



Lady Robinsons Beach – Investigation and Design Study

Stage 2: Coastal Processes Conceptual Model and Management Options Assessment

Report MHL2813
January 2023

In association with:

Coastal Environment and Balmoral Group Australia



Prepared for:

Bayside Council



Foreword

The Department of Planning, Industry and Environment acknowledges that it undertakes studies on Aboriginal land. We acknowledge the traditional custodians of the land on which this study took place, the Gweagal, Bidjigal and Gadigal peoples of the Eora Nation. We pay our respect to Elders past, present and emerging, and extend this respect to Aboriginal peoples present in the area today.

In August 2020, NSW government's professional specialist advisor, Manly Hydraulics Laboratory (MHL) were commissioned by Bayside Council to undertake *Lady Robinsons Beach – Investigation and Design Study: Stage 2 Coastal Processes Conceptual Model and Management Options Assessment*.

Stage 2 works have been broken down in the following tasks:

1. Numerical model investigation of the impact of historical dredging and shoreline reclamation on present-day erosion trends
2. Develop a conceptual coastal processes model and provide assessment of proposed management strategies (present report)
3. Establishment of a Working Group to review and refine proposed works including two stakeholder engagement workshops (present report)
4. Undertake Multi-Criteria-Analysis (MCA) including a Cost-Benefit Analysis (CBA) of management options (present report).

This report documents Items 2 - 4 of the Stage 2 works, namely the development of a conceptual model of coastal processes and Multi-Criteria-Analysis of coastal management options for Lady Robinsons Beach. The report was prepared by Matthew Phillips, Eduardo Pombo Lavin, Doug Lord (Coastal Environment) and Edward Couriel.

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Executive summary

Over the last 80 years, the shorelines of Botany Bay (Kamay) have undergone heavy urbanisation with the development of Port Botany and Sydney Airport parallel runways, affecting wave propagation throughout the Bay and contributing to patterns of beach erosion along its western foreshore at Lady Robinsons Beach. Beach stabilisation and shore protection measures have been implemented progressively since the 1930s however erosion at various sections of the beach continues to be a major problem.

The present study has developed a conceptual model of coastal processes for Lady Robinsons Beach, synthesising information from previous studies including MHL2720 and MHL2812. The conceptual model divides the foreshore into three zones, from the Georges River entrance in the south to the Cooks River in the north, each with differing coastal processes and sediment transport characteristics. Sediment transport pathways focussing on exchanges in the subaerial beach and immediate nearshore. Utilising beach profile analysis (2006 to 2018) presented in Stage 1 works (MHL2720), the conceptual model indicates accretion/erosion trends in subaerial beach sections and nearshore groyne compartments since completion of major beach stabilisation works in 2005/2006.

Regions of sediment loss are identified as priority locations for coastal management attention and sandy beach restoration. These include:

- north of Groyne 5 to Brighton Baths including adjacent dunes and beach access
- depleted groyne compartments including:
 - Groyne D7 to D8 at Sandringham Bay
 - Groyne 1 to D2 at Ramsgate
 - Groyne D4 to D6 at Dolls Point.

Alleviating coastal erosion issues at the priority locations, restoring sandy beach and safe beach user amenity, enhancing resilience of the dry beach width available to users form the key objectives of coastal management in the study. Eight management options listed in **Table E.1** were developed and assessed to enhance and maintain sandy beach amenity at Lady Robinsons Beach where practicable and valuable over the next 50-year design planning period.

Cost-benefit and multi-criteria analysis was undertaken to aid in the decision-making process of a preferred option and to assess each management option on a range of economic, social and environmental criteria. Preliminary costings, cost-benefit analysis and multi-criteria analysis findings are summarised in **Table E.1**.

The findings indicate that all options provide significant community benefits and improvements in serviceability relative to the base case (“status quo”). Options differ in capital and ongoing costs as well as varying degrees of practicality. Results of the MCA indicate that Option 8 (Targeted foreshore amenity management approach) to be the highest-ranking option followed by Options 1, 2 and 7 which involve more intensive sand nourishment programs and groyne lengthening schemes. These options are also highly ranked in the results of the cost-benefit analysis.

Given the results and ongoing shoreline evolution associated with substantial past developments in the Botany Bay sediment compartment, it is recommended that Council seek a flexible management approach that targets desired user amenity values for different foreshore regions of Lady Robinsons Beach with the ability to adapt to future amenity and shoreline changes.

The findings are to be considered alongside several other aspects that are not well monetarised and a range of other considerations arising from engineering studies, stakeholder consultation, available funding arrangements, legislation, policy and planning context; all upon which a preferred option should be selected.

It is considered beneficial that a Lady Robinsons Beach Foreshore Master Plan be developed in consultation with community and stakeholders to confirm desired outcomes and inform the detailed design preferred options in subsequent works.

Table E.1: Summary of management options assessment

Management Option	Initial costs (\$M)	Ongoing costs every 5 years (\$M) ^b	Benefit-Cost Ratio ^c (NPV, \$M)	Multi-Criteria Analysis Rank/Score
1 Active beach management via sand transfer (major ongoing)	\$6.0	\$2.7 (1.5 - 3.9)	2.60 (\$24.2)	2 / 46
2 Lengthening groynes and sand transfer (moderate ongoing)	\$11.7	\$1.4 (0.8 - 2.2)	2.28 (\$22.0)	4 / 39
3 Groyne shape alteration and sand transfer (moderate ongoing)	\$14.3	\$1.4 (0.8 - 2.2)	1.98 (\$19.5)	7 / 17
4 Lengthening groynes, additional end groynes and sand transfer (minor ongoing)	\$16.9	\$0.3	2.02 (\$19.9)	5 / 33
5 Lengthening groynes, detached breakwaters and sand transfer (minor ongoing)	\$15.6	\$0.2	2.20 (\$21.5)	6 / 27
6 Sand Pumping System	\$17.9	\$1.6	1.64 (\$15.3)	8 / 1
7 Active beach management (Option 1) with initial mass sand nourishment	\$3.0 ^d	\$2.7 (1.5 – 3.9) Beginning after year 10	3.31 ^d (\$27.4)	3 / 42
8 Targeted foreshore amenity management approach	\$14.5	\$0.6 (0.3 - 0.9)	2.99 (\$34.0)	1 / 73

^a Costs do not include additional expenditure required for the upkeep of existing structures, sand nourishment to offset sea level rise impacts and beach profile monitoring (refer to Section 4.1.9 and 4.3 for additional cost estimates).

^b Costs for ongoing sand nourishment are indicative and may vary. Ongoing beach monitoring is recommended to evaluate and optimise future nourishment works.

^c 7% discount rate and 50-year horizon

^d Costs may vary depending on tunnel spoil processing requirements prior to nourishment. Additional costs would be required for onsite crushing/screening, environmental approvals and removal of contaminant materials. Additional tunnel spoil crushing and screening costs for Option 7 is estimated to reduce the Net Present Value (7% discount rate, 50-year horizon) for this option to approximately \$21.5M (Benefit-Cost Ratio 2.23).