Greymouth Floodwall Rating District 2023-2026 Asset Management Plan

West Coast Regional Council

388 Main South Road
Greymouth
7805

Updated 11.06.2024

Table of Contents

1.0 Purpose of this Document

The purpose of this document is to summarise the management philosophy that is applied to the Greymouth Floodwall Rating District including the infrastructure assets and services. This approach ensures that acceptable levels of service are provided in the most cost-effective manner and contribute to the achievement of the community outcomes identified in the West Coast Regional Council's Long-Term-Plan (LTP).

This AMP defines the objectives and performance standards of the Greymouth Floodwall Rating District for which the West Coast Regional Council bears the maintenance responsibility, including providing a basis upon which the effectiveness can be measured. The key purposes of this AMP are to:

- Provide a history of the Greymouth Floodwall protection scheme.
- Convey the long-term strategy for the management of the Greymouth Floodwall Rating District.
- Provide a tool to assist with management assets in a cost effective and sustainable manner.
- Manage the environmental, service delivery and financial risks of asset failure.
- Demonstrate that the service potential of the rivers and drainage assets is being maintained.

2.0 Asset Management Objectives

West Coast Regional Council recognises that the Greymouth Floodwall Asset Management Plan is the fundamental driver of flood protection for the scheme. This AMP has been developed in accordance with the Local Government Act 2002, with the first AMP completed in 2003 with three yearly updates or earlier where information indicates a significant change from what is stated in the current AMP.

In order to fulfil the outcomes, vision, goals and objectives of these assets, the West Coast Regional Council have adopted a systematic approach to the long-term management of its assets and services on the Greymouth Floodwall by preparing this AMP.

West Coast Regional Council is committed to best appropriate practice asset management in order to achieve the following key objectives:

- Meet the service expectations of the Greymouth Floodwall community.
- Ensure maintenance activities achieve efficient results with optimal benefits.
- Demonstrate Council's approach to managing risk and meeting growth requirements towards a sustainable future.
- Comply with all statutory requirements.

3.0 Backgrounds

3.1 Greymouth Floodwall Background

From the earliest days of settlement, the communities of Greymouth, Blaketown and Cobden have been exposed to the risk of flooding from the Grey River.

Major floods have occurred in 1867, 1868, 1872, 1884, 1887, 1897, 1905, 1936, 1940, 1967, 1970, 1976, 1977 and 1978. In the late 1970's the Westland Catchment Board began investigative work on the development of flood protection measures for these communities.

On March 25, 1985, the Westland Catchment Board presented an updated report and design, indicating an approximate cost of $3 million. The design embodied a set of strategically placed stopbanks intended to contain a Grey River flood peak of 5,500 cumecs which at that time was estimated to have a return period in the order of 50 years. Financial approval was sought from Government and in December 1986, the approval for a $3.2m scheme was given on the basis of 60% Government funding/ 40 % local funding.

Work commenced in 1986 but during the construction of the Cobden stopbanks two major floods occurred on 19 May and 13 September 1988 which caused extensive inundation and consequential damage. These events gave both urgency to the completion of the project and the need to re-assess the scheme standard. The technical review which ensued resulted in the upgrading of the scheme design to 6,100 cumecs with 900 mm of freeboard. The revised scheme represented a re-assessment of the peak flow expected with an average annual exceedance probability of 2 % i.e. a retention of the 50 year return period flood capability.

This amended proposal was forwarded to Government and approval for an upgraded $4.2m scheme was approved on the basis of 80% Government funding/20% local funding.

The first contract was let for the Cobden Stage 1 stopbank in November 1986 and the final contract for the raising of the Blaketown Tiphead Road was completed in September 1990. It was completed at an overall cost of $4m. (80% Government/ 20% Grey District Council).

Since the completion of the protection works the system has experienced flood flows in excess of 5,500 cumecs on two occasions i.e. 5,812 cumecs (16 December 1997) and 5,667 cumecs (19 October 1998). Although some minor seepage was observed, in several places, through and beneath the scheme stopbanks during such events the structures have performed satisfactorily and averted what would otherwise have been widespread flooding and consequential damage to these communities. Concerns had been expressed by sections of the Cobden community relating to the extent of seepage observed during major floods and the implications that this might have for the structural integrity of the stopbanks.

Acting on these concerns the West Coast Regional Council commissioned an investigation of the stopbank. The purpose of this investigation was to assess the nature, cause, potential threats and remedies for the seepage problem and report findings to the Greymouth Joint Flood Wall Committee which is a joint committee of both the Grey District Council and the West Coast Regional Council.

The investigation was undertaken by Civil and Environmental Consulting Ltd. and resulted in "Greymouth Flood Protection System Integrity Report" (31 March 1999). This report concluded that there was a need to modify the Cobden stopbank to incorporate seepage control measures in order to

lessen the risk of seepage induced instability. This strengthening works were carried out in 2000. The report also recommended that consideration be given also to a re-evaluation of hydraulic capacity of the system using updated river flood flow and tide information.

As a result, the return period for the scheme design capacity event of 6,100 cumecs was determined to be in the order of 30 year event, rather than a 50 year event as previously calculated. As a result of the revised analysis, the Joint Floodwall Committee, in 2006, decided to design an upgrade to the floodwall to a new service level of 6,600 cumecs (the revised 50 Year Return Period Flood Event) with 600mm freeboard.

As a result of further deliberations by the Joint Floodwall Committee, it was decided to apply for a second option of a higher threshold to the 7,400 cumecs flow with 600 freeboard, which equates to a 150 year design flood. This would ensure that future development of the structure, if required, would not require additional resource consent. Resource consents for this were applied for in 2006 and were granted in December 2008. Tenders for this work were let in 2009, and work was completed in 2010 to the 50 year event level with concrete work to the higher 150 year level.

It was anticipated that in the future the community would wish to bring the entire wall up to the higher flood protection level. In 2020 Council applied to the Ministry of Business, Innovation & Employment's Provincial Development Unit to fund the upgrade of the remaining sections of the floodwall to the 1 in 150 year standard. The application was successful and a grant was awarded for up to $1,950,000 (75% of estimated project costs). Due to a planned upgrade of a 150m length of the Greymouth Port access road at Short Street this section of the floodwall was raised to the 1 in 150 year height at the end of 2021. The remaining areas of work are due to be completed during 2024-2025.

As a result of the community consultation for the Long Term plan in 2021, council resolved to extend the Greymouth Rating District boundary to include Coal Creek and New River Rating Districts. The assets of these two schemes will now be administered under the Greymouth Rating District.

3.2 Coal Creek Background

Inundation of the area known as the Coal Creek Flats has occurred since pre-European occupation of the area. Minimal records have been kept of these events prior to 1951. Some minor rockwork had been carried out in the 1930's to prevent erosion of the right bank of the Grey River along this low frontage. The protection works consisted of 1,850 lineal metres of stopbanking to prevent the farmland from flooding. The rock associated with this stopbank was carried out by the Public Works Department in 1938 and was strengthened in 1941 and 1943. The local authorities and ratepayers had made repeated requests to strengthen the deteriorating protection works since 1945.

On 7 March 1951 erosion took place over 300 lineal metres; however, reference was made to future erosion problems over a much larger length of exposed riverbank. An estimate for 9,000 tonnes of rock to be placed as protective rock rip rap was forwarded by the Ministry of Works. This work was delayed due to objections from the Railways Department regarding their ongoing problems at the Omoto Slip, as it felt that the proposed work may be detrimental to their protection works on the true left bank. On 20 March 1957 a design flood of 5,900 cumecs was adopted. This gave 0.9 metre freeboard on the stopbank.

On 7 May 1957 a meeting was held with local ratepayers and representatives from the Westland Catchment Board, Grey County Council and Ministry of Works. The ratepayer's share of costs of the proposed works was $6,000, payable over a 20-year term. Agreement was reached by the local ratepayers, resulting in the Coal Creek Rating District being established in December 1957. The classification was a single-classed targeted rate based on capital value.

The Westland Catchment Board accepted a tender from Mr B. Piner for the proposed works which included the placing of 18,000 tonnes of rock as rip rap. The final works were completed on 9 June 1958.

On 27 February 1973, H.R. Langridge and Sons Ltd carted 1,000 tonnes of rock to form 8 spur groynes on the mid-section of eroding bank.

A major flood in April 1974 damaged these spurs and an estimate of $21,000 was prepared to repair the damage.

On 30 September 1977 Cooks Roadmakers carted 5,000 tonnes of rock to top up the existing rock work on the upper and lower section of the eroding bank.

A major flood in 1984 generated erosion problems on the left bank and an estimate was prepared to construct a stopbank on the left bank, and the raising of the Coal Creek stopbank on the right bank. The total estimated cost was $231,000.

Two major floods occurred in May and September 1988 resulting in major damage to the Coal Creek stopbank caused by overtopping with 600 metres of stopbanking being destroyed.

A major flood occurring on 16 December 1997 caused overtopping at the top 150 metre section of the Coal Creek stopbank. This flood was estimated at 5949 cumecs (between a 20-50-year event). The bank was raised over this section by approximately 200mm to prevent possible failure of the bank due to scouring out the back batter. The calculated 50-year return period event was 6346 cumecs.

The upper part of the stopbank (344 metres) was raised by 1.5 metres in 2012 after a flood came very close to overtopping the stopbank at this location. The cost was $135,284 and involved 3,000 tonnes of rock and 7,200 tonnes of compacted hardfill.

An erosion scour upstream of the upper section of stopbank has been progressively eroding the north bank of the river over the past few decades. The scour had progressed to the extent that it was undermining the toe rock of the upper stopbank. In 2016 a small rock spur was constructed upstream of the erosion scour, and a diversion cut was excavated through the gravel beach opposite the erosion scour.

As a result of the LTP consultation in 2021, the Coal Creek Rating district will be included as part of the Greymouth Rating District from July 1st 2022 and will be disbanded. This work was completed in 2022 and all prudent reserve monies redistributed to the landowners in the scheme.

3.3 New River Background

Saltwater Creek (catchment area 27km²) and New River (catchment area 117km²) combine and flow into the Tasman Sea. The combined mouth has moved many times and has migrated from Pandora Ave in the south to as far north as Clough Road.

In December 2010 an intense rainfall event caused Saltwater Creek and New River to flood properties on the western side of the State Highway, and forced the closure of the State Highway.

The Grey District Council undertook emergency works to open a new mouth of Saltwater Creek and New River approximately 1.5km south of the Paroa Hotel. In addition, they constructed a rock-lined bund (or groyne) to the north of this new outlet to prevent the New River re-entering its old channel.

The Grey District Council obtained a resource consent for the groyne, and for maintenance of the new outlet. The consent allows for the re-excavation of the outlet should it block and the back-up of water reaches a trigger point identified as the top of the culvert on the beach access road alongside the Paroa School sports field.

Following community consultation, the West Coast Regional Council established a rating district in 2011 based on the capital value of each property. An opinion survey was sent to all properties within the rating district to gauge support for what the future management of the outlet would be. The survey results showed the majority supported the simple option of periodically clearing the outlet at its current location alongside the groyne.

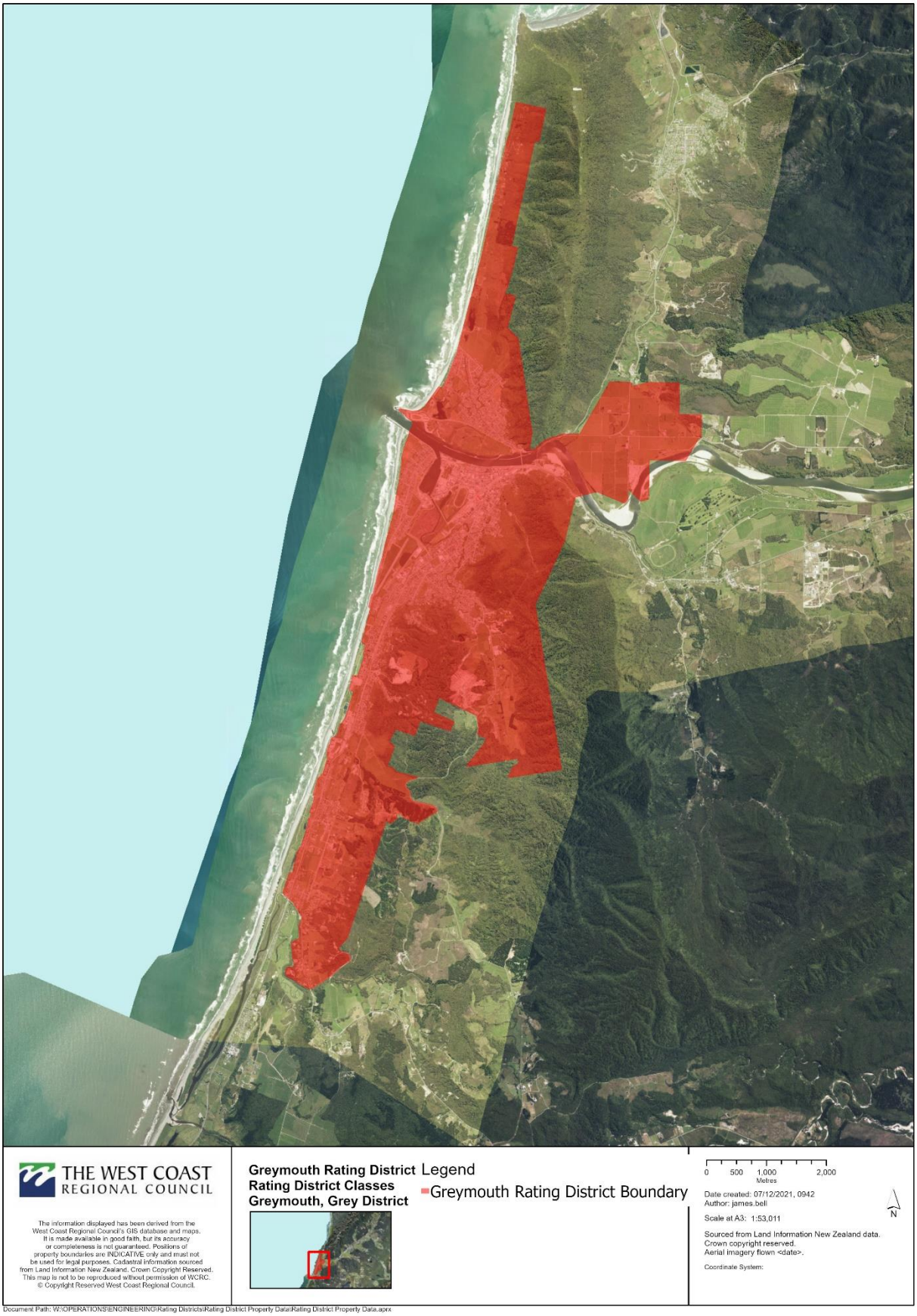
In early 2012 the outlet next to the new groyne became blocked. By July the back-up of water had reached the trigger-point and the outlet was re-opened. The following year, the outlet blocked again, and was re-opened in May 2013.

In June 2013 a combination of rough seas and flooding in New River allowed the river to form a new outlet directly downstream of the New River bridge. Saltwater Creek maintained a separate outlet next to the groyne until July, when both outlets closed due to a build-up of gravel. In August the water again reached the trigger point and the outlet was re-opened next to the groyne.

The current situation is that a combined Saltwater Creek / New River mouth has again migrated south and is located below the New River bridge. Should this new mouth close, and the back-up of water reaches the trigger point, then the outlet will again be re-opened next to the groyne.

After the Long Term Plan consultation in 2021, Council decided to disband the New River/Salt Water Creek rating district. Some properties that were part of this rating district will now be part of the Greymouth Rating District, which was also part of the 2021 LTP consultation. All maintenance and existing standards will now be administered under the Greymouth Rating District.

4.0 Greymouth Rating District Map



5.0 Description of Assets

5.1 Description of Assets - GREYMOUTH

Asset	Quantity	Unit	Rate
Top course, basecourse (AP40)	10,227	M3	$67.01
AP65	1,584	M3	$54.94
Fill Material	172,606	M3	$41.00
Blanket	2,358	M3	$44.67
Rock	47,387	Tonnes	$81.00
Rubble	3,168	Tonnes	$52.00
Topsoil	5,204	M3	$125.00
Clay Material	64,962	M3	$41.00
Filter Material	10,013	M3	$41.00
Basecourse & Surface Restoration	170	M3	$109.38
Topsoil & Grassing	1	LS	$44,000.00
Asset value			$15,744,738.87
Contingencies			$2,361,710.83
Resource Consents			$362,128.99
Replacement Cost			**$18,468578.69**
Depreciating Assets			
Structures			$3,976411.62
All Assets Replacement Cost			**$22,444,990.32**

5.3 Asset Map

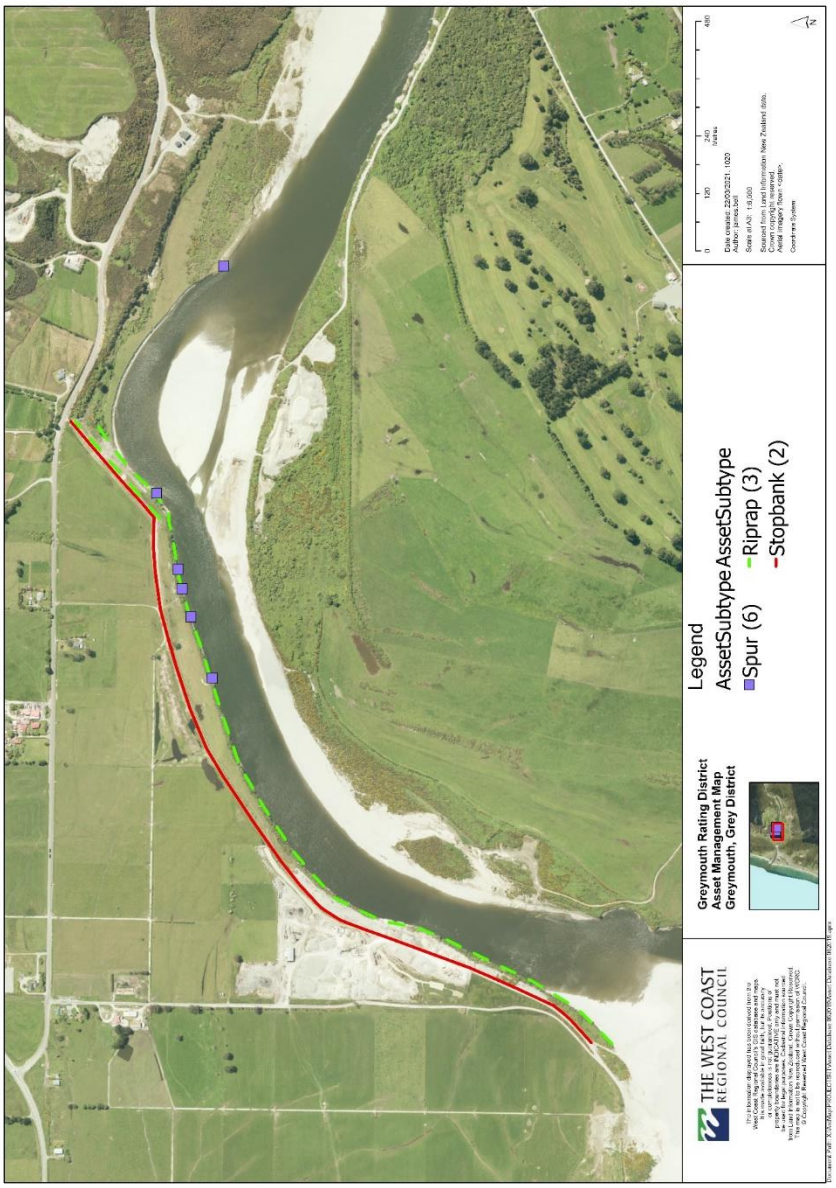

THE WEST COAST
REGIONAL COUNCIL
The information displayed has been derived from the West Coast Regional Council's GIS database and maps. It is made available in good faith, but its accuracy or completeness is not guaranteed. Positions of property boundaries are INDICATIVE only and must not be used for legal purposes. Cadastral information sourced from Land Information New Zealand. Crown Copyright Reserved. This map is not to be reproduced without permission of WCRC. © Copyright Reserved West Coast Regional Council.
Greymouth Rating District
Asset Management Map
Greymouth, Grey District
Legend
AssetSubtype AssetSubtype
Floodgate (2) Riprap (1)
Stopbank (8)
0 225 450 900
Metres
Date created: 19/03/2021, 1550
Author: james.bell
Scale at A3: 1:10,938
Sourced from Land Information New Zealand data.
Crown copyright reserved.
Aerial imagery flown <date>.
Coordinate System:
N
Document Path: X:\ArcMap\FRDJFCT\911\Asset Database 08\2019\Asset Database 08\2019.aprx

5.4 Description of Assets – COAL CREEK

The Coal Creek Rating District manages a 1.9 km stopbank on the right bank of the Grey River, protecting the Coal Creek Flats; this stopbank is protected by 1.8 km of rock rip rap. The area protected is predominantly dairy farming with some dry-stock properties. Community infrastructure such as roads, power and telephone lines all derive benefit from the river control system as well as recreational facilities and industrial properties.

Asset	**Quantity**	**Unit**	**Rate**
Rock	46,099	Tonne	$62.00
Fill	49,200	m^3	$26.00
Top course	580		$35.01
Asset Value			**$4,157,643.80**
On-costs (15%)			*$623,646.57*
Resource Consents (2%)			*$95,625.81*
Total Asset Value			**$4,876,916.18**
Asset Value as of 1 July 2023			

5.6 Asset Map



Note: Not all assets have been added to the asset map due to having no spatial data to represent them.

5.7 Combined Asset Value

Total Assets Value as at 1st July 2023	
Greymouth	**$22,444,990.32**
Coal Creek	**$4,876,916.18**
New River	**$0.00**
Total Including Contingencies	**$27,321,906.50**

6.0 Existing Standard

Greymouth

The scheme now protects the town from a 6,600 cumec flood event (the revised 50 Year Return Period Flood Event) with 600mm freeboard. A flood of this size has a 2% chance of occurring in any given year. Parts of the floodwalls (the concrete sections) have been built up higher to the 7,400 cumec plus freeboard level in anticipation that the community will eventually wish to build the earth structures up to this higher protection level.

Coal Creek

The historic "Existing Standard" was 900mm above the highest known flood. The Council has suggested to the rating district that a new flood capacity analysis should be commissioned. However, the rating district has decided that they do not wish to have any flood analysis undertaken to quantify the actual level of protection that the scheme currently provides.

New River

The objective of the New River Rating District is to limit the flooding associated with the backup of New River and Saltwater Creek at Paroa, by creating a temporary diversion through to the sea, south of the groyne.

6.1 Service Level

The Levels of Service represented in this AMP are described and aligned with community values including affordability, quality, safety, community engagement, reliability and sustainability. Councils in New Zealand will generally adopt one of three methods for determining the level of service provided by a scheme:

- Agreeing on a scope of physical works with the community without reference to a target capacity or return period (low risk schemes)
- Providing physical works with a level of performance provided in terms of a target capacity (medium risk schemes)
- Providing physical works with a level of performance in terms of a target return period (high risk schemes)

Each of the three methods for determining the level of service may be suitable for a given scheme, provided that communities understand event likelihood, scheme and property vulnerability, potential consequences, and residual risk.

Where council staff have recommended physical works or analysis that did not proceed due to community resistance to cost, then councils are only able to track their service delivery through measures around maintenance works programmes or a general description of asset condition.

A key level of service for the Greymouth Floodwall is to prevent flooding of the townships of Greymouth, Cobden and Blaketown from the Grey River for flood events up to 6,600 cumecs.

6.2 Maintenance Programme

The maintenance of the Greymouth Floodwall can be broken into two categories:

1. Stopbanking

2. Erosion Control

Stopbank Maintenance

Maintenance includes repair of any scouring, vegetation removal to facilitate access and to optimize berm flow, control of vehicle access to prevent damage to stopbank batter slopes, topping up of stopbanks as required to maintain stopbank capacity in terms of design, maintenance of grass cover, maintenance of drainage provision, routine and flood surveillance operations and reporting.

Construction of drainage and sewage lines and other utility services that penetrate the bank provide potential lines of weakness through the structure. Unless proper precautions are taken in the design and construction of these penetrations there is a risk that they may become preferential lines for seepage flow. Where pressurised pipelines such as pumped drainage outfalls are installed or malfunctioning floodgates exist premature saturation of the stopbank core can occur under flood conditions which in turn may lead to a loss of strength from elevated soil pore water pressures or induce internal erosion of the stopbank core or its foundation.

Stopbanks can be damaged in the event of an earthquake by cracking where displacement occurs, or by liquefaction of the foundation material. These actions may result in subsidence, slumping or spreading. The probability of seismic damage coinciding with a flood is considered remote.

Erosion Control Works

Erosion control works consist of continuous rock rip rap facings of specific sections of stopbanking. Erosion control facings are designed and constructed to provide protection to the stopbanks core from the river's erosive forces during floods.
Rock is used in the formation of these facings of the required grading to resist the forces (velocity) of the river. Routine maintenance ensures the coverage and stability of rock rip rap on stopbanks is maintained to lessen the risk of failure.

Any slumping of rock rip rap is topped up with rock that has acceptable durability, angularity and appropriate grading to provide the required protection to the underlying structure.

Where slumping of rock rip rap facings has occurred, an assessment needs to be made to ascertain cause prior to remedial works being executed in order to ensure as far as is reasonably practical the failure mechanism is thoroughly understood and an appropriate remedy found.

An annual maintenance programme will be prepared each year in consultation with the Joint Floodwall Committee prior to adoption by the Regional Council for inclusion in the Annual Plan.

In preparing the annual maintenance programme consideration will be given to:

- An inspection to identify works requiring immediate repair.
- Works anticipated as being required given a 'normal' season.
- Flexibility to meet unbudgeted damages.
- Surveillance, reporting and investigations

An annual report will be presented to the Joint Flood Wall Committee outlining maintenance expenditure for the financial year.

6.3 Damage Exposure

River control works are constructed in a very high energy environment with the purpose of resisting and absorbing some of that energy. It is considered that no matter what the standard of maintenance carried out, it is inevitable that damage will occur to structures.

In the years since their construction the sections of bank faced with rock riprap have been exposed to three flood events with flows in excess of 4,000 cumecs without appreciable damage.

The mean annual flood of the Grey River at the Dobson hydrometric station is currently estimated at 3,840 cumecs. Whilst the possibility exists for premature failure of the stopbanks, performance to date indicates that the most likely cause of failure will be over topping with flows in excess of the design capacity.

Event size (AEP)	Value	Damage ratio	Damage exposure	Prudent Reserve	Prudent reserve contribution
10%	$27,321,907	2%	$546,438	$546,438	100%
5%	$27,321,907	4%	$1,092,876	$765,013	70%
2%	$27,321,907	8%	$2,185,753	$1,092,876	50%

It has been deemed, within reason, that all Rating Districts have a prudent reserve target balance that contributes to at least 100% of the damage exposure for a 10% AEP event, 70% for a 5% AEP event and 50% for a 2% AEP event. These percentages define what is an appropriate and acceptable level of risk for Council and the community.

6.4 Prudent Reserve

Why do we need a prudent reserve?

- Minimise the financial impact of unplanned works, such as those caused by weather events
- Ensure the rating district is able to contribute funding that is sustainable and affordable
- Ensure Council's debt level is managed, and that borrowing is still available when required
- Ensure the debt levels of the rating district do not exceed the ability to fund the repayments

This target balance for the 'prudent reserve' for this rating district is $400,000 as agreed by council. This prudent reserve is immediately available. It is likely the current reserve will only cover a portion of the actual cost of the potential damage that could occur.

If an event were to occur and the prudent reserve does not cover the full repair and rebuild cost of the assets, it is understood by the community that the remaining costs will be paid by loan or the rating district accounts will be in overdraft. In the instance of extreme weather events, NEMA funding and the Councils private insurance will be accessed for cost recovery if the criteria are met. The West Coast Regional Council's insurance policy has a $250,000 excess. 40% of eligible rebuild costs will be met by this policy.

Below are the key criteria that needs to be met to access the NEMA funding, which can cover up to 60% of eligible rebuild costs

The provisions for government financial support to local authorities apply whether or not a state of emergency is, or has been, in force

Government assistance will not normally be available for assets which receive a subsidy from any other source, unless:

- *the local authority has adequately protected itself through asset and risk management including mitigation, where appropriate, and the proper maintenance of infrastructure assets, or*
- *the local authority has made sound financial provisions (such as the provision of reserve funds, effective insurance or participation in a mutual assistance scheme with other local authorities) to a level sufficient to ensure that the local authority could reasonably be expected to meet its obligation to provide for its own recovery*

Threshold

Threshold for reimbursement; As with other response claims, Government policy is to reimburse 60 percent of the combined eligible costs (response and essential infrastructure costs), above the following thresholds:

- *0.0075 percent of the net capital value of the city council, district council or unitary authority involved*
- *0.002 percent of the net capital value of unitary authorities where the assets in question are of a type that ordinarily are managed by regional councils, or*
- *0.002 percent of net capital value in the case of regional councils*

7.0 Funding

7.1 Maintenance

Maintenance is funded by targeted rates, the level of rating being determined each year in the Annual Plan process. This involves:

a) Preparation of an annual works programme and corresponding budget in consultation with the Greymouth Joint Floodwall Committee.

b) Adoption of the annual works programme and budget by the Greymouth Joint Floodwall Committee.

c) Discussion of the works report and budget with the ratepayers.

d) Adoption of final budget in the Council's Annual Plan.

The aim of maintenance is to ensure the infrastructure assets are kept at a standard where they can always perform to their service level. Where rock is required to be placed on an existing stopbank under direct attack from the river, the protection required to maintain the existing stopbank at its same service potential would be charged to the scheme maintenance account.

Capital works are generally defined as works which increase the service level of the scheme. Such work would include increasing the design standard or the area covered by a scheme and works to increase security or performance of an erosion control system or structure over and above that identified in the asset plan.

7.2 Damage Repairs

Routine damage repairs are funded by a combination of:

a) Carrying out work as scheduled in annual works programme.

b) Reprioritising works identified in the annual works programme.

c) Use of financial reserves.

Major damage repairs would be funded by loans raised by the Council and repaid by targeted rating over a number of years.

7.3 Financial Reserves

Financial reserves are held within the rating district account to:

a) Meet the costs of unscheduled works.

b) Enable an immediate response to flood damage repairs.

c) Prevent major fluctuation in rating levels annually.

The levels of financial reserves held in the rating account are determined by the estimated damage exposure and the likely need for un-programmed works.

7.4 Depreciation

The bulk of WCRC's assets comprise bulk formation of excavation, fill and heavy rock protection. These assets are considered to have an infinite Useful Life (UL) with a strategy to maintain in perpetuity. The predominant mechanisms for deterioration are slumping and or storm or flood event damage. In these circumstances the performance and level of service is brought back to specification by remedial and / or emergency works from operational and maintenance budgets. Otherwise, these assets do exist in perpetuity.

From 2023 WCRC have recognized the difference between operational and maintenance expenditure (typically to remediate after an event) and capital expenditure that improves performance or level of service, or reduces risk. The former are not capitalised, the latter are capitalised and are added to the asset register and valuation.

Assets with an infinite Useful Life do not depreciate, so these assets are valued separately as non-depreciating.

Asset components in this category include:

- Excavation
- Cleanout (of natural water courses for utilisation as drains)
- Fill
- Rock protection
- Top course, differentiated from normal road assets in that life and deterioration mechanisms are the same as for the stopbanks they traverse

- Bedding gravel and filter fabric noting that even if fabric deteriorates it would not be replaced unless the stopbank itself was being replaced, or it was being replaced as part of an event remedy operation and maintenance.

Around 3.4%, by replacement cost value, of WCRC's assets are of a nature that will deteriorate, have a limited useful Life, and hence are depreciating. These include:

- Culverts and associated assets
- Constructed assets such as concrete flood walls in Greymouth
- Miscellaneous assets.

8.0 Performance Measures

The overall performance measure is that the infrastructure assets are maintained to meet their service levels at all times. This includes:

1. Ensuring floodbanks continue to protect the town from a 6,600 cumec flood event plus freeboard (Greymouth Stopbanks Only).
2. Maintaining rock rip rap facings and grass cover on stopbanks to prevent active erosion of the stopbank core.
3. Maintaining stopbank drainage systems to control seepage flows and prevent internal erosion of the stopbank core and foundation and loss of stability.

The following procedures may be adopted to ensure the adequacy of maintenance.

<table>
<tr><th>Period</th><th>Procedure</th><th>Performance Measure</th></tr>
<tr><td rowspan="4">Annually</td><td>Produce annual works reports for the rating district to include type of work to be undertaken, quantities, location and costs.</td><td rowspan="4">1. No reports of reduced freeboard anywhere along the stopbank system, without an agreed hydraulic and hydrological investigation in progress and a precursor to consideration of appropriate response measures.

2. No reports of:
- stopbanks and bank protection erosion requiring repairs
- sand size or greater erosion products being present in seepage flows exiting the stopbanks or their foundations under flood conditions
- Increasing seepage flows exiting the stopbanks or their foundations under flood conditions
- obstructed stopbank drainage facilities
- Cracking of stopbank crest
- Evidence of slumping or foundation heave

Without an agreed programme of remedial work in progress.</td></tr>
<tr><td>Organise contracts for agreed scheme work, oversee contract completion and report to Council.</td></tr>
<tr><td>Report on works undertaken during the previous financial period to the rating district ratepayers and Council.</td></tr>
<tr><td>Inspect all works and prepare a maintenance programme and budget.</td></tr>
<tr><td>Decennial</td><td>Re-survey all river cross-sections between the Grey River mouth and the Cobden bridges and re-evaluate the hydraulic capacity of the stopbank system and report findings against the current design standard.</td><td>Report to Council and ratepayers on revaluation of assets and the Plan review.</td></tr>
</table>

	Re-measure cross section river profiles and carry out a comparative analysis with preceding surveys to establish possible bed level trends and effects on flood carrying capacity.	
	Carry out an assessment of hydrology at the Dobson recorder and update for scheme design discharge and report findings.	
	Revaluation of the existing infrastructural assets to include any additional volumes to stopbanks and bank protection works from previous reviews.	
	Critically evaluate the performance of the stopbank under service conditions with particular emphasis on seepage control and stability.	

8.1 AMP Review and Monitoring

This plan is a living document, which is relevant and integral to daily activity. To ensure the plan remains useful and relevant the following on-going process of AMP monitoring and review activity will be undertaken:

- Formal adoption of the AMP by the West Coast Regional Council.
- Review and formally adopt Levels of Service to comply with the Joint Floodwall Committee.
- Revise this AMP three-yearly prior to the Long Term Plan (LTP) to incorporate and document changes to works programmes and outcome of service level reviews.
- Quality assurance audits of asset management information to ensure the integrity and cost effectiveness of data collected.
- Peer review and external audits will be undertaken to assess the effectiveness with which this plan meets corporate objectives. Periodic internal audits will be undertaken to assess the adequacy of asset management processes, systems and data and external audits will be undertaken to measure asset management and performance against ‘best practice’.