Part A

INFRASTRUCTURAL ASSET MANAGEMENT PLAN

Policies and Procedures common to all Scheme assets managed by Horizons Regional Council

horizons regional council

Effective 1 July 2018

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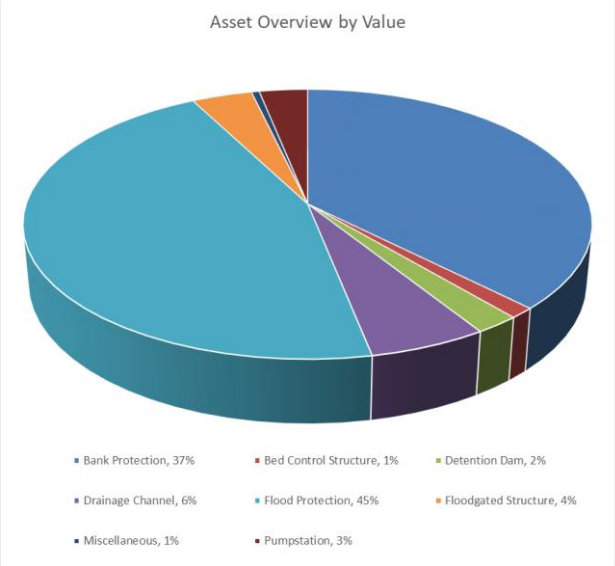
NON-TECHNICAL SUMMARY

Horizons Regional Council now manages 34 river and drainage schemes (see list in Appendix G). They range in scale from schemes that have no assets and are focussed on maintaining the channel capacity through vegetation clearance, to the Lower Manawatu Scheme (LMS) that has a diverse portfolio of assets, some extremely complex to operate and maintain, with an annual budget of over $10.8 million.



A major part of many schemes is the flood protection provided by stopbanks. These account for the majority of the value of the river and drainage scheme assets in the Region. The bulk of the rest of the value is made up of erosion protection works which includes live protection works and rockwork, drainage channels and the Moutoa Sluicegates.

The combined replacement value of the 28 schemes with assets is around $467 million. Together they form systems that limit damage to people and property (land, buildings, roads etc.) along rivers and on floodplains throughout the Region.

Figure 1: Asset Overview by Value

Horizons is required by the Local Government Act (LGA) to apply sound accounting and management practices to these systems. Asset management planning for river and drainage schemes is one aspect of this.

The quality of river and drainage engineering in New Zealand has evolved over time as land use has developed and funding policies have changed. In many cases, the past approach was ad hoc, but tailored to meet current objectives. However, because of the long time frames involved, this often meant a cycle of disaster (e.g. flood) and response (e.g. erosion protection), then a period of complacency, leading to a gradual deterioration (lack of maintenance) until the next major flood. The present focus of asset management planning for Horizons is the maintenance of the existing assets so that they do not deteriorate and therefore, continuously meet objectives agreed with each scheme's stakeholders.

An important aspect of asset management planning is to identify and monitor the assets so that long-term costs can be identified and appropriate decisions can be made, such as when to replace them. For example, trees may provide an erosion protection function along a riverbank, but their condition (e.g. age and vulnerability to erosion) will impact on their usefulness and effectiveness in providing that protection.

Horizons has completed the process of enhancing its asset knowledge by mapping assets using the latest Geographic Information Systems (GIS) methods and linking these maps to the asset database. The maps are also updated annually to show the

extent of completed capital works and any other significant changes such as that arising from flood damage.

An important outcome is the ability to periodically review the effectiveness of existing river assets and develop more appropriate channel design.

The Asset Management Plan (AMP) for each scheme shall make clear:

- the standard of maintenance and/or flood protection for each scheme;
- the significant risks to the assets; and
- the monitoring and reporting requirements for each scheme.

The AMP is also an appropriate place to summarise some of the risks to the community.

This AMP is divided into two sections:

- Part A, a base plan which sets out the policies and procedures common to all the schemes; and
- Part B, which sets out specific asset related information for each scheme.

Part B comprises 27 separate documents, one for each of the schemes with infrastructural assets. (Moutoa and Whirokino merged as one)

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1. Introduction

1.1 Background

The River Management Group of Horizons Regional Council (Horizons) currently administers and manages 34 River and Drainage Schemes that range in size and complexity. Six of the river schemes only involve channel maintenance and have no assets, while the remaining 28 schemes have a total asset value of $465 million. The majority of this value is found in five river schemes and four drainage schemes, with the Lower Manawatu River Scheme (LMS) maintaining over $252 million of assets alone. The asset type with the largest value is stopbanks, followed by live protection works (including tied tree works, protection plantings and erosion protection reserves), drains, rock linings and the Moutoa Sluicegates. Floodgates, pumpstations and detention dams form a minor part of overall scheme assets. A full summary of the value of assets in each scheme is set out in Appendix L.

River control and drainage infrastructure assets in these schemes form stationary systems or networks that serve defined communities. The systems as a whole are intended to be maintained indefinitely to specified levels of service by the continuing maintenance, replacement, and refurbishment of their component parts.

Infrastructure assets are not tradeable as a system even though individual components such as pumps may have a tradeable value and be able to be sold. Infrastructure assets have a high degree of interdependence, both within a system and/or between networks. For example, the failure of a section of erosion control planting could lead to the failure of a section of stopbank and ultimately to flooding of property. The failure of a river control system could also undermine the ability of a roading or sewerage network to perform its function.

Infrastructure assets are constructed to a defined standard or service level and this level may be reduced in time with wear or damage leading to a reduction in the performance standard of the system or a reduction in the economic life of the system. This loss of service potential can be restored or replaced with maintenance and/or the renewal of component parts of the system. The standard of the system may also need to be changed either by increasing or reducing the service level according to the requirements of the community benefiting from the service provided by the assets.

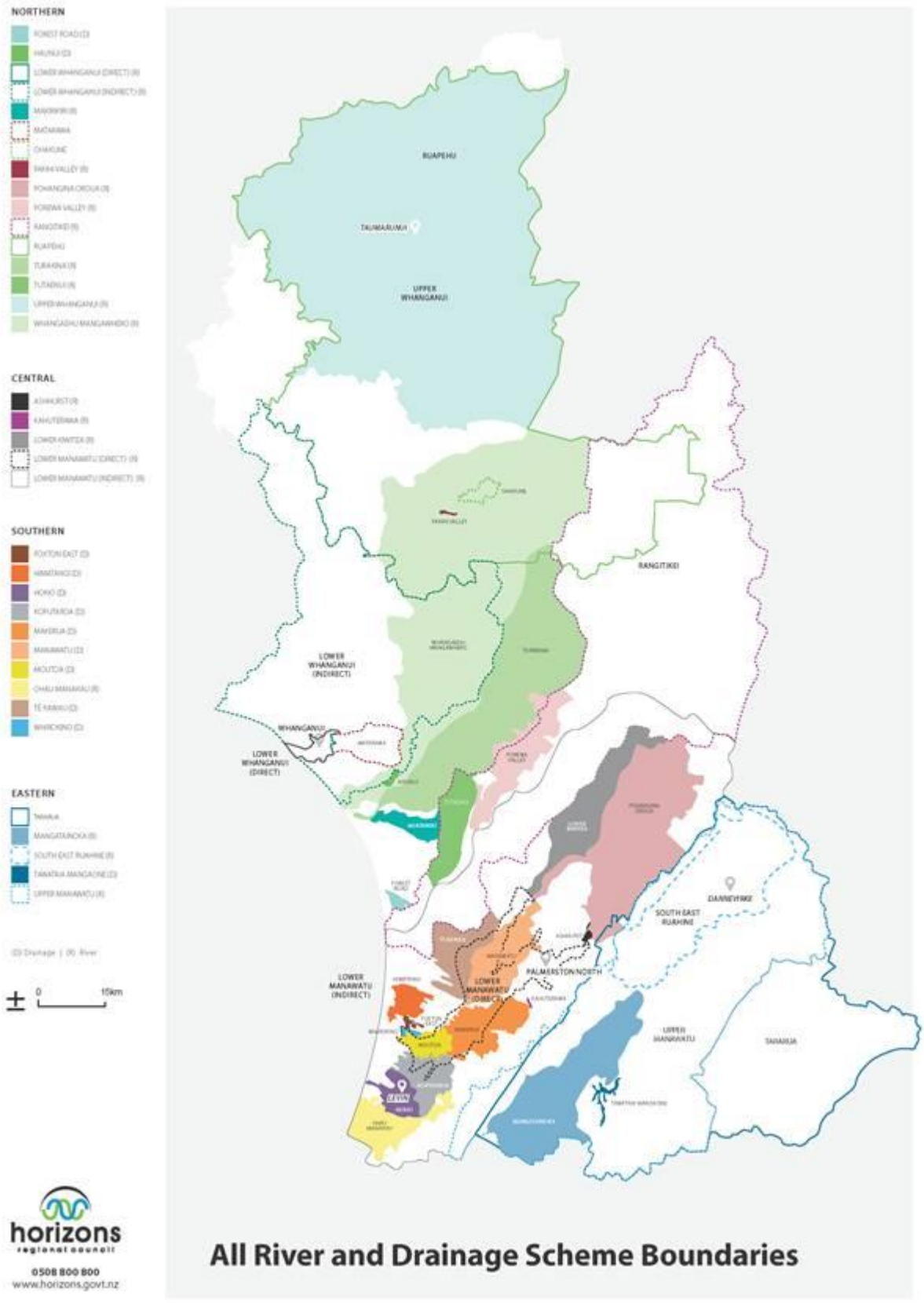


Figure 2: River and Drainage Schemes of the Horizons Region (Rating Areas)

The Tararua District, Ruapehu District, Kahuterawa, Ohakune, Turakina, and Whangaehu-Mangawhero Schemes only undertake channel clearance works and do not maintain any flood or erosion protection assets. Therefore, there is no Scheme specific AMP or Register of Assets for those six schemes.

1.2 Overview of Other Relevant Documentation

The diagram below shows how the AMP fits into the planning framework that integrates our business across different legislative requirements.

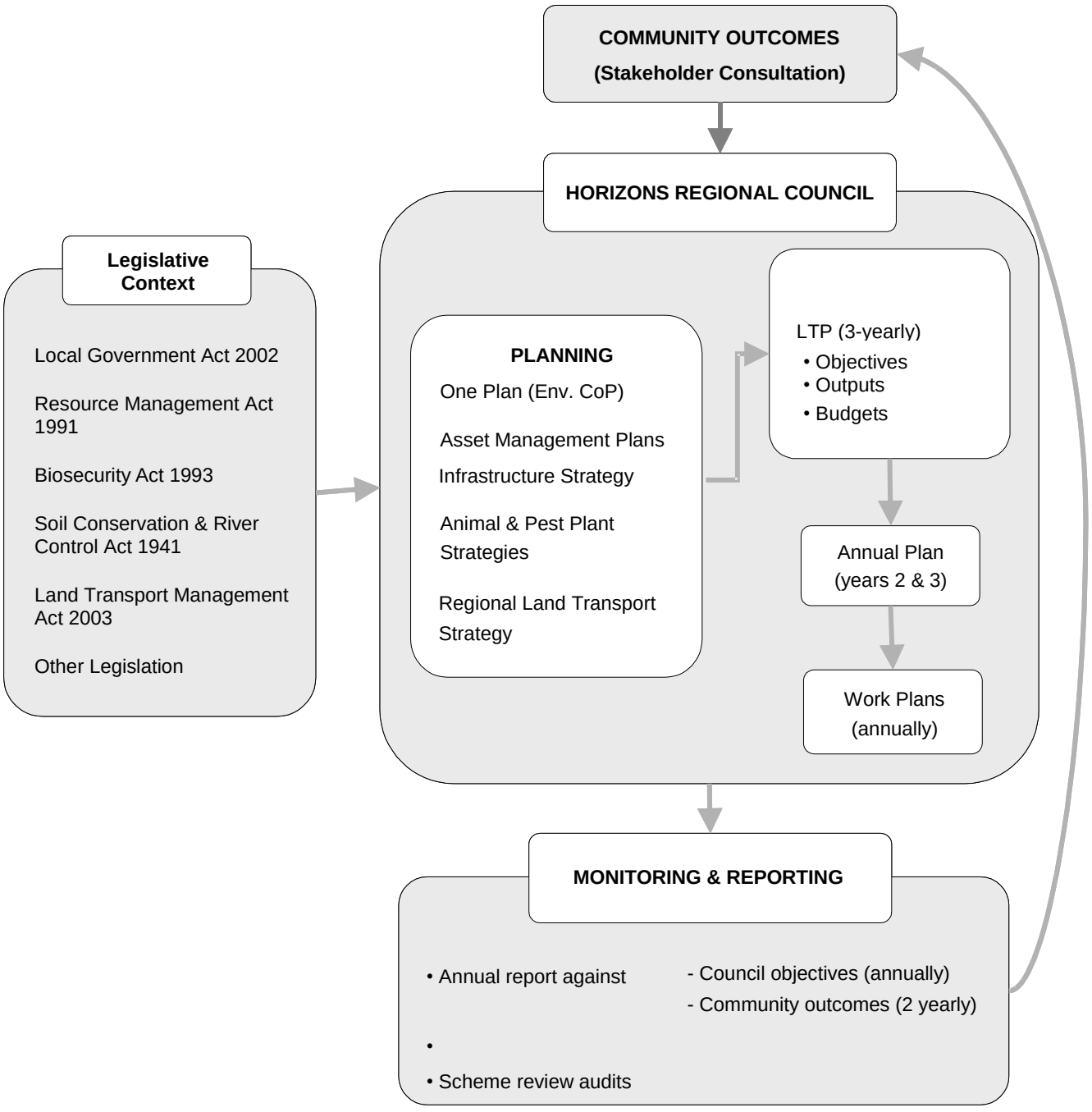


Figure 3: Planning Framework

1.3 Long-Term Plan

Under the Local Government Act 2002 (LGA), councils must produce a Long-Term Plan (LTP) every three years.

The LTP includes Horizons' work programme in detail for the next three years and in general for the following seven years. An additional requirement introduced in the amendments under the LGA in 2014 is for an Infrastructure Strategy extending forecast expenditure at least 30 years into the future. In the years between, Horizons must produce an Annual Plan. The LTP consists of two volumes:

Volume 1 – Long-Term Plan

Considers the priority issues that communities have identified over the next 10 years.

Volume 2 – Council Activities, Financials and Policies

Considers Horizon's required expenditure to undertake its responsibilities that include the management, design and operational activities associated with river and drainage schemes in the Region.

The LTP links community outcomes with Council business. Each group outlines their objectives for the following 10 years, with the detail provided in each group's annual business plan.

The process revolves around the LGA, it specifies that Council has to have an audited annual plan and report on their achievements against this annual plan in an Annual Report. Asset Management Plans are revised on a three yearly cycle and feed into the LTP which is also produced every three years. Scheme Reviews are undertaken in accordance with Table 1.

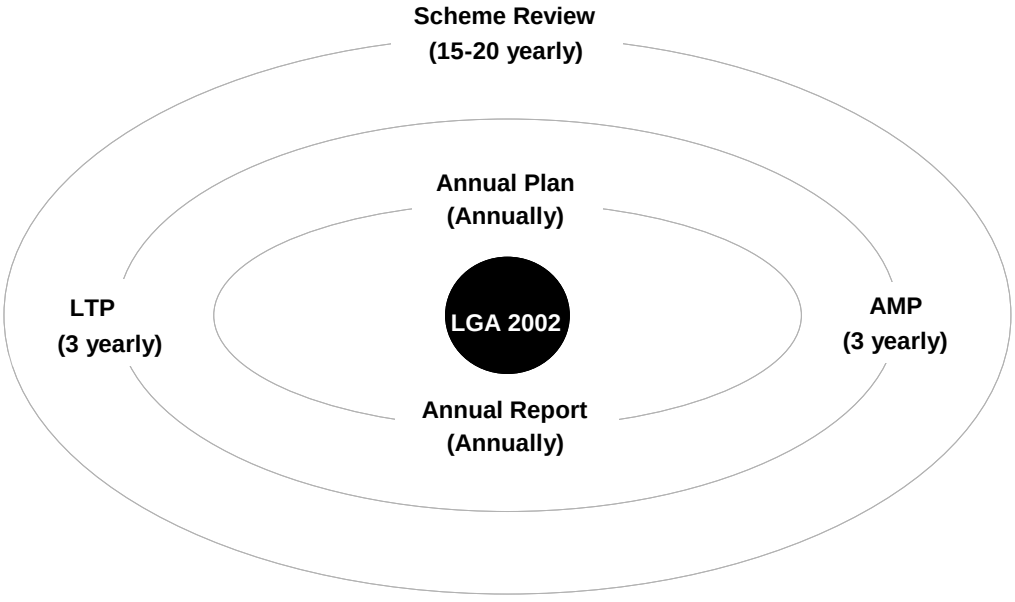


Figure 4: Overview of the LTP Process

1.4 Linking Community Outcomes to Asset Management Plans

Community outcomes are defined in the LGA and include the outcomes Horizons aims to achieve to meet the current and future needs of its communities for good-quality local infrastructure. The outcomes are described in the Long-Term Plan (LTP), which is developed every three years in consultation with Horizons' communities.

The LTP sets out what activities Horizons' intends to carry out over the coming ten years, and the levels of service for each activity. The community outcomes are linked to the activities that contribute to them, to show what Horizons is doing to achieve them. Council reports regularly on how it has progressed its community outcomes by linking them to the contributing activities in the Annual Report.

The natural hazard resilience community outcome is most closely linked to community awareness and response to natural hazards or emergencies. The levels of service for these activities come from this Asset Management Plan, which therefore contributes to the natural hazard resilience community outcome.

The LTP defines the goal for the natural hazard resilience community outcome as:

A community that is aware of hazards and is prepared and empowered to respond to and recover from a natural hazard or emergency.

The flood control schemes that provide a prescribed level of protection against flood events are managed by the River Management Group and are included under Part B of this AMP. Horizons provides early warning of flood events through a large network of river and rainfall monitoring stations, this network is managed by the Catchment Data Team and is not covered in the AMPs.

Our river and drainage activities contribute primarily to achieving natural hazard resilience and a robust economy by:

- Protecting people, property and infrastructure from flooding by containing floods to river corridors and floodways;
- Building and maintaining drainage networks, pump stations and other infrastructure to enable low-lying land to be farmed; and
- Reducing the effects of river erosion on adjoining land.

How well Horizons meets these goals is judged through feedback and consultation with stakeholders and communities, supported by regular inspections and surveys. Goals are met through the development of and compliance with plans and standards such as the Environmental Code of Practice for River Works (CoP), which address the environmental and cultural goals, and the AMPs, which focus on the economic and risk management aspects of the outcome.

1.5 Scheme Reviews

While the LTP process consults on and defines community outcomes, a Scheme Review consults on and defines levels of service. A Scheme Review assesses the current level of service for flood and erosion protection and drainage services provided by a scheme, and analyses the gap between what is currently provided and what the community desires. A business plan is proposed that closes any gap between current and desired levels of service, for instance a Scheme Review may determine that 20% of assets are in a poor condition, however the community would like that to be reduced to 10%, therefore the business plan included in the Scheme Review would address this gap.

The essential elements of the Scheme Review are:

- the level of service currently provided;
- the cost of providing the existing service;
- the level of service the community wants; and
- the cost of providing that desired service.

A level of service is ultimately agreed between Horizons and the community and funding provision is made in the LTP. The plan is then implemented.

The dynamic nature of river systems means that Scheme Reviews are necessarily subject to periodic amendment. Works recommended in the Scheme Review may have to be re-prioritised due to floods, changing land use or new inspection and survey data. Horizons may also have other good reasons to alter the priorities of maintenance and capital works outlined in Scheme Reviews. Scheme Managers consult with affected groups before any significant changes are made to the recommended works programmes.

Horizons have completed reviews for all of the schemes it managed over the period 1992 to 2010. Whilst there is no current policy that guides the frequency of reviews, the need for reviews in the next 10 years has been determined through consideration of the changing expectations and desired performance of the Schemes.

River management plans provide guiding documents for a number of new schemes introduced since 2003. The latest of these were for the Taringamotu and Kahuterawa Schemes, which came into effect on 1 July 2012.

Scheme Audits

A programme of Scheme Audits has been introduced to examine the degree to which the recommendations of Scheme Reviews have been carried out and how well the actual scheme costs align with the assumptions made in the development of targeted rating systems.

It is accepted that some deviation from the recommendations will inevitably occur and that management must be flexible enough to accommodate changed circumstances and experience gained over the years since the review.

The purpose of the Scheme Audits is therefore not to ensure that management blindly follows the review recommendations, but rather to ensure

that where significant deviations have occurred there has been a well-informed, considered and documented process leading to that change.

The Scheme Audits report on changes since the most recent review and identify any further changes required to performance and management strategies, as well as any changes to the rating system.

While it had originally been intended to audit all schemes on a 5-yearly cycle, it was subsequently determined that similar objectives would be achieved on a 10-yearly cycle. It is this cycle that has been used to inform the programme going forward.

Operations and Maintenance Manuals

The Infrastructure Strategy 2018-2048 has identified the need to prioritise operational effectiveness and reliability of Horizons' flood protection network. As part of the response strategy to this issue Operations and Maintenance (O&M) Manuals will be developed for the Schemes. These O&M Manuals will be developed with risk and criticality as central considerations applying the assessment framework developed for dams in 2017-18.

Programme of Scheme Reviews, Audits, and Operations and Maintenance Manual Development

The programme for scheme reviews, audits and the development of O&M manuals is shown in table 1 overleaf. This programme has been developed as a prioritised implementation plan as each will require a level of resourcing to develop and produce. All programmed audits, reviews, and O&M manuals have been budgeted for in Horizons' 10 year financial forecasts.

Table 1 - Scheme Reviews, Audits, and O&M Manual development programme

1.6 Infrastructure Strategy

Horizons are required by the 2014 amendment to the LGA to prepare a long-term financial strategy containing projections for at least 30 years[1] of future revenues, expenses, cash flow and loan requirements in respect of all infrastructural assets. The basis of these requirements was a desire that Local Authorities take a long-term view of their activities and ensure the responsible management of the assets under their control.

1.7 Asset Management Plan

The first set of AMPs was prepared in June 1998. The current review of these AMPs will be completed in 2017, and will feed directly into the LTP 2018-2028.

Asset Management Plans must also reflect roles and responsibilities of Horizons with regard to river and drainage management which are defined in:

- Orders in Council for Local Government Reorganisation 9 June 1989.
- Resource Management Act 1991.

[1] LGA Amendment 2014, previously 10 years. Must now include forecast renewal expenditure.

- Local Government Act 2002.
- Civil Defence Act 1983.
- Public Works Act 1981.
- Soil Conservation and Rivers Control Act 1941.
- Land Drainage Act 1908.

Asset Management Plans comprise of:

- Part A, Base Plan, which sets out the policies and procedures common to all the schemes; and
- Part B, Scheme Specific, with particular information for each river and drainage scheme.

Part A: Base Plan

The Base Plan sets out the policies, processes and procedures which are common across all river and drainage schemes including:

- overview of asset management;
- the components making up infrastructure assets and their purpose;
- the methods to be employed to ensure they provide the services required;
- the requirements and methods for monitoring asset condition and performance;
- the funding policies;
- risk assessment, risk management and damage recovery;
- consultation methods and approvals;
- reporting;
- reviews; and
- continuous improvement of asset management practices.

Part B: Scheme Specific

Asset management plans for each scheme will define:

- the standard of flood and/or erosion protection to be provided for each scheme;
- the significant risks to the assets; and
- the monitoring and reporting requirements for each scheme.

The detail provided by scheme specific Asset Management Plans will include:

- the history of the scheme;
- agreed service levels;
- Scheme benefits;
- expenditure and funding projections;
- flood history;
- damage exposure;
- reporting on performance; and
- consultation.

1.8 History of Asset Management Plans

The need for AMPs was recognised in the mid 1980s when it became apparent to the Audit Office that many of the infrastructure assets in New Zealand were nearing the end of their economic life and no plan or financial provision had been made for their upgrade or replacement. It was also recognised that continually deferred maintenance was leading to reduced service life of some infrastructure assets and/or some infrastructure was being kept in service beyond its economic life.

In 1992 the LGA was amended by the addition of the 'Number 3 Amendment', which required local government to adopt sound accounting and management practices. The practices that facilitated compliance with this requirement included valuation of infrastructure, depreciation of value to recognise the loss of service potential, funding depreciation to provide a fund to replace 'worn' assets and asset management planning.

Horizons completed AMPs for all of its river and drainage schemes in 1998 and the first valuation of its infrastructure assets under FRS-3 in 2001. These plans followed a standard format, which was developed in consultation with Audit New Zealand.

To assist Asset Managers, a consortium called the National Asset Management Steering Group (NAMS) including Association of Local Government Engineers New Zealand, Local Government New Zealand, New Zealand Society of Local Government Managers, Office of the Auditor General, New Zealand Recreation Association, New Zealand Water and Wastes Association and the Hansen User Group, prepared and published the following:

- International Infrastructure Asset Management Manual.
- NZ Contract Management Manual.
- NZ Infrastructure Asset Valuation and Depreciation Guidelines.
- Creating Customer Value from Community Assets.
- Optimised Decision Making Guidelines.

This series of manuals are the guidelines to current best practice for managing infrastructure assets and have been followed in the development of these AMPs.

1.9 Annual Report Requirements

Schedule 10, Clause 15 of the LGA requires that councils should:

- report the results of any measurement undertaken during the year of progress toward achievement of community outcomes to which a group of activities contributes;
- include in an audited statement a comparison between the actual service provisions and the intended level of service (as per the LTP) for groups of activities; and
- include in the audited statements the reasons for any significant variance between the actual provision and the expected service provision.

In addition, Section 261B of the LGA requires councils to report specifically on flood protection and control works in accordance with the Non-Financial Performance Measures Rules 2013.

1.10 Advanced Asset Management Plans

This Plan includes the features of advanced asset management as appropriate for the type of assets being managed.

1.10.1 Objectives of the Asset Management Plans

In accordance with Audit New Zealand criteria, the objectives of the AMPs are to:

- define the desired level of service;
- deliver the existing or desired levels of service;
- ensure assets are maintained in perpetuity without loss of service potential, either through maintenance or by programmed renewals; and
- ensure that assets are managed and maintained in the most cost effective way over their life cycle.

These objectives are put into practice by:

Maintenance
Maintain all flood protection and drainage scheme assets in perpetuity.

Financial Management
The value of an asset being maintained in perpetuity will:

- reduce, should part, or all, of the asset be removed, because of flood damage (“write down”);
- increase through the replacement of flood damaged assets following a write down, or through the creation of new assets; and
- adjust when asset replacement costs change.

Monitoring
Comprehensively monitor the river and drainage systems to show:

- assets are maintained efficiently in perpetuity; and
- assets are capable of delivering the level of service they were designed for.

The Asset Management Plan details the procedures and policies that ensure cost effective and measurable levels of service are provided to the regional community. The direct benefits of sound asset management are:

- the level of service required by the community is provided;
- the cost of owning assets is minimised over their lives (lifecycle costs);
- the risk of asset failure is minimised (risk management);
- decisions to add to, or replace, components are optimised; and
- there is improved accountability over the use of public resources.

Assets are classed under several major types and subtypes and are shown in Appendix L**.**

1.10.2 Levels of Service

Scheme specific AMPs record the desired level of service, the asset's ability to provide that level of service and the financial requirements to satisfy that desired level of service. Levels of service for flood control schemes are described as the asset's ability to withstand a flood event having a particular capacity or return period. This depends on the level of flood protection provided and the system's ability to withstand erosion during flooding.

Since flood events occur rarely, performance measures need to be established so as to determine the asset's ability to provide the level of service required.

Levels of service and related performance measures are discussed in more detail in Part B, the scheme specific AMPs.

1.10.3 Timeframe

All the schemes are managed to provide the agreed level of service in perpetuity subject to changes of those service levels when requested or agreed by the affected communities.

1.10.4 Description of Assets

All the assets have been recorded as to quantity, type, location and value. This information is currently stored in the Asset Management System (AMS), a purpose built computer database specifically developed for Horizons using PowerBuilder software. Locations of assets have traditionally been either through river distance, marked up aerial photos or on scheme plans.

Assets have now been more precisely located in the field using GPS and mapped electronically using GIS, which has then been used to reconcile and update the existing AMS data. This has improved the accuracy of scheme maps and provides a common electronic data source for viewing on the office intranet (using Compass) or on handheld electronic devices by field staff.

While this process has seen some significant changes in some asset dimensions and quantities, the resulting change in value for any scheme has generally been less than 10% and in any year the overall change in total scheme value has been less than 1%.

The existing record is a reliable physical inventory of assets linked to their financial description meeting the valuation standards set out in the NZ Valuation and Depreciation Guidelines.

1.10.5 Financial Forecasts

Ten-year financial forecasts are updated and reported to each Annual Scheme Ratepayers meeting (as required by this Plan, sec 9.2(a)). Deferred maintenance, such as flood damage repairs, that will affect the level of service of an asset is recognised by a write-down of the asset's value. Expenditure to

return the asset to its desired level of service will then be included in the CAPEX forecast for that scheme.

Long-term forecasts projecting at least 30 years into the future have also been prepared to plan for asset renewals as required by Council's Infrastructure Strategy (as described in Section 5).

1.10.6 Assumptions, Confidence Levels and Improvement Programmes

A section on confidence levels, assumptions and improvement programmes is included in this Plan (see Section 10).

1.10.7 Qualification and Experience

This Plan has been prepared by experienced river and drainage and asset management engineers, and has been peer reviewed by a professionally qualified engineer.

1.10.8 Peer Review of Asset Management Plans

To judge how successful our AMPs are, they will be peer reviewed against the following 10 audit criteria set out by Audit New Zealand:

- defined service levels;
- defined timeframes (lifecycle);
- assets described (physical and financial);
- adequate financial information (10 years +);
- recognition of declining service potentials;
- assumptions and confidence levels stated;
- improvement programmes outlined;
- to be prepared by qualified people;
- to be a firm commitment of the organisation; and
- to be regularly reviewed.

1.10.9 Commitment

Horizons and its engineering staff are committed to AMPs as the key tool for managing its river control and drainage assets. Horizons and staff see the public consultation process and Liaison Committee structure as vital to ensuring the communities receive the services and ownership of the river control infrastructure at a cost that is sustainable to them.

1.10.10 Updating

Provision is made in the plans for review after three years, to link in with the LTP, or sooner if there is a change in the maintenance or funding policy.

1.10.11 Risk Management

Horizons is the flood manager for the Manawatu-Whanganui Region with responsibility to the community for flood mitigation and control. Flood mitigation is provided by networks of infrastructural assets that provide a

defined level of service to a community. Assets may fail when the level of service provided by an asset is exceeded, such as during a major flood event. Failure may begin as the relatively minor loss of erosion protection to a stopbank, leading to the stopbank being vulnerable to erosion and a catastrophic breach, resulting in significant flooding and endangerment to life.

Horizons has an Emergency Response Manual that outlines the processes and procedures that will be undertaken in times of heightened flood risk or emergency situations. This manual links to the Emergency Response Plan which describes the relevant roles and responsibilities of Horizons' staff at the varying levels of the response. Some schemes have specific Flood Action Plans to ensure a properly coordinated response with local authorities and emergency services.

Other risks such as earthquake, piping, pest infestations (biosecurity), climate change, silt build-up and gravel accumulation are discussed in Section 3.

1.10.12 Optimised Decision Making

The useful lives of infrastructural assets managed by Horizons are significantly affected by flood events and changing levels of service rather than the length of service, wear and tear or predictable loading undergone by the asset.

Given that most of the infrastructure is required to be maintained to its full service potential in perpetuity, optimised decision making with respect to replacement and predicting maintenance requirements is not very relevant and planned renewals are more simply based on the useful life approach.

The opportunity does exist however, for future lifetime optimisation of major floodgated structures and pumpstations.

2. Funding

2.1 Funding Policy

Horizons' funding policy for river and drainage works is set out in the Funding and Financial Policies section of the Council's Long-Term Plan.

In summary, the funding of scheme works is based on either the benefit a community receives from the works or the extent to which the activities of a community cause the need for the work. Funding comes from three revenue sources as follows:

- Targeted Rates – differential targeted rates levied on properties receiving direct benefit from (or causing need for) the work. Differentials between groups of property depend on level of benefit or cause. Targeted rates fund 80% of scheme costs.

- General Rates – uniform rate levied over all properties in the Manawatu-Wanganui Region. This funding represents the benefits that are received by the whole Region from scheme works, including the benefits to national infrastructure and people from outside the Region. 20% of scheme costs are funded from the general rate.

- Other Income – some schemes have revenue from other sources including land rentals and forestry. Those revenues reduce the funding required from targeted rates.

2.2 Financial Assumptions

The key financial assumptions used for this AMP are:

- annual asset maintenance costs determined from a zero base are adequate to maintain assets in perpetuity;
- flood damage will be repaired;
- annual business plans will reflect the financial requirements of the Scheme specific Asset Management Plan;
- long-term resource consents will be granted for river maintenance and operations;
- the current regime of gravel extraction and channel maintenance will continue for the duration of this Plan; and
- current costs of labour and materials will remain stable or at least remain in-line with inflation.

In addition, key factors from the Infrastructure Strategy are:

- asset life cycles are determined as attached in Appendix C;
- renewal funding provision is required when the renewal funding line is below the loan servicing cost line; and
- annual renewal funding provision is 1% of 100 year assessed renewal cost.

2.3 Accounting Practices

2.3.1 Valuation

The assets were revalued on 1 July 2017 and these asset values have been used in this AMP.

Revaluation was based on the methods developed for the July 2001 valuation, updated for current construction costs and taking into account new capital works, replacements and loss in service potential (e.g. un-repaired flood damage). The methodology adopted was the current replacement cost basis in which the significant elements of the infrastructure were identified, measured and valued at the current cost of that work type. Unit rates were developed for the major asset types, based on actual costs. The values are necessarily approximate, due to the variability of the works involved, but provide a reasonable overall average. If work has not been undertaken recently on a particular asset sub-type in a scheme, the replacement cost of that asset is brought up to today's replacement costs using the appropriate Capital Goods Price Index supplied by Statistics NZ.

This revaluation process is carried out every three years, with annual adjustments for additions or disposals based on actual capital expenditure and the unit rates from the last revaluation.

The major assets, by value, are stopbanks, rockwork, flow diversion structures, tied tree work, and drains. Minor assets include floodgates, bed control structures and miscellaneous bank protection works. Dams and pumpstations each make up about 3% of the total value. An important notional asset in many schemes is the maintained flood capacity of the river fairway. The fairway has not been included in the valuation.

The valuation methodology was peer reviewed in 2018 and complies with:

- NZ IAS 16, Property, Plant and Equipment; and
- NZ Infrastructure Asset Valuation and Depreciation Guidelines. In particular, account has been taken of section 5.5 (Land Drainage and River Protection Assets) of this guideline.

The value of assets described in this plan will change during the life of the plan due to:

- assets constructed or disposed of to provide the desired level of service;
- assets replaced following flood damage may not be of the same type as those lost;
- annual maintenance activities that may have resulted in minor extension of some edge protection assets; and
- loss of assets during extreme events.

Financial information on assets is maintained and updated in the Financial Management Information System (OZONE). Increases and decreases in valuation are reflected in the revaluation reserve and are accounted for in accordance with NZ IAS 16. Information maintained in OZONE and the general ledger is reconciled to the AMS. The AMS not only includes financial

information, but details of the asset's useful life, which is used for depreciation calculations of an asset's value.

2.3.2 Depreciation

The LGA (including amendments) establishes a framework for the financial operations of Horizons. One of the requirements of the Act is that for each year, the projected revenues of Horizons must cover its projected expenses. One of the items that is specifically referred to in the Act as being an expense is the cost of "the decline in the service potential of assets". Depreciation is the commonly accepted method of recording and accounting for the decline in service potential. Effectively therefore the Act stipulates that Horizons should, as part of its projections of likely expenditure, include the annual depreciation for all its assets and that it should collect revenue to cover these costs.

In principle, this requirement to account for and fund depreciation is fair, as it ensures that the costs of using assets are allocated over the years in which benefits are received. However, depreciation is only required where there is a loss of service potential and Horizons plans to maintain most scheme assets as a whole in such a way that their service potential does not decline. There are also concerns over the impact of depreciation on current ratepayers where loans for capital improvements are also being serviced, as effectively the current ratepayers would be paying twice for the assets.

Earthworks (stopbanks and drains) and erosion control works (plantings and rock linings) are generally considered to be maintained in perpetuity by continued maintenance, repair and replacement when damaged. This is to maintain the systems in a condition which will ensure they are always capable of performing to their full service capacity, unless a conscious decision is made by the scheme stakeholders to reduce the level of service. The asset life is not time-dependent, but rather influenced by the frequency and severity of the loading imposed on them by the river (where and when flood forces occur). As a result, certain assets are to be depreciated but not necessarily funded.

All the operating and maintenance costs are expensed in the year they occur and the assets are kept in a condition to provide their full service performance at any time. The small ancillary structures such as fencing are treated as part of the main item and any repairs or replacements are expensed as they occur. For those assets that are not depreciated, any work to restore them to their stated service potential will be treated as operating expenditure, so long as this expenditure is incurred prior to the end of the same financial year the damage was incurred.

In a situation where the asset service level has been impaired and the damage cannot be repaired within the term of the valuation that is within the financial year the value of the asset is to be written down by the estimated cost of the replacement or repair and the repair cost treated as a capital item.

Most of the assets are considered to have infinite life spans. Structures such as floodgates and pumpstations are, however, depreciated over the useful life of the asset.

This approach to depreciation is consistent with Section 5.5.4 NZ Infrastructure Asset Valuation and Depreciation Guidelines.

The asset management policy in Appendix B describes the approach taken for each asset, while the resulting useful lives and depreciation applicable to all asset subtypes are set out in the table in Appendix C.

2.4 Maintenance Funding

The level of maintenance and the strength of river control systems are very much limited by the ability of the benefiting community to pay the costs of physical works. Maintenance is funded by scheme and general rates, the level of rating being determined each year through the Long-Term Plan/Annual Plan process, which involves:

- preparation of a works programme and corresponding budget;
- discussions with Liaison Committees and scheme stakeholders at Annual Scheme meetings;
- adoption of the draft programme and budget by Horizons;
- public notification of the Draft Long-Term Plan and consideration of submissions; and
- adoption of the final Long-Term Plan by Horizons.

2.5 Damage Repairs

Routine damage repairs are generally funded by a combination of:

- reprioritising works within the current works programme; and
- use of scheme and general infrastructure reserves (recovered in subsequent years by rating).

Major damage would generally be funded by:

- reprioritising works within the current works programme;
- use of scheme and general infrastructure reserves (recovered in subsequent years by rating);
- claims on Council's Infrastructure Asset Insurance policies where they are in place;
- loans raised either internally or on the commercial markets and repaid by rating in subsequent years; and
- grants from Horizons' general infrastructure reserve or from Central Government under the National Civil Defence Plan (the Recovery Plan).

2.6 Asset Impairment "Write down/Write up"

When an asset is damaged by a flood event, a loss of service potential will occur until the asset is reinstated. Reinstatement of damaged assets is, in the majority of cases, completed in the same fiscal year as the loss occurs.

If the asset is not repaired in the same fiscal year as it was damaged, the asset is written down in the Asset Management System by writing down the

asset dimensions to reflect the actual quantities and dimensions in the field at the end of the fiscal year, and subtracting the actual estimated cost of repairs from its replacement value. When the damaged asset is repaired, the asset is written up in the AMS by recording the increased dimensions and adding the actual cost of the repairs to the asset valuation as a CAPEX addition. The increased dimensions are linked to the cost of repairs in the Asset Management System so all asset improvements are accounted for.

All changes in values are accounted for in accordance with IAS 16, accounting for property plant and equipment, Institute of Chartered Accountants NZ.

2.7 Financial Risk Management

2.7.1 Withdrawal from LAPP Fund

Prior to 2013, Horizons managed a substantial portion of its risk around infrastructure assets through its participation in the Local Authority Protection Programme (LAPP).

However, following the Canterbury earthquakes and the substantial claims made against it, the LAPP fund had difficulty purchasing adequate re-insurance on the international market and found it necessary to significantly change the scope of infrastructural insurance cover it was able to provide to members. The cover ultimately offered did not adequately meet Horizons' needs and accordingly Horizons withdrew from the fund as from 1 July 2013. Horizons now manages its infrastructure asset risk through the following measures:

- Maintaining the impetus for increasing individual scheme reserves as signalled in the 2018-2028 Long-Term Plan, as a means of ultimately being in a position to self-insure against moderate (less than 50-year return period) events;
- Increasing self-insurance capability through the continued growth of a regional Infrastructure Insurance Reserve, funded through a four-tier Uniform Annual Charge;
- Purchasing commercial insurance (100% cover) for the major scheme infrastructure, with a current insured value of $230 million under the umbrella of the Manawatu-Wanganui LASS Insurance Proposal. This cover has a deductible of $3 million.
- Ensuring through good management of financial ratios, in accordance with its Liability Management Policy, that there is the capacity to borrow in order to fund damage reinstatement works arising from natural disaster events, should that be necessary;
- Ensuring through prudent risk management processes, including insurance and balance sheet management, that the criteria for Central Government assistance through its National Civil Defence Emergency Management Plan will be satisfied in the event of a major natural disaster.

A list of insured infrastructural asset types is presented in Appendix C. Insured assets in each scheme are set out in the Flood Loss Database in Appendix H.

2.7.2 Emergency Reserves

Emergency reserves are held within each scheme account to:

- Meet costs of un-programmed but urgent works, including flood damage to uninsured assets.
- Enable a rapid commencement of flood damage repairs that may ultimately be funded from other sources.
- Fund the deductible applicable in respect of an insurance claim.

A recent review of the level of reserves to be held by individual schemes concluded that the desired level is that which would fund the cost of damage that is reasonably expected to be incurred in a 2% AEP (50 year) flood event.

Assumptions made in reaching this conclusion are:

- It is most unlikely that an event exceeding 2% Annual Exceedance Probability (AEP) will qualify for assistance under the Recovery Plan. Uninsured damage in particular would then need to be totally funded from reserves.
- While it is most likely that there would be sufficient damage to insured assets in a 5% to 2% (20 year to 50 year) flood to trigger an insurance claim, it is unlikely that such an event would impact uniformly across all the schemes. Accordingly the insurance deductible would need to be shared by a portion of the 20 schemes that employ insured assets. For that reason the portion of reserves held for the purpose of funding deductibles needs to be greater than would be the case if flood damage was uniformly spread across all schemes in proportion to their respective insured asset values. The calculation for this impact is shown in the 50 year Flood Damage Reserves table in Appendix H.

The recommended target level of reserves for individual schemes is indicated in Table 2 below. It should be noted that these targets are for the repair of flood damage only.

Since 2012-13, schemes have been encouraged to increase contributions to their reserve funds in order to achieve the target levels as soon as possible. Many schemes have responded positively and have supported the rate increase specifically for that purpose. In addition, savings achieved in insurance premiums have been directly transferred to reserves. However the total sum of emergency reserves held is presently only 38% of target.

Table 2: Proposed 50 year target emergency reserve level for each Scheme

Scheme Name	Scheme Reserve Balance at 30 June 2017	Reserve Target 50 yr event
Ashhurst Stream	14,477	6,000
Forest Rd Dr	1,028	12000
Foxton East Dr	8543	1400
Haunui Dr	-	7900
Himatangi Dr	8,074	8000
Hokio Dr	13,910	11500
Kahuterawa	-	0
Koputaroa Dr	109,366	105000
Lower Kiwitea	215,962	520000
Lower Manawatu	2,360,855	4260000
Lower Whanganui	266,630	74000
Makerua Dr	143,453	99000
Makirikiri	32,509	23000
Manawatu Dr	109,975	570000
Mangatainoka	1,005,698	1270000
Matarawa	24,988	22000
Moutoa Dr	80,164	57000
Ohau-Manakau	185,782	1190000
Pakihi	3,545	1600
Pohangina-Oroua	460,926	1140000
Porewa	45,755	16700
Rangitikei	960,786	5770000
SE Ruahine	494,243	3250000
Tawataia-Man	8,719	6400
Te Kawau Dr	136,372	128000
Turakina	5,605	0
Tutaenui	36,967	6700
Up Manawatu	487,510	1350000
Up Whanganui	305,374	124000
Whangaehu	36,990	0
Whirokino Dr	15,365	9800
TOTAL:	7,579,571	20,040,000

2.7.3 Regional Infrastructure Reserve

In 2012-13, Horizons established an Infrastructure Reserve Fund for the purpose of:

- Funding unbudgeted costs of damage to regional infrastructure arising from major natural disaster events. The level of funding to be determined on a case-by-case basis.
- Funding the general rate contribution (currently 20%) of unbudgeted expenditure within schemes primarily associated with flood damage, and where the substantive costs (80%) are funded from individual scheme reserves.

2.8 Risk Factors for Flood Loss Curves

Flood loss curves are graphs that show the estimated cost to repair asset damage from floods of varying magnitudes. They also record the reinstatement costs for past floods. The graphs were a requirement of the Local Authority Protection Programme (LAPP) to assist in determining the risk profile for insured infrastructural assets. The same data is now used by Aon, the brokers who manage Horizons' insurance cover.

The Asset Management Plans also include curves that assess damage to all scheme assets, not just those that are insured. These curves assist Scheme Managers and members of the Scheme Liaison Committees to determine an appropriate target level of emergency reserve for the respective scheme.

The risk factors (% Damage) for the 100 Year (1% AEP) were determined by calibrating them against actual costs in the 2004, 2010 and 2015 floods. These factors were then modified as appropriate for the 20 year and 500 year and other pertinent factors.

The risk factors were reviewed and updated in 2012 to better reflect the likely damage for well engineered structures such as floodgates and flow diversion structures. Allowance was also made for improvements since the 2004 and 2010 floods, both in terms of the more robust replacement works (e.g. rock lining replacing concrete riprap) as well as changes in works practices and design. This resulted in a substantial reduction in expected flood losses.

In October 2014 the risk factors for drainage channels were reviewed and reduced by half to better reflect the damage experienced in 2004. The revised risk factors are set out in the summary and detailed flood loss factor tables in Appendix H.

Note that stopbank losses have been capped to reflect the likely extent of localised high damage areas: the maximum length for 20yr, 100yr, 500yr damage is 250 m, 4,000 m, 5,000 m respectively.

Full details of the resulting estimated flood damage in each scheme are set out in Appendix H and summarised in Table 3a and 3b below. 100 year damage in all schemes is estimated to total $49 million and affect 10.6% of the assets, but their geographic spread means that this is unlikely in any one event. A conjunctive flood risk analysis completed in 2013 concluded that actual damage would be approximately 50% of the "all scheme" damage in a 100 year event.

Table 3a: Estimated Flood Damage for All Assets

All Assets	Estimated Replacement Cost	Estimated Total Damage		
		20 yr Event	100 yr Event	500 yr Event
Damage to All Assets (excluding pumpsations)	$ 418,062,053.51	$ 12,158,952.84	$ 49,307,807.33	$ 110,992,935.36
% Damage/Replacement cost		2.9%	11.8%	26.5%
Flood Control and Major Drainage Schemes	$ 426,127,721.65	$ 8,932,311.32	$ 39,617,959.93	$ 85,738,082.87
% Damage/Replacement cost		2.1%	9.5%	20.5%
Erosion Schemes and Minor Drainage	$ 39,401,783.40	$ 3,226,641.52	$ 9,689,847.41	$ 25,254,852.49
% Damage/Replacement cost		0.8%	2.3%	6.0%

Table 3b: Estimated Flood Damage for Insured Assets

Assets covered by Insurance (excludes Erosion and Minor Drainage Schemes)	Estimated Replacement Cost	Estimated Total Damage		
		20 yr Event	100 yr Event	500 yr Event
Totals for Infrastructure Asset Insurance	$ 349,003,720.21	$ 12,155,792.43	$ 39,010,617.74	$ 110,892,073.23
% Damage/Replacement cost		3.5%	11.2%	31.8%
Pumpstations and others covered by Material Damage	$ 47,281,036.41			
TOTAL insured	$ 396,284,756.62			

Note 1 - the total estimated replacement cost includes pumpstations and other assets covered by Material Damage Insurance, but the estimated total damage excludes these assets. Work in progress is not included.
Note 2 - Erosion schemes and minor drainage schemes not covered by insurance are Lower Kiwitea, Pohangina-Oroua, SE Ruahine, Upper Manawatu and Forest Road, Haunui, Himatangi, and Hokio.
Note 3 – Material Damage (All Risk) Insurance covers Pumpstations, Control House buildings and electrical gear, portable flood barriers.

Earthquake Estimates

As a result of the Christchurch earthquakes a revised LAPP earthquake risk assessment was carried out in 2012 by GNS to incorporate modified damage ratios for liquefiable soils. This resulted in an eight-fold increase in the damage estimates, with the 500 year quake damage of $33.4 million approaching the estimated 100 year flood damage of $37.7 million (2011 asset values and risk factors). The difference was even less when the updated risk factors 2012 were applied, with the 100 year flood damage reducing to $14.4 million.

These estimates assume damage is spread across the whole region in any one event, when actually it is likely to be more scheme specific.

Nevertheless, the GNS assessment highlights that earthquakes are a much more significant risk than previously thought.

However it is highly unlikely that an earthquake will occur at the same time as a major flood and the funding provision for disaster recovery recognises this.

2.9 Scheme Credit Balance

Because of the unpredictability of floods and the variation in expenditure required to repair flood damage from year to year, some budget under-spending can occur. Any unspent funds in one year are held for the scheme involved and carried over to the following year.

Any significant surpluses are typically transferred to the scheme's emergency reserve fund, where they attract interest. Smaller surpluses are typically left with the scheme operating balance and are then available to assist with any extraordinary expenditure in the following year.

Funds held in these circumstances typically can vary from year to year. The availability, or otherwise, of these funds is not normally taken into account when budgeting for a subsequent year.

3. Risks

3.1 River Schemes

3.1.1 Failure of Protection Works

Stopbank systems are designed to contain a flood of a specified size, with crests of the stopbanks built to a level where overflow should not occur at flood discharges less than the design flow. Stopbanks, however, do not generally have the strength to resist the erosive power of floodwaters. This strength is provided by the erosion control works which are constructed to resist the high energy flood flows and to keep the high velocity flows away from the stopbanks and natural terraces.

Live protection works (i.e. structures that utilise live vegetation such as willows) make up almost 50% of assets providing erosion control. They are generally designed to perform satisfactorily at flows of up to 50% of the mean annual flood (mean annual flood is the average of the highest flows recorded each year for the period of record and has a return period of 2.3 years). However, a series of such floods or prolonged rain will saturate and weaken these erosion protection works and will eventually result in asset damage at lower discharges than the design discharge. Failure of live protection work is particularly significant where stopbanks are being protected, which could leave stopbanks exposed to high energy, high velocity flows that will greatly increase the risk of failure of this flood protection asset.

Assets work as a system and the system is only as strong as its weakest link. To minimise the risk of failure of flood protection works, any associated erosion protection works must be maintained to their full service potential. Deterioration of asset condition will result in an increased risk of failure, even at flows well below the asset design flow.

3.1.2 Risk of Damage

River control works are constructed in a very high-energy environment with the purpose of resisting and absorbing some of that energy. Damage to such systems is inevitable, no matter what the standard of maintenance.

The assessment process for the maximum damage potential to river scheme assets in a single flood event is detailed in the preceding section. These damage percentages take account of the geographic spread of each class of asset and consider the risk to the system as a whole. Any single item can be completely destroyed.

3.1.3 Impact of Maintenance and Construction Works

Weakness can arise in flood protection systems while construction or maintenance works are being undertaken. Horizons ensures that, during construction, back up systems to retain the capacity of the system, or contingency plans to restore the capacity of the system within the time frame

that a flood event can be predicted, are in place. Such contingency plans are written into the specifications for construction and maintenance work (see Horizons' Environmental Code of Practice for River Works).

3.1.4 Other Risks

Earthquake
The Manawatu-Wanganui Region encompasses some of the most seismically active parts of New Zealand. Small earthquakes have occurred regularly and large shakes have occurred in Wanganui (magnitude 7 in 1889), and in Pahiatua (magnitude 7 in 1934). Most recently, on 20 January 2014, there was a 6.2 magnitude quake near Eketahuna. The report Earthquake Hazards in the Manawatu-Wanganui Region by S Beanland, IGNS, estimates that a rupture of an active fault within the region will result in a magnitude 6.5 to 7.5 earthquake about once every 100 years.

Stopbanks could be damaged in an earthquake by cracking, vertical or horizontal displacement, or by liquefaction of the foundation material. The risk of liquefaction principally depends on:

- the magnitude of earthquake shaking at a particular location;
- the strength and grading of the materials. Fine sands are more susceptible than silty sands; and
- the position of the water table. Liquefaction can only occur in saturated materials.

It follows from the above that the most at risk areas are where there is a high water table, with loose sands near the ground surface. Foundation materials under the stopbanks in the Manawatu-Wanganui Region are generally sandy silts and not prone to liquefaction unless saturated. However, the Moutoa Floodway stopbanks on the right bank have been identified as being particularly at risk[2] and the urban area at Foxton is also susceptible to liquefaction[3]. Zones susceptible to liquefaction are shown in Appendix F.

The probability of seismic damage coinciding with a flood is very remote. The risk of seismic damage is much lower than the risk of flood damage. Risk estimates for asset types have been quantified and incorporated in the flood loss curves.

Detention dams managed by Horizons are located in the highest risk zone for seismic loading defined in the New Zealand Loadings Code NZS 4203:1992 (superseded by NZS1170: 2004). However, the risk of liquefaction is considered low due to the absence of loose sands in the founding soils.

Piping
Piping occurs when flow through a porous bank or foundation washes out the fine material leading to cohesion failure. Stopbanks comprised mainly of fine sand, common on the Moutoa Floodway, have the highest risk of piping

2 Lower Manawatu Scheme Review Stage 2A Geotechnical Study Vol 1 Text July 1994 Riley Consultants Ltd.

3 Assessment of Liquefaction induced ground failure susceptibility in the Manawatu-Wanganui Region, GD Dellow, TP Coote, RD Beetham, IGNS.

failure. All stopbanks constructed in the past 10 years consist of silts and sandy silts which have a high resistance to piping failure.

A significant risk to detention dams is excessive seepage pressures, leading to piping and possible failure by internal erosion. Generally, ground conditions indicate that this is not a significant risk in dam foundations. It is expected that the monitoring of seepage pressures will be a requirement of the Dams Safety Assurance Programme, when the legislation is passed into law.

Fire
Fire could potentially damage live tree erosion protection works. It is unlikely that fire damage will be extensive, but could be significant in localised areas.

Wind
The risk of wind damaging the live tree erosion protection work is very low. The species of vegetation used are selected to have the maximum strength against erosion, have very strong root systems and are therefore also resistant to wind damage.

Biosecurity
The vegetation that forms the main erosion control defence is based largely on willow species. This is because the willows are cheap, are easy to propagate in harsh conditions, have very strong root systems and can be used as whole trees for anchored tree work to give immediate erosion protection.

Where reliance is placed largely on a single plant species, the risk of disease or insect damage is high. This is demonstrated by historical outbreaks of Willow Sawfly (Nematus Oligosphilus) that had the potential to decimate willows, the planting of choice for cost effective bank protection.

During that outbreak, Horizons contributed to national research (undertaken by HortResearch) into the lifecycle of willow sawfly, and the breeding of resistant willow species and alternative plant materials for river control. These have been adopted by some of our schemes. However, willow sawfly has not adapted well to New Zealand conditions and is no longer active in the Region.

More recently the giant willow aphid has become established and has the potential to present similar concerns.

Other biosecurity hazards to our infrastructural assets include:

- willow blight;
- noxious plants, principally old-man's beard, wild ginger, wandering jew (Tradescantia fluminensis);
- aquatic weeds; and
- rabbits.

These hazards are currently managed within existing maintenance budgets, usually through the physical removal of the offending plant or hazard.

Climate Change
Climate change, including sea level rise, is predicted for the future. This could have the effect of changing the probability of floods and in the lower (tidal) reaches of the rivers, the height of flood levels relative to the surrounding ground. For drainage schemes, it is considered unlikely that pumpstations will have to be relocated and drains re-graded due to rising sea levels, however there will probably be increased maintenance costs for clearing silt from floodgates and increased running costs associated with pumpstations being used more frequently and for longer periods.

Any changes in standards resulting from climate change effects will be addressed in the review processes. Changes to address these effects, if warranted, could involve significant levels of public consultation, ratepayer agreement, resource consents and expenditure.

New assets within tidal zones are designed with climate change allowances to ensure longevity of assets.

Public and Landowner Use
Assets located in urban areas are subjected to a high level of public use such as stopbanks used for walking and biking tracks, off road motor vehicles crossing assets to gain access to the river to collect firewood, dump rubbish and unwanted plants or to use the river for recreational purposes. Horizons encourages recreational access to the river corridor in accordance with the environmental strategy, but must exercise an element of control over where that access is available to prevent damage to assets; for instance, a stopbank will have a metalled track to prevent rutting at a river access point.

The majority of river control infrastructure is located on land not owned by Horizons. Landowners with scheme assets on their land therefore have a responsibility for care of the river and drainage system, particularly to ensure the performance of stopbanks by:

- providing access to the assets for maintenance and inspection;
- controlling stock so they do not damage the grass cover or the structure of the banks themselves (normally achieved by fencing stopbanks out from adjacent paddocks and controlling grazing and stock movements);
- controlling stock to ensure that berm plantings are not damaged;
- not cutting live trees or anchored tree work or layered trees;
- not dumping refuse or noxious plant material in the riverbeds;
- controlling vehicle and machinery movements so they do not damage stopbanks; and
- advising Horizons of problems requiring attention, e.g. debris removal, blockages of culverts, erosion, ineffective floodgates etc.

Horizons has a policy of recovering damage repair costs on behalf of the scheme from landowners or individuals where that damage is caused by the offender's action or inaction. Prosecutions may ultimately be taken under the Soil Conservation and Rivers Control Act.

Landowners should consult with Horizons before developing berm protection areas (either planted in protection trees or covered with broom/gorse) for agricultural production. Horizons will assist the landowner to assess whether any development will reduce the level of performance of the river control

scheme or increase the risk to their own property and that of downstream owners.

Population growth and land use change is coordinated with Territorial Authorities. Significant practice changes will be incorporated into the 2021 edition of the Asset Management Plans. Scheme reviews and audits will individually identify population growth threats.

Sustainable Land Use Initiative

Following the February 2004 floods and given the quantity of sediment deposited in the rivers, Horizons, in conjunction with community leaders and Central Government, has developed a package that will assist and encourage sustainable management of hill country areas. This Sustainable Land Use Initiative (SLUI) involves extensive planting and retirement programmes to reduce hill country erosion and sediment inputs to rivers in the Region. This programme will run in conjunction with a wider approach to integrated hill country management and lowland river/flood erosion control scheme management. This new approach is known as Integrated Catchment Management.

Since 2006 SLUI has helped over 650 landowners safeguard their properties against erosion. Landowners aren't the only ones benefiting though. Reducing erosion means less soil enters our streams and rivers which mean better water quality and lower flood risk to downstream communities. So far, SLUI has invested over $70 million and has planted ~~over~~ nearly 14 million trees, built over 900 km of retirement fencing, and protected 30,500 ha of land. The programme is on track, meeting its annual targets and funding support from MPI (previously MAF) until June 2019. Work is delivered through a priority catchment approach and a report analysing changes to sediment run-off was completed in 2012. A further report completed in 2014 used more advanced modelling to conclude that at the current rate of planting (2000-3000 ha per year) there would be a 17-30% reduction in sediment runoff by 2043, but this reduction could be over 50% in some catchments where work programmes were more extensive. For our river schemes this is expected to slow down the loss of flood capacity due to silt build-up, particularly on the Oroua and Rangitikei River berms where SLUI is targeting work.

Gravel Accumulation

Gravel accumulation typically occurs on the inside of river bends. A build-up of gravel on the inside of a river bend may progressively narrow the river channel, resulting in increased flow velocities and energy which increase the risk of undermining and/or erosion on the outside of the bend. Gravel accumulation can reduce the flood carrying capacity of the channel, which ultimately reduces the level of service of stopbanks along that channel. Severe gravel accumulation also increases the risk of avulsion, whereby the river changes course. This may result in assets on the original channel becoming redundant and new assets being required on the new channel alignment.

Regular cross section surveys monitor gravel accumulation and form an integral part of analysing the capacity of river channels and provide information for gravel extraction and general river management purposes.

Schemes are subjected to the risk of additional costs to remove gravel build-ups resulting from large flood events. Wherever possible, gravel extraction is undertaken by contractors who have a demand for the resource, which reduces the cost to Horizons for this operation. However, costs may be incurred to remove gravel of low quality. These costs can generally be accommodated from within approved maintenance budgets.

3.2 Drainage Schemes

Drainage schemes are designed to control groundwater levels and/or to provide a path for the removal of surface water. The consequences of drainage failure are higher ground water levels, longer ponding durations and ultimately pasture or crop damage.

Failure of drainage systems can result from:

- excessive weed growth in any one year;
- channel or structure blockages;
- high flows in drains causing erosion; and
- pumpstation or floodgate failure.

Each drainage system has a works programme that is based on historical data to control weed growth, remove blockages, and maintain pumpstations and floodgates to minimise the chance of system failure.

Failure of a drainage system can also be attributed to overloading caused by increased urban development or changing land use with inadequate provision for controlling outflows to the system. Capital works would then be required to increase the capacity of the system, leading to increased costs to maintain these additions.

3.3 Factors Influencing Stakeholder Expectation

The factors influencing stakeholder expectations include changing weather patterns, change of land use and the economic or technical feasibility of providing services. In the long-term, stakeholder expectations are likely to increase with intensified use of the land in the scheme due to population increases and redistribution. Ongoing uncertainty around risk management and the cost of insurance is also likely to influence future expectations. Changes in the use of the land, from predominantly dairy to other forms of production, may also have an impact. Also, there may be less tolerance to the more frequent inundation of unprotected land due to a change in weather patterns.

Changes in demand will affect asset utilisation and how assets are managed. This includes more frequent maintenance, refurbishment/renewal and upgrade or extension of scheme assets, as beneficiaries expect assets to perform to a higher level of service. These changes will impact on scheme expenditure and will be reflected in the management of the scheme assets in the scheme specific AMPs.

4. Maintenance

4.1 Maintenance of Assets in Perpetuity

It has been proven that with thorough planned and implemented maintenance many infrastructural assets will have an infinite life. These assets are said to be maintained in perpetuity.

Within the asset listings, there are a few exceptions where assets cannot be maintained in perpetuity. Examples are:

- large flow diversion structures;
- floodgated structures;
- pumpstations;
- timber structures; and
- concrete structures.

Assets that do gradually deteriorate and have a finite life are depreciated. In the event of replacement being necessary, it will be treated as a renewal expense that extends the life of the asset and therefore will be a capital expense.

Present asset condition is an important consideration when related to maintaining assets in perpetuity. If an asset's current condition is poor, then above average maintenance will be required to provide the level of service expected from that asset and it may be more cost effective to renew it.

Horizons assesses an asset's condition and grades it from 1-5, with 1 for no maintenance required and 5 for a total rebuild required. This sets the level of maintenance required to return the asset to its full service potential. Assets with a finite life are assessed as to their remaining useful life. Provision for the renewal of assets that are nearing the end of their useful life will be made in the scheme's annual work programmes.

If an asset's quantities or dimensions change, then the "write up" or "write down" principle described earlier will apply (see section 2.6).

4.2 Maintenance Priority

Appendix D describes the maintenance issues associated with asset types in river schemes, while Appendix E covers drainage schemes.

On the basis of damage potential and consequence, maintenance of stopbanks is the first priority followed by edge protection works that limit erosion and maintain the channel in its existing alignment. The philosophy is to maintain the assets in perpetuity at their designed level of service.

The AMS guides engineers in setting the priority of works programmes. During an inspection, an engineer not only specifies a maintenance requirement that raises the asset to its full service potential, but specifies a priority as to how urgent that maintenance is. These priorities drive the works

programme for the scheme, with high priority work undertaken before low priority work.

The tables in Appendix J provide definitions of the various **maintenance ratings** and examples of the expected condition associated with each rating for each asset type. The tables facilitate the assignment of consistent ratings by the many staff involved in asset inspections.

There are a number of uncertainties that can impact on the assignment of a **priority** for undertaking maintenance or repair works arising from the maintenance ratings. For example, weather conditions and maintenance budgets can significantly constrain un-programmed maintenance in particular. Notwithstanding that difficulty, it is a key objective to undertake all of the highest priority (emergency) repairs at the earliest possible opportunity and to undertake high priority repairs to assets rated at Condition 5 within six months. Generally the requirement for such short response times will result from a flood event, rather than gradual deterioration and will be associated with critical assets.

Following a major Region-wide event, various un-controllable constraints, particularly those associated with insurance or Central Government funding and labour/resource availability, are likely to impact on that objective.

The matrix below defines the expected response time in relation to the five condition ratings and four priority ratings that are assigned in respect of every asset inspection that identifies the need for works. The response times in all cases must be regarded as maximums and for certain asset types will be considerably shorter.

Priority / Maintenance rating	Scheduled	Medium	High	Emergency
1				
2		36 months	36 months	
3	36 months	24 months	18 months	
4	36 months	24 months	12 months	6 months
5	24 months	12 months	6 months	Immediate

4.3 Maintenance Programme

An annual programme of maintenance will be prepared each year on the basis of inspections recorded in the AMS. This programme will generally be discussed with a Liaison Committee of ratepayer representatives prior to adoption by Horizons for inclusion in the Draft Long-Term Plan (LTP).

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

- works identified as necessary;
- works that can be anticipated given a 'normal' season;
- flexibility to meet unbudgeted damages;
- Scheme funding; and
- environmental effects.

Bi-monthly reports of maintenance work are submitted to the River Management Group Manager and the Catchment Operations Committee. Maintenance activity reports are also submitted to the Scheme Liaison Committee and are made available to ratepayers annually.

4.4 Maintenance Cost

Estimates of maintenance requirements are prepared using inspection data from the AMS and historic unit rates. These maintenance requirements drive the business plan and feed into the scheme budget. The predictable nature of much of the scheme expenditure is of assistance when inputting future maintenance costs into the business plan. Maintenance costs are determined from a zero base and include provision for repairing and restoring assets to their full service potential.

The forecasts make no allowance for additional expenditure that will occur from a significant flood event causing major asset damage. The forecasts do, however, assume that there will be minor damage from small floods, or freshes, and that this damage can be repaired within the annual maintenance budget.

A study entitled “The Review of Flood Protection Scheme Maintenance”, commissioned by the Ministry of the Environment, established that the maintenance level for adequately maintained schemes in various parts of New Zealand was between 2% and 4% of the capital value of the scheme. The actual percentage was found to vary depending on the type of scheme. The maintenance cost for all schemes managed by Horizons fall within this band.

5. Deferred Maintenance

Maintenance may be deferred as a result of:

- reassessing the priorities for works/expenditure following damage;
- a lack of construction capacity to complete all the required maintenance within a programmed period;
- an inability of a scheme to fund the required level of maintenance; and
- damage repairs needing to be spread over a long time period, as dictated by scale of work, site conditions, seasonal requirements for planting and access to materials.

Where maintenance is deferred and such deferral will affect the performance of the scheme:

- the deferred maintenance and its potential impact shall be reported to the Scheme Liaison Committee and the Catchment Operations Committee; and
- a programme for the implementation of the deferred maintenance must be agreed by the Scheme Liaison Committee and the Catchment Operations Committee. If this programme extends beyond the next asset valuation, the value of the outstanding maintenance shall be written down and, when constructed, be treated as a capital work; or
- the service level of the scheme must be reviewed and endorsed by the Catchment Operations Committee;
- the scheme value is adjusted to recognise the loss of value of the infrastructure; and
- the appropriate section of Part B of this AMP is reviewed and endorsed by the Scheme Liaison Committee and the Catchment Operations Committee.

6. Renewals

Maintenance is defined as work necessary for retaining an asset as near as practicable to its original condition, but excludes renewal.

Significant work that restores or replaces an existing asset towards its original size, condition or capacity is treated as a renewal expense and a capital expenditure.

Renewal only applies to assets that have finite useful lives and are depreciated accordingly.

A summary of the maintenance and renewal policy for each asset is set out in Appendix B.

7. New Capital Works

New capital work is capital expenditure necessary to create a new asset, or to improve an existing asset beyond its original capacity or performance. Examples – stopbank raising, new pumpstation.

Loan funding is typically required for this work, with annual payments covered by scheme rates and general rates in accordance with Horizons funding policy.

Details of the new or improved asset are entered in the AMS once the work is completed. If it is not completed in one year then the annual expenditure is recorded as work in progress (WIP) in the AMS. A dummy asset is used for this purpose in each affected scheme - asset type “Design & Investigation WIP”, subtype “Assets to be determined” (WIP asset numbers are XX9999, where XX is the scheme number).

Any new asset types created by new capital works will require an update of the respective tables and appendices in this Plan, as well as affected spreadsheets such as those for flood loss curves and condition ratings.

For consistency and ease of reporting, all capital expenditure (CAPEX) is recorded in the AMS at the end of the year date, 31 May 2017. Additions and disposals are recorded on 29 May 2017.

Consequently all new capital works (or additions/disposals) that are subject to depreciation will incur one month of depreciation in the year they were constructed (or discovered).

8. Service Levels and Objectives

The objectives and service levels for each scheme are set out in the appropriate section of Part B of this Plan.

In virtually all cases, the prime objective is to maintain the service level of the respective systems in perpetuity. This means individual components may require routine replacement or repair. With some exceptions relating to major structures, such as the floodgates at Moutoa and on some drainage schemes, the repair, replacement or replanting costs will be relatively minor and will be treated as planned maintenance. These costs will be expensed at the time they occur.

Communities have the opportunity to reduce the level of service over time for reasons of cost. The first stage in this process would be through their Scheme Liaison Committee, ending with Horizons approval for the reduced level of service, generally through the Asset Management Plan review process.

The level of service for each asset group is presented in Appendix K.

9. Performance Measures and Reporting

9.1 Monitoring of Assets

Monitoring activities are required to demonstrate that the River Management Group is meeting its objectives to provide the agreed level of service, and that maintenance is being undertaken that ensures assets are maintained in perpetuity.

River environments are dynamic and changeable, responding with high variability to similar channel works and protection measures. Rivers are also subject to climatic variations, where long quiescent periods with no flood events are typically followed by short, stormy periods with a number of floods occurring in quick succession. Therefore river management and monitoring must be flexible, aware of and responsive to the natural cycles of floods and the associated changes in river conditions. It can be difficult to draw absolute conclusions from data collected in the field given the complexity of our river systems. An asset overview is provided by the following monitoring initiatives:

- establishing an annual maintenance plan and reporting on its effectiveness in providing the desired level of service;
- reviewing capital expenditure against budgets provided;
- regular inspections of all assets by River Management staff;
- periodic aerial photography;
- survey of river channels and stopbank heights; and
- annual audit of asset registers against flood damage reports and capital works records.

9.2 Monitoring Procedures

The inspections and reviews are summarised in Appendix I and described in detail below.

To assess maintenance standards the following monitoring and reporting procedures are in place:

a. Annually

i. Establish works programmes and budget – discussed with Scheme Liaison Committee – peer reviewed and approved by Group Manager, River Management – subjected to annual scheme ratepayer meetings and LTP/Annual Plan process.

ii. Review and update maintenance programmes and budgets twice yearly or following a substantial flood event.

iii. Report on works undertaken, condition of system and costs to Scheme Liaison Committee at least twice annually. Report to specifically identify any deferred maintenance that will impact on the performance of the Scheme.

iv. Prioritise works required to deliver desired levels of service, as determined by the Scheme Review.

v. Inspect drains, pumpstations and floodgated structures to assess their condition and maintenance requirements. Report to Scheme Liaison Committee on inspection and proposed works to maintain the performance of the drainage system.
vi. Inspect stopbanks for erosion, damage, or active berm erosion. Report on inspection and on the programme for dealing with these problems.
vii. Dam specific monitoring in accordance with Building (Dam Safety) Regulations 2008 and subsequent amendments.
viii. Check flood warning levels and stopbank service levels where any significant changes to the river environment are apparent.
ix. Review level of service and effectiveness of asset types providing erosion protection. Global level of service may be reduced by biosecurity hazard (giant willow aphid).
x. Review stopbank structural condition as identified by annual visual inspection.
xi. Using updated survey information, the river's design alignment may require revision to maintain the desired level of service.

b. Three Yearly

i. Review and revise the Asset Management Plans, Part A and B.
ii. Revalue the infrastructure assets for all river and drainage schemes using the same methodology and standards as in the 2001 valuation of infrastructural assets and current construction costs.
iii. Review asset quantities/dimensions in the Asset Management System using as-built drawings, aerial photographs and completed works programmes (note that GIS/AMS dimensions are updated annually to show capital works and other changes).

c. Flood Performance

Report to Scheme Liaison Committee and Horizons on the performance of the river control system whenever that system experiences a significant flood.

d. Riverbed Surveys

Bed level surveys carried out as state of the environment monitoring or as part of the works monitoring, as noted in the relevant section of Part B of this plan.

9.3 Reporting

Reports on flood performance and damage shall be made according to the appropriate needs for information, records and approvals.

10. Confidence Levels, Assumptions and Improvement Programme

10.1 Confidence Levels

This plan is based on the experience of generations of Horizons (and former authorities) staff in managing river control infrastructure since the early 1950s. Very little is certain in this field, as the frequency of floods and location at which damaging forces act are far from predictable.

For these reasons this document is an adaptive management plan based on responsible levels of maintenance relative to the level of assets being protected; consultation with the benefiting communities; and reporting of performance, maintenance, damage and costs on a regular and relevant basis.

10.2 Assumptions

- That some damage to river control infrastructure is inevitable. Most assets are placed in a high-energy environment and erosion control works in particular are intended to protect the stopbanks and natural terraces from the forces of the river.
- That past performance is a good indicator of future requirements and performance.
- That ongoing maintenance of river control and drainage systems is essential for their continued performance.
- That the time, location and extent of damage to a river control or drainage system cannot be predicted with any confidence.
- That damage to a river control system is not necessarily proportional to the river flow or probability (return period) of flood size.
- That rivers are dynamic systems and management regimes must be constantly adapting to meet the changes in the river morphology.
- That the ratepayers' ability to pay (which is generally in proportion to the level of development on the flood plain) will ultimately determine the standard of each river control or drainage scheme.
- The size of a river or frequency of flooding does not determine the standard of a river control Scheme (note point immediately above).
- The design standard of any and every river control scheme will be exceeded at some time.
- Climate change has not been specifically accounted for in this plan. It is accepted that the climate is changing and that adaptive management practices are needed to respond appropriately to changes.
- Floods are a natural and land forming process. The need for river control works is a result of human occupation of the floodplains and communities' desire to protect the developments and assets built on those floodplains.
- Willow trees will continue to be a viable and acceptable material to use for river control.
- That RMA processes and conditions will not make continued maintenance of river control infrastructure unaffordable or impractical.

- Environmental considerations will continue to be important in designing and maintaining maintenance programmes.
- The costs of river control and drainage works and their maintenance are largely (presently 80%) met by those who either directly or indirectly benefit from or contribute to the need for the works, with wider indirect benefit being recognised by a general rate across the Region (currently 20%).
- There are organisations and sections of the economy that derive benefit from river control and drainage activities that are exempt from rating and do not contribute towards these works. These include (but are not limited to) government assets, public utilities such as roads, railways, telecommunication and power transmission lines and public land such as land administered by the Department of Conservation.

10.3 Improvement Programme

10.3.1 Asset Management System

All asset data is managed by Horizons' Staff. This data was originally stored in Excel spreadsheets and in the personal databases of Area Engineers. To obtain an overview of how our assets are performing, a central database, the Asset Management System (AMS), was designed, built and implemented. This Powerbuilder application became fully operational in July 2005.

Ongoing improvements and enhancements to the AMS include:

- using GPS and GIS to show asset locations;
- mapping assets to improve our confidence levels regarding asset data, including dimensions and quantities;
- centralised electronic storage of as-built drawings, specifications, contracts and photographs;
- enhanced asset inspection condition ratings; and
- integration of AMS asset mapping into Compass.

The AMS Powerbuilder software platform is now old technology that is no longer supported by the manufacturer. In addition, the AMS developers (Datacom) now have very limited resources for making changes to the system. Other Powerbuilder applications at Horizons are being progressively replaced and incorporated into the new IRIS platform and it is likely that within 1-2 years a purpose-built or off-the-shelf replacement for the AMS will be introduced. This will provide the opportunity for further improvements such as integrating the AMS with hand held devices in the field and incorporating risk analysis for stopbanks.

10.3.2 Asset Mapping

It has been recognised that the preferred method of determining exact asset locations and dimensions is through accurate asset mapping. Over recent years the staff familiar with each scheme have progressively mapped their assets using GPS and updated the data in AMS.

The resulting asset maps are included in Part B of their respective AMP.

The maps are updated at the end of each financial year to track capital works and flood damage.

10.3.3 Institutional Knowledge, Training and Continual Improvement

There is a lack of trained and experienced river engineers available in New Zealand and all regional councils have encountered difficulties in recruiting professional, technical and working staff following resignations and retirements. Horizons is responding to this situation in part by investing in staff through a structured training programme, raising engineering cadets to engineering officers and engineering officers to contract engineers.

Self improvement collaboration opportunities with other regional councils, which include exchange visits, will be taken annually to test staff knowledge against their peers.

Current procedures require the documentation of practices and procedures, and encourage a culture of support, training and continuous improvement. This embodies succession planning and minimises the risks associated with loss of institutional, geographic, technical and people knowledge.

10.3.4 Changes in Technology

Changes in technology may also affect the management, monitoring and decision-making processes and techniques rather than directly enhance the actual physical scheme.

These changes may include the following:

- hydraulic modelling and flood forecasting;
- rainfall or flow statistical analysis techniques;
- understanding and monitoring of the Southern Oscillation that affects La Niña and El Niño climate patterns; and
- advanced electrical or mechanical components for pumpstations and floodgates.
- Live streaming webcams to view critical points of river
- Remote control technology to operate critical mechanical infrastructure
- Drone flight footage to inspect and record assets

Advances in technology may improve the quality and accuracy of data, performance of asset components, prediction accuracy and ultimately a more cost-effective management of the scheme.

11. Review

These Asset Management Plans will be reviewed either when there is a significant change in maintenance/performance standards, or a change in funding policy, or at periods of not less than three years.

Appendix A

Definition of Terms

Definition of Terms

Aggradation	The deposition of bed material resulting in the raising of the river bed level and a reduction in the flood-carrying capacity.
Amenity Values	Means those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m^3/s has an AEP of 5%, it means there is a 5% chance (i.e. a chance of one-in-twenty) of a peak flood of 500 m^3/s or larger occurring in any one year. AEP is the inverse of the return period in years, expressed as a percentage, so the 5% AEP flow has a 20 year return period (see definition below).
Annual Plan	The Horizons Regional Council's Annual Plan.
Annual Report	The Horizons Regional Council's Annual Report.
Avulsion	The sudden formation of a new river channel, e.g. during a flood.
Batter	The sloped surface of an embankment or stopbank.
Bed	In relation to any river, the space of land which the waters of the river cover at its fullest flow without overtopping its banks. Includes the river berm, if present. Note definition of fairway below.
Bed Material	Boulders, stones, gravel, sand, silt and associated materials present in the beds of rivers.
Berm	The elevated margin of the riverbed between the main terrace or stopbank and the active riverbed. General well vegetated or planted in trees and flooded only in floods exceeding about the average annual flood.
Braided River	Any river with multiple successively divergent and re-joining channels separated by gravel islands.
Capital	Work necessary to create a new asset, or to improve an existing asset beyond its original capacity or performance. Examples – stopbank raising, new pumpstation.
Cumec	Measurement of river flow. Cubic metre per second, m^3/s. For example 500 cumecs is 500 m^3/s.
Diversions, Channel Realignment	Channel construction to shorten the flow path or improve alignment. This work may replace an existing channel or may be of a temporary nature.

Drainage Works Drainage works include pumpstations and drains presently managed to collect and convey stormwater safely away so that it does not backup or pond on the land surface.

Enhancement An increase in quality, value or serviceability.

Environment Includes:

a. Ecosystems and their constituent parts, including people and communities.
b. All natural and physical resources.
c. Amenity values.
d. The social, economic, aesthetic, and cultural conditions which affect the matters stated in *a* to *c* of this definition or which are affected by those matters.

Erosion Erosion includes processes of wearing away of the land surface by natural agents (mainly water) and the transport of the material that results.

Erosion Control Works Works designed to protect stopbanks or natural banks from erosion to maintain channel stability or to reduce the deposition of sediment into the lower reaches of a river reducing the effective depth of flow.

Fairway The central open shingle area of the riverbed where the main flood flows are carried. Generally, this is the section of the riverbed that will be at its capacity in the average annual flood.

Flood-carrying Capacity The ability of a river to accommodate flood flows within its bed without exceeding its banks (including stopbanks).

Floodplain The area of land adjacent to a river over which floodwater has historically or could potentially flow. The fan that has been built up in geological time by the river.

Groynes Embankments or structures built at an acute angle to the river flow designed to reduce water velocity adjacent to a stopbank or terrace. Groynes may be permeable or impermeable and constructed of a variety of materials (e.g. rock, rope and rail, tied trees).

Habitat The natural home of plants or animals, or communities of them. It has both biological and physical components that, among other things, may include water, rocks, soil or vegetation.

Infrastructure Those built structures necessary for operating and supplying utilities and services to the community (including, but not limited to, telecommunications, natural or manufactured fuel, bridges, electricity, water, drainage, sewerage, road and rail links, seaports and airports). In this AMP, drainage works, erosion control works and flood protection assets are regarded as infrastructure.

Maintenance Work necessary for retaining an asset as near as practicable to its original condition, but excluding renewal. Examples – drain cleaning, stock damage repair.

Mean Annual Flow	The average value of the highest flood recorded in each year of record. The mean annual flood has a return period of 2.3 years or a probability of occurrence of 43% (AEP).
Meander	The movement from side to side of the riverbed of the braids or channel.
Method	A specific action, procedure, programme or technique adopted to carry out a policy.
Objective	A statement of a desired outcome.
Operating Costs	Expenditure incurred in the active process of utilising an asset. Will consume resources such as manpower, energy, chemicals and materials, but will have no effect on asset condition. Examples – mowing, inspections, insurance, compliance.
Policy	A statement that guides or directs decision-making. A policy indicates a general commitment to a general course of action in working towards an objective.
Renewal	Significant work that restores or replaces an existing asset towards its original size, condition or capacity. Examples – pump rebuild, culvert replacement.
Return Period	The average time between floods equivalent to/or exceeding a given magnitude. For example, a 100-year return period flood has a magnitude expected to be equalled or exceeded on average once every hundred years. Such a flood has a 1% chance of being equalled or exceeded in any given year, i.e. 1% AEP, and is often used interchangeably with “recurrence interval” or “flood frequency”.
River	A continually or intermittently flowing body of fresh water; and includes a stream and modified watercourse; but does not include any artificial watercourse (including an irrigation canal, water supply race, canal for the supply of water for electricity power generation, and farm drainage canal).
River Control Works	Stopbanks, access tracks, rockwork, anchored trees, wire rope and iron structures and other structures erected for the purpose of river control. Also includes areas of vegetation maintained or planted in the beds of rivers (particularly along the banks and berms).
Service Level	Defined service quality for an activity against which service performance may be measured.
Stopbank	Compacted earth structures generally parallel to the river channel designed to increase the depth of water and hence the flood carrying capacity.
Toe of Stopbank	The intersection of the batter of the stopbank with the natural ground. The riverward toe is on the river side of the stopbank subject to flooding, while the landward toe is on the land side protected from flooding.

Appendix B

Horizons Regional Council's Asset Management Policy

Horizons Regional Council's Asset Management Policy

Policy Statement on the Management of Horizons Regional Council Infrastructural Assets

Background

The Manawatu-Wanganui Regional Council, trading as Horizons Regional Council, administers 35 river and drainage schemes within its Region. The purpose of the schemes is to prevent and/or control flooding and erosion on the Region's rivers and to provide effective land drainage to areas of significant economic importance to the Region and to New Zealand. Six of the 34 schemes are not included in this AMP as they are only for channel maintenance and therefore have no assets.

The river control and drainage infrastructure assets that are managed by the schemes are stationary systems or networks that serve defined communities. The systems as a whole are intended to be maintained indefinitely to specified levels of service by the continuing maintenance, replacement and refurbishment of their component parts. Infrastructure assets are not tradeable as a system even though individual components such as pumps may have a tradeable value and able to be sold.

This Policy describes the assets and sets out typical asset life cycles. The asset life cycle is the expected life span of a particular asset type. The typical asset life cycle may be adjusted for local conditions. Assets with a finite asset life will be depreciated accordingly.

Management Policy

The following Policy will be applied to the management of Horizons Regional Council's Infrastructural Assets:

Bridges

Concrete bridges will be regarded as having a 200 year life and will be depreciated accordingly.

Generally all expenditure will be treated as a maintenance expense. Any replacement will be treated as a renewal expense which will extend the life of the asset and therefore will be a capital expenditure.

Currently this Policy would only cover one asset, a small access bridge in the Matarawa Scheme. The major bridge structure over the Moutoa Sluicegates is incorporated as an integral part of the whole concrete structure for this asset.

Concrete Riprap

Concrete riprap provides protection against lateral erosion through the placement of concrete rubble, usually sourced from demolition sites, directly against the lower section of a riverbank. Concrete riprap has been commonly used in the past as a less costly alternative to rock linings in situations where softer erosion protection measures are not effective. However aesthetic considerations have dictated some restrictions on the use of demolition concrete in recent years. Concrete riprap is typically used in less

critical and low risk areas as it provides a lesser level of erosion protection than rock lining.

The rubble is able to settle as the channel bed degrades and also provides immediate protection compared to vegetation based protection measures that take time to establish. Maintenance will include ongoing topping up of the concrete rubble as it settles debris clearance and vegetation control.

Concrete rubble is sometimes used to provide a temporary repair to localised dropouts in tree bank protection. Such works become re-vegetated in time and will be treated as maintenance.

The 2004 floods damaged significant quantities of concrete riprap bank protection. Due to the inability to source the large volume of concrete riprap lost in the flood, the high level of bank protection it provided and the risk of aggravated damage from this lost bank protection affecting critical assets such as stopbanks, it was agreed with LAPP and AIG insurance that rock could be used to replace concrete riprap, as it would provide an equivalent level of protection and was immediately available. It was therefore agreed that concrete riprap would forthwith be valued at the same rate as rock.

Concrete riprap will be regarded as having an infinite life and will not be depreciated.

Concrete riprap can be subject to damage by floods and in this event repairs will be treated as a maintenance expense. If substantial damage occurs the opportunity may be taken to replace with rock. This would provide an increased level of service and be treated as a capital expense.

In a very rare instance a river may change course during a flood rendering redundant some of the constructed bank protection. In this event the redundant concrete riprap will not be maintained. If possible the concrete may be recovered for use elsewhere on the scheme.

The cost of new concrete riprap at new erosion sites on a river will be treated as a capital expense which may be funded from rates, scheme reserves or by way of a loan.

Culverts

Culverts provide permanent access across drains and natural watercourses, without either obstructing water flows or impeding fish passage. For culverts that run beneath stopbanks, see Floodgated Culverts.

Culverts are an integral part of a drainage channel and therefore are not valued or inspected separately. Culvert maintenance is incorporated into the scheduled Drain Maintenance Programme. Culvert replacement will be funded by the scheme so long as it is part of drainage improvements or required for maintenance access. This may also involve cost-sharing with the landowner.

These structures are usually an incidental and very minor component of a drainage channel and as such all these structures will be regarded as having an infinite life and all work to repair or replace these structures will be treated as a maintenance expense.

Detention Dams

All the detention dams managed by Horizons Regional Council were constructed at a time when significant government subsidy was available for their construction. It is generally acknowledged that in the present user pays environment it may not be economic to replace most of the dams.

The dams are all earth fill structures with associated inlet and outlet concrete structures and culverts. The earth structure component of the dams will be regarded as having an infinite life and will not be depreciated.

All dams will be maintained to their design service potential except as noted below and all costs will be regarded as a maintenance expense.

Some dams are experiencing problems with gradual infilling of the ponding area due to siltation from upper catchment run-off. Where siltation affects the pond storage capacity, reinstate as a maintenance item or consult around the option of reducing the level of service. It is noted that there has been a recent shift towards afforestation of the upper catchments in some of the detention dam schemes and this may mitigate this problem.

The inlet and outlet structures and associated culverts within these dams and any concrete spillways nominally have a life of 70 years and will be depreciated accordingly as an interim provision until individual asset assessments provide better information. Renewal of these structures will be treated as capital expenditure.

All dams managed by Horizons Regional Council will comply with the Building (Dam Safety) Regulations 2008.

Drainage Channels

All drainage channels will be regarded as having an infinite life and will be maintained to their design service potential. No provision will be made for depreciation. Note that drainage channels include access culverts, as mentioned above.

Regular inspection of the drainage systems will be undertaken. This may involve inspection in both the spring and autumn which are the traditional seasons in which maintenance work is undertaken.

All mechanical cleaning of drains and chemical spraying of drains will be treated as a maintenance expense. Much of the drainage system is chemically sprayed each year. Some drains are mechanically cleaned on a one to three year basis. The necessity for drain maintenance is very dependent on weed growth in drains which can vary from season to season.

On a rare instance, either because of land settlement or severe siltation or changed land use, a drain may require substantial re-grading or relocation. Where this is required for increased level of service it will be treated as a capital improvement. This expense will be treated as an extraordinary capital expense and will be funded either directly from annual rates or from scheme emergency reserves or by way of a loan. It may also involve cost-sharing with affected landowners.

Floodgates

Floodgates prevent the backflow of flood water up drains. They are most commonly associated with culverts under stopbanks, but may also involve relatively large reinforced concrete structures. The floodgates themselves may take various forms (e.g. top-hung, side-hung, and counterbalanced) and utilise a variety of materials (e.g. alloy, cast iron, concrete, steel, timber). These structures include associated components such as inlet and outlet headwalls, winches and grills.

Floodgates have historically been classified as floodgated culverts (minor and major) and floodgate structures. Major structures were given a 70 year useful life and depreciated accordingly. Minor structures were to be maintained in perpetuity with all the relatively minor expenses involved in repair or replacement being treated as maintenance. Recent experience indicates that the replacement of even relatively minor floodgate structures can impose a substantial burden on the maintenance budget and they should now be treated in the same way as major floodgates.

For this Policy, a culvert is defined as a water conduit that carries a significant amount of soil overburden and relies heavily on the surrounding soil envelope for support and a floodgate structure is a major reinforced concrete structure fitted with floodgates to prevent backflow.

- **Floodgate structure**

  Floodgate structures will be regarded as having a life of 100 years and will be depreciated accordingly.

  This will be an interim provision until individual asset assessments provide better information.

  Generally all expenditure on existing structures will be treated as a maintenance expense. Any replacement of an entire gate or structure will be treated as a renewal expense which will extend the life of the asset and therefore will be a capital expenditure.

- **Floodgated Culvert Major**

  These structures consist of floodgates fitted to circular culverts with a diameter of 1.2 m or greater or box culverts with a cross sectional area of 1.2 sq m or greater. The culverts are mostly reinforced concrete with a few corrugated steel culverts.

  All these culverts will be regarded as having a 70 year life and will be depreciated accordingly.

  Generally all expenditure on existing structures will be treated as a maintenance expense including lowering of culverts where culvert pipes are reused. Any replacement of culverts or replacement of an entire gate will be treated as a renewal expense which will extend the life of the asset and therefore will be a capital expenditure.

- **Floodgate Culvert Minor**

  These structures consist of floodgates fitted to circular culverts with a diameter less than 1.2 m or box culverts with a cross sectional area less than 1.2 sq m.

  These structures were previously considered an incidental and very minor component of a stopbank or drainage channel and as such all these structures were regarded as having an infinite life, with all work to repair or replace them treated as a maintenance expense.

  This is no longer considered appropriate so they will now be treated the same way as Floodgated Culvert Major and regarded as having a 70 year life and depreciated accordingly.

Flow Diversion Structures

Horizons Regional Council manages and owns three flow control structures within the Lower Manawatu Scheme (LMS) – Moutoa Sluicegates, Makino Diversion Gates, Flygers Line Spillway Gates. There is also a small structure (Gordon Park) in the Matarawa Scheme. Their purpose is to divert floodwaters through an alternative flood channel or designated floodway.

By far the largest of these is the Moutoa Sluicegates. It was completed in 1962 and consists of a large concrete structure with nine radial steel gates and associated electrical control equipment. There is also a control building located nearby.

Concrete bore tests indicate that the previous life of 100 years is too conservative. The steel gates are now repainted on a 10 year cycle and are expected to last longer than steelwork in more corrosive situations. The electrical gear was renewed recently after 50 years. As an interim provision, until individual asset assessments provide better information, the concrete structure will now be regarded as having a 200 year life, the steel gates a 100 year life, electrical gear 50 years and the control building 100 years. Each of these asset components will be depreciated accordingly.

The Makino Diversion Gate structure was constructed in 2009 and consists of a concrete structure with two vertical steel gates that are lowered to limit flood flow into Feilding. There is also a small concrete control shed containing the electrical control gear and a similar shed for a standby generator. Given the relatively small size of this structure and the likely durability of each component it is considered appropriate to treat the structure (including the steel gates) as one asset, with a life of 100 years. The electrical control gear (including the shed) is regarded as having a life of 50 years, as is the generator (and shed). This is an interim provision until individual asset assessments provide better information. Each of the asset components will be depreciated accordingly.

Flygers Line Gates was constructed in 1985 and consists of a concrete labyrinth weir topped with light steel gates that flip under water pressure when the Mangaone Stream reaches critical flood levels. The concrete structure will be regarded as having a life of 100 years and the steel gates 100 years (as an interim provision). Each component will be depreciated accordingly.

Gordon Park diversion structure in the Matarawa Scheme is simply a culvert to constrict flow in the main stream. It will be regarded the same as a floodgated culvert with a life of 70 years and will be depreciated accordingly.

Generally all expenditure on the components of the Moutoa, Makino, Flygers Line and Matarawa structures will be treated as a maintenance expense. Any replacement will be treated as a renewal expense which will extend the life of the asset and therefore will be a capital expenditure.

Grade Controls

Grade controls prevent erosion of the bed of the watercourse by the placement of a structure across the full width of a channel. These structures artificially raise the bed level and thereby reduce the channel gradient and flow velocity. A vertical drop is created and the energy arising from that drop is dissipated on a short section of armoured bed or 'scour apron'.

These structures will generally be formed from quarried rock or river boulders, however other materials such as timber or culvert pipes may be utilised. In some situations piles may be driven to assist in retaining rock and maintaining structural shape and integrity.

This definition of grade controls excludes concrete weirs and drop structures, which are covered separately under Weirs and Drop Structures.

Grade controls will be regarded as having an infinite life and will not be depreciated.

All grade control structures will require periodic maintenance, usually as a consequence of flood damage. All repair work will be treated as a maintenance expense for as long as the structure is required. If the bed stabilises there may be no need for the structure. Total replacement may be required in rare instances and, as for new grade control structures, will be treated as capital expenditure.

Groynes

Groynes modify channel alignment and mitigate lateral erosion through the placement of structures that protrude from riverbanks and reduce flow velocity immediately adjacent to those banks. Groynes may be classified as either permeable or impermeable and may take various forms and utilise a variety of materials.

Permeable groynes allow water to pass through them, which equalises the water pressure on both sides of the structure and minimises some of the scouring effect generally associated with groynes. When the flowing water passes through the permeable structures, the turbulence is reduced, the horizontal loading is reduced and bed load deposition occurs.

Impermeable groynes do not allow water to pass through them and therefore have a more pronounced effect in terms of flow deflection.

Permeable groynes will usually achieve their intended purpose within their variable finite life. They will be maintained as required and will not be depreciated.

Cased concrete piled groynes (at Fitzroy Bend in the LMS) will be maintained to the extent possible and also regarded as having an infinite life. They will not be depreciated and in the event of undermining or collapse they will be replaced as an extraordinary capital expense.

Impermeable groynes (rock) will be maintained to their full service potential in perpetuity, with regular topping up and other maintenance as required. They will not be depreciated and all costs will be treated as maintenance expenditure. Total replacement may be required in rare instances and will be treated as maintenance if there is no increase in level of service or otherwise as capital expenditure.

Lateral Walls (including Flood Walls)

Lateral walls prevent lateral erosion by the placement of rigid structures along the lower section of riverbanks. Lateral walls are often used where there is insufficient space to place rock or concrete rubble and where live edge protection works will not give the desired level of protection to the bank. These structures will be designed by a suitably qualified or experienced engineer. Considerations in the choice of lateral wall type include cost benefit, minimising the disruption to the environment, aesthetic and recreational impacts, practical construction constraints and future maintenance.

Flood walls are typically used where there is insufficient space to construct or raise stopbanking. They have also been used where raising a stopbank would risk settlement damage to a gas line. In urban areas where a walkway has been required along the top of the stopbank then a double timber flood wall or "planter box" type of construction has been used.

- **Timber Walls**
  Timber walls are typically constructed from timber posts, railway irons or similar supports driven into the bed of the river and tied back to an anchor. Horizontal boards are fixed to the supports and backfilled between the wall and the stream bank with gravel or other suitable material. Rock is often placed on the river side toe of the lateral wall to protect against under scour and loss of backfill.

  Timber flood walls and double timber flood walls (planter boxes) provide flood protection where there is insufficient space for an earth stopbank.

  Timber walls that provide lateral erosion protection or act as retaining walls for the channel banks would have nominal life of 20 years but, because of uncertainty regarding flood damage and their relatively minor scale they will be regarded as having a variable finite life, replacement will be treated as maintenance expenditure and they will not be depreciated.

  Timber flood walls and stopbank retaining walls are in a less harsh environment and will be regarded as having a life of 50 years and will be depreciated accordingly. Replacement will be treated as renewal expenditure and all other costs treated as maintenance expenditure.

- **Concrete Walls**
  Concrete walls are typically constructed using pre-cast panels, poured in situ structures, or specialist pre-cast blocks such as Mass Blocs. Concrete block walls may incorporate additional soil stabilisation works such as synthetic geogrids.

  Concrete block walls (i.e. Mass Blocs) and tiered concrete lining (i.e. the steps along the Palmerston North river walkway) that provide lateral erosion protection will be regarded as having a life of 100 years and will be depreciated accordingly.

Concrete flood walls (typically cast in situ) and block flood walls (e.g. Firth precast blocks) will be regarded as having a life of 200 years and will be depreciated accordingly.

- **Gabion Baskets**
  Gabion baskets are wire mesh units filled with graded rock for placement along the bank toe to provide erosion protection. Gabion baskets are not used extensively on account of relatively high cost, limited life and questionable aesthetics.

  They will be maintained to their service capacity for as long as they are required and all costs will be treated as maintenance expenditure.

  Gabion baskets would have a nominal life of 20 years but will be regarded as having a variable finite life, because of their relatively minor scale, any replacement will be treated as maintenance expenditure and they will not be depreciated.

Permeable Mesh Units

Permeable mesh units prevent erosion through the placement of prefabricated structural steel 'fence units' longitudinally along riverbanks or laterally as groynes and wing walls (e.g. to grade control structures). Permeable mesh units consist of rails, pre-fabricated mesh units, tree material and vegetation planting. The mesh units initially encourage siltation and aid vegetation establishment but remain as an integral part of permanent edge protection.

They will be maintained to their service capacity until vegetation is established and they are no longer required. All costs will be treated as maintenance expenditure.

As these structures are of a temporary nature and prone to flood damage, they will be considered to have a variable finite life and will not be depreciated. In the rare instance that replacement is required, it will be treated as maintenance expenditure.

Portable Flood Barriers

Portable flood barriers are provided where it is not practicable to construct permanent flood protection. They typically include inflatable barriers (WIPP) or steel panels (Geodesign) with an impermeable membrane that are stored at or near the sites involved. For the purposes of this definition they do not include stoplogs, which are typically more robust and minor assets. These are covered under Miscellaneous Structures.

Currently Horizons Regional Council has three portable flood barriers, two WIPP barriers for use at Rosvall Place and Hartley Street along the Manawatu Estuary frontage at Foxton Beach and one Geodesign barrier for use at Q-West in Wanganui.

The barriers are installed in large floods in accordance with the guidelines set out in the respective Flood Action Plans for Foxton Beach and Whanganui. Regular training is carried out to ensure staff and local authorities are familiar with the process.

Portable flood barriers will be regarded as having a life of 50 years and will be depreciated accordingly.

Replacement will be treated as renewal expenditure and all other costs treated as maintenance expenditure.

Protection Planting and Erosion Protection Reserves

Protection planting and erosion protection reserves prevent lateral erosion of the riverbank and maintain river alignment, by planting trees that develop strong root systems to stabilise the riverbank. Tree planting will also provide tree material for subsequent layering or use in heavy tied tree erosion protection works (see Tied Tree Works).

Willows continue to be the preferred species for primary erosion control immediately adjacent to the river channel. Willows are able to withstand the harsh environment of the river margins and may be specially bred so that they provide a good strong root system, do not spread readily, are not brittle, and are not readily palatable to stock and animal pests. In addition, the ability of the willow to be grown from cut material means that it provides a potential resource, on site, for future protective works. Outside a willow planting zone, native pioneer species or production species may be planted.

Protection plantings will be regarded as having an infinite life and will not be depreciated.

The plantings will require periodic maintenance consisting of layering and replanting where localised flood damage has occurred or trees are diseased or have died, or have become too large and need to be felled. This work will be treated as a maintenance expense and will be funded from rates. New areas of planting will be treated as a capital cost which will usually be funded from rates.

Pumpstations

New pumpstations will be regarded as having an operational life of 100 years for the structure (concrete and timber framing), 50 years for the electrical control equipment and 25 years for the pumps, mechanical components (e.g. floodgates) and steelwork (e.g. screens and catwalks). They will be depreciated accordingly.

After 100 years it is expected that the pumpstations will either require complete replacement or very major refurbishment depending on the extent of renewal expenditure during its life.

Replacement of the pumpstation may also be necessary due to changes in land use or land settlement requiring lower pumping levels. This will be treated as an extraordinary capital expense.

A 50 year life for the electrical control equipment is justified for the main switchboard and the relatively minor cost of other components such as electronic water level sensors. A 25 year life for mechanical components is justified by the corrosive environment in which they are typically located.

As far as practicable the pumpstations will be maintained at their original design service capacity for their expected life. Repairs and maintenance will be carried out as necessary to ensure that their intended life is achieved.

Approximately every seven years, pumps will be removed for a servicing check and partial overhaul if required. If substantial overhaul is necessary this will be treated as capital expenditure (renewal) extending the life of the pump otherwise the expenditure will be treated as a maintenance cost.

Rock Linings

Rock linings provide protection against lateral erosion through the placement of rock directly against the lower sections of riverbanks. The use of rock to armour banks is common on rivers where there is little tolerance for erosion on account of the close proximity of buildings or infrastructure or where high erosive forces preclude the use of softer erosion protection measures such as edge vegetation.

Rock linings will be treated as having an infinite life and maintenance will be undertaken to maintain their design service potential.

Rock linings are able to settle as the channel bed degrades and provides immediate protection compared to vegetation based protection measures that take time to establish. Ongoing maintenance will include topping up of the rock as it settles debris clearance and vegetation control.

Rock work can be subject to localised damage by floods and in this event repairs will be treated as a maintenance expense.

To recognise that the standards of design for rock linings has increased over the years, the asset has been sub-divided into engineered and non-engineered rock linings. The only difference between the two is the durability of the asset in a flood. In a 100 year flood event, it is estimated that 2.5% of an engineered rock lining asset will be damaged, as compared with 25%[4] of a non-engineered rock lining asset.

If substantial damage occurs to non-engineered rock then the opportunity may be taken to replace with a higher standard engineered asset (rock or otherwise). That would provide an increased level of service and would therefore be treated as capital expenditure.

The cost of new rock linings at new erosion sites on a river will also be treated as a capital expense.

In a very rare instance a river may change course during a flood, rendering redundant some of the constructed bank protection. In this event the redundant rock linings will not be maintained. If possible the rock may be recovered for use elsewhere on the Scheme.

Stopbanks

Stopbanks provide flood protection through the construction of earth embankments or other flood retaining structures. Stopbanking is the most effective and economical structural method of flood control for many New Zealand rivers.

For the purposes of this definition, stopbanks include guide banks and property protection bunds. Guide banks deflect flood flows and may be overtopped in large

[4] Loss ratios revised 2012, were 15% and 50%.

design events. Property protection bunds are currently only provided in the Taonui Basin and include small earth embankments as well as minor associated works such as floodgates and flood walls.

All stopbanking will be regarded as having an infinite life and maintenance will be undertaken as necessary to maintain the design service potential.

In some situations stopbanks require to be raised periodically in response to a decline in service potential arising from aggradation of the river channel and consequent loss of flood carrying capacity or from climate change and consequent increase in flood flows and higher sea levels. Some recent stopbank designs have made allowance for aggradation and climate change effects, but given the uncertainty involved it is likely that further increases in height would be required to maintain the current level of service.

If there is a progressive loss of capacity due to channel aggradation then consultation would be required through a scheme review process to assess the options i.e. reduced level of service or upgrade. If upgraded then treat as an extraordinary capital expense.

Where silt is removed on a planned and regular basis (e.g. Oroua River or Makirikiri Floodway) it will be treated as maintenance.

If climate change impacts on the level of service then any upgrade would be treated as new capital expenditure.

Some older stopbanking (>30 years) may have been constructed to standards that are inferior to present day standards. This stopbanking may be at greater risk of failure in the event of a major flood. Investigation and testing of all Horizons Regional Council's 400 km of stopbanking to identify problems would be very costly and it would not be economic to do this unless there is some observed evidence of a problem such as seepage or obvious settlement.

If structural deficiencies are identified then replacement will be treated as either an extraordinary maintenance or capital expense depending on the scale of the work.

This may require the repair of stock damage or in some instances the topping up of stopbanks where settlement of the stopbank has occurred. Minor work will be treated usually as an extraordinary maintenance expense, but if substantial breaking down and rebuilding of the stopbank is necessary, this will be treated as extraordinary capital expenditure.

Over time, stopbanking may be threatened by erosion of the river berm land adjacent to the stopbank. In this event, the stopbanking may need to be rebuilt in a new location. The cost of this work will be treated as capital expenditure and the work will be funded as an extraordinary capital expense.

Flood damage can also occur to stopbanking. This will also be treated as an extraordinary maintenance expense and scheme emergency reserves will be maintained to help provide for this unplanned maintenance expenditure.

Maintaining the flood carrying capacity of the channel has become an issue in rivers with high silt deposits. Channel capacity is maintained depending on scheme type. Silt removal exercises involve loading and transporting silt from within the channel over the

stopbank, and by encouraging the fluvial transportation of silt by flows by leaving river banks scarred and susceptible to transport through the reach.

Tied Tree Edge Protection

Tied tree edge protection prevents lateral erosion of the riverbank and maintains river alignment, by providing relatively heavy vegetative protection, developing strong root systems, and encouraging the deposition of sediment at the toe of the banks. Tied tree edge protection is the most common method of riverbank erosion control utilised throughout the Region.

Appropriately sized trees for the size of channel are utilised and anchored in place with wire rope and either driven railway irons or concrete anchors are used to form a continuous protective live vegetation structure to buffer flows along the riverbank.

These “soft” structures are an integral part of edge protection planting work and as such will be treated as having an infinite life.

As for all planting work, tied tree work may require a high level of maintenance expenditure due to the high-risk environment in which these structures are located. All expenditure in established sites will be treated as maintenance expenditure.

Weirs and Drop Structures

Weirs are flumes that control the flow in the river while drop structures change bed levels of the river. They are generally concrete structures exposed to in-stream wear so are expected to have a 70 year life, and will be depreciated accordingly. Although the Makino Floodway drop structure is made of gabions it is expected to have a similar life due to its infrequent use (about once every 5-10 years).

In the event of replacement being necessary, it will be treated as a renewal expense that extends the life of the asset and therefore will be a capital expenditure.

Miscellaneous Structures

Amenity assets (e.g. timber decks and concrete lookout platforms along the Manawatu River walkway in Palmerston North), spillways, security fences and other minor assets will be regarded as having an infinite life and will not be depreciated.

All expenditure on existing assets will be treated as maintenance expenditure.

Conclusion

The Policy outlined above has been developed as the typical approach to be taken to the management of Horizons Regional Council’s Infrastructural Assets. There may be a need to vary this policy, by exception, on some schemes. Any variation will be identified in the Asset Management Plan for the scheme.

This Policy will be reviewed when Horizons Regional Council next reviews its Asset Management Plans in December 2021.

Asset Management Policy Summary

Asset Type	Maintenance/Renewal Policy	Asset Life Cycle	Depreciate?	Approx. Value 1 July 2017
Concrete riprap	Maintain to full service potential in perpetuity (periodic topping up etc). If substantial damage occurs, opportunity may be taken to replace with rock. That would provide increased levels of service and be treated as new capital expenditure accordingly	Infinite	No	$34.5million
Rock linings – engineered and non-engineered.	Maintain to full service potential in perpetuity (periodic topping up etc.). If substantial damage occurs to non-engineered rock, opportunity may be taken to replace with a higher standard engineered asset. That would provide increased levels of service and be treated as new capital expenditure accordingly	Infinite	No	$61.1 million
Stopbanks – no settlement or loss of channel capacity	Maintain to design standard in perpetuity. If climate change impacts on levels of service, any upgrade would be treated as new capital expenditure.	Infinite	No	$172.1 million
Stopbanks – structural deficiencies identified	Maintain in perpetuity and Replace when deficiencies are identified, as either an extraordinary maintenance or capital expense	Infinite (unable to pre-determine deficiencies)	No	included
Stopbanks – progressive loss of capacity	Maintain in perpetuity. Consult through scheme review process re options – i.e. reduced level of service or upgrade. If upgraded, treat as extraordinary capital expense. Where silt is removed on a planned and regular basis (e.g. Oroua River), that will be treated as maintenance.	Infinite (possibly to a reduced levels of service)	No	included
Timber flood walls and stopbank retaining walls	Maintain and Renew	50 years	Yes	$2.66 million
Concrete flood walls and retaining walls	Maintain and Renew	200 years	Yes	$4.7 million

Portable flood barriers	Maintain and Renew	50 years	Yes	$283,000
Detention dams	Maintain earth embankments in perpetuity. Where siltation affects capacity, reinstate as a maintenance item or consult around option of reducing levels of service. Renew culverts and concrete spillways as capital expenditure.	Infinite (earth structures) 70 years (culverts and spillways) as an interim provision until individual asset assessments provide better information.	No Yes	$10.3 million
Floodgated culverts –all	Maintain exposed components e.g. flap gates and screens. Renew either entire structure or components as capital expenditure	70 years	Yes	$14.8 million
Drainage channels, including culvert crossings	Maintain in perpetuity, including re-grading and minor relocation. Where enlargement or relocation is required for increased levels of service, treat as a capital improvement.	Infinite	No	$27.2 million
Bridges (concrete)	Maintain and Renew	200 years	Yes	$54,000
Grade Controls (loose rock/boulders) These typically have imprecise dimensions	Maintain as required. Total replacement may be required in rare instances and will be treated as capital expenditure - new.	Infinite	No	$531,000
Grade controls and weirs (concrete structures)	Maintain and Renew.	70 years	Yes	$3.8 million
Groynes – encased concrete	Maintain to extent possible. In event of undermine and collapse, replace as extraordinary capital expense.	Infinite	No	$666,000
Groynes - permeable	Maintain as required. Will usually achieve intended purpose within their variable finite life. In rare situations where replacement is required, treat as capital expenditure – new.	Undefined	No	$3.9 million

Groynes – impermeable rock	Maintain to full service potential in perpetuity (periodic topping up etc.) Total replacement may be required in rare instances and will be treated as new capital expenditure or maintenance if no increase in levels of service.	Infinite	No	$3.35 million
Lateral riverbank retaining/erosion walls (timber, rail and netting, gabions)	Maintain and Renew as necessary. Because of the relatively minor scale of these structures, replacement will be treated as maintenance expenditure.	Undefined	No	$538,000
Lateral erosion walls - mass blocs and tiered concrete	Maintain and Renew	100 years	Yes	$599,000
Lateral erosion walls – Permeable mesh units	Maintain. These structures are of a temporary nature and have a variable finite life. Protect vegetation during establishment	Undefined	No	$6.6 million
Tied tree edge protection	Maintain in perpetuity (high maintenance cost) Replace as necessary as a maintenance expenditure	Infinite	No	$27.9 million
Protection planting and erosion protection reserves.	Maintain in perpetuity (high maintenance cost) Replace as necessary as a maintenance expenditure. New planting areas will be established as capital expenditure – new.	Infinite	No	$33.4 million
Flood control/diversion structures	Maintain and Renew	Concrete – 200 years (Makino 100). Control building 100 years, steelwork – 100 years Electrical – 50 years (as an interim provision until individual asset assessments provide better information) Concrete – 100 years Steel work– 100 years (as an interim provision until individual asset assessments provide better information)	Yes	$37 million

Pumpstations	Maintain to ensure design service capacity. Renew (overhaul) components or entire structure as required. Potentially complete replacement could be required where land settlement significantly compromises effectiveness. That would be treated as an extraordinary capital expenditure.	Concrete – 100 years Mechanical (pumps and gates) and structural steel – 25 years Electrical – 50 years	Yes	$14.7 million
Miscellaneous structures (amenity assets, spillways, security fences etc.)	Maintain in perpetuity. Replace if necessary and treat as either maintenance or extraordinary capital expense.	Infinite	No	$1.3 million
TOTAL (excludes forestry and WIP)				**$464 million**

Note

1. Forestry is managed on a self-sustaining basis and is not depreciated. Any surplus income after felling, replanting, trimming and other management costs is added to scheme reserves. Current value is approximately $1 million.
2. WIP is “work in progress” – it is annual capital expenditure that is yet to be allocated to new or existing assets still under construction. Current value is approximately $1.2 million.

Appendix C

Typical Useful Lives for Asset Types and Insured Assets

The Useful Life of an asset is the life of the asset until it ceases to be able to provide the required level of service because of physical deterioration. The maximum Useful Life is sometimes termed the Physical Life.

Asset Depreciation is based on the Useful Life, therefore a 50 year Useful Life results in a 2% depreciation per year.

The Remaining Useful Life of an asset is the remaining life of that asset and is assessed during the revaluation process, currently undertaken every three years.

Where assets have been assessed 'as new', this means that regardless of when it was constructed, if the Useful Life of that asset is 50 years, it is still considered to have a life of 50 years from the date of revaluation. Thus, previous years' depreciation will be zeroed. However, if the asset is assessed as having a Remaining Useful Life less than the Useful Life set out below, the previous accumulated depreciation for that asset will be carried over to the next financial year.

The condition factor is a guide as to what level of maintenance is required, and is assessed at every inspection of that asset. Condition factors are used for Annual Maintenance Programs and have no bearing on the life of the asset.

The following is a list of all our asset types with their maximum useful lives and whether they will be depreciated. Some assets with a specified Useful Life are not depreciated due to uncertainty over their replacement (e.g. grade controls may not need to be replaced if the channel has stabilised) or high risk of flood damage (variable finite life).

Also included is their current insurance status, which applies to assets in the main flood protection schemes but not assets in those classed as erosion control schemes (Lower Kiwitea, Pohangina-Oroua, South Eastern Ruahine, Upper Manawatu-Lower Mangahao) or minor drainage schemes (Forest Road, Haunui, Himatangi, Hokio). Material Damage (All Risks) Insurance covers pumpstations, control building and electrics at Moutoa Sluicegates and Makino Diversion structure plus portable flood barriers while all the other insured asset subtypes are covered by Infrastructure Asset Insurance.

Asset Sub Type	**Useful Life**	**Depreciated**	**Insured**
Amenity Enhancement	Perpetual	N	N
Bed Armouring	Perpetual	N	Y
Firth Block Flood Wall (Block Flood Walls)	200	Y	Y
Bridge	200	Y	N
Bridge Flood Wall (steel plate)	Perpetual	N	Y
Cased concrete piled groynes	Perpetual	N	Y
Mass Bloc Retaining Wall (Concrete Block Walls)	100	Y	Y
Concrete Flood Wall	200	Y	Y
Concrete Riprap	Perpetual	N	Y
Detention Dam	Perpetual	N	Y

Detention Dam Culvert/Spillway[1]	70	Y	Y
Drain Reach	Perpetual	N	N
Drop Structure	70	Y	Y
Environmental Enhancement	Perpetual	N	N
Erosion Protection Reserve	Perpetual	N	N
Floodgated Culvert Major	70	Y	Y
Floodgated Culvert Minor	70	Y	Y
Floodgate Structure	100	Y	Y
Flow Diversion Structures[7] - Major - Moutoa, Makino - Minor - Flygers Line	Conc 200 Steel 100 Bldg[3] 100 Elec[3] 50 Conc 100 Steel 100	Y Y Y Y Y Y	Y
Forestry	Perpetual	N	N
Gabions[2]	Undefined	N	Y
Grade Control (loose rock)[2]	Perpetual	N	Y
Grade Control (concrete)	70	Y	Y
Guidebank	Perpetual	N	Y
Handrails	Perpetual	N	N
Kneebreakers	Perpetual	N	N
Misc. Spillway	Perpetual	N	Y
Permeable Groyne[2]	Undefined	N	N
PMU[2]	Undefined	N	Y
Portable Flood Barrier[5]	50	Y	Y/N
Property[4]	Perpetual	N	Y/N
Property Mitigation Bund	Perpetual	N	Y
Protection Planting	Perpetual	N	N
Pumpstation Building[3]	100	Y	Y
Pumpstation Electrical[3]	50	Y	Y
Pumpstation Floodgate[3]	25	Y	Y
Pumpstation Land	Perpetual	N	N
Pumpstation Pump[3]	25	Y	Y
Rock Groyne	Perpetual	N	Y
Rock Lining (engineered)	Perpetual	N	Y
Rock Lining (non-engineered)	Perpetual	N	Y
Security Fence	Perpetual	N	N
Self help depots	Perpetual	N	N
Stock Gate	Perpetual	N	N
Stop Logs[5]	Perpetual	N	Y/N
Stopbank	Perpetual	N	Y
Tied Tree Work	Perpetual	N	N

Tiered Concrete Lining (concrete steps Palmerston North)	100	Y	Y
Timber Flood Wall	50	Y	Y
Double Timber Flood Wall (Timber Planter Boxes)	50	Y	Y
Timber Retaining Wall - stopbank - channel[2]	 50 Undefined	 Y N	Y
Toe Drain	Perpetual	N	Y
Vehicle ramp over stopbank	Perpetual	N	N
Walkway	Perpetual	N	N
Weir[6]	70	Y	Y

Notes

1. Detention dam culvert/spillway includes Inlet Structure, Outlet Structure, Inlet/Outlet Structure, Spillway.
2. Some assets with an undefined Useful Life are not depreciated due to uncertainty over their replacement (e.g. grade controls may not need to be replaced if the channel has stabilised) or high risk of flood damage (variable finite life).
3. Control buildings and electrics plus pumpstation assets are covered by Material Damage (All Risks) Insurance Policy, not Infrastructural Asset Insurance Policy.
4. Property assets currently include a house property at Kopane (insured under Material Damage Policy) and land for Makino Diversion structure (not insured).
5. Portable Flood Barrier and Stoplog assets include site works (not insured) and portable flood barriers (insured under Material Damage Policy).
6. Weirs are generally concrete except the nine rock weirs in lower Ashhurst Stream, which are not insured.
7. The Matarawa Flow Diversion structure is an exception. It is a single culvert structure acting as a flow constriction and is treated as a floodgated culvert with a 70 year life.

Appendix D

Maintenance of River Control Schemes

Maintenance Issues

River control systems can be broken into three zones, each with their own maintenance issues.

Fairway

Aims:

- To maintain a stable alignment;
- To maintain a channel cleared of vegetation that would otherwise impede flows or divert flood flows into fairway edge, causing erosion; and
- To control aggradation (retain channel capacity).

Maintenance Issues:

- Gravel extraction management;
- Channel works;
- Vegetation control; and
- Fairway edge stability.

Potential Damage:

- Excess gravel build-up in critical locations;
- Bed degradation;
- Deposited debris (trees);
- Braid alignment causing direct attack on fairway edges;
- Bed vegetation (e.g. on beaches) - brushweeds and trees; and
- Reducing channel width – edge encroachment.

Braid alignment changes can occur in minor floods. Gravel build-up and debris is most likely to occur in floods over two times mean annual flood.

Berm/Buffer Zone

Aims:

- To maintain a stable berm, prevent erosion.
- To develop and maintain a system which will reduce flow velocities at high river levels, i.e. the system of tree planting and groynes.
- To maintain a balance between erosion protection value and fairway capacity.

Maintenance Issues:

- Erosion control works at the fairway edge.
- Maintenance of berm vegetation – replacement and development of plantings, removal of old or diseased trees.
- Tree species selected to:
  - Provide effective protection
  - Enhance environment
  - Provide income
  - Provide material for erosion control work
  - Reduce risk of disease.
- Maintain groynes - particularly armoured heads.
- Weed control - plants such as Clematis Vitalba (old man’s beard) can destroy trees.
- Track maintenance - public access and access for maintenance work.
- Landowner control of stock to ensure no damage to berm vegetation.

Potential Damage:
This is the area with the major exposure to damage, which can occur in any flow over the mean annual flood.

Erosion control works are constructed to absorb the energy of the river, control the alignment and prevent lateral erosion of lower terrace land and adjoining stopbanks.

Damage is not proportional to discharge. In a moderate flood where the river has room to develop an exaggerated meander, i.e. acute angle of bank attack, the impact on the erosion control works can be very high. Likewise where an earlier moderate flood has weakened erosion control works the damage can be disproportionate to the discharge.

Damage will include destruction or weakening of erosion control structures including groynes and trees and erosion (removal) of sections of the berm. The urgency of replacement/repair of this damage will depend on the quantity and quality of the remaining berm protection.

In general, for a wide berm where stopbanks are not at risk, the level of service has been set at approximately a 20 year return period flood event or flood volume (flow during a specified duration). That is, the bank protection works will prevent bank erosion in a flood event with a return period of less than approximately 20 years. This 20 year level of service was selected on a basis of experience that the combination of capital and maintenance expenditure on the protection works over its lifetime would be optimal at this standard.

In some cases the berm width is very narrow. In this case the level of service to the stopbank is necessarily the same as the return period of the design flood event. This level of service is achieved by selecting an appropriately robust bank protection measure.

It should be noted that the bank protection works, berm and stopbanks combine as a unit to provide the required level of protection to the floodplain. In the design flood event, failure of some of the bank edge protection works may be expected. However, the system will have done its job provided water does not reach the 'protected' floodplain.

The width of the buffer zone necessary is a function of the location on the river, the width of the design channel, the degree of strengthening of the buffer zone and the width of the buffer zone. Also to be considered is the provision of sufficient room for maintenance access.

Stopbanks
Aim: to prevent flooding by containing river flood flows to a specified design standard (e.g. 100 year return period).

Stopbanks are generally constructed of compacted river silts with a grass cover. They do not have the strength to resist the erosive forces of a river in flood without the work described in the sections above.

The stopbanks are built to a level based on the calculated water level at a particular flood discharge, plus freeboard.

Maintenance Issues:

- Repair erosion (internal and external including foundations), vehicle damage and water damage;
- Track maintenance (many stopbanks have metalled roads across them providing vehicle access to the river);
- Maintain top level;
- Control trees and brushweeds on stopbank;
- Stock control; and
- Construction demands:
  - pipes through banks; and
  - structures adjacent to banks.

Potential Damage:
During a flood stopbanks can be damaged by:

a. Lateral erosion of the berm, leading to undermining failure of the stopbank. This type of failure can occur at flood levels below the capacity of the river system, can be sudden, and scour away long lengths of stopbank and berm. Efforts to prevent this type of failure assume the highest priority both where the situation is identified as a potential for erosion failure or for repair of the system after a failure has occurred. Narrow berms are often protected by rock linings.

b. Overtopping. Stopbanks are not designed or built to sustain overtopping. Where the depth of water flowing over the top of a bank exceeds 150 mm and/or the duration of overtopping is measured in hours, the bank will almost certainly be eroded. The erosion generally starts by scouring of the landward batter of the bank and therefore an even surface and strong vegetation cover on this landward batter is very important.

c. Piping. Flow through porous bank or foundation material washing out fines leading to a collapse. Seepage flow along culverts and other pipes or lines passing through or under stopbanks can initiate failures. Prudent design may involve seepage cut-offs or filters to prevent fines being washed out.

d. Scour. Vegetation, bare areas, stock camping sites and other localised defects on the stopbank and berm can cause localised turbulence or weaknesses that can result in scour holes and failure. Wave action on such local defects can also cause scour, especially if the stopbank is composed of sand covered in a silty outer layer (as with some of the Moutoa Spillway stopbanks). High flow velocities at local flow concentrations (e.g. where berm flow re-enters the main fairway flow) may need armouring and/or snub groynes to safely deflect the flow away from the stopbank.

Repair of any erosion with the potential to cause stopbank failure will have a very high priority over other maintenance items.

During normal use, damage can be caused by:

a. Vehicle movements that destroy vegetation and wear ruts resulting in low spots and weaknesses.

b. Stock. Grazing stock can destroy the vegetation on the stopbanks causing weakness. Stock can also form tracks, bare camping areas etc. which cause a weakness leading to erosion and ultimate failure of the stopbank.

c. Construction. Unauthorised construction of pipelines or cables under stopbanks, or structures close to or encroaching into the toe of a stopbank can weaken the bank.

Repairs of damage occurring during normal use are undertaken as a part of routine maintenance.

Concrete and Reinforced Concrete Structures

Various techniques can be used to assess the cause and extent of concrete and reinforcement deterioration. These include measurement of the depth of concrete cover, sampling of concrete to determine levels of contamination, removal of cores for strength assessment and assessment of reinforcement corrosion by excavation and electrical testing.

These all require specialist equipment. When samples are recovered or concrete is broken open to check the state of reinforcement, it is particularly important to avoid causing structural damage and to repair the opening correctly.

Timber Structures

For wooden structures common tests include: pressing to check for softening, checking for softening using a sharpened spike, boring to determine the location and depth of decay, and coring to provide samples for identifying the type of wood.

Even the simplest of these tests should be used with care as they have the potential to weaken the structure of the remaining wood.

A detailed condition rating assessment guide for timber assets is included at the end of Appendix J.

Maintenance Tasks

The maintenance tasks for each asset type are summarised below:

Asset	Inspection Frequency	Maintenance Task
Bed control structures, weirs and grade controls	Annually	• Replace rock (apron or crest) • Clear debris • Batter bank slumps • Repair apron scour • Treat corrosion • Undertake structural repairs
Dams	To Building (Dam Safety) Regulations 2008	• Clear inlet screens • Maintain inlet channels • Repair stock damage • Undertake structural repairs • Repair scour • Maintain spillway grass cover • Manage vegetation • De-silt ponding areas • Maintain fencing
Drainage channels	6/12-Monthly	• Mechanical/Chemical maintenance • Batter bank slumps • Unblock culverts • Repair culverts • Clear debris • Maintain access (including spreading) • Maintain gradient
Floodgated structures (major and minor, steel or wood, concrete or plastic)	Annually	• Repair gate and hinges • Undertake structural repairs • Repair scour • Clear debris • Treat corrosion • Maintain winch • Clear outlet channel • Control seepage • Maintain safety features
Flood Walls (block, concrete, timber, timber planter boxes)	Annually	• Structural maintenance, replacing warped timber. • Vegetation control (removal, mowing, spraying) • Erosion (minor earthwork, erosion protection) • Fencing • Checking ties and connections are tight and degree of corrosion.
Groynes (permeable, tree)	Annually	• Clear debris • Repair head scour • Undertake structural repairs • Redesign outflanked assets

Protection planting	Annually	• Undertake tree thinning • Undertake layering • Replacement planting • Remove or spray noxious plants/trees
Pumpstations: Land	Annually	• Mow grass • Remove or spray noxious plants/trees • Maintain access tracks • Maintain fencing • Undertake land improvements
Pumpstations: Building	Six-monthly	• Maintain building durability (Paint) • Undertake structural repairs • Maintain bird proofing • Maintain safety features • Maintain weather-tightness
Pumpstations: Electrical	Four-monthly	• Replace major components • Replace minor components • Maintain lighting
Pumpstations: Pumps	Ongoing	• Lubrication • Service pump
Pumpstations: Floodgate (includes screens, handrails and other steelwork)	Six-monthly	• Maintain floodgate • Replace weed screen • Treat corrosion • Repair winch
Rockwork, concrete riprap and rock groynes	Annually	• Maintain vegetation (willow etc.) • Clear debris • Top up rock loss • Cut off protruding steel • Maintain rock stockpile
Stopbank	Annually	• Manage grass cover (controlled grazing, mowing) • Remove or spray noxious plants/trees • Maintain structural integrity of the bank • Maintain design profile • Repair stock damage and scour • Maintain access (ramps etc.) – metalling • Maintain fencing
Tied tree work, PMU and lateral fence erosion protection work	Annually	• Maintain bulk • Maintain anchors • Undertake planting • Undertake layering

Appendix E

Maintenance of Drainage Schemes

Maintenance Issues

Drains

Aims:

- to maintain drain capacity; and
- to maintain a stable alignment.

Maintenance Issues:

- weed growth;
- access for maintenance;
- overloading of drainage systems from increased runoff due to development;
- keep drains in operating condition without causing enlargement;
- aggradation and degradation; and
- capacity at bridges and culverts.

Potential Damage:

- blockages of channels and pump screens;
- excess shingle build-up in critical locations;
- bed degradation; and
- bank erosion.

Pumps

Aims:

- to maintain drain discharge when gravity outlets are shut by high river levels;
- to maintain drainage levels; and
- to control the duration and extent of ponding.

Maintenance Issues:

- weed growth in drains;
- heavy weed build-up on screens;
- electrical systems failure;
- power outages;
- operating pumps below minimum levels to offset settlement;
- increased demand due to more intensive land use;
- control of vermin, birds, vandalism, fire; and
- settlement, earthquakes.

Potential Damage:

- blockages of channels and pump screens;
- screens damaged by mechanical cleaning (using excavators);
- motor damage from manual over-ride of automatic control system;
- high drainage levels and ponding;
- increased wear and tear on pumps;
- structural damage to pumpstation building and components; and
- pipe movement, washouts of outlets and stopbanks.

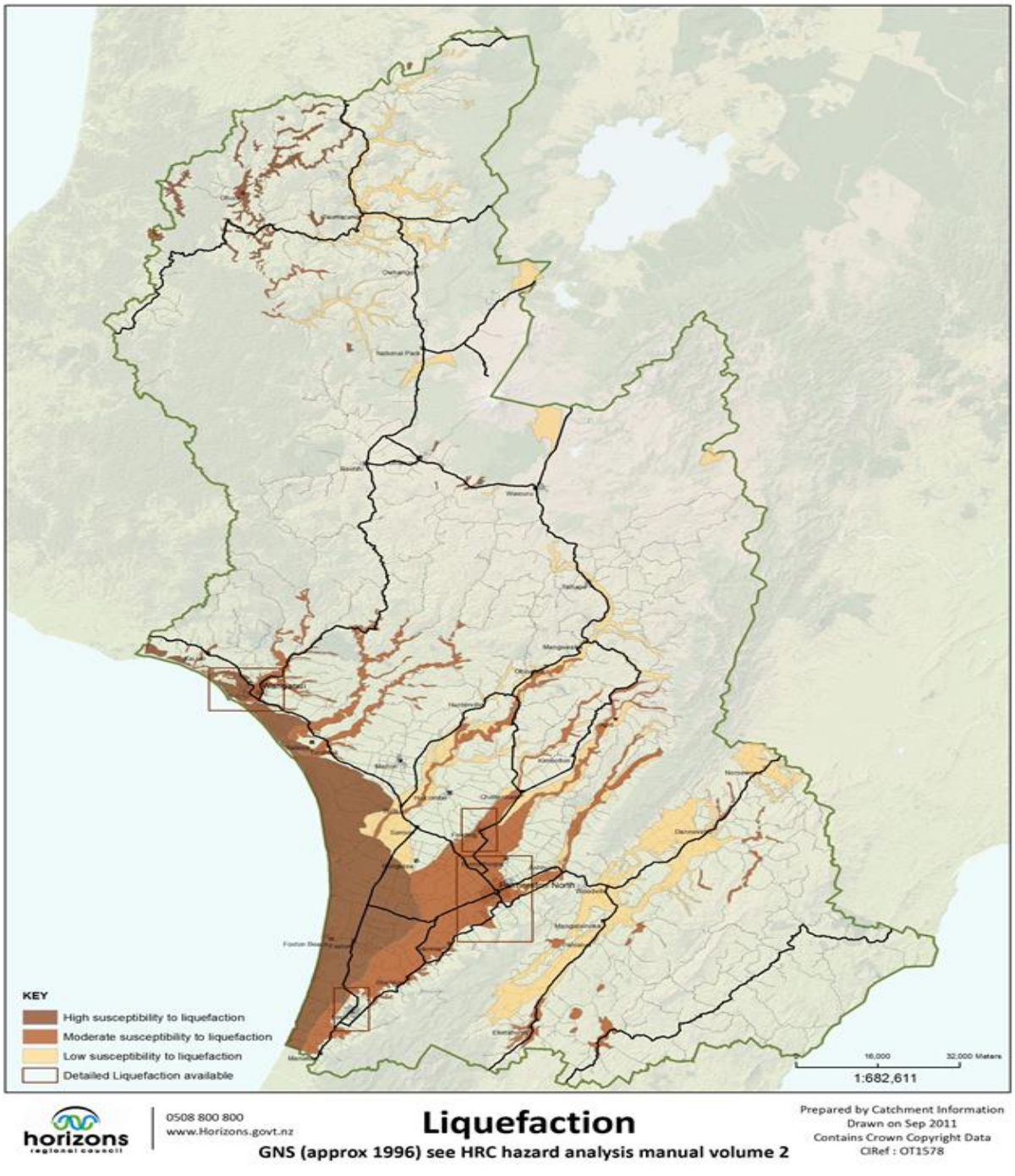
Stopbanks

As for river control schemes, but often smaller scale and built to relatively low protection standard so more prone to overtopping.

Appendix F

Areas Susceptible to Liquefaction

The plan included in this appendix shows the areas with a high susceptibility to liquefaction, a moderate susceptibility to liquefaction and low susceptibility to liquefaction. Assets in these zones will be inspected for earthquake damage after a significant event.



Appendix G

Asset Numbers and Scheme Management Areas

The River Management Group of Horizons Regional Council works out of three depots or service centres (at Marton, Woodville and Kairanga) and from Head Office located in Palmerston North. Each service centre has an Area Engineer that manages a designated area.

There are four areas:

- **Northern** is managed from the Marton office and covers the catchments of the Whanganui, Whangaehu, Turakina and Rangitikei Rivers, as well as the Pohangina catchment above Ashhurst and the Oroua catchment above Reid Line, Feilding.
- **Central** is managed from Kairanga and covers the Lower Manawatu River and its tributaries west of the Tararua Ranges, including the Oroua River up to Reid Line and the Kiwitea Stream;
- **Southern** is also managed from Kairanga and covers the drainage scheme areas south of the Rangitikei River and west of Palmerston North, as well as the river schemes south of Levin; and
- **Eastern** is managed from Woodville and covers the area east of the Ruahine Ranges.

Schemes are associated with each area as follows:

Scheme No.	Scheme Name	Area
11	Ashhurst Stream	Central
53	Forest Road	Northern
72	Foxton East Drainage	Southern
55	Haunui Drainage	Northern
74	Himatangi Drainage	Southern
75	Hokio Drainage	Southern
92	Kahuterawa*	Central
77	Koputaroa Drainage	Southern
14	Lower Kiwitea	Central
20	Lower Manawatu	Central
90	Lower Whanganui	Northern
79	Makerua Drainage	Southern
57	Makirikiri	Northern
80	Manawatu Drainage	Southern
40	Mangatainoka	Eastern
58	Matarawa	Northern
81	Moutoa Drainage	Southern
54	Ohakune*	Northern
83	Ohau-Manakau	Southern
61	Pakihi	Northern
23	Pohangina-Oroua	Northern
62	Porewa	Northern
64	Rangitikei	Northern
60	Ruapehu*	Northern
45	South Eastern Ruahine	Eastern
43	Tararua*	Eastern
42	Tawataia-Mangaone	Eastern
87	Te Kawau Drainage	Southern
59	Turakina*	Northern

66	Tutaenui	Northern
47	Upper Manawatu-Lower Mangahao	Eastern
68	Upper Whanganui	Northern
56	Whangaehu-Mangawhero*	Northern
89	Whirokino Drainage	Southern

Other		
1	Within Scheme – not HRC owned	
5	Environmental Grant	
98	Not maintained assets	

Note – the six schemes marked with an asterix are for channel maintenance only and have no assets, so they are not do not have individual Asset Management Plans.*

Asset Identification Numbers have been allocated for each asset and can be interpreted as follows:

2 0 4 0 2 0
Scheme Asset Number

- The first 2 digits relate to the scheme
- The last 4 digits relate to the type of asset.

Asset numbers have been allocated as follows:

Asset Number	**Asset Sub-type**
0 - 999	Tied Tree Work
1000 - 1999	Erosion Protection Reserve
1000 - 1999	Protection Planting
2000 - 2999	Concrete Riprap
2000 - 2999	Rock Linings
3000 - 3019	Cased Concrete Piled Groynes
3020 3029	Tiered Concrete Lining
3000 - 3199	Rock Groynes
3000 - 3199	Permeable Groynes
3200 - 3299	Gabions
3300 - 3399	Timber Retaining Wall
3400 - 3599	PMU
3600 - 3799	Grade Control
3800 - 3849	Bed Armouring
3850 - 3899	Weir
3900 - 3999	Drop Structure
4000 - 4999	Guidebank
4000 - 4999	Stopbank
5000 - 6799	Drain Reach
6500 - 7899	Floodgate Culvert Major
6500 - 7899	Floodgate Culvert Minor
6500 - 7999	Floodgate Structure
8000 - 8199	Pump No.1
8000 - 8199	Pump No.2
8000 - 8199	Pump No.3

8000	-	8199	Pump No.4
8000	-	8199	Pumpstation Building
8000	-	8199	Pumpstation Electrical
8000	-	8199	Pumpstation Floodgate etc.
8000	-	8199	Pumpstation Land/Access
8000	-	8199	Pumpstation Pump
8200	-	8499	Forestry
8500	-	8799	Dam
8500	-	8799	Inlet Structure
8500	-	8799	Inlet/Outlet Structure
8500	-	8799	Outlet Structure
8500	-	8799	Spillway
8800[1]	-	8819	Flow Diversion Structure
8820	-	8839	Misc. Spillway
8840	-	8859	Toe Drain
8860	-	8899	Stock Gates
9000	-	9010	Bridge
9000	-	9010	Property
9050	-	9099	Concrete Block Walls (Mass Bloc Retaining Walls, Firth Block Flood Walls)
9100	-	9149	Concrete Flood Walls
9150	-	9199	Timber Flood Walls/ Bridge Flood Wall
9200	-	9229	Amenity Enhancement
9230	-	9249	Environmental Enhancement
9251	-	9300	Stoplogs/Portable Flood Barriers
9350	-	9399	Double Timber Flood Walls (Planter Boxes)
9400	-	9419	Benchmarks (deleted 2014)[2]
9500	-	9519	Vehicle Ramps over Stopbanks
9520	-	9529	Walkway
9530	-	9539	Security Fence
9540	-	9549	Kneebreakers
9550	-	9559	Handrails
9600	-	9700	Property Mitigation Bunds (Taonui Basin Upgrade)

1. Generally 8800-8819, but one or two assets originally input as floodgate structures and 7500 numbers not changed.
2. Benchmarks are incidental to stopbank assets, not a separate asset.

For tracking costs against budget, the following codes are used for non-specific asset management. These tasks are essential Scheme works to maintain assets but it is not practicable to book these costs to individual assets.

8900-8930	Channel/Berm Clearance
8901	Noxious Plants Channel Control
8905-8930	Vegetation Clearance
8910	Floodway Inspections
8911	River Inspections
8912	Leased Inspections
8913	Dam Inspections
8914	Floodgate Inspections
8915	Stopbank Inspections
8920	Pumpstation Inspections
8921	Drain Inspections
8940	Resource Consent

8950	Vegetation Clearance
8950 – 8999	Mowing
9250	Self Help Depots
9261	District Liaison Advice
9990-9999	Assets to be Determined (WIP-Work in Progress)

Provision has also been made in the AMS for a Dam Database to manage all the dams in the Region based on type of purpose:

- Electricity Generation
- Flood Detention
- Other
    - Recreational
    - Stockwatering
    - Stormwater Detention
    - Water Supply

Each dam type is either

- Concrete
- Earth
- Other.

The Dam Database is not managed by the River Management Group and does not form part of this Infrastructural Asset Management Plan.

Appendix H

Reserves and Flood Risk Assessment Database

50 year Flood Damage Reserves

Scheme Name	Scheme Reserve Balance at 30 June 2017	Flood Damage All Assets	Flood Damage Insured Assets	Insurance Deductible $3m (half Region)	50yr Reserves after insurance deductible	Proposed Reserves (Rounded Values)
				$6,000,000		
		A	B	C	A-B+C	
Ashhurst Stream	14,477	10,000	7,000	$3,061.14	6,061	6,000
Forest Rd Dr	1,028	12,000	0	$0	12,000	12,000
Foxton East Dr	8,543	1,750	680	297.3678572	1,367	1,400
Haunui Dr	-	7,900	0	0	7,900	7,900
Himatangi Dr	8,074	8,000	0	0	8,000	8,000
Hokio Dr	13,910	11,500	0	0	11,500	11,500
Koputaroa Dr	109,366	212,000	190,000	83088.07774	105,088	105,000
Lower Kiwitea	215,962	520,000	0	0	520,000	520,000
Lower Manawatu	2,360,855	8,200,000	7,000,000	$3,061,139.71	4,261,140	4,260,000
Lower Whanganui	266,630	170,000	170,000	74341.96429	74,342	74,000
Makerua Dr	143,453	169,000	125,000	54663.20904	98,663	99,000
Makirikiri	32,509	53,000	53,000	23177.20063	23,177	23,000
Manawatu Dr	109,975	800,000	410,000	179295.3256	569,295	570,000
Mangatainoka	1,005,698	2,040,000	1,370,000	599108.771	1,269,109	1,270,000
Matarawa	24,988	35,500	23,800	10407.875	22,108	22,000
Moutoa Dr	80,164	60,000	5,000	2186.528361	57,187	57,000
Ohau-Manakau	185,782	1,750,000	1,000,000	437305.6723	1,187,306	1,190,000
Pakihi	3,545	3,700	3,700	1618.030987	1,618	1,600
Pohangina-Oroua	460,926	1,140,000	0	0	1,140,000	1,140,000
Porewa	45,755	38,000	38,000	16617.61555	16,618	16,700
Rangitikei	960,786	7,400,000	2,900,000	1268186.45	5,768,186	5,770,000
SE Ruahine	494,243	3,250,000	0	0	3,250,000	3,250,000
Tawataia-Man	8,719	6,900	1,000	437.3056723	6,337	6,400
Te Kawau Dr	136,372	218,000	160,000	69968.90757	127,969	128,000
Tutaenui	36,967	13,500	12,200	5335.129202	6,635	6,700
Up Manawatu	487,510	1,350,000	0	0	1,350,000	1,350,000
Up Whanganui	305,374	259,000	240,000	$104,953.36	123,953	124,000
Whirokino Dr	15,365	16,000	11,000	4810.362395	9,810	9,800
Totals	7,536,976	27,755,750	13,720,380	6,000,000	20,035,370	**20,040,000**

The proposed reserves are based on funding the non-insured amount of the 50 year flood damage (as read from the Flood Loss Curves for each scheme in Part B of the Asset Management Plans). The insurance deductible is currently set at $3 million and given the likely geographical extent of such large storms it is assumed that half the insured assets are affected in any one event. A deductible of $6 million has therefore been applied pro rata to all the insured assets.

The reserves for each scheme must cover the deductible for damage to insured assets and all the damage to non-insured assets.

It is assumed that insurance would cover the remaining damage to insured assets, but in localised events it is possible that the damage would not exceed the $3 million deductible and the scheme would be liable for all the damage. It is considered that any request for emergency funding would be relatively small and not unduly impact on Horizons Regional Council's finances.

Note that the highlighted erosion schemes and minor drainage schemes are not insured and their reserves cover the full 50 year flood damage. Several minor river management schemes have reserves for occasional channel clearing and removal of debris blockages but as they are not associated with any assets they are not included in the table above.

Summary of Flood Damage Loss Factors

Asset Sub Type	Insured by IAI	% Value	20yr % Damage	100yr % Damage	500yr % Damage
Amenity Enhancement	N	80%	0%	0%	0.5%
Bed Armouring	Y	100%	0%	3%	5.0%
Benchmarks	N	100%	1%	2%	4.0%
Firth Block Flood Wall	Y	100%	0%	1%	10.0%
Bridge	N	100%	0%	2%	4.0%
Bridge Flood Wall	Y	100%	0%	1%	10.0%
Cased concrete piled groyne	Y	80%	1%	2%	5.0%
Massbloc Retaining Wall	Y	100%	0%	1%	10.0%
Concrete Flood Wall	Y	100%	0%	1%	10.0%
Concrete Rip Rap	Y	100%	5%	25%	50.0%
Detention Dam	Y	100%	0%	1%	2.0%
Drain Reach	N	100%	0%	5%	10.0%
Drop Structure	Y	100%	1%	3%	5.0%
Erosion Protection Reserve	N	100%	10%	30%	85.0%
Floodgated Culvert Major	Y	100%	0%	2%	4.0%
Floodgated Culvert Minor	Y	100%	0%	2%	4.0%
Floodgated Structure	Y	100%	0%	2%	4.0%
Flow Diversion Structure	Y	80%	0%	0%	0.5%
Forestry	N	0%	0%	0%	0.0%
Gabions	Y	100%	2%	10%	20.0%
Grade Control	Y	100%	2%	15%	30.0%
Guidebank	Y	100%	1%	1%	2.0%
Handrails	N	100%	0%	0%	85.0%
Kneebreaker	N	100%	1%	6%	75.0%
Misc Spillway	Y	100%	1%	3%	10.0%
Portable Flood Barrier	N	0%	0%	0%	0.0%
PMU	Y	100%	5%	20%	40.0%
Property	N	0%	0%	0%	0.0%
Property Mitigation Bund	N	100%	1%	6%	10.0%
Protection Planting	N	100%	10%	30%	85.0%
Pumpstation	N	0%	0%	0%	0.0%
Rock Groyne	Y	100%	2%	10%	20.0%
Rock Lining (engineered)	Y	100%	1%	3%	5.0%
Rock Lining (non-engineered)	Y	100%	5%	25%	50.0%
Security Fence	N	100%	0%	0%	85.0%
Self Help Depots	N	100%	1%	1%	2.0%
Stock Gate	N	100%	5%	100%	100.0%
Stopbank	Y	100%	1%	6%	10.0%
Stop Log	N	0%	0%	0%	0.0%
Tied Tree Work	N	100%	10%	30%	85.0%
Tiered Concrete Lining	Y	80%	0%	0%	1.0%
Timber Flood Wall	Y	100%	0%	1%	10.0%
Double Timber Flood Wall	Y	100%	0%	1%	10.0%
Timber Retaining Wall	Y	100%	10%	50%	75.0%
Toe Drain	Y	0%	0%	0%	0.0%
Permeable Groyne	N	100%	20%	40%	70.0%
Vehicle ramp over stopbank	N	100%	1%	6%	6.0%
Walkway	N	100%	1%	6%	85.0%
Weir	Y	100%	1%	3%	5.0%

Note: 20 yr - Stopbanks 1% to a max loss length of 250m

Note: 100yr - Stopbanks 6% to a max loss length of 4000m

Note: 500yr - Stopbanks 10% to a max loss length of 5000m

20 year Flood Loss Factors

	3.1		4		5.0		Insured by
	F'way: >3 m/s		Ponding		S'bank		IAI
	%	%	%	%	%	%	
Asset Sub Type	Value	Damage	Value	Damage	Value	Damage	
Amenity Enhancement	80%	0%					N
Bed Armouring	100%	0%					Y
Benchmarks	100%	1%					N
Firth Block Flood Wall	80%	0%					Y
Bridge	80%	0%					N
Bridge Flood Wall	100%	0%					Y
Cased concrete piled groyne	80%	0.5%					Y
Massbloc Retaining Wall	80%	0%					Y
Concrete Flood Wall	80%	0%					Y
Concrete Rip Rap	100%	5%					Y
Detention Dam			100%	0.0%			Y
Drain Reach							N
Drop Structure	100%	0.5%					Y
Erosion Protection Reserve	100%	10%					N
Floodgated Culvert Major	80%	0%	20%	0.0%			Y
Floodgated Culvert Minor	80%	0%	20%	0.0%			Y
Floodgated Structure	80%	0%	20%	0.0%			Y
Flow Diversion Structure	80%	0%					Y
Forestry	0%	0%					N
Gabions	100%	2%					Y
Grade Control	100%	2%					Y
Guidebank					100%	1%	Y
Handrails	0%	0%					N
Kneebreaker	100%	1%					N
Misc Spillway	100%	1%					Y
Portable Flood Barrier							N
PMU	100%	5%					Y
Property							N
Property Mitigation Bund					100%	1%	Y
Protection Planting	100%	10%					N
Pumpstation							N
Rock Groyne	100%	2.0%					Y
Rock Lining (engineered)	100%	0.5%					Y
Rock Lining (non-engineered)	100%	5%					Y
Security Fence	0%	0%					N
Self Help Depots	100%	1%					N
Stock Gate	100%	5%					N
Stopbank					100%	1%	Y
Stop Log							N
Tied Tree Work	100%	10%					N
Tiered Concrete Lining	100%	0%					Y
Timber Flood Wall	100%	0%					Y
Double Timber Flood Wall	100%	0%					Y
Timber Retaining Wall	100%	10%					Y
Toe Drain							Y
Permeable Groyne	100%	20%					N
Vehicle ramp over stopbank	100%	1%					N
Walkway	100%	1%					N
Weir	100%	0.5%					Y

Note: Stopbanks 1% to a max loss length of 250m

100 year Flood Loss Factors

	3.1		4		5.0		Insured by
	F'way: >3 m/s		Ponding		S'bank		IAI
	%	%	%	%	%	%	
Asset Sub Type	**Value**	**Damage**	**Value**	**Damage**	**Value**	**Damage**	
Amenity Enhancement	80%	0%					N
Bed Armouring	100%	2.5%					Y
Benchmarks	100%	2%					N
Firth Block Flood Wall	80%	1%					Y
Bridge	80%	1%	20%	1%			N
Bridge Flood Wall	100%	1%					Y
Cased concrete piled groyne	80%	2%					Y
Massbloc Retaining Wall	80%	1%					Y
Concrete Flood Wall	80%	1%					Y
Concrete Rip Rap	100%	25%					Y
Detention Dam			100%	1%			Y
Drain Reach			100%	5%			N
Drop Structure	100%	2.5%					Y
Erosion Protection Reserve	100%	30%					N
Floodgated Culvert Major	80%	1%	20%	1%			Y
Floodgated Culvert Minor	80%	1%	20%	1%			Y
Floodgated Structure	80%	1%	20%	1%			Y
Flow Diversion Structure	80%	0%					Y
Forestry							N
Gabions	100%	10%					Y
Grade Control	100%	15%					Y
Guidebank					100%	1%	Y
Handrails	0%	0%					N
Kneebreaker	100%	6%					N
Misc Spillway	100%	2.5%					Y
Portable Flood Barrier							N
PMU	100%	20%					Y
Property							N
Property Mitigation Bund					100%	6%	Y
Protection Planting	100%	30%					N
Pumpstation							N
Rock Groyne	100%	10%					Y
Rock Lining (engineered)	100%	2.5%					Y
Rock Lining (non-engineered)	100%	25%					Y
Security Fence	0%	0%					N
Self Help Depots	100%	1%					N
Stock Gate	100%	100%					N
Stopbank					100%	6%	Y
Stop Log							Y
Tied Tree Work	100%	30%					N
Tiered Concrete Lining	100%	0%					Y
Timber Flood Wall	100%	1%					Y
Double Timber Flood Wall	100%	1%					Y
Timber Retaining Wall	100%	50%					Y
Toe Drain							Y
Permeable Groyne	100%	40%					N
Vehicle ramp over stopbank	100%	6%					N
Walkway	100%	6%					N
Weir	100%	2.5%					Y

Note: Stopbanks 6% to a max loss length of 4000m

500 year Flood Loss Factors

	3.1		4		5.0		Insured by
	F'way: >3$^{m/s}$		Ponding		S'bank		IAI
	%	%	%	%	%	%	
Asset Sub Type	**Value**	**Damage**	**Value**	**Damage**	**Value**	**Damage**	
Amenity Enhancement	80%	0.5%					N
Bed Armouring	100%	5%					Y
Benchmarks	100%	4%					N
Firth Block Flood Wall	100%	10%					Y
Bridge	80%	2%	20%	2%			N
Bridge Flood Wall	100%	10%					Y
Cased concrete piled groyne	80%	5%					Y
Massbloc Retaining Wall	100%	10%					Y
Concrete Flood Wall	100%	10%					Y
Concrete Rip Rap	100%	50%					Y
Detention Dam			100%	2%			Y
Drain Reach			100%	10%			N
Drop Structure	100%	5%					Y
Erosion Protection Reserve	100%	85%					N
Floodgated Culvert Major	80%	2%	20%	2%			Y
Floodgated Culvert Minor	80%	2%	20%	2%			Y
Floodgated Structure	80%	2%	20%	2%			Y
Flow Diversion Structure	80%	0.5%					Y
Forestry							N
Gabions	100%	20%					Y
Grade Control	100%	30%					Y
Guidebank					100%	2%	Y
Handrails	100%	85%					N
Kneebreaker	100%	75%					N
Misc Spillway	100%	10%					Y
Portable Flood Barrier							N
PMU	100%	40%					Y
Property							N
Property Mitigation Bund					100%	10%	N
Protection Planting	100%	85%					N
Pumpstation							N
Rock Groyne	100%	20%					Y
Rock Lining (engineered)	100%	5%					Y
Rock Lining (non-engineered)	100%	50%					Y
Security Fence	100%	85%					N
Self Help Depots	100%	2%					N
Stock Gate	100%	100%					N
Stopbank					100%	10%	Y
Stop Log							N
Tied Tree Work	100%	85%					N
Tiered Concrete Lining	80%	1%					Y
Timber Flood Wall	100%	10%					Y
Double Timber Flood Wall	100%	10%					Y
Timber Retaining Wall	100%	75%					Y
Toe Drain							Y
Permeable Groyne	100%	70%					N
Vehicle ramp over stopbank	100%	6%					N
Walkway	100%	85%					N
Weir	100%	5%					Y

Note: Stopbanks 10% to a max loss length of 5000m

EXPECTED FLOOD DAMAGE TO ALL ASSETS (excluding Pumpstations)
Flood Risk Assessment for 2016-17 - Erosion Schemes or Minor Drainage Schemes not insured - Option of Concrete Riprap as Rock
Based on Flood Loss Risk Assessment October 2012 (with updated Drain Loss October 2014) - 1 July 2017 Valuation
Table 1a
Horizons Regional Council

Scheme	Asset Type	Asset Sub Type	Quantity	Units	Covered by IAI	Estimated Replacement Cost	Expected Damage Total per asset type 20 yr	Expected Damage Total per asset type 100 yr	Expected Damage Total per asset type 500 yr	Expected Damage Percentage20 yr	Expected Damage Percentage 100 yr	Expected Damage Percentage 500 yr	Expected Damage Dollars Total per Scheme 20 yr	Expected Damage Dollars Total per Scheme 100 yr	Expected Damage Dollars Total per Scheme 500 yr
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N	$ 101,266.20		$5,063	$10,127						
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21		$864	$8,645						
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38	$1,762	$10,570	$17,617						
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46		$241	$482						
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N	$ 16,124.84	$81	$403	$806						
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56		$324	$3,243						
Ashhurst Stream						$ 424,490.65					4.1%	9.6%	$ 1,842.30	$ 17,466.35	$ 40,919.50
Forest Road	Bed Control Structure	Weir	1	no.	N	$ 50,812.03	$254	$1,270	$2,541						
Forest Road	Drainage Channel	Drain Reach	14.87	km	N	$ 382,147.04		$19,107	$38,215						
Forest Road						$ 432,959.07							$ 254.06	$ 20,377.65	$ 20,377.65
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00		$777	$1,554						
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N	$ 36,516.00		$1,826	$3,652						
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65	$116	$697	$1,161						
Foxton East Drainage						$ 86,990.65							$ 116.13	$ 3,299.80	$ 6,367.35
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N	$ 272,616.51		$13,631	$27,262						
Haunui Drainage						$ 272,616.51							$ -	$ 13,630.83	$ 27,261.65
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N	$ 259,360.02		$12,968	$25,936						
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N	$ 35,822.10	$179	$896	$1,791						
Himatangi Drainage	Flood Protection	Stopbank	20	m	N	$ 1,221.46	$12	$73	$122						
Himatangi Drainage						$ 296,403.58							$ 191.33	$ 13,936.84	$ 27,849.25
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N	$ 367,976.77		$18,399	$36,798						
Hokio Drainage	Bed Control Structure	Weir	1	no.	N	$ 53,733.14	$269	$1,343	$2,687						
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N	$ 23,216.08		$464	$929						
Hokio Drainage						$ 444,925.99							$ 268.67	$ 20,206.49	$ 40,412.98
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00		$8,275	$16,551						
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51		$15,491	$30,982						
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N	$ 789,508.29		$39,475	$78,951						
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N	$ 2,005,453.30									
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97		$6,327	$12,654						
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23	$46,065	$276,388	$460,647						
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	$198	$989	$1,979						
Koputaroa Drainage						$ 8,910,053.14							$ 46,262.63	$ 346,946.52	$ 601,763.55
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N	$ 813,306.39	$162,661	$325,323	$569,314						
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N	$ 42,273.30	$211	$1,057	$2,114						
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N	$ -									
Lower Kiwitea	Bank Protection	PMU	1415	m	N	$ 264,532.27	$13,227	$52,906	$105,813						
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N	$ 520,424.79	$52,042	$156,127	$442,361						
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N	$ 118,083.42	$5,904	$29,521	$59,042						
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N	$ 604,383.24	$60,438	$181,315	$513,726						
Lower Kiwitea	Flood Protection	Stopbank	550	m	N	$ 24,913.82	$249	$1,495	$2,491						
Lower Kiwitea						$ 2,387,917.23							$ 294,733.37	$ 747,743.94	$ 1,694,860.96
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	$154,514	$772,571	$1,545,141						
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	$160,024	$800,118	$1,600,235						
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	$51,057	$255,285	$510,569						
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	$1,405,328	$7,026,640	$14,053,280						
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10		$16,815	$168,153						
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N	$ 2,067,788.97	$206,779	$620,337	$1,757,621						
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	$3,333	$13,331	$33,328						
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18	$14,443	$14,443	$28,886						
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22									
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N	$ 121,509.02									
Lower Manawatu	Miscellaneous	Property	0.293	ha	N	$ 13,283.89									
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N	$ 224,232.32			$1,121						
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N	$ 4,090,046.64	$409,005	$1,227,014	$3,476,540						
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34		$38,767	$77,533						
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07		$42,733	$85,465						
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41		$61,929	$123,858						
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N	$ 539,308.58		$26,965	$53,931						
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44		$17,516	$35,032						
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29		$20,474	$204,740						
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	$2,368	$11,840	$23,680						
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28	$1,262,327	$7,573,964	$12,623,273						
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N	$ 339,777.13	$67,955	$135,911	$237,844						
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	$3,807	$9,518	$38,073						
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	$20,329	$101,643	$152,464						
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N	$ 7,428.86	$74	$74	$149						
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39		$11,994	$119,942						
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N	$ 64,825.33									
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47	$12,385	$74,309	$123,849						
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91			$161,028						
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49		$7,117	$71,172						
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61		$218	$2,184						
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83			$5,999						
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28		$1,643	$16,429						
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	$12,770	$63,850	$127,699						
Lower Manawatu						$ 252,309,724.77							$ 3,786,497.46	$ 18,947,017.59	$ 37,459,216.56
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N	$ 18,883.90	$189	$1,133	$14,163						
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N	$ 25,604.99	$256	$1,536	$1,536						
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33		$3,556	$7,111						
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49		$739	$1,479						
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65		$2,840	$28,401						
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N	$ 28,584.58			$24,297						
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06		$1,244	$12,437						
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	$1,804	$9,018	$13,527						
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49	$20,090	$120,539	$200,898						
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N	$ 218,962.79									
Lower Whanganui	Miscellaneous	Walkway	1	no.	N	$ 122,367.73	$1,224	$7,342	$104,013						
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69		$8,356	$83,556						
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N	$ 228,882.05			$1,144						
Lower Whanganui	Miscellaneous	Handrails	1	no.	N	$ 11,630.92			$9,886						
Lower Whanganui	Flood Protection	Stop Log	1	no.	N	$ 52,193.73									
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52		$4,820	$48,195						
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	$1,648	$8,238	$16,476						
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	$3,074	$15,369	$30,737						
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	$23,194	$115,970	$231,941						
Lower Whanganui						$ 5,835,768.33							$ 51,477.34	$ 300,698.99	$ 829,797.37
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74	$29,931	$179,584	$299,307						
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00		$1,143	$2,286						
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71		$11,364	$22,728						
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83		$13,385	$26,771						
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N	$ 1,476,633.96		$73,832	$147,663						
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N	$ 4,381,455.97									
Makerua Drainage						$ 10,145,772.21							$ 29,930.67	$ 279,308.01	$ 498,754.69
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	$1,243	$3,106	$12,425						
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00		$3,908	$7,815						
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75		$2,658	$5,316						
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00	$11,097	$66,581	$110,969						
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	$1,877	$9,385	$18,771						
Makirikiri						$ 1,937,623.01							$ 14,216.47	$ 85,638.25	$ 155,295.33
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88		$12,787	$25,573						
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28	$102,142	$612,854	$1,021,424						
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45		$26,373	$52,746						
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09		$34,152	$68,304						
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N	$ 13,939,039.76		$696,952	$1,393,904						
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N	$ 3,862,607.24									
Manawatu Drainage						$ 31,681,465.70							$ 102,142.39	$ 1,383,117.93	$ 2,561,951.08
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	$8,391	$41,953	$83,906						
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89	$8,565	$51,388	$85,646						
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N	$ 542,502.25		$27,125	$54,250						
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	$9,982	$74,863	$149,725						
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N	$ 332,234.13	$66,447	$132,894	$232,564						
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N	$ 2,668,756.03	$266,876	$800,627	$2,268,443						
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	$12,672	$63,359	$126,718						
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	$139,052	$695,262	$1,390,524						
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	$707	$3,533	$7,066						
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N	$ 408,212.66	$40,821	$122,464	$346,981						
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	$263,766	$1,055,066	$2,110,131						
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	$10,776	$53,879	$107,759						
Mangatainoka						$ 16,639,918.55							$ 828,053.59	$ 3,122,411.18	$ 6,963,711.95

All Assets Continued…

Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89	$3,774	$22,644	$37,739						
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73			$1,837						
Matarawa	Miscellaneous	Bridge	1	no.	N	$ 53,908.55		$1,078	$2,156						
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N	$ 40,270.02			$201						
Matarawa	Drainage Channel	Drain Reach	7.476	km	N	$ 404,540.51		$20,227	$40,454						
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	$78	$388	$775						
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23		$13,634	$27,268						
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00		$3,230	$6,460						
Matarawa						$ 2,783,939.73							$ 3,851.45	$ 61,200.44	$ 116,891.51
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N	$ 3,632,177.19									
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12		$4,579	$9,158						
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96		$810	$1,621						
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00		$9,190	$18,379						
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N	$ 1,973,240.17		$98,662	$197,324						
Moutoa Drainage						$ 6,334,358.44									
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45	$27,161	$162,964	$271,607						
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38		$2,184	$4,368						
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71		$8,090	$16,180						
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00		$4,663	$9,327						
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N	$ 238,596.49		$11,930	$23,860						
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N	$ 3,529,899.66	$352,990	$1,058,970	$3,000,415						
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N	$ 374,800.45	$37,480	$112,440	$318,580						
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	$4,617	$23,087	$46,175						
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	$1,385	$6,926	$13,852						
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68		$175	$351						
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	$264,940	$1,324,698	$2,649,395						
Ohau-Manakau						$ 13,281,452.40							$ 688,572.98	$ 2,716,128.37	$ 6,354,110.34
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21		$6,503	$13,006						
Pakihi						$ 650,290.21							$ -	$ 6,502.90	$ 13,005.80
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N	$ 186,415.13									
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N	$ 72,461.89		$3,623	$7,246						
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N	$ 964,136.43	$192,827	$385,655	$674,896						
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N	$ 2,860,110.05	$286,011	$858,033	$2,431,094						
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N	$ 217,681.70	$1,088	$5,442	$10,884						
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N	$ 32,982.08	$1,649	$8,246	$16,491						
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N	$ 18,536.66	$371	$1,854	$3,707						
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N	$ 1,158,903.19	$115,890	$347,671	$985,068						
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N	$ 150,845.04	$7,542	$30,169	$60,338						
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N	$ 259,459.01	$12,973	$64,865	$129,730						
Pohangina-Oroua						$ 5,921,531.18							$ 618,352.06	$ 1,705,556.63	$ 4,319,452.92
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64		$66,737	$133,474						
Porewa						$ 6,673,689.64							$ -	$ 66,736.90	$ 133,473.79
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39	$97,933	$587,599	$979,331						
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31	$6,302	$6,302	$12,605						
Rangitikei	Miscellaneous	Forestry	35.4	ha	N	$ 874,830.58									
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18		$7,283	$14,566						
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00		$2,995	$5,989						
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N	$ 322,256.34		$16,113	$32,226						
Rangitikei	Bank Protection	Permeable groyne	3013	m	N	$ 553,555.60	$110,711	$221,422	$387,489						
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N	$ 4,390,061.57	$439,006	$1,317,018	$3,731,552						
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	$9,604	$48,018	$96,037						
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	$728,568	$3,642,839	$7,285,679						
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N	$ 18,674,444.02	$1,867,444	$5,602,333	$15,873,277						
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15		$1,105	$11,045						
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N	$ 31,529.82			$158						
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89									
Rangitikei	Pumpstation	Pumpstation	1	no.	N	$ 10,858.50									
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18		$276	$2,762						
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42		$1,992	$19,923						
Rangitikei						$ 52,636,033.06							$ 3,259,568.66	$ 11,455,295.63	$ 28,452,637.16
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N	$ 1,424,649.00	$14,246	$85,479	$142,465						
South East Ruahine	Flood Protection	Guidebank	76	m	N	$ 4,979.09	$50	$50	$100						
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N	$ 2,339,299.52		$116,965	$233,930						
South East Ruahine	Bed Control Structure	Weir	22	no.	N	$ 1,109,508.62	$5,548	$27,738	$55,475						
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N	$ 1,282.40	$26	$192	$385						
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N	$ 845,277.47	$169,055	$338,111	$591,694						
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N	$ 5,930,697.17	$593,070	$1,779,209	$5,041,093						
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N	$ 59,431.44	$2,972	$59,431	$59,431						
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N	$ 165,271.79	$8,264	$41,318	$82,636						
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N	$ 18,208.70	$91	$455	$910						
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N	$ 8,203,700.49	$820,370	$2,461,110	$6,973,145						
South East Ruahine	Bank Protection	PMU	1944.16	m	N	$ 716,122.35	$35,806	$143,224	$286,449						
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N	$ 78,873.37	$3,944	$19,718	$39,437						
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N	$ 7,192.02	$719	$3,596	$5,394						
South East Ruahine						$ 20,904,493.43							$ 1,654,159.93	$ 5,076,597.50	$ 13,512,544.23
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N	$ 200,525.95		$10,026	$20,053						
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60		$1,915	$3,830						
Tawataia-Mangaone						$ 392,007.55							$ -	$ 11,941.11	$ 23,882.23
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60	$38,315	$229,891	$383,151						
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N	$ 659,510.14									
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86		$3,988	$7,975						
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77		$11,883	$23,767						
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05		$18,867	$37,735						
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N	$ 2,042,551.91		$102,128	$204,255						
Te Kawau Drainage						$ 8,270,486.33							$ 38,315.13	$ 366,756.59	$ 656,882.92
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64	$196	$1,174	$1,956						
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	$57	$143	$571						
Tutaenui	Drainage Channel	Drain Reach	3	km	N	$ 44,438.63		$2,222	$4,444						
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73		$14,373	$28,747						
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	$617	$4,629	$9,259						
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	$101	$506	$1,011						
Tutaenui						$ 1,558,127.24							$ 971.07	$ 23,046.61	$ 45,987.35
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N	$ 170,836.56	$1,708	$10,250	$17,084						
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N	$ 724,437.57		$36,222	$72,444						
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N	$ 121,215.47	$24,243	$48,486	$84,851						
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N	$ 3,792,212.54	$379,221	$1,137,664	$3,223,381						
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N	$ 633,868.38	$3,169	$15,847	$31,693						
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N	$ 623,570.41	$31,179	$155,893	$311,785						
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N	$ 459,160.52	$9,183	$45,916	$91,832						
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N	$ 1,983,931.61	$198,393	$595,179	$1,686,342						
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N	$ 231,703.35	$11,585	$46,341	$92,681						
Upper Manawatu Lower Mangahao						$ 8,740,936.41							$ 658,682.11	$ 2,091,797.54	$ 5,612,092.84
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70	$19,759	$118,551	$197,585						
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54		$3,002	$6,004						
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N	$ 37,780.46	$3,778	$11,334	$32,113						
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	$8,678	$43,390	$86,781						
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	$37,714	$188,569	$377,137						
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	$4,050	$20,249	$40,497						
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N	$ 34,065.77	$3,407	$10,220	$28,956						
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N	$ 847.75		$42	$85						
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	$342	$1,367	$2,734						
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59		$803	$1,606						
Upper Whanganui						$ 4,938,009.81							$ 77,726.40	$ 397,527.00	$ 773,498.45
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94	$2,534	$15,203	$25,338						
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N	$ 65,893.29									
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00		$854	$1,709						
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00		$1,554	$3,109						
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N	$ 174,513.61		$8,726	$17,451						
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	$233	$582	$2,328						
Whirokino Drainage						$ 637,520.24							$ 2,766.67	$ 26,919.76	$ 49,935.94
						$ 465,529,505.05				1.3%	5.3%	11.9%	$12,158,953	$49,307,807	$110,992,935
						$ 931,059,010.10									
		Flood Control and Major Drainage Schemes				$426,127,722	92%						$8,932,311	$39,617,960	$85,738,083
Note:		Erosion Schemes and Minor Drainage				$39,401,783	8%						$3,226,642	$9,689,847	$25,254,852
Updated with Asset Revaluation 1 July 2017		TOTAL all assets				$465,529,505							$12,158,953	$49,307,807	$110,992,935
Flood risk updated October 2012, revised Drain loss factors Oct 2014.															
IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)															

EXPECTED FLOOD DAMAGE TO INFRASTRUCTURAL ASSET INSURED

Flood Risk Assessment for 2016-17 - Erosion Schemes or Minor Drainage Schemes not insured - Option of Concrete Riprap as Rock

Based on Flood Loss Risk Assessment October 2012 (with updated Drain Loss October 2014) - 1 July 2017 Valuation

Table 1b

Horizons Regional Council

Scheme	Asset Type	Asset Sub Type	Quantity	Units	Covered by IAI	Estimated Replacement Cost	Insured	Expected Damage Total per asset type 20 yr	Expected Damage Total per asset type 100 yr	Expected Damage Total per asset type 500 yr	Expected Damage Percentage 20 yr	Expected Damage Percentage 100 yr	Expected Damage Percentage 500 yr	Expected Damage Dollars Total per Scheme 20 yr	Expected Damage Dollars Total per Scheme 100 yr	Expected Damage Dollars Total per Scheme 500 yr
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N	101266.2			$5,063	$10,127						
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	$ 86,448.21		$864	$8,645						
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38	$ 176,167.38	$1,762	$10,570	$17,617						
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	$ 12,055.46		$241	$482						
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N	$ 16,124.84	$ -	$81	$403	$806						
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	$ 32,428.56		$324	$3,243						
Ashhurst Stream						$ 424,490.65	$ -				0.6%	2.2%	13.3%	$ 1,842.30	$ 6,896.31	$ 40,919.50
Forest Road	Bed Control Structure	Weir	1	no.	N	$ 50,812.03	$ -	$254	$1,270	$2,541						
Forest Road	Drainage Channel	Drain Reach	14.87	km	N	$ 382,147.04	$ -		$19,107	$38,215						
Forest Road						$ 432,959.07	$ -							$ 254.06	$ 20,377.65	$ 20,377.65
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	$ 38,862.00		$777	$1,554						
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N	$ 36,516.00	$ -		$1,826	$3,652						
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65	$ 11,612.65	$116	$697	$1,161						
Foxton East Drainage						$ 86,990.65	$ -				0.2%	5.2%	12.6%	$ 116.13	$ 2,603.04	$ 6,367.35
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N	$ 272,616.51	$ -		$13,631	$27,262						
Haunui Drainage						$ 272,616.51	$ -							$ -	$ 13,630.83	$ 27,261.65
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N	$ 259,360.02	$ -		$12,968	$25,936						
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N	$ 35,822.10	$ -	$179	$896	$1,791						
Himatangi Drainage	Flood Protection	Stopbank	20	m	N	$ 1,221.46	$ -	$12	$73	$122						
Himatangi Drainage						$ 296,403.58	$ -							$ 191.33	$ 13,863.55	$ 27,849.25
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N	$ 367,976.77	$ -		$18,399	$36,798						
Hokio Drainage	Bed Control Structure	Weir	1	no.	N	$ 53,733.14	$ -	$269	$1,343	$2,687						
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N	$ 23,216.08	$ -		$464	$929						
Hokio Drainage						$ 444,925.99	$ -							$ 268.67	$ 20,206.49	$ 40,412.98
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	$ 413,766.00		$8,275	$16,551						
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	$ 774,543.51		$15,491	$30,982						
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N	$ 789,508.29	$ -		$39,475	$78,951						
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N	$ 2,005,453.30	$ -									
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	$ 316,349.97		$6,327	$12,654						
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23	$ 4,606,474.23	$46,065	$276,388	$460,647						
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	$ 3,957.84	$198	$989	$1,979						
Koputaroa Drainage						$ 8,910,053.14	$ -				0.8%	1.2%	9.8%	$ 46,262.63	$ 70,558.06	$ 601,763.55
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N	$ 813,306.39	$ -	$162,661	$325,323	$569,314						
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N	$ 42,273.30	$ -	$211	$1,057	$2,114						
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N	$ -	$ -									
Lower Kiwitea	Bank Protection	PMU	1415	m	N	$ 264,532.27	$ -	$13,227	$52,906	$105,813						
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N	$ 520,424.79	$ -	$52,042	$156,127	$442,361						
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N	$ 118,083.42	$ -	$5,904	$29,521	$59,042						
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N	$ 604,383.24	$ -	$60,438	$181,315	$513,726						
Lower Kiwitea	Flood Protection	Stopbank	550	m	N	$ 24,913.82	$ -	$249	$1,495	$2,491						
Lower Kiwitea						$ 2,387,917.23	$ -							$ 294,733.37	$ 746,249.11	$ 1,694,860.96
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	$ 30,902,823.44	$154,514	$772,571	$1,545,141						
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	$ 3,200,470.63	$160,024	$800,118	$1,600,235						
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	$ 2,552,845.99	$51,057	$255,285	$510,569						
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	$ 28,106,560.30	$1,405,328	$7,026,640	$14,053,280						
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	$ 1,681,533.10		$16,815	$168,153						
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N	$ 2,067,788.97	$ -	$206,779	$620,337	$1,757,621						
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	$ 666,550.86	$3,333	$13,331	$33,328						
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18	$ 1,444,296.18	$14,443	$14,443	$28,886						
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22	$ 381,430.22									
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N	$ 121,509.02	$ -									
Lower Manawatu	Miscellaneous	Property	0.293	ha	N	$ 13,283.89	$ -									
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N	$ 224,232.32	$ -			$1,121						
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N	$ 4,090,046.64	$ -	$409,005	$1,227,014	$3,476,540						
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	$ 1,938,333.34		$38,767	$77,533						
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	$ 2,136,630.07		$42,733	$85,465						
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	$ 3,096,453.41		$61,929	$123,858						
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N	$ 539,308.58	$ -		$26,965	$53,931						
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	$ 700,631.44		$17,516	$35,032						
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	$ 2,047,397.29		$20,474	$204,740						
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	$ 473,595.50	$2,368	$11,840	$23,680						
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28	$ 126,232,728.28	$1,262,327	$7,573,964	$12,623,273						
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N	$ 339,777.13	$ -	$67,955	$135,911	$237,844						
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	$ 380,728.99	$3,807	$9,518	$38,073						
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	$ 203,285.52	$20,329	$101,643	$152,464						
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N	$ 7,428.86	$ -	$74	$74	$149						
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	$ 1,199,418.39		$11,994	$119,942						
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N	$ 64,825.33	$ -									
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47	$ 1,238,486.47	$12,385	$74,309	$123,849						
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	$ 32,205,589.91			$161,028						
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	$ 711,723.49		$7,117	$71,172						
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	$ 21,837.61		$218	$2,184						
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	$ 599,902.83			$5,999						
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	$ 164,287.28		$1,643	$16,429						
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	$ 2,553,983.49	$12,770	$63,850	$127,699						
Lower Manawatu						$ 252,309,724.77	$ -				1.5%	4.6%	15.3%	$ 3,786,497.46	$ 11,284,301.74	$ 37,459,216.56
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N	$ 18,883.90	$ -	$189	$1,133	$14,163						
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N	$ 25,604.99	$ -	$256	$1,536	$1,536						
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	$ 177,776.33		$3,556	$7,111						
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	$ 36,974.49		$739	$1,479						
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	$ 284,006.65		$2,840	$28,401						
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N	$ 28,584.58	$ -			$24,297						
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	$ 124,372.06		$1,244	$12,437						
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	$ 18,036.43	$1,804	$9,018	$13,527						
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49	$ 2,008,976.49	$20,090	$120,539	$200,898						
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N	$ 218,962.79	$ -									
Lower Whanganui	Miscellaneous	Walkway	1	no.	N	$ 122,367.73	$ -	$1,224	$7,342	$104,013						
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	$ 835,560.69		$8,356	$83,556						
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N	$ 228,882.05	$ -			$1,144						
Lower Whanganui	Miscellaneous	Handrails	1	no.	N	$ 11,630.92	$ -			$9,886						
Lower Whanganui	Flood Protection	Stop Log	1	no.	N	$ 52,193.73	$ -									
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	$ 481,953.52		$4,820	$48,195						
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	$ 82,378.76	$1,648	$8,238	$16,476						
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	$ 614,740.37	$3,074	$15,369	$30,737						
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	$ 463,881.85	$23,194	$115,970	$231,941						
Lower Whanganui						$ 5,835,768.33	$ -				1.0%	3.5%	15.9%	$ 51,288.50	$ 179,027.37	$ 815,634.45
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74	$ 2,993,066.74	$29,931	$179,584	$299,307						
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	$ 57,150.00		$1,143	$2,286						
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	$ 568,199.71		$11,364	$22,728						
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	$ 669,265.83		$13,385	$26,771						
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N	$ 1,476,633.96	$ -		$73,832	$147,663						
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N	$ 4,381,455.97	$ -									
Makerua Drainage						$ 10,145,772.21	$ -				0.7%	2.3%	11.6%	$ 29,930.67	$ 99,724.01	$ 498,754.69
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	$ 124,250.96	$1,243	$3,106	$12,425						
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	$ 195,375.00		$3,908	$7,815						
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	$ 132,891.75		$2,658	$5,316						
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00	$ 1,109,686.00	$11,097	$66,581	$110,969						
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	$ 375,419.30	$1,877	$9,385	$18,771						
Makirikiri						$ 1,937,623.01	$ -				0.7%	1.0%	8.0%	$ 14,216.47	$ 19,057.09	$ 155,295.33
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	$ 639,329.88		$12,787	$25,573						
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28	$ 10,214,239.28	$102,142	$612,854	$1,021,424						
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	$ 1,318,640.45		$26,373	$52,746						
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	$ 1,707,609.09		$34,152	$68,304						
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N	$ 13,939,039.76	$ -		$696,952	$1,393,904						
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N	$ 3,862,607.24	$ -									
Manawatu Drainage						$ 31,681,465.70	$ -				0.7%	5.5%	18.5%	$ 102,142.39	$ 770,263.58	$ 2,561,951.08
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	$ 167,811.80	$8,391	$41,953	$83,906						
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89	$ 856,458.89	$8,565	$51,388	$85,646						
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N	$ 542,502.25	$ -		$27,125	$54,250						
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	$ 499,083.47	$9,982	$74,863	$149,725						
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N	$ 332,234.13	$ -	$66,447	$132,894	$232,564						
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N	$ 2,668,756.03	$ -	$266,876	$800,627	$2,268,443						
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	$ 2,534,361.81	$12,672	$63,359	$126,718						
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	$ 2,781,047.81	$139,052	$695,262	$1,390,524						
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	$ 35,328.80	$707	$3,533	$7,066						
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N	$ 408,212.66	$ -	$40,821	$122,464	$346,981						
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	$ 5,275,328.39	$263,766	$1,055,066	$2,110,131						
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	$ 538,792.51	$10,776	$53,879	$107,759						
Mangatainoka						$ 16,639,918.55	$ -				6.5%	24.2%	54.9%	$ 828,053.59	$ 3,071,023.65	$ 6,963,711.95

Insured Assets Continued…

Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89	$ 377,391.89	$3,774	$22,644	$37,739							
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	$ 367,424.73			$1,837							
Matarawa	Miscellaneous	Bridge	1	no.	N	$ 53,908.55	$ -		$1,078	$2,156							
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N	$ 40,270.02	$ -			$201							
Matarawa	Drainage Channel	Drain Reach	7.476	km	N	$ 404,540.51	$ -		$20,227	$40,454							
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	$ 15,505.80	$78	$388	$775							
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23	$ 1,363,388.23		$13,634	$27,268							
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	$ 161,510.00		$3,230	$6,460							
Matarawa						$ 2,783,939.73	$ -				0.2%	1.1%	3.9%	$ 3,851.45	$ 24,923.04	$ 89,623.75	
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N	$ 3,632,177.19	$ -										
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	$ 228,942.12		$4,579	$9,158							
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	$ 40,512.96		$810	$1,621							
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	$ 459,486.00		$9,190	$18,379							
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N	$ 1,973,240.17	$ -		$98,662	$197,324							
Moutoa Drainage						$ 6,334,358.44	$ -										
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45	$ 2,716,071.45	$27,161	$162,964	$271,607							
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	$ 109,201.38		$2,184	$4,368							
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	$ 404,509.71		$8,090	$16,180							
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	$ 233,172.00		$4,663	$9,327							
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N	$ 238,596.49	$ -		$11,930	$23,860							
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N	$ 3,529,899.66	$ -	$352,990	$1,058,970	$3,000,415							
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N	$ 374,800.45	$ -	$37,480	$112,440	$318,580							
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	$ 92,349.81	$4,617	$23,087	$46,175							
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	$ 277,049.44	$1,385	$6,926	$13,852							
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	$ 7,011.68		$175	$351							
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	$ 5,298,790.33	$264,940	$1,324,698	$2,649,395							
Ohau-Manakau						$ 13,281,452.40	$ -				7.5%	27.9%	69.5%	$ 688,572.98	$ 2,553,164.08	$ 6,354,110.34	
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21	$ 650,290.21		$6,503	$13,006							
Pakihi						$ 650,290.21	$ -					1.0%	2.0%	$ -	$ 6,502.90	$ 13,005.80	
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N	$ 186,415.13	$ -										
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N	$ 72,461.89	$ -		$3,623	$7,246							
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N	$ 964,136.43	$ -	$192,827	$385,655	$674,896							
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N	$ 2,860,110.05	$ -	$286,011	$858,033	$2,431,094							
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N	$ 217,681.70	$ -	$1,088	$5,442	$10,884							
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N	$ 32,982.08	$ -	$1,649	$8,246	$16,491							
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N	$ 18,536.66	$ -	$371	$1,854	$3,707							
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N	$ 1,158,903.19	$ -	$115,890	$347,671	$985,068							
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N	$ 150,845.04	$ -	$7,542	$30,169	$60,338							
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N	$ 259,459.01	$ -	$12,973	$64,865	$129,730							
Pohangina-Oroua						$ 5,921,531.18	$ -							$ 618,352.06	$ 1,705,556.63	$ 4,319,452.92	
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64	$ 6,673,689.64		$66,737	$133,474							
Porewa						$ 6,673,689.64	$ -					1.0%	2.0%	$ -	$ 66,736.90	$ 133,473.79	
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39	$ 9,793,308.39	$97,933	$587,599	$979,331							
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31	$ 630,237.31	$6,302	$6,302	$12,605							
Rangitikei	Miscellaneous	Forestry	35.4	ha	N	$ 874,830.58	$ -										
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	$ 364,140.18		$7,283	$14,566							
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	$ 149,733.00		$2,995	$5,989							
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N	$ 322,256.34	$ -		$16,113	$32,226							
Rangitikei	Bank Protection	Permeable groyne	3013	m	N	$ 553,555.60	$ -	$110,711	$221,422	$387,489							
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N	$ 4,390,061.57	$ -	$439,006	$1,317,018	$3,731,552							
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	$ 1,920,730.74	$9,604	$48,018	$96,037							
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	$ 14,571,357.37	$728,568	$3,642,839	$7,285,679							
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N	$ 18,674,444.02	$ -	$1,867,444	$5,602,333	$15,873,277							
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	$ 110,454.15		$1,105	$11,045							
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N	$ 31,529.82	$ -			$158							
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89	$ 11,694.89										
Rangitikei	Pumpstation	Pumpstation	1	no.	N	$ 10,858.50	$ -										
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	$ 27,615.18		$276	$2,762							
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	$ 199,225.42		$1,992	$19,923							
Rangitikei						$ 52,636,033.06	$ -				11.7%	39.1%	102.4%	$ 3,259,568.66	$ 10,861,394.76	$ 28,452,637.16	
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N	$ 1,424,649.00	$ -	$14,246	$85,479	$142,465							
South East Ruahine	Flood Protection	Guidebank	76	m	N	$ 4,979.09	$ -	$50	$50	$100							
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N	$ 2,339,299.52	$ -		$116,965	$233,930							
South East Ruahine	Bed Control Structure	Weir	22	no.	N	$ 1,109,508.62	$ -	$5,548	$27,738	$55,475							
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N	$ 1,282.40	$ -	$26	$192	$385							
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N	$ 845,277.47	$ -	$169,055	$338,111	$591,694							
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N	$ 5,930,697.17	$ -	$593,070	$1,779,209	$5,041,093							
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N	$ 59,431.44	$ -	$2,972	$59,431	$59,431							
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N	$ 165,271.79	$ -	$8,264	$41,318	$82,636							
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N	$ 18,208.70	$ -	$91	$455	$910							
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N	$ 8,203,700.49	$ -	$820,370	$2,461,110	$6,973,145							
South East Ruahine	Bank Protection	PMU	1944.16	m	N	$ 716,122.35	$ -	$35,806	$143,224	$286,449							
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N	$ 78,873.37	$ -	$3,944	$19,718	$39,437							
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N	$ 7,192.02	$ -	$719	$3,596	$5,394							
South East Ruahine						$ 20,904,493.43	$ -							$ 1,651,188.35	$ 4,931,637.33	$ 13,453,112.79	
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N	$ 200,525.95	$ -		$10,026	$20,053							
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60	$ 191,481.60		$1,915	$3,830							
Tawataia-Mangaone						$ 392,007.55	$ -					6.2%	12.5%	$ -	$ 11,941.11	$ 23,882.23	
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60	$ 3,831,512.60	$38,315	$229,891	$383,151							
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N	$ 659,510.14	$ -										
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	$ 199,381.86		$3,988	$7,975							
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	$ 594,166.77		$11,883	$23,767							
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	$ 943,363.05		$18,867	$37,735							
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N	$ 2,042,551.91	$ -		$102,128	$204,255							
Te Kawau Drainage						$ 8,270,486.33	$ -				0.7%	2.5%	11.8%	$ 38,315.13	$ 136,865.83	$ 656,882.92	
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64	$ 19,560.64	$196	$1,174	$1,956							
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	$ 5,706.95	$57	$143	$571							
Tutaenui	Drainage Channel	Drain Reach	3	km	N	$ 44,438.63	$ -		$2,222	$4,444							
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73	$ 1,437,329.73		$14,373	$28,747							
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	$ 30,862.28	$617	$4,629	$9,259							
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	$ 20,229.01	$101	$506	$1,011							
Tutaenui						$ 1,558,127.24	$ -				0.1%	1.4%	3.0%	$ 971.07	$ 21,872.97	$ 45,987.35	
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N	$ 170,836.56	$ -	$1,708	$10,250	$17,084							
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N	$ 724,437.57	$ -		$36,222	$72,444							
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N	$ 121,215.47	$ -	$24,243	$48,486	$84,851							
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N	$ 3,792,212.54	$ -	$379,221	$1,137,664	$3,223,381							
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N	$ 633,868.38	$ -	$3,169	$15,847	$31,693							
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N	$ 623,570.41	$ -	$31,179	$155,893	$311,785							
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N	$ 459,160.52	$ -	$9,183	$45,916	$91,832							
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N	$ 1,983,931.61	$ -	$198,393	$595,179	$1,686,342							
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N	$ 231,703.35	$ -	$11,585	$46,341	$92,681							
Upper Manawatu Lower Mangahao						$ 8,740,936.41	$ -							$ 658,682.11	$ 2,081,547.35	$ 5,612,092.84	
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70	$ 1,975,854.70	$19,759	$118,551	$197,585							
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	$ 150,100.54		$3,002	$6,004							
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N	$ 37,780.46	$ -	$3,778	$11,334	$32,113							
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	$ 1,735,614.38	$8,678	$43,390	$86,781							
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	$ 754,274.42	$37,714	$188,569	$377,137							
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	$ 202,485.90	$4,050	$20,249	$40,497							
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N	$ 34,065.77	$ -	$3,407	$10,220	$28,956							
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N	$ 847.75	$ -		$42	$85							
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	$ 6,834.30	$342	$1,367	$2,734							
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	$ 40,151.59		$803	$1,606							
Upper Whanganui						$ 4,938,009.81	$ -				1.6%	5.7%	15.9%	$ 77,726.40	$ 278,975.71	$ 773,498.45	
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94	$ 253,384.94	$2,534	$15,203	$25,338							
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N	$ 65,893.29	$ -										
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	$ 42,722.00		$854	$1,709							
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	$ 77,724.00		$1,554	$3,109							
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N	$ 174,513.61	$ -		$8,726	$17,451							
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	$ 23,282.40	$233	$582	$2,328							
Whirokino Drainage						$ 637,520.24	$ -				0.7%	3.0%	12.6%	$ 2,766.67	$ 11,716.66	$ 49,935.94	
						$ 465,529,505.05	$ 349,003,720.21				2.6%	8.4%	23.8%	$12,155,792	$39,010,618	$110,892,073	
						$ 931,059,010.10	$ 349,027,002.61										
		Pumpstations and others covered by Material Damage				**$47,281,036**	10%										
Note:						**TOTAL insured**	**$396,308,039**											
Updated with Asset Revaluation 1 July 2017																	
Flood risk updated October 2012, revised Drain loss factors Oct 2014.																	

Flood Risk Assessment Database: Valuation 1 July 2017

All Assets except Pumpstations - Infrastructural Asset Insurance (IAI) covers assets indicated

Table 2a (Updated Risk Factors October 2014)

Horizons Regional Council

5% AEP (20 Yr Return Period Event)

							3.1			4			1% or 250m of damage 5.0				
							F'way: >3 m/s			Ponding			S'bank				
Scheme	Asset Type	Asset Subtype	Quantity	Units	Covered by IAI	Estimated replacement cost	% Value	% Damage		% Value	% Damage		% Value	% Damage		Total A	Total Damage
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N	$ 101,266.20											
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	100%										
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38							100%	26.54	$1,762	$1,762	
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	80%			20%							
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N	$ 16,124.84	100%	1%	$81							$81	
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	80%										
Ashhurst Stream						$ 424,490.65											$1,842
Forest Road	Bed Control Structure	Weir	1	no.	N	$ 50,812.03	100%	1%	$254							$254	
Forest Road	Drainage Channel	Drain Reach	14.87	km	N	$ 382,147.04											
Forest Road						$ 432,959.07											$254
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	80%			20%							
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N	$ 36,516.00											
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65							100%	3.4	$116	$116	
Foxton East Drainage						$ 86,990.65											$116
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N	$ 272,616.51											
Haunui Drainage						$ 272,616.51											
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N	$ 259,360.02											
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N	$ 35,822.10	100%	1%	$179							$179	
Himatangi Drainage	Flood Protection	Stopbank	20	m	N	$ 1,221.46											
Himatangi Drainage						$ 296,403.58											$179
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N	$ 367,976.77											
Hokio Drainage	Bed Control Structure	Weir	1	no.	N	$ 53,733.14	100%	1%	$269							$269	
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N	$ 23,216.08	80%			20%							
Hokio Drainage						$ 444,925.99											$269
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	80%			20%							
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	80%			20%							
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N	$ 789,508.29											
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N	$ 2,005,453.30											
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	80%			20%							
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23							100%	167.95	$46,065	$46,065	
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	100%	5%	$198							$198	
Koputaroa Drainage						$ 8,910,053.14											$46,263
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N	$ 813,306.39	100%	20%	$162,661							$162,661	
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N	$ 42,273.30	100%	1%	$211							$211	
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N	$ -	100%	5%									
Lower Kiwitea	Bank Protection	PMU	1415	m	N	$ 264,532.27	100%	5%	$13,227							$13,227	
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N	$ 520,424.79	100%	10%	$52,042							$52,042	
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N	$ 118,083.42	100%	5%	$5,904							$5,904	
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N	$ 604,383.24	100%	10%	$60,438							$60,438	
Lower Kiwitea	Flood Protection	Stopbank	550	m	N	$ 24,913.82											
Lower Kiwitea						$ 2,387,917.23											$294,484
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	100%	1%	$154,514							$154,514	
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	100%	5%	$160,024							$160,024	$131,612
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	100%	2%	$51,057							$51,057	
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	100%	5%	$1,405,328							$1,405,328	
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	80%										
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N	$ 2,067,788.97	100%	10%	$206,779							$206,779	
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	80%	1%	$2,666							$2,666	
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18							100%	40.12903	$14,443	$14,443	
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22											
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N	$ 121,509.02											
Lower Manawatu	Miscellaneous	Property	0.293	ha	N	$ 13,283.89											
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N	$ 224,232.32	80%										
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N	$ 4,090,046.64	100%	10%	$409,005							$409,005	
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	80%			20%							
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	80%			20%							
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	80%			20%							
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N	$ 539,308.58											
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	100%										
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	80%										
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	100%	1%	$2,368							$2,368	
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28							100%	250	$102,818	$102,818	
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N	$ 339,777.13	100%	20%	$67,955							$67,955	
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	100%	1%	$3,807							$3,807	
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	100%	10%	$20,329							$20,329	
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N	$ 7,428.86	100%	1%	$74							$74	
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	100%										
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N	$ 64,825.33											
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47							100%	0.14	$12,385	$12,385	
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	80%										
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	100%										
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	100%										
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	100%										
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	80%										
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	100%	1%	$12,770							$12,770	
Lower Manawatu						$ 252,309,724.77											$2,626,322
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N	$ 18,883.90	100%	1%	$189							$189	
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N	$ 25,604.99	100%	1%	$256							$256	
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	80%			20%							
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	80%			20%							
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	100%										
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N	$ 28,584.58											
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	100%										
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	100%	10%	$1,804							$1,804	
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49							100%	43.4	$20,090	$20,090	
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N	$ 218,962.79											
Lower Whanganui	Miscellaneous	Walkway	1	no.	N	$ 122,367.73	100%	1%	$1,224							$1,224	
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	80%										
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N	$ 228,882.05	80%										
Lower Whanganui	Miscellaneous	Handrails	1	no.	N	$ 11,630.92											
Lower Whanganui	Flood Protection	Stop Log	1	no.	N	$ 52,193.73											
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	80%										
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	100%	2%	$1,648							$1,648	
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	100%	1%	$3,074							$3,074	
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	100%	5%	$23,194							$23,194	
Lower Whanganui						$ 5,835,768.33											$51,477
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74							100%	194.3	$29,931	$29,931	
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	80%			20%							
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	80%			20%							
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	80%			20%							
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N	$ 1,476,633.96											
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N	$ 4,381,455.97											
Makerua Drainage						$ 10,145,772.21											$29,931
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	100%	1%	$1,243							$1,243	
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	80%			20%							
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	80%			20%							
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00							100%	71.57976	$11,097	$11,097	
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	100%	1%	$1,877							$1,877	
Makirikiri						$ 1,937,623.01											$14,216
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	80%			20%							
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28							100%	250	$74,318	$74,318	
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	80%			20%							
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	80%			20%							
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N	$ 13,939,039.76											
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N	$ 3,862,607.24											
Manawatu Drainage						$ 31,681,465.70											$74,318
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	100%	5%	$8,391							$8,391	
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89							100%	66.62	$8,565	$8,565	
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N	$ 542,502.25											
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	100%	2%	$9,982							$9,982	
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N	$ 332,234.13	100%	20%	$66,447							$66,447	
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N	$ 2,668,756.03	100%	10%	$266,876							$266,876	
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	100%	1%	$12,672							$12,672	
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	100%	5%	$139,052							$139,052	
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	100%	2%	$707							$707	
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N	$ 408,212.66	100%	10%	$40,821							$40,821	
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	100%	5%	$263,766							$263,766	
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	100%	2%	$10,776							$10,776	
Mangatainoka						$ 16,639,918.55											$828,054

20 year Continued…

Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89							100%	42.97053	$3,774	$3,774		
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	80%											
Matarawa	Miscellaneous	Bridge	1	no.	N	$ 53,908.55	80%											
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N	$ 40,270.02	80%											
Matarawa	Drainage Channel	Drain Reach	7.476	km	N	$ 404,540.51												
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	100%	1%	$78							$78		
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23				100%								
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	80%			20%								
Matarawa						$ 2,783,939.73												$3,851
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N	$ 3,632,177.19												
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	80%			20%								
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	80%			20%								
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	80%			20%								
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N	$ 1,973,240.17												
Moutoa Drainage						$ 6,334,358.44												
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45							100%	126.85	$27,161	$27,161		
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	80%			20%								
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	80%			20%								
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	80%			20%								
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N	$ 238,596.49												
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N	$ 3,529,899.66	100%	10%	$352,990							$352,990		
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N	$ 374,800.45	100%	10%	$37,480							$37,480		
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	100%	5%	$4,617							$4,617		
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	100%	1%	$1,385							$1,385		
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	100%											
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	100%	5%	$264,940							$264,940		
Ohau-Manakau						$ 13,281,452.40	#N/A	#N/A		#N/A	#N/A							$688,573
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21				100%								
Pakihi						$ 650,290.21	#N/A	#N/A		#N/A	#N/A							
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N	$ 186,415.13												
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N	$ 72,461.89												
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N	$ 964,136.43	100%	20%	$192,827							$192,827		
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N	$ 2,860,110.05	100%	10%	$286,011							$286,011		
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N	$ 217,681.70	100%	1%	$1,088							$1,088		
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N	$ 32,982.08	100%	5%	$1,649							$1,649		
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N	$ 18,536.66	100%	2%	$371							$371		
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N	$ 1,158,903.19	100%	10%	$115,890							$115,890		
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N	$ 150,845.04	100%	5%	$7,542							$7,542		
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N	$ 259,459.01	100%	5%	$12,973							$12,973		
Pohangina-Oroua						$ 5,921,531.18												$618,352
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64				100%								
Porewa						$ 6,673,689.64												
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39							100%	194.88632	$97,933	$97,933		
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31							100%	20.3673	$6,302	$6,302		
Rangitikei	Miscellaneous	Forestry	35.4	ha	N	$ 874,830.58												
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	80%			20%								
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	80%			20%								
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N	$ 322,256.34												
Rangitikei	Bank Protection	Permeable groyne	3013	m	N	$ 553,555.60	100%	20%	$110,711							$110,711		
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N	$ 4,390,061.57	100%	10%	$439,006							$439,006		
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	100%	1%	$9,604							$9,604		
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	100%	5%	$728,568							$728,568		
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N	$ 18,674,444.02	100%	10%	$1,867,444							$1,867,444		
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	80%											
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N	$ 31,529.82	80%											
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89												
Rangitikei	Pumpstation	Pumpstation	1	no.	N	$ 10,858.50												
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	100%											
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	80%											
Rangitikei						$ 52,636,033.06												$3,259,569
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N	$ 1,424,649.00												
South East Ruahine	Flood Protection	Guidebank	76	m	N	$ 4,979.09												
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N	$ 2,339,299.52												
South East Ruahine	Bed Control Structure	Weir	22	no.	N	$ 1,109,508.62	100%	1%	$5,548							$5,548		
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N	$ 1,282.40	100%	2%	$26							$26		
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N	$ 845,277.47	100%	20%	$169,055							$169,055		
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N	$ 5,930,697.17	100%	10%	$593,070							$593,070		
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N	$ 59,431.44	100%	5%	$2,972							$2,972		
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N	$ 165,271.79	100%	5%	$8,264							$8,264		
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N	$ 18,208.70	100%	1%	$91							$91		
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N	$ 8,203,700.49	100%	10%	$820,370							$820,370		
South East Ruahine	Bank Protection	PMU	1944.16	m	N	$ 716,122.35	100%	5%	$35,806							$35,806		
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N	$ 78,873.37	100%	5%	$3,944							$3,944		
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N	$ 7,192.02	100%	10%	$719							$719		
South East Ruahine						$ 20,904,493.43												$1,639,864
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N	$ 200,525.95												
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60				100%								
Tawataia-Mangaone						$ 392,007.55												
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60							100%	250	$32,917	$32,917		
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N	$ 659,510.14												
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	80%			20%								
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	80%			20%								
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	80%			20%								
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N	$ 2,042,551.91												
Te Kawau Drainage						$ 8,270,486.33												$32,917
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64							100%	4.17789	$196	$196		
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	100%	1%	$57							$57		
Tutaenui	Drainage Channel	Drain Reach	3	km	N	$ 44,438.63												
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73				100%								
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	100%	2%	$617							$617		
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	100%	1%	$101							$101		
Tutaenui						$ 1,558,127.24												$971
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N	$ 170,836.56												
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N	$ 724,437.57												
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N	$ 121,215.47	100%	20%	$24,243							$24,243		
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N	$ 3,792,212.54	100%	10%	$379,221							$379,221		
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N	$ 633,868.38	100%	1%	$3,169							$3,169		
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N	$ 623,570.41	100%	5%	$31,179							$31,179		
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N	$ 459,160.52	100%	2%	$9,183							$9,183		
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N	$ 1,983,931.61	100%	10%	$198,393							$198,393		
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N	$ 231,703.35	100%	5%	$11,585							$11,585		
Upper Manawatu Lower Mangahao						$ 8,740,936.41												$656,974
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70							100%	39.27723	$19,759	$19,759		
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	80%			20%								
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N	$ 37,780.46	100%	10%	$3,778							$3,778		
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	100%	1%	$8,678							$8,678		
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	100%	5%	$37,714							$37,714		
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	100%	2%	$4,050							$4,050		
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N	$ 34,065.77	100%	10%	$3,407							$3,407		
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N	$ 847.75												
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	100%	5%	$342							$342		
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	80%			20%								
Upper Whanganui						$ 4,938,009.81												$77,726
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94							100%	19.76	$2,534	$2,534		
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N	$ 65,893.29												
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	80%			20%								
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	80%			20%								
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N	$ 174,513.61												
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	100%	1%	$233							$233		
Whirokino Drainage						$ 637,520.24												$2,767
	TOTALS:					$ 465,529,505.05			$10,437,125						$512,163	$10,949,288	$11,080,900	

Note:
Flood risk updated October 2012; drain loss revised 2014
IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)

Flood Risk Assessment Database: Valuation 1 July 2017
All Assets except Pumpstations - Infrastructural Asset Insurance (IAI) covers assets indicated
Table 2b (Updated Risk Factors October 2014)
Horizons Regional Council
1% AEP (100 Yr Return Period Event)

6% or Max 4000m of damage

Scheme	Asset Type	Asset Subtype	Quantity	Units	Covered by IAI	Estimated replacement cost	3.1 F'way: >3 m/s % Value	3.1 F'way: >3 m/s % Damage		4 Ponding % Value	4 Ponding % Damage		5.0 S'bank % Value	5.0 S'bank % Damage		Total A	Total Damage
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N	$ 101,266.20				100%	5%	$5,063				$5,063	
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	100%	1%	$864							$864	
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38							100%	159.24	$10,570	$10,570	
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	80%	1%	$96	20%	1%	$24				$121	
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N	$ 16,124.84	100%	3%	$403							$403	
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	80%	1%	$259							$259	
Ashhurst Stream						$ 424,490.65											$17,281
Forest Road	Bed Control Structure	Weir	1	no.	N	$ 50,812.03	100%	3%	$1,270							$1,270	
Forest Road	Drainage Channel	Drain Reach	14.87	km	N	$ 382,147.04				100%	5%	$19,107				$19,107	
Forest Road						$ 432,959.07											$20,378
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	80%	1%	$311	20%	1%	$78				$389	
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N	$ 36,516.00				100%	5%	$1,826				$1,826	
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65							100%	20.4	$697	$697	
Foxton East Drainage						$ 86,990.65											$2,911
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N	$ 272,616.51				100%	5%	$13,631				$13,631	
Haunui Drainage						$ 272,616.51											$13,631
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N	$ 259,360.02				100%	5%	$12,968				$12,968	
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N	$ 35,822.10	100%	3%	$896							$896	
Himatangi Drainage	Flood Protection	Stopbank	20	m	N	$ 1,221.46							100%	1.2	$73	$73	
Himatangi Drainage						$ 296,403.58											$13,937
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N	$ 367,976.77				100%	5%	$18,399				$18,399	
Hokio Drainage	Bed Control Structure	Weir	1	no.	N	$ 53,733.14	100%	3%	$1,343							$1,343	
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N	$ 23,216.08	80%	1%	$186	20%	1%	$46				$232	
Hokio Drainage						$ 444,925.99											$19,974
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	80%	1%	$3,310	20%	1%	$828				$4,138	
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	80%	1%	$6,196	20%	1%	$1,549				$7,745	
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N	$ 789,508.29				100%	5%	$39,475				$39,475	
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N	$ 2,005,453.30											
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	80%	1%	$2,531	20%	1%	$633				$3,163	
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23							100%	1007.7	$276,388	$276,388	
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	100%	25%	$989							$989	
Koputaroa Drainage						$ 8,910,053.14											$331,900
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N	$ 813,306.39	100%	40%	$325,323							$325,323	
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N	$ 42,273.30	100%	3%	$1,057							$1,057	
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N	$ -	100%	25%									
Lower Kiwitea	Bank Protection	PMU	1415	m	N	$ 264,532.27	100%	20%	$52,906							$52,906	
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N	$ 520,424.79	100%	30%	$156,127							$156,127	
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N	$ 118,083.42	100%	25%	$29,521							$29,521	
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N	$ 604,383.24	100%	30%	$181,315							$181,315	
Lower Kiwitea	Flood Protection	Stopbank	550	m	N	$ 24,913.82							100%	33	$1,495	$1,495	
Lower Kiwitea						$ 2,387,917.23											$747,744
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	100%	3%	$772,571							$772,571	
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	100%	25%	$800,118							$800,118	$419,870
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	100%	10%	$255,285							$255,285	
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	100%	25%	$7,026,640							$7,026,640	
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	80%	1%	$13,452							$13,452	
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N	$ 2,067,788.97	100%	30%	$620,337							$620,337	
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	80%	2%	$10,665							$10,665	
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18							100%	240.77418	$86,658	$86,658	
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22											
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N	$ 121,509.02											
Lower Manawatu	Miscellaneous	Property	0.293	ha	N	$ 13,283.89											
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N	$ 224,232.32	80%										
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N	$ 4,090,046.64	100%	30%	$1,227,014							$1,227,014	
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	80%	1%	$15,507	20%	1%	$3,877				$19,383	
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	80%	1%	$17,093	20%	1%	$4,273				$21,366	
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	80%	1%	$24,772	20%	1%	$6,193				$30,965	
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N	$ 539,308.58				100%	5%	$26,965				$26,965	
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	100%	3%	$17,516							$17,516	
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	80%	1%	$16,379							$16,379	
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	100%	3%	$11,840							$11,840	
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28							100%	4000	$1,645,090	$1,645,090	
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N	$ 339,777.13	100%	40%	$135,911							$135,911	
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	100%	3%	$9,518							$9,518	
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	100%	50%	$101,643							$101,643	
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N	$ 7,428.86	100%	1%	$74							$74	
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	100%	1%	$11,994							$11,994	
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N	$ 64,825.33											
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47							100%	0.84	$74,309	$74,309	
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	80%										
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	100%	1%	$7,117							$7,117	
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	100%	1%	$218							$218	
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	100%										
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	80%	1%	$1,314							$1,314	
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	100%	3%	$63,850							$63,850	
Lower Manawatu						$ 252,309,724.77											$13,008,192
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N	$ 18,883.90	100%	6%	$1,133							$1,133	
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N	$ 25,604.99	100%	6%	$1,536							$1,536	
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	80%	1%	$1,422	20%	1%	$356				$1,778	
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	80%	1%	$296	20%	1%	$74				$370	
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	100%	1%	$2,840							$2,840	
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N	$ 28,584.58											
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	100%	1%	$1,244							$1,244	
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	100%	50%	$9,018							$9,018	
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49							100%	260.4	$120,539	$120,539	
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N	$ 218,962.79											
Lower Whanganui	Miscellaneous	Walkway	1	no.	N	$ 122,367.73	100%	6%	$7,342							$7,342	
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	80%	1%	$6,684							$6,684	
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N	$ 228,882.05	80%										
Lower Whanganui	Miscellaneous	Handrails	1	no.	N	$ 11,630.92											
Lower Whanganui	Flood Protection	Stop Log	1	no.	N	$ 52,193.73											
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	80%	1%	$3,856							$3,856	
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	100%	10%	$8,238							$8,238	
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	100%	3%	$15,369							$15,369	
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	100%	25%	$115,970							$115,970	
Lower Whanganui						$ 5,835,768.33											$295,916
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74							100%	1165.8	$179,584	$179,584	
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	80%	1%	$457	20%	1%	$114				$572	
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	80%	1%	$4,546	20%	1%	$1,136				$5,682	
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	80%	1%	$5,354	20%	1%	$1,339				$6,693	
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N	$ 1,476,633.96				100%	5%	$73,832				$73,832	
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N	$ 4,381,455.97											
Makerua Drainage						$ 10,145,772.21											$266,362
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	100%	3%	$3,106							$3,106	
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	80%	1%	$1,563	20%	1%	$391				$1,954	
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	80%	1%	$1,063	20%	1%	$266				$1,329	
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00							100%	429.47856	$66,581	$66,581	
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	100%	3%	$9,385							$9,385	
Makirikiri						$ 1,937,623.01											$82,356
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	80%	1%	$5,115	20%	1%	$1,279				$6,393	
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28							100%	2061.6	$612,854	$612,854	
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	80%	1%	$10,549	20%	1%	$2,637				$13,186	
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	80%	1%	$13,661	20%	1%	$3,415				$17,076	
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N	$ 13,939,039.76				100%	5%	$696,952				$696,952	
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N	$ 3,862,607.24											
Manawatu Drainage						$ 31,681,465.70											$1,346,462
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	100%	25%	$41,953							$41,953	
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89							100%	399.72	$51,388	$51,388	
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N	$ 542,502.25				100%	5%	$27,125				$27,125	
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	100%	15%	$74,863							$74,863	
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N	$ 332,234.13	100%	40%	$132,894							$132,894	
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N	$ 2,668,756.03	100%	30%	$800,627							$800,627	
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	100%	3%	$63,359							$63,359	
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	100%	25%	$695,262							$695,262	
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	100%	10%	$3,533							$3,533	
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N	$ 408,212.66	100%	30%	$122,464							$122,464	
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	100%	20%	$1,055,066							$1,055,066	
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	100%	10%	$53,879							$53,879	
Mangatainoka						$ 16,639,918.55											$3,122,411

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Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89							100%	257.82318	$22,644	$22,644	
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	80%										
Matarawa	Miscellaneous	Bridge	1	no.	N	$ 53,908.55	80%	1%	$431	20%	1%	$108				$539	
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N	$ 40,270.02	80%										
Matarawa	Drainage Channel	Drain Reach	7.476	km	N	$ 404,540.51				100%	5%	$20,227				$20,227	
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	100%	3%	$388							$388	
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23				100%	1%	$13,634				$13,634	
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	80%	1%	$1,292	20%	1%	$323				$1,615	
Matarawa						$ 2,783,939.73											$59,046
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N	$ 3,632,177.19											
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	80%	1%	$1,832	20%	1%	$458				$2,289	
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	80%	1%	$324	20%	1%	$81				$405	
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	80%	1%	$3,676	20%	1%	$919				$4,595	
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N	$ 1,973,240.17				100%	5%	$98,662				$98,662	
Moutoa Drainage						$ 6,334,358.44											$105,951
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45							100%	761.1	$162,964	$162,964	
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	80%	1%	$874	20%	1%	$218				$1,092	
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	80%	1%	$3,236	20%	1%	$809				$4,045	
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	80%	1%	$1,865	20%	1%	$466				$2,332	
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N	$ 238,596.49				100%	5%	$11,930				$11,930	
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N	$ 3,529,899.66	100%	30%	$1,058,970							$1,058,970	
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N	$ 374,800.45	100%	30%	$112,440							$112,440	
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	100%	25%	$23,087							$23,087	
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	100%	3%	$6,926							$6,926	
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	100%	3%	$175							$175	
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	100%	25%	$1,324,698							$1,324,698	
Ohau-Manakau						$ 13,281,452.40											$2,708,660
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21				100%	1%	$6,503				$6,503	
Pakihi						$ 650,290.21											$6,503
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N	$ 186,415.13											
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N	$ 72,461.89				100%	5%	$3,623				$3,623	
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N	$ 964,136.43	100%	40%	$385,655							$385,655	
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N	$ 2,860,110.05	100%	30%	$858,033							$858,033	
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N	$ 217,681.70	100%	3%	$5,442							$5,442	
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N	$ 32,982.08	100%	25%	$8,246							$8,246	
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N	$ 18,536.66	100%	10%	$1,854							$1,854	
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N	$ 1,158,903.19	100%	30%	$347,671							$347,671	
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N	$ 150,845.04	100%	20%	$30,169							$30,169	
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N	$ 259,459.01	100%	25%	$64,865							$64,865	
Pohangina-Oroua						$ 5,921,531.18											$1,705,557
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64				100%	1%	$66,737				$66,737	
Porewa						$ 6,673,689.64											$66,737
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39							100%	1169.31792	$587,599	$587,599	
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31							100%	122.2038	$37,814	$37,814	
Rangitikei	Miscellaneous	Forestry	35.4	ha	N	$ 874,830.58											
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	80%	1%	$2,913	20%	1%	$728				$3,641	
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	80%	1%	$1,198	20%	1%	$299				$1,497	
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N	$ 322,256.34				100%	5%	$16,113				$16,113	
Rangitikei	Bank Protection	Permeable groyne	3013	m	N	$ 553,555.60	100%	40%	$221,422							$221,422	
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N	$ 4,390,061.57	100%	30%	$1,317,018							$1,317,018	
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	100%	3%	$48,018							$48,018	
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	100%	25%	$3,642,839							$3,642,839	
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N	$ 18,674,444.02	100%	30%	$5,602,333							$5,602,333	
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	80%	1%	$884							$884	
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N	$ 31,529.82	80%										
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89											
Rangitikei	Pumpstation	Pumpstation	1	no.	N	$ 10,858.50											
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	100%	1%	$276							$276	
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	80%	1%	$1,594							$1,594	
Rangitikei						$ 52,636,033.06											$11,481,049
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N	$ 1,424,649.00							100%	955.7064	$85,479	$85,479	
South East Ruahine	Flood Protection	Guidebank	76	m	N	$ 4,979.09							100%	4.56	$299	$299	
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N	$ 2,339,299.52				100%	5%	$116,965				$116,965	
South East Ruahine	Bed Control Structure	Weir	22	no.	N	$ 1,109,508.62	100%	3%	$27,738							$27,738	
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N	$ 1,282.40	100%	15%	$192							$192	
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N	$ 845,277.47	100%	40%	$338,111							$338,111	
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N	$ 5,930,697.17	100%	30%	$1,779,209							$1,779,209	
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N	$ 59,431.44	100%	100%	$59,431							$59,431	
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N	$ 165,271.79	100%	25%	$41,318							$41,318	
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N	$ 18,208.70	100%	3%	$455							$455	
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N	$ 8,203,700.49	100%	30%	$2,461,110							$2,461,110	
South East Ruahine	Bank Protection	PMU	1944.16	m	N	$ 716,122.35	100%	20%	$143,224							$143,224	
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N	$ 78,873.37	100%	25%	$19,718							$19,718	
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N	$ 7,192.02	100%	50%	$3,596							$3,596	
South East Ruahine						$ 20,904,493.43											$5,076,846
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N	$ 200,525.95				100%	5%	$10,026				$10,026	
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60				100%	1%	$1,915				$1,915	
Tawataia-Mangaone						$ 392,007.55											$11,941
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60							100%	1746	$229,891	$229,891	
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N	$ 659,510.14											
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	80%	1%	$1,595	20%	1%	$399				$1,994	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	80%	1%	$4,753	20%	1%	$1,188				$5,942	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	80%	1%	$7,547	20%	1%	$1,887				$9,434	
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N	$ 2,042,551.91				100%	5%	$102,128				$102,128	
Te Kawau Drainage						$ 8,270,486.33											$349,387
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64							100%	25.06734	$1,174	$1,174	
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	100%	3%	$143							$143	
Tutaenui	Drainage Channel	Drain Reach	3	km	N	$ 44,438.63				100%	5%	$2,222				$2,222	
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73				100%	1%	$14,373				$14,373	
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	100%	15%	$4,629							$4,629	
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	100%	3%	$506							$506	
Tutaenui						$ 1,558,127.24											$23,047
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N	$ 170,836.56							100%	107.7	$10,250	$10,250	
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N	$ 724,437.57				100%	5%	$36,222				$36,222	
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N	$ 121,215.47	100%	40%	$48,486							$48,486	
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N	$ 3,792,212.54	100%	30%	$1,137,664							$1,137,664	
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N	$ 633,868.38	100%	3%	$15,847							$15,847	
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N	$ 623,570.41	100%	25%	$155,893							$155,893	
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N	$ 459,160.52	100%	10%	$45,916							$45,916	
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N	$ 1,983,931.61	100%	30%	$595,179							$595,179	
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N	$ 231,703.35	100%	20%	$46,341							$46,341	
Upper Manawatu Lower Mangahao						$ 8,740,936.41											$2,091,798
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70							100%	235.66338	$118,551	$118,551	
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	80%	1%	$1,201	20%	1%	$300				$1,501	
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N	$ 37,780.46	100%	30%	$11,334							$11,334	
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	100%	3%	$43,390							$43,390	
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	100%	25%	$188,569							$188,569	
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	100%	10%	$20,249							$20,249	
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N	$ 34,065.77	100%	30%	$10,220							$10,220	
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N	$ 847.75				100%	5%	$42				$42	
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	100%	20%	$1,367							$1,367	
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	80%	1%	$321	20%	1%	$80				$402	
Upper Whanganui						$ 4,938,009.81											$395,624
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94							100%	118.56	$15,203	$15,203	
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N	$ 65,893.29											
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	80%	1%	$342	20%	1%	$85				$427	
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	80%	1%	$622	20%	1%	$155				$777	
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N	$ 174,513.61				100%	5%	$8,726				$8,726	
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	100%	3%	$582							$582	
Whirokino Drainage						$ 637,520.24											$25,715
	TOTALS:					$ 465,529,505.05			$37,496,820			$1,502,403			$4,398,093	$43,397,317	$43,817,187

Note:
Flood risk updated October 2012; drain loss revised 2014
IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)

Flood Risk Assessment Database: Valuation 1 July 2017
Insured Assets (excluding Pumpstations and Other Assets covered by Material Damage Policy)
Table 2c (Updated Risk Factors October 2014)
Horizons Regional Council
0.2% AEP (500 Yr Return Period Event)

							3.1			4			10% or max 5000m of damage 5.0				
							F'way: >3 m/s			Ponding			S'bank				
Scheme	Asset Type	Asset Subtype	Quantity	Units	Covered by IAI	Estimated replacement cost	% Value	% Damage		% Value	% Damage		% Value	% Damage		Total A	Total Damage
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N	101266.2				100%	10%	$10,127				$10,127	
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	100%	10%	$8,645							$8,645	
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38							100%	265.4	$17,617	$17,617	
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	80%	2%	$193	20%	2%	$48				$241	
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N	$ 16,124.84	100%	5%	$806							$806	
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	100%	10%	$3,243							$3,243	
Ashhurst Stream						$ 424,490.65											$40,678
Forest Road	Bed Control Structure	Weir	1	no.	N	$ 50,812.03	100%	5%	$2,541							$2,541	
Forest Road	Drainage Channel	Drain Reach	14.87	km	N	$ 382,147.04				100%	10%	$38,215				$38,215	
Forest Road						$ 432,959.07											$40,755
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	80%	2%	$622	20%	2%	$155				$777	
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N	$ 36,516.00				100%	10%	$3,652				$3,652	
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65							100%	34	$1,161	$1,161	
Foxton East Drainage						$ 86,990.65											$5,590
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N	$ 272,616.51				100%	10%	$27,262				$27,262	
Haunui Drainage						$ 272,616.51											$27,262
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N	$ 259,360.02				100%	10%	$25,936				$25,936	
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N	$ 35,822.10	100%	5%	$1,791							$1,791	
Himatangi Drainage	Flood Protection	Stopbank	20	m	N	$ 1,221.46							100%	2	$122	$122	
Himatangi Drainage						$ 296,403.58											$27,849
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N	$ 367,976.77				100%	10%	$36,798				$36,798	
Hokio Drainage	Bed Control Structure	Weir	1	no.	N	$ 53,733.14	100%	5%	$2,687							$2,687	
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N	$ 23,216.08	80%	2%	$371	20%	2%	$93				$464	
Hokio Drainage						$ 444,925.99											$39,949
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	80%	2%	$6,620	20%	2%	$1,655				$8,275	
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	80%	2%	$12,393	20%	2%	$3,098				$15,491	
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N	$ 789,508.29				100%	10%	$78,951				$78,951	
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N	$ 2,005,453.30											
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	80%	2%	$5,062	20%	2%	$1,265				$6,327	
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23							100%	1679.5	$460,647	$460,647	
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	100%	50%	$1,979							$1,979	
Koputaroa Drainage						$ 8,910,053.14											$571,670
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N	$ 813,306.39	100%	70%	$569,314							$569,314	
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N	$ 42,273.30	100%	5%	$2,114							$2,114	
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N	$ -	100%	50%									
Lower Kiwitea	Bank Protection	PMU	1415	m	N	$ 264,532.27	100%	40%	$105,813							$105,813	
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N	$ 520,424.79	100%	85%	$442,361							$442,361	
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N	$ 118,083.42	100%	50%	$59,042							$59,042	
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N	$ 604,383.24	100%	85%	$513,726							$513,726	
Lower Kiwitea	Flood Protection	Stopbank	550	m	N	$ 24,913.82							100%	55	$2,491	$2,491	
Lower Kiwitea						$ 2,387,917.23											$1,694,861
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	100%	5%	$1,545,141							$1,545,141	
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	100%	50%	$1,600,235							$1,600,235	$1,120,941
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	100%	20%	$510,569							$510,569	
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	100%	50%	$14,053,280							$14,053,280	
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	100%	10%	$168,153							$168,153	
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N	$ 2,067,788.97	100%	85%	$1,757,621							$1,757,621	
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	80%	5%	$26,662							$26,662	
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18							100%	401.2903	$144,430	$144,430	
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22											
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N	$ 121,509.02											
Lower Manawatu	Miscellaneous	Property	0.293	ha	N	$ 13,283.89											
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N	$ 224,232.32	80%	1%	$897							$897	
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N	$ 4,090,046.64	100%	85%	$3,476,540							$3,476,540	
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	80%	2%	$31,013	20%	2%	$7,753				$38,767	
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	80%	2%	$34,186	20%	2%	$8,547				$42,733	
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	80%	2%	$49,543	20%	2%	$12,386				$61,929	
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N	$ 539,308.58				100%	10%	$53,931				$53,931	
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	100%	5%	$35,032							$35,032	
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	100%	10%	$204,740							$204,740	
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	100%	5%	$23,680							$23,680	
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28							100%	5000	$2,056,363	$2,056,363	
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N	$ 339,777.13	100%	70%	$237,844							$237,844	
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	100%	10%	$38,073							$38,073	
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	100%	75%	$152,464							$152,464	
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N	$ 7,428.86	100%	2%	$149							$149	
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	100%	10%	$119,942							$119,942	
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N	$ 64,825.33											
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47							100%	1.4	$123,849	$123,849	
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	80%	1%	$128,822							$128,822	
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	100%	10%	$71,172							$71,172	
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	100%	10%	$2,184							$2,184	
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	80%	1%	$4,799							$4,799	
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	100%	10%	$16,429							$16,429	
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	100%	5%	$127,699							$127,699	
Lower Manawatu						$ 252,309,724.77											$26,824,127
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N	$ 18,883.90	100%	75%	$14,163							$14,163	
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N	$ 25,604.99	100%	6%	$1,536							$1,536	
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	80%	2%	$2,844	20%	2%	$711				$3,556	
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	80%	2%	$592	20%	2%	$148				$739	
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	100%	10%	$28,401							$28,401	
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N	$ 28,584.58	100%	85%	$24,297							$24,297	
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	100%	10%	$12,437							$12,437	
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	100%	75%	$13,527							$13,527	
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49							100%	434	$200,898	$200,898	
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N	$ 218,962.79											
Lower Whanganui	Miscellaneous	Walkway	1	no.	N	$ 122,367.73	100%	85%	$104,013							$104,013	
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	100%	10%	$83,556							$83,556	
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N	$ 228,882.05	80%	1%	$916							$916	
Lower Whanganui	Miscellaneous	Handrails	1	no.	N	$ 11,630.92	100%	85%	$9,886							$9,886	
Lower Whanganui	Flood Protection	Stop Log	1	no.	N	$ 52,193.73											
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	100%	10%	$48,195							$48,195	
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	100%	20%	$16,476							$16,476	
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	100%	5%	$30,737							$30,737	
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	100%	50%	$231,941							$231,941	
Lower Whanganui						$ 5,835,768.33											$825,273
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74							100%	1943	$299,307	$299,307	
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	80%	2%	$914	20%	2%	$229				$1,143	
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	80%	2%	$9,091	20%	2%	$2,273				$11,364	
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	80%	2%	$10,708	20%	2%	$2,677				$13,385	
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N	$ 1,476,633.96				100%	10%	$147,663				$147,663	
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N	$ 4,381,455.97											
Makerua Drainage						$ 10,145,772.21											$472,862
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	100%	10%	$12,425							$12,425	
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	80%	2%	$3,126	20%	2%	$782				$3,908	
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	80%	2%	$2,126	20%	2%	$532				$2,658	
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00							100%	715.7976	$110,969	$110,969	
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	100%	5%	$18,771							$18,771	
Makirikiri						$ 1,937,623.01											$148,730
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	80%	2%	$10,229	20%	2%	$2,557				$12,787	
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28							100%	3436	$1,021,424	$1,021,424	
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	80%	2%	$21,098	20%	2%	$5,275				$26,373	
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	80%	2%	$27,322	20%	2%	$6,830				$34,152	
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N	$ 13,939,039.76				100%	10%	$1,393,904				$1,393,904	
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N	$ 3,862,607.24											
Manawatu Drainage						$ 31,681,465.70											$2,488,639
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	100%	50%	$83,906							$83,906	
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89							100%	666.2	$85,646	$85,646	
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N	$ 542,502.25				100%	10%	$54,250				$54,250	
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	100%	30%	$149,725							$149,725	
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N	$ 332,234.13	100%	70%	$232,564							$232,564	
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N	$ 2,668,756.03	100%	85%	$2,268,443							$2,268,443	
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	100%	5%	$126,718							$126,718	
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	100%	50%	$1,390,524							$1,390,524	
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	100%	20%	$7,066							$7,066	
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N	$ 408,212.66	100%	85%	$346,981							$346,981	
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	100%	40%	$2,110,131							$2,110,131	
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	100%	20%	$107,759							$107,759	
Mangatainoka						$ 16,639,918.55											$6,963,712

500 year Continued…

Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89							100%	429.7053	$37,739	$37,739	
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	80%	1%	$1,470							$1,470	
Matarawa	Miscellaneous	Bridge	1	no.	N	$ 53,908.55	80%	2%	$863	20%	2%	$216				$1,078	
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N	$ 40,270.02	80%	1%	$161							$161	
Matarawa	Drainage Channel	Drain Reach	7.476	km	N	$ 404,540.51				100%	10%	$40,454				$40,454	
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	100%	5%	$775							$775	
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23				100%	2%	$27,268				$27,268	
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	80%	2%	$2,584	20%	2%	$646				$3,230	
Matarawa						$ 2,783,939.73											$112,175
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N	$ 3,632,177.19											
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	80%	2%	$3,663	20%	2%	$916				$4,579	
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	80%	2%	$648	20%	2%	$162				$810	
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	80%	2%	$7,352	20%	2%	$1,838				$9,190	
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N	$ 1,973,240.17				100%	10%	$197,324				$197,324	
Moutoa Drainage						$ 6,334,358.44											$211,903
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45							100%	1268.5	$271,607	$271,607	
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	80%	2%	$1,747	20%	2%	$437				$2,184	
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	80%	2%	$6,472	20%	2%	$1,618				$8,090	
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	80%	2%	$3,731	20%	2%	$933				$4,663	
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N	$ 238,596.49				100%	10%	$23,860				$23,860	
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N	$ 3,529,899.66	100%	85%	$3,000,415							$3,000,415	
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N	$ 374,800.45	100%	85%	$318,580							$318,580	
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	100%	50%	$46,175							$46,175	
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	100%	5%	$13,852							$13,852	
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	100%	5%	$351							$351	
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	100%	50%	$2,649,395							$2,649,395	
Ohau-Manakau						$ 13,281,452.40											$6,339,173
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21				100%	2%	$13,006				$13,006	
Pakihi						$ 650,290.21											$13,006
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N	$ 186,415.13											
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N	$ 72,461.89				100%	10%	$7,246				$7,246	
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N	$ 964,136.43	100%	70%	$674,896							$674,896	
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N	$ 2,860,110.05	100%	85%	$2,431,094							$2,431,094	
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N	$ 217,681.70	100%	5%	$10,884							$10,884	
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N	$ 32,982.08	100%	50%	$16,491							$16,491	
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N	$ 18,536.66	100%	20%	$3,707							$3,707	
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N	$ 1,158,903.19	100%	85%	$985,068							$985,068	
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N	$ 150,845.04	100%	40%	$60,338							$60,338	
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N	$ 259,459.01	100%	50%	$129,730							$129,730	
Pohangina-Oroua						$ 5,921,531.18											$4,319,453
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64				100%	2%	$133,474				$133,474	
Porewa						$ 6,673,689.64											$133,474
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39							100%	1948.8632	$979,331	$979,331	
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31							100%	203.673	$63,024	$63,024	
Rangitikei	Miscellaneous	Forestry	35.4	ha	N	$ 874,830.58											
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	80%	2%	$5,826	20%	2%	$1,457				$7,283	
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	80%	2%	$2,396	20%	2%	$599				$2,995	
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N	$ 322,256.34				100%	10%	$32,226				$32,226	
Rangitikei	Bank Protection	Permeable groyne	3013	m	N	$ 553,555.60	100%	70%	$387,489							$387,489	
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N	$ 4,390,061.57	100%	85%	$3,731,552							$3,731,552	
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	100%	5%	$96,037							$96,037	
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	100%	50%	$7,285,679							$7,285,679	
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N	$ 18,674,444.02	100%	85%	$15,873,277							$15,873,277	
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	100%	10%	$11,045							$11,045	
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N	$ 31,529.82	80%	1%	$126							$126	
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89											
Rangitikei	Pumpstation	Pumpstation	1	no.	N	$ 10,858.50											
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	100%	10%	$2,762							$2,762	
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	100%	10%	$19,923							$19,923	
Rangitikei						$ 52,636,033.06											$28,492,747
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N	$ 1,424,649.00							100%	1592.844	$142,465	$142,465	
South East Ruahine	Flood Protection	Guidebank	76	m	N	$ 4,979.09							100%	7.6	$498	$498	
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N	$ 2,339,299.52				100%	10%	$233,930				$233,930	
South East Ruahine	Bed Control Structure	Weir	22	no.	N	$ 1,109,508.62	100%	5%	$55,475							$55,475	
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N	$ 1,282.40	100%	30%	$385							$385	
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N	$ 845,277.47	100%	70%	$591,694							$591,694	
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N	$ 5,930,697.17	100%	85%	$5,041,093							$5,041,093	
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N	$ 59,431.44	100%	100%	$59,431							$59,431	
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N	$ 165,271.79	100%	50%	$82,636							$82,636	
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N	$ 18,208.70	100%	5%	$910							$910	
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N	$ 8,203,700.49	100%	85%	$6,973,145							$6,973,145	
South East Ruahine	Bank Protection	PMU	1944.16	m	N	$ 716,122.35	100%	40%	$286,449							$286,449	
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N	$ 78,873.37	100%	50%	$39,437							$39,437	
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N	$ 7,192.02	100%	75%	$5,394							$5,394	
South East Ruahine						$ 20,904,493.43											$13,512,943
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N	$ 200,525.95				100%	10%	$20,053				$20,053	
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60				100%	2%	$3,830				$3,830	
Tawataia-Mangaone						$ 392,007.55											$23,882
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60							100%	2910	$383,151	$383,151	
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N	$ 659,510.14											
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	80%	2%	$3,190	20%	2%	$798				$3,988	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	80%	2%	$9,507	20%	2%	$2,377				$11,883	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	80%	2%	$15,094	20%	2%	$3,773				$18,867	
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N	$ 2,042,551.91				100%	10%	$204,255				$204,255	
Te Kawau Drainage						$ 8,270,486.33											$622,145
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64							100%	41.7789	$1,956	$1,956	
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	100%	10%	$571							$571	
Tutaenui	Drainage Channel	Drain Reach	3	km	N	$ 44,438.63				100%	10%	$4,444				$4,444	
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73				100%	2%	$28,747				$28,747	
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	100%	30%	$9,259							$9,259	
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	100%	5%	$1,011							$1,011	
Tutaenui						$ 1,558,127.24											$45,987
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N	$ 170,836.56							100%	179.5	$17,084	$17,084	
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N	$ 724,437.57				100%	10%	$72,444				$72,444	
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N	$ 121,215.47	100%	70%	$84,851							$84,851	
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N	$ 3,792,212.54	100%	85%	$3,223,381							$3,223,381	
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N	$ 633,868.38	100%	5%	$31,693							$31,693	
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N	$ 623,570.41	100%	50%	$311,785							$311,785	
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N	$ 459,160.52	100%	20%	$91,832							$91,832	
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N	$ 1,983,931.61	100%	85%	$1,686,342							$1,686,342	
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N	$ 231,703.35	100%	40%	$92,681							$92,681	
Upper Manawatu Lower Mangahao						$ 8,740,936.41											$5,612,093
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70							100%	392.7723	$197,585	$197,585	
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	80%	2%	$2,402	20%	2%	$600				$3,002	
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N	$ 37,780.46	100%	85%	$32,113							$32,113	
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	100%	5%	$86,781							$86,781	
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	100%	50%	$377,137							$377,137	
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	100%	20%	$40,497							$40,497	
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N	$ 34,065.77	100%	85%	$28,956							$28,956	
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N	$ 847.75				100%	10%	$85				$85	
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	100%	40%	$2,734							$2,734	
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	80%	2%	$642	20%	2%	$161				$803	
Upper Whanganui						$ 4,938,009.81											$769,693
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94							100%	197.6	$25,338	$25,338	
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N	$ 65,893.29											
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	80%	2%	$684	20%	2%	$171				$854	
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	80%	2%	$1,244	20%	2%	$311				$1,554	
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N	$ 174,513.61				100%	10%	$17,451				$17,451	
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	100%	10%	$2,328							$2,328	
Whirokino Drainage						$ 637,520.24											$47,527
	TOTALS:					$ 465,529,505.05			$90,778,651			$3,004,807			$6,644,701	$100,428,160	$101,549,101

Note:
Flood risk updated October 2012; drain loss revised 2014
IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)

Flood Risk Assessment Database: Valuation 1 July 2017
Insured Assets (excluding Pumpstations and Other Assets covered by Material Damage Policy)
Table 3a (Updated Risk Factors October 2014)
Horizons Regional Council
5% AEP (20 Yr Return Period Event)

Scheme	Asset Type	Asset Subtype	Quantity	Units	Covered by IAI	Estimated replacement cost	3.1 F'way: >3 m/s % Value	3.1 F'way: >3 m/s % Damage		4 Ponding % Value	4 Ponding % Damage		5.0 S'bank % Value	5.0 S'bank % Damage		Total A	Total 5%AEP Flood Risk
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N												
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	100%										
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38							100%	26.54	$1,762	$1,762	
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	80%			20%							
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N												
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	80%										
Ashhurst Stream																	$1,762
Forest Road	Bed Control Structure	Weir	1	no.	N												
Forest Road	Drainage Channel	Drain Reach	14.87	km	N												
Forest Road																	
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	80%			20%							
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N												
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65							100%	3.4	$116	$116	
Foxton East Drainage																	$116
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N												
Haunui Drainage																	
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N												
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N												
Himatangi Drainage	Flood Protection	Stopbank	20	m	N												
Himatangi Drainage																	
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N												
Hokio Drainage	Bed Control Structure	Weir	1	no.	N												
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N												
Hokio Drainage																	
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	80%			20%							
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	80%			20%							
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N												
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N												
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	80%			20%							
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23							100%	167.95	$46,065	$46,065	
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	100%	5%	$198							$198	
Koputaroa Drainage																	$46,263
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N												
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N												
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N												
Lower Kiwitea	Bank Protection	PMU	1415	m	N												
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N												
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N												
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N												
Lower Kiwitea	Flood Protection	Stopbank	550	m	N												
Lower Kiwitea																	
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	100%	1%	$154,514							$154,514	
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	100%	5%	$160,024							$160,024	
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	100%	2%	$51,057							$51,057	
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	100%	5%	$1,405,328							$1,405,328	
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	80%										
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N												
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	80%	1%	$2,666							$2,666	
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18							100%	40.12903	$14,443	$14,443	
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22											
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N												
Lower Manawatu	Miscellaneous	Property	0.293	ha	N												
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N												
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N												
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	80%			20%							
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	80%			20%							
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	80%			20%							
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N												
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	100%										
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	80%										
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	100%	1%	$2,368							$2,368	
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28							100%	250	$102,818	$102,818	
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N												
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	100%	1%	$3,807							$3,807	
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	100%	10%	$20,329							$20,329	
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N												
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	100%										
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N												
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47							100%	0.14	$12,385	$12,385	
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	80%										
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	100%										
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	100%										
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	100%										
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	80%										
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	100%	1%	$12,770							$12,770	
Lower Manawatu																	$1,942,508
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N												
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N												
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	80%			20%							
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	80%			20%							
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	100%										
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N												
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	100%										
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	100%	10%	$1,804							$1,804	
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49							100%	43.4	$20,090	$20,090	
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N												
Lower Whanganui	Miscellaneous	Walkway	1	no.	N												
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	80%										
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N												
Lower Whanganui	Miscellaneous	Handrails	1	no.	N												
Lower Whanganui	Flood Protection	Stop Log	1	no.	N												
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	80%										
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	100%	2%	$1,648							$1,648	
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	100%	1%	$3,074							$3,074	
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	100%	5%	$23,194							$23,194	
Lower Whanganui																	$49,809
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74							100%	194.3	$29,931	$29,931	
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	80%			20%							
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	80%			20%							
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	80%			20%							
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N												
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N												
Makerua Drainage																	$29,931
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	100%	1%	$1,243							$1,243	
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	80%			20%							
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	80%			20%							
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00							100%	71.57976	$11,097	$11,097	
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	100%	1%	$1,877							$1,877	
Makirikiri																	$14,216
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	80%			20%							
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28							100%	250	$74,318	$74,318	
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	80%			20%							
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	80%			20%							
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N												
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N												
Manawatu Drainage																	$74,318
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	100%	5%	$8,391							$8,391	
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89							100%	66.62	$8,565	$8,565	
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N												
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	100%	2%	$9,982							$9,982	
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N												
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N												
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	100%	1%	$12,672							$12,672	
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	100%	5%	$139,052							$139,052	
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	100%	2%	$707							$707	
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N												
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	100%	5%	$263,766							$263,766	
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	100%	2%	$10,776							$10,776	
Mangatainoka																	$453,910

20 year Continued…

Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89							100%	42.97053	$3,774	$3,774	
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	80%										
Matarawa	Miscellaneous	Bridge	1	no.	N												
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N												
Matarawa	Drainage Channel	Drain Reach	7.476	km	N												
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	100%	1%	$78							$78	
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23				100%							
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	80%			20%							
Matarawa																	$3,851
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N												
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	80%			20%							
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	80%			20%							
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	80%			20%							
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N												
Moutoa Drainage																	
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45							100%	126.85	$27,161	$27,161	
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	80%			20%							
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	80%			20%							
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	80%			20%							
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N												
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N												
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N												
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	100%	5%	$4,617							$4,617	
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	100%	1%	$1,385							$1,385	
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	100%										
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	100%	5%	$264,940							$264,940	
Ohau-Manakau																	$298,103
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21				100%							
Pakihi																	
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N												
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N												
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N												
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N												
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N												
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N												
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N												
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N												
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N												
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N												
Pohangina-Oroua																	
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64				100%							
Porewa																	
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39							100%	194.88632	$97,933	$97,933	
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31							100%	20.3673	$6,302	$6,302	
Rangitikei	Miscellaneous	Forestry	35.4	ha	N												
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	80%			20%							
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	80%			20%							
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N												
Rangitikei	Bank Protection	Permeable groyne	3013	m	N												
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N												
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	100%	1%	$9,604							$9,604	
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	100%	5%	$728,568							$728,568	
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N												
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	80%										
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N												
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89											
Rangitikei	Pumpstation	Pumpstation	1	no.	N												
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	100%										
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	80%										
Rangitikei																	$842,407
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N												
South East Ruahine	Flood Protection	Guidebank	76	m	N												
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N												
South East Ruahine	Bed Control Structure	Weir	22	no.	N												
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N												
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N												
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N												
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N												
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N												
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N												
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N												
South East Ruahine	Bank Protection	PMU	1944.16	m	N												
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N												
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N												
South East Ruahine																	
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N												
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60				100%							
Tawataia-Mangaone																	
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60							100%	250	$32,917	$32,917	
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N												
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	80%			20%							
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	80%			20%							
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	80%			20%							
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N												
Te Kawau Drainage																	$32,917
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64							100%	4.17789	$196	$196	
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	100%	1%	$57							$57	
Tutaenui	Drainage Channel	Drain Reach	3	km	N												
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73				100%							
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	100%	2%	$617							$617	
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	100%	1%	$101							$101	
Tutaenui																	$971
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N												
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N												
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N												
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N												
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N												
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N												
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N												
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N												
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N												
Upper Manawatu Lower Mangahao																	
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70							100%	39.27723	$19,759	$19,759	
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	80%			20%							
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N												
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	100%	1%	$8,678							$8,678	
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	100%	5%	$37,714							$37,714	
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	100%	2%	$4,050							$4,050	
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N												
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N												
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	100%	5%	$342							$342	
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	80%			20%							
Upper Whanganui																	$70,542
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94							100%	19.76	$2,534	$2,534	
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N												
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	80%			20%							
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	80%			20%							
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N												
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	100%	1%	$233							$233	
Whirokino Drainage																	$2,767
	TOTALS:					$ 349,027,002.61			$3,352,227						$512,163	$3,864,390	$3,864,390

Note:
Flood risk updated October 2012; drain loss revised 2014
IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)

Flood Risk Assessment Database: Valuation 1 July 2017
Insured Assets (excluding Pumpstations and Other Assets covered by Material Damage Policy)
Table 3b (Updated Risk Factors October 2014)
Horizons Regional Council
1% AEP (100 Yr Return Period Event)

							3.1 F'way: >3 m/s			4 Ponding			5.0 S'bank					Earthquake Exposure		
							%	%		%	%		%	%						
Scheme	Asset Type	Asset Subtype	Quantity	Units	Covered by IAI	Estimated replacement cost	Value	Damage		Value	Damage		Value	Damage		Total A	Total 1%AEP Flood Risk	Risk Factor	Damage	Total 1% AEP EQ Risk
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N															
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	100%	1%	$864							$864		0.03408	$2,946	
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38							100%	159.24	$10,570	$10,570		0.03408	$6,004	
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	80%	1%	$96	20%	1%	$24				$121		0.02822	$340	
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N													0.03408		
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	80%	1%	$259							$259		0.03408	$1,105	
Ashhurst Stream																	$11,815			$10,395
Forest Road	Bed Control Structure	Weir	1	no.	N													0.02701		
Forest Road	Drainage Channel	Drain Reach	14.87	km	N															
Forest Road																				
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	80%	1%	$311	20%	1%	$78				$389		0.0194	$754	
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N															
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65							100%	20.4	$697	$697		0.0194	$225	
Foxton East Drainage																	$1,085			$979
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N															
Haunui Drainage																				
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N															
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N													0.03337		
Himatangi Drainage	Flood Protection	Stopbank	20	m	N													0.03337		
Himatangi Drainage																				
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N															
Hokio Drainage	Bed Control Structure	Weir	1	no.	N													0.03621		
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N													0.03621		
Hokio Drainage																				
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	80%	1%	$3,310	20%	1%	$828				$4,138		0.03384	$14,002	
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	80%	1%	$6,196	20%	1%	$1,549				$7,745		0.03384	$26,211	
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N															
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N															
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	80%	1%	$2,531	20%	1%	$633				$3,163		0.03384	$10,705	
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23							100%	1007.7	$276,388	$276,388		0.04085	$188,174	
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	100%	25%	$989							$989		0.04085	$162	
Koputaroa Drainage																	$292,425			$239,254
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N															
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N													0.0309		
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N													0.0309		
Lower Kiwitea	Bank Protection	PMU	1415	m	N													0.0309		
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N															
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N													0.0309		
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N															
Lower Kiwitea	Flood Protection	Stopbank	550	m	N													0.0309		
Lower Kiwitea																				
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	100%	3%	$772,571							$772,571		0.0358	$1,105,085	
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	100%	25%	$800,118							$800,118		0.0358	$114,449	
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	100%	10%	$255,285							$255,285		0.0358	$91,290	
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	100%	25%	$7,026,640							$7,026,640		0.0358	$1,005,091	
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	80%	1%	$13,452							$13,452		0.0358	$60,132	
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N															
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	80%	2%	$10,665							$10,665		0.0358	$23,836	
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18							100%	240.77418	$86,658	$86,658		0.0358	$51,648	
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22												0.0358	$13,640	
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N															
Lower Manawatu	Miscellaneous	Property	0.293	ha	N													0.0358		
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N													0.0358		
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N															
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	80%	1%	$15,507	20%	1%	$3,877				$19,383		0.0296	$57,433	
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	80%	1%	$17,093	20%	1%	$4,273				$21,366		0.0296	$63,308	
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	80%	1%	$24,772	20%	1%	$6,193				$30,965		0.0296	$91,748	
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N															
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	100%	3%	$17,516							$17,516		0.0358	$25,055	
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	80%	1%	$16,379							$16,379		0.0358	$73,215	
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	100%	3%	$11,840							$11,840		0.0358	$16,936	
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28							100%	4000	$1,645,090	$1,645,090		0.0358	$4,514,082	
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N															
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	100%	3%	$9,518							$9,518		0.0358	$13,615	
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	100%	50%	$101,643							$101,643		0.0358	$7,269	
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N													0.0358		
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	100%	1%	$11,994							$11,994		0.0358	$42,891	
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N													0.0358		
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47							100%	0.84	$74,309	$74,309		0.0358	$44,288	
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	80%											0.0358	$1,151,672	
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	100%	1%	$7,117							$7,117		0.0358	$25,451	
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	100%	1%	$218							$218		0.0358	$781	
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	100%											0.0358	$21,453	
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	80%	1%	$1,314							$1,314		0.0358	$5,875	
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	100%	3%	$63,850							$63,850		0.0358	$91,330	
Lower Manawatu																	$10,997,891			$8,711,572
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N															
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N															
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	80%	1%	$1,422	20%	1%	$356				$1,778		0.0112	$1,993	
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	80%	1%	$296	20%	1%	$74				$370		0.0112	$414	
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	100%	1%	$2,840							$2,840				
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N															
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	100%	1%	$1,244							$1,244		0.0135	$1,683	
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	100%	50%	$9,018							$9,018		0.0135	$244	
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49							100%	260.4	$120,539	$120,539		0.0135	$27,181	
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N															
Lower Whanganui	Miscellaneous	Walkway	1	no.	N															
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	80%	1%	$6,684							$6,684		0.0135	$11,305	
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N															
Lower Whanganui	Miscellaneous	Handrails	1	no.	N															
Lower Whanganui	Flood Protection	Stop Log	1	no.	N															
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	80%	1%	$3,856							$3,856		0.0135	$6,521	
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	100%	10%	$8,238							$8,238		0.0135	$1,115	
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	100%	3%	$15,369							$15,369		0.0135	$8,317	
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	100%	25%	$115,970							$115,970		0.0135	$6,276	
Lower Whanganui																	$285,905			$65,050
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74							100%	1165.8	$179,584	$179,584		0.03986	$119,304	
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	80%	1%	$457	20%	1%	$114				$572		0.0330	$1,888	
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	80%	1%	$4,546	20%	1%	$1,136				$5,682		0.0330	$18,768	
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	80%	1%	$5,354	20%	1%	$1,339				$6,693		0.0330	$22,106	
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N															
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N															
Makerua Drainage																	$192,530			$162,065
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	100%	3%	$3,106							$3,106		0.0135	$1,681	
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	80%	1%	$1,563	20%	1%	$391				$1,954		0.0112	$2,190	
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	80%	1%	$1,063	20%	1%	$266				$1,329		0.0135	$1,798	
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00							100%	429.47856	$66,581	$66,581		0.0135	$15,014	
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	100%	3%	$9,385							$9,385		0.0135	$5,079	
Makirikiri																	$82,356			$25,763
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	80%	1%	$5,115	20%	1%	$1,279				$6,393		0.0296	$18,943	
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28							100%	2061.6	$612,854	$612,854		0.0358	$365,261	
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	80%	1%	$10,549	20%	1%	$2,637				$13,186		0.0296	$39,071	
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	80%	1%	$13,661	20%	1%	$3,415				$17,076		0.0296	$50,596	
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N															
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N															
Manawatu Drainage																	$649,510			$473,872
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	100%	25%	$41,953							$41,953		0.0410	$6,875	
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89							100%	399.72	$51,388	$51,388		0.0410	$35,089	
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N															
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	100%	15%	$74,863							$74,863		0.0410	$20,447	
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N															
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N															
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	100%	3%	$63,359							$63,359		0.0410	$103,833	
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	100%	25%	$695,262							$695,262		0.0410	$113,940	
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	100%	10%	$3,533							$3,533		0.0410	$1,447	
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N															
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	100%	20%	$1,055,066							$1,055,066		0.0410	$216,130	
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	100%	10%	$53,879							$53,879		0.0410	$22,074	
Mangatainoka																	$2,039,302			$519,836

100 year Continued…

Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89							100%	257.82318	$22,644	$22,644		0.01353	$5,106	
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	80%											0.01353	$4,971	
Matarawa	Miscellaneous	Bridge	1	no.	N															
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N															
Matarawa	Drainage Channel	Drain Reach	7.476	km	N															
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	100%	3%	$388							$388		0.01353	$210	
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23				100%	1%	$13,634				$13,634		0.01353	$18,447	
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	80%	1%	$1,292	20%	1%	$323				$1,615		0.01353	$2,185	
Matarawa																	$38,280			$30,919
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N															
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	80%	1%	$1,832	20%	1%	$458				$2,289		0.03274	$7,496	
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	80%	1%	$324	20%	1%	$81				$405		0.03274	$1,326	
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	80%	1%	$3,676	20%	1%	$919				$4,595		0.03274	$15,044	
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N															
Moutoa Drainage																	$7,289			$23,866
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45							100%	761.1	$162,964	$162,964		0.04027	$109,376	
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	80%	1%	$874	20%	1%	$218				$1,092		0.03337	$3,644	
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	80%	1%	$3,236	20%	1%	$809				$4,045		0.03337	$13,498	
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	80%	1%	$1,865	20%	1%	$466				$2,332		0.03337	$7,781	
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N															
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N															
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N															
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	100%	25%	$23,087							$23,087		0.0403	$3,722	
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	100%	3%	$6,926							$6,926		0.0403	$11,165	
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	100%	3%	$175							$175		0.0403	$283	
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	100%	25%	$1,324,698							$1,324,698		0.04027	$213,382	
Ohau-Manakau																	$1,525,320			$362,851
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21				100%	1%	$6,503				$6,503		0.0142	$9,234	
Pakihi																	$6,503			$9,234
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N															
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N															
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N															
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N															
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N													0.03089		
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N													0.03089		
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N													0.03089		
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N															
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N													0.03089		
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N													0.03089		
Pohangina-Oroua																				
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64				100%	1%	$66,737				$66,737		0.02272	$151,626	
Porewa																	$66,737			$151,626
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39							100%	1169.31792	$587,599	$587,599		0.02701	$264,517	
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31							100%	122.2038	$37,814	$37,814		0.02701	$17,023	
Rangitikei	Miscellaneous	Forestry	35.4	ha	N															
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	80%	1%	$2,913	20%	1%	$728				$3,641		0.02238	$8,149	
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	80%	1%	$1,198	20%	1%	$299				$1,497		0.02238	$3,351	
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N															
Rangitikei	Bank Protection	Permeable groyne	3013	m	N															
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N															
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	100%	3%	$48,018							$48,018		0.02701	$51,879	
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	100%	25%	$3,642,839							$3,642,839		0.02701	$393,572	
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N															
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	80%	1%	$884							$884		0.02701	$2,983	
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N													0.02701		
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89												0.02701	$316	
Rangitikei	Pumpstation	Pumpstation	1	no.	N															
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	100%	1%	$276							$276		0.02701	$746	
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	80%	1%	$1,594							$1,594		0.02701	$5,381	
Rangitikei																	$4,324,163			$747,918
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N													0.04167		
South East Ruahine	Flood Protection	Guidebank	76	m	N															
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N															
South East Ruahine	Bed Control Structure	Weir	22	no.	N													0.04167		
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N													0.04167		
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N															
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N															
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N															
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N													0.04167		
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N													0.04167		
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N															
South East Ruahine	Bank Protection	PMU	1944.16	m	N													0.04167		
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N													0.04167		
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N													0.04167		
South East Ruahine																				
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N															
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60				100%	1%	$1,915				$1,915		0.04067	$7,788	
Tawataia-Mangaone																	$1,915			$7,788
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60							100%	1746	$229,891	$229,891		0.03337	$127,858	
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N															
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	80%	1%	$1,595	20%	1%	$399				$1,994		0.02765	$5,513	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	80%	1%	$4,753	20%	1%	$1,188				$5,942		0.02765	$16,429	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	80%	1%	$7,547	20%	1%	$1,887				$9,434		0.02765	$26,084	
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N															
Te Kawau Drainage																	$247,260			$175,883
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64							100%	25.06734	$1,174	$1,174		0.0214	$418	
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	100%	3%	$143							$143		0.0214	$122	
Tutaenui	Drainage Channel	Drain Reach	3	km	N															
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73				100%	1%	$14,373				$14,373		0.0214	$30,716	
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	100%	15%	$4,629							$4,629		0.0214	$660	
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	100%	3%	$506							$506		0.0214	$432	
Tutaenui																	$20,825			$32,348
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N													0.0374		
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N															
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N															
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N															
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N													0.0374		
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N													0.0374		
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N													0.0374		
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N															
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N													0.0374		
Upper Manawatu Lower Mangahao																				
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70							100%	235.66338	$118,551	$118,551		0.0040	$7,864	
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	80%	1%	$1,201	20%	1%	$300				$1,501		0.0033	$501	
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N															
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	100%	3%	$43,390							$43,390		0.0040	$6,908	
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	100%	25%	$188,569							$188,569		0.0040	$3,002	
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	100%	10%	$20,249							$20,249		0.0040	$806	
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N															
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N															
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	100%	20%	$1,367							$1,367		0.0040	$27	
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	80%	1%	$321	20%	1%	$80				$402		0.0033	$134	
Upper Whanganui																	$374,028			$19,242
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94							100%	118.56	$15,203	$15,203		0.0362	$9,160	
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N															
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	80%	1%	$342	20%	1%	$85				$427		0.0300	$1,280	
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	80%	1%	$622	20%	1%	$155				$777		0.0300	$2,329	
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N															
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	100%	3%	$582							$582		0.0300	$698	
Whirokino Drainage																	$16,990			$13,466
	TOTALS:					$ 349,027,002.61			$16,741,610			$140,020			$4,300,497		$21,182,127			$11,783,927

Flood risk updated October 2012; drain loss revised 2014

IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)

Note:
Earthquake loss factors by GNS have been corrected for Forest Road, Lower Whanganui, Matarawa, Te Kawau Drainage (highlighted in Green) – error in location coordinates.

Flood Risk Assessment Database: Valuation 1 July 2017
Insured Assets (excluding Pumpstations and Other Assets covered by Material Damage Policy)
Table 3b (Updated Risk Factors October 2014)
Horizons Regional Council
0.2% AEP (500 Yr Return Period Event)

							3.1 F'way: >3 m/s			4 Ponding			5.0 S'bank				
Scheme	Asset Type	Asset Subtype	Quantity	Units	Covered by IAI	Estimated replacement cost	% Value	% Damage		% Value	% Damage		% Value	% Damage		Total A	Total 0.2%AEP Flood Risk
Ashhurst Stream	Drainage Channel	Drain Reach	5.7	km	N												
Ashhurst Stream	Flood Protection	Timber Flood Wall	308	m	Y	$ 86,448.21	100%	10%	$8,645							$8,645	
Ashhurst Stream	Flood Protection	Stopbank	2654	m	Y	$ 176,167.38							100%	265.4	$17,617	$17,617	
Ashhurst Stream	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 12,055.46	80%	2%	$193	20%	2%	$48				$241	
Ashhurst Stream	Bed Control Structure	Weir	1	no.	N												
Ashhurst Stream	Flood Protection	Concrete Flood Wall	1	no.	Y	$ 32,428.56	100%	10%	$3,243							$3,243	
Ashhurst Stream																	$29,746
Forest Road	Bed Control Structure	Weir	1	no.	N												
Forest Road	Drainage Channel	Drain Reach	14.87	km	N												
Forest Road																	
Foxton East Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 38,862.00	80%	2%	$622	20%	2%	$155				$777	
Foxton East Drainage	Drainage Channel	Drain Reach	6.93	km	N												
Foxton East Drainage	Flood Protection	Stopbank	340	m	Y	$ 11,612.65							100%	34	$1,161	$1,161	
Foxton East Drainage																	$1,939
Haunui Drainage	Drainage Channel	Drain Reach	8.79	km	N												
Haunui Drainage																	
Himatangi Drainage	Drainage Channel	Drain Reach	51.8	km	N												
Himatangi Drainage	Bed Control Structure	Weir	3	no.	N												
Himatangi Drainage	Flood Protection	Stopbank	20	m	N												
Himatangi Drainage																	
Hokio Drainage	Drainage Channel	Drain Reach	44.854	km	N												
Hokio Drainage	Bed Control Structure	Weir	1	no.	N												
Hokio Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	N												
Hokio Drainage																	
Koputaroa Drainage	floodgated Structure	floodgated Culvert Major	4	no.	Y	$ 413,766.00	80%	2%	$6,620	20%	2%	$1,655				$8,275	
Koputaroa Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 774,543.51	80%	2%	$12,393	20%	2%	$3,098				$15,491	
Koputaroa Drainage	Drainage Channel	Drain Reach	51.675	km	N												
Koputaroa Drainage	Pumpstation	Pumpstation	4	no.	N												
Koputaroa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 316,349.97	80%	2%	$5,062	20%	2%	$1,265				$6,327	
Koputaroa Drainage	Flood Protection	Stopbank	16795	m	Y	$ 4,606,474.23							100%	1679.5	$460,647	$460,647	
Koputaroa Drainage	Bank Protection	Rock Lining (non-engineered)	36	t	Y	$ 3,957.84	100%	50%	$1,979							$1,979	
Koputaroa Drainage																	$492,720
Lower Kiwitea	Bank Protection	Permeable groyne	4715	m	N												
Lower Kiwitea	Bank Protection	Rock Lining (engineered)	600	t	N												
Lower Kiwitea	Bank Protection	Rock Lining (non-engineered)		t	N												
Lower Kiwitea	Bank Protection	PMU	1415	m	N												
Lower Kiwitea	Bank Protection	Protection Planting	25.712	ha	N												
Lower Kiwitea	Bank Protection	Concrete Rip Rap	1676	t	N												
Lower Kiwitea	Bank Protection	Tied Tree Work	5332	m	N												
Lower Kiwitea	Flood Protection	Stopbank	550	m	N												
Lower Kiwitea																	
Lower Manawatu	Bank Protection	Rock Lining (engineered)	281087.44	t	Y	$ 30,902,823.44	100%	5%	$1,545,141							$1,545,141	
Lower Manawatu	Bank Protection	Rock Lining (non-engineered)	29111	t	Y	$ 3,200,470.63	100%	50%	$1,600,235							$1,600,235	
Lower Manawatu	Bank Protection	Rock groyne	25659	t	Y	$ 2,552,845.99	100%	20%	$510,569							$510,569	
Lower Manawatu	Bank Protection	Concrete Rip Rap	255653.05	t	Y	$ 28,106,560.30	100%	50%	$14,053,280							$14,053,280	
Lower Manawatu	Bank Protection	Massbloc Retaining Wall	1047.4	m	Y	$ 1,681,533.10	100%	10%	$168,153							$168,153	
Lower Manawatu	Bank Protection	Protection Planting	93.318	ha	N												
Lower Manawatu	Bank Protection	Cased concrete piled groyne	1	no.	Y	$ 666,550.86	80%	5%	$26,662							$26,662	
Lower Manawatu	Flood Protection	Guidebank	4012.903	m	Y	$ 1,444,296.18							100%	401.2903	$144,430	$144,430	
Lower Manawatu	Flood Protection	Toe Drain	4	no.	Y	$ 381,430.22											
Lower Manawatu	Pumpstation	Pumpstation	2	no.	N												
Lower Manawatu	Miscellaneous	Property	0.293	ha	N												
Lower Manawatu	Miscellaneous	Amenity Enhancement	2	no.	N												
Lower Manawatu	Bank Protection	Tied Tree Work	27264.687	m	N												
Lower Manawatu	floodgated Structure	floodgated Structure	7	no.	Y	$ 1,938,333.34	80%	2%	$31,013	20%	2%	$7,753				$38,767	
Lower Manawatu	floodgated Structure	floodgated Culvert Minor	130	no.	Y	$ 2,136,630.07	80%	2%	$34,186	20%	2%	$8,547				$42,733	
Lower Manawatu	floodgated Structure	floodgated Culvert Major	36	no.	Y	$ 3,096,453.41	80%	2%	$49,543	20%	2%	$12,386				$61,929	
Lower Manawatu	Drainage Channel	Drain Reach	32.12	km	N												
Lower Manawatu	Bed Control Structure	Bed Armouring	1	no.	Y	$ 700,631.44	100%	5%	$35,032							$35,032	
Lower Manawatu	Flood Protection	Concrete Flood Wall	19	no.	Y	$ 2,047,397.29	100%	10%	$204,740							$204,740	
Lower Manawatu	Bed Control Structure	Drop Structure	1	no.	Y	$ 473,595.50	100%	5%	$23,680							$23,680	
Lower Manawatu	Flood Protection	Stopbank	306932.037	m	Y	$ 126,232,728.28							100%	5000	$2,056,363	$2,056,363	
Lower Manawatu	Bank Protection	Permeable groyne	1571	m	N												
Lower Manawatu	Miscellaneous	Misc Spillway	1	no.	Y	$ 380,728.99	100%	10%	$38,073							$38,073	
Lower Manawatu	Bank Protection	Timber Retaining Wall	541	m	Y	$ 203,285.52	100%	75%	$152,464							$152,464	
Lower Manawatu	Miscellaneous	Self Help Depots	1	no.	N												
Lower Manawatu	Flood Protection	Timber Flood Wall	1839.7	m	Y	$ 1,199,418.39	100%	10%	$119,942							$119,942	
Lower Manawatu	Flood Protection	Portable Flood Barrier	3	no.	N												
Lower Manawatu	Flood Protection	Property Mitigation Bund	14	no.	Y	$ 1,238,486.47							100%	1.4	$123,849	$123,849	
Lower Manawatu	Flood Protection	Flow Diversion Structure	9	no.	Y	$ 32,205,589.91	80%	1%	$128,822							$128,822	
Lower Manawatu	Flood Protection	Double Timber Flood Wall	3	no.	Y	$ 711,723.49	100%	10%	$71,172							$71,172	
Lower Manawatu	Flood Protection	Bridge Flood Wall	1	no.	Y	$ 21,837.61	100%	10%	$2,184							$2,184	
Lower Manawatu	Bank Protection	Tiered Concrete Lining	57	m	Y	$ 599,902.83	80%	1%	$4,799							$4,799	
Lower Manawatu	Flood Protection	Firth Block Flood Wall	1	no.	Y	$ 164,287.28	100%	10%	$16,429							$16,429	
Lower Manawatu	Bed Control Structure	Weir	2	no.	Y	$ 2,553,983.49	100%	5%	$127,699							$127,699	
Lower Manawatu																	$21,297,146
Lower Whanganui	Miscellaneous	Kneebreaker	1	no.	N												
Lower Whanganui	Miscellaneous	Vehicle ramp over stopbank	3	no.	N												
Lower Whanganui	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 177,776.33	80%	2%	$2,844	20%	2%	$711				$3,556	
Lower Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 36,974.49	80%	2%	$592	20%	2%	$148				$739	
Lower Whanganui	Flood Protection	Double Timber Flood Wall	1	no.	Y	$ 284,006.65	100%	10%	$28,401							$28,401	
Lower Whanganui	Miscellaneous	Security Fence	3	no.	N												
Lower Whanganui	Flood Protection	Timber Flood Wall	174.1	m	Y	$ 124,372.06	100%	10%	$12,437							$12,437	
Lower Whanganui	Bank Protection	Timber Retaining Wall	48	m	Y	$ 18,036.43	100%	75%	$13,527							$13,527	
Lower Whanganui	Flood Protection	Stopbank	4340	m	Y	$ 2,008,976.49							100%	434	$200,898	$200,898	
Lower Whanganui	Flood Protection	Portable Flood Barrier	4	no.	N												
Lower Whanganui	Miscellaneous	Walkway	1	no.	N												
Lower Whanganui	Flood Protection	Concrete Flood Wall	14	no.	Y	$ 835,560.69	100%	10%	$83,556							$83,556	
Lower Whanganui	Miscellaneous	Amenity Enhancement	2	no.	N												
Lower Whanganui	Miscellaneous	Handrails	1	no.	N												
Lower Whanganui	Flood Protection	Stop Log	1	no.	N												
Lower Whanganui	Flood Protection	Firth Block Flood Wall	4	no.	Y	$ 481,953.52	100%	10%	$48,195							$48,195	
Lower Whanganui	Bank Protection	Rock groyne	828	t	Y	$ 82,378.76	100%	20%	$16,476							$16,476	
Lower Whanganui	Bank Protection	Rock Lining (engineered)	9515	t	Y	$ 614,740.37	100%	5%	$30,737							$30,737	
Lower Whanganui	Bank Protection	Concrete Rip Rap	7180	t	Y	$ 463,881.85	100%	50%	$231,941							$231,941	
Lower Whanganui																	$670,463
Makerua Drainage	Flood Protection	Stopbank	19430	m	Y	$ 2,993,066.74							100%	1943	$299,307	$299,307	
Makerua Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 57,150.00	80%	2%	$914	20%	2%	$229				$1,143	
Makerua Drainage	floodgated Structure	floodgated Culvert Minor	41	no.	Y	$ 568,199.71	80%	2%	$9,091	20%	2%	$2,273				$11,364	
Makerua Drainage	floodgated Structure	floodgated Culvert Major	13	no.	Y	$ 669,265.83	80%	2%	$10,708	20%	2%	$2,677				$13,385	
Makerua Drainage	Drainage Channel	Drain Reach	105.7	km	N												
Makerua Drainage	Pumpstation	Pumpstation	9	no.	N												
Makerua Drainage																	$325,199
Makirikiri	Miscellaneous	Misc Spillway	1	no.	Y	$ 124,250.96	100%	10%	$12,425							$12,425	
Makirikiri	floodgated Structure	floodgated Culvert Minor	13	no.	Y	$ 195,375.00	80%	2%	$3,126	20%	2%	$782				$3,908	
Makirikiri	floodgated Structure	floodgated Structure	1	no.	Y	$ 132,891.75	80%	2%	$2,126	20%	2%	$532				$2,658	
Makirikiri	Flood Protection	Stopbank	7157.976	m	Y	$ 1,109,686.00							100%	715.7976	$110,969	$110,969	
Makirikiri	Bed Control Structure	Drop Structure	3	no.	Y	$ 375,419.30	100%	5%	$18,771							$18,771	
Makirikiri																	$148,730
Manawatu Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 639,329.88	80%	2%	$10,229	20%	2%	$2,557				$12,787	
Manawatu Drainage	Flood Protection	Stopbank	34360	m	Y	$ 10,214,239.28							100%	3436	$1,021,424	$1,021,424	
Manawatu Drainage	floodgated Structure	floodgated Culvert Minor	69	no.	Y	$ 1,318,640.45	80%	2%	$21,098	20%	2%	$5,275				$26,373	
Manawatu Drainage	floodgated Structure	floodgated Culvert Major	15	no.	Y	$ 1,707,609.09	80%	2%	$27,322	20%	2%	$6,830				$34,152	
Manawatu Drainage	Drainage Channel	Drain Reach	275.775	km	N												
Manawatu Drainage	Pumpstation	Pumpstation	1	no.	N												
Manawatu Drainage																	$1,094,736
Mangatainoka	Bank Protection	Concrete Rip Rap	1900	t	Y	$ 167,811.80	100%	50%	$83,906							$83,906	
Mangatainoka	Flood Protection	Stopbank	6662	m	Y	$ 856,458.89							100%	666.2	$85,646	$85,646	
Mangatainoka	Drainage Channel	Drain Reach	49.567	km	N												
Mangatainoka	Bed Control Structure	Grade Control	19	no.	Y	$ 499,083.47	100%	30%	$149,725							$149,725	
Mangatainoka	Bank Protection	Permeable groyne	2320.33	m	N												
Mangatainoka	Bank Protection	Tied Tree Work	16440.86	m	N												
Mangatainoka	Bank Protection	Rock Lining (engineered)	28694.57	t	Y	$ 2,534,361.81	100%	5%	$126,718							$126,718	
Mangatainoka	Bank Protection	Rock Lining (non-engineered)	31487.6	t	Y	$ 2,781,047.81	100%	50%	$1,390,524							$1,390,524	
Mangatainoka	Bank Protection	Rock groyne	400	t	Y	$ 35,328.80	100%	20%	$7,066							$7,066	
Mangatainoka	Bank Protection	Protection Planting	272.03	ha	N												
Mangatainoka	Bank Protection	PMU	7499.24	m	Y	$ 5,275,328.39	100%	40%	$2,110,131							$2,110,131	
Mangatainoka	Bank Protection	Gabions	559	m	Y	$ 538,792.51	100%	20%	$107,759							$107,759	
Mangatainoka																	$4,061,474

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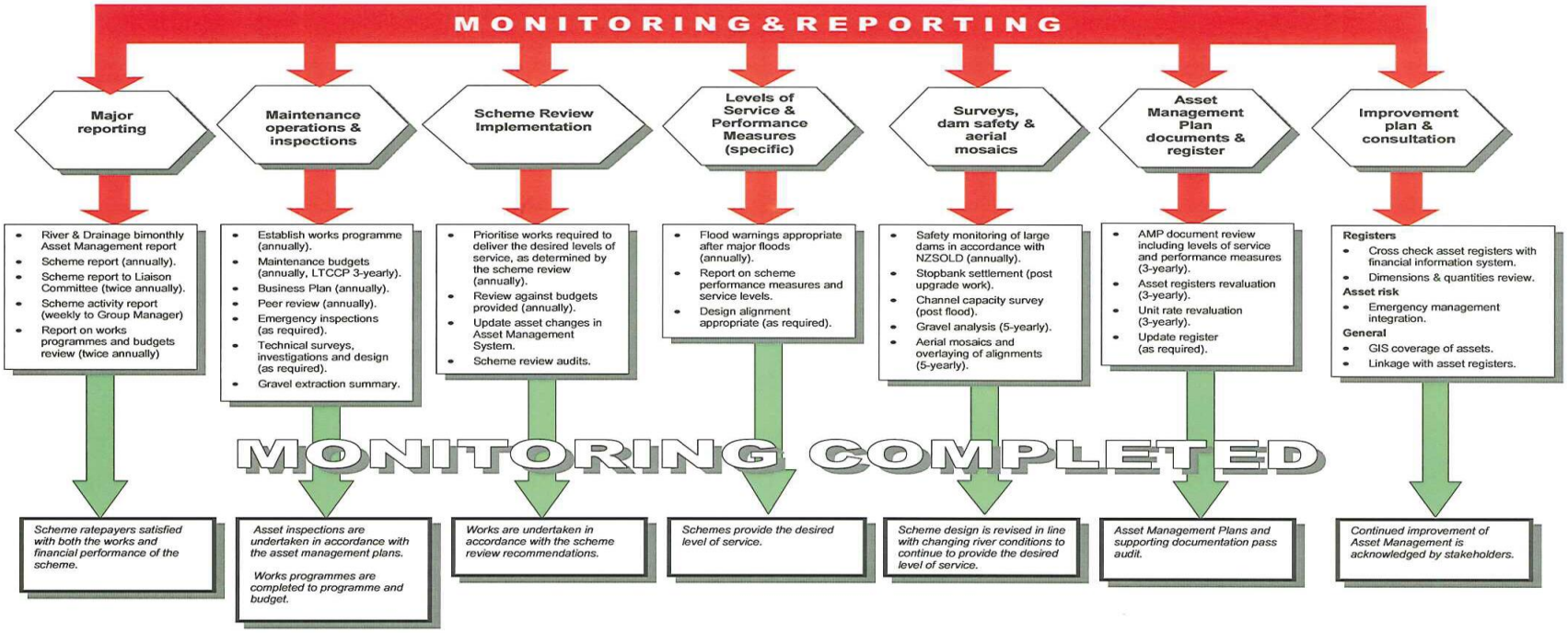
Matarawa	Flood Protection	Stopbank	4297.053	m	Y	$ 377,391.89							100%	429.7053	$37,739	$37,739	
Matarawa	Flood Protection	Flow Diversion Structure	1	no.	Y	$ 367,424.73	80%	1%	$1,470							$1,470	
Matarawa	Miscellaneous	Bridge	1	no.	N												
Matarawa	Miscellaneous	Amenity Enhancement	1	no.	N												
Matarawa	Drainage Channel	Drain Reach	7.476	km	N												
Matarawa	Bank Protection	Rock Lining (engineered)	240	t	Y	$ 15,505.80	100%	5%	$775							$775	
Matarawa	Detention Dam	Detention Dam	5	no.	Y	$ 1,363,388.23				100%	2%	$27,268				$27,268	
Matarawa	floodgated Structure	floodgated Culvert Minor	16	no.	Y	$ 161,510.00	80%	2%	$2,584	20%	2%	$646				$3,230	
Matarawa																	$70,482
Moutoa Drainage	Pumpstation	Pumpstation	5	no.	N												
Moutoa Drainage	floodgated Structure	floodgated Structure	2	no.	Y	$ 228,942.12	80%	2%	$3,663	20%	2%	$916				$4,579	
Moutoa Drainage	floodgated Structure	floodgated Culvert Minor	4	no.	Y	$ 40,512.96	80%	2%	$648	20%	2%	$162				$810	
Moutoa Drainage	floodgated Structure	floodgated Culvert Major	6	no.	Y	$ 459,486.00	80%	2%	$7,352	20%	2%	$1,838				$9,190	
Moutoa Drainage	Drainage Channel	Drain Reach	65.605	km	N												
Moutoa Drainage																	$14,579
Ohau-Manakau	Flood Protection	Stopbank	12685	m	Y	$ 2,716,071.45							100%	1268.5	$271,607	$271,607	
Ohau-Manakau	floodgated Structure	floodgated Structure	3	no.	Y	$ 109,201.38	80%	2%	$1,747	20%	2%	$437				$2,184	
Ohau-Manakau	floodgated Structure	floodgated Culvert Minor	18	no.	Y	$ 404,509.71	80%	2%	$6,472	20%	2%	$1,618				$8,090	
Ohau-Manakau	floodgated Structure	floodgated Culvert Major	3	no.	Y	$ 233,172.00	80%	2%	$3,731	20%	2%	$933				$4,663	
Ohau-Manakau	Drainage Channel	Drain Reach	46.535	km	N												
Ohau-Manakau	Bank Protection	Tied Tree Work	10860	m	N												
Ohau-Manakau	Bank Protection	Protection Planting	19.05	ha	N												
Ohau-Manakau	Bank Protection	Rock Lining (non-engineered)	840	t	Y	$ 92,349.81	100%	50%	$46,175							$46,175	
Ohau-Manakau	Bank Protection	Rock Lining (engineered)	2520	t	Y	$ 277,049.44	100%	5%	$13,852							$13,852	
Ohau-Manakau	Bed Control Structure	Bed Armouring	1	no.	Y	$ 7,011.68	100%	5%	$351							$351	
Ohau-Manakau	Bank Protection	Concrete Rip Rap	48197	t	Y	$ 5,298,790.33	100%	50%	$2,649,395							$2,649,395	
Ohau-Manakau																	$2,996,318
Pakihi	Detention Dam	Detention Dam	2	no.	Y	$ 650,290.21				100%	2%	$13,006				$13,006	
Pakihi																	$13,006
Pohangina-Oroua	Miscellaneous	Forestry	38.4	ha	N												
Pohangina-Oroua	Drainage Channel	Drain Reach	6.78	km	N												
Pohangina-Oroua	Bank Protection	Permeable groyne	5018	m	N												
Pohangina-Oroua	Bank Protection	Tied Tree Work	21971	m	N												
Pohangina-Oroua	Bank Protection	Rock Lining (engineered)	1980	t	N												
Pohangina-Oroua	Bank Protection	Rock Lining (non-engineered)	300	t	N												
Pohangina-Oroua	Bank Protection	Rock groyne	870	t	N												
Pohangina-Oroua	Bank Protection	Protection Planting	74.815	ha	N												
Pohangina-Oroua	Bank Protection	PMU	1103.22	m	N												
Pohangina-Oroua	Bank Protection	Concrete Rip Rap	2360	t	N												
Pohangina-Oroua																	
Porewa	Detention Dam	Detention Dam	27	no.	Y	$ 6,673,689.64				100%	2%	$133,474				$133,474	
Porewa																	$133,474
Rangitikei	Flood Protection	Stopbank	19488.632	m	Y	$ 9,793,308.39							100%	1948.8632	$979,331	$979,331	
Rangitikei	Flood Protection	Guidebank	2036.73	m	Y	$ 630,237.31							100%	203.673	$63,024	$63,024	
Rangitikei	Miscellaneous	Forestry	35.4	ha	N												
Rangitikei	floodgated Structure	floodgated Culvert Minor	23	no.	Y	$ 364,140.18	80%	2%	$5,826	20%	2%	$1,457				$7,283	
Rangitikei	floodgated Structure	floodgated Culvert Major	2	no.	Y	$ 149,733.00	80%	2%	$2,396	20%	2%	$599				$2,995	
Rangitikei	Drainage Channel	Drain Reach	22.34	km	N												
Rangitikei	Bank Protection	Permeable groyne	3013	m	N												
Rangitikei	Bank Protection	Tied Tree Work	32533	m	N												
Rangitikei	Bank Protection	Rock Lining (engineered)	21439	t	Y	$ 1,920,730.74	100%	5%	$96,037							$96,037	
Rangitikei	Bank Protection	Rock Lining (non-engineered)	162644	t	Y	$ 14,571,357.37	100%	50%	$7,285,679							$7,285,679	
Rangitikei	Bank Protection	Erosion Protection Reserve	899.3	ha	N												
Rangitikei	Flood Protection	Concrete Flood Wall	2	no.	Y	$ 110,454.15	100%	10%	$11,045							$11,045	
Rangitikei	Miscellaneous	Amenity Enhancement	1	no.	N												
Rangitikei	Flood Protection	Toe Drain	1	no.	Y	$ 11,694.89											
Rangitikei	Pumpstation	Pumpstation	1	no.	N												
Rangitikei	Flood Protection	Timber Flood Wall	80	m	Y	$ 27,615.18	100%	10%	$2,762							$2,762	
Rangitikei	Flood Protection	Firth Block Flood Wall	2	no.	Y	$ 199,225.42	100%	10%	$19,923							$19,923	
Rangitikei																	$8,468,077
South East Ruahine	Flood Protection	Stopbank	15928.44	m	N												
South East Ruahine	Flood Protection	Guidebank	76	m	N												
South East Ruahine	Drainage Channel	Drain Reach	83.103	km	N												
South East Ruahine	Bed Control Structure	Weir	22	no.	N												
South East Ruahine	Bed Control Structure	Grade Control	1	no.	N												
South East Ruahine	Bank Protection	Permeable groyne	3213.45	m	N												
South East Ruahine	Bank Protection	Tied Tree Work	56819.2	m	N												
South East Ruahine	Bank Protection	Stock Gate	562.23	m	N												
South East Ruahine	Bank Protection	Rock Lining (non-engineered)	1779	t	N												
South East Ruahine	Bank Protection	Rock Lining (engineered)	196	t	N												
South East Ruahine	Bank Protection	Protection Planting	775.18	ha	N												
South East Ruahine	Bank Protection	PMU	1944.16	m	N												
South East Ruahine	Bank Protection	Concrete Rip Rap	849	t	N												
South East Ruahine	Bank Protection	Timber Retaining Wall	19.14	m	N												
South East Ruahine																	
Tawataia-Mangaone	Drainage Channel	Drain Reach	14.891	km	N												
Tawataia-Mangaone	Detention Dam	Detention Dam	1	no.	Y	$ 191,481.60				100%	2%	$3,830				$3,830	
Tawataia-Mangaone																	$3,830
Te Kawau Drainage	Flood Protection	Stopbank	29100	m	Y	$ 3,831,512.60							100%	2910	$383,151	$383,151	
Te Kawau Drainage	Pumpstation	Pumpstation	2	no.	N												
Te Kawau Drainage	floodgated Structure	floodgated Structure	1	no.	Y	$ 199,381.86	80%	2%	$3,190	20%	2%	$798				$3,988	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Minor	33	no.	Y	$ 594,166.77	80%	2%	$9,507	20%	2%	$2,377				$11,883	
Te Kawau Drainage	floodgated Structure	floodgated Culvert Major	12	no.	Y	$ 943,363.05	80%	2%	$15,094	20%	2%	$3,773				$18,867	
Te Kawau Drainage	Drainage Channel	Drain Reach	179.32	km	N												
Te Kawau Drainage																	$417,889
Tutaenui	Flood Protection	Stopbank	417.789	m	Y	$ 19,560.64							100%	41.7789	$1,956	$1,956	
Tutaenui	Miscellaneous	Misc Spillway	1	no.	Y	$ 5,706.95	100%	10%	$571							$571	
Tutaenui	Drainage Channel	Drain Reach	3	km	N												
Tutaenui	Detention Dam	Detention Dam	18	no.	Y	$ 1,437,329.73				100%	2%	$28,747				$28,747	
Tutaenui	Bed Control Structure	Grade Control	2	no.	Y	$ 30,862.28	100%	30%	$9,259							$9,259	
Tutaenui	Bank Protection	Rock Lining (engineered)	184	t	Y	$ 20,229.01	100%	5%	$1,011							$1,011	
Tutaenui																	$41,543
Upper Manawatu Lower Mangahao	Flood Protection	Stopbank	1795	m	N												
Upper Manawatu Lower Mangahao	Drainage Channel	Drain Reach	18.876	km	N												
Upper Manawatu Lower Mangahao	Bank Protection	Permeable groyne	724.66	m	N												
Upper Manawatu Lower Mangahao	Bank Protection	Tied Tree Work	23039.91	m	N												
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (engineered)	9910	t	N												
Upper Manawatu Lower Mangahao	Bank Protection	Rock Lining (non-engineered)	9749	t	N												
Upper Manawatu Lower Mangahao	Bank Protection	Rock groyne	4402	t	N												
Upper Manawatu Lower Mangahao	Bank Protection	Protection Planting	277.96	ha	N												
Upper Manawatu Lower Mangahao	Bank Protection	PMU	336.85	m	N												
Upper Manawatu Lower Mangahao																	
Upper Whanganui	Flood Protection	Stopbank	3927.723	m	Y	$ 1,975,854.70							100%	392.7723	$197,585	$197,585	
Upper Whanganui	floodgated Structure	floodgated Culvert Minor	14	no.	Y	$ 150,100.54	80%	2%	$2,402	20%	2%	$600				$3,002	
Upper Whanganui	Bank Protection	Tied Tree Work	475	m	N												
Upper Whanganui	Bank Protection	Rock Lining (engineered)	25750	t	Y	$ 1,735,614.38	100%	5%	$86,781							$86,781	
Upper Whanganui	Bank Protection	Rock Lining (non-engineered)	11190.6	t	Y	$ 754,274.42	100%	50%	$377,137							$377,137	
Upper Whanganui	Bank Protection	Rock groyne	2482	t	Y	$ 202,485.90	100%	20%	$40,497							$40,497	
Upper Whanganui	Bank Protection	Protection Planting	1.98	ha	N												
Upper Whanganui	Drainage Channel	Drain Reach	0.705	km	N												
Upper Whanganui	Bank Protection	PMU	50	m	Y	$ 6,834.30	100%	40%	$2,734							$2,734	
Upper Whanganui	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 40,151.59	80%	2%	$642	20%	2%	$161				$803	
Upper Whanganui																	$708,539
Whirokino Drainage	Flood Protection	Stopbank	1976	m	Y	$ 253,384.94							100%	197.6	$25,338	$25,338	
Whirokino Drainage	Pumpstation	Pumpstation	1	no.	N												
Whirokino Drainage	floodgated Structure	floodgated Culvert Minor	3	no.	Y	$ 42,722.00	80%	2%	$684	20%	2%	$171				$854	
Whirokino Drainage	floodgated Structure	floodgated Culvert Major	1	no.	Y	$ 77,724.00	80%	2%	$1,244	20%	2%	$311				$1,554	
Whirokino Drainage	Drainage Channel	Drain Reach	10.98	km	N												
Whirokino Drainage	Miscellaneous	Misc Spillway	1	no.	Y	$ 23,282.40	100%	10%	$2,328							$2,328	
Whirokino Drainage																	$30,076
	TOTALS:					$ 349,027,002.61			$34,257,883			$280,040			$6,482,041		$41,019,965

Note:
Flood risk updated October 2012; drain loss revised 2014
IAI = Infrastructural Asset Insurance (excludes Material Damage cover for Pumpstations and other assets)

Appendix I

Monitoring and Reporting Procedures

Horizons Regional Council



Appendix J

Condition Rating

Overview of Maintenance Rating Classification

Rating	Classification	Action	Description
1	Very Good	No Action required	New or near new condition. Some wear but no evidence of damage. Can include repaired assets where the repair is as good as the original.
2	Good	Monitor to see if there are changes	Deterioration or minor damage that may affect performance. Includes most repaired assets.
3	Moderate	Consider assessment by Area Engineer	Clearly needs some attention but is still working. Structure in need of repair. Includes repaired where the repair is deteriorated.
4	Poor	Get assessment by Area Engineer	Either not working or is working poorly because of damage or deterioration. Condition or structure is poor or structural integrity in question.
5	Very Poor	Replace or repair	Needs urgent attention.

Specific Maintenance Rating Classification

Asset	Maintenance Rating	Maintenance	Guidelines
Bed control structures, including weirs and grade controls	1	No Maintenance	Fully effective
	2	Minor	Debris clearance required
	3	Medium	Component replacement or extension required
	4	Major	Structural deterioration
	5	Uncertainty	Structure failure
Detention Dams	1	No Maintenance	Fully effective
	2	Minor	Inlet blockage, stock damage, debris in ponding area
	3	Medium	Heavy vegetation accumulation, silted inlets
	4	Major	Spillway scour, significant capacity loss
	5	Uncertainty	Structural failure e.g. earthquake
Drainage Channels	1	No Maintenance	Fully effective
	2	Minor	Localised blockage to clear, chemical treatment to control weed growth marginally affecting performance, minor impediment to flow
	3	Medium	Significantly ineffective drainage requiring mechanical clearance
	4	Major	Major slumping, loss of gradient, structural damage, culvert collapse or obstruction
	5	Uncertainty	System failure

Asset	Maintenance Rating	Maintenance	Guidelines
Floodgated structures (major and minor) excluding flow diversion structures (Moutoa Gates, Makino Gates, Flygers Line Gates)	1	No Maintenance	Fully effective
	2	Minor	Minor corrosion, debris accumulation, safety concerns
	3	Medium	Damaged hinge arms, winch components, significant gate leakage, access safety concerns
	4	Major	Conduit seepage evident, structural deterioration
	5	Uncertainty	Structural failure
Hard edge protection including rock linings, rock groynes and concrete riprap	1	No Maintenance	Fully effective
	2	Minor	Minor vegetation/debris presence
	3	Medium	Minor loss, slumping, protruding steel
	4	Major	Major loss, slumping, outflanking
	5	Uncertainty	Structure failure
Permeable Groynes	1	No Maintenance	Fully effective
	2	Minor	Loose ropes, debris loading
	3	Medium	Components need replacing
	4	Major	Effectiveness reduced e.g. outflanking
	5	Uncertainty	Structure failure
Protection Planting	1	No Maintenance	Fully effective
	2	Minor	Layering or infill planting required
	3	Medium	Partial replacement required
	4	Major	Dead/destroyed
	5	Uncertainty	Refer to Area Engineer
Pumpstations: Overall Condition	1	No Maintenance	Fully effective
	2	Minor	Weed build-up, minor corrosion, lubrication low, building needs paint or bird proofing
	3	Medium	Minor component failure, noisy running, building leaks
	4	Major	Major component failure, pump seized, structural defects
	5	Uncertainty	Non operational
Pumpstations: Land/Access	1	No Maintenance	Fully effective
	2	Minor	Overgrown
	3	Medium	Track rutting
	4	Major	Scour, ground failure
	5	Uncertainty	Inaccessible

Asset	Maintenance Rating	Maintenance	Guidelines
Pumpstations: Building	1	No Maintenance	Fully effective
	2	Minor	Needs painting, not bird-proof
	3	Medium	Not weathertight
	4	Major	Structural defects
	5	Uncertainty	Not serviceable
Pumpstations: Floodgates etc.	1	No Maintenance	Fully effective
	2	Minor	Minor corrosion, weed build-up
	3	Medium	Component failure
	4	Major	Safety concerns, major component failure
	5	Uncertainty	Non operational
Pumpstations: Electrical	1	No Maintenance	Fully effective
	2	Minor	Electrical failure not affecting pump operation
	3	Medium	Minor component failure (delay timer, multi-ranger)
	4	Major	Starter board, power supply failure
	5	Uncertainty	Non operational
Pumpstations: Pump	1	No Maintenance	Fully effective
	2	Minor	Lubrication low
	3	Medium	Noisy running
	4	Major	Seized
	5	Uncertainty	Non operational
Stopbanks	1	No Maintenance	Fully effective
	2	Minor	Poor grass cover, stock tracking
	3	Medium	Bull or rabbit holes, no grass cover, trees, gorse, blackberry
	4	Major	Deformation, crest dips or narrows, berm okay
	5	Uncertainty	Refer to Area Engineer
Tied tree work, PMU and lateral fence erosion protection work	1	No Maintenance	Fully effective
	2	Minor	Minor displacement of elements
	3	Medium	Damaged elements
	4	Major	Exposed bank/major damage
	5	Uncertainty	Structural failure – beyond repair

Asset	Maintenance Rating	Maintenance	Guidelines
Timber assets including flood walls, retaining walls. (See table below for more details)	1	No Maintenance	Fully effective
	2	Minor	Minor displacement of elements
	3	Medium	Damaged elements
	4	Major	Major damage or deterioration of elements
	5	Uncertainty	Structural failure – beyond repair

Enhanced Condition Ratings

The following enhanced condition ratings have been developed to recognise that the risk of stopbank failure depends on more than just the physical condition ratings determined by annual maintenance inspections. These are indicative only and subject to change during the life of this Plan. A comprehensive risk profile approach is currently being developed at national level and it is expected that this will incorporate similar principles as the enhanced condition ratings set out below.

Stopbank: Design	Design Rating 1	Low risk of overtopping	Stopbank crest is equal to or exceeds the calculated flood profile for the scheme and 450 mm freeboard
	Design Rating 2	Minor risk of overtopping	Stopbank crest is equal to or exceeds the calculated flood profile for the Scheme and has more than 150 mm freeboard
	Design Rating 3	Major risk of overtopping	Stopbank crest is equal to or exceeds the calculated flood profile for the Scheme and has less than 150 mm freeboard
	Design Rating 4	Certain overtopping	Stopbank crest is below the calculated flood profile for the scheme

Stopbank: Structural	Structural Rating 1	Low risk of geotechnical failure during overtopping	Batters and crest width to Scheme design criteria and geotechnically sound, with correct material (>30% silt/clay) properly compacted
	Structural Rating 2	Low risk of geotechnical failure when bank full flood, high risk of failure when overtopped	Batters steeper and crest width narrower than scheme design criteria. Old stopbank constructed without a specification and with unknown geotechnical status. Silt content adequate, compaction below standard
	Structural Rating 3	High risk of geotechnical failure at less than bank full flood	Geotechnical properties known to be marginal Foundation/stopbank has sand content high enough to create low risk of piping failure. Peat layers present in stopbank or foundation

Visual Assessment and Grading for Timber Assets

Feature	Suggested Action	Comment	Recommended Grade
Sound.	No action.	No action required.	1
Surface staining or discolouration – normal site.	No action.	No action required if surface discolouration only.	
Holes – not water holding area.	Monitor.	May need repair.	2
Cracking. No evidence of rot.	Monitor.	May reduce the strength but can sometimes have no effect.	
Warping – not water holding area.	Monitor.	Could stay the same or get worse.	
Surface staining or discolouration – high visibility site.	Cleaning or repainting.	Action depends on aesthetic requirements.	3
Cracking. Evidence of rot.	Specialist assessment.	Rot always needs inspection or replacement since it can spread.	
Damaged or loose fixings – operational issue.	Repair or replace.	If the fixing prevents the component operating (e.g. loose or missing hinge) it is Grade 4.	4
Cracking. Evidence of rot. Loss of material.	Specialist assessment.		
Holes – flood wall.	Urgent repair.	Needs repair.	5
Warping – flood wall.	Urgent repair.	Needs repair.	
Damaged or loose fixings - flood wall.	Urgent repair.	Needs repair.	
Major rot.	Specialist assessment.	Needs urgent attention as rot can spread.	
Broken or clearly failed.	Repair replace.	Needs urgent attention.	

Appendix K

Levels of Service and Performance Measures

Examples of Level of Service and Performance Measures

Strategic outcome	Customer Level of Service	Technical Level of Service Required Performance Measure
The service protects people and property from the impacts of flooding	Flood flows not exceeding 1% AEP will be contained within stopbanks to protect adjoining developed areas and farmland	Dam is fully compliant with NZSOLD requirements
		Dam is at maintenance rating 2 or above
		Stopbanks at maintenance rating 2 or above
		Floodwalls at maintenance rating 2 or above
		Floodgates at maintenance rating 2 or above
		Moutoa/Makino Floodgates are at maintenance rating 2 or above
This service minimises river bank erosion	River alignment maintained to a predetermined design alignment	Rock lining at maintenance rating 2 or above
		Concrete riprap at maintenance rating 2 or above
		Protection planting at maintenance rating 2 or above
		Bed control structures at maintenance rating 2 or above
		Bank protection structures at maintenance rating 2 or above
The service collects and conveys catchment run-off to minimise surface ponding	To maintain drainage capacity that facilitates maintenance of appropriate groundwater levels	Drainage channels at maintenance rating 2 or above
		Floodgates at maintenance rating 2 or above
		Pumpstations at operational level 2 or above

Scheme specific measures are in Part B, Appendix F.

Appendix L

Schedules of Assets & Unit Rates as at 1 July 20174

Asset Type	Asset Subtype	Physical Quantity		Replacement Value
Bank Protection	Cased concrete piled groyne	1	no.	$666,550.86
Bank Protection	Concrete Rip Rap	317815.1	t	$34,493,460.08
Bank Protection	Erosion Protection Reserve	899.3	ha	$18,674,444.02
Bank Protection	Gabions	559	m	$538,792.51
Bank Protection	Massbloc Retaining Wall	1047.4	m	$1,681,533.10
Bank Protection	Permeable Groyne	20575.44	m	$3,969,502.62
Bank Protection	PMU	12348.47	m	$6,645,365.70
Bank Protection	Protection Planting	1540.045	ha	$14,751,827.93
Bank Protection	Rock Groyne	34642	t	$3,350,736.63
Bank Protection	Rock Lining (engineered)	382116	t	$38,933,087.07
Bank Protection	Rock Lining (non-engineered)	247138.2	t	$22,225,282.16
Bank Protection	Stock Gate	562.23	m	$59,431.44
Bank Protection	Tied Tree Work	194735.7	m	$27,903,947.36
Bank Protection	Tiered Concrete Lining	57	m	$599,902.83
Bank Protection	Timber Retaining Wall	608.14	m	$228,513.97
Bank Protection	Bed Armouring	2	no.	$707,643.12
Bank Protection	Drop Structure	4	no.	$849,014.80
Bank Protection	Grade Control	22	no.	$531,228.15
Bank Protection	Weir	30	no.	$3,819,984.22
Detention Dam	N/A	53	no.	$10,316,179.41
Drain Reach	Drain Reach	1107.392	km	$27,244,585.72
Flood Protection	Bridge Flood Wall	1	no.	$21,837.61
Flood Protection	Concrete Flood Wall	36	no.	$3,025,840.69
Flood Protection	Double Timber Flood Wall	4	no.	$995,730.14
Flood Protection	Firth Block Flood Wall	7	no.	$845,466.22
Flood Protection	Flow Diversion Structure	10	no.	$32,573,014.64
Flood Protection	Guidebank	6125.633	m	$2,079,512.58
Flood Protection	Portable Flood Barrier	7	no.	$283,788.12
Flood Protection	Property Mitigation Bund	14	no.	$1,238,486.47
Flood Protection	Stop Logs	1	no.	$52,193.73
Flood Protection	Stopbank	488856.7	m	$168,798,115.39
Flood Protection	Timber Flood Wall	2401.8	m	$1,437,853.84
Flood Protection	Toe Drain	5	no.	$393,125.11
Floodgated Structure	Floodgate Structure	18	no.	$3,621,580.29
Floodgated Structure	Floodgated Culvert Major	95	no.	$7,866,560.46
Floodgated Structure	Floodgated Culvert Minor	430	no.	$6,964,098.77

Miscellaneous	Amenity Enhancement	6	no.	$524,914.21
Miscellaneous	Forestry	73.8	ha	$1,061,245.71
Miscellaneous	Handrails	1	no.	$11,630.92
Miscellaneous	Kneebreakers	1	no.	$18,883.90
Miscellaneous	Misc Spillway	4	no.	$533,969.30
Miscellaneous	Property	0.293	ha	$13,283.89
Miscellaneous	Security Fence	3	no.	$28,584.58
Miscellaneous	Self help depots	1	no.	$7,428.86
Miscellaneous	Vehicle ramp over stopbank	3	no.	$25,604.99
Miscellaneous	Walkway	1	no.	$122,367.73
Pumpstation	NA	24	no.	$14,739,464.65
	Grand Total			$ 465,475,596.50

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Ashhurst Stream

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Flood Protection	Timber Flood Wall	308.000	m	$86,448.21
Floodgated Structure	Floodgated Culvert Minor	13.000	no.	$12,055.46
Drainage Channel	Drain Reach	5.700	km	$101,266.20
Flood Protection	Concrete Flood Wall	1.000	no.	$32,428.56
Bed Control Structure	Weir	1.000	no.	$16,124.84
Flood Protection	Stopbank	2654.000	m	$176,167.38
		Scheme Total:		$424,490.65

Eastern Manawatu

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Channel Maintenance	Channel Clearance	77900.000	m	$0.00
		Scheme Total:		$0.00

Forest Road

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Drainage Channel	Drain Reach	14.870	km	$382,147.04
Bed Control Structure	Weir	1.000	no.	$50,812.03
		Scheme Total:		$432,959.07

Foxton East Drainage

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Flood Protection	Stopbank	340.000	m	$11,612.65
Floodgated Structure	Floodgated Culvert Major	1.000	no.	$38,862.00
Drainage Channel	Drain Reach	6.930	km	$36,516.00
		Scheme Total:		$86,990.65

Haunui Drainage

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Drainage Channel	Drain Reach	8.790	km	$272,616.51
		Scheme Total:		$272,616.51

Himatangi Drainage

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Bed Control Structure	Weir	3.000	no.	$35,822.10
Drainage Channel	Drain Reach	51.800	km	$259,360.02
Flood Protection	Stopbank	20.000	m	$1,221.46
		Scheme Total:		$296,403.58

Hokio Drainage

Asset Type Name	Asset Subtype Name	Total Assets		Scheme Cost/Valuation
Drainage Channel	Drain Reach	44.854	km	$367,976.77

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Hokio Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Floodgated Structure	Floodgated Culvert Minor	4.000 no.	$23,216.08
Bed Control Structure	Weir	1.000 no.	$53,733.14
		Scheme Total:	$444,925.99

Ihuraua

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Channel Maintenance	Channel Clearance	1.000 m	$0.00
		Scheme Total:	$0.00

Koputaroa Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Pumpstation	NA	4.000 no.	$2,005,453.30
Flood Protection	Stopbank	16795.000 m	$4,606,474.23
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Drainage Channel	Drain Reach	51.675 km	$789,508.29
Floodgated Structure	Floodgated Culvert Major	4.000 no.	$413,766.00
Floodgated Structure	Floodgated Culvert Minor	33.000 no.	$774,543.51
Bank Protection	Rock Lining (non-engineered)	36.000 t	$3,957.84
Floodgated Structure	Floodgate Structure	2.000 no.	$316,349.97
		Scheme Total:	$8,910,053.14

Lower Kiwitea

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Bank Protection	Concrete Rip Rap	1676.000 t	$118,083.42
Bank Protection	PMU	1415.000 m	$264,532.27
Bank Protection	Protection Planting	25.712 ha	$520,424.79
Bank Protection	Permeable Groyne	4715.000 m	$813,306.39
Channel Maintenance	Channel Clearance	0 m	$0.00
Bank Protection	Tied Tree Work	5332.000 m	$604,383.24
Flood Protection	Stopbank	550.000 m	$24,913.82
Bank Protection	Rock Lining (non-engineered)	0 t	$0.00
Bank Protection	Rock Lining (engineered)	600.000 t	$42,273.30
		Scheme Total:	$2,387,917.23

Lower Manawatu

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Flood Protection	Flow Diversion Structure	9.000 no.	$32,205,589.91
Flood Protection	Guidebank	4012.903 m	$1,444,296.18
Flood Protection	Double Timber Flood Wall	3.000 no.	$711,723.49

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Lower Manawatu

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Flood Protection	Concrete Flood Wall	19.000 no.	$2,047,397.29
Flood Protection	Firth Block Flood Wall	1.000 no.	$164,287.28
Channel Maintenance	Channel Clearance	45900.000 m	$0.00
Channel Maintenance	Vegetation Clearance	4.000 no.	$0.00
Channel Maintenance	Stopbank Mowing	3.000 no.	$0.00
Flood Protection	Bridge Flood Wall	1.000 no.	$21,837.61
Bed Control Structure	Weir	2.000 no.	$2,553,983.49
Bed Control Structure	Bed Armouring	1.000 no.	$700,631.44
Bank Protection	Timber Retaining Wall	541.000 m	$203,285.52
Bank Protection	Rock Lining (non-engineered)	29111.000 t	$3,200,470.63
Bank Protection	Tiered Concrete Lining	57.000 m	$599,902.83
Bank Protection	Rock Lining (engineered)	281087.440 t	$30,902,823.44
Bank Protection	Protection Planting	93.318 ha	$2,067,788.97
Drainage Channel	Drain Reach	32.120 km	$539,308.58
Bank Protection	Permeable Groyne	1571.000 m	$339,777.13
Bank Protection	Massbloc Retaining Wall	1047.400 m	$1,681,533.10
Bank Protection	Rock Groyne	25659.000 t	$2,552,845.99
Flood Protection	Portable Flood Barrier	3.000 no.	$64,825.33
Bed Control Structure	Drop Structure	1.000 no.	$473,595.50
Bank Protection	Tied Tree Work	27264.687 m	$4,090,046.64
Bank Protection	Concrete Rip Rap	255653.050 t	$28,106,560.30
Flood Protection	Property Mitigation Bund	14.000 no.	$1,238,486.47
Bank Protection	Cased concrete piled groyne	1.000 no.	$666,550.86
Miscellaneous	Self help depots	1.000 no.	$7,428.86
Miscellaneous	Misc Spillway	1.000 no.	$380,728.99
Miscellaneous	Environmental Enhancement	3.000 no.	$0.00
Miscellaneous	District Liaison Advice	1.000 no.	$0.00
Miscellaneous	Amenity Enhancement	2.000 no.	$224,232.32
Miscellaneous	Consent Compliance Cost	1.000 no.	$0.00
Floodgated Structure	Floodgated Culvert Major	36.000 no.	$3,096,453.41
Floodgated Structure	Floodgated Culvert Minor	130.000 no.	$2,136,630.07
Floodgated Structure	Floodgate Structure	7.000 no.	$1,938,333.34
Flood Protection	Toe Drain	4.000 no.	$381,430.22
Miscellaneous	Property	0.293 ha	$13,283.89
Flood Protection	Timber Flood Wall	1839.700 m	$1,199,418.39
Pumpstation	NA	2.000 no.	$121,509.02

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Lower Manawatu

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Flood Protection	Stopbank	306932.037 m	$126,232,728.28
		Scheme Total:	$252,309,724.77

Lower Whanganui

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Miscellaneous	Walkway	1.000 no.	$122,367.73
Miscellaneous	Vehicle ramp over stopbank	3.000 no.	$25,604.99
Miscellaneous	Security Fence	3.000 no.	$28,584.58
Miscellaneous	Kneebreakers	1.000 no.	$18,883.90
Miscellaneous	Handrails	1.000 no.	$11,630.92
Miscellaneous	Amenity Enhancement	2.000 no.	$228,882.05
Flood Protection	Timber Flood Wall	174.100 m	$124,372.06
Floodgated Structure	Floodgated Culvert Major	1.000 no.	$36,974.49
Flood Protection	Stopbank	4340.000 m	$2,008,976.49
Flood Protection	Stop Logs	1.000 no.	$52,193.73
Flood Protection	Portable Flood Barrier	4.000 no.	$218,962.79
Flood Protection	Firth Block Flood Wall	4.000 no.	$481,953.52
Flood Protection	Double Timber Flood Wall	1.000 no.	$284,006.65
Floodgated Structure	Floodgated Culvert Minor	16.000 no.	$177,776.33
Flood Protection	Concrete Flood Wall	14.000 no.	$835,560.69
Channel Maintenance	Vegetation Clearance	1.000 no.	$0.00
Channel Maintenance	Erosion Control	1.000 no.	$0.00
Channel Maintenance	Improvements/Plantings	1.000 no.	$0.00
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bank Protection	Timber Retaining Wall	48.000 m	$18,036.43
Bank Protection	Rock Lining (non-engineered)	1.000 t	$0.00
Bank Protection	Rock Lining (engineered)	9515.000 t	$614,740.37
Bank Protection	Rock Groyne	828.000 t	$82,378.76
Bank Protection	Concrete Rip Rap	7180.000 t	$463,881.85
		Scheme Total:	$5,835,768.33

Makerua Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Pumpstation	NA	9.000 no.	$4,381,455.97
Floodgated Structure	Floodgated Culvert Minor	41.000 no.	$568,199.71
Floodgated Structure	Floodgated Culvert Major	13.000 no.	$669,265.83
Floodgated Structure	Floodgate Structure	1.000 no.	$57,150.00
Flood Protection	Stopbank	19430.000 m	$2,993,066.74

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Makerua Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Drainage Channel	Drain Reach	105.700 km	$1,476,633.96
		Scheme Total:	$10,145,772.21

Makirikiri

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Miscellaneous	Misc Spillway	1.000 no.	$124,250.96
Floodgated Structure	Floodgated Culvert Minor	13.000 no.	$195,375.00
Floodgated Structure	Floodgate Structure	1.000 no.	$132,891.75
Flood Protection	Stopbank	7157.976 m	$1,109,686.00
Bed Control Structure	Drop Structure	3.000 no.	$375,419.30
		Scheme Total:	$1,937,623.01

Manawatu Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Pumpstation	NA	1.000 no.	$3,862,607.24
Floodgated Structure	Floodgated Culvert Minor	69.000 no.	$1,318,640.45
Floodgated Structure	Floodgated Culvert Major	15.000 no.	$1,707,609.09
Floodgated Structure	Floodgate Structure	1.000 no.	$639,329.88
Flood Protection	Stopbank	34360.000 m	$10,214,239.28
Drainage Channel	Drain Reach	275.775 km	$13,939,039.76
Channel Maintenance	Channel Clearance	1.000 m	$0.00
		Scheme Total:	$31,681,465.70

Mangatainoka

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Bank Protection	Rock Groyne	400.000 t	$35,328.80
Bank Protection	Protection Planting	272.030 ha	$408,212.66
Bank Protection	PMU	7499.240 m	$5,275,328.39
Bank Protection	Gabions	559.000 m	$538,792.51
Bank Protection	Concrete Rip Rap	1900.000 t	$167,811.80
Bank Protection	Rock Lining (engineered)	28694.570 t	$2,534,361.81
Bank Protection	Permeable Groyne	2320.330 m	$332,234.13
Flood Protection	Stopbank	6662.000 m	$856,458.89
Drainage Channel	Drain Reach	49.567 km	$542,502.25
Channel Maintenance	Channel Clearance	82000.000 m	$0.00
Bed Control Structure	Grade Control	19.000 no.	$499,083.47
Bank Protection	Tied Tree Work	16440.860 m	$2,668,756.03

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Mangatainoka

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Bank Protection	Rock Lining (non-engineered)	31487.600 t	$2,781,047.81
		Scheme Total:	$16,639,918.55

Matarawa

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Miscellaneous	Bridge	1.000 no.	$53,908.55
Miscellaneous	Amenity Enhancement	1.000 no.	$40,270.02
Floodgated Structure	Floodgated Culvert Minor	16.000 no.	$161,510.00
Flood Protection	Stopbank	4297.053 m	$377,391.89
Flood Protection	Flow Diversion Structure	1.000 no.	$367,424.73
Drainage Channel	Drain Reach	7.476 km	$404,540.51
Detention Dam	NA	5.000 no.	$1,363,388.23
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bank Protection	Rock Lining (engineered)	240.000 t	$15,505.80
		Scheme Total:	$2,783,939.73

Moutoa Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Pumpstation	NA	5.000 no.	$3,632,177.19
Floodgated Structure	Floodgated Culvert Minor	4.000 no.	$40,512.96
Floodgated Structure	Floodgated Culvert Major	6.000 no.	$459,486.00
Floodgated Structure	Floodgate Structure	2.000 no.	$228,942.12
Drainage Channel	Drain Reach	65.605 km	$1,973,240.17
Channel Maintenance	Channel Clearance	1.000 m	$0.00
		Scheme Total:	$6,334,358.44

Ohau-Manakau

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Floodgated Structure	Floodgated Culvert Minor	18.000 no.	$404,509.71
Floodgated Structure	Floodgated Culvert Major	3.000 no.	$233,172.00
Flood Protection	Stopbank	12685.000 m	$2,716,071.45
Drainage Channel	Drain Reach	46.535 km	$238,596.49
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bed Control Structure	Bed Armouring	1.000 no.	$7,011.68
Bank Protection	Tied Tree Work	10860.000 m	$3,529,899.66
Bank Protection	Rock Lining (non-engineered)	840.000 t	$92,349.81
Bank Protection	Rock Lining (engineered)	2520.000 t	$277,049.44
Floodgated Structure	Floodgate Structure	3.000 no.	$109,201.38
Bank Protection	Protection Planting	19.050 ha	$374,800.45

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Ohau-Manakau

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Bank Protection	Permeable Groyne	0 m	$0.00
Bank Protection	Concrete Rip Rap	48197.000 t	$5,298,790.33
		Scheme Total:	$13,281,452.40

Pakihi

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Detention Dam	NA	2.000 no.	$650,290.21
		Scheme Total:	$650,290.21

Pohangina-Oroua

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Miscellaneous	Forestry	38.400 ha	$186,415.13
Drainage Channel	Drain Reach	6.780 km	$72,461.89
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bank Protection	Tied Tree Work	21971.000 m	$2,860,110.05
Bank Protection	Rock Lining (non-engineered)	300.000 t	$32,982.08
Bank Protection	Rock Lining (engineered)	1980.000 t	$217,681.70
Bank Protection	Rock Groyne	870.000 t	$18,536.66
Bank Protection	Protection Planting	74.815 ha	$1,158,903.19
Bank Protection	PMU	1103.220 m	$150,845.04
Bank Protection	Permeable Groyne	5018.000 m	$964,136.43
Bank Protection	Concrete Rip Rap	2360.000 t	$259,459.01
		Scheme Total:	$5,921,531.18

Porewa

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Detention Dam	NA	27.000 no.	$6,673,689.64
Channel Maintenance	Channel Clearance	1.000 m	$0.00
		Scheme Total:	$6,673,689.64

Rangitikei

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Pumpstation	NA	0 no.	$10,858.50
Miscellaneous	Forestry	35.400 ha	$874,830.58
Miscellaneous	Amenity Enhancement	1.000 no.	$31,529.82
Floodgated Structure	Floodgated Culvert Major	2.000 no.	$149,733.00
Flood Protection	Toe Drain	1.000 no.	$11,694.89
Flood Protection	Timber Flood Wall	80.000 m	$27,615.18
Flood Protection	Stopbank	19488.632 m	$9,793,308.39

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Rangitikei

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Flood Protection	Guidebank	2036.730 m	$630,237.31
Flood Protection	Firth Block Flood Wall	2.000 no.	$199,225.42
Flood Protection	Concrete Flood Wall	2.000 no.	$110,454.15
Drainage Channel	Drain Reach	22.340 km	$322,256.34
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bank Protection	Tied Tree Work	32533.000 m	$4,390,061.57
Bank Protection	Rock Lining (non-engineered)	162644.000 t	$14,571,357.37
Floodgated Structure	Floodgated Culvert Minor	23.000 no.	$364,140.18
Bank Protection	Rock Lining (engineered)	21439.000 t	$1,920,730.74
Bank Protection	Rock Groyne	1.000 t	$0.00
Bank Protection	Permeable Groyne	3013.000 m	$553,555.60
Bank Protection	Erosion Protection Reserve	899.300 ha	$18,674,444.02
		Scheme Total:	$52,636,033.06

South East Ruahine

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Flood Protection	Stopbank	15928.440 m	$1,424,649.00
Flood Protection	Guidebank	76.000 m	$4,979.09
Channel Maintenance	Channel Clearance	101.000 m	$0.00
Bed Control Structure	Weir	22.000 no.	$1,109,508.62
Bed Control Structure	Grade Control	1.000 no.	$1,282.40
Bank Protection	Timber Retaining Wall	19.140 m	$7,192.02
Bank Protection	Tied Tree Work	56819.200 m	$5,930,697.17
Bank Protection	Stock Gate	562.230 m	$59,431.44
Bank Protection	Rock Lining (non-engineered)	1779.000 t	$165,271.79
Bank Protection	Rock Lining (engineered)	196.000 t	$18,208.70
Bank Protection	Protection Planting	775.180 ha	$8,203,700.49
Drainage Channel	Drain Reach	83.103 km	$2,339,299.52
Bank Protection	PMU	1944.160 m	$716,122.35
Bank Protection	Permeable Groyne	3213.450 m	$845,277.47
Bank Protection	Concrete Rip Rap	849.000 t	$78,873.37
		Scheme Total:	$20,904,493.43

Tawataia-Mangaone

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Drainage Channel	Drain Reach	14.891 km	$200,525.95
Detention Dam	NA	1.000 no.	$191,481.60

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Tawataia-Mangaone

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Channel Maintenance	Channel Clearance	1.000 m	$0.00
		Scheme Total:	$392,007.55

Te Kawau Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Pumpstation	NA	2.000 no.	$659,510.14
Floodgated Structure	Floodgated Culvert Minor	33.000 no.	$594,166.77
Floodgated Structure	Floodgated Culvert Major	12.000 no.	$943,363.05
Floodgated Structure	Floodgate Structure	1.000 no.	$199,381.86
Flood Protection	Stopbank	29100.000 m	$3,831,512.60
Drainage Channel	Drain Reach	179.320 km	$2,042,551.91
Channel Maintenance	Channel Clearance	1.000 m	$0.00
		Scheme Total:	$8,270,486.33

Tutaenui

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Miscellaneous	Misc Spillway	1.000 no.	$5,706.95
Flood Protection	Stopbank	417.789 m	$19,560.64
Drainage Channel	Drain Reach	3.000 km	$44,438.63
Detention Dam	NA	18.000 no.	$1,437,329.73
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bed Control Structure	Grade Control	2.000 no.	$30,862.28
Bank Protection	Rock Lining (engineered)	184.000 t	$20,229.01
		Scheme Total:	$1,558,127.24

Upper Manawatu Lower Mangahao

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Flood Protection	Stopbank	1795.000 m	$170,836.56
Channel Maintenance	Channel Clearance	1.000 m	$0.00
Bank Protection	Tied Tree Work	23039.910 m	$3,792,212.54
Bank Protection	Rock Lining (non-engineered)	9749.000 t	$623,570.41
Bank Protection	Rock Lining (engineered)	9910.000 t	$633,868.38
Bank Protection	Rock Groyne	4402.000 t	$459,160.52
Bank Protection	Protection Planting	277.960 ha	$1,983,931.61
Drainage Channel	Drain Reach	18.876 km	$724,437.57
Bank Protection	PMU	336.850 m	$231,703.35
Bank Protection	Permeable Groyne	724.660 m	$121,215.47
		Scheme Total:	$8,740,936.41

Asset: Quantities by Scheme Report

Selection Criteria: Scheme Type = 'Drainage Scheme', 'River Scheme'; Annual Plan Date = 30/06/2017; Include WIP Assets = N

Upper Whanganui

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Floodgated Structure	Floodgated Culvert Minor	14.000 no.	$150,100.54
Flood Protection	Stopbank	3927.723 m	$1,975,854.70
Drainage Channel	Drain Reach	0.705 km	$847.75
Channel Maintenance	Vegetation Clearance	1.000 no.	$0.00
Channel Maintenance	Channel Clearance	11000.000 m	$0.00
Bank Protection	Tied Tree Work	475.000 m	$37,780.46
Bank Protection	Rock Lining (non-engineered)	11190.600 t	$754,274.42
Bank Protection	Rock Lining (engineered)	25750.000 t	$1,735,614.38
Bank Protection	Rock Groyne	2482.000 t	$202,485.90
Floodgated Structure	Floodgated Culvert Major	1.000 no.	$40,151.59
Bank Protection	Protection Planting	1.980 ha	$34,065.77
Bank Protection	PMU	50.000 m	$6,834.30
		Scheme Total:	$4,938,009.81

Whangaehu-Mangawhero

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Channel Maintenance	Vegetation Clearance	1.000 no.	$0.00
Channel Maintenance	Channel Clearance	2.000 m	$0.00
		Scheme Total:	$0.00

Whirokino Drainage

Asset Type Name	Asset Subtype Name	Total Assets	Scheme Cost/Valuation
Miscellaneous	Misc Spillway	1.000 no.	$23,282.40
Floodgated Structure	Floodgated Culvert Minor	3.000 no.	$42,722.00
Floodgated Structure	Floodgated Culvert Major	1.000 no.	$77,724.00
Flood Protection	Stopbank	1976.000 m	$253,384.94
Drainage Channel	Drain Reach	10.980 km	$174,513.61
Pumpstation	NA	1.000 no.	$65,893.29
		Scheme Total:	$637,520.24
		Total Asset Value:	$465,529,505.05

INFRASTRUCTURAL ASSET VALUATION 2017 - UNIT RATES

ASSET TYPE		BANK PROTECTION													BED CONTROL STRUCTURES				DETENTION DAMS			DRAINAGE		FLOOD PROTECTION										FLOODGATED STRUCTURES			MISCELLANEOUS						
SUB ASSET TYPE	Action Sheet Completed	Cased Concrete Piled Groy	Massbloc Retaining Walls	Erosion Protection Reserve	Gabions	Iron and Mesh Work (PMU)	Protection Planting	Rock Groynes	Rock Lining /Concrete Ripr	Stock Gates	Tied Tree Works	Tiered Concrete Lining	Timber Retaining Wall	Permeable Groynes (Tree	Bed Armouring	Drop Structures	Grade Controls	Weirs	Dams	Spillway	Inlet/outlet, Inlet and Outlet	Drainage Channels	Pumpstations	Firth Block Flood Walls	Concrete Flood Walls, brid	Guide Bank	Portable Flood Barriers, sto	Property Mitigation Bunds	Stopbank	Timber Flood Walls	Double Timber Flood Walls	Toe drains	Floodgated Culverts Major	Floodgated Culverts Minor	Floodgated Structures	Amenity Enhancement (se	Bridge	Flow Diversion Structures	Forestry	Misc - Self help depots	Misc Spillway	Property
		each	m	ha	m	m	ha	tonne	tonne	m	m	m	m	m	tonnes	each	each	each	each	each	each	m^3 cut	each	m	m	m^3 fill	m	m	m^3 fill	m	m	m	each	each	each	each	each	each	ha	each	each	each
CGPI Reference No.		2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	1	3	3	2	2	2	1	2	1	1	2	2	3	2	3	2	2	2	2	5	2	1	5
Design and supervision on-cost			16%	14%		14%	14%	7.5%	7.5%		14%		16%	14%								14%				7.5%			7.5%													
Lower Kiwitea		NA	NA	NA	NA	164	17,755	NA	65.54	NA	99.43	NA	NA	151.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lower Manawatu		CGPI	456.3	NA	NA	NA	19,437	92.55	102.27	NA	131.6	CGPI	323.9	189.7	CGPI	CGPI	NA	CGPI	NA	NA	NA	DF	CGPI	CGPI	CGPI	SF	CGPI	CGPI	SF	CGPI	CGPI	CGPI	CGPI	CGPI	CGPI	CGPI	NA	CGPI	NA	CGPI	CGPI	CGPI
Lower Whanganui		NA	NA	NA	NA	NA	NA	92.55	60.1	NA	NA	NA	323.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	CGPI	NA	CGPI	NA	SF	CGPI	CGPI		NA	CGPI	NA	CGPI	NA	NA	NA	NA	NA	NA
Makirikiri		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	CGPI	CGPI	NA	NA	NA	NA	NA	CGPI	NA
Mangatainoka		NA	NA	NA	CGPI	617.1	1,316	82.16	82.16	NA	142.4	NA	NA	125.6	NA	NA	CGPI	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Matarawa		NA	NA	NA	NA	NA	NA	NA	60.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	CGPI	CGPI	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	CGPI	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA
Ohau Manakau		NA	NA	NA	NA	NA	17,258	NA	102.27	NA	285.1	NA	NA	NA	CGPI	NA	NA	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA
Pakihi Valley		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pohangina Oroua		NA	NA	NA	NA	119.9	13,588	19.82	102.27	NA	114.2	NA	NA	168.5	NA	NA	NA	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA
Porewa Valley		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rangitikei River		NA	NA	18,215	NA	NA	NA	89.7	83.34	NA	118.4	NA	NA	161.2	NA	NA	NA	NA	NA	NA	NA	DF	NA	CGPI	CGPI	SF	NA	NA	SF	CGPI	NA	CGPI	CGPI	CGPI	NA	CGPI	NA	NA	CGPI	NA	NA	NA
S E Ruahines		NA	NA	NA	NA	323.1	9,283	NA	86.42	CGPI	91.56	NA	323.9	230.7	NA	NA	CGPI	CGPI	NA	NA	NA	DF	NA	NA	NA	SF	NA	NA	SF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tawataia Mangaone		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	CGPI	CGPI	DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tutaenui		NA	NA	NA	NA	NA	NA	NA	102.27	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	CGPI	CGPI	CGPI	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA
Upper Manawatu-Lower Mangahao		NA	NA	NA	NA	603.4	6260.9	97.03	59.5	NA	144.4	NA	NA	146.7	NA	NA	NA	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Upper Whanganui		NA	NA	NA	NA	119.9	15,092	76	62.7	NA	69.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA	NA
Ashhurst		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA	DF	NA	NA	CGPI	NA	NA	NA	SF	CGPI	NA	NA	NA	CGPI	NA	NA	NA	NA	NA	NA	NA	NA
Forest Rd		NA	NA	NA	NA	NA	w	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	NA
Foxton East		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	NA	NA	NA	NA	NA	NA	NA	NA	NA
Haunui		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Himatangi		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	SF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hokio		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA	DF	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	NA	NA	NA	NA	NA	NA	NA	NA
Koputaroa		NA	NA	NA	NA	NA	NA	NA	102.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	CGPI	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA
Makerua		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	CGPI	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA
Manawatu		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	CGPI	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA
Moutoa		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	CGPI	NA	NA	NA	NA	NA	NA	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA
Te Kawau		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	CGPI	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	CGPI	NA	NA	NA	NA	NA	NA	NA
Whirokino		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	DF	CGPI	NA	NA	NA	NA	NA	SF	NA	NA	NA	CGPI	CGPI	NA	NA	NA	NA	NA	NA	CGPI	NA

Unit Rates => See Appendix 1 for unit rate information

CGPI => Adjust values using Capital Goods Price Index

DF => Drain formula - refer drainage section of report

Drainage Unit Rate = $3.15 per m3

SF => Stopbank formula - refer stopbank section of report

1. Local Fill : c=1.1, $V= $10.76, $A=$1.76, $F=$16.00

2. Imported Fill (LMS urban, Lower Kiwitea, Ashhurst) : c=1.1, $V=$16.16, $A=$1.04, $F=$16.00

3. Imported Fill (Lower Whanganui): c=1.1, $V=$34.17, $A=$6.17, $F=$16.00

EPR => Erosion Protection Reserve formula - refer to section in report

EPR Unit Rate = $18,215.38 per ha

Note 1. Concrete Riprap varies from $19-$47 per tonne (see Appendix 1) but is valued the same as rock lining for insurance purposes - major flood damage will likely exceed availability of concrete rubble and require rock for repairs.

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