

#1 Retaining Wall Portfolio Asset Management Plan



Moreton Bay Regional Council
Retaining Wall Portfolio
Asset Management Plan
July 2021

Moreton Bay Regional Council

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Supporting Information

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

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Retaining Wall Portfolio Asset Management Plan

Definitions for Abbreviations

Term	Definition
ACR	Asset Consumption Ratio
AI	Action Item
AM	Asset Management
AMP	Asset Management Plan
AMT	Asset Management Team within Infrastructure Planning
ASR	Asset Sustainability Ratio
CSR	Customer Service Request
CLOS	Community Levels of Service
COF	Consequence of Failure
DTMR	Department of Transport & Main Roads
DWCP	Drainage Waterways and Coastal Planning
ECM	Engineering Construction and Maintenance or; Enterprise Content Management component of Technology One
ePID	Electronic Project Identification Document for Project Prioritisation / Approval
REDS	Regional Economic Development Strategy
RWPAMP	Retaining Wall Portfolio Asset Management Plan
GIS	Geographical Information System
ITPD	Integrated Transport Planning and Design
IPWEA	Institute of Public Works Engineering Australasia
LANDIMP	Land Improvement
LGIP	Local Government Infrastructure Plan
LTFE	Long Term Financial Forecast
MBRC	Moreton Bay Regional Council
PAMP	Portfolio Asset Management Plan
PRP	Parks and Recreational Planning
RUL	Remaining Useful Life
SAM	Strategic Asset Management System
SAMP	Strategic Asset Management Plan
SIM	Structures Inspection Manual
SIP	Strategic Infrastructure Planning
TLOS	Technical Levels of Service
TOMAS	MBRC's Asset Management System (based on Technology One platform)
TRANSPORT	Transport
TRV	Total Replacement Value

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Retaining Wall Portfolio Asset Management Plan

Executive Summary

The Retaining Wall Portfolio Asset Management Plan (RWPAMP) outlines Moreton Bay Regional Council's (MBRC's) approach to the management of retaining wall assets located throughout the MBRC region.

This plan is MBRC's first capture of the retaining wall portfolio including retaining walls located in transport corridors and open spaces such as parks, playgrounds and sports precincts. Retaining walls are long-life assets with typical service lives of 40 - 60 years.

Retaining walls primarily serve three purposes:

- Provide Stability - by providing lateral support and reinforcement to the soil or other material to be retained.
- Prevent Erosion - by providing a durable facing to the material being retained to prevent loss of material or hazards caused from falling material and debris.
- Visual Appeal - by forming an aesthetic feature whilst providing support to the delivery of both transport and open space services.

Figures 1-3 are examples of the three retaining wall types within the retaining walls portfolio.



Figure 1 - Albany Forest Drive concrete crib wall



Figure 2 - Stoneridge Boulevard Park sandstone rock wall



Figure 3 - Bellthorpe Range Road gabion rock wall

MBRC retaining wall assets collectively have an estimated total replacement value of \$53.2M for a total wall length of 44,209 metres. Retaining wall assets on the MBRC register classified under Transport are primarily wall constructs located within Transport corridors while Land Improvement classified walls are located in open spaces such as parks and other non-transport corridor related locations.

Land improvement category comprises 59% by total length of retaining walls on the asset register whilst the transport category makes up the remaining 41%.

The estimated useful life was revised as part of developing this RWPAMP to reflect the current age and condition profiles for MBRC's retaining wall assets and benchmarked against industry standard lives. The table below summarises MBRC's retaining wall assets including useful lives and current age range.

Table 0.1 - Summary of MBRC Retaining Walls

Wall Category	Construction Material	Count of Walls	Length (m)	Expected Useful Life (Years)	Current Age Range (Years)	Current Replacement Cost
Transport	Concrete	291	6,866	60	1-60	11,769,154
	Rock	298	6,955	60	1-50	11,533,219
	Masonry	136	3,064	60	1-49	4,556,952
	Timber	53	1,169	40	1-53	365,557

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Wall Category	Construction Material	Count of Walls	Length (m)	Expected Useful Life (Years)	Current Age Range (Years)	Current Replacement Cost
Land Improvement	Concrete	431	9,120	60	1-46	11,483,846
	Rock	361	7,327	60	1-30	7,243,737
	Masonry	348	7,135	60	1-36	5,060,809
	Timber	101	2,393	40	1-26	1,180,448
TOTAL		2019	44,209			\$53,193,722

Around 8% of the retaining walls by number and length are constructed from timber. These will be replaced with retaining walls constructed from modern and more durable equivalent materials (e.g. timber look concrete sleepers) where economic and practical to do so.

The last 25 years has seen significant growth in both the number and value of retaining wall assets being built in line with the significant growth in the region. MBRC performs maintenance on road reserve and park complex retaining walls with maintenance work split between roads and parks maintenance teams.

Privately owned retaining walls are excluded from Council’s maintenance schedules even if located along or within a road or park boundary.

The maintenance of a retaining wall is the responsibility of the property owner whose land the retaining wall benefits. Retaining walls are not normally a matter of joint responsibility for neighbours because a retaining wall is usually of more benefit to one neighbour. Private retaining walls are defined as walls that only serve a purpose to the adjacent private property, and do not serve a primary purpose of supporting or protecting Council owned land and infrastructure.

Critical maintenance work is generally outsourced to specialist external contractors to remediate while non-specialist tasks are attended to by MBRC maintenance personnel.

Figure 4 shows the age profile for MBRC’s assets, which indicates the number of assets and the total current replacement cost within each age band. Around 95% of assets are less than 25 years old indicating a relatively young asset base when compared to expected life of 40-60 years for retaining walls. As age reflects the year in which the assets were built, the profile also indicates the pattern in which they were acquired over time.

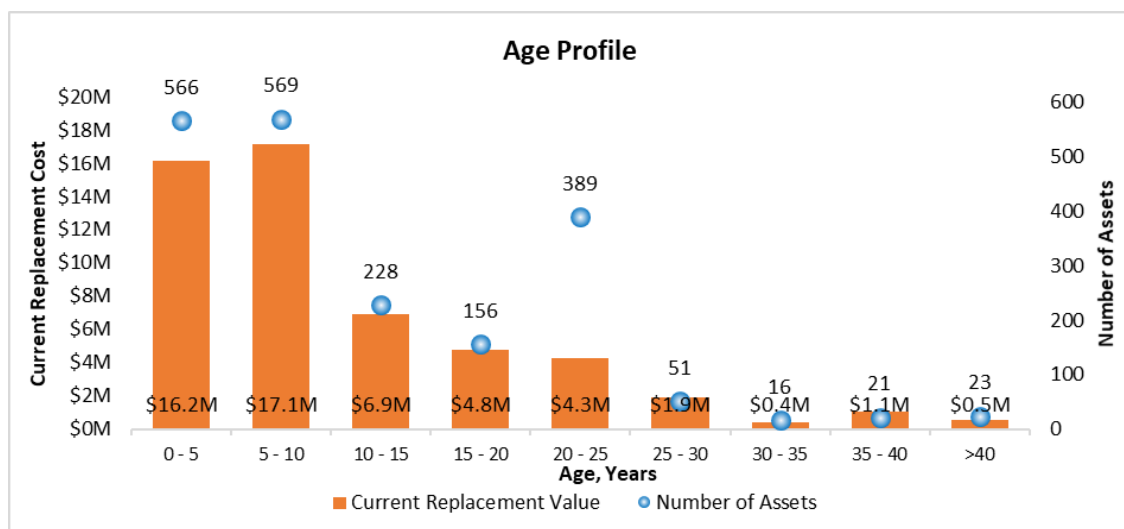


Figure 4 - Age profile for retaining walls in Moreton Bay Region

Figure 5 below illustrates the condition profile for retaining walls with heights of more than 1m and reflects the Level 2 condition assessments carried out in 2020 and 2021. Walls 1m or less in height are not subject to the same regulatory and design standards and, because of a much

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Retaining Wall Portfolio Asset Management Plan

lower level of risk, are only subjected to periodic Level 1 inspections. Less than 1% (2 walls) are rated to be in poor condition (condition 4) with 84% of the total length of retaining walls deemed to be in fair to very good condition.

Walls with height over 1m comprise of 26% of the total retaining walls portfolio while walls with height of 1m and less making up the remaining 74%. A total of 448 or 85% of retaining walls over the height of 1m have been condition assessed using the Level 2 criteria as prescribed in the Department of Transport and Main Roads Structures Inspection Manual. A further remaining 70 walls will undergo a Level 2 condition assessment in FY2022 which will achieve 100% condition assessment data for all retaining walls with height exceeding 1m.(These walls comprise the TBC category in Figure 5).

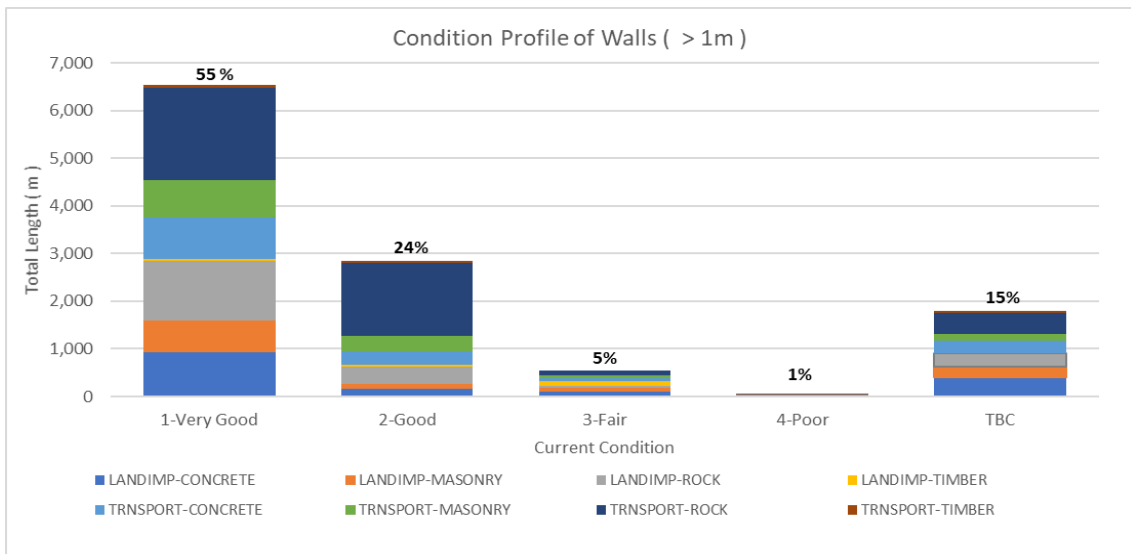


Figure 5 - Condition profile for Retaining Walls (Wall Height >1m)

Figure 6 highlights the condition profile for walls with height of 1m and less based on periodic Level 1 inspections and estimated condition based on age. These level 1 inspections will continue using internal resources. A total of 85% of retaining walls with height of 1m and less are in fair to very good condition and overall, 84% of the portfolio (all retaining wall heights) was assessed as being in fair to very good condition.

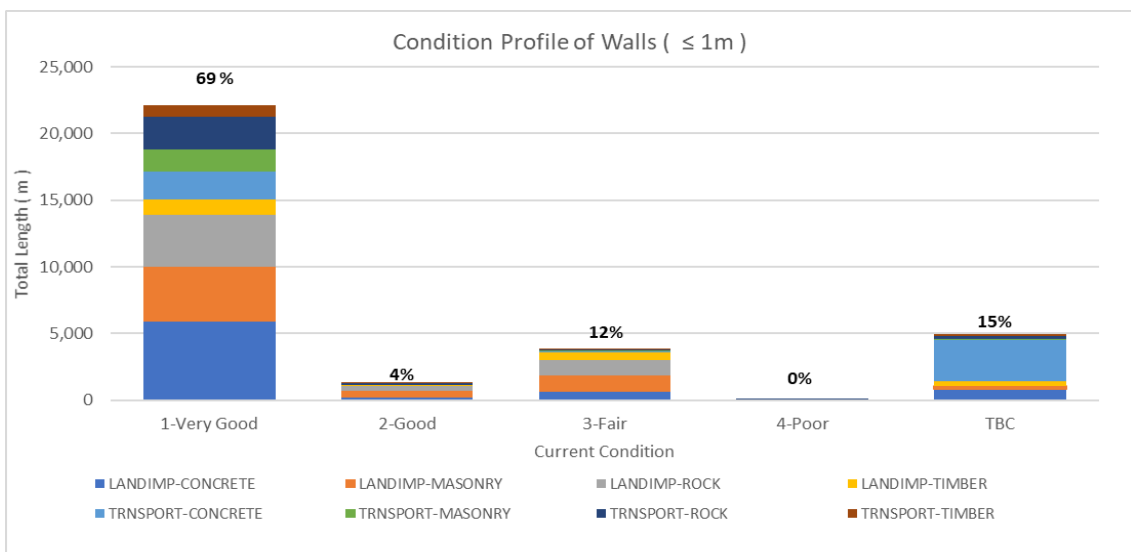


Figure 6 - Condition profile for Retaining Walls (Wall Height ≤ 1m)

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The Level 2 condition inspections provide an information source for identifying current defects in the retaining walls as well as information to assess the remaining useful life so that future replacement can be estimated and scheduled. Maintenance is both planned, based on observed defects from condition assessments, and reactive, based on CSR's generated by the community.

The current levels of funding are:

- \$100,000 per annum for planned and reactive maintenance
- \$100,000 per annum for new retaining walls and upgrades until FY2025, then increasing to \$200,000 per annum from FY2026 onwards
- \$400,000 per annum for renewals and replacements until FY2025, then increasing to \$800,000 per annum from FY2026 onwards

A lifecycle assessment was carried out to determine the future cost requirements for the retaining walls asset portfolio over the next 50 years. The lifecycle analysis presented a strong case for retaining the annual maintenance expenditure with the potential to reduce capital renewal/replacement funding for retaining walls assets in the short to medium term.



Figure 7 - An example of a condition 4 rated retaining wall in need of rectification or renewal. This eroded anchored wall on Goat Track Road will be renewed in FY2022

Figure 8 summarises the level of capital expenditure projected to be required over the next 50 years as determined from the lifecycle model. Whilst the model indicates a low amount of capital expenditure being required for retaining wall replacement over the next 30 years, it highlights that beyond FY2052 there will need to be a reassessment of capital allocation for retaining walls. This capital allocation reassessment is due to a high portion of assets built within the last 10-20 years reaching their expected end of life.

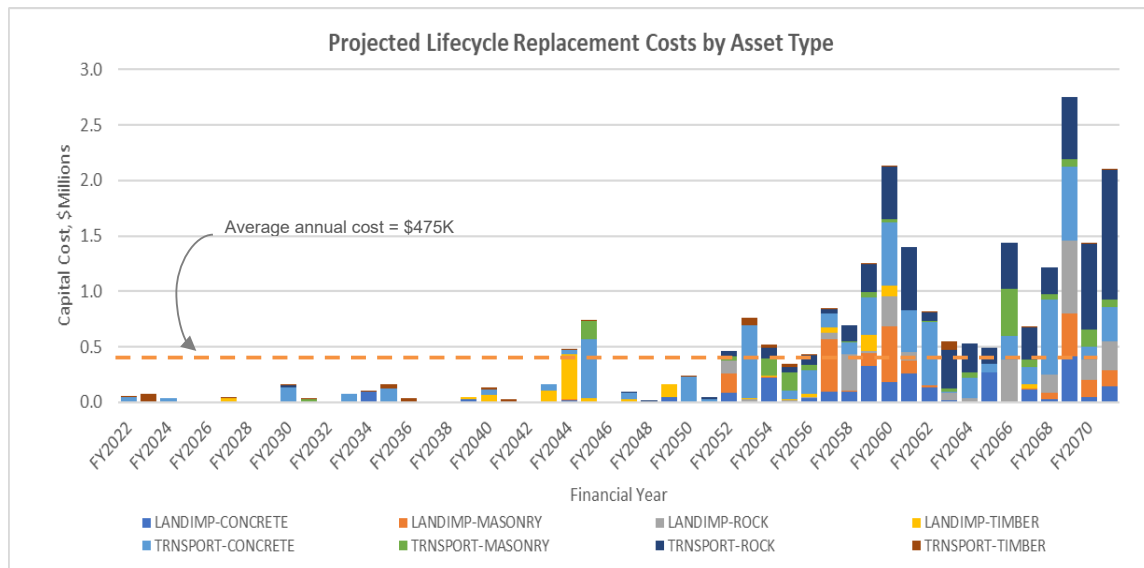


Figure 8 - Projected 50-year lifecycle replacement costs for retaining walls

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The long-term average funding required for renewal and replacement of retaining wall assets is \$475K per annum. The low number of retaining walls currently requiring replacement also aligns with the condition profile and general observations made during recent Level 2 condition inspections.

To sustain the existing retaining wall asset portfolio, and provide the expected community and technical levels of service described in this asset management plan, **the recommended budget allocations are outlined below:**

- **Retain** the current budget for both planned and reactive maintenance of **\$100K per annum from FY2022 to FY2030**
- **Retain** the current budget for asset new/upgrade of **\$100K per annum to FY2025** with subsequent **increase to \$200K per annum from FY2026 onwards**
- **Temporarily reduce** the current \$400K per annum budget for asset renewals/ replacements to **\$250K per annum from FY2023 through to FY2045** with a proposed review of the renewal budget beyond FY2045 subject to ongoing condition assessment
- It is predicted that **renewals expenditure will need to increase beyond FY2045** as per below. However, these numbers will be confirmed by future condition assessment and lifecycle analysis:
 - FY2045 - FY2055: \$250K / annum
 - FY2055 - FY2060: \$500K / annum
 - FY2060 - FY2070: \$1 M / annum
 - FY2070 - FY2080: \$3 M / annum

Figure 9, Table 0.2 and Table 0.3 summarise the recommended budget requirements for the next 25 years including proposed new acquisitions.

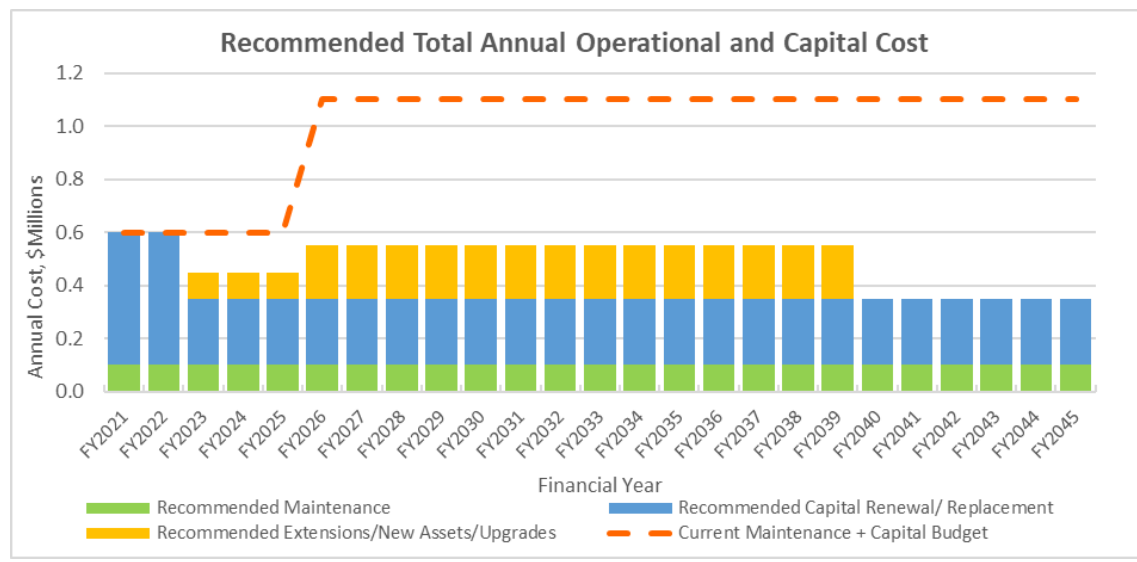


Figure 9 - Recommended total annual operational and capital budgets

Table 0.2 Recommended annual operational and capital budgets; FY2022-FY2033

Cost Type	Estimated Annual Cost, \$000's											
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
Operations and Maintenance	100	100	100	100	100	100	100	100	100	100	100	100
Extensions/New Assets/Upgrades	0	100	100	200	200	200	200	200	200	200	200	200

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Capital Renewal/ Replacement	500	250	250	250	250	250	250	250	250	250	250	250
TOTAL	600	450	450	550	550	550	550	550	550	550	550	550

Table 0.3 - Recommended annual operational and capital budgets; FY2034-FY2045

Cost Type	Estimated Annual Cost, \$000's											
	FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043	FY2044	FY2045
Operations and Maintenance	100	100	100	100	100	100	100	100	100	100	100	100
Extensions/New Assets/Upgrades	200	200	200	200	200	200	200	200	200	200	200	200
Capital Renewal/ Replacement	250	250	250	250	250	250	250	250	250	250	250	250
TOTAL	550	550	550	550	550	550	550	550	550	550	550	550

The long term financial projection beyond 2045, is that an increase in funding will be required, to address renewals and replacement for a large portion of retaining walls between 2070 and 2080 as illustrated in Figure 10 below. In practice, ongoing condition assessments will identify asset remaining lives and provide opportunities for interventions to extend lives and smooth out future major capital replacement funding needs.

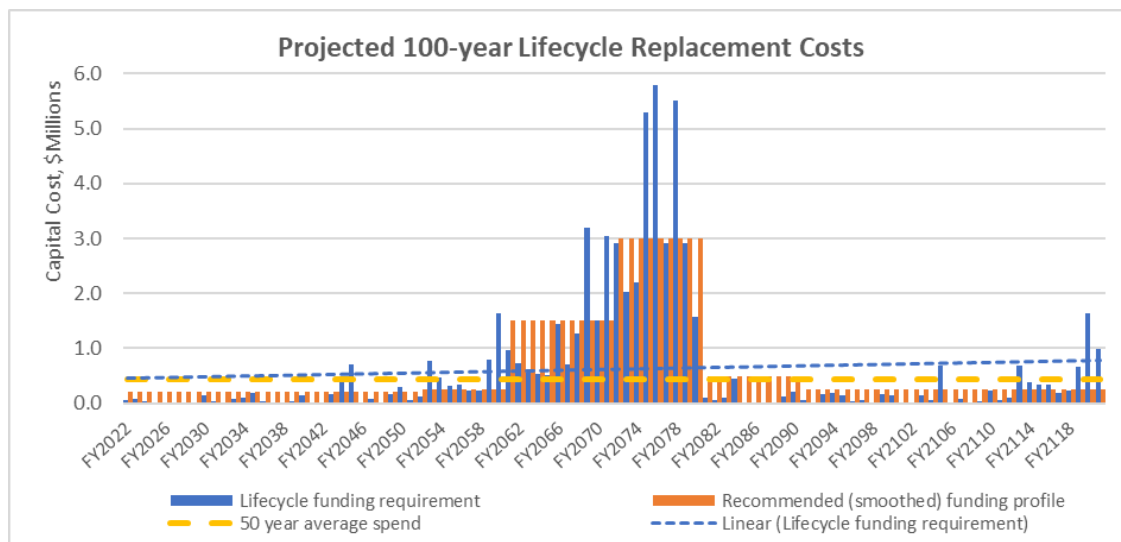


Figure 10 - Projected 100-year lifecycle capital renewal and replacement costs

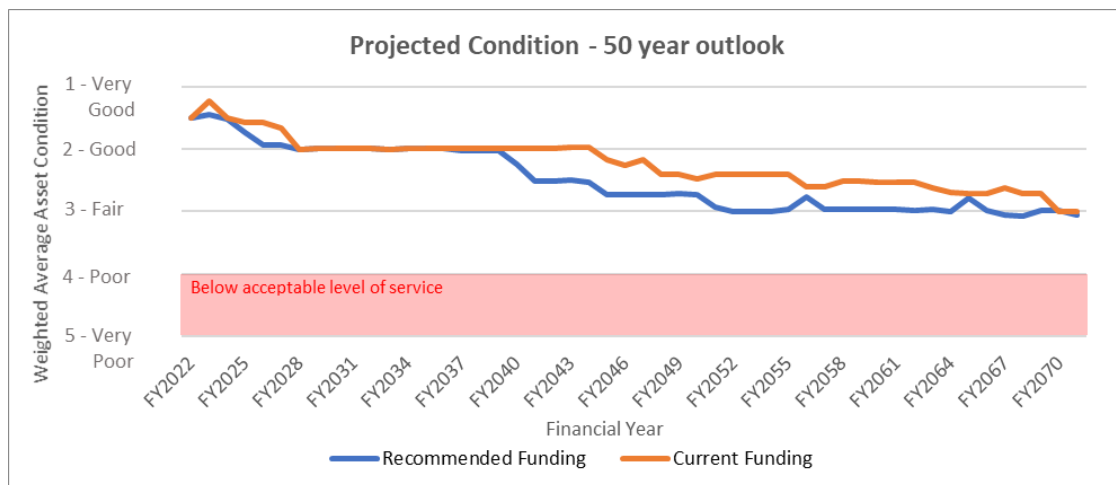


Figure 11 - Projected condition of MBRC's retaining wall assets over 50 years

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As justification for adjustments to the renewal and replacement capital spend, an analysis was carried out to determine the future condition of the retaining wall asset portfolio with the recommended budget and if the currently adopted budgets were continued. Figure 11 illustrates that with the currently adopted funding schedule the condition of the asset portfolio will maintained to a slightly higher condition when compared to the recommended funding. The recommended (reduced) funding will still maintain the asset portfolio to an acceptable condition.

Figure 12 and 13 below further illustrates that even with the proposed reduced funding levels of the current with the proposed recommended budget, the decline in asset health is negligible with the heat maps showing similar profiles for poor to very poor assets in the short to medium term. It is further predicted that with the reduced renewals funding, the retaining wall asset base will continue to provide acceptable levels of service. This reduction in funding is expected to provide a cost saving of approximately \$11.5 million over the next 25 years.

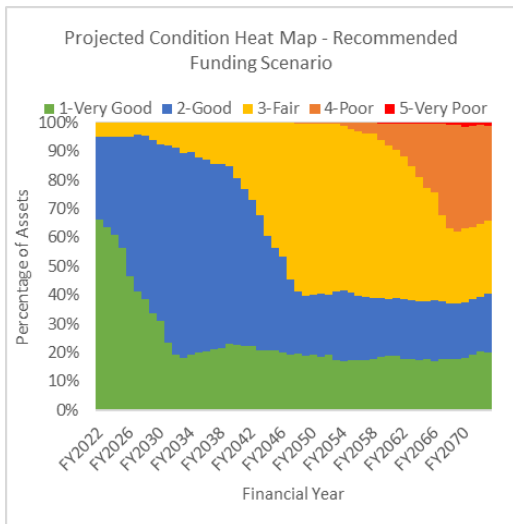


Figure 12 - Heatmaps for projected condition with current funding

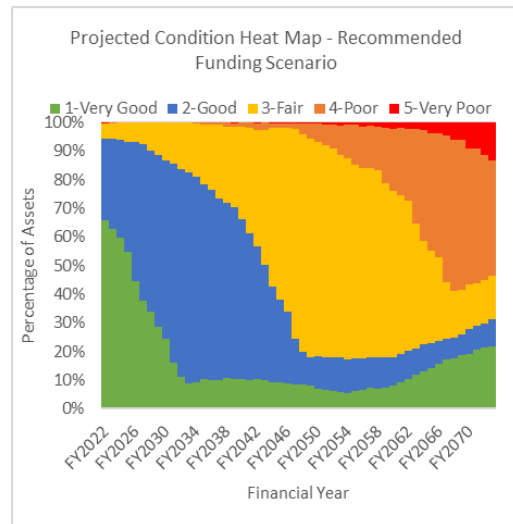


Figure 13 - Heatmaps for projected condition with recommended funding

The sustaining principles behind the recommended budgets are also illustrated through the following financial sustainability indicators:

- Asset sustainability ratio
- Asset consumption ratio

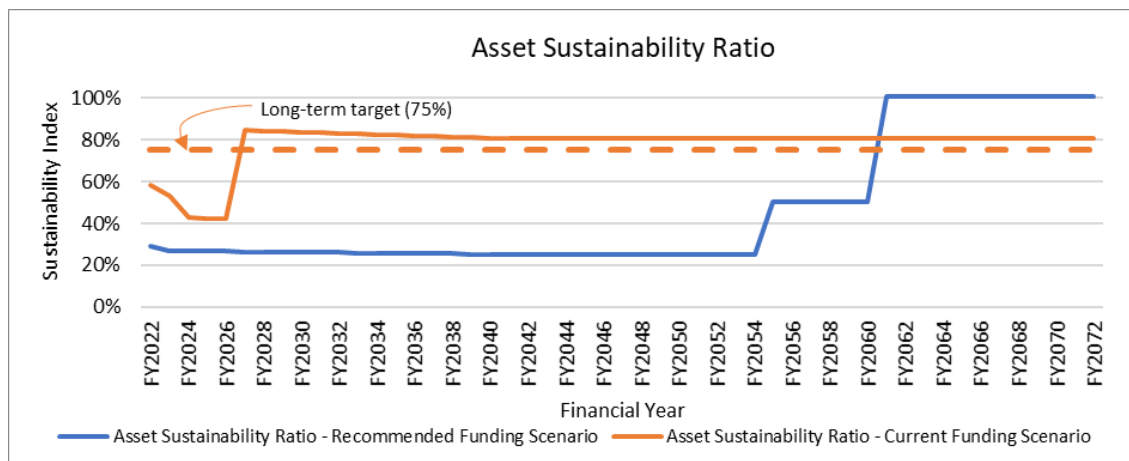


Figure 14 - Projected sustainability ratio based on current and recommended funding scenarios.

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Figure 14 shows the asset sustainability ratio which measures renewal and replacement capital expenditure against depreciation of the asset. The intent is for capital investment to offset depreciation to maintain the value of the portfolio, and inherently demonstrate maintaining the portfolio itself. While not particularly relevant for new asset portfolios whereby minimal capital expenditure is required early in the life of the asset, it demonstrates that the recommended funding will rapidly lead towards achieving long term sustainability.

The life cycle modelling highlighted low funding requirements to sustain the retaining wall portfolio over the next 35 years due to its young age. The low sustainability index for the recommended funding scenario (blue solid line in Figure 14) is appropriate for a young asset base in good condition that is not expected to require significant capital outlay until well into the future, in this case being from FY2055 and beyond.

The Asset Consumption Ratio is the net (depreciated) value of the infrastructure assets divided by their gross current replacement cost as illustrated in Figure 15. Council’s desired range is an ACR value of between 40% to 80%. The ACR drops below 40% due to the age distribution of the retaining wall portfolio and large concentration of assets nearing replacement age at a similar time. Beyond the 50-year period, and with an increase in funding of up to \$1 million beyond FY2045, the ACR is expected to return above the 40% target.

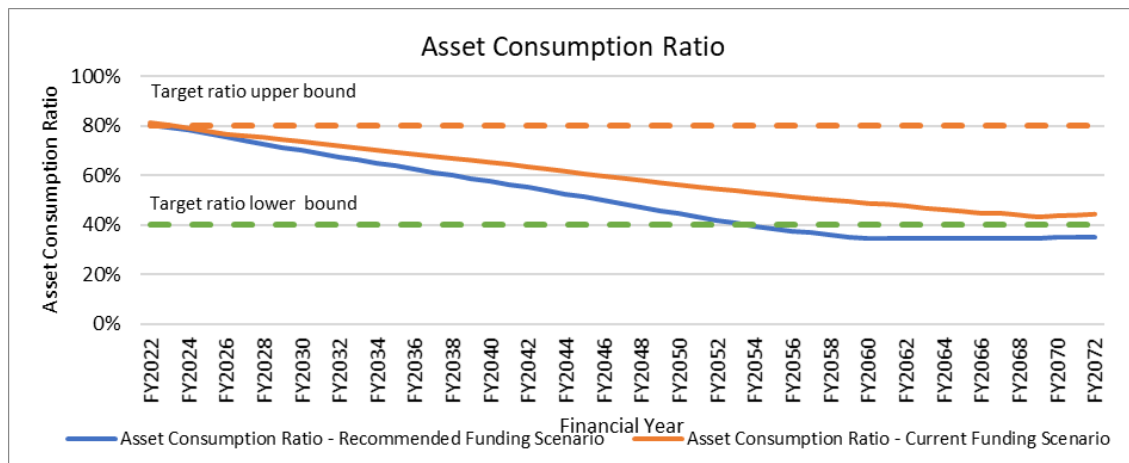


Figure 15 - Projected asset consumption ratio based on current and recommended funding scenarios

Key Issues

- Based on lifecycle modelling and observations from the Level 2 condition assessments conducted in 2020 and 2021, the current allocated renewals budget can be reduced without incurring any significant reduction in levels of service over the next 20-25 years.
- Retaining wall renewals peak between FY2070 to FY2080 when a significant outlay of capital will be required in the vicinity of approximately \$33.2 million (62% of current replacement cost), to address renewals for this large portion of the retaining wall portfolio. This anticipated renewal spend will be subject to ongoing assessment of condition data as retaining walls enter the final stages of their useful life.
- The asset lives were reviewed (generally extended) as part of developing this asset management plan and undertaking the lifecycle modelling. Benchmarking of the lives showed that the adopted lives are still conservative compared to some other local governments. Ongoing review of the condition of MBRC’s retaining wall assets and typical age at replacement is essential for optimising budget allocations as well as improving service life predictions for different retaining wall types.

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- Some (15%) retaining walls over 1.0m high do not have a recorded condition. Initiating a third stage of condition assessments for the remaining 70 retaining walls will ensure that all walls over the height of 1m have been subjected to a comprehensive condition inspection to help inform renewal modelling and other decision-making.

As per Council's strategic asset management framework, it is imperative that Council adopts a proactive approach to managing retaining wall asset lifecycle including planned and routine maintenance.

The recommended funding adjustments, both for capital renewal/replacement and routine and planned maintenance, will allow Council to achieve its strategic asset management objectives including:

- Organisational commitment to effective asset management
- Managing risk appropriately
- Delivery of services to agreed standards
- Optimise asset performance
- Minimise asset failure through earlier intervention

Once further engineering inspections are performed and improvements to the asset data have been made, any major revisions to the renewal and maintenance budget for retaining wall assets will be presented to Council for further consideration.

Retaining Wall Portfolio Asset Management Plan

1 Purpose

The purpose of the Retaining Wall Portfolio Asset Management Plan (RWPAMP) is to outline MBRC's approach to the management of retaining wall assets. In accordance with MBRC's Infrastructure Asset Management Policy¹ and Strategic Asset Management Plan, the RWPAMP serves to:

- Demonstrate organisational commitment to responsible, effective, and sustainable management of the assets.
- Demonstrate informed decision making and management of risk.
- Communicate and justify funding requirements.
- Ensure compliance with regulatory requirements.
- Demonstrate continuous review and improvement of asset management processes, systems, data, and technology.
- Provide a high level of assurance to executive management, councillors and the community regarding MBRC's asset management systems, processes, practices, and outcomes.

This RWPAMP will be reviewed and updated on a biennial basis. MBRC's approach to asset management has been aligned to the ISO 55000 series of standards for infrastructure asset management, as outlined in Council's Strategic Asset Management Plan (SAMP).

The retaining wall asset categories included in this portfolio are listed below -

- Transport corridor retaining walls
- Land improvement retaining walls

Excluded from this AMP are walls classed as barrier walls, privately owned walls, waste facility retaining walls, bridge structure retaining walls, visual screening walls, noise attenuation walls and walls under the ownership of Queensland Rail and the Department of Transport and Main Roads.

Private retaining walls are defined as walls that only serve a purpose to the adjacent private property, and do not serve a primary purpose of supporting or protecting Council owned land and infrastructure.

2 Asset Information

This RWPAMP outlines MBRC's approach to the management of retaining wall assets located throughout the MBRC region.

The range of retaining wall assets are diverse and with simple or specialised designs to primarily function as an earth retaining structure.

Retaining wall assets on the MBRC register classed under Transport are primarily wall constructs located within Transport corridors while Land Improvement classed walls are located in open spaces such as parks and other non-transport corridor related locations.

¹ Policy No.: 2150-043

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Retaining Wall Portfolio Asset Management Plan

Retaining walls primarily serve 3 purposes:

- Provide Stability - by providing lateral support and reinforcement to the soil or other material to be retained.
- Prevent Erosion - by providing a durable facing to the material being retained to prevent loss of material or hazards caused from falling material and debris.
- Visual Appeal - by forming an aesthetic feature whilst providing support to the delivery of both transport and open space services.

2.1 Asset Types & Hierarchy

Integrated Transport Planning and Design (ITPD) along with Parks and Recreation Planning (PRP) are the nominated asset owners for the retaining wall portfolio with Asset Maintenance responsible for day to day maintenance as outlined in the RACI matrix in Appendix A.

The asset owner is responsible for making strategic decisions in the key stages of asset management during the asset life cycle in relation to:

- Design
- Procurement (new assets)
- Operation
- Maintenance (including inspections and condition assessment)
- Renewal/Replacement
- Upgrades
- Decommission or disposal

Table 2.1 below provides a breakdown of “Asset Categories” for the retaining wall portfolio. Retaining wall assets are not currently componentised within the asset registers. As a future improvement opportunity, consideration needs to be given to the benefits that might be achieved through componentisation. Differentiating between transport and land improvement retaining walls via spatial analysis should also be undertaken as an improvement action item as all retaining walls are currently classed under Open Space in the asset register.

This differentiation will also provide benefits when prioritising asset renewals, evaluating risks and optimising maintenance strategies for the retaining wall portfolio.

Table 2.1 - Asset Types & Hierarchy

Asset Classification Type	Asset Hierarchy Level	Asset Function
Open Space	Asset Class-Level1	<ul style="list-style-type: none"> • Provides lateral support and reinforcement of earth masses at location having a change in elevation • Prevents erosion • Visual appeal as an aesthetic structure in road corridors and park complexes
↳ Structures	Asset Group-Level2	
↳ Retaining Walls	Asset Type-Level 3	

Construction material type can vary from masonry, stone, concrete, timber and steel depending on application and design requirement. MBRC’s retaining wall construction by material type along with expected useful life is summarised in Table 2.2.

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Table 2.2 - Retaining Wall Types

Wall Category	Construction Material	Count of Walls	Length (m)	Expected Useful Life (Years)	Current Age Range (Years)	Current Replacement Cost
Transport	Concrete	291	6,866	60	1-60	11,769,154
	Rock	298	6,952	60	1-50	11,533,219
	Masonry	136	3,064	60	1-49	4,556,952
	Timber	53	1,169	40	1-53	365,557
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	Rock	361	7,327	60	1-30	7,243,737
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	Timber	101	2,393	40	1-26	1,180,448
TOTAL		2019	44,209			\$53,193,722

MBRC have a total of 2019 retaining walls on its register with a total replacement value of \$53 million covering a total length of approximately 44,209 metres. Around 8% of the retaining walls by number and length are constructed from timber. These will be replaced with retaining walls constructed from modern and more durable equivalent materials (eg timber look concrete sleepers) where economic and practical to do so.

Transport corridor retaining walls comprise of 41% of the total retaining wall portfolio and these largely tend to be engineered walls given the function it serves around road corridor. Land Improvement retaining walls make up the remaining 59% and are largely non-engineered walls with heights under 1m.



Figure 16 - A rock constructed retaining wall in the land improvement category at Mapleton Drive, North Lakes.

Walls exceeding 1m in height needs to be designed and approved by appropriate engineering authority and must comply with standards set out by local government and the requirements of earth retaining structures standard - AS4678. Currently MBRC have a total of 11,812 metres of wall (27% of all walls) with a height exceeding 1m as illustrated by Figure 17.

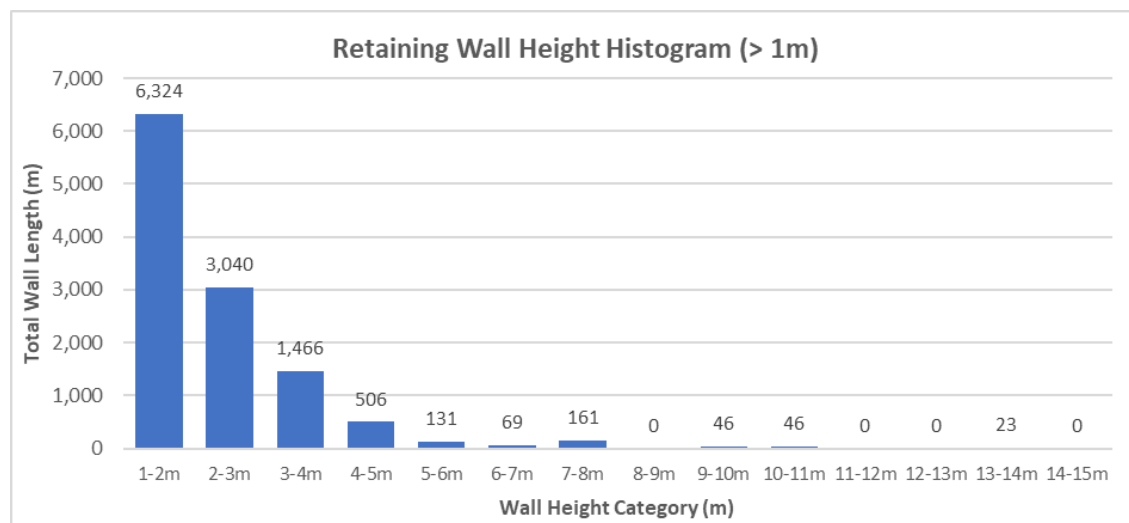


Figure 17 - Grouping of retaining wall height with exceeding 1m

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Retaining wall construction includes a variety of designs based on cost, soil types, earth retaining structures functional requirements, aesthetics along with state and local government regulatory requirements. The most common types of retaining wall designs are illustrated in Appendix B and summarised below:

- **Gravity Walls** - a retaining wall that is prevented from overturning or sliding by its own weight
- **Embedded Retaining Walls (Pile)** - retaining walls consisting of a row of piles often bored and cast-in-situ
- **Cantilever Walls** - a retaining wall that resists the lateral pressure of the retained soil using countervailing soil force
- **Anchored Walls** - a retaining wall that is provided with additional support by ground anchors to a grouted zone

Figure 18 summarises the common design types in MBRC's asset register. Analysis of attribute data for retaining walls indicate 82% of walls are gravity walls, 11% piled, 4% cantilevered and anchored walls making up the remaining 3%.

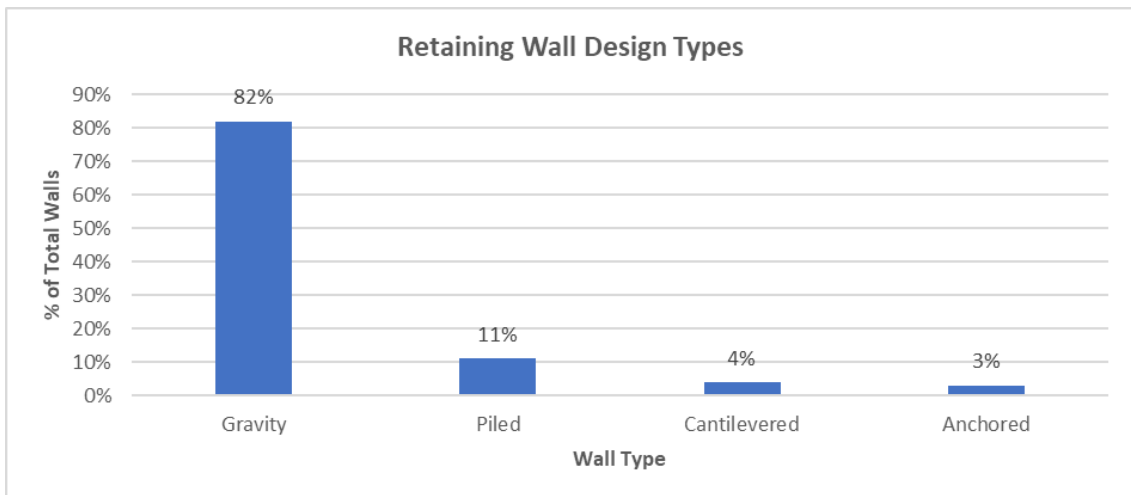


Figure 18 - Retaining walls design type composition in the Moreton Bay Region

The following figures illustrate 4 design types of retaining walls owned by MBRC.



Figure 19 - Mathieson Park cantilevered wall



Figure 20 - Stoneridge Boulevard Park gravity wall

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan



Figure 21 - Sheaves Road piled wall



Figure 22 - Goat Track Road anchored wall

Action Items:

AI-RW1	Review retaining wall assets to uniquely identify road reserve and land improvement walls and subsequent asset owner for these classifications. Use spatial and survey methods, where applicable, to improve spatial integrity of retaining wall location
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2.2 Asset Prioritisation

The type of retaining wall constructed is determined such that it is fit for purpose at its location and designed functionality. The walls are classified into a priority/importance hierarchy based on STAR rating classification in TOMAS. Retaining walls are assigned a STAR rating value of the parent asset based on its location in a road corridor or park complex.

This method of determination ensures that retaining walls that are constructed in road corridors and park complexes inherit the same level of importance as the parent asset. Currently less than 30% of retaining walls have been assigned a STAR rating based on the methodology prescribed.

Action Items:

AI-RW2	Update STAR rating for retaining walls on MBRC register identifying its criticality in relation to the road reserve and park complex
---------------	--

2.3 Asset Relationships

The asset relationships can be formed between physical assets (and/or their asset components) or associated to a site within the corporate asset register (TOMAS).

Retaining walls aren't further componentised in the asset register to form a parent - child relationships. Given these structures vary in design parameters along with different modes of failure, it is proposed that a review is conducted to establish if componentisation and associated asset relationships will be of value to the retaining walls asset portfolio.

Appendix C illustrates some common elements of retaining walls:

- Face Units - provides support and withstands earth forces.
- Geotextile Fabric - a permeable material commonly used to separate drainage material from other backfill material.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

- Retained material - commonly natural soil or rock, intended to be retained by the constructed retaining wall.
- Foundation - base of the retaining wall often varies with wall design type
- Backfill material - filling material often placed behind the retaining wall face
- Drainage system - key element of any retaining wall structure that reduces hydrostatic loading on the wall by draining excess water from behind the wall structure.

Action Items:

AI-RW3	Review componentisation level and relationships that link “parent” and “child” asset components to determine if this is required for retaining wall asset within TOMAS.
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2.4 Asset Attributes

Asset attributes provide unique information regarding the characteristics, type and status of a retaining wall asset. Asset attribute details are listed for retaining walls in Appendix D.

The current data capture for retaining wall attributes requires improvement due to some gaps in data for key fields such as height, wall design type, construction material and retaining wall use. A review and data cleansing exercise for retaining wall attribute data will provide additional benefit for asset management, operational and financial assessments.

Action Items

AI-RW4	Review retaining wall asset attributes with stakeholders and update the asset management system
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3 Levels of Service

The following subsections summarise the community and technical levels of services for the retaining wall asset portfolio, including current and expected long term performance.

Appendix B for Council’s Strategic Asset Management Plan (SAMP) provides definitions for Council’s corporate visions, strategic priorities and associated service levels.

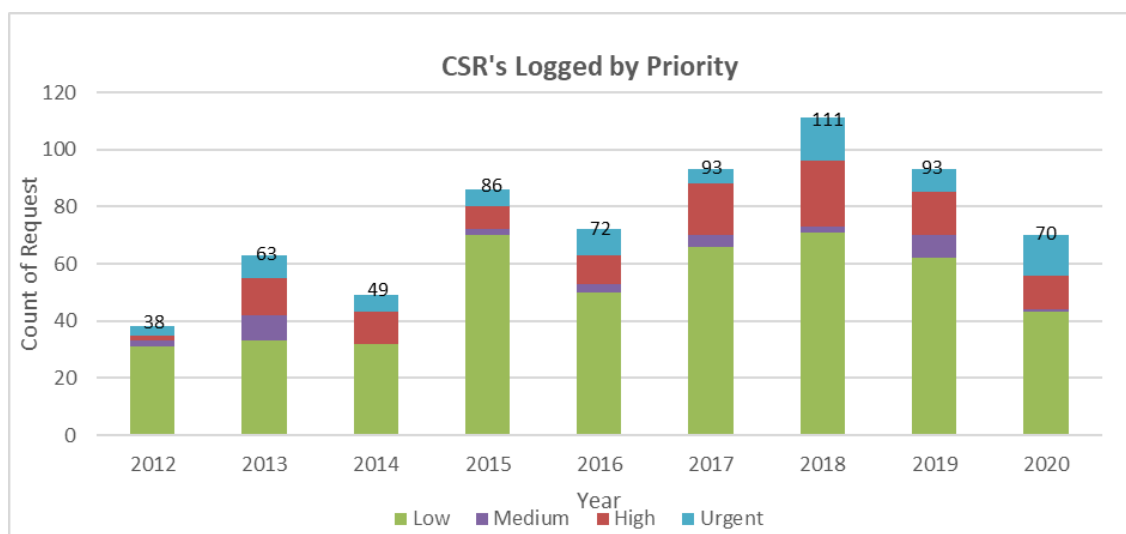


Figure 23 - Customer Service Request figures logged for retaining walls

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Community feedback and opinion is monitored and measured daily through Council's customer service requests (CSR's) to determine the extent to which MBRC's retaining walls portfolio satisfies community expectation. Figure 23 illustrates, a total of 675 customer requests have been logged since 2012 for issues relating to retaining walls. Only 7 CSR's were open at the time of this report creation indicating a response and completion rate of 99% for all retaining wall service requests.

Analysis of CSR data indicate 58% of requests logged was due to damage and drainage issues in both road and land improvement categories, 15% was for graffiti while vegetation along with general issues relating to retaining walls made up remaining 14% and 13% respectively.

Damage issues largely included cosmetic or minor structural defects on retaining walls along with poor drainage behind retaining walls and on private property. These contributed to over 50% of customer service requests since 2012.

3.1 Community Levels of Service

The Customer Levels of Service are considered in terms of:

Quality How good is the service and 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 table below summarises the community levels of service for retaining walls.

Table 3.1 - Community Levels of Service

Service attribute	Service objective	Performance measure process	Current performance	Expected performance in 10 years (LTFF)
Quality	Retaining walls are aesthetically pleasing, designed and constructed to industry best practice to meet community expectations.	As-Cons Handover Management Analysis of CSRs in relation to retaining wall defects and performance issues	Retaining wall Structures are designed and constructed in accordance with State legislations and industry and global standards as a minimum 675 CSR'S recorded since 2012. 99% completed to date with 7 open complaints resolution in progress	Retaining Walls (Council constructed and donated) are designed and constructed in accordance with modern engineering best practice and conform to all relevant standards Reduction in number of CSR's received rate from current after targets are agreed on with stakeholders
Function	Ability to retain earth masses and support soil loading via appropriate design and construction	Number of defective or failed walls logged during inspections and defects processed via customer request	High proportion of retaining wall assets are functioning as expected with recent selective inspections highlighting no wall with condition stage 5	The healthy profile of the retaining walls portfolio via Level 2 inspections and the relatively young age of the retaining wall assets indicate the current performance is expected to continue for the next 10 years.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Service attribute	Service objective	Performance measure process	Current performance	Expected performance in 10 years (LTFF)
Capacity/ Utilisation	Retaining Wall structure additionally supplements transport network growth as well as facilitates land improvement development	Adequate number of walls constructed in line with transport and land improvement development	Unknown at this stage as there's retaining wall capacity /utilisation studies undertaken by council	No issues perceived with reduced levels of service relating to capacity or utilisation issues with sufficient allocated funding for retaining walls construction and renewals in the next 10-year period with consideration for regional growth

Action Items:

AI-RW5	Undertake detailed analysis of current and historical customer service requests relating to retaining walls defects and failures to assist in maintenance planning
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3.2 Technical Levels of Service

Supporting the community, service levels are operational or technical measures of performance. These technical measures relate to the allocation of resources to service activities that the organisation undertakes to best achieve the desired community outcomes and demonstrate effective organisational performance.

Table 3.2 - Technical Levels of Service

Service attribute	Service objective	Activity measure process	Current performance	Recommended optimum position	Agreed sustainable position
Condition Assessments	Scheduled inspections are performed to identify defects & assess asset condition	No. of level 1 and 2 inspections completed according to the specified frequency	Ad - Hoc inspections are being currently done on retaining walls at Level 1. Initial round of Level 2 inspections has been carried out on selected walls with heights exceeding 1m in the last 2 years	Inspections performed according to timeframes specified in Table 5.3 20% of the retaining walls portfolio every year (\$100K pa budget)	Inspections performed according to timeframes specified in Table 5.3 20% of the retaining walls portfolio every year (\$100K pa budget)
Safety	Ensure safe, suitable work procedures	Incident reports	Zero recorded work-related injuries	Zero work related injuries per year. Internal operational cost only	Zero work related injuries per year Internal operational cost only
Planned Maintenance (PM)	Retaining Wall assets are proactively maintained to reduce the likelihood of	Planned maintenance as per schedules in TOMAS.	0% planned maintenance \$100K annually - no split defined between Planned and Reactive	≥ 20% planned maintenance \$100K to be shared between planned and reactive as	≥ 20% planned maintenance \$100K to be shared between planned and reactive as

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Retaining Wall Portfolio Asset Management Plan

Service attribute	Service objective	Activity measure process	Current performance	Recommended optimum position	Agreed sustainable position
	defects and failures occurring			identified in Table 5.7	identified in Table 5.7
Reactive Maintenance (RM)	Retaining wall assets receive routine maintenance to address significant defects	Reactive maintenance WO's in TOMAS.	100% reactive maintenance \$100K annually - no split defined between Planned and Reactive	≤ 80% reactive maintenance \$100K to be shared between planned and reactive as identified in Table 5.7	≤ 80% reactive maintenance \$100K to be shared between planned and reactive as identified in Table 5.7
Capital Programming – New and Upgrades	Deficient retaining walls are upgraded to meet current design standards & legislative requirements	Timeframe for assessment and initiation of upgrade/ renewal projects for existing deficient assets where identified	Deficient assets identified are upgraded within 10 years \$100K annually, increasing to \$200K after FY2025	Deficient assets are assessed within 2 years from identification & upgrade/ renewal projects are initiated and upgraded within 2 years from assessment \$100K annually, increasing to \$200K after FY2025	Deficient assets are assessed within 2 years from identification & upgrade/ renewal projects are initiated and upgraded within 6 years from assessment \$100K annually, increasing to \$200K after FY2025
Capital Programming - Replacements	Retaining Walls are renewed to meet / achieve the designed service life while achieving the most cost beneficial outcome	Number of conditions 3, 4 & 5 Retaining Walls after level 2 inspections	Cond. 3 - 352 Cond. 4 - 11 Cond. 5 - 0 \$400K annually, increasing to \$800k after FY2025	Nil 4 & 5 condition Retaining Walls FY2023 - FY2055: \$250K / annum FY2055 - FY2060: \$500K / annum FY2060 - FY2070: \$1 M / annum FY2070 - FY2080: \$3 M / annum to cater for a large influx of renewals from 2070 to 2080 as per forecasted lifecycle modelling in Appendix K	Nil 4 & 5 condition Retaining Walls FY2023 - FY2055: \$250K / annum FY2055 - FY2060: \$500K / annum FY2060 - FY2070: \$1 M / annum FY2070 - FY2080: \$3 M / annum to cater for a large influx of renewals from 2070 to 2080 as per forecasted lifecycle modelling in Appendix K

Action Items:

AI-RW6	Review reactive and planned % allocations for retaining walls after stakeholder consultations to ensure optimal cost approach for maintenance of retaining walls.
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4 Future Demand

Moreton Bay Region is one of Australia’s fastest growing regions. Its regional population is forecast to grow by a further 50% to approximately 690,000² by 2041. That means an additional 240,000 residents over the next 25 years. In accordance with the State Government’s South East Queensland Regional Plan 2017, Moreton Bay Region is also expected to deliver an additional 88,300 dwellings by this time.

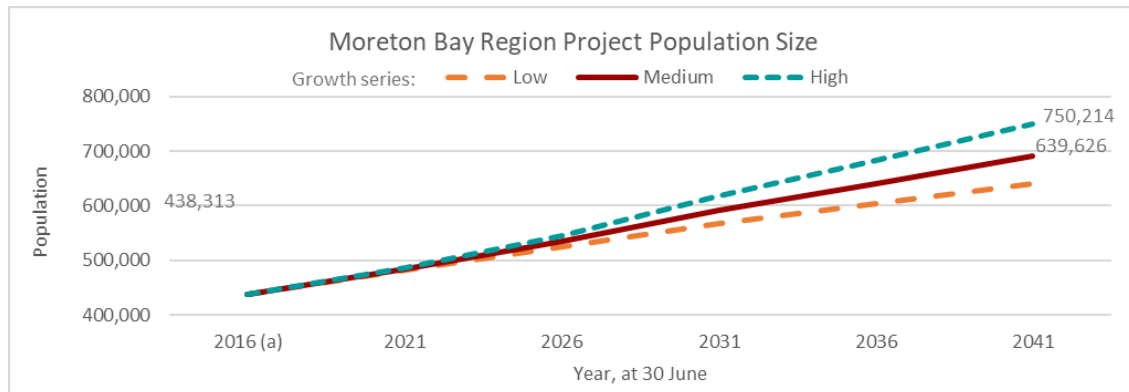


Figure 24 - Moreton Bay Region projected population growth. Source: Queensland Government

Growth management is identified as a key issue in Council’s Corporate Plan and well-planned growth is emphasised in the Community Plan. The provision of transport services and associated infrastructure has been given a high priority in MBRC’s planning activities. LGIP2 report in 2020 and Council’s recently adopted Regional Economic Development Strategy (REDS), identified significant infrastructure constructions in both transport network and land improvement categories.

Future retaining wall infrastructure will be progressively delivered to service future demand within the region in accordance with Council’s adopted Local Government Infrastructure Plan (LGIP).

In addition to population growth, climate change patterns could also provide adverse weather condition and events impacting designed useful lives of current retaining wall structures and place additional demand for renewals / replacements and upgrades.

5 Asset Lifecycle Management

5.1 Asset Capacity & Performance

Engineered retaining walls are long life assets, designed and constructed in accordance with AS4698 standards. The standards outline a class hierarchy for retaining walls, in Appendix E, where class A, B and C are walls that must comply to design specifications pertaining to loading related to:

- Live loads
- Wind and Earthquake loads
- Hydraulic loads

² Medium growth series

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

The standards outline minimum loading requirements along with design life specifications as performance guidelines for retaining walls.

Retaining walls are generally constructed and maintained to meet design standards where these are available. Locations where deficiencies in service performance are known are detailed in Table 5.1.

Table 5.1 - Known service performance deficiencies

Location	Service Deficiency
Retaining Wall Face	Aesthetics and visual appeal due to vegetation growth, cracks and spalled concrete as well as lateral deformations and ruptures leading to gradual deterioration of wall structure
Behind Wall Structure	Voids and erosions, loss of fill could potentially cause local and global stability issues
Wall components	Detached and loose portions of wall structure including foundation indicating potential structural issues and integrity of wall

The above service deficiencies were identified from Level 2 condition inspections recently on retaining wall structures highlighting locations of deficiencies in the assets inspected.

Capacity constraining factors relate to materials used for the retaining wall construction where material with low load bearing capacity are primarily used for Class A structures which are below the height of 1 m and of low risk if failure occurs. Class B and C structures often use high load bearing materials such as concrete to ensure wall performance and longevity is obtained.

Both asset capacity & performance is not currently captured for retaining walls for use in Council's Strategic Asset Management System (TOMAS). Development and implementation of a performance monitoring process for 4 and 5 STAR rated retaining wall assets is recommended. This should incorporate quantitative performance indicators based on industry and in consultation with MBRC stakeholders. Where possible, any proven innovative technology that could assist with the provision of this performance reporting should be trialled and if successful implemented.

Action Items:

AI-RW7	Research current retaining walls asset performance measurement practices & implement a process for capturing performance data for 4 and 5 STAR rated walls
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5.2 Condition & Profile

Moreton Bay Regional Council's approach to assessing the condition of its retaining wall assets aligns to the 1 to 5 grading scale used for other asset classes and is described in the summary table below.

Table 5.2 -Condition rating scale summary

Condition Score	Subjective rating	Notional Remaining Useful Life*	Description
1	Very Good ('as new')	90% - 100%	Free of defects with little or no deterioration evident. Only planned maintenance required.
2	Good	56% - 90%	Free of defects affecting structural performance, integrity and durability. Deterioration of a minor nature and only minor maintenance required plus planned maintenance.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Condition Score	Subjective rating	Notional Remaining Useful Life*	Description
3	Fair	25% - 56%	Moderate to significant deterioration. Developed defects are present but do not affect short term / medium term structural integrity. Moderate loss of hydraulic capacity. Moderate maintenance required.
4	Poor	6% - 25%	Significant deterioration and defects. Moderate maintenance is required. Rehabilitate / renew in the short term and flag for future part / full replacement. This may include moderate loss of hydraulic capacity.
5	Very Poor	0% - 6%	Failed or failure imminent. The asset is unserviceable and may be hazardous. Major work / replacement required

* Remaining life is expressed as a percentage of the total expected useful life.

5.2.1 Condition

MBRC recently commissioned a Level 2 condition inspection for walls with height exceeding 1m which represents 27% of total retaining wall assets by length. All walls exceeding 1m in height need to be designed and approved by appropriate engineering bodies and must comply not only to AS4698 but also to state and local government regulations.

Of particular interest are retaining walls over the height of 1m as they represent engineered wall serving a specialised function. A total of 613 retaining walls was assessed during the Level 2 inspections and the results are graphed below.

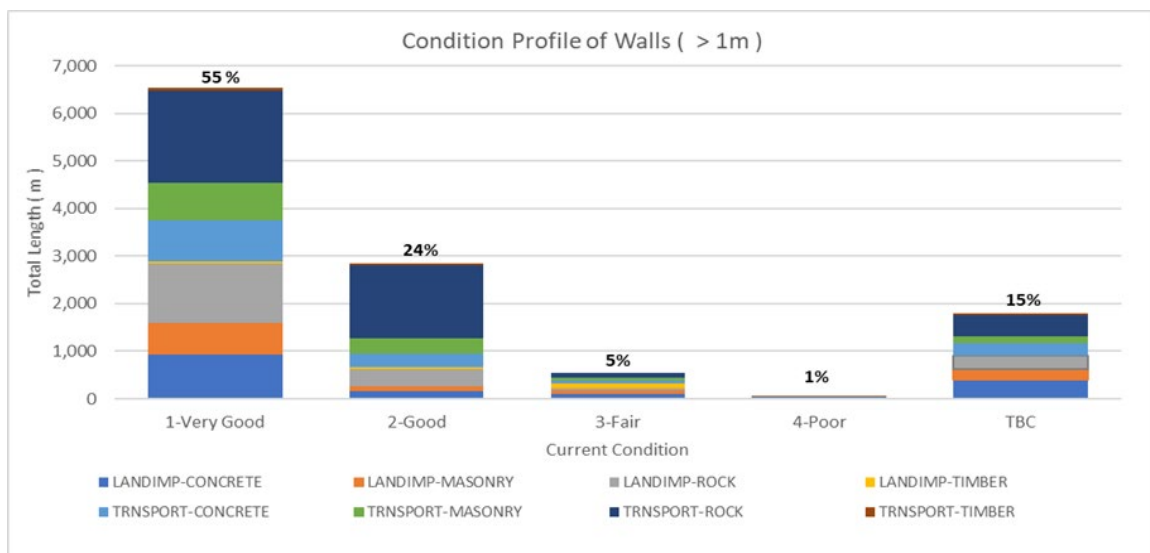


Figure 25 - Retaining walls indicative condition profile (estimated based on age for walls >1m)

The graph illustrates that 84% of retaining walls are in fair to very good condition. A very small portion of walls, 2 during the recent count, have been rated at condition 4. Both of these walls have been scheduled for renewal by FY2023 and represent only 0.26% of the total portfolio replacement cost.

Approximately 70 or 15% of walls over the height of 1m are yet to be condition assessed. These have been scheduled to be assessed in FY2022.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Figure 26 highlights the condition profile for walls with height of 1m and less based on periodic Level 1 inspections and estimated condition based on age. A total of 85% of retaining walls with height of 1m and less are in fair to very good condition.

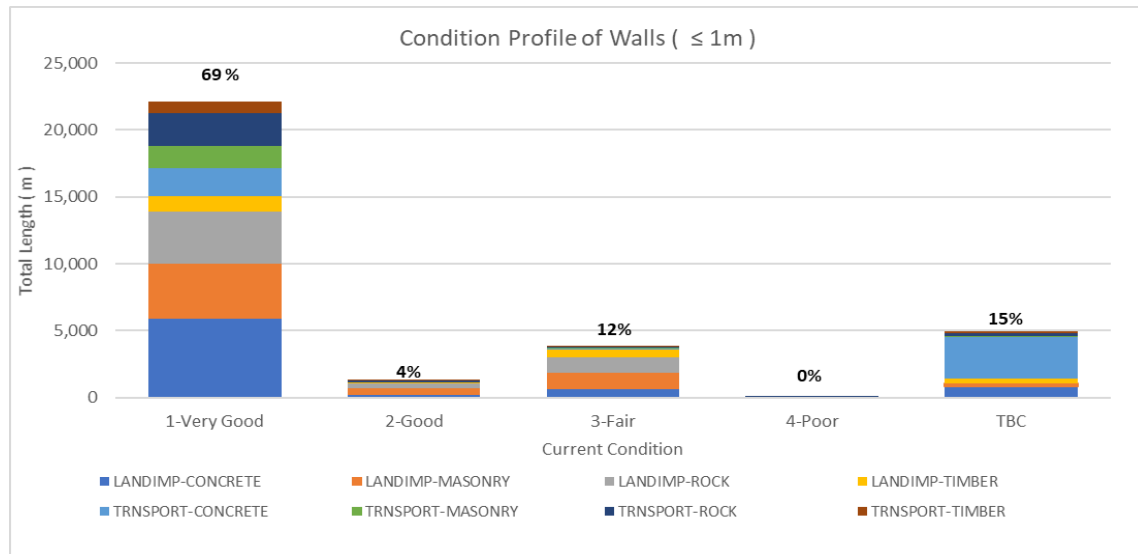


Figure 26 - Condition profile for Retaining Walls (Wall Height ≤ 1m)

Overall, 84% of the portfolio (all retaining wall heights) were assessed as being in fair to very good condition primarily due to a young asset base where 93% of the walls by current replacement value are under the age of 25 years as illustrated by the graph below.

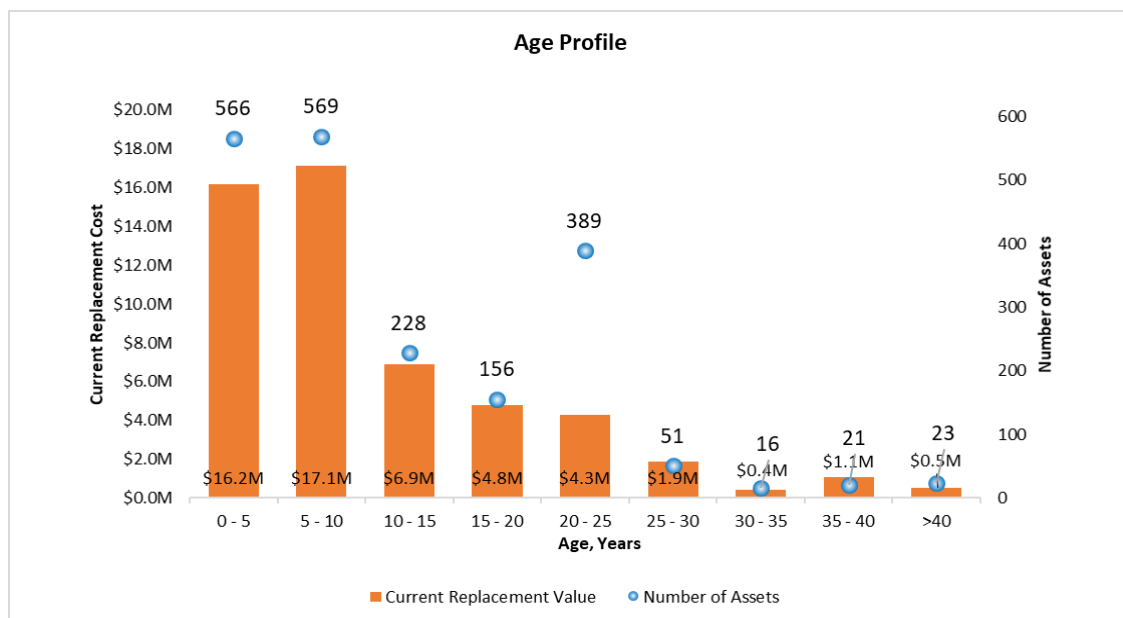


Figure 27 - Age profile for Retaining Walls in Moreton Bay Region

Action Items:

- AI-RW8** Complete Level 2 condition data for remaining walls over 1m in TOMAS
- AI-RW9** Determine options of capturing condition data for wall under 1m with relevant stakeholders along with the ability to leverage current Artificial Intelligence practices for condition assessments of these assets

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

5.2.2 Current Condition Inspection Plan

MBRC undertook two Level 2 condition assessment for retaining walls with height exceeding 1.5 m in both the transport and land improvement category in 2020 and 2021. The assessed walls of this height are generally classed as B and C as prescribed in AS4678 structure inspection guidelines in Appendix F and G on engineered earth retaining structures.

5.2.3 Recommended Condition Inspection Plan

Development and implementation of a condition inspection plan for retaining wall assets is recommended based on the condition inspection process outlined in Table 5.3. The condition inspection plan will ensure missing condition data is captured for all retaining wall with heights exceeding 1m. The recommended condition assessment plan is to carry out Level 2 inspections for 20% of the retaining walls portfolio every year. This equates to a 5 year rolling program which aligns the recommendations in the TMR Structures Inspection Manual (SIM) as summarised below.

Table 5.3 - Recommended Condition Inspection Plan

Asset Type	Inspection type	Frequency	Resource
Retaining Walls	Level 1 Inspection Visual inspection & defect identification / monitoring.	Annually Level 1 inspection based on internal inspection scheduled triggered from TOMAS and as part of Routine Maintenance on Roads and Park complexes	Internal - Asset Maintenance with inspection specifications to be defined with relevant stakeholders
	Level 2 Inspection Inspection & condition assessment.	TMR structures inspection guidelines in Appendix F indicate where: <ul style="list-style-type: none"> Condition 1-2: 5 yearly Condition 3: 3 yearly Condition 4: 6 monthly MBRC intends to carry out condition assessment on 20% of retaining walls portfolio / annually	External - Managed by AM
	Level 3 Inspection Detailed investigation by specialist civil consultant.	As required (generally triggered by observation of serious faults during a Level 2 Inspection)	External - Managed by AM

Action Items:

AI-RW10	Develop test point & inspection Schedules for Level 1 inspections for all 3, 4 and 5 STAR rated retaining walls across MBRC along with the use of AI technology where practical
AI-RW11	Develop and implement Level 2 condition assessment schedule for all walls exceeding height of 1m rating
AI-RW12	Develop technical guidelines for Level 1 inspections to assist in identification and monitoring of retaining wall defects for MBRC asset maintenance personnel along with building in house technical subject matter expert (structural engineers) for civil structures

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

5.3 Defect Management

5.3.1 Current Defect Management Plan

Defects are used to record issues that do not represent an immediate safety or operational risk to MBRC and are continually monitored through asset inspections.

Defects at MBRC is managed and addressed through a risk-based system where defects are raised with priority status and a risk score along with defect type signifying the type of defect present on the retaining wall. Appendix H gives a brief description of some common defect types present in the retaining wall asset base.

The 3 most common type of retaining wall failures as illustrated in Appendix I are:

- **Sliding** - where the retaining wall slides forward away from backfill on its base or sliding occurs within the wall structure itself
- **Settlement** - where the retaining wall foundation has moved vertically up or down from its original base position
- **Overturning** - where the retaining wall has rotated and pitched forwards about its base

Some contributing reasons for these failures are as listed below:

- Overloading of the retaining wall structure
- Design issues (Non-Compliant to AS4678)
- Movement of Soil and Load
- Footing Issue
- Poor Drainage system (increased hydrostatic load)
- Lack of proper reinforcement of retaining wall
- Vegetative control issues

The Consequence of Failure (COF) if Retaining Walls fail include:

- Death or injury to personnel
- Damage to property
- Disruption of transport operations - closure of road infrastructure
- Environmental damage - bioretention basins, waterways, land erosion

A recent analysis of defect types which can be a result of underlying structural issues is presented in Table 5.3 below.

Table 5.3 - Current Defect Types Summary in TOMAS

Type of Defect	Description of Defect Type	Count of Defect	% Of Total
Vegetation	Vegetation overgrowth including tree growth behind walls	64	26%
Minor Cosmetic issue	Minor issues relating to visual and structural defects	41	17%
Voids	Voids or spaces behind wall	40	16%
Cracks	Cracks on wall elements	21	8%
Physical Changes	Physical changes of wall structure such as leaning, overturning or settling	19	8%
Erosion	Erosion of material around the wall structure	13	5%
Lateral Deformation/ Bulging	Bulging of wall	13	5%

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Type of Defect	Description of Defect Type	Count of Defect	% Of Total
Ruptures	Ruptured elements in the wall structure	11	4%
Deteriorating Structure	Gradual breakdown of components of wall structure	9	4%
Exposed Reinforcement	Exposed reinforcement of the wall element	5	2%
Other	Any issues not classed elsewhere	4	2%
Spall	Breaking or chipping of pieces of construction material	3	1%
Minor issue, no impact on functionality	Any minor issues not classed elsewhere	2	0.5%
Settlement	Settlement of the wall structurally	1	0.5%
Fixture missing	Missing components of the wall mainly front elements	1	0.5%
Structure missing	Missing Wall	1	0.5%
Defect Total		248	100%

Figure 28 below illustrates common retaining wall defects from recent level 2 inspections.



Figure 28 - Examples of retaining wall defects including (from left to right) vegetation damage on Albany Forest Drive crib wall, cracking of wall front, and erosion of sprayed concrete wall both on Old Northern Road.

5.3.2 Recommended Defect Management Plan

Currently, defects are typically packaged up and repaired by contractors on a needs / priority basis. However, a defect rectification program will need to be developed that will allow rectification of defects to be programmed and planned based on STAR rating, risk scores and priority rating where identified in TOMAS.

Action Items:

- | | |
|----------------|---|
| AI-RW13 | Develop a defect management plan documenting the risk-based approach and business processes for managing defects for all retaining wall assets |
| AI-RW14 | Review & amend existing defect codes, risk score, priority ratings, response timelines and work types with stakeholders for retaining wall assets to ensure it aligns with the defect management plan |

5.4 Risk Management Plan

Risks for MBRC assets are assessed using Council's Enterprise Risk Management (ERM) framework to identify and evaluate the risk. This includes assessment of the likelihood and consequence of the risk and process to eliminate or mitigate the risk. Table 5.4 summarises typical failure modes and impacts for critical retaining wall assets.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Table 5.4 - Retaining Wall Critical Elements

Critical Elements	Failure Mode	Impact
Retaining wall Face components <ul style="list-style-type: none"> • Blocks • Stone • Concrete • Steel • Timber 	<ul style="list-style-type: none"> • Tilting, rotation or bulging of wall • Back-of-wall drainage system failure • Cracks • Lateral deformation of face • Raptures • Spalling • Failure of reinforcing elements • Global stability failure 	<ul style="list-style-type: none"> • Potential closure of transport corridor • Damage to residential property • Environmental damage if earth retaining structure was part of a water body
Supporting components such as posts, columns geo-synthetic anchor strips and drainage system	<ul style="list-style-type: none"> • Structural/Physical failure 	<ul style="list-style-type: none"> • Potential integrity issue of the overall wall structure
Foundation of wall	<ul style="list-style-type: none"> • Settlement or rotation • Erosion / voids, loss of fill 	<ul style="list-style-type: none"> • Potential to cause overturning, sliding, bearing and global stability failure of walls

Key risks are summarised in Table 5.5 and these will be considered as part of an ongoing risk management process.

Table 5.5 - Retaining Wall Risk Management Plan

Risk Category and Type	Causation	Consequences	Existing Control Measures	Likelihood/Consequence	Residual Risk Rating
Operational - Health & Safety	Lack of WHS Training	Risks associated with internally maintaining walls with heights exceeding 2m.	WHS training for internal asset maintenance staff to mitigate potential risks. Most of specialised retaining wall maintenance is contracted externally by Council	Possible/Major	Low
Operational - Health & Safety	Poorly designed and deteriorated retaining walls resulting in public safety risks	Structural failure of walls in open spaces and road corridors increase in risk as heights of wall increases	As - Cons are designed, constructed and approved by appropriate engineering statutory bodies and comply with all established standards and design protocols	Unlikely / Major	Low
Operational Service delivery	Retaining wall assets deterioration due to age or lack of maintenance.	Retaining wall becomes unfit for purpose leading to reduced levels of service	Reactive maintenance, condition assessments and inspections, renewal planning, AMP.	Possible	Low

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Retaining Wall Portfolio Asset Management Plan

Risk Category and Type	Causation	Consequences	Existing Control Measures	Likelihood/Consequence	Residual Risk Rating
Operational Service delivery	Lack of internal expertise on retaining wall structures	Retaining wall maintenance and inspection strategies not optimised leading to reduced levels of service and reduced useful lives	Critical inspections and maintenance is outsourced to specialist third party providers	Possible / Moderate	Low
Strategic	Inadequate financial allocation for Retaining wall portfolio management	Deteriorating asset base due to reduced funding in maintaining upkeep and functionality	Annual Budget reviews for intended service level and available funding.	Possible / Moderate	Low
Strategic - Service Delivery Internal - Lack of Information	Lack of information in corporate system	Compromised decision-making and inability, to provide optimal services and asset operation.	Established condition assessments program and associated asset register data periodic review plus updates to accurately reflect retaining wall condition and attribute data used in modelling for renewals, maintenance and replacements.	Possible	Low
Strategic/Operational	Lack of resourcing for operational and maintenance of retaining wall activates	Compromised functionality of retaining wall assets	Approved schedules (maintenance and inspections) are strictly adhered to and completed on agreed timelines	Possible/ Low	Low
Strategic/Operational - Service Delivery	Asset deterioration due to lack of renewals/ replacement	Compromised functionality of retaining wall assets	Continuous review of approved renewals / replacement program of critical assets.	Possible/ Moderate	Low
Strategic/Operational - Service Delivery	Failure of retaining walls owned by MBRC but not on asset register	Negative media attention and council reputation loss	Proactive surveys conducted by Asset Management's survey team to identify non-captured retaining walls in the region	Possible/ Moderate	Low
Strategic - Political / Reputation	Full or Partial closure of road corridor due to failed retaining wall	Negative media attention and council reputation loss	Proactive condition assessment conducted on 86% of high risk engineered walls and poor condition walls earmarked of renewals and replacements	Possible/ Low	Low

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Risk Category and Type	Causation	Consequences	Existing Control Measures	Likelihood/Consequence	Residual Risk Rating
Environmental	Climate Change	Anomalous weather events such as flooding and causing frequent retaining wall failures by way of erosion	continuous improving design are prioritised vs like for like replacement ensuring new material, designs and asset resilience is maintained for long life assets like retaining walls	Possible/Moderate	Low

Action Items:

AI-RW15 Implement a risk matrix for retaining walls based on Road (Local, Arterial, State) and Open space (Local, Regional, District etc) to assist decision making in all aspects of asset lifecycle
--

5.5 Maintenance Plan

Maintenance is performed under two categories for retaining wall assets;

- **Planned Maintenance** - Maintenance that is planned to occur based on asset type and priority with the purpose of maintaining ongoing serviceability and extending service life. Planned maintenance involves both routine maintenance activities that are performed on regular schedules and programmed maintenance activities including the actioning of defects in a cost-effective and efficient manner.
- **Reactive Maintenance** - Maintenance carried out to restore partial asset failures and is typically in response to customer service requests (CSR's).

5.5.1 Current Maintenance Plan

Currently MBRC performs 100% reactive maintenance on retaining walls where defects have been identified through ad-hoc inspections on road reserve structures and park complexes along with issues raised through CSR's by the community.

Critical maintenance work is generally outsourced to specialist external contractors to remediate while minor cosmetic and structural defects are attended to by MBRC maintenance personnel.

A current budget of \$100K has been assigned to the retaining walls portfolio.

5.5.2 Recommended Maintenance Plan

Development of a maintenance plan for retaining wall assets is recommended to address existing deficiencies and provide a mechanism for an optimised maintenance approach. The maintenance plan will incorporate the recommended maintenance activities outlined in Table 5.6 and document the following key requirements for maintenance of retaining wall assets;

- Routine maintenance activities required for all retaining wall asset types including scheduled frequencies based on asset priority and approved risk matrix
- Programmed maintenance activities required for retaining wall assets including defect management procedures outlining;
 - Defect intervention levels and process for identifying and bundling defects into programmed maintenance packages based upon risk
 - Process for escalating defects that can't be actioned through programmed maintenance for delivery through capital works programs.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

- Roles and responsibilities for all maintenance activities performed for retaining wall assets

The current maintenance budget will need to be reviewed upon completion of a maintenance plan to achieve the “recommended” items as included in Table 5.6.

Table 5.6 summarises the recommended maintenance activities dependent on wall design and complexity with cost breakdown in Appendix I.

Table 5.6 - Recommended Maintenance Activities for Retaining Walls

Asset Type	Activities	Type	Frequency	Cost Allocation
Retaining Walls	Void / Fill / Erosion remediation	Planned (Programmed)	Triggered by level 2 or level 3 inspection / Yearly	Priority use of existing budget, when triggered
	Crack / Spalled concrete remediation	Planned (Programmed)	Triggered by level 2 or level 3 inspection / Yearly	Priority use of existing budget, when triggered
	Exposed reinforcement repairs	Planned (Programmed)	Triggered by level 2 or level 3 inspection / Yearly	Priority use of existing budget, when triggered
	Minor Cosmetic Tasks (pressure cleaning, Drainage weep holes clearing, where applicable)	Planned (Routine)	Yearly depending on Star rating and if funding hasn't been used by programmed maintenance	\$21K annually if funding hasn't been used by programmed maintenance
	Minor tasks such as attending to facial elements of Retaining Wall (missing blocks, grout filling)	Planned (Routine)	Yearly depending on Star rating and if funding hasn't been used by programmed maintenance	\$46K annually if funding hasn't been used by programmed maintenance
	Vegetation / Pest Control	Planned (Routine)	Yearly depending on Star rating and if funding hasn't been used by programmed maintenance	\$33K annually if funding hasn't been used by programmed maintenance
	Specialist Remediation or Restoration (Drainage system remediation, Geosynthetic fabric replacement)	Reactive	Triggered by level 2 or level 3 inspection / Ad hoc	Priority use of existing budget, when triggered
Total				\$100K annually

An analysis of defects from the recent condition assessment of 613 walls indicates a repair bill of approximately \$789k as highlighted in Table 5.7.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Retaining Walls Defect Cost (Level 2 Inspection)			
Overall Condition	Count of Overall Condition	Sum of Estimated Repair Cost (\$)	% Estimated Repair Cost
1	126	115,650	15%
2	154	337,900	43%
3	29	335,250	42%
Total	309	788,800	100%

Table 5.7 - Defect costs after level 2 inspection

It is recommended that condition 3 walls with defects are addressed within the next 5 years with condition 2 defects rectification completed in the following 5 years. The current budget of \$100k annually is deemed adequate for this program of works if conducted over the next 10 years.

It is expected that any triggered planned programme maintenance work will take precedence over scheduled routine maintenance.

Given the nature of retaining wall defects, the assets functionality and complexities in planning maintenance, it is proposed that planned maintenance is only carried out for prioritised retaining walls (height > 1m and STAR rating) on the MBRC register. This approach should allow for potentially approximately 60 walls to be maintained annually as calculated in Appendix J once existing defect works identified in Table 5.6 has been completed.

Action Items:

AI-RW16	Generate schedules within TOMAS for recommended maintenance activities based on STAR rating, height of wall and in consultation with Asset Maintenance or nominated department
AI-RW17	Review, update provide training to Asset maintenance or nominated department on maintenance and inspection for retaining walls based on TMR or Industry specifications

5.5.3 Current Resource Plan

Maintenance of retaining wall assets is currently performed by a mixture of internal Council staff and external contractors with roles and responsibilities falling across several Council departments in response to CSR's and identified defects.

Table 5.8 below highlights no resource allocation for planned routine maintenance for retaining walls.

Table 5.8 - Existing Resource Plan

Activity	Transport Category	Land Improvement Category
Planned Maintenance (Routine)	None	None
Planned Maintenance (Programmed)	External - Specialised Contractors	External - Specialised Contractors
Reviewing & Programming Defects	Internal - Asset Maintenance	Internal - Asset Maintenance

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Activity	Transport Category	Land Improvement Category
Reactive Maintenance	Internal - Asset Maintenance (Non-Specialised Tasks Only)	Internal - Asset Maintenance (Non-Specialised Tasks Only)
	External - Specialised Contractors	External - Specialised Contractors
Reviewing Condition & Programming Renewals	Internal - Asset Maintenance Technical Services and Asset Management	Internal - Asset Maintenance Technical Services and Asset Management

5.5.4 Recommended Resource Plan

It is recommended that most of the maintenance activities for retaining wall assets be performed by external contractors due to the need for specialist skills, plant & equipment. There is the option of using current internal staff for non-specialised tasks on a proactive maintenance schedule. The recommended resource plan for maintenance of retaining wall assets is outlined in Table 5.9. It is expected that the proposed planned routine tasks highlighted in Table 5.6 can be adequately managed by the asset maintenance team.

Development and implementation of a process for external contractors to record maintenance activities and inspections electronically using TOMAS is recommended via e-Contractor.

Table 5.9 - Recommended Resource Plan

Activity	Transport Category	Land Improvement Category
Planned Maintenance (Routine)	Internal - Asset Maintenance Teams (Non-Specialised Tasks)	Internal - Asset Maintenance Teams (Non-Specialised Tasks)
Planned Maintenance (Programmed)	External - Specialised Contractors	External - Specialised Contractors
Reviewing & Programming Defects	Internal - Asset Maintenance	Internal - Asset Maintenance
Reactive Maintenance	Internal - Asset Maintenance (Non-Specialised Tasks Only)	Internal - Asset Maintenance (Non-Specialised Tasks Only)
Reviewing Condition & Programming Renewals	Internal - Asset Maintenance Technical Services and Asset Management	Internal - Asset Maintenance Technical Services and Asset Management

Action Items:

AI-RW18	Develop & implement process for external contractors to record all maintenance activities & inspections electronically using TOMAS (e-contractor)
AI-RW19	Identify training needs for Asset Maintenance to ensure proposed planned routine tasks are managed effectively within accepted industry practices

5.6 Renewal Plan

The purpose of developing a renewal plan is to identify assets that need to be replaced to maintain the current level of service and to avoid asset failure due to deterioration.

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

In preparing this asset management plan, a condition-based model was prepared to determine the base annual renewal costs associated with the retaining wall asset portfolio. The model developed for the RWPAMP has a 100-year planning horizon to capture the full lifecycle of all assets. The results reported in this plan cover a 10, 25 or 50-year period as appropriate.

The deterioration curve used in the asset lifecycle model uses a parabolic deterioration scale and is based on the IPWEA asset deterioration profile as illustrated by Figure 29.

For example, assets in condition 1 (very good or 'as-new' condition) are expected to have a remaining useful life of 90-100% of their expected life. Assets in condition 2 (good condition) are expected to have a remaining useful life of 56-90% of their expected life. If a condition 2 asset has a 60-year life, its remaining life is estimated to be between 34 (56% x 60) and 54 (90% x 60) years.

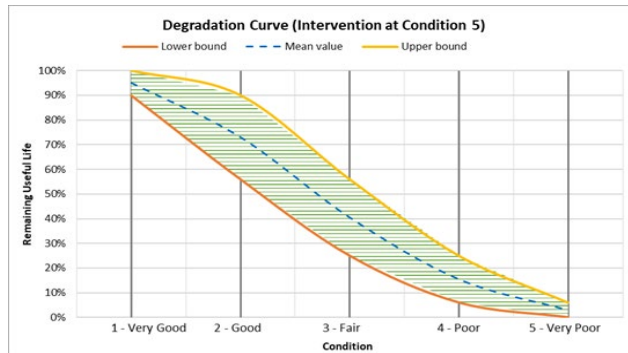


Figure 29 - Asset Deterioration Curve

For lifecycle modelling of MBRC's retaining wall assets the trigger for replacement was when the asset reached condition 5 (very poor condition). This intervention level may be reviewed in future revisions of the asset management plan or, varied across different asset types to reflect the criticality and different levels of service provided by the assets.

An overview of the modelling process is provided by Figure 30 below. The model was used to project the future net value and condition of the asset portfolio for both the current funding level and recommended budget amount. Section 5.6.1 includes a comparison of the model outcomes for both the current and recommended budgets as a means of benchmarking the results and measuring the effectiveness of the recommended increased budgets. Appendix K demonstrate the predicted condition of the assets based on current and recommended renewal funding.

5.6.1 Current Renewal Plan

Currently, retaining walls are renewed on an as-needs basis, determined from their Level 1 and 2 inspections as well as valid CSR's logged in the system. A parent ePID program has been setup in 2019 to fund renewals for the retaining walls portfolio with the following allocations:

- FY2021 - FY2025: \$400K / annum
- FY2025 - FY2040: \$800K / annum

Asset maintenance technical services identifies prospective retaining walls to renew based on condition data. The current renewal projects for retaining walls assigned to the parent program has only been projected until FY2022.

The charts in Appendix L and Appendix M provide a comparison of the future condition of the asset portfolio by retaining wall construction type with current and recommended funding.

5.6.2 Recommended Renewal Plan

Based on the data and modelling, the portfolio of retaining walls is relatively young and level 2 condition scores highlight a healthy asset base. The modelling has also highlighted that there are no substantial renewals that the recommended funding can't accommodate until FY2055 onwards.

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Retaining Wall Portfolio Asset Management Plan

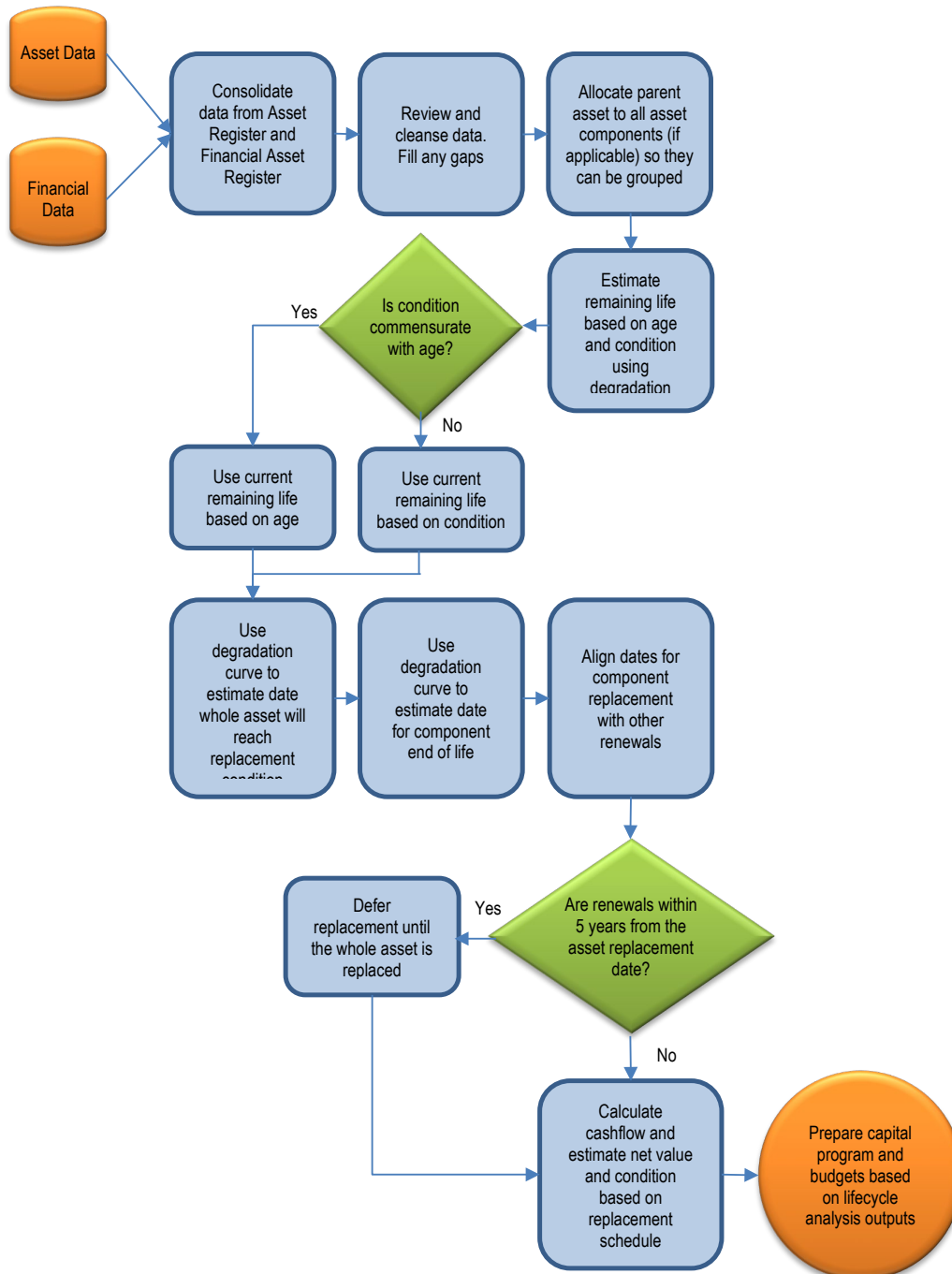


Figure 30 - Flow chart for determining lifecycle capital costs and program

Based on condition data, defect analysis and young age profile of the retaining wall asset base, the recommendation for renewals budget is as follows:

- FY2023 - FY2055: \$250K / annum
- FY2055 - FY2060: \$500K / annum
- FY2060 - FY2070: \$1 M / annum
- FY2070 - FY2080: \$3 M / annum

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)
Retaining Wall Portfolio Asset Management Plan

Detailed review of the renewal budget beyond FY2055 is recommended with analysis of ongoing condition and asset performance data to provide insight for future funding allocations.

Figure 31 summarises the results from the lifecycle modelling and illustrates the estimated level of capital renewal expenditure projected to be required over the next 50 years.

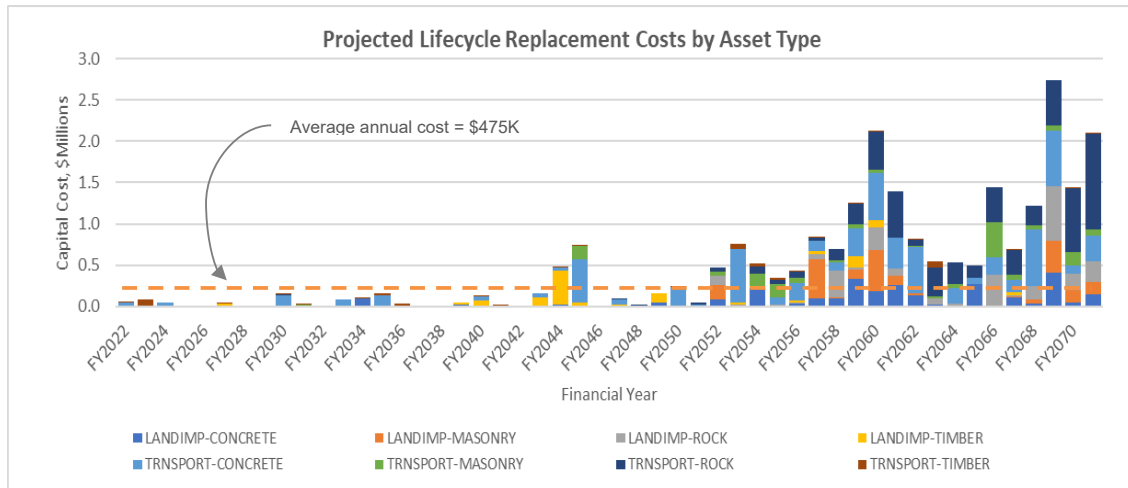


Figure 31 -Projected 50-year lifecycle replacement costs for retaining walls, before cashflow smoothing

Appendix O provides an indicative list of retaining wall asset renewals and replacements, identified through lifecycle modelling using the methodology described in the preceding sections and illustrated above. The renewal plan is based on current condition data and the recommended budget. To achieve a smoothed cashflow, some renewals were deferred or brought forward from their project dates.

The following chart illustrates transport related retaining walls will contribute 62% towards modelled renewal projects with concrete and rock constructed walls being the key driver. Land Improvement walls follow a similar renewal trend with both concrete and rock adding up to 22% of renewals projected for this category.

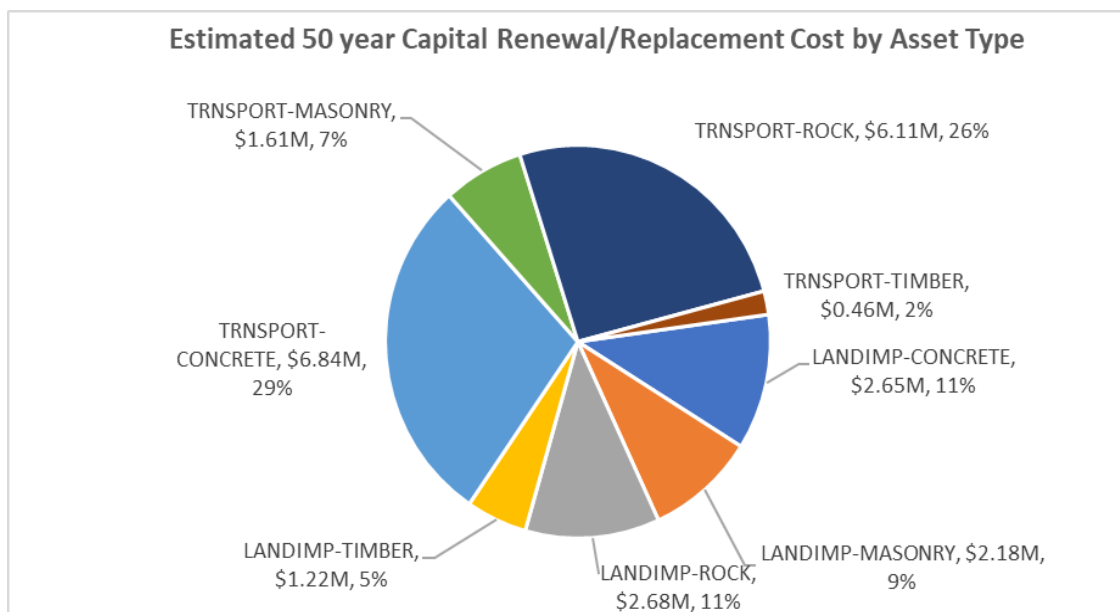


Figure 32 - 50 year estimated capital cost split by asset type

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

The lifecycle model has identified an opportunity to reduce the current capital renewal and replacement budgets and still maintain current level of service provided by MBRC’s retaining wall assets.

As highlighted above, given the healthy condition of the retaining wall asset base and the young age of the portfolio, to reduce the current allocation and continue with the proposed level of funding of \$250K from FY2023 until at least FY2055. This reduction in capital funding for renewals is not expected to result in reduced levels of service or an increase in Council’s liability due to deteriorated assets.

The temporary reduction in the recommended budget amount would need to be regularly reviewed and it is expected that beyond 50 years a substantially higher amount will be required as a large number of retaining walls will start to reach end of life requiring full replacement.

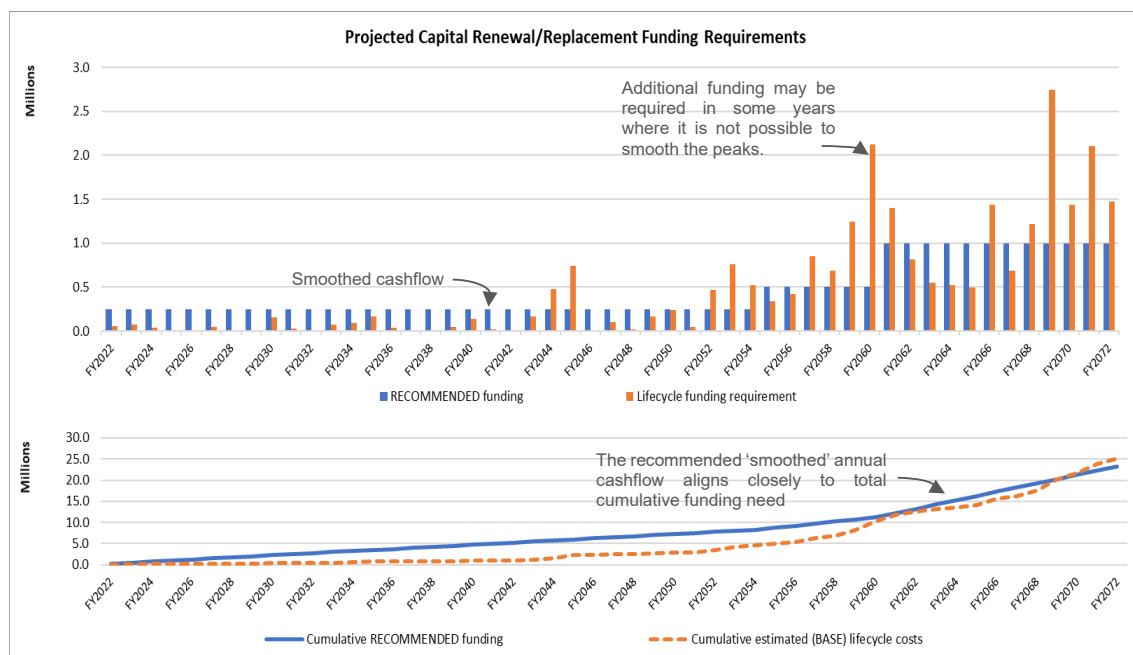


Figure 33 - Capital renewal estimated lifecycle costs and recommended funding

Figure 33 illustrates how the recommended capital budget (blue) is intended to meet the cumulative capital funding needs identified through the lifecycle modelling (orange) to help explain the need to retain the current funding over time. The orange peaks highlight some instances where additional funding may be required due to insufficient smoothed cashflow to address renewals. The lifecycle model outputs, and recommended funding amounts have been used to develop the indicative capital works program.

If the above renewal plan is adopted, it will allow for a more sustainable funding model for retaining wall assets and continued current levels of service well into the near future. The recommended renewal plan funding will allow Council to achieve its strategic asset management objectives including:

- Organisational commitment to effective asset management
- Managing risk appropriately by earlier intervention and renewal strategy
- Delivery of services to agreed standards
- Optimise asset performance
- Minimise asset failure by intervening prior to assets reaching Condition 5

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

As further condition data becomes available, the renewal budget allocation should be updated accordingly based on priority, condition, utilisation, star rating, criticality and remaining useful life of retaining wall assets.

It is also recommended that the use of smart technology be utilised where possible to assist in the capture of asset quality monitoring and condition-based information.

Action Items:

AI-RW20 Create ePID's for the recommended retaining wall renewal programs for budget FY2023 onwards once the RWPAMP is adopted by council
--

6 Systems

The asset management processes within MBRC are supported by a number of corporate information management systems. The corporate systems that support asset management activities are described in detail in Table 6.1 in Appendix B of the SAMP. The systems include:

- Financial management system (Technology One)
- Asset management system (TOMAS/Technology One)
- Performance planning and monitoring system (built on Technology One)
- Corporate electronic document system (ECM/Technology One)
- Geographical Information System (ArcGIS) and Geoportal (corporate spatial system)

MBRC does not use a proprietary retaining wall management system for management of its retaining walls portfolio. Lifecycle modelling carried out for this asset management plan was modelled using Excel.

7 Financial Summary

7.1 Useful Life and Valuation Methodology

When assets are initially recognised, each asset is recorded with an estimated useful life which is used as a basis for determining depreciation. Table 7.1 below outlines the estimated useful life for retaining wall assets and their valuation methodology³.

Table 7.1 - Retaining wall assets Useful Lives

Asset Type	Estimated Useful Life	Valuation Methodology
Retaining Wall - Block	60 years	Fair Value methodology is used for all Transport related walls. Last valued FY2017/18. Land Improvement walls are based on initial purchase cost and doesn't get revalued.
Retaining Wall - Concrete	60 years	
Retaining Wall - Crib	60 years	
Retaining Wall - Masonry	60 years	
Retaining Wall - Rock	60 years	
Retaining Wall - Sandstone	60 years	
Retaining Wall - Timber	40 years	

³ Refer also to MBRC's Non-current Asset Accounting Policy

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

It is worth noting that while financial useful life is used for financial valuations, the retaining wall asset lifecycle modelling has used useful life averaged between financial and industry nominated useful lives for retaining wall structures.

7.2 Financial Statements and Ratios

7.2.1 Valuations & Depreciation

The financial asset register shows the current replacement value for retaining wall assets as \$50,192,341. However, there are several assets with missing replacement values and often these are non-financial assets as they are below the financial recognition threshold.

For the purposes of this asset management plan and for estimating the ongoing lifecycle costs for the full portfolio, an estimate was made of the replacement values for all MBRC owned assets. The assets were valued using the average replacement cost unit rates which were determined using MBRC’s civil construction cost estimator spreadsheet.

The estimated total replacement value for the full retaining walls asset portfolio is estimated to be \$53,193,722. Rock and concrete constructed wall collectively make up around 80% (\$42M) of the portfolios total replacement value as shown in Figure 34.

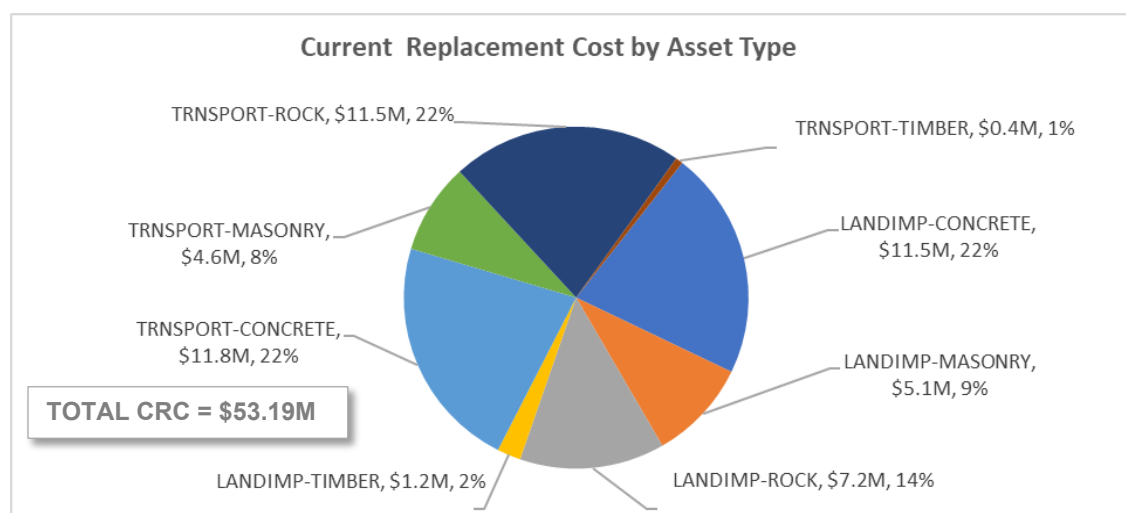


Figure 34 - Current replacement cost by asset type

The projected total replacement value is summarised in Table 7.2 and Table 7.3 and illustrated by Figure 35 below. It assumes that no disposals will take place over that period, all existing assets will be replaced at end of life, and that all scheduled new and improvement projects will be built by their scheduled dates.

Table 7.2 - Projected TRV, net value and depreciation including new acquisitions (\$M) FY2022-FY2033

Description	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
Current Portfolio TRV	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2
Cumulative Value of Extensions/New Assets/Upgrades	0.4	0.5	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4
Projected Total TRV	53.6	53.7	53.8	54.0	54.2	54.4	54.6	54.8	55.0	55.2	55.4	55.6
Projected Total Net Value	42.6	42.0	41.3	40.6	40.1	39.5	38.9	38.4	37.8	37.2	36.7	36.1
Projected Annual Depreciation	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)
Retaining Wall Portfolio Asset Management Plan

Table 7.3 - Projected TRV, net value and depreciation including new acquisitions (\$M) FY2034-FY2045

Description	FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043	FY2044	FY2045
Current Portfolio TRV	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2	53.2
Cumulative Value of Extensions/New Assets/Upgrades	2.6	2.8	3.0	3.2	3.4	3.6	3.6	3.6	3.6	3.6	3.6	3.6
Projected Total TRV	55.8	56.0	56.2	56.4	56.6	56.8	56.8	56.8	56.8	56.8	56.8	56.8
Projected Total Net Value	35.6	35.0	34.3	33.7	33.2	32.6	32.0	31.2	30.5	29.8	29.1	28.3
Projected Annual Depreciation	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9

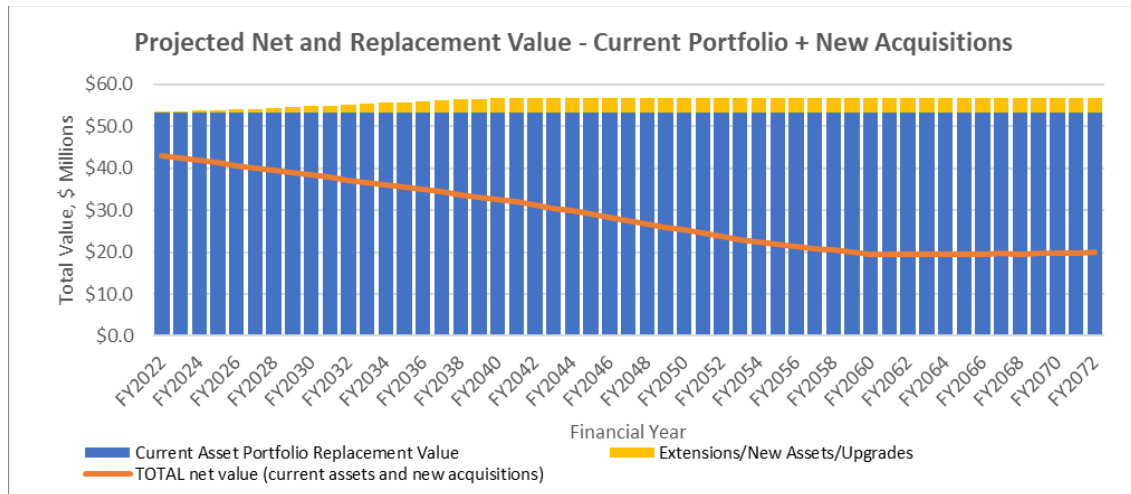


Figure 35 - Projected replacement and net value for current portfolio and new acquisitions

As part of the lifecycle modelling, a projection was made of the future net value of the retaining wall portfolio based on the current budget and recommended funding levels. The projected net value for both funding scenarios is illustrated by Figure 36.

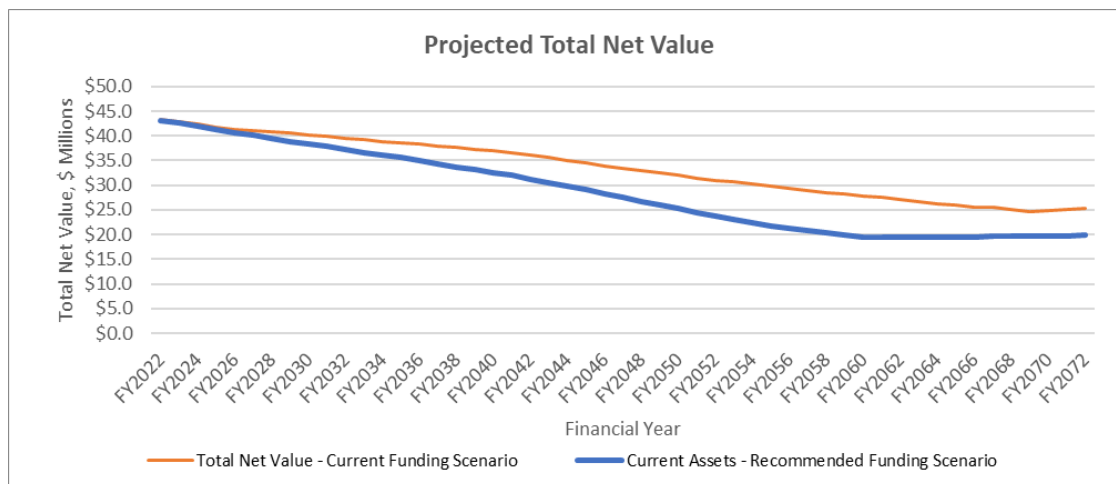


Figure 36 - Projected net asset value based on current and recommended funding scenarios

The projected net values demonstrate that while the current renewal funding is adequate, the recommended budget is expected to provide a similar long-term sustainable outcome at a

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Retaining Wall Portfolio Asset Management Plan

reduced funding level. This represents a cost saving of approximately \$11.5 million over the next 25 years. The sustainability indicators in Section 7.2.2 provide further comparison of the outcomes from the two funding scenarios.

Action Items:

AI-RW21	Review and reconcile the operational and financial registers for retaining wall assets
AI-RW22	Compare data in the financial asset register against the revised useful and remaining lives and update as appropriate. Reassess the replacement cost, net value and annual depreciation expense if changes are made to any useful lives.

7.2.2 Financial Sustainability Ratios

The Asset Sustainability Ratio (ASR) demonstrates the extent to which the infrastructure assets managed by Council are being replaced as they reach the end of their useful lives. This ratio measures how much capital expenditure goes toward replacing existing assets each year relative to depreciation expense. The typical target range is approximately 90% to 110%. Being a high growth Council, Council’s target range is approximately 75% which allows for balancing capital expenditure on existing assets with building of new infrastructure due to population growth.

Figure 37 shows the ASR for MBRC’s retaining wall asset portfolio. The intent is for capital investment to offset depreciation to maintain the value of the portfolio, and inherently demonstrate maintaining the portfolio itself. While not particularly relevant for new asset portfolios whereby minimal capital expenditure is required early in the life of the asset, it demonstrates that the recommended funding will lead towards achieving long term sustainability.

The life cycle modelling highlighted the low funding requirements to sustain the retaining wall portfolio over the next 35 years due to its young age. The low sustainability index for the recommended funding scenario (blue solid line in Figure 37) is appropriate for a young asset base in good condition that is not expected to require significant capital outlay until well into the future, in this case being from FY2055 and beyond.

The recommended funding projects a rising sustainability index from FY2054 onwards where increased capital injection would be required to sustain high levels of renewals due from FY2055 to FY2080 as illustrated by the 100-year lifecycle modelling in Appendix K.

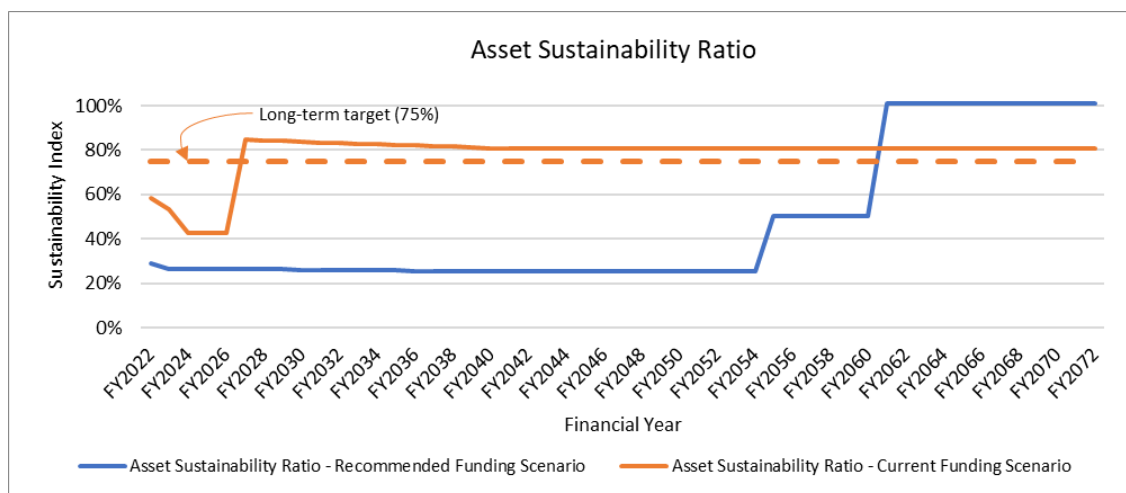


Figure 37 - Projected sustainability ratio based on current and recommended funding scenarios

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Retaining Wall Portfolio Asset Management Plan

The Asset Consumption Ratio (ACR) is the net value of infrastructure assets divided by gross current replacement cost of infrastructure assets. This ratio seeks to highlight the extent of asset consumption. Council’s desired range is between 40% to 80%.

The ACR seeks to demonstrate that the asset portfolio is being maintained within a sustainable and economic range. Figure 38 shows that both the current funding and the recommended funding follow a similar curve in asset portfolio deteriorating to the lower consumption ratio target of 40% over the next 50 years. The key difference is the current funding will achieve this lower bound target at a substantially high capital cost when compared to recommended budget. It is therefore evident that the proposed funding allocations will put Council in a much stronger financial position to maintain the retaining wall asset portfolio as shown by these financial ratios.

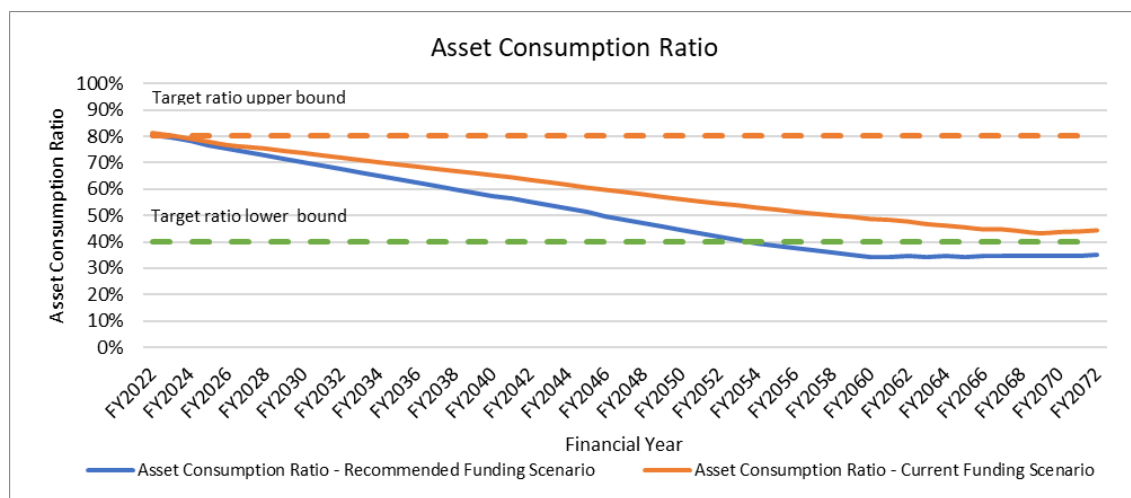


Figure 38 - Projected asset consumption ratio based on current and recommended funding scenarios

7.3 Forecast Costs

The age profile for MBRC’s retaining wall assets indicated that there will be a growing portion of assets reaching their expected useful lives between FY2055 and FY2080. This is primarily due to retaining walls typically being long-life assets with expected service life of 50 to 100 years. This expected renewal projection will be dependent on the overall satisfactory condition of these assets as they approach end of useful service life. Currently around 93% of the asset portfolio is less than 25 years old highlighting a very young and healthy asset base.

Section 5.5 described the justification and need for introducing planned preventative maintenance on top of the existing routine and reactive maintenance activities. Section 5.6 identified the funding that is predicted to be required for renewal or replacement of assets components over the next 50 years.

To sustain the existing retaining wall asset portfolio, and provide the expected community and technical levels of service described in this asset management plan, the recommended budget allocations are outlined below:

- **Retain** the current budget for both planned and reactive maintenance of **\$100K per annum from FY2022 to FY2030**
- **Retain** the current budget for asset new/upgrade of **\$100K per annum to FY2025** with subsequent **increase to \$200K per annum from FY2026 onwards**

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

- **Temporarily reduce** the current \$400K per annum budget for asset renewals/ replacements to **\$250K per annum from FY2023 through to FY2045** with a proposed review of the renewal budget beyond FY2045 subject to ongoing condition assessment
- It is predicted that renewals expenditure will need to increase beyond FY2045 as per below. However, these numbers will be confirmed by future condition assessments
 - FY2045 - FY2055: \$250K / annum
 - FY2055 - FY2060: \$500K / annum
 - FY2060 - FY2070: \$1 M / annum
 - FY2070 - FY2080: \$3 M / annum

For long term financial projection beyond 2045, an increase in funding will be required, to address renewals and replacement for a large portion of retaining walls approaching end of useful life between 2055 and 2080 as illustrated in Appendix K.

The following chart and tables summarise the recommended funding need. The amounts shown for capital renewals and replacements align to the amounts shown in the indicative renewal and replacement capital works plan in Appendix O. The proposed new assets and upgrades are listed in Appendix N.

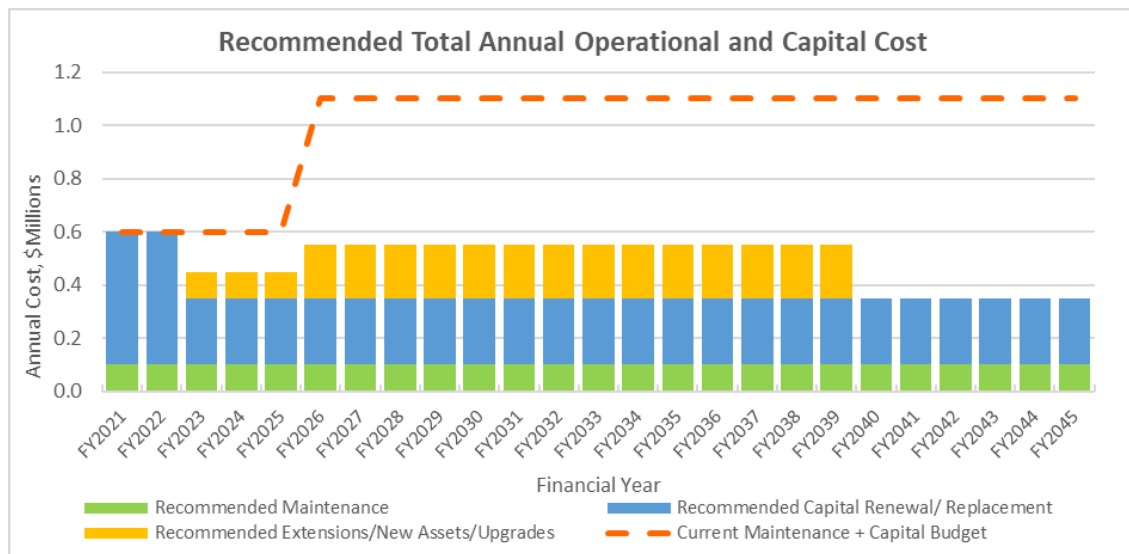


Figure 39 - Recommended total annual operational and capital budget

Table 7.4 Recommended annual operational and capital budgets; FY2022-FY2033

Cost Type	Estimated Annual Cost, \$000's											
	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
Operations and Maintenance	100	100	100	100	100	100	100	100	100	100	100	100
Extensions/New Assets/Upgrades	0	100	100	100	200	200	200	200	200	200	200	200
Capital Renewal/ Replacement	500	250	250	250	250	250	250	250	250	250	250	250
TOTAL Estimated Annual Cost	600	450	450	450	550	550	550	550	550	550	550	550

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Retaining Wall Portfolio Asset Management Plan

Table 7.5 - Recommended annual operational and capital budgets; FY2034-FY2045

Cost Type	Estimated Annual Cost, \$000's											
	FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043	FY2044	FY2045
Operations and Maintenance	100	100	100	100	100	100	100	100	100	100	100	100
Extensions/New Assets/Upgrades	200	200	200	200	200	200	200	200	200	200	200	200
Capital Renewal/Replacement	250	250	250	250	250	250	250	250	250	250	250	250
TOTAL Estimated Annual Cost	550	550	550	550	550	550	550	550	550	550	550	550

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Retaining Wall Portfolio Asset Management Plan

8 Improvement and Monitoring

During the preparation of the RWPAMP the following improvement items have been identified and are set out in Table 8.1 below.

Table 8.1 - RWPAMP Action Items

Action No.	Detail	Responsibility	Due date
AI-RW1	Review retaining wall assets to uniquely identify road reserve and land improvement walls and subsequent asset owner for these classifications. Use spatial and survey methods, where applicable, to improve spatial integrity of retaining wall location	AMT	Q1 22/23
AI-RW2	Update STAR rating for retaining walls on MBRC register identifying its criticality in relation to the road reserve and park complex	AMT	Q1 22/23
AI-RW3	Review componentisation level and relationships that link "parent" and "child" asset components to determine if this is required for retaining wall asset within TOMAS.	AMT	Q1 22/23
AI-RW4	Review retaining wall asset attributes with stakeholders and update the asset management system	AMT	Q4 21/22
AI-RW5	Undertake detailed analysis of current and historical customer service requests relating to retaining walls defects and failures to assist in maintenance planning	AM Engineer	Q3 22/23
AI-RW6	Review reactive and planned % allocations for retaining walls after stakeholder consultations to ensure optimal cost approach for maintenance of retaining walls.	AM Engineer/Asset Maintenance	Q4 21/22
AI-RW7	Research current retaining walls asset performance measurement practices & implement a process for capturing performance data for 4 and 5 STAR rated walls	AM Engineer	Q2 22/23
AI-RW8	Complete Level 2 condition data for remaining walls over 1m in TOMAS	AM Engineer	Q3 21/22
AI-RW9	Determine options of capturing condition data for wall under 1m with relevant stakeholders along with the ability to leverage current Artificial Intelligence practices for condition assessments of these assets	AMT	Q4 21/22
AI-RW10	Develop test point & inspection Schedules for Level 1 inspections for all 3, 4 and 5 STAR rated retaining walls across MBRC along with the use of AI technology where practical	AM Engineer/Asset Maintenance	Q4 21/22
AI-RW11	Develop and implement Level 2 condition assessment schedule for all walls exceeding height of 1m rating	AM Engineer	Q3 21/22
AI-RW12	Develop technical guidelines for Level 1 inspections to assist in identification and monitoring of retaining wall defects for MBRC asset maintenance personnel along with building in house technical subject matter expert (structural engineers) for civil structures.	AM Engineer/Asset Maintenance	Q3 22/23

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Retaining Wall Portfolio Asset Management Plan

Action No.	Detail	Responsibility	Due date
AI-RW13	Develop a defect management plan documenting the risk-based approach and business processes for managing defects for all retaining wall assets	AM Engineer/Asset Maintenance	Q4 21/22
AI-RW14	Review & amend existing defect codes, risk score, priority ratings, response timelines and work types with stakeholders for retaining wall assets to ensure it aligns with the defect management plan	AM Engineer/Asset Maintenance	Q4 21/22
AI-RW15	Implement a risk matrix for retaining walls based on Road (Local, Arterial, State) and Open space (Local, Regional, District etc) to assist decision making all aspects of asset lifecycle	AMT	Q1 22/23
AI-RW16	Generate schedules within TOMAS for recommended maintenance activities based on STAR rating, height of wall and in consultation with Asset Maintenance	AM Engineer/Asset Maintenance	Q4 21/22
AI-RW17	Review, update provide training for Asset Maintenance for retaining walls based on TMR or Industry specifications	AM Engineer/Asset Maintenance	Q1 22/23
AI-RW18	Develop & implement process for external contractors to record all maintenance activities & inspections electronically using TOMAS (e-contractor)	AM Engineer/Asset Maintenance	Q1 22/23
AI-RW19	Identify training needs for Asset Maintenance to ensure proposed planned routine tasks are managed effectively within accepted industry practices	AM Engineer/Asset Maintenance	Q1 22/23
AI-RW20	Create ePID's for the recommended retaining wall renewal programs for budget FY2023 onwards once the RWPAMP is adopted by council	AM Engineer/Asset Maintenance/AMT	Q3 21/22
AI-RW21	Review and reconcile the operational and financial registers for retaining wall assets	AM Engineer/AMT	Q1 22/23
AI-RW22	Compare data in the financial asset register against the revised useful and remaining lives and update as appropriate. Reassess the replacement cost, net value and annual depreciation expense if changes are made to any useful lives.	AMT/ Finance	Q1 22/23

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Retaining Wall Portfolio Asset Management Plan

9 Appendices

Table 9.1 - List of Appendices

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Retaining Wall Portfolio Asset Management Plan

Appendix A - Retaining Wall RACI Matrix Report

by Selected Asset

<u>Asset selection:</u>		<u>Definitions:</u>
Asset Class	Open Space	<ul style="list-style-type: none"> Responsible parties are those who do the work to complete the task. Accountable individuals or groups ultimately must answer for the completion of the deliverable or task. Consulted parties are involved in making the decision or completing the task (e.g., Subject Matter Experts) Informed individuals are kept up to date on progress (e.g., copied on email), often only on completion of the activity or decision
Asset Group/s	Structures	
Asset Type/s	Retaining Walls	

System Requirement	Activity Group	Activity	Sub-activity	Department or Role			
				Responsible	Accountable	Consult	Inform
Governance, Policy and Strategy	Leadership Governance	Provide leadership, direction and commitment to asset management		AMSC	CEO	SLT	CES_CSS&R, IP_ITP, ECM_AMTC, IP_AMGT
		Determine organisational context for services delivered by assets		CES_CSS&R, IP_ITP	CEO	COMM, ECM_AMTC	IP_AMGT
		Develop understanding of the needs and expectations of stakeholders		CES_CSS&R, IP_ITP	C&ES, ECM	COMM	ELCO
		Determine organisation roles, responsibilities and authorities		SLT	CEO	CES_CSS&R, IP_ITP, ECM_AMTC, IP_AMGT	ELCO
		Management reviews		SLT	CEO	CES_CSS&R, IP_ITP, ECM_AMTC, IP_AMGT	ELCO
	Asset Management Policy	AM Policy preparation and revision		IP_AMGT	AMSC	SLT	CES_CSS&R, IP_ITP, ECM_AMTC
		AM Policy endorsement		ELCO	CEO	IP_AMGT, AMSC, SLT	FCS_G&ES
	Strategic planning	Develop MBRC consolidated Strategic Asset Management Plan		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC	AMSC, SLT
		Strategic Asset Management Plan endorsement		ELCO	CEO	IP_AMGT, AMSC, SLT	FCS_G&ES
		Develop service/network strategy and/or master plans		CES_CSS&R, IP_ITP	C&ES, ECM	COMM, PL_SP&P, ECM_AMTC	IP_AMGT, FCS_ACC

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ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

System Requirement	Activity Group	Activity	Sub-activity	Department or Role			
				Responsible	Accountable	Consult	Inform
	Communications and engagement	Promote awareness of asset management policies and documentation		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC	AMSC
		Promote awareness of asset management activities and engage with stakeholders		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC	AMSC
	Change management	Assessment of impact of change and develop change management plan		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC	AMSC, SLT
		Endorsement of proposed changes and change management plan		SLT	C&ES, ECM	IP_AMGT	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC
AM Resource Capacity and Capability	Asset Management Competence	Asset Management competence assessment		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC	AMSC, SLT
		Asset management training		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC	AMSC, SLT
	Resources	Internal resource capability and capacity assessment		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT	AMSC, SLT
		Assess resource gaps and addition requirements		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT	AMSC, SLT
		Outsourcing procurement and management		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT	AMSC, SLT
Asset Management Systems and Data Management	Asset Management System	Develop asset management systems requirements		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC, FCS ICT	AMSC, SLT
		Systems management		FCS ICT	F&CS	IP_AMGT, CES_CSS&R, IP_ITP, ECM_AMTC	AMSC, SLT
		Information standards and requirements documentation		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC	FCS ICT, PL_SP&P

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Retaining Wall Portfolio Asset Management Plan

System Requirement	Activity Group	Activity	Sub-activity	Department or Role				
				Responsible	Accountable	Consult	Inform	
		Data review and cleansing		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_ACC	
	Non-financial asset data capture and maintenance	Spatial Data	ADAC checks	IP_AMGT	ECM_IP	PL_SP&P	PL_SP&P	
			Asset data capture	IP_AMGT	ECM_IP	PL_SP&P	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC	
			Missing asset investigations and data capture	IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_ACC	
		Non-spatial Data	Asset data capture	IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_PM	ECM_AMTC, FCS_ACC	
	Missing asset investigations and data capture		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_ACC		
	Proprietary software management		Software acquisitions		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ICT	AMSC
			Software management		FCS_ICT	F&CS	IP_AMGT	CES_CSS&R, IP_ITP, ECM_AMTC
			Operation of software and management of outputs		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC	AMSC
	Asset Management and Planning	Asset Management Plans	Prepare asset management plans		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC	AMSC
Asset management plan endorsement				ELCON	CEO	IP_AMGT	AMSC	
Levels of Service		Develop customer levels of service		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, ECM_AMTC	FCS_CE	
		Develop technical levels of service		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, ECM_AMTC, PL_SP&P	ECM_PM	
		Develop and review/improve technical design standards		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, ECM_AMTC, PL_SP&P	ECM_PM	
Condition/Defect Monitoring		Level 1 Condition Assessment	Scheduling	ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT	

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Retaining Wall Portfolio Asset Management Plan

System Requirement	Activity Group	Activity	Sub-activity	Department or Role				
				Responsible	Accountable	Consult	Inform	
		Level 2/3 Condition Assessment	Assessment and reporting	ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT	
			Upload condition data to relevant AM systems	ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP, FCS_ICT	IP_AMGT	
			Scheduling	IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP	AMSC	
			Assessment and reporting	EXCON	IP_AMGT	CES_CSS&R, IP_ITP	ECM_AMTC	
			Upload condition data to relevant AM systems	IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, FCS_ICT	ECM_AMTC	
		Defects Identification	Assessment and reporting	ECM_AMTC, EXCON	C&ES, ECM	CES_CSS&R, IP_ITP, IP_AMGT	ECM_AMTC	
			Upload defects data to relevant AM systems	ECM_AMTC, IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, FCS_ICT	ECM_AMTC	
		Lifecycle modelling	Assess asset condition and performance and review useful lives		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_ACC
			Develop models and determine lifecycle costs		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_ACC
			Project asset values and determine financial benchmarks		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_ACC
	Project and assess asset performance and condition under different funding scenarios			IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP	AMSC	
	Undertake industry benchmarking			IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP	AMSC	
	Financial management, data capture and reporting	Financial Register	Asset	Initial financial recognition	FCS_ACC	F&CS	IP_AMGT	CES_CSS&R, IP_ITP
				Maintain financial asset register	FCS_ACC	F&CS	IP_AMGT	IP_AMGT
		Asset Valuations	Revaluation of financial assets	FCS_ACC	F&CS	IP_AMGT	CES_CSS&R, IP_ITP	
			Valuation of non-financial assets	IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP	FCS_ACC	
			Develop and maintain a schedule of asset replacement cost unit rates	FCS_ACC	F&CS	CES_CSS&R, IP_ITP	IP_AMGT	
Budgets/ePIDS		Raise ePIDS		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT	FCS_ACC	

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Retaining Wall Portfolio Asset Management Plan

System Requirement	Activity Group	Activity	Sub-activity	Department or Role			
				Responsible	Accountable	Consult	Inform
	Financial reporting	Annual budget submissions		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT	FCS_ACC
		Financial management of approved budgets		FCS_ACC	F&CS	CES_CSS&R, IP_ITP, ECM_AMTC	IP_AMGT
		Dashboarding and reporting of financial performance		IP_AMGT	C&ES, ECM	FCS_ACC	CES_CSS&R, IP_ITP, ECM_AMTC
Asset creation	New capital works	Design and specifications		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT, PL_SP&P	EXCON
		Procurement and project management		ECM_PM	C&ES, ECM	CES_CSS&R, IP_ITP	CES_CSS&R, IP_ITP, ECM_AMTC
		Delivery, testing and commissioning		EXCON	C&ES, ECM	ECM_PM	CES_CSS&R, IP_ITP, ECM_AMTC, IP_AMGT
	Asset replacement	Design and specifications		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT, PL_SP&P	EXCON
		Procurement and project management		ECM_PM	C&ES, ECM	CES_CSS&R, IP_ITP	CES_CSS&R, IP_ITP, ECM_AMTC
		Delivery, testing and commissioning		EXCON	C&ES, ECM	ECM_PM	CES_CSS&R, IP_ITP, ECM_AMTC, IP_AMGT
	Donated assets	Design and specifications		DEV	DEV	PL_SP&P	IP_AMGT
		Procurement and project management		DEV	DEV	PL_SP&P	IP_AMGT
		Delivery, testing and commissioning		DEV	DEV	PL_SP&P	CES_CSS&R, IP_ITP, ECM_AMTC, IP_AMGT
Asset Operation and Maintenance	Asset Maintenance	Asset/facilities maintenance		ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT
		Develop asset/facilities maintenance plans		ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT
		Work order management		ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT

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Retaining Wall Portfolio Asset Management Plan

System Requirement	Activity Group	Activity	Sub-activity	Department or Role			
				Responsible	Accountable	Consult	Inform
	Operational delivery	Operational planning and management		CES_CSS&R, ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT
		Equipment management		CES_CSS&R, ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT
	Customer requests	Monitoring and response to customer service requests		CES_CSS&R, ECM_AMTC	C&ES, ECM	CES_CSS&R, IP_ITP	IP_AMGT
	Leasing	Procurement and management of leases		CES_PS	C&ES	CES_CSS&R, IP_ITP	IP_AMGT
Risk Management	Risk management	Review, update corporate risk management plan		IP_AMGT	C&ES, ECM	CES_CSS&R, IP_ITP, ECM_AMTC	FCS_G&ES
		Implement risk management recommendations		CES_CSS&R, IP_ITP, ECM_AMTC	C&ES, ECM	IP_AMGT	FCS_G&ES
Asset Performance and Utilisation	Utilisation	Assess asset/facility utilisation		CES_CSS&R, IP_ITP	C&ES, ECM	ECM_AMTC	IP_AMGT
	Capacity	Assess asset/facility capacity		CES_CSS&R, IP_ITP	C&ES, ECM	ECM_AMTC	IP_AMGT
	Dependability	Assess asset/facility availability, reliability, criticality etc.		CES_CSS&R, IP_ITP	C&ES, ECM	ECM_AMTC	IP_AMGT
	Performance	Monitor, analyse and evaluate asset performance		CES_CSS&R, IP_ITP	C&ES, ECM	ECM_AMTC	IP_AMGT
	Non-conformance	Identify nonconformity and undertake corrective action		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT	IP_AMGT
	Optimisation	Assess network/service configuration for optimisation and value management		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT	IP_AMGT
Environment and Sustainability	Environment and Sustainability	Environmental management		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, PL_EP&P, CES_ES	IP_AMGT
		Energy management		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, CES_ES	IP_AMGT
		Sustainability monitoring and assessment		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, CES_ES	IP_AMGT
		Assess impact of climate change and appropriate actions		CES_CSS&R, IP_ITP	C&ES, ECM	IP_AMGT, CES_ES	IP_AMGT
Asset End of Life	Asset Disposals	Disposal planning		CES_CSS&R, IP_ITP	ECM_IP	PL_SP&P	ECM_AMTC, IP_AMGT, FCS_ACC
		Design and specifications		CES_CSS&R, IP_ITP	C&ES, ECM	PL_SP&P	ECM_AMTC

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Retaining Wall Portfolio Asset Management Plan

System Requirement	Activity Group	Activity	Sub-activity	Department or Role			
				Responsible	Accountable	Consult	Inform
		Disposal and site remediation		ECM_PM	C&ES, ECM	ECM_AMTC, PL_SP&P	IP_AMGT, FCS_ACC
		Financial de-recognition		FCS_ACC	F&CS	CES_CSS&R, IP_ITP	IP_AMGT
Review and Audit	Asset Management Review and Audit	Internal audit		INAUDT	CEO	CES_CSS&R, IP_ITP, IP_AMGT, FCS_ACC	CEO, SLT
		External audit		EXAUDT	F&CS	CES_CSS&R, IP_ITP, IP_AMGT, FCS_ACC	CEO, ELCO
		Asset management maturity assessment		EXCON	IP_AMGT	CES_CSS&R, IP_ITP, IP_AMGT, FCS_ACC	AMSC
Innovation and improvement	Innovation	Explore and implement innovation improvements		INNO	ECM	CES_CSS&R, IP_ITP, ECM_AMTC	SLT, ELCO
	Continual improvement	Planning, management and implementation of asset management improvements		IP_AMGT	ECM_IP	CES_CSS&R, IP_ITP, ECM_AMTC, FCS_ACC	AMSC

Department/Role Abbreviation Descriptions:

Abbrev.	Definition
AMSC	AM Steering Committee
C&ES	Community and Environmental Services
CEO	Chief Executive Officer
CES_CSS&R	Community Service, Sport and Recreation
CES_ES	Environmental Services
CES_PS	Property Services
COMM	Community
DEVL	Developers

Abbrev.	Definition
ECM	Engineering, Construction and Maintenance
ECM_AMTC	Asset Maintenance
ECM_IP	Infrastructure Planning
ECM_PM	Project Management
ELCO	Elected Council
EXAUDT	External Audit
EXCON	External contractor/consultant
F&CS	Finance and Corporate Services
FCS_ACC	Accounting Services

Abbrev.	Definition
FCS_CE	Community Engagement
FCS_G&ES	Governance and Executive Services
FCS ICT	Information and Communications Technology
INNO	Innovation Team
IP_AMGT	Asset Management
IP_ITP	Integrated Transport Planning
PL_EP&P	Environmental Planning and Policy
PL_SP&P	Strategic Planning and Placemaking
SLT	Senior Leadership Team

Appendix B - Common Types of Retaining Walls on MBRC register

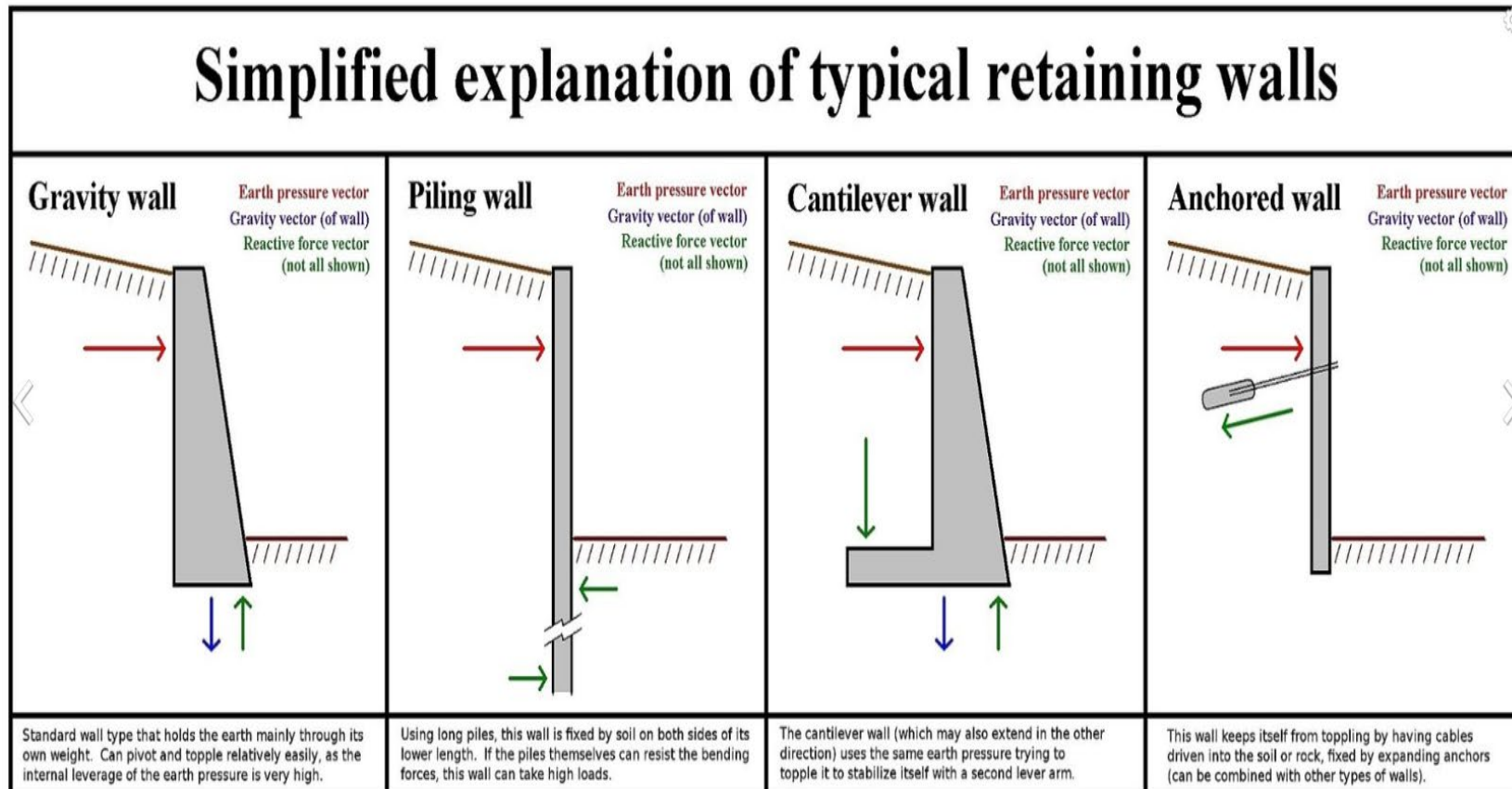


Figure 40 - Construction types of retaining wall

Ref: Wikipedia contributors. (2021, April 28). Retaining wall. In Wikipedia, The Free Encyclopedia. Retrieved 04:12, May 19, 2021, from https://en.wikipedia.org/w/index.php?title=Retaining_wall&oldid=1020311759

Appendix C - Basic Retaining Wall Schematic

Retaining Wall cross section schematic from AS4678 - 2002 standard below illustrates key components of a cantilevered type retaining wall such as location of backfill material types, draining system, wall and foundation construction.

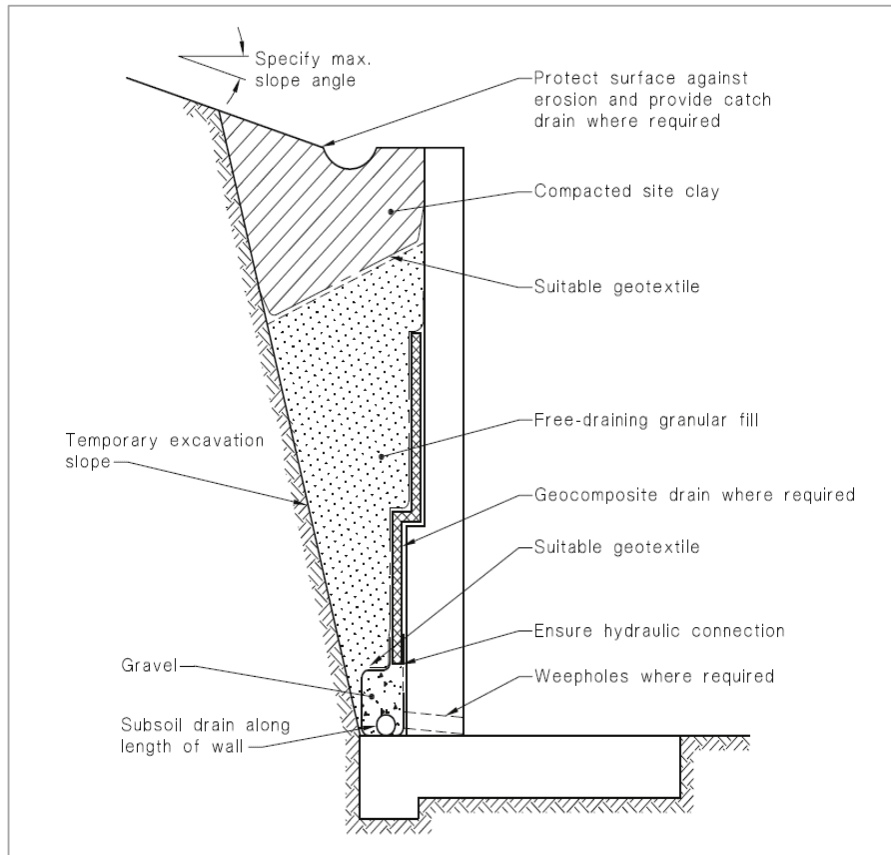


Figure 41 - Cantilevered Retaining Wall Schematic

Ref: Standards Australia. (2002). Earth-retaining structures - AS4678-2002. Australia. Standards Australia: pg85

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Appendix D - Retaining Wall Asset Attributes

Table 9.2 - Asset Attributes

Asset Group	Asset Attributes
<p>Retaining Wall (All Types)</p>	<ul style="list-style-type: none"> • Asset Type Description/Details • Material • Use • Construction • Location (GIS) • Street Address • Install Date • Commission Date • Last Inspected Date • Star Rating (1, 2, 3, 4 or 5) • Observed Condition • Area (m²) • Length (m) • Width (m) • Depth (m) • Owner (MBRC, State or Private)

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Appendix E - Retaining Wall Structure Classification

The following extract highlights the structure classification in AS4678 for retaining walls into A, B and C classes.

Table 9.3 - Extract of retaining wall structure classification from AS4678-2002.

TABLE A1
EXAMPLES OF STRUCTURE CLASSIFICATION

Classification	Description	Examples
A	Low consequence for loss of human life, or small or moderate economic, social or environmental consequences	Where failure would result in minimal damage and loss of access: Walls in areas rarely visited by people Walls on private property supporting gardens, fences, etc.
B	Medium consequence for loss of human life, or considerable economic, social or environmental consequences	Where failure would result in moderate damage and loss of services: Walls not included in classifications A or C Walls supporting or above normal structures Walls supporting minor roads Walls above public spaces Walls with height ≥1.5 m
C	High consequence for loss of human life, or very great economic, social or environmental consequences	Where failure would result in significant damage or risk to life: Walls supporting structures identified for post-disaster recovery Walls supporting or above access or services to structures identified for post-disaster recovery

TABLE A2
GENERAL METHOD FOR STRUCTURE CLASSIFICATION

Public impact (economic, social or environmental)	Risk to life		
	Low	Medium	High
Low	A	B	B
Medium	B	B	C
High	B	C	C

Ref: Standards Australia. (2002). Earth- retaining structures - AS4678-2002. Australia. Standards Australia: pg45

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Appendix F - Condition Monitoring Requirements

The following extract from AS4678 outlines the inspection process for A, B and C class retaining wall structures.

Table 9.4 - AS4678 Extract of Inspection and Monitoring of Retaining Wall Structures

TABLE 7.1
MONITORING LEVELS FOR EARTH-RETAINING STRUCTURES

Structure classification (see Table I.1)	Recommended monitoring level
C	Regular visual inspection and inspections after events such as floods or earthquakes. Monitoring of vertical and horizontal deformations, flows from drainage system, possibly pore pressures, earth pressures and stresses in selected soil-reinforcing elements and anchors. Check on corrosion or degradation of soil reinforcing materials (e.g. exhuming of dummy reinforcing elements embedded in the backfill during construction)
B	Regular visual inspection and inspections after events such as floods or earthquakes. Includes check of effectiveness of the drainage system. Basic monitoring of lateral deformation
A	No monitoring required

NOTES:

- 1 Basic indicators of the performance of earth structures are—
 - (a) lateral deformation; and
 - (b) settlement.
- 2 A visual inspection should detect excessive movement, cracks or ruptures, lack of drainage capacity, physical changes and changes in the environmental conditions.
- 3 Where a wall is evidencing structural distress, to assess the degree of instability and to assist in the selection of remedial measures, the following could also be considered:
 - (a) Seepage flows (including flows from drainage pipes).
 - (b) Pore pressures.
 - (c) Vertical earth pressures.
 - (d) Lateral earth pressures.
 - (e) Vibrations.
 - (f) Stresses in structural components (including reinforcing elements).
 - (g) Rate of corrosion or chemical degradation of reinforcing strips and meshes.
 - (h) Temperature.

Ref: Standards Australia. (2002). Earth- retaining structures - AS4678-2002. Australia. Standards Australia: pg42

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Appendix G - Condition Monitoring Frequency

The following table extracted from DTMR'S Structures Inspection Manual Part 1: Structures Inspection Policy highlights inspection frequency based on condition rating of retaining wall structures.

Structure type	Overall condition state of structure	Inspection frequency (years)
Bridges and culverts ³	1 – 2	5
	3	3
	4	1 ^{1,2}
Ultrasonic testing of steel/aluminium culverts without a structural reinforced concrete invert ⁴	1 – 2	Not required
	3	Every 2 nd Level 2
	4	Every Level 2
Ultrasonic testing of steel trough decks on timber girders ⁴	1 – 2	Not required
	3	Every 3 rd Level 2
	4	Every Level 2
Tunnels	1 – 2	5
	3	3
	4	1 ^{1,2}
Busway bridges, including elevated and underground stations and pedestrian overbridges at busway stations	1 – 2	5
	3	3
	4	1 ^{1,2}
Other bridges over the road network	1 – 2	5
	3	3
	4	1 ^{1,2}
Retaining structures above/below the road network (excludes retaining structures inspected as part of any other structure)	1 – 2 ⁵	5
	3	3
	4	1 ^{1,2}
Underwater components (all components other than steel culverts) permanently submerged	1 – 2 ⁵	8
	3 ⁵	1
	4 ⁵	1 ^{1,2}
Confined spaces inspection (all components representing confined space hazards (for example, interior of box culverts))	1–2 ⁶	8
	3 ⁶	1
	4 ⁶	1 ^{1,2}
Large Traffic Management Signs (LTMS) and gantries	1 – 2	2
	3	1 ¹
	4	1 ^{1,2}

¹ Level 1 and level 2 inspections to be staggered by six months to ensure inspections occur every six months.

² Or at frequency specified by *Structure Maintenance Manual/Structures Management Plan* (whichever is greater).

³ Includes critical 'minor' culverts.

⁴ These conditions only apply where the overall condition state of the structure is attributable to corrosion of the metal barrel / steel trough.

⁵ These conditions only apply where the overall condition state of the structure is attributable to the condition of the underwater components.

⁶ These conditions only apply where the overall condition state of the structure is attributable to the condition of the components requiring confined space inspection.

Source: Department of Transport and Main Roads: Structures Inspection Manual Part 1: Structures Inspection Policy, pg. 18, Table 3.4.2 – Level 2 inspection frequencies

Appendix H - Common Retaining Wall Defect Types

Table 9.5 - Defect Types

Defect Type	Description
Cracking	Cracking of material originating from any cause. Can range from hairline cracks to open cracks.
Displacement	Any gaps that develop between components caused by minor movement of the structure.
Erosion	Erosion of concrete components that produces exposure of aggregate or reinforcement.
Erosion/Decay (Timber)	Erosion or decay of timber caused by timber rot or timber parasites.
Joint Cracking	Physical cracking or settlement in the joint or cracks reflected through the wearing surface as a result of joint movement beneath.
Physical Damage	Any physical damage on the structure caused by vandalism, impacts, or other causes.
Scour	Erosion of soil/earth around the base of the structure caused by flowing water.
Spalling	When flakes or chunks of concrete break off the main structure or member. This is usually caused by internal corrosion of reinforcement, which expands and causes the concrete to spall
Vegetation	Excessive vegetation growth on or behind the retaining wall, preventing access to or affecting performance of the structure by increasing water saturation levels around the structure

Appendix I - Common Retaining Wall Failure Modes

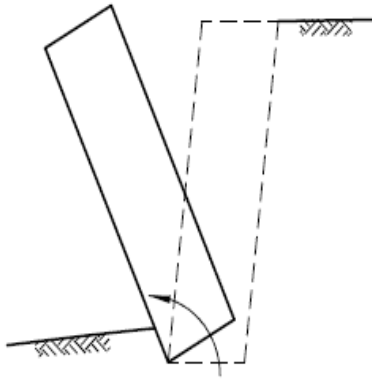


Figure 42 - Rotation or Overturning

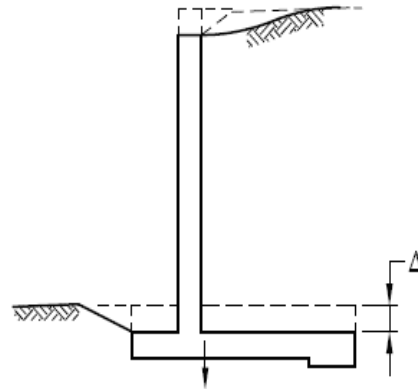


Figure 43 - Settlement (displacement of foundation)

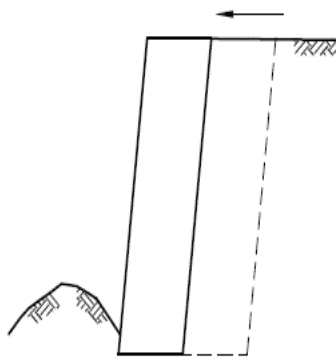


Figure 44 - Sliding of wall base

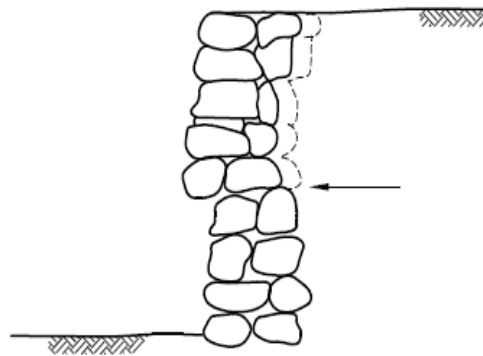


Figure 45 - Sliding within wall section

Ref: Standards Australia. (2002). Earth- retaining structures - AS4678-2002. Australia. Standards Australia: pg20-27

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Retaining Wall Portfolio Asset Management Plan

Appendix J - Routine Maintenance Cost Breakdown

Table 9.6 - Retaining Wall Planned Routine Maintenance Cost

Routine Maintenance Tasks	Task Description	Cost of Tasks	Count of Defects	% Allocation of Defect Type	Allocation Breakdown by Defect Type	Average Cost
Vegetation/Pest Control	1. Tree removal	\$32,821	64	32.82%	\$32,821	\$512.82
	2. Insect nest control 3. Spraying overgrown vegetation					
Minor Cosmetic Tasks	1. Pressure cleaning	\$21,026	41	21.03%	\$21,026	\$328.53
	2. Drainage weep holes clearing, where applicable					
Minor tasks and repairs	1.Repairs to facial elements of Wall (replacing missing blocks, wall caps etc) 2. grout filling 3. backfilling of materials behind walls)	\$46,153	40	20.51%	\$20,513	\$320.51
			21	10.77%	\$10,769	\$168.27
			13	6.67%	\$6,667	\$104.17
			11	5.64%	\$5,641	\$88.14
			5	2.56%	\$2,564	\$40.06
Total			195	100%	\$100,000	

Avg. Cost with Majority Defect Type **\$1,560**
Possible Walls Covered in Routine Maintenance **64**

**Note: Cost of active maintenance on calculated 64 Retaining walls (64 Bridges * \$1.56k = \$100k) depends on level of maintenance required on any one particular wall.*

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)
Retaining Wall Portfolio Asset Management Plan

Appendix K - Retaining Wall Overall Asset Type Replacement / Renewal Graphs

Lifecycle modelling has been conducted at the asset type level to determine the future costs and timing for renewal and replacement of waste assets.

The following graphs illustrate the results of the lifecycle modelling.

This appendix should also be read in conjunction with Appendices L and M that illustrate the impact of current and recommended funding on the condition of the portfolio as derived from the same models. It should also be read in conjunction with Appendix O which lists the assets identified for replacement through the lifecycle model based on their current condition.

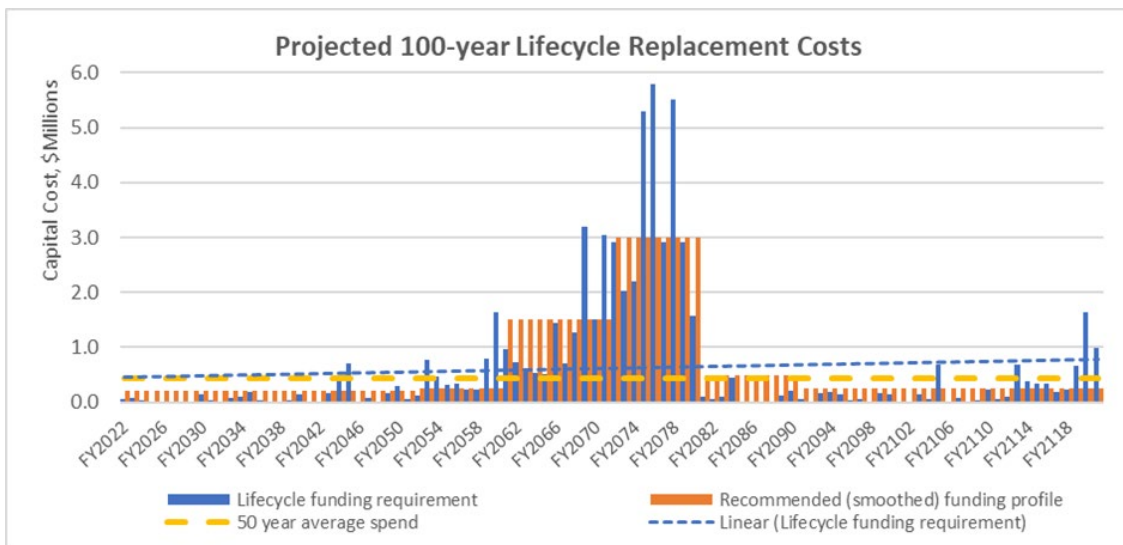


Figure 46 - Projected 100-year lifecycle capital renewal and replacement costs

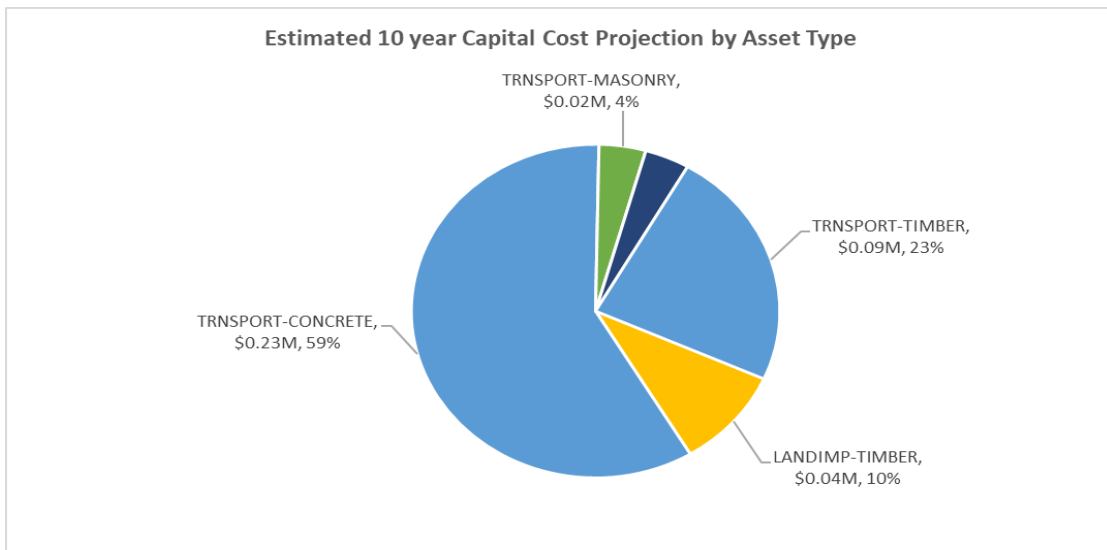


Figure 47 - Estimated total 10-year capital cost by asset type

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Retaining Wall Portfolio Asset Management Plan

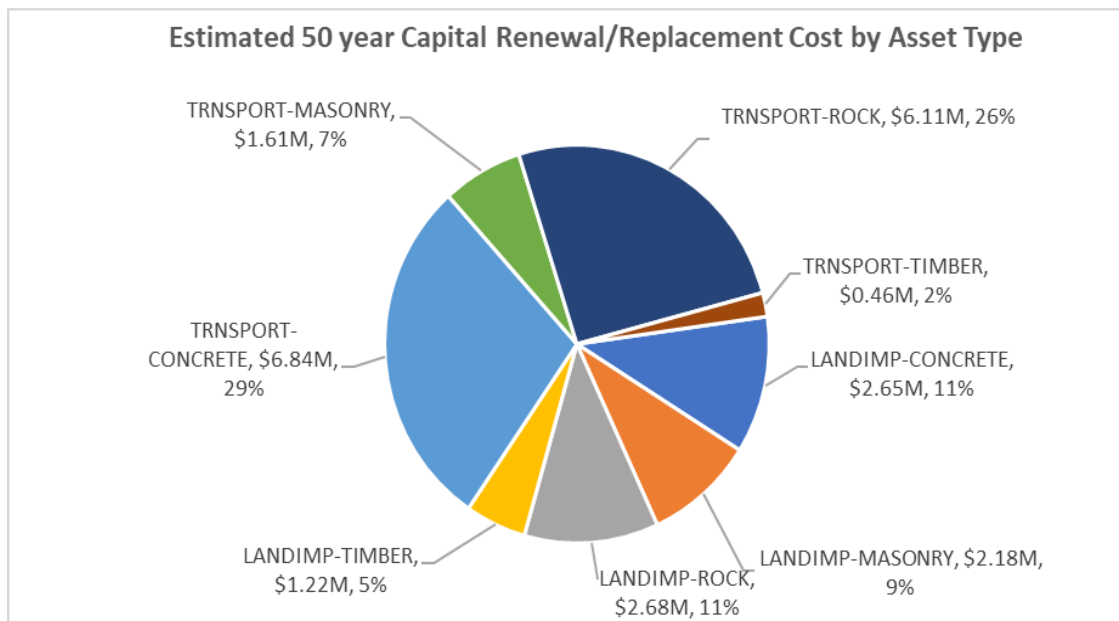


Figure 48- Estimated total 50-year capital cost by asset type

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Retaining Wall Portfolio Asset Management Plan

Appendix L - Retaining Wall Projected Condition - Overall

The projected condition of MBRC’s Retaining Walls has been determined as part of the lifecycle modelling for two different scenarios. The following charts illustrate the projected condition for all assets over a 50-year period. Below condition 4 is considered to be below an acceptable level of service and a trigger for replacement.

All Retaining Wall Assets

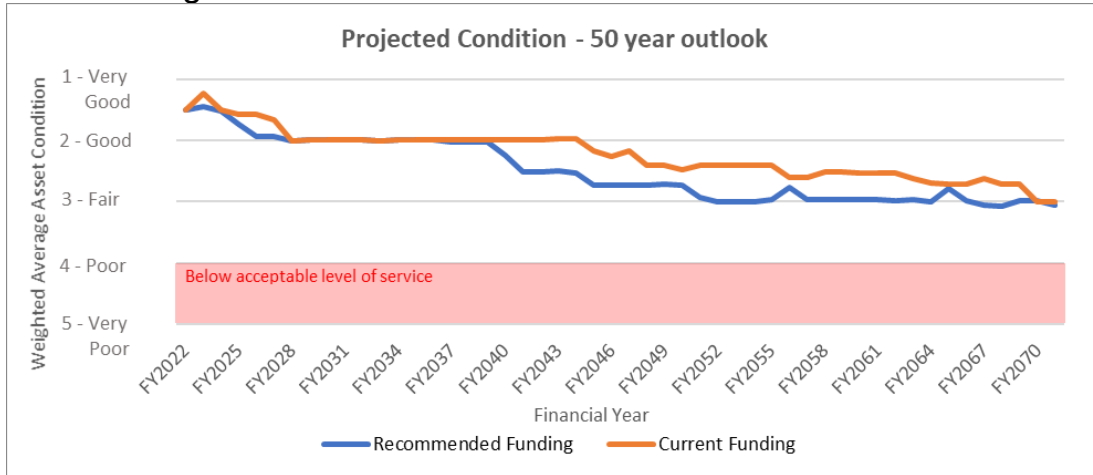
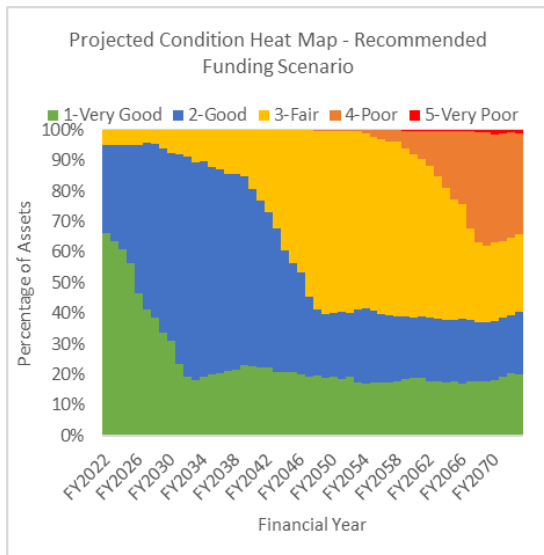


Figure 49 - Projected condition for all asset types

Current Funding:



Recommended Funding:

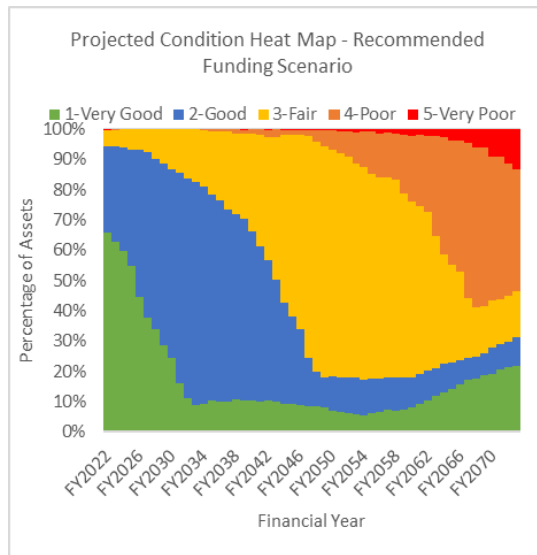


Figure 50 - Condition heat maps for all assets

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)
Retaining Wall Portfolio Asset Management Plan

Appendix M - Retaining Wall Projected Condition by Asset Type

The projected condition of MBRC's Retaining Wall has been determined as part of the lifecycle modelling for two different scenarios. The following charts illustrate the projected condition for each asset type over a 50-year period. Below condition 4 is considered to be an unacceptable level of service.

Transport Retaining Walls

Current Funding:

Recommended Funding:

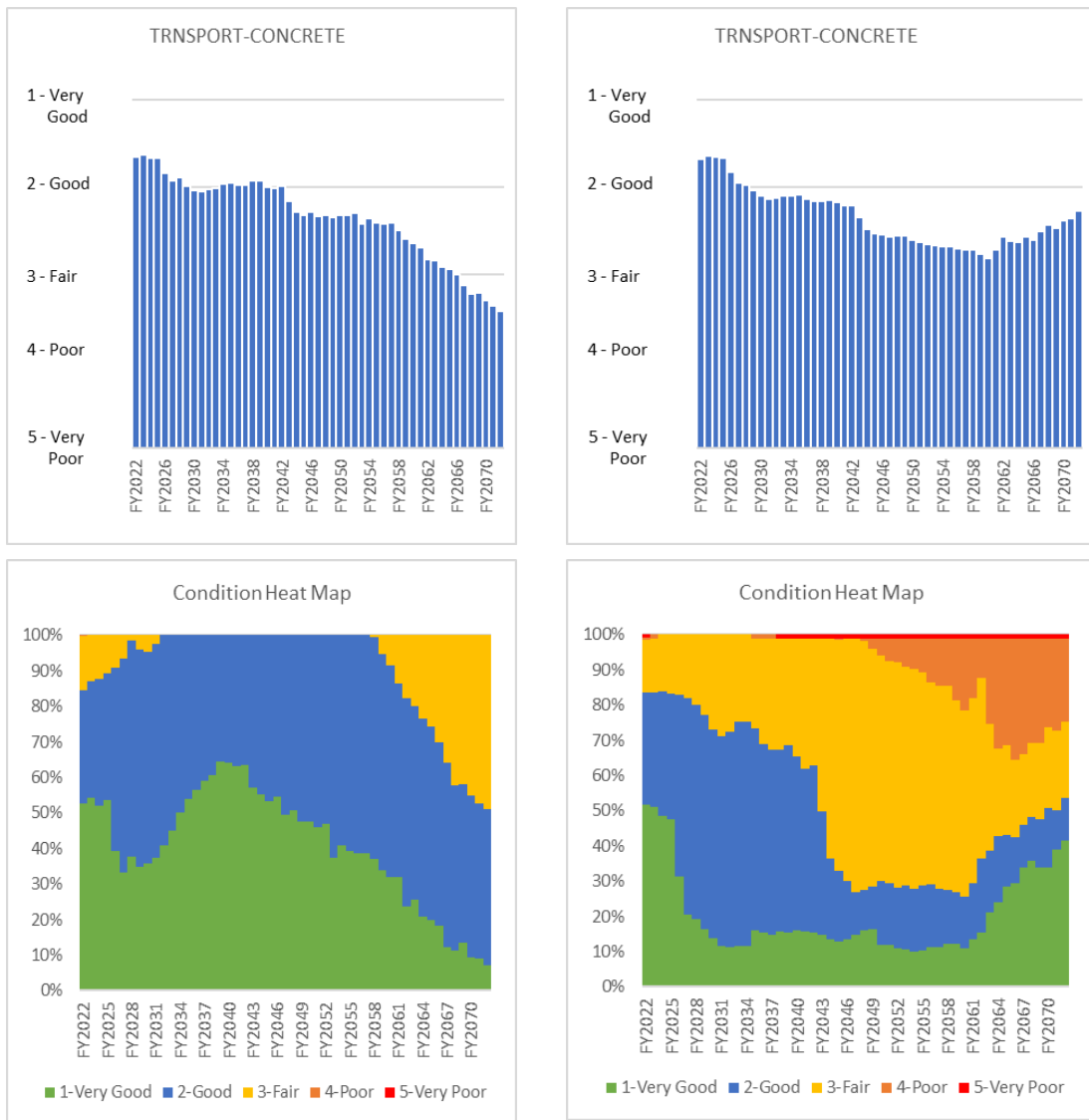
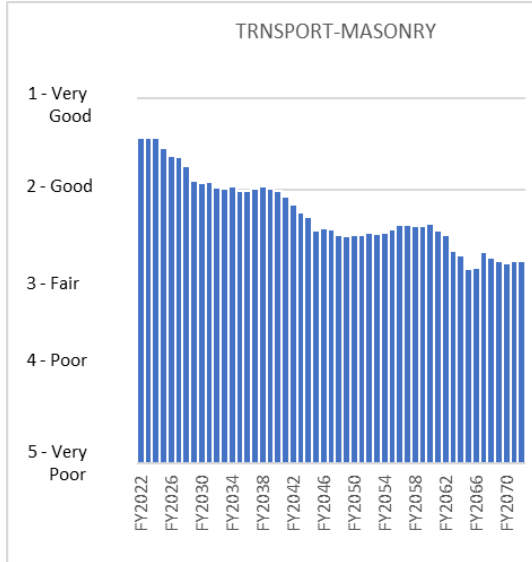


Figure 51 - Condition profiles and heat maps for Transport - Concrete Retaining Walls

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Retaining Wall Portfolio Asset Management Plan

Current Funding:



Recommended Funding:

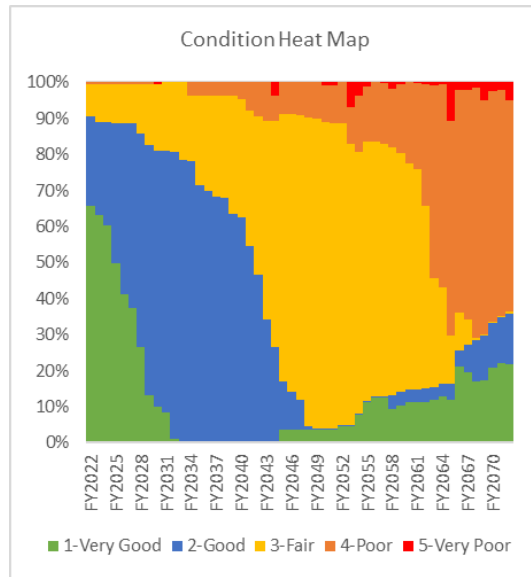
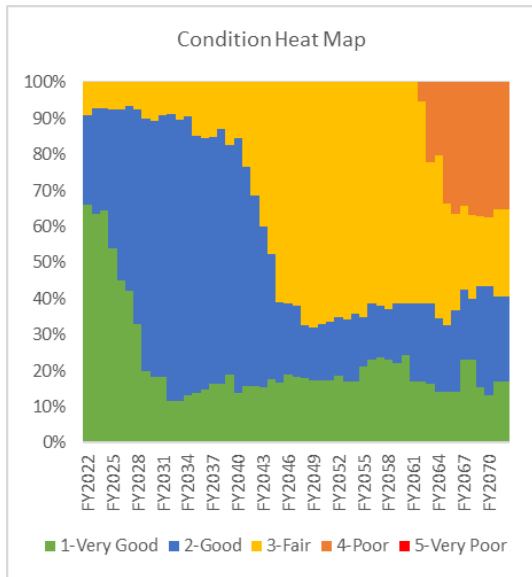
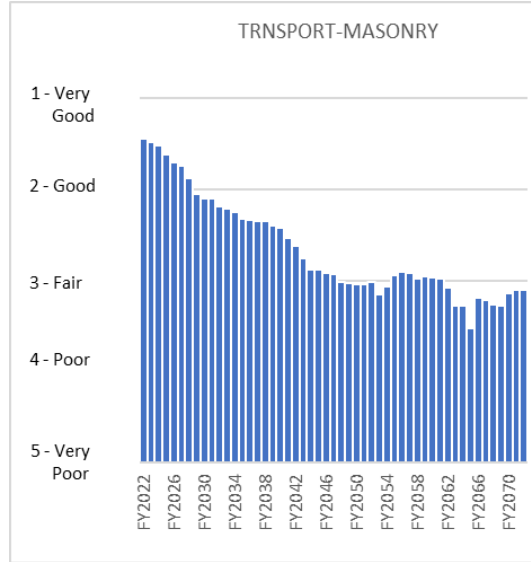
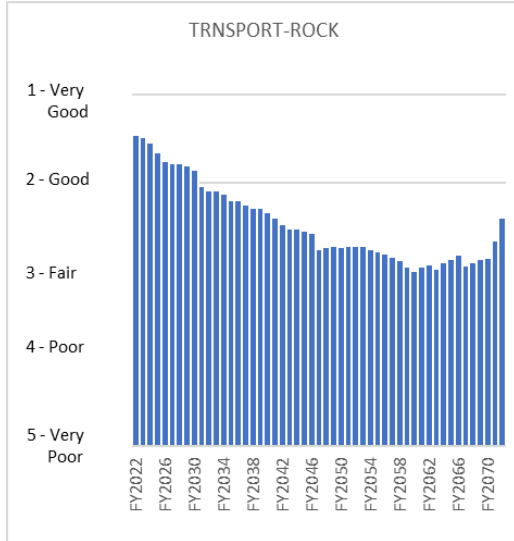


Figure 52 - Condition profiles and heat maps for Transport - Masonry Retaining Walls

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Retaining Wall Portfolio Asset Management Plan

Current Funding:



Recommended Funding:

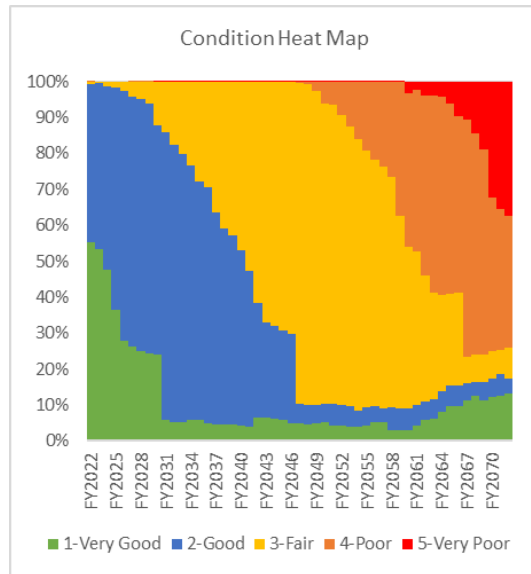
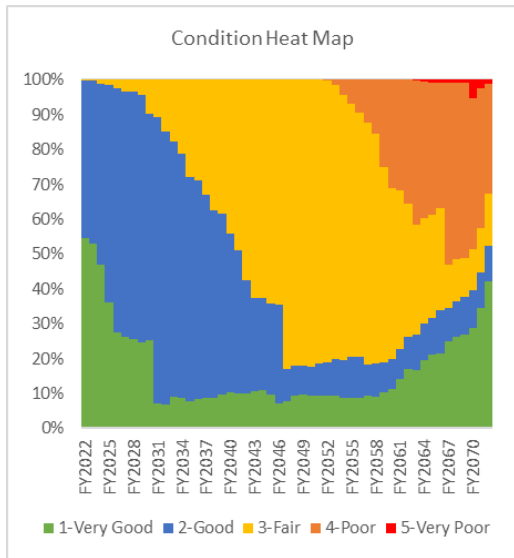
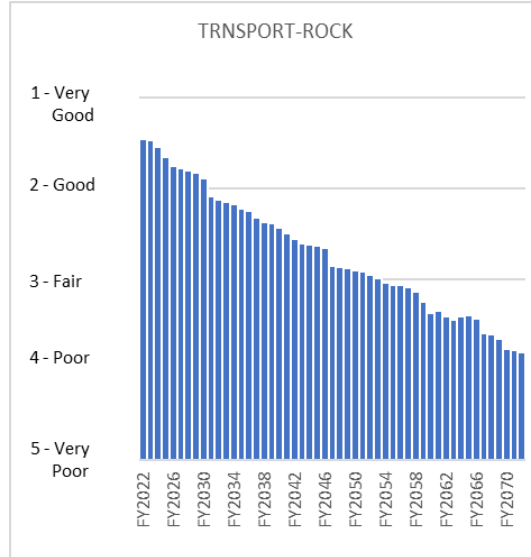
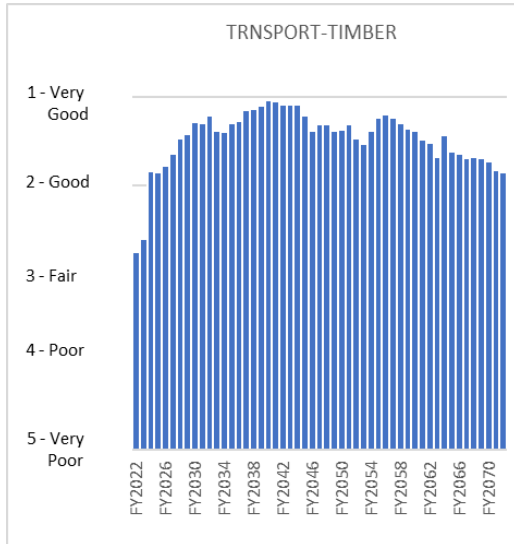


Figure 53 - Condition profiles and heat maps for Transport - Rock Retaining Walls

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)
Retaining Wall Portfolio Asset Management Plan

Current Funding:



Recommended Funding:

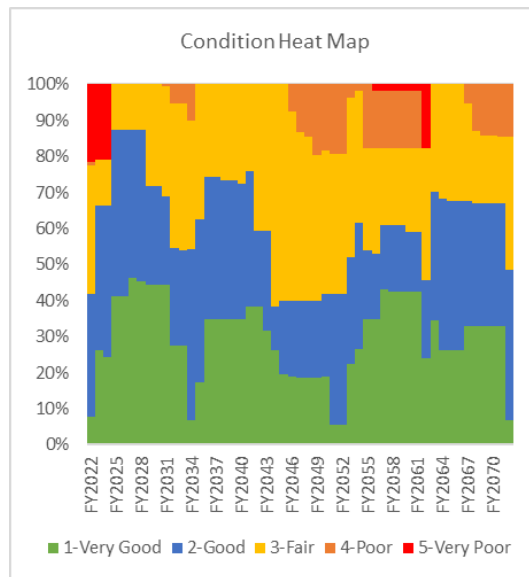
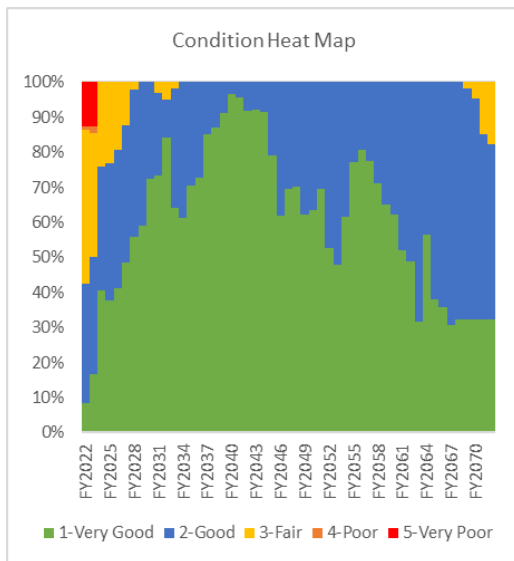
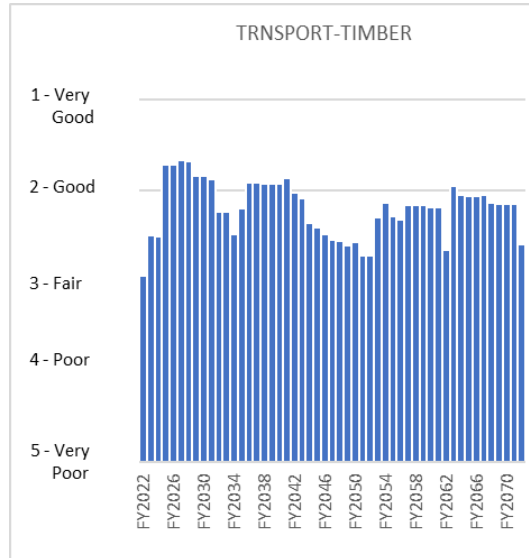


Figure 54 - Condition profiles and heat maps for Transport - Timber Retaining Walls

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Retaining Wall Portfolio Asset Management Plan

Land Improvement Retaining Walls

Current Funding:

Recommended Funding:

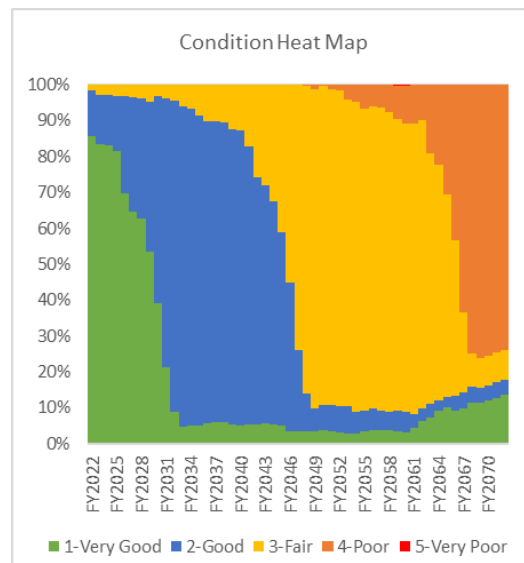
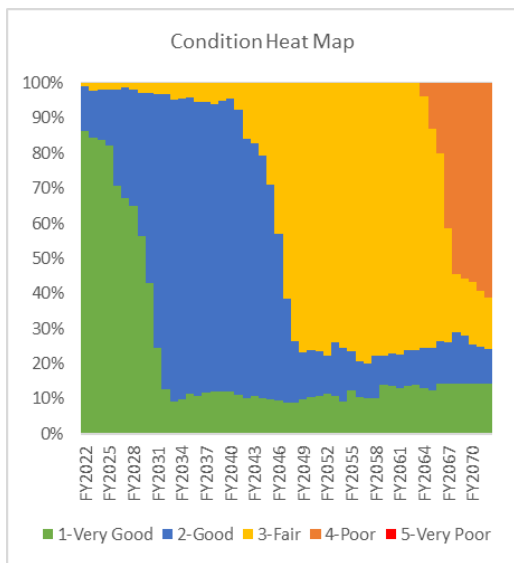
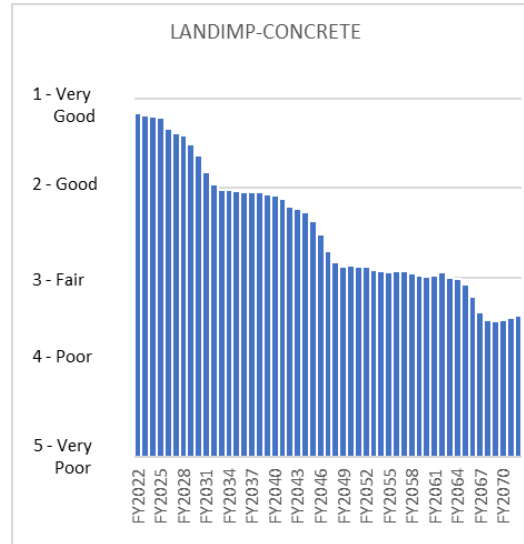
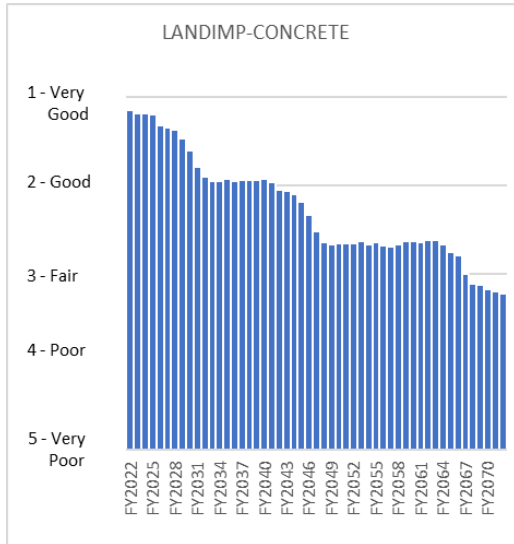
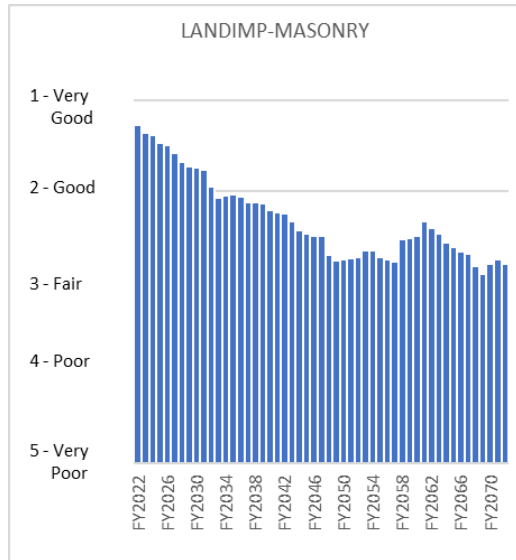


Figure 55 - Condition profiles and heat maps for Land Improvement - Concrete Retaining Walls

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Retaining Wall Portfolio Asset Management Plan

Current Funding:



Recommended Funding:

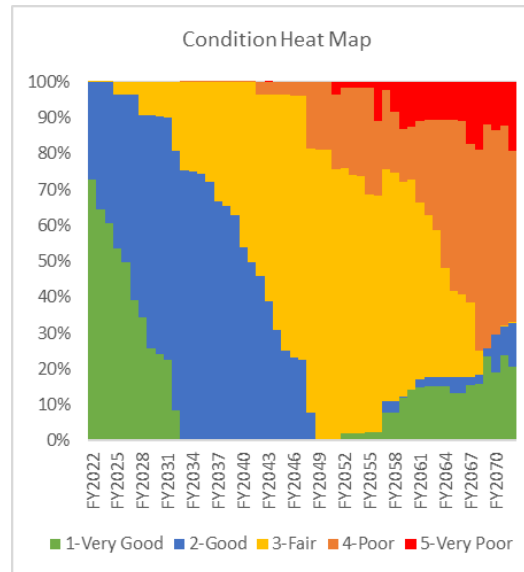
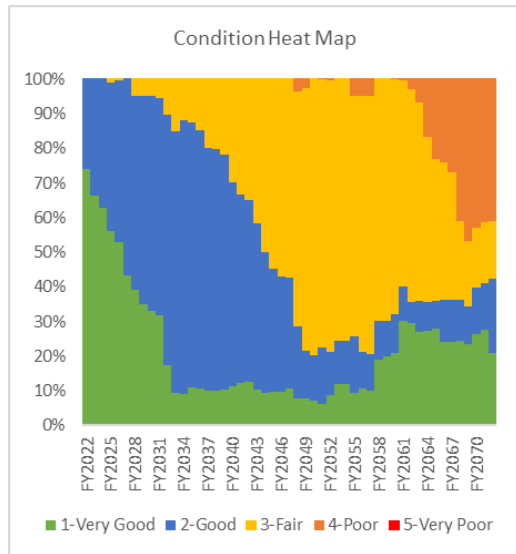
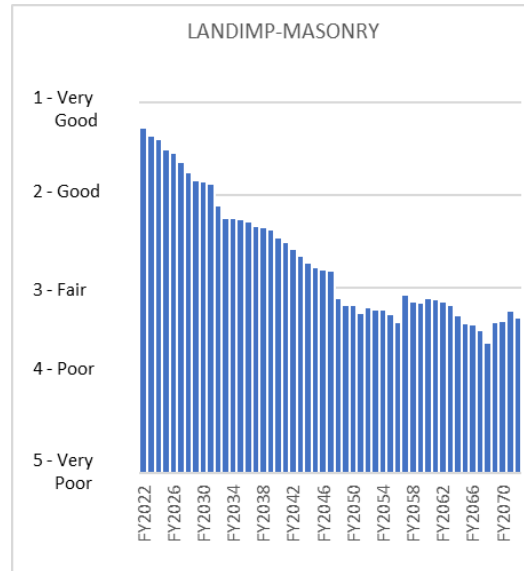
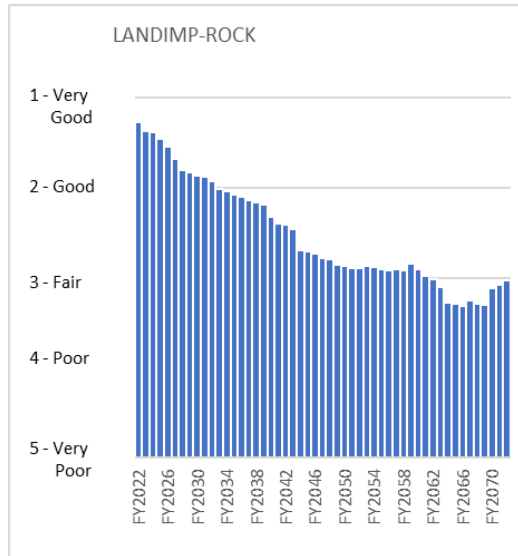


Figure 56 - Condition profiles and heat maps for Land Improvement - Masonry Retaining Walls

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Retaining Wall Portfolio Asset Management Plan

Current Funding:



Recommended Funding:

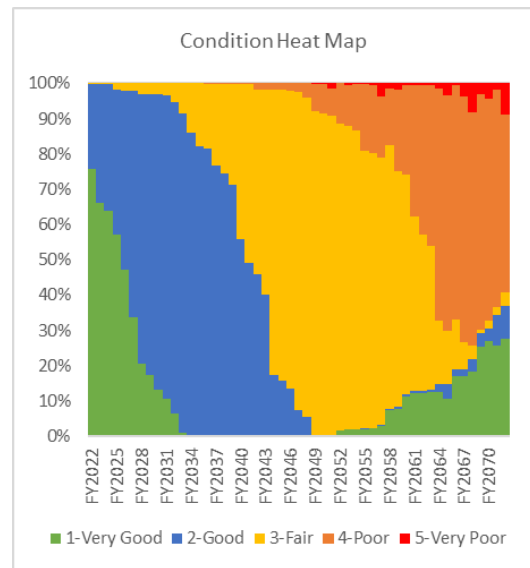
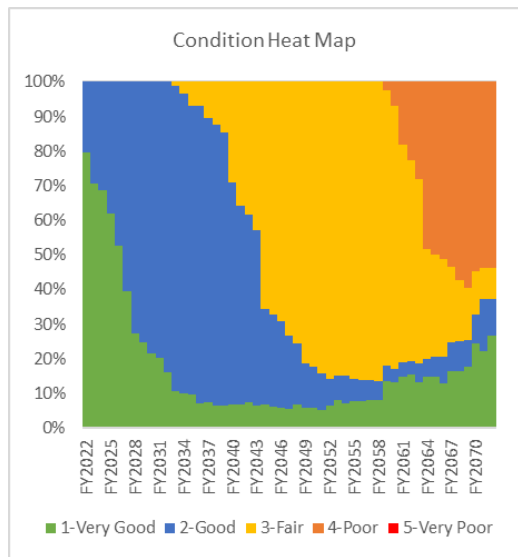
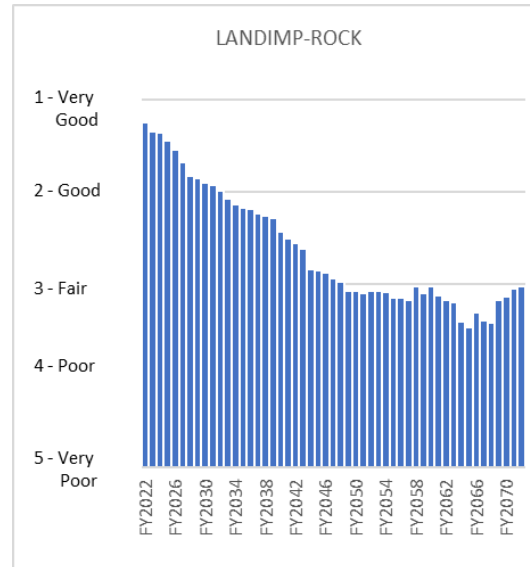
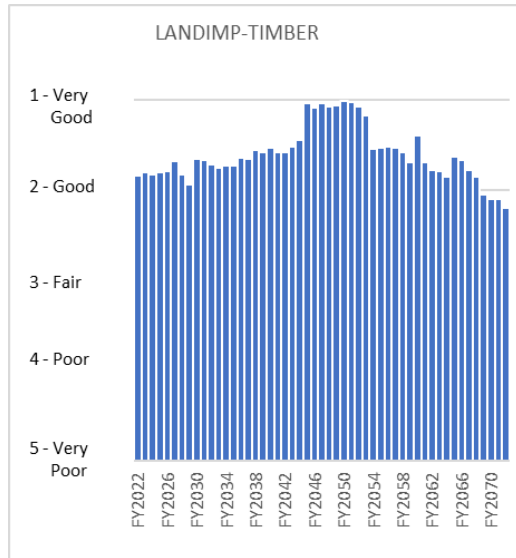


Figure 57 - Condition profiles and heat maps for Land Improvement - Rock Retaining Walls

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Retaining Wall Portfolio Asset Management Plan

Current Funding:



Recommended Funding:

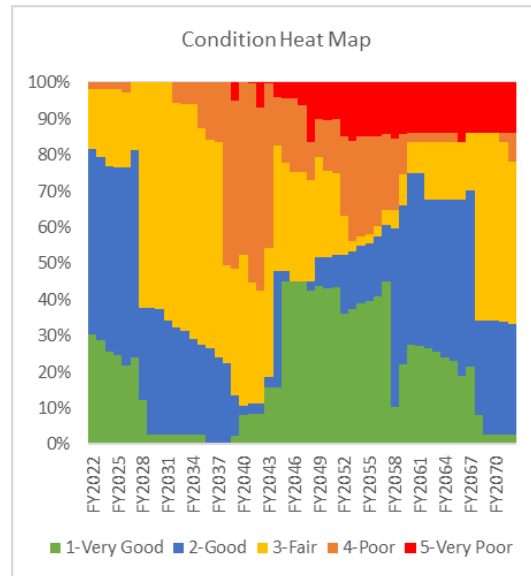
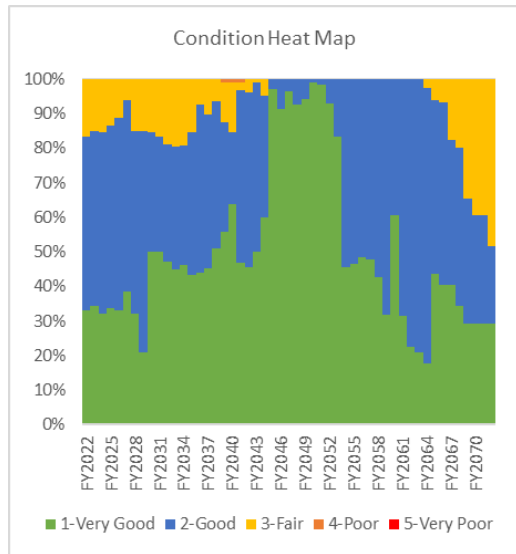
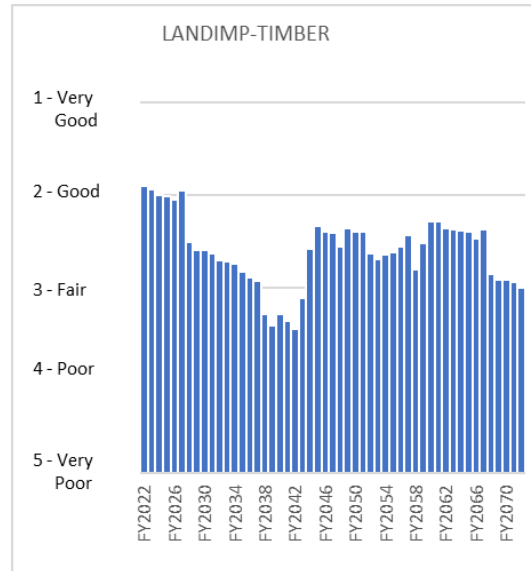


Figure 58 - Condition profiles and heat maps for Land Improvement - Timber Retaining Walls

ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Appendix N - Indicative 25-year NEW / UPGRADE Capital Plan

The table below represents an indicative plan for new capital works, based on information in the ePID systems, or estimated forward budgets. All costs are in 2021-dollar terms and do not include allowance for escalation, inflation or GST. The program of works is subject to review and change as further information becomes available.

Location	Project No	Asset Type	Date	Total Cost
New/Upgrade Capital Works for FY2021				
Eatons Hill,Saraband Drive	PN105402	Retaining Wall Installation	1/06/2021	5,000
Ferny Hills, Samford Road	PN102138	Retaining Wall Installation	1/06/2021	28,700
Dayboro ,Roderick Cruice Park	PN105476	Retaining Wall Installation	1/06/2021	30,400
Total for FY2021:				64,100
New/Upgrade Capital Works for FY2022				
Margate, Margate Parade	PN111303	Retaining Wall Installation	30/06/2022	5,000
Narangba ,Oakey Flat Road	PN111331	Retaining Wall Installation	30/06/2022	5,000
Albany Creek , John Leitch Memorial Park	PN101281	Retaining Wall Installation	30/06/2022	43,750
Albany Creek ,Thiess Drive	PN106499	Retaining Wall Installation	30/06/2022	5,000
Bellara , Eucalypt Street	PN108999	Retaining Wall Installation	30/06/2022	5,000
Eatons Hill ,Saraband Drive	PN109274	Retaining Wall Installation	30/06/2022	5,000
Ferny Hills , Kolora Crescent	PN111325	Retaining Wall Installation	30/06/2022	5,000
Ferny Hills,Patricks/Gordon/Caesar Roads	PN106451	Retaining Wall Installation	30/06/2022	62,500
LCI Everton Hills , Buckland Road	PN103571	Retaining Wall Installation	30/06/2022	6,800
LCI Narangba ,Matterhorn Drive - Gekko Gully	PN111165	Retaining Wall Installation	30/06/2022	5,000
LCI Scarborough ,Eversleigh Road	PN106808	Retaining Wall Installation	30/06/2022	79,000
LCI Warner , Ira Buckby Road	PN108262	Retaining Wall Installation	30/06/2022	5,000
Redcliffe , Anzac Avenue	PN109794	Retaining Wall Installation	30/06/2022	5,000
Redcliffe , Trilby Street	PN108775	Retaining Wall Installation	30/06/2022	5,000
Redcliffe ,Trilby Street	PN107823	Retaining Wall Installation	30/06/2022	5,000
Samford Village , John Scott Park	PN107649	Retaining Wall Installation	30/06/2022	5,000
Woody Point ,Oxley Avenue	PN109000	Retaining Wall Installation	30/06/2022	5,000

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Retaining Wall Portfolio Asset Management Plan

Location	Project No	Asset Type	Date	Total Cost
New/Upgrade Capital Works for FY2023				Total for FY2023:
Bray Park ,Sparkes Road	PN111319	Retaining Wall Installation	30/06/2023	5,000
Warner ,Old North Road	PN108717	Retaining Wall Installation	30/06/2023	19,000
				Total for FY2023: 24,000
New/Upgrade Capital Works for FY2024				
To be identified through ongoing ITPD and PRP Planning			30/06/2024	200000
				Total for FY2024: 200000
New/Upgrade Capital Works for FY2025				
To be identified through ongoing ITPD and PRP Planning			30/06/2025	200000
				Total for FY2025: 200000
New/Upgrade Capital Works for FY2026				
To be identified through ongoing ITPD and PRP Planning			30/06/2026	200000
				Total for FY2026: 200000
New/Upgrade Capital Works for FY2027				
To be identified through ongoing ITPD and PRP Planning			30/06/2027	200000
				Total for FY2027: 200000
New/Upgrade Capital Works for FY2028				
To be identified through ongoing ITPD and PRP Planning			30/06/2028	200000
				Total for FY2028: 200000
New/Upgrade Capital Works for FY2029				
To be identified through ongoing ITPD and PRP Planning			30/06/2029	200000
				Total for FY2029: 200000
New/Upgrade Capital Works for FY2030				
To be identified through ongoing ITPD and PRP Planning			30/06/2030	200000
				Total for FY2030: 200000
New/Upgrade Capital Works for FY2031				
To be identified through ongoing ITPD and PRP Planning			30/06/2031	200000
				Total for FY2031: 200000
New/Upgrade Capital Works for FY2032				
To be identified through ongoing ITPD and PRP Planning			30/06/2032	200000
				Total for FY2032: 200000
New/Upgrade Capital Works for FY2033				
To be identified through ongoing ITPD and PRP Planning			30/06/2033	200000
				Total for FY2033: 200000
New/Upgrade Capital Works for FY2034				
To be identified through ongoing ITPD and PRP Planning			30/06/2034	200000

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Retaining Wall Portfolio Asset Management Plan

Location	Project No	Asset Type	Date	Total Cost
			Total for FY2034:	200000
New/Upgrade Capital Works for FY2035				
To be identified through ongoing ITPD and PRP Planning			30/06/2035	200000
			Total for FY2035:	200000
New/Upgrade Capital Works for FY2036				
To be identified through ongoing ITPD and PRP Planning			30/06/2036	200000
			Total for FY2036:	200000
New/Upgrade Capital Works for FY2037				
To be identified through ongoing ITPD and PRP Planning			30/06/2037	200000
			Total for FY2037:	200000
New/Upgrade Capital Works for FY2038				
To be identified through ongoing ITPD and PRP Planning			30/06/2038	200000
			Total for FY2038:	200000
New/Upgrade Capital Works for FY2039				
To be identified through ongoing ITPD and PRP Planning			30/06/2039	200000
			Total for FY2039:	200000
New/Upgrade Capital Works for FY2040				
To be identified through ongoing ITPD and PRP Planning			30/06/2040	200000
			Total for FY2040:	200000
New/Upgrade Capital Works for FY2041				
To be identified through ongoing ITPD and PRP Planning			30/06/2041	200000
			Total for FY2041:	200000
New/Upgrade Capital Works for FY2042				
To be identified through ongoing ITPD and PRP Planning			30/06/2042	200000
			Total for FY2042:	200000
New/Upgrade Capital Works for FY2043				
To be identified through ongoing ITPD and PRP Planning			30/06/2043	200000
			Total for FY2043:	200000
New/Upgrade Capital Works for FY2044				
To be identified through ongoing ITPD and PRP Planning			30/06/2044	200000
			Total for FY2044:	200000
New/Upgrade Capital Works for FY2045				
To be identified through ongoing ITPD and PRP Planning			30/06/2044	200000
			Total for FY2045:	200000

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Retaining Wall Portfolio Asset Management Plan

Appendix O – Indicative 25-year RENEWAL Capital Works Plan

The table below represents an indicative renewal and replacement capital works plan, derived from undertaking lifecycle cost modelling based on current condition and asset data. All costs are in 2021 dollar terms and do not include allowance for escalation, inflation or GST. The program of works is subject to review and change as further condition data becomes available.

Asset Number	Location	Treatment	Total Cost
Renewal/Replacement Works for FY2022			
A00304224	Tarnee Street,Narangba (ePID 111358)	Renew retaining wall	15,000
A00787554	Griffith Road, Newport (ePID 110089)	Renew retaining wall	10,000
A00787553	Griffith Road, Newport (ePID 110089)	Renew retaining wall	10,000
A00787552	Griffith Road, Newport (ePID 110089)	Renew retaining wall	10,000
A00800898	Old Northern Road,Eatons Hill (ePID 111359)	Renew retaining wall	20,000
A00420284, A00459297, A00016005, A00067093	New Settlement Road,Burpengary (ePID 109721)	Renew retaining wall	300,000
A00802384	Goat Track,Highvale (ePID 111367)	Renew retaining wall	135,000
Total for FY2022:			500,000
Renewal/Replacement Works for FY2023			
A00081714	Scarborough Beach Park ,Scarborough	Renew retaining wall	34,697
A00268379	Bradley Street,Dayboro	Renew retaining wall	2,304
A00320330	Bradley Street,Dayboro	Renew retaining wall	23,962
A00369705	Bradley Street,Dayboro	Renew retaining wall	6,912
A00419347	Bradley Street,Dayboro	Renew retaining wall	5,760
A00470590	Bradley Street,Dayboro	Renew retaining wall	1,536
A00066486	Minerva Court,Eatons Hills	Renew retaining wall	2,414
A00268983	O'Loan Street,Petrie	Renew retaining wall	49,761
A00167773	Minerva Court,Eatons Hills	Renew retaining wall	5,645
A00369392	South Pine Road,Brendale	Renew retaining wall	3,024
A00419344	South Pine Road,Brendale	Renew retaining wall	2,772
A00419503	Mount Nebo	Renew retaining wall	6,246
A00016619	Devoran Street,Margate	Renew retaining wall	2,032
A00799853	Timms Road,Everton Hills	Renew retaining wall	2,374
A00800205	Old Northern Road,Albany Creek	Renew retaining wall	9,253
A00800888	Old Northern Road,Albany Creek	Renew retaining wall	2,691
A00800890	Old Northern Road,Albany Creek	Renew retaining wall	2,691
A00800893	Old Northern Road,Albany Creek	Renew retaining wall	31,298
A00801545	Old Northern Road,Albany Creek	Renew retaining wall	2,691
A00801546	Old Northern Road,Albany Creek	Renew retaining wall	2,691
A00801547	Old Northern Road,Eatons Hill	Renew retaining wall	2,691
A00800934	Albany Creek Road,Albany Creek	Renew retaining wall	9,942
A00801370	South Pine Road,Eatons Hill	Renew retaining wall	19,102
A00801495	Ira Buckby Road,Cashmere	Renew retaining wall	2,691
A00803597	Todds Road,Griffin	Renew retaining wall	1,768
A00913809	Youngs Crossing Road,Multiple	Renew retaining wall	1,923
A00913810	Youngs Crossing Road,Kallangur	Renew retaining wall	1,923
A00921791	Sheaves Road,Multiple	Renew retaining wall	1,923
A00921792	Sheaves Road,Narangba	Renew retaining wall	1,923
A00921788	Monarch Court,Kallangur	Renew retaining wall	1,923
A00921790	Oakblue Crescent,Kallangur	Renew retaining wall	1,923

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Retaining Wall Portfolio Asset Management Plan

Asset Number	Location	Treatment	Total Cost
A00493900	Dohles Rocks Road, Scarborough	Renew retaining wall	1,514
Total for FY2023:			250,000
Renewal/Replacement Works for FY2024			
A00081714	Scarborough Beach Park, Scarborough	Renew retaining wall	50,000
A00066487	Kelly Street, Dayboro	Renew retaining wall	4,190
A00112076	Kelly Street, Dayboro	Renew retaining wall	38,707
A00162302	Kelly Street, Dayboro	Renew retaining wall	37,325
A00066486	Minerva Court, Eatons Hills	Renew retaining wall	69,778
A00799605	Retreat Court, Bunya	Renew retaining wall	18,806
A00803596	Todds Road, Lawnton	Renew retaining wall	19,962
A00803597	Todds Road, Griffin	Renew retaining wall	3,967
A00909233	Warwick Lane, Rothwell	Renew retaining wall	7,265
Total for FY2024:			250,000
Renewal/Replacement Works for FY2025			
A00802298	Jagera Court, Closeburn (ePID 110984) - works may be carried out in 21/22 (pending further investigation)	Renew retaining wall	250,000
Total for FY2025:			250,000
Renewal/Replacement Works for FY2026			
A00802298	Jagera Court, Closeburn (ePID 110984)	Renew retaining wall	50,000
A00250586	Settlement Cove Park, Redcliffe	Renew retaining wall	13,414
A00504021	Queens Beach Park (North), Scarborough	Renew retaining wall	24,588
A00081714	Scarborough Beach Park, Scarborough	Renew retaining wall	6,112
A00149093	Scarborough Beach Park, Scarborough	Renew retaining wall	17,463
A00250586	Settlement Cove Park, Redcliffe	Renew retaining wall	15,251
A00066487	Kelly Street, Dayboro	Renew retaining wall	44,885
A00319988	Barber Road, Ferny Hill	Renew retaining wall	8,496
A00060827	Enchelmaier Street, Dayboro	Renew retaining wall	41,688
A00799605	Retreat Court, Bunya	Renew retaining wall	24,257
A00920882	Baree Way, Narangba	Renew retaining wall	1,923
A00920883	Wollumbin Place, Narangba	Renew retaining wall	1,923
Total for FY2026:			250,000
Renewal/Replacement Works for FY2027			
A00060827	Enchelmaier Street, Dayboro	Renew retaining wall	3,330
A00923191	Endeavour Park	Renew retaining wall	51,601
A00759198	Government Street, North Lakes	Renew retaining wall	9,738
A00825369	Dayboro Road, Caboolture	Renew retaining wall	5,824
A00799720	Blyth Road, Murrumba Downs	Renew retaining wall	8,608
A00799719	Blyth Road, Bellmere	Renew retaining wall	8,608
A00187802	Humpybong Park, Redcliffe	Renew retaining wall	17,520
A00319988	Barber Road, Ferny Hill	Renew retaining wall	5,904
A00420627	School Road, Kallenger	Renew retaining wall	10,138
A00320329	Railway Avenue, Strathpine	Renew retaining wall	16,470
A00320328	Albany Forest Drive, Albany	Renew retaining wall	62,232
A00363777	Paddy Road, Warner	Renew retaining wall	12,701
A00541830	Mayfield Road, Everton Hills	Renew retaining wall	22,430
A00574110	Mayfield Road, Mount Delaney	Renew retaining wall	14,401
A00574111	Delaney Creek Road, Beachmere	Renew retaining wall	26,098
A00029179	Anzac Avenue, Redcliffe	Renew retaining wall	2,228

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Asset Number	Location	Treatment	Total Cost
A00121662	Whytecliffe Parade, Redcliffe	Renew retaining wall	1,923
A00228816	Gayundah Esplanade, North Lakes	Renew retaining wall	1,684
A00380737	Redcliffe Point, Redcliffe	Renew retaining wall	2,228
A00921796	Spring Road, Narangba	Renew retaining wall	1,923
A00003879	Landsborough Avenue, Bunya	Renew retaining wall	2,228
A00053801	Landsborough Avenue, Lawnton	Renew retaining wall	2,228
A00153442	Landsborough Avenue, Caboolture South	Renew retaining wall	4,479
A00436182	Landsborough Avenue, North Lakes	Renew retaining wall	2,228
A00451524	Landsborough Avenue, Ferny Hills	Renew retaining wall	2,228
A00585470	Mundin Street, Murrumba Downs	Renew retaining wall	1,757
A00654322	Casuarina Drive South, Ferny Hills	Renew retaining wall	2,228
A00799995	Alana Street, Murrumba Downs	Renew retaining wall	1,966
Total for FY2027:			250,000

Renewal/Replacement Works for FY2028			
Asset Number	Location	Treatment	Total Cost
A00666180	Samsonvale Road, Strathpine	Renew retaining wall	24,799
A00230695	Landsborough Avenue, North Lakes	Renew retaining wall	8,968
A00320328	Albany Forest Drive, Albany	Renew retaining wall	15,654
A00268771	Albany Forest Drive, Albany	Renew retaining wall	30,354
A00320328	Albany Forest Drive, Albany	Renew retaining wall	103,992
A00541830	Mayfield Road, Everton Hills	Renew retaining wall	23,440
A00782323	Esme Avenue, Newport	Renew retaining wall	15,120
A00802310	Woods Road, Highvale	Renew retaining wall	7,594
A00668584	Gum Street, Petrie	Renew retaining wall	1,923
A00757593	Carmody Court, Petrie	Renew retaining wall	1,923
A00782844	Carmody Court, Lawnton	Renew retaining wall	1,923
A00791352	Samsonvale Road, Kallangur	Renew retaining wall	1,923
A00798152	Anzac Avenue, Upper Caboolture	Renew retaining wall	1,923
A00798169	Crestbrook Drive, Caboolture	Renew retaining wall	1,923
A00798544	Elliott Street, Banksia Beach	Renew retaining wall	1,923
A00079460	Anzac Avenue, Redcliffe	Renew retaining wall	2,228
A00228816	Gayundah Esplanade, North Lakes	Renew retaining wall	544
A00920888	Oxenfoord Court, Narangba	Renew retaining wall	1,923
A00920889	Kelburn Court, Kallangur	Renew retaining wall	1,923
Total for FY2028:			250,000

Renewal/Replacement Works for FY2029			
Asset Number	Location	Treatment	Total Cost
A00666180	Samsonvale Road, Strathpine	Renew retaining wall	12,382
A00137134	Gayundah Arboretum Park, Redcliffe	Renew retaining wall	8,513
A00233765	Redcliffe	Renew retaining wall	29,105
A00218200	Albany Forest Drive, Albany	Renew retaining wall	10,434
A00268771	Albany Forest Drive, Albany	Renew retaining wall	139,566
A00168628	Staghorn Parade, North Lakes	Renew retaining wall	21,094
A00800173	Old Northern Road (Service Road), Albany Creek	Renew retaining wall	2,058
A00802290	Turbal Court, Clear Mountain	Renew retaining wall	14,362
A00802310	Woods Road, Highvale	Renew retaining wall	10,563
A00921789	Camberwell Drive, Kallangur	Renew retaining wall	1,923
Total for FY2029:			250,000

Renewal/Replacement Works for FY2030			
Asset Number	Location	Treatment	Total Cost
A00137134	Gayundah Arboretum Park, Redcliffe	Renew retaining wall	49,231
A00369396	Warner Road, Warner	Renew retaining wall	15,818
A00218200	Albany Forest Drive, Albany	Renew retaining wall	131,874

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Retaining Wall Portfolio Asset Management Plan

Asset Number	Location	Treatment	Total Cost
A00168628	Staghorn Parade,North Lakes	Renew retaining wall	26,850
A00800205	Old Northern Road,Albany Creek	Renew retaining wall	3,846
A00802663	Herron Road,Cedar Creek	Renew retaining wall	22,381
Total for FY2030:			250,000

Renewal/Replacement Works for FY2031			
A00137134	Gayundah Arboretum Park ,Redcliffe	Renew retaining wall	45,976
A00015811	Hay Road,Dayboro	Renew retaining wall	24,960
A00116422	Enchelmaier Street,Dayboro	Renew retaining wall	13,801
A00369396	Warner Road,Warner	Renew retaining wall	3,946
A00066404	Anzac Avenue,Redcliffe	Renew retaining wall	54,900
A00116419	Hay Road,Dayboro	Renew retaining wall	40,320
A00161917	Ted Road,Mount Glorious	Renew retaining wall	3,894
A00087438	Mt O'Reilly Road,Narangba	Renew retaining wall	6,696
A00799852	Timms Road,Everton Hills	Renew retaining wall	11,468
A00799861	Timms Road,Everton Hills	Renew retaining wall	4,808
A00800205	Old Northern Road,Albany Creek	Renew retaining wall	3,846
A00802394	Woodglen Court,Samford Valley	Renew retaining wall	25,093
A00802663	Herron Road,Cedar Creek	Renew retaining wall	10,292
Total for FY2031:			250,000

Renewal/Replacement Works for FY2032			
A00137134	Gayundah Arboretum Park ,Redcliffe	Renew retaining wall	50,000
A00419343	Enchelmaier Street,Dayboro	Renew retaining wall	11,284
A00470880	Enchelmaier Street,Dayboro	Renew retaining wall	134,400
A00116422	Enchelmaier Street,Dayboro	Renew retaining wall	4,316
A00065768	Coriander Drive,Kobble Creek	Renew retaining wall	7,468
A00802394	Woodglen Court,Samford Valley	Renew retaining wall	1,639
A00909243	Retreat Court,Ferny Hills	Renew retaining wall	40,893
Total for FY2032:			250,000

Renewal/Replacement Works for FY2033			
A00454009	Eeles Drive,Manning Court Park	Renew retaining wall	11,042
A00233501	Bertie Dow Park ,Rothwell	Renew retaining wall	9,314
A00437132	Charlish Park ,Redcliffe	Renew retaining wall	10,129
A00137134	Gayundah Arboretum Park ,Redcliffe	Renew retaining wall	19,516
A00419343	Enchelmaier Street,Dayboro	Renew retaining wall	14,636
A00117580	South Pine Road,Brendale	Renew retaining wall	118,276
A00781027	Mott Street,Strathpine	Renew retaining wall	17,088
A00800087	Forest Court,Albany Creek	Renew retaining wall	6,707
A00802659	Lacebark Court,Cedar Creek	Renew retaining wall	17,285
A00909243	Retreat Court,Ferny Hills	Renew retaining wall	26,008
Total for FY2033:			250,000

Renewal/Replacement Works for FY2034			
A00454009	Eeles Drive,Manning Court Park	Renew retaining wall	21,530
A00642234	Caspian Parade,Everton Hills	Renew retaining wall	25,855
A00117580	South Pine Road,Brendale	Renew retaining wall	148,385
A00781026	Mott Street,Strathpine	Renew retaining wall	3,738
A00781028	Mott Street,Mount Mee	Renew retaining wall	2,011
A00799628	Bunya Lake Court,Arana Hills	Renew retaining wall	19,708
A00800087	Forest Court,Albany Creek	Renew retaining wall	15,090

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Retaining Wall Portfolio Asset Management Plan

Asset Number	Location	Treatment	Total Cost
A00800205	Old Northern Road,Albany Creek	Renew retaining wall	1,322
A00800938	Agnes Street,Albany Creek	Renew retaining wall	8,914
A00802052	Adams Road,Cashmere	Renew retaining wall	1,370
A00123680	Hanlon Road,Woorim	Renew retaining wall	2,077
Total for FY2034:			250,000

Renewal/Replacement Works for FY2035			
A00825369	Dayboro Road,Caboolture	Renew retaining wall	1,923
A00642234	Caspian Parade,Everton Hills	Renew retaining wall	31,537
A00117580	South Pine Road,Brendale	Renew retaining wall	127,759
A00798853	Caesar Road,Ferny Hills	Renew retaining wall	15,402
A00800938	Agnes Street,Albany Creek	Renew retaining wall	5,457
A00801367	South Pine Road,Eatons Hill	Renew retaining wall	23,426
A00802052	Adams Road,Cashmere	Renew retaining wall	757
A00802315	Hulcombe Road,Highvale	Renew retaining wall	13,703
A00804149	Narangba Road,Mango Hill	Renew retaining wall	17,063
A00919013	South Pine Road,Brendale	Renew retaining wall	67
A00919014	South Pine Road,Brendale	Renew retaining wall	1,923
A00919015	South Pine Road,Brendale	Renew retaining wall	1,923
A00919016	South Pine Road,Clontarf	Renew retaining wall	1,923
A00452843	Barber Road,Warner	Renew retaining wall	1,923
A00200647	Aurora Boulevard,North Lakes	Renew retaining wall	1,576
A00401047	Aurora Boulevard,North Lakes	Renew retaining wall	1,918
A00447454	Aurora Boulevard,North Lakes	Renew retaining wall	1,718
Total for FY2035:			250,000

Renewal/Replacement Works for FY2036			
A00353314	Barnes Street,Mango Hill	Renew retaining wall	13,471
A00281381	Scarborough Beach Park ,Scarborough	Renew retaining wall	17,463
A00117580	South Pine Road,Brendale	Renew retaining wall	127,218
A00801367	South Pine Road,Eatons Hill	Renew retaining wall	42,406
A00801844	Ira Buckby Road West,Cashmere	Renew retaining wall	21,261
A00802173	Ira Buckby Road,Cashmere	Renew retaining wall	1,688
A00804136	New Road,Kallangur	Renew retaining wall	6,770
A00804149	Narangba Road,Mango Hill	Renew retaining wall	2,136
A00909240	Lindsay Street,Deception Bay	Renew retaining wall	2,269
A00641639	Goodrich Road West,Warner	Renew retaining wall	1,923
A00919009	South Pine Road,Brendale	Renew retaining wall	1,923
A00919010	South Pine Road,Brendale	Renew retaining wall	1,923
A00919011	South Pine Road,Brendale	Renew retaining wall	1,923
A00919012	South Pine Road,Brendale	Renew retaining wall	1,923
A00919013	South Pine Road,Brendale	Renew retaining wall	1,856
A00202842	Barber Road,Redcliffe	Renew retaining wall	1,923
A00910636	Everglades Drive,Narangba	Renew retaining wall	1,923
Total for FY2036:			250,000

Renewal/Replacement Works for FY2037			
A00161270	Barnes Street,Mango Hill	Renew retaining wall	4,472
A00211466	Barnes Street,Mango Hill	Renew retaining wall	20,586
A00302998	Barnes Street,Mango Hill	Renew retaining wall	19,559
A00353314	Barnes Street,Mango Hill	Renew retaining wall	5,383
A00212580	Rohlf Street,Dayboro	Renew retaining wall	22,272
A00015948	McKenzie Street,Dayboro	Renew retaining wall	19,200

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Asset Number	Location	Treatment	Total Cost
A00269009	South Pine Road,Brendale	Renew retaining wall	18,647
A00117580	South Pine Road,Brendale	Renew retaining wall	89,881
A00799616	Retreat Court,Arana Hills	Renew retaining wall	32,118
A00801367	South Pine Road,Eatons Hill	Renew retaining wall	17,882
Total for FY2037:			250,000

Renewal/Replacement Works for FY2038			
A00161270	Barnes Street,Mango Hill	Renew retaining wall	15,792
A00197681	Darwin Circuit,North Lakes	Renew retaining wall	7,312
A00238678	Lefroy Court,Warner	Renew retaining wall	7,521
A00406983	Aurora Boulevard,Aurora Boulevard Park	Renew retaining wall	14,236
A00168769	Camelia Avenue,Everton Hills	Renew retaining wall	13,824
A00218359	South Pine Road,Brendale	Renew retaining wall	11,520
A00269009	South Pine Road,Brendale	Renew retaining wall	5,929
A00015280	River Vista Crescent,Murrumba Downs	Renew retaining wall	6,466
A00799616	Retreat Court,Arana Hills	Renew retaining wall	30,257
A00800203	Keong Road,Albany Creek	Renew retaining wall	101,369
A00801844	Ira Buckby Road West,Cashmere	Renew retaining wall	2,126
A00799627	Retreat Court,Warner	Renew retaining wall	19,318
A00920371	Stark Drive,Narangba	Renew retaining wall	1,923
A00920878	Kintail Place,Narangba	Renew retaining wall	1,923
A00920879	Kintail Place,Narangba	Renew retaining wall	1,923
A00920880	Stonehaven Place,Narangba	Renew retaining wall	1,923
A00920881	Glenross Place,Narangba	Renew retaining wall	1,923
A00136633	Hasking Street,Petrie	Renew retaining wall	4,714
Total for FY2038:			250,000

Renewal/Replacement Works for FY2039			
A00406983	Aurora Boulevard,Aurora Boulevard Park	Renew retaining wall	45,680
A00825369	Dayboro Road,Caboolture	Renew retaining wall	13,854
A00420626	River Vista Crescent,Murrumba Downs	Renew retaining wall	50,508
A00470637	River Vista Crescent,Murrumba Downs	Renew retaining wall	45,732
A00015280	River Vista Crescent,Murrumba Downs	Renew retaining wall	2,812
A00060826	Collins Road,Bunya	Renew retaining wall	31,997
A00167838	Hasking Street,Ferny Hills	Renew retaining wall	4,068
A00799627	Retreat Court,Warner	Renew retaining wall	45,680
A00920390	Boronia Outlook,Brendale	Renew retaining wall	1,923
A00630588	Gympie Road,Petrie	Renew retaining wall	55
A00640879	Anzac Avenue,Redcliffe	Renew retaining wall	1,923
A00640880	Anzac Avenue,Redcliffe	Renew retaining wall	1,923
A00640903	Anzac Avenue,Bongaree	Renew retaining wall	1,923
A00647344	Fifth Avenue,Bray Park	Renew retaining wall	1,923
Total for FY2039:			250,000

Renewal/Replacement Works for FY2040			
A00406983	Aurora Boulevard,Aurora Boulevard Park	Renew retaining wall	33,168
A00349647	Windemere Avenue,North Lakes	Renew retaining wall	10,908
A00578667	Dugandan Road,Caboolture	Renew retaining wall	5,924
A00217802	Collins Road,Bunya	Renew retaining wall	13,902
A00060826	Collins Road,Bunya	Renew retaining wall	85,603
A00570925	Yingally Drive,Highvale	Renew retaining wall	2,948
A00640246	Hickory Drive,Griffin	Renew retaining wall	23,084
A00799602	Retreat Court,Ferny Hills	Renew retaining wall	5,581

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Asset Number	Location	Treatment	Total Cost
A00801844	Ira Buckby Road West,Cashmere	Renew retaining wall	17,325
A00799627	Retreat Court,Warner	Renew retaining wall	1,555
A00802041	Williamson Road,Warner	Renew retaining wall	1,923
A00019867	Anzac Avenue,Wamuran	Renew retaining wall	1,923
A00130633	Anzac Avenue,Scarborough	Renew retaining wall	1,923
A00146647	North Street,Arana Hills	Renew retaining wall	1,923
A00223635	Redcliffe Point,Redcliffe	Renew retaining wall	1,923
A00278772	Whytecliffe Parade,Redcliffe	Renew retaining wall	1,923
A00325586	Redcliffe Point,Redcliffe	Renew retaining wall	1,923
A00393150	Anzac Avenue,Redcliffe	Renew retaining wall	1,923
A00435113	Morris Road,Wamuran	Renew retaining wall	1,923
A00443516	Carmody Court,Redcliffe	Renew retaining wall	1,923
A00040545	School Road,North Lakes	Renew retaining wall	1,923
A00130913	Forest Ridge Drive,North Lakes	Renew retaining wall	1,923
A00146480	School Road,Ferny Hills	Renew retaining wall	1,923
A00175919	Old Northern Road,Narangba	Renew retaining wall	1,923
A00182247	Forest Ridge Drive,North Lakes	Renew retaining wall	1,923
A00303408	Irula Street,Kallangur	Renew retaining wall	1,923
A00306401	School Road,North Lakes	Renew retaining wall	1,923
A00354684	Saraband Drive,North Lakes	Renew retaining wall	1,923
A00362767	School Road,Narangba	Renew retaining wall	1,923
A00462245	School Road,North Lakes	Renew retaining wall	1,923
A00584887	Mt Mee Road,Petrie	Renew retaining wall	1,923
A00665428	Marsden Road,Dakabin	Renew retaining wall	4,748
A00081261	Irula Street,Bray Park	Renew retaining wall	1,687
A00090065	Irula Street,Bray Park	Renew retaining wall	1,561
A00233984	Irula Street,North Lakes	Renew retaining wall	1,620
Total for FY2040:			250,000

Renewal/Replacement Works for FY2041			
A00407474	Gayundah Esplanade,Gayundah Arboretum Park	Renew retaining wall	37,445
A00406983	Aurora Boulevard,Aurora Boulevard Park	Renew retaining wall	7,765
A00167772	Collins Road,Bunya	Renew retaining wall	7,686
A00217802	Collins Road,Bunya	Renew retaining wall	76,738
A00112028	Hulcombe Road,Highvale	Renew retaining wall	7,384
A00496888	Williams Street,Dayboro	Renew retaining wall	4,345
A00023207	Williams Street,Dayboro	Renew retaining wall	6,239
A00100872	Williams Street,Margate	Renew retaining wall	34,472
A00640246	Hickory Drive,Griffin	Renew retaining wall	45,211
A00799779	Willem Drive,Draper	Renew retaining wall	3,117
A00799778	Willem Drive,Ferny Hills	Renew retaining wall	3,117
A00799267	Willem Drive,Bunya	Renew retaining wall	3,117
A00801844	Ira Buckby Road West,Cashmere	Renew retaining wall	8,615
A00425196	Forestcreek Place,Woody Point	Renew retaining wall	668
A00081261	Irula Street,Bray Park	Renew retaining wall	4,081
Total for FY2041:			250,000

Renewal/Replacement Works for FY2042			
A00407474	Gayundah Esplanade,Gayundah Arboretum Park	Renew retaining wall	10,165
A00048100	Mcgahey Street,Rothwell Park	Renew retaining wall	39,835
A00217801	Retreat Court,Bunya	Renew retaining wall	25,067
A00268981	Retreat Court,Bunya	Renew retaining wall	4,704

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ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Asset Number	Location	Treatment	Total Cost
A00319987	Retreat Court,Bunya	Renew retaining wall	4,032
A00369393	Retreat Court,Bunya	Renew retaining wall	58,464
A00419595	Retreat Court,Bunya	Renew retaining wall	7,258
A00470418	Retreat Court,Bunya	Renew retaining wall	3,629
A00015808	Retreat Court,Bunya	Renew retaining wall	19,958
A00066402	Retreat Court,Bunya	Renew retaining wall	3,360
A00218341	Glen Eaton Court,Eatons Hills	Renew retaining wall	3,024
A00268376	Glen Eaton Court,Eatons Hills	Renew retaining wall	7,056
A00112028	Hulcombe Road,Highvale	Renew retaining wall	13,448
A00640246	Hickory Drive,Griffin	Renew retaining wall	50,000
Total for FY2042:			250,000

Renewal/Replacement Works for FY2043			
A00030164	Palmgrove Place,North Lakes	Renew retaining wall	9,616
A00353505	Mundin Street,Mathieson Park	Renew retaining wall	6,101
A00479162	Mogahey Street,Rothwell Park	Renew retaining wall	18,193
A00048100	Mogahey Street,Rothwell Park	Renew retaining wall	5,055
A00909247	Kunde Street,Mango Hill	Renew retaining wall	72,619
A00015809	Retreat Court,Bunya	Renew retaining wall	34,051
A00066698	Retreat Court,Bunya	Renew retaining wall	2,957
A00117411	Retreat Court,Bunya	Renew retaining wall	5,040
A00168532	Retreat Court,Bunya	Renew retaining wall	7,560
A00217801	Retreat Court,Bunya	Renew retaining wall	38,437
A00640246	Hickory Drive,Griffin	Renew retaining wall	29,348
A00029111	Forestcreek Place,Redcliffe	Renew retaining wall	1,923
A00080054	Forestcreek Place,Redcliffe	Renew retaining wall	1,923
A00180257	Forestcreek Place,Redcliffe	Renew retaining wall	1,923
A00425196	Forestcreek Place,Woody Point	Renew retaining wall	1,255
A00922903	Chesterfield Drive,Murrumba Downs	Renew retaining wall	6,199
A00898090	Lionheart Crescent,Narangba	Renew retaining wall	7,800
Total for FY2043:			250,000

Renewal/Replacement Works for FY2044			
A00502515	Hartley Crescent,North Lakes	Renew retaining wall	242,838
A00443898	Mabel Street,Margate	Renew retaining wall	5,239
A00496888	Williams Street,Dayboro	Renew retaining wall	1,923
Total for FY2044:			250,000

Renewal/Replacement Works for FY2045			
A00502515	Hartley Crescent,North Lakes	Renew retaining wall	41,288
A00353505	Mundin Street,Mathieson Park	Renew retaining wall	1,321
A00529720	Ferny Way,George Willmore Park	Renew retaining wall	6,793
A00015809	Retreat Court,Bunya	Renew retaining wall	24,342
A00496888	Williams Street,Dayboro	Renew retaining wall	383
A00640246	Hickory Drive,Griffin	Renew retaining wall	8,114
A00634347	Albany Forest Drive,Albany Creek	Renew retaining wall	163,950
A00798856	Caesar Road,Warner	Renew retaining wall	958
A00922906	Kelly Street,Ferny Hills	Renew retaining wall	2,851
Total for FY2045:			250,000

Renewal/Replacement Works for FY2046			
A00529057	Carmody Court,Sweeney Reserve	Renew retaining wall	11,506

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ITEM 3.3 RETAINING WALL PORTFOLIO ASSET MANAGEMENT PLAN - 62426951 (Cont.)

Retaining Wall Portfolio Asset Management Plan

Asset Number	Location	Treatment	Total Cost
A00529720	Ferny Way, George Willmore Park	Renew retaining wall	2,066
A00153511	Anzac Park ,Petrie	Renew retaining wall	6,426
A00283833	Suttons Beach Park, Scarborough	Renew retaining wall	16,299
A00015809	Retreat Court, Bunya	Renew retaining wall	17,006
A00579371	Mackie Road, Narangba	Renew retaining wall	18,671
A00579370	Mackie Road, Narangba	Renew retaining wall	13,203
A00579368	Mackie Road, Narangba	Renew retaining wall	25,852
A00579369	Mackie Road, Narangba	Renew retaining wall	14,285
A00620242	Nocturnal Promenade, Narangba	Renew retaining wall	3,459
A00640246	Hickory Drive, Griffin	Renew retaining wall	49,662
A00798833	Plucks Road, Ferny Hills	Renew retaining wall	18,847
A00798856	Caesar Road, Warner	Renew retaining wall	1,688
A00800275	Bunya Road, Warner	Renew retaining wall	3,373
A00800897	Old Northern Road, Albany Creek	Renew retaining wall	27,022
A00790156	Dixon Street, Strathpine	Renew retaining wall	1,923
A00029180	Redcliffe Parade, Redcliffe	Renew retaining wall	2,228
A00909237	Redcliffe Parade, Redcliffe	Renew retaining wall	2,228
A00909238	Redcliffe Parade, Redcliffe	Renew retaining wall	2,228
A00909239	Redcliffe Parade, Draper	Renew retaining wall	2,228
A00799263	Willem Drive, Draper	Renew retaining wall	2,228
A00799264	Willem Drive, Draper	Renew retaining wall	2,228
A00799268	Willem Drive, Scarborough	Renew retaining wall	2,228
A00922902	Ogg Road, Albany Creek	Renew retaining wall	3,117
Total for FY2046:			250,000