Tiakina te Taiao

A MANAGEMENT PLAN FOR LEE VALLEY

A Tangata Whenua Perspective

November 2009

A Management Plan for Lee Valley; A tangata whenua perspective

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Waimea Water Augmentation Committee

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Recommended citation:
Walker D P, 2009. A Management Plan for Lee Valley; A tangata whenua perspective. Prepared for Tiakina te Taiao Ltd and Waimea Water Augmentation Committee. Tiakina te Taiao occasional report.

A MANAGEMENT PLAN FOR LEE VALLEY:

A Tangata Whenua Perspective

Toitü te marae o Tangaroa
Toitü te iwi
If the domain of Tane survives to give sustenance
and the domain of Tangaroa likewise remains
So too will the people.[1]

Acknowledgments

Kia ora koutou
Ko Hiwipango te maunga
Ko Waimeha te awa
Ko Tainui mei Tokomaru mei Kurahaupo nga waka
Ko Ngäti Rarua, mei Te Atiawa, mei Ngäti Tama, mei Ngäti Koata, mei Ngäti Kuia nga iwi
Ko Te Awhina mei Whakatu nga marae

E nga uri o Ranginui raua ko Papatuanuku. Nga Atua kaitiaki:

- Tangaroa
- Tawhirimatea
- Haumietiketikie
- Tane Mahuta
- Rongomatane
- Tumatauenga

I would like to thank many people for their input and assistance in the preparation of this report, in particular the Tiakina te Taiao working party, these being Pat Park, Mel McColgan, Hori Kahukura, Daren Horne, Justin Kere and Moetu Stephens. Thanks to Cherie Tawhai for research and administrative assistance. Also thanks to Sally Marx, Joseph Thomas and Damian Velluppillai.

na Dean Walker
for Tiakina te Taiao

[1] B James (1993, p6)

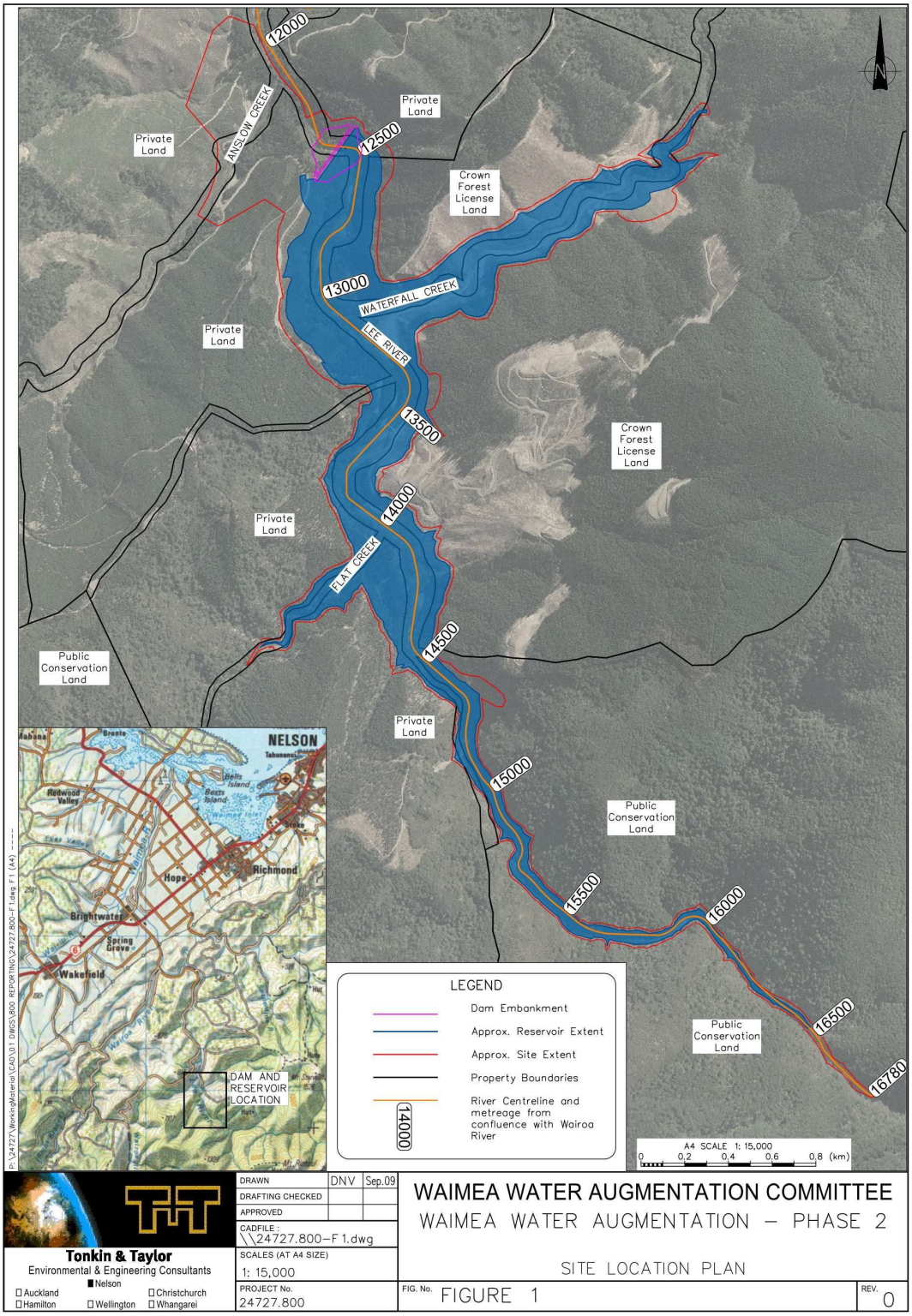
1 Introduction

In March 2006 a document titled *A Cultural Impact Assessment; Part of the feasibility study into a Proposed Waimea Water Augmentation Scheme* was prepared by Nelson Iwi Resource Management Advisory Komiti on behalf of tangata whenua ki Waimea (Walker, 2006). It was prepared as part of the Waimea Water Augmentation Committee Phase 1 investigations into the feasibility of a water storage dam in the Waimea catchment (See Map 1 for location of study area and proposed dam). The purpose of the scheme is to augment flows in the Waimea River for irrigation, community supply and ecological purposes. The cultural impact assessment documented the potential effects of the proposed water augmentation scheme on the values of Tangata Whenua. It also made recommendations for change and included responses from the Waimea Water Augmentation Committee to the requests made by Tangata Whenua.

At the time of the preparation of the cultural impact assessment two shortlisted sites were identified as meeting the design criteria from an initial 18 sites. These sites were Site 11, Upper Lee Valley and Site 15, Eastern Branch of the Wairoa River. Cognizance of these two sites was taken during the development of the cultural impact assessment. The outcome of Phase 1 of the feasibility study was that the Upper Lee Valley site was finally settled upon as best meeting the design criteria.

A working party was established by Tiakina te Taiao to carry out the work programme. This document was prepared and the work managed by Dean Walker on behalf of Tiakina te Taiao for the Waimea Water Augmentation Committee. This was in response to recommendations made in the cultural impact assessment relevant to Phase 2 of the feasibility investigations. Of the 14 recommendations made in CIA during Phase 1, this programme of work and document covers seven. (Of the other seven, others will need to be

implemented at later phases of the overall project, or may not be necessary to follow up).



The work programme and resulting document covered the following items in roughly the order they were carried out. These are explored further in the relevant chapters.

1.1 Taonga Survey

The taonga survey focused on native trees that may be able to be salvaged from the inundated area behind the dam (the footprint area). Other plants, stone (particularly argillite), birds, fish and archaeological evidence was also noted. Data was then inputted into Tiakina te Taiao's GIS. This was updated a number of times as the location of the dam, reservoir levels and dam footprint changed and other information came to light.

1.2 Biodiversity Restoration and Management

This chapter outlines desires and opportunities identified by the Tiakina te Taiao working party for the management of taonga within the vicinity of the reservoir along with a brief discussion of each.

1.3 Harvest Plan

A harvest plan for the removal or transfer of native trees and other taonga was developed including possible access and skid site locations. The relevant permit process required by the Ministry of Forestry as per the Forest Amendment Act, 1993 is also outlined.

1.4 Potential Public Access

A map was produced identifying areas of existing legal public access to the Lee River and Richmond Forest Park as well as options for continued access to these areas.

1.5 Potential Restoration Sites

A GIS exercise was carried out using a range of criteria in order to determine potential restoration sites. Two maps were produced one based on sites by priority and the other by recommended vegetation types.

1.6 Iwi Indicator Sites

Five iwi indicator sites for monitoring of cultural and environmental health have been identified within the catchment of the reservoir. The data gathered will be input into Tiakina te Taiao's GIS. These sites will be monitored at regular intervals according to a cultural health indices (CHI) which has been developed by Tiakina te Taiao.

2 Taonga Survey

2.1 Introduction

A taonga survey was carried out over three days and one night during mid March 2008. An additional day was carried out in mid September 2009. Three iwi members participated in the survey along with Dean Walker, Project Manager for Tiakina te Taiao Ltd. The survey concentrated on the initial reservoir footprint area; that is the area which will be potentially inundated by the reservoir (The footprint area was later adjusted following further geotech investigation by Tonkin and Taylor and refinement of reservoir level and construction areas).

The daytime surveys concentrated on an assessment of ngahere (native trees) and pakohe (argillite) boulders present within the footprint area which may potentially be available for harvest should this project go ahead. The trees had been observed by iwi members on a previous visit. Note was also taken of understorey recruitment and seedlings that could potentially be available for transfer and well as bird species present. The night time survey was focused on lizards and was carried out in conjunction with and led by Graham Ussher, Restoration Ecologist with Tonkin and Taylor.

2.2 Methodology

Initially the area to be surveyed (the reservoir footprint) was examined using aerial photographs and Tiakina te Taiao's Geographical Information Systems (GIS). Areas deemed to be native forest (both old growth and regenerating) were digitised into compartments. Hard copies of these maps were taken into the field and ground-truthed. Some areas were indeed found to be native forest. Others were found to be Douglas fir (*Pseudotsuga menziesii)* as well as exotic and indigenous scrub areas deemed to be of low cultural value. The

boundaries were then adjusted in order to build a picture of the various compartments, their areas and forest types within. These were later readjusted and recalculated based on Philip Simpson's vegetation survey, confirmation of the final reservoir level (including flood range) of RL 202 metres and further ground-truthing.

Standard forest inventory systems for estimating timber volumes in New Zealand usually involve the establishment of sample plots of a fixed size. These plots are usually 20 x 20 metre square plots or less commonly circular plots of the same area. The plots are randomly selected and timber trees over 20cm diameter at base height (d.b.h) are recorded including species, d.b.h and merchantable height. Timber volume is calculated for each plot using timber volume tables for indigenous species (Ellis, 1979). These volumes are then extrapolated over the whole compartment in order to give an estimation of total timber volume within that compartment.

Because of the nature of this forest, essentially broken remnants, riparian strips and patches of regeneration, the standard methodology was not always appropriate and a variety of other methods were used to improve the volumetric estimate. The purpose of all methods, however, was to estimate the species make up and merchantable volume for each species within each compartment. These methods used are described below.

- 20 x 20 metre square plot. Sites where the compartment size and width allowed.
- 10 metre wide transects of varying lengths. Mainly along riparian strips where 20 x 20 metre plots would not have been appropriate.
- Total count. Small compartments where total measurement was possible.
- 6 x 6 metre square plot. Used in the measurement of kanuka forest where larger plots would be unwieldy and time consuming.
- For the kahikatea pole stand (compartment F) the minimum d.b.h was reduced to 15cm and for the kanuka forest no minimum d.b.h applied.

At each site, regardless of plot type, diameter at breast height (d.b.h) along with merchantable height (ht) for each tree was measured using a standard diameter tape and Suunto clinometer for tree height.

This information was later used to derive volumes using volume tables from *Tree Volume Equations for the Major Indigenous Species in New Zealand* (Ellis, 1979). These tables have equations for beech and rimu (including poles) but not for the other species measured. In lieu of this deficiency the rimu tables were also used for the other podocarps, including matai, totara and kahikatea.

Due to a lack of standard methodology in measuring kanuka forest the beech pole tables were used for the kanuka above 10cm dbh. For poles less than this the equation .35 x basal area x height was used as suggested by the New Zealand Farm Forestry (Information leaflet no.26, May 2002) as a 'quick and dirty estimate', where basal area = πr^2.

A full survey of pakohe was not carried out but its presence and absence in the riverbed was noted along with general comments about the size and location of boulders and quality of material for cultural use.

Standard 5 minute bird counts were carried out at selected sites.

A night survey was carried out focused on lizards but the occurrences of night birds, spiders and pest animals were also noted.

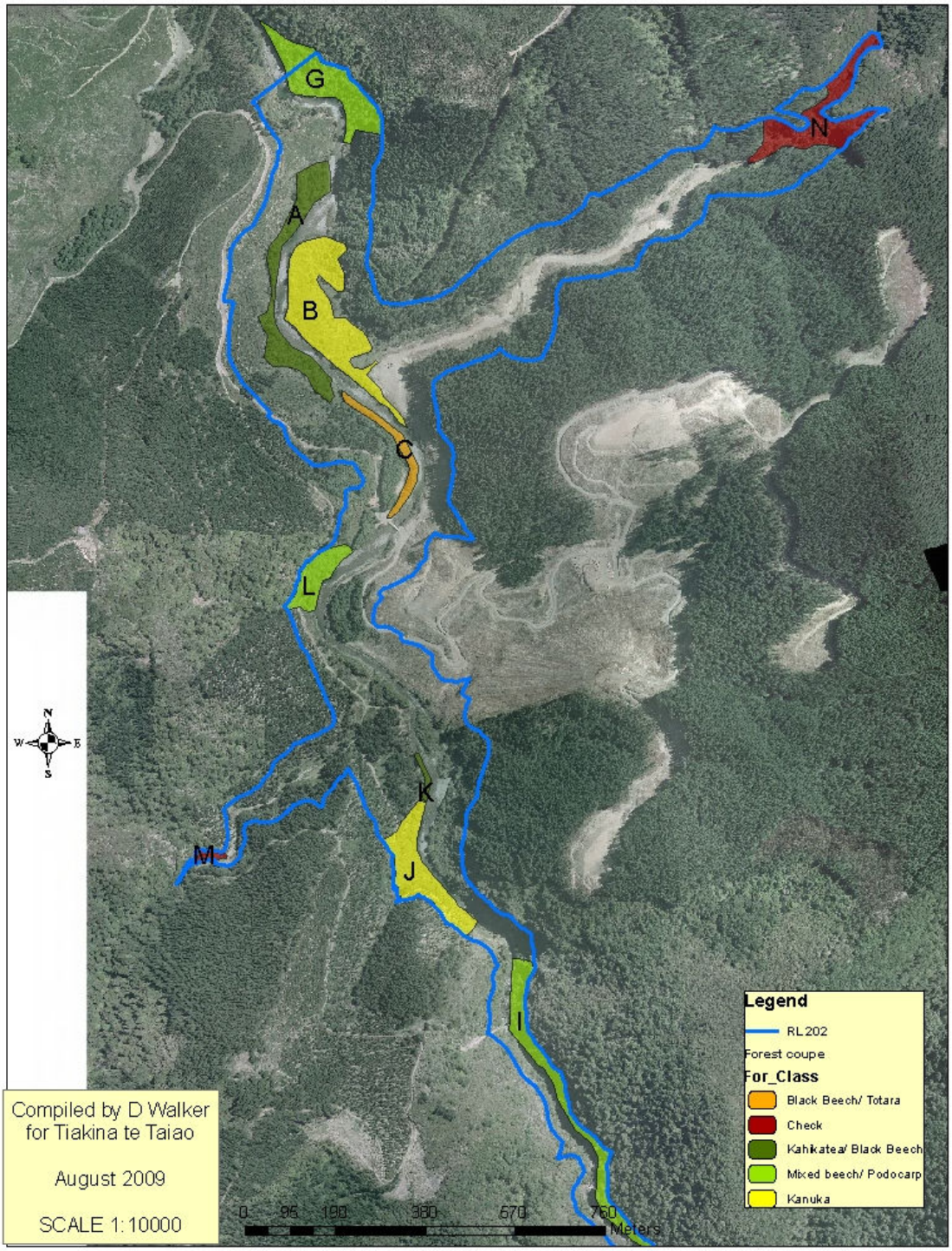
2.3 Results (Ngahere)

Day one focused on the middle section immediately down stream of the forestry bridge that crosses the Lee River. On the true right compartment A is mainly regenerated kahikatea forest with scattered black beech on flat to moderately steep terrain. (See Map 2 for the compartment numbers and locations, and tables 1 and 2 for timber volumes, etc.) Compartment B is comprised of around 233 cubic metres of kanuka on flat ground. Compartment

C can be described as scattered black beech along riverbank. This forest type is typical of much of the riparian strip alongside the river though in slightly higher densities than the unmeasured areas.

Day two focused on the area immediately upstream of the initial dam site (at river chainage 11000m). It also included the gorge which more recently became the revised dam site (at river chainage 12500). Compartment D is an "atypical" riparian strip for the area in that rather than being predominantly black beech it is mixed beech/ podocarp forest with rimu being the dominant species. Compartments E and H are "typical" riparian strips where beech predominates and exotic grasses are often found underneath. Compartment F is regenerating kahikatea forest (with occasional black beech) and is in poor condition due to pig rooting. Compartment G is the largest area of old growth forest within the footprint area. It is mixed beech/podocarp forest with red beech and matai being significant species. The quality of the timber is possibly low on these steeper slopes due to the fact that a number of trees were observed to have basal damage caused by rocks rolling down the slope. (Compartments D, E, F and H whilst surveyed do not appear in Map 2 or Table 1 because of the revised dam location and reservoir footprint.

Day three focused on the area upstream of the forestry road bridge. Compartment I is located furthest upstream in the footprint area. It is gorgey in nature. Red and silver beech dominate with occasional rimu and matai. Compartment J is essentially pure kanuka forest. Severe pig rooting has prevented little else in the way of regeneration. Compartment K is a typical riparian strip of the footprint area being black beech dominant with occasional podocarps (in this case kahikatea). Compartment L is a mixed beech/ podocarp forest with at least two very large rimu, one over 1.3 metres in diameter.



Map 2 Lee Valley Forest Classes and Compartments

Day four was carried out on the 16th of September, 2009. The tasks including checking two new compartments M and N for forest type, as well as restoration options and suitable locations for future monitoring sites adjacent to the reservoir. M and N were not included in the March 2008 survey as they were for the most part outside of the initial reservoir footprint[2]. In September 2008 Tiakina was notified by Tonkin and Taylor that the footprint area would be different due to geotechnical difficulties and recalculated water requirements. In mid 2009 a new RL of 202 metres was released signalling the estimated high flood level of the reservoir.

Initially compartments M and N were assumed to be mixed beech/ podocarp forest. The original calculation of volumes for these compartments were based on this assumption. While on inspection compartment M was this forest type, N was found to be more akin to the kahikatea/ black beech forest type (although it did include small amounts of other beech species). Trees were not measured within these two compartments and have been extrapolated from compartment I in the case of M and compartment A, D and H in the case of N; these compartments appearing to be most similar in nature.

The estimated timber volumes appear in the Table 1 below for each of the compartments A to N rounded to the nearest cubic metre. As stated above compartments D, E, F and H whilst measured do not appear in the Table 1 below as these were downstream of the new footprint area. The new footprint will extend further upstream than the original area. The compartment sizes and volume figures were adjusted to account for the new footprint area. A single miro was observed and measured in compartment G. This was incorporated into the matai figures as none others were seen and to separate it out would have led to an over-estimated of miro. Hard beech was also incorporated in with red beech as there was also only one occurrence of that species.

[2] These areas were not surveyed by Philip Simpson during his vegetation survey (Simpson, May 2008)

COMP	Area (ha)	METHOD	Bl_B[3]	Rd_B	Sl_B	Rimu	Kahik	Matai	Totara	Kan
A	2.0	Total Measure	45			1	31	2		
B	3.1	6x6 plots (5)	3							233
C	0.6	Total Measure	3						3	
G	2.0	20x20 plots (3)	22	487	14			125		
I	2.6	Measured .7ha		52	45	11		11		
J	1.7	6x6 plots (3)								147
K	0.1	Total Measure	7				2			
L	0.8	Measured .08ha	13	20	1	33				
M	0.2	Ex from comp I		4	3	1		1		
N	2.0	Ex from comp A,D and H	43	10	2	3		7		
	15.1	**TOTAL**	**136**	**573**	**65**	**49**	**33**	**146**	**3**	**380**

Table 1: Timber Volume by Compartment

Photo 1: Compartment I. Yellow green tree centre is Matai. Emergent to left is rimu. Beeches are red and silver.

[3] Bl_B = Black beech, Rd_B = Red beech, Sl_B = Silver Beech, Kahik = Kahikatea, Kan = Kanuka

Additional notes appear in Table 2 below including relative occurrence of seedlings, and negative and positive comments associated with compartments A to M. A to L were visited in March 2008, G again on the 30 June 2009 and M, N on 16 September 2009.

COMP	Seedlings	Slope	Negative Comments	Positive Comments
A	Plenty	Moderate		
B	Some	Flat		
C	None	Flat		
D	Some	Steep		One bellbird heard
E	None	Flat		
F	Few	Flat	Pig damage, Clematis vitalba	
G	Plenty + pungas	Steep	Hawthorn	A group of four tuis and 1 fantail on 1st visit. Plently of bellbirds on 2nd visit.
H	Few	Flat		
I	Some	Gorge		
J	Few	Moderate	Pig rooting	
K	Few	Modertate	Pig rooting	
L	Few	Steep		
M	Few	Moderate		
N	Plenty	Steep		Kereru x 2, Plenty of tui and bellbirds seen and heard

Table 2: Additional Notes

2.4 Forest Classification

From the taonga survey it appears that around 15 hectares of indigenous forest will be lost with the construction of the dam made up of four broad forest types. These are listed in the Table 3 below. These remnant forest types are probably representative of the natural vegetation types of the Lee Valley.

Black beech is the dominant riparian and drier slope *Nothofagus* species. On the fertile sites the associated podocarp species are from dry to wetter soils; totara, rimu and then kahikatea. On the upper slopes red and silver beech are the dominant *Nothofagus* species with matai and rimu the dominant podocarps. The kanuka forest is indicative of disturbance. This disturbance tends to be caused by either flooding on the river flats or fire and slippage on the higher slopes.

Forest Type	**Compartments**	**Area**
Totara/ Black beech forest	C and N	2.6 hectares
Kahikatea/ Black beech forest	A and K	2.1 hectares
Mixed beech/ Podocarp forest	G, I, L and M	5.6 hectares
Kanuka forest	B and J	4.8 hectares
Total		15.1 hectares

Table 3: Forest types, compartments and approximate areas of each

This table and the figures do not include scrubland, other low vegetation or all of the riparian vegetation or smaller patches of unmeasured native remnant. Most of the native forest lies within road/ river reserves with LINZ being the landholder. The next largest landholder of native forest is private land identified in 5 compartments over 4 titles and 2 owners. Table 4 below outlines forest ownership and approximate areas. Ownership does not necessarily indicate a forest harvest right.

Forest Ownership	**Compartments**	**Area**
LINZ (road/ river reserve)	C, K, parts of all others	7.1 hectares
Private land	Parts of A, G, J, I, M	3.2 hectares
Department of Conservation	I	2.6 hectares
Crown Forest Licence	Parts of B, N	2.2 hectares
Total		15.1 hectares

Table 4: Forest ownership, compartments and approximate areas of each

2.5 Results (Pakohe/ Argillite)

A survey of pakohe (argillite) was carried out over the three days of investigation in the riverbed of the Lee River. The survey covered the footprint area of the original reservoir (i.e. upstream of river chainage 11000m). It was felt likely that pakohe would be found in the area as a number of ancient pakohe workings are located in the area. The closest site registered with the NZ Archaeological Association is located 3 km downstream of the proposed dam site, near the old lime works. It is described as *an argillite quarry and working area* (site number N28-009).

Pakohe was commonly observed with boulders typically scattered every 50 to 100 metres or so apart and relatively evenly spread throughout the section of the river surveyed. Typically these boulders were rounded and less than a metre in diameter. One square shaped boulder was significantly larger being 3 to 4 metres across.

The quality of the pakohe surveyed varied somewhat. Much was heavily fractured and deemed to be of low value. In pre-European times this stone would not have been sought after because of the small piece sizes able to be recovered and its low strength. There were significant numbers of boulders of high quality, however, that had little or no fracture particularly below the Lee River – Anslow Creek confluence. Some good boulders were also located further upstream near where the Lee River emerges from the Department of Conservation estate (around river chainage 14000m). In the past these highest quality boulders would have been less than useful because of lack of fracture and the difficulty in obtaining adze size roughouts. Today with modern tools this quality of pakohe can be made use of.

There were lesser amounts of pakohe that was moderately fractured. This type of boulder would have been the most sought after prior to the arrival of Europeans because of the relative ease in winning adzes from such fractured material. One boulder of slightly fractured pakohe appeared to have

characteristic compression blows associated with working such boulders for roughouts. The marks may, however, be purely natural. No stone working areas or other evidence of pre-European pakohe utilisation was found. However it is likely that pakohe was worked from this section of the river as it is present there and there is plenty of other evidence of stone working downstream and within the wider Waimea catchment.

It is likely that tangata whenua would take the opportunity to gather/ harvest pakohe both within and adjacent to the project area. Once the dam is constructed and the reservoir created opportunities for pakohe recovery in the catchment will be reduced. It also makes sense to recover pakohe during the construction phase as suitable heavy machinery for recovery will be present at this time. Currently the right to ownership of pakohe is subject to Treaty of Waitangi claims. Nothing in this report shall prejudice these claims. The outcome of the claims may clarify issues of legal process and ownership of pakohe.

2.6 Results (Other Taonga)

The other two taonga survey revealed disappointing results. The iwi members at the time described the area as dead or sterile. There were surprisingly few birds present in any of the compartments surveyed. At only two sites were any birds observed. Compartment G contained the most birds but even at that site only 4 tui and 1 fantail was observed. This could partly be explained on seasonal grounds with autumn not being a particularly vocal time of the year for birds. Another explanation could be the effect of the harvesting (logging) operations that were currently being undertaken in the surrounding plantation forest at time of harvesting. During a more recent visit (June 30, 2009) a number of bellbirds (korimako) and a shag (kawau) were observed at the same site.

A night survey for lizards was carried out led by Tonkin and Taylor ecologist Graham Ussher. Iwi members assisted as well as a Department of

Conservation officer. No lizards were observed at any site despite suitable habitat. Their lack of presence was put down not so much to the effects of logging but more so the effects of predation by rats and possums.

2.7 Other Taonga (Not Surveyed)

A number of other taonga species are reported to be present, or at least have been present, in the Lee catchment which have implications for future management or restoration efforts. Hay and Young (2005) reported the presence of the native fish species koaro, redfin bully, upland bully as well as both the longfin and shortfin eels. It is likely that other species are also present but the survey of these has yet to be carried out.

It has also been reported that whio (blue duck) have been seen in the Lee catchment. While the Lee River is certainly characteristic of whio habitat there is little evidence to suggest that individuals have resided there in the recent past. According to Hay and Young observations of whio were made in 1984 and 1993 on the lower reaches of the Lee. As part of these investigations and a survey conducted by Department of Conservation as part of Phase 1 investigations for the Waimea Water Augmentation project, no sightings have been made of whio despite concerted efforts.

3 Biodiversity Restoration and Management

3.1 Opportunities and Discussion

Below is a list of opportunities developed by the Tiakina te Taiao working party for the biodiversity restoration and management of the proposed Lee Valley dam and reservoir. From the perspective of the working party none of these opportunities are set in stone, so to speak, with the exception of the first. This is why they have been labelled opportunities rather than recommendations. They will take cognisance of any other restoration and management opportunities put forward by others and Tiakina te Taiao's position may be adjusted accordingly.

3.1.1 To maintain, enhance or restore the mauri and wairua of the Lee Valley.

Tiakina te Taiao believe that the mauri (or life supporting capacity) and wairua (spiritual essence) of the Waimea River system has been gradually degraded over the last one hundred years or more due to the demands of human activities. This degradation has been essentially caused by changes in the landscape from native/natural ecosystems to exotic/artificial systems today. As a general statement anything that artificially blocks the flow of a river (such as a dam) also has the potential to degrade the mauri or wairua of that river.

The Waimea Augmentation Scheme is designed to improve flows in the river and the ecological restoration efforts should also help to offset negative effects on the life supporting capacity and spiritual values of a dam on the Lee River. However, the working party also believes that the scheme has the potential to continue to degrade the mauri and wairua of the Waimea due to intensification and further industrialisation of agricultural systems on the Waimea Plains. It has been argued that the higher river flow as a result of the scheme during the summer months will result in greater dilution of

intensification effects and improved water quality. The working party would like to see monitoring (both scientific and cultural) mechanisms put in place and methods to ensure that these improvements occur.

3.1.2 To harvest, as part of any salvage operation, taonga such as indigenous timber, seedlings, kohatu (stone/ minerals including pakohe) that may be inundated by the reservoir or otherwise affected by the project.

These special taonga would be used for cultural or community purposes, or in the case of seedlings used in any restoration plan. The species and volume of potential timber available is estimated in Chapter 2.3 and an outline of harvest methodologies in Chapter 4. Around 80% of the native trees to be inundated are on public land (LINZ river and road reserves, DoC estate and Crown Forest Licences) and 20% on private land (see table 4). It is unclear as to whether the private land will be purchased with or without trees. The only legal mechanism for the harvest of indigenous trees within the DoC estate is through a cultural harvest permit. It is likely that the same applies for indigenous trees on LINZ and Crown Forest Licence lands. The preference of the working party would be to enter into a joint venture between landowners for the harvest of these trees.

3.1.3 To enhance or restore the same or a greater area of indigenous forest lost under the proposed reservoir footprint.

This objective is based on the principle that one should give back to the environment at least what one takes from it in order to leave it in a better state. Our survey revealed that around 15 hectares of indigenous forest including kanuka will be inundated or otherwise directly affected by the reservoir. As such the working party believe that at least this amount of area needs to be actively replaced. The preference of the working party was overwhelmingly in favour of restoration efforts immediately around the

reservoir. They felt that Compartments D, E, and F (downstream of the proposed dam site) would also benefit from restoration efforts.

3.1.4 To strengthen current natural ecosystems and ecological functions within the catchment in general and more specifically within the vicinity of the reservoir

Initially the working party was keen on seeking the restoration of a similar mix of forest types and species lost under the proposed project footprint as per Table 3. Later the replacement of current ecological functions (i.e. connectivity and bird pathways) became more important than the precise replication of forest types. Other considerations in terms of restoring indigenous communities included;

- Planting of vegetation type(s) or species of a higher productivity than those that will be lost.
- Planting of rare or endangered plants or plant communities i.e. black maire and white maire.
- Planting of plants and plant communities that have high cultural use i.e. wetland and podocarp communities

3.1.5 To manage and harvest on a long term basis some taonga species such as timber, eel and harakeke.

The purpose of this objective is in order for tangata whenua, in particular, to maintain a cultural connection to and use of such species. Since European settlement opportunities to manage indigenous species for harvest has been lost. This loss has been in parallel with the loss of the role of tangata whenua as kaitiaki and the practice of kaitiakitanga. This has partly been caused by a decline in species but also to do with philosophical differences in conservation management.

The dominant model of conservation today, with it focus on preservation rather than use, has impacted heavily on these traditions. This restoration plan is an opportunity to redress this problem. A letter of agreement would be necessary between tangata whenua and the owner of the project in order for the security of management, harvest rights and responsibilities.

3.1.6 To reduce the number of pest animal species within the catchment in general and more specifically within the vicinity of the reservoir.

In the past the iconic whio (Blue Duck) was a feature of the Lee River and the other tributaries of the Waimea River system. Early in the investigations there was some discussion on the benefits of a conservation focus on the whio as a keystone species. Subsequent surveys revealed that whio are not currently residing in the Lee Valley and have probably not done so for at least 25 years, though occasional transient birds have been reported. Further, the Department of Conservation's whio recovery programme does not include the Waimea catchment and as such a focus on whio did not receive support from that quarter.

The working party is still in favour of a pest control programme with a focus on a keystone species, if not the whio, then another. They believe that pest control programmes with a focus on a keystone species tend to receive a higher profile and have a greater chance of success than more generic programmes. This would raise the profile of the project as one that is not only about water augmentation but also about conservation. Other suggested features of a pest control programme include;

- The control of mustelids and pigs in the catchment to be a priority.
- Plant and animal pest control would include an initial hit then ongoing maintenance not just for the reservoir area but the plan should look at whole Lee Valley.
- The edges of ecosystems are often the most productive but they also attract animal pests. The water body will probably be a magnet for wildlife

as well as pests. This may present a good opportunity to carry out ongoing pest control in the dam area that could benefit the greater Lee Valley catchment.

- A monitoring programme involving Department of Conservation, iwi (using cultural indicator tools) and the Waimea Water Augmentation Committee.

3.1.7 To build into the project funding mechanisms for the ongoing maintenance of restoration efforts and the management of biodiversity

This project is likely to cover certain development costs of restoration efforts. However the ongoing maintenance costs are less certain. The working party felt that a mechanism should be built into the project to cover these ongoing costs. A levy on water use (i.e. cents per m3 of water used) was felt to be a fair way to pay for the maintenance of restoration. There could be other alternative mechanisms. The Cobb Dam Restoration Fund is seen as a good working model which could be replicated in the Lee Valley. If cash also flowed from the harvest of taonga species then a levy could also be made on or a contribution from these. A one-off restoration payment was seen as less desirable based on the fact that the benefits of the scheme to water users would be ongoing. It was felt that biodiversity benefits should also be ongoing.

3.1.8 To allow for the passage of fish and eels past the finished dam.

Most large scale dams constructed today allow for the passage of fish and eels. The methods and success of the passages do vary somewhat, however. It is understood that fish passage mechanisms are being built into the design of this scheme. The working party assumes that best practice in terms of fish passage would take place.

3.1.9 To maintain public access rights to Richmond Forest Park as well as provide access for the management of biodiversity within the catchment.

Currently legal public access exists along the Lee River and its tributaries in the form of road and river reserves. In the main stem the legal width varies between 60 and 90 metres, Waterfall Creek 50 metres and a minor tributary to the southwest 30 metres. These provide physical public access to these waterways as well as connecting the Lee Valley road end with Richmond Forest Park. Access is by foot, albeit difficult in places, by way of the riverbed and an old pack track. It is unknown how many people use this route but huts in the Lee Valley have been removed in the recent past. This has probably been in response to limited usage as well as contributed to a decline in users.

The Tiakina working party has been adamant throughout this process on the continuation of access rights to the area. The iwi associated with Tiakina have been subject to loss of access and property rights themselves. They have concerns on the loss of rights on principle. They wish to maintain public access to Richmond Forest Park and the waterways. It is understood that the WWAC has allowed for a 5 metre buffer for significant floods over and above the normal top water level of RL197 metres (to RL202 metres). This is probably insufficient to allow for legal public access around the edge of the reservoir.

It is also understood that some of the private landowners wish to restrict continued public access to the area. The private landowners have indicated that they are unlikely to agree to the sale of their land for the project if this results in the public access around the reservoir adjacent to their land because of concerns such as fire. Any attempt to increase this buffer width will probably be met with resistance by these landowners.

It is also acknowledged that it is unlikely that there will be a public access road up to the dam, however, the current legal foot access would continue up the

river/ road reserves. Discussions with the Department Of Conservation have indicated that they may be prepared to upgrade the existing pack track to the dam site. WWAC have also indicated that they may be willing to negotiate public access around the true right of the dam to Richmond Forest Park via Waterfall Creek.

A compromise for public access and Tiakina's desires is possible but has yet to be found. It has been suggested that public access may be possible from the Lee Valley through Crown Forest Licence Land. This option was taken to the Tiakina te Taiao Board Meeting on 2nd November 2009. The Board said that as the said land was subject to Treaty of Waitangi Claim, this process would have to be completed, before they could or could not support any compromise. In the minutes it was reiterated that "The Board consider the principle of public access is important and want public access retained".

3.1.10 To establish and maintain scientific and cultural monitoring sites

The working party would like to see the establishment of scientific and cultural monitoring sites around the dam and reservoir. The location of monitoring sites should reflect biodiversity management. It is likely that, in terms of the cultural indices, monitoring would be carried out at the same time as maintenance or harvest of taonga species (and perhaps at the same time as scientific monitoring). Six indicative monitoring sites are located on Map 6, one downstream of the dam, one at the dam site and 4 around the edge of the reservoir in areas that may be actively managed.

4 Harvest Plan

For the purposes of this plan there were 3 items of interest in terms of harvest. These are ngahere (trees), seedlings and pakohe (argillite). This harvest plan is not meant to be a definitive plan but simply outlines the possibility of the harvest of the said items. It is noted that for water quality reasons, vegetation is likely to be cleared in the reservoir footprint area regardless of the harvest of taonga.

4.1 Access

Access into the area for harvest is reasonably good due to the existing network of forestry roads and tracks, albeit that some of this roads are on private land and access would have to be negoiated. Compartment I within the Department of Conservation estate is an exception due to the gorgey nature of the area. Some tracks may have to be upgraded and others extended in order to improve access for the harvest of the said taonga. It is assumed that some tracks would need to be constructed in order for the reservoir clearance to proceed, and this would allow access for the harvest of taonga species.

4.2 Ngahere

Philip Simpson (Simpson, 2008) identified 24.5 hectares of native vegetation within the reservoir footprint. Simpson described some of this as ‘fine timber trees’ including beech (four species), tanekaha, kahikatea, matai, rimu, totara, kanuka and others. Our survey identified around 15 hectares of such harvestable native trees. The difference in the two figures is primarily due to the fact that Simpson surveyed the original and larger reservoir footprint. He also included scrublands and bedrock turf communities. As well as this we did

not include very thin areas of riparian vegetation in our survey. There is probably around 1 to 2 hectares of additional forest trees that fit this category.

Of the 15 hectares identified as harvestable native trees around 3 hectares[4] of this is currently in private ownership (see Map 3 and Table 4). It is unclear as to whether the land would be purchased by the project owners with or without these trees. If purchased without the trees it would make sense to enter into some sort of joint venture with the landowner(s) for their harvest.

As noted above, it is likely that all exotic forest within the reservoir footprint would be removed during the construction of the dam. It would also probably make economic sense to co-ordinate the harvest of the two, particularly if there is a joint venture arrangement as suggested above.

Under the Forests Amendment Act 1993 native timber can normally only be harvested and milled under a sustainable management regime (plan or permit) as the purpose of the Act is 'to promote the sustainable forest management of indigenous forest land'. However, there is a provision under section 5, *Prohibition on milling indigenous timber,* being 5 (1) (ii) (C), that allows 'for the construction or maintenance of an access way or water impoundment'. The appropriate paperwork would need to be sought with the Ministry of Forestry (Indigenous Forest Unit) and any sawmill would have to be registered as per the Act.

If the private landowners wanted to harvest native trees prior to the sale of the land then they would also be subject to the Forest Amendment Act 1993. Generally speaking private land owners are only able to harvest as much timber as the forest is capable of regenerating. Under the sustainable permit provisions in respect of the podocarp species (i.e. rimu, matai and kahikatea) 10% of the standing volume or 250m3 (whichever is the least) and in respect of the beech species 10% of the standing volume or 500m3 (whichever is the least) permits may be issued. In respect of beech forests the maximum area

[4] This figure was revised from the previous estimate of 6 hectares

that could be clearfelled as a coupe is 0.5ha. There are a number of other requirements (such as size of compartments, proximity to other coupes, ability to regenerate, etc) that would apply and, in the opinion of the author, it is unlikely that the Ministry of Forestry would issue a harvest permit except perhaps for very small volumes. The Forest Amendment Act only applies to trees that are harvested and milled for timber. If the trees were harvested for firewood, for example, then the Forest Amendment Act does not apply and the activity would be legal. However, under the Tasman District Resource Management Plan rules the maximum area a landowner can destroy or remove of indigenous vegetation or forest without a resource consent is 0.2 hectares over a three-year period. In the opinion of the author it is unlikely that the private landowners would be bothered to apply for resource consent given the economics and ethics of converting native forest to firewood.

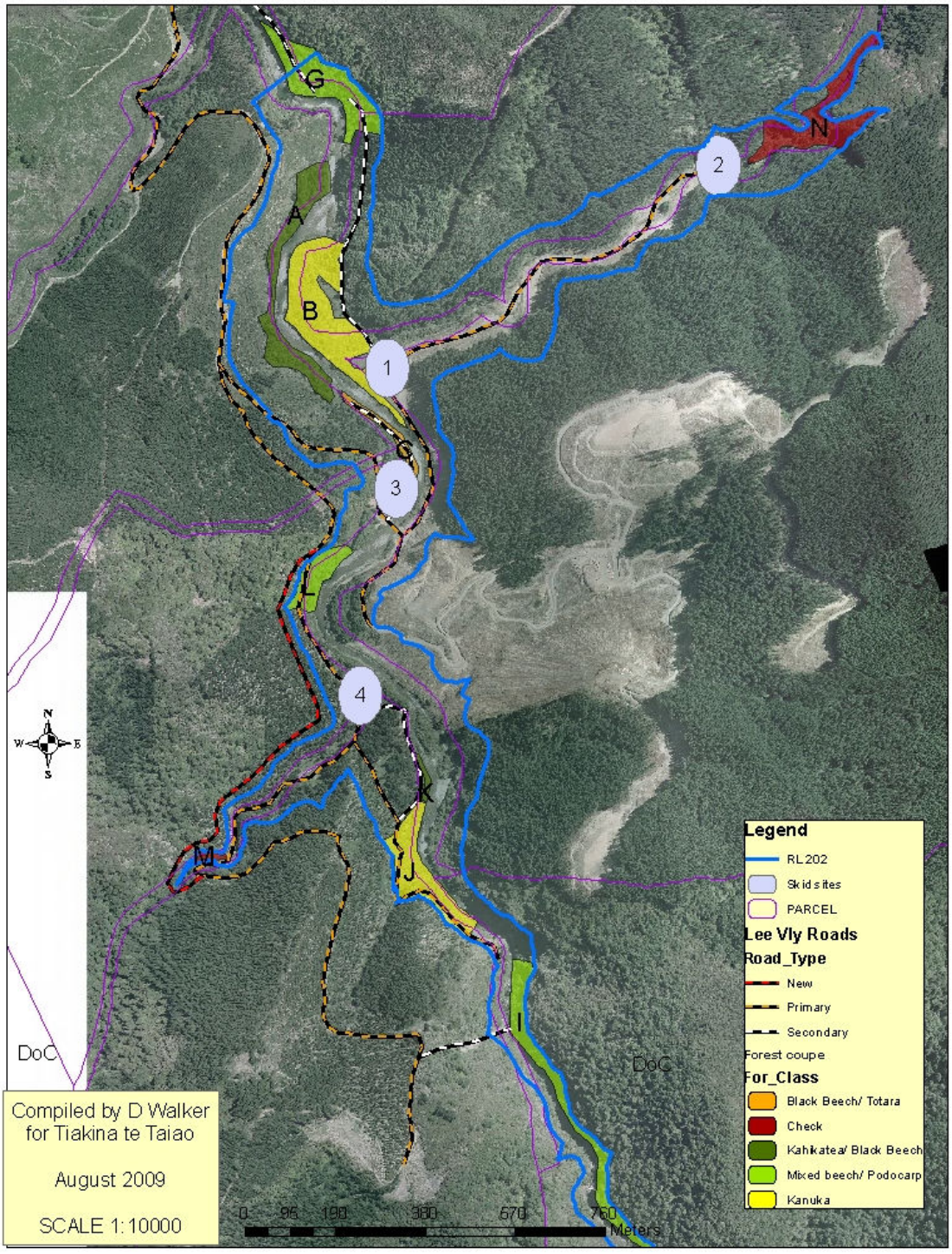
Map 3 shows forest compartments, existing roads and tracks, as well as possible extensions, within and around the reservoir footprint. Possible skid sites are also delineated. Most compartments could be harvested using ground based skidder, hauler or dozer methods with the exception of Compartment I. The trees would be hauled to the appropriate skid site and cut to logs before being loaded and carted away by log truck.

Skid 1: Compartment B and G. The track has recently been created/ upgraded as part the geotech investigations. The northern part of compartment G may have to be harvested separately as the steep inside of a bend in the river makes access difficult.

Skid 2: Compartment N. Some new track may be required.

Skid 3: Compartments A and C. Some new track may be required. The gap between A and C is quite swampy so A could be harvested from road above.

Skid 4: Compartments L, K, J and M.



Map 3 Lee Valley Proposed Harvest Plan

Compartment I: The used of ground based methods such as skidder, hauler or dozer are not possible due to the steep slope and limited access. The use of skyline systems are probably not practical due to economies of scale and damage to standing and regenerating forest. Heli-logging may be possible

and cost effective due to the high value of the logs. The possibility of cutting trees to logs on site and retrieving 'floaters' as the reservoir fills could also be investigated.

Other trees: There are other native trees outside of the delineated compartments which may be possible to harvest. These are mainly contained in narrow riparian strips. These would be harvested individually or in groups as access and machinery allow. These strips contain a high percentage of black beech which is not a particularly high value species, both in monetary and use terms.

4.3 Seedlings

Phillip Simpson (Simpson, 2008) suggested that some older native specimens (up to a metre tall) growing in the inundation area could be wrenched several months before removal and relocated, e,g, tanekaha, matai, totara. The working group concurred with this idea. There are plenty and a good range of seedlings observed in compartments A and G. These could be potted up and stored for a season under the cover of kanuka in compartment B. Also Compartment N looks like a likely place with seedlings due to the size and proximity of the compartment. Most of the other compartments except for Compartment I had poor seedling recruitment due to pig rooting and grazing by ungulates. After a season these seedlings would then be ready to be transferred and planted in the restoration areas. Simpson also noted the presence of rare species such as black maire and white maire which could also be propagated and planted in these areas.

4.4 Pakohe (Argillite)

Most of the best pakohe is located downstream of the proposed dam site. While its removal may both be possible and desirable from Tiakina's perspective it does not fall within the project footprint. Much of the rest within the footprint is either too large to easily move or is of low quality. However, there are some good quality boulders around and upstream of the 14000 mark

that have relatively easy access and would be worth retrieving. The best method would probably be with a digger and truck.

5 Potential Restoration Opportunities

A number of criteria were taken into consideration of potential restoration opportunities in the development of this restoration plan. These criteria were then included in a GIS analysis to arrive at a number of sites that were deemed suitable for restoration. The results are displayed in Maps 5 and 6 as well as Table 5. In Map 5 the potential restoration sites are graded and displayed by priority. In Map 6 the sites are displayed by suitable forest type. Table 5 includes area of each site, priority, suitable vegetation type and site notes. The following criteria were included in the analysis.

- Approximately 15 hectares to be restored.
- Proximity to the reservoir. A nominal strip of 50 metres was used.
- Proximity to current and probable vehicle access i.e. Areas that have or are likely to have vehicle access were favoured over those that will have no or poor access.
- Proximity to reasonably intact ecosystems. Sites that were connected to natural ecosystems were favoured over sites that were not.
- Instability zones. These zones were seen as prime restoration sites although care would have to be taken with selection of plants so as not to destabilise the zones.
- Slope. Flatter areas were favoured over steeper sites.
- Connectivity/ bird pathways. Cognisance of bird pathways was taken.

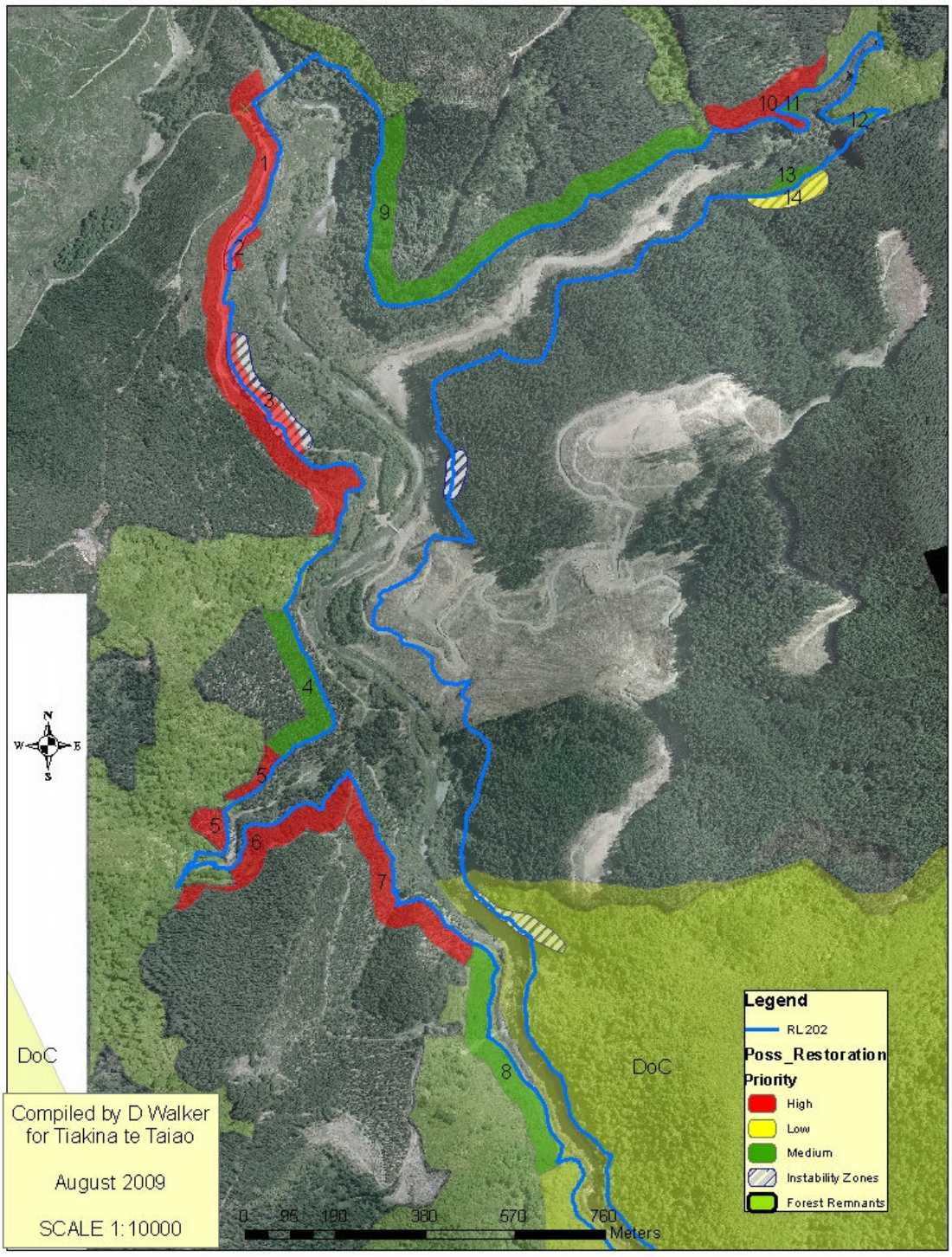
5.1 Wetland Development

Opportunities for the development of wetlands were also explored with slope stability, back eddies, slope, probable currents and prospects for the construction of bunds taken into account. There were 5 sites that were deemed suitable, with the most suitable being near where Waterfall Creek would enter the reservoir. Bunds could be built to retain areas of wetland that would remain damp as the level of the reservoir fell during the summer

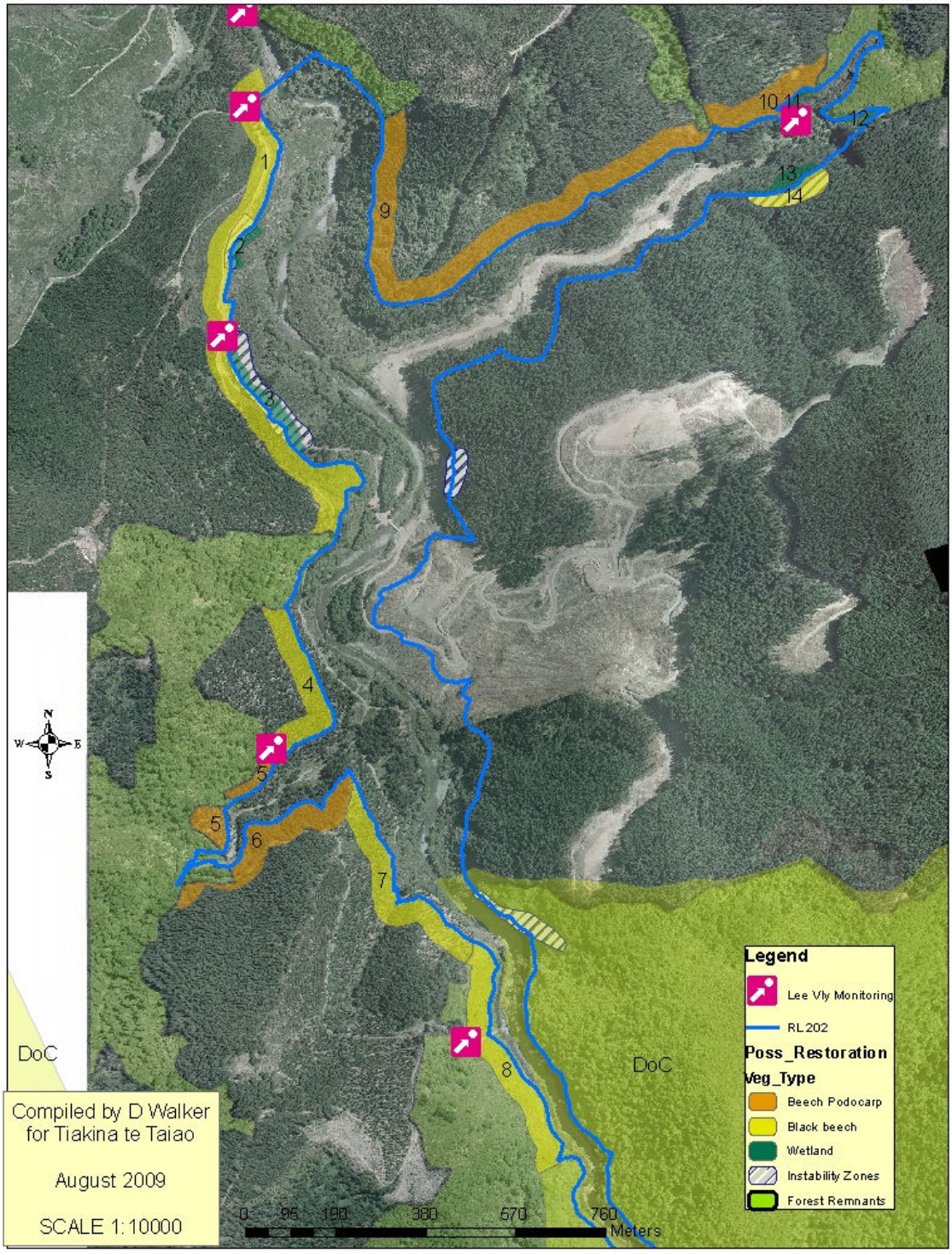
months. Due to the lack of flattish land around the edge of the reservoir the construction of bunds may be problematic as well as the wetlands created would be relatively small. This is not to suggest that the idea should not be explored further, however, an alternative solution may be to see if and where wetlands start to develop naturally and enhance these areas.

Site Num	Area (ha)	Priority	Vegetation Type	Site notes
1	6.1	High	Black beech	Good road access, provides connectivity between native forests to north and south, Opportunity to plant instability zones, Some flat areas
2	0.3	High	Wetland	Good road access, Wetland opportunity over instability zone and flatter ground
3	0.6	High	Wetland	Good road access, Wetland opportunity over instability zone and flatter ground
4	1.9	Medium	Black beech	Good road access, Proximity to relatively intact ecosystem, Provides connectivity opportunity
5	0.9	High	Beech Podocarp	Good road access, Proximity to relatively intact ecosystem, Provides connectivity opportunity and opportunity to increase size of significant matai forest remnant
6	2.1	High	Beech Podocarp	Good road access, Proximity to relatively intact ecosystem, Provides connectivity opportunity and opportunity to increase size of significant matai forest remnant
7	2.4	High	Black beech	Provides connectivity opportunity
8	2.7	Medium	Black beech	Provides connectivity opportunity, Currently regenerating native scrub
9	5.8	Medium	Beech Podocarp	Provides connectivity opportunity between forest remnants to the west and east
10	1.5	High	Beech Podocarp	Provides connectivity opportunity between forest remnants to the west and east, proximity to relatively intact ecosystem, Some flat area
11	0.2	Medium	Wetland	Wetland opportunity
12	0.2	Medium	Wetland	Wetland opportunity
13	0.4	Medium	Wetland	Wetland opportunity
14	0.6	Low	Black beech	Opportunity to plant instability zones

Table 5: Potential restoration sites including area of each site, priority, suitable vegetation type and site notes.



Map 5 Lee Valley Restoration by Priority



Map 5 Lee Valley Restoration by Forest Class

6 Monitoring

Tiakina te Taiao has developed a freshwater cultural health index and applied it at a variety of sites within the Motueka, Riwaka, Maitai and Whakapuaka catchments. The index compartmentalises the environment into Atua domains (a Māori cultural framework) including that of Tangaroa, Tane Mahuta, Haumiatiketike, Rongomatane, Tūmatauenga and Tawhiri Matea. Attributes including riverbank condition, riverbed composition, water clarity, water flow, water quality, channel shape, riparian vegetation, catchment vegetation, river modification/use, use of river margins and smell are scored from 1 (poor) to 5 (excellent). The overall cultural stream health measure is calculated as the average of these scores. An assessment of the mahinga kai status and traditional status of the site is also determined, along with a judgement of whether iwi would return to the site. Such cultural indicators help to articulate cultural values, assess the state of the environment from a cultural perspective, and assist with establishing a role for tangata whenua in environmental monitoring.

When comparing guidelines associated with scientific data Young *et al* (2008) found that the cultural stream health assessments imposed stricter standards across many criteria reflecting strong Maori perspectives and preferences for very high environmental standards. They also found that the cultural approach tends to be more qualitative, holistic, and subjective being mainly based on acquiring in–depth cultural and environmental knowledge of a local environment (e.g., mātauranga Māori, local and historical knowledge). In comparison to science approaches it is generally cost effective. This work, as part of the Motueka ICM programme, showed that scientifically and culturally–based monitoring and assessments, along with community–based approaches, can provide an enriched and complementary understanding of freshwater systems. Each approach offering a slightly different worldview that can be extrapolated to other parts of the environment.

Six iwi indicator sites for monitoring of cultural and environmental health have been identified within the catchment of the reservoir (see Map 6 for approximate locations). The choice of locations is linked to sites where biodiversity could be actively managed. The data gathered will be input into Tiakina te Taiao's GIS. These sites will be monitored at regular intervals, probably during maintenance or harvest of taonga species, in order to detect changes in environmental health of the reservoir and river valley.

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