

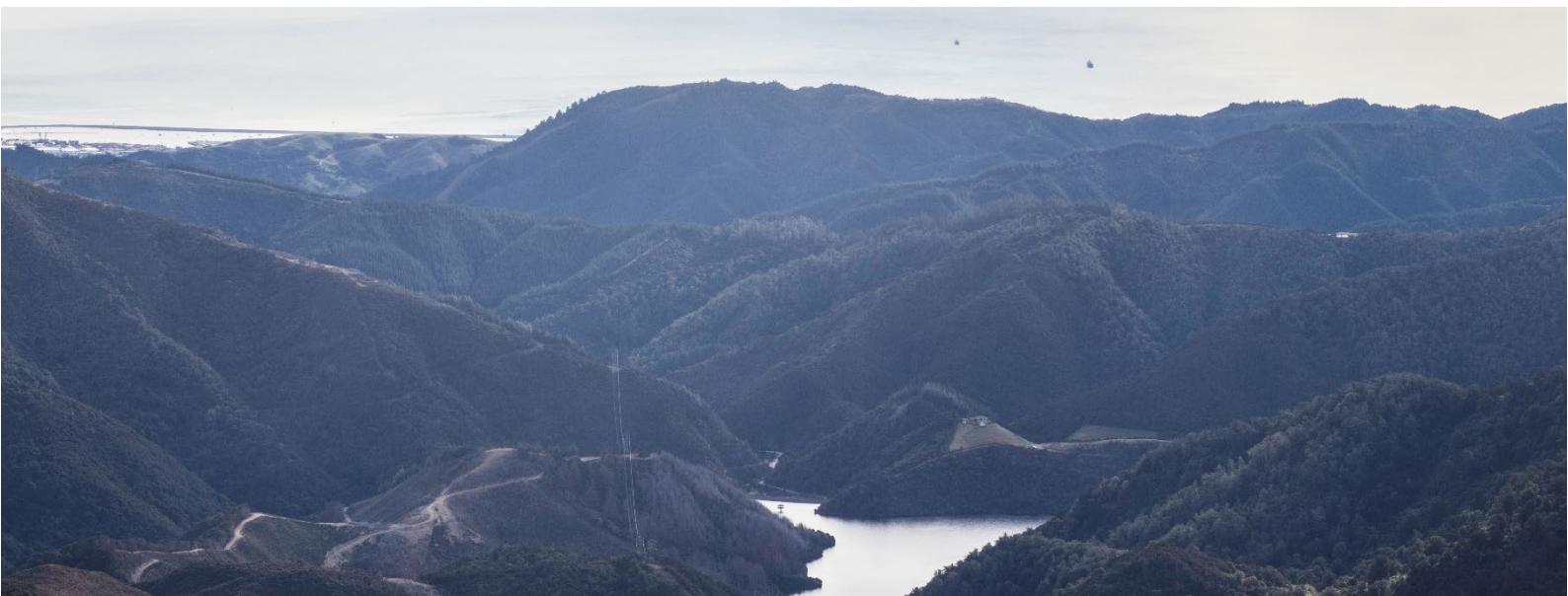


Ecological Restoration Plan

# Maitai River

Final

Prepared for Nelson City Council by Morphum Environmental Ltd  
July 2020



The union of engineering  
design and nature.



Engineers & Consultants

### Document Control

**Client Name:** Nelson City Council  
**Project Name:** Maitai Restoration Plan Phase 2-3  
**Project Number:** P02534  
**Document:** Maitai Ecological Restoration Plan

### Revision History

Status	Date Issued (dd/mm/yyyy)	Author	Reviewed By	Released By
Final	12/08/2020	Dave Brockerhoff	Mark Lowe	Stu Farrant

### Reviewed by:

**Reviewer:** Mark Lowe

**Signature:**

### Released by:

**Reviewer:** Stu Farrant

**Signature:**

## Executive Summary

The Maitai River and riparian corridor is an area with significant ecological and cultural values in the Nelson Region. The river meanders through the Maitai valley before flowing through the Nelson city centre into the Nelson haven estuary. The upper Maitai valley is still representative of the old-growth forest that was historically dominant in the area, but nearer the urban centre of Nelson City the proportion of modified land use increases. The Maitai River has had ongoing water quality issues related to the modified nature of the catchment, resulting in repeated toxic *Phormidium* algal blooms.

Nelson City Council has engaged Morphem Environmental to develop an Ecological Restoration Plan (ERP) for the Maitai River Esplanade. The overall objective of the ERP is to guide restoration efforts to protect and enhance the biodiversity values of the river and the riparian corridor. This ERP details priority Enhancement Opportunities and guidance on how the Maitai River Esplanade may be managed to meet this objective.

The ERP has a 10-year timeframe, with more detail and focussed actions on council managed land in the first five years.

The Maitai River corridor has been separated into the following zones to allow for appropriate management strategies that respond to the pressures and opportunities of the corresponding land use:

- Urban Zone: Haven to Clouston Bridge
- Recreational Zone: Clouston Bridge to Gibbs Bridge
- Rural Recreational Zone: Gibbs Bridge to Maitai Campground
- Rural Zone: Maitai Campground to Maitai Dam (Gate)

The ERP provides a work programme which can be used by Council's contract managers and contractors to achieve operational goals for maintaining and restoring the riparian corridor along the Maitai river. Additional Enhancements Opportunities have also been identified outside of the council managed land which would further support the objective of protecting and enhancing the ecological values of the river corridor. For these additional Enhancement Opportunities Council may be able to support implementation through a variety of means including, funding, advocacy, and regulatory tools.

A total of 61 individual Enhancement Opportunities covering 77 hectares have been described in this report. The Enhancement Opportunities in the four zones have been summarized in the tables below. Enhancement Opportunities have been grouped into several categories as outlined in Table 1. The number of Enhancement Opportunities on and outside of Nelson City Council managed land are summarised in Table 2.

In addition to the specific Enhancement Opportunities outlined in the ERP, several long-term management objectives have been identified. Where possible, retiring grazing land and production forestry and replacing these land uses with native vegetation. Ongoing council actions and advocacy can support this long-term goal. It is also recommended that NCC use a combination of advocacy, and regulatory and policy tools to ensure potential hydrological and water quality effects from future development are appropriately managed. This may include provisions to achieve desired outcomes being adopted through private plan changes and proactively working with developers and their agents to ensure that the implementation of any water sensitive design elements will support the long-term performance required to protect the river.

Monitoring the progress and effectiveness of enhancement work is important to demonstrate efficient use of resources and finding, while also allowing for adaptive management actions to be implemented where needed. Developing a geospatial database to support monitoring will greatly increase the efficiency, usability and communication of monitoring information to various Council and external

parties. It is also recommended that a more detailed monitoring plan be developed which details specific monitoring methods, locations and auditing and reporting requirements.

**Table 1: Number and area (ha) of identified Maitai River Enhancement Opportunities across the four Zones.**

<b>Enhancement Opportunity Type</b>	<b>Urban</b>	<b>Recreational</b>	<b>Rural Recreational</b>	<b>Rural</b>	<b>Total</b>
Weed Control	3 (3.0 ha)	5 (17.9 ha)	4 (5.0 ha)	8 (11.4 ha)	20 (37.3 ha)
Enhancement Planting	2 (1.0 ha)	1 (0.2 ha)	9 (18.5 ha)	4 (4.3 ha)	16 (24.0 ha)
Willow Removal	-	3 (0.4 ha)	-	-	3 (0.4 ha)
Bank Erosion Mitigation	-	1 (0.1 ha)	-	-	1 (0.1 ha)
Protection Area	1 (0.4 ha)	5 (2.5 ha)	-	9 (12.6 ha)	15 (15.5 ha)
River Corridor Pine Setback	-	-	2 (0.1 ha)	4 (0.2 ha)	6 (0.3 ha)
<b>Total</b>	<b>6 (4.4 ha)</b>	<b>15 (21.1 ha)</b>	<b>15 (23.6 ha)</b>	<b>25 (28.5)</b>	<b>61 (77.5)</b>

**Table 2: Number of Enhancement Opportunities on and outside of Nelson City Council managed land.**

<b>Enhancement Type</b>	<b>NCC Managed</b>	<b>Not NCC Managed</b>	<b>Total</b>
Weed Control	12	8	17
Enhancement Planting	12	4	12
Willow Removal	2	1	3
Bank Erosion Mitigation	0	1	1
Protection Area	8	7	15
River Corridor Pine Setback	4	2	6
<b>Total</b>	<b>38</b>	<b>23</b>	<b>61</b>

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# 1. Introduction

The Maitai River is a key area in the Nelson Region with significant ecological and cultural values. The river flows approximately 15.3 km from the Maitai Dam to the Nelson Haven Estuary. On the way it meanders past native forests, pine plantations, recreational reserves, and finally through the Nelson city centre. Sections of the Maitai River corridor have been vested as conservation, landscape, and esplanade reserves under the Reserves Act 1977 and are under the ongoing management of Nelson City Council (NCC). It forms an important part of Nelson's highly valued outdoor recreation network, and local biodiversity through providing steppingstones and wildlife corridors linking the habitats within the Maitai Valley. The upper Maitai Valley retains areas of the old-growth forest that was historically dominant in the area, but nearer the urban centre of Nelson City the proportion of modified land use increases and little of the original riparian forest remains.

## 1.1 Purpose of Ecological Restoration Plan

Nelson City Council (NCC) has engaged Morphem Environmental (Morphum) to develop an Ecological Restoration Plan (ERP) for the Maitai River Esplanade. The overall objective of the ERP is to guide restoration efforts to protect and enhance the biodiversity values of the river and the riparian corridor. This ERP details priority Enhancement Opportunities and guidance on how the Maitai River Esplanade may be managed to meet this objective. The ERP has a 10-year timeframe, with more detail and focussed actions on council managed land. Areas of specific amenity and recreational values of the area have been identified but the focus of this ERP is on maintaining and improving existing and potential sites of ecological value. Additional Enhancement Opportunities have also been identified for consideration.

The ERP provides a work programme which can be used by Council's contract managers and contractors to achieve operational goals for maintaining and restoring the riparian corridor along the Maitai river.

The Maitai River corridor has been separated into four Management Zones with different land use patterns and ecological values for the purpose of this ERP to allow for appropriate management strategies that respond to the pressures and opportunities of the corresponding land use. The four zones are as follows:

- Urban Zone: Haven to Clouston Bridge
- Recreational Zone: Clouston Bridge to Gibbs Bridge
- Rural Recreational Zone: Gibbs Bridge to Maitai Campground
- Rural Zone: Maitai Campground to Maitai Dam (Gate)

The aims of the ERP which support the overall objective include:

- Describe the goals and priorities for the Enhancement Opportunities along the Maitai River to enable consistent messaging to the public
- Providing a clear works programme for contractors
- Provide measurable goals against which success can be measured
- Providing for a consistent approach from contractors
- Provide an approach that is coordinated and efficiently utilises available resources
- Provide a practical operational focus

## Focus of Ecological Restoration Plan

The ERP was informed by a workshop with NCC and contractors, a contractor survey web-app, and existing reports and databases. A prioritisation process was designed through which to evaluate the importance of individual potential Enhancement Opportunities with respect to achieving the objectives of the ERP. While the focus of this ERP is on Enhancement Opportunities on Council managed land,

additional Enhancements Opportunities have been identified outside of the Council managed land which further support the objective of protecting and enhancing the ecological values of the river corridor. Council may be able to support implementation of these additional Enhancement Opportunities through a variety of means including funding, advocacy, and regulatory measures.

The ERP provides operationally focussed and prioritised ecological enhancement and maintenance actions; however, does not include plantings plans, or species-specific control mechanisms. Additionally, whilst there is a known issue with goat and deer hindering restoration efforts, particularly in the upper Maitai, specific details regarding animal pest control are not included within the ERP.

## Limitations

- The Enhancement Opportunities in this report have not been field verified. Rather they have been prioritised using existing reports and documents provided by NCC, a Contractor web app survey, and workshop with Contractors and NCC staff.
- The Enhancement Opportunities in this report are not intended to be inclusive of every possible opportunity in the Maitai River Esplanade. Instead they are the key Enhancement Opportunities identified through the provided information.
- The Significant Natural Area (SNA) locations and details have not been made available to Morphum. Descriptions of important natural values have been given but the ERP is unable to comment on which areas are within the SNA overlay.

## 1.2 The Maitai River Corridor

The Maitai River corridor begins at the foot of the Maitai Dam, flowing approximately 15.3 km and dropping 240 m in elevation, to the mouth of the Maitai River in the Nelson Haven estuary. Several tributaries feed into the Maitai, notably Sharland Creek, Groom Creek, and Neds Creek. The Maitai is a moderately-sized, low-gradient river, and with gravelly substrates (Leathwick 2019).

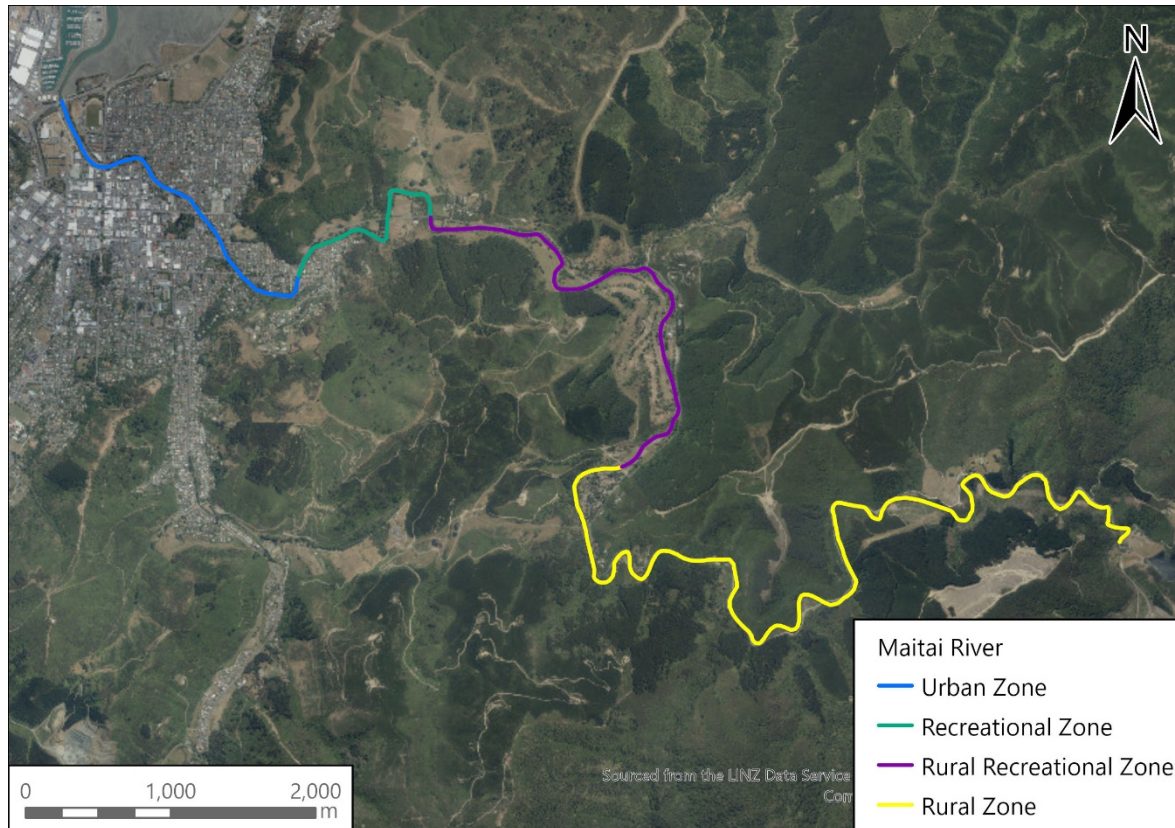
The stream mouth of the Maitai opens into Nelson Haven, a bar-built, fluvial erosion estuary, approximately 1300 ha in area, at the southern end of Tasman Bay. The estuary is ecologically significant as it is an important feeding and roosting habitat for wading birds, including some rare and threatened species (Bell 1986).

On its course, the Maitai passes through zones of different land use patterns and habit types, ranging from native broadleaf forest, to pine plantations, recreational reserves, and urban development. An analysis of the Land Cover Database v5.0 (Landcare Research 2020) within a 40 m corridor of the Maitai River was used to examine these differences. Urban parkland / open space is the most dominant land cover group in the Maitai river corridor. This is closely followed by the high producing exotic (pasture) grassland, native hardwood forest, and developed land classes. The zone with the highest percentage of native hardwood forest in the river corridor is the Recreational zone, although the Rural zone has approximately twice the total area of native forests. Pasture grassland is found exclusively in the Recreational and Rural Recreational zones between the Clouston Bridge and the Maitai Valley Motor camp. Production forestry is most prevalent in the Rural zone and the Rural Recreational zone to a lesser degree.

The river corridor is known for its many recreational activities. Swimming holes, sport fields, and scenic reserves, and walking tracks are found on rivers banks. A more detailed description of each separate zone can be found in the following sections (Section 1.2.2 – 1.6).



### 1.2.1 Reserve Map



**Figure 1: Aerial image of the Maitai River corridor and the identified Management Zones.**

### 1.2.2 Management Zones

The Maitai ERP has been divided into four Management Zones which generally coincide with the zones described in the Nelson Esplanade and Foreshore Reserves Management Plan (Table 3). The extent of the Management Zones was determined based on predominant land use patterns to allow for appropriate management strategies that respond to the pressures and opportunities of the corresponding land use. The Urban zone is dominated by urban development with slim riparian margins. The Recreational zone consists largely of recreational reserves, with a small area of residential development. The Rural Recreational zone is a mix of recreational reserves and pasture farmland. The Rural zone is dominated by pine plantations with pockets of native forest.

**Table 3: Maitai River Management Zones**

Management Zone	Extent	Length (m)	Percent of River length (%)
Urban Zone	Haven to Clouston Bridge	2,470	16.1
Recreational Zone	Clouston Bridge to Gibbs Bridge	1,500	9.8
Rural Recreational Zone	Gibbs Bridge to Maitai Campground	3,600	23.5
Rural Zone	Maitai Campground to Maitai Dam (Gate)	7,770	50.6

## 1.3 Existing Values

### 1.3.1 Urban Zone

The Urban zone has been heavily modified from its original land cover and now has greatly reduced biodiversity values. The river corridor is predominantly residential land with some managed reserves along the bank containing grass lawns and large exotic feature trees such as willows (*Salix* sp.), cedars (*Cedrus* sp.), and oaks (*Quercus* sp.). The lower reach, before the outlet to the estuary, passes through commercial and active recreation land.

The Maitai River Walkway on the true left bank of the river follows these reserves along the Maitai River Esplanade. The largest bush section in the Urban zone is on the true left bank between the Nile St west and Nile St west bridges (Clouston Bridge). However, there is also high levels of weed infestation in this section of bush, with established populations of ivy and Japanese honeysuckle in addition to several other pest plant species.

An area of particular note is the reach adjacent to Shakespeare Walk where there is an area of confirmed Inanga spawning. Inanga have been classified as 'at risk – declining' (Dunn et al., 2018), so protecting/enhancing the remaining spawning areas is crucial to helping support this ecologically and culturally significant species. Inanga also has significant cultural value as a harvest species and is the main target species of whitebait fishing which occurs on the Maitai during the whitebait season. Another area of significant cultural and recreational value in the Urban zone is the Queen's Garden botanical garden, which is home to several registered heritage trees. The majority of the riparian zone on council land has been enhanced with a narrow band of native stream bank planting.

Blooms of *Phormidium* cyanobacteria have been an ongoing issue in the lower Maitai River. The toxic algae form mats on the riverbed and pose a public health risk in a river with so many recreational values, especially at the many swimming holes along the Maitai. Algae blooms occur annually generally between early-October and mid-December (Wood et al. 2015). The occurrence of the algal blooms has been associated with nutrient-rich sediment runoff from upstream sources such as pasture farmland and pine plantations. Pasture farmland and production forestry are most common in the rural recreational and rural zones.

### 1.3.2 Recreational Zone

The Recreational zone has high levels of modification. The Recreational zone has a small amount of residential development but is predominantly recreational reserves. Branford Park, Hanby Park, the Black Hole and Dennes swimming hole, and the Maitai Cricket ground are all found within this zone. As with the reserves in the Urban zone, the reserves are primarily maintained lawns with interspersed exotic trees and overall low biodiversity values. The Recreational zone is likely to undergo some changes in land cover as a result of the residential development planned near the Kaka Hill tributary, which joins the Maitai River at Denne's Hole.

Pasture grasslands are also prominent in the recreational zone, representing a third of adjacent land use. Sections of native bush are present on the true right bank of the Maitai in the vicinity of Dennes Hole, as well as, Branford reserve, and a further small section at Black hole. Pest plants (predominantly old man's beard and ivy) have been recorded in association with the developed length of the river corridor in the Recreational zone. Only a small number (<5 instances) of weed infestations have been located in the remainder of this zone.

Willows are abundant along the riverbanks between Black hole and Gibbs bridge, with the largest density immediately downstream of Gibbs bridge where they have been creating ongoing bank erosion issues. The bank erosion issues have been created by willows accumulating sediment and shifting the

river channel which is now eroding the true right bank of the bend in the river. There are nine listed heritage trees in Branford and Hanby park which have high amenity and cultural values.

### 1.3.3 Rural Recreational Zone

The Rural Recreational zone consists of the 3.6 km of the river valley from Gibbs bridge till it narrows at the Maitai Valley Motor camp. The highest land cover categories in this zone are urban parkland / open space and pasture grasslands. Further from the immediate river corridor there is a substantial area of production forestry interspersed with pockets of native forest such as that near the Sharlands Creek confluence.

There are two large recreational reserves in this zone, specifically the Waahi Taakaro Reserve and Waahi Taakaro Golf Course, which together comprise of approximately 80% of the true left bank of the Maitai river in the Rural Recreational Zone. The Waahi Taakaro Reserve is an active farm of which the grazing lease is due to expire in August 2023. Neither the reserve or golf course have existing high biodiversity values, their heavily grazed and carefully maintained lawns limit opportunity for increasing species diversity and forest regeneration.

Beginning at the Rural Recreational Zone forestry pine plantations become increasingly common heading upstream, and in some sections the pine stands reach within 10 m of the watercourse.

Only a very small proportion of the historic native vegetation remains along the river. Willow (*Salix* sp.) and Strawberry Dogwood (*Dendrobenthamnia capitata*) are among the most common riparian species in this reach of the Maitai river, but, were the target of a large weed control operation between the Sharland's creek confluence and the motor camp in 2018 and are now less abundant (Nelmac, 2018). Selective willow removal is still required downstream of this reach, between Sharland's creek and Gibbs bridge, although these willows have not been reported as being associated with erosion issues. High densities of pest plants (predominantly old man's beard, greater bindweed, and *Tradescantia*) are present on the golf course perimeter and around Sunday hole.

### 1.3.4 Rural Zone

Overall, the rural zone has the highest existing native biodiversity values of the four zones and is included almost entirely in the Maitai Water Conservation Reserve. It consists predominantly of pine plantations and native bush, with some excellent examples of high value native forest, such as that around Neds Creek and Smith's Ford. Smith's Ford in particular supports a stand of mature matai (*Prumnopitys taxifolia*). Between the interspersed blocks of native forest there are large production pine stands with very low ecological value.

There are several areas of weed infestation in the rural zone, which are important to control as they can act as source populations for the downstream catchment where these pest species can be spread by watercourse vectors. The only known site of aluminium plant (*Galeobdolon luteum*) in the Maitai River Esplanade is in the vicinity of Polford bridge and should be a high priority for weed control action. Aluminium plant is a vigorous, shade-tolerant weed which will form dense groundcover mats out competing native seedlings. It is able to rapidly spread through plant fragments so there is a risk that if not controlled this population may seed further sites downstream. Old man's beard is another prominent weed species in the rural zone with its highest densities around the Maitai dam.

Several popular walking and mountain biking tracks, such as the Coppermine and Dunn mountain trails, in the rural zone contribute to recreational values of the zone.

## 2. Enhancement Opportunities

The ERP provides key Enhancement Opportunities for each of the four Management Zones identified. A total of 61 Enhancement Opportunities across ~77 hectares have been identified. The tables in sections 2.2 through 2.6 outline the priority, area (ha), ecological value of enhancement sites, and priority (Low, Medium and High) for the various Enhancement Opportunities. The tables have been divided into opportunities on and outside of Nelson Council managed land. Some NCC managed reserves extend past NCC owned land parcels. While the project scope initially included recommended timeframes for Enhancement Opportunities, due to changes in funding streams for the implementation of this Plan, it was agreed with NCC to instead provide priorities in high, medium, and low categories. Enhancement Opportunities were identified in several different types of NCC Reserves (Table 4). The largest proportion of Enhancement Opportunities on Council managed land were in Esplanade Foreshore reserves.

**Table 4: Number of Enhancement Opportunities in different NCC Reserve Types**

Reserve Type	NCC Owned	Outside NCC Land
Esplanade Foreshore	17	9
Conservation	15	-
Landscape	2	1
Neighbourhood Park	-	2
None	4	11

### 2.1 Prioritisation Process

Due to the large area of the Maitai river corridor there will be many possible opportunities for potential restoration and enhancement projects. As such a method through which different areas and Enhancement Opportunities within the corridor may be prioritised was developed. The Enhancement Opportunities outlined in this document are not intended to be inclusive of all potential opportunities in the Maitai River Esplanade. Rather, they are some of the key Enhancement Opportunities identified through the resources described above. The prioritisation focuses on enhancement actions that meet the overall aim of the ERP. The Indigenous Biodiversity Ranking (Leathwick 2019) was used to identify areas of particularly high ecological value which have been included in the Enhancement Opportunities as protection areas. Additionally, ecological values were assigned using attributes from the EIANZ ecological impact assessment guidelines (Roper-Lindsay et al., 2018).

Key guidelines which have been used to prioritise Enhancement Opportunities include:

- Enhancement Opportunities with a greater number of overlapping identified drivers for enhancement are prioritised.
- Enhancement Opportunities that address specific issues and will directly support the aim of the ERP are prioritised (e.g. bank erosion).
- Protecting existing high-quality sites (high biodiversity and ecological values) has been prioritised over enhancing degraded sites.
- Enhancement Opportunities that link to existing high value sites are given a higher priority

## 2.2 Urban Zone: Haven to Clouston Bridge

Due to the high proportion of residential development in the Urban Zone, there is a limited areas of Nelson City Council owned land in this Zone. The narrow riparian river corridor is dominated by maintained lawn reserves with feature trees and the small sections of Council owned land among them have previously been identified as Enhancement Opportunities and already implemented. A substantial proportion of the riparian corridor in the Urban Zone is however included in NCC managed reserves, and a number of potential Enhancement Opportunities were identified in this area.

**Table 5: Urban Zone Enhancement Opportunities: NCC Managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Weed Control</b>					
Several weed infestation sites with high ecological and/or amenity value have been identified. These sites require weed control action to reduce the impact of pest plants on these high value areas. A detailed field survey will be performed at the described sites to guide a pest plant control plan which will include the following:					
<ul style="list-style-type: none"> <li>Species and extent of pest plants present on site</li> <li>Method through which pest plants will be controlled</li> <li>Timing of pest control efforts</li> <li>Measures with which the success of weed control will be measured</li> <li>Follow up infill planting species and methodology where appropriate</li> </ul>					
<b>Avon Tce</b>					
From 2016 Nelson Halo Weed and Vegetation data. Small number of mature pest trees and ground cover weeds.					
<ul style="list-style-type: none"> <li>Veldt grass, <i>Tradescantia</i>, periwinkle</li> <li>Bay tree, Chinese privet</li> </ul>					
	WC1	Low	0.2	Low	Esplanade Foreshore

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Nile St to Nile St East – Immediate 20 m riparian buffer</p> <p>High densities of several ground cover weeds and pest tree species on the true left bank of the river. Maitai River Esplanade walkway passes through this reach.</p> <ul style="list-style-type: none"> <li>• Old man’s beard, honey suckle, <i>Tradescantia</i>, climbing dock, ivy.</li> <li>• Privet, silver wattle, hawthorn, Bay laurel, woolly nightshade, gorse.</li> </ul>	WC2	Med	0.95	Med	Esplanade Foreshore
<p>Nile St to Nile St East – Uphill of immediate riparian buffer</p> <p>High densities of several ground cover weeds and pest tree species on the true left bank of the river. This area is further away from the river edge and the Maitai River Esplanade walkway.</p> <ul style="list-style-type: none"> <li>• Old man’s beard, honey suckle, <i>Tradescantia</i>, climbing dock, ivy.</li> <li>• Privet, silver wattle, hawthorn, Bay laurel, woolly nightshade, gorse.</li> </ul>	WC3	Low	1.78	Med	Esplanade Foreshore
<b>Enhancement Planting</b>					
<p>Sites have been identified as opportunities for potential enhancement planting and described below. A detailed field survey should be undertaken at these sites to guide a site-specific planting plan which will detail:</p>					
<ul style="list-style-type: none"> <li>• Species and size of habitat appropriate native plants, divided into site scale planting zones (i.e. stream bank, riparian)</li> <li>• Site map outlining planting zones</li> <li>• Timing of planting</li> <li>• Method and extent of pest control required</li> <li>• Methods through which the success of the planting will be measured</li> </ul>					
<p>Shakespeare Walk</p> <p>Enhancement planting for confirmed inanga spawning site. There has already been a small amount of riparian planting here, but the true right stream bank is still largely unmanaged grass. Native streambank plants should be phased in to improve spawning habitat quality.</p> <ul style="list-style-type: none"> <li>• Only small sections of this reach should be planted at once to prevent a sudden large drop in the amount of suitable inanga spawning vegetation, and all planting should provide high quality inanga habitat.</li> </ul>	EP1	High	0.15	High	Esplanade Foreshore

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Avon Tce / Domett St</p> <p>Opportunity for riparian enhancement planting along river edge. Current maintained lawn reserves have limited biodiversity value.</p>	EP14	Med	0.84	Low	Esplanade Foreshore
<b>Protection Area</b>					
<p>Areas of especially high existing indigenous biodiversity value were identified using the biodiversity rankings report (Leathwick 2019). These areas represent valuable habitat which provide steppingstones and ecological corridors throughout the Maitai Valley and should be managed to maintain existing biodiversity values, including:</p> <ul data-bbox="208 679 1021 767" style="list-style-type: none"> <li>• Fencing where appropriate</li> <li>• Protecting through covenant (or similar) where possible and appropriate</li> <li>• Providing ongoing pest plant and animal control</li> </ul>					
Domett St	PA1	Low	0.38	Med	Esplanade Foreshore

## 2.3 Recreational Zone: Clouston Bridge to Gibbs Bridge

**Table 6: Recreational Zone Enhancement Opportunities: NCC Managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Weed Control</b>					
Several weed infestation sites with high ecological and/or amenity value have been identified. These sites require weed control action to reduce the impact of pest plants on these high value areas. A detailed field survey will be performed at the described sites to guide a pest plant control plan which will include the following:					
<ul style="list-style-type: none"> <li>Species and extent of pest plants present on site</li> <li>Method through which pest plants will be controlled</li> <li>Timing of pest control efforts</li> <li>Measures with which the success of weed control will be measured</li> <li>Follow up infill planting species and methodology where appropriate</li> </ul>					
<b>Branford Park</b>					
From Contractor Survey	WC4	Med	0.24	Low	Esplanade Foreshore, Neighbourhood Park
<ul style="list-style-type: none"> <li>Old man's beard, ivy, greater bindweed, periwinkle, <i>Tradescantia</i></li> <li>Chinese privet, bay laurel, sycamore, barberry, hawthorn</li> </ul>					
<b>Hanby Park</b>					
From Contractor Survey	WC5	Med	0.22	Med	Esplanade Foreshore
<ul style="list-style-type: none"> <li>Old man's beard, <i>Tradescantia</i>, broom, gorse, barberry.</li> <li>Selective willow removal work where appropriate.</li> </ul>					
<b>Black Hole</b>					
From Contractor Survey. There is an existing contract for weed control activities in this area.	WC6	High	0.23	Med	Esplanade Foreshore
<ul style="list-style-type: none"> <li>Old man's beard, <i>Tradescantia</i>, broom, gorse, barberry.</li> <li>Selective willow removal work required.</li> </ul>					



Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Western Cricket Ground Boundary</p> <p>From Contractor Survey. Infill planting is recommended once weed control is completed.</p> <ul style="list-style-type: none"> <li>• Old man's beard, barberry</li> </ul>	WC7	Med	0.16	Low	Esplanade Foreshore
<p>Botanical Hill</p> <p>Significant infestation of vine weeds in this area. Popular walking tracks through the Botanical Hill reserve mean the area has high amenity value. This is a backstop project recommended by NCC – up to 5 years of work.</p>	WC18	Med	17.0	High	Landscape
<b>Enhancement Planting</b>					
<p>Several sites have been identified as opportunities for potential enhancement planting and described below. A detailed field survey should be undertaken at these sites to guide a site-specific planting plan which will detail:</p>					
<ul style="list-style-type: none"> <li>• Species and size of habitat appropriate native plants, divided into site scale planting zones (i.e. stream bank, riparian)</li> <li>• Site map outlining planting zones</li> <li>• Timing of planting</li> <li>• Method and extent of pest control required</li> <li>• Methods through which the success of the planting will be measured</li> </ul>					
<p>Denne's Hole / Kaka Hill Tributary</p> <p>Confluence of the Kaka Hill tributary and the Maitai River. Stabilising planting should be used to provide resilience to further erosion issues in this area. Potential to enhance existing wetland environment in this location.</p>	EP2	Med	0.21	Med	None

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Willow Removal</b>					
<p>An assessment of the following reaches of the Maitai River is undertaken to assess and geospatially map the existing extent of willows (including those established on the banks and within the channel, as well as, the location of formed debris jams).</p> <p>A willow management plan will then be developed, and implemented, that includes details and considerations of:</p> <ul style="list-style-type: none"> <li>• Control methods for willows of different ages and locations to minimise regrowth</li> <li>• Risks associated with exacerbating erosion through the control or removal of existing willows</li> <li>• Complimentary erosion mitigation measures including appropriate riparian planting, stock fencing and engineering solutions</li> <li>• Timing of control</li> <li>• Costs of control</li> <li>• Follow up infill planting species and methodology where appropriate</li> </ul>					
Black Hole	WR1	Low	0.07	Low	Esplanade Foreshore
<p>Native infill planting between existing willows has already been completed. The effects of the remaining willows on conveyance and bank erosion should be investigated, and a willow removal plan should be developed and implemented if appropriate.</p>					
Gibb's Bridge / Cricket Ground East	WR3	High	0.23	Low	Esplanade Foreshore
<p>Contractor survey reported that willows in this area are creating erosion issues and should be a priority for removal.</p>					

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Protection Area</b>					
<p>Areas of especially high existing indigenous biodiversity value were identified using the biodiversity rankings report (Leathwick 2019). These areas represent valuable habitat which provide steppingstones and ecological corridors throughout the Maitai Valley and should be managed to maintain existing biodiversity values, including:</p> <ul style="list-style-type: none"> <li>• Fencing where appropriate</li> <li>• Protecting through covenant (or similar) where possible and appropriate</li> <li>• Providing ongoing pest plant and animal control</li> </ul>					
<p>Branford Reserve</p> <p>There is an opportunity for taonga enhancement planting in the Branford Reserve / Botanical Hill area.</p>	PA2	High	0.83	High	Landscape
Branford Park	PA3	Low	0.25	Med	Neighbourhood Park
Hanby Park	PA4	Med	0.29	Med	Esplanade Foreshore. Landscape
Black Hole	PA5	Low	0.41	Low	Neighbourhood Park
Dennes Hole	PA6	Low	0.67	High	Landscape, Neighbourhood Park

**Table 7: Recreational Zone Enhancement Opportunities: Outside of NCC managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p><b>Bank Erosion</b></p> <p>Northeast Cricket Ground Boundary</p> <p>This area of bank erosion has been driven by willow growth and the resulting sediment build up shifting the main channel north, eroding the true right bank. This erosion hotspot had been investigated in 2018 and several potential corrective actions described (Christensen Consulting, 2018).</p> <p>Option A: Remove willows on true left bank and cut a channel to relocate the river to its previous alignment. The high degree of sediment accumulation makes it likely that substantial excavation will be required to dig the new channel.</p> <p>Option B: Leave current river alignment unchanged and plant a 15 m wide willow buffer on the true right bank to slow erosion. Rock groynes may be installed if additional erosion protection required. This would allow for the restoration and enhancement of willow area on the true left bank following further investigation and investment.</p> <p>An alternative option presented as part of this EMP:</p> <p>Option C (Preferred option): Regrade sections of true right bank and install rock groynes to deflect high energy flows from this side. Replant with native species selected for strong root structure including dense underplanting of <i>carex</i> species.</p>	SE1	High	0.1	Low	None

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Willow Removal</b>					
<p>An assessment of the following reaches of the Maitai River is undertaken to assess and geospatially map the existing extent of willows (including those established on the banks and within the channel, as well as, the location of formed debris jams).</p>					
<p>A willow management plan will then be developed, and implemented, that includes details and considerations of:</p>					
<ul style="list-style-type: none"> <li>• Control methods for willows of different ages and locations to minimise regrowth</li> <li>• Risks associated with exacerbating erosion through the control or removal of existing willows</li> <li>• Complimentary erosion mitigation measures including appropriate riparian planting, stock fencing and engineering solutions</li> <li>• Timing of control</li> <li>• Costs of control</li> <li>• Follow up infill planting species and methodology where appropriate</li> </ul>					
Gibbs Bridge / Cricket Ground					
<p>Contractor survey reported that willows in this area are creating erosion issues and should be a priority for removal.</p>	WR2	High	0.14	Low	None

## 2.4 Rural Recreational Zone: Gibbs Bridge to Maitai Campground

**Table 8: Rural Recreational Zone Enhancement Opportunities: NCC Managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Weed Control</b>					
Several weed infestation sites with high ecological and/or amenity value have been identified. These sites require weed control action to reduce the impact of pest plants on these high value areas. A detailed field survey will be performed at the described sites to guide a pest plant control plan which will include the following:					
<ul style="list-style-type: none"> <li>• Species and extent of pest plants present on site</li> <li>• Method through which pest plants will be controlled</li> <li>• Timing of pest control efforts</li> <li>• Measures with which the success of weed control will be measured</li> <li>• Follow up infill planting species and methodology where appropriate</li> </ul>					
Sunday Hole					
From Contractor Survey	WC8	Med	0.4	Low	Esplanade Foreshore
<ul style="list-style-type: none"> <li>• Old man's beard, greater bindweed, <i>Tradescantia</i></li> <li>• Selective willow removal where appropriate.</li> </ul>					
Almond Tree Flat					
From Contractor Survey	WC9	Med	0.4	Low	Esplanade Foreshore
<ul style="list-style-type: none"> <li>• Old man's beard, <i>Tradescantia</i></li> <li>• Selective willow removal where appropriate.</li> </ul>					
Golf Course Perimeter					
From Contractor Survey. Infill and taonga planting recommended once weed control is completed.	WC10	Med	0.86	Low	Esplanade Foreshore
<ul style="list-style-type: none"> <li>• Old man's beard, greater bindweed</li> <li>• Strawberry dogwood, grey willow</li> <li>• Selective willow removal where appropriate.</li> </ul>					

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Mahitahi Wetland</p> <p>The Mahitahi wetland was re-instated at the confluence in 2017/18 and has been enhanced through several recent planting projects. As wetlands are a rare habitat type it is important that they are protected and maintained.</p> <ul style="list-style-type: none"> <li>Investigate type and extent of weeds which may be present in the wetland.</li> <li>Apply appropriate weed control to improve likelihood of enhancement planting succeeding.</li> </ul>	WC11	High	2.2	High	Esplanade Foreshore
<b>Enhancement Planting</b>					
<p>Several sites have been identified as opportunities for potential enhancement planting and described below. A detailed field survey should be undertaken at these sites to guide a site-specific planting plan which will detail:</p> <ul style="list-style-type: none"> <li>Species and size of habitat appropriate native plants, divided into site scale planting zones (i.e. stream bank, riparian)</li> <li>Site map outlining planting zones</li> <li>Timing of planting</li> <li>Method and extent of pest control required</li> <li>Methods through which the success of the planting will be measured</li> </ul>					
<p>Waahi Taakaro Reserve</p> <p>The current grazing lease for the Waahi Taakaro Reserve expires in August 2023. Retiring this area of grazing land should be considered. Planting in this area should be prioritised to the riparian margin and establishing a 20 m riparian buffer would produce the most efficient increase in ecological values in this area.</p>	EP3	Low	1.96	Low	Esplanade Foreshore
<p>Old Nursery / Global Forest</p> <p>This small stand of exotic trees is the site of an ongoing Citizenship Planting project - Global Forest. A small tributary flow through this stand which is proposed to be fenced with stock exclusion fencing to prevent stock damaging the stream channel and hampering restoration efforts.</p>	EP4	Med	0.21	Low	Esplanade Foreshore

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Almond Tree Flat</p> <p>There is a small grazing block present here which should be considered retiring when the current grazing lease expires in August 2023. Selective willow removal and riparian planting will increase the ecological values of this area.</p>	EP5	Med	0.73	Low	Esplanade Foreshore
<p>Golf Course Drainage Channels</p> <p>Two drainage channels run through the northern end of the golf course. The golf course is a potential source of nutrient runoff to the Maitai river. Planting these channels with low growing rushes and sedges would improve their filtration ability and reduce nutrient runoff.</p>	EP6	High	0.35	Low	None
<p>Sharland's Creek Picnic Area</p> <p>The Sharland's Creek picnic area currently has limited ecological values with only maintained lawns and a small number of exotic feature trees. There is an opportunity to increase the ecological and amenity values of the picnic area by planting native taonga canopy trees.</p>	EP7	Med	0.26	Low	Esplanade Foreshore
<p>Golf Course Perimeter</p> <p>This site has been identified as a good potential area for enhancement planting during the contractor survey. Key weed species which will be controlled as part of site preparation are:</p> <ul style="list-style-type: none"> <li>• Old man's beard, greater bindweed, barberry</li> <li>• Selective willow removal as appropriate</li> </ul>	EP9	High	1.18	Low	None
<p>Mahitahi Wetland Extension</p> <p>The Mahitahi Wetland, at the confluence of Groom Creek and the Maitai River, was constructed by NCC in 2017/18. There is the opportunity to extend the existing wetland through this area which has a variety of established natives including some wetland species. Removal of existing fences and weed control required before this area is developed.</p>	EP10	High	1.31	High	Esplanade Foreshore



Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Sunday Hole</p> <p>The maintained lawn and picnic area at Sunday Hole has limited biodiversity value and could be improved through native planting.</p>	EP15	Med	11.0	Low	Esplanade Foreshore
<b>River Corridor Pines</b>					
<p>A number of production forestry pine stands are within the riparian buffer zone which offer an opportunity to improve ecological value following harvest. It is a requirement of the NES-PF that afforestation must not occur within 10 m of a perennial river with a bankfull channel width of 3 m or more (NES-PF 2017 14.3). When harvested, areas within the stream buffer should not be replanted with pines, and where possible, replaced with native species.</p>					
Almond Tree Flat – TLB approx. 150 m of pine within 10 m of river.	RP1	Low	0.04	Low	Esplanade Foreshore

**Table 9: Rural Recreational Zone Enhancement Opportunities: Outside of NCC managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Enhancement Planting</b>					
Several sites have been identified as opportunities for potential enhancement planting and described below. A detailed field survey should be undertaken at these sites to guide a site-specific planting plan which will detail:					
<ul style="list-style-type: none"> <li>• Species and size of habitat appropriate native plants, divided into site scale planting zones (i.e. stream bank, riparian)</li> <li>• Site map outlining planting zones</li> <li>• Timing of planting</li> <li>• Method and extent of pest control required</li> <li>• Methods through which the success of the planting will be measured</li> </ul>					
<b>Sharland's Creek Catchment</b>					
Upstream of its confluence with the Maitai River, Sharlands Creek is on privately owned land. There is a large area of production forestry in the Sharlands Creek catchment, and some grazing land on the valley floor. However, approximately 1.5 km of the stream have little to no vegetated riparian margin. NCC could encourage landowners in this area to plant a riparian stream buffer which would help mitigate the runoff issues associated with these land uses.	EP8	Low	1.52	Low	None
<b>River Corridor Pines</b>					
A number of production forestry pine stands are within the riparian buffer zone which offer an opportunity to improve ecological value following harvest. It is a requirement of the NES-PF that afforestation must not occur within 10 m of a perennial river with a bankfull channel width of 3 m or more (NES-PF 2017 14.3). When harvested, areas within the stream buffer should not be replanted with pines, and where possible, replaced with native species.					
Golf Course South end – TRB approx. 200 m of pine within 20 m of river.	RP2	Low	0.05	Low	None

## 2.5 Rural Zone: Maitai Campground to Maitai Dam (Gate)

**Table 10: Rural Zone Enhancement Opportunities: NCC Managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Weed Control</b>					
Several weed infestation sites with high ecological and/or amenity value have been identified. These sites require weed control action to reduce the impact of pest plants on these high value areas. A detailed field survey will be performed at the described sites to guide a pest plant control plan which will include the following:					
<ul style="list-style-type: none"> <li>• Species and extent of pest plants present on site</li> <li>• Method through which pest plants will be controlled</li> <li>• Timing of pest control efforts</li> <li>• Measures with which the success of weed control will be measured</li> <li>• Follow up infill planting species and methodology where appropriate</li> </ul>					
Smith's Ford Reserve					
From Contractor Survey	WC15	Low	0.84	High	Conservation
<ul style="list-style-type: none"> <li>• Old man's beard</li> </ul>					
Linton Hill					
This site has been previously planted. It now consists of long unmanaged grass with interspersed natives and shrubby weeds. Requires follow up weed control for gorse, broom, and blackberry	WC16	Low	0.31	Med	Conservation
<ul style="list-style-type: none"> <li>• Gorse, broom, blackberry</li> </ul>					
Coppermine Trail Access					
This area is one of the main access points to the Coppermine trail which is popular with mountain bikers and walkers. Weed control here is a priority due to the high recreational and amenity values present. Additionally, this site is a source population for the upper catchment and should be among the first treated.	WC17	High	1.18	Med	Conservation
<ul style="list-style-type: none"> <li>• Old man's beard</li> </ul>					

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p>Ned's Creek</p> <p>A planned mountain bike track will be joining the road at the Ned's Creek confluence and the increased public traffic means that this site may become a weed source population if not correctly managed.</p>	WC19	Med	0.45	Med	Conservation
<p>Caretaker Rd</p> <p>The road to the caretaker's cottage has been previously planted but a vine weed infestation is hampering canopy growth. Pest plants should be controlled to support restoration efforts.</p>	WC20	Med	7.78	Med	Conservation
<p><b>Enhancement Planting</b></p>					
<p>Several sites have been identified as opportunities for potential enhancement planting and described below. A detailed field survey should be undertaken at these sites to guide a site-specific planting plan which will detail:</p>					
<ul style="list-style-type: none"> <li>• Species and size of habitat appropriate native plants, divided into site scale planting zones (i.e. stream bank, riparian)</li> <li>• Site map outlining planting zones</li> <li>• Timing of planting</li> <li>• Method and extent of pest control required                             <ul style="list-style-type: none"> <li>– There is a known issue with goat and deer hindering restoration efforts, particularly in the upper Maitai. Additional animal exclusion fencing, and pest damage monitoring may be required to maximise the likelihood of planted natives establishing successfully.</li> </ul> </li> <li>• Methods through which the success of the planting will be measured</li> </ul>					
<p>Matai Valley Motor Camp</p> <p>Opportunity for riparian enhancement planting along edge of motor camp. Additional infill planting after willows removed.</p>	EP11	Low	0.97	Low	Esplanade Foreshore

<b>Recommendation</b>	<b>Site Code</b>	<b>Priority</b>	<b>Area (ha)</b>	<b>Existing Ecological Value</b>	<b>Reserve Type</b>
<p>Dunn Mountain Trail</p> <p>This area is a clear-felled pine stand which could be replaced with native vegetation. It is important to plant stabilising vegetation to prevent erosion bank slipping, as well as the establishment of pest species in the disturbed soils. The site backs onto further pine stands but there is an area established native forest on opposite side of river.</p>	EP12	Med	0.91	Low	Conservation
<p>Linton Hill</p> <p>The upper reaches of this tributary are forested, but there is approximately 180 m of exposed stream between forest and Maitai river. The exposed reach does not have any riparian vegetation and the unstable bank have eroded causing the stream to become severely incised. Wilding pines are beginning to colonise the grazed unforested areas.</p>	EP13	Med	0.93	Med	Conservation
<p>Dam Spillway</p> <p>There is an existing weed control contract for the area at the bottom of the Maitai Dam (ends June 2022). The managed lawns in this area have limited ecological value. Some planting of the immediate riparian margin has already occurred but this could be expanded. Initially significant weed control is required to prepare this site for planting.</p>	EP16	Med	1.48	Low	Conservation
<p><b>Protection Area</b></p> <p>Areas of especially high existing indigenous biodiversity value were identified using the biodiversity rankings report (Leathwick 2019). These areas represent valuable habitat which provide steppingstones and ecological corridors throughout the Maitai Valley and should be managed to maintain existing biodiversity values, including:</p> <ul style="list-style-type: none"> <li>• Fencing where appropriate</li> <li>• Protecting through covenant (or similar) where possible and appropriate</li> <li>• Providing ongoing pest plant and animal control</li> </ul>					
Smith's Ford Reserve	PA9	Med	0.32	Med	Conservation
Dunn Mountain Trail	PA11	Med	2	Med	Conservation

<b>Recommendation</b>	<b>Site Code</b>	<b>Priority</b>	<b>Area (ha)</b>	<b>Existing Ecological Value</b>	<b>Reserve Type</b>
Venner Reserve Stream	PA12	High	0.49	Med	Conservation
Maitai Water Reserve	PA13	High	3.18	High	Conservation
Maitai Water Reserve	PA14	High	0.89	High	Conservation
Maitai Water Reserve	PA15	High	0.95	High	Conservation

### **River Corridor Pines**

A number of production forestry pine stands are within the riparian buffer zone which offer an opportunity to improve ecological values following harvest. It is a requirement of the NES-PF that afforestation must not occur within 10 m of a perennial river with a bankfull channel width of 3 m or more (NES-PF 2017 14.3). When harvested, areas within the stream buffer should not be replanted with pines, and where possible, replaced with native species.

Maitai Valley Motorcamp – TLB across from camp, approx. 60 m or river.	RP3	Low	0.01	Low	Esplanade Foreshore
Smith's Ford Reserve – TLB approx. 250 m of river.	RP5	Low	0.05	Low	None
Smith's Ford Upstream – TLB approx. 400 m of river.	RP6	Low	0.08	Low	Conservation

**Table 11: Rural Zone Enhancement Opportunities: Outside of NCC managed Land**

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<b>Weed Control</b>					
<p>Several weed infestation sites with high ecological and/or amenity value have been identified. These sites require weed control action to reduce the impact of pest plants on these high value areas. A detailed field survey will be performed at the described sites to guide a pest plant control plan which will include the following:</p> <ul style="list-style-type: none"> <li>• Species and extent of pest plants present on site</li> <li>• Method through which pest plants will be controlled</li> <li>• Timing of pest control efforts</li> <li>• Measures with which the success of weed control will be measured</li> <li>• Follow up infill planting species and methodology where appropriate</li> </ul>					
<p>Polford Bridge</p> <p>Only known site of aluminium plant in the Maitai river corridor</p> <ul style="list-style-type: none"> <li>• <i>Tradescantia</i>, aluminium plant, old man's beard</li> </ul>	WC12	High	0.39	High	None
<p>Smith's Ford Reserve</p> <ul style="list-style-type: none"> <li>• Check required around mown area for holly plants.</li> <li>• Old man's beard</li> </ul>	WC13	Med	0.12	High	None
<p>Smith's Ford Reserve</p> <p>Forest block on the true right bank contains a stand of Matai with high ecological value.</p> <ul style="list-style-type: none"> <li>• Old man's beard, <i>Tradescantia</i></li> </ul>	WC14	High	0.32	High	None

Recommendation	Site Code	Priority	Area (ha)	Existing Ecological Value	Reserve Type
<p><b>Protection Area</b></p> <p>Areas of especially high existing indigenous biodiversity value were identified using the biodiversity rankings report (Leathwick 2019). These areas may represent valuable habitat which provide steppingstones and ecological corridors throughout the Maitai Valley and should be managed to maintain existing biodiversity values, including:</p> <ul style="list-style-type: none"> <li>• Fencing where appropriate</li> <li>• Protecting through covenant (or similar) where possible and appropriate</li> <li>• Providing ongoing pest plant and animal control</li> </ul>					
Maitai Valley Motor Camp	PA7	Low	0.81	High	None
Smith's Ford Reserve	PA8	Low	2.29	High	None
Linton Hill	PA10	Low	1.5	High	None
<p><b>River Corridor Pines</b></p> <p>A number of production forestry pine stands are within the riparian buffer zone which offer an opportunity to improve ecological values following harvest. It is a requirement of the NES-PF that afforestation must not occur within 10 m of a perennial river with a bankfull channel width of 3 m or more (NES-PF 2017 14.3). When harvested, areas within the stream buffer should not be replanted with pines, and where possible, replaced with native species.</p>					
Downstream of the Polford Bridge – TLB approx. 400 m of river.	RP4	Low	0.09	Low	None



## 2.6 Long-term 10-year Management Objectives.

In addition to the specific enhancement opportunities outlined above several long-term management objectives have been identified which will support the objective of protecting and improving the biodiversity values of the river and riparian corridor.

### 2.6.1 Riparian Enhancement

In its current state the majority of the Maitai has limited width of vegetated riparian margins. Wide densely vegetated riparian margins provide various ecosystem functions which will support the objective of protecting and improving the biodiversity values of the river and riparian corridor. Continuous riparian margins can increase habitat connectivity along the river corridor, increase the habitat quality of the freshwater environment by providing overhead shading and refugia for native fauna, and once they become established will provide seed sources which can facilitate natural dispersal of native species. In addition to the habitat values riparian vegetation can provide resilience against stream bank erosion, as well as, filtering surface runoff.

A long-term objective of the ecological restoration of the Maitai River corridor should be to achieve a functional and self-sustaining vegetated native riparian margin along the majority of the river length. Community groups, such as Friends of Maitai, are already engaged in several restoration projects along the Maitai River Esplanade and can be a valuable asset in helping achieve a fully established riparian margin. Council advocacy and funding can help encourage further community-based projects which have the added benefit of boosting environmental awareness and engagement.

Riparian buffer widths of circa 5 m are unlikely to be self-sustaining and may require replanting or ongoing weed control (Parkyn et al. 2000). Riparian margins will need to be quickly established to maximise the likelihood of establishment and minimising the risk of weed infestation. In addition to the ecological benefits of wider vegetated riparian margins, increasing vegetated riparian buffer widths has also been showing to improve contaminant filtration efficiency. Narrower buffers (5 m) have been reported to remove 50% of nitrogen (TN) and phosphorous (TP) as well as 75% of sediment runoff (Daigneault & Elliott 2017). Wide buffers of 20 m or greater have been shown to be able to remove a high (<80%) of nitrate in some instances (Fennessy & Cronk, 1997). The suggested minimum riparian buffer width is 10 - 20 m from the stream edge (Parkyn et al. 2000),

It is acknowledged that particularly in the Urban and Recreational Zones it will be difficult to establish vegetated riparian buffers of this width due to existing development (e.g. residential development and roading infrastructure), however, it is also less critical as a filtration mechanism in these zones when stormwater flows are connected by reticulated systems.

### 2.6.2 Planting Site Preparation and Maintenance

Appropriate site preparation and planting maintenance is required to ensure the highest probability of planting establishment and success. Without sufficient site preparation there is a risk that plant growth may be limited or planting may suffer high mortality rates, making it difficult to reach restoration canopy cover targets and requiring additional replacement planting. Similarly, if enhancement planting sites are not maintained there is a risk that plants may not grow at the desired rates or become overrun by invasive weeds. The nature and extent of the site preparation and maintenance required will vary from site to site due to factors such as current land use, existing pest plants, grazing damage risk, and the level of public access. For example, it is known that grazing by wild goats present in the upper Maitai Valley have previously inhibited planting efforts as they can damage planted saplings, and additional fencing of planting areas should be considered in this area. Details on site-specific preparation and

maintenance measures should be included in site-specific enhancement plans to be approved before enhancement works begin.

### 2.6.3 Pest Plant and Animal Control

In addition to the weed control Enhancement Opportunities identified in this Plan, it is important that a holistic pest management strategy is engaged for the entire Maitai River catchment. Many pest plant species can be quickly transported to other areas of the catchment by watercourse, animal, human, or other vectors. As such it is crucial that effective pest monitoring programs are in place to quickly identify pest species as they arrive in the catchment. Rapid response to new pest populations and adaptable pest management strategies will reduce the likelihood of populations becoming established and creating long term issues.

Due to the substantial area of production forestry in the Nelson Region, wilding pines have become an issue in the surrounding area, including the Maitai River Valley. Wind dispersed wilding pines are able to quickly establish into areas without existing dense native forest cover, including tussock grasslands, and low growing / regenerating forests, and scrubland. Pines can also be an issue within native forests where they compete for space with native species and their needles create an acidic carpet which inhibits the growth of native ground cover and understory species. Moreover, the ecological values provided by exotic conifers are substantially less than those of native canopy species, as they do not provide food sources for native birds or insects. Individual pines can be controlled through hand pulling of saplings or by felling / ring barking when they are larger. Community volunteer groups can be especially effective at controlling juvenile conifer saplings. Aerial foliar application of herbicide is an effective method of controlling established dense conifer forests, but non-targeted herbicide application has other associated issues and there is a risk that non-target species may be affected.

Introduced animal pests pose a threat to both New Zealand's native fauna and flora. Rats, mustelids, feral cats, and possums are all effective predators to which many native bird species are not well adapted to deal with. The lack of familiarity with mammalian pests and vulnerable nesting behaviour meant that native birds have been especially hard hit by these introduced predators. Animal trapping networks have been shown to be effective at reducing pest numbers and several projects are already in operation, managed by NCC, Iwi, and community groups among others. Poison bait stations can also be used and are a good option in areas where frequent trap checking is impractical due to difficult access or terrain. Herbivorous pests such as feral goats, deer, possums, and rabbits / hares are an issue in the rural upstream areas of the Maitai River Valley where they can damage native seedlings and make native forest regeneration difficult. Goats in particular are known to be an issue for enhancement planting in the Rural Zone. Exclusion fencing will help mitigate the impacts of grazing animals on restoration sites, but population control is also important. In this respect recreational hunters can provide a useful function by reducing the number of these pests present in the region.

### 2.6.4 Retiring Grazing Land and Production Forestry

There is a large area of grazing land and plantation forestry adjacent to the Maitai river in the Rural Recreational and the Rural Zone. The biodiversity and ecosystem function provided by these land uses is less than established native forest. Where possible these land uses should be retired from the river corridor and replaced with native vegetation. This may not be immediately possible, but as grazing leases expire or pine stands are harvested, it should be strongly considered. It should also be recommended to private owners with land adjacent to the Maitai river that they consider planting the stream banks and riparian margin with native species. If planting is not practical at a site, then at a minimum, stock exclusion fencing should be installed to prevent stock from entering tributaries to the

Maitai and increasing sediment runoff. Funding, advocacy, regulatory, or other measures could be used to promote this.

Grazing pasture, pine plantations, and the Waahi Taakaro golf course have limited vegetation ground cover which means that any fertilizer not absorbed in the application area is likely to runoff into the watercourses. Effluent runoff from adjacent farmland is another source of nutrients to the freshwater environment. This can lead to eutrophication issues in the river which can contribute to algal and macrophyte blooms. Toxic *Phormidium* cyanobacteria in particular have been an ongoing issue in the Maitai River.

A two-pronged strategy is crucial in dealing with eutrophication and sedimentation issues. Foremost the sources of excess nutrient and sediment runoff must be investigated and mitigated through means such as education programmes and enforcement. This will involve encouraging and enforcing reduced and more targeted application of fertilizers for use in plantation forestry, agriculture, and reserve management. Secondly, appropriate riparian planting has the ability to partially filter and prevent excess nutrient and sediment runoff from reaching the watercourse. Riparian enhancement as described above (2.6.1) is also a potential tool for reducing nutrient runoff. Where riparian planting is not feasible streams should at a minimum be protected with stock exclusion fencing. Stock can damage stream banks increasing erosion, sedimentation, and effluent nutrient runoff.

### 2.6.5 Stream Bank Erosion

Stream bank erosion had been identified as a high priority issue by Nelson City Council. Only one area of severe erosion had been identified on the Maitai River, specifically in the Recreational Zone on the true right bank upstream of Dennes Hole. A stream field survey was not in the scope of this ERP, so it is not possible to confirm that there are no additional areas with ongoing erosion or at-risk stream banks. If any further reaches with erosion issues are identified, a combination of soft engineering tools and riparian planting should be implemented to remediate these areas. Appropriate riparian planting is a tool through which banks can be stabilised and reduce the risk of stream bank erosion in future, but as a short-term solution are not effective at preventing stream banks that are already highly incised or undercut from collapsing when still responding to upstream hydrological changes. In these instances, riparian planting will need to be supported by additional soft engineering tools.

### 2.6.6 Above the Maitai Dam

Upstream of the Maitai Dam lies one of the largest native forest remnants in the Nelson Region. Other than the small area of production forestry and previously cleared land now dominated by gorse and broom around the Maitai River South Branch, the area is dominated by old growth forest. The scope of this ERP was focused on the Maitai River corridor, particularly in council managed land, downstream of the Dam. Therefore, no specific Enhancement Opportunities have been identified above the Maitai Dam, but it is important to consider the entire catchment for regional management strategies. Scaling back production forestry, restoring disturbed areas of the native bush, and controlling pest animals will help achieve the desired outcomes of the ERP. Other opportunities previously mentioned in this report, such as animal and plant pest control, are also important in the greater catchment.

The Maitai River North Branch and valley to the Maungatapu Saddle is culturally significant for local Iwi as this was the main access route between Nelson and the Te Hoiere / Pelorus River and Pelorus Sound. The Pelorus catchment has recently been identified as an exemplar catchment as part of the Ministry for the Environment's At Risk Catchments programme and been allocated significant funding for restoration and enhancement. There is an opportunity to collaborate with the Marlborough Regional Council to create a corridor of high-quality ecological habitat between the two regions.

## 2.6.7 Water Sensitive Design

Increases in impervious surfaces and associated stormwater discharges have the potential to alter hydrology resulting in increased peak flow discharges and potential increased stream erosion and associated effects on water quality, habitat and fauna. The increases in impervious surfaces also has the potential to adversely impact water quality through the generation and transport of contaminants to the receiving environment. The potential adverse hydrological and water quality effects of development can be mitigated through integrating water sensitive design principles into the planning and design of urban development within the catchment draining to the Maitai. Where appropriate these tools should be incorporated into the designs of new developments (Greenfield) as well as re-development (Brownfield). Council advocacy and regulatory tools could support these desired outcomes and will require Council to work closely with developers and their agents. This is both a requirement of the RMA/NPS-FM and will enable Council to meet their future requirements under these legal policies.

Whilst a private plan change or resource consent application has not been submitted to council at the time of writing the ERP, the proposed development at Kaka Hill will likely result in stormwater discharge to the Kaka hill tributary. The Kaka Hill tributary flows into the Maitai River at Dennes Hole. The stormwater management adopted by the proposed development should be required to adopt water sensitive design principles to mitigate the potential adverse hydrological and water quality effects on the tributary and main stem. This may include the use of constructed wetlands, raingardens and inclusion of rainwater tanks connected to reuse. Water quality and flow objectives and provisions to achieve these desired outcomes could be adopted through a private plan change.

There is also an opportunity to further enhance an area of wetland along the Kaka Hill tributary within the vicinity of the confluence with the Maitai River confluence, possibly integrated with the ecological enhancement and/or stormwater management aspirations of the proposed Kaka hill development (noting that the wetland likely covers both private and council managed land).

The further enhancement of the wetland could be integrated with the ecological enhancement and/or stormwater management aspirations of the proposed Kaka hill development.

## 2.6.8 Educational Opportunities

The Maitai River has a long cultural history. The regions Tangata Whenua, the Te Taihu, valued the Nelson region for its seasonal fisheries, fertile soils, and quality argillite geology which was worked into stone tools. The stories of the Maitai Valley can be told and carried forward through art installations, display boards, or other exhibits at key and/or popular locations. New enhancement planting sites are a great educational opportunity where displays can tell the story of the planting process and developing vegetation. Ecological values can also be incorporated into these displays. For example, art installations may also act as "fish hotels" by providing instream refugia for native freshwater animals.

### 3. Summary

The Maitai River and riparian corridor is an area with significant ecological and cultural values in the Nelson Region. The river meanders through the Maitai valley before flowing through the Nelson city centre into the Nelson haven estuary. The upper Maitai valley is still representative of the old-growth forest that was historically dominant in the area, but nearer the urban centre of Nelson City the proportion of modified land use increases. Nelson Council owns a substantial proportion of the Maitai River margin (~40% % of the 15.3 km long 40 m wide riparian corridor, predominantly in the Rural Recreational and Rural Zones) which represents an opportunity for NCC to protect and enhance the biodiversity values of the river and the riparian corridor.

The overall objective of the ERP is to guide restoration efforts to protect and enhance the biodiversity values of the river and the riparian corridor. This ERP details priority Enhancement Opportunities and guidance on how the Maitai River Esplanade may be managed to meet this objective. Effective use of Council resources guided by the priority schedule in this report, in combination with engaging community groups and developers, will support the objective of the ERP. Each of the four Management Zones outlined have different composition of land uses, pressures and opportunities. The Enhancement Opportunities listed in this report reflect these differences.

The ERP provides a work programme which can be used by Council's contract managers and contractors to achieve operational goals for maintaining and restoring the riparian corridor along the Maitai river. Additional Enhancements Opportunities have also been identified outside of council managed land which further support the objective of protecting and enhancing the ecological values of the river corridor. For these additional Enhancement Opportunities Council may be able to support implementation through a variety of means including, funding, advocacy, and regulatory tools. Furthermore, the high level of public access to a large proportion of the Maitai River Esplanade will enhance community engagement with restoration actions and allow for educational and storytelling opportunities.

A total of 61 Enhancement Opportunities covering 77 hectares have been described in this ERP. Thirty-three of these Enhancement Opportunities are on NCC managed land. The majority of Enhancement Opportunities are weed control, enhancement planting and protection actions.

Weed control actions are focused on reducing the impact of pest plants on high value areas. A detailed field survey is required at these sites to guide development of pest control plans. Similarly, enhancement planting sites require a detailed field survey to enable the development of site-specific planting plans.

Areas of high existing indigenous biodiversity value were identified using the biodiversity rankings report (Leathwick 2019). These areas represent valuable habitat which provide steppingstones and ecological corridors throughout the Maitai Valley and should be managed to maintain existing biodiversity values, including through pest control, fencing, and protecting through covenant (or similar) where possible and appropriate.

Three areas of willow control are recommended for further investigation. An assessment of the of these areas is recommended to geospatially map the existing extent and impacts of the willows. A willow management plan should then be developed and implemented. An area of bank erosion, located on the true right bank Northeast of the Cricket Ground Boundary, has been caused by willow growth and the resulting sediment build up shifting the main channel north. This erosion has been investigated in 2018 and several potential corrective actions described (Christensen Consulting, 2018).

In addition to the specific Enhancement Opportunities outlined in the ERP, several long-term management objectives have been identified which support the objective of protecting and improving the biodiversity values of the river and riparian corridor. The enhancement planting opportunities

identified in the ERP are not intended to be inclusive of every possible opportunity in the Maitai River Esplanade. A long-term objective of the ecological restoration of the Maitai River corridor should be to achieve a functional and self-sustaining vegetated native riparian margin along the majority of the river length. Where possible grazing land and production forestry should be retired from the river corridor and replaced with native vegetation. Ongoing council actions and advocacy can support this long-term goal. Finally, it is recommended that NCC use a combination of advocacy, regulatory and policy tools to ensure potential hydrological and water quality effects from future development are appropriately managed in line with the RMA/NPS-FW. This should include provisions to achieve desired outcomes being adopted through private plan changes.

Monitoring the progress and effectiveness of enhancement work is important to demonstrate efficient use of resources and funding, while also allowing for adaptive management actions to be implemented where needed. The monitoring table provided in this report (Appendix 2) provides a high-level framework through which this could be achieved. Developing a geospatial database to support monitoring will greatly increase the efficiency, usability and communication of monitoring information to various Council and external parties. It is also recommended that a more detailed monitoring plan be developed which details specific monitoring methods, locations and auditing and reporting requirements.

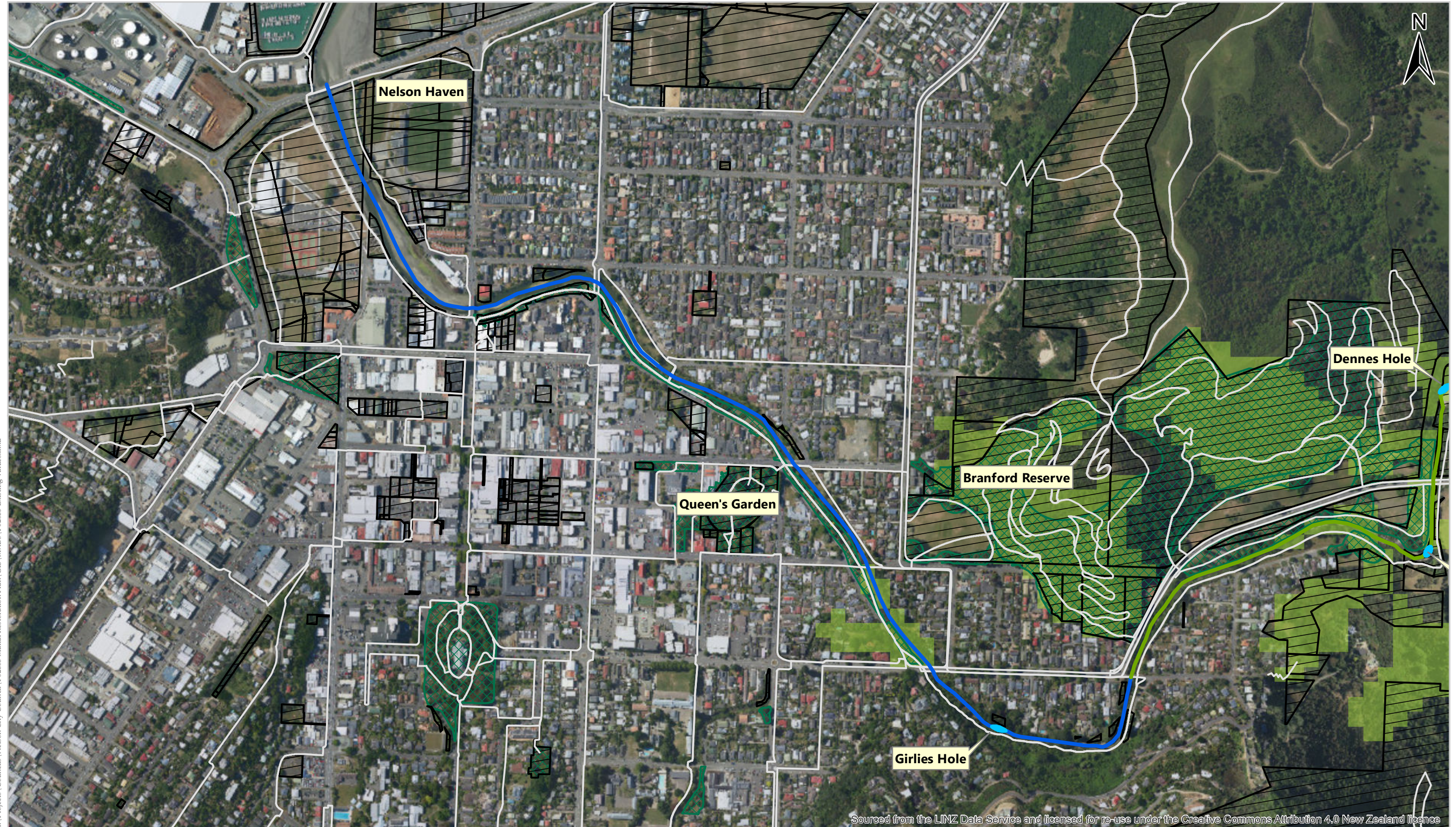
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## Appendix 1 Existing Value and Enhancement Opportunity Maps



# MAITAI RIVER RESTORATION PLAN - URBAN ZONE: EXISTING VALUES



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<b>Maitai River</b>		
Urban Zone	Nelson Terrestrial Biodiversity Ranking (top 30%) (Leathwick 2019)	NCC Owned Land
Recreational Zone	Heritage Woodlands	Tracks
Rural Recreational Zone		Swimming Holes
Rural Zone		

Client	<b>NELSON CITY COUNCIL</b>	Project no.	P02534
Project	<b>MAITAI RESTORATION PLAN</b>	Date	22 Jun 2020
		Drawn	CU
		Approved	ML

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# MAITAI RIVER RESTORATION PLAN - URBAN ZONE: ENHANCEMENT OPPORTUNITIES



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## Maitai River

- Urban Zone
- Recreational Zone
- Rural Recreational Zone
- Rural Zone

## Enhancement Opportunities

- Weed Control
- Enhancement Planting
- Significant Erosion
- Willow Removal
- River Corridor Pines
- Protection Area

Client **NELSON CITY COUNCIL**  
 Project **MAITAI RESTORATION PLAN**

0 250 500 m

Project no. P02534  
 Date 14 Aug 2020  
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# MAITAI RIVER RESTORATION PLAN - RECREATIONAL ZONE: EXISTING VALUES



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<b>Maitai River</b> <span style="color: blue;">—</span> Urban Zone <span style="color: green;">—</span> Recreational Zone <span style="color: purple;">—</span> Rural Recreational Zone <span style="color: yellow;">—</span> Rural Zone		Nelson Terrestrial Biodiversity Ranking (top 30%) (Leathwick 2019) Heritage Woodlands	NCC Owned Land — Tracks Swimming Holes	Client <b>NELSON CITY COUNCIL</b> Project <b>MAITAI RESTORATION PLAN</b> Project no. P02534 Date 22 Jun 2020 Drawn CU Approved ML
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# MAITAI RIVER RESTORATION PLAN - RECREATIONAL ZONE: ENHANCEMENT OPPORTUNITIES



Code	NCC Land	Priority	Reserve Type
EP2	Yes	Med	None
PA2	Yes	High	Landscape
PA4	Yes	Med	Esplanade Foreshore, Landscape
WC6	Yes	High	Esplanade Foreshore
WC7	Yes	Med	Esplanade Foreshore
WR1	Yes	Low	Esplanade Foreshore
WR3	Yes	High	Esplanade Foreshore
PA3	No	Low	Neighbourhood Park
PA5	No	Low	Neighbourhood Park
PA6	No	Low	Landscape, Neighbourhood Park
SE1	No	High	None
WC4	No	Med	Esplanade Foreshore, Neighbourhood Park
WC5	No	Med	Esplanade Foreshore
WC18	Yes	Med	Landscape
WR2	No	High	None



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### Maitai River

- Urban Zone
- Recreational Zone
- Rural Recreational Zone
- Rural Zone

### Enhancement Opportunities

- Weed Control
- Enhancement Planting
- River Corridor Pines
- Protection Area
- Significant Erosion
- Willow Removal

Client **NELSON CITY COUNCIL**  
 Project **MAITAI RESTORATION PLAN**

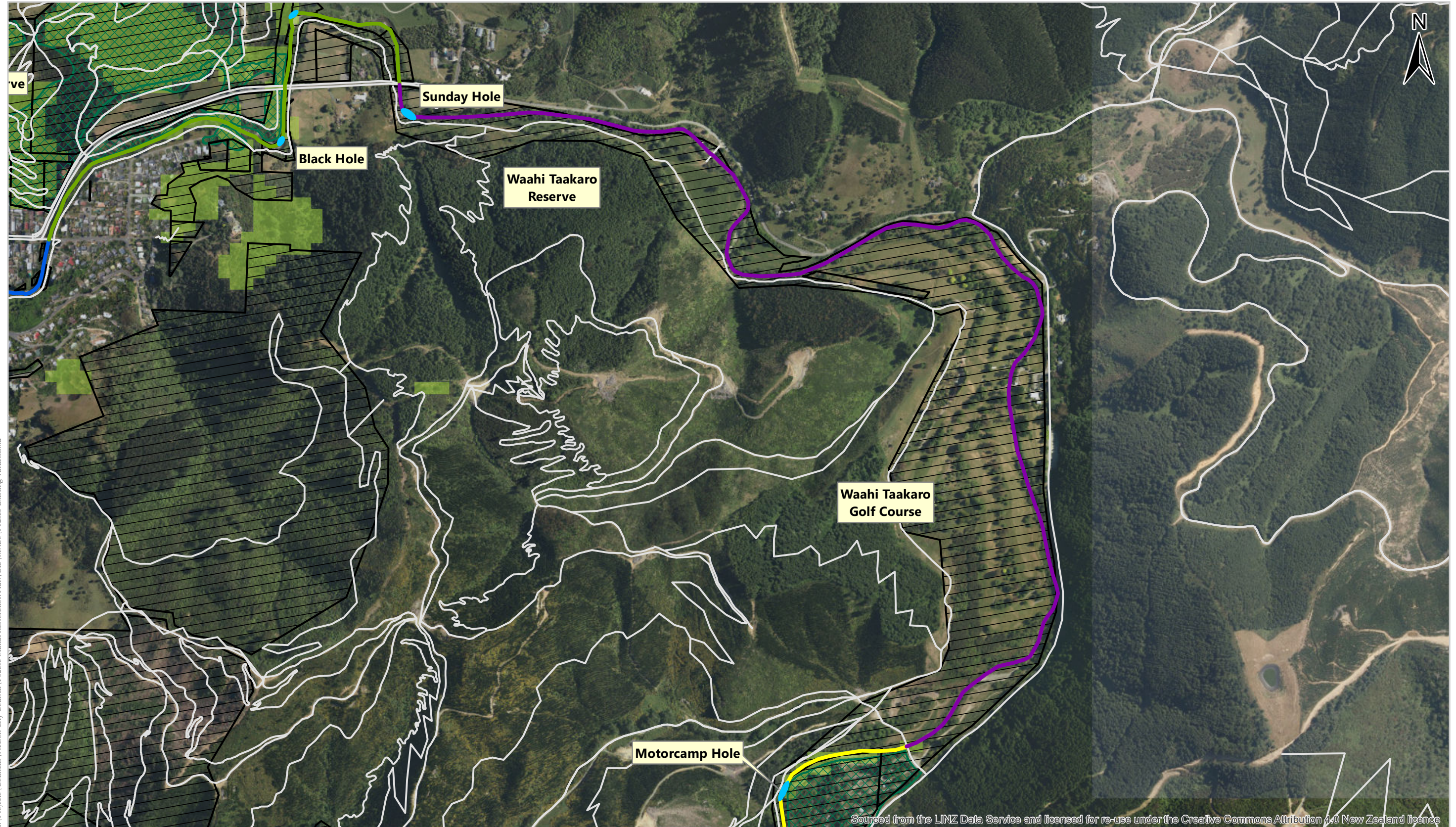
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# MAITAI RIVER RESTORATION PLAN - RURAL RECREATIONAL ZONE: EXISTING VALUES



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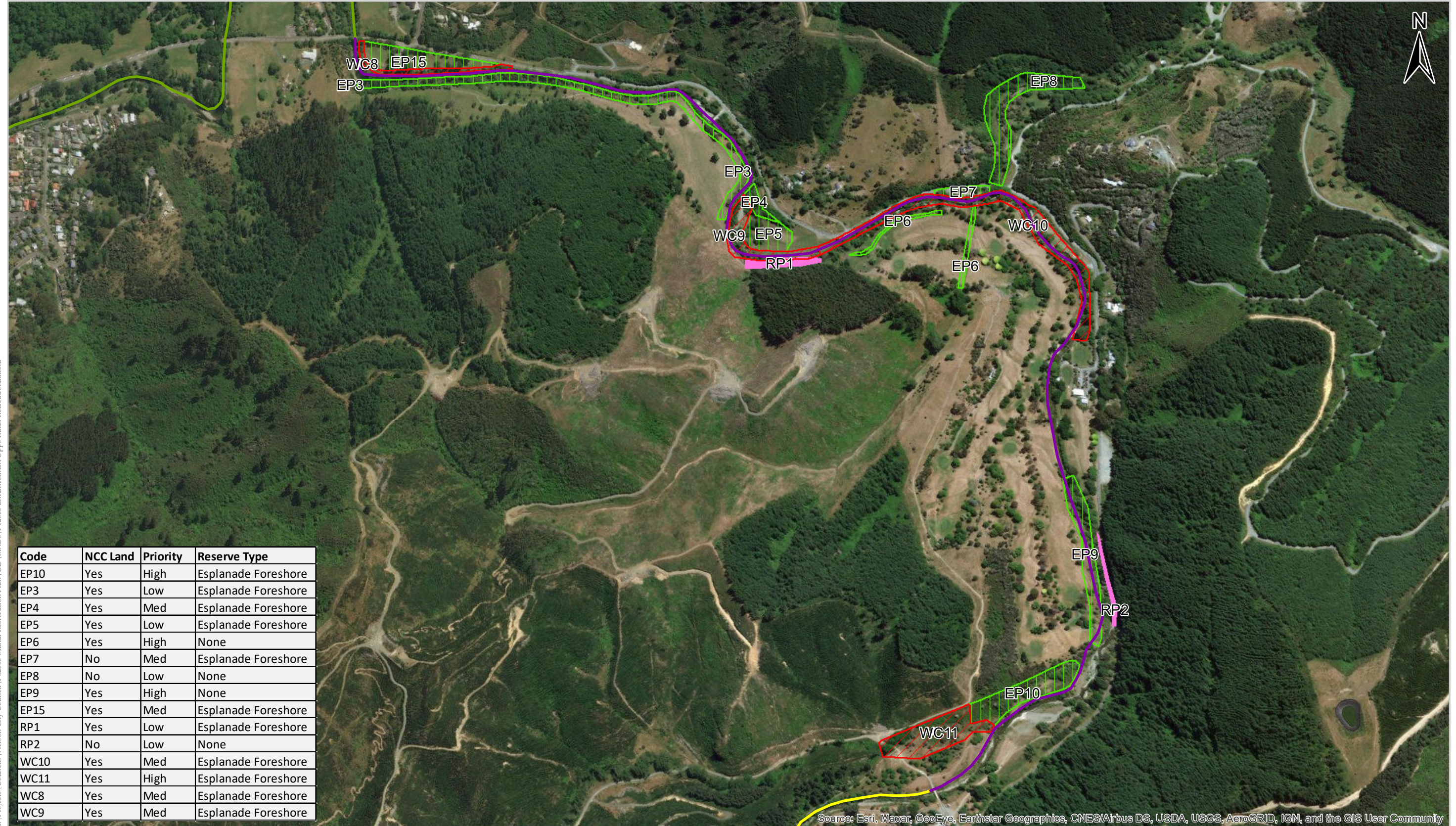
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- |                         |  |                |
|-------------------------|--|----------------|
| <b>Maitai River</b>     | Nelson Terrestrial Biodiversity Ranking (top 30%) (Leathwick 2019) | NCC Owned Land |
| Urban Zone              | Heritage Woodlands   | Tracks         |
| Recreational Zone       |  | Swimming Holes |
| Rural Recreational Zone |  |                |
| Rural Zone              |  |                |

Client	<b>NELSON CITY COUNCIL</b>	Project no.	P02534
Project	<b>MAITAI RESTORATION PLAN</b>	Date	22 Jun 2020
		Drawn	CU
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# MAITAI RIVER RESTORATION PLAN - RURAL RECREATIONAL ZONE: ENHANCEMENT OPPORTUNITIES



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Code	NCC Land	Priority	Reserve Type
EP10	Yes	High	Esplanade Foreshore
EP3	Yes	Low	Esplanade Foreshore
EP4	Yes	Med	Esplanade Foreshore
EP5	Yes	Low	Esplanade Foreshore
EP6	Yes	High	None
EP7	No	Med	Esplanade Foreshore
EP8	No	Low	None
EP9	Yes	High	None
EP15	Yes	Med	Esplanade Foreshore
RP1	Yes	Low	Esplanade Foreshore
RP2	No	Low	None
WC10	Yes	Med	Esplanade Foreshore
WC11	Yes	High	Esplanade Foreshore
WC8	Yes	Med	Esplanade Foreshore
WC9	Yes	Med	Esplanade Foreshore

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**Maitai River**

- Urban Zone
- Recreational Zone
- Rural Recreational Zone
- Rural Zone

**Enhancement Opportunities**

- Weed Control
- Enhancement Planting
- Significant Erosion
- Willow Removal
- River Corridor Pines
- Protection Area

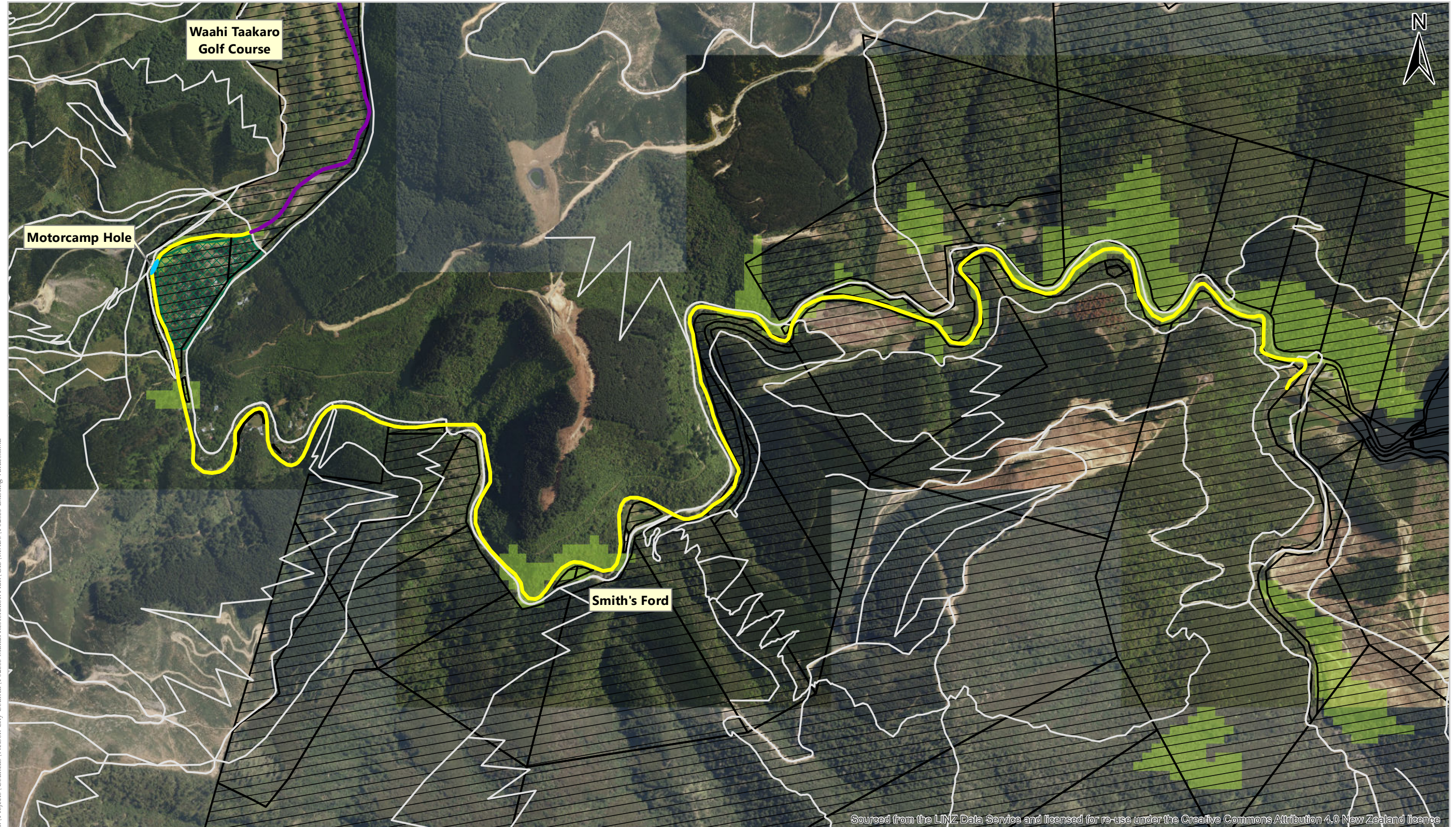
Client **NELSON CITY COUNCIL**  
 Project **MAITAI RESTORATION PLAN**

0 275 550 m

Project no. P02534  
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# MAITAI RIVER RESTORATION PLAN - RURAL ZONE: EXISTING VALUES



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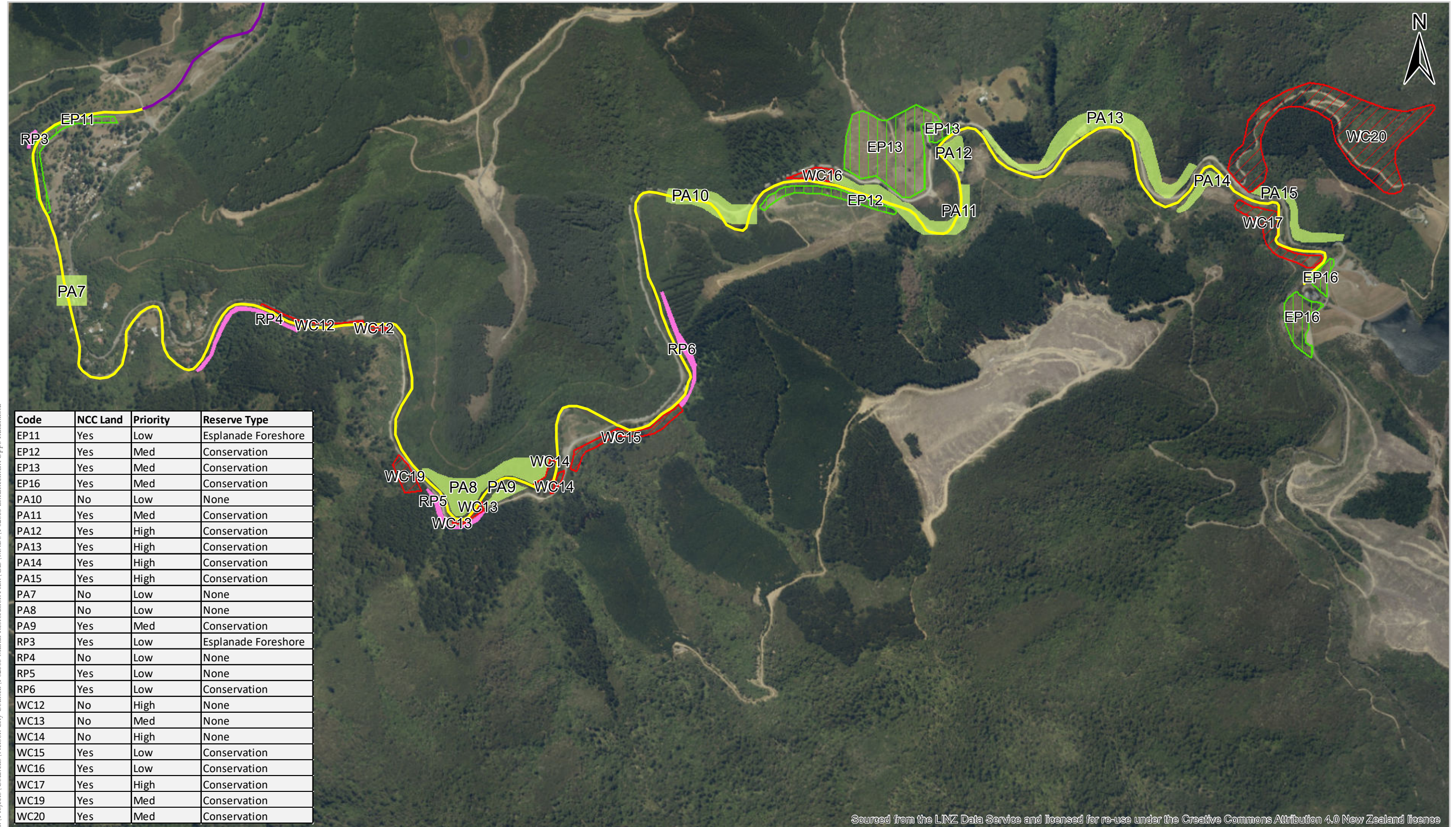
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<b>Maitai River</b> <span style="color: blue;">—</span> Urban Zone <span style="color: green;">—</span> Recreational Zone <span style="color: purple;">—</span> Rural Recreational Zone <span style="color: yellow;">—</span> Rural Zone		<span style="background-color: lightgreen; border: 1px solid black; display: inline-block; width: 20px; height: 10px;"></span> Nelson Terrestrial Biodiversity Ranking (top 30%) (Leathwick 2019) <span style="background-color: white; border: 1px solid black; display: inline-block; width: 20px; height: 10px; border-style: dashed;"></span> Heritage Woodlands	<span style="background-color: white; border: 1px solid black; display: inline-block; width: 20px; height: 10px; border-style: dashed;"></span> NCC Owned Land — Tracks <span style="background-color: blue; display: inline-block; width: 20px; height: 10px;"></span> Swimming Holes	Client <b>NELSON CITY COUNCIL</b> Project <b>MAITAI RESTORATION PLAN</b> Project no. <b>P02534</b> Date <b>22 Jun 2020</b> Drawn <b>CU</b> Approved <b>ML</b>
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# MAITAI RIVER RESTORATION PLAN - RURAL ZONE: ENHANCEMENT OPPORTUNITIES



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**Maitai River**

- Urban Zone
- Recreational Zone
- Rural Recreational Zone
- Rural Zone

**Enhancement Opportunities**

- Weed Control
- Enhancement Planting
- Significant Erosion
- Willow Removal
- River Corridor Pines
- Protection Area

Client **NELSON CITY COUNCIL**

Project **MAITAI RESTORATION PLAN**

Project no. P02534  
Date 14 Aug 2020

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## Appendix 2 Enhancement Success Monitoring Table

Table 12 outlines the main objective associated with the Enhancement Opportunity type, a summary of the actions proposed to achieve that objective, the evidence requirements to demonstrate success, and the measures of success. The high-level monitoring framework outlined in Table 12 is intended to apply to Enhancement Opportunities on council managed land to demonstrate success of the application of the ERP. Enhancement Opportunities outside of NCC managed land may be supported by council through a variety of means, however, council control over the success of enhancement of privately-owned land is less certain.

Developing a geospatial database to support monitoring will greatly increase the efficiency, usability and communication of monitoring information to various Council and external parties. It is also recommended that a more detailed monitoring plan be developed which details specific monitoring methods, locations and auditing and reporting requirements.

**Table 12: Enhancement Success Monitoring Measures**

Objective	Enhancement Actions	Evidence	Measure of Success
<p><b>Weed Control.</b></p> <p>Protect and enhance native vegetation and wildlife habitat through an ongoing targeted programme of weed control.</p>		<p>Initial weed survey assessments completed at high priority sites. (location and abundance of weeds and pest plant species).</p> <p>Follow-up annual weed surveys</p>	<p>Weed abundance and distribution recorded in high priority sites demonstrates progressive decline over a 5-year period.</p>
	<p>Develop detailed weed and pest plant control plans plan, including location map, weed species list, control actions and timeline, and photo point(s) for each weed control site on Council managed land.</p>		<p>Weed and pest plant control plans completed, and control initiated within the time frames outlined for each weed control site outlined in the ERP on council managed land.</p>

Objective	Enhancement Actions	Evidence	Measure of Success
	Undertake weed control - herbicide application/ physical removal. Apply adaptive management as required, taking note of any new pest species that are identified within the Maitai River Esplanade and adjusting control actions where appropriate.	Record weed control effort and herbicide usage for each site	Annual effort and amount of herbicide used decreases over time.
		Establish photo points at key locations and take photos at least annually.  Photo point locations and photos can be captured in a geospatial database and made available to council staff, contractors and/or the public to demonstrate successful change over time.	Photo points show reduction in weed and pest plant cover over time.
<p><b>Enhancement Planting.</b></p> Enhance native vegetation abundance, structure and diversity by revegetation / enhancement planting in appropriate locations.	Develop detailed planting plan including location map, species list, and photo point(s) for each enhancement planting site on Council managed land.  Undertake enhancement planting.	Track staging of enhancement planting status (for sites on council managed land) in a geospatial database that can be made available to council staff, contractors and/or the public to demonstrate successful change over time.	Planting plans completed and enhancement planting initiated within the time frames outlined for each enhancement planting site outlined in the ERP on council managed land.

Objective	Enhancement Actions	Evidence	Measure of Success
	Carry out regular planting maintenance and monitoring. Apply adaptive management as required, for example: reconsidering species selection if certain species fail to establish, undertake animal pest control is hindering plant establishment.	Geospatial database of maintenance activities performed, plant damage and replacement, pest control, and canopy.	75% canopy closure achieved 5 years after planting 90% survival of planted vegetation.
		Carry out annual photo point monitoring.  Photo point locations and photos can be captured in a geospatial database and made available to council staff, contractors and/or the public to demonstrate successful change over time.	Changes in vegetation and successful establishment of plantings clearly shown in photo points and through regular visits.
<p><b>Willow Removal</b></p> <p>Identify and remove willows which are creating stream bank erosion and debris jam issues.</p>	Perform river corridor willow survey.	Geospatial database identifying willows in the Maitai River Esplanade, highlighting willows creating erosion issues and including control techniques and timing.	Survey of areas identified for willow survey completed within timeframe specified in this ERP
	Undertake removal of willows creating erosion and debris jams.	Geospatial database of willow control actions	Control and/or removal of willows identified in the survey within the time frames specified.  Successful control and removal demonstrated through follow up survey one year following control and additional control undertaken as required.

Objective	Enhancement Actions	Evidence	Measure of Success
<p><b>Existing High Biodiversity Value Areas (Protection Areas)</b></p> <p>Maintain biodiversity values in locations of existing high biodiversity value (identified as protection areas in the ERP)</p>	<p>Ongoing pest plant and animal control within areas identified as protection areas in the ERP.</p>	<p>Geospatial database of pest control activities performed, and fencing installed within existing high biodiversity areas.</p>	<p>Ensure a pest plant and animal control plan is developed and implemented for each of the protection areas identified on council managed land within the time frames outlined in the ERP for each site.</p>
		<p>Initial weed survey assessments completed at high priority sites. (location and abundance of weeds and pest plant species).</p> <p>Follow-up annual weed surveys</p> <p>Record weed control effort and herbicide usage for each site</p> <p>Monitoring of pest animal populations</p>	<p>Weed abundance and distribution recorded in high priority sites demonstrates progressive decline over a 5-year period.</p> <p>Annual effort and amount of herbicide used decreases over time.</p>
	<p>Providing covenant protection (or similar) and fencing where possible and appropriate.</p>	<p>Increase in land covered by covenant (or similar) protections.</p>	<p>Undertake an assessment of protection options and fencing requirements for each of the protection areas identified on council managed land within time frames outlined in the ERP for each site.</p> <p>Progressively work towards achieving the protection and/or fencing goals.</p>
	<p>NCC to take a proactive approve to protection areas identified on council land and an advocacy and support role to seeking outcomes for privately owned land.</p>		