Okato Scheme

Asset Management Plan

Taranaki Regional Council
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1. Introduction

1.1 The Plan

This Management Plan has been prepared to assist those delegated the responsibility for managing the Okato Scheme on behalf of the Taranaki Regional Council (the Council).

The Okato Scheme comprises works in the Stony River and Kaihihi Stream primarily to protect the Okato community and to manage a short reach of the Stony River upstream and downstream of the SH45 Bridge. Figure 4 shows the location of the Scheme.

The Okato Scheme assets include earthen stopbanks, river training groynes, rock riprap and flood overflow channels. Works on the Stony and the Kaihihi involve the management of in-channel gravel build up, the maintenance of bank protection and alignment control works, the maintenance of river edge vegetation, and the maintenance of stopbanks and overflow channels.

The current valuation of these assets (in terms of Local Government requirements) to 30 June 2020 is $413,420.

1.2 Purpose and ownership of the Plan

The purpose of this Plan is to provide the means and mechanisms to enable the Scheme Manager to plan for the most efficient economic and sustainable management of the Okato Scheme.

The Okato assets need to be managed, to ensure they continue to effectively deliver scheme benefits on a long term, sustainable basis. Management requires provision for monitoring, maintenance and in some instances eventual replacement of these assets.

This Plan defines the objectives and performance standards for the scheme and the level of maintenance needed to ensure these are met at all times.

The Plan also provides a base against which the Council's performance in maintaining these infrastructural assets can be measured. This management plan will provide a framework for technical and financial inputs relating to the assets and their impact on long term financial planning.

Responsibility for implementing the Plan lies with the Council, which is the body responsible for managing the asset.

1.3 Duration and review of the Plan

The duration of the Plan is ten years from the date of formal preparation and acceptance by Council. This Plan has also been prepared with a 30-year time horizon. Maintenance costs and rates are current to June 2020.

The Plan will be updated, after the proposed capital works are completed and then reviewed again after ten years or earlier if required, to ensure that the requirements of the community are met, and that the assets are maintained at their most effective levels of service.

1.4 Legislative requirements

The principal statute affecting the management of infrastructure assets is the Local Government Act 2002 (the Act).

The Act empowers local authorities to provide a range of services. Specifically, the Act, together with the Soil Conservation and Rivers Control Act 1941, obligates regional councils to minimise and prevent damage by floods and erosion. The Council executing its responsibilities and powers as a catchment authority in terms of the Soil Conservation and Rivers Control Act 1941 constructed the schemes.

Part VI of the Act requires councils to effectively and efficiently manage their finances and assets. This involves planning for the maintenance, loss of service potential and capital upgrade of all assets. The associated funding for these commitments also needs to be provided for.

This asset management plan will assist the Council with defining the basis for determining long-term financial strategies. Information from the Plan will be used in preparing financial plans and statements required by the Act.

The Office of the Controller and Auditor-General (OAG) has a responsibility to ensure that councils comply with the requirements of the Local Government Act 2002. Part of this involves ensuring that councils are adequately providing for the ongoing maintenance, renewal and capital expenditure on infrastructure assets. The OAG has issued a number of guidelines to assist councils in the preparation of asset management plans.

1.5 Assumptions

There are a number of assumptions made in preparation of this asset management plan. These are made using current knowledge and experience, but may vary with time and in the light of further experience. Further, they will be updated when the Plan is reviewed. The assumptions are:

- that the Council will continue to perform its existing functions in respect to the current legislation;
- there will be no major changes that impact upon the role of the Council in terms of soil conservation and river control; and
- financial projections are in 2020/2021 dollars.

1.6 Assets to be managed

The Okato Scheme covers the Stony River from 500m downstream of the SH45 Bridge to 1850 m upstream of the bridge, and the Kaihihi Stream from the upstream edge of Okato Township to the SH45 Bridge.

The Scheme Assets include:

Stony River

- The right bank river training rock riprap downstream of the SH45 Bridge
- The stopbanks/guide banks and flood overflow channels on the right bank of the River between 1000m and 1800m upstream of the SH45 Bridge.

Kaihihi Stream

- Rock riprap at three sites on the right bank of the Stream and three sites on the left bank
- A series of snub groynes at two locations on the right bank
- Two sections of stopbank on the left bank upstream of Old South Road

The extent of the Scheme is shown in Figure 2 with Figure 3 showing the location of the Scheme assets in more detail.

1.7 Background

The Taranaki Regional Council has undertaken works in both the Stony River and the Kaihihi Stream over the years funded by a targeted rate on New Plymouth and North Taranaki constituencies. These works have been included in the "Minor Scheme Works" funding category.

The Stony River is a steep and aggressive river contained to a large degree in an incised channel over most of its length from Wiremu Road to SH45. Whilst serious erosion to its banks is occurring at some locations, the cost of works to control this erosion would be very high and clearly not cost effective. The Stony River has a very steep catchment of some 51 km^2 that rises to above 2,000m on the very unstable western slopes of Mount Taranaki.

With the exception of a very large item of work to control the rivers alignment upstream of Wiremu Road, works in the Stony River have to a large degree been undertaken to maintain the alignment of the channel in the reach of river from 600m upstream to 600m downstream of the SH45 Bridge. This work has been undertaken to encourage the large volumes of gravel transported down the river to this point to move through to the lower river and not build up and threaten the highway bridge and properties in that reach.

The much smaller Kaihihi Stream is equally as steep as the Stony River in its lower reaches but although its catchment is greater than 75% of the Stony, its flood flows are significantly smaller because its headwaters only rise to an elevation of approximately 800m on the more stable Pouakai Ranges.

Whilst the Kaihihi Stream channel is much more stable than the Stony River channel, erosion still occurs along its unconsolidated stony river banks and relatively course gravel deposits build up on the insides of bends resulting in erosion on the opposite banks. Erosion also occurs from time to time during flood events over relatively straight reaches of the Stream.

Numerous works have been undertaken in the Kaihihi Stream over the years. These include; river bank protection works required following the removal in 1990 of the Okato Dairy Factory Water Intake Weir that was located approximately 220m upstream of the SH45

Bridge; bank protection works at a number of sites including that adjacent to and upstream of the Old South Road swing bridge; a stopbank to provide flood protection to the Okato swimming pool complex; and the extraction of gravel that builds up from time to time at a number of locations along the stream channel adjacent to Okato.

On-going river alignment and maintenance works have occurred in the Stony River but very little if any on-going maintenance is undertaken on the Kaihihi Stream other than some gravel removal from time to time.

1.8 Current river issues (2020)

1.8.1 Stony River

The large flood in April 2008 remobilised a large amount of bed material within the Stony River channel and significant quantities of gravel are now moving downstream in what are relatively small flood events. Accelerated erosion on the upper mountain is also threatening to further increase this bed load and may result in more adverse effects in the not too distant future.

On-going works have been required every one to two years in the 1.2 kilometre reach of the river centred on the SH45 Bridge to maintain as far as practicable a relatively straight alignment that maximises the rivers grade and thus its ability to transport the large volumes of gravel material through this reach. Approximately $25,000 has been spent annually on average on this reach of the river to manage the gravel deposits and control the channel's alignment. This work will need to continue.

In the reach of the Stony River between 1000m and 1800m upstream of the SH45 Bridge, the river has in the past, overflowed its banks and flowed in northerly direction to join the Kaihihi Stream where it flows along the southern edge of Okato, and flowed down Kaihihi Road. The last time that this occurred was in the flood in April 2008. This flood caused damage to the farm through which it flowed, the Kaihihi Stream itself and to commercial properties at the intersection of Kaihihi Road and SH45. It is clear from the topography of the overflow area that this has occurred many times in the distant past.

Whilst these overflows are uncommon, with large volumes of gravel being transported by the Stony River from its upper reaches and increases in rainfall arising from the effects of climate change, they are likely to occur more regularly in the future.

Works required to reduce the risk of overflows causing future damage to the area were undertaken as capital works in 2013. The assets and their maintenance are included and allowed for in this plan.

1.8.2 Kaihihi Stream

After the 2008 flood, a detailed inspection of the Kaihihi Stream, over a length of 1.7 km from the SH45 Bridge to the upstream extent of Okato Township, identified a number of sites where river management and maintenance problems were evident. These included:

- areas of trees and vegetation that were reducing the flood carrying capacity of the channel and were or have the potential to cause river bank erosion;

- large trees that had fallen into the channel and are diverting the stream flow and cause erosion;
- the build up of gravel on the insides of bends, causing or having the potential to cause erosion on the opposite stream bank;
- heavy rock riprap and snub groynes that will need on-going maintenance especially following large flood events; and
- the stopbank that prevents flooding of the Okato Swimming Pool complex requiring maintenance and upgrading.

The adverse effects arising from the removal of the old dairy factory water supply weir upstream of the SH45 Bridge has been addressed and the river is now relatively stable through this reach.

Whilst the works required to manage and maintain the Kaihihi Stream channel are relatively minor in nature, failure to manage the channel and maintain the existing stream works will not only result in damage to a series of private properties, it will cause damage to a number of community assets such as part of the Stony River Walkway that runs along the right bank of the steam upstream of the Old South Road swing bridge, the swing bridge itself, the Okato Swimming Pool, and land under the control of the Department of Conservation, and the New Plymouth District Council.

Downstream of SH45, the Kaihihi Stream is heavily congested in parts with old willow trees that are diverting the stream channel in places, causing erosion and flooding of the adjacent properties. The land affected is owned by a relatively small number of landowners, some of whom have undertaken works to protect their own properties and others who have done very little, with their inactivity in some places adversely affecting neighbouring properties. It is not proposed that the stream downstream of SH45 is brought into the Scheme.

1.9 Climate

Because of its exposure to disturbed weather systems from the Tasman Sea, the Taranaki region is often quite windy, but has few climate extremes. The most settled weather occurs during summer and early autumn. Summers are warm. Typical summer daytime maximum air temperatures range from 19°C to 24°C but seldom exceed 30°C. Winters are relatively mild with daytime maximum air temperatures ranging from 10°C to 14°C but are normally the most unsettled time of the year. Frost occurs inland during clear calm conditions in winter. Annual sunshine hours average about 2000 hours. Northwesterly airflows prevail and sea breezes occasionally occur along the coast during summer.

The mountain and ranges have a strong influence on rainfall in the area by attracting orographic type events which are often associated with frontal systems and depressions moving through the Tasman Sea. Annual rainfall on the upper slopes of the northern Egmont National Park ranges from 1500 to 5000mm.

1.9.1 Climate change

Some of the predicted impacts of a moderate rate of climate change for Taranaki include changes in average temperature, sea level rise and rainfall patterns. In general, Taranaki, like much of the west coast of New Zealand, is likely to become warmer and wetter.

Climate scientists estimate that Taranaki's temperature could be up to 3°C warmer over the next 70-100 years. This compares to a temperature increase in New Zealand during last century of about 0.7°C. Taranaki could be up to 20% wetter with more varied rainfall patterns and flooding could become up to four times as frequent by 2070.

As extreme weather events become more frequent or severe, the costs and damages associated with them are also likely to increase.

1.10 Land ownership

The land within the area included in the Okato Scheme is either privately owned, or under the control of the New Plymouth District Council or the Department of Conservation.

1.11 Protection standard

No particular protection standard has been adopted for the Okato Scheme. The stopbanking and overflow channel that will guide water that spills from the Stony River will be constructed to a standard that will give the best practicable standard of protection without unduly affecting the farm through which it will be constructed.

The rock riprap on the Kaihihi will be sized to prevent damage in a 100 year event. The standard applied when the stopbank upstream of old South Road was constructed is unknown. This will be examined further when the stopbank is upgraded/maintained.

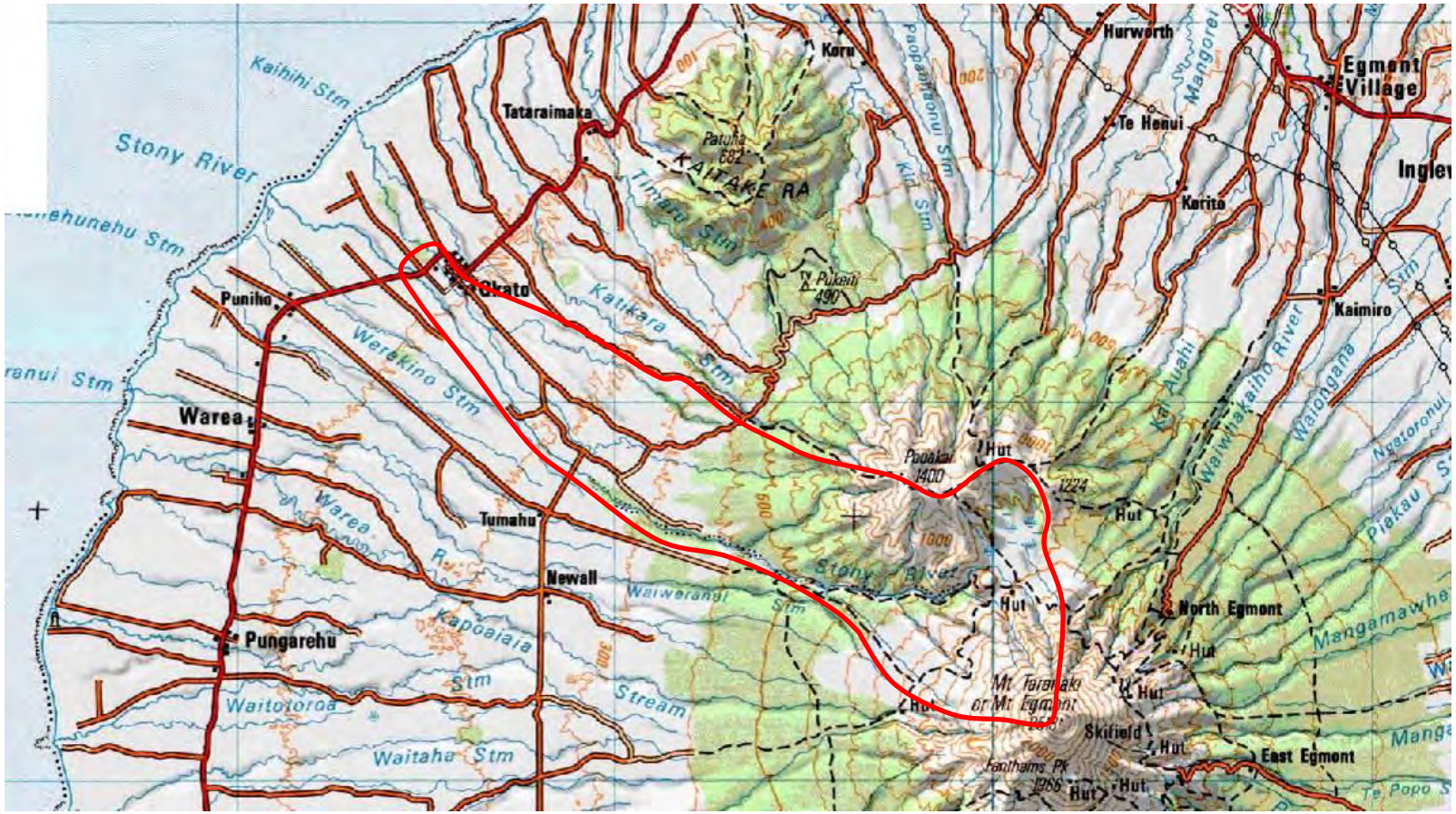

Figure 1: Stony River and Kaihihi Stream Catchment

2. General Scheme information

2.1 Principal Scheme features

2.1.1 Objectives of the Scheme

The Okato Scheme consists of a number of component infrastructural assets to manage the alignment of the Stony River, control flooding from the Stony into the Kaihihi, to control erosion of the Kaihihi Stream where erosion threatens the Okato area, and to limit flooding of the community asset of the Okato swimming pool complex.

The Okato Scheme assets that provide erosion control in the Kaihihi Stream have been constructed primarily to manage the alignment of the river channel to minimise the risk to property and community assets. The works in the Stony River have been undertaken largely to manage the channel's alignment to improve the channels gravel transport capabilities to reduce gravel build up at key locations.

Works were undertaken in 2013 to reduce the risk of flood waters that overflow the right bank of the Stony River from flooding in a northerly direction towards the Kaihihi Stream and affecting properties and community infrastructure in that area.

2.1.2 Scheme works' boundaries

Works on the Okato Scheme extend on the Kaihihi Stream from the SH45 Bridge to the upstream extent of the Okato Township and on the Stony River from 600m downstream of SH45 to 1810 m upstream of SH45. Works on the Stony River channel itself are limited to a reach 500m upstream and downstream of SH45.

2.1.3 Hydrology

There is no specific design flood event for the Okato Scheme but where practicable rock riprap will be sized to withstand a 100 year event. Stopbanking overflow channels will again be designed to provide the best available protection within the constraints imposed by cost and natural ground features.

2.1.4 Overview of Scheme assets

The Stony River assets include:

- substantial rock riprap river training works located on the right bank of the river directly downstream of the SH45 Bridge;
- a low level stopbank/guidebank located on the right bank at about 1800 m upstream of the SH45 bridge (Refer to Figure 6); and
- two overland flow channel blocks/guide banks on the right bank of the river at 1000 and 1200 m upstream of the SH45 bridge (Refer to Figure 6).

The Kaihihi Stream assets include:

- A 35m length of rock riprap on the right bank at River distance 100m;
- A 25m length of rock riprap on the left bank at River distance 275m;

- A series of 5 snub groynes right bank at River distance 675m;
- A 50m length of rock riprap on the right bank at River distance 925m (Old South Road);
- A 70m length of rock riprap on the left bank at River distance 1050m;
- A 20m series of snub groynes on the right bank at River distance 1250m (new);
- A 60m length of rock riprap on the left bank at River distance 1350m
- A 25m length of rock riprap on the right bank at River distance 1525m;
- A 90m long earthfill stopbank on the left bank at River distance 1000m; and
- A 65m long earthfill stopbank on the left bank at river distance 1100m (Extended).

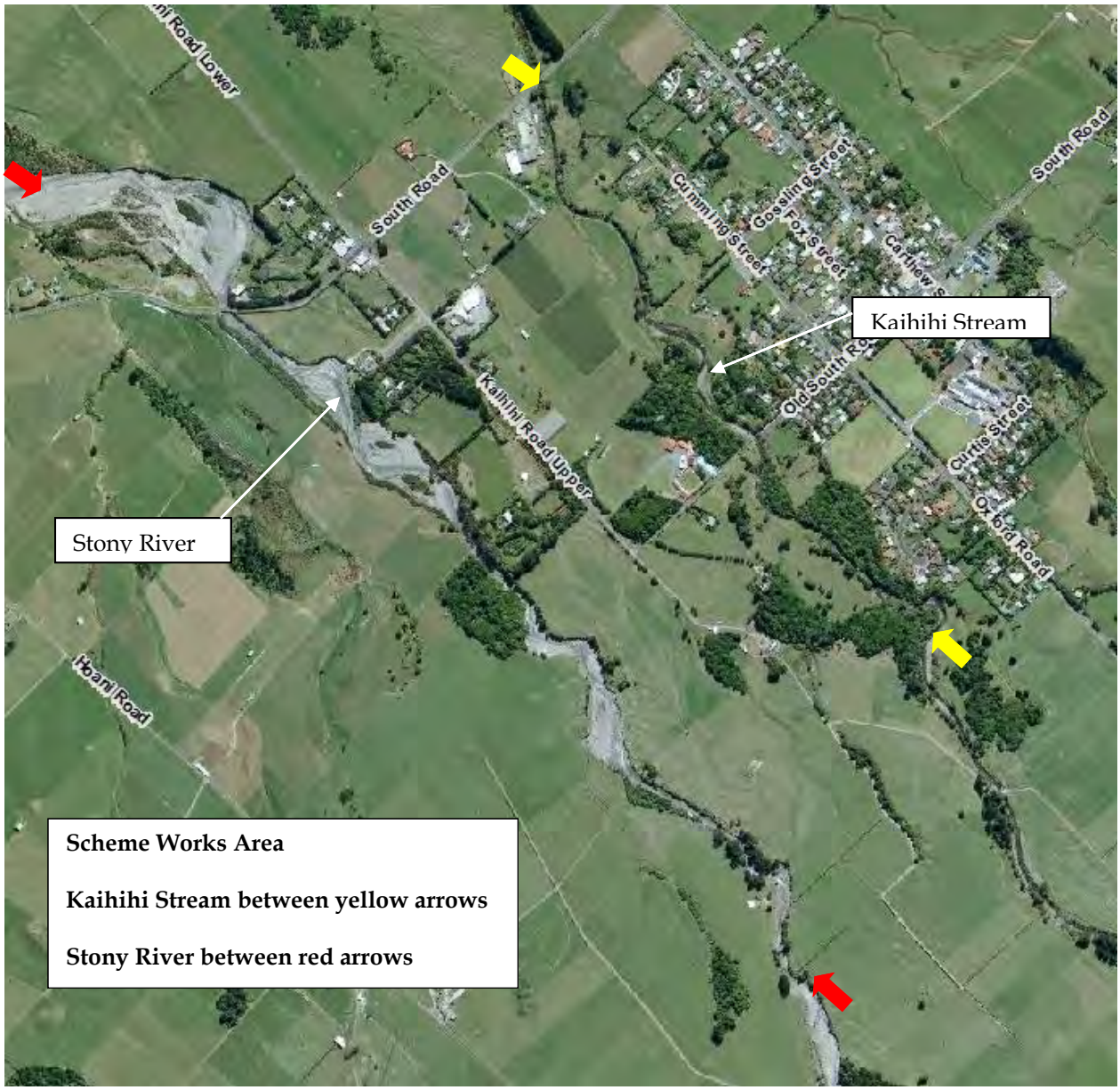

Figure 2: Extent of Scheme Works Area

3. Assets

3.1 Description of assets

3.1.1 Stopbanks

Stopbanks on the Kaihihi Stream are compacted earth structure, which prevent frequent flooding of the Okato Swimming Pool complex. On the Stony River they are compacted earthfill structures, possibly with a rock core that prevent frequent overland flow from the Stony River to the Kaihihi Stream

Stopbanks are constructed to meet appropriate compaction standards, batters slopes and top width to ensure their structural integrity.

3.1.2 Rock riprap erosion protection (bank lining)

Rock Riprap is rock placed mechanically on an eroded or potentially erodible riverbank to prevent riverbank erosion that may threaten the integrity of the adjacent riverbank.

The rock is sized and placed to meet particular standards to ensure it withstands the river forces that occur during large flood events.

3.1.3 Rock riprap river training work

Rock Riprap is rock placed mechanically on an alignment within or on the edge of the channel to guide the river flow.

The rock is sized and placed to meet particular standards to ensure it withstands the river forces that occur during large flood events.

3.1.4 Snub groynes

Snub groynes are engineered piles of rock placed on the riverbank extending out into the river flow to guide and divert the flow of the river away from the adjacent riverbank.

3.1.5 Overland flow channel block

Overland flow channel blocks are in effect stopbanks built to close off flood channels that pass through the Stony River floodplain. These will be constructed with rock and earth fill obtained when clearing the overflow flood channel.

3.2 Asset capacity – design standards

3.2.1 Stopbanks, and channels

There is no particular design standard for the stopbanks and channels on the Kaihihi Stream or Stony River. These banks have been constructed to prevent the more common overflows and not to prevent flooding from any particular event.

Figure 3: Kaihihi Stream assets

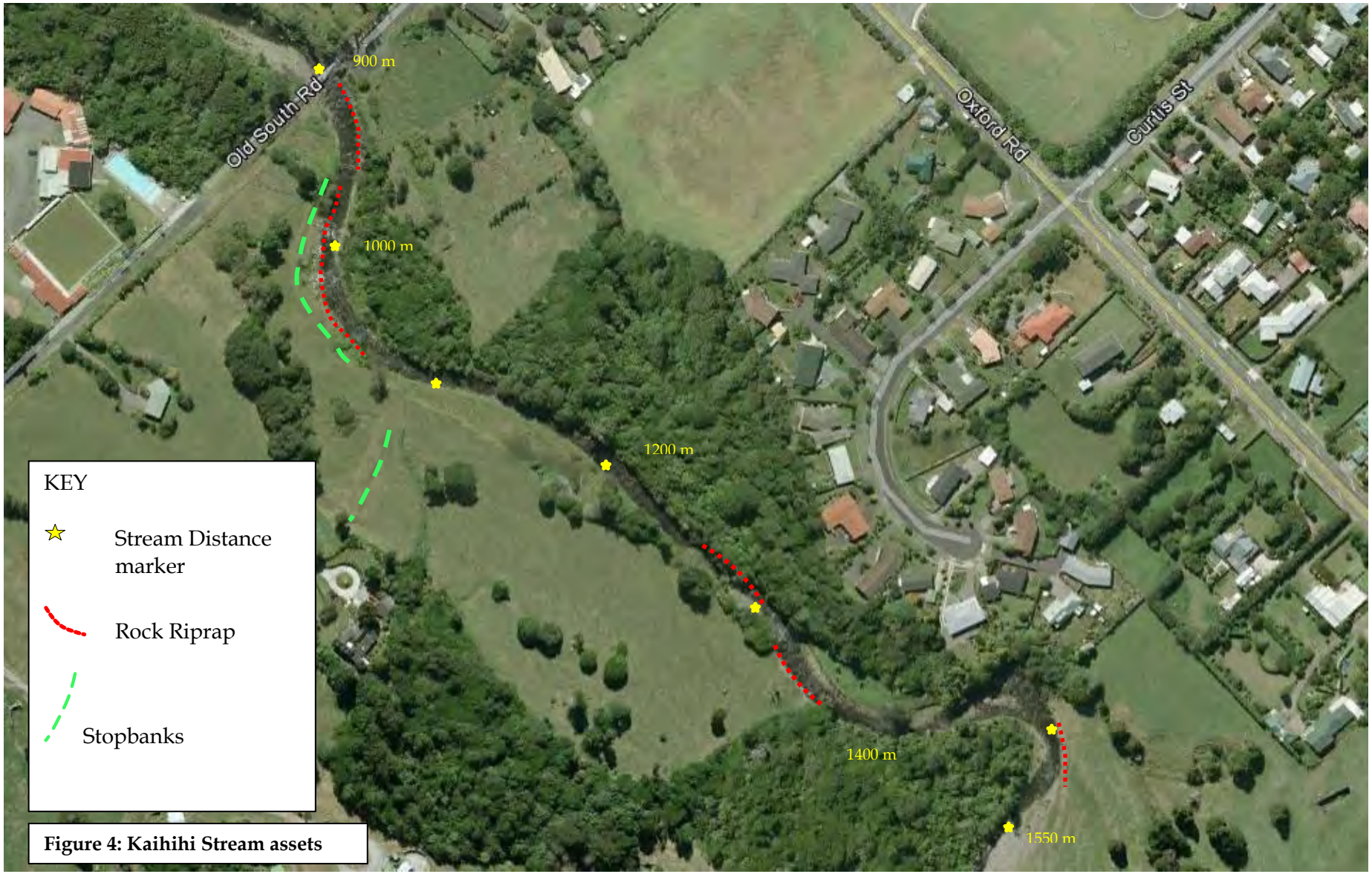

Figure 4: Kaihihi Stream assets

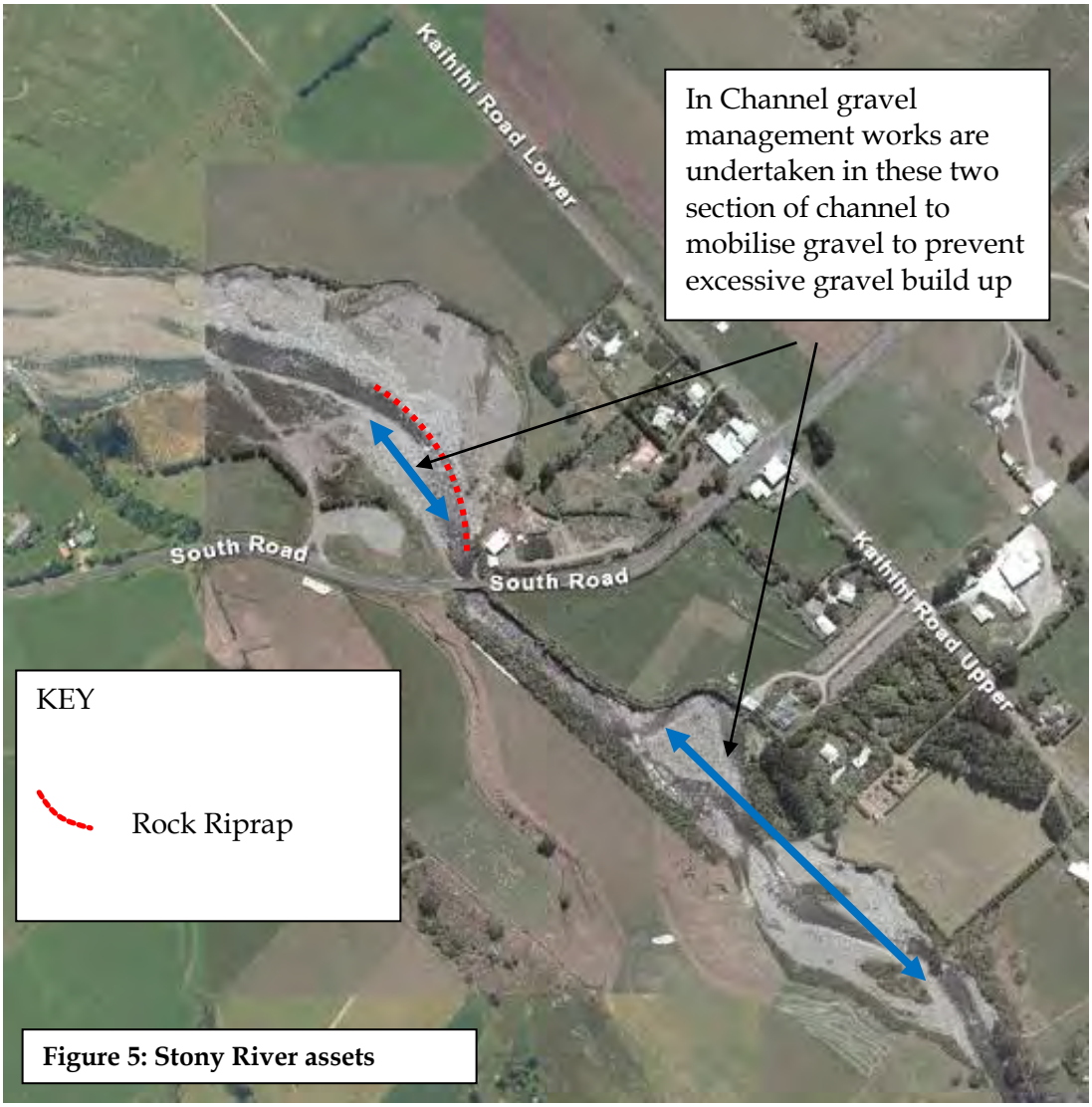

Figure 5: Stony River assets

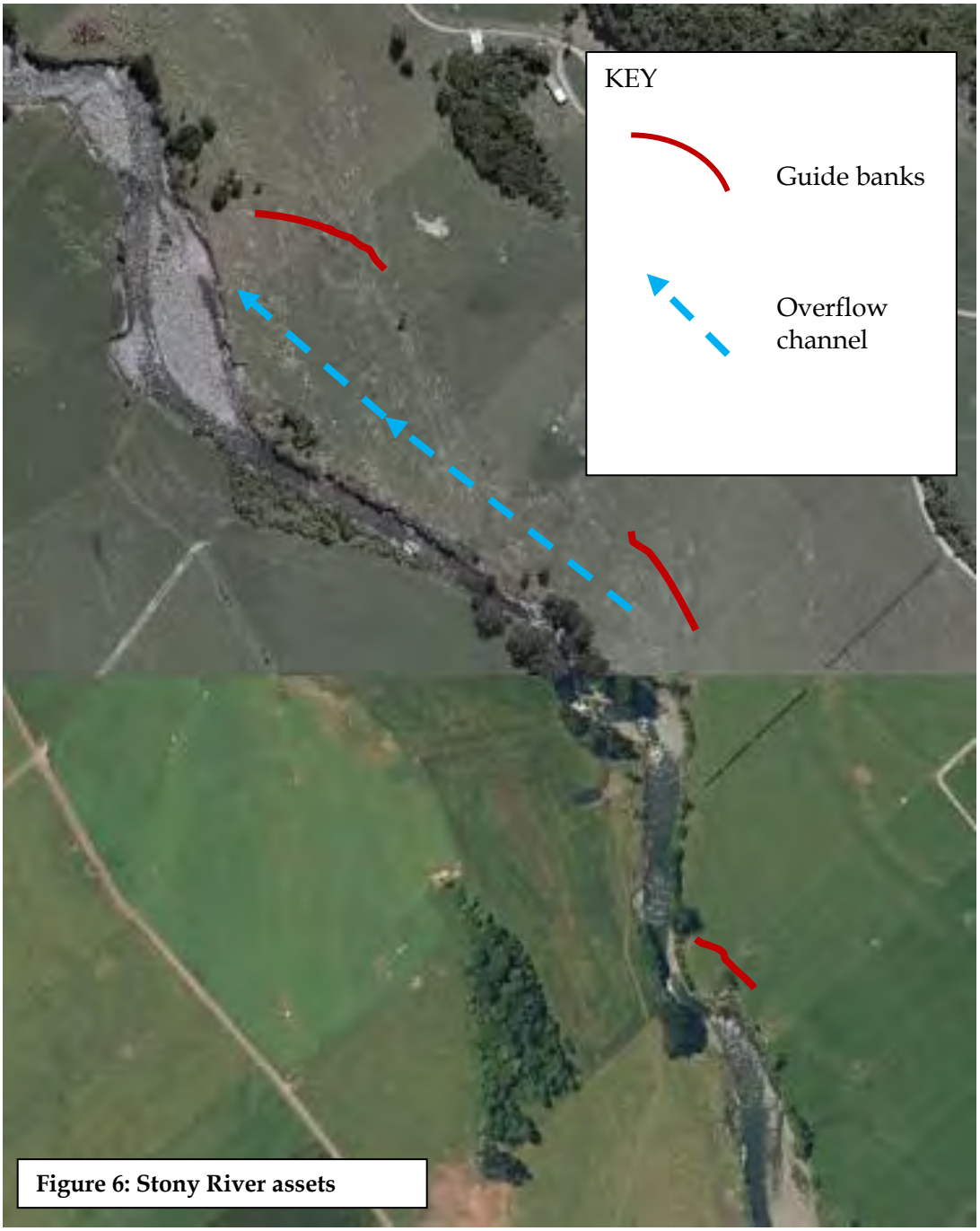

Figure 6: Stony River assets

3.2.2 Rock riprap – river training

Rock riprap in the Stony River will need specific design that recognizes the local grade on the channel and flood flows. Where practicable the design standard shall be the 1% AEP flood event.

3.2.3 Rock riprap erosion protection

Rock riprap is designed to remain effective in a design flood event and will depend on the velocity and the batter slope at the site. Rock in the Kaihihi Stream has remained relatively stable and any future rock used must be of a similar or larger size and grade. Where practicable the design standard shall be the 1% AEP flood event.

3.2.4 Snub (rock) groynes

Snub groynes are designed to remain effective in a design flood event and will depend on their length, design features and river flow velocity at the site. The groynes in the Kaihihi Stream have remained relatively stable and any future rock used must be of a similar or large size and grade. Minor topping up is required from time to time to ensure that they remain effective. Where practicable the design standard shall be the 1% AEP flood event.

3.3 Physical parameters

The following table includes the existing and proposed scheme assets:

Table 1: Physical Parameters

Asset Type	Location	Life (yrs)	Quantity			
Stony River						
Rock Riprap - River Training	Right bank – downstream SH45 from 35 to 185 m downstream	indefinite	5,000	tonnes	145	m
Stopbank – Guidebank	Right bank – 1800m upstream of SH45	indefinite	400	m^3	100	m
Overflow channel block/Guidebank	Right bank – 1000m upstream of SH45	indefinite	300	m^3	25	m
Overflow channel block/Guidebank	Right bank – 1600m upstream of SH45	indefinite	250	m^3	40	m
Kaihihi Stream						
Rock Riprap	Right bank 100m upstream of SH45	Indefinite	140	tonnes	35	m
Rock Riprap	Left bank 275m upstream of SH45	Indefinite	150	tonnes	25	m
Snub Groynes	Right bank 675m upstream of SH45	Indefinite	40	tonnes	5	
Rock Riprap and Snub Groynes	Right bank adjacent to Old South Rd Bridge	Indefinite	425	tonnes	50	m
Rock Riprap	Left bank 100m upstream of Old South Rd	Indefinite	450	tonnes	70	m

Stopbank	Left bank 100m upstream of Old South Rd	indefinite	1,000	m^3	155	m
Snub Groynes	Right bank 350m upstream of Old South Rd	Indefinite	25	tonnes	3	
Rock Riprap	Left bank 445m upstream of Old South Rd	Indefinite	120	tonnes	60	m
Rock Riprap	Right bank 600m upstream of Old South Rd	Indefinite	50	tonnes	25	m

3.4 Asset condition

3.4.1 Stopbanks

The only stopbank currently in the Scheme is on the left bank upstream of Old South Road. It is narrow and only about 1 m high. It is approximately 20 years old and reasonably robust.

There is a lot of rank vegetation and weeds growing on the bank which will be cleared and the structure of the bank will be tidied up at the same time it is joined to the bank a little further upstream.

The reformed bank will be constructed with 2:1 batters and at least a 2m top width.

3.4.2 Edge protection

Whilst there are areas of vegetation along the riverbank, there are no areas that have been purposely planted with willow vegetation.

Rock riprap and groynes are generally in good condition but can vary to some degree depending on their location, age and their previous maintenance. Willow has become lodged and has grown amongst the rock and will be removed.

3.5 Asset management system

The Taranaki region has a relatively small number of river control schemes within which infrastructural assets have been constructed and these schemes have a relatively small number of assets.

Because of this, it is possible to manage and keep track of these assets with very simple tools. Other councils that have a large network of infrastructural assets generally have an array of asset management tools used for the management of their assets.

The infrastructural assets are recorded in a simple Excel spreadsheet located on the Council's file system, Number 1178385

3.6 Asset value

River scheme infrastructural assets in the Taranaki Region are valued at current replacement value.

The valuation of the Okato Scheme has been undertaken for the first time as this plan has been developed. They will be reviewed and updated annually following a detailed annual inspection of the total Scheme. This is a practical option as the area involved and the number of Scheme assets are relatively small.

The 2014 asset values are set out in Table 2 and in the internal document 'Asset valuation Spreadsheet: 1864151'.

Table 2: Asset Values

Asset Type	Left or Right bank	Location	Quantity		Value 30/6/2017
Stony River					
Rock Riprap - lining	RB	Downstream SH45 from 35 to 185 m downstream	5,000	tonne	$287,920
Stopbank - Guidebank	RB	1800m upstream of SH45	400	m^3	$4,630
Overflow channel block	RB	1000m upstream of SH45	250	m^3	$3,440
Overflow channel block	RB	1600m upstream of SH45	300	tonne	$2,870
Kaihihi Stream					
Rock Riprap	RB	100m upstream of SH45	140	tonne	$8,060
Rock Riprap	LB	275m upstream of SH45	150	tonne	$8,640
Snub Groynes	RB	675m upstream of SH45	40	tonne	$2,300
Rock Riprap	RB	Adjacent to Old South Rd Bridge	425	tonne	$24,470
Rock Riprap	LB	100m upstream of Old South Rd	450	tonne	$25,910
Stopbank	LB	100m upstream of Old South Rd	1,000	m^3	$30,490
Snub Groynes	RB	350m upstream of Old South Rd	25	tonne	$1,440
Rock Riprap	LB	445m upstream of Old South Rd	120	tonne	$6,910
Rock Riprap	LB	500m upstream of Old South Rd	60	tonne	$3,460
Rock Riprap	RB	600m upstream of Old South Rd	50	m	$2,880
TOTAL					**$ 413,420**

4. Maintenance and renewals plan

4.1 Asset management system

Maintenance refers to the work necessary to retain the operating standard or service capacity of the scheme and to keep the asset operational. Because a natural river system is involved, the work needed cannot always be accurately forecast in time. However, experience gives a very good guide as to the type and general level of work necessary to meet scheme requirements in periods of 'normal' river flow i.e. the base level of maintenance.

Maintenance can include:

- Works to maintain a structural element e.g. a stopbank or a length of edge protection;
- Regular operational activities, eg. riverbank vegetation control, gravel removal and management
- Replacement of elements of the system such as rock riprap destroyed in flood event

The maintenance plan will set out the programmes and costs required to maintain the desired level of service.

4.2 Service levels

4.2.1 General

There is no particular design standard for the stopbanks and channels on the Kaihihi Stream or Stony River. The stopbanks have been constructed to prevent the more common overflows and not to prevent flooding from any particular event.

Minor damage to the erosion protection works adjacent to the stopbank on the Kaihihi Stream could result in a failure of the stopbanks, leading to inundation of the area it protects. i.e. the Scheme's value could be retained almost 100%, but its effectiveness could be compromised.

Rock riprap is designed to remain effective in a large flood event and will depend on the velocity and the batter slope at the site. Rock in the Kaihihi Stream has remained relatively stable and any future rock used must be of a similar or large size and grade. Where practicable the design standard shall be the 1% AEP flood event.

4.2.2 Stopbanks

The Council will maintain the Kaihihi stopbanks to ensure that the 2012 standard of protection is retained.

The stopbank and overflow channel blocks that prevent water spilling from the Stony River will be maintained to the level they were when constructed.

4.2.3 Edge protection – rock riprap and groynes

Rock riprap and groynes are generally in good condition and will be monitored periodically. Replenishment is generally not required but will be undertaken if the riprap reduces to 75% of the in-place rock.

4.3 Maintenance history

Works have been undertaken to on the Stony and Kaihihi to maintain the rock riprap works and the alignment of the channel by removing and relocating gravel build ups as they become a problem.

There has however never been a maintenance programme as such and any works that are undertaken are done so when a problem occurs or when the need is noticed during an add hoc inspection.

Annual expenditure of approximately $30,000 on average has occurred over the years on maintenance and channel management activities.

Little if any vegetation control work has been undertaken.

4.4 Maintenance programme

The Council has now developed a maintenance programme, which will minimize the risks of failures to the scheme works, and thereby provide for the most efficient and economic operation of the scheme. A detailed assessment has been undertaken of the work required to provide for the long term sustainable management of the Okato Scheme assets.

The key work components of this are summarised in Table 3 below, along with a general description of the activity and its estimated required frequency. Frequencies given are for the range of conditions anticipated throughout the Okato Scheme.

Table 3: Maintenance frequency

Item/Activity	Description	Estimated Frequency
Channel / Flood fairway		
• General overview	• Overview & general inspection of channels	• 1 yearly
• Gravel beach mtce	• Clear gravel buildup when required	• As required (1 yearly estimate)
• Berm mtce	• Tree and weed clearing	• 1 yearly
Riverbanks		
• Normal inspection	• Overview and general inspection of river banks	• 1 yearly
• Post flood inspection	• Detailed inspection looking for erosion damage to riverbanks and rock works and vegetation congestion	• As required
• Vegetation control	• Clear/maintain trees	• 1 yearly
• Rock riprap	• Realign, and top-up as inspection identified	• As required (4 yearly estimate)
Stopbanks		
• Detailed inspections	• walkover inspection	• 1 yearly
• Miscellaneous mtce	• Miscellaneous minor repairs to grass cover, weed control	• 1 yearly
	• larger mtce requirements	• 4 yearly

In general the priority order for maintenance work in the Okato Scheme will be:

- retaining the integrity of the stopbanks and flood channel blocks;
- retaining the strength and integrity of erosion control works; and
- keeping channels and flood fairways clear of obstruction.

4.4.1 Programmed inspections

All programmed inspections must be recorded on the inspection sheets set out in Appendix B and filed in the inspections folder kept on the River Engineering Office.

All matters identified as needing action must be completed as soon as practicable and marked off on the inspection sheets once completed.

4.5 Maintenance costs

4.5.1 Asset maintenance expenditure requirements

All expenditure on infrastructure assets will fall into one of two categories: capital expenditure or operating expenditure.

(a) Capital Expenditure

Capital expenditure projects are those displaying one or more of the following characteristics:

- Construction works which create a new asset that did not previously exist in any shape or form.
- Expenditure which purchases or creates a new asset (not a replacement) or in any way improves an asset beyond its original design capacity.
- Upgrade works which increase the capacity of the asset.

(b) Operating expenditure

All maintenance, upgrading, reconstruction, renewal and renovation work that does not increase the capacity of assets is treated as operating expenditure.

Operating expenditure can be divided further into two; normal ongoing day to day routine maintenance works and those other more infrequent larger projects that upgrade or renew the asset to its full (or original) service potential.

(i) Routine maintenance expenditure: Routine Maintenance projects can be expected to display some of the following characteristics:

- Regular and ongoing annual expenditure necessary to keep the assets operating at the required level of service, e.g. inspections; management; liaison with ratepayers etc.
- Day to day and/or general upkeep works designed to keep the assets operating, e.g. insurances, power costs.
- Works which provide for the normal care and attention of the asset including repairs and minor replacements.
- Minor response type remedial works i.e. isolated instances where portions or sections of a unit of an asset fail and need immediate repair to make the asset operational again.

(ii) Renewal expenditure: Work displaying one or more of the following attributes can be classified as renewal expenditure:

- Works which do not increase the capacity of the asset, i.e. works which improve and enhance the assets restoring them to (or below) their original size, condition, capacity, etc.
- The replacement component of augmentation works which does not increase the capacity of the asset, i.e. that portion of the work which restores the assets to their original size, condition, capacity, etc.
- The replacement component of a capital work which replaces the redundant element of an existing asset.
- Reconstruction or rehabilitation works involving improvements, realignment and regrading.
- Renewal and/or renovation of existing assets, i.e. restoring the assets to a new or fresh condition.

4.6 Expenditure

Expenditure in the foreseeable future will focus almost entirely on maintenance and renewals.

A long term program of monitoring and maintenance works with detailed cost estimates and the average annual expenditure required to ensure the Scheme is maintained to its full service potential is set out in Section 6.

5. Funding and financial planning

5.1 Accounting policies

It is the accounting policy of the Council that the Okato Scheme assets are not depreciated. The funds required to maintain the asset in an as new condition are considered to be the maintenance budgets in the forthcoming period.

The Council uses the following procedures when applying the above policy:

- all expenditure (routine maintenance, flood damage maintenance and maintenance works) to maintain the existing as new condition (as required by the scheme objectives) is considered to be normal maintenance work and is financed as part of the maintenance budgets established for the period; and
- any additional new minor capital works that increases the assets performance ability are included in the capital works budget for the period, but, are still financed from the accumulated reserve funds.

5.2 Revenue and Financing policy

It is the Council's policy that river control schemes are funded by targeted rates over the community benefiting from the protection.

The Lower Waitara, Waiwhakaiho and Okato Schemes have catchments that, when combined, comprise a substantial portion of the New Plymouth district. Significant flood control assets are managed and maintained within these catchments but because of the types of assets involved, normal maintenance costs are relatively minor. Accordingly, the Lower Waitara, Waiwhakaiho and Okato Schemes are funded from a rate that is a 100% capital value based works and services rate, applied over the whole of the New Plymouth district. This system is considered to be the most administratively efficient and appropriate funding mechanism.

5.3 Funding for disaster relief

The Taranaki Regional Council has made the decision to be self-funding in the event of a major disaster in the flood management scheme areas. This philosophy exists due to:

- the potentially high cost of insurance (relative to the benefits)
- the low probability of accessing Government or other disaster funding through participation in projects such as LAPP (Local Authority Protection Programme)
- the ability of the Council to reinstate the assets without significant financial implications

5.4 Routine maintenance costs

Routine maintenance costs for the Okato Scheme assets are relatively constant and easy to estimate. The cost of routine maintenance has been based in the past expenditure with an allowance for increased monitoring and maintenance. The estimated costs include monitoring and maintenance of riverbanks and berms, rock riprap works and stopbanks. The new maintenance programme is set out in Section 4.4 and estimated maintenance costs are set out in Section 6.

5.5 Flood damage funding

Due to the variability of flood events and their unpredictability, determining an appropriate programming of flood damage maintenance expenditure is more difficult than estimating routine maintenance allowances. Annual flood damage maintenance expenditure will vary greatly, from virtually nothing to relatively large costs when a rock protection work sustains major damage. Costs over a number of years could be very low, then, during a period of more intense flooding, maintenance costs could increase to well beyond the annual average.

Therefore, no sensible programming of the flood damage costs can be prepared. Rather the estimated annual average flood damage maintenance cost should be used to guide annual scheme funding, with the unexpended portion of the budgeted costs accumulated year by year. This level is estimated at $15,000 per annum for the Waitara, Waiwhakaiho and Okato Schemes.

In the cases where there are significant flood damage repairs, the process established in Section 5.8 would be utilised to reinstate the schemes to as new condition.

5.6 Non-routine maintenance costs

From time to time the Council needs to expend additional funds to maintain the level of protection offered by the scheme because either the river channel dynamics have significantly changed or the Council's knowledge and understanding of the schemes has improved. This expenditure is not of a capital nature as the overall level of protection offered by the schemes has not changed. Accordingly, it is included in the Annual Works Rivers budget. This expenditure has to be funded using the same funding policy as the other maintenance expenditure.

The planned maintenance works are included in the reserve fund movements for the next ten years. This expenditure is funded from the accumulated reserve fund balances. However, where the reserve balance is not sufficient to finance the maintenance works expenditure, then the level of the targeted rate would have to be increased.

5.7 Capital works funding

Capital expenditure that increases the level of protection provided by a scheme will generally be funded by either external or internal borrowing. This reflects the long life of the assets and the need to spread the costs of those assets over the life of the assets. Interest and principal repayments for the borrowing will be funded by the targeted rate.

5.8 Financial planning

The funding of expenditure on the Okato Scheme is by way of a targeted rate. This is currently set to cover all expenditure in accordance with the *Revenue and Financing Policy*.

Any under-expenditure on the scheme is transferred to the North Taranaki River Control Schemes reserve. Similarly, any over-expenditure is funded from a transfer out of the reserve. As at 30 June 2020 the balance of this reserve was $1.2M.

Each year, the targeted rate is expected to fund the routine maintenance plus any flood damage maintenance work identified in the annual review of the schemes. As noted above, if there are an unusually high level of repairs arising out of the annual review then this will be funded via the process outlined in Section 5.1.

If there were no significant repairs arising out of the annual inspections then the reserve fund would continue to grow. The appropriate maximum level for the reserve needs to be considered.

This level is dependent upon the Council's ability to reinstate the assets as a result of a rare large damaging flood event. The Council has a philosophy of self-insurance to recover the service potential of the scheme assets after such an event. The estimated worst case scenario is total flood damage of $500,000. The Council needs to be able to fund this level of expenditure as a maximum.

5.9 Funding for disaster relief

In all river flood control schemes the damage caused by the rare large floods is particularly hard to estimate and can vary greatly. This damage occurs at irregular intervals, with unpredictable timing. In the case of a major flooding event it is proposed that funding for reinstatement be accessed through the following hierarchy:

- Firstly, any unused/uncommitted funds from the maintenance budgets for the river control schemes for that financial year will be used;
- Secondly, any balance remaining in the reserve fund will be used;
- Thirdly, any surplus Council-wide cash and investment balances will be loaned to the scheme reserve fund; and
- Finally, consideration will be given to the raising of debt finance.

The individual options available will be considered on a case by case basis.

6. Maintenance and monitoring cost estimates

Table 4 sets out the ongoing cost of maintaining and monitoring of the Okato Scheme.

The frequency of the works have been estimated but may vary as a result of the frequency of flood events and other changes that may necessitate more frequent activities in some areas.

It is likely though that there will be some more and some less frequent and will balance out within a year.

Details are in the internal document 'Works Cost Spreadsheet: 1094753'.

Table 4: Long Term monitoring and Maintenance Requirements

MAINTENANACE AND CAPITAL WORKS ESTIMATES				
Item	**Work Description**	**Work Frequency**	**Contractor cost**	**TOTAL annualised**
		Years		Excluding Staff
OVERVIEW AND GENERAL INSPECTION				
General	Inspections	1		-
CHANNEL MANAGEMENT				
kaihihi Stream	Vegetation control - trees	1	2,000	2,000
	Vegetation control - weeds	1	500	500
	Rock riprap & snub groynes	2	6,000	3,000
	Gravel beach mtce	1	1,000	1,000
	Stopbank maintenance	4	2,000	500
Stony River	Channel management	1	7,750	7,750
	Stopbank maintenance	4	1,000	250
ANNUAL COSTS			**$20,250**	**$15,000**

Table 5 and Figure 7 set out the estimated cost of managing and maintaining the Okato Scheme for the period 2021 to 2031.

The estimates separate the staff and internal cost from external costs that would be contracted out. The flood damage allowance is as per Section 5.5.

Table 5: Cost estimates 2021 to 2031

Year	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2028/29	2029/30	2030/31
Contractor costs	16,000	12,250	15,250	12,250	16,000	12,250	15,250	12,250	16,000	12,250
Total Annual Maintanence Costs	16,000	12,250	15,250	12,250	16,000	12,250	15,250	12,250	16,000	12,250

Note: In addition to these costs an allowance for flood damage of $15,000 is a shared with the Lower Waiwhakaiho Flood Control Scheme, and Lower Waitara Flood Control Scheme.

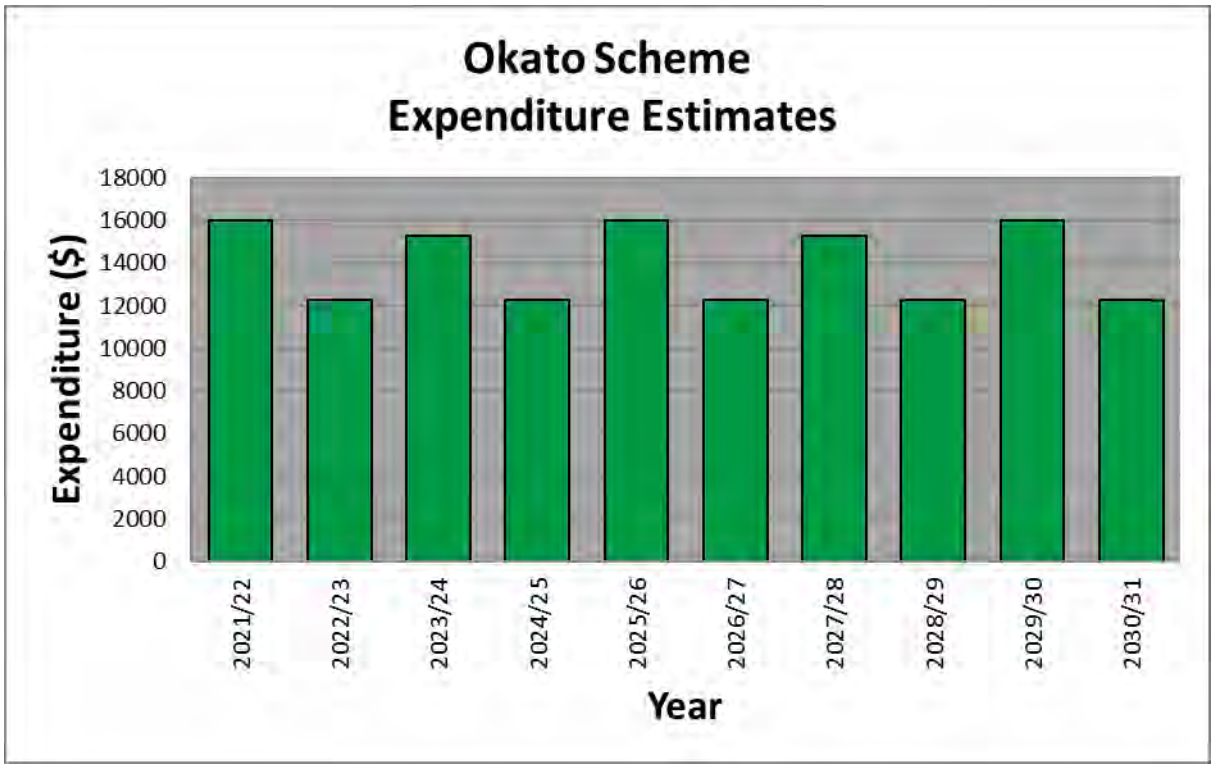

Figure 7: Cost estimates 2021 to 2031

7. Infrastructure Strategy

This Infrastructure Strategy identifies:

- the infrastructure issues for the Scheme for the period from 2015 to 2045; and
- the principle options for managing those issues and the implications of the options.

Some relatively minor upgrade works were undertaken on the Okato Scheme in 2012/13. The Scheme currently manages sections of the Stony River and Kaihihi Stream to control the channel alignments and limit the adverse effects of out of channel floods flows as is practicable but to no particular standard.

The land use in the area protected by the Scheme is predominantly agricultural with some small areas of urban and commercial. The protection standard provided by the Scheme is considered to be an acceptable standard considering the land use and the nature of the assets at risk. Significant changes in the land uses are unlikely to occur in the area benefiting from the scheme works.

There is no upgrade planned for the Scheme within the next 30 years.

The risk to some of the Scheme infrastructure arising from natural disasters is significant especially those associated with the Stony River. Depending on the size of the damage to the Stony River assets, their repair may involve capital expenditure but those in the Kaihihi Stream would be funded from Scheme Reserves. $15,000 is budgeted each year for the repair of flood damage from the North Taranaki Schemes and if unspent, accumulates in the Scheme reserves account.

The Scheme has infrastructural assets that fall into six types. The following table sets out how the Council will manage these asset types.

Asset Type	Renewal or replacement requirements	Expenditure
Earth stopbanks and guidebanks	• No replacement required. Stopbanks will be maintained to the design levels and standards.	Operational
Rock river training works	• Rock does not need replacement. • Some rock repositioning may be required from time to time • Minor topping up may be required very irregularly.	Operational
Rock groynes	• Rock does not need replacement. • Minor repositioning may be required.	Operational
Rock riprap	• Rock does not need replacement. • Minor topping up may be required very irregularly.	Operational

Risk Management

The following table sets out the risk faced by the Scheme assets by natural disasters and indicates the financial implications and potential size of that risk.

The potential risk to the Scheme assets arise from over design flood events.

Asset Type	Disaster Type	Risk	Financial Risk	Expenditure type to fund repair
Earth stopbanks and guidebanks	Flood	Some minor damage possible. If a stopbank was to fail, the damage to the stopbank would be very localized.	Minor	Operational
Rock river training works	Flood	The large rock river training works could be severely damaged in a very large flood in the river.	Significant	Capital
Rock groynes	Flood	Moderate	Minor	Operational
Rock riprap	Flood	Moderate risk of rock riprap needing to be repositioned or topped up.	Minor	Operational

The indicative estimated set out below for the management of the Scheme assets is drawn from Section 6 of this plan. There will be no capital expenditure over the next 30 year period.

Year(s)	2021/ 2022	2022/ 2023	2023/ 2024	2024/ 2025	2025/ 2026	2026/ 2027	2027/ 2028	2028/ 2029	2029/ 2030	2030/ 2031	2031/ 2036	2036/ 2041	2041/ 2046	2046/ 2051
Estimated operating costs ($1000's)	16	12	15	12	16	12	15	12	16	12	75	75	75	75

Assumptions Made

The assumptions made in determining the above estimates are:

- That the frequency and size/nature of the future maintenance works required are in line with that which has occurred over recent years.
- That the frequency of damaging flood events and the damage that occurs in these events does not change significantly.

Appendix A

Inspection Record Sheets

Okato Scheme

Detailed Scheme Inspection – Stony River

(Annually)

Inspected by:				Date:	
Stony River					
Downstream of SH45					
	Condition		Comment	Action Required	Date Actioned
	Good	Poor			
Right bank rock riprap					
Channel capacity (gravel build up)					
Upstream of SH45 (Cavey's)					
Channel alignment					
Channel capacity (gravel build up)					
Flood overflow channel and channel blocks					
Upstream stopbank					
Overflow channel block (upstream)					
Overflow channel block (downstream)					

Okato Scheme

Detailed Scheme Inspection – Kaihihi Stream

(Annually)

Inspected by:				Date:	
Kaihihi Stream					
SH45 to Old West Road					
	Condition		Comment	Action Required	Date Actioned
	Good	Poor			
Rock work 100m u\s RB					
Rock work 275m u/s LB					
Snub groynes 675m u/sRB					
Rock work and groynes downstream of Swing Br. RB					
Channel capacity (gravel build up)					
Upstream of Old West Road (OWR)					
Rock work upstream OWR. RB					
Rock work 100m u/s LB					
Rock work 275m LB					
Rock work 350m u/s RB					
Rock work 445m u/s LB					
Rock work 600m u/s RB					
Stopbank 100m u/s LB					
Channel capacity (gravel build up)					