NORTH SYDNEY COUNCIL

ASSET MANAGEMENT PLAN

MARINE STRUCTURES 2022-2032

Document Control	Asset Management Plan

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Marine Structures

Executive summary

Located across the North Sydney Council LGA are 28 Marine Structures comprised of timber boardwalks, bridges, boat ramps, decks, dinghy storage facilities, pontoons, Jetties, wharves, and slipways.

The condition of Marine Structures was assessed in 2018 by Manly Hydraulics Laboratory. For each marine structure each component was assessed and assigned a condition rating. In 2017 by Manly Hydraulics Laboratory was commissioned to carry out a condition assessment on Council's boat ramps. In total 28 Marine Structures were visited in the field.

Each marine structure was divided into its components and a condition score was assigned to each component.

Overall some 91.6% of the portfolio is in very good to fair condition (1-3) with some 8.4% in poor to very poor condition (4-5).

A Risk rating was assigned to each component. Overall 91.6% of the portfolio has a low to medium risk rating and 8.6% has a high to very high risk rating.

The total Replacement Value of the portfolio is $28,312,337 as at 30 June 2021. The values are shown in the Table below.

Table 1: Marine Structures – Summary Table

Asset Category	Qty	Replacement Value (2021)	Accumulated Depreciation (2021)	Fair Value (2021)	Depreciation Expense
Marine Structures	**28**	**$28,312,337**	**$10,588,649**	**$17,723,688**	**$636,292**

The following table provides a summary of the quantities and replacement values for each marine structure type. The portfolio is dominated by timber deck, beams and piles.

Table 2: Marine Structures- Typology

Marine Structure Type	Count of Structure Type	Sum of Replacement Costs
Boardwalk	3	$1,586,405
Boardwalk/Bridge	1	$363,087
Boat ramp	5	$984,638
Bridge	2	$302,217
Bridge/Boardwalk	1	$73,340
Decking	1	$97,320
Dinghy Storage	5	$474,679
Floating pontoon and access way	1	$151,830
Jetty/Wharf	1	$817,962
Sandstone Jetty	1	$139,611

Marine Structure Type	Count of Structure Type	Sum of Replacement Costs
Shed	1	$69,806
Slipway	1	$0
Stairway and Jetty	1	$139,273
Tunks Park, Pontoon, Access & Jetty	1	$362,459
Wharf	1	$343,290
Wharf/Jetty	2	$22,406,419
Grand Total	**28**	**$28,312,337**

Marine Structures – Future Demand

Drivers affecting demand for marine structures include things such as population change, regulation changes – new development, community expectations (Public Safety), technological changes, economic factors and environmental factors.

Marine Structures – Levels of Customer Service

Service levels are defined service levels in two terms, customer levels of service and technical levels of service. These are supplemented by organisational measures.

Customer Levels of Service measure how the customer receives the service and whether value to the customer is provided.

Customer levels of service measures used in the asset management plan are:

Quality How good is the service … *what is the condition or quality of the service?*

Function Is it suitable for its intended purpose …. *Is it the right service?*

Capacity/Use Is the service over or under used … *do we need more or less of these assets?*

The current and expected customer service levels are detailed in the table below.

Table 3: Marine Structures – Levels of Customer Service

Service Attribute	Expectation	Performance Measure Used	Current Performance	Desired Position in 10 Years
Quality	Marine structures are well maintained.	Percentage of marine structures in 'very good' or 'good' (1, 2, 3) condition and percentage 'poor' or 'very poor' (4, 5) Condition.	91.6% of marine structures in 'very good', 'good' or 'Fair' (1, 2, 3) condition. 8.4% of marine structure components in 'poor' or 'very poor' (4, 5) Condition.	Maintain – Condition 1-2-3 Improve and replace Condition 4-5

Service Attribute	Expectation	Performance Measure Used	Current Performance	Desired Position in 10 Years
Function	Standard marine structures are constructed from timber.	Percentage of marine structures constructed from sandstone where practical.	57% of marine structure components are constructed or partly constructed from timber.	Monitor/ Improve
Capacity and Use	Number of marine structures required is appropriate.	Number of additional marine structures required	No additional marine structures identified as being required	Monitor/ Improve

Marine Structures – Levels of Technical Service

Technical Levels of Service - Supporting the customer service levels are operational or technical measures of performance. These technical measures relate to the allocation of resources to service activities to best achieve the desired customer outcomes and demonstrate effective performance.

Technical service measures are linked to the activities and annual budgets covering:

- Operations – the regular activities to provide services (e.g. cleaning, inspections, etc).
- Maintenance – the activities necessary to retain an asset as near as practicable to an appropriate service condition. Maintenance activities enable an asset to provide service for its planned life (e.g. deck repair – painting, minor works),
- Renewal – the activities that return the service capability of an asset up to that which it had originally (e.g. marine structure replacement and or marine structure component replacement),
- Upgrade/New – the activities to provide a higher level of service (e.g. increasing the size or length of a marine structure or upgrading its structural capacity through complete replacement to address new site conditions. (e.g. replacing a timber handrail with a stainless steel handrail).

Table 4 shows the technical levels of service expected to be provided for marine structures. The 'Desired' position in the table documents the position being recommended in this AM Plan.

Table 4: Marine Structures – Technical Levels of Service

Service Attribute	Service Activity Objective	Activity Measure Process	Current Performance	Desired for Optimum Lifecycle Cost
Operations	Undertake network inspections to monitor condition	Network inspections to monitor condition	Network inspected in 2018	Network inspected every 5 years
Maintenance	Reactive service Requests completed in a timely manner or made safe.	Respond to complaints.	Minor repairs undertaken in accordance with Maintenance Management System	Minor repairs undertaken in accordance with Maintenance Management Delivery System.
Renewal	Maintain existing	Percentage of	8.4% of marine	Improve or replace

Service Attribute	Service Activity Objective	Activity Measure Process	Current Performance	Desired for Optimum Lifecycle Cost
	assets to a satisfactory condition	marine structures in poor/very poor (4, 5) Condition.	structure components in poor/very poor (4, 5) Condition.	
Upgrade	Standard marine structures are constructed from timber where practical.	Percentage of marine structures constructed from timber where practical.	57% of marine structure components are constructed or partly constructed from timber	Maintain
New	Satisfactory provision of marine structures.	New marine structures provided as required.	No additional marine structures identified as being required	No additional marine structures identified as being required

Marine Structures - Condition

The condition of Council's marine structures were surveyed in 2018 by Consultants, Manly Hydraulics Laboratory. The following condition criteria was used.

Table 5: Marine Structures Condition Survey Criteria

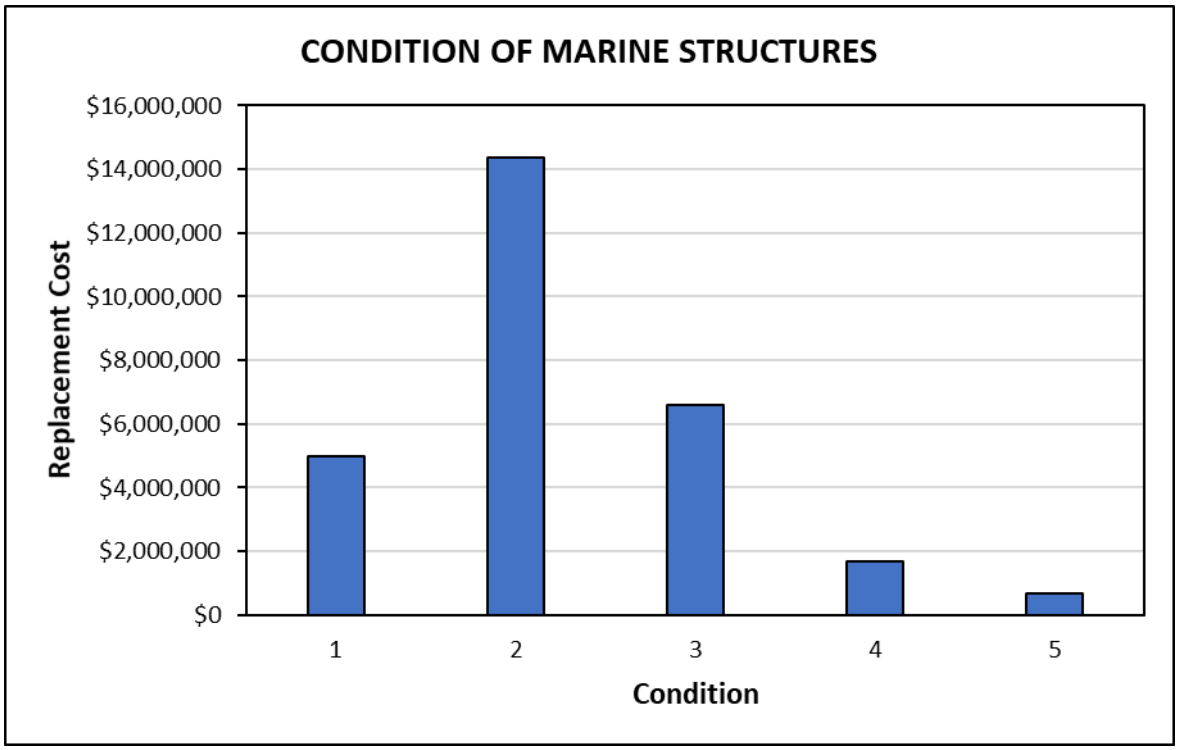
Grade	Condition	Description
1	Very good	Sound Physical condition. Asset likely to perform adequately without major work.
2	Good	Acceptable physical condition: minimal short-term failure risk but potential for deterioration in long-term (10 years plus). Only minor work required (if any).
3	Fair	Significant deterioration evident; failure unlikely within next 2 years but further deterioration likely and replacement likely within next 10 years. Work may be required but asset is still serviceable: minor components or isolated sections of the asset need replacement or repair now, but asset still functions safely at an adequate level of service.
4	Poor	Failure likely in short-term. Likely need to replace most or all of asset within 2 years. Substantial work required in short term, asset barely serviceable: no immediate risk to health or safety but works required within 2 years to ensure asset remains safe.
5	Very poor	Failed or failure imminent. Major work or replacement required urgently. Immediate need to replace most or all of asset. Health and safety hazards exist which present a possible risk to public safety, or asset cannot be serviced/operated without risk to users.

The Table below shows the condition of marine structure assets in terms of replacement cost where condition 1 is very good and 5 is very poor condition. It should be noted that the replacement cost is based on the condition of marine structure components. In practice and where funds permit marine structure components in condition 3 are generally replaced at the same time as marine structure components in condition 4 or 5 if they are adjacent, there are potential risks, and it is cost effective.

Table 6: Marine Structures Condition Survey Results – Overall

CONDITION OF MARINE STRUCTURES – ENTIRE NETWORK		
Condition	**Replacement Cost**	**% Condition (based on cost)**
1 (Very Good)	$4,979,288	17.6%
2 (Good)	$14,387,315	50.7%
3 (Fair)	$6,447,601	23.3%
4 (poor)	$1,674,449	5.9%
5 (Very Poor)	$693,684	2.5%
Total	**$28,312,337**	**100.0%**

The Graph below shows the condition of Marine structures assets over the entire network in terms of replacement cost.



Marine Structures – Review of Useful Lives

The Useful Lives of Marine Structures such as timber wharves and jetties are affected by termites, borers, and physical collisions. Also the reduced availability of quality timber such as Turpentine as well as the banning of chromated copper arsenate timber has resulted in a reduced life of timber components. The Ports Australia "wharf Structures Condition Assessment Manual" has been used as a guide for the adopted Useful Lives of Marine Structures components. Generally, anything made from concrete and steel has a life of 50 years and anything made from timber has a life of 25 years, refer Table below.

Asset Type	Component	Material	Expected Life (years)	Adopted Useful Life (years)
Wharves, Jetty, Pier	Piles	Concrete	20 - 50	50
		Steel	50	50
		Timber	20 - 50	25
	Deck	Concrete	50	50
		Timber	20 - 25	25
	Fenders	Rubber	20	25
		Timber	10 – 20	25
	Substructure	Concrete	50	50
		Steel	50	50
		Timber	25	25
Pontoon	Pontoon	Concrete	50	50
		Steel	50	50
Fixed Furniture	Walkways	Steel	50	50
		Timber	20 - 25	25
	Handrails	Steel (galvanised)	10 - 20	50

Based on this Depreciation is as follows:

Capital funding to maintain a renewal ratio of 1	
	Annual Depreciation
Marine Structures	**$636,292**

A budget of $636,292 is required on average over the long term to maintain the condition of Council's marine structures network, noting that fluctuations in renewal requirements in the medium term.

Marine Structures – Funding Strategy

The Asset Renewal Funding Ratio is the most important indicator. It compares funding with depreciation. An Asset Renewal Funding Ratio of 1 or greater sustained over the long term indicates the optimal renewal and replacement of assets.

The forecast for Depreciation (or Long Term Average Annual Asset Consumption) is $636,292. Therefore, an annual average capital renewal funding of $636,292 (2021 dollars) will achieve an Asset Renewal Funding Ratio of 1.

The cost to fully replace assets identified by Consultants, Manly Hydraulics Laboratory in condition 4 and 5 as well as the cost to replace the condition 3 assets which will become condition 4 over the next 10 is $8,164,273. This is an average annual cost of $816,427 which is greater than the $636,292 Depreciation Expense and also greater than the average annual forecast budget of $468,500. With further investigation and detailed design it is hoped that alternate and lesser cost solutions may be possible to maintain marine structures assets at an optimal level.

Marine Structures – Capital works

Replacement of marine structure components is assumed to be a Capital works project.

The ranking criteria used to determine priority of identified renewal and replacement proposals is detailed in table 7. A priority for action of 1 to 5 has been assigned to each marine structure requiring capital works as described in the following table.

Marine Structures – Managing the Risks

There are risks associated with providing and maintaining marine structures. They are primarily as follows:

- Sudden failure of marine structures providing structural support to public boardwalks, shelters and private jetties – causing property damage – public safety hazards, injury or death.
- Marine structure asset renewals not funded when required. Conditions will deteriorate and funding shortfall grows due to higher cost renewal treatments being required.
- Damage to infrastructure as a result of major storm events.

The following risk response table was used to identify those marine structure components requiring action within the next 10 years.

Table 7: Marine Structures – Risk Response Table

Level of Risk		Condition	Action Required	Time frame for repairs, upgrade or replacement
VH	Very High Risk	5	Immediate corrective action	1-10 years
H	High Risk	4	Prioritised action required	4-10 Years
M	Medium Risk	3	Planned action required	4-10 Years
L	Low Risk	2	Manage by routine procedures	Inspections 1-2 years
New	No Risk	1	None	None

Consideration has been given to each marine structure component, whether to replace the marine structure component or perform maintenance on it.

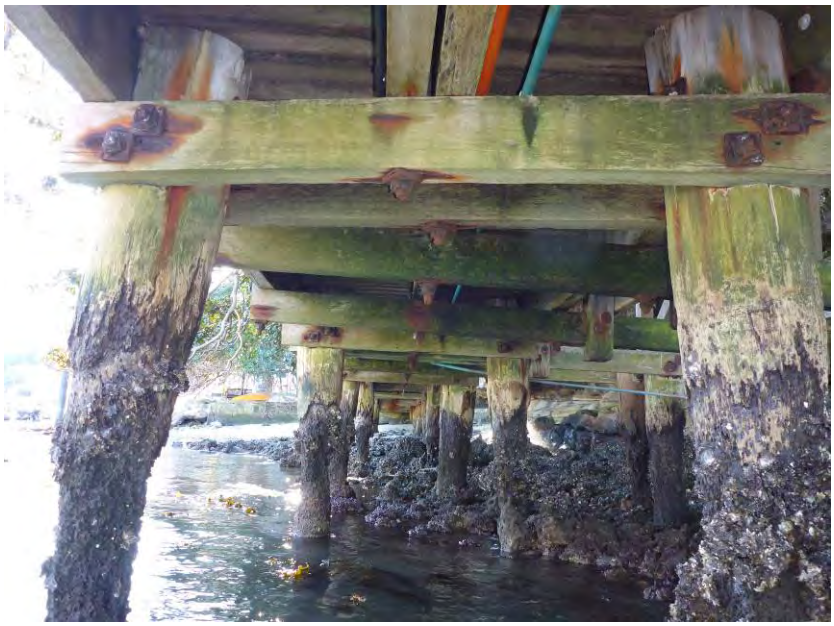
Components that have a **Very High or High** risk rating were considered to need replacement within the 1-10 year forecast period.

Components with a **Medium** risk rating were also considered needing replacement within the 4-10 year forecast period.

Examples failing timber piles – Wondakiah wharf

Examples failing steel piles – Boatbuilders Walk Bridge

Examples corroding fence – Jefferys Street Bridge



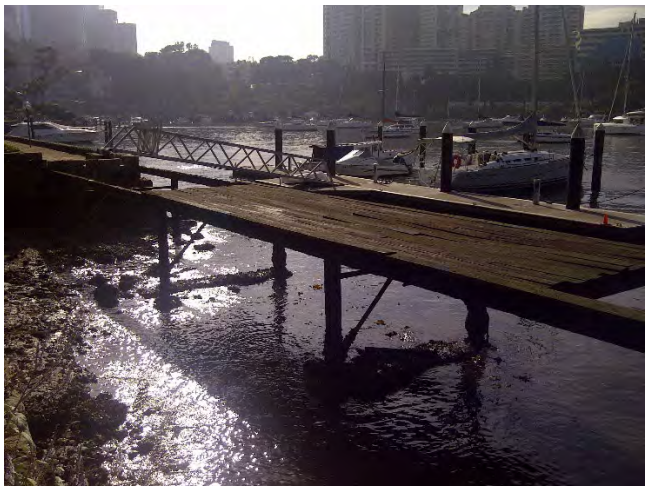
Examples timber piles – Hayes Street Boardwalk – Currently closed

Examples of piles in very poor condition

Termites found in timber marine structure

Evidence of marine worms in timber structure

Neutral Bay Jetty – Currently closed



East Crescent Street Jetty – Currently closed

Examples of crowded foreshore on New Years Eve in the North Sydney LGA – Blues Point

Council will endeavour to manage these risks within available funding by prioritising marine structure renewal works based on the North Sydney Council Marine Structures Condition Audit prepared by Consultants, Manly Hydraulics Laboratory.

Table 8: Marine Structures – Capital renewal Priorities based on Condition and Risk Rating

Risk Matrix - Marine Structures (Condition and Risk Rating)					
Likelihood of Marine Structure failing (L) Refer to Table 5. Condition Criteria	Marine Structures (No of Components)				
	Relative Usage	Low	Medium	High	Very High
	Park Hierarchy	Local	District	Regional	
	Priority	d	c	b	a
Condition 1 – Very Good (17.6%)	5	2	96	11	477
Condition 2 - Good (50.7%)	4	29	931	23	92
Condition 3 – Fair (23.3%)	3	10	388	5	6
Condition 4 – Poor (5.9%)	2	13	122	N/A	N/A
Condition 5 – Very Poor (2.5%)	1	2	72	4	N/A

(Note: Also Refer to Table 6)

Note: This table has been based on data from the 2018 North Sydney Council Marine Structures Condition Audit, performed by Manly Hydraulics Laboratory.

Note: Factors which are used to determine the priority include 'Relative Usage' and 'Park Hierarchy'. The most critical factor is used to determine the priority.

It should be noted that marine structures may also be replaced based on other criteria including:

- Damage
- Marine structures replaced in association with other projects such as seawall works
- Landscape projects

Marine Structures – Maintenance

Routine maintenance is the regular on-going work that is necessary to keep assets operating, including instances where portions of the asset fail and need immediate repair to make the asset operational again, e.g. minor repair of decking, fence repair.

Maintenance includes all actions necessary for retaining an asset as near as practicable to an appropriate service condition including regular ongoing day-to-day work necessary to keep assets operating.

Current maintenance expenditure levels are considered to be adequate to meet projected service levels.

Over the longer term future operations and maintenance expenditure is forecast to be steady as the asset stock is not forecast to increase. The following table summarises the prioritised capital and maintenance works.

Marine Structures – Prioritised Expenditure Forecast

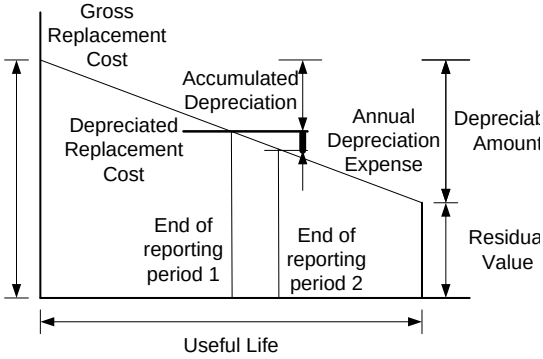
Table 9: Marine Structures – Prioritised Expenditure Forecast – 10 years FY2023-FY2032

Year		Priority	Capital Costs	Maintenance Costs	Total Costs
1	2022/23	1d	$475,000	$24,378	$499,378
2	2023/24	1d	$550,000	$24,378	$574,378
3	2024/25	1d	$510,000	$24,378	$534,378
4-10	2025/32	1d	$3,150,000	$170,646	$3,320,646
Works Identified	2025/32	3c to 3d	$3,479,273		$3,479,273
		Grand Total	**$8,164,273**	**$243,780**	**$8,408,053**

In summary the value of marine structure assets in the Table below.

Table 10: Marine Structures – Valuation

Asset Category	Qty	Replacement Value (2021)	Accumulated Depreciation (2021)	Fair Value (2021)	Depreciation Expense
Marine Structures	**28**	**$28,312,337**	**$10,588,649**	**$17,723,688**	**$636,292**



Marine Structures – Valuation Forecast

Asset values (Marine Structures) are forecast to remain steady. It is forecast that no additional assets are expected to be added to the asset stock from new construction and acquisition by Council or from assets constructed by land developers or other assets donated to Council.

Marine Structures – Key Assumptions – Financial Forecasts

Key assumptions made in this asset management plan for Marine Structures are:

Table 11: Key Assumptions made in AM Plan and Risks of Change

Key Assumptions	Risks of Change to Assumptions
Useful Lives of Marine Structures	Low risk
Rate of deterioration	Low risk

Marine Structures – Creation / Acquisition / Upgrade Program

New works are those that create a new asset that did not previously exist, or works which will upgrade or improve an existing asset beyond its existing capacity. They may result from growth, social or environmental needs. Assets may also be acquired at no cost. No new assets are currently identified.

Marine Structures – Disposal Plan

No marine structure assets have been identified for disposal. Marine structures will be periodically reviewed for disposal on the basis of relative usage and/ or public safety concerns.

Marine Structures – Forecast reliability and confidence

The estimated confidence level and reliability of data used in this AMP is considered to be reliable as the data is based on a detailed condition report on Marine Structures.

Marine Structures – Improvement Plan

The improvement plan is shown in the table below.

Task No	Task	Responsibility	Resources Required	Timeline
1	Research the Useful Life of Marine Structures	EPS	Staff Time	2024

Marine Structures – Monitoring and Review Procedures

This Asset Management Plan will be reviewed during annual budget planning processes and amended to show any material changes in service levels and/or resources available to provide those services as a result of budget decisions.

The Asset Management Plan has a life of 4 years and is due for complete revision and updating within 1 year of each Council election.

Marine Structures – Renewal and Replacement Program

Renewal and replacement expenditure is major work which does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing asset to its original service potential. Work over and above restoring an asset to original service potential is considered to be an upgrade/expansion or new work expenditure resulting in additional future operations and maintenance costs.

Marine structure assets requiring renewal/replacement have been identified by the North Sydney Council Marine Structures Condition Audit completed by Consultants, Manly Hydraulics Laboratory, in 2018.

Marine Structures – Funding Scenarios

The Long Term Financial Plan includes three scenarios, all of which maintain current services levels but propose differing levels of capital expenditure on the renewal of Council's ageing infrastructure assets.

In summary:

- Pessimistic Scenario - This Scenario results in a decline in operating results and deficits in the later years.
- Optimistic Scenario - This Scenario results in improvements in operating results for the life of the plan.
- Planned Scenario - This Scenario results modest surplus operating results for the life of the plan.

Table 12: Funding Scenarios – Marine Structures – North Sydney Councils 10 Year Plan

Scenario	Capital Funding Level Required Per Annum	10 Year Plan $ Total
Scenario 1.	$468,500/year	**$4,685,000**
Scenario 2.	$468,500/year	**$4,685,000**
Scenario 3.	$468,500/year	**$4,685,000**

Note: *These Scenarios are based on the 10-year Long Term Financial Plan.*

Marine Structures – Service and Risk Tradeoffs

The decisions made in adopting this AM Plan are based on the objective to achieve the optimum benefits from the available resources.

Service trade-off

If this funding Scenario is adopted, then the Level of Service will be maintained.

Risk trade-off

If funding Scenario is adopted, then it there is less risk of a sudden collapse of a marine structure.

Marine Structures – Renewal and Replacement Program – FY2023-FY2032 (10 Year Plan)

Council's projected 10 year Capital Renewal Program is shown in the Tables below. It is based on the funding required to replace marine structure assets identified by North Sydney Council Marine Structures Condition Audit completed by Consultants, Manly Hydraulics Laboratory, in 2018.

It should be noted that Marine Structures may also be replaced based on other criteria including:

- Damage
- Marine structures replaced in association with other projects such as seawall works
- Landscape projects

Project priorities may also be subject to change due to accelerated deterioration, sudden failure or finalization of detailed designs and project costings. Due to the amount of funding required to complete seawall and marine structure projects, funds may be pooled to carry out either marine structure projects, seawall projects or projects from both asset categories.

Table 13: Marine Structures – Renewal and Replacement Program

Priority Projects 2022/23 (Year 1)

Replace Year	Priority	Marine Structure ID	Location	Risk Rating / Category	Condition	Capital Cost
2022/23	1d	MS019	BETWEEN 9 AND 11 SHELLCOVE ROAD, NEUTRAL BAY - Stairway and Jetty	Very High (5)	Very Poor	$450,000
2022/23		New	Milson Park - Storage Facilities for Kayaks			$25,000
					Total	**$475,000**

Note: *These Cost estimates do not include inflation / building escalations costs which can vary between 3-8% each year.*

Table 14: Marine Structures – Renewal and Replacement Program

Priority Projects 2023/24 (Year 2)

Replace Year	Priority	Marine Structure ID	Location	Risk Rating / Category	Condition	Capital Cost
2023/24	1d	MS015	WRIXTON PARK - Floating pontoon and access way	Very High (5)	Very Poor	$450,000
2023/24		New	John Street Open Space - Small Watercraft Storage Facilities and Improved Access			$40,000
2023/24		New	Tunks Park - Storage Facilities for Kayaks an Improved Access			$60,000
					Total	**$550,000**

Note: *These Cost estimates do not include inflation / building escalations costs which can vary between 3-8% each year.*

Table 15: **Marine Structures – Renewal and Replacement Program**

Priority Projects 2024/25 (Year 3)

Replace Year	Priority	Marine Structure ID	Location	Risk Rating / Category	Condition	Capital Cost
2024/25	1d	MS002	WANDAKIAH - Wharf/Jetty – Stage 1	Very High (5)	Very Poor	$450,000
2024/25		New	Anderson Park - Small Watercraft Storage Facilities			$20,000
2024/25		New	Dowling Street Reserve - Small Watercraft Storage Facilities and Improved Access to Foreshore			$40,000
					Total	**$510,000**

Note: *These Cost estimates do not include inflation / building escalations costs which can vary between 3-8% each year.*

Table 16: Marine Structures – Renewal and Replacement Program

Priority Projects 2025/32 (Year 4-10)

Replace Year	Priority	Marine Structure ID	Location	Risk Rating / Category	Condition	Capital Cost
2025/32	1d	MS002	WANDAKIAH - Wharf/Jetty – Stage 2	Very High (5)	Very Poor	$3,150,000
					Total	**$3,150,000**

Note: *These Cost estimates do not include inflation / building escalations costs which can vary between 3-8% each year.*

Table 17: Marine Structures – Renewal and Replacement Program

Works Identified – Years 2025 - 32 (Years 4 - 10)

Replace Year	Priority	Marine Structure ID	Location	Risk Rating / Category	Condition	Capital Cost
2025/32	3c	MS022	TUNKS PARK - Tunks Park, Pontoon, Access & Jetty	Medium (3)	Fair	$1,020,000
2025/32	3c	MS026	SHELLBANK PARADE DINGHY STORAGE - Dinghy Storage	Medium (3)	Fair	$80,000
2025/32	3d	MS005	SRA SHED - Shed	Medium (3)	Fair	$200,000
2025/32	3d	MS007	SAWMILLERS RESERVE/BOATBUILDERS WALK - Boardwalk/Bridge	Medium (3)	Fair	$503,000
2025/32	3d	MS018	KURRABA POINT RESERVE BOAT RAMP - Boat Ramp	Medium (3)	Fair	$240,000
2025/32	3d	MS023	KURRABA POINT RESERVE DINGHY STORAGE - Dinghy Storage	Medium (3)	Fair	$390,000
2025/32	3d	MS024	SAWMILLERS RESERVE/BOATBUILDERS WALK - Boat ramp	Medium (3)	Fair	$700,000
2025/32	3d	MS029	KURRABA RESERVE DINGHY STORAGE - Dinghy Storage	Medium (3)	Fair	$14,273
2025/32			Contingency			$332,000
					Total	**$3,479,273**

Note: *These Cost estimates do not include inflation / building escalations costs which can vary between 3-8% each year.*

Marine Structures Renewal Program


Lavender Bay Wharf and Boardwalk - Before


Lavender Bay Wharf and Boardwalk – After – Completed 2017

Marine Structures – Performance Measures

The effectiveness of the asset management plan can be measured in the following ways:

- The degree to which the required projected expenditures identified in this asset management plan are incorporated into the long term financial plan,
- The degree to which 1-5 year detailed works programs, budgets, business plans and corporate structures take into account the 'global' works program trends provided by the asset management plan,
- The degree to which the existing and projected service levels and service consequences (what we cannot do), risks and residual risks are incorporated into the Strategic Plan and associated plans,
- The Asset Renewal Funding Ratio achieving the target of 1.0.

Marine Structures – References

- North Sydney Council Marine Structures Condition Audit by Consultants, Manly Hydraulics Laboratory
- North Sydney Council Seawalls and Backfill Condition Audit by Consultants, Manly Hydraulics Laboratory – Appendix E – Boat Ramp Investigations
- IPWEA, 2006, 'International Infrastructure Management Manual', Institute of Public Works Engineering Australasia, Sydney, www.ipwea.org/IIMM
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- IPWEA, 2015, 2nd edn., 'Australian Infrastructure Financial Management Manual', Institute of Public Works Engineering Australasia, Sydney, www.ipwea.org/AIFMM.
- IPWEA, 2015, 3rd edn., 'International Infrastructure Management Manual', Institute of Public Works Engineering Australasia, Sydney, www.ipwea.org/IIMM
- IPWEA, 2012 LTFP Practice Note 6 PN Long Term Financial Plan, Institute of Public Works Engineering Australasia, Sydney

APPENDICES

Appendix A: Maintenance Management System

Defect Management Inspection – Marine Structures

Inspection areas have been defined in accordance with the identified key factors of:

- Areas where failure is most disruptive and expensive to the community/users.
- Traffic (both vehicular and pedestrian) flows, e.g. pedestrian use areas; retail/commercial areas; schools and hospitals

Inspection frequencies are based on these areas as defined by the reference maps and the resources currently available to undertake the inspections.

Red – 2 times per year; **Blue** – Annual; **Other** – Once every 2 years;

The results of inspections will be downloaded into the MMDS database.

There are 5 categories in which a defect may be placed. Not all categories may be applicable to every inspection area and/or type of asset:

Cat 5		Will be **made safe** no later than 2 working days after allocation of defect to work crew. Defect may then be re-categorised as Cat 4 or Cat 3.
Cat 4		Will be repaired no later than 10 working days after allocation of defect to work crew.
Cat 3		Will be placed on Zone Maintenance Program. This program operates on an 8 week cycle, however, depending on workload and reactive maintenance requests, Cat 3 defects may miss a cycle or more before repairs are able to be undertaken.
Cat 2		Deferred maintenance. Defect may be repaired if close-by to Cat 4 or Cat 3 defect that is being repaired. Otherwise will be re-inspected on next area inspection.
Cat 1		As new. Surface displaying no defects. May have aesthetic aspects such as gum, stains, services mark-up, etc.

Intervention Matrix

MARINE STRUCTURES	RED	BLUE	OTHER
MISSING or UNSTABLE	**28**	**24**	**21**
NOT FUNCTIONAL	**23**	**19**	**16**
DAMAGED BUT STILL FUNCTIONAL	**20**	**16**	**13**
FUNCTIONAL - PAINT/GRAFFITI/DIRTY	**18**	**14**	**11**
AS NEW	**10**	**6**	**3**

Scoring example: 28 = High Use Area score 10 and Defect of Missing or Unstable score 18

Inspections of marine structures will include all the marine structures that the EPS Division is responsible for. Inspections will involve the identification of **surface visible defects** only.

Expert structural assessments of each marine structure will be a separate element of the asset management regime.

NORTH SYDNEY COUNCIL - GUIDE FOR MARINE STRUCTURES DEFECT RATING

AN EXPLANATION OF THE DEFECT INSPECTION SYSTEM

SITE OF INSPECTION		SCORE
RED	MS001; MS002; MS003; MS006; MS007; MS008; MS009; MS010; MS011; MS012; MS013; MS014; MS016; MS021 and MS022 INSPECTIONS - 2 PER YEAR	10
BLUE	MS015; MS017; MS018 and MS024 INSPECTION - ANNUAL	6
WHITE	MS004; MS005; MS019; MS023 and MS025 INSPECTION - EVERY 2 YEARS	3

MARINE STRUCTURE TYPE

TIMBER DECKING - WHARF, JETTY or BOARDWALK	HANDRAIL - WHARF, JETTY or BOARDWALK
CONCRETE DECKING - WHARF, JETTY or BOARDWALK	PONTOON + GANGWAY
KERBING - WHARF or BOARDWALK	ACCESS LADDER or STAIRS
BOAT RAMP	PILES or OTHER VISIBLE STRUCTURAL MEMBERS *
LIGHTING - WHARF, JETTY or BOARDWALK	OTHER eg. SHELTER or SIGNAGE

* INSPECTION WILL BE UNDERTAKEN FROM DECK. PHOTOS TAKEN and IDENTIFIED DEFECTS WILL BE REFERRED TO MARINE STRUCTURE EXPERTS FOR ASSESSMENT + RECOMMENDATION

DEFECT - WHEN UNSURE REFER TO PHOTOS IN GUIDELINES FOR GUIDANCE

MISSING, DAMAGED AT A CRITICAL LOCATION or UNSTABLE	18
NON-FUNCTIONAL - THE DAMAGE IS SUCH THAT NO LONGER FIT FOR PURPOSE.	13
RED/BLUE SITES - GAPS and/or RISE & FALL BETWEEN TIMBER DECK PLANKS GREATER THAN 10MM	13
WHITE SITES - GAPS and/or RISE & FALL BETWEEN TIMBER DECK PLANKS GREATER THAN 20MM	13
ALL SITES - GAPS, SETTLEMENT, RISE & FALL ON CONCRETE DECK SECTIONS GREATER THAN 10MM	13
FUNCTIONAL - THE DAMAGE IS SUCH THAT THE ASSET CAN STILL BE USED.	10
RED/BLUE SITES - GAPS and/or RISE & FALL BETWEEN TIMBER DECK PLANKS LESS THAN 10MM	10
WHITE SITES - GAPS and/or RISE & FALL BETWEEN TIMBER DECK PLANKS LESS THAN 20MM	10
ALL SITES - GAPS, SETTLEMENT, RISE & FALL ON CONCRETE DECK SECTIONS LESS THAN 10MM	10
FUNCTIONAL - THE DAMAGE IS FADED PAINT; GRAFFITI; PEELING PAINT; DIRTY; etc	8
AS NEW	0

HAZARD TYPE

MISSING - SECTION or PART NO LONGER IN ITS PLACE	BROKEN - SECTION DAMAGED, eg. HOLES, SPLITS, CRACKS
ROTTEN - TIMBER ROTTING/SPLIT; METAL RUSTING, etc.	BENT/SAGGING - NOT IN LINE/FLUSH (VERT or HORIZ)
LOOSE - ABLE TO BE MOVED WHEN IT SHOULDN'T BE	FINISH - FADED; PEELING; DIRTY; GRAFFITI
NECKING OF TIMBER PILE - DIAMETER < 300MM	