

REPORT

Manly West Esplanade Precinct Masterplan

Reinstatement of the Boardwalk and Harbour Pool –
Considerations in a Feasibility Study

Client: Northern Beaches Council

Reference: PA1893-RP190319

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Table of Contents

1	INTRODUCTION	1
1.1	Background	1
1.2	Scope of Work	2
1.3	Structure of the Report	2
2	ADVICE ON STUDIES TO ASSESS FEASIBILITY OF REINSTATING THE BOARDWALK AND HARBOUR POOL	3
2.1	General	3
2.2	Brief Comments on Scope for Studies	3
2.2.1	Hydrographic and land survey	3
2.2.2	Geotechnical investigation	4
2.2.3	Condition assessment of existing structures	4
2.2.4	Coastal processes including climate change	5
2.2.5	Aquatic ecology	6
2.2.6	Landscape character and visual impact assessment	6
2.2.7	Heritage study	7
2.2.8	Ecological engineering opportunities	7
2.2.9	Navigation impact assessment	7
2.2.10	Safety in design	8
2.2.11	Concept design	8
2.2.12	Capital cost estimates and whole of life assessment	9
2.2.13	Planning strategy/approvals pathway	9
2.3	Preliminary Program	10
3	MEETING WITH ROADS AND MARITIME SERVICES	11
4	DESIGN CONCEPT AND COST ESTIMATES	12
4.1	General	12
4.2	Design Concept	12
4.3	Order of Cost Estimate for Construction	15
4.3.1	Cost estimate for construction supplied by Quantity Surveyor	15
4.3.2	Adjusted cost estimate for construction	15
4.3.3	Whole of life cost estimate	16
5	WORKSHOP AND PRESENTATION	17
6	CONCLUDING REMARKS	18

Table of Tables

Table 1	Order of Cost Estimate for Construction (after Muller Partnership, November 2018)	15
Table 2	Adjusted Order of Cost Estimate for Construction	16

Table of Figures

Figure 1	Indicative concept for reinstatement of boardwalk and harbour pool for illustration purposes only	1
Figure 2	View of boardwalk and harbour pool looking towards Manly Wharf – 1940	13
Figure 3	Closer view of boardwalk showing low level platform, recreational activities and lighting – 1950	14
Figure 4	View looking towards the harbour showing low level and upper level platforms and piling – date unknown	14
Figure 5	View looking west/south-west towards the former Manly Aquarium and Manly Pavilion with the existing netted swimming enclosure in the foreground	17
Figure 6	View to existing maritime infrastructure at the western end of the study area	18

Appendices

Appendix A	Design Concept Engineering Sketches
Appendix B	Order of Cost Estimate for Construction by Muller Partnership
Appendix C	Whole of Life Cost Model by Muller Partnership
Appendix D	Copy of RHDHV Presentation at Workshop on 21 November 2018

1 INTRODUCTION

1.1 Background

Northern Beaches Council (Council) is preparing a maritime precinct masterplan for Manly West Esplanade. As part of the masterplan process, consideration is being given to the possibility of reinstating the boardwalk and harbour pool which existed up until 1974 when it was severely damaged in a coastal storm and subsequently demolished.

Haskoning Australia Pty Ltd, a company of Royal HaskoningDHV (RHDHV), was engaged by Council to provide expert technical advice in relation to the scope of feasibility studies for the concept of reinstating the boardwalk and harbour pool, from a coastal, maritime and environmental point of view.

An indicative concept plan for reinstatement of the boardwalk and harbour pool provided to RHDHV at the inception meeting, for illustration purposes only, is shown in **Figure 1**.

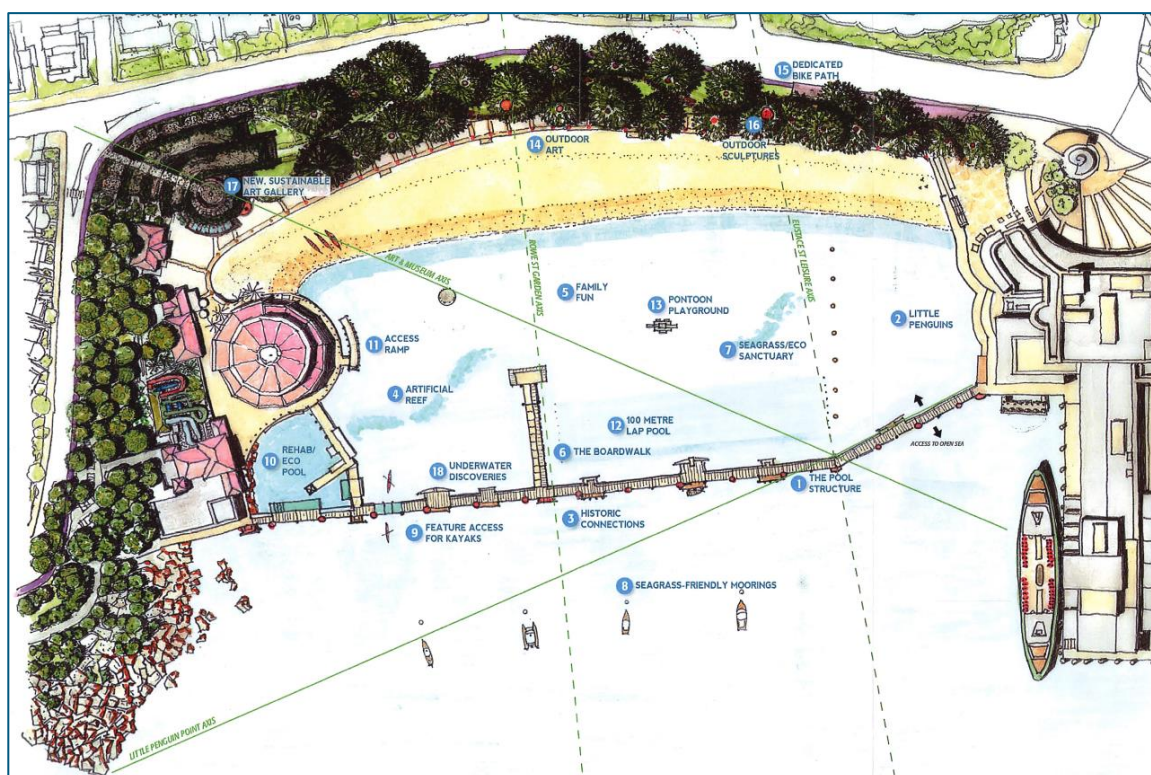


Figure 1 Indicative concept for reinstatement of boardwalk and harbour pool for illustration purposes only

Source: Designed by Maurice Patten, Architect, ©Patten Design (Provided by Northern Beaches Council to Royal HaskoningDHV)

1.2 Scope of Work

The scope of work involved the following main tasks:

- inception meeting to discuss background, including a site inspection;
- advice on the architecture of the masterplan and mandatory requirements and recommended elements for a complete and robust feasibility study of the concept to reinstate the boardwalk and harbour pool¹;
- meeting with Roads and Maritime Services (RMS);
- preparation of a design concept for the boardwalk including hand drawn sketches;
- preparation of an order of cost estimate for construction of the boardwalk and harbour pool, compilation of indicative operating and maintenance costs, and preparation of a whole of life cost estimate;
- attendance at a workshop with Council staff to discuss the Manly West Esplanade Precinct Masterplan including a brief presentation of the main findings of the work undertaken by RHDHV; and
- preparation of the report herein setting out the findings of the scope of work.

1.3 Structure of the Report

The report is structured in the following way:

- **Section 2** sets out advice on the individual studies recommended for a complete and robust assessment of the feasibility of reinstatement of the boardwalk and harbour pool;
- **Section 3** sets out notes prepared from the meeting with RMS;
- **Section 4** sets out the design concept and cost estimates including the whole of life cost estimate;
- **Section 5** outlines the presentation and discussion at the workshop; and
- **Section 6** includes a number of concluding remarks.

The report assumes the reader has a good knowledge of the study area.

¹ Any feasibility study itself was to be a separate piece of work and subject to a subsequent project phase if approved. This work has not proceeded at this time.

2 ADVICE ON STUDIES TO ASSESS FEASIBILITY OF REINSTATING THE BOARDWALK AND HARBOUR POOL

2.1 General

Based on background provided at the inception meeting, the site inspection, local knowledge of the study area, and experience of the writer, 13 individual studies were recommended in order to assess the feasibility of reinstatement of the boardwalk and harbour pool at Manly West Esplanade in a complete and robust approach. These studies are listed below.

Brief comments on the scope of work for the studies are included in the following section. As agreed with Council, these comments do not constitute a detailed Brief for the individual studies. A preliminary program was also provided, which is included at the end of this section.

The information in this section was initially conveyed to Council in a memo dated 16 July 2018.

Recommended list of studies:

- hydrographic and land survey;
- geotechnical investigation;
- condition assessment of existing structures;
- coastal processes;
- aquatic ecology;
- landscape character and visual impact assessment;
- heritage study;
- ecological engineering opportunities;
- navigation impact assessment;
- safety in design;
- concept design;
- capital cost estimate and whole of life assessment; and
- planning strategy/approvals pathway.

2.2 Brief Comments on Scope for Studies

2.2.1 Hydrographic and land survey

A suitable land survey, including foreshore structures, may already exist for the Masterplan area. This should be confirmed.

An up-to-date hydrographic survey is important for a number of reasons:

- confirmation of available depth for diving safety assessment;
- confirmation of available depth for navigation access;
- input to coastal processes studies, eg. wave transformation; and
- input to cost estimates eg. length of support piles for the boardwalk.

An outline scope of work is provided below:

- coverage should include all foreshore structures within the Masterplan area, the sandy beach, and the seabed for a minimum distance of 50m seaward of the conceptual alignment of the boardwalk;
- levels should be in metres reduced to both Australian Height Datum (AHD) and Zero on the Fort Denison Tide Gauge (ZFDTG), and referred to MGA co-ordinates on the GDA94 datum;
- hydrographic data should be captured and certified by a Certified Professional in Hydrographic Surveying; and
- hydrographic data should comply with the latest version of the Information Guide – Maritime Property: Guidelines for Hydrographic and Geotechnical Data (RMS).

2.2.2 Geotechnical investigation

Geotechnical information is important for concept design of the boardwalk structure and for preparation of cost estimates. It is suggested that the geotechnical investigation be undertaken in a staged manner due to potential costs, commencing with a desk top study which assembles and reviews all existing geological and geotechnical information for the study area.

Existing geotechnical information may be available from previous investigations or from pile driving records associated with:

- former boardwalk;
- Manly Wharf;
- Manly Aquarium; and
- existing piled swimming enclosure

Depending on the extent of existing available geotechnical information and the outcomes of ongoing assessment of the feasibility of reinstatement of the boardwalk, additional studies may be justified. Such studies would likely include geophysical and geotechnical investigations.

A geophysical investigation should be conducted within a strip of seabed between Manly Wharf and Manly Pavilion having coverage of the expected alignment of the boardwalk and adjacent areas (to allow interpolation). This investigation would inform a program of drilling and possibly cone penetrometer testing.

2.2.3 Condition assessment of existing structures

A condition assessment of the following existing structures is recommended in order to assess their suitability for incorporation into the Masterplan, the need for repairs, upgrading or replacement, etc. Some condition assessments may have already been completed.

- Manly Wharf (at eastern take-off point for boardwalk);
- boardwalk structure at Manly Pavilion (at western take-off point for boardwalk);
- Manly Aquarium, including intake structures;
- seawall along West Esplanade; and
- existing swing moorings.

The condition assessment would normally comprise the following main activities:

- review of 'as constructed' drawings and basis of design (BoD) documents;
- detailed inspection above water, and below water by divers (as required), using non-destructive techniques;
- reporting of condition against established criteria; and
- preparation of recommendations for repairs/upgrading/replacement as required.

It is possible that access by plant and equipment to undertake repairs, and the like, to existing structures may be limited following reinstatement of the boardwalk which could therefore bring forward the need for such works to be undertaken on existing structures.

2.2.4 Coastal processes including climate change

A knowledge of the local coastal processes is important since, for example, the coastal processes will influence the design of the boardwalk (eg. wave loading) and since coastal processes may be potentially affected by the proposed boardwalk (eg. wave energy at the shoreline).

The following coastal processes should be documented to the extent necessary to assess the feasibility of reinstatement of the boardwalk and harbour pool:

- water level variation – astronomical tide, storm surge, wave setup and wave runup;
- wave climate – swell, local wind waves, and boat wake;
- currents – tidal, wind-induced and wave-induced;
- sediment movement;
- beach erosion;
- shoreline recession;
- oceanic inundation; and
- stormwater.

An assessment should be undertaken of the impact of coastal processes on the proposed structures and the impact of the proposed structures on coastal processes. This assessment may be based on existing available information or may involve specific studies such as numerical modelling of waves and currents, subject to the level of detail of existing information and the sensitivity of the particular issue.

A summary should be prepared of the current state of knowledge of Climate Change, in particular sea level rise and storminess, which have the potential to influence the design of the boardwalk and harbour pool. Reference should be made to the latest report of the Intergovernmental Panel on Climate Change (IPCC), which currently is the Fifth Assessment Report (AR5) released in 2013. It would be necessary to adopt a specific planning period for the proposed boardwalk and harbour pool for assessment of the potential impacts of climate change. The planning period is likely to be greater than 80 years, ie. to the year 2100 as a minimum. Consideration should be given to the potential to manage the impacts of Climate Change using adaptive approaches.

2.2.5 Aquatic ecology

Aquatic ecology at the site may influence the design of the boardwalk and harbour pool eg. avoidance of sensitive habitat, and may be potentially impacted by the structures. The structures may also provide additional aquatic habitat. In addition, opportunities may exist to purposely design beneficial ecological outcomes as part of the Masterplan (refer Section 2.8).

A study is required to document the existing aquatic ecology at the site, which would involve review of existing available information and site inspections including diver surveys. Key issues are likely to be Little Penguins and seagrasses. Manly is home to an endangered population of Little Penguins, understood to be the only mainland breeding colony in NSW, comprising approximately 60 breeding pairs.

An assessment of the potential construction phase and operational phase impacts of the boardwalk and harbour pool on aquatic ecology would need to be undertaken. Considerations would include seabed disturbance by piling, overshadowing of the seabed by the boardwalk structure, indirect impacts due to any changes to coastal processes, and impacts due to changes in the levels of usage of the site which may create greater disturbance.

2.2.6 Landscape character and visual impact assessment

The potential for the boardwalk to impact on the existing landscape character and visual environment is expected to be a key issue. A best practice methodology for this assessment would need to be adopted. This would be expected to include:

- ensuring all receptors (viewers) have been adequately identified, even at distance;
- prioritising views from the public domain as recommended in the Principles outlined in the Land and Environment Court;
- being clear on and separately defining quantitative impacts (distance, magnitude, direction, etc.) against qualitative impacts (viewer type, location, etc.);
- providing a clear rationale for how impacts are compared and contrasted;
- ensuring photo montages include views from 'worst case' locations, identified from the analysis above;
- being clear on the differing forms of adaptive options, namely avoidance, amelioration (eg. design), mitigation (eg. screening) and compensation (on or off site).

The landscape character and visual impact assessment (LCVIA) should be carried out in accordance with the Roads and Maritime Services Environmental Impact Assessment (EIA) practice note – Guideline for Landscape Character and VIA EIA – No. 4.

The VIA report should include:

- preparation of a view analysis matrix as the basis of the impact assessment. Criteria should include distance from proposed development, angle of view, magnitude of change and visual sensitivity (applied to each identified viewpoint);
- preparation of a visual impact assessment map – this map combines the total view-shed of the site with location of key receptors and cross references to the matrix table that evaluates those impacts;

- preparation of accurate photo montages to portray the proposal within the visual scene from agreed viewpoints;
- preparation of mitigation suggestions and assessment of residual impacts.

2.2.7 Heritage study

The history of the maritime development and recreational use of the site should be documented and the reinstatement of the boardwalk and harbour pool evaluated in the context of the heritage value.

It is understood the boardwalk and pool were built by the Port Jackson and Manly Steam Ship Company and were opened in December 1931. The boardwalk was constructed of NSW North Coast hardwoods on turpentine piles, approximately 335m long and 3.4m wide, with a 2m wide bather's platform at a lower level. The pool was equipped with an array of water recreation facilities including pontoons with slides, water wheels and springboards for diving.

The boardwalk was severely damaged in an East Coast Low storm on the night of May 24, 1974 (the so-called Sygna storm) and was subsequently demolished.

2.2.8 Ecological engineering opportunities

The opportunity exists to include the design of sustainable ecosystems (ecological engineering) as part of reinstatement of the boardwalk and harbour pool. The current draft concept shows a 'rehab/eco pool' between the former Aquarium and reinstated boardwalk which is an example of an ecological engineering approach. Other examples could include placement of artificial reef modules in selected locations below the footprint of the boardwalk (where they are not a hazard to navigation).

A specialist study should be dedicated to ecological engineering opportunities. The study should draw upon existing research findings at the UNSW Sydney Institute of Marine Science (SIMS) located in Chowder Bay in Sydney Harbour. Reinstatement of the boardwalk in itself could become an ecological research project.

2.2.9 Navigation impact assessment

The eastern end of the boardwalk would be located close to the berthing approach of Manly Ferries at Manly Wharf. An existing 'ferry arrestor' is located in this area to mitigate the risk to property and risk to life from a ferry overshooting the berth.

A navigation impact assessment should be undertaken to assess the risk to property and risk to life associated with a boardwalk being constructed close to the ferry berthing operations. This may involve navigation simulation studies utilising a navigation bridge simulator to quantify the risk.

The navigation impact assessment should also include the potential for conflict between motorised and non-motorised recreational vessels but this would be expected to be manageable with appropriate segregation and controls.

2.2.10 Safety in design

It is recommended that Safety in Design be addressed as a stand-alone topic given a number of specific risks associated with reinstatement of the boardwalk and harbour pool, which include:

- diving or jumping from the boardwalk structure;
- shark attack; and
- collision between ferries and the boardwalk structure.

The risk of collision would be addressed within the navigation impact assessment as noted above but should be cross-referenced in the Safety in Design study.

Assessment of the diving risks should have regard to documents such as the Safe Diving Depth Policy prepared by Swimming New South Wales Ltd. This document has been previously applied by the writer in relation to the upgrading of rock pools within the Northern Beaches Council local government area. The assessment of diving risk may influence:

- position (alignment) of the boardwalk;
- incorporation of diving platforms and the like on the boardwalk; and
- location and freeboard of floating pontoons located within the harbour pool.

The diving and jumping risk would also influence the separation distance between the boardwalk and any pontoons located within the harbour pool.

There have been at least 16 fatal shark attacks in Sydney Harbour since the late 1880s, all in the summer months of December, January and February. The latest was in January 1963 in nearby Sugarloaf Bay, Middle Harbour. The latest near-fatal attack was in February 2009 at Garden Island.

The harbour pool would need to be shark proof for safe swimming. Evaluation of netting and more rigid enclosures should be undertaken including review of the efficacy of nets and rigid enclosures adopted at other locations in Sydney Harbour. In addition to effectiveness for prevention of shark entry, consideration would include appearance and durability in the wave climate at the site.

Safety in Design should also ensure the boardwalk and harbour pool can be constructed using safe work methods. This should be relatively straightforward as maritime construction involving piling is a common activity in Port Jackson, although the West Esplanade site is more exposed to ocean swell and has a longer local wind fetch (to the south) in comparison to many other sites.

2.2.11 Concept design

It would be necessary to prepare a concept design (drawings) for the boardwalk having regard to the various site constraints and opportunities, and user requirements. Key considerations would include:

- alignment - end points are essentially fixed but curvature could be introduced;
- width – which may be variable, eg. provision for viewing platforms and the like;
- elevation – wave action, climate change, visual impact, and end connections etc.;
- need for access to and from the water, eg. by recreational vessels and swimmers;
- ecological engineering;
- balustrading;
- services such as lighting;

- safety, eg. diving and shark proofing;
- construction materials (durability, appearance, cost);
- structural system;
- buildability; and
- capital cost and maintenance cost.

A basis of design (BoD) document should be prepared and agreed with Council. This document should include the agreed design life for the structures and maintenance regime.

Drawings should include a general arrangement and typical sections.

2.2.12 Capital cost estimates and whole of life assessment

Preparation of capital cost estimates and a whole of life assessment ie. inclusive of maintenance over an agreed time period, would be fundamental to the feasibility study. It is recommended the estimates be prepared by an experienced Quantity Surveyor in consultation with a suitably qualified and experienced maritime/coastal engineer.

Further comments are provided below:

- the estimates should clearly set out all assumptions and inclusions/exclusions;
- where possible, rates should be benchmarked against similar recent projects, in particular the rates for piling which is likely to be the critical, higher construction risk, activity; and
- a P₅₀ and P₉₀ Risk Contingency allowance should be developed based on development of a Risk Register.

2.2.13 Planning strategy/approvals pathway

It is understood that Northern Beaches Council would be the Applicant should reinstatement of the boardwalk and harbour pool proceed to a Development Application.

It would be important to prepare a planning strategy/understanding of the approvals pathway for reinstatement of the boardwalk and harbour pool as this information can dictate the scope and staging of studies. Key principal planning documents would include:

- Sydney Harbour Catchment Regional Environmental Plan 2005 (REP); and
- Sydney Harbour Foreshores and Waterways Area Development Control Plan 2005 (DCP).

It is noted that the Sydney Harbour Catchment REP is currently being reviewed and consolidated with other planning instruments. Other legislation may also apply depending on the details of the application, eg. Fisheries Management Act 1994.

Under the Sydney Harbour Catchment REP the subject site falls within Zone No. W2 – Environment Protection. The objectives of this zone are as follows:

- (a) to protect the natural and cultural values of waters in this zone;
- (b) to prevent damage or the possibility of longer term detrimental impacts to the natural and cultural values of waters in this zone and adjoining foreshores;

- (c) to give preference to enhancing and rehabilitating the natural and cultural values of waters in this zone and adjoining foreshores; and
- (d) to provide for the long term management of the natural and cultural values of waters in this zone and adjoining foreshores.

It is clear there is a strong emphasis on the natural and cultural values of the waters in this zone and adjoining foreshores.

Generally speaking, the approvals process would involve:

- Permission to Lodge (Land Owners Consent);
- Development Consent; and
- Construction Certificate.

2.3 Preliminary Program

A suggested preliminary program for the main studies is set out below. Each study would require preparation of a Brief, submission of proposals, and award of a Contract. The time for these activities is not shown here but would be expected to take around 8 to 10 weeks. A number of the studies could be awarded in combination.

The total duration of the studies would be expected to be around 16 weeks subject to the number of hold points or Workshops and the like Council may wish to introduce, and the time required for review and finalisation of draft reports.

Study	Week No.															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Hydrographic and land survey																
Geotechnical investigation (desk top only)																
Condition assessment of existing structures																
Coastal processes including climate change																
Aquatic ecology																
Landscape character and visual impact assessment																
Heritage study																
Ecological engineering opportunities																
Navigation impact assessment																
Safety in design																
Concept design																
Capital cost estimates and whole of life assessment																
Planning strategy/approvals pathway																
Allowance for review and finalisation of reports																

3 MEETING WITH ROADS AND MARITIME SERVICES

A meeting was held with RMS on 19 July 2018 to discuss the possible reinstatement of the boardwalk and harbour pool. The meeting was attended by Graham Middleton of Council, Greg Britton of RHDHV and three RMS personnel, namely:

- Ms Nhu Doan, Senior Project Manager;
- Mr Indee Chandrawansa, Grants & Property Manager;
- Mr Dan Duemmer, Manager Operations Sydney Harbour.

The following summary notes were compiled by the writer and previously supplied to Council by email on 16 October 2018:

- RMS are still investigating future uses at Manly Wharf, undertaking a patronage study;
- constraints for development of Many Wharf include Little Penguins, seagrass, and heritage;
- RMS do not anticipate any significant changes to use of the western side of the Wharf, some additional commercial vessels may utilise the western side in between usage by Freshwater class ferries;
- eastern side of the Wharf is at capacity at times;
- there is strong demand for use of the area west of the Wharf by recreational vessels;
- the fate of the aquarium building is uncertain, negotiations are ongoing with the tenant about 'making good';
- Council is looking at the feasibility of a University use for the aquarium building;
- temporary pick up/set down structure(s) for recreational vessels need to be considered on the Harbour side of any boardwalk;
- additional ferry arrestor may be required due to collision risk with boardwalk?
- any swing moorings need to be 'environmentally friendly', but the industry is not set up to install or maintain these types of moorings;
- RMS is undertaking a seagrass mapping exercise, *Posidonia* seagrass exists in the area;
- there is some scope to look at larger charter type vessel access at the western end of any boardwalk, depending on demand (noting most pick-ups are undertaken closer to the city);
- DPI Fisheries may have a concern at any additional motorised boating access due to impact on seagrass/ecology;
- the western end of the boardwalk could be the location for non-motorised access, e.g. kayaks, stand-up boards (as the eastern side of the Wharf, which is currently used, is not the safest location);
- 'Boating Now' program could be available for funding of recreational boating infrastructure, the program ends in 2019 but is likely to be replaced with a similar program, most grants are in the range \$100,000 - \$200,000, maximum has been \$1.2M, typical funding is 50:50 with Council but RMS can go to 60:40, preference is to fund infrastructure but the program can also fund studies/designs.

4 DESIGN CONCEPT AND COST ESTIMATES

4.1 General

In discussions with Council it was agreed that an appropriate initial task would be to develop a high level design concept for the boardwalk and harbour pool, an order of cost estimate for construction, indicative operating and maintenance costs, and a whole of life cost estimate. On this basis and other factors, Council could then consider whether it would be productive to proceed with detailed feasibility studies.

It was also agreed that the order of cost estimate for construction of the boardwalk and harbour pool, and whole of life cost estimate, should be prepared by a suitably qualified Quantity Surveyor (QS), with review by RHDHV based on our experience in the coastal/maritime sector.

4.2 Design Concept

A design concept for the boardwalk and harbour pool for purposes of costing was prepared by RHDHV. The design concept was to comprise a 'sympathetic replication' of the former structure but with modern materials where appropriate to achieve a minimum design life of 50 years and adequate durability in the marine environment. The overall layout of the structures was to be based broadly on the concept shown earlier in **Figure 1**.

Council provided a number of historical photos of the former structure for context, several of which are reproduced in **Figures 2, 3 and 4**.

Hand drawn engineering sketches of the boardwalk were prepared and are included in **Appendix A**. A number of features of the design concept are set out below. Main features were discussed and agreed with Council prior to preparation of the order of cost estimate for construction.

- boardwalk to comprise two levels, an upper level for main thoroughfare between Manly Wharf and the existing boardwalk at Manly Pavilion, and a lower level for access to the harbour pool, with upper and lower levels separated by 1m in elevation;
- an upper deck level of 3.0 above Australian Height Datum (3.0m AHD) was adopted for concept purposes, having regard to existing deck levels at Manly Wharf and the boardwalk at Manly Pavilion, extreme water levels during storms (astronomical tide, storm surge, wave conditions) and visual impact considerations;
- width of the upper and lower boardwalk levels to be each 2.5m;
- overall length of boardwalk approximately 260m;
- additional section of boardwalk approximately 30m long branching off the main boardwalk in a landward direction, at the lower deck level, 2.5m wide;
- two pontoons within the harbour pool for recreation purposes;
- intermittent viewing platforms along the main boardwalk on the harbour side;
- shark proof netting along the length of the boardwalk and returning at Manly Wharf;
- construction materials:
 - decking : recycled wood plastic composite (WPC) that looks as close to real timber as possible

- joists : fibre reinforced polymer (FRP) pultruded section
- headstocks : either reinforced concrete or steel hollow section
- foundations : pairs of steel tubular piles driven into the seabed (6m spacing along boardwalk)
- balustrade : traditional timber balustrade as visible in the historical photos
- services:
 - lighting
 - water
- ladders and life buoys at minimum 60m spacing.

Information on geotechnical conditions along the boardwalk alignment was not available, although based on the former structure it can be inferred that conditions were suitable for driven piles. For purposes of the design concept and order of cost estimate for construction it was assumed the foundation conditions comprise medium dense sand.

Construction of an over-water piled boardwalk structure at Manly West Esplanade would be technically feasible and could be competitively tendered to a number of suitably qualified maritime contractors. The estimated construction period would be approximately 40 weeks.

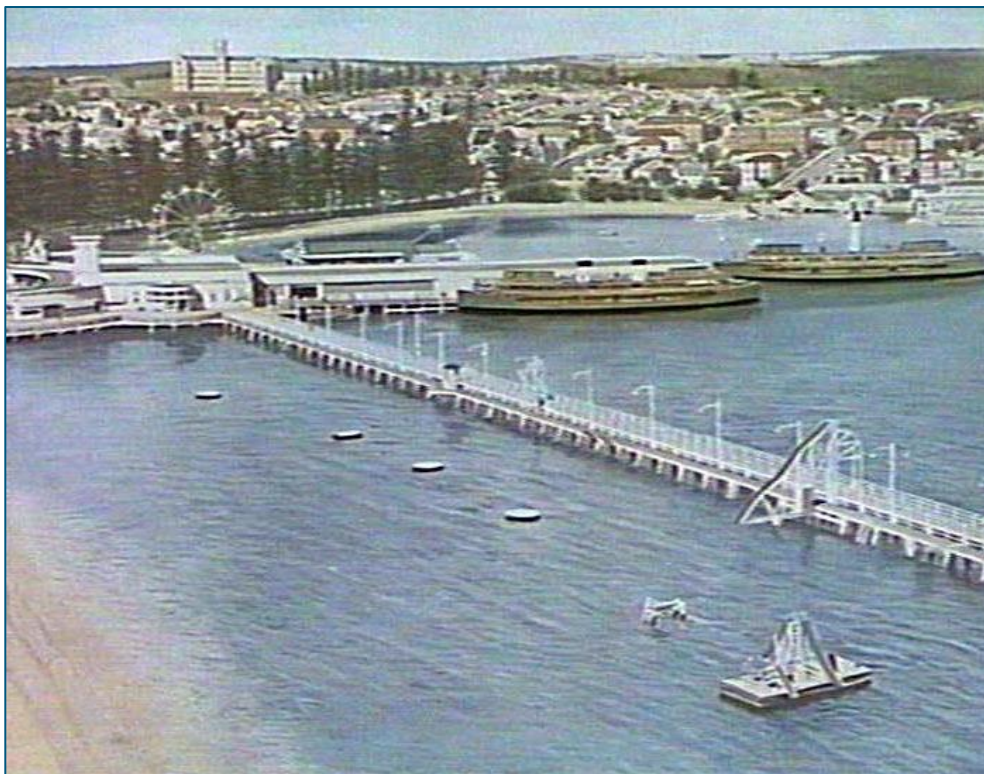


Figure 2 View of boardwalk and harbour pool looking towards Manly Wharf – 1940

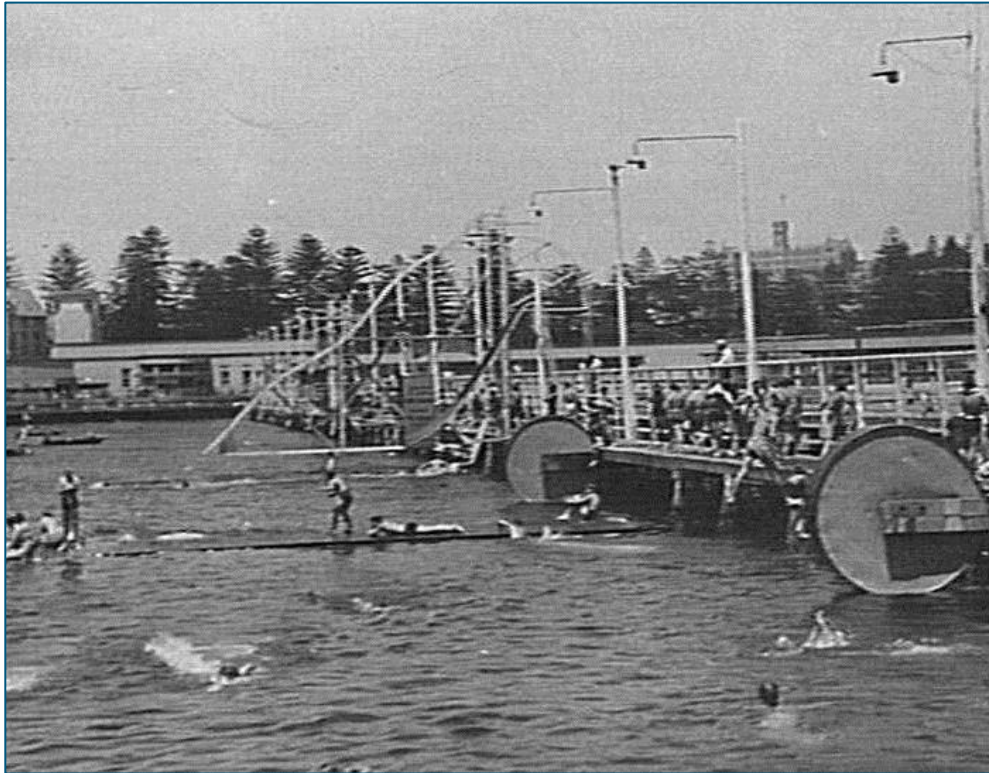


Figure 3 Closer view of boardwalk showing low level platform, recreational activities and lighting – 1950



Figure 4 View looking towards the harbour showing low level and upper level platforms and piling – date unknown

4.3 Order of Cost Estimate for Construction

4.3.1 Cost estimate for construction supplied by Quantity Surveyor

The order of cost estimate for construction prepared by the QS (Muller Partnership) is included in **Appendix B**. This cost estimate is summarised in Table 1. The cost estimate does not allow for a number of items including any property acquisition, finance costs, escalation, design and documentation, planning authority fees and charges, and client side project management.

A number of further qualifications, assumptions and exclusions also apply to the QS estimate as noted in the report in **Appendix B**.

An adjusted order of cost estimate for construction has been prepared by RHDHV using the QS estimate as a basis, which is set out in **Section 4.3.2**. It is recommended that the adjusted estimate be adopted by Council in assessing whether to proceed with detailed feasibility studies.

Table 1 Order of Cost Estimate for Construction (after Muller Partnership, November 2018)

Ref	Description	Cost (excl GST)
1.0	Demolition	\$28,400
2.0	Piles	\$2,971,125
3.0	Metalwork	\$573,610
4.0	Decking	\$1,007,540
5.0	Wharf furniture & equipment	\$647,000
6.0	Services	\$230,000
7.0	Design development allowance	\$273,000
8.0	Preliminaries and margin	\$1,375,325
9.0	Sub Total (excl GST)	\$7,106,000
10.0	Identified risk items	\$75,000
11.0	Construction contingency	\$1,437,000
12.0	Total (excl GST)	\$8,618,000

4.3.2 Adjusted cost estimate for construction

The order of cost estimate for construction prepared by the QS has been adjusted by RHDHV based on our experience in the coastal/maritime sector, taking into account information provided to RHDHV by Council in relation to shark netting and client side project management following finalisation of the QS estimate, and so as to include several items not allowed for in the QS estimate. The adjusted estimate is set out in Table 2.

A number of exclusions still apply to the adjusted estimate including any property acquisition, finance costs, escalation, and planning authority fees and charges. A significant assumption concerns the geotechnical conditions (assumed to be medium dense sands), given that piling costs account for around 40% of the total construction cost. The identified risk items have been expanded to include geotechnical risk plus risk of delays due to ferry movements.

Table 2 Adjusted Order of Cost Estimate for Construction

Ref	Description	Cost (excl GST)
1.0	Base cost from QS estimate	\$7,106,000
2.0	Add extra allowance for mobilisation and demobilisation of piling rig and jack-up barge	\$200,000
3.0	Add allowance for piling for viewing platforms (not accounted for in QS estimate)	\$550,000
4.0	Add extra allowance for shark netting (based on advice of Council)	\$140,000
5.0	Add allowance for lifeguard stations or huts (not accounted for in QS estimate)	\$100,000
6.0	Add extra allowance for pontoons and gangway	\$20,000
7.0	Add allowance for divers to manage seagrass, penguins and seahorses for duration of construction contract over 40 weeks at \$8,000/week (based on advice of Council)	\$400,000
	Adjusted Sub Total (excl GST)	\$8,516,000
8.0	Identified risk items (eg. environmental controls, geotechnical, delays due to ferry movements)	\$250,000
9.0	Construction contingency (20%)	\$1,703,200
10.0	Allow for investigation and design costs, environmental studies and approvals, and client side project management (total 12%)	\$1,021,900
11.0	Allow for client side project management during construction (10%)	\$851,600
	Adjusted Total (excl GST)	\$12,342,700
	Say	\$12.4M

4.3.3 Whole of life cost estimate

A whole of life cost estimate was prepared by the QS and is included in **Appendix C**. It is based on a 50 year time period and discount rate of 7% as agreed with Council. The estimated operating costs over the 50 year period were supplied by Council in a spreadsheet. The maintenance requirements for the boardwalk and pontoons were determined by RHDHV and included in a spreadsheet for costing by the QS. The spreadsheets are included within the QS report in **Appendix C**.

The whole of life cost estimate is summarised below.

Total Capital Cost:	:	\$12.4M (as adjusted by RHDHV – refer Table 2)
Operating Cost (50 year):	:	\$15.8M
Total Maintenance Cost (50 year)	:	\$0.7M

5 WORKSHOP AND PRESENTATION

A workshop to discuss the Manly West Esplanade Precinct Masterplan was conducted at the Council Dee Why office on 21 November 2018 including all the relevant departments within Council. A brief presentation of the main findings of the RHDHV scope of work was made by the writer. A copy of this presentation is included in **Appendix D²**.

A complete report on the workshop is to be prepared by others and will inform the Masterplan process going forward. Several key points raised at the workshop regarding the boardwalk, noted by the writer, are summarised below:

- the boardwalk is relatively expensive as an additional pedestrian connection between Manly Wharf and the existing boardwalk at Manly Pavilion when a pedestrian connection already exists along the foreshore;
- the boardwalk and harbour pool would attract a significant operating cost, particularly in relation to user safety involving employment of lifeguards;
- the area has a quiet natural beauty which may be impacted adversely by the boardwalk and harbour pool; and
- environmental concerns include the existence of *Posidonia* seagrass, Little Penguins, and Seahorse.



Figure 5 View looking west/south-west towards the former Manly Aquarium and Manly Pavilion with the existing netted swimming enclosure in the foreground

² Note that the order of cost estimate for construction discussed at the workshop was \$11.2M. This cost is now estimated to be \$12.4M, as noted in **Section 4.3.2**, based on adjustments outlined in that Section.

6 CONCLUDING REMARKS

It would be technically feasible to reinstate the boardwalk and harbour pool at Manly West Esplanade. The order of cost estimate for construction is \$12.4M. Based on a 50 year time period and discount rate of 7% the net present value of operating costs and maintenance costs are estimated to be \$15.8M and \$0.7M respectively.

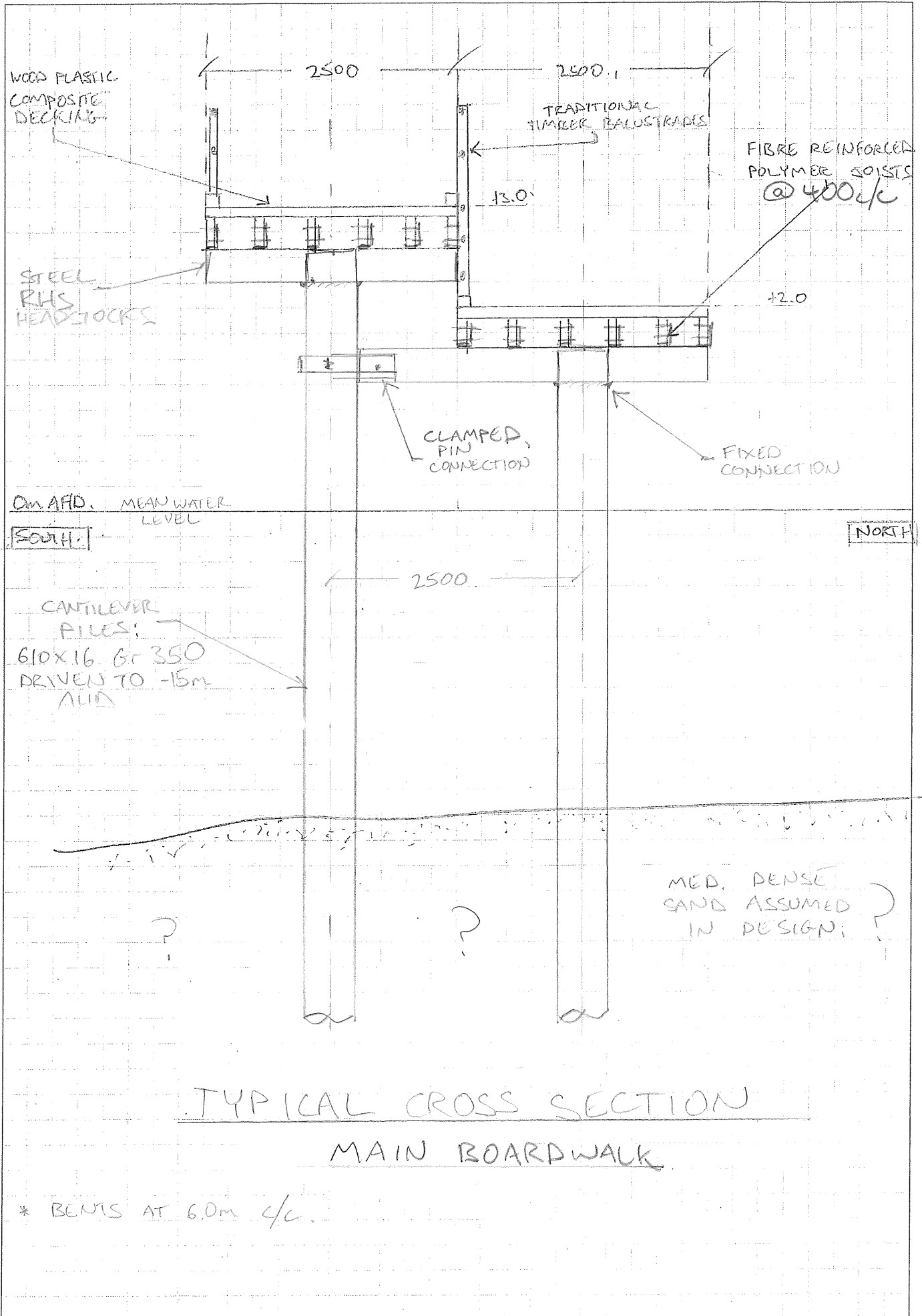
A range of individual studies would need to be undertaken for purposes of a complete and robust feasibility study to reinstate the boardwalk and harbour pool. These individual studies are outlined based on experience in **Section 2**.

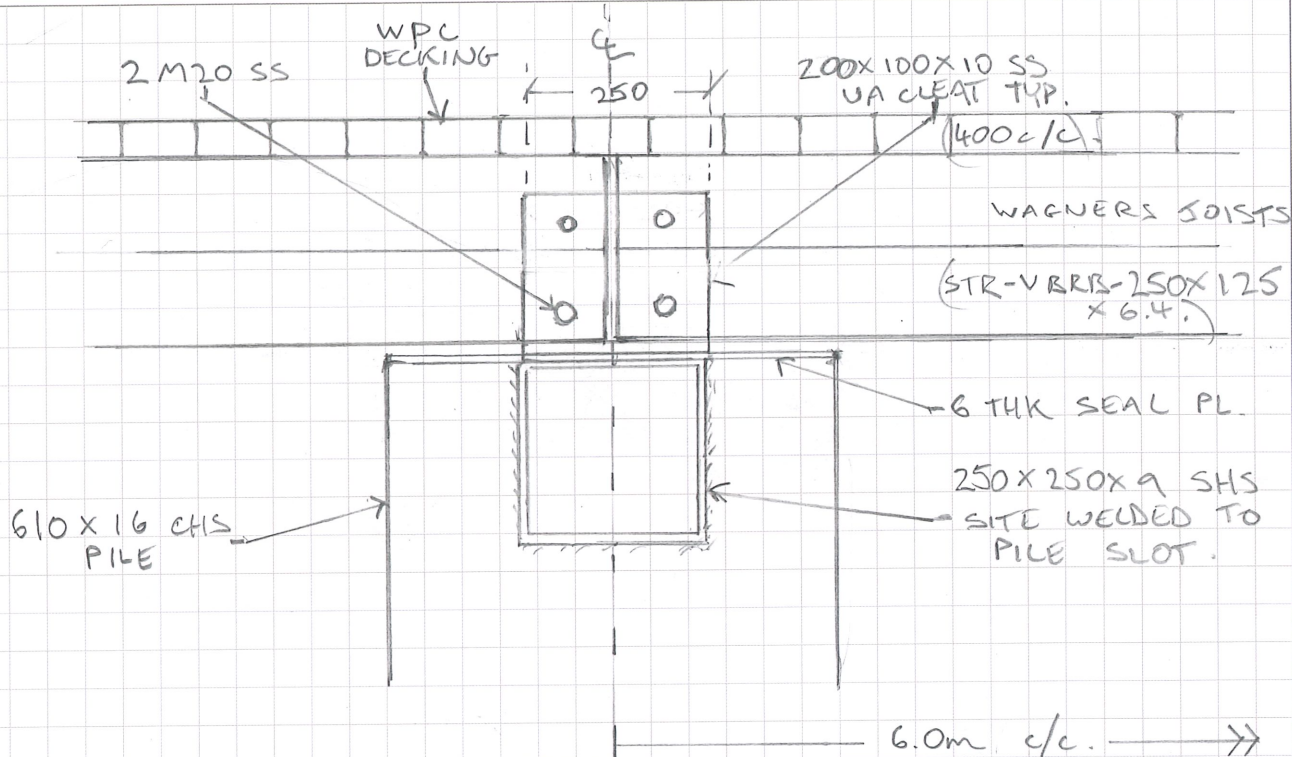
Should the view be taken that reinstatement of the boardwalk and harbour pool is not preferred, there may be opportunity to activate additional waterway access and waterfront uses at the western end of the study area, in the area of the former Manly Aquarium and Manly Pavilion where maritime infrastructure has been in place for decades as part of the built environment (refer **Figure 6**).



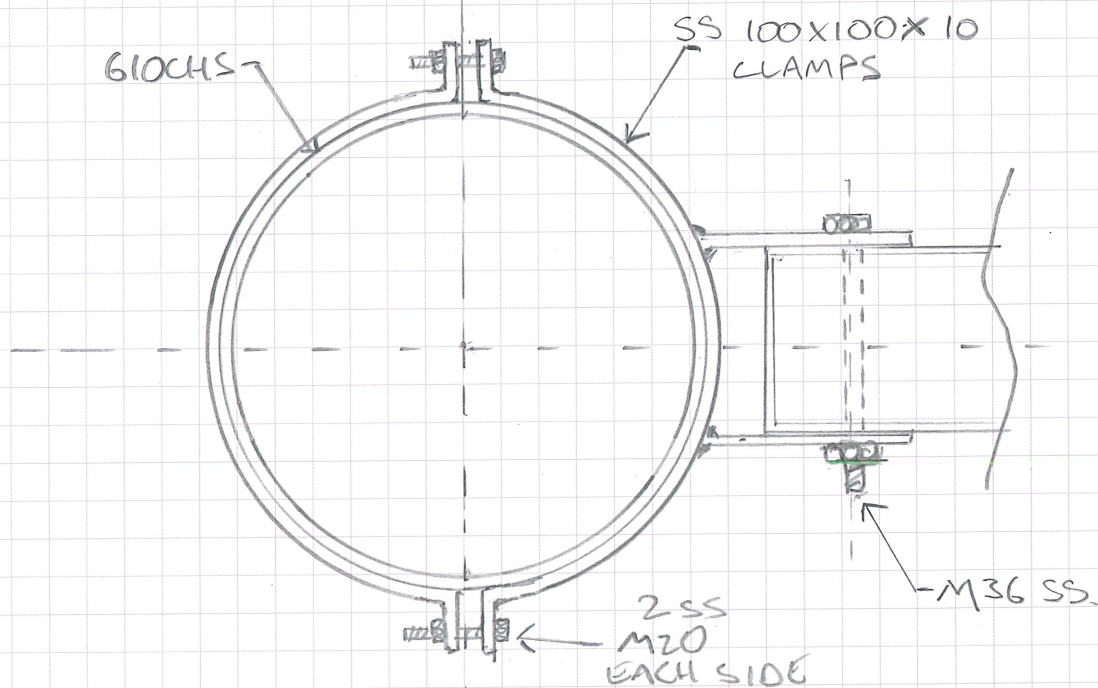
Figure 6 View to existing maritime infrastructure at the western end of the study area

Appendix A Design Concept Engineering Sketches

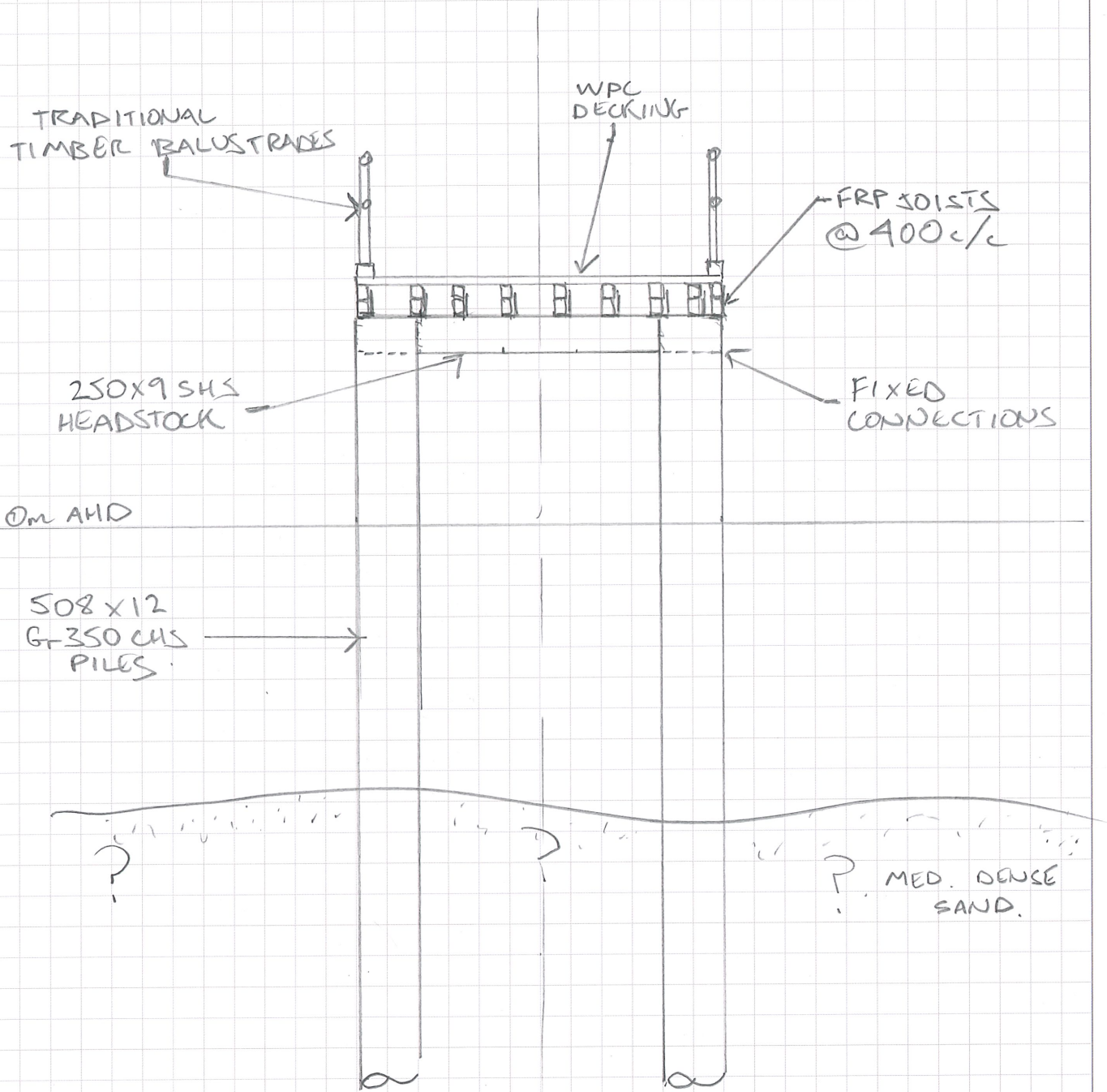




JOIST & HEADSTOCK CONNECTION



HEADSTOCK TO PILE PIN CONNECTION



TYPICAL CROSS SECTION
CENTRE / BRANCHING ROADWALK

* BENTS AT 6.0m c/c

Appendix B Order of Cost Estimate for Construction by Muller Partnership

MULLER *partnership*

MANLY WEST ESPLANADE BOARDWALK AND
HARBOUR POOL REINSTATEMENT

ORDER OF COST ESTIMATE

Newcastle :: Sydney :: Melbourne
15 NOVEMBER 2018



15 November 2018

Royal HaskoningDHV Pty Ltd
Level 14, 56 Berry Street
NORTH SYDNEY NSW 2060

ATTENTION: GREG BRITTON

**RE: MANLY WEST ESPLANADE BOARDWALK AND
HARBOUR POOL REINSTATEMENT
ORDER OF COST ESTIMATE**

As per your request dated 16th October 2018, Muller Partnership have prepared an Order of Cost Estimate for the above project totalling **\$8,618,000 Excl GST** and enclose our report.

Please note the attached Order of Cost Estimate has been prepared based on the current preliminary information and should be updated if additional information becomes available. Please take note of our Assumptions (Item 3.0) and Exclusions (Item 4.0).

Should you wish to discuss any of the above please do not hesitate to contact either *Harley Gleeson* or the undersigned.

Yours faithfully

MULLER PARTNERSHIP



**CAMERON BEARD
DIRECTOR**

CB:HG 18373 Manly West Esplanade Boardwalk and Harbour Pool Reinstatement - Order of Cost Estimate

Disclaimer

Muller Partnership have prepared this report in part on the basis of information supplied to it in the ordinary course of business by Greg Britton of Royal HaskoningDHV.

Whilst all reasonable professional care and skill have been exercised to validate its accuracy and authenticity, Muller Partnership is unable to provide any Guarantee in that regard, and will not be liable to any party for any loss arising as a result of any such information subsequently being found to be inaccurate, lacking authenticity or having been withheld.

This report is only intended for use by HaskoningDHV and Muller Partnership accepts no responsibility to other parties who use opinions or information contained herein. They do so at their own risk.

In acting as Quantity Surveyor for HaskoningDHV, Muller Partnership's liability is limited to the scope of services and value limit, as defined in their Professional indemnity insurance cover. A copy is available on request.

This report covers only the items as contained in this report. Should HaskoningDHV require additional items or areas of assessment, these should be specifically requested and will be actioned as agreed between the parties.

Document history & status

Revision	Date	Description	By	Review	Approved
1	15/11/2018	Order of Cost Estimate	HG	CB	CB

CONTENTS

1.0	Executive Summary.....	5
2.0	Schedule Of Information	7
3.0	Assumptions.....	8
4.0	Exclusions	9
	Appendix A – ORDER OF COST ESTIMATE	10

Glossary of Key Terms

<i>Construction Contingency</i>	The Construction Contingency is a contingency allowance made for unknowns that may occur during construction due to latent conditions or issues with the documentation.
<i>Design Development Allowance</i>	The Design Development Allowance is a contingency included within our estimate to allow for the unknown costs associated with progressing the development from the initial concept through until the 'For Construction'. At the time of For Construction documentation this contingency should be 0% as all of the project will have been designed and costed accordingly.
<i>Preliminaries & Margin</i>	The Preliminaries and Margin Allowance is an allowance for the builder margin and their establishment and management of the site. This item will therefore include for items such as site fencing & amenities, site foreman, head office overheads, insurances, scaffolding & hoarding, craneage, site cleaning, OH&S management, QA, etc.

1.0 EXECUTIVE SUMMARY

Project Description

The project considered by this report is for the proposed reinstatement of the Manly West Esplanade Boardwalk and Harbour Pool located at Manly Cove, Manly. The scope of works is generally as follows:

- Removal of existing shark netting and timber piles;
- Construction of a 260m main boardwalk comprising 2 level boardwalk constructed using CHS steel piles, structural steel headstocks and pile clamps, FRP RHS joists and Wood Plastic Composite decking;
- Construction of a 30m centre boardwalk and 52m viewing platforms constructed using CHS steel piles, structural steel headstocks and pile clamps, FRP RHS joists and Wood Plastic Composite decking;
- Traditional timber handrails to boardwalks;
- Supply and installation of 15m long aluminium truss gangway;
- Central Pontoon [10m x 4m];
- Pontoon Playground [6m x 4m];
- Ladders and life buoys;
- Shark netting;
- Boardwalk lighting;

Cost Overview

A summary of the Order of Cost Estimate is as follows:

Order of Cost Estimate Cost Summary		
Ref	Description	\$ Excl GST
1.0	Demolition	\$28,400
2.0	Piles	\$2,971,125
3.0	Metalwork	\$573,610
4.0	Decking	\$1,007,540
5.0	Wharf Furniture & Equipment	\$647,000
6.0	Services	\$230,000
7.0	Design Development Allowance	\$273,000
8.0	Preliminaries and Margin	\$1,375,325
9.0	SUBTOTAL [EXCL GST]	\$7,106,000
10.0	Identified Risk Items	\$75,000
11.0	Construction Contingency	\$1,437,000
12.0	TOTAL [EXCL GST]	\$8,618,000

We note the attached estimates are for construction costs only and do not allow for items such as property acquisition, finance costs, escalation, design & documentation or planning & authority fees & charges or Client Side Project Management. Please refer to the Qualification, Assumptions and Exclusions sections of this report for further details.

2.0 SCHEDULE OF INFORMATION

Muller Partnership has used the following information in compiling our Order of Cost Estimate:

1. Royal HaskoningDHV Pty Ltd Memo document titled 'West Esplanade Boardwalk and Harbour Pool Reinstatement – Concept Design' dated 25 October 2018, received 02 November 2018 [Ref: PA1893NT01];
2. Materials Take Off Sheet provided by Harry Gibbs of Royal HaskoningDHV dated 02 November 2018, received 02 November 2018;
3. Email and telephone correspondence with Harry Gibbs of Royal HaskoningDHV in relation to scope (numerous);

All rates used within our Order of Cost Estimate have been gathered from our in-house databases as well as being constructed from first principles namely labour, materials and waste to reflect current market and project specific value.

3.0 ASSUMPTIONS

We have made the following assumptions in the preparation of our Order of Cost Estimate:-

1. The works will be competitively tendered to a number of suitable qualified contractors on a lump sum basis;
2. A design development allowance of 5% has been included for all estimates;
3. A construction contingency of 20% has been included for all estimates;
4. The Contractor will have clear uninterrupted access to the site;
5. A provisional allowance of \$18,000 *Excl GST* has been included for the disconnection and remove of the existing shark nets;
6. A provisional allowance of \$10,400 *Excl GST* has been included for the extraction and disposal of timber shark net piles;
7. It is assumed the pile removal will occur at when the piling rig is established onsite;
8. A mobilisation and demobilisation allowance of \$180,000 *Excl GST* has been included for the piling rig and jack up barge;
9. 6mm steel pile caps have been assumed to the top of all piles;
10. A provisional allowance of \$80,000 *Excl GST* has been included for the aluminium gangway;
11. A provisional allowance of \$273,000 *Excl GST* has been included for traditional timber handrails;
12. A provisional number of 12 no. Ladders have been included;
13. A provisional number of 12 no. life buoys have been included;
14. A provisional allowance of \$72,000 *Excl GST* has been included for the Central Pontoon;
15. A provisional allowance of \$45,000 *Excl GST* has been included for the Pontoon Playground;
16. A provisional allowance of \$230,000 *Excl GST* has been included for the lighting to the boardwalk [Assumed 15m spacings];
17. An identified risk item of \$75,000 *Excl GST* has been included for a silt curtain to the extent of the works area;

4.0 EXCLUSIONS

Within the following Order of Cost Estimate the acronym 'EXCL' means work that has **not** been included in our estimate. We specifically note the following exclusions from the estimated cost:

1. GST;
2. Escalation;
3. Authority's fees and charges & legal fees;
4. Client Side Project Management;
5. Delay costs including latent conditions;
6. Design Consultant costs;
7. Works outside the specified site area;
8. Finance costs;
9. Works outside normal hours;
10. Land/ Property Acquisition;
11. Contamination allowances [NB: Unless Otherwise Noted];
12. Treatment/ disposal of unsuitable material [NB: Unless Otherwise Noted];
13. Aboriginal and Heritage impacts;
14. Delays resulting from approvals such as Environmental/ Authorities;
15. Consideration or delays caused by Ferry movements;
16. Restrictions imposed by RMS;
17. Communications services;
18. Cathodic protection;
19. Other scope identified in the masterplan drawing (i.e. Dedicated bike path, Outdoor art, outdoor sculptures, new sustainable art gallery, seagrass-friendly moorings, artificial reef, access ramp, little penguins area, seagrass/ eco sanctuary, underwater discoveries, Rehab/eco pool)
20. Play equipment;
21. Works to nearby structures;

APPENDIX A – ORDER OF COST ESTIMATE

**MANLY WEST ESPLANADE BOARDWALK AND HARBOUR POOL
REINSTATEMENT
ORDER OF COST ESTIMATE
NOVEMBER 2018**

MAIN COST SUMMARY

<i>Ref</i>	<i>Description</i>	<i>%</i>	<i>Cost/ m2</i>	<i>Sub Total</i>	<i>Total</i>
1.0	DEMOLITION	0.33		28,400	28,400
2.0	PILES	34.48		2,971,125	2,971,125
3.0	METALWORK	6.66		573,610	573,610
4.0	DECKING	11.69		1,007,540	1,007,540
5.0	WHARF FURNITURE & EQUIPMENT	7.51		647,000	647,000
6.0	SERVICES	2.67		230,000	230,000
7.0	DESIGN DEVELOPMENT ALLOWANCE [5%]	3.17		273,000	273,000
8.0	PRELIMINARIES AND MARGIN	15.96		1,375,325	1,375,325
9.0	SUBTOTAL [EXCL GST]				<u>7,106,000</u>
10.0	IDENTIFIED RISK ITEMS	0.87		75,000	75,000
11.0	CONSTRUCTION CONTINGENCY [20%]	16.67		1,437,000	1,437,000
12.0	TOTAL [EXCL GST]				<u>8,618,000</u>
		100.00		8,618,000	8,618,000

**MANLY WEST ESPLANADE BOARDWALK AND HARBOUR POOL
REINSTATEMENT
ORDER OF COST ESTIMATE
NOVEMBER 2018**

ESTIMATE DETAILS

<i>Ref</i>	<i>Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Rate</i>	<i>Amount</i>
1.0 DEMOLITION					
	<u>Demolition of existing water based items</u>				
1	Allowance to disconnect and remove existing shark net [Provisional]	200.00	m	90.00	18,000.00
2	Allowance to extract and dispose of existing timber pile for shark nets [Provisional]	13.00	No	800.00	10,400.00
				Total :	28,400.00
2.0 PILES					
	<u>Site Mobilisation/Demobilisation</u>				
1	Allowance for mobilisation & demobilisation of piling rig and jack up barge	1.00	Item	180,000.00	180,000.00
	<u>355 dia CHS Piles</u>				
	<u>Supply CHS Piles</u>				
2	Supply 355 dia x 9.5 thick wall x 12m long steel piles	13.00	No	1,950.00	25,350.00
	<u>Install CHS piles from barge</u>				
3	Install 355 dia x 9.5 thick wall x 12m long steel piles driven into seabed	13.00	No	6,600.00	85,800.00
	<u>508 dia CHS Piles</u>				
	<u>Supply CHS Piles</u>				
4	Supply 508 dia x 12 thick wall x 17m long steel piles	12.00	No	4,975.00	59,700.00
5	Supply 508 dia x 12 thick wall x 18m long steel piles	2.00	No	5,265.00	10,530.00
	<u>Install CHS piles from barge</u>				
6	Install 508 dia x 12 thick wall x 17m long steel piles driven into seabed	12.00	No	12,750.00	153,000.00
7	Install 508 dia x 12 thick wall x 18m long steel piles driven into seabed	2.00	No	13,500.00	27,000.00
	<u>610 dia CHS Piles</u>				
	<u>Supply CHS Piles</u>				
8	Supply 610 dia x 16 thick wall x 17m long steel piles	88.00	No	7,990.00	703,120.00
9	Supply 610 dia x 16 thick wall x 18m long steel piles	2.00	No	8,460.00	16,920.00
	<u>Install CHS piles from barge</u>				
10	Install 610 dia x 16 thick wall x 17m long steel piles driven into seabed	88.00	No	14,450.00	1,271,600.00
11	Install 610 dia x 16 thick wall x 18m long steel piles driven into seabed	2.00	No	15,300.00	30,600.00
	<u>Miscellaneous CHS Pile Works</u>				
	<u>Pile Trimming</u>				
12	Cut back 355 dia piles following driving	13.00	No	325.00	4,225.00
13	Cut back 508 dia piles following driving	14.00	No	350.00	4,900.00

**MANLY WEST ESPLANADE BOARDWALK AND HARBOUR POOL
REINSTATEMENT
ORDER OF COST ESTIMATE
NOVEMBER 2018**

ESTIMATE DETAILS

<i>Ref</i>	<i>Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Rate</i>	<i>Amount</i>
2.0 PILES					(Continued)
14	Cut back 610 dia piles following driving	90.00	No	400.00	36,000.00
	Pile caps				
15	Allowance to supply, fabricate and install 6mm x 355 dia pile cap	13.00	No	270.00	3,510.00
16	Allowance to supply, fabricate and install 6mm x 508 dia pile cap	14.00	No	355.00	4,970.00
17	Allowance to supply, fabricate and install 6mm x 610 dia pile cap	90.00	No	430.00	38,700.00
	Pile Surface Treatment				
18	Allowance for epoxy coating steel pile	50.00	m2	120.00	6,000.00
19	Denso wrap to steel pile	800.00	m2	370.00	296,000.00
	Stainless Steel Wearing Plate				
20	Allowance to supply and install 3mm stainless steel circumferential plate 3,000 long to 508 dia pile [Provisional]	2.00	No	3,100.00	6,200.00
21	Allowance to supply and install 3mm stainless steel circumferential plate 3,000 long to 610 dia pile [Provisional]	2.00	No	3,500.00	7,000.00
				Total :	2,971,125.00

3.0 METALWORK

Headstock

1	Allowance to fabricate and supply 250 x 250 x 9 SHS	14.00	t	5,000.00	70,000.00
2	Extra over allowance for 250 long x 200 x 100 x 10 SS UA Cleat to last at 400 cts	738.00	No	175.00	129,150.00

Headstock Connections

3	Allowance for headstock connections to piles comprising cutting piles to allow for headstocks to be slotted into and welded in place [Provisional]	188.00	No	1,100.00	206,800.00
4	Allowance to fabricate and supply 10mm thick plate Pile Clamps to 610 OD x 16 steel tube pile [Provisional]	44.00	No	830.00	36,520.00
5	Install pile clamps to 610 OD steel pile including 4M20 SS bolts each side and 1 M36 to headstock	44.00	No	935.00	41,140.00

Gangway

6	Allowance to supply and install 15,000 long x 1,800 wide Aluminium truss gangway [Provisional]	1.00	No	80,000.00	80,000.00
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Signage

7	Allowance for signage to boardwalks [provisional]	1.00	Item	10,000.00	10,000.00
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Total : 573,610.00

4.0 DECKING

**MANLY WEST ESPLANADE BOARDWALK AND HARBOUR POOL
REINSTATEMENT
ORDER OF COST ESTIMATE
NOVEMBER 2018**

ESTIMATE DETAILS

<i>Ref</i>	<i>Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Rate</i>	<i>Amount</i>
4.0 DECKING					
	<u>Joists</u>				
1	Allowance to supply and install 250 x 125 x 6.4 FRP RHS joists [STR-VBRB-250x125x6.4 by Wagners]	4,430.00	m	160.00	708,800.00
	<u>Decking</u>				
2	Allowance to supply and install Wood Plastic Composite (WPC) decking	1,546.00	m2	190.00	293,740.00
	<u>Connections</u>				
3	Allowance for tie into existing wharf structures [Provisional]	2.00	No	2,500.00	5,000.00
				Total :	1,007,540.00
5.0 WHARF FURNITURE & EQUIPMENT					
	<u>Handrails</u>				
1	Allowance to supply and install traditional timber balustrades [Provisional]	780.00	m	350.00	273,000.00
	<u>Ladders</u>				
2	Supply and install waterside wharf access ladders [Provisional]	12.00	No	20,000.00	240,000.00
	<u>Miscellaneous</u>				
3	Lifebouy including stand	12.00	No	600.00	7,200.00
	<u>Shark Net</u>				
4	Allowance to supply and install shark Braided PE net fixed to new boardwalk structure	280.00	m	35.00	9,800.00
	<u>Pontoons</u>				
5	Allowance to supply and install Central Pontoon comprising 10m x 4m pontoon platform [Provisional]	1.00	Item	72,000.00	72,000.00
6	Ditto Pontoon Playground comprising 6m x 4m pontoon platform [Provisional]	1.00	Item	45,000.00	45,000.00
				Total :	647,000.00
6.0 SERVICES					
	<u>Lighting</u>				
1	Allowance for light poles every 15m along boardwalks including connection to shore based power	23.00	No	10,000.00	230,000.00
	<u>Power</u>				
2	Allowance for electrical services to boardwalk [Provisional]		m		EXCL
	<u>Comms</u>				
3	Allowance for comms services to boardwalk [Provisional]		m		EXCL
	<u>Water</u>				

**MANLY WEST ESPLANADE BOARDWALK AND HARBOUR POOL
REINSTATEMENT
ORDER OF COST ESTIMATE
NOVEMBER 2018**

ESTIMATE DETAILS

<i>Ref</i>	<i>Description</i>	<i>Quantity</i>	<i>Unit</i>	<i>Rate</i>	<i>Amount</i>
6.0 SERVICES					(Continued)
4	Allowance for water services to boardwalk [Provisional]		m		EXCL
Total :					230,000.00
7.0 DESIGN DEVELOPMENT ALLOWANCE [5%]					
Total :					
8.0 PRELIMINARIES AND MARGIN					
1					
Total :					
9.0 SUBTOTAL [EXCL GST]					
1					
Total :					
10.0 IDENTIFIED RISK ITEMS					
1	Allowance for silt curtain to perimeter of works [Provisional]	250.00	m	300.00	75,000.00
2	Amplification of electrical services		Item		EXCL
3	Heritage Works to adjoining wharfs		Item		EXCL
4	Cathodic Protection		Item		EXCL
Total :					75,000.00
11.0 CONSTRUCTION CONTINGENCY [20%]					
Total :					
12.0 TOTAL [EXCL GST]					
1					
Total :					

Appendix C Whole of Life Cost Model by Muller Partnership

MULLER *partnership*

MANLY WEST ESPLANADE BOARDWALK AND
HARBOUR POOL REINSTATEMENT

WHOLE OF LIFE MODEL

Newcastle :: Sydney :: Melbourne

19 MARCH 2019

An abstract graphic consisting of several thick, overlapping, curved lines in shades of blue and teal. The lines flow from the bottom left towards the right, creating a sense of movement and depth. The background is a solid grey, and the lines vary in opacity, creating a layered effect.

19 March 2019

Royal HaskoningDHV Pty Ltd
Level 14, 56 Berry Street
NORTH SYDNEY NSW 2060

ATTENTION: GREG BRITTON

**RE: MANLY WEST ESPLANADE BOARDWALK AND
HARBOUR POOL REINSTATEMENT
WHOLE OF LIFE MODEL**

As per your request dated 1st March 2019, Muller Partnership have prepared the Whole of Life Model for the above project and enclose our report.

Please note the attached Whole of Life Model has been prepared based on the provided information and should be updated if/when additional information becomes available. Please take note of our Assumptions (Item 3.0) and Exclusions (Item 4.0).

Should you wish to discuss any of the above please do not hesitate to contact either *Harley Gleeson* or the undersigned.

Yours faithfully

MULLER PARTNERSHIP



CAMERON BEARD
DIRECTOR

CB:HG 18373 Manly West Esplanade Boardwalk and Harbour Pool Reinstatement Whole of Life Model

Disclaimer

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In acting as Quantity Surveyor for Royal HaskoningDHV. Muller Partnership's liability is limited to the scope of services and value limit, as defined in their Professional indemnity insurance cover. A copy is available on request.

This report covers only the items as contained in this report. Should Royal HaskoningDHV require additional items or areas of assessment, these should be specifically requested and will be actioned as agreed between the parties.

The construction costs are current as at the date of this assessment only. The values assessed herein may change significantly and unexpectedly over a relatively short period (including as a result of general market movements or factors specific to the particular property). We do not accept liability for losses arising from such subsequent changes in values.

Document history & status

Revision	Date	Description	By	Review	Approved
1	18/03/2019	Whole of Life Model	HG	CB	CB
2	19/03/2019	Whole of Life Model – Assumption Update	HG	CB	CB

CONTENTS

1.0	Executive Summary.....	5
2.0	Schedule Of Information	6
3.0	Assumptions.....	7
4.0	Exclusions	8
	Appendix A – WHOLE OF LIFE MODEL.....	9
	Appendix B – Supporting Documents	10

1.0 EXECUTIVE SUMMARY

Muller Partnership has been engaged by Royal Haskoning DHV to prepare a Whole of Life Model for the Manly West Esplanade Boardwalk project.

Scope

Generally, the scope included within the attached report comprises assessment of the Whole of Life costs over a 50 year period for the entire project scope including piles, metalwork, decking, wharf furniture and equipment and services. The Whole of Life Model generally considers Capital Costs, Operating Costs and Maintenance Costs to determine the Net Present Value.

Cost Summary

Item	Total NPV
Total Capital Cost (50yr)	\$7,106,000
Total Operating Cost (50yr)	\$15,796,397
Total Maintenance Cost (50yr)	\$704,505
Overall Total	\$23,606,902

2.0 SCHEDULE OF INFORMATION

Muller Partnership has used the following information in compiling our Whole of Life Model:

- Muller Partnership Report titled “Manly West Esplanade Boardwalk and Harbour Pool Reinstatement - Order of Cost Estimate” dated 15 November 2018;
- Council provided spreadsheet titled “Manly West Esplanade Annual Operational Cost Estimates per annum” dated 6 March 2019, received 8 March 2019;
- Royal Haskoning spreadsheet titled “Manly West Esplanade Maintenance Tasks” dated 11 March 2019, received 11 March 2019;
- Email and telephone correspondence with Greg Britton and Harry Gibbs of Royal HaskoningDHV in relation to scope (numerous);

All rates used within our Whole of Life Model have been gathered from our in-house databases as well as being constructed from first principles namely labour, materials and waste to reflect current market and project specific value.

3.0 ASSUMPTIONS

We have made the following assumptions in the preparation of our Whole of Life Model:-

1. A discount rate of 7% has been utilised to calculate the Net Present Value as requested by Greg Britton of Royal Haskoning DHV;
2. The Capital Cost has been included as per the Muller Partnership Order of Cost Estimate dated 15 November 2018 (excluding contingencies);
3. All costs provided by Council have been included as provided and extended out to 50 years (as per the requested of Royal Haskoning DHV).
4. It is assumed the Council listed Safety Equipment item includes for maintenance to light poles, life buoys and signage. No allowance has been made for these separately within the WOL model;
5. The Maintenance list provided by Royal Haskoning DHV has been adopted, with costs for each maintenance item being included at the specified frequency;
6. Royal HaskoningDHV nominated Shark Net maintenance and expected life replacement costs have been excluded from the maintenance costs as these have been included in the operational costs provided by Council.

4.0 EXCLUSIONS

Within the following Whole of Life Model the acronym 'EXCL' means work that has **not** been included in our estimate. We specifically note the following exclusions from the estimated cost:

1. GST;
2. Due Diligence of Council of Royal Haskoning numbers;
3. Works after 50 years are excluded [NB: Assumed end of life];
4. Make good from vandalism;
5. Acts of God and other insurable events;
6. Play Equipment;
7. Income;

APPENDIX A – WHOLE OF LIFE MODEL

MANLY WEST ESPLANADE BOARDWALK
Order of Cost Estimate - Whole of Life Review

FY Ending	Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036
CAPITAL COSTS (\$ 2019)																			
Based on the Order of Cost Estimate dated 15 November 2018.																			
Demolition	\$	\$	28,400																
Piles	\$	\$	2,971,125																
Metalwork	\$	\$	573,610																
Decking	\$	\$	1,007,540																
Wharf Furniture & Equipment	\$	\$	647,000																
Services	\$	\$	230,000																
Design Development Allowance	\$	\$	273,000																
Preliminaries and Margin	\$	\$	1,375,325																
TOTAL CAPITAL COSTS		7,106,000	\$	7,106,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL CAPITAL PV 7%		7,106,000	\$	7,106,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OPERATING COSTS (\$ 2019)																			
Based on the Council provided per annum cost dated 6 March 2019.																			
Staffing																			
Education Staffing x 2	\$	\$	150,000	\$	150,000	\$	150,000	\$	150,000	\$	150,000	\$	150,000	\$	150,000	\$	150,000	\$	150,000
Events Activations	\$	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000
Marketing	\$	\$	30,000	\$	30,000	\$	30,000	\$	30,000	\$	30,000	\$	30,000	\$	30,000	\$	30,000	\$	30,000
Education Programs Aboriginal Heritage and Enviro	\$	\$	200,000	\$	200,000	\$	200,000	\$	200,000	\$	200,000	\$	200,000	\$	200,000	\$	200,000	\$	200,000
Beach Services																			
Operations Life Guards x 5 @ 60	\$	\$	300,000	\$	300,000	\$	300,000	\$	300,000	\$	300,000	\$	300,000	\$	300,000	\$	300,000	\$	300,000
Equipment/ Play	\$	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000
Safety Equipment	\$	\$	50,000		\$	50,000		\$	50,000		\$	50,000		\$	50,000		\$	50,000	
Shark Netting maintenance	\$	\$	15,000	\$	15,000	\$	15,000	\$	15,000	\$	15,000	\$	15,000	\$	15,000	\$	15,000	\$	15,000
Beach cleansing	\$	\$	10,000	\$	10,000	\$	10,000	\$	10,000	\$	10,000	\$	10,000	\$	10,000	\$	10,000	\$	10,000
Shark Netting replacement 5 years	\$						\$	150,000				\$	150,000				\$	150,000	
Environmental																			
Seahorse audits 2 per year	\$	\$	12,000	\$	12,000	\$	12,000	\$	12,000	\$	12,000	\$	12,000	\$	12,000	\$	12,000	\$	12,000
Marine Condition reports 2 per year	\$	\$	8,000	\$	4,000	\$	4,000	\$	4,000	\$	4,000	\$	4,000	\$	4,000	\$	4,000	\$	4,000
Penguin protection	\$	\$	5,000	\$	5,000	\$	5,000	\$	5,000	\$	5,000	\$	5,000	\$	5,000	\$	5,000	\$	5,000
Operations																			
Cleansing/ Bins/ Pressure cleaning	\$	\$	40,000	\$	40,000	\$	40,000	\$	40,000	\$	40,000	\$	40,000	\$	40,000	\$	40,000	\$	40,000
Water	\$	\$	20,000	\$	20,000	\$	20,000	\$	20,000	\$	20,000	\$	20,000	\$	20,000	\$	20,000	\$	20,000
Electricity	\$	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000	\$	100,000
Maintenance/ paint/ replacement etc.	\$	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000	\$	50,000
TOTAL OPERATING COSTS			\$	1,140,000	1,086,000	1,136,000	1,086,000	1,136,000	1,236,000	1,136,000	1,086,000	1,136,000	1,086,000	1,286,000	1,086,000	1,136,000	1,086,000	1,236,000	1,136,000
TOTAL OPERATING PV 7%		15,796,397	\$	1,140,000	1,009,980	982,526	873,532	849,787	859,871	734,981	653,447	635,685	565,166	622,401	488,812	475,525	422,774	411,282	416,162
MAINTENANCE COSTS (\$ 2019)																			
Based on the Royal Haskoning DHV Maintenance tasks provided 11 March 2019.																			
General																			
Engineering Inspection	\$5,000 each x 2 Years	\$		\$	5,000		\$	5,000		\$	5,000		\$	5,000		\$	5,000		\$
Repairs as required	\$2,000 each x 1 Year	\$		\$	2,000	\$	2,000	\$	2,000	\$	2,000	\$	2,000	\$	2,000	\$	2,000	\$	2,000
Piles																			
Dive Inspection - Piles	\$10,000 each x 5 Years	\$					\$	10,000					\$	10,000			\$	10,000	
Replace Denso Wrapping to All Piles	800m2 @ \$600/m2 x 25 Years	\$																	
Replace Pontoon Restraint Wear Plates																			
\$85,000 each x 25 Years																			
Metalwork																			
Repaint Headstocks (Blast clean, prime, recoat, assume working from Barge)	\$215,000 each x 20 Years	\$																	
Gangway Maintenance (Greasing, Bearings, Flooring, other minor repairs)	\$10,000 each x 5 Years	\$					\$	10,000				\$	10,000				\$	10,000	
Decking																			
Minor Repairs to Joists (5% every 5 years)	\$54,000 each x 5 Years	\$					\$	54,000				\$	54,000				\$	54,000	
Replace Damaged Decking Boards (10% every 5 years)	\$42,000 each x 5 Years	\$					\$	42,000				\$	42,000				\$	42,000	
Replace Decking Boards - Expected Life to Replacement of 25 years	\$430,000 each x 25 Years	\$																	
Wharf Furniture & Equipment																			
Repaint Handrails	\$70,000 each x 10 Years	\$										\$	70,000						
Replace Handrails - Expected Life to Replacement of 25 years	\$360,000 each x 25 Years	\$																	
Maintain Shark Nets (Clean, Inspect, Repair Tears)	Included in Operational Costs Above	\$																	
Replace Shark Net - Expected Life to Replacement of 5 years	Included in Operational Costs Above	\$																	
General Maintenance for Two pontoons (Tighten Bolts, Replace Worn Pile Guides, Replace Timber Wales)	\$25,000 each x 10 Years	\$										\$	25,000						
Replace Pontoons - Expected Life to Replacement of 25 years	\$156,000 each x 25 Years	\$																	
TOTAL MAINTENANCE COSTS			\$	-	2,000	7,000	2,000	7,000	118,000	7,000	2,000	7,000	2,000	218,000	2,000	7,000	2,000	7,000	118,000
TOTAL MAINTENANCE PV 7%		704,505	\$	-	1,860	6,054	1,609	5,236	82,091	4,529	1,203	3,917	1,041	105,508	900	2,930	779	2,534	39,731
TOTAL O & M COSTS			\$	1,140,000	1,088,000	1,143,000	1,088,000	1,143,000	1,354,000	1,143,000	1,088,000	1,143,000	1,088,000	1,504,000	1,088,000	1,143,000	1,088,000	1,143,000	1,354,000
TOTAL O & M PV 7%		16,500,902	\$	1,140,000	1,011,840	988,581	875,140	855,023	941,962	739,510	654,651	639,602	566,207	727,909	489,713	478,456	423,552	413,816	455,893
LIFECYCLE COSTS																			
TOTAL PV 7%		\$	\$	8,246,000	\$	1,011,840	\$	988,581	\$	875,140	\$	855,023	\$	941,962	\$	739,510	\$	654,651	\$

[illegible]

APPENDIX B – SUPPORTING DOCUMENTS

Council provided spreadsheet dated 6/03/2019 received 8 March 2019.

Manly West Esplanade Annual Operational Cost Estimates per annum											
Staffing	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	
Education Staffing x 2	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
Events Activations	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Marketing	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Education Programs Aboriginal Heritage and Enviro	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Beach services											
Operations Life Guards x 5 @ 60	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Equipment/ Play	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Safety Equipment	50,000		50,000		50,000		50,000		50,000		50,000
Shark Netting maintenance	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000
Beach cleansing	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Shark Netting replacement 5 years						150,000					150,000
Environmental											
Seahorse audits 2 per year	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
Marine Condition reports 2 per year	8,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Penguin protection	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Operations											
Cleansing/ Bins/ Pressure cleaning	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000	40,000
Water	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Electricity	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Maintenance/ paint/ replacement etc.	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000
Income											
	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000	-100,000
	1,040,000	986,000	1,036,000	986,000	1,036,000	1,136,000	1,036,000	986,000	1,036,000	1,136,000	

Project No.
Project Name
Date
Prepared by

PA1893
Manly West Esplanade
11-Mar-19
H Gibbs



Ref	ASSET	MAINTENANCE REQUIREMENT	DESCRIPTION	MAINTENANCE FREQUENCY (YEARS)	EXPECTED LIFE TO REPLACEMENT (YEARS)
0.0	GENERAL				
0.1		ENGINEERING INSPECTION	CONDITION ASSESSMENT BY QUALIFIED ENGINEER BY LAND/ DECK AND BY BOAT	2	
1.0	DEMOLITION				
2.0	PILES				
2.1	ALL PILES	DIVE INSPECTION	PILE INSPECTIONS BY DIVERS (ALLOW ONE WEEK FOR DIVE TEAM)	5	50
2.2	SUPPORT PILES	REPLACE WRAPPING	REPLACE WITH DENSO SEASHEILD SYSTEM. REVIEW OF ENVIRONMENTAL FACTORS NECESSARY	25	50
2.3	PONTOON RESTRAINT PILES	REPLACE WEAR PLATES		25	50
3.0	METALWORK				
3.1	HEADSTOCKS	REPAINT	BLAST CLEAN, PRIME, RECOAT. ASSUME WORKING FROM BARGE.	20	50
3.2	GANGWAY	GENERAL MAINTENANCE	GREASING, BEARINGS, FLOORING, OTHER MINOR REPAIRS	5	50
4.0	DECKING				
4.1	JOISTS	MISC MINOR REPAIRS		5	50
4.2	DECKING	REPLACE DAMAGED BOARDS	REPLACE DEFECTIVE BOARDS (SAY 10% EVERY 5 YEARS)	5	25
4.3	ALL BOLTS				25
5.0	WHARF FURNATURE & EQUIPMENT				
5.1	HANDRAILS	REPAINT	REPAINT HANDRAILS	10	25
5.2	LADDERS	-			50
5.3	SHARK NETS	MAINTAIN	CLEAN, INSPECT, REPAIR TEARS	1	5
5.4	TWO PONTOONS	GENERAL MAINTENANCE	TIGHETEN BOLTS, REPLACE WORN PILE GUIDES, ETC, REPLACE TIMBER WALES	10	25
6.0					
6.1	ALL	REPAIRS AS REQUIRED		1	50

Appendix D Copy of RHDHV Presentation at Workshop on 21 November 2018

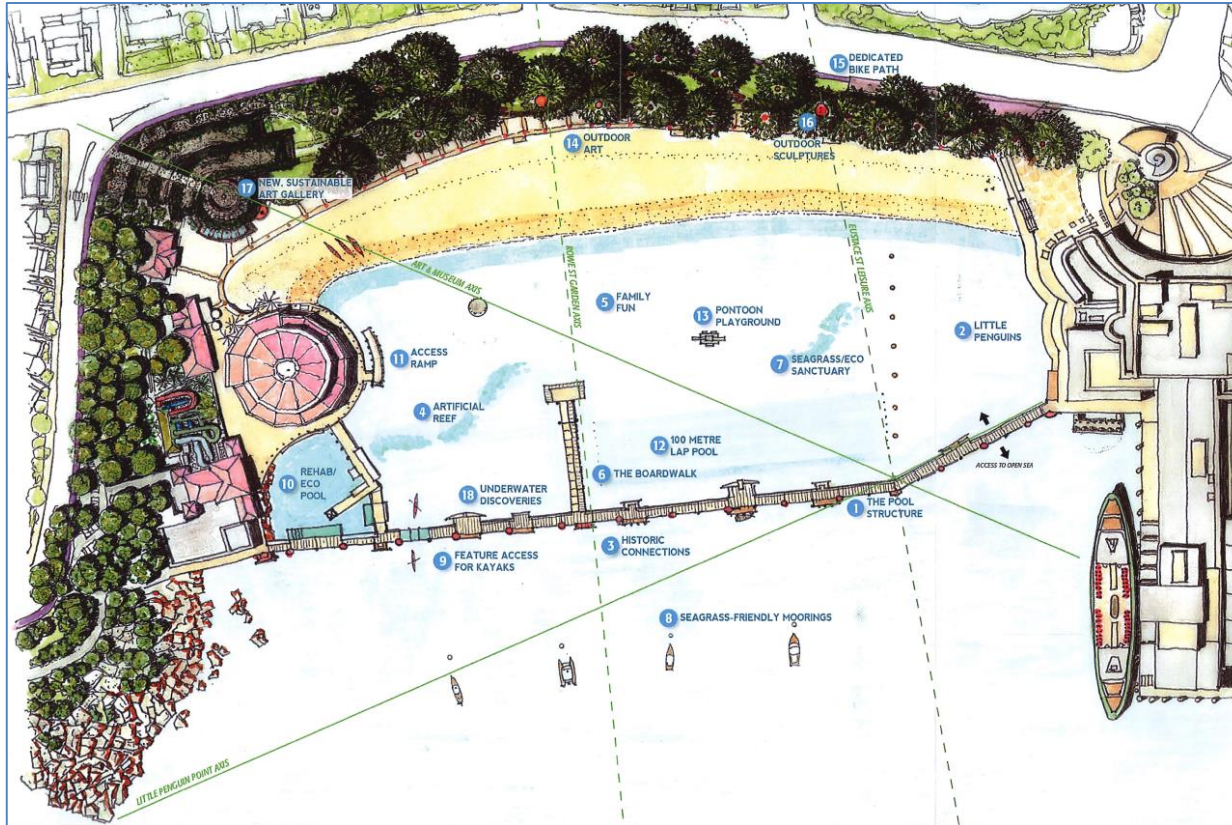
Manly West Esplanade Precinct

Masterplan

Workshop

Wednesday 21 November 2018

Proposed Boardwalk



Manly West Esplanade Boardwalk Masterplan

Work to date:

- site visit / inception meeting
- memo 16 July 2018 setting out:
 - list of suggested main studies to assess feasibility of reinstating boardwalk and harbour pool (13 off)
 - brief comments on scope of work for studies
 - preliminary program
- meeting with RMS 19 July 2018
- concept design sketch
- order of cost estimate (capital)

Concept design:

- 'sympathetic replication'
- modern materials to achieve required design life and durability
- width of boardwalk – two levels, each 2.5m wide
- balustrade – traditional timber
- preferred decking – recycled wood plastic composite (WPC)

Order of cost estimate (capital):

- \$11.2M (provisional)
- includes:
 - construction contingency (25%)
 - environmental studies, approvals, design and documentation
 - client side project management
- major component – piling (approx. 40%)

List of main studies:

- hydrographic and land survey
- geotechnical investigation
- condition assessment of existing structures
- coastal processes
- aquatic ecology
- landscape character and visual impact assessment
- heritage study

List of main studies:

- ecological engineering opportunities
- navigation impact assessment
- safety in design
- concept design
- capital cost estimates and whole of life assessment
- planning strategy / approvals pathway