SOUTH WAIRARAPA DISTRICT COUNCIL
Kia Reretahi Tātau

ASSETS AND SERVICES COMMITTEE

Agenda

NOTICE OF MEETING

An ordinary meeting will be held in the Supper Room, Waihinga Centre, Texas Street, Martinborough on Wednesday 16 December 2020 at 9:00am. The meeting will be held in public (except for any items specifically noted in the agenda as being for public exclusion).

MEMBERSHIP OF THE COMMITTEE

Councillors Brian Jephson (Chair), Garrick Emms, Rebecca Fox, Pip Maynard, Alistair Plimmer, Ross Vickery and Mayor Alex Beijen.

Open Section

A1. Apologies

A2. Conflicts of interest

A3. Public participation

As per standing order 14.17 no debate or decisions will be made at the meeting on issues raised during the forum unless related to items already on the agenda.

A4. Actions from public participation

A5. Extraordinary business

A6. Minutes for Confirmation: Pages 1-4

Assets and Services Committee Minutes of 4 November 2020

***Proposed Resolution**: That the minutes of the Assets and Services Committee meeting held on 4 November 2020 are a true and correct record.*

B. Decision Reports

B1. Draft Roading Activity Management Plan Pages 5-128

C. Information and Verbal Reports from Chief Executive and Staff

D. Member and Appointment Reports

***Proposed Resolution**: To receive members' reports.*

SOUTH WAIRARAPA DISTRICT COUNCIL
Kia Reretahi Tātau

ASSETS AND SERVICES COMMITTEE
Minutes from 4 November 2020

Present:	Councillors Brian Jephson (Chair), Garrick Emms, Alistair Plimmer, Ross Vickery and Mayor Alex Beijen (from 9:20am). Via audio-visual link: Cr Rebecca Fox (from 9:38am).
In Attendance:	Euan Stitt (Group Manager Partnerships and Operations), Harry Wilson (Chief Executive), Karen Yates (Policy and Governance Manager), Amy Wharram (Communications Manager), Jorja Bramley (Communications Advisor), Russell O'Leary (Planning and Environment Group Manager) and Suzanne Clark (Committee Advisor). Wellington Water: Colin Crampton, Ian McSherry, Jeremy McKibbin, Stephen Wright and Linda Fairbrother.
Conduct of Business:	The meeting was held in the Supper Room, Waihinga Centre, Texas Street, Martinborough and was conducted in public between 9:00am and 11:20am except where expressly noted.
Also in Attendance:	Perry Cameron (public participation). Cr Brenda West and via audio-visual link: Cr Pam Colenso and Cr Leigh Hay.

Open Section

A1. Apologies

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/57) to receive apologies from Cr Pip Maynard and lateness apologies from Cr Rebecca Fox.

(Moved Cr Plimmer/Seconded Cr Vickery) Carried

A2. Conflicts of Interest

Cr Emms noted that he may have a conflict of interest with agenda item 'B3 Featherston Wastewater Treatment Plant Consent Update'.

A3. Public Participation

Mr Cameron's family trust owned land in Lake Ferry and had worked with previous council officers to get a wastewater system in place suitable for 200 residents. The South Wairarapa Biodiversity Group had undertaken plantings in the area. Mr Cameron had concerns about the performance of the wastewater system and would like to be kept informed of any developments.

A4. Actions from Public Participation

Members deferred discussion of Mr Cameron's submission until agenda item B2 Lake Ferry Wastewater Incident Report.

A5. Extraordinary Business

There was no extraordinary business.

A6. Minutes for Confirmation

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/58) that the minutes of the Assets and Services Committee meeting held on 23 September 2020 are a true and correct record.

(Moved Cr Plimmer/Seconded Cr Vickery) Carried

B Information and Verbal Reports from Chief Executive and Staff

B1. Partnerships and Operations Report

Mr Stitt answered questions regarding Wellington Water staff qualifications, water race management arrangements, the coastal erosion report, Featherston War Memorial lighting, extension of library services to include Masterton and roading reseals.

Mayor Beijen joined the meeting at 9:20am.

Wellington Water staff presented a cost estimating model and discussed estimating difficulties and budget credibility concerns, wastewater project capacities, staffing capacity and capability, accessibility to and communications with elected members, and correct scoping and costing of the Pinot Grove and Papawai projects with councillors.

Mr Wilson advised that there were no national standards for wastewater, but that standards were lifting as Council's projects were developing.

Cr Fox joined the meeting at 9:38am.

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/59):

1. To receive the Partnerships and Operations Report.

   (Moved Cr Emms/Seconded Cr Jephson) Carried

2. Action 591: Review whether additional lighting can be placed on or around the Featherston War Memorial; E Stitt

B3. Featherston Wastewater Treatment Plant Consent Update

Wellington Water outlined the status of the Featherston Wastewater Treatment Plant including work undertaken to look at objectives and drivers, community engagement, and assembling of 16 ideas/options. Community feedback will be used to produce a short list for development and range estimate costing.

Wellington Water addressed members concerns relating to why the project was starting at square one, choice of wording, and a review of community engagement material.

Mr Crampton advised that Greater Wellington Regional Council weren't prepared to withdraw the Featherston Wastewater consent without a plan for a new consent being in place. The current work programme would address this requirement.

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/60):

1. To receive the Featherston Wastewater Treatment Plant Update Report.

(Moved Cr Plimmer/Seconded Cr Vickery) Carried

B2. Lake Ferry Wastewater Incident Report

The meeting adjourned at 10:33am.

The meeting reconvened at 10:45am.

Wellington Water outlined the issues with the Lake Ferry wastewater system noting that the consent conditions were not being breached but it was unclear whether conditions permitted longer term use of UV treatment while repairs were being made. A final solution and cost would be available by the next meeting.

The Committee agreed that further discussions with the tree felling contractor regarding steps taken to protect the asset prior to works should be undertaken.

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/61):

1. To receive the Lake Ferry Wastewater Incident Report.

(Moved Mayor Beijen/Seconded Cr Jephson) Carried

B4. Drinking Water and Wastewater Improvement Programme Update

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/62) to receive the Drinking Water and Wastewater Improvement Programme Update Report.

(Moved Cr Plimmer/Seconded Cr Vickery) Carried

B5. Papawai Road and Pinot Grove Wastewater Cost Uplift Report

Members provided direction to Wellington Water on the production of fact sheets on the projects and deferred consideration of this report.

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/63):

1. To receive the Papawai Road and Pinot Grove Wastewater Cost Uplift Report.

(Moved Cr Jephson/Seconded Cr Plimmer) Carried

2. Action 596: Deliver fact sheets covering why the Papawai Road and Pinot Grove wastewater projects were undertaken, current and future capacity projections, how the budget was set and a conclusion on how Council will be assured of best value for money; E Stitt

B6. Consent Application for Ecoreef Trial Project Report

Members discussed project start timeframes and whether halting natural erosion could be achieved in the long term.

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/64) to receive the Consent Application for Ecoreef Trial Project Report.

(Moved Cr Emms/Seconded Cr Vickery) Carried

B7. Action Items Report

ASSETS AND SERVICES COMMITTEE RESOLVED (A&S2020/65) to receive the Action Items Report.

(Moved Cr Plimmer/Seconded Cr Emms) Carried

Confirmed as a true and correct record

……..(Chair)

……..(Date)

ASSETS AND SERVICES COMMITTEE

16 DECEMBER 2020

AGENDA ITEM B1

DRAFT ROADING ACTIVITY MANAGEMENT PLAN

Purpose of Report

To provide Councillors with an update on the Draft Roading Activity Management Plan and seek input to its strategic direction.

Recommendations

Officers recommend that the Committee:

1. *Receive the Draft Roading Activity Management Plan Report*
2. *Consider the Activity Management Plan and provide strategic feedback for consideration.*

1. Executive Summary

The Roading Activity Management Plan (AMP) is the key tool to support Council's funding request from the Waka Kotahi (NZTA) National Land Transport Plan (NLTP) for the 2021 -2024 period. This AMP supports the Land Transport funding request within the SWDC Long Term Plan (LTP) for the same period.

The AMP has been developed in collaboration with the Carterton District Council, as part of the Ruamahanga Roads shared services model, and is the only such collaborative plan within the Wellington Region.

2. Discussion

2.1 What the AMP is for

The AMP brings together all levels of transport planning and delivery together with the goals, strategies and expectations of the Government Policy Statement (GPS) by improving investment decision making.

The AMP is still in draft form and the budgets contained within it have not been agreed by either Councils or Waka Kotahi.

The AMP in its draft form is being shared with Councillors at this time to improve engagement and visibility into the work planned and budgeted for through the LTP. As such, it provides further detail on the following matters:

- the detail specified in clause 2 of schedule 10 of the Local Government Act 2002,
- an awareness of community views and expectations relating to the use of the land transport network,
- evidence of links to regional and national land transport strategies and targets,
- proposed transport levels of service targets and implementation plans,
- the organisation's transport demand management strategy, including demand forecasts and the proposed additional asset capacity, non-asset-based solutions (including inter-agency and community initiatives), or changes to service levels and standards,
- life-cycle management strategies,
- current asset value, annual depreciation, asset condition and expected asset lives,
- major risks and a risk management strategy (including safety and sustainability issues),
- how best value for money will be achieved in the delivery of its land transport services,
- the organisation's procurement strategy for the activities in the plan,
- the organisation's decision-making and prioritisation process for including activities in a Regional Land Transport Plan (RLTP),
- a detailed list of activities for the first three years and an outline of actions for the following seven years,
- a financial plan that is clearly linked to an RLTP and a Long Term Plan (LTP) or Annual Plan,
- how the performance and use of the network is monitored, and
- indications of the completeness and accuracy of asset information, assumptions and financial projections.

2.2 Next Steps

As the key strategic document for planning roading strategy in the District the Committees views on the strategic direction are sought at this time.

It is intended to submit the AMP to Waka Kotahi and the Roading Excellence Group (REG) on the 11th December for moderation and to support the 2021-2024 LTP funding process. However, specific feedback from the committee can be incorporated into it after that date before it is finalised.

3. Financial Considerations

The budgeted programme outlined in the AMP supports the Council LTP and Waka Kotahi NLTP funding requests.

4. Conclusion

As a key asset for the District our Roading network requires significant expenditure to maintain and upgrade it. The AMP is the core strategic document used to drive this

investment from SWDC ratepayers and Waka Kotahi. Council's input a this stage is sought prior to it being finalised.

5. Appendices

Appendix 1 – Ruamahanga Roads Draft Roading Activity Management Plan

Contact Officer: Tim Langley, Roading Manager, Ruamahanga Roads
Reviewed By: Euan Stitt, GM Partnerships and Operations

Appendix 1 – Ruamahanga Roads Draft Roading Activity Management Plan

Ruamāhanga Roads – Asset Plan

February / 2020

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1. Index for Tables

2. Index for Graphs & Pictures

3. Executive Summary

3.1. Purpose

The purpose of this executive summary is to inform the Council's governance. This section therefore is a summary of the key information required to inform their decisions.

A fuller summary of the funding business case is provided in the next section and the body of the asset plan provides the evidence and analysis to support the Executive Summary and the funding proposal.

3.2. Roading Network

Ruamahanga Roads is the joint network of roads of South Wairarapa and Carterton District Councils.

The Road Transport network is one of the primary assets that enable the people in the community to interact with each other.

3.3. Operation & Renewal Funding Changes

3.3.1. Network Condition

The roading infrastructure is made up of assets with long lives. This means it takes some years before the asset's deterioration, as a result of underfunding of maintenance and renewal, becomes manifestly obvious to the users.

It is critical that the network's condition is addressed before deterioration fully manifests because by then the cost to remedy the situation will be extremely high. Note the New Zealand water supply & waste water services are now facing this situation where there are high costs of unplanned maintenance combined with the requirement for high renewal expenditure to remedy the situation.

3.3.2. Maintenance Cost

The overall cost of maintaining the Roading Network has increased by 18%. The primary reason for the cost increase is that the contract rates are, on average, 40% higher than 3 years ago. The overall increase is lower than 40% because the volume of work required has been reassessed based on the current trend in the roading network's condition.

3.3.3. Renewal Requirement

The renewal rate for surfacing on the South Wairarapa section of the network has been increased so the average age of surfacing is reduced from 27 years to 20 years. The renewal rate on the Carterton section of the network is reduced so an average of 20 years is achieved. Note the current average age on Carterton's section is 15 years. The Asset Plan average seal life prediction is based on the observed local performances of surfacing on the networks in South Wairarapa and Masterton Districts.

Note the overall funding required for renewals is currently lower than the amount of annual depreciation. However, as the assets get older the funding required for renewals will exceed the annual depreciation rate. Currently there is insufficient data and analysis to predict the size and timing of the peak requirement for renewal funding. The planned improvement of the asset data and analysis, over the next three years, should enable a prediction of the peak requirement and its timing.

3.3.4. Waka Kotahi Contribution

The other factor that will affect both Councils' funding over the next 3 years is that Waka Kotahi is reducing its financial assistance rate to both Councils over the next 3 years by 2% for Carterton and 1% for South Wairarapa.

3.4. The key strategic issues

The **two** strategic issues being addressed over the next 3 years are network safety and resilience.

3.4.1. Safety

An investment of $2,205,000 Carterton, $1,781,000 South Wairarapa and $348,250 Special Purpose Road is proposed over 3 years to improve the network's safety.

The safety for users of the network is a key issue and action is required to reduce death and serious accidents on the network. Action is required because:

- There are on average approximately 10 serious injuries or fatal road crashes occurring on the road network annually.
- These crashes have a significant impact on the community.
- The approximate average annual social cost to the community of these crashes is $5.0 million.

3.4.2. Resilience

The proposed investment, over the next 3 years, into projects to improve the Network's resilience is $ 30,000 Carterton, $155,000 South Wairarapa and $1,075,000 Special Purpose Road.

The resilience of the network is a key issue because climate change means that unless the network's resilience is increased there will be a higher risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion. The network's resilience needs to be improved now because, if left until climate change impacts are observed, the joint costs of repairing failures and improving the resilience will not be sustainable.

The projects required to improve resilience should also reduce the negative environmental impacts of water runoff from roads. This will occur because the most frequent action required to improve resilience will be improved management of water runoff.

3.4.3. Other Key Issues

The **other key** roading network issues and the proposed actions are set out in the following table.

Key Issue	Proposed Action over the next 3 years
1. The changing demands on the network from population growth, new developments and planned developments.	Monitor changing demands on the network and determine if a response is required in the 4 to10 year timeframe.
2. The restrictions to the travel of High Capacity Vehicles (HCVs) across the network.	$50,000 is assigned to determine the funding priority for removing the restrictions to HCV movements.
3. The negative environmental impact of road runoff.	It is expected that the negative impacts of road runoff will be addressed with the actions to improve the network's resilience.

3.5. Network Performance & REG/ Waka Kotahi Report Graphs

The following is an explanation of the key observations made on the REG/ Waka Kotahi Report Graphs shown below.

3.5.1. Statutory Performance Measures

The graphs in the Service Performance section show the achievement against the targets set by the Councils for the Statutory Performance Measures. The target not achieved by Carterton is road safety and the target not achieved by South Wairarapa is the timeframe for service request responses. The funding proposal includes funding to improve the network's safety. The new maintenance contract, which started at the beginning of 18/19 year, has improved the response to service requests.

3.5.2. Community Satisfaction

The other common measurement the Carterton and South Wairarapa networks have is the community satisfaction survey. Carterton District has a target value of 55% and has achieved 50%. South Wairarapa District split the measure into roads and footpaths with targets of 85% and 75% respectively and achieved 68% and 62% in the 2018/19 survey. The Carterton target has been achieved. However, the target is set low. Improvements to network safety performance and service requests response should lift the levels of community satisfaction with the service delivered.

3.5.3. Activity Management

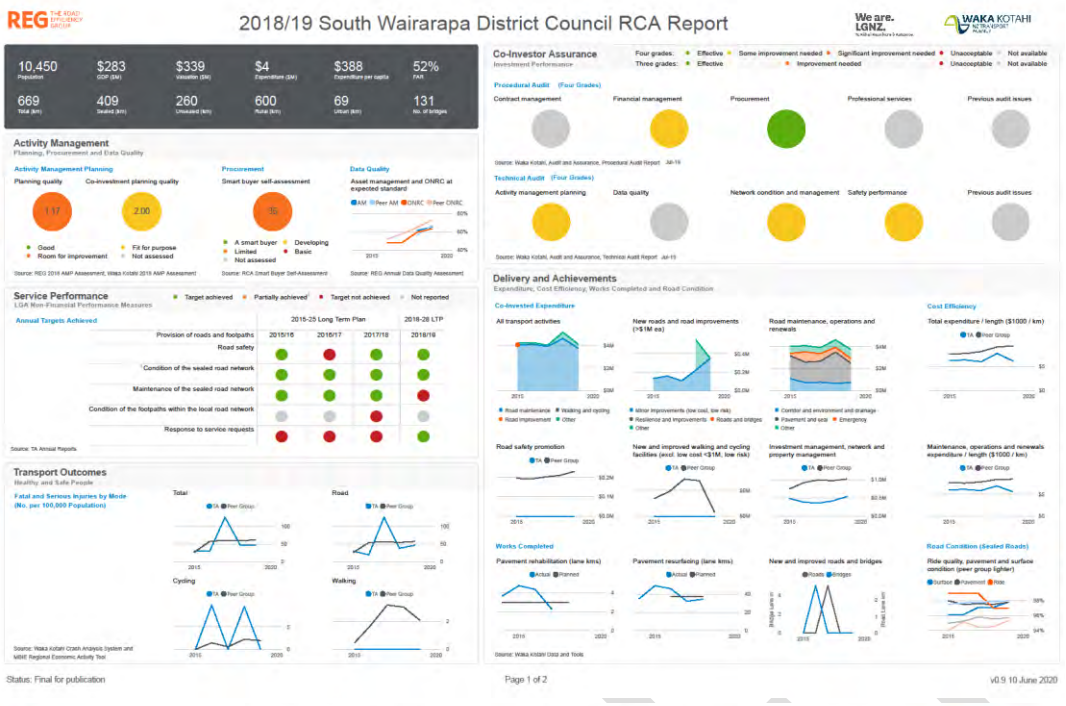
The Activity Management graphs, which show the Council's self-assessment, indicate that Planning Quality and Procurement have room for improvement and are limited. The Co-Investor Assurance section, where the assessment is made by Waka Kotahi in their audits, shows Procurement as effective and Activity Management Planning only requiring some improvement. The Ruamāhanga Roads has a procurement strategy recently approved by Waka Kotahi and has a fully revised and redrafted Asset Management Plan.

3.5.4. Delivery & Achievement

The Delivery and Achievement section graphs show that both Councils are significantly more efficient with their use of maintenance and renewal funds than their peer group. This will not significantly alter if the proposed changes in maintenance and renewal funding are adopted.

3.5.5. Safety

The Customer Outcomes section graphs show that the Collective Risk on both Councils' networks has trended up to the peer group average. The proposed investment in network safety improvements is expected to arrest this upward trend in fatal and serious injuries.


2018/19 South Wairarapa District Council RCA Report
Activity Management
Service Performance
Transport Outcomes
Co-Investor Assurance
Delivery and Achievements
Status: Final for publication
Page 1 of 2
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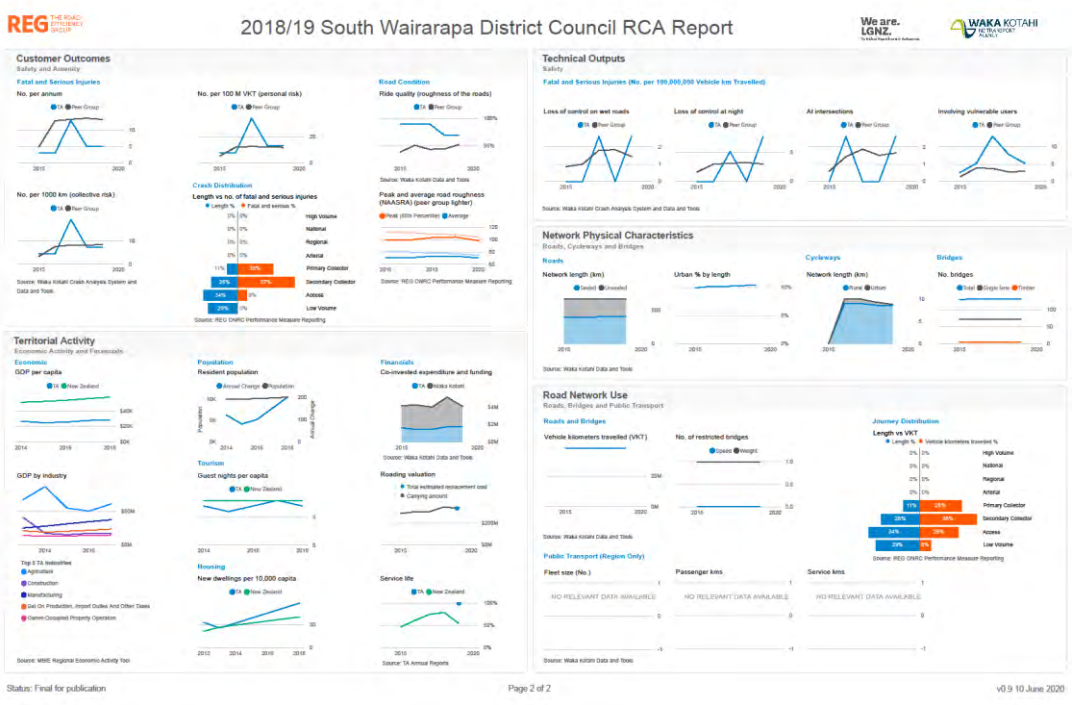
2018/19 South Wairarapa District Council RCA Report
Customer Outcomes
Technical Outputs
Territorial Activity
Network Physical Characteristics
Road Network Use
Status: Final for publication
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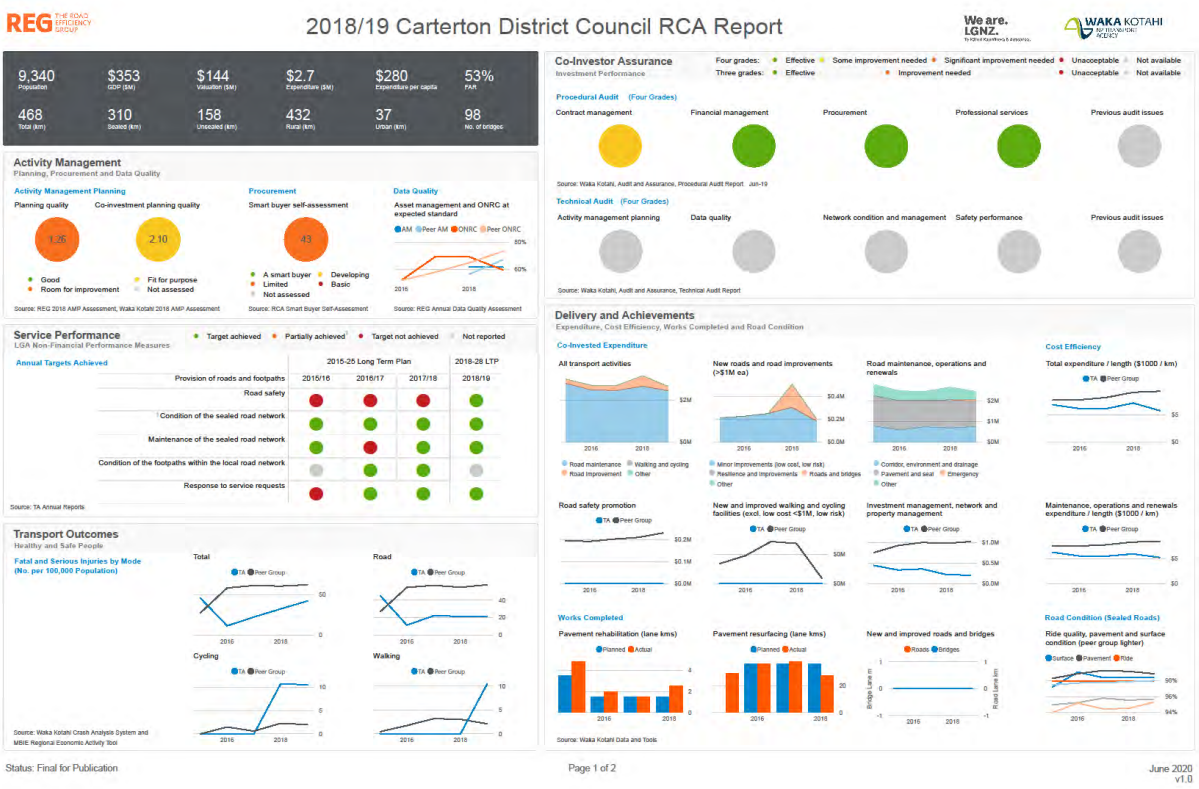
2018/19 Carterton District Council RCA Report
We are. LGNZ.
WAKA KOTAHI
9,340 Population
$353 GDP ($M)
$144 Valuation ($M)
$2.7 Expenditure ($M)
$280 Expenditure per capita
53% FAR
468 Total (km)
310 Sealed (km)
158 Unsealed (km)
432 Rural (km)
37 Urban (km)
98 No. of bridges
Activity Management
Planning, Procurement and Data Quality
Activity Management Planning
Planning quality
Co-investment planning quality
1.26
2.10
Good
Room for improvement
Fit for purpose
Not assessed
Procurement
Smart buyer self-assessment
43
A smart buyer
Developing
Limited
Basic
Not assessed
Data Quality
Asset management and ONRC at expected standard
AM
Peer AM
ONRC
Peer ONRC
Source: REG 2018 AMP Assessment, Waka Kotahi 2018 AMP Assessment
Source: RCA Smart Buyer Self-Assessment
Source: REG Annual Data Quality Assessment
Co-Investor Assurance
Investment Performance
Four grades: Effective Some improvement needed Significant improvement needed Unacceptable Not available
Three grades: Effective Improvement needed Unacceptable Not available
Procedural Audit (Four Grades)
Contract management
Financial management
Procurement
Professional services
Previous audit issues
Source: Waka Kotahi, Audit and Assurance, Procedural Audit Report Jun-19
Technical Audit (Four Grades)
Activity management planning
Data quality
Network condition and management
Safety performance
Previous audit issues
Source: Waka Kotahi, Audit and Assurance, Technical Audit Report
Service Performance
LGA Non-Financial Performance Measures
Target achieved
Partially achieved
Target not achieved
Not reported
Annual Targets Achieved
2015-25 Long Term Plan
2018-28 LTP
2015/16
2016/17
2017/18
2018/19
Provision of roads and footpaths
Road safety
Condition of the sealed road network
Maintenance of the sealed road network
Condition of the footpaths within the local road network
Response to service requests
Source: TA Annual Reports
Delivery and Achievements
Expenditure, Cost Efficiency, Works Completed and Road Condition
Co-Invested Expenditure
All transport activities
New roads and road improvements (>$1M ea)
Road maintenance, operations and renewals
Road maintenance
Walking and cycling
Road improvement
Other
Minor improvements (low cost, low risk)
Resilience and improvements
Roads and bridges
Corridor, environment and drainage
Pavement and seal
Emergency
Cost Efficiency
Total expenditure / length ($1000 / km)
Road safety promotion
New and improved walking and cycling facilities (excl. low cost <$1M, low risk)
Investment management, network and property management
Maintenance, operations and renewals expenditure / length ($1000 / km)
Works Completed
Pavement rehabilitation (lane kms)
Pavement resurfacing (lane kms)
New and improved roads and bridges
Road Condition (Sealed Roads)
Ride quality, pavement and surface condition (peer group lighter)
Source: Waka Kotahi Data and Tools
Transport Outcomes
Healthy and Safe People
Fatal and Serious Injuries by Mode (No. per 100,000 Population)
Total
Road
Cycling
Walking
Source: Waka Kotahi Crash Analysis System and MBIE Regional Economic Activity Tool
Status: Final for Publication
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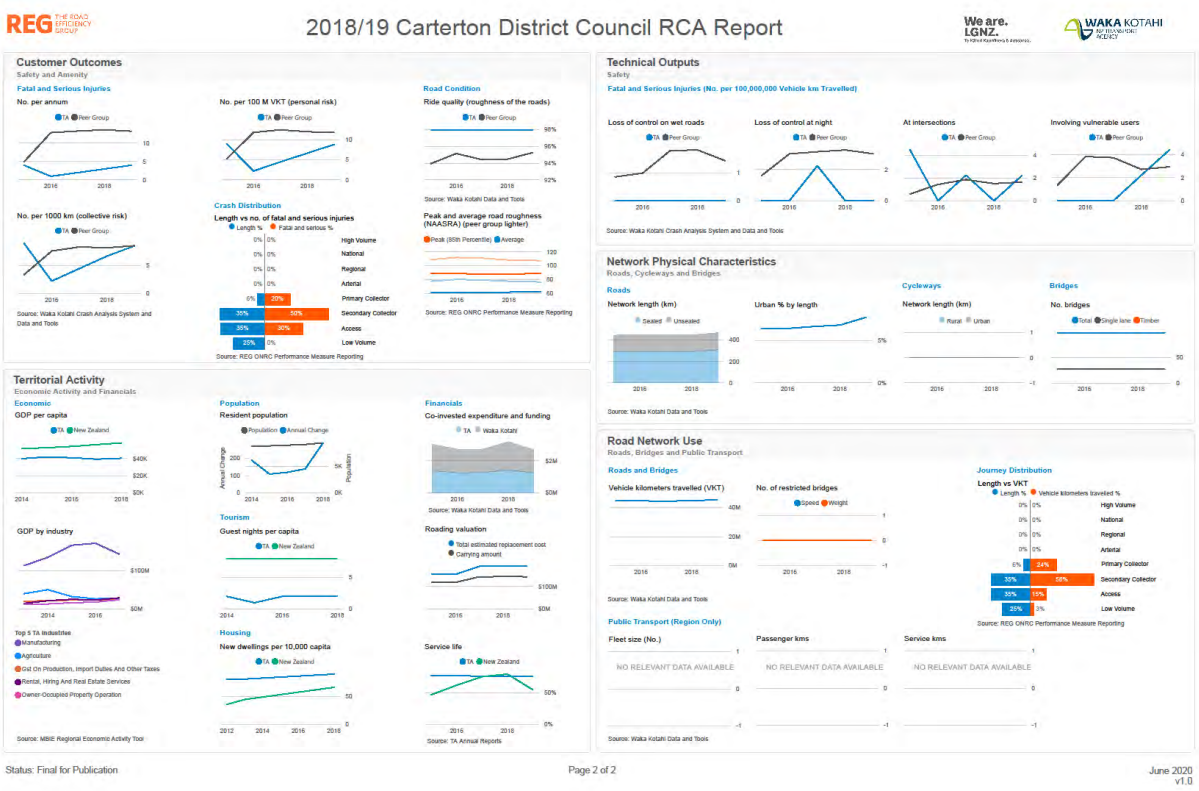
v1.0


2018/19 Carterton District Council RCA Report
We are. LGNZ.
WAKA KOTAHI
Customer Outcomes
Safety and Amenity
Fatal and Serious Injuries
No. per annum
No. per 100 M VKT (personal risk)
No. per 1000 km (collective risk)
Source: Waka Kotahi Crash Analysis System and Data and Tools
Crash Distribution
Length vs no. of fatal and serious injuries
High Volume
National
Regional
Arterial
Primary Collector
Secondary Collector
Access
Low Volume
Source: REG ONRC Performance Measure Reporting
Road Condition
Ride quality (roughness of the roads)
Source: Waka Kotahi Data and Tools
Peak and average road roughness (NAASRA) (peer group lighter)
Peak (85th Percentile)
Average
Source: REG ONRC Performance Measure Reporting
Technical Outputs
Safety
Fatal and Serious Injuries (No. per 100,000,000 Vehicle km Travelled)
Loss of control on wet roads
Loss of control at night
At intersections
Involving vulnerable users
Source: Waka Kotahi Crash Analysis System and Data and Tools
Network Physical Characteristics
Roads, Cycleways and Bridges
Roads
Network length (km)
Sealed
Unsealed
Urban % by length
Cycleways
Network length (km)
Rural
Urban
Bridges
No. bridges
Total
Single lane
Timber
Source: Waka Kotahi Data and Tools
Territorial Activity
Economic Activity and Financials
Economic
GDP per capita
New Zealand
GDP by industry
Top 5 TA Industries
Manufacturing
Agriculture
Gst On Production, Import Duties And Other Taxes
Rental, Hiring And Real Estate Services
Owner-Occupied Property Operation
Source: MBIE Regional Economic Activity Tool
Population
Resident population
Population
Annual Change
Tourism
Guest nights per capita
Housing
New dwellings per 10,000 capita
Financials
Co-invested expenditure and funding
Waka Kotahi
Source: Waka Kotahi Data and Tools
Roading valuation
Total estimated replacement cost
Carrying amount
Service life
Source: TA Annual Reports
Road Network Use
Roads, Bridges and Public Transport
Roads and Bridges
Vehicle kilometers travelled (VKT)
No. of restricted bridges
Speed
Weight
Source: Waka Kotahi Data and Tools
Journey Distribution
Length vs VKT
Length %
Vehicle kilometers travelled %
High Volume
National
Regional
Arterial
Primary Collector
Secondary Collector
Access
Low Volume
Source: REG ONRC Performance Measure Reporting
Public Transport (Region Only)
Fleet size (No.)
Passenger kms
Service kms
NO RELEVANT DATA AVAILABLE
Source: Waka Kotahi Data and Tools
Status: Final for Publication
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June 2020
v1.0

4. Funding Case Summary

4.1. Ruamāhanga Roads – Asset Plan

Ruamahanga Roads is the joint network of roads of South Wairarapa and Carterton District Councils. South Wairarapa and Carterton Districts lie in the far south of the North Island in the eastern part of the Wellington region. The purpose of this asset plan document is to draw together the information from the asset management analysis to determine the funding needs of the Ruamāhanga Roading network. The road network is considered rural and consists of 110km of urban roads and 991km of rural roads. South Wairarapa's road network is bigger than Caterton's, its rural network being 40% larger.

19th century pioneer view of the Wairarapa

The population of both Carterton and South Wairarapa districts is predicted to continue to grow. The average rate of growth to 2051 is predicted to average at just under 1% pa. With the increase in population and the continued increase in use of motor vehicles, vehicle kilometres travel per capita will also increase at a similar rate. The main employment sectors in Carterton and South Wairarapa are agriculture and forestry which apply heavy loads onto the road surface and tend to cause deterioration.

Map indicating South Wairarapa and Carterton Districts

4.2. The Roading network

The Councils' activity of operating the Roading network primarily involves maintenance, renewal and creation of new assets that make up the network.

The roading network assets are the road formation, pavements and surfacing along with the structures on the network. These structures are bridges, culverts, footpaths/cycleways, signage and lighting.

The size of the asset that creates the roading network is illustrated in the table below which shows the lengths of road in each One Network Road Category (ONRC).

Table 4.1 Roading Network Lengths in each ONRC Category

ONRC Category	Length (Km)					
	Urban			Rural		
	combined	Carterton	South Wairarapa	combined	Carterton	South Wairarapa
National						
Primary Collector	9		9	87	25	62
Secondary Collector	12	8	4	316	149	167
Access	36	10	26	347	146	201
Low Volume	53	30	23	241	92	149
Total	**110**	48	62	**991**	412	579

4.3. Key Decisions

The key decisions required to determine the funding level for the roading activity are:

1. The funding split between maintenance and renewals.
2. The level of investment towards improving the safety to users of the roading network.
3. The level of investment into improving the network's resilience to climate change.
4. The level of investment into addressing changing demands on the network from population growth, new developments and planned developments.
5. The level of investment into removing the restrictions to the travel of High Capacity Vehicles (HCVs) across the network.
6. The level of investment into reducing the negative environmental impact of road runoff.

4.4. Opportunity Timeframes

The funding case has been built around addressing the three highest priority key problem statements. The three highest priority problem statements are:

- **Maintenance & Renewal Funding,**
- **Network Safety, and**
- **Network Resilience.**

The proposed timeframes for addressing the improvement opportunities are as follows:

Table 4.2 Improvement Timeframes

Opportunity	Action 0-3 years	Action 4-10 years	Action 10 years +

1.The funding split between maintenance and renewals.	Immediately action	Continue action	Continue action
2.The improvement the safety to users of the roading network.	Implement programme to improve safety for network users	Continue programme to improve safety for network users	Action is expected to be completed
3. The improvement of the network's resilience to climate change	The determination of prioritised programme of work that will improvement the network's resilience.	Implementation of the programme of work to improve the network's resilience.	Implementation of the programme of work to improve the network's resilience.
4.The changing demands on the network from population growth, new developments and planned developments.	Monitor changing demands on the network and determine if a response is required in the 4 to10 year timeframe.	Monitor changing demands on the network.	Monitor changing demands on the network.
5. The level of investment into removing the restrictions to the travel of High Capacity Vehicles (HCVs) across the network.	Determine the funding priority for removing the restrictions.	High priority restrictions removed. Determine the funding priority for removing the restrictions.	High priority restrictions removed. Determine the funding priority for removing the restrictions.
6. The level of investment into reducing the negative environmental impact of road runoff.	It is expected that the negative impacts of road runoff will be address with the actions to improve the network's resilience.	It is expected that the negative impacts of road runoff will be address with the actions to improve the network's resilience.	It is expected that the negative impacts of road runoff will be address with the actions to improve the network's resilience.

4.5. Funding Case No.1- Maintenance & Renewal Funding

1. Problem Statement

Underinvestment in renewing the districts roads has led to a decrease in road ride quality which is expected to accelerate in future years and is symptomatic of the roads' viability. If this issue is not resolve in the short to medium term, the cost of returning the network up to suitable standard will increase substantially in future years.

2. Urgency

It is critical that the network's condition is addressed before deterioration fully manifests because by then the cost to remedy the situation will be extremely high. Note the New Zealand water supply & wastewater services are now facing this situation where there are high costs of unplanned maintenance combined with the requirement for high renewal expenditure to remedy the situation.

3. Roading Network Purpose

The Road Transport network is one of the primary assets that enable the people in the community to interact with each other. The other assets that allow people in communities to connect are telecommunications and radio. Also, rail, water and air in conjunction with roads allow people to connect.

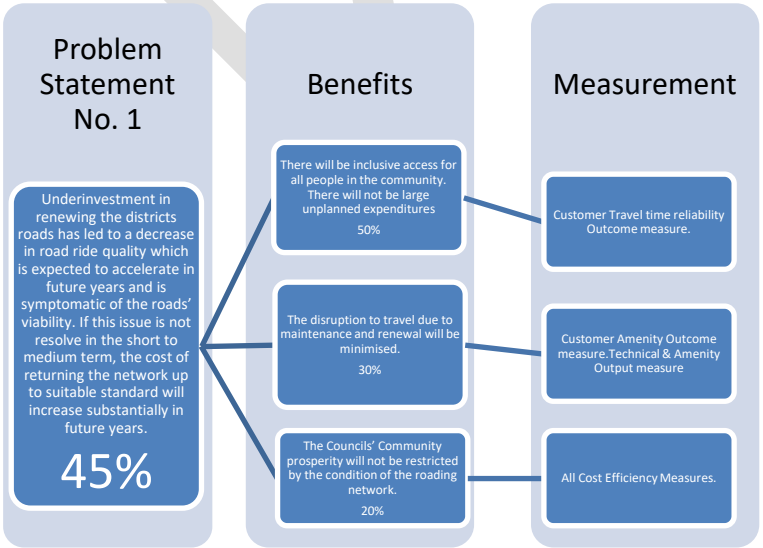
4. Community Outcomes – Well-beings

The efficient maintenance & renewal of the network's assets will contribute to the achievement of the following community outcomes.
*SWDC-contributes to the "Sustainable South Wairarapa and Vibrant and Strong C*ommunities" outcomes.
Carterton- contributes to the" *A prosperous economy and Quality fit-for-purpose* Infrastructure" outcomes.

5. Contribution to GPS

The efficient maintenance & renewal of the network's assets will contribute to the GPS objectives:
Safety – Developing a transport system where no-one is killed or seriously injured.
Better Transport Options – Providing people with better transport options to access social and economic opportunities.
Improving Freight Connections – Improving freight connections for economic development.

6. Opportunity – Benefits – Measurement



7. Evidence - Pavements

The comparison of the performance of Carterton & South Wairarapa networks indicates that both condition and low level of funding for maintenance and renewal of the South Wairarapa network are key issues for the network's sustainability. The South Wairarapa network is starting to show the effects of the low level of funding. The network's smooth travel index has been declining over the last four years. This has been exacerbated going forward as less work is being done now than in the past years because the funding has not been increased to match the increased cost. The balance between surfacing renewal and pavement maintenance is critical to optimisation of expenditure. Pressure is coming on the asset management team to move funding from renewals to maintenance to resolve immediate issues at the expense of long term asset management. The decline in condition is occurring in the Low Volume and Access Roads at present. However, in time, this will occur in the Primary and Secondary Collector class of roads and at this point the deteriorating condition of the Road Network will become more visible to the Community. Note over the next three years it is planned to develop a sealed road deterioration model to predict this rate of change.

8. *Evidence – Bridge Maintenance*

The last financial year's inspection of the network's bridges identified the value of outstanding bridge maintenance, inclusive of Structural repairs, as shown in the following table.

	High Priority	Median Priority
South Wairarapa DC	$267,800	$260,500
Carterton DC	$171,525	$262,500

9. *Evidence – Drainage Maintenance*

The roadside open channel drainage requires renewal on a 12 year cycle and prior to resealing or heavy metaling of unsealed roads. This renewal is to remove the build-up of materials in the channels, minor slip material and shoulder build-up so the water can drain from the carriageway and pavement. The renewal funding for roadside drainage needs to enable this cycle to be achieved so that the asset lives of the pavement is not compromised. Also, ensuring the roadside drainage is fully effective will increase the network's resilience. It is critical that the roadside drainage is maintained because if it is neglected until a problem is evident the funding will be required to both repair the prematurely failed pavement and the roadside drainage.

11. *Options*

The options available for improving the efficient maintenance & renewal of the network's assets are:

- Do nothing, this would mean that the access road conditions would continue to become worse to the point that they would become impassable and/or unsafe for vehicle traffic. Costs of renewing assets at this stage is significantly higher than if intervention happens earlier.
- Re-allocate funding from the higher volume roads to the lower volume access roads. This would mean the condition of the higher volume roads would rapidly deteriorate.
- Increase maintenance funding. The increased maintenance funding, to have an effect on condition, would need to increase year on year as the average age of the networks assets increases.
- Increase the renewal funding. Increasing the rate of asset renewal will, in time, reduce the requirement for expenditure on maintenance. Note it could take 5 to 10 years to have an effect on the maintenance demands.

12. Recommended Response (Programme of Work & Funding)

The following actions are proposed to improve the efficiency of maintenance & renewal of the network's assets.

1. The adjustment of the surfacing renewals budget so that an average surface age of 20 years is delivered over the long term.
2. The funding of the backlog of bridge maintenance.
3. The funding of the backlog of maintenance on the South Wairarapa section of the network.
4. The changes required for funding of the Carterton section of the network can be accommodated by transfers between the work category budgets within the overall allocation for maintenance and renewal on the network.
5. The changes required for funding of the South Wairarapa section of the network will require an increase in the maintenance and renewal funding.

The benefits of these actions will be:

1. There will not be large unplanned expenditures.
2. There will be inclusive access for all people in the community.
3. The disruption to travel due to road failure will be minimised.
4. The Councils' Community prosperity will not be restricted by the condition of the roading network.
5. The correct amount and balance between renewals and pavement maintenance funding will deliver to the Councils' Community the lowest whole of life cost for the delivery of the roading transport service.

If no action is taken

The consequence of not increasing the budgets for maintenance and renewal are:

1. The increasing deterioration of the network's condition.
2. A greater number of potholes to repair and repeated repairs of the same potholes.
3. Some potholes not being repaired resulting in large areas of pavement failure.
4. A significantly increased cost to stop the decline and restore the network's condition.

4.6. Funding Case No.2- Network Safety

1. Problem Statement

The safety for users of the network is a key issue. Action is required to reduce death and serious accidents on the network.

2. Urgency

- There are on average approximately 10 serious injuries or fatal road crashes occurring on the road network annually.
- These crashes have a significant impact on the community.
- The approximate average annual social cost to the community of these crashes is $5.0 million.

3. Community Outcomes – Well-beings

The reduction of road crashes will contribute to the achievement of the following community outcomes.

- SWDC-contributes to "the vibrant and strong community" outcome.
- Carterton-contributes to "A safe district" outcome.

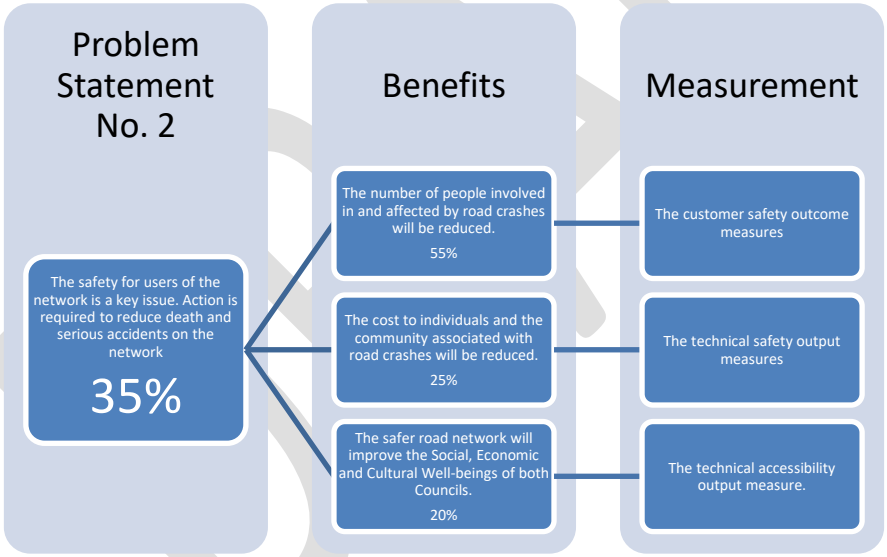
4. Contribution to GPS

The actions to reduce the road crashes on the network will contribute to the GPS objective:

- To develop a transport system where no-one is killed or seriously injured.

The benefits will be a reduction in annual social costs of crashes of approximately $5.0 million.

5. Opportunity – Benefits – Measurement



6. Evidence – Crashes on Narrow Roads

The data graphs below show that the crash rate is rising on the secondary collectors. The current crash rate is not high compared to other authorities in the Wellington Region. However, with the national focus to achieve zero crashes, it is expected that the other authorities will reduce the crash rates on their networks.

The table below shows that significant lengths of the secondary collector road widths are below the standard width. The Carterton section of the network has 30 km and South Wairarapa section of the network has 33 km below the standard width.

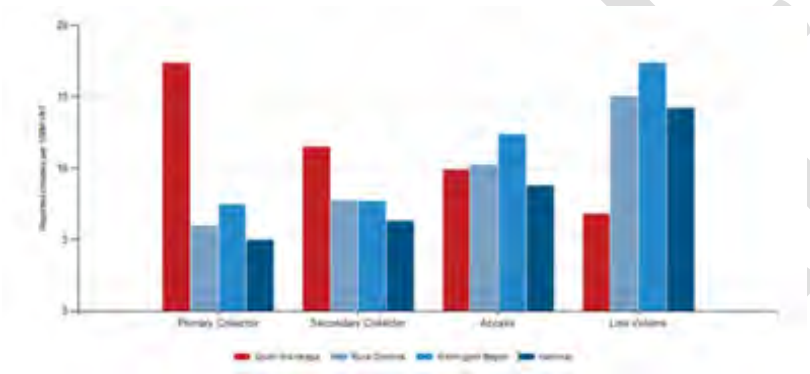
The correlation between the rising crash rates on secondary collector roads and their under widths means that it is time that these substandard road widths are addressed. This trend of crash rates on secondary collector roads with substandard widths is consistent with the analysis used to set the standard road widths.

The NZTA safety network programme analysis has identified, on the South Wairarapa roads, that speed management on some sections of the network could significantly reduce the crash rate on the network.

The table below identifies the length of secondary collectors in both districts with insufficient carriageway widths.

Road Categories	Carriageway targeted width	RCA	Length of Rural Road	Length of Urban Road	Length less than targeted width
Primary Collector	5.5 to 7.0m	SWDC	61.9	2.3	0
		CDC	24.8	0.4	0.6
Secondary Collector	5.5 to 6.0m	SWDC	160.4	4.5	32.6
		CDC	143.0	8.3	29.9
Access	<5.5m	SWDC	14.2	26.8	0
		CDC	84.6	9.9	0
Low Volume	<5.0m	SWDC	104.6	28.1	0
		CDC	10.8	18.9	0

The graph below indicates the large number of crashes on secondary collectors.



7. *Evidence* – NZTA Safety Network Analysis Results

The NZTA safety network programme analysis has identified, on the South Wairarapa roads, that the actions shown in the table below will reduce crashes. Note the NZTA analysis does not have carriageway widening as a treatment option.

Corridor/Intersection Name	Treatment	Indicative Cost of Intervention	DSi saved per 100M	Length of corridor
Bidwills Cutting Road/Wards Line SH53 - Kemptons Line SNP	Speed Management	$ 100,000	50.82	10.7
Longbush Hinakura - Carterton Bdy SNP	Speed Management	$ 100,000	14.29	6.6
Western Lake Rd Woodward - East West Access SNP	Speed Management	$ 100,000	36.5	27.9
Cape Palliser Lake Ferry - Ngawi Lighthouse SNP	Speed Management	$ 200,000	17.79	37.5
Lake Ferry Road Whiterock - Lake Ferry Settlement SNP	Speed Management	$ 200,000	53.27	32.3
Kahutara SH53 - Lake Ferry SNP	Speed Management	$ 100,000	94.81	22.3
Ponatahi Road Huangarua River - Kokotau Rd SNP	Speed Management and Signs & Marking upgrade	$ 650,000	13.04	16.2
Fox & Birdwood IS SNP	Intersection upgrade	$ 400,000	10	0
	Total value	**$ 1,850,000**		

8. *Options*

The options available for improving the efficient maintenance & renewal of the network's assets are:

1. To do nothing. This will mean the personal risk to road users on the Councils' network will continue to be worse than other peer districts.
2. To increase funding to the programme of road safety education. The increase in education alone will have limited effectiveness unless it is accompanied by other actions.
3. Reduce road speeds. The reduction in the speed limit will be the most cost effective measure for the reduction of serious injury crashes. However, it will be difficult to achieve without a high level of enforcement.
4. Increase Enforcement. There is a large network with a low density of traffic which means increased enforcement will not be as cost effective as other measures.
5. Network safety improvements. Target improvements that reduce the personal risk on the network will reinforce the other messages that action is required to reduce road crashes.

12. Recommended Response (Programme of Work & Funding)

The recommended programme to reduce the road crashes on the network is as follows:

- To continue with the current level of road safety education.
- To continue with the current level of road enforcement.
- To invest $400,000 annually from Low Cost Low Risk funding category, $200,000 on each Council's network, on widening of the secondary collector road network. The widening is so these road widths align to ONRC standards to achieve a uniform Customer level of service with the rest of New Zealand.
- To invest $100,000 annually from Low Cost Low Risk or R2Z funding category, $50,000 on each Council's network, on speed management.
- To increase cumulatively 1% annually over the next five years the funding of the Traffic Facilities and Guard Rail category. This increased funding will ensure the additional delineation and signage required for the widened Secondary collectors and speed management is maintained. It will also ensure delineation is uniform with the ONRC Customer level of service.

The implementation of the above programme of work over the next 10 to 15 years will address the current network crash issue.

12. Benefits

The benefits of these actions will be:
a) The reduction in the number of people involved in and affected by road crashes.
b) The reduction in cost to individuals and the community associated with road crashes.

C***onsequence of Not Increasing Funding***

The consequence of not acting on the roading network safety issue is that the personal risk to road users in the Carterton and South Wairarapa Districts will continue to increase compared to other peer districts. If a safer road network is not achieved it will negatively impact on the social, economic and cultural well-beings of both Councils.

4.7. Funding Case No.3- Network Resilience

1. Problem Statement

The resilience of the network to Climate change is a key issue. The risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion of roads needs to be addressed. This is particularly important to address where climate change is reducing the current level of network resilience.

2. Urgency

- The resilience of the network needs to be improved now rather than when climate change impacts the road network. This is because, if left until climate change impacts are observed, the joint costs of repairing failures and improving the resilience will not be sustainable.
- The tasks required to improve resilience will also progress the improvement of water quality. This will occur because the most frequent action required to improve resilience will be improved management of water runoff.

3. Community Outcomes – Well-beings

The improvement to the network's resilience will contribute to the achievement of the following community outcomes.

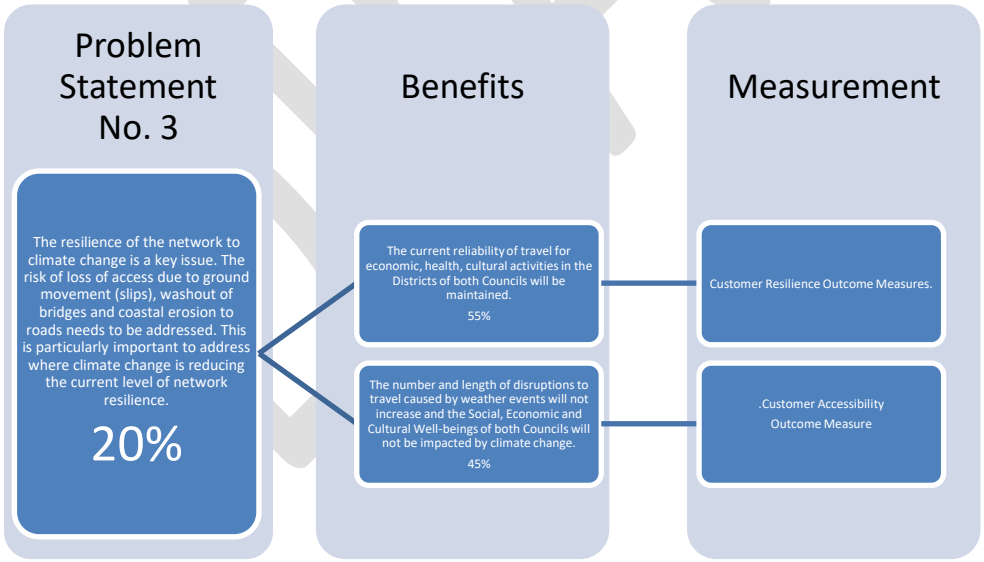
- SWDC-contributes to "A place that's accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people" outcome.
- Carterton- contributes to "A vibrant and prosperous economy" outcome.

4. Contribution to GPS

The actions to improve the road network's resilience will contribute to the GPS objective:

- To provide resilience & security to better transport options to access social and economic opportunities.

5. Opportunity – Benefits – Measurement



6. Evidence – Effects of Climate Change

The evidence of this issue is the prediction of climate change. The climate change prediction is that the network's area will be subjected to more frequent intense localised rain events. To reduce the risk of loss of access due to ground movement (slips) and washout of bridges the design of the current drainage systems needs to be checked to determine their capacity to handle these more frequent high intensity events.

The sea level is also predicted to rise with climate change. This will exacerbate the coastal erosion and has specific ramifications for the Cape Palliser Road.

The current level of unplanned maintenance, other than the Cape Palliser Road, is at a reasonable risk level of six percent of the operation budget. However, it is important the resilience is improved ahead of climate change impacts. This is because once climate change impacts are affecting the network the joint costs of repairing failures and improving resilience will not be sustainable.

7. Options

The options available to address the network resilience are:

1. To do nothing, which will mean both the number and the length of disruptions to travel, caused by weather events, will increase.
2. To develop a programme of work, and then fund its implementation, that will increase the resilience of the network during weather events.
3. To fund a trial of a new method for protection of the Cape Palliser Road.

18. Recommended Response (Programme of Work & Funding)

The following actions are proposed as the first steps to manage the effects of climate change on the roading network.

a) The trial of a new method of erosion protection for the Cape Palliser Road.
b) The undertaking of a flood event risk assessment of bridge sites with assistance from the Wellington Regional Council.
c) The undertaking of a survey to identify the highest risk sites on the network that could be damaged in a flood event. Then to develop a mitigation plan including treatment of drainage infrastructure at these sites.

The design tasks b) & c) will be implemented within the Low Cost & Low Risk category funding allocation of $15,000 from each Council. The funding for task a) is a specific project item. Note the tasks b) and c) will provide the information required for the next Long Term Plan to determine a programme for improving the resilience of the network. The current level of information means that an estimate of the required programme of work is not known. However, to indicate the commitment into future years it is suggested that each Council's programme from year four of the Long-Term Plan show the funding of an additional $100,000 per year in the Low Cost & Low Risk funding category.

12. Benefits

The benefits of these actions will be:

a) The current reliability of travel for economic, health, cultural activities in the Districts of both Councils will be maintained.
b) The current levels of Social, Economic and Cultural Well-beings of both Councils will not be reduced by the resilience of the roading network.

Consequence of Not Increasing Funding

The consequence of not acting is that the number and length of disruptions to travel caused by weather events will increase. If the resilience of the network is not maintained then it will negatively impact on the Social, Economic and Cultural Well-beings of both Councils.

4.8. Funding

The table below identifies the funding required to implement the planned actions to achieve the strategic direction. The future dollar values are based on the value in June 2020 with a 2% inflation adjustment applied out to year 4.

Table 4.3 **Ruamāhanga Road Network**- Annual Budgets for the next 10 years

Raumahanga Road Network - Annual Budgets for the next 10 years												
Activity	**Years**											
	Previous Years		1	2	3	4	5	6	7	8	9	10
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
Maintenance												
Physical work undertaken by contractors	$3,181,503	$3,431,503	$3,769,093	$3,844,475	$3,921,364	$3,999,791	$3,999,791	$3,999,791	$3,999,791	$3,999,791	$3,999,791	$3,999,791
Business Unit costs												
Staff, Council overheads & Consultants	$739,025	$989,025	$1,104,712	$1,126,806	$1,149,342	$1,172,329	$1,172,329	$1,172,329	$1,172,329	$1,172,329	$1,172,329	$1,172,329
Renewals												
All Renewals	$2,769,514	$2,769,514	$3,344,595	$3,411,487	$3,479,716	$3,549,311	$3,549,311	$3,549,311	$3,549,311	$3,549,311	$3,549,311	$3,549,311
Improvements												
Low -cost Low-risk	$759,250	$759,250	$2,207,500	$1,729,750	$1,707,000	$1,607,000	$1,607,000	$1,607,000	$1,607,000	$1,607,000	$1,607,000	$1,607,000
Base-line Subtotal	**$7,449,292**	**$7,949,292**	**$10,425,899**	**$10,112,517**	**$10,257,423**	**$10,328,431**	**$10,328,431**	**$10,328,431**	**$10,328,431**	**$10,328,431**	**$10,328,431**	**$10,328,431**
Project 1												
Project 2												

South Wairarapa's - Share of Road Network Annual Budgets for the next 10 years												
Activity	**Years**											
	Previous Years		1	2	3	4	5	6	7	8	9	10
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
Maintenance												
Physical work undertaken by contractors	$1,930,203	$2,180,203	$2,265,500	$2,310,810	$2,357,026	$2,404,167	$2,404,167	$2,404,167	$2,404,167	$2,404,167	$2,404,167	$2,404,167
Business Unit costs												
Staff, Council overheads & Consultants	$391,125	$641,125	$740,000	$754,800	$769,896	$785,294	$785,294	$785,294	$785,294	$785,294	$785,294	$785,294
Renewals												
All Renewals	$1,277,514	$1,277,514	$1,807,500	$1,843,650	$1,880,523	$1,918,133	$1,918,133	$1,918,133	$1,918,133	$1,918,133	$1,918,133	$1,918,133
Improvements												
Low -cost Low-risk	$478,750	$478,750	$1,157,500	$1,119,750	$1,112,000	$1,012,000	$1,012,000	$1,012,000	$1,012,000	$1,012,000	$1,012,000	$1,012,000
Base-line Subtotal	**$4,077,592**	**$4,577,592**	**$5,970,500**	**$6,029,010**	**$6,119,445**	**$6,119,594**	**$6,119,594**	**$6,119,594**	**$6,119,594**	**$6,119,594**	**$6,119,594**	**$6,119,594**
Project 1												
Project 2												

South Wairarapa's LR - Share of Road Network Annual Budgets for the next 10 years												
Activity	**Years**											
	Previous Years		1	2	3	4	5	6	7	8	9	10
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
Maintenance												
Physical work undertaken by contractors	$1,666,323	$1,916,323	$1,993,500	$2,033,370	$2,074,037	$2,115,518	$2,115,518	$2,115,518	$2,115,518	$2,115,518	$2,115,518	$2,115,518
Business Unit costs												
Staff, Council overheads & Consultants	$345,000	$595,000	$650,000	$663,000	$676,260	$689,785	$689,785	$689,785	$689,785	$689,785	$689,785	$689,785
Renewals												
All Renewals	$1,149,644	$1,149,644	$1,625,000	$1,657,500	$1,690,650	$1,724,463	$1,724,463	$1,724,463	$1,724,463	$1,724,463	$1,724,463	$1,724,463
Improvements												
Low -cost Low-risk	$345,000	$345,000	$695,000	$647,000	$624,000	$624,000	$624,000	$624,000	$624,000	$624,000	$624,000	$624,000
Base-line Subtotal	**$3,505,967**	**$4,005,967**	**$4,963,500**	**$5,000,870**	**$5,064,947**	**$5,153,766**	**$5,153,766**	**$5,153,766**	**$5,153,766**	**$5,153,766**	**$5,153,766**	**$5,153,766**
Project 1												
Project 2												

South Wairarapa's SPR - Share of Road Network Annual Budgets for the next 10 years												
Activity	**Years**											
	Previous Years		1	2	3	4	5	6	7	8	9	10
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
Maintenance												
Physical work undertaken by contractors	$263,880	$263,880	$272,000	$277,440	$282,989	$288,649	$288,649	$288,649	$288,649	$288,649	$288,649	$288,649
Business Unit costs												
Staff, Council overheads & Consultants	$46,125	$46,125	$90,000	$91,800	$93,636	$95,509	$95,509	$95,509	$95,509	$95,509	$95,509	$95,509
Renewals												
All Renewals	$127,870	$127,870	$182,500	$186,150	$189,873	$193,670	$193,670	$193,670	$193,670	$193,670	$193,670	$193,670
Improvements												
Low -cost Low-risk	$133,750	$133,750	$462,500	$472,750	$488,000	$388,000	$388,000	$388,000	$388,000	$388,000	$388,000	$388,000
Base-line Subtotal	**$571,625**	**$571,625**	**$1,007,000**	**$1,028,140**	**$1,054,498**	**$965,828**	**$965,828**	**$965,828**	**$965,828**	**$965,828**	**$965,828**	**$965,828**
Project 1												
Project 2												

Carterton's - Share of Road Network Annual Budgets for the next 10 years												
Activity	**Years**											
	Previous Years		1	2	3	4	5	6	7	8	9	10
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31
Maintenance												
Physical work undertaken by contractors	$1,251,300	$1,251,300	$1,503,593	$1,533,665	$1,564,338	$1,595,625	$1,595,625	$1,595,625	$1,595,625	$1,595,625	$1,595,625	$1,595,625
Business Unit costs												
Staff, Council overheads & Consultants	$347,900	$347,900	$364,712	$372,006	$379,446	$387,035	$387,035	$387,035	$387,035	$387,035	$387,035	$387,035
Renewals												
All Renewals	$1,492,000	$1,492,000	$1,537,095	$1,567,837	$1,599,193	$1,631,177	$1,631,177	$1,631,177	$1,631,177	$1,631,177	$1,631,177	$1,631,177
Improvements												
Low -cost Low-risk	$280,500	$280,500	$1,050,000	$610,000	$595,000	$595,000	$595,000	$595,000	$595,000	$595,000	$595,000	$595,000
Base-line Subtotal	**$3,371,700**	**$3,371,700**	**$4,455,399**	**$4,083,507**	**$4,137,977**	**$4,208,837**	**$4,208,837**	**$4,208,837**	**$4,208,837**	**$4,208,837**	**$4,208,837**	**$4,208,837**
Project 1												
Project 2												

4.9. Efficiency

The national information on roading costs allows Carterton and South Wairarapa District Councils' performance to be compared nationally. The information does not currently provide an analysis of the combined Ruamāhanga Road network, consequently we have examined each network separately.

The historic level of funding for the Carterton & South Wairarapa Roading Network's maintenance and renewal has been very low compared to their peer group, see Figures 11.1 and 11.3. This means that the current strategy for maintenance and renewals is providing an efficient cost outcome. However, the condition surveys are showing a marked decrease in levels of service on low volume roads. The reduced amount of work that can be done because of increased contract rates means the decline in levels of service will increase unless action is taken to address the trend.

4.10. Performance Targets - Levels of Service – LTP KPI

4.10.1. Performance measures

The following table shows the performance achievement against the targets set by the Councils for the Statutory Performance measures.

Table 4.4 Statutory Performance measure Achievement compared to Target

Statutory Performance Measure	Description of Measure	Carterton Target	Carterton Achievement 2018/19 Year	SWDC Target	SWDC Achievement 2018/19 Year
road safety	The number of crashes causing injuries is reduced	Fatal: decrease or ≤1 increase, Serious injury: decrease or ≤3 increase	1 fatal No serious injury	<7	Increased by 2.
road condition	Average quality of ride on the sealed local road network, measured by smooth travel exposure	≥90%	98%	95%	97%
road maintenance	Percentage of sealed road network that is resurfaced.	≥5%	5%	5%	4.6%
footpaths	Percentage of footpaths compliant with condition standards	≥95%	Not measured, previous year 98.1%	95%	Not survived. Previous year 87%
response to service requests	The % of Customer service requests relating to roads and footpaths responded to within a fixed time.	90%	91%	80%	91%

4.11. Risks & Assumptions

4.11.1. Risks

The table below identifies the risks that could disrupt the service delivered by the roading network. The table also details the actions contained in this plan to manage each risk.

Table 4.5 Risks to Roading Network Services

	Name of Risk	Nature of Risk	Actions
1	Storm events	The damage from a storm event prevents the use of a section of the network. This could be the effect of flooding, washout or a slip that prevents access along a section of road.	The current level of resilience is assumed to be acceptable. There is an action to develop a programme of work to ensure this level of risk does not increase with climate change.
2	Earthquake	The damage from an earthquake event prevents the use of a section of the network. This could be the effect of a damaged bridge, damage to the road surface from liquefaction or a slip that prevents access along a section of road.	It is assumed that the current level of resilience is acceptable to the community. No action is proposed to specifically increase resilience for an earthquake event. However improved resilience to accommodate climate change may also increase earthquake resilience.
3	Asset management and/or delivery failure.	The asset management process fails to predict, accurately enough, funding required for operation, maintenance and renewal of the roading network. The Asset Plan's identified programme of maintenance and renewal is not completed. The result of both of these failures is that insufficient work is carried out on the Roading network's assets to ensure it can continue to deliver services in the future without a significant additional expenditure.	The monitoring by governance of management reports on work achievement should provide timely notice if this type of failure occurs. Also every three years the budget levels are reassessed again. The reassessed budgets can take into account the trend in condition of the roading network's assets and the required level of service.
5	Business failure.	There are a number of business risks that can disrupt the operation of a roading network. An example of this type of risk is lack of training to operate effectively in an emergency.	The development of a business continuity plan for roading. The monitoring by Governance of management reports to ensure these risks are identified and an acceptable level of action is being undertaken to manage them.

4.11.2. Assumptions

The assumptions made are listed below. There is a risk that these assumptions do not correctly reflect the situation they cover. These risks are managed by monitoring the assumptions and by their re-assessments in three years.

Table 4.6 Asset Planning Assumptions

	Assumption Name	Description of Assumption
1	Population Growth	The current trend in population will continue, (approx. just under 1% pa). Note the lack of sound census data means growth is not as easily quantified.
2	NZTA funding	The assumption is that NZTA funding will continue at the current levels.
3	Natural Resource Plan Requirements	It is assumed that the total Natural Resource Plan will be adopted without changes from the draft.
4	Missing information	It is assumed that all relevant information has been taken into account in the preparation of the asset plan.
5	Consent Conditions	It is assumed that there will be no significant changes to consent conditions other than those applying to Stormwater runoff.

4.12. Future Demand & Influences

4.12.1. Climate Change

There are two aspects to the climate change issue. The first is what is being done to mitigate for the effects of climate change on the service delivery. An example of addressing the effects of climate change is the improvement of the network's resilience. This would enable the network to withstand more frequent and severe storms. The second issue is what the business is doing to reduce the rate of climate change. An example of this action would be to reduce greenhouse gas generation from the business activity and/or an action offsetting the greenhouse gas emissions generated by the business.

This plan proposes the first step towards developing a programme of work to reduce the impact of climate change on the service delivery by increasing the network's resilience.

4.12.2. Growth

The data for the current asset management plan is built on the population projections provided by the report titled "Population Projections 2019-2051Wairarapa June 2020" by Infometrics.

The population of both Carterton and South Wairarapa districts is predicted to continue to grow. The average rate of growth to 2051 is predicted to average at just under 1% pa. With

the increase in population and the continued increase in use of motor vehicles, vehicle kilometres travel per capita will also increase at a similar rate. The main employment sectors in Carterton and South Wairarapa are agriculture and forestry which apply heavy loads onto the road surface and tend to cause deterioration.

The Councils are developing growth strategies and detailed growth plans. These plans will identify infrastructure requirements to support the growth. Once these plans are completed the identified requirements for the Roading Network will be included in this Asset Plan.

4.12.3. Regulations

There are many regulations that are relevant to the roading group of activities. The particular regulation that will change the requirements on the roading network is the recommendations in the Ruamāhanga Whaitua report. This is expected to require increased treatment of stormwater runoff from the roading network before it enters water bodies. It is expected that the Ruamāhanga Whaitua recommendations will be adopted. It is assumed that the community, because of the level of engagement during the Ruamāhanga Whaitua process, are prepared to pay for the increased roading network costs associated with meeting the new stormwater discharge consent requirements.

This plan proposes the first step towards developing a programme of work to manage and treat stormwater runoff from the roading network.

5. Purpose of the Ruamāhanga Roads Asset Management Plan

The purpose of this asset plan document is to draw together information from the asset management analysis to determine the funding needs of the Ruamāhanga Roading network. The funding level determined needs to ensure the network sustainably delivers the set service levels.

5.1. The Roading network

The Councils' activity of operating the roading network primarily involves maintenance, renewal and creation of new assets that make up the network.

The roading network assets are the road formation, pavements, surfacing and the structures on the network. These road network structures are bridges, culverts, footpath/cycleway, signage and lighting.

The size of the asset that creates the network is illustrated in the table below which shows the lengths of road in each One Network Road Category (ONRC).

Table 5.1 Roading Network Lengths in each ONRC Category

ONRC Category	Length (Km)					
	Urban			Rural		
	combined	Carterton	South Wairarapa	combined	Carterton	South Wairarapa
National						
Primary Collector	9		9	87	25	62
Secondary Collector	12	8	4	316	149	167
Access	36	10	26	347	146	201
Low Volume	53	30	23	241	92	149
Total	**110**	48	62	**991**	412	579

6. Strategic Direction

6.1. Reason for a Public Road Network

The following are the reasons why Carterton and South Wairarapa Councils provide and maintain a network of public roads.

a) The road transport network is one of the primary assets that enables the people in the community to interact with each other. Rail, water and air, in conjunction with roads, also allow people to connect. Other assets that allow people in communities to connect are telecommunications and radio.

b) The level of service the community demands from its road transport is dependent on how critical the connection along the road is to the community's functions of social, cultural and commercial activities.

c) The greater the intensity of demand, both existing and future, the higher the level of service the community will wish to have along the road. This is reflected in the ONRC classification of each road link in the network.

6.2. Community Outcomes & Well-being's Contribution

The roading and footpath network benefits every resident and visitor in the districts and is an essential enabler to high levels of social, economic and cultural well-beings in the districts.

The Roading network's contribution to Carterton District Council's community outcomes is set out in the table below.

Table 6.1 Road Activity links to Carterton Community Outcomes

Community outcome **Council group of activities**	A strong community	A prosperous economy	A healthy natural and built environment	Quality fit-for-purpose infrastructure	A strong and effective Council
Roads and footpaths		✓	✓	✓	

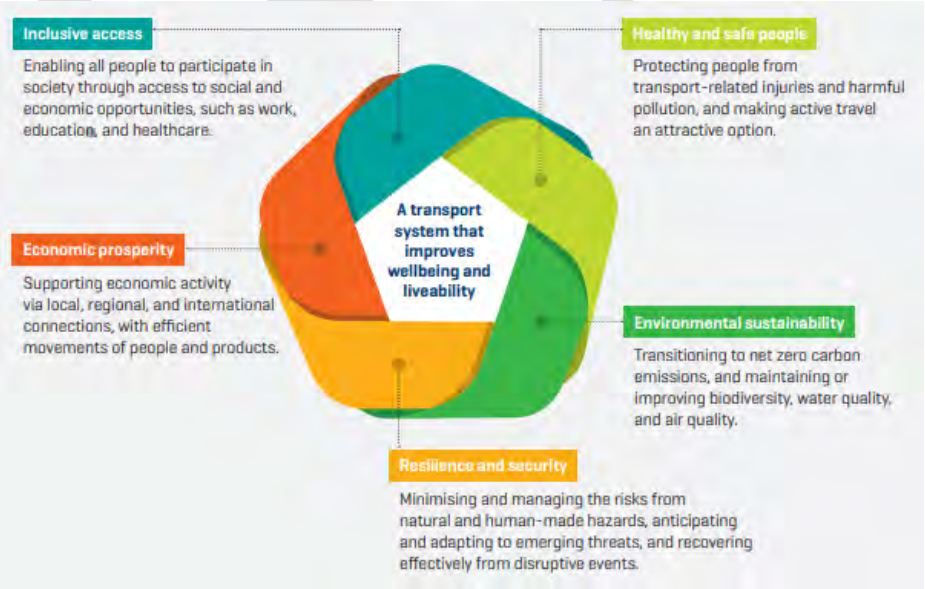
The contribution to four of the five South Wairarapa Council's (SWDC) community outcomes is as set out in the table below.

Table 6.2 Road Activity links to SWDC Community Outcomes

Community Outcome	How the Roading Activity Contributes
Healthy & economically secure people	By advocating for better transport systems for the community with regard to health services, employment opportunities and social services
Vibrant and strong communities	By ensuring land transport, in all its forms, is safe for the community and that it encourages a sense of pride and belonging
Sustainable South Wairarapa	By ensuring all transport options and telecommunications add to the sustainability of the South Wairarapa
A place that's accessible and easy to get around	By sustainable maintenance of the Roading Network infrastructure to a level the Community agrees to fund.

6.2.1. Transport Government Policy Statement (GPS)

The Government has set out it's new draft strategic priorities and outcomes Framework for the next NLTP, There is strong alignment between these strategic priorities, the Ministry of Transport's Transport Outcomes Framework (Arataki), the RLTP and the strategic case all aligning with the Treasury's Living Standards Framework for national wellbeing. The alignment of these priorities with local objectives is explored in the next chapter.



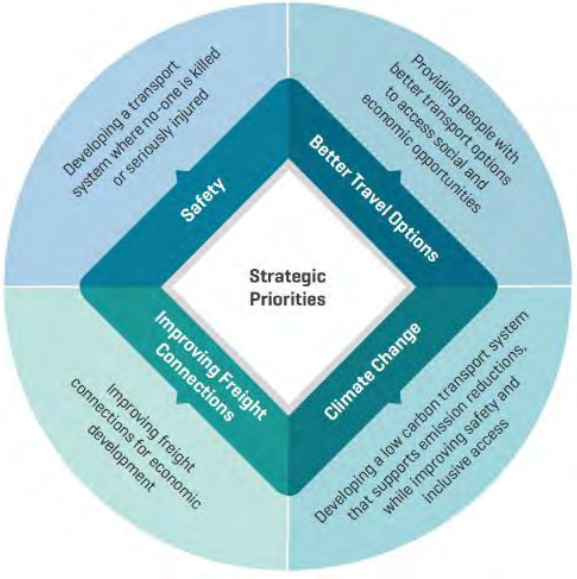
R

E 2: TRANSPORT OUTCOMES FRAMEWORK

Strategic priorities

The previous GPS, GPS 2018, had the following four strategic priorities:

- Safety (Key Priority)
- Access (Key Priority)
- Environment (Supporting Priority)
- Value for Money (Supporting Priority)



The draft GPS has slightly changed these strategic priorities in the following ways:

- ‘Access’ has been separated into ‘Better Travel Options’, which is more urban focused, and ‘Improving Freight Connections’, which is more regional focused.
- ‘Environment’ has been renamed ‘Climate Change’.
- ‘Value for Money’ is no longer a strategic priority. Instead, it is now a principle relevant to all investments in the land transport system.
- ‘Safety’ has been expanded to ‘Health and Safe People’ to include heath and active travel

The Government’s strategic direction is underpinned by the principle of mode neutrality and value for money. The four strategic prioritises for investment working together to achieve the Transport Outcomes vision of a safe system that will improve the welling and liveability of the consumer.

7. Key Decisions/ Opportunities / Problem Statements

The problem/opportunity statements were developed in a workshop with the stakeholder representatives. This was a different group of people to those involve in the previous ILM workshop three years ago. There was no reference to the previously developed problem statements. However, the problem statements developed in this workshop are the same issues as identified three years ago. This gives a high level of confidence that they are the key issues.

The key decisions required to determine the funding level for the Roading Activity are:

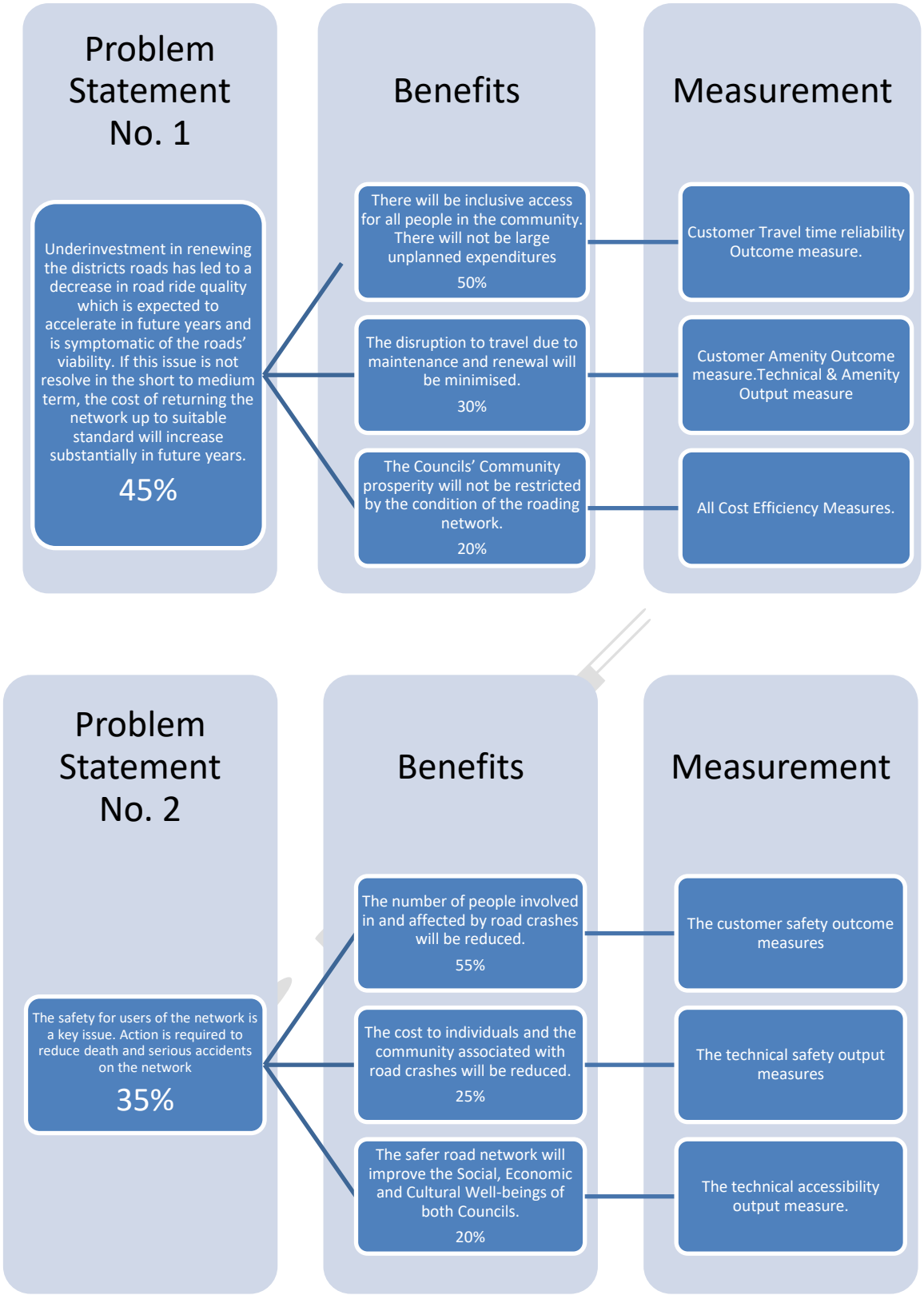
1. The funding split between maintenance and renewals.
2. The level of investment towards improving the safety to users of the roading network.
3. The level of investment into improving the network's resilience to climate change.
4. The level of investment into addressing changing demands on the network from population growth, new developments and planned developments.
5. The level of investment into removing the restrictions to the travel of High Capacity Vehicles (HCVs) across the network.
6. The level of investment into reducing the negative environmental impact of road runoff.

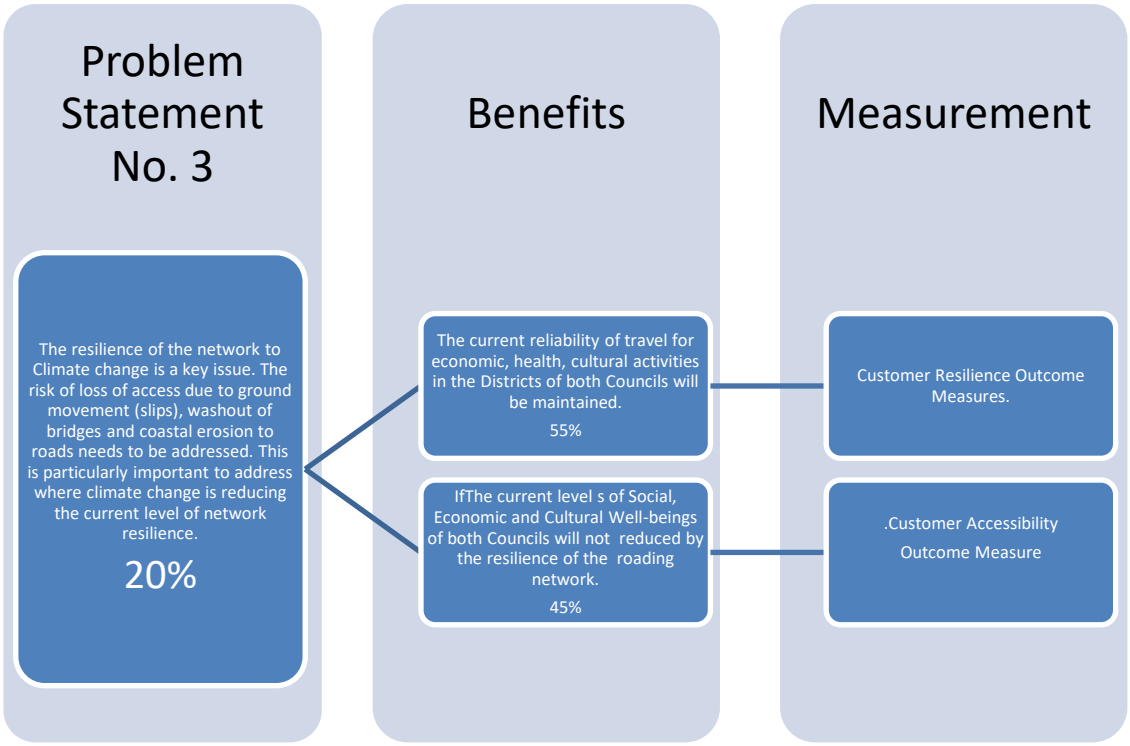
7.1. Problem/Opportunity Statements

There were six Problem statements identified in the workshop. The funding case is built around addressing the three highest priority Problem statements. The three highest priority problem statements are:

- **Maintenance & Renewal Funding,**
- **Network Safety, and**
- **Network Resilience.**

These three highest priority Problem statements are summarised with their associated benefits and performance measure in the following diagrams.


Problem Statement No. 1
Underinvestment in renewing the districts roads has led to a decrease in road ride quality which is expected to accelerate in future years and is symptomatic of the roads' viability. If this issue is not resolve in the short to medium term, the cost of returning the network up to suitable standard will increase substantially in future years.
45%
Benefits
There will be inclusive access for all people in the community. There will not be large unplanned expenditures
50%
The disruption to travel due to maintenance and renewal will be minimised.
30%
The Councils' Community prosperity will not be restricted by the condition of the roading network.
20%
Measurement
Customer Travel time reliability Outcome measure.
Customer Amenity Outcome measure.Technical & Amenity Output measure
All Cost Efficiency Measures.
Problem Statement No. 2
The safety for users of the network is a key issue. Action is required to reduce death and serious accidents on the network
35%
Benefits
The number of people involved in and affected by road crashes will be reduced.
55%
The cost to individuals and the community associated with road crashes will be reduced.
25%
The safer road network will improve the Social, Economic and Cultural Well-beings of both Councils.
20%
Measurement
The customer safety outcome measures
The technical safety output measures
The technical accessibility output measure.



7.2. Opportunity/Problem Timeframes

The proposed timeframes for addressing the improvement opportunities are as follows:

Table 7.1 Improvement Timeframes

Opportunity	Action 0-3 years	Action 4-10 years	Action 10 years +
1.The funding split between maintenance and renewals.	Immediately action	Continue action	Continue action
2.The improvement the safety to users of the roading network.	Implement programme to improve safety for network users	Continue programme to improve safety for network users	Action is expected to be completed
3. The improvement of the network's resilience to climate change	The determination of prioritised programme of work that will improvement the network's resilience.	Implementation of the programme of work to improve the network's resilience.	Implementation of the programme of work to improve the network's resilience.
4.The changing demands on the network from population growth, new developments and planned developments.	Monitor changing demands on the network and determine if a response is required in the 4 to10 year timeframe.	Monitor changing demands on the network.	Monitor changing demands on the network.
5. The level of	Determine the	High priority	High priority

investment into removing the restrictions to the travel of High Capacity Vehicles (HCVs) across the network.	funding priority for removing the restrictions.	restrictions removed. Determine the funding priority for removing the restrictions.	restrictions removed. Determine the funding priority for removing the restrictions.
6. The level of investment into reducing the negative environmental impact of road runoff.	It is expected that the negative impacts of road runoff will be address with the actions to improve the network's resilience.	It is expected that the negative impacts of road runoff will be address with the actions to improve the network's resilience.	It is expected that the negative impacts of road runoff will be address with the actions to improve the network's resilience.

8. Full Description of Key Issue/Opportunities/ Problem Statements

Note the full programme business cases are included in the Life Cycle Section of this document in the appropriate funding category subsection.

8.1. Maintenance & Renewal Split

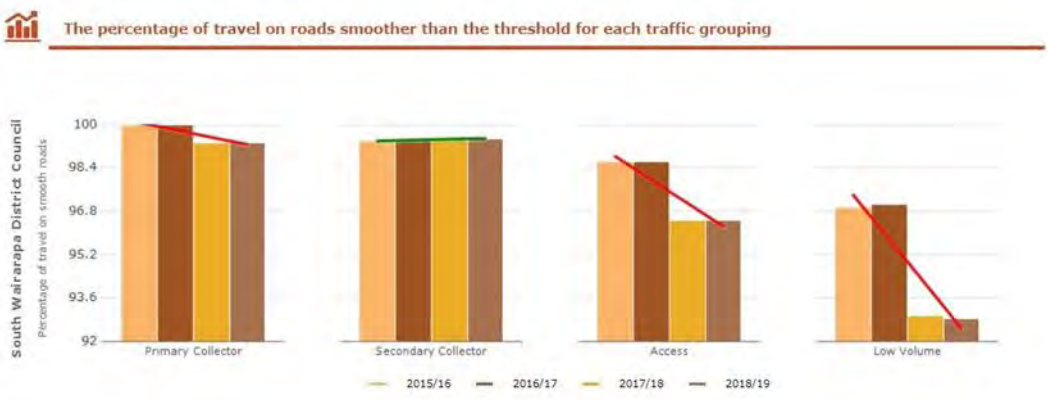
The roading infrastructure is made up of assets with long lives. This means the effect of underfunding maintenance and renewal take some years before the asset's deterioration becomes manifestly obvious to the users. The costs of recovery once the deterioration is fully manifested will be many times more than the increases required before the deterioration manifests.

Councils' budgets are always under scrutiny, which is heightened with the current reductions in rates increases in response to the Covid 19 crisis and the pressure to meet new statutory requirements for Water Services. The funding of Roading maintenance and renewals is a significant budget for Councils so they are an obvious target for reduced expenditure.

The comparison of the performance of Carterton & South Wairarapa networks indicates that condition and low level of funding for maintenance and renewal of the South Wairarapa network is a key issue for the network's sustainability. The South Wairarapa network is starting to show the effects of the low level of funding. The network's smooth travel index has been declining over the last four years, see graph below. This has been exacerbated going forward as less work is being done now than in the past years because the funding has not been increased to match the increased cost. The balance between surfacing renewal and pavement maintenance is critical to optimisation of expenditure.

The decline in condition is occurring in the Low Volume and Access Roads at present. However, in time, this will occur in the Primary and Secondary Collector class of roads and at this point the deteriorating condition of the Road Network will become more visible to the Community.

Table 8.1 Percentage of travel on roads smoother than the threshold for each road category



The following pie charts show the current split between activities for providing the roading network in the first three charts. The last two charts show the breakdown of the maintenance budget into work categories. Note the major part of the renewal funding is spent on replacing the road surfacing.

Table 8.2 Expenditure split across maintenance, renewal, low cost improvements & management

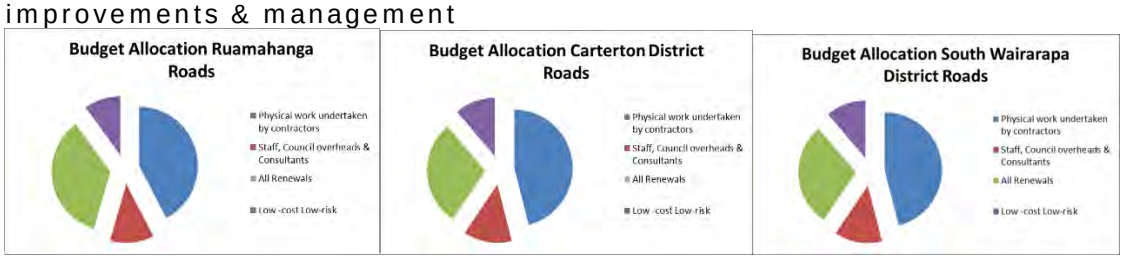
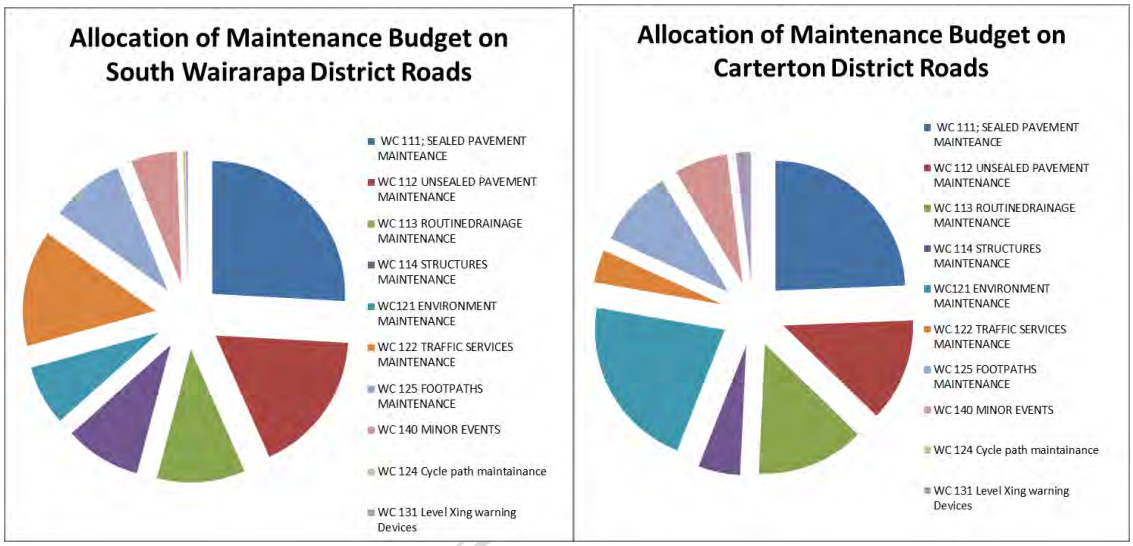


Figure 8.1 Allocation of maintenance budgets – Carterton & South Wairarapa networks



The balance between surfacing renewal and pavement maintenance is critical to optimisation of expenditure. The current renewal funding levels means the surfacing on the Carterton portion of the network is required to last on average 16 years and on the South Wairarapa portion 25 years. These surfacing renewal averages have resulted in seal road pavement maintenance on the Carterton portion of the network of 24% and on the South Wairarapa network 27% of the maintenance budget. It is proposed to adjust the renewal funding so that over time the average surfacing renewal life on both networks becomes 20 years. To ensure the quantity of maintenance undertaken on the South Wairarapa network is similar to the historic levels, until the increased surfacing renewals reduces the cost of pavement maintenance, a $100,000 per year increase in maintenance funding for the South Wairarapa network is proposed.

The options to consider are:

1. Do nothing, this would mean that the access road conditions would continue to become worse to the point that they would become impassable and/or unsafe for vehicle traffic.
2. Re-allocate funding from the higher volume roads to the lower volume access roads. This would mean the condition of the higher volume roads would rapidly deteriorate.

3. Increase maintenance funding. The increased maintenance funding, to have an effect on condition, would need to increase year on year as the average age of the networks assets increases.
4. Increase the renewal funding. Increasing the rate of asset renewal will, in time, reduce the requirement for expenditure on maintenance. Note it could take 5 to 10 years to have an effect on the maintenance demands.

The proposed action is to increase the funding for both renewals and maintenance.

The benefits of these actions will be:

1. There will not be large unplanned expenditures.
2. There will be inclusive access for all people in the community.
3. The disruption to travel due to maintenance and renewal will be minimised.
4. The Councils' Community prosperity will not be restricted by the condition of the roading network.
5. The correct amount and balance between renewals and pavement maintenance funding will deliver to the Councils' Community the lowest whole of life cost for the delivery of the roading transport service.

The consequence of not increasing the budgets for maintenance and renewal are:

1. The increasing deterioration of the network's condition.
2. A greater number of potholes to repair and repeated repairs of the same potholes.
3. Some potholes not being repaired resulting in large areas of pavement failure.
4. A significantly increased in comparison with the cost increase proposed to stop the decline and restore the network's condition.

8.2. Safety of Network Users

The safety for users of the network is a key issue. The personal risk on the Carterton section of the network is high compared to its peer group. There is a National objective to reduce road crashes because nationally the level is high compared to other Countries.

The options for consideration are:

1. To do nothing, this will mean the personal risk to road users on the Councils' network will continue to be worse than other peer districts.
2. To increase funding to the programme of road safety education.
3. To address the network asset so that it is safer to travel on the network.

The planned actions to address the safety issues are:

a) To continue the current programme of road safety education.
b) To increase the allocated funds to the low-cost low risk (LCLR) category.
c) To select (LCLR) projects that will reduce the impacts and/or the chance of accidents to all modes of road users.

The benefits of these actions will be

a) The reduction in the number of people involved in and affected by road crashes.

b) The reduction in cost to individuals and the community associated with road crashes.
.

The funds are planned to be found from a re-allocation of capital renewal funding to the low-cost/ low- risk budget.

The contributions of these actions to community outcomes and well-beings are as follows:

a) SWDC-contributes to “the vibrant and strong community” outcomes.
b) Carterton-contributes to “A safe district” outcome.

The consequence of not acting on the roading network safety issue is that the personal risk to road users in the Carterton and South Wairarapa Districts will continue to increase compared to other peer districts. If a safer road network is not achieved it will negatively impact on the social, economic and cultural well-beings of both Councils.

8.3. Climate Change Resilience

The resilience of the network to climate change is a key issue. The risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion to roads needs to be addressed. This is particularly important to address where climate change is reducing the current level of network resilience.

The evidence of this issue is the prediction of climate change to increase the severity of storm events and the impact on the Cape Palliser Road.

The options for consideration are:

1. To do nothing, which will mean both the number and the length of disruptions to travel, caused by weather events, will increase.
2. To develop a programme of work, and then fund its implementation, that will increase the resilience of the network during weather events.

The following actions are proposed as the first steps to manage the effects of climate change on the roading network.

a) The trial of a new method of erosion protection for the Cape Palliser Road.
b) The undertaking of a flood event risk assessment of bridge sites with assistance from the Wellington Regional Council.
c) The undertaking to identify the highest risk sites on the network to be damaged in a flood event and to develop a possible mitigation plan.
d) The undertaking of an inspection to identify and then carry out treatment of drainage infrastructure where it is found to be deficient combined with increased funding for drainage maintenance.

The benefit from undertaking these actions is that the current reliability of travel for economic, health, cultural activities in the Districts of both Councils will be maintained.

The funds for increased resilience are planned to be found from a reallocation of current operational funds.

The contributions of these actions to Community Outcomes & Well-beings are as follows:

a) SWDC-contributes to “A place that’s accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people” outcomes.
b) Carterton- contributes to “A vibrant and prosperous economy” outcome.

The consequence of not acting is that the number and length of disruptions to travel caused by weather events will increase. If the resilience of the network is not maintained then it will negatively impact on the Social, Economic and Cultural Well-beings of both Councils.

8.4. Changing Demand

The changing demands on the network as a result of population growth and new developments are a key issue for the transport network. Examples of these changing transport requirements are the eastern development of Carterton, urban growth, southern structure plan, and demands for improved access across the Wairarapa, urban growth strategy and, for both Councils, the growth of retirement villages.

The options for considerations are:

1. To do nothing, this will result in a lower level of service delivered and will constrain growth. Also, the opportunity of contributions to the solution by the developers will be lost.
2. To develop a programme of work required to address the changing demands on the network.
3. To require developers to identify the changes required by their developments on the network and for them to fund the necessary upgrade work.

The planned actions to address the changes in demand on the network are to:

a) identify specific projects related to growth and planned development,
b) set an initial priority for the improvement projects and
c) develop a proposal and an initial business case for the top five priority improvement projects.

The benefits of these actions will be to create a defined programme of work to improve safety, access and connections to accommodate the changing demands on the Roading network.

The undertaking of these actions to address the changes in demand on the network will require the budgeting of $100,000, over a two-year period. Note each Council’s share of $100,000 would be $50,000.

The contributions of these actions to Community Outcomes & Well-beings are as follows:

a) SWDC-contributes to “A place that’s accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people” outcomes.
b) Carterton- contributes to “A vibrant and prosperous economy, Quality fit-for-purpose infrastructure” outcome.
c)

The consequences of not carrying out improvements to meet changing demands will be to lower the level of service delivered and to constrain growth. If the Road Network is not

improved to accommodate growth then there will be a negative impact on the Social, Economic and Cultural Well-beings of both Councils.

8.5. Access Restriction

The restrictions to the travel of high capacity vehicles (HCVs) across the transport network are a key issue. There are twelve bridges on the network that restrict the travel of HCV vehicles.

The options for consideration are:

1. To do nothing, this will mean the restrictions to HCV movements on the network will remain.
2. To determine the effect that the restrictions have on current actual freight movement currently being undertaken on the routes with restricted bridges. Then to develop a programme to replace the bridges that significantly restrict current HCV movements.
3. To replace all bridges that restrict HCV movements.

The following actions are proposed as the first steps to remove access restrictions to HCV vehicles. The actions assume that some of the bridges could have their restrictions removed if a more complex strength analysis is undertaken on the structure.

a) The first step is to list the bridges in priority order.
b) Then, proceeding following the priority order, to carry out a complex analysis of each bridge's load capacity. This analysis would determine if the restriction on HCV movement on each bridge can be removed. Note if the replacement cost is not high, the bridge may be replaced rather than incurring the cost of the complex analysis.
c) Lastly to provide a cost benefit analysis on strengthening or replacing the bridges.

The benefit of this action would be:

a) To possibly enable HCV access across some bridges.
b) To identify which bridges need to be replaced to enable HCV travel on the network.
c) To enable a business case to be developed for providing improved access for HCV vehicles.

The cost of the priority report would require a budget of $60,000. The cost of analysis of each bridge could be determined as part of producing the priority report.

The contributions of these actions to Community Outcomes & Well-beings are as follows:

a) SWDC contributes to "A place that's accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people" outcomes.
b) Carterton contributes to "A vibrant and prosperous economy, Quality
c) A fit-for-purpose infrastructure" outcome.

The consequence of not undertaking this investigation would mean that the current restrictions on HCV movements would remain. If the Road Network restriction on the movement of HCV vehicles is not removed it could impact on the Economic Well-beings of both Councils.

8.6. Environmental Impact – Stormwater Runoff

The management of drainage and the treatment of the runoff from the road is a key issue for the network. This is particularly so if the standards of the proposed sections of the natural resources plan and its requirements for stormwater treatment are to be met. Note the natural resources plan indicates the Community wishes to have the level of service for stormwater management raised. This means provision for meeting the natural resources plan should be made ahead of its full adoption.

The options for consideration are:

1. To only undertake action when required by enforcement action.
2. To develop and then fund a programme to reduce the environmental impact of the network.
3. To fund the improvements identified in the programme, item 3, when they are associated with asset renewal work.

The following action proposed as the first step to reduce the environmental impact of stormwater runoff is to develop a programme for improving the treatment of water runoff from the roading network.

The benefit of developing a programme for improving runoff would be the first step to addressing the negative effects on the environment from runoff. The improvement identified in this programme can then be implemented when the programmed roadside drainage renewal is undertaken

The cost of developing the programme across the network would be in the order of $100,000. The cost would depend on the level of detail required to be included in the programme. Note this action could be included in the brief for identification of the drainage deficiencies.

The contributions of these actions to Community Outcomes & Well-beings are as follows:

a) SWDC-contributes to “the Sustainable South Wairarapa” outcome.
b) Carterton-contributes to “A healthy natural and built environment” outcome.

The consequences of not undertaking this action are:

a) when new Stormwater discharge consents are required then significant expenditure will be required to meet the Natural Resources Plan requirements for the discharge,
b) negative impacts of road runoff will continue,
c) expenditure on drainage renewals will be less efficient, and
d) if impacts of stormwater runoff are not reduced it will continue to reduce the Environmental Well-being of both Councils

9. Future Demand & Influences

9.1.1. Climate Change

There are two aspects to the climate change issue. The first is what is being done to mitigate for the effects of climate change on the service delivery. An example of addressing the effects of climate change is the improvement of the Network's resilience. This would enable the Network to withstand more frequent and severe storms. The second issue is what the business is doing to reduce the rate of climate change. An example of this action would be to reduce greenhouse gas generation from the business activity and/or an action offsetting the greenhouse gas emissions generated by the business.

This plan proposes the first step towards developing a programme of work to reduce the impact of climate change on the service delivery by increasing the network's resilience. Details of Ruamāhanga Roads proposals to address the issues that climate change has inflicted on South Wairarapa and Carterton districts are mainly contained in the business case for drainage.

9.1.2. Growth

The data for the current asset management plan is built on the 2018 population projections. Note this projection should be revised once 2018 census data is released.

Carterton and South Wairarapa Districts have experienced relatively high population growth since the development of these predictions.

The Councils have recently completed growth strategies. There are also more detailed growth plans being developed. These plans will identify infrastructure requirements to support the growth.

This plan proposes the first step towards developing a programme of work to support the growth that is occurring in the Wairarapa Districts.

9.1.3. Regulatory

There are many legislative instruments that are relevant to the roading group of activities. The particular piece of work that will change the requirements on the roading networks is the recommendations in the Ruamāhanga Whaitua report. This is expected to require increased treatment of stormwater runoff from the roading network before it enters water bodies. It is expected that the Ruamāhanga Whaitua recommendations will be adopted. It is assumed that the community, because of the level of engagement during the Ruamāhanga Whaitua process, are prepared to pay for the increased roading network costs associated with meeting the new stormwater discharge consent requirements.

This plan proposes the first step towards developing a programme of work to manage and treat stormwater runoff from the roading network.

10. Strategic Alignment

The following section details the key issues for the service delivered by the Ruamāhanga Network as problem statements, the benefits from addressing these issues, how the benefits will be measured and the links to the strategic direction of the Councils and the GPS.

10.1. Strategic fit – Connection Central Government Outcome to Strategic Problems

The following chart shows how addressing the Problem Statement, (key issues), will contribute to the achievement of the GPS Strategic Outcomes and the Councils Community Outcomes.

	Central Government GPS Outcomes (draft 2021) Investment Priority	Description of Strategic Problems / Key Issue
1	Healthy and safe people Safety – Developing a transport system where no-one is killed or seriously injured.	**The safety for users of the network is a key issue. Action is required to reduce death and serious accidents on the network.**
2	Resilience & Security Better Transport Options – Providing people with better transport options to access social and economic opportunities.	**The resilience of the network to Climate change is a key issue. The risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion to roads needs to be addressed.**
3	Inclusive Access Better Transport Options – Providing people with better transport options to access social and economic opportunities.	**The changing demand on the network as a result of population growth and new developments is a key issue for the transport network.**
4	Economic Prosperity Improving Freight Connections – Improving freight connections for economic development.	**The restrictions to the travel of HCVs across the transport network are a key issue. There are twelve bridges on the network that restrict the travel of HMV vehicles.**
5	Environmental Sustainability Better Transport Options – Providing people with better transport options to access social and economic opportunities.	**The management of drainage and treatment of the runoff from the road is a key issue for the network. This is particularly so if the standards of the proposed natural resources plan and its requirements for Stormwater treatment are to be met.**
6	Inclusive Access & Economic Prosperity Safety – Developing a transport system where no-one is killed or seriously injured. Better Transport Options – Providing people with better transport options to access social and economic opportunities. Improving Freight Connections – Improving freight connections for economic development.	**The roading infrastructure is made up of assets with long lives. This means it takes some years before the asset's deterioration, as a result of this underfunding of maintenance and renewal, becomes manifestly obvious to the users. The costs of recovery once the deterioration is fully manifested will be many times more than the increases required before the deterioration manifests.**

10.2. Strategic Fit – Connection to Council's Outcomes

The table 7.1 below shows the connection between the Councils' Outcomes and the Central Government outcomes & investment priorities to asset key issues, (strategic problems), and the contribution, (benefits) towards the Councils' Outcomes from addressing these key issues and the consequences of inaction.

Table 10.1 Connection of Councils' Outcomes & Central Government Outcome to Strategic Problems

	Outcome & Wellbeing Contribution	GPS Outcomes (draft 2021)	Central Government investment Priority	Description of Strategic Problems / Key Issue	Contribution to Outcome Achievement / Benefit of Action and the Consequences of inaction
1	SWDC- contributes to "the vibrant and strong community" outcomes. Carterton- contributes to "A safe district" outcome.	Healthy and safe people	Safety – Developing a transport system where no-one is killed or seriously injured.	The safety for users of the network is a key issue. Action is required to reduce death and serious accidents on the network. These actions are expected to include: changes to geo-metric design, improvements to traffic services, improved surfacing, road safety education and speed limit management.	The number of people involved in and affected by road crashes will be reduced. The cost to individuals and the community associated with road crashes will be reduced. If a safer road network is not achieved it will negatively impact on the Social, Economic and Cultural Well-beings of both Councils.
2	SWDC- contributes to "A place that's accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people" outcomes. Carterton- contributes to "A vibrant and prosperous economy" outcome.	Resilience & Security	Better Transport Options – Providing people with better transport options to access social and economic opportunities.	The resilience of the network to Climate change is a key issue. The risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion to roads needs to be addressed. This is particularly important to address where climate change is reducing the current level of network resilience.	The current reliability of travel for economic, health, cultural activities in the Districts of both Councils will be maintained. If the resilience of the network is not maintained then it will negatively impact on the Social, Economic and Cultural Well-beings of both Councils.

3	SWDC- contributes to "A place that's accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people" outcomes. Carterton- contributes to "A vibrant and prosperous economy, Quality fit-for-purpose infrastructure" outcome.	Inclusive Access	Better Transport Options – Providing people with better transport options to access social and economic opportunities.	The changing demand on the network as a result of population growth and new developments is a key issue for the transport network. Examples of these changing transport requirements are the Eastern development of Carterton, Urban Growth, Southern Structure Plan, demands for improved access across the Wairarapa, Urban Growth Strategy and, for both Councils, the growth of retirement villages.	There is a defined programme of work to improve safety, access and connections. If the Road Network is not improved to accommodate growth then there will be a negative impact on the Social, Economic and Cultural Well-beings of both Councils.
4	SWDC- contributes to "A place that's accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people" outcomes. Carterton- contributes to "A vibrant and prosperous economy, Quality fit-for-purpose infrastructure" outcome.	Economic Prosperity	Improving Freight Connections – Improving freight connections for economic development.	The restrictions to the travel of HCVs across the transport network are a key issue. There are twelve bridges on the network that restrict the travel of HMV vehicles.	The benefit of this action would be to enable more efficient options for freight movement to be used. If the Road Network restriction on the movement of HMV vehicles is not removed it could impact on the Economic Well-beings of both Councils.
5	SWDC- contributes to "the Sustainable South Wairarapa" outcome. Carterton- contributes to "A healthy natural and built environment" outcome.	Environmental Sustainability	Better Transport Options – Providing people with better transport options to access social and economic opportunities.	The management of drainage and the treatment of the runoff from the road is a key issue for the network. This is particularly so if the standards of the proposed natural resources plan and its requirements for Stormwater treatment are to be met. Note the proposed natural resources plan indicates the Community wishes to have the level of service for Stormwater management raised. This means provision for meeting the proposed natural resources plan should be made ahead of its adoption.	The benefit of developing a programme for improving runoff would be the first step to address the negative effects on the environment from runoff. The improvement identified in this programme can then be implemented when the programmed roadside drainage renewal is undertaken. If impacts of stormwater runoff are not reduced it will continue to reduce the Environmental Well-being of both Councils.

6	SWDC- contributes to the "Sustainable South Wairarapa and Vibrant and Strong Communities" outcome. If the Road Network is not funded to off-set increased costs then there will be a negative impact on the Social, Economic and Cultural Well-beings within SWDC Council District.	Inclusive Access Economic Prosperity	Safety – Developing a transport system where no-one is killed or seriously injured. Better Transport Options – Providing people with better transport options to access social and economic opportunities. Improving Freight Connections – Improving freight connections for economic development.	The roading infrastructure is made up of assets with long lives. This means the effect of underfunding maintenance and renewal take some years before the asset's deterioration becomes manifestly obvious to the users. The costs of recovery once the deterioration is fully manifested will be many times more than the increases required before the deterioration manifests. Councils' budgets are always under scrutiny, which is heightened with the current reductions in rates increases in response to the Covid 19 crisis and the pressure to meet new statutory requirements for Water Services. The funding of Roading maintenance and renewals is a significant budget for Councils so they are an obvious target for reduced expenditure. The comparison of the performance of Carterton & South Wairarapa networks indicates that condition and the low level of funding for maintenance and renewal of the South Wairarapa network is a key issue for the network's sustainability. The South Wairarapa network is starting to show the effects of the low level of funding. The network's smooth travel index has been declining over the last four years, see graph below. This has been exacerbated going forward as less work is being done now than in the past years because the funding has not been increased to match the increased cost. The balance between surfacing renewal and pavement maintenance is critical to optimisation of expenditure.	There will not be large unplanned expenditures. There will be inclusive access for all people in the community. The disruption to travel due to maintenance and renewal will be minimised. The Councils' Community prosperity will not be restricted by the condition of the roading network. The correct amount and balance between renewals and pavement maintenance funding will deliver to the Councils' Community the lowest whole of life cost for the delivery of the roading transport service.

10.3. Linking Key Issues / Strategic Problems to Programme Business Cases

The table 7.2 below shows the connection between the key issues, (Strategic Problems) and the programme business cases. Note the full programme business cases are included in the Life Cycle Section of this document in the appropriate funding category subsection.

Table 10.2 Linkage of Strategic Problems to Programme Business Cases

Linking Key Issues / Strategic Problems to Programme Business Cases				
	Description of Strategic Problems / Key Issue	**Benefit of Action & Consequence of not acting**	**Response / Programme Business Case**	**ONRC Performance measures**
1	The safety for users of the network is a key issue. Action is required to reduce death and serious accidents on the network. These actions are expected to include: changes to geo-metric design, improvements to traffic services, improved surfacing, road safety education and speed limit management.	Benefits The number of people involved in and affected by road crashes will be reduced. The cost to individuals and the community associated with road crashes will be reduced. Consequences The personal risk to Road users in the Carterton and South Wairarapa Districts will continue to get worse compared to other Peer Districts.	Road Widening. Increased funding of road marking and maintenance and renewal of signs	Customer Safety Outcome Measures Technical Safety output Measures Technical accessibility output measure.
2	The resilience of the network to Climate change is a key issue. The risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion to roads needs to be addressed. This is particularly important to address where climate change is reducing the current level of network resilience.	Benefits The current reliability of travel for economic, health, cultural activities in the Districts of both Councils will be maintained. Consequences The number and length of disruptions to travel caused by weather events will increase.	Bridge Maintenance funding Level.	Customer Resilience Outcome Measures. Customer Accessibility Outcome Measure
3	The changing demands on the network as a result of population growth and new developments is a key issue for the transport network. Examples of these changing transport requirements are the Eastern development of Carterton, Urban Growth, Southern Structure Plan, demands for improved access across the Wairarapa, Urban Growth Strategy and, for both Councils, the growth of retirement villages.	Benefits There is a defined programme of work to improve safety, access and connections. Consequences The consequences of not carrying out improvements to meet changing demands will be to lower the level of service delivered and to constrain growth.	The current funding environment means that these projects will not be considered for Council funding. The required network improvements required could be charged to the developer if required in the next ten years.	Customer Travel Time Reliability Outcome Measure.
4	The restrictions to the travel of HCVs across the transport network are a key issue. There are twelve bridges on the network that restrict the travel of HMV vehicles.	Benefits The benefit of this action would be: to possibly enable HCV access across some bridges. to identify which bridges need to be replaced to enable HCV travel on the network. to enable a business case to be developed for providing improved access for HCV vehicles. Consequences The consequence of not undertaking this investigation would mean that the current restrictions on HCV movements would remain.	The number of journeys currently affected by the restrictions is low. It is therefore concluded that a programme business case would not identify a high enough priority for investment to address this issue in the next 3 years.	Customer Accessibility Outcome Measure
5	The management of drainage and treatment of the runoff from the road is a key issue for the network. This is particularly so if the standards of the proposed natural resources plan and its requirements for Stormwater treatment are to be met. Note the proposed natural resources plan indicates the Community wishes to have the level of service for Stormwater management raised. This means provision for meeting the	Benefits The benefit of developing a programme for improving runoff would be the first step to address the negative effects on the environment from runoff. The improvement identified in this programme can then be implemented when the programmed roadside drainage renewal is undertaken. Consequences The consequences of not undertaking this action are:	Drainage Maintenance & Renewal	Customer Resilience Outcome Measure. Cost Efficiency Performance Measure 5.

	proposed natural resources plan should be made ahead of its adoption.	when new Stormwater discharge consents are required then significant expenditure will be required to meet the Natural Resources Plan requirements for the discharge, negative impacts of road runoff will continue and expenditure on drainage renewals will be less efficient.		
6	The roading infrastructure is made up of assets with long lives. This means the effect of underfunding maintenance and renewal takes some years before the asset's deterioration becomes manifestly obvious to the users. The costs of recovery once the deterioration is fully manifested will be many times more than the increases required before the deterioration manifests. Councils' budgets are always under scrutiny, which is heightened with the current reductions in rates increases in response to the Covid 19 crisis and the pressure to meet new statutory requirements for Water Services. The funding of Roading maintenance and renewals is a significant budget for Councils so they are an obvious target for reduced expenditure. The comparison of the performance of Carterton & South Wairarapa networks indicates that condition and low level of funding for maintenance and renewal of the South Wairarapa network is a key issue for the network's sustainability. The South Wairarapa network is starting to show the effects of the low level of funding. The network's smooth travel index has been declining over the last four years, see graph below. This has been exacerbated going forward as less work is being done now than in the past years because the funding has not been increased to match the increased cost. The balance between surfacing renewal and pavement maintenance is critical to optimisation of expenditure.	Benefits There will not be large unplanned expenditures. There will be inclusive access for all people in the community. The disruption to travel due to maintenance and renewal will be minimised. The Councils' Community prosperity will not be restricted by the condition of the roading network. The correct amount and balance between renewals and pavement maintenance funding will deliver to the Councils' Community the lowest whole of life cost for the delivery of the roading transport service. Consequences The consequences if Road funding is not increased, so the required maintenance can be completed, will be increasing deterioration of the network's condition. In time, this will manifest in a greater number of potholes to repair and repeated repairs of the same potholes. Then the situation would progress to some potholes not being repaired and to large areas of pavement failure. The cost at this point of stopping the decline and restoring the network's condition will be significantly greater than the cost increase proposed.	.Pavement Maintenance & Renewal Drainage Maintenance & Renewal **Bridge Maintenance**	All Cost Efficiency Measures. Customer Travel time reliability Outcome measure. Customer Amenity Outcome measure. Technical Amenity Output measure.

11. Economic Case

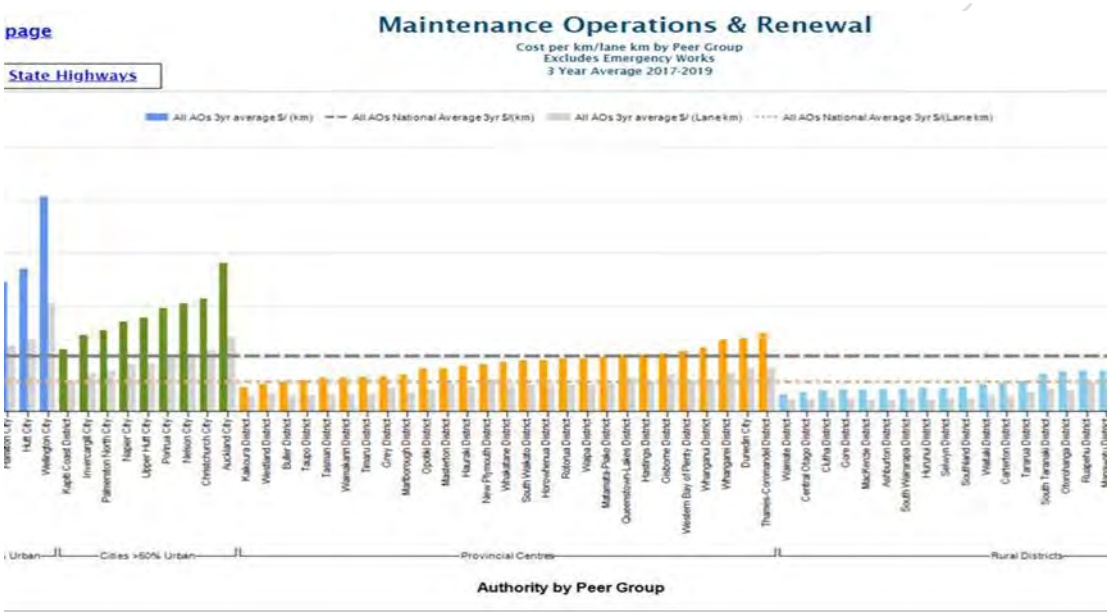
11.1. Efficiency – benchmarking of costs

The national information on roading costs allows Carterton and South Wairarapa District Councils' performance to be compared nationally. The information does not currently provide an analysis of the combined Ruamāhanga road network.

a. Carterton District Network

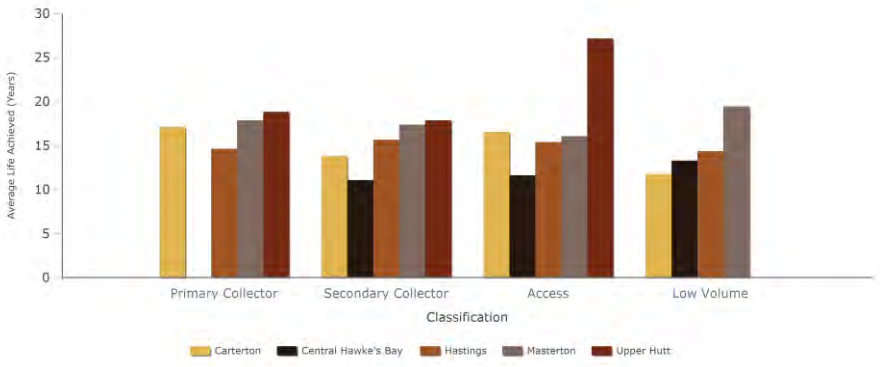
The historic level of funding for the Carterton Roading Network's maintenance and renewal has been low compared to its peers.

Figure 11.1 National Comparison of Maintenance & Renewal



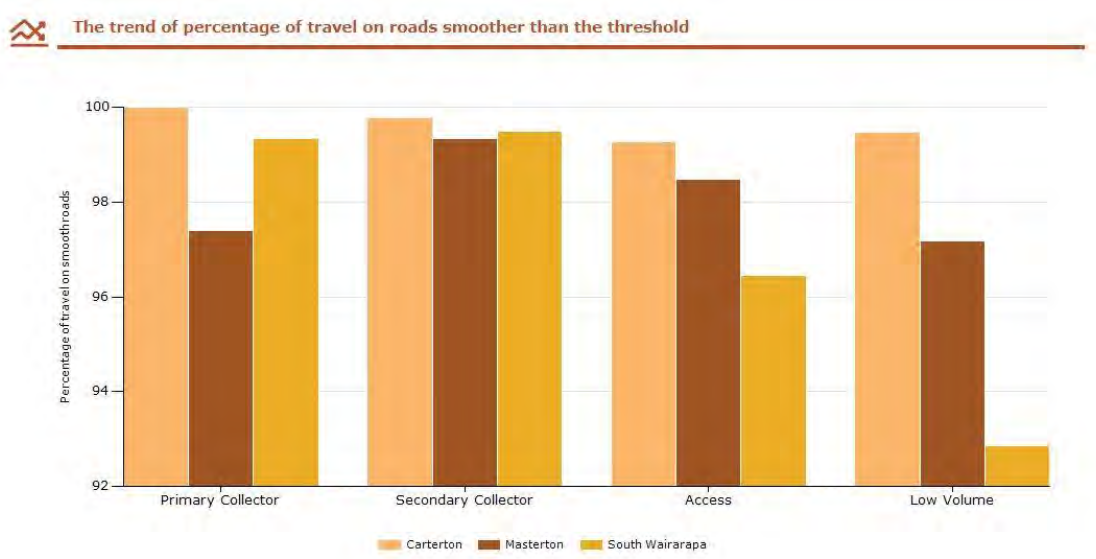
The rates of asset renewal are above the mean in comparison with other councils. The Low Volume seal surfaces are required to last 12 years at the historic levels of renewal funding.

Figure 11.2 Caterton Chipseal resurfacing average life achieved, four-year average to 2018/19



The road condition, measured through the Smooth Travel Exposure (STE), is the highest amongst the Wairarapa Councils. This is particularly so for the Access and Low volume ONRC category roads.

Carterton District - percentage of travel on roads smoother than the threshold for each ONRC category

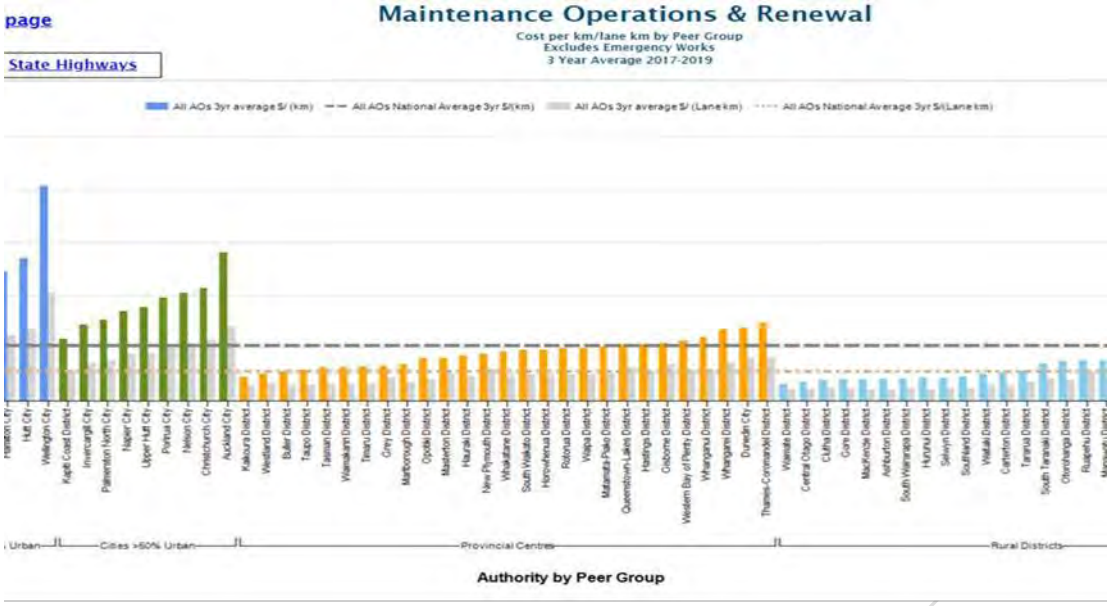


b. South Wairarapa District Network

The national information on roading costs allows South Wairarapa District Council's performance to be compared nationally.

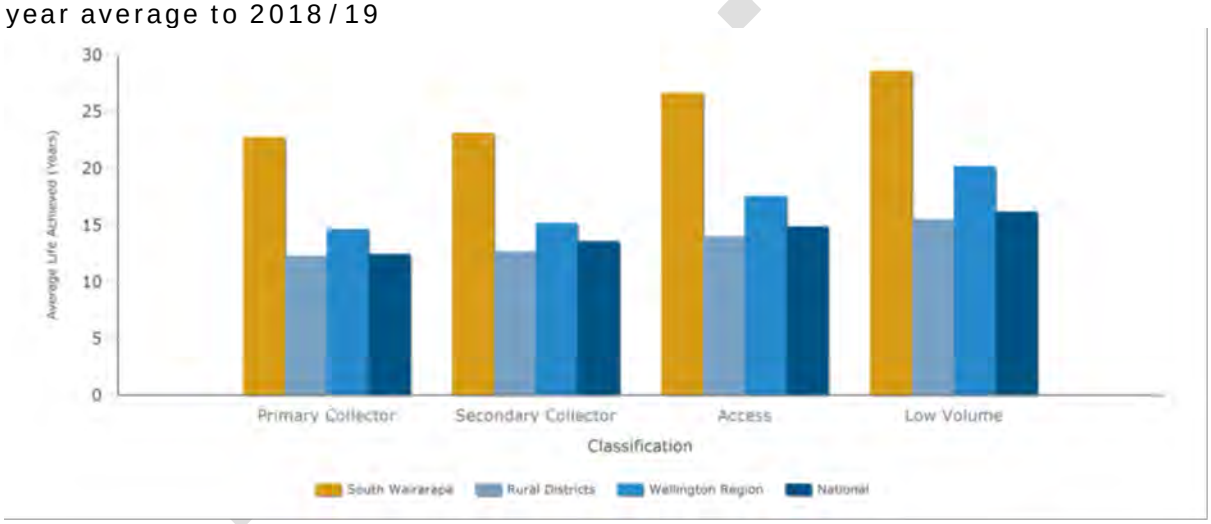
The historic level of funding for the South Wairarapa Roading Network's maintenance and renewal has been very low.

Figure 11.3 National Comparison of Maintenance & Renewal



The rates of asset renewal are also low in comparison with other councils. The Access and Low Volume seal surfaces are required to last 27 years at the historic levels of renewal funding, which is considered to be an unrealistic intervention level

Figure 11.4 South Wairarapa Chipseal resurfacing average life achieved, four-year average to 2018/19



Previously the road condition, measured through the Smooth Travel Exposure (STE), equalled and exceeded the peer group average and was a significantly better result than the national average. However, over the last four years this measure shows the road network's condition is declining. This is particularly apparent for the Low Volume and Access road categories.

Figure 11.5 South Wairarapa percentage of travel on roads smoother than the threshold for each ONRC category

11.2. Performance Targets - Levels of Service – LTP KPI

11.2.1. Performance measures

The following table shows the performance achievement against the targets set by the Councils for the Statutory Performance Measures.

The Statutory Performance Measures have been developed so that performance and management of the roading networks can be compared by communities across New Zealand. The other common measurement the Carterton and South Wairarapa networks have is the community satisfaction survey. Carterton District has a target value of 55% and has achieved 50%. South Wairarapa District split the measure into roads and footpaths with targets of 85% and 75% respectively and achieved 68% and 62% in the 2018/19 survey.

There are other performance measures used by the Councils for the management of their network. It is preferable that these measures are not included in future LongTerm Plan documents. The advantage of not including these, other than the Statutory Performance measures, in the Long Term Plan (LTP) document is that Governance and Management can be more dynamic. They can adjust their focus to different aspects of the business as required by changed circumstances without needing to alter the LTP.

Figure 11.6 Statutory Performance measure Achievement compared to Target

Statutory Performance Measure	Description of Measure	Carterton Target	Carterton Achievement 2018/19 Year	SWDC Target	SWDC Achievement 2018/19 Year
road safety	The number of crashes causing injuries is reduced	Fatal: decrease or ≤1 increase, Serious injury: decrease or ≤3 increase	1 fatal No serious injury	<7	Increased by 2.
road condition	Average quality of ride on the sealed local road network, measured by	≥90%	98%	95%	97%

	smooth travel exposure				
road maintenance	Percentage of sealed road network that is resurfaced.	≥5%	5%	5%	4.6%
footpaths	Percentage of footpaths compliant with condition standards	≥95%	Not measured, previous year 98.1%	95%	Not survived. Previous year 87%
response to service requests	The % of Customer service requests relating to roads and footpaths responded to within a fixed time.	90%	91%	80%	91%

11.2.2. Evaluation of Performance

The following sections discuss the achievement against each of the performance measures and options for improving the achievement.

11.2.3. Safety

The performance target set for safety was not achieved on both networks. The reporting against the performance measures is only an annual snapshot. The following graphs however have been generated from the last 10 years of records and compares the safety on the Ruamāhanga network with other networks. Although crash rates have declined over the last ten years on the Ruamāhanga network, the crash rate is still relatively high compared to other Districts. This, along with the Regional and National goal to reduce Road network crashes, means increasing the safety to users is a priority.

Figure 11.7 The total number of reported crashes by traffic volume over 10 years - Carterton Network

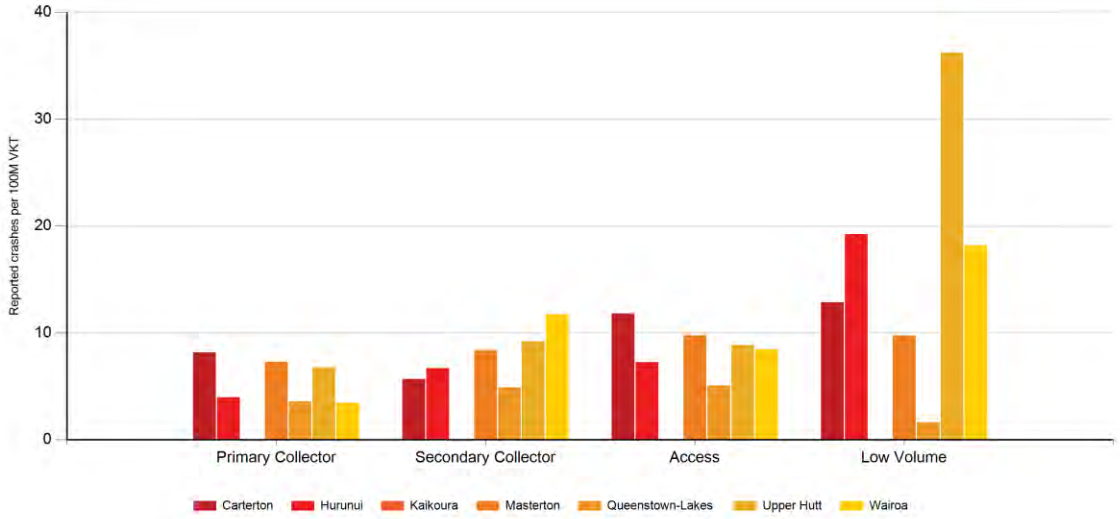


Figure 11.8 The total number of reported crashes per kilometre over 10 years - Carterton Network

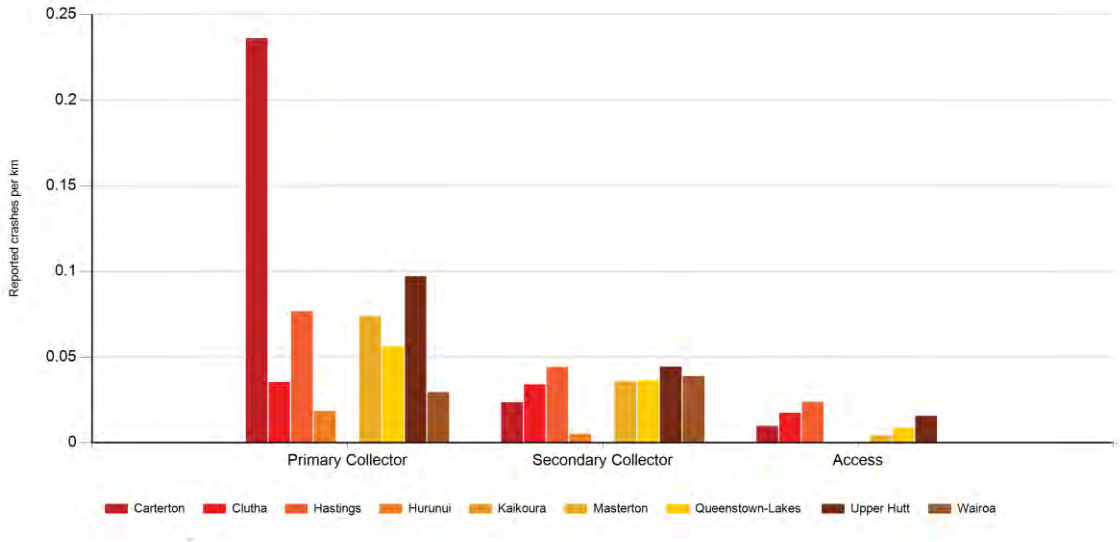


Figure 11.9 Comparative trend in reported serious injuries & fatalities over 10 years - Carterton Network

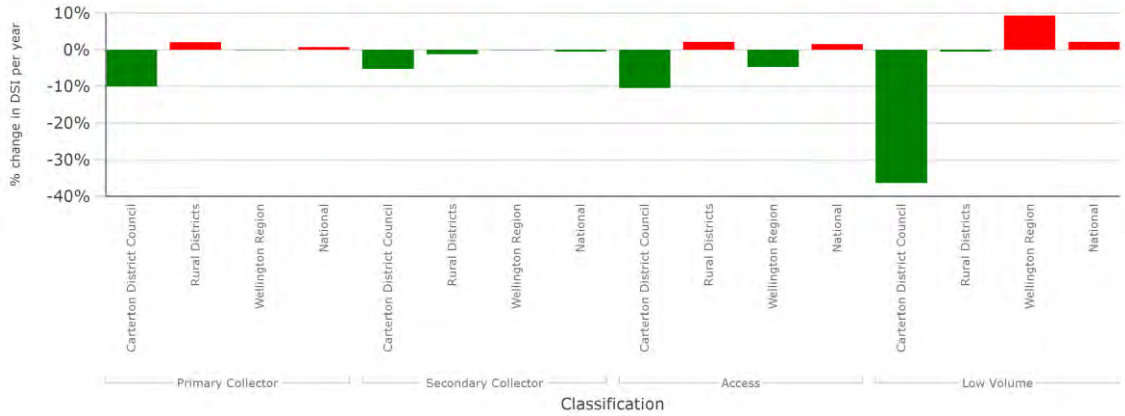


Figure 11.10 The total number of reported crashes per kilometre over 10 years - South Wairarapa network

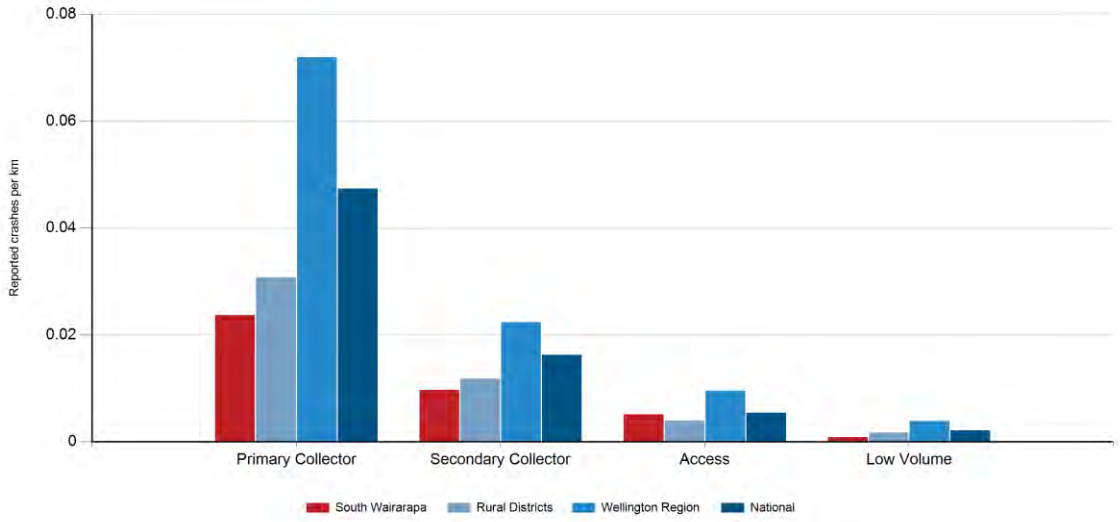


Figure 11.11 The total number of reported crashes by traffic volume over 10 years - South Wairarapa network

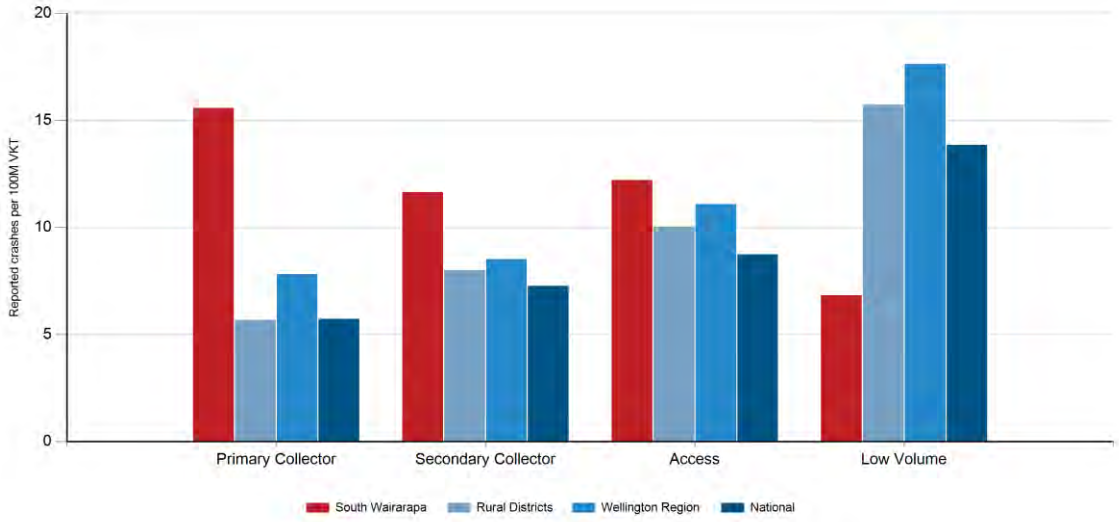
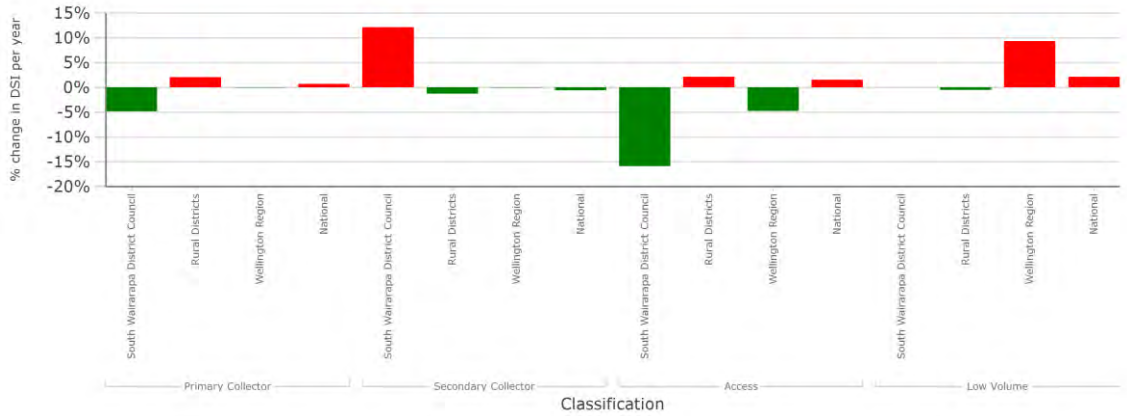


Figure 11.12 Comparative trend in reported serious injuries & fatalities over 10 years - South Wairarapa network



11.2.4. Conclusion – what these safety figures tell us

These figures indicate there is a significantly higher number of crashes on primary collectors in both Carterton District and South Wairarapa District when compared to peer groups. Interestingly, the number of crashes only appears to be an issue when compared against vehicle kilometres travelled. This suggests that the roads are infrequently used (compared to a national average) but have a high crash rate when they are used.

11.2.5. Road Condition

The target for condition of the road network has been achieved for the Ruamāhanga network. A more detailed analysis however of the road condition shows that the South Wairarapa component is declining. This decline is exacerbated by the reduced quantity of maintenance work now being completed. To prevent a significant decline in the network condition the funding for maintenance of the South Wairarapa network needs to be increased.

11.2.6. Road Maintenance - sealed

The target percentage for the Road Maintenance performance measure is set by the asset management process. The asset management process needs to determine the optimum renewal rate for the resurfacing so that the combined cost of renewals and maintenance is minimised. This analysis, although not an exact science, concludes that the target of a 20 year life for the surfacing for lightly trafficked rural roads, which equates to renewing 5% of the network length every year, should continue as the target for the roading network's resurfacing.

The review of achievement over the last 3 years concludes that:

a) the capital budget allocation to resurfacing on the Carterton section of the network could be reduced as it has overachieved the target level and
b) the capital budget allocation on the South Wairarapa section of the network should be increased because the target lengths have not been achieved over the past three years.

This is confirmed as a strategy for optimisation of the combined cost of maintenance and renewal because the pavement maintenance costs on Carterton's section of the network are lower than the South Wairarapa section. It is therefore concluded that an increase in the surfacing renewal on the Wairarapa network section is expected to reduce the overall requirement for sealed pavement maintenance.

11.2.7. Footpaths

The target for footpath maintenance, when last measured, has been achieved for the Carterton section of the network but not achieved for the South Wairarapa section of the network. This would indicate that there should be a small increase in the provision for footpath maintenance on the South Wairarapa section of the network.

11.2.8. Response times

The target times for responses has been achieved. There is no information that would suggest that the target time for responses should be changed. Note the task identified below to learn more about why customers are not satisfied with the service delivered, may provide information that indicates the response time target should be changed.

11.2.9. Resident's Satisfaction

The targets for resident's satisfaction have not been achieved. These targets are also low compared to satisfaction levels that a business would need to achieve from its customers.

The causes of the low levels of community satisfaction are not known. There is not enough data to analyse to determine definitively the causes for the dissatisfaction. At present any conclusion drawn would be based on speculation. The consultation on the Long Term Plan may provide some evidence however, at this stage, the Asset Plan's improvement actions should include work to determine the reasons for the low levels of satisfaction with the service delivered by the Roading group of activities. Once the reasons are known, then an action plan can be developed to address this issue. Note the reason could be that expectations do not align with willingness to pay for the service.

11.3. ONRC Performance Measures

The table below shows which ONRC performance measures are monitored and the performance measures where there is insufficient data collected to undertake monitoring. The improvement plan identifies a plan to improve the data so that an increased number of ONRC measures can be monitored.

The Appendix provides details of each of the monitored performance measures. The analysis of the monitored performance measures is provided in the Life Cycle section of this document.

Legend	
	Good/ excellent preformance
	Should be improved
	Needs Action

Table 11.1 ONRC Performance Measures

Safety – Customer Outcome Performance Measures		Carterton	Result	South Wairarapa	Result
Customer Outcome 1: the number of fatal and serious injuries on the network		Monitored	↓	Monitored	↔
Customer Outcome 2: collective risk (fatal and serious injury rate per kilometre)		Monitored	↓	Monitored	↔
Customer Outcome 3: personal risk (fatal and serious injury rate by traffic volume).		Monitored	↓	Monitored	↔
Safety – Technical Output Performance Measures					
Technical Output 1: permanent hazards		not monitored		not monitored	
Technical Output 2: temporary hazards		not monitored		not monitored	
Technical Output 3: sight distances		not monitored		not monitored	
Technical Output 4: loss of control on wet roads		Monitored	↓	Monitored	↔
Technical Output 5: loss of driver control at night		Monitored	↓	Monitored	↔
Technical Output 6: intersections		Monitored	↓	Monitored	↔
Technical Output 7: hazardous faults		not monitored		not monitored	
Technical Output 8: cycle path faults		Monitored	↓	Monitored	↔
Technical Output 9: vulnerable users		Monitored	↓	Monitored	↔
Technical Output 10: roadside obstructions		not monitored		not monitored	
Resilience – Customer Outcome Performance Measures					
Customer Outcome 1: the number of journeys impacted by unplanned events		not monitored		not monitored	
Customer Outcome 2: the number of instances where road access is lost		not monitored		not monitored	
Amenity – Customer Outcome Performance Measures					
Customer Outcome 1: Smooth Travel Exposure (STE) – roughness of the road (% of travel on sealed roads which are smoother than a defined threshold)		Monitored	✸	Monitored	↔
Customer Outcome 2: peak roughness		Monitored	✸	Monitored	↔
Amenity – Technical Output Performance Measures					
Technical Output 1: roughness of the road (median and average)		not monitored		not monitored	
Technical Output 2: aesthetic faults		not monitored		not monitored	
Accessibility – Customer Outcome Performance Measures					
Customer Outcome 1: proportion of network not available to Class 1 heavy vehicles and 50MAX vehicles		not monitored		not monitored	
Accessibility – Technical Output Performance Measures					
Technical Output 1: accessibility		not monitored		not monitored	
Travel Time Reliability – Customer Outcome Performance Measures					
Customer Outcome 1: throughput at indicator sites		not monitored		not monitored	
Cost Efficiency Performance Measures					
Cost Efficiency 1: pavement rehabilitation		Monitored	✸	Monitored	✸
Cost Efficiency 2: chipseal resurfacing		Monitored	✸	Monitored	✸
Cost Efficiency 3: asphalt resurfacing		not monitored		not monitored	
Cost Efficiency 4: unsealed road metalling		Monitored	↔	Monitored	↔
Cost Efficiency 5: Overall network cost, and cost by work category		Monitored	✸	Monitored	✸

11.3.1. What this table tells us and how we have reacted to it

Table 13.1 provides a stark picture of Ruamāhanga Roads, the Safety results both in terms of Customer Outcome Performance Measures and Technical Output Performance Measures indicate urgent action is needed to improve the safety performance of the districts' roads. Whilst the excellent performance in cost efficiency indicates that the districts have been receiving good value for the money spent, perhaps too good, as the lack of investment is now showing in the safety results, especially in Carterton District. Furthermore, the

improvement needed in the smooth travel exposure and peak roughness in South Wairarapa's network also speaks of underinvestment. The Response to these issues can be found in Chapter 15 Asset and Lifecycle Management.

12. Financial Case

The Ruamāhanga Roads' annual budget is proposed to increase from $7,949,292 in 2020/21 to $10,255,899 in 2021/22. This is an increase of $2,061,607 or 26%, which at face value appears to be unwarranted. However, this is an increase from a very low base as Ruamāhanga Roads is, according to ONRC data, one of the most cost-efficient networks in the country.

Closer examination of the increase shows that over half the increase (just over $1.2 million) is for low cost low risk projects. This funding will be used to address safety issues on the network which the ONRC Performance Measures suggest 'needs action'. A further $600 thousand will be used to increase the amount of renewals being carried out to a level which is sustainable in the long term.

Further, there have been significant cost increases, of 40%. ,in the contract rates in the past year This means the extent of Maintenance, Operational and Renewal (MOR) work carried out would be significantly reduced without a budget increase. The funding sought to adjust for the contract rate increase in the routine maintenance is only 10% as the predictions of the required quantities of work have been re-evaluated in this asset plan.

The funding increases for Maintenance, Operations & Renewals (MOR) have been approved by South Wairarapa District Council. This funding is also currently being implemented by Carterton District Council. It is therefore considered to be practical to deliver these funding increases. The increasing population of the districts should also mean that it is affordable.

The councils will consider the increase in Low Cost Low Risk (LCLR). They are expected to approve increased funding for LCLR as it will improve safe travel on the network which is consistent with the Road to Zero vision.

Ruamāhanga Roads believe that they have the resources to be able to spend the increased levels of funding and the proposal is feasible.

The table below identifies the funding required to implement the planned actions to achieve the Strategic direction.

Table 12.1 **Ruamāhanga Road**s Network - Annual Budgets for the next 10 years

Raumahanga Road Network - Annual Budgets for the next 10 years											
Activity	**Years**										
	Previous Years		1	2	3	4	5	6	7	8	9
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30
Maintenance											
Physical work undertaken by contractors	$3,181,503	$3,431,503	$3,769,093	$3,844,475	$3,921,364	$3,999,791	$3,999,791	$3,999,791	$3,999,791	$3,999,791	$3,999,791
Business Unit costs											
Staff, Council overheads & Consultants	$739,025	$989,025	$1,104,712	$1,126,806	$1,149,342	$1,172,329	$1,172,329	$1,172,329	$1,172,329	$1,172,329	$1,172,329
Renewals											
All Renewals	$2,769,514	$2,769,514	$3,344,595	$3,411,487	$3,479,716	$3,549,311	$3,549,311	$3,549,311	$3,549,311	$3,549,311	$3,549,311
Improvements											
Low -cost Low-risk	$759,250	$759,250	$2,037,500	$1,559,750	$1,547,000	$1,547,000	$1,547,000	$1,547,000	$1,547,000	$1,547,000	$1,547,000
Base-line Subtotal	**$7,449,292**	**$7,949,292**	**$10,255,899**	**$9,942,517**	**$10,097,423**	**$10,268,431**	**$10,268,431**	**$10,268,431**	**$10,268,431**	**$10,268,431**	**$10,268,431**
Project 1											
Project 2											

South Wairarapa's - Share of Road Network Annual Budgets for the next 10 years											
Activity	**Years**										
	Previous Years		1	2	3	4	5	6	7	8	9
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30
Maintenance											
Physical work undertaken by contractors	$1,930,203	$2,180,203	$2,265,500	$2,310,810	$2,357,026	$2,404,167	$2,404,167	$2,404,167	$2,404,167	$2,404,167	$2,404,167
Business Unit costs											
Staff, Council overheads & Consultants	$391,125	$641,125	$740,000	$754,800	$769,896	$785,294	$785,294	$785,294	$785,294	$785,294	$785,294
Renewals											
All Renewals	$1,277,514	$1,277,514	$1,807,500	$1,843,650	$1,880,523	$1,918,133	$1,918,133	$1,918,133	$1,918,133	$1,918,133	$1,918,133
Improvements											
Low -cost Low-risk	$478,750	$478,750	$1,037,500	$999,750	$1,002,000	$1,002,000	$1,002,000	$1,002,000	$1,002,000	$1,002,000	$1,002,000
Base-line Subtotal	**$4,077,592**	**$4,577,592**	**$5,850,500**	**$5,909,010**	**$6,009,445**	**$6,109,594**	**$6,109,594**	**$6,109,594**	**$6,109,594**	**$6,109,594**	**$6,109,594**
Project 1											
Project 2											

South Wairarapa's LR - Share of Road Network Annual Budgets for the next 10 years											
Activity	**Years**										
	Previous Years		1	2	3	4	5	6	7	8	9
	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30
Maintenance											
Physical work undertaken by contractors	$1,666,323	$1,916,323	$1,993,500	$2,033,370	$2,074,037	$2,115,518	$2,115,518	$2,115,518	$2,115,518	$2,115,518	$2,115,518
Business Unit costs											
Staff, Council overheads & Consultants	$345,000	$595,000	$650,000	$663,000	$676,260	$689,785	$689,785	$689,785	$689,785	$689,785	$689,785
Renewals											
All Renewals	$1,149,644	$1,149,644	$1,625,000	$1,657,500	$1,690,650	$1,724,463	$1,724,463	$1,724,463	$1,724,463	$1,724,463	$1,724,463
Improvements											
Low -cost Low-risk	$345,000	$345,000	$645,000	$597,000	$574,000	$574,000	$574,000	$574,000	$574,000	$574,000	$574,000
Base-line Subtotal	**$3,505,967**	**$4,005,967**	**$4,913,500**	**$4,950,870**	**$5,014,947**	**$5,103,766**	**$5,103,766**	**$5,103,766**	**$5,103,766**	**$5,103,766**	**$5,103,766**
Project 1											
Project 2											

13. Commercial Case

13.1. Procurement

There has been a procurement strategy and Local Government 17a review for Transport services Completed in 2019. The procurement strategy analysed the market and has determined how the services required to implement the work identified in this asset plan will be procured.

The current arrangement for procurement, made in accordance with the procurement strategy and Local Government 17a review, is that a single physical works contract has been let for delivery of maintenance, renewal and low cost & low risk improvements. The operation & management of the service is undertaken by Council staff, which is supplemented, where necessary, with short term engagements of additional resources from consultants.

The contract documentation was updated to incorporate the latest legislative requirements (e.g. Health and Safety in Employment), and the requirements of the One Network Road Classification (ONRC). Sustainable market criteria and succession and training requirements was also included in the contract specification.

The procurement strategy evaluated the risks of the relatively limited supplier market. It was felt that some of the local contracting firms lacked the skills required to carry out all the full range of work required. However, there is sufficient competition at present and this is expected to continue. There was interest from the three large national contractors in the large road maintenance contract when it was tendered.

The programme delivery efficiency was considered as part of the recent development of the procurement for the physical works contract. An assessment of the abilities of local and national contractors was made. Whilst it was considered that the smaller local contractors did not have the breadth of skills and resources to tackle all the requirements of the contract, it was understood that local contractors currently sub-contract to the national contractors and will continue to do so.

14. Management Case

The creation of Ruamāhanga Roads has enabled the resources of South Wairarapa and Carterton District Council's asset management teams to be combined into one organisation. By doing so expertise and good practice can be shared and the risk of experienced staff leaving can be reduced. Combining the areas has allowed a larger contract to be let and by doing so increased the likelihood of better value for money. The larger area allows staff efficiencies to be made which will result in a higher quality of monitoring and asset management.

14.1. Working with others

To share knowledge and gain maximum efficiencies Ruamāhanga Roads is also working with:

- Waka Kotahi on the Road to Zero
- Department of Conservation (DoC), to maintain the small length of DoC roads within the region, with funding received from DoC to cover the associated cost. The DoC network is very small, in the order of 1-2km in total length and is incorporated within the physical works contract.
- Maintenance required on the Special Purpose Road to Ngawi. This road is a high risk route subject to regular slips and undercutting, with a high demand to monitor and maintain it in a serviceable state.
- Masterton DC - Road Safety Coordination is combined Ruamāhanga Roads

14.2. Risks

The table below identifies the risk of disruption to the service delivered by the Roading network. The table also details the actions contained in this plan to manage each risk.

Table 14.1 Risk to Roading Network Service

	Name of Risk	Nature of Risk	Actions
1	Storm events	The damage from a storm event prevents the use of a section of the network. This could be the effect of flooding, washout or a slip that prevents access along a section of Road.	The current level of resilience is assumed to be acceptable. There is an action to develop a programme of work to ensure this level of risk does not increase with Climate change.
2	Earthquake	The damage from an earthquake event prevents the use of a section of the network. This could be the effect of a damaged bridge, damage to the Road surface from liquefaction or a slip that prevents access along a section of Road.	It is assumed that the current level of resilience is acceptable to the community. No action is proposed to specifically increase resilience for an earthquake event. However improved resilience to accommodate climate change may also increase earthquake resilience.
3	Asset management and/or delivery failure.	The asset management process fails to predict, accurately enough, funding required for operation, maintenance and renewal of the Roading network. The Asset Plan's identified programme of maintenance and renewal is not completed.	The monitoring by Governance of management reports on work achievement should provide timely notice if this type of failure occurs. Also, every three years the budget levels are reassessed again. The reassessed budgets can take into

		The result of both of these failures is that insufficient work is carried out on the Roading network's assets to ensure it can continue to deliver service in the future without a significant additional expenditure.	account the trend in condition of the Roading network's assets.
5	Business failure.	There are a number business risks that can disrupt the operation of a Roading network. An example of this type of risk is lack of training to effectively operate in an emergency.	The monitoring by Governance of management reports to ensure these risks are identified and an acceptable level of action is being undertaken to manage them.

14.3. Assumptions

The assumptions made are listed below. There is a risk that these assumptions do not correctly reflect the situation they cover. These risks are managed by monitoring the assumptions and their re-assessments in three years.

Table 14.2 Asset Planning Assumptions

	Assumption Name	Description of Assumption
1	Population Growth	The current trend in population will likely continue. Note the lack of sound census data means growth is not as easily quantified.
2	NZTA funding	The assumption is that NZTA funding will continue at not less than the current levels.
3	Natural Resource Plan Requirements	It is assumed that the draft Natural Resource Plan will be adopted without changes from the draft.
4	Missing information	It is assumed that all relevant information has been taken into account in the preparation of the asset plan.
5	Consent Conditions	It is assumed that there will be no significant changes to consent conditions other than those applying to Stormwater runoff.

15. Asset and Lifecycle Management

This section determines the budgets required, then outlines the strategy for maintenance and renewal of the assets so they can deliver the levels of service while optimising their lifecycle costs.

The overall objective of a Lifecycle Management Plan is:

"To ensure that the current strategies do not consume the asset leading to an unexpected increase in maintenance/renewal expenditure in the future".

This Lifecycle Management Plan is divided into the following road elements:

- Sealed Pavements
- Unsealed Pavements
- Pavement Drainage
- Bridges
- Culverts
- Carriageway Lighting
- Traffic Facilities & Signage
- Vegetation & Streetscapes
- Footpaths and Pedestrian Crossings

15.1. Sealed Pavements

15.1.1. Funding – Sealed Pavements

The estimated value of the quantum of work required to maintain the Ruamāhanga Network at the current service levels is set out in the table below.

Table 15.1 Sealed Pavement Maintenance & Renewal Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 111; SEALED PAVEMENT MAINTEANCE	$500,000.00	$49,000.00	$549,000.00	$396,451	$945,451.15
WC 212 SEALED ROAD RESURFACING (SEPARABLE PORTION B)	$700,000.00	$100,000.00	$800,000.00	$448,200	$1,248,200.00
WC 214 PAVEMENT REHABILITATION	$250,000.00	$0.00	$250,000.00	$340,596	$590,596.19
Total Budget	**$1,450,000**	**$149,000**	**$1,599,000**	**$1,185,247**	**$2,784,247.34**

These figures have been determined from the historic records of work completed and from a review of the resulting asset condition. The cost of the historic volume of work has been adjusted to take account of the new contract rates. The volume of work has then been adjusted to take account of the proposed investments in renewals. Note the determination of the funding level requires judgement and use of local knowledge as well as the analysis of the trend in the asset condition information. These judgements are validated by monitoring the Asset Condition data.

The trend in the asset information for the Carterton section of the network shows the asset condition has been maintained. The trend in the South Wairarapa section of the network is showing signs of decline. The cost of pavement maintenance work has increased by

approximately 40% in the last year. In the past the full pavement maintenance budget had not been spent on the Carterton section of the network. It is therefore concluded that the Carterton network section can absorb the increased cost of work within the current budget but may need to be increased in future years. The South Wairarapa network has in the past spent the entire maintenance budget and the network condition is declining. It is therefore concluded that the pavement maintenance budget should be increased for the South Wairarapa section of the network along with an increased level of surfacing renewal.

The surfacing renewal budget has achieved a 15 year average surfacing life on the Carterton network section and on the South Wairarapa network section a 27 year average surfacing life. The surfacing renewal budget has been adjusted to achieve an average life of 20 years on both sections. This is considered justified because the Carterton section with the shorter surfacing lives has achieved a better asset condition and has a lower cost for sealed pavement maintenance.

The rehabilitation budgets have been kept at the same levels as they have been in previous years. This means that the small sections with the highest maintenance cost can be renewed to ensure that the maintenance work required does not rapidly increase. Note the network is not homogenous and experience shows only relatively small localised areas of pavement failure occur. Without better tools to predict the level of future failure, keeping the pavement renewal at a similar level to the current length requirement is the lowest value for prudent management of the pavement. The pavement's need for renewal should be monitored to ensure there is no backlog occurring at this level of funding. If a backlog appears then additional funding will need to be sought.

15.1.2. Business case for Maintenance & Renewal Funding

Underinvestment in renewing the districts roads has led to a decrease in road ride quality which is expected to accelerate in future years and is symptomatic of the roads' viability. If this issue is not resolve in the short to medium term, the cost of returning the network up to suitable standard will increase substantially in future years.

15.1.3. Timing of interventions - Issues considered

- It is critical for the delivery of lowest whole of life cost that the correct balance between renewals and maintenance is funded.
- The current level of funding for maintenance and renewal of the network is a key issue for the network's sustainability.
- The decline in condition is occurring in the Low Volume and Access Roads at present. However, in time, this will occur in the Primary and Secondary Collector class of roads, predominately in South Wairarapa and at this point the deteriorating condition of the Road Network will become more visible to the Community.
- It is critical that the network's condition is addressed before deterioration fully manifests because by then the cost to remedy the situation will be extremely high. Note the New Zealand water supply & wastewater services are now facing this situation where there are high costs of unplanned maintenance combined with the requirement for high renewal expenditure to remedy the situation.

Roading Network Purpose

The Road Transport network is one of the primary assets that enable the people in the community to interact with each other. The other assets that allow people in communities to connect are telecommunications and radio. Also, rail, water and air in conjunction with roads allow people to connect.

Community Outcomes

The efficient maintenance & renewal of the network's assets will contribute to the achievement of the following community outcomes.

- *SWDC-contributes to the "Sustainable South Wairarapa and Vibrant and Strong C*ommunities" outcomes.

- Carterton- contributes to the" *A prosperous economy and Quality fit-for-purpose* Infrastructure" outcomes.

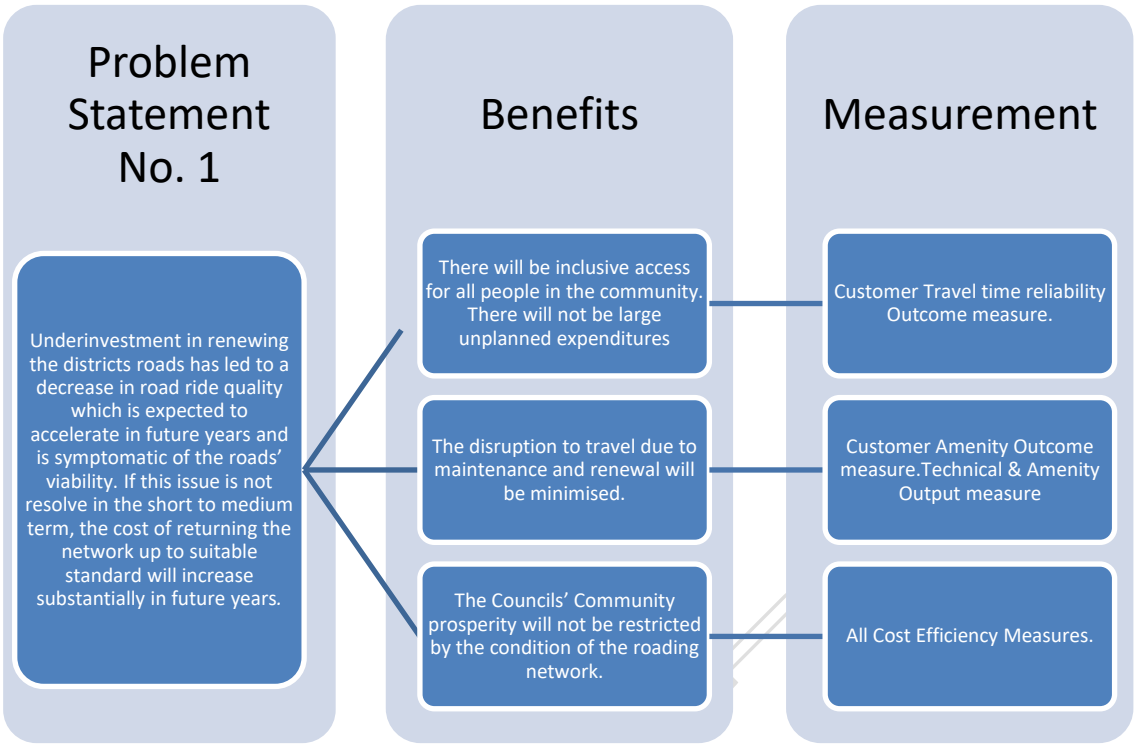
Contribution to GPS

The efficient maintenance & renewal of the network's assets will contribute to the GPS objectives:

- Safety – Developing a transport system where no-one is killed or seriously injured.
- Better Transport Options – Providing people with better transport options to access social and economic opportunities.
- Improving Freight Connections – Improving freight connections for economic development.

15.1.4. Benefits & Measurement

The diagram below shows the mapping of the measurement of benefits arising from efficient maintenance & renewal of the network's assets.

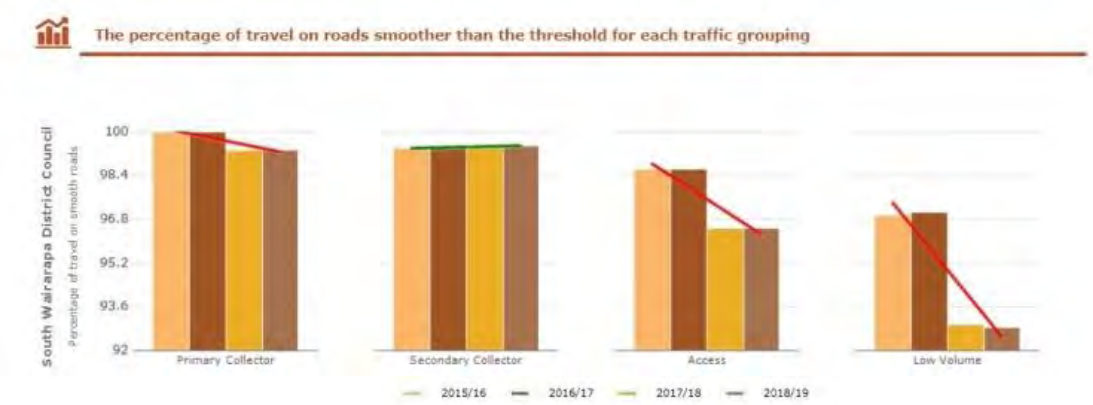


15.1.5. Evidence & Options

The comparison of the performance of Carterton & South Wairarapa networks indicates that both condition and low level of funding for maintenance and renewal of the South Wairarapa network are key issues for the network's sustainability. The South Wairarapa network is starting to show the effects of the low level of funding. The network's smooth travel index has been declining over the last four years, see graph below. This has been exacerbated going forward as less work is being done now than in the past years because the funding has not been increased to match the increased cost. The balance between surfacing renewal and pavement maintenance is critical to optimisation of expenditure.

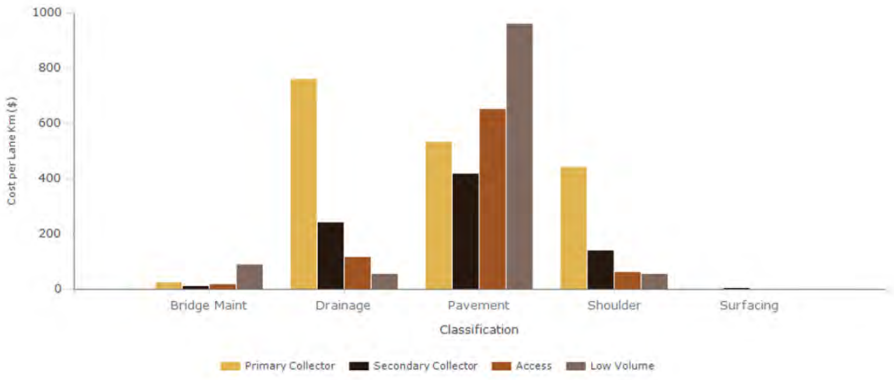
The decline in condition is occurring in the Low Volume and Access Roads at present. However, in time, this will occur in the Primary and Secondary Collector class of roads and at this point the deteriorating condition of the Road Network will become more visible to the Community.

Table 15.2 Percentage of travel on roads smoother than the threshold for each road category South Wairarapa

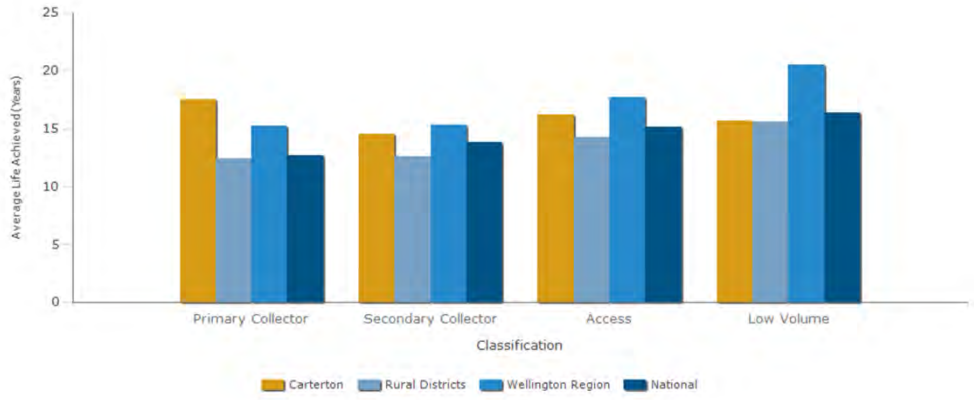


15.1.6. Sealed Road Efficiency - Carterton

The total cost of Maintenance costs per Lane km by Cost Group over the 2019/20 Financial Year.

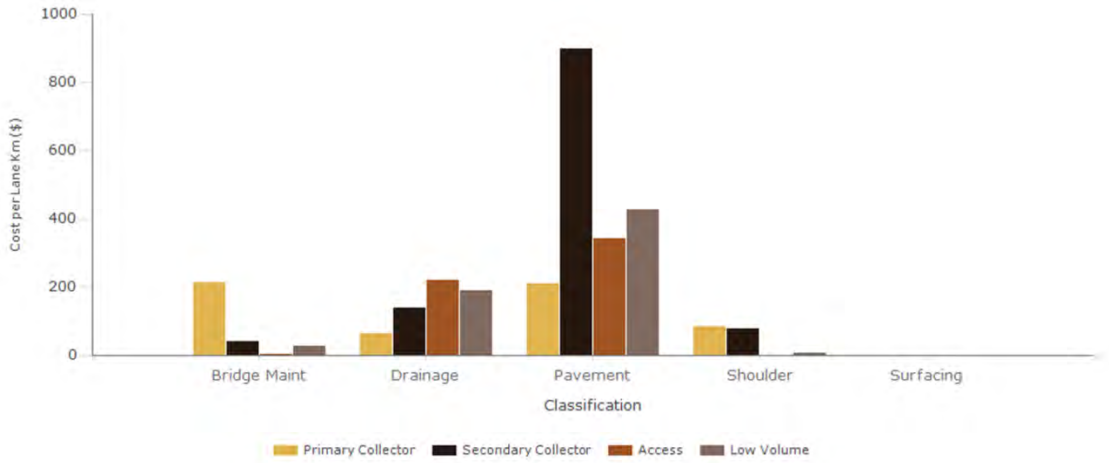


Chipseal resurfacing average life achieved, four-year average to 2019/20

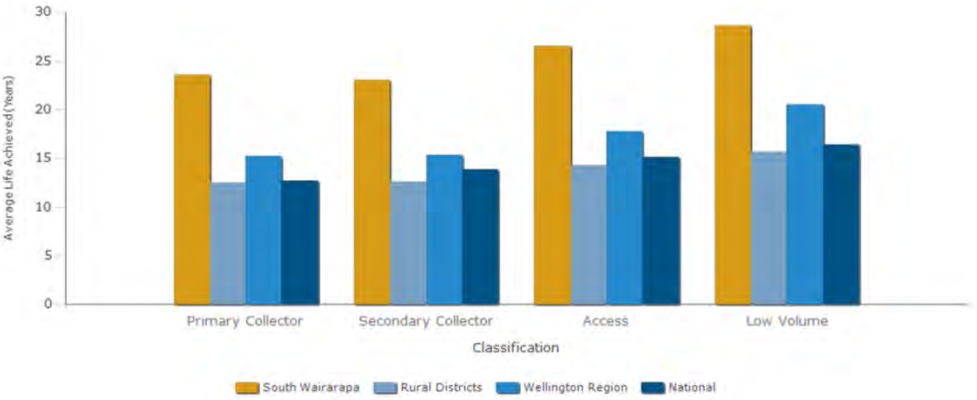


15.1.7. Sealed Road Efficiency – South Wairarapa

The total cost of Maintenance costs per Lane km by Cost Group over the 2019/20 Financial Year.



Chipseal resurfacing average life achieved, four-year average to 2019/20



15.1.8. Evidence – Bridge Maintenance

The last financial year's inspection of the network's bridges identified the value of outstanding bridge work inclusive of Structural repairs as shown in the table below.

	High Priority	Median Priority
South Wairarapa DC	$267,800	$260,500
Carterton DC	$171,525	$262,500

15.1.9. Evidence – Drainage Maintenance

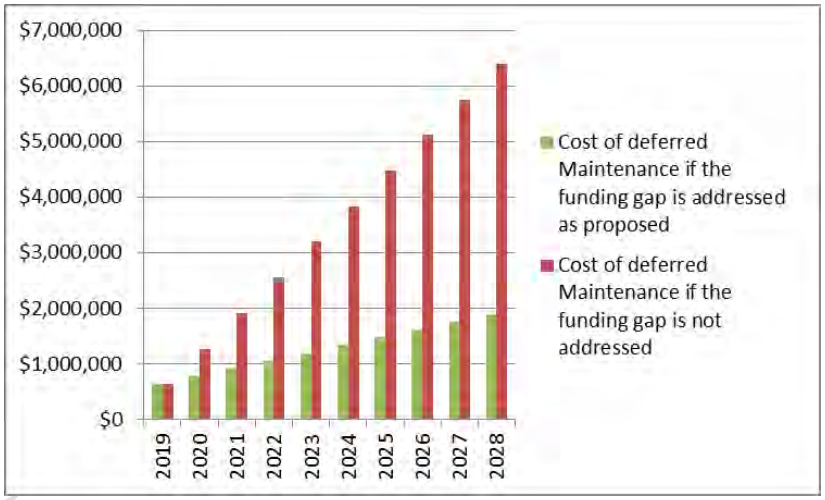
The open channel roadside drainage requires renewal on a 12-year cycle and prior to resealing or heavy metaling of unsealed roads. This renewal is to remove the build-up of materials in the channels, minor slip material and shoulder build-up so the water can drain from the carriageway and pavement. The renewal funding for roadside drainage needs to enable this cycle to be achieved so that the asset lives to the pavement is not compromised. Also, ensuring the roadside drainage is fully effective will increase the network's resilience. It is critical that the roadside drainage is maintained because if it is neglected until the

problem is evident then increase funding will be required to both repair the prematurely failed pavement and the roadside drainage.

15.1.10. Consequence of Not Increasing Funding

The consequence if Road funding is not increased, so the required maintenance can be completed, will be increasing deterioration of the network's condition. In time this will manifest in a greater number of potholes to repair and repeated repairs of the same potholes. Then the situation would progress to some potholes not being repaired and to large areas of pavement failure. At this point the cost of stopping the decline and restoring the network's condition will be significantly greater than the cost proposed in this report.

The current funding level, which is effectively a fifth less than previous years, means that no preventative maintenance is undertaken. The maintenance work is confined to the minimum work required to fix failures. This requires a much higher management and supervision effort by the Ruamāhanga Business Unit staff to ensure only the absolutely necessary work is undertaken. The present business incentive for the Contractor and his workmen is to carry out the repair work in one location to a high standard. This in time could result in frustration between the contracted parties. Note the result of focusing limited resources on the higher category roads is already evident in the declining condition of the roads in the Low Volume and Access road categories.



Future costs of Funding Gap

15.1.11. Options

The options available for improving the efficient maintenance & renewal of the network's assets are:

1. Do nothing, this would mean that the access road conditions would continue to become worse to the point that they would become impassable and/or unsafe for vehicle traffic.
2. Re-allocate funding from the higher volume roads to the lower volume access roads. This would mean the condition of the higher volume roads would rapidly deteriorate.
3. Increase maintenance funding. The increased maintenance funding, to have an effect on condition, would need to increase year on year as the average age of the networks assets increases.
4. Increase the renewal funding. Increasing the rate of asset renewal will, in time, reduce the requirement for expenditure on maintenance. Note it could take 5 to 10 years to have an effect on the maintenance demands.

15.1.12. Option Analysis

The following is a multi-criteria analysis of options that could be used to improve the efficient maintenance & renewal of the network's assets.

Strategic Case Multi Criteria Option Analysis			
Problem No 1: Efficient Maintenance & Renewal Funding			
Short list of 3 options from the following Options			
Option	yes/no	Reason	Rank
1. Do nothing,	no	This would mean that the access road conditions would continue to become worse to the point that they would become impassable and/or unsafe for vehicle traffic.	0
2. Re-allocate funding from the higher volume roads to the lower volume access roads.	no	The re-allocation of funds from the higher volume roads would result in the condition of these roads rapidly deteriorating.	4
3 Increase maintenance funding.	yes	The increased maintenance funding will enable the current back log of maintenance to be addressed. Note, without and increase in renewal funding, the maintenance funding would need to increase year on year as the average age of the networks assets increases.	3
4. Increase the renewal funding.	yes	Increasing the rate of asset renewal will, in time, reduce the requirement for expenditure on maintenance. Note it could take 5 to 10 years to have an effect on the maintenance demands.	2
5. Increase the maintenance & renewal funding.	yes	The increased rate of renewal will contain the rising maintenance costs and increased maintenance will ensure the network's condition is maintained until the renewal backlog is addressed.	1

Criteria/Drivers to Consider	**Weighting**	**How good is this option**					
		Option 1		**Option 2**		**Option 3**	
		Raw	**Score**	**Raw**	**Score**	**Raw**	**Score**
Meets GPS	15.00%	3	0.45	3	0.45	3	0.45
Meets RLTP	10.00%	3	0.3	3	0.3	3	0.3
Addresses problems	15.00%	3	0.45	3	0.45	3	0.45
Will realise benefits	15.00%	3	0.45	3	0.45	3	0.45
Will meet Community Outcomes	15.00%	3	0.45	3	0.45	3	0.45
Provides high performance impacts	10.00%	3	0.3	3	0.3	3	0.3
Provides high environmental impacts	5.00%	2	0.1	2	0.1	2	0.1
Provides cultural impacts	5.00%	2	0.1	2	0.1	2	0.1
How costly	10.00%	3	0.3	2	0.2	1	0.1
other					0		0
other					0		0
Totals	100.00%		2.9		2.8		2.7

15.1.13. Recommended Programme of Work & Funding

The following actions are proposed to improve the efficient maintenance & renewal of the network's assets.

1. The adjustment of the surfacing renewals budget so that an average surface age of 20 years is delivered over the long term.
2. The funding of the backlog of bridge maintenance.
3. The funding of the backlog of maintenance on the South Wairarapa section of the network.

4. The changes required for funding of the Carterton section of the network can be accommodated by transfers between the work category budgets within the overall allocation for maintenance and renewal on the network.
5. The changes required for funding of the South Wairarapa section of the network will require an increase in the maintenance and renewal funding.

The benefits of these actions will be:

1. There will not be large unplanned expenditures.
2. There will be inclusive access for all people in the community.
3. The disruption to travel due to maintenance and renewal will be minimised.
4. The Councils' Community prosperity will not be restricted by the condition of the roading network.
5. The correct amount and balance between renewals and pavement maintenance funding will deliver to the Councils' Community the lowest whole of life cost for the delivery of the roading transport service.

The consequences of not increasing the budgets for maintenance and renewal are:

1. The increasing deterioration of the network's condition.
2. A greater number of potholes to repair and repeated repairs of the same potholes.
3. Some potholes not being repaired resulting in large areas of pavement failure.
4. A significantly increased cost to stop the decline and restore the network's condition.

15.1.14. Strategy for Pavement Maintenance & Renewal

The Contractor undertakes inspections of the whole network to identify the pavement maintenance repairs required to ensure:

- Sealed surfaces remain waterproof,
- There is no increase in road roughness,
- There is no reduction in skid resistance beyond the normal expectation for the road section,
- The safety of the road user is not compromised,
- The programme of work generated is reviewed and approved by the Ruamāhanga Roading staff. The programme maintenance work can include failure repairs, surface opening and levelling, resurfacing, edge breaks, unsealed shoulders and service cover adjustments.

The pavement's surfacing is the primary method of waterproofing the pavement layer. The waterproofing minimises the need for maintenance and pavement layer renewal.

The surfacing renewal programme is developed by matching the funding budget to a selection of the road sections that have the highest benefit for renewal when selected using the following criteria.

- The age of individual road sections surfacing.
- The current condition of the binder in the surfacing.
- The type of surfacing that was last applied and the relevant life expectancy of that type of surfacing treatment.
- The condition of the pavement's roughness, rutting, cracking etc.

- The record of pavement maintenance expenditure on the section.
- The current condition of the chip used in the surfacing.
- The traffic volume and ONRC classification of the section.

The pavement renewals are carried out on a very small number of road sections where the long-term least-cost option is judged to be reconstruction of the pavement layer. The condition and performance of a road section as observed from routine inspections along with the measured values from the condition rating and roughness surveys are used to initially identify sections to include in the rehabilitation programme. Each section is then inspected to determine the highest benefit sections to complete within the rehabilitation budget allocation.

15.1.15. Asset condition and monitoring Rating Survey

The sealed roading network is condition rated every two years. This involves manually inspecting 10% of the road at regular intervals to identify and measure several different forms or types of faults such as:

Shoving

Rutting >30mm

Potholes

Pothole Patches

Cracking – Alligator Cracks

Cracking – Longitudinal and Transverse Cracks

The results of all this inspection data (condition measurements and observations) are recorded against the relevant assets in the RAMM database. Various summary reports form the Condition Rating assessment for the network. This assessment provides a picture of the pavement condition of the sealed roading network and can be compared to previous assessments to identify medium to long term trends resulting from the associated maintenance strategy and funding level.

Roughness Survey

Roads are measured for roughness on the same frequency as the condition ratings. As with condition data, roughness measurements are also entered into the RAMM database.

Condition/Performance Results

The following graphs represent the outcomes recorded for completed condition rating and roughness surveys:

a) Road Roughness >150 NAASRA counts

The Road Roughness is measured using a special-purpose vehicle travelling down both the outside lanes for the length of the road. The rougher the road, the higher the NAASRA counts per lane kilometre. A NAASRA count of greater than 150 typically indicates a road where its roughness will be noticed by users and a number of complaints from users will be received.

Condition Index (CI)

The Condition Index is a combined index calculated in RAMM, a ‘weighted sum’, of the surface faults in sealed road surfaces. CI combines alligator cracking, scabbing, potholes, pothole patches and flushing. The higher the number, the better the condition.

Pavement Integrity Index (PII)

The Pavement Integrity Index is a combined index calculated in RAMM of the pavement faults in sealed road surfaces. It is a 'weighted sum' of the pavement defects divided by total lane length. PII combines surface faults (CI) with rutting and shoving. The higher the number the greater the pavement integrity.

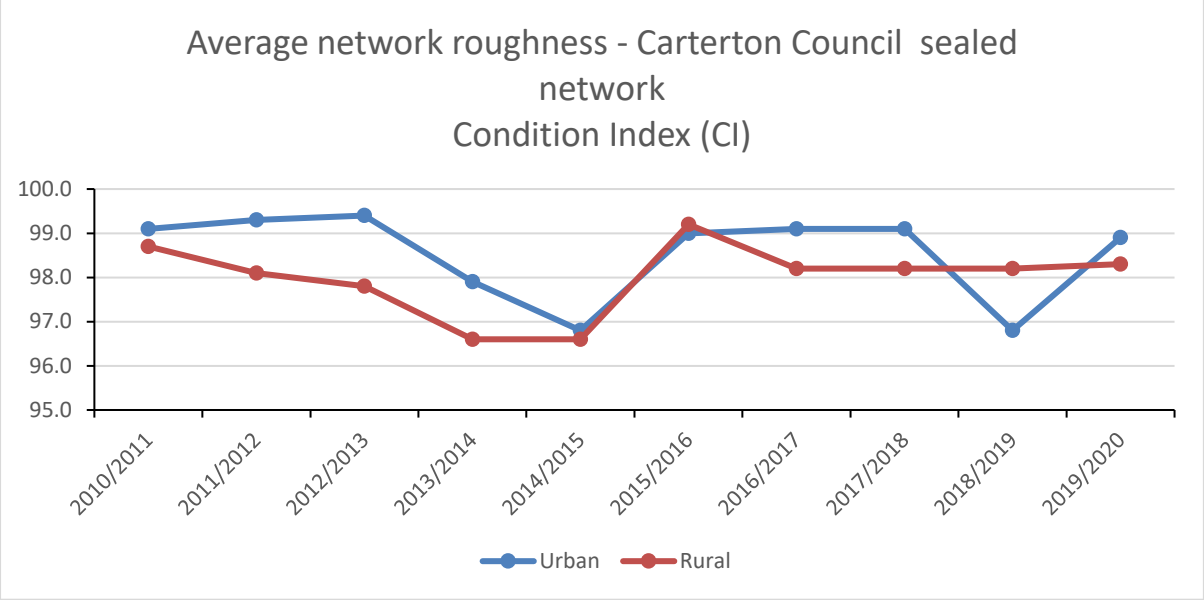
Smooth Travel Exposure (STE)

The Smooth Travel Exposure measures the percentage of vehicle kilometres travelled in a year (VKT) that occurs on 'smooth' sealed roads and indicates the ride quality experienced by motorists. A 'smooth' road is one smoother than a predetermined NAASRA roughness threshold. The thresholds used vary with traffic density and road location. Heavily trafficked roads have a lower (smoother) threshold. This means high volume urban roads have lower roughness thresholds than low volume rural roads.

Figure 15.1 Road Roughness – Carterton sealed roads

Graph to be formatted for report

Figure 15.2 Condition Index - Carterton sealed roads



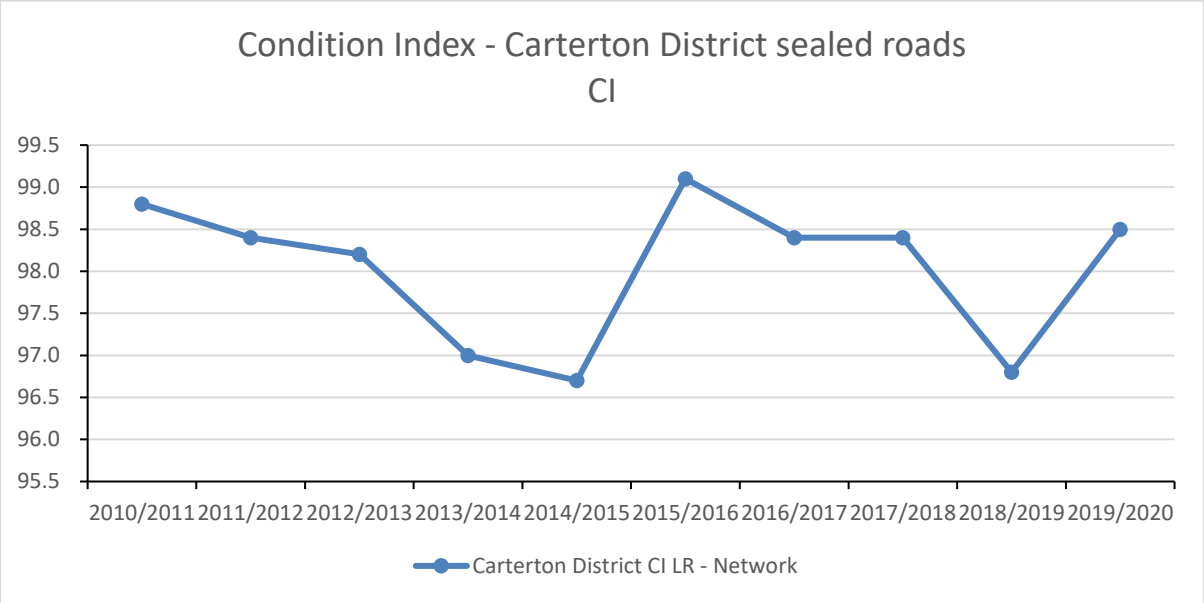
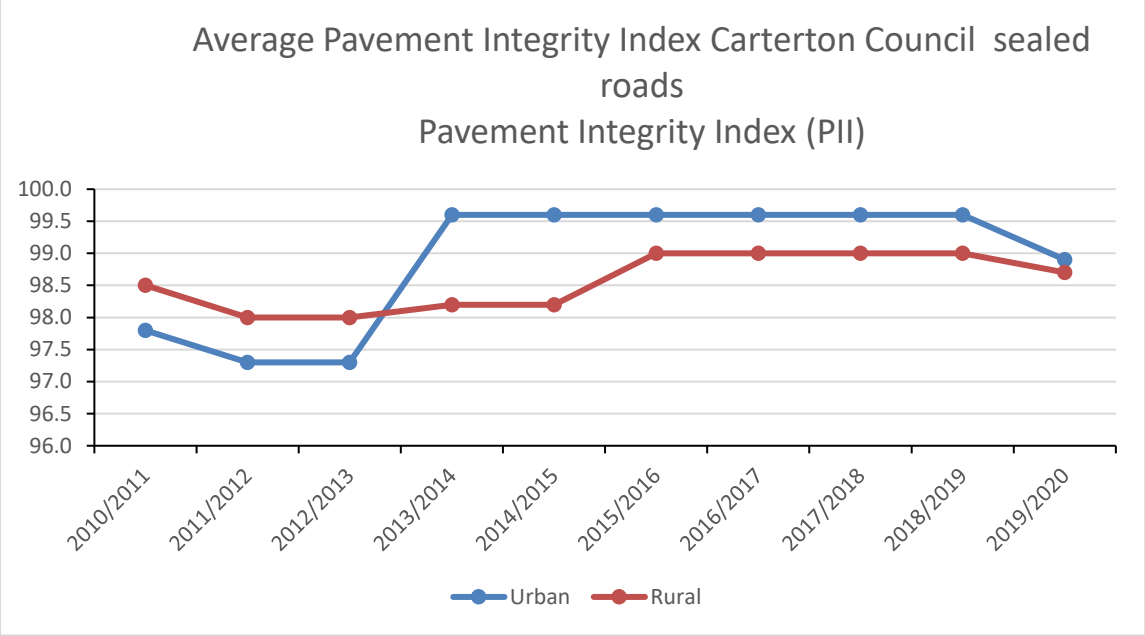


Figure 15.3 Pavement Integrity Index - Carterton



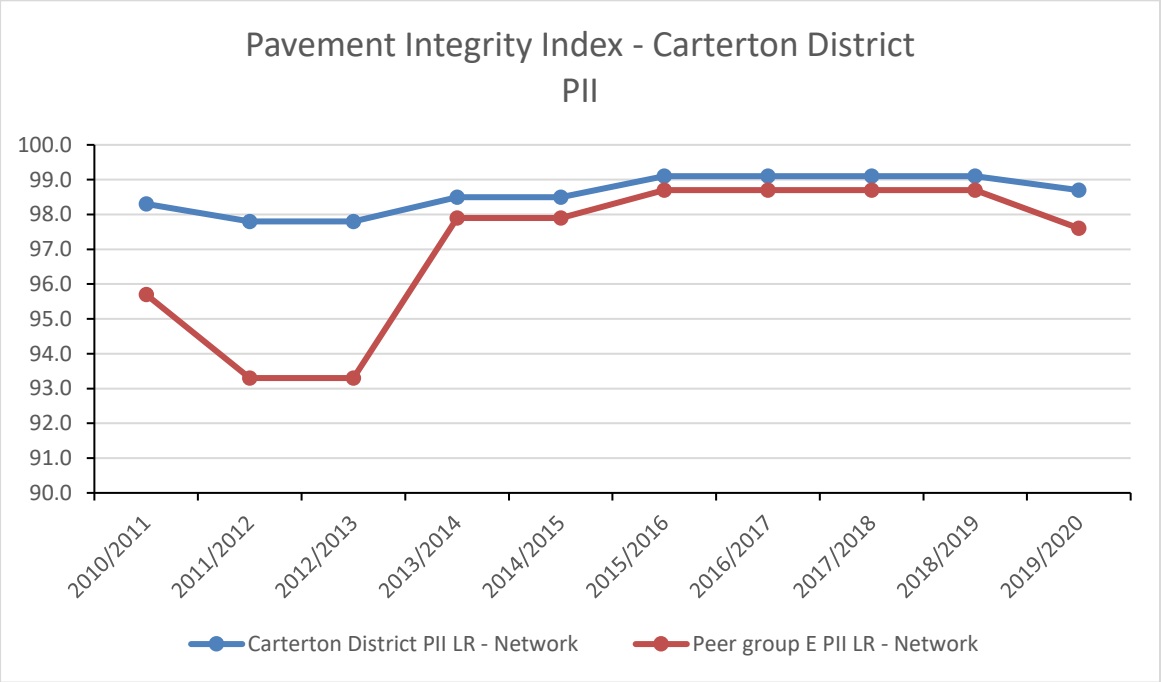


Figure 15.4 Smooth Travel Exposure - Carterton Sealed Roads

Graph to be formatted for report

Figure 15.1 Road Roughness – SWDC sealed roads

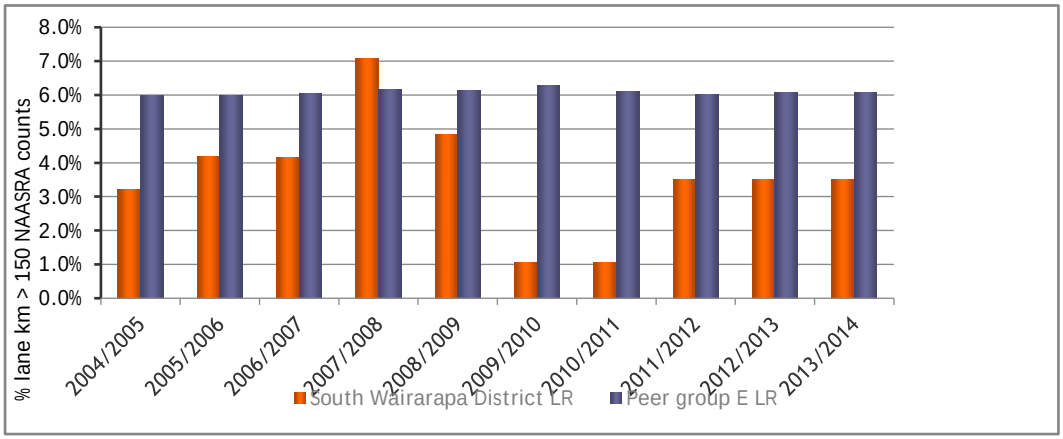
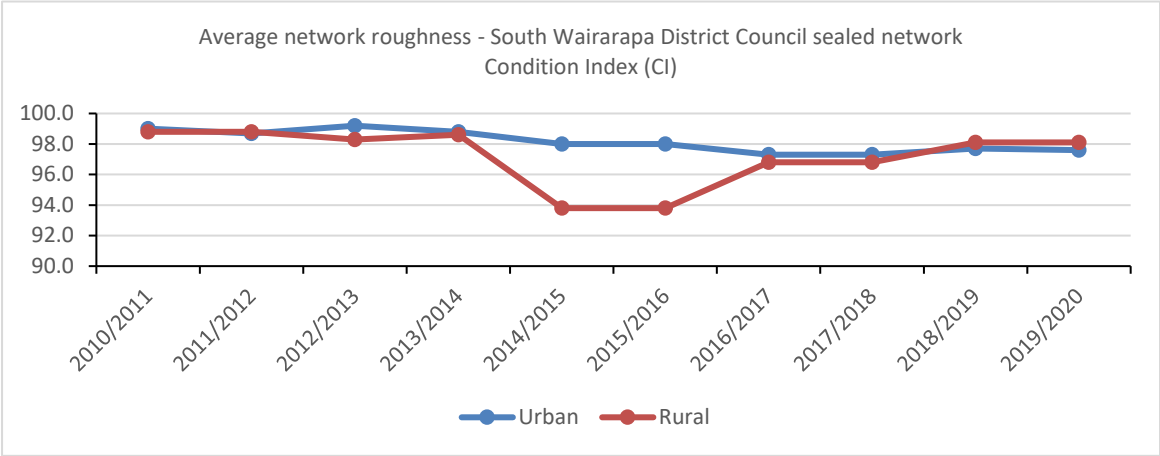


Figure 15.2 Condition Index - SWDC sealed roads



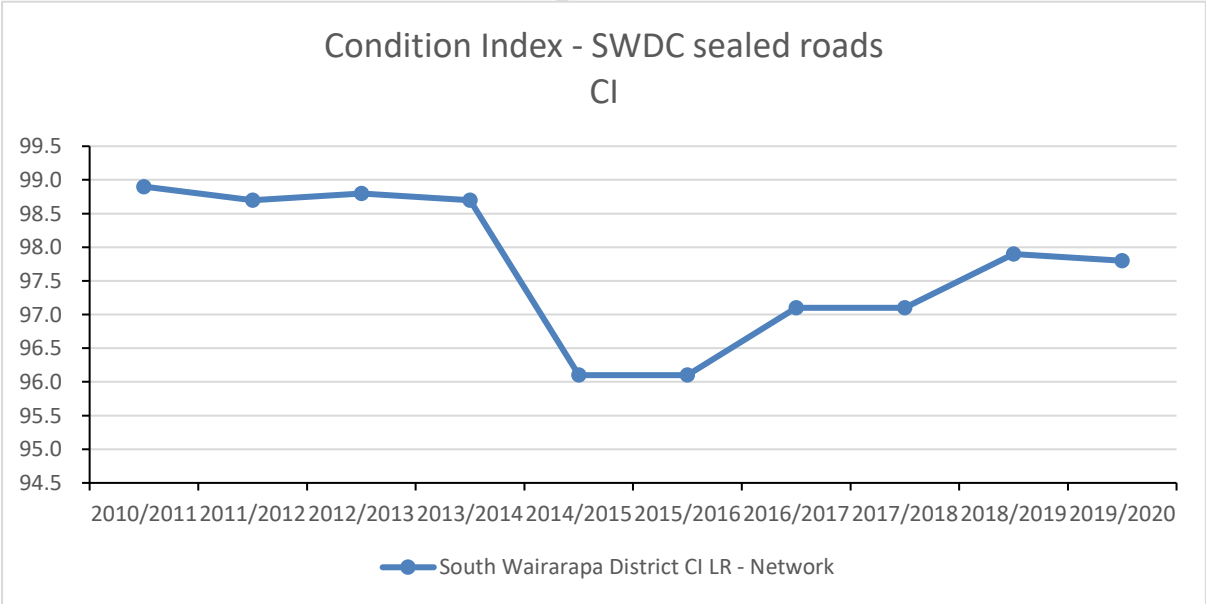
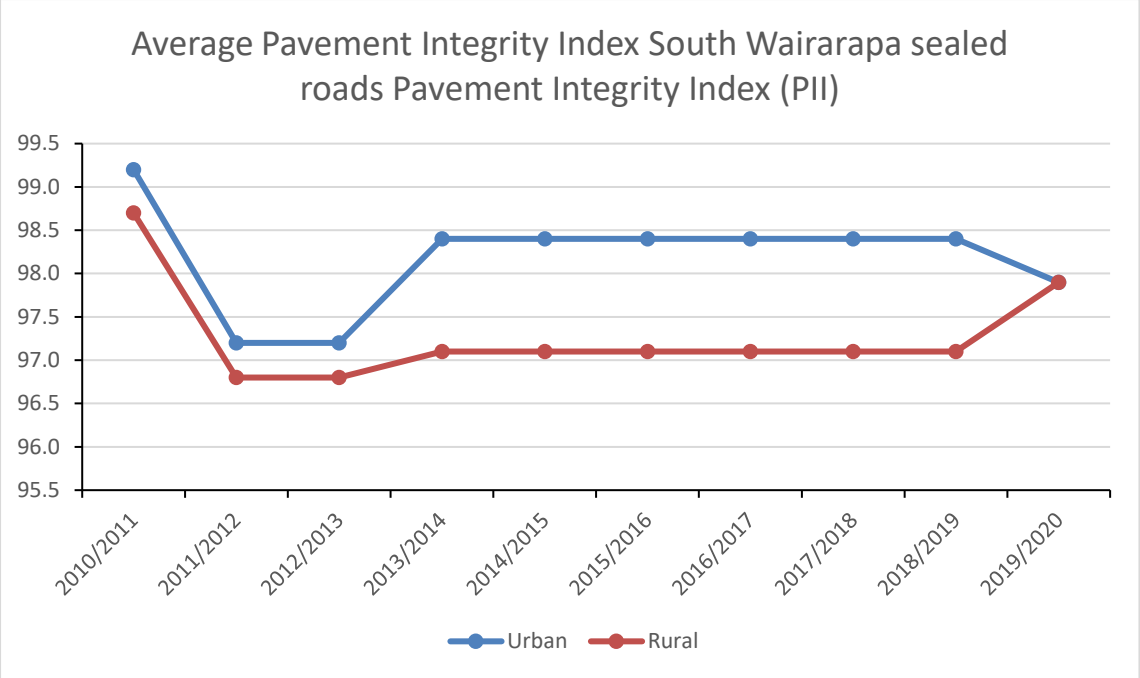


Figure 15.3 Pavement Integrity Index - SWDC



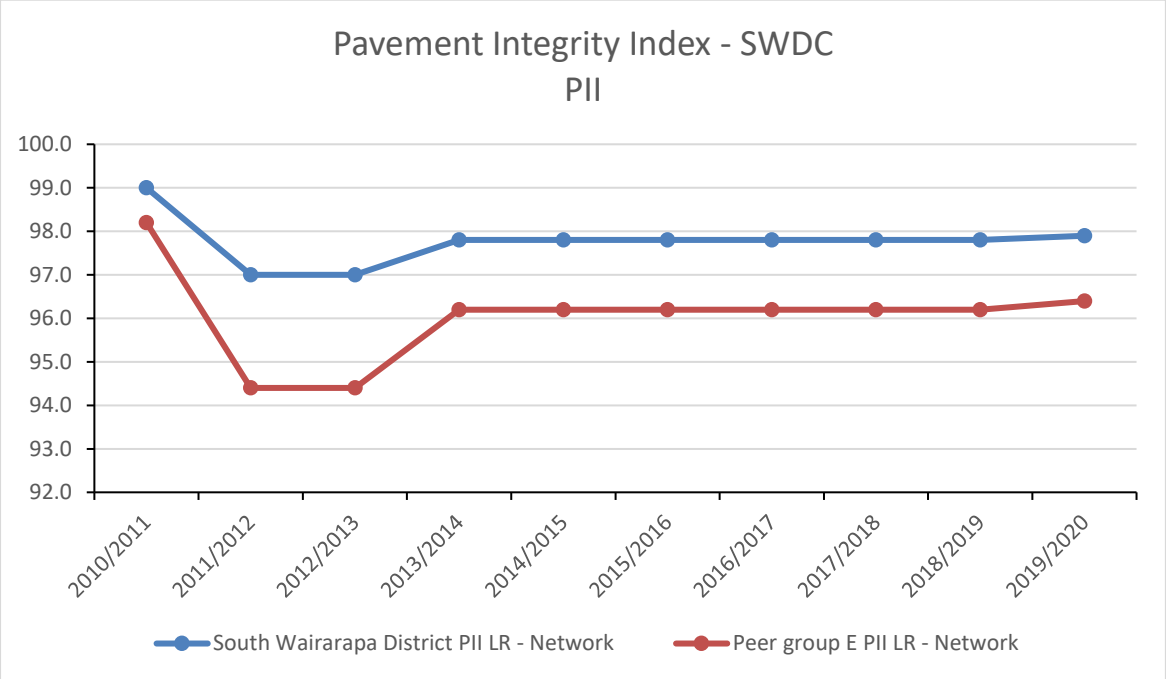
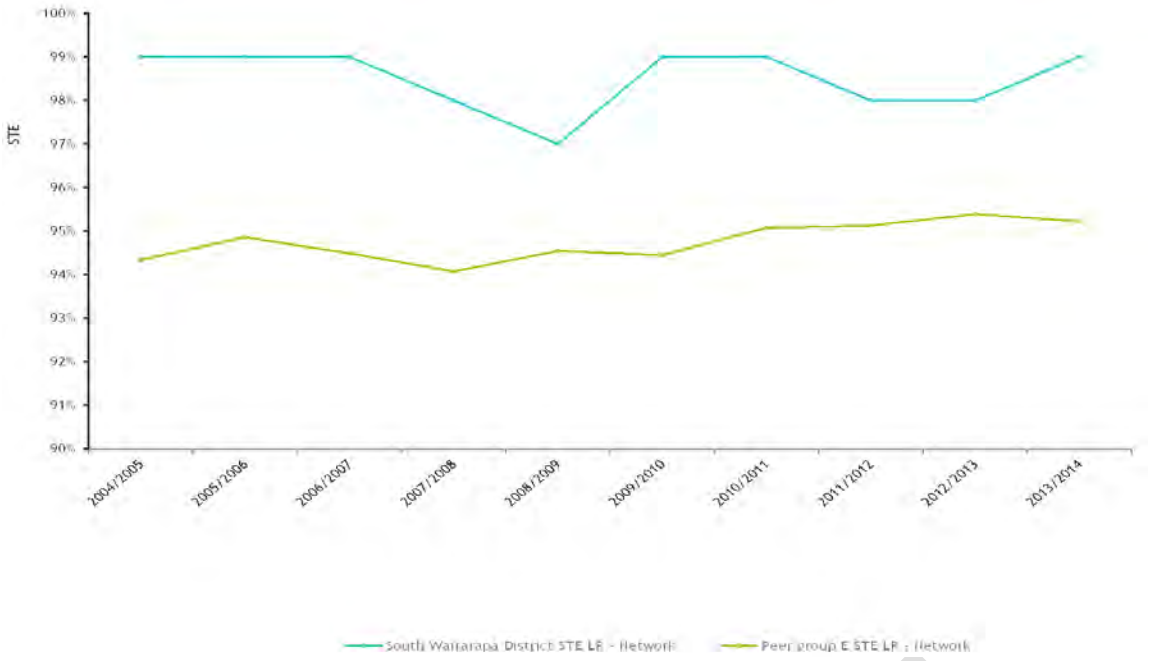


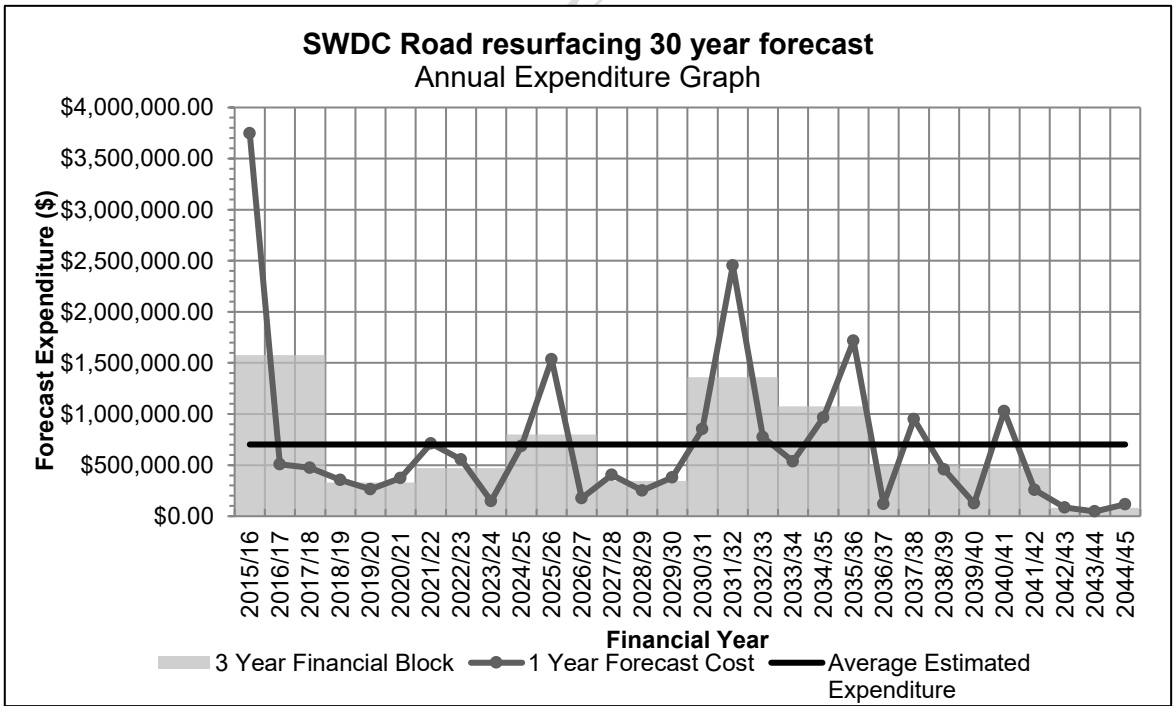
Figure 159.4 Smooth Travel Exposure - SWDC Sealed Roads



15.1.16. Age distribution and life

The forecast graphs will be updated after the completion of the improvement task to develop a deterioration model. This deterioration model will provide a more accurate prediction of the peak renewal demand and when it will occur.

Figure 15.5 Road Resurfacing Forecast - SWDC



A constant level of expenditure equal to the average estimated expenditure will theoretically 'smooth' the renewal requirement over successive years. Also a constant level of expenditure enables simpler financial management of the renewal funding requirement.

15.2. Unsealed Pavements

15.2.1. Funding – Unsealed Pavements

The estimated value of the quantum of work required to maintain the Ruamāhanga Network of unsealed pavements at the current service levels is set out in the table below.

Table 15.3 Unsealed Pavement Maintenance & Renewal Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 112 UNSEALED PAVEMENT MAINTENANCE	$340,000.00	$15,000.00	$355,000.00	$167,892	$522,892.00
WC 211 UNSEALED ROAD METALLING	$400,000.00	$5,000.00	$405,000.00	$440,000	$845,000.00
Total Budget	**$740,000**	**$20,000**	**$760,000**	**$607,892**	**$1,367,892.00**

These figures have been determined from the historic records of work completed on the unsealed network and the resulting outcome. The cost of the historic volume of work has been adjusted to take account of the new contract rates.

The re-metalling budgets have been kept at the same levels as they have been in previous years. The reason for this is that this level in the past has delivered a successful outcome. It needs to be appreciated however that this is only half the amount in theory required to maintain the running surface on the unsealed network. This means that the pavement layers could be degrading. Without better data and information on the unsealed network the effect on the unsealed pavements cannot be assessed. There is no provision included for pavement renewals on the unsealed network. There are no records of a historic requirement. If however it is required in the future a funding adjustment would be sought.

15.2.2. Strategy for Unsealed Pavement Maintenance & Renewal

Routine maintenance works for unsealed roads primarily consist of;

- Grading
- Flanking
- Spot metalling and pothole repair
- Restoration of correct camber
- Maintenance of running course

Unsealed roads are grouped into 3 classes according to usage

- Class U1 ADT >100vpd
- Class U2 ADT < 100vpd
- Maintain on Request – unused roads.

The objective for routine grading is to maintain the unsealed road surface condition at frequencies determined by need, based on past experience, environmental condition, moisture and weather patterns, to ensure the required service levels are met.

The frequency of grading is based on condition as observed by the maintenance contractor during regular inspections of the network for monthly work programming, customer complaints and minimum service level and attendance standards provided in the network maintenance contract.

The renewal of the running surface on the unsealed roads is applied based on a 'rule of thumb' for wearing course loss at an average of 10mm of depth per year. Based on the 'rule of thumb' approximately 54km on the South Wairarapa section and 28 Km on Carterton section of heavy metalling is required per year. The current level of funding means that only 29km on the South Wairarapa section and 20km on the Carterton section of heavy metalling is carried out each year.

The sections of road selected for heavy metalling are those that are assessed to provide the greatest benefit from increased protection of the underlying pavement layer. To determine the sections that will provide the greatest benefit the surfacing layer is inspected to identify the sites where the greatest amount of following damage has occurred to the surface. Pavement materials are lost to:

- degradation of the wearing course stone,
- climate conditions,
- scouring and erosion, and
- traffic abrasion.

The pavement renewal (rehabilitation) sites are where pavements have been worn down so that the required build-up of metal is 100mm or more. These can be heavily trafficked routes or sites subject to frequent wash-off, dust-off or abrasion of metal.

The budget does not differentiate between heavy metalling and rehabilitation treatments for unsealed roads. If rehabilitation sites are identified their priority would be balanced against the road sections that require heavy metalling.

15.2.3. Asset condition and monitoring

The roughness and condition rating surveys are currently not completed for unsealed road sections. Therefore, indicative condition is assessed from maintenance records and frequency of complaints regarding surface defects on unsealed roads.

The level of complaints received over the past year regarding unsealed roads is very low. The maintenance costs have remained relatively stable therefore the unsealed network's condition is assessed to meet customer expectations.

The application of unsealed road metalling (rebuild and wearing course applications) to augment the routine maintenance activities is expected to be positively influencing this customer expectation outcome.

15.2.4. Age distribution and life

See Improvement Section:. There is no current centralised data on the age of the unsealed road pavements and their construction. The improvement section has an action to address this data gap.

15.3. Pavement Drainage

15.3.1. Funding – Pavement Drainage

The Funding in this section covers the maintenance and renewal costs for the Stormwater and ground water drainage system on the roading network. This drainage system is made up of the following key components; surface channels, small culvert and subsoil drains.

Table 15.4 Drainage Maintenance & Renewal Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 113 ROUTINE DRAINAGE MAINTENANCE	$245,000.00	$18,000.00	$263,000.00	$175,848	$438,848.00
WC 213 Drainage Renewals	$150,000.00	$20,000.00	$170,000.00	$165,000	$335,000.00
Total Budget	**$395,000**	**$38,000**	**$433,000**	**$340,848**	**$773,848.00**

15.3.2. Strategy for Pavement Drainage Maintenance & Renewal

Any faults found are recorded when undertaking road pavement inspections. The appropriate remedial or upgrade works are subsequently determined and scheduled for action on a priority basis, or in the case of assets affected by other road works, scheduled as part of that project.

The roadside drainage is renewed on a 12-year cycle or prior to resealing or heavy metaling of unsealed roads. This renewal is to remove the build-up of materials in the channels, minor slip material and shoulder build-up so the water can drain from the carriageway.

15.3.3. Asset condition and monitoring

The Figure below shows the recorded condition of the small culverts on the Carterton section of the network.

No data collected

The second Figure below shows the recorded condition of the small culverts on the South Wairarapa section of the network.

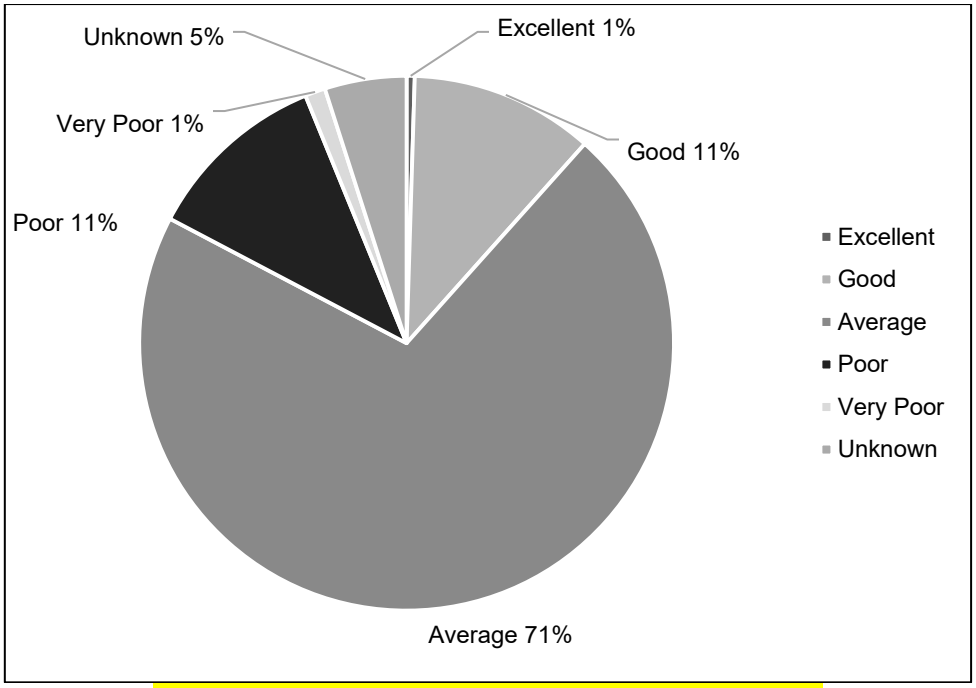


Figure 15.6 Condition - Small Culverts SWDC

The condition of Stormwater open channels and subsoil drains is observed when undertaking maintenance inspections.

The overall condition of the drainage assets is assessed to be average.

15.3.4. Age distribution and life

No data collected

15.4. Bridges, Major Culverts and other Structures

15.4.1. Funding – Structures including Bridges, and Major Culverts and Other Structures on the network

The funding in this section covers the requirements for bridges, major culverts and other significant network structures such as retaining walls. There are no bridge replacements budgeted to occur over the next ten years. However, the painting of steel bridge components and renewal of timber decks is included in the budgets. Note major culverts are culverts with a cross-section greater than 3.4 square metres.

Table 15.5 Structures Maintenance & Renewal Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 114 STRUCTURES MAINTENANCE	$150,000.00	$95,000.00	$245,000.00	$68,034	$313,034.00
W/C215 STRUCTURES COMPONENTS REPLACEMENTS	$80,000.00	$50,000.00	$130,000.00	$70,892	$200,892.43
Total Budget	**$230,000**	**$145,000**	**$375,000**	**$138,926**	**$513,926.43**

Evidence

The last full financial year of bridge inspections completed over the networks indicated outstanding bridge works, inclusive of Structural repairs and Traffic services improvements, are required to the value set out in the following table.

	High Priority	Median Priority
South Wairarapa DC	$267,800	$260,500
Carterton DC	$171,525	$262,500

15.4.2. Strategy for Bridge Maintenance & Renewal

The maintenance & renewal funding level has been determined from the bridge inspection reports and historic expenditure required to maintain the bridges, major culverts and other structures on the Roading network. The long-term renewal requirement has been based on the expected life of the structures. Note that the expected life is likely to be adjusted as a result of the inspections closer to the renewal dates.

Methodology

The bridges, major culverts and structures are inspected at scheduled frequencies. The inspection also involves reviewing the previous inspection reports with a view to identifying existing defects or items noted for monitoring or assessment. The inspection form report allows the maintenance items to be identified and bridge replacement dates to be reviewed. The inspection schedule is shown in the table below.

Table 159-15.6 Bridge Inspection - Type & Frequency

Inspection Type	Frequency
Bridges - Detailed	6 years or more frequently for some particular bridges because of their condition.

General - Bridges	2 years
General - Major Culverts	3 years
Annual Maintenance Inspections – all structures	Annual
Special Inspections	When an inspection trigger event occurs.

The specifics of each inspection type are outlined below.

Detailed Inspections – 6 Yearly

Detailed Inspections are carried out at a regular interval of 6 years. Information regarding the structure and previously recorded defects is reviewed. A careful examination of every component of the bridge is made to find out anything that could affect the structural integrity of the bridge. The members and any recorded defects are closely examined. The longitudinal profile of the structure and streambed is measured and plotted against previous measurements to detect changes in approach embankment, waterway location and signs of scour and erosion. Defects are noted for maintenance or other action.

General Inspections – 2 Yearly Bridges and 3 yearly Culverts

General Inspections are carried out at a regular interval of 2 years for bridges and 3 years for major culverts. The data recorded for each structure is verified and any changes noted. The site and every part of the structure is visually inspected, and an examination of previously recorded defects made to check if they have become more serious. Defects are recorded and the cost of recommended actions is estimated.

Annual Maintenance Inspections – all structures

The majority of annually identified defects are:

- Issues that affect surface drainage
- Sealing of decks
- Stream cleaning / debris removal through and around culverts
- Vegetation control
- Repairs to marker posts and sight rails
- Erosion repairs and reinstatement of formation support
- Minor repairs to structural and other components

These defects are identified in an annual maintenance inspection report.

Special Inspections

Special inspections are scheduled when required and are additional to the other inspections. Special inspections typically cover:

an inspection after an earthquake,

an inspection after a flood event,

an inspection after a known overload or vehicle impact has occurred to a bridge.

15.4.3. Asset condition and monitoring

The bridges in the network have been inspected and rated following the NZ Infrastructure Asset Valuation & Depreciation Guidelines Version 2. The bridge rating has considered the following factors:

- Construction dates (79 of the bridges have unknown history, construction date has been estimated based on inspection observations)
- Assumed design standards at the time of construction
- Construction quality
- Material quality based on age and material type
- Operational Stresses based on traffic loading
- Maintenance History
- Asset Working Environment based on flooding history
- External Stresses based on the erosive quality of the waterway.

Table 15.7 Picture of Bridge before & after maintenance

Table 15.8 Bridge Condition *Table to be updated*

Condition	No. Bridges SWDC Network	No. Bridges Carterton Network
Excellent	66	77
Good	70	43
Average	3	1
Poor	1	0
Very Poor	0	0

15.4.4. Age distribution and life

Table 15.9 Construction Date of Bridges *Table to be updated*

Construction Date	No. Bridges SWDC Network	No. Bridges Carterton Network
1920-1929	0	4
1930-1939	9	18
1940-1948	7	6
1950-1959	4	13
1960-1969	13	5
1970-1979	6	0
1980-1989	8	2
1990-1999	1	5
2000-2009	0	0
2010-2019	3	3
Unknown	89	65

Table 15.10 Bridges - Remaining Life *Table to be updated*

Remaining Life (Years)	**No. Bridges SWDC Network**	**No. Bridges Carterton Network**
<10	3	1
11-20	10	19
21-30	45	28
31-40	4	0
41-50	0	1
51-60	0	0
61-70	0	0
71-80	78	72

15.4.5. Asset Capacity and Performance

Currently the bridge asset is performing to its intended capacity. See Improvement section. The analysis of bridge widths in relation to traffic volumes is an improvement action for this AMP.

The following bridges restrict the movement of HCV vehicles.

Identification Number	Bridge Name	Road Name	Location
B30	Enaki	Brookyn Rd	RP 2754
B29	Enaki	Mannings Rd	RP 1375
B26		Taumata Island	RP 866
B13	Kourarau	Te Kapi Rd	RP 936
B41	Enaki	Belvedere	RP 3760

15.5. Carriageway Lighting

15.5.1. Funding – Carriageway Lighting

The funding in this section covers the requirements for operation of the carriageway lighting. The major component of this cost is electricity and the balance is for the renewal of poles that support the lights. Note the lights are recently installed LED lights. These have a design life of 10 years and it is anticipated that significant renewal of lights will not be required before 2035. It is assumed that the current lights would all be replaced in the period 2035 to 2045. Therefore, the renewals budget is for accident damage to lights and pole replacements where the light is not on the electricity reticulation owned poles.

The funding for Carriageway lighting maintenance is contained in the Traffic Facilities & Guardrails table value. The additional annual budget required for electricity supply is $15,000 for the Carterton section of the network and $15,000 for the South Wairarapa section.

15.5.2. Strategy for Carriage Lighting Maintenance & Renewal

The streetlighting is inspected annually in May to ensure it is functioning. It is also inspected at particular locations when a customer-request requires inspection of street lighting.

15.5.3. Asset condition and monitoring

The streetlights were all replaced with LED lights in 2018. They have not been inspected but are assumed to be still in excellent condition.

15.5.4. Age distribution and life

The streetlights were all replaced with LED lights in 2018. The warranted life for these LED lights is 10 years. Based on the warranted life, significant replacement is not expected to be required until 2038. However, some of the lights are mounted on older poles which are expected to require replacement over the next 15 years.

15.6. Traffic Facilities & Guardrails

15.6.1. Funding – Traffic Facilities, Guardrails

The funding in this section covers the requirements for traffic facilities, guardrail maintenance and renewals. Also, the carriageway lighting maintenance costs are included in the budget values.

Table 15.11 Traffic Services Maintenance & Renewal Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 122 TRAFFIC SERVICES MAINTENANCE	$300,000.00	$30,000.00	$330,000.00	$139,101	$469,100.51
WC 222 TRAFFIC SERVICES RENEWALS	$45,000.00	$7,500.00	$52,500.00	$72,406	$124,906.00
Total Budget	**$345,000**	**$37,500**	**$382,500**	**$211,507**	**$594,006.51**

Note the **Business Case 2** in the Low Cost – Low Risk section is used in the determination of the required budget amounts.

15.6.2. Strategy for Traffic Facilities & Guardrail Maintenance & Renewal

The monthly network inspections and customer requests identify the maintenance requirements for the traffic facilities and guardrails.

The Routine maintenance for traffic services and guardrails includes:

- Painting of posts and rails
- Cleaning of signs and surfaces
- Straightening of posts and edge marker posts
- Re-erecting of non-damaged signs, edge marker posts and rails
- Centreline and pavement markings
- Sight rails and guardrails

The traffic facilities have a relatively short life compared to the other network assets. This means that rather than investing in the cost of condition assessment and the development deterioration modelling prediction, the budget for renewal of traffic facilities is determined by using the following table of expected asset lives.

Note the traffic facilities are critical to providing guidance to road users. A failed traffic facility is likely to result in a road crash, so it is critical that the traffic facilities do not fail.

Traffic Facility Asset categories	Assumed Asset Life
Regulatory Sign	15 years
Other Signs	20 years
Paint markings	1 year
Thermoplastic markings	5 years
Sight Rails	20 years
Guard Rails	40 years

The quantity of traffic facility assets on the network is expected to grow over time as more are added to the network to increase user safety.

15.6.3. Asset condition and monitoring

The renewal cycle for the traffic facility assets means they are in good condition.

See Improvement section: The improvement actions include a condition assessment of the guardrails and sight rails.

15.6.4. Age distribution and life

The age profile for the traffic facility asset, because of their short lives, is assumed to be uniform. The guardrails and sight rails are an exemption to this assumption.

15.7. Footpath, Cycleway and Pedestrian Crossings

15.7.1. Funding – Footpath, Cycleway and Pedestrian Crossings

The funding in this section covers the requirements for footpath, cycleway and pedestrian crossing maintenance and renewal. Note there is a new category for footpath renewals. $140,000 of Carterton and $155,000 of South Wairarapa maintenance funds will be moved to this category.

Table 15.12 Footpaths & Cycle Path Maintenance Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 125 FOOTPATHS MAINTENANCE	$175,000.00	$0.00	$175,000.00	$160,000	$335,000.00
WC 124 Cycle path maintainance	$6,000.00	$0.00	$6,000.00	$0	$6,000.00
Total Budget	**$181,000**	**$0**	**$181,000**	**$160,000**	**$341,000.00**

15.7.2. Strategy for Footpath, Cycleway & Pedestrian Crossings Maintenance & Renewal

The routine footpath maintenance ensures that a safe trafficable surface, appropriate for the intended use and service level, is maintained on existing footpaths and cycleways on the roading network.

The quantity of routine maintenance required is based on the historic volume of work required to maintain the current condition of the footpaths and cycleway combined with a renewal investment that achieves an average of 2 km of renewal annually.

15.7.3. Asset condition and monitoring

See improvement section: There is an improvement action to develop and age profile of the footpaths and this will be correlated to the assessed footpath condition.

15.7.4. Age distribution and life

See improvement section: There is an improvement action to develop and age profile of the footpaths and this will be correlated to the assessed footpath condition.

15.8. Vegetation and Streetscapes

15.8.1. Funding – Vegetation and Streetscapes

The funding in this section covers the requirements for vegetation and streetscape maintenance.

Table 1515.13 Environment Maintenance Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC121 ENVIRONMENT MAINTENANCE	$165,000.00	$20,000.00	$185,000.00	$242,500	$427,500.00

15.8.2. Strategy for Vegetation and Streetscapes maintenance

The Routine maintenance for Vegetation and Streetscapes comprises:

- Regular verge mowing,
- Maintaining safe intersection sight distances by mowing and vegetation pruning,
- Cleaning and repairs as required to maintain streetscapes including graffiti removal, and vegetation refurbishment,
- Litter collection on rural roads,
- Maintenance of rest areas and protection planting, and
- Clean-ups for crash sites, spills, loose chip and removal of hazardous material.

The quantity of work is related to the length of the network.
See Improvement Section. There is an improvement action to determine, for each ONRC category, the cost per rural km and per urban km.

The control of vegetation on the network is important to ensure sightlines are clear for users so they can avoid crashes. The collection of litter ensures it does not become a distraction for users and provides a pleasant environment. The maintenance of rest areas is important, so the network users are encouraged to take breaks, so they do not have crashes due to fatigue.

There is no provision required for renewal of vegetation and streetscapes.

Note there are some streetscape features that are maintained by others because they have a greater interest in the character of the streetscape at these locations. The following table documents these streetscape features and their location on the network.

None currently identified.

15.8.3. Asset condition and monitoring

The network inspection ensures that the routine vegetation management, litter collection, rest area maintenance and clean-ups have been undertaken. Also, customer requests are monitored to ensure that work is delivered to the customer expectations.

15.9. Low Cost Low Risk

The funding shown in the table below is the requirement for low cost & low risk improvement projects.

Table 15.14 Low Cost, Low Risk Project Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 341LOW COST, LOW RISK ROADING IMPROVEMENTS	$695,000.00	$462,500.00	$1,157,500.00	$1,050,000	$2,207,500.00
Total Budget	**$695,000**	**$462,500**	**$1,157,500**	**$1,050,000**	**$2,207,500.00**

The funding for low cost & low risk projects is required to progress a programme of work:

- to improve the level of personal safety for users of the network,
- to increase the resilience of the network to climate change, and
- to improve the treatment of Stormwater discharging from the network.

15.9.1. Business case No. 2- Network Safety

The safety for users of the network is a key issue. Action is required to reduce death and serious accidents on the network.

It is an urgent priority to fund a programme of work to reduce the number of crashes because:

- There are on average approximately 10 serious injuries or fatal road crashes occurring on the road network annually.
- These crashes have a significant impact on the community.
- The approximate average annual social cost to the community of these crashes is $5.0 million.
- There are actions that can be taken to reduce these crashes.

15.9.2. Community Outcomes

The reduction of road crashes will contribute to the achievement of the following community outcomes.

- SWDC-contributes to “the vibrant and strong community” outcome.
- Carterton-contributes to “A safe district” outcome.

Contribution to GPS

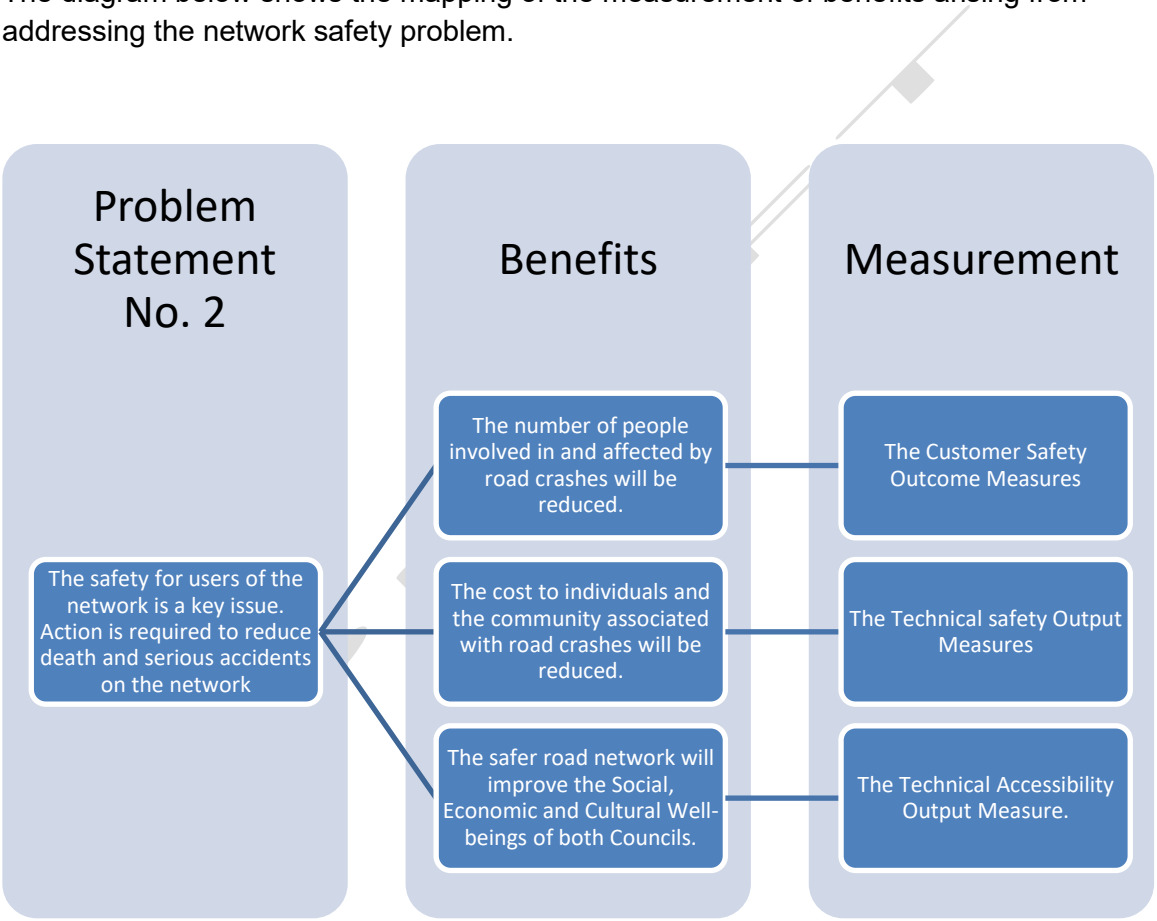
The actions to reduce the road crashes on the network will contribute to the GPS objective:

- To develop a transport system where no-one is killed or seriously injured.

The benefits will be a reduction in annual social costs of crashes of approximately $5.0 million.

Benefits & Measurement

The diagram below shows the mapping of the measurement of benefits arising from addressing the network safety problem.



15.9.3. Evidence & Options

The data graphs below show that the crash rate is rising on the secondary collectors. The current crash rate is not high compared to other authorities in the Wellington Region.

However, with the national focus to achieve zero crashes, it is expected that the other authorities will reduce the crash rates on their networks.

The table below shows that significant lengths of the secondary collector road widths are below the standard width. The Carterton section of the network has 30 km and South Wairarapa section of the network has 33 km below the standard width.

The correlation between the rising crash rates on secondary collector roads and their under widths means that it is time that these substandard road widths are addressed. This trend of crash rates on secondary collector roads with substandard widths is consistent with the analysis used to determine the standard road widths.

The NZTA safety network programme analysis has identified, on the South Wairarapa roads, that speed management on some sections of the network could significantly reduce the crash rate on the network.

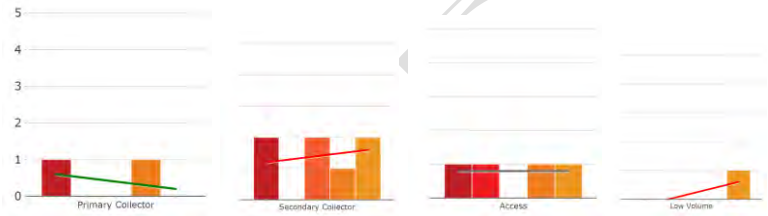
The options available to address the network safety issue are:

1. To do nothing.
2. To increase funding for the programme of road safety education.
3. To reduce speed limits on roads.
4. To increase funding of enforcement on roads.
5. To improve the safety of the network asset so that it is safer to travel on the network.

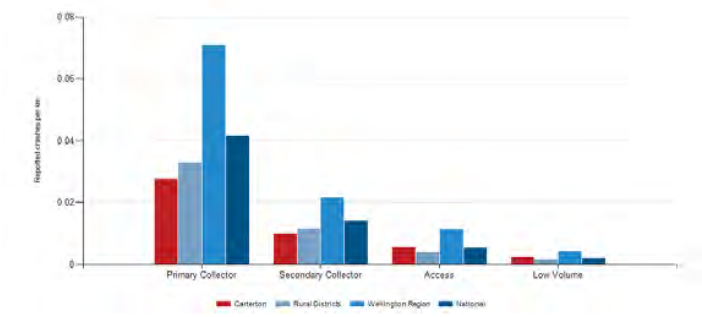
15.9.4. Crash Evidence - Carterton

The following is the evidence on the Carterton section of the network.

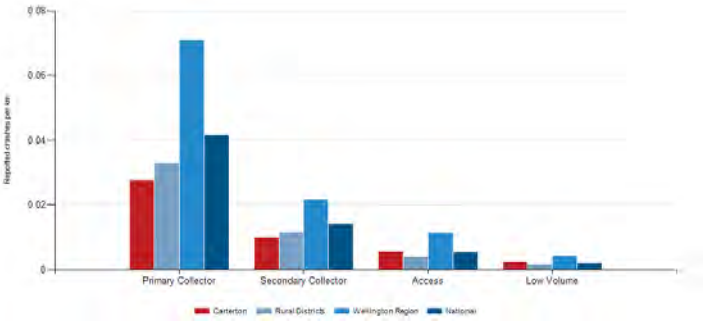
The graphs below show: The total number of reported serious injuries and fatalities (DSI) each year on the network



The graphs below show: The total number of reported crashes per kilometre over the past 10 years on the network



The graphs below show: The total number of reported crashes by traffic volume over the past 10 years on the network

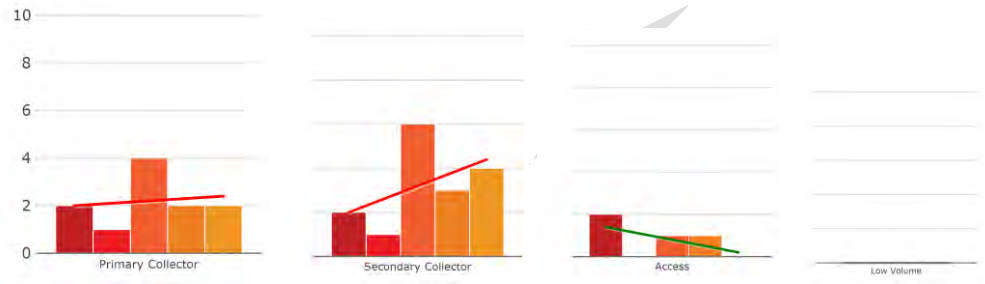


15.9.5. Crash Evidence – South Wairarapa

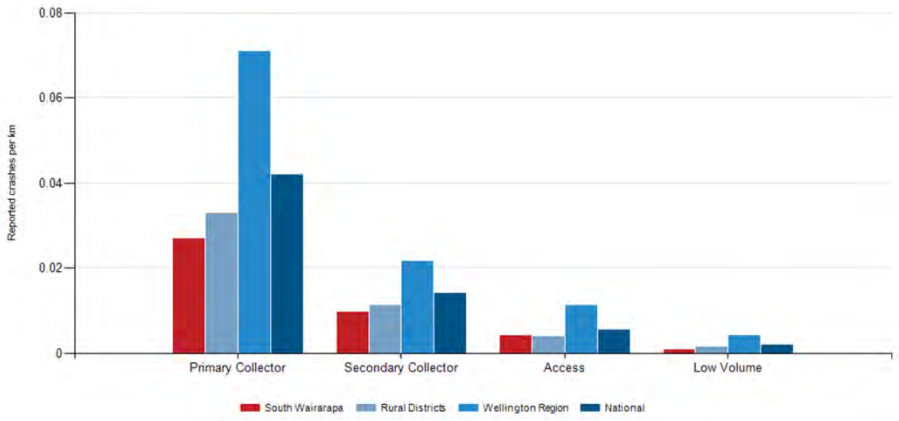
The following is the evidence on the South Wairarapa section of the network.

The total number of reported serious injuries and fatalities (DSI) each year on the network for the past five years.

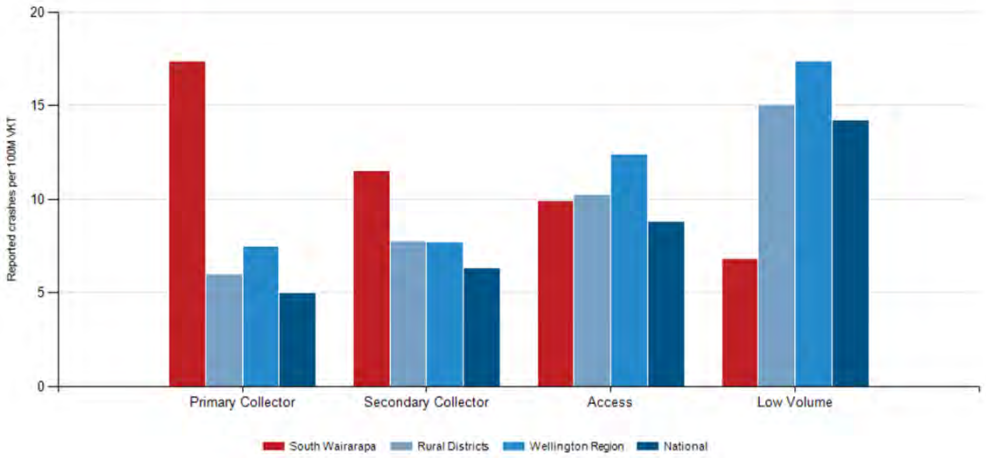
Reported Injury Counts



The total number of reported crashes per kilometre over the past 10 years on the network



The total number of reported crashes by traffic volume over the past 10 years on the network



15.9.6. Carriageway Widths Analysis

The table below shows ONRC target carriageway widths compared to actual widths and identifies that there is a significant length of the Secondary Collector roads on the network that are under-width.

Road Categories	Carriageway targeted width	RCA	Length of Rural Road	Length of Urban Road	Length less than targeted width
Primary Collector	5.5 to 7.0m	SWDC	61.9	2.3	0
		CDC	24.8	0.4	0.6
Secondary Collector	5.5 to 6.0m	SWDC	160.4	4.5	32.6
		CDC	143.0	8.3	29.9
Access	<5.5m	SWDC	14.2	26.8	0
		CDC	84.6	9.9	0
Low Volume	<5.0m	SWDC	104.6	28.1	0
		CDC	10.8	18.9	0

15.9.7. NZTA Safety Network Analysis Results

The NZTA safety network programme analysis has identified, on the South Wairarapa roads, that the actions shown in the table below will reduce crashes. Note the NZTA analysis does not have carriageway widening as a treatment option.

Corridor/Intersection Name	Treatment	Indicative Cost of Intervention	DSi saved per 100M	Length of corridor
Bidwills Cutting Road/Wards Line SH53 - Kemptons Line SNP	Speed Management	$ 100,000	50.82	10.7
Longbush Hinakura - Carterton Bdy SNP	Speed Management	$ 100,000	14.29	6.6
Western Lake Rd Woodward - East West Access SNP	Speed Management	$ 100,000	36.5	27.9
Cape Palliser Lake Ferry - Ngawi Lighthouse SNP	Speed Management	$ 200,000	17.79	37.5
Lake Ferry Road Whiterock - Lake Ferry Settlement SNP	Speed Management	$ 200,000	53.27	32.3
Kahutara SH53 - Lake Ferry SNP	Speed Management	$ 100,000	94.81	22.3
Ponatahi Road Huangarua River - Kokotau Rd SNP	Speed Management and Signs & Marking upgrade	$ 650,000	13.04	16.2
Fox & Birdwood IS SNP	Intersection upgrade	$ 400,000	10	0
	Total value	**$ 1,850,000**		

15.9.8. Option Analysis

The following is a multi-criteria analysis of options that could be used to address the road crash problem.

Strategic Case Multi Criteria Option Analysis			
Problem No 2: Network Safety			
Short list of 3 options from the following Options			
Option	yes/no	Reason	Rank
1. Do nothing	no	The personal risk to road users on the Councils' network would continue to worsen.	0
2 Increase the Road safety education programme.	yes	The increase in education sharpens the focus on the need for driving behaviours that avoid crashes on the road network.	3
3 Reduce network speed	yes	The reduction in the speed limit will be the most cost effective measure for the reduction of serious injury crashes. Note however that this will be difficult to achieve without a high level of enforcement.	2
4 Increase Police enforcement	no	Compliance would be reliant on the education messages. The reason for not progressing this option is because the network is large with a low density of traffic. This means increased enforcement is unlikely to be as cost effective.	4
5 Network safety improvements	Yes	The target improvements that reduce the personal risk on the network, will both increase the network's safety and reinforce the education messages that action is required to reduce road crashes.	1

Criteria/Drivers to Consider	**Weighting**	**How good is this option**					
		Option 1		**Option 2**		**Option 3**	
		Raw	**Score**	**Raw**	**Score**	**Raw**	**Score**
Meets GPS	15.00%	3	0.45	3	0.45	3	0.45
Meets RLTP	10.00%	3	0.3	3	0.3	3	0.3
Addresses problems	15.00%	3	0.45	2	0.3	2	0.3
Will realise benefits	15.00%	2	0.3	2	0.3	2	0.3
Will meet Community Outcomes	15.00%	2	0.3	2	0.3	1	0.15
Provides high performance impacts	10.00%	2	0.2	2	0.2	2	0.2
Provides high environmental impacts	5.00%	2	0.1	2	0.1	2	0.1
Provides cultural Impacts	5.00%	2	0.1	2	0.1	2	0.1
How costly	10.00%	1	0.1	3	0.3	3	0.3
other					0		0
other					0		0
Totals	100.00%		2.3		2.35		2.2

15.9.9. Recommended Programme of Work & Funding

The multi criteria analysis of the options does not reflect the effect of the combined implementation of the options. The implementation of one option alone will not be as effective as a mixed investment in all the options. For example, the credibility of road safety education messages will be limited unless it is accompanied by an investment in network improvements and speed limit management.

The recommended programme to reduce the road crashes on the network is as follows:

- To continue with the current level of road safety education.
- To continue with the current level of road enforcement by the police.
- To invest $400,000 annually from Low Cost Low Risk funding category, $200,000 on each Council's network, on widening of the secondary collector road network. The widening is so these road widths align to ONRC standards to achieve a uniform Customer level of service with the rest of New Zealand.
- To invest $100,000 annually from Low Cost Low Risk funding category, $50,000 on each Council's network, on speed management.
- To increase, cumulatively 1% annually over the next five years, the funding of the Traffic Facilities and Guard Rail category. This increased funding will ensure the additional delineation and signage required for the widened Secondary collectors and speed management is maintained. It will also ensure delineation is uniform with the ONRC Customer level of service.

The implementation of the above programme of work over the next 10 to 15 years will address the current network crash issue.

15.9.10. Business case No. 3- Network Resilience

The resilience of the network to Climate change is a key issue. The risk of loss of access due to ground movement (slips), washout of bridges and coastal erosion to roads needs to be addressed. This is particularly important to address where climate change is reducing the current level of network resilience.

15.9.11. Issues considered related to the timing of interventions

It is an urgent priority to fund a programme of work that improves the resilience of the network because:

- The resilience of the network needs to be improved now rather than when climate change impacts the road network. This is because, if left until climate change impacts are observed, the joint costs of repairing failures and improving the resilience will not be sustainable.
- The tasks required to improve resilience will also progress the improvement of water quality. This will occur because the most frequent action required to improve resilience will be improved management of water runoff.

15.9.12. Community Outcomes

The improvement to the network's resilience will contribute to the achievement of the following community outcomes.

- SWDC-contributes to "A place that's accessible and easy to get around, Sustainable South Wairarapa, Healthy & economically secure people" outcome.

- Carterton- contributes to "A vibrant and prosperous economy" outcome.

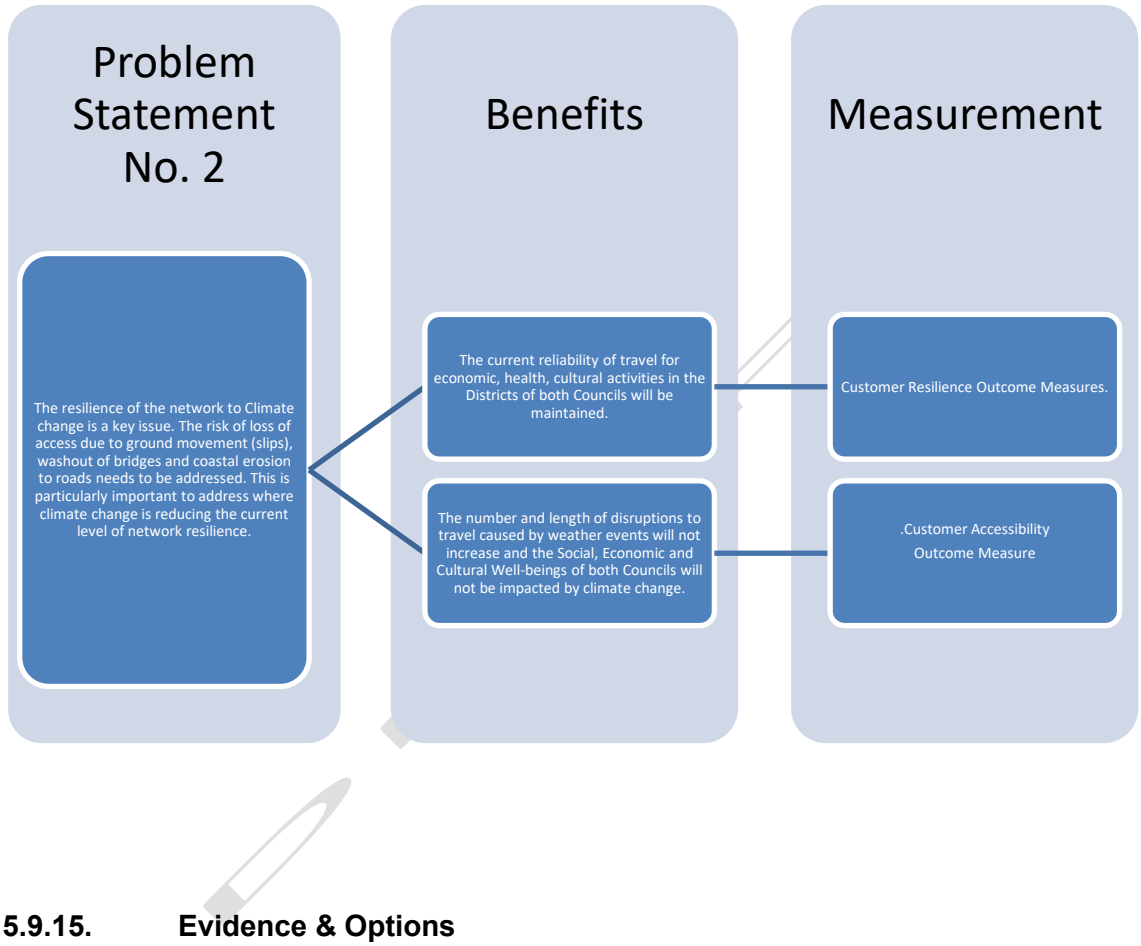
15.9.13. Contribution to GPS

The actions to improve the road network's resilience will contribute to the GPS objective:

- To provide resilience & security to better transport options to access social and economic opportunities.

15.9.14. Benefits & Measurement

The diagram below shows the mapping of the measurement of benefits arising from improving the network's resilience.



15.9.15. Evidence & Options

The evidence of this issue is the prediction of climate change. The climate change prediction is that the network's area will be subjected to more frequent intense localised rain events.

To reduce the risk of loss of access due to ground movement (slips) and washout of bridges the design of the current drainage systems need to be checked to determine their capacity to handle these more frequent high intensity events.

The sea level is also predicted to rise with climate change. This will exacerbate the coastal erosion and has specific ramifications for the Cape Palliser Road.

The current level of unplanned maintenance, other than the Cape Palliser Road, is at a reasonable risk level of six percent of the operation budget. However, it is important the resilience is improved ahead of climate change impacts. This is because once climate change impacts are affecting the network the joint costs of repairing failures and improving resilience will not be sustainable.

The options available to address the network resilience are:

1. To do nothing, which will mean both the number and the length of disruptions to travel, caused by weather events, will increase.
2. To develop a programme of work, and then fund its implementation, that will increase the resilience of the network during weather events.
3. To fund a trial of a new method for protection of the Cape Palliser Road.

15.9.16. Option Analysis

The following is a multi-criteria analysis of options that could be used to improve the network's resilience.

Strategic Case Multi Criteria Option Analysis							
Problem No 3: Network Resilience							
Short list of 3 options from the following Options							
Option	yes/no	Reason					Rank
1. To do nothing.	no	The number and the length of disruptions to travel, caused by weather events, would increase.					0
2. To develop a programme of work, and then fund its implementation.	yes	The network will have increased resilience during weather events. Note the start of the implementation of improved resilience will not occur until four years time.					2
3. To implement a programme of work that improves the network's resilience.	yes	The network will have increased resilience during weather events.					3
4. To fund a trial of a new method for protection of the Cape Palliser Road.	yes	The existing protection design is being destroyed by the sea's action. The sea level rise will increase its potential to destroy the road protection.					1
Criteria/Drivers to Consider	**Weighting**	**How good is this option**					
		Option 1		**Option 2**		**Option 3**	
		Raw	**Score**	**Raw**	**Score**	**Raw**	**Score**
meets GPS	15.00%	3	0.45	3	0.45	3	0.45
Meets RLTP	10.00%	3	0.3	3	0.3	3	0.3
Addresses problems	15.00%	3	0.45	3	0.45	3	0.45
Will realise benefits	15.00%	3	0.45	3	0.45	3	0.45
Will meet community outcomes	15.00%	3	0.45	2	0.3	2	0.3
Provides high performance impacts	10.00%	2	0.2	2	0.2	2	0.2
Provides high environmental impacts	5.00%	2	0.1	2	0.1	2	0.1
Provides cultural impacts	5.00%	3	0.15	2	0.1	2	0.1
How costly	10.00%	2	0.2	3	0.3	1	0.1
other					0		0
other					0		0
Totals	100.00%		2.75		2.65		2.45

15.9.17. Recommended Programme of Work & Funding

The following actions are proposed as the first steps to manage the effects of climate change on the roading network.

a) The trial of a new method of erosion protection for the Cape Palliser Road.
b) The undertaking of a flood event risk assessment of bridge sites with assistance from the Wellington Regional Council.
c) The undertaking of a survey to identify the highest risk sites on the network that could be damaged in a flood event. Then to develop a mitigation plan including treatment of drainage infrastructure where it is found to be deficient.

The design tasks b) & c) will be implemented within the Low Cost & Low Risk category funding allocation of $15,000 from each Council. The funding for task a) is a specific project item. Note the tasks b) to c) will provide the information required for the next Long Term Plan to determine a programme for improving the resilience of the network. The current level of information means that an estimate of the required programme of work is not known. However, to indicate the commitment into future years it is suggested that each Council's programme from year four of the Long-Term Plan show the funding of an additional $100,000 per year in the Low Cost & Low Risk funding category.

15.9.18. Low Cost Low Risk Improvements

Within the Traffic Service category, the improvements targeted at delineation and signage on Secondary Collector roads in order to decrease the death and serious injury figures in both networks. In conjunction with the localised pavement widening this also aligns with national standards driven from ONRC standards to achieve a uniform Customer level of service across New Zealand.

The table below identifies standard delineation targets. The under-width Secondary Collectors will need to be delineated to this standard once they are widened.

Road marking or delineation device	Desirable minimum sealed width (m)	Absolute minimum sealed width (m)	Minimum traffic volume VPD[14]	ONRC[15]	Comment
ROAD MARKING					
Dashed centre-line (total route)	5.5	5.1	200	AC/LV	
Dashed centre-line (isolated sections)	5.5	5.1	100	AC/LV	
Edge lines (total route)	6.6	6.0	>200	SC	
Edge lines (isolated sections)	6.6	6.0	<200	AC/LV	
Intersection markings solid centre-line only	5.5	5.0	200	AC/LV	
Intersection markings solid centre-line, edge line and continuity line	6.6	6.0	>200	SC	
DELINEATION DEVICES					
Unsealed roads					
Edge marker posts (total route)	-	-	>200	SC	On straights, 100m spacing between posts, with pairs opposite.
Edge marker posts (isolated sections)	-	-	<200	AC/LV	On straights, 100m spacing between posts, with pairs opposite.
Sealed roads					
Edge marker posts	-	-	100	AC	On straights, 100m spacing between posts, with pairs opposite.
Reflective raised pavement markers	6.0	-	>200	SC	20m centres

[14] The minimum traffic volume in vehicles per day (VPD) above which the marking or device should normally be applied

[15] SC – Secondary Collector, AC/LV – Access/Low Volume

Note:

- Curve warning signage improvements will be following carriageway widening undertaken as part of LCLR works in Pavements, and
- Guard rail installation will occur on curves where justified and for protection from hitting solid structures

15.10. Minor Events and Rail Crossing

The tables in this section show the funding requirements for minor events and rail crossing maintenance & renewal.

Table 15.15 Minor Events Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 140 MINOR EVENTS	$105,000.00	$45,000.00	$150,000.00	$128,879	$278,879.04

The budget for minor events has been determined by the average amount required to repair damage caused by the minor events of the past three years.

Table 15.16 Level Xing warning Devices Maintenance Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 131 Level Xing warning Devices	$7,500.00	$0.00	$7,500.00	$24,888	$32,388.00

The budget of level Xing warning devices is the annual amount required by Kiwi Rail to maintain the level Xing warning devices. There have been no requests by Kiwi Rail for a contribution to pavement maintenance at any railway crossing over the next 3 years.

15.11. Network & Asset Management

The table in this section shows the funding requirements for the annual costs of network & asset management.

Table 15.17 Network & Asset Management Funding

Estimated Annual Budget Requirement					
	South Wairarapa Component			Carterton Component	Ruamāhanga Roads
Description	LR	SPR	Total	Total	Total
WC 151 NETWORK and ASSET MANGEMENT	$650,000.00	$90,000.00	$740,000.00	$364,712	$1,104,712.00

15.11.1. Introduction

This work category provides for the general management and control of the road network and for management of road assets. Funding assistance is subject to the condition of funding set out below.

The budget of Network and Asset Management includes the estimated funds required to cover the cost of Council staff engaged in management of roading network, the Council overhead costs allocated to the Roading activity and consultants to supplement Council staff.

15.11.2. Scope

Examples of activities funded under the Network & Asset Management category are:

- management of the road network
- promotion and information activities which maximise the efficiency of the road network.
- implementation and operation of road asset management systems
- regular, routine updates to the activity management plan
- roughness and condition rating surveys
- traffic count surveys, including pedestrian and cycle counts
- road network inspections and field validation of proposed programmes
- routine refreshing of the asset deterioration model
- maintenance and routine updating of transport models
- legalisation of existing road reserves
- Professional services for road maintenance activity classes other than for operational traffic management and emergency works.

15.11.3. Strategic Case

Network and Asset Management is linked to funding of all activities. It provides for the scoping and definition of the problems, analysis of options to mitigate the problem, procurement of funding and physical works to address the problem. Once the solution is implemented it provides for ongoing analysis and monitoring of the effectiveness of the solution for benchmarking and feedback.

15.11.4. Council's Strategic Goals

Network and Asset Management is a core component to achieve Council's strategic goal which is:

- To provide a road network that is fit for purpose for the safe, effective and efficient movement of vehicles and people at a reasonable cost.

15.11.5. ONRC Customer Outcomes

Network and Asset Management provides monitoring and assesses progress toward the achievement of ONRC Customer outcomes.

15.11.6. Benefits

The benefits of carrying out Network and Asset Management ensures the monitoring and management of delivery so KPI's can be achieved. The core principles that guide Network & Asset Management actions are:

- **Policy-driven** - Resource allocation decisions are based on a well-defined set of policy goals and objectives.
- **Performance-based** - Policy objectives are translated into system performance measures that are used for both day-to-day and strategic management.
- **Analysis of Options and Trade-offs** - Decisions on how to allocate funds within and across different types of investments (e.g., preventive maintenance versus rehabilitation, pavements versus bridges) are based on an analysis of how different allocations will impact achievement of relevant policy objectives.
- **Decisions Based on Quality Information** - The merits of different options with respect to goals are evaluated using credible and current data.
- **Monitoring Provides Clear Accountability and Feedback** - Performance results are monitored and reported for both impacts and effectiveness

15.11.7. Consequences

The consequences of not carrying out Network and Asset Management are that:

- the best whole of life costs may not be achieved,
- policy goals and objectives or the needs of the community are not delivered,
- quality information analysis and decision making does not occur,
- accountability and feedback reporting will be unreliable, and
- poor decisions will be made on funding allocations and different investment types.

16. Asset Disposal

The disposal of roading assets occurs when:

a) The road is realigned or a bridge is replaced, and
b) The statutory process of road stopping is completed.

There are no plans, over the next 10 years, to replace bridges or realign the existing roads. However, the investigation of bridges that restrict HCV movements may result in bridge replacement.

There are no plans to undertake the statutory road stopping process over the next 10 years. Note a Council can initiate the process to stop a road. However, the final decision to stop a road needs the approval of Central Government.

17. Asset Acquisition and Creation

The acquisition of Roading network assets usually occurs when a developer completes a subdivision of land. The roads in the new subdivision, if they are public roads, become the responsibility of the Councils. There have been subdivisions, both urban and rural, that have occurred in the past years. The past rate of subdivision is not expected to increase. The length of network added by development of sub-divisions is not likely to significantly change the funding required over the next 15 years. This is because the roading assets are long life assets which means renewals, except for road markings, would not be required in the next 10 years.

The other source of network acquisition is the lifting of a State Highway designation from a road. If the State Highway designation is removed, then the road becomes the responsibility of the Councils to maintain. There are no known plans for NZTA to change the State Highway designation on roads in the Councils' areas.

Note unformed public roads, commonly referred to as "paper roads", are the Councils' responsibility. There are no plans to change the current unformed roads to formed roads.

The creation of new asset occurs when a bridge is replaced, or a road is realigned. There are no plans, over the next 10 years, to replace bridges or realign the existing roads. However, the investigation into bridges that restrict HCV movements may result in bridge replacements in the 4 to 10 year period.

18. Asset Capacity and Performance

No issues have been identified with the Networks capacity. The asset plan has actions identified to address the Network's safety performance.

19. Design Standards

New pavements are designed in accordance with Austroads and NZTA standards. However, most of the Network's road sections were constructed before these standards applied.

20. Data Confidence

The tables below show analysis of the data accuracy as at 20 May 2020. The analysis of data accuracy shows some errors. However, these gaps in data do not mean that the findings in this Asset Plan are incorrect. The gaps in the data are filled in the asset plan by personal knowledge of the roading management team. The gaps mean that some of the findings are not backed, as at the 20 May 2020, with evidence from the RAMM database. Note that a number of these gaps in the RAMM data will be filled after the end of the financial year. The balance of the gaps are either part of the improvement programme or are now being filled by improved data collection requirements in the new maintenance contract. The new contract was started about a year ago, but it is expected to take 3 years before the improved data will provide better evidence.

Category	Type	Ref	Metric Description	PM Affected	Primary Dimension	AM Importance	Result	Trend	This year Last year
Maintenance Activity: **Maintenance Activity**	AM	AM-MA1	Consistency of pavement, surfacing and shoulder maintenance activity units	COST EFFICIENCY	**Accuracy**	Moderate	No Data		
Maintenance Activity: **Maintenance Activity**	AM	AM-MA2	Pavement, surfacing, shoulder and drainage maintenance activity known	COST EFFICIENCY	**Completeness**	Moderate	0.0		
Maintenance Activity: **Maintenance Activity**	AM	AM-MA3	Correctly located shoulder and drainage maintenance activity	COST EFFICIENCY	**Accuracy**	Low	0.0		
Maintenance Activity: **Maintenance Activity**	AM	AM-MA4	Level of pavement, surfacing, shoulder and drainage maintenance activity known	COST EFFICIENCY	**Completeness**	High	0.0		
Maintenance Activity: **Maintenance Activity**	PM	MA1	Complete pavement and surface maintenance activity	COST EFFICIENCY	**Completeness**	High	No results displayed until after end of financial year		
Maintenance Activity: **Maintenance Activity**	PM	MA2	Correctly located pavement and surface maintenance activity	COST EFFICIENCY	**Accuracy**	High	0.0		
Maintenance Activity: **Maintenance Activity**	PM	MA4	Pavement and surface maintenance activity has a valid location	COST EFFICIENCY	**Accuracy**	High	0.0		
Condition: **Roughness**	PM	RO1	Roughness survey within 2.5 years	AMENITY	**Completeness**	High	No results displayed until after end of financial year		
Condition: **Roughness**	PM	RO3	Roughness data has valid location	AMENITY	**Accuracy**	High	99.9	–	
Condition: **Rating**	AM	AM-CO1	Road rating data current		**Completeness**	High	No results displayed until after end of financial year		
Condition: **Rating**	AM	AM-CO2	Rating data locations valid		**Accuracy**	Moderate	NA		
Demand/Use: **Traffic Count**	PM	TC1	Well targeted traffic count programme	AMENITY COST EFFICIENCY	**Completeness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Count**	PM	TC3	Traffic count programme activity on sealed network	AMENITY COST EFFICIENCY	**Timeliness**	Moderate	No results displayed until after end of financial year		
Demand/Use: **Traffic Count**	PM	TC4	Traffic loading understood	AMENITY COST EFFICIENCY	**Completeness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE1	Network has traffic estimates	AMENITY COST EFFICIENCY	**Completeness**	High	98.0	–	
Demand/Use: **Traffic Estimates**	PM	TE2a	Traffic estimates are maintained (High Volume to Arterial)	AMENITY COST EFFICIENCY	**Timeliness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE2b	Traffic estimates are maintained (Primary and Secondary Collectors)	AMENITY COST EFFICIENCY	**Timeliness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE2c	Traffic estimates are maintained (Access including Low Volume)	AMENITY COST EFFICIENCY	**Timeliness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE3	Traffic estimates updated following counts	AMENITY COST EFFICIENCY	**Accuracy**	High	44.2		
Demand/Use: **Traffic Estimates**	PM	TE4	Considered traffic loading	AMENITY COST EFFICIENCY	**Completeness**	High	100.0		
Crash: **Crash Data**	PM	CR1	Crash data is recent	SAFETY	**Timeliness**	Moderate	11.0		
Crash: **Crash Data**	PM	CR2	Crash records with valid location	SAFETY	**Accuracy**	Moderate	No results displayed until after end of financial year		

Category	Type	Ref	Metric Description	PM Affected	Primary Dimension	AM Importance	Result	Trend	This year Last year
Maintenance Activity: **Maintenance Activity**	AM	AM-MA1	Consistency of pavement, surfacing and shoulder maintenance activity units	COST EFFICIENCY	**Accuracy**	Moderate	2.8		
Maintenance Activity: **Maintenance Activity**	AM	AM-MA2	Pavement, surfacing, shoulder and drainage maintenance activity known	COST EFFICIENCY	**Completeness**	Moderate	41.6		
Maintenance Activity: **Maintenance Activity**	AM	AM-MA3	Correctly located shoulder and drainage maintenance activity	COST EFFICIENCY	**Accuracy**	Low	99.9		
Maintenance Activity: **Maintenance Activity**	AM	AM-MA4	Level of pavement, surfacing, shoulder and drainage maintenance activity known	COST EFFICIENCY	**Completeness**	High	95.5		
Maintenance Activity: **Maintenance Activity**	PM	MA1	Complete pavement and surface maintenance activity	COST EFFICIENCY	**Completeness**	High	No results displayed until after end of financial year		
Maintenance Activity: **Maintenance Activity**	PM	MA2	Correctly located pavement and surface maintenance activity	COST EFFICIENCY	**Accuracy**	High	55.8		
Maintenance Activity: **Maintenance Activity**	PM	MA4	Pavement and surface maintenance activity has a valid location	COST EFFICIENCY	**Accuracy**	High	99.8		
Condition: **Roughness**	PM	RO1	Roughness survey within 2.5 years	AMENITY	**Completeness**	High	No results displayed until after end of financial year		
Condition: **Roughness**	PM	RO3	Roughness data has valid location	AMENITY	**Accuracy**	High	100.0	–	
Condition: **Rating**	AM	AM-CO1	Road rating data current		**Completeness**	High	No results displayed until after end of financial year		
Condition: **Rating**	AM	AM-CO2	Rating data locations valid		**Accuracy**	Moderate	100.0		
Demand/Use: **Traffic Count**	PM	TC1	Well targeted traffic count programme	AMENITY COST EFFICIENCY	**Completeness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Count**	PM	TC3	Traffic count programme activity on sealed network	AMENITY COST EFFICIENCY	**Timeliness**	Moderate	No results displayed until after end of financial year		
Demand/Use: **Traffic Count**	PM	TC4	Traffic loading understood	AMENITY COST EFFICIENCY	**Completeness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE1	Network has traffic estimates	AMENITY COST EFFICIENCY	**Completeness**	High	79.6	–	
Demand/Use: **Traffic Estimates**	PM	TE2a	Traffic estimates are maintained (High Volume to Arterial)	AMENITY COST EFFICIENCY	**Timeliness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE2b	Traffic estimates are maintained (Primary and Secondary Collectors)	AMENITY COST EFFICIENCY	**Timeliness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE2c	Traffic estimates are maintained (Access including Low Volume)	AMENITY COST EFFICIENCY	**Timeliness**	High	No results displayed until after end of financial year		
Demand/Use: **Traffic Estimates**	PM	TE3	Traffic estimates updated following counts	AMENITY COST EFFICIENCY	**Accuracy**	High	19.4		
Demand/Use: **Traffic Estimates**	PM	TE4	Considered traffic loading	AMENITY COST EFFICIENCY	**Completeness**	High	31.3		
Crash: **Crash Data**	PM	CR1	Crash data is recent	SAFETY	**Timeliness**	Moderate	11.0		
Crash: **Crash Data**	PM	CR2	Crash records with valid location	SAFETY	**Accuracy**	Moderate	No results displayed until after end of financial year		

21. Critical Assets

The critical assets in a roading network are the bridges. The bridges are a relatively high cost asset, repair or replacement after a failure is complex and expensive. The network, with one bridge failure, can no longer function as a network until the bridge is replaced or repaired.

The Councils' lifelines plans are also taken into account in determining the critical links in the network. Priority is given in the lifelines plans to roads that provide access to other critical utility infrastructure and large communities.

The following table is a list of the critical links.

Table to be added

22. Asset Depreciation

22.1. Purpose of this section

The tables in this section list the asset values and compares the depreciation to the proposed funding level of renewals. The comparison of the annual depreciation to the renewal funding is an important validation of both assessments. There are some differences, which is acceptable. The discussion provides the reasons for these differences.

The asset plan approach and the valuation approach should come to a similar value for depreciation and renewal if the component assets' ages are uniformly spread over the expected asset life. However, for the Ruamāhanga Roading Network this is not the case as identified in the section below.

22.2. Discussion of Comparison

The valuation has been prepared by an independent engineer using their expertise and knowledge of expected asset lives achieved. The asset plan Life Cycle section renewal determination is made from observations of the assets' condition, performance, observed rate of deterioration and knowledge of the asset's current age.

The comparison of the depreciation to the identified renewal funding shows that the planned renewal of assets on the network is lower than the annual level of depreciation. This is as expected because the network's assets do not have a uniform age distribution. The most significant differences occur in the asset categories of Bridges, Large Culverts and Culverts. The majority of these assets have an expected life of over 120 years so renewal of these assets has not yet commenced.

The funding required for renewals is currently lower than the amount of annual depreciation. However, as the assets get older the funding required for renewals will exceed the annual depreciation rate. Currently there is insufficient data and analysis to predict the size and time of the peak requirement for renewal funding. The planned improvement of the asset data and analysis, over the next three years, should enable a prediction of the peak requirement and its timing.

The comparison of the Valuation's and the Asset Plan's predicted asset lives shows there are some differences. This is most significant regarding the dollar value determined for sealed pavement resurfacing. The valuation has assumed an average life of sealed surfacing of 15 years. The asset plan has assumed an average life of 20 years. This is based on the actual performance of surfacing lives achieved on the South Wairarapa & Masterton District networks. It is expected that the valuation approach would have a more conservative assumption than the asset plan assumption. The valuation assumption is based on nationally achieved figures. The asset plan assumption is based on observed local performance in the field.

The other significant funding difference occurs with the renewal of the unsealed pavements. The Valuation assumed asset lives are 50 years for the pavement and 8 years for the wearing course. The asset plan budget does not differentiate between heavy metalling and rehabilitation treatments for unsealed roads. The renewal of the running surface on the unsealed roads is applied based on a 'rule of thumb' for wearing course loss at an average of 10mm of depth per year. Based on the 'rule of thumb' approximately 28 Km of heavy metalling is required per year on the Carterton network section. It appears that the valuation has defined the top 80mm of metal as the wearing course. The usual use of this term "wearing course" refers to a thin layer of one small stone depth on the surface which is replaced at approximately 18 month intervals as part of the maintenance treatment.

It should also be noted that the majority of the pavements are old, approximately 60 years of the assumed 75 year life. The pavements' age is not a uniform distribution so a growing peak requirement for renewal should be expected.

There are further detailed comments in the table on any significant differences between the renewal funding level and the annual depreciation.

Table 22.1 Comparison Renewal Budgets to Annual Depreciation – Carterton

Carterton Network							
Roading Asset Component Valued	Optimised Replacement Cost ($)	Optimised Depreciated Replacement Cost ($)	Value assumed life Yrs.	Annual Depreciation ($)	Annual Renewal budget 21-22	d life for renewals	Comment
Formation	$64,413,687	$64,413,687	infinite	$0			
Sealed Pavement	$44,985,262	$38,427,731	Basecourse 75	$133,855	$340,596	Basecourse 75,	The majority of the pavements are old. The pavements age is not a uniform distribution so a growing peak requirement for renewal should be expected.
Sealed Surface	$11,534,452	$5,002,360	sealed surface 15	$751,289	$448,200	sealed surface 20,	The average is currently 15 years. The budgeted renewal value reflects moving towards and average of 20years for sealed surfacings. The valuation has taken a conservative approach to the seal lifes. The Asset Plan average seal life is based on the local experience including the networks in SWDC & Masterton Districts.
Unsealed Pavement	$6,840,006	$5,130,005	50	$68,400	$440,000	unsealed metalling 10.	The majority of the pavements are old. The pavements age is not a uniform distribution so a growing peak requirement for renewal should be expected. The budget does not differentiate between heavy metalling and rehabilitation treatments for unsealed roads. If rehabilitation sites are identified their priority would be balanced against the road sections that require heavy metalling.
Unsealed Wearing Cour	$2,191,532	$1,095,766	8	$273,941		1.5 years	The renewal of the running surface on the unsealed roads is applied based on a 'rule of thumb' for wearing course loss at an average of 10mm of depth per year. Based on the 'rule of thumb' approximately 28 Km on Carterton section of heavy metalling is required per year. The current level of funding means that only 20km on the Carterton section of heavy metalling is carried out each year. It appears that the valuation has defined the top 80mm of metal as the wearing course. The usual use of this term refers to a thin layer of one small stone depth on the surface which is replace at approximately 18 month intervals each year.
Stormwater Channels and Kerb and Channels	$9,611,749	$5,691,338	SWCS 10 years, all others 80 years	$209,856	$165,000	concrete asset types 80, side	This is consider a reasonable match as the section of this category that have an 80 year life should not require renewal at this stage.
Culverts	$11,884,437	$6,462,069	All material & asset types 80	$148,555	$0	concrete asset types 80, plastic and armco	There are a large number of concrete structures that have not come to the end of their life which will mean a peak demand for renewals in the future.
Footpaths	$8,944,567	$4,472,283	Asphaltic 30, concrete 80, seal 20, paving blocks 60.	$146,644	$140,000		The asset has a predominant length of concrete footpaths that have not reached the end of their life. This means that there will be a peak demand for footpath replacement in the future. However there is insufficient data for the asset plan to evaluate the expected remaining lives of the footpaths. The current observed condition means there is not a high priority for the gathering of data.
Signs	$708,046	$354,023	signs 10	$70,805	$72,406	y signs 15, Other Signs 20, markings 1.	The asset plan estimates the signs, road markings and traffic facilities as a one combined budget. Note the road markings replacement is a maintenance budget rather than capital renewal. The budget for signs replacement is an operational budget.
Road Markings	$52,936	$26,468	markings 4	$13,234		markings 1 year.	The road markings are replace annually. The budget for annual remarking is an operational budget.
Traffic Facilities	$16,807	$8,404	Traffic Islands 50 years	$1,681			The primary type of assetin this group are edge marker post. The edge markposts are replace under maintenance (operational budget) when they are damaged.
Railings	$1,051,352	$525,676	guard rail 50, timber site rail	$42,054		guard rail 40, timber site rail 20.	Note the Asset Plans has identified, as an asset information improvement task, the need to undertake a condition rating of railings to enable preditction of the renewal requirement.
Traffic Island	$35,425	$17,712	50 years	$708			There are no traffic islands identified for renewal. Note the network only six traffic Island and with a 50 year life most years will not require renewal funding.
Bridges	$39,568,032	$15,013,278	concrete 130, timber 80, culverts 125	$326,300	$70,892		The regular inspection programme checks the bridge and large culvert conditions. Regular maintenance is proposed be be increased so the expected lives for the culverts and bridge assets is achieved. The assets that have an expect life of over 120 years would not expected to require renewal at in the next 3 years.
Large Culverts	$10,879,661	$5,708,824	concrete 130, timber 80, culverts 125	$87,037	$0		The regular inspection programme checks the bridge and large culvert conditions. Regular maintenance is proposed be be increased so the expected lives for the culverts and bridge assets is achieved. The assets that have an expect life of over 120 years would not expected to require renewal at in the next 3 years.
Retaining Walls	$126,131	$117,837	material types 80 years.	$1,577	$0		The asset plan includes the funding for retaining wall replacement within the work category for bridges and culverts.
Street Lighting - Bracket	$836,731	$415,457	50 years	$16,618	$0		All the streetlights, (lamps & lanterns) were replaced in 2018 with LED lights.The expected life of the LED lanterns & lamps is 20 years.
Street Lighting - Pole	$410,485	$246,115	50 years	$8,210	$0		All the streetlights, (lamps & lanterns) were replaced in 2018 with LED lights.The expected life of the LED lanterns & lamps is 20 years.
Street Lighting - Lamp	$144,926	$90,064	LED 15,lamps -other 4	$18,140	$0	Poles & lanterns 20	All the streetlights, (lamps & lanterns) were replaced in 2018 with LED lights.The expected life of the LED lanterns & lamps is 20 years.
TOTAL	$214,236,224	$153,219,097		$2,318,904	$1,677,094		

Table 22.2 Comparison Renewal Budgets to Annual Depreciation – South Wairarapa

South Wairarapa Network							
Roading Asset Component Valued	Optimised Replacement Cost ($)	Optimised Depreciated Replacement Cost ($)	Value assumed life Yrs.	Annual Depreciation ($)	Annual Renewal budget 21-22	Assumed life for renewals	Comment
Land	$81,569,946	$81,569,946		$0			
Formation	$132,676,009	$132,676,009	infinite	$0			
Unsealed	$20,569,692	$20,317,155		$0	$400,000	unsealed metalling10.	The valuation has not depreciated the metal on unsealed roads. This means the annual depreciation does not account for the $400,000 annual renewal cost of heavy metalling. Note the asset plan estimates that this is about two thirds of the required funding level.The notes by the valuer suggest that the valuer assumed the metalling is budgeted as maintenance.
Subbase	$29,560,836	$28,652,426	infinite	$18,168			The renewal of the subbase is included in the basecourse budget.
Basecourse	$36,540,388	$22,837,743	Basecourse 75 to 100	$321,112	$250,000	Basecourse 75	The funding level for pavement rehabiliation is based on observed need. However the need could be higher and the funding level should possibly match the depreciation level. Increasing the rate of pavement rehabiliation could reduce the maintenance funding required.
Surfacing	$10,194,021	$3,384,208	sealed surface 20	$509,701	$700,000	sealed surface 20.	The increase in renewal funding above the depreciation rate is to address the backlog of surfacings required to be renewed.The renewal of surfacing was underfunded in the past.
Drainage	$17,632,107	$8,185,497	Various refer to valuation appendix for details.	$240,877	$150,000	All concrete asset types 80, side drains 12, plastic and armco culverts 35.	1) There are a large number of concrete structures that have not come to the end of their life which will mean a peak demand for renewals in the future. 2) There is a significant difference in the estimate of side drain life. The valuation does not provide a life for this component unless it is constructed of concrete. This issue needs to be addressed. The field experience does not align with the assumed life in the valuation.
Footpaths	$6,377,815	$3,001,967	Asphaltic 25, concrete 50, seal 25, paving blocks 50.	$161,321	$0		The asset has a predominant length of concrete footpaths that have not reached the end of their life. This means that there will be a peak demand for footpath replacement in the future. However there is insufficient data for the asset plan to evaluate the expected remaining lives of the footpaths. The current observed condition means there is not a high priority for the gathering of data.
Berms	$5,116,799	$5,116,799	infinite	$0	$0		There is no renewal planned for the berms.
Signs & Road Markings	$709,143	$354,572	signs 15, markings 5	$47,718		Regulatory signs 15, Other Signs 20, markings 1.	The asset plan estimates the signs, road markings and traffic facilities as one combined budget. Note the road markings replacement is a maintenance budget rather than capital renewal.
Traffic Facilities	$1,631,045	$618,036	Steel guard rail 20, timber site rail 20, all others 20.	$92,864	$45,000	Steel guard rail 40, timber site rail 20.	The combined annual depreciation is $79,686 compared to renewal funding of $72,406.
Bridges/Culverts	$58,576,803	$22,901,221	concrete 75, Steel 30	$657,312	$80,000		The regular inspection programme checks the bridge and large culvert conditions. Regular maintenance is proposed be be increased so the expected lives for the culverts and bridge assets is achieved.
Retaining Walls	$11,093,548	$8,385,953	All material types 50	$108,304	$0		The asset plan includes the funding for retaining wall replacement within the work category for bridges and culverts.
Street Lighting	$1,358,174	$798,816	Poles 40, lamps & lanterns 15 to 30.	$63,818	$0	lamps & lanterns 20	All the streetlights, (lamps & lanterns) were replaced in 2018 with LED lights.The expected life of the LED lanterns & lamps is 20 years.
TOTAL	$413,606,326	$338,800,348		$2,221,195			

23. Improvement and Monitoring

The following table identifies the actions that will be taken to improve the accuracy of the Asset Plan information over the next three years. The table identifies the issue, improvement action and benefit achieved by the improvement action.

Action Ref No.	Issue being addressed	Benefit achieved by the improvement	Action
1. Develop a pavement deterioration model.	There could be a future peak funding requirement for renewal that the current analysis does not show. .	The risk of an unforeseen spike in renewal funding is removed.	The development of a pavement deterioration model for sealed road pavements and the use of this model to validate the current forecast for renewals and maintenance.
2. Costs by ONRC Road Category	The maintenance costs of each ONRC Road Category are not known.	The future maintenance costs will be able to be predicted by the length of network in each ONRC Road Category.	The development of a table that shows cost per Rural Km and per urban km for each ONRC category of road. The cost in this table will relate to work required to clean-up crash sites, spills, loose chip and removal of hazardous material. This will mean that the quantity of work required can be related to the length of the network.
3. Footpath & Cycleway age profile	There is no data to determine the renewal forecast for footpaths & cycleway.	A data based 30 year funding forecast for footpaths & cycleway.	The determination of the age distribution and life of the footpath & cycleway networks so an age profile can be produced, and future renewal requirements estimated.
4. Guardrail & Sightrail Condition assessment.	There is no data to determine the renewal forecast for guardrail and sight rails.	A data based 30 year funding forecast for guardrail & sight rail renewals.	The undertaking of a condition assessment of the guardrail and sight rail. This will enable an age profile to be determined for each of the traffic facility assets, and future renewal requirements to be forecasted.
5. Determine the traffic safety of the network's narrow bridges. *Low priority improvement*	The impact of the network's narrow bridges on the Network's safety is unknown.	The improvement to the network's safety can be taken into account when considering bridge renewals.	The bridge asset is performing to its intended capacity. However, bridge widths in relation to traffic volumes should be reviewed so it can be determined when their widths will impact on the safety performance of the network.
6. Unsealed Pavement age profile.	There could be a future peak funding requirement for Heavy Metalling that the current analysis does not show. .	The risk of an unforeseen spike in Heavy Metalling funding requirements is removed.	There is no current centralised store of data on the age of the unsealed road pavements and their construction. This data is to be collected and added to the RAMM database so the pavement age of the unsealed network and the re-metalling frequency can be forecast.
7. Analysis of cost data provided by the Road	Use is not being made of the detailed cost data provided by the	The accuracy of budget forecasts will be improved.	The improved data being delivered through the new maintenance contract, which has been in place for oneyear, means the following can now be undertaken:

Maintenance contractor.	maintenance contract.	a. The analysis to determine the cost for maintaining and heavy metalling of unsealed roads. b. The analysis to determine the cost of each environmental management work category item. c. The analysis to determine the cost for maintenance and renewal of surface water channels.

THE END

AGENDA ITEM C1

PARTNERSHIPS AND OPERATIONS REPORT

Purpose of Report

To update Councillors on activity and progress within the Partnerships and Operations group.

Recommendations

Officers recommend that the Committee:

1. Receive the Partnerships and Operations Report.

1. Group Manager Commentary

The last period has continued the trend of significant activity across the Partnerships and Operations portfolio. As well as the usual activity at this time of year (e.g. road reseals, grounds maintenance) there has also been additional work that the team have been delivering (e.g. Spatial Plan and LTP inputs, PGF projects, library book sales). This report, along with the associated project dashboard, highlights the extent of activity being undertaken and provides updates against each.

Additional projects have been added to the dashboard. These are projects that have commenced since the last report:

- Kuranui Gym – SWDC involvement and community access
- Water Reform Request for Information (RFI)
- Waihinga Centre Lessons Learned review
- Greenspace review for Greytown
- Walking and Cycling Strategy
- Innovating Streets project (Martinborough)
- Road Stopping/encroachment policy development

As well as these projects there have been some key operational issues being addressed in the period, including Greytown street lighting (actually an issue with power supply/infrastructure, now resolved with PowerCo) and the ongoing issue of flooding of Donalds Creek at Longwood Road East (approach being agreed with GWRC).

2. Water

2.1 Reducing leakage across the South Wairarapa

A team has been set up at Wellington Water to work on reducing the leakage across the region, including SWDC. The team meets weekly to monitor progress with leak surveys and repairs. It will also identify any further work that may be required.

Ground surveys have been completed in Martinborough, Featherston and Greytown. Repairs of leaks located in Featherston and Martinborough are underway. The ground survey of Greytown identified 29 leaks – 10 of which are on private networks. We will prioritise repairs of the public network in Greytown and notify property owners of their responsibilities to investigate and repair private leaks.

A night flow audit for Greytown was undertaken for the week ending 11/12/2020. This is to identify any commercial water users that are operating at night, so an accurate night flow can be determined. This information will help determine if there is any further leakage. We expect to gain insights from this work within a week following the audit, which will be reported to this committee.

Plans are been drawn up to carry out "step testing" in Greytown. The step testing will be carried out if the night flows do not drop, once ground survey leaks have been repaired.

The delivery crew are prioritising the larger leaks for repair, alongside leaks reported by the public. There is a risk that this additional leak survey work will create a lot of additional repair work for our service crews, which could impact budgets.

2.2 Key Projects Updates

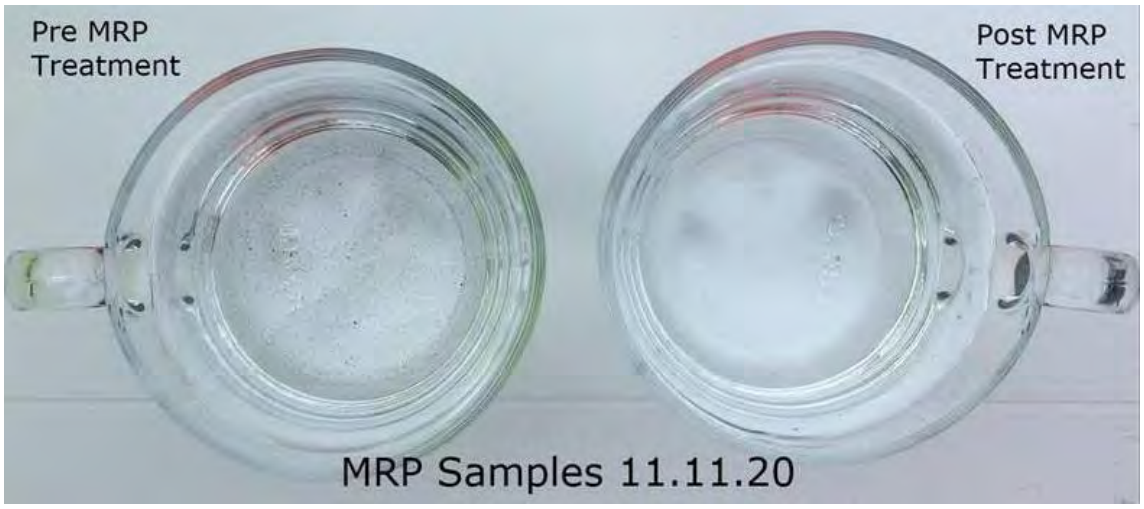
As we enter the summer demand period it becomes increasingly difficult to complete upgrades to water supply and wastewater assets.

As outlined at previous meetings, delivery of some projects has been challenging due to multiple factors, including:

- Limited accuracy or availability of full as-built information
- Project scopes being previously poorly defined
- Fragile systems with little system resilience
- Ongoing process of uncovering systemic risks requiring mitigation
- Availability of operational staff to provide input to upgrades or be trained in their use, while also responding to call volumes or issues.

2.2.1. Manganese Reduction Plant

The Manganese Reduction Plant (MRP) commissioning work is complete and tests verify it successfully reduces the manganese to the required levels.



However, in conducting the commissioning work for the MRP, a water contamination risk has been identified in the network and this needs to be mitigated before the MRP itself can be brought into use.

Plans for this additional work are with the contractor to price and complete urgently. Once this work is completed the plant can be brought into service. The timeline of this work will be shared.

2.3 Waiohine Water Treatment Plant (WTP) Upgrades

The 4th bore project was delayed whilst securing budget to cover cost of increased scope and further to procure and award contract. Contractor availability had also slowed progress.

However, installation of the 4th pump and peripheral civil works construction activities have now commenced. We are aiming to complete this work by February 2021, but this is dependent on summer demand as the plant would need to be taken offline during works.

The Waiohine treated water storage procurement phase is underway for the installation and setting up of the equipment. We expect to award the contract in January 2021. Physical works are scheduled to start after the completion of the 4th bore.

A temporary fix for the Waiohine pH dosing system upgrade will be completed first to make the system operable and mitigate risk. The design of this is currently being completed in collaboration with contractors. Options assessment will be completed prior to investing in further upgrade works on this system.

2.4 Memorial Park WTP upgrades stages 2 and 3

A cost analysis has been completed to determine the most effective delivery approach. From this, the works have been rolled into a single stage and has resulted in estimated $200k overall savings in sunk cost. Emergency plan being prepared should existing pump fail prior to replacement.

A changed delivery approach for this project means it can progress without waiting for Waiohine upgrades. The new target date for completion has moved to April 2021 (brought forward from Jun 21). Construction contract to be awarded in December 2020. Delivery of the containerised plant will be approximately 3 months from contract award to installation, with civil works and reinstatement completed thereafter.

Obtaining approvals under the reserve management plan will need to be completed in parallel with the construction of the containerised plant.

2.5 Lake Ferry WWTP driplines

Planned renewal brought forward following forestry contractor damage to lines. Project is on hold pending result of options assessment paper. Renewals options assessment paper being finalised with Wellington Waters' three waters decision making committee (3WDMC). Delivery to be adjusted based on the feedback from 3WDMC and SWDC. Current forecasted cost (lvl3) for full renewal of driplines is at $326k.

2.6 Featherston WWTP

A second community drop-in session has been completed and the information was also on display at Greytown and Martinborough libraries. Preliminary scoring and level 1 estimates prepared for the long list in preparation of an Officers' shortlisting workshop.

2.7 Martinborough WWTP valve automation

The installation of an automated valve to reduce overflow risk in Martinborough is in progress. Due to contractor workload across the district the civil and electrical works will be undertaken in the new year. Practical completion is scheduled for February 2021.

2.8 Pipeline project briefs

At Appendix 1 of this report, Wellington Water have provided project briefs for the two key pipeline projects that are underway, Pinot Grove and Papawai Road upgrades.

3. Land Transport

3.1 Roading Maintenance - Ruamahanga Roads

An outline of key works completed through November 2020 is provided below:

- 282.5 km of roads were inspected and identified faults recorded in RAMM for future scheduling with 208.4 being sealed and 73.9 being unsealed.
- 7 bridges were inspected and found to be in an acceptable condition.
- 159 rural culverts were inspected
- 112.4 km of unsealed roads were graded
- 35 m3 of maintenance metal was applied to the unsealed roads
- 13 sealed road potholes were identified and filled.
- 42.7 km of mechanical street sweeping was completed
- Pre-seal repairs for the 2021-2022 sealing season have continued

- Maintenance works continued on the footpaths within the 3 towns.
- District reseals, both Urban and Rural, have been completed for the 2020-2021 season
- Wetter than average November lead to slips, flooding and land dropouts throughout the district with a number of emergency responses.

Lake Ferry Road

Te Awaiti Bridge abutment washout

White Rock Rd slips

Glendrynoch Rd bridge approaches

- The spring cycle of chemical spraying of rural water tables and signs has commenced and will be completed prior to rural berm mowing.
- Works commenced on Ruakokoputuna Road seal extension with sealing programmed to be completed prior to Christmas.

3.2 Further activities of note

- Annual bridge inspection programme has commenced and to date no urgent faults have been identified. Types of inspection have been done as required by NZTA. This is a key programme of work and one that will continue into future years.
- Roading infrastructure input has been supplied to all subdivision resource consents.
- The Joint Carterton/South Wairarapa Roading Activity Management Plan is currently being developed and funding proposals for considerations in the LTP process are underway.
- Sealed pavement condition and surface watertable rating has been carried out by Roading Logistic Consultants. This activity is completed every 2 years
- Footpath condition rating has been carried out by Roading Logistic Consultants.

4. Amenities

4.1 Housing for Seniors

All Housing for Seniors units are fully tenanted. Recent activity includes:

- Installation of an oven in a flat at Burling Flats Featherston.
- Two units at Cecily Martin flats in Martinborough have new sliding front doors installed.

4.2 Pain Farm

Pain Farm Homestead and Cottage are due for inspections in the second week of January 2021. Quotes being sort for Extractor Fan to be installed in the Cottage bathroom.

4.3 SWDC Playgrounds

Work has continued on upgrades and maintenance of playgrounds, including:

- More planting and fence to be quoted at the Martinborough Playground as more funds from the Waihinga Trust has become available.
- Featherston playground is now fully fenced and general refresh is underway with painting and new bark
- one new child/parent swing installed in Featherston.

4.4 Parks and Reserves

Activity has been ongoing in maintaining our parks and reserves:

- Grass growth due to the seasonal rain and ground temperature has required increased maintenance with our contractor.
- Solar lights have arrived for installation into Stella Bull Park before Xmas
- Replacing Huangarua Park seat and rubbish bin as both old assets were very tired.
- Reopening of the New York Toilets in Martinborough and upgraded the sewage pipe work. These facilities are only to be used by the sports clubs.
- Lych gate currently being built and hopefully installed prior to Xmas for the 150 years of the Waihinga Cemetery, Martinborough

4.5 Cemeteries

Featherston Lioness WW1 Project - Completed in time for Armistice Day 11 November 2020 at Featherston Cemetery.

Purchases of burial plots/niches 28/10/20 to 3/12/2020

	Greytown	Featherston	Martinborough
Niche		2	1
In-ground ashes Beam	1		
Burial plot			1
Services area			
Total	**1**	**2**	**2**

Ashes interments/burials 28/10/20 to 3/12/2020

	Greytown	Featherston	Martinborough
Burial		1	1
Ashes in-ground	2		1
Ashes wall			
Services Area			
Disinterment			
Total	**2**	**1**	**2**

4.6 Swimming Pools

SWIMMING POOLS ARE OPEN!

Featherston, Greytown and Martinborough pools all opened for the swim season on the 28th November 2020 and will close March 14th 2021. Entry is still free and the bookings for events and BBQs are filling fast. Monitoring of usage to inform future strategy is ongoing.

4.7 Further work

Significant additional effort has been expended in managing the delivery of the following Provincial Growth Fund (PGF) projects:

- Upgrade to facilities at Anzac Hall, Featherston
- Refurbishment of the Featherston War Memorial
- Supporting upgrades to the Featherston Community Centre
- Supporting the Hau Ariki marae project, and
- Supporting the Tauherenikau bridge trail project.

These projects are included in the Amenities programme dashboard and are in addition to the team's workload.

5. Appendices

Appendix 1 – Wellington Water Pipeline Project brief – Papawai Rd upgrade

Appendix 2 - Wellington Water Pipeline Project brief – Pinot Grove upgrade

Appendix 3 – Programme Reports

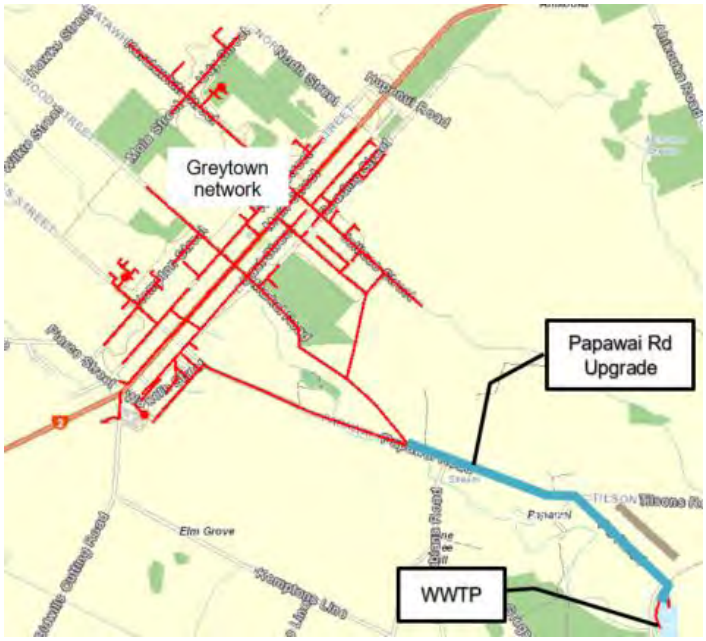
Contact Officer: Euan Stitt, GM Partnerships and Operations

Appendix 1 - Wellington Water Pipeline Project brief – Papawai Rd upgrade

Papawai Road Wastewater Renewal Fact Sheet

What are we doing?

Replacing 2.2km of 225mm concrete wastewater main with a new 350mm polyethylene (PE) main on Papawai Road, Greytown.



Why are we renewing this pipeline?

The existing wastewater main down Papawai Road is the most critical wastewater pipeline in Greytown. It conveys all of the town's flow to the treatment plant (WWTP). It was laid in 1974 and probably has a few years of life left in it, but with the growth of the township since the 70s it has now reached capacity.

The primary goal of the project is to enable growth by providing increased capacity. The new pipeline will also be more resilient than the current one. It will be fully sealed and so more resistant to earthquakes and reduced leakage out of and into the pipe. We are also taking the opportunity to reconfigure the outlet pipe at the treatment plant to enable future upgrades to the plant.

What is the effect of the increased capacity on the network?

Initially there is minimal effect. The treatment plant at present is estimated to have capacity for a further 10-20% increase in population. The wastewater main pipe is being future-proofed to allow for the treatment plant upgrades planned over the next 10 years.

How has the project developed?

Prior to Wellington Water's involvement, in December 2018 the SWDC received a quotation from Higgins to complete the project for $1,792,000. The quotation included some contingency but excluded design and project management fees and was not based on an engineer's design. This

means the project had minimal scope development and so there was a very high risk that it would have cost more than the tendered price to complete. This tender lapsed and Wellington Water re-tendered in April 2020.

The April 2020 tender price received was $2,674,000. Since the project had not been fully scoped, designed and a robust engineer's estimate developed, we could not adequately appraise the value provided by this tender. So we put the project though Wellington Water's normal project delivery processes. This involves preliminary and final design and ensures due diligence for things such as option selection, cost estimation, quality, health and safety and contract management.

This has reduced the level of risk particularly from an outcome and cost perspective so we now have confidence that project will deliver the best whole-of-life value to council.

The works have now been re-tendered with submissions due in the next few weeks.

Below is a comparison table providing an overview of the costs.

Table 1:

Deliverable /scope	**Original Budget (Nov 2019)**	**Tender (April 2020)**	**Engineer Estimate / Level 4 (Aug 2020)**
Professional costs	$139,132	$265,600	$255,500
Construction	$1,679,255 (tender Dec 2018)	$2,673,655	$2,035,500
Contingency	$113,120 (tender Dec 2018)	$21,825	$386,500
Total	**$1,931,500**	**$2,960,980**	**$2,677,500**

What can we learn from this?

It's important that projects are properly scoped and adequately developed, with costs accurately estimated before budgets are set. It's also important that people know what stage a project is at, when estimates are being used. Wellington Water uses a cost estimating manual to account for the amount a project has been developed at each stage of its evolution and minimise cost risk.

Appendix 2 - Wellington Water Pipeline Project brief – Pinot Grove upgrade

Pinot Grove Wastewater Renewal Fact Sheet

What are we doing?

Replacing 0.7km of 150mm asbestos cement wastewater main with a 250mm polyethylene (PE) main in Weld Street, Martinborough.

Why are we renewing this pipeline?

The existing wastewater main in Weld Street carries wastewater from approximately the southern third of Martinborough. It is under-sized for the load, resulting in frequent blockages and occasional overflows from manholes during wet weather conditions.

The primary goal of the project is to allow for growth while also improving wastewater service to this part of town. The new pipeline will have greater capacity and be more resilient to earth movement than the current one. It will be fully sealed and so more resistant to leaks out of and into the pipe.

What is effect will this have on the rest of the network?

The new 250mm pipe will feed into the existing 300mm main pipe that goes to the Martinborough wastewater treatment plant. The 300mm pipe was upgraded in 2005.

The Martinborough wastewater treatment plant is nearing capacity. Planned upgrades for the plant will need to factor in growth.

How has the project developed?

Prior to Wellington Water's involvement, SWDC set a budget for the pipe renewal of $295,000. It's not clear what was included in this budget, and as the project was not clearly scoped, it carried a high level of risk.

In March 2020 Wellington Water estimated the project would cost between $726,000 and $980,000. It issued the project for tender and received no conforming tenders.

To reduce the level of risk and provide confidence that project would deliver the best whole-of-life value, we put the project though Wellington Water's normal project delivery processes. This involves preliminary and final design and ensures due diligence for things such as option selection, cost estimation, quality, health and safety and contract management.

This provided a robust estimate (known as an engineer's estimate), of $795,000. This was subsequently corroborated by a conforming tender.

After the tender was received, the project cost estimate was revised to allow for the additional scope of safely removing and disposing of asbestos cement.

The tender has been awarded to Fulton Hogan, who are using a local contractor to perform a portion of the work.

Below is a comparison table providing an overview of the project elements and estimates.

Table 1:

Deliverable /scope	**Original (2017)**	**Engineer's Estimate**	**Current/Post Tender (2020)**
Professional costs	No Budget allowed/Included	$127,500	$106,000
Construction	$295,000	$545,500	$582,500
Contingency	Included	$122,500	$126,000
Total	**$295,000**	**$795,000**	**$814,500**

What can we learn from this?

It's important that projects are properly scoped and adequately developed, with costs accurately estimated before budgets are set. It's also important that when estimates are being used, people know what stage a project is at. Wellington Water uses a cost estimating manual to account for the amount a project has been developed at each stage of its evolution and to minimise cost risk.

Appendix 3 – Programme Reports

SWDC Assets and Services Committee		**Programme**	Amenities
Meeting	16-Dec-20	**Period**	Dec-20

	Finance	Delivery	H&S	Stakeholders	Risk profile	Commentary
Overall Programme Status (RAG)						Overall programme progressing to schedule, other than those projects that did not receive PGF funding. These may receive funding in LTP.
Current Projects						
Featherston War Memorial	**$250k**	**tbc**				
Repair earthquake damage and structural deficiencies						Ongoing. Working closely with contractor to resolve emerging challenges in the project. Street lighting to Sphere has to be removed due to engineer on earthquakes. Options for lighting need to be decided.
Anzac Hall upgrades	**$100k**	**Nov-20**				
Toilets, roof and wall repairs						99% completed awaiting on Ladies toilet door that needed replacing. Successful delivery attracting positive community response.
Featherston Community Centre	**$110k**	**tbc**				
Roof and wall repairs, asbestos removal, painting, car park and kitchen/toilet repairs						Work commenced on entrance and building work inside
Hau Ariki marae - PGF support	**$371k**	**tbc**				
Various upgrades - sprinkler systems, water storage, kitchen/toilet upgrades.						Finalising discussions with PGF and marae on timing and processes. Paper going to 17/12 Council meeting on possible financial risk due to terms of MBIE contract.
Tauherenikau Bridge	**$1.36m**	**tbc**				
Construct cycle/walkway over Tauherenikau river						Finalising discussions with PGF and Greytown Trails Trust on timing and processes. Paper going to 17/12 Council meeting on possible financial risk due to terms of MBIE contract.
Kuranui College Gym	**$1m**	**tbc**				
Manage delivery of gym in college and provide for community access.						NEW PROJECT - Min of Ed lead. Preliminary plans completed and QS review underway. Agreement between Kuranui College, SWDC and MoE to be drafted in new year to formalise structure, access, roles/responsibilities etc.
SWDC Tree asset management	**tbc**					
Develop a long term District wide programme for tree management						Awaiting business case to be presented for LTP. May break into zones and capture the most public used Parks and Reserves as a trial this year to determine the state of our trees to attach to the Parks management plan. Relates to H & S and age of trees.
Stella Bull Park Lighting	**$12k**	**Nov-20**				
Install lighting for safety/security of users						Lights have arrived 2/12/2020 and will be installed prior to Christmas.
Peace Garden, Featherston	**$120k**	**tbc**				
Construct accessible ramp and web-enabled information display with additional seating and planting						Heritage NZ have received partial private funding to progress, meeting w/c 14th Dec on site to consider delivery v revised budget (half of that required for current design).
Featherston Stadium	**$20k**	**tbc**				

Upgrade to kitchen, seating and ablutions						PGF declined, will carry out repairs as funding becomes available
Ngawi Community Hall	**$30k**	**Dec-20**				
Upgrade septic system						Designer engaged, Resource consent applied to GW, Resource consent stopped awaiting on further investigation of land
Cemetries data project	**n/a**	**Dec-20**				
Data validation, GPS capture and database established						Data validation ongoing, GPS and photo capture commenced. Support from CDC also being provided. Project will be placedon hold at Christmas
Pain Farm upgrades	**$100k**	**Sep-20**				
Upgrades to Main House and cottage to meet standards			↑			Standard maintenace with some trees and driveway to cottage
SWDC Lease review programme	**n/a**	**Dec-20**				
Complete review of leases						Data capture and strategy under development. Focus on Papawai and Lake Ferry leases in short-term. Multiple leases to work through
Senior Housing	**$85k**	**Oct-20**				
Heat pump/air conditioning installation and paiting (int and ext)						Work completed - under budget
Swimming Pools	**$15k**	**Oct-20**				
Upgrade to Greytown Stand and painting						Work completed - on time for new season
Martinborough Waihinga Cemetery	**$15k**	**Oct-20**				
Install Lych gate as part of anniversary celebrations						Gate built and will be installed pre Christmasmas
Considine Park, Martinborough	**$8k**	**Nov-20**				
Install additional lime path						Likely Lions involvement - to be discussed at next meeting.
Park exercise equipment	**$45k**	**Oct-20**				
Install outdoor exercise equipment in local parks						Works completed - proving popular in communities

Status key: *On track/achieving* *Some concern* *Off Track/Major concern*

SWDC Assets and Services Committee	**Programme** Other
Meeting 16-Dec-20	**Period** Dec-20

	Finance	Delivery	H&S	Stakeholders	Risk profile	Commentary
Overall Programme Status (RAG)		↓				Additional projects added to A&S dashboard for visibility. May be moved to other sheets once progressed from strategy phase. Some resource constraints limiting progress.
Current Projects						
Kuranui Gym	**$1m**	**tbc**				
Manage SWDC involvement in College Gym build, management and community access.						NEW PROJECT - Min of Ed lead. Preliminary plans completed and QS review underway. Agreement between Kuranui College, SWDC and MoE to be drafted in new year to formalise structure, access, roles responsibilities etc.
Water Reform RFI	**n/a**	**1st Feb 21**				
Respond to DIA Request for Informatio to inform Water Reform Process	↓					RFI work continues with Wellington Water compiling data for some sections, in consultation with DIA and WICS. SWDC Finance compiling rest. Significant resource challenge at time of developing LTP (Finance highlighted as 'some concern'). Part of regional approach and support with WWL shareholding Councils and CDC/MDC.
Waihinga Lessons Learned	**$15k**	**tbc**				
Business Improvement - Undertake a review of the Waihinga Centre project to improve future SWDC project delivery		↓		↓		Independent contractor identified to conduct review. Currently gathering relevant documents to inform review. Timeline to be confirmed with reviewer.
Greenspace review	**$40k**	**Jul-21**				
Undertake a review of the availability and use of Council greenspace provision in Greytown						Resolution from AP deliberations. Further data collection underway, including use, size and accessibility.
Walking and Cycling Strategy	**tbc**	**tbc**				
Develop a District-wide Walking and Cycling strategy		↓				Linked to 5TTN project and other stakeholders. SWDC plans to be developed at town level. Project commenced with initial scoping underway.
Innovating Streets - Martinborough	**$200k**	**Apr-21**				
Develop and test repurposing of car parks near square				↓		Boffa Miskell engaged as PM and lead. Initial scoping complete. Engagement with key stakeholders (incl. Cr Colenso) to commence pre-Christmas. Initial site montoring (baseline establishment) to begin. Some community concern at possible pedestrianisation of Kitchener St, which is NOT in scope of this project but perception will need resolution.
Road Stopping Policy	**$15k**	**Jan-21**				
Develop a Road Stopping Policy						Contractor engaged now funding approved. Work in progress, with draft policy being reviewed now.

Status key: *On track/achieving* | *Some concern* | *Off Track/Major concern*

SWDC Assets and Services Committee		**Programme**	Roading
Meeting	16-Dec-20	**Period**	Dec-20

	Finance	Delivery	H&S	Stakeholders	Risk profile	Commentary
Overall Programme Status (RAG)						Resource constraints and additional workload are being managed with CDC - action underway to mitigate with temp resource. Works season progressing well with reseal programme complete and other key works on track.
Current Projects						
Ruakokoputuna	**$400k**	**Oct 20 - Dec 20**				
Ruakokoputuna Seal Extension						Work has started and on schedule to be sealed before Christmas subject to
Sealed Road Pavement Rehab	**$220K**	**Dec 20- Feb 21**				
Western Lake Rd Area Wide						H&S risk relates to nature of road and speed. Expected to commence before Christmas.
Sealed Road Resurfacing Local Roads	**$467.5k**	**Oct 20 - Dec 20**				
Scheduled programme of works comprising 14.5kms of resurfacing on: Shooting Butts Road, Hikinui Road, Bucks Road, Underhill Road, Boundary Road, Pa Road, Birdie Way, Eagle Place, Fairway Drive, Te Muna Road, Papawai Road, Fraters Road, Tilsons Road, Hecklers Road, Moroa Road, Kahutara Road, White Rock Road, Lake Ferry Road, East Street.						Programme complete
Sealed Road Resurfacing Special Purpose Rd	**$115K**	**Jan 21 - Jun 21**				
3.5 kms of resurfacing work on Cape Palliser Road						Programme complete
FootPath Renewals	**$177K**	**Oct 20 - Jun 21**				
Planned maintenance						Work ongoing, Bethume Street, west Street, Regent Street(maybe deferred due to UFB rollout)
FootPath maintenance Extra Funding	**$375K**	**Jun 20 - Jun 21**				
Footpath Maintenance $125K per town						High level of input required by staff. Work ongoing.
Esther Street Footpath Extension	**$70K**	**Sep-20**				
Noted from AP submissions						**Works completed.**
Low Cost Low Rik Local Roads	**$345K**	**Aug 20 - jun 21**				
Culvert Extensions, safety improvements, seal widening, intersection improvements, slip stabilisation, guardrails, kerb and channel works.						Seal widening on Western Lake Road complete
Low Cost low Rick Special Purpose Rd	**$250K**	**Aug 20 - jun 21**				
Guardrail installation, Signage upgrade, Rock revetment supply						Includes $100k carry forward from 19/20
Aseet Management Plan	**$50k**	**June 20 - Nov 20**				
Plan development and RLTP funding						Joint AMP with CDC and NZTA funding request 2021.2024. Draft plan submitted for A&S input to 16/12 meeting. To be submitted 11/12/20 but input still possible.
Reading Street Upgrade	**$250k**					
Upgrade Reading Street as part of Orchards Development						3rd party dependent
Speed Limit Review		**Nov 20 - Jun 21**				
Consult re speed review						Link to NZTA speed reduction and Road to Zero, Urban safety for vulnerable users etc. NZTA planned consultation dates through Nov and in discussions with NZTA on alignment.
Tora Farm Rd bridge beam painting x2	**$100K**	**Jan 21 - Jun 21**				

Painting steel beams on Tora Farm and Pukeamuri Bridges		↓				Enviornmental and Health and Safety risk due to working above waterways and working at height. Delayed due to Resouce consent conditions re the habitat of various species.

Status key: *On track/achieving* *Some concern* *Off Track/Major concern*

SWDC Assets and Services Committee	**Programme** Water
Meeting 16/12/2020	**Period** Dec-20

	Finance	Delivery	H&S	Stakeholders	Risk profile	Commentary
Overall Programme Status (RAG)						Known budget challenges exist and are being managed as per previous reports. Rework to programme and changes to approaches on some projects are bringing forward delivery in some areas. Summer demand may impact delivery on water projects (ability to have plant offline while undertaken).
Major Projects						
Manganese Reduction Plant - Martinborough	**$2.5m**	**Nov 19 - Nov 20**				
Construct and commission a manganese reduction plant		↑				The MRP has been fully tested and is ready to begin operating. However, a water contamination risk has been identified in the reticulation network that must be mitigated before it is brought fully into operation. The plans for this have been completed and contractors are scheduling the works.
Featherston WWTP	**$500k***	**Jul 20 - Jun 2025**				
Develop and implement a suitable wastewater solution for Featherston						Second community drop in session completed and the information was also on display at Greytown and Martinborough libraries. Preliminary scoring and level 1 estimates prepared for the long list of ideas in preparation for an Officers workshop. Further update to be provided in meeting. Fstn WWTP now a standing item on A&S agenda.
Upgrade/Renewal Projects						
Papawai Road WW Upgrade	**$2.8m**	**May 2021 onwards**				
Capacity issue - upgrade pipe						Tender evaluation is currently being completed. Tender price is close to the Engineers Estimate which correlates to the projects expected estimate of $2.8m. Programme phasing adjusted to allow for delivery of Memorial Park this FY ahead of Papawai Road. Larger portion of Papawai Road construction will be rolled over into 21/21FY in order to remain within annual (programme) budget. Project brief attached to Officers' Report.
Pinot Grove WW upgrade	**$300k**	**Mar 21 - Jul21**				
Capacity issue - upgrade pipe		↑				Construction activities have commenced, practical completion programmed for March 2021. Project brief attached to Officers' Report
Waiohine Water Treatment Plant (WTP)	**$900k**	**Dec-20**				
a) 4th bore/pump and commissioning		↓				The 4th Bore project was delayed whilst securing budget to cover cost of required scope and to procure and award contract. Contractor resource availability has slowed progress. Installation of 4th pump and peripheral civil works construction activities have commenced, practical completion scheduled for late January 2021. Has had consequential impact on related works.
b) Treated water storage (chlorine)		↓				Treated water storage procurement phase underway, award expected early January 2021, physical work scheduled to start after 4th bore completed, with practical completion six weeks thereafter (early March).
c) pH dosing system upgrade		↓				A temporary fix for the Waiohine pH dosing system upgrade will be completed first to make the system operable and mitigate risk. The design of this is currently being completed in collaboration with contractors. Options assessment is to be completed prior to investing in further upgrade works on this system.
d) Site Security						Security Fencing policy (standard) to be completed prior to brief being released for pricing
Memorial Park WTP upgrades stage 2	**$330k**	**Nov-20**				
Replace bore pump, new filter, additional pipework and run to waste		↓				A cost analysis has been completed to determine the most effective delivery approach. From this, the works have been rolled into a single stage and has resulted in estimated $200k overall savings in sunk cost. Emergency plan being prepared should existing pump fail prior to replacement.

Memorial Park WTP upgrades stage 3	**$1.5m**	**Apr-21**				
Chemical dosing, UV and filter upgrades		↑				A changed delivery approach for this project means it can progress without waiting for Waiohine upgrades. The new target date for completion has moved up to April 2021 (brought forward from Jun 21). Construction contract to be awarded in December 2020. Delivery of the containerised plant will be approximately 3 months from contract award to installation, with civil works and reinstatement completed thereafter. Obtaining approvals under the reserve management plan will need to be completed in parallel with the construction of the containerised plant.
Lake Ferry WWTP driplines	**$326k**	**tbc**				
Renewal driplines at WWTP	↓	↓				Planned renewal brought forward following forestry-related damage to lines. Project on hold pending result of options assessment. Renewals options assessment paper being finalised with Wellington Waters three waters decision making committee (3WDMC). Current forecasted cost (level 3) for full renewal of driplines at $326k.
WWTP Improvement Programme	**$400k**	**Dec-20**				
Enhance processes, facilities and management of WWTPs across District	↓					The installation of an automated valve to reduce overflow risk in Martinborough is in progress. Due to contractor workload across the district the civil and electrical works will be undertaken in the new year. A water balance and irrigator fault analysis has been undertaken for Martinborough. Irrigation management and contingency plans are being put in place to improve compliance during the irrigation season. Concept designs for operational health and safety improvements are due to start in December as are investigations for site security improvements.
SWDC-led Projects						
Water Race User Survey	**n/a**	**Dec-20**				
Survey Water Race users and related stakeholders on use		↓				Additional external resource engaged, qualitative survey (interviews) to be completed through Dec 20 with formal quantitative from Jan 21.
Longwood Water Race Consent	**n/a**	**Dec-20**				
Gain consent for continued use of water race						Reporting to GW completed, awaiting outcome. Water Race continues to operate under existing consent.

Status key: *On track/achieving* *Some concern* *Off Track/Major concern*

CAPE PALLISER ROAD COASTAL EROSION REPORT

Purpose of Report

To inform Councillors of the outcomes of the Cape Palliser Coastal Erosion Report.

Recommendations

Officers recommend that the Committee:

1. *Receive the Cape Palliser Road Coastal Erosion Report.*
2. *Note the funding application being submitted to Waka Kotahi for further work to be completed.*

1. Executive Summary

WSP Consultants were engaged to carry out a Geotechnical Survey and report on the resilience of a section of the Cape Palliser Road. The report utilised drone footage to identify key issues with the stretch of road and has identified two key areas for further investigation.

2. Background

Cape Palliser Road has been subject to ongoing erosion and risk from landslides for some time. WSP Consultants were engaged to carry out a Geotechnical Survey on the section from the DoC Station to the end of the Whatarangi Cliffs, approximately 3.3 kilometres.

3. Discussion

3.1 Report Findings

The report (at Appendix 1) has identified two landslide areas (Johnsons Hill (s2.3) and Te Kopi North (s3.2) as the two highest risk sites for the road due to slope stability:

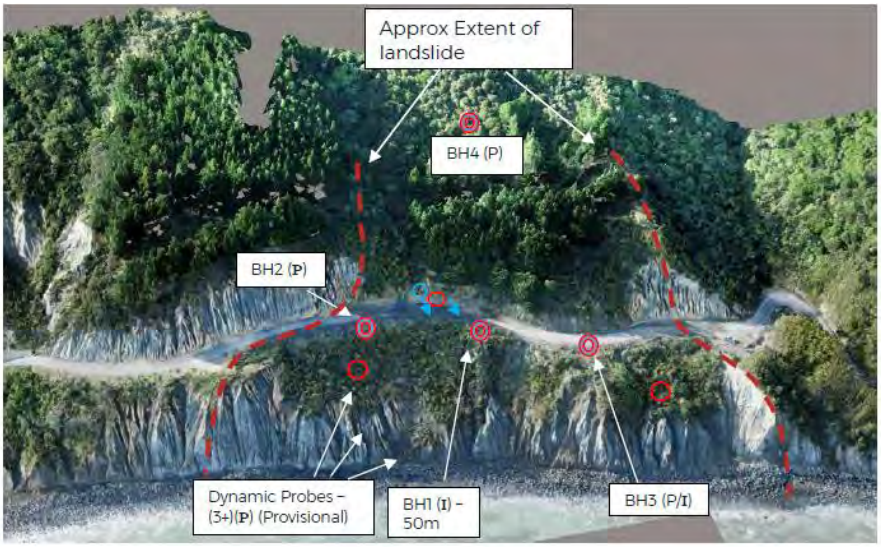


Figure 2: Active section of Johnson's Hill landslide, showing provisional location of boreholes and whether inclinometers (I) or standpipe piezometers (P) installed.

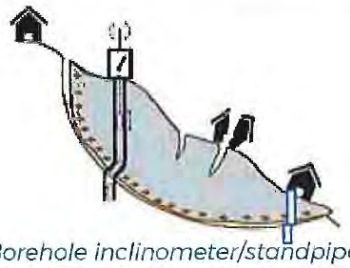
Figure 3: Active section of Te Kopi North landslide, with provisional location of boreholes (15-30m deep each), with inclinometers (I) proposed in one and standpipe piezometers (P) in three boreholes and probe holes.

In order to fully understand and monitor the land movement in these areas it is now intended to:

- Carry out engineering geological mapping
- Installation and monitoring of a rainfall gauge
- Survey monitoring of the landslides
- Drill Investigation boreholes

- Borehole Instrumentation and monitoring
- Borehole water level monitoring, as shown below:

a) Monitoring of pipe deformation over time



Borehole inclinometer/standpipe tubes bent at base of landslide

3.2 Next Steps

A funding application to Waka Kotahi (NZTA) is being developed to secure resilience funding to complete this work. If this funding is secured local residents will be engaged prior to works being undertaken.

In addition to this work, the trial of the ecoreef solution will be rolled out in the coming year to attempt to mitigate the effects of coastal erosion in the area.

4. Appendices

Appendix 1 – Cape Palliser Road Resilience Report

Contact Officer: Tim Langley, Roading Manager
Reviewed By: Euan Stitt, GM Partnerships and Operations

Appendix 1 – Cape Palliser Road Resilience Report

Project Number: 5-C4072.00

Cape Palliser Road Resilience

28 October 2020

CONFIDENTIAL

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Executive Summary

The landscape around Cape Palliser Road has a history of coastal retreat and slope instability. Ongoing coastal erosion has resulted in significant direct damage to the road during major storm events and sea swells. The road is also impacted by unstable slopes, including a large-scale landslide at Johnson's Hill, which has caused road damage on multiple occasions and continues to pose a risk to vehicle access. This landslide has shown renewed movement since the Kaikōura earthquake in November 2016.

The ongoing coastal erosion and slope movement has highlighted the need for a management strategy to mitigate risks to the road and increase its resilience. This is especially important since Cape Palliser Road is a key access route to several settlements along this stretch of coastline. There are also several popular tourist destinations accessed via the road, such as the Pūtangirua Pinnacles and Cape Palliser Lighthouse.

South Wairarapa District Council (SWDC) has engaged WSP to undertake a preliminary geotechnical assessment of a 3.3 km-long vulnerable coastal section of Cape Palliser Road, between Hurupi Stream and Whatarangi settlement. This includes a review of hazards to the road, an analysis of data gathered from site visits and drone survey to determine rates of coastal erosion, and a preliminary risk assessment, with potential mitigation options.

A long-term strategy for resilience of the road is outside the scope of this study. SWDC requires this assessment to inform decisions around the responsible management of this vulnerable road in the short term, and to ensure continued access for residents and those seeking to travel to the Cape Palliser area. Considering the limited Council funding available, this assessment may also be used to support funding applications to Waka Kotahi NZ Transport Agency for risk mitigation works and resilience enhancements. The current scope focuses on identifying the main risk areas in order to identify locations for short-term interventions.

The investigations completed under this study involved:

(i) A UAV-based topographic survey of the study area in May 2020 and preparation of a 3D model of the site from the UAV survey data. This model provides a useful foundational dataset for decision-making.

(ii) An information search and review of previous historic photography and reports, plus topographic, geological and hazard information available for the site.

(iii) A site visit on 10 June 2020 with Tim Langley from SWDC.

(iv) Digitising of the position of the sea-cliff crest over time from aerial photographs and providing this information on drawings to allow coastal erosion rates to be determined.

(v) Analysis of coastal effects and future trends, erosion 'hot spots' and performance of past interventions.

(vi) Review of past information on the Johnson's Hill Landslide.

(vii) Assessment of the risk posed by the different sections of the road corridor including slopes above and below the road and the coastal effects.

(viii) Determination of the indicative risk to the various sections of road in the short, medium and long term.

(ix) Provision of risk mitigation options.

The 3.3km long study area has been divided into 4 main sections: 1) DOC Station, 2) Johnson's Hill, 3) Te Kopi and 4) Whatarangi Bluff. These have been further subdivided based on site characteristics to allow risks to be assigned that are representative of each section of the road.

The main hazards impacting the road and the related risks are as follows:

- Instability above the road (overslip, rockfall) affects cuttings in Section 2 (Johnson's Hill), and Section 4 (Whatarangi Bluff). However, this is generally acceptable as failures are typically relatively small to date and quick to clear, or debris is easy to dodge due to low traffic volumes.
- Wave overtopping, localised erosion and storm debris affect Section 1 (DOC Station), and Section 3 (Te Kopi). Risk from debris thrown onto the road is presently generally acceptable to SWDC as debris volumes are relatively small and can be removed quickly. The risk level is expected to remain acceptable over the coming ~5 – 10 years, but a potential increase in debris volumes may become less acceptable in the medium to long term if sea level rises and storm event frequency increases.
- Destabilisation and slippage of slopes below the road eating into the carriageway, caused by coastal erosion at the base of the sea cliff and/or groundwater seepages daylighting on the sea cliff face. The affected Sections are Section 1 (DOC Station), Section 3 (Te Kopi), and Section 4 (Whatarangi Bluff). Consequences of underslip erosion are loss of road width, which can pose a risk for people and vehicle safety, especially when the slip is large or unsighted.
- The most obvious examples of underslips are the large Johnson's Hill landslide and the large landslide about 100m south, at the north end of Te Kopi, both of which affect the full carriageway width for in excess of 100m.

Coastal erosion rates in the past 24 years on this section of Cape Palliser Road are similar to the decades prior to 1996 (approximately 0.2 – 1 m/yr on average), but it is possible that the rate will increase as the rate of sea level rise increases. This study excluded probabilistic modelling of erosion scenarios, but such a study could help predict the potential recession rates under varying projections for sea level rise.

In the short term (next approximately 5 to 10 years), the effect on the road is expected to be manageable. However, in the medium to long term the effect of climate change and sea level rise is expected to make the management of Cape Palliser Road increasingly challenging.

The risks to the various sections of the road have been presented using a traffic light (green, orange red) format on A3 tables to allow the risks to be differentiated visually.

A summary of recommendations for short-term management includes:

- Optimising road and slope drainage throughout the study area.
- Repairing and improving boulder beaches to provide more alongshore consistency and continuity, in order to reduce future damage and maintenance requirements.
- Geotechnical investigations, monitoring and assessment of the active landslides at Johnson's Hill and Te Kopi North.
- Regular drone surveys to identify any developing coastal erosion hotspots or slope instability that may need proactive mitigation.

To address future risks from climate change, and the anticipated increases in sea level and storm frequency, the development of a long-term management strategy for the road is recommended. This strategy should ideally follow, or be consistent with, the Ministry for the Environments dynamic adaptive pathway (DAP) approach (MfE, 2017). The DAP approach allows for developing "*a series of actions over time to achieve objectives under uncertain and changing conditions*" – such as the performance of the road under increasing challenges from climate change.

1 Introduction

1.1 Background

The landscape around Cape Palliser Road has a history of coastal retreat and slope instability. Ongoing coastal erosion has resulted in significant direct damage to the road during major storm events and sea swells. The road is also impacted by unstable slopes, including a large-scale landslide at Johnson's Hill, which has caused road damage on multiple occasions and continues to pose a risk to vehicle access. This landslide has shown renewed movement since the Kaikōura earthquake in November 2016.

The ongoing coastal erosion and slope movement has highlighted the need for a management strategy to mitigate risks to the road and increase its resilience. This is especially important since Cape Palliser Road is a key access route to several settlements along this stretch of coastline. There are also several popular tourist destinations accessed via the road, such as the Pūtangirua Pinnacles and Cape Palliser Lighthouse.

1.2 Scope

South Wairarapa District Council (SWDC) has engaged WSP to undertake a preliminary geotechnical assessment of a 3.3 km-long vulnerable coastal section of Cape Palliser Road, between Hurupi Stream and Whatarangi settlement. This includes a review of hazards to the road, an analysis of data gathered from site visits and drone survey to determine rates of coastal erosion, and a preliminary risk assessment, with potential mitigation options.

SWDC requires this assessment to inform decisions around the responsible management of this vulnerable road, and to ensure continued access for residents and those seeking to travel to the Cape Palliser area, in the short term. Considering the limited Council funding available, this assessment may also be used to support funding applications to Waka Kotahi NZ Transport Agency for risk mitigation works and resilience enhancements. The current scope focuses on identifying the main risk areas in order to identify locations for short-term interventions. A long-term strategy for resilience of the road is outside the scope of this study.

1.3 Risk Assessment and Mitigation

The risk assessment process in this report considers the *likelihood* of particular events, as well as the *consequences* of those events in terms of potential road damage and reduced access for road users. The risks to people and infrastructure are considered and reported separately.

When determining the likelihood of an event, the past occurrence of such an event is considered, along with previous observations of the terrain and geology and the current condition of the site. Potential consequences are likewise determined based on the impacts of similar events in the past.

As this report relates to the roadway, the consequences relate primarily to the extent of road affected in terms of carriageway width and the related reduction in level of service and/or safety and how quickly a certain level of service can be reinstated.

This method of determination is subjective yet informed by expert judgement and allows for a comparative assessment of relative risk at key locations within the study area.

In order to assess the risk and propose mitigation options, a robust understanding of the site, ground conditions, and past slope performance is required. These current and past observations are discussed in the following sections.

2 Investigations Completed

2.1 Drone Survey

A UAV-based topographic survey of the study area was undertaken in May 2020. This involved capturing imagery from about 60m above ground level across the whole site, including Cape Palliser Road and the cliffs and slopes to either side the road. A DJI Phantom 4 RTK drone was used to obtain photographs with accurate survey positioning data. A 3D model of the site was then developed, using the UAV imagery and survey coordinates, and processed in photogrammetric software Pix 4D. From the 3D model the following outputs were produced:

- a 'point cloud', for generating cross sections (profiles), used to assess cliff dimensions (heights and slope angles) and erosion rates, and to show indicative remedial options;
- an accurate ('orthomosaic') photo as a current base map;
- a 'reality mesh' for visualisation of the site using Bentley Context Capture software.

2.2 Site Inspections

A site visit was made by WSP engineers David Stewart and Giles Farquhar on 10 June 2020, with Tim Langley from SWDC in attendance.

During this site visit, visual inspections were made of the condition of the road, slopes and existing risk mitigation installations. Geological observations are discussed in Appendix D – Site Geology. Tim Langley of SWDC provided additional insight into the current and historic condition of the site, SWDC maintenance strategies, and previous works undertaken.

Further drone imagery was obtained, with predominantly video footage taken along the shoreline in the northern section of the study area (around DOC Station), plus selected areas of Johnson's Hill and Whatarangi Bluff. Additional aerial photographs were captured of the upper slope above the Johnson's Hill landslide, to supplement those obtained during the initial UAV survey in May 2020.

2.3 Desktop Appraisal

A desktop appraisal was undertaken to review a variety of existing geotechnical data at the project area to better understand the ground conditions and natural processes occurring.

Information relating to known hazards, risks and interventions along the route was gathered from various geotechnical studies, assessment reports, correspondence records, and historic and recent photographs taken at the study area. Useful sources included the New Zealand Geotechnical Database, WSP Spatial database, Masterton District Library and Archive, media articles, and information provided by SWDC.

The site geology was investigated using geological maps of Wellington from GNS, along with information reported in previous studies within or near to the study area. This information is presented in Appendix D – Site Geology.

Useful records were provided by SWDC, including the insights of Tim Langley (SWDC Roading Manager) who shared a large amount of knowledge acquired during his experiences of managing Cape Palliser Road. Conversations with former Greater Wellington Regional Council (GWRC) land management specialist Stan Braaksma were also informative, as he outlined his knowledge of the Johnson's Hill landslide, gained during time spent assisting SWDC.

WSP Technical Director – Geotechnical, Alexei Murashev, has been involved in Cape Palliser Road investigations since the mid-1990s. He has provided important information from his recollections and personal records. Records from Nick Perrin of GNS provided considerable insight into the Johnsons Hill landslide which is summarised in Appendix C.

3 Site Description

3.1 Overview

Cape Palliser Road is a low traffic volume, rural coastal road located at the eastern edge of Palliser Bay, South Wairarapa. Our study area encompasses a 3.3 km section of the road between Hurupi Stream and Whatarangi Bluff, as well as the slopes above and below the road. The settlement of Te Kopi and several other dwellings are located within the study area, as is the access road to the Pūtangirua Pinnacles.

This section of the coastline is exposed to a variety of hazards. Coastal erosion threatens the slopes below the road, and we are aware that SWDC frequently carries out works to repair areas that are damaged during storm events.

There have also been instances of slope failure above the road, particularly in the steep cliffs at Whatarangi Bluff, along with larger scale slope movement in the Johnson's Hill landslide area. Various mitigation measures have been implemented in the past to protect the road from damage – these measures are outlined in more detail in Table 2.

Figure 1: Site overview, showing the individual sections and the main geographical features referred to in this study (Google Earth, 2020)

3.1.1 Study Area Sections

We have divided the study area into four sections (Figure 1). Each of these is characterised by a different set of issues impacting the road.

Section 1 – DOC Station: This section is located at the northern end of the study area, between the Hurupi and Pūtangirua Streams. The road here is vulnerable to wave overtopping and coastal erosion, due to its low elevation and location adjacent to the beach. Department of Conservation buildings are present in this section, on the inland side of the road.

Section 2 – Johnson's Hill: This section is located south of Pūtangirua Stream. At this location, Cape Palliser Road climbs higher above sea level and is cut into the hillside at Johnson's Hill. The road here is vulnerable to slope movement of various types, including a significant active slump which has been identified at the southern end of Section 2.

Section 3 – Te Kopi: This section is located between Johnson's Hill and Whatarangi Bluff. The Te Kopi settlement is in this area, with dwellings on both sides of the road. A 150 m stretch of the road in this section is located beside the crest of the sea cliff and is vulnerable to wave overtopping and coastal erosion.

Section 4 – Whatarangi Bluff: This section is between Te Kopi and Whatarangi Stream. The road here is positioned on a narrow terrace, in places less than 10 m wide, cut into the steep mudstone cliffs of Whatarangi Bluff. The pavement runs close to the crest of the sea cliff and is vulnerable to underslip caused by coastal erosion. Past underslip has led to the road being realigned by cutting further into the slopes above.

3.1.2 Land Ownership

Prior to any future road realignment or other risk mitigation measures being installed, issues around land ownership and consents may need to be addressed. This report does not cover these issues in detail.

Cape Palliser Road is positioned on land owned by SWDC. The width of this council-owned parcel is variable throughout the study area, with a minimum width of approximately 20 m in areas of private land ownership beside the road, and a much greater width at Whatarangi Bluff. Potential mitigation works or road realignment within this area should present few issues around land access.

Land parcels beside the road in the Te Kopi and Johnson's Hill sections are understood to be privately owned. Issues around land access and purchase may therefore require resolution prior to any potential works outside of council-owned land. Increased time and cost would likely be required for those land parcels which are in multiple ownership, including a parcel located north of the Johnson's Hill landslide which has 124 listed owners. Parcel boundaries are displayed on the plans of the study area in Appendix A.

When considering potential works, additional steps should be taken to protect Māori-owned land, such as an urupā (cemetery) located inland of the road in Te Kopi. Beca (2000) previously reported that the council installed a rock protection system on the seaward side of the road near the Te Kopi urupā in 1999, after being informed by iwi that the road should not be realigned onto urupā land.

3.2 Active Processes and Mitigation to date

Various significant hazard events have occurred within the site, with the worst effects usually seen during or after storms. Examples of such events and associated damage are presented in Table 1.

Other hazards which may result in damage to the road corridor include impacts from large seismic events from ground shaking, fault rupture, liquefaction, tectonic uplift or settlement and tsunamis. A detailed assessment of these hazards is outside the scope of this preliminary study.

Nick Perrin (2002) reported that houses at Te Kopi were threatened by the sea in 1995, and a shed had recently fallen onto the beach. At least one other house had also fallen between 1995 and 2002. Multiple road collapses occurred between Te Kopi and Whatarangi Bluff in this period, due to coastal erosion of the cliffs.

In the DOC station section, storm surge events cause debris to be thrown up from the beach and onto the road. This happens about 5 times a year on average, but is generally seen as an acceptable level of disruption by SWDC since these debris can be cleared.

In 2020, the highest section of the road at DOC Station was lowered because the slope below had become too steep for rip rap to stay in place during storm events.

At Johnson's Hill, slope movement within the landslide area has resulted in abrupt grade changes on the road at the margins of the slip. SWDC periodically lower the road on the approaches to the subsided landslide area, to match the road level on the landslide. This occurred in early 2020, and a subsoil cut-off drain was also installed to intercept groundwater on the upslope side of the road.

At Whatarangi Bluff, sea cliff erosion has caused multiple dropouts that have encroached into the road carriageway. The road has therefore been realigned repeatedly, sometimes with associated

cutbacks of the slopes above the road. Localised cutbacks were made at the southern end following a significant dropout in 2015.

A range of structures and interventions have been implemented to mitigate the risks posed by the hazards summarised in Table 1. These mitigation measures are summarised in Table 2.

Table 1: The primary natural hazards affecting Cape Palliser Road within the study area.

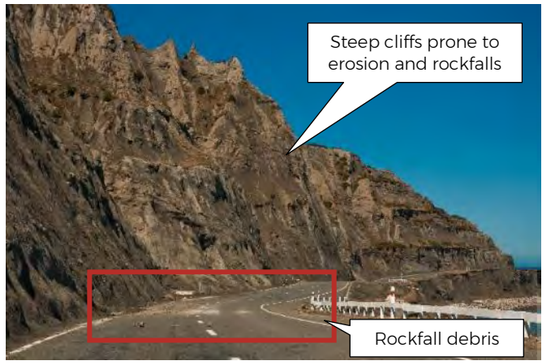
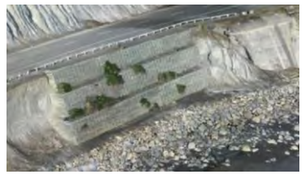
Hazard Impacting the Road	Example		Hazard Description and Sections Impacted	Risk Level Description and Risk Acceptability
Instability above the road (overslip, rockfall)		Whatarangi Bluff, March 1999 (Capper, 2011)	Slippage or small debris flows from erodible mudstone cut faces or rockfalls from harder bands, particularly in steep cut sections. Sections impacted: Johnson's Hill (Section 2) Whatarangi Bluff (Section 4)	Generally acceptable as failures are generally relatively small to date and quick to clear, or easy to dodge debris due to low traffic volumes.
Wave overtopping, localised erosion and storm debris		DOC Station, June 2013 (Actual Vision Ltd, 2013)	Wave overtopping the cliff, causing road damage and carrying debris from the beach onto the road during storm events. Sections impacted: DOC Station (Section 1) Te Kopi (Section 3)	Both wave and debris overtopping affect the level of service of the road and can put people and vehicles at risk. Risk from debris is presently generally acceptable to SWDC as debris volumes are relatively small and can be removed quickly. The risk level is expected to remain acceptable over the coming ~5-10 years, but a potential increase in debris volumes may become less acceptable in the medium to long term if sea level rises and storm event frequency increases.
Instability below the road (underslip), localised erosion		Whatarangi Bluff, September 2015 (Stuff, 2015)	Destabilisation and slumping of slopes below the road eating into the carriageway, related to coastal erosion at the base of the sea cliff and to groundwater seepages daylighting on the cliff face Sections impacted: DOC Station (Section 1) Te Kopi (Section 3) Whatarangi Bluff (Section 4)	Consequences of localised erosion may lead to significant road width eroded away, which can pose at risk people and vehicle safety if, for instance, a vehicle drives into a non-existent (eroded) section of road. Due to the low likelihood of significant road widths being removed at once, risk tolerances will vary depending on the extent of road affected. Underslips impacting the shoulder or one lane may be broadly tolerable with some traffic management controls. Whole road closure for multiple days is not likely to be acceptable as there are no alternative access routes.
Larger-scale landslide		Johnson's Hill Landslide, ongoing (WELA, 2003)	Larger-scale movement of unstable slopes that the road is located on. Sections impacted: Johnson's Hill (Section 2.3) Te Kopi (Section 3.2)	Varies depending on the extent of road affected and the amount of dropping of the road. Significant earthquakes (e.g. Kaikōura 2016) and saturation following significant rainfall (e.g. winter 1995) increase movement and risk. Landslide movement at Johnson's Hill and the north end of Te Kopi typically causes grade changes within the road, which can result in rough ride, loss of control, damage vehicle undercarriages or in the worst case make the road impassable. In the worst case, mass evacuation of the landslide and road may result in longer-term road closure or fatalities. Johnson's Hill landslide has been the most problematic while at the north end of Te Kopi (Section 3.2) settlement of the pavement seems to be gradual and is currently resulting in reduced level of service only.

Table 2: Existing and previous risk mitigation measures installed within the study area.

Mitigation measure	Example		Description	Where used at site?	Performance
Concrete retaining walls / facings		(Harris, 1997)	Concrete structures installed in the 1990s to hold up the slope behind them, to hold the line and prevent coastal erosion and, in some cases, to protect stormwater structural assets (many are also culvert outlet structures).	Whatarangi Bluff (Section 4.2) – multiple walls present, having been installed since the 1990s	Have halted erosion locally but 'hard edges' have focussed erosion resulting in outflanking and exaggerated erosion immediately adjacent.
Crib wall		(WSP UAV imagery, 2020)	Stacked timber frame wall filled with soil and rock, to hold up the slope behind them and prevent waves from eroding the toe of the slope.	Whatarangi Bluff – one example currently present	Performing well to stop erosion in the area. Nonetheless, the alongshore irregularities the structure presents may have caused "end-effects", causing localised erosion.
Gabions		(NZ Herald, 2013)	Wire mesh baskets filled with rocks, placed in front of slopes to absorb wave energy.	DOC Station – currently present	Not a good long-term solution, as they become undermined and outflanked as per photo. The current state of most of the gabions along Cape Palliser Road can be considered failed structures.
Groynes		(Wairarapa Times-Age, 1995)	Elongate structures placed perpendicular or oblique to the shoreline, to induce beach accretion by retaining part of the along-shore sediment transport.	Whatarangi Bluff – groynes were in place prior to 1995 but are no longer present	The groyne structures may have contributed to either beach accretion or erosion in the past. With the information available, it is not possible to make comments on the performance of these coastal structures.
Boulder beach / rip rap		(WSP UAV imagery, 2020)	Engineered, interlocking rock armour which helps with wave energy dissipation and protects from coastal erosion.	Section: 1. 100% of length 2. Historically used, no recent rip rap 3. Some rip rap was installed in 1999 at Te Kopi 4. Multiple layers used since 2009 - buried at base of cliff (as per SWDC drawings)	The current rock rip-rap design, together with the lack of maintenance, lead to a current structural failure and poor performance of the structure. Cape Palliser Road has numerous compromised sections – particularly in Section 1, but also in Section 4

Mitigation measure	Example		Description	Where used at site?	Performance
Other erosion barriers		(Duggan, 1994)	Other structures installed to absorb and deflect wave energy, including tyres and non-engineered rock armour.	Near private residences – tyre barriers were installed in the early 1990s at Te Kopi	Due to the lack of information, it is not possible to comment on the performance of such measure.
Drainage measures		(WSP UAV imagery, 2020)	To intercept and redirect groundwater and / or surface water from slopes to improve slope stability. Existing and previous measures: 1. Drilled sub-horizontal drains 2. Swales and surface cut-off drains 3. Subsoil cut-off drains 4. Culverts with long outlet pipes to discharge on more stable ground 5. Planting to remove moisture from soil Other Options: 6. Pumpwells	Johnson's Hill – measures 1 to 5 are currently present in various states/condition, with a new subsoil drain installed in May 2020.	Measures need to be located strategically to target groundwater and/or surface sources that are affecting stability. Measures require maintenance; drainage may be destroyed or blocked, while outlet pipes may not remain in optimum locations.
Road realignment		(WSP UAV imagery, 2020)	Repositioning of the road further back from the cliff edge, to reduce the risk of road sections collapsing due to erosion.	Multiple sections – recent realignment at Whatarangi Bluff after a drop out in 2015	Creating a larger buffer zone between cliff edge and road reduces the risk of road erosion and overtopping.

4 Landslide Hazards

4.1 Terminology Used

Further to the hazards shown in Table 1 and as summarised in Figure 2, landslides can affect the road in a number of ways:

a) Landslides or rockfalls from above (referred to here as **overslips**), which result in landslide debris on the road which can either block one or more lanes, impact vehicles or be an obstacle that vehicles can drive into.

   Overslips are mainly confined to the cuttings in Section 2 (Johnson's Hill) and Section 4 (Whatarangi Bluff).

   Significant gully erosion occurs on the exposed slopes above road, with holes forming occasionally. Small slips occur from time on these cut slopes. We are not aware of significant past issues from overslips/rockfalls.

b) Landslides from below (referred to as **underslips**) in which part, or all, of the road corridor drops or is removed by the landslide. This could be caused by removal of support below by e.g. coastal erosion or man-made processes, elevated groundwater from heavy rain or seepages through permeable layers.

c) The extreme case of an underslip is a landslide that affects both the slope above and below e.g. the Johnson's Hill and Te Kopi North landslides.

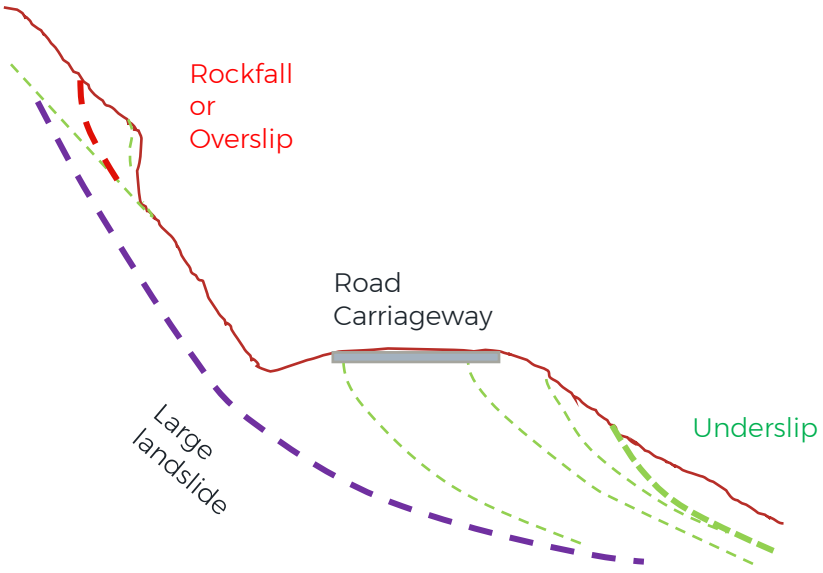


Figure 2: Different categories of instability, with respect to the road carriageway

4.2 Overview of Landslides

GNS Science have a National Landslide Database (GNS, 2019) which shows landscapes that GNS have assessed as being caused by landsliding. The majority of the current Cape Palliser Road study area is shown by GNS as 'landslide area' (Figure 3). Our understanding is that these refer to sites where land sliding has long ceased as well as sites which may still be active. The level of activity is not shown on GNS's map.

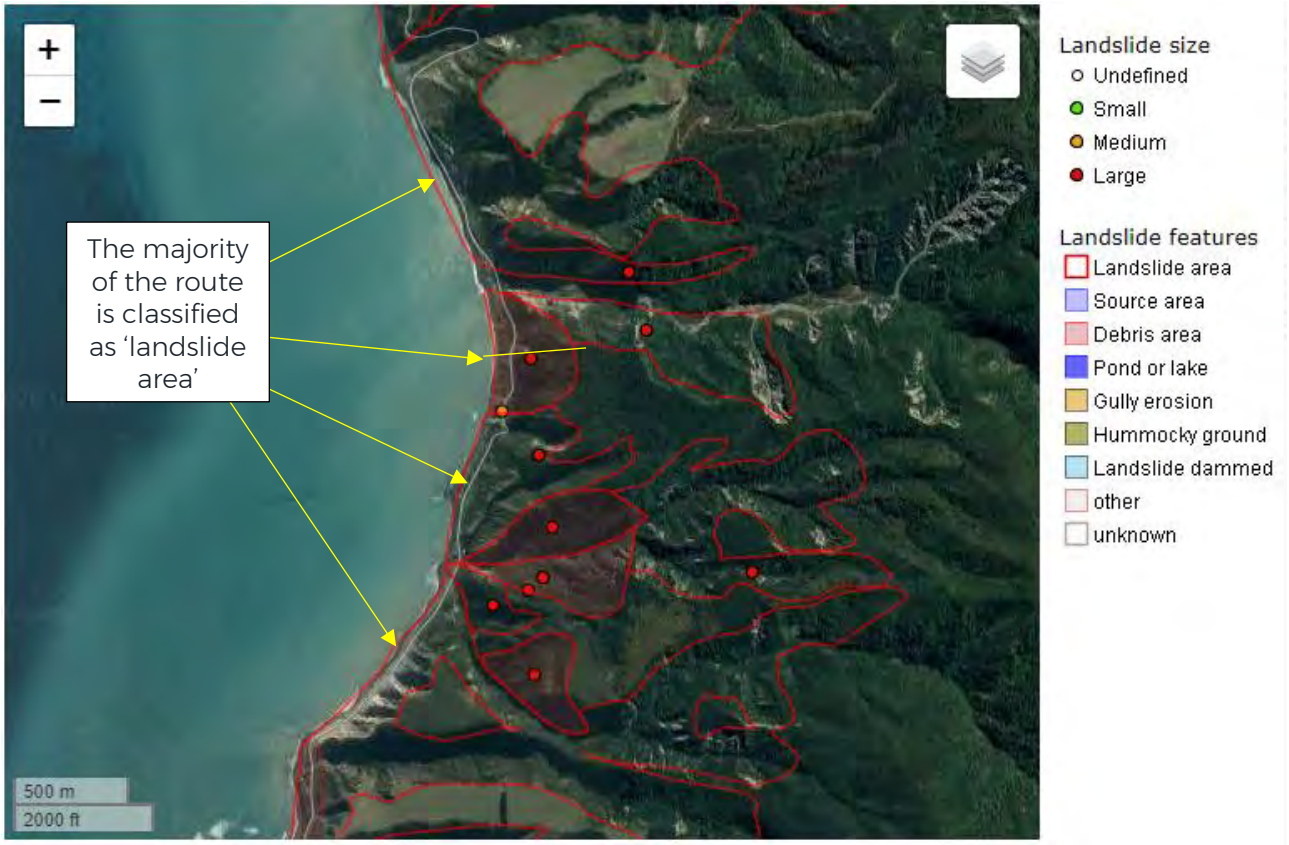


Figure 3: The study area as seen in the GNS landslide database.

Investigations for this study have confirmed two active large landslides affecting the road are present, within an older presumably dormant landslide area. The larger and most problematic of these is known as the Johnson's Hill landslide (Figure 4).

Figure 4: The indicative extent of the two large active landslides on Johnson's Hill and the northern end of Te Kopi. Lateral extent is well defined from observed side scarps within the road (abrupt changes in gradient). Upslope extent is not well defined.

4.3 Johnson's Hill Landslide

The New Zealand Landslide Database (GNS, 2019), which summarises national landslide data, indicates that significant portions of the site have landslide features. This includes a large area at Johnson's Hill (Figure 5).

Details on the Johnson's Hill landslide from the 1990s are given in the Beca (2000) road realignment options report. Technical analyses of the landslide were provided by Nick Perrin of GNS (1995; 2002), who reported that an approximately 2 x 10^5 m^3 volume of material, with the upper active extent not defined, had reactivated from the debris associated with an older, deep-seated slip (about 2 to 4 x 10^6 m^3). This reactivation was reportedly due to wave erosion at the toe, and was worsened by road cuttings and heavy winter rainfall in 1995. The slip was actively creeping at the time of Perrin's report (1995), and a tension crack was observed along the side scarp.

Further assessments by Stan Braaksma of GWRC in the 1990s included a walkover of the slope above the road, with a view to identifying springs which may have been causing instability; none were found (Braaksma, 2020). Braaksma also arranged for tree planting above the road at Johnson's Hill, to address slope instability.

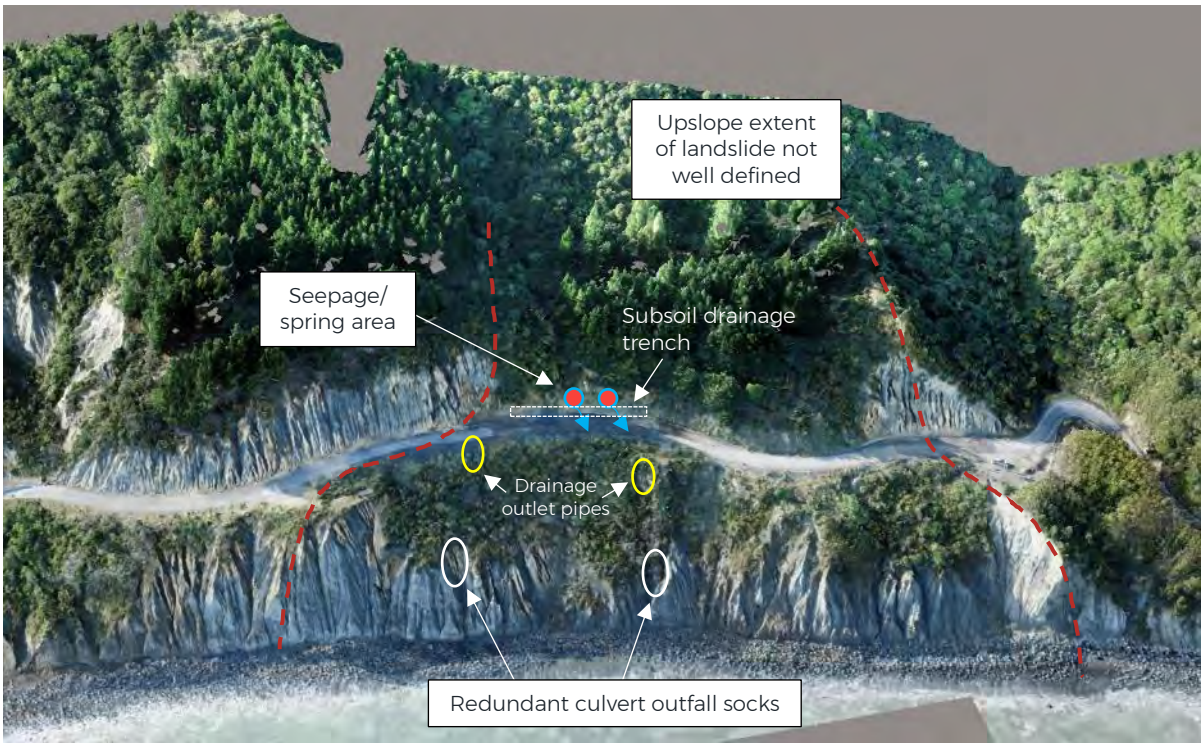


Figure 5: Active section of Johnson's Hill landslide, with various drainage features shown.

An inspection completed by Samcon (2018) identified damage where Cape Palliser Road crosses the landslide failure area (defined by weaker gully material between stronger siltstone batters). A crack was observed to track diagonally across the carriageway, with subsidence of the road surface by up to 150 mm at the southern end of the slip area, increasing to up to 400 mm at the northern end (Figure 6).

Figure 6: Views north and south along Cape Palliser Road at the Johnson's Hill landslide (Samcon, 2018).

Samcon advised against filling the settled area, warning that this may trigger further slope movement. They instead suggested lowering the adjacent road approaches (as completed in 2020) to reduce water and silt ponding in the failure area. They also recommended that drainage be modified to divert water to a culvert north of the slip area, where it could be discharged to the coast over better ground (solid siltstone). Subsoil drains were installed in 2020 – Samcon noted that the installation of such drains could (potentially) risk feeding water into the failure plane. They also suggested that if further drops occurred, realignment of the road into the slope above may be necessary.

Figure 7 highlights the progressive lowering of the road level, as seen in a comparison of 2003 and 2020 images from the same location.

A conceptual model for the landslide is provided in Figure 8 showing the active section of the landslide within a larger presumably dormant landslide. As can be seen the depth of the landslide is not well known. The presence of the active Dry River Fault tracking near the base of the landslide may be a contributing factor to the landslide – both in terms of relative fault movement and also the effect of the fault (and related structures) on groundwater in the vicinity.

Further details and discussion about the Johnson's Hill landslide are given in Appendix C.2.

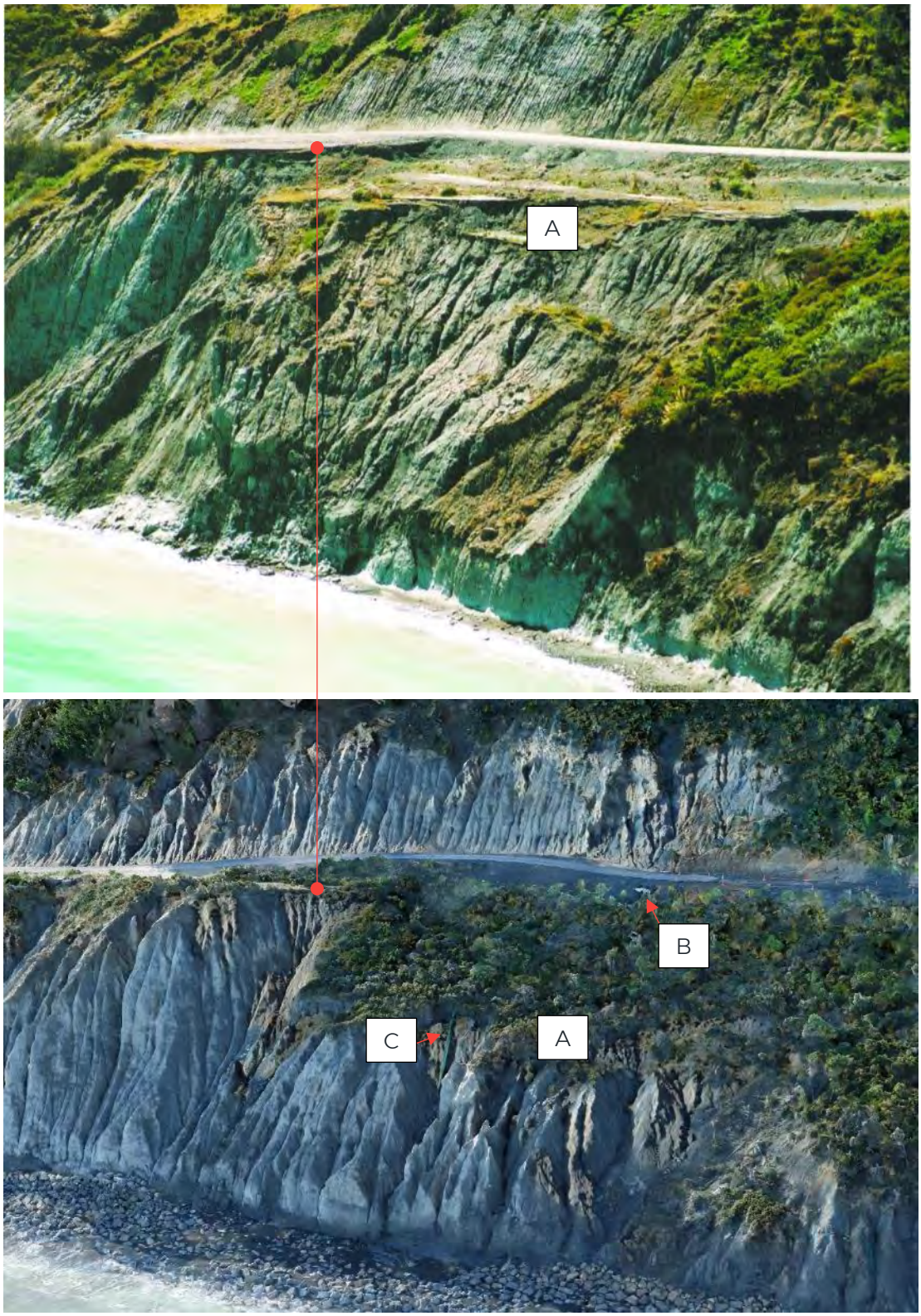


Figure 7: Images from 2003 and 2020 showing the development of the Johnson's Hill landslide. Note that slumped old road benches in 2003 at A have all but disappeared - down the slope as at 2020. Note the extent of rill erosion in 2020. B is culvert outlet. C is the redundant outlet sock.

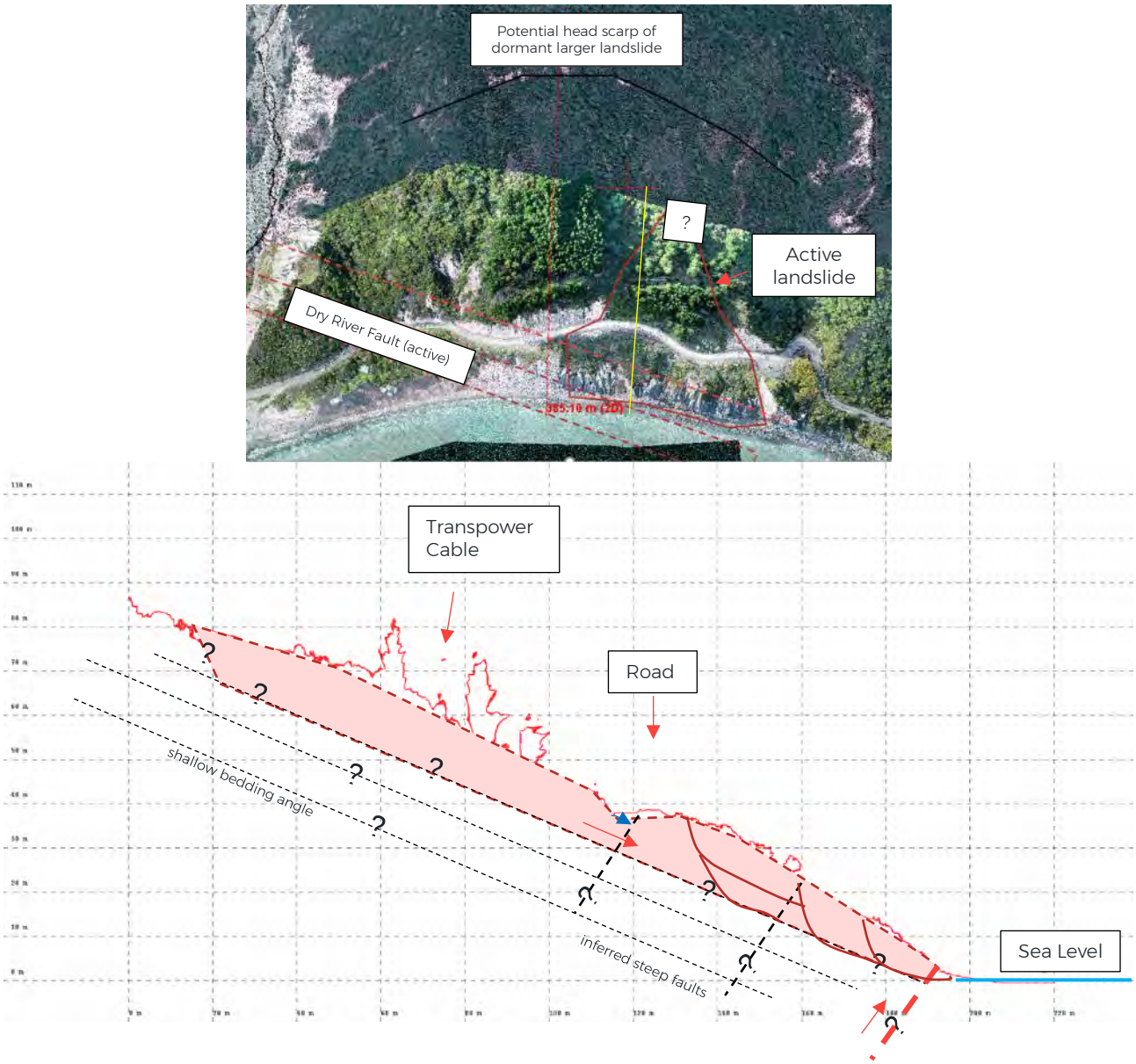


Figure 8: Conceptual model for active section of Johnson's Hill landslide. Depth and extent are indicative. An indicative position of the Dry River Fault is shown at the toe of the landslide.

5 Coastal Erosion

The study site is a naturally erodible coast characterised by high cliff recession rates. This section of the report summarises the findings of the desktop assessment of erosion rates at Cape Palliser and presents an extended analysis of cliff retreat.

5.1 Previously Reported Erosion Rates

Coastal erosion rates in eastern Palliser Bay have been investigated in several previous studies. Rates of erosion reported in these studies are presented by section in Table 3.

The Whatarangi Blue Disc settlement is located just beyond the southern boundary of our study area. The four remaining sections – DOC Station, Johnson's Hill, Te Kopi, and Whatarangi Bluff – are covered in our investigations, and erosion rates here were assessed by Beca (2000) for the period 1944 to 1996.

Erosion of the coast alongside Cape Palliser Road is reported to be cyclic, with accelerated erosion in the 1920s to 1930s, 1976 to 1977, and 1992 to 2000, and reduced erosion in the 1940s, 1950s and 1960s (Beca, 2000). Retreat rates as high as 1.0 to 1.5 m/yr are common during periods of accelerated erosion. Beca (2000) suggest that these cycles of severe erosion correspond to periods of low beach levels, while reduced erosion took place as the beach naturally rebuilds and protects the cliffs from wave energy.

Table 3: Previously reported erosion rates in eastern Palliser Bay.

Area	Period	Erosion rate (mm/yr)	Source
DOC Station	1973 – 1979	60	Beca (2000)
	1979 – 1993	40	
	1993 – 1996	150	
Johnson's Hill	1944 – 1973	150	Beca (2000)
	1973 – 1979	650	
	1979 – 1993	200	
	1993 – 1996	500	
Te Kopi	1944 – 1973	30 – 153	Beca (2000)
	1973 – 1979	30 – 641	
	1979 – 1993	30 – 371	
	1993 – 1996	50 – 1200	
Whatarangi Bluff	1968 – 1993	80	Beca (2000)
	1993 – 1996	200	
Whatarangi Blue Disc Settlement (located just beyond the southern boundary of our study area)	1924 – 1930	1270	King (1930)
	1944 – 1973	91	Beca (2000)
	1973 – 1979	1440	
	1979 – 1993	166	
	1993 – 1996	1000	
	1960s – 2008	450 – 750	T+T (2018)
	2008 – 2011	1100	
	2011 – 2018	1500	

5.2 Extended Erosion Rates Analysis

As part of this study, WSP have determined coastal erosion rates for DOC Station, Johnson's Hill, Te Kopi, and Whatarangi Bluff. These sections were investigated by Beca (2000) for the years up to 1996, and we have analysed the subsequent period from 1996 to 2020. Historic aerial imagery was sourced from LINZ for the years 1996, 2013 and 2017. 2020 imagery was acquired during WSP's UAV survey investigations. 2013 LiDAR elevation data was also available from LINZ, and this has been used for comparison with an elevation model generated from the 2020 UAV data.

To analyse coastal erosion, the aerial images were overlaid in QGIS and the cliff crestline position was manually digitised at each time interval. The distance between different cliff crestlines provides a measure of the coastal retreat distance over the intervening years, allowing the average rate of erosion to be determined. Measurements were taken at 20 m intervals throughout the entire study area, from north to south. This provides good coverage from which to calculate average erosion rates for each subsection.

Average rates of erosion were calculated by measuring the distance between digitised cliff crest lines and dividing by the number of years between data captures. Supplementary erosion rates between the 2013 LiDAR and 2020 UAV elevation datasets were assessed by extracting profiles perpendicular to the coastline and measuring the offset between cliff crest positions in the two datasets.

5.2.1 Findings

The changing position of the sea cliff line since 1996 is shown on the plans in Appendix A. A statement on the accuracy of the position of the lines is provided after the plans in Appendix A.

Average erosion rates for the years since 1996 are recorded in Table 4. These rates are of a similar order to those previously reported in eastern Palliser Bay. Strong erosion rates were generally found to be around 1.0 – 1.5 m/yr, with moderate rates closer to 0.5 m/yr.

Our analysis reveals some hotspot areas of rapid erosion, notably in Section 2.1 with erosion rates up to 2.3 m/yr in 2013 – 2017. This is where a holiday home fell onto the beach in 2017. Section 1.4 also experienced rapid erosion of up to 1.1 m/yr. Both Section 1.4 and Section 2.1 have little to no coastal protective structures in place,

Conversely, erosion rates at Whatarangi Bluff (Section 4) were found to be low, particularly since 2013. This may reflect a lull within ongoing episodic erosion, whereby coastal retreat occurs via significant cliff dropouts followed by periods of relative quiet. The exception is Section 4.4, where erosion rates for intervals between 1996 and 2017 were about 1.0 – 1.3 m/yr. This is the site of the September 2015 cliff dropout that led to subsequent road realignment. Erosion rates for 2017 – 2020 show that there has been much slower retreat since the 2015 dropout. This again highlights the likely episodic nature of erosion.

Table 4: Average erosion rates for each subsection within the study area. The erosion rates are coloured from red to green, red being the higher rates found and green the lower rates.

Section		RP Start	RP End	Average erosion rates (m/yr)					
				1996-2013	2013-2017	2017-2020	1996-2017	1996-2020	2013-2020
DOC Station	1.1	12.56	12.86	0.33	0.48	0.30	0.36	0.35	0.44
	1.2	12.86	13.04	0.17	0.26	0.18	0.19	0.19	0.24
	1.3	13.04	13.3	0.45	0.30	0.26	0.42	0.40	0.34
	1.4	13.3	13.44	1.03	1.06	0.52	1.04	0.97	0.81
Johnson's Hill	2.1	13.48	13.76	0.84	2.31	1.75	1.12	1.20	2.07
	2.2	13.76	13.84	0.43	0.47	0.26	0.44	0.41	0.30
	2.3	13.84	14.1	0.19	0.22	0.22	0.20	0.20	0.20
	2.4	14.1	14.14	0.85	0.29	0.06	0.74	0.65	0.19
Te Kopi	3.1	14.14	14.18	0.70	0.29	0.43	0.62	0.60	0.35
	3.2	14.18	14.34	0.43	0.13	0.15	0.38	0.35	0.06
	3.3	14.34	14.56	0.34	0.28	0.59	0.33	0.36	0.41
	3.4	14.56	14.72	0.53	0.53	0.29	0.53	0.50	0.40
	3.5	14.72	14.86	0.28	0.63	0.37	0.35	0.35	0.52
Whatarangi Bluff	4.1	14.86	15.18	0.51	0.15	0.20	0.44	0.41	0.18
	4.2	15.18	15.66	0.37	0.10	0.11	0.32	0.29	0.10
	4.3	15.66	15.8	0.35	-0.04	0.09	0.27	0.25	0.05
	4.4	15.8	15.86	1.04	1.31	0.19	1.09	0.98	0.91

6 Management Options for Coastal Protection

Because of the awareness raised of increased pressures on the coastal zone due to the accelerating climate change, management strategies to deal with coastal erosion are broadly divided into the following categories (MfE, 2017):

- **Accommodate:** adjusting existing assets by using measures that anticipate hazard risk, such as raising floor levels, providing alternative inundation pathways where existing protection structures are overtopped under stormy condition.
- **Protect:** holding the line using natural buffers or hard structures like seawalls.
- **Retreat:** moving existing people and assets away from the coast in a managed way over time, or because of erosion and inundation damage after climate-related events.
- **Avoidance**: strategies that stop putting people and assets in harm's way, primarily using land-use planning measures.

These management strategies may be considered, in some cases, a little simplistic (Bosboom & Stive, 2015). The choice of a pertinent management strategy is directly related to the level of vulnerability and the land use, therefore linked to the social, economic and cultural value of the coastal zone, as well as to the available funding (Bosboom & Stive, 2015).

As stated previously in this report, the study area of Cape Palliser road runs along the coastal edge of Palliser Bay and it is exposed to various coastal hazards, including coastal erosion and inundation. This section provides a summary of the past protection measures applied in the study area, as well as various preliminary management options for coastal protection. Before the implementation of the different options, further development of a coastal management strategy for Palliser Road is recommended. The latter will serve, not only to optimise the coastal protection options (in isolation or combined), but also to ensure a more integrated coastal zone management.

6.1 Monitoring Programme

Monitoring the evolution of the coastal zone is necessary to better understand the dynamics of the coastal foreshore and cliff edge (as well as slope / landslide movements), and therefore to make more informed decisions to manage the coastal corridor along Cape Palliser Road.

- Drone photography / or aerial lidar data capture are both ideal methods for capturing the latest topography and facilitating monitoring of the evolution of the site. Aerial LiDAR (such as that captured in 2013) typically has a more expensive one-off cost and better suited for large areas, whilst drone capture (such as carried out in May 2020) is better suited for small to moderate sized areas.
- The frequency of such capture would depend on the purpose but data captures as frequent as once a month (and after storm events) would allow an understanding of beach foreshore seasonal fluctuations, but also contribute to better erosion rates analysis and help us investigate the recovery capacity of the beach foreshore after storm events.
- Less frequent data captures (say every 4-6 months and after storm events) would enable monitoring of erosion rates but not necessarily the fluctuations in recovery capacity (as the capture may at a non-representative point in time).
- Monitoring of coastal erosion (and slope movement) hot-spots by doing monthly and post-storm events inspections. This may involve checking for erosion (or land movement) against reference marks.

6.2 Accommodate

The following options under *accommodate* strategies have been considered:

6.2.1 *Reshaping the rock rip-rap*

Currently, large areas of Cape Palliser Bay foreshore are covered with scattered rocks from rock revetments constructed in the past and presently in a failure state. The positioning of this rocks is currently arbitrary, and in some cases, the rocks may be creating zones where erosive coastal hydrodynamics are enhanced.

Together with the help of a coastal engineer, these available resources could be recycled and used to improve the current erosion protection in specific areas. If enough quality rocks and material are available, this option could minimise erosion hot-spots and wave overtopping by reinforcing and reshaping the current rock rip-rap.

6.2.2 *Improved drainage*

Improving drainage in some areas of Cape Palliser (e.g. Section 4), can help to reduce structural and cliff loads. A common cause of cliff failure along the coast is the combination between wave action, soil saturation and water run-off. By improving drainage, erosion associated with water run-off can be mitigated, and the likelihood of cliff failure may be reduced.

6.3 Protect

There are a large number of *protect* options that can be listed, this include beach nourishment, offshore breakwater(s), planting or any other engineered structured among others. The following options under *protect* strategies have been shortlisted for this project:

6.3.1 *Do minimum*

The do minimum option implies holding the line, therefore maintaining current erosion protection measures. This option has proved to need reactive measures against storm events damage, and it will require further maintenance of the existing coastal protection measures in place.

To hold the line may include short-term benefits, such as the maintenance of the current levels of service and erosion protection, but the benefits of the do minimum management approach tend to decrease with time.

Holding the line and do minimum has been the most recent management strategy for Cape Palliser Road. The do minimum strategy implies a high risk of structural failure, which is currently the status of most of the revetment and other structures along the coast. The do minimum scenario is therefore not recommended as it likely to be not feasible in the long term.

6.3.2 *Revetment – Rock or concrete units*

Coastal revetments fall in the category of hard protection structures: they consist on sloping structures and are constructed as permeable structures using rocks or concrete blocks. When well designed, revetments can be considered one of the more resilient coastal protection structures because of their ability to absorb wave energy and minimise wave reflection and run-up. This type of coastal structure requires a source of quality rock or concrete units that complies with appropriate specifications.

Cape Palliser Road has historically been protected by revetments. Nonetheless, some design deficiencies were highlighted in previous sections, which lead to a short design life and a currently failed structure.

A new revetment design and construction considering the coastal dynamics of Cape Palliser road, and following both national and international guidelines to cope with foreshore bed lowering and scour, could lead to a larger life-span and low maintenance coast in the medium to long-term. This option falls under hard-structures and therefore induced foreshore lowering and potential long-term loss of the beach are some of the risk associated.

6.3.3 *Groyne(s)*

Groynes are perpendicular to the shore structures that influence the rate of longshore sediment transport under both normal and extreme conditions. Groynes can be considered permeable, allowing water flow through at reduced velocities, or impermeable, blocking and deflecting the current.

A groyne or a groyne field can be considered as an option to retain sediment and increase foreshore beach levels. Nonetheless, careful analysis should be undertaken to avoid side effects such as erosion of the downdrift side or rip currents generation. Groynes are often complemented with nourishment to mitigated adverse side effects.

This option can have a high visual impact and will affect coastal nearshore dynamics. In order to implement groyne(s) as an option, it is recommended to have a better understanding of the sediment budget and the longshore sediment transport dynamics in Palliser Bay.

6.3.4 *Seawalls*

A seawall is a form of coastal defence constructed where the coastal processes impact upon the coastal landforms. The purpose of a seawall is to protect the coastal hinterland from coastal hazards such as coastal erosion and inundation. It is typically an impermeable structure that impede the exchange of sediment between land and sea, and it induces wave reflection.

Because of the lack of space in some section along the study area, a seawall can be deemed as a good coastal protection option as it is a vertical structure with a small foot print. Nonetheless, this option needs to be considered with care, as seawalls induced foreshore bed lowering, influence nearshore coastal dynamics, can cause end-wall effects and would likely lead to more beach encroachment.

6.3.5 *Salt resistant planting*

It has been proven that vegetated areas can help reduce flood and erosion risk. For most of the coastal area at Cape Palliser, planting can be considered not feasible because of the lack of natural dunes and foreshore space.

Nonetheless, in areas where there is still space between the road and the cliff edge, planting can be considered to help mitigate cliff erosion.

6.3.6 *Secondary/set back raised defence*

Some sections of the road are better protected against erosion because there is land between the road and the sea. Whilst this land acts as a buffer and protects the road, the land itself may be prone to rapid erosion under extreme conditions and the erosion may reach the road.

In order to protect the road, it may be worthwhile to consider coastal defences that are set-back from the shore and sit between the road and the sea. For instance, a buried back-stop wall of sheet pile can act as a fail-safe measure to protect the road from rapid erosion. However, such defences are not designed to be permanently exposed to coastal conditions, so the land between the road and the sea should be reinstated after an erosion event.

6.4 Retreat

The following options are the main strategies involving *retreat* considered:

6.4.1 *Do nothing*

The *do nothing* approach is to accept the deterioration of the existing coastal defences and cliff. The lack of maintenance will likely cause the existing protection measures to fail, decreasing even further the provided level of service.

If adopting this option, maintenance costs will be removed, but for Cape Palliser, this will imply the loss of access along this stretch of coastline and it is therefore not considered feasible.

6.4.2 *Realignment & Alternative Route Selection*

Realignment will require relocation of the road and transport infrastructure and, potentially, altering the route significantly for the most vulnerable stretches of road. The relocation of the assets reduces exposure to hazards and can be seen as a proactive approach to cope with the uncertainties associated with the effects of storm events and future climate change pressures.

The challenges for a realignment of Cape Palliser road include the lack of available landward space for relocation and the potential loss of a coastal corridor. Nonetheless, this option creates space for the coastal changes to occur without damaging the road, and can reduce and even eliminate, coastal hazard exposure, improve the resilience of the coastal edge and gives the option of increasing amenity value along the coast.

Realignments can be:

- small scale – involving minor adjustments of the road by a matter of metres such has occurred at Johnson's Hill and Whatarangi Bluff;
- large scale – involving the road climbing into the hills behind the current alignment (for instance, an 7km long realignment was proposed by Beca (2000) (Appendix H Beca inland road realignment option), and other bypass options were considered e.g. via White Rock, north of Cape Palliser.
- changes in vertical alignment – some sections are less than 5m above sea level hence consideration of lifting the road level would result in less flooding in King tides and storm surges. However, this would result in higher slopes below the road which may require greater cost to engineer.

If road access was severed for long periods due to natural hazards then the default access mode would be by boat (or air) as there is no alternative road access past this location.

6.5 Avoidance

Avoidance options can include forced land-use change and rezonation of the study area among other options. However, no avoidance approaches have been contemplated for the preliminary set of risk mitigation options presented in this report.

7 Risk Assessment of Corridor

The following tables provide a summary of the risks to the road within the four sections of the study area. These sections have been further subdivided into subsections based on characterisation of road risk related factors. Risks have been assessed for the short term (ST; next approximately 5 – 10 years into the future), medium term (MT; approximately 10 – 25 years) and long term (LT; approximately 25 – 50+ years).

7.1 Section 1 (DOC Station) – Preliminary Risk Assessment

		Section 1.1	Section 1.2	Section 1.3	Section 1.4
	RP Extents	12.56 to 12.86	12.86 to 13.04	13.04 to 13.30	13.30 to 13.44
	Road Elevation (NZGD/NZTM2000)	4.2 m to 5.0 m	4.6 m to 7.0 m	4.6 m to 6.9 m	6.9 m to 8.6 m
	Structures below the road	Rip rap – poor condition Gabions – occasional, very poor condition	Rip rap – poor to moderate condition Gabions – occasional, poor condition	Rip rap – poor to moderate condition Gabions – occasional, very poor condition	None
Risk to the road relating to:	Slopes above the road	Low risk – shallow slope. Wide shoulder.	Low to moderate risk – shallow to moderate slope. Narrow shoulder.	Low to moderate risk – shallow to moderate slope. Wide shoulder. Historic landslide on upper slope above southern end.	Low to moderate risk – shallow to moderate slope. Wide shoulder. Historic landslide on upper slope.
	Slopes below the road	Moderate risk – low but steep slope, overhanging in places. Very narrow shoulder. Rip rap and gabions undermined. Wave overtopping may damage the road during storm events.	Moderate risk – low but steep slope, overhanging in places. Very narrow shoulder. Rip rap and gabions undermined.	Moderate to high risk – low but steep slope, overhanging in places. Very narrow shoulder. Rip rap and gabions undermined. Wave overtopping may damage the road during storm events. Tension cracks and settling across ~1/4 of seal width.	Low risk – low, shallow slope. Wide shoulder, buffer zone to erode before road coastal erosion happens.
	Coastal hazards	Moderate risk – moderate erosion rates and very narrow shoulder. Rip rap undermined. Low elevation above MSL. Wave overtopping may damage the road during storms. Flooding occurred at the northern end in June 2013.	Moderate risk – moderate erosion rates and very narrow shoulder. Rip rap undermined. Low elevation above MSL. Wave overtopping may damage the road during storm events.	Moderate risk – moderate erosion rates and very narrow shoulder. Rip rap undermined. Low elevation above MSL.	Low to moderate risk – high erosion rates, but road is set back and at moderate elevation above MSL.
	Overall Risk (ST)	Moderate	Moderate	Moderate (to High)	Low to Moderate
	Overall Risk (MT)	Moderate to High	Moderate to High	Moderate to High	Moderate
	Overall Risk (LT)	High	High	High	Moderate to High
	Conclusion	Increasing risk over time due to Sea Level Rise (SLR) and the anticipated increase in storm frequency and severity, likely increasing erosion rates and frequency of coastal inundation.	As for Section 1.1.	As for Section 1.1.	As for Section 1.1.
	Recommendations	Improve rock rip rap protection to mitigate and protect against coastal erosion, wave overtopping and undermining. Ensure consistent height and slope alongshore, following design specifications.	As for Section 1.1.	As for Section 1.1.	As for Section 1.1.

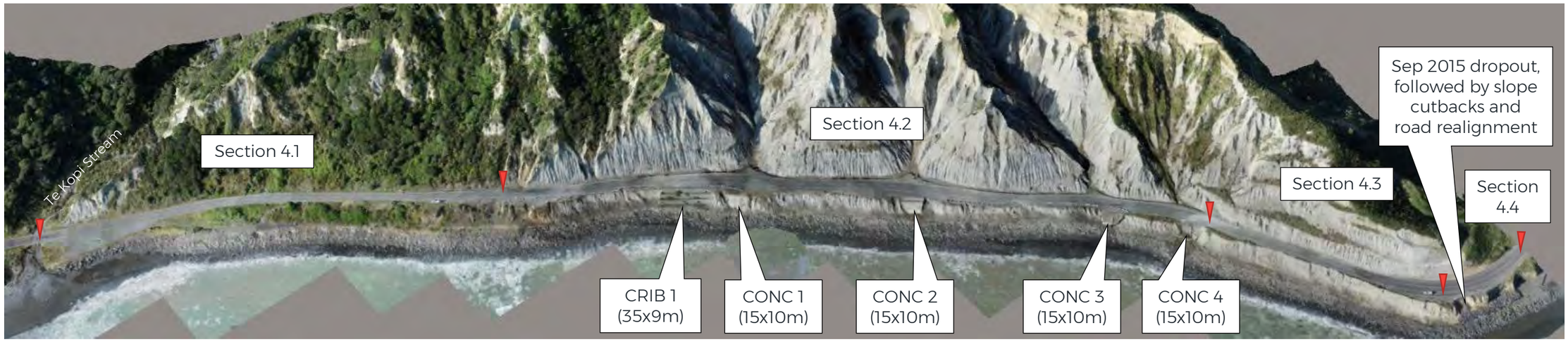
7.2 Section 2 (Johnson's Hill) – Preliminary Risk Assessment

		Section 2.1	Section 2.2	Section 2.3 (Johnson's Hill Active landslide)	Section 2.4
	RP Extents	13.48 to 13.76	13.76 to 13.84	13.84 to 14.10	14.10 to 14.14
	Road Elevation (NZGD/NZTM2000)	8.4 m to 30.0 m	30.0 m to 37.5 m	34.6 m to 38.7 m	30.4 m to 34.6 m
	Structures below the road	Cliff toe rip rap – occasional, very poor condition	Cliff toe rip rap – very poor condition	Cliff toe rip rap – very poor condition	Cliff toe rip rap – very poor condition
Risk to the road relating to:	Slopes above the road	Low to moderate risk – moderately steep slope. Narrow shoulder. Small overslips and rockfalls at southern end.	Moderate risk – moderately steep cut slope. Narrow shoulder. Small overslips and rockfalls. Gully erosion of cut slopes.	High risk – large-scale active landslide. Areas with moderately steep cut slopes and narrow shoulder. Gully erosion of cut slopes.	Low risk – moderately steep slope in stream gully. Wide shoulder. Outside area of active landslide.
	Slopes below the road	Low risk – low to moderate height, shallow slope. Wide shoulder.	Low to Moderate risk – high, steep slope, but with moderately wide shoulder. Gully erosion of slope.	High risk – large-scale active landslide. High, moderately steep slope. Narrow shoulder. Gully erosion of slope.	Low to moderate risk – moderately steep slope into stream gully. Narrow shoulder.
	Coastal hazards	Low to moderate risk – very high erosion rates, but road is set back and at moderate to high elevation above MSL.	Low to moderate risk – moderate erosion rates and steep slope. Destabilisation due to toe erosion may trigger slope movement. High elevation above MSL.	Moderate to high risk – moderate erosion rates, removing toe of sliding slope. May trigger further slope movement. High elevation above MSL.	Low risk – moderate erosion rates, but road is set back and at high elevation above MSL
	Overall Risk (ST)	Low to Moderate	Low to Moderate	High	Low
	Overall Risk (MT)	Moderate	Moderate	High to Very High	Low to Moderate
	Overall Risk (LT)	Moderate to High	Moderate to High	Very High	Moderate
	Conclusion	Increasing risk over time due to Sea Level Rise (SLR) and the anticipated increase in storm frequency and severity, likely increasing erosion rates and frequency of coastal inundation.	Increasing risk over time due to SLR and the anticipated increase in storm frequency and severity, likely leading to increased erosion rates and potential slope instability.	Increasing risk over time due to SLR and the anticipated increase in storm frequency and severity, likely leading to increased erosion rates and acceleration of slope movement if not mitigated, with potential for larger-scale failure.	As for Section 2.2.
	Recommendations	Improve rip rap protection at toe of cliff, to slow coastal erosion due to wave action. Ensure consistent height and slope, following design specifications.	As for Section 2.1.	As for Section 2.1. Also: Monitor slope movement; Install additional drainage to increase slope stability.	As for Section 2.1.

7.3 Section 3 (Te Kopi) – Preliminary Risk Assessment

		Section 3.1	Section 3.2	Section 3.3	Section 3.4	Section 3.5
	RP Extents	14.14 to 14.18	14.18 to 14.34	14.34 to 14.56	14.56 to 14.72	14.72 to 14.86
	Road Elevation (NZGD/NZTM2000)	26.8 m to 30.4 m	12.4 m to 26.8 m	4.1 m to 12.4 m	4.8 m to 8.7 m	5.8 m to 8.7 m
	Structures below the road	Rip rap – very poor condition	Rip rap – very poor condition	Rip rap – occasional, very poor condition Homemade protective structures – occasional, v. poor condition	Rip rap – poor condition	None
Risk to the road relating to:	Slopes above the road	Low risk – moderately steep slope in stream gully. Wide shoulder. Outside area of active landslide.	Moderate to high risk – active slope movement. Shallow slope. Narrow shoulder.	Moderate risk – shallow to moderate slope, wide shoulder. Dormant but possibly creeping landslide.	Low to moderate risk – moderately steep slope. Narrow shoulder. Small overslips and rockfalls at southern end.	Low risk – shallow slope. Wide shoulder.
	Slopes below the road	Low to moderate risk – moderately steep slope into stream gully. Narrow shoulder.	Moderate to high risk – road deformation due to active slope movement. Moderately high, shallow to moderately steep slope.	Low risk – low, shallow slope.	Moderate risk – low but steep slope, overhanging in places. Rip rap undermined.	Low to moderate risk – steep cliffs ~7 m high at northern end, but road is set back from the crest by 5 – 30 m
	Coastal hazards	Low risk – high erosion rates, but road is set back and at high elevation above MSL.	Moderate to high risk – moderate erosion rates, removing toe of slope, may trigger further movement High elevation above MSL.	Low to moderate risk – moderate erosion rates, and low elevation ASL at southern end, but road is >10 m inland, behind dwellings.	Moderate risk – moderate to high erosion rates and narrow shoulder. Rip rap undermined. Low elevation ASL (potential inundation in storm surges).	Low to moderate risk – moderate erosion rates, but road is set back by 5 – 30 m.
	Overall Risk (ST)	Low	Moderate to High	Low to moderate	Moderate	Low to Moderate
	Overall Risk (MT)	Low to Moderate	High	Moderate	Moderate to High	Moderate
	Overall Risk (LT)	Moderate	High to Very High	Moderate to High	High	Moderate to High
	Conclusion	Increasing risk over time due to Sea Level Rise (SLR) and the anticipated increase in storm frequency and severity, likely leading to increased erosion rates and potential slope instability.	As for Section 3.1.	Increasing risk over time due to SLR and the anticipated increase in storm frequency and severity, likely increasing erosion rates and frequency of coastal inundation.	As for Section 3.3.	Increasing risk over time due to SLR and the anticipated increase in storm frequency and severity, likely leading to increased erosion rates. Underslip threat will increase as cliffs retreat.
	Recommendations	Improve rip rap protection at toe of slope, to slow coastal retreat due to erosion. Ensure continuity alongshore with consistent height and slope, following design specifications.	As for Section 3.1. Also: Monitor slope movement; Consider installing drainage.	As for Section 3.1.	As for Section 3.1.	As for Section 3.1.

7.4 Section 4 (Whatarangi Bluff) – Preliminary Risk Assessment



		Section 4.1	Section 4.2	Section 4.3	Section 4.4
	RP Extents	14.86 to 15.18	15.18 to 15.66	15.66 to 15.80	15.80 to 15.86
	Road Elevation (NZGD/NZTM2000)	5.8 m to 15.4 m	10.7 m to 15.4 m	12.3 m to 14.6 m	10.2 m to 12.7 m
	Structures below the road	Rip rap – very poor to poor condition, geotextile exposed.	Rip rap – v. poor to poor condition, geotextile exposed. 1x crib retaining wall: CRIB1 – good condition. 4x concrete retaining walls with culvert outlet at base: CONC 3 – poor condition; CONC 1/2/4 – moderate.	Rip rap – very poor to poor condition, geotextile exposed.	Rip rap – poor condition at base, geotextile exposed. Newer rip rap above is in good condition.
Risk to the road relating to:	Slopes above the road	Low risk – shallow slope. Narrow shoulder.	Moderate risk – high, steep cut slopes in weak mudstone. Narrow to moderate shoulder. Rockfall debris and small overslips.	Moderate risk – high, steep cut slopes in weak mudstone. Narrow to moderate shoulder. Rockfall debris and small overslips.	Moderate risk – high, steep cut slopes in weak mudstone. Narrow to moderate shoulder. Rockfall debris and small overslips.
	Slopes below the road	Low to moderate risk – shallow to moderate slope. Narrow shoulder, widening at southern end.	Moderate risk – weak mudstone cliffs 7 – 10 m high. Narrow shoulder, widening in places. Localised tension cracking near edge line, with tendency for rapid dropout failures. Walls are being undermined and outflanked.	Moderate risk – weak mudstone cliffs 7 – 10 m high. Narrow shoulder, locally very narrow (<1 m). Tendency for rapid dropout failures.	Moderate to high risk – weak mudstone cliffs 5 – 10 m high. Narrow shoulder, with 3x embayment sections (including from Sept 2015 dropout). Cliff face water seepages, linked to slope instability.
	Coastal hazards	Low to moderate risk – Moderate erosion rates and low elevation ASL at northern end (potential inundation in storm surges). Insufficient toe erosion protection as rip rap is poor.	Moderate risk – moderate erosion rates but high elevation ASL (low inundation potential). Insufficient toe erosion protection from rip rap. Erosion hotspots adjacent to walls, due to wave focusing.	Moderate risk – moderate erosion rates but high elevation ASL (low inundation potential). Insufficient toe erosion protection from poor condition rip rap.	Moderate to high risk – high erosion rates, and exposed to strong wave energy given shoreline angle. High elevation ASL (low inundation potential). Improved toe protection from recent rip rap.
	Overall Risk (ST)	Low	Moderate (locally high where shoulder is cracking)	Moderate	Moderate to High
	Overall Risk (MT)	Low to Moderate	Moderate to High	Moderate to High	High
	Overall Risk (LT)	Moderate	High	High	High to Very High
	Conclusion	Increasing risk over time due to Sea Level Rise (SLR) and the anticipated increase in storm frequency and severity, likely increasing erosion rates and frequency of coastal inundation.	As for Section 4.1.	As for Section 4.1.	As for Section 4.1.
	Recommendations	Improve rock rip rap protection to mitigate and protect against coastal erosion, wave overtopping and undermining. Ensure consistent height and slope alongshore, following design specifications.	As for Section 4.1. Also: Repair retaining walls to prevent undermining.	As for Section 4.1.	As for Section 4.1. Also: Maintain the recently installed rip rap.

8 Discussion & Conclusions

The road corridor along the 3.3km study section on Cape Palliser Road is comprised of weak rocks and erodible soils which are highly susceptible to erosion and instability.

In addition to active coastal erosion, frequent movement of the Johnson's Hill landslide (Section 2.3) has been particularly problematic for management of the road over many years, resulting in progressive realignment of the road into the hill. A second large active landslide also affects (currently to a lesser degree) the road, at the northern approach into the Te Kopi settlement (Section 3.2). The gentle downslope dip of bedding in the mudstone toward the sea provides the opportunity for sections of slope to fail along these bedding planes; with more permeable bands within this mudstone thought to convey groundwater to lower sections of the slope, resulting in increased risk of instability where these seepages daylight on the sea cliffs below.

While the vast majority of the slopes along the 3.3 km long study section are inferred to have been formed by large ancient landslides most appear to be not active.

Road cuttings (present in Sections 2 and 4) tend to be impacted by rill erosion, but instability of these cuts has generally not resulted in large-scale failures.

Johnson's Hill landslide:

After a period of relative inactivity, the Johnson's Hill Landslide reactivated after the 2016 Kaikoura Earthquake and presents ongoing risks for travel disruption and safety as well as maintenance costs for SWDC.

Due to the scale and complexity of this landslide, options for eliminating the risk here are costly. Large-scale realignment along a 7 km inland route was previously proposed by Beca (2000) – see Appendix H for the suggested route. This option would also bypass most of the rest of the vulnerable coastal sections in the study area apart from DOC Station (Section 1). However, Beca's bypass option has significant constraints.

In order to minimise the disruption at Johnson Hill, the most cost-effective risk mitigation measures are likely to be drainage related: a) slope dewatering using subsoil drains and drilled sub-horizontal drains, and b) management of surface flows to divert these away from unstable or weaker land.

The assessment of the landslide by GNS in the 1990s is largely still valid. However, there is significant uncertainty about the depth, subsurface conditions (including groundwater) and movement behaviour of the landside (and also the Te Kopi North landslide). Investigations to obtain this information are engineering geological mapping, drilling investigations and slope monitoring - using e.g. using comparison of subsequent drone surveys, monitoring of survey marks and borehole inclinometers. This information will enable geotechnical assessment of the landslide(s) and identification of optimal mitigation measures.

Coastal hazards and mitigation

Coastal erosion rates since 1996 are generally of a similar magnitude to those prior to 1996. However, given climate change projections the erosion rates are expected to increase due to high sea levels and more frequent and severe storm events.

The risk assessment carried out is qualitative but shows that while conditions may well be manageable in the short term, in the medium and long-term management of the road is likely to be increasingly onerous, without significant interventions.

Different coastal protection options have been described in this report, all of which are classified according to the nationally defined management approaches for coastal protection: accommodate, protect, retreat and avoidance. Because the coastal hazards affecting the integrity of the road

corridor along Cape Palliser are likely to be more severe with time, a plan to manage the coastal corridor is needed. Nonetheless, managing a stretch of coast affected by both coastal erosion and inundation is very challenging because of the dynamic nature of the coastal system, the large number of factors affecting decision making, and because of the uncertainty component that climate change adds.

Different interventions along the coast are likely to be effective, but care needs to be taken as managing different section of the coast in isolation has proven to have secondary effects (e.g. end-effects created by hard structures), affecting negatively other parts of the coastline. It is therefore recommended to take a holistic approach in order to create a Strategic Management Plan for the whole coastline, being informed by the dynamic adaptive pathway (DAP) approach following national guidelines (MfE, 2017).

"An adaptive pathway planning approach is a risk-based approach which avoids the need to have firm 'predictions' or to use only one scenario as a basis for decision making. It accommodates uncertainty (…). The dynamic adaptive policy pathways approach develops a series of actions over time (pathways) to achieve objectives under uncertain and changing conditions. It is built on the notion that decisions are made over time as conditions change, and cannot be predicted" [(MfE, 2017), *pg.26]*

Short-term options would include the reshaping of the current rocks spread along the foreshore to improve slope consistency and alongshore continuity. Furthermore, the design of a more resilient coastal revetment for the areas more heavily affected by coastal erosion can help reduce maintenance costs and risk to people and vehicles during storm events.

Drainage measures are a key method for minimising the risks of instability through control of surface stormwater away from vulnerable areas, and targeted subsoil drains to intercept groundwater that is contributing to instability on cliff faces below the road or slope movements generally.

This study considers only a 3.3 km stretch of Cape Palliser Road. Similar issues relating to coastal erosion and inundation are seen further south of the study area at specific locations along Cape Palliser Road. Further investigations to identify at-risk areas in these other sections of Cape Palliser Road would be appropriate to increase the long-term resilience of the road as a whole, and to maintain access for residents and visitors to the southern end of the road.

We are also aware of other risk mitigation options that are being explored for Cape Palliser Road, which are not considered in detail in this report. This includes the 'Eco-Reef' system – comprising hexagonal concrete blocks, sand, aggregate and native plants – which are proposed to be trialled in three locations along the Cape Palliser Road in conjunction with SWDC – including one at the northern end of Section 1.1.

9 Recommendations

The following recommendations are intended to provide next steps for meeting SWDC's requirements to address short-term risks and a path for the future for managing risks along Cape Palliser Road.

1. Develop a **Strategic Management Plan (SMP)** for the road for the short to long term, based on the risks and mitigation options outlined in this report and consultation with the various stakeholders. Ideally this should be extended to include other 'at risk' sites to the south of the study area to provide a comprehensive assessment of the whole length of Cape Palliser Road. The SMP can be carried out in a staged manner and the intention is that this document will guide the scope of subsequent recommended items.

Landslide risk management (short-term actions for Johnsons Hill and Te Kopi North landslides)

2. Carry out investigations including engineering geological mapping of the Johnson's Hill and Te Kopi North landslides to better understand its extent and depth with a view of providing recommendations for targeted subsurface investigations and remedial measures.
3. Carry out survey monitoring of two landslides, involving establishment and survey of marks/pins, UAV surveys and rainfall gauge monitoring to assist detection of movement trends in the landsides.
4. Drill investigation boreholes and install groundwater and slope movement monitoring instruments (PVC standpipes and inclinometer tubing) to determine the depth of movement and groundwater conditions in the landslide at the two landslide sites.
5. Progressively develop subsurface ground model of the landslides based on assessment of geotechnical investigations and monitoring and carry out computer-based slope stability assessment.
6. Develop stabilisation measures based on geotechnical assessment of the data.
7. Devise and implement drainage measures to improve slope stability, including installation of drilled sub-horizontal drains and surface and/or subsurface cut-off drains in the landslides – especially above the road at the Johnsons Hill site. It is envisaged that this work could be staged with some works started early at obvious locations.

Coastal erosion risk management (short-term measures)

8. Design and implement more robust rip rap coastal erosion structures throughout the site, including provision of guidelines for repairs and new structures. This will improve slope consistency and alongshore continuity.
9. Repair or replace concrete-faced walls at Whatarangi Bluff where damage has occurred at the edges of these walls. This will reinstate protection and support of the cliffs.
10. Progress risk mitigation designs for the highest risk erosion hot spot sites.
11. Carry out periodic aerial surveys of the project area (e.g. LiDAR or UAV 3D models), to allow coastal cliff regression rates to be monitored and coastal erosion hot spots to be identified.
12. Carry out inspection of structures and erosion hot spots investigations at set frequency intervals and after storm events.

Longer-term recommendations

13. Review road drainage throughout the site, identify deficiencies and implement improvements.

14. Design and implement interventions for long-term coastal protection and slope stabilisation within the study area (and elsewhere on Cape Palliser Road), as identified in the Strategic Management Plan (SMP).

15. Develop business cases to secure funding to implement the preferred options from the agreed Strategic Management Plan.

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Disclaimers and Limitations

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