

"Controls

1. For development proposals on land identified in the coastal hazards map under Great Lakes Local Environmental Plan 2014, a report from a suitably qualified geotechnical engineer and an engineer specialising in coastal marine processes will be required, to determine the geotechnical and physical stability of the land is not compromised and to determine suitable measures for protection of the building against coastal erosion and recession, changes in storm frequency and intensity and sea level rise.
2. Where native vegetation that currently protects a dune system from erosion processes will be affected by proposed development, a Vegetation and Environmental Impact Assessment by a qualified arborist or ecologist may be required.
3. A linear sea level rise of 0.9m to the year 2100 is to be taken into account.
4. A Geotechnical Report shall also be required on sites affected by coastal hazards such as coastal erosion or erosion or reduced foundation capacity. "

Chapter 5 (5.5 Setbacks)

"To maintain visual amenity along the coastal frontage within the Pacific Palms area, a minimum setback of 15m from the seaward property boundary applies to the coastal hazard areas identified within Great Lakes LEP coastal hazard maps. No habitable buildings or structures are permitted within the setback area."

Chapter 9 (9.2.1 Design Principles)

"Good subdivision design goes beyond minimum lots size requirements. Careful appraisal and systematic analysis of the site with consideration of all the natural and man-made constraints is required to ensure that its best qualities are used most effectively to suit the proposed development. The matters that may be taken into account when determining the suitability or otherwise of a site for subdivision include, but are not necessarily limited to, the following: Hazards and Constraints: Potential impact of sea level rise and coastal erosion and the need for foreshore protection"

Table 3 Assessment of Risk Management Options

Option	Capital Cost	Ave Annual Cost/Yr	Advantages	Disadvantages
1. Beach Nourishment	n/a	$350,000+ (as per current strategy)	'soft engineering' option which maintains beach amenity	Requires establishment of plant for each nourishment campaign. Relies on sufficient nourishment volume being available to protect assets during a severe erosion event which is not predictable. Funding for beach nourishment may not be allocated/ made available when 15 m trigger is met or in an emergency. Beach nourishment may not be eligible for State Government funding assistance as it is considered 'maintenance'. May require separate environmental impact assessment and approvals for each nourishment campaign.
2. On-demand sand nourishment (Hopper)	$1.7 million	$182,500 If council staff/plant/equipment could be utilised for ongoing works maybe able to reduce this cost to approximately $100K	Minimises establishment time and costs for beach nourishment. More efficient system for beach nourishment. System capital cost would be eligible for funding assistance. An ongoing approval may be able to be obtained, eliminating the need for environmental impact assessment and gaining approvals for each nourishment campaign.	Would require an additional sand source to maintain beach width in the future under predicted sea level rise.
3. Development Controls	n/a	n/a	Allows for coastal processes. New development/ assets are removed from areas at risk from coastal hazards. Maintains beach amenity (provided restoration works are undertaken as assets are removed).	Does not address risks to existing assets/ development. Public access along the back of the beach may be restricted. Limit to time over which current land uses can be maintained.

** options include beach nourishment to maintain beach amenity*

1.4 Preferred Risk Management Option

Subject to exhibition of this draft, based on the assessment of risk management options summarised in *Table **3*** , and community consultation, on-demand sand nourishment in the form of hydraulic pumping equipment (hopper arrangement) is the main preferred management option for Jimmys Beach – Winda Woppa.

Based on historical rates of erosion and accretion, the ideal nourishment strategy would involve placement of smaller quantities of sand onto the Jimmy's Beach 'null point' on a more frequent basis.

Trucking can commence immediately to undertake these more frequent nourishment campaigns without any significant capital outlay and to confirm the effectiveness and required volumes for regular nourishment. To reduce on-going annual costs and minimise impacts, trucking should then be replaced by hydraulic pumping in the form of an on-demand sand nourishment system. A further detailed feasibility assessment for an on-demand beach nourishment system should take place to provide a detailed technical investigation of the hopper system and its viability.

As part of this review, a number of general coastal zone/foreshore management improvements were also identified to:

- address issues raised during consultation.,
- improve public access and beach amenity in general.
- facilitate appropriate recreational uses of the coastal zone.
- protect the values (Natural Heritage, Cultural Heritage and Community see Section 2.2 of the CZMP).

These recommendations are discussed in Section 1.5 below.

1.5 General Coastal Zone Management Recommendations

Actions recommended in the Foreshore Management Plan for Port Stephens (Umwelt 2009) included:

- Rationalising and standardising foreshore signage and ensuring it is appropriately located.
- Carrying out minor upgrades to Winda Woppa boatramp as outlined in the Waterways Shore Facilities Management Strategy (Jelliffe Environmental 2003).
- Implementing improvements as recommended in the Tea Gardens Hawks Nest & Bulahdelah Stormwater Management Plan (Jelliffe Environmental 2000).
- Planning for and undertaking dune stabilisation, vegetation management, beach access points and structures.
- Formalising carparks.

The following management measure were suggested through community consultation and identified through site inspections:

- Access Management (Pedestrians/4WD/PWC/Boats) - Pedestrian access is maintained or improved and vehicle/boat access reviewed.

- Compliance issues - Improve compliance/ enforce penalties for, unauthorised vehicle access, 4WDing over dune vegetation and on beach, littering, PWC/power boats in unauthorised area or dangerous driving, and unauthorised parking.
- Foreshore facilities – Maintain and improve foreshore facilities such as boat ramp, picnic and recreation facilities.