

ECOLOGICAL ASSESSMENT & RESTORATION REPORT

**FOR A SERIES OF NATURAL AREAS WITHIN THE
DUCK CREEK VIEWS LTD PROPERTY,
1158 WERANUI ROAD, WAINUI.**

June 2008

Prepared on behalf of
Duck Creek Views Ltd

Prepared by
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1.0 Introduction

This natural area assessment and restoration report includes the following information:

- A Bush Assessment Report relating to a circa 13.5ha forest remnant on the property (Section 3.0),
- A Wetland Assessment Report relating to the 0.6ha wetland area (Section 4),
- A Wetland Restoration Plan relating to the above wetland area (Section 5.0),
- A Significant Enhancement Planting Plan relating to 6 ha of proposed revegetation (Section 6.0),
- A Plant and Animal Pest Management Plan relating to pest mgmt across the property (Section 7.0).

The locations of the natural areas that are the subject of this document are mapped in Figure 1 overleaf.

The bush and wetland assessment reports contained herein are based on the Rodney District Council's 'Field Assessment of Forest Quality Guidelines' and 'Guidelines for the Field Assessment of Wetland Quality' in the Proposed District Plan 2000 (PDP 2000). The Significant Enhancement Planting Plan is based on the PDP 2000 Rules 7.14.4, 7.14.2.3 and 7.14.4.2)

2.0 Physical Description

The 38ha site is situated at 1158 Weranui Road, Wainui, approximately 5 km (line of sight) inland from Orewa.

The predominant landuse is pastoral farming with open pasture covering 60% of the property. A now disused limestone quarry is located in the middle of the property. A large native forest remnant extends along the properties northern boundary covering a further 35% of the land area, with minor areas of regenerating native bush also scattered through the pastoral portion of the property (3.5%), along with a wetland area (1.5%) associated with the main forest remnant.

The topography of the property is a mix of flat alluvial pasture land south of the quarry, with rolling hills and a mix of bush and pasture, north thereof. A stream tributary of the Waiwera River runs eastward through the site dissecting the flat land in the southern half of the property.

The site is within the lowland bioclimatic zone of the Rodney Ecological District.

In the pastoral portion of the property, in addition to the minor scattered areas of native bush, gorse was noted becoming common throughout the 'rougher' portions of the land, particularly surrounding and north of the quarry. A minor area of plantation pine was also noted near the properties western-most boundary, while a smaller poplar plantation was noted on the eastern boundary immediately south of the small wetland that abuts the south-eastern corner of the forest remnant.

The natural areas are not recognised in the PDP 2000 Planning Maps as SNA's, and no covenants are in place over any of the natural areas within the property.

Further detail on the forest and wetland remnants and the proposed 6ha revegetation area is provided in the relevant sections of this document.



Fig 1. Graphic identifying the location of the natural areas proposed for legal and physical protection on the Duck Creek Views Ltd property.

N.B. The forest area measurement (12.1ha) excludes the 20m forested wetland buffer area that in accordance with PDP 2000 rulings is unable to be used in calculating the forest area.

3.0 Bush Assessment

N.B. This section focuses on the main 12.1ha forest remnant proposed for protection. As per Figure 2 overleaf an additional 1.3ha forest remnant is also proposed for protection, along with a small 0.08ha wetland that abuts the SE corner of the main bush area.

3.1 General Notes on Vegetation

The quality of the vegetation noted throughout the subject forest area was found to be high.

A number of vegetation types were noted across the forest areas, however the overall vegetation composition within the canopy and emergent tiers consisted predominantly of taraire, totara, kahikatea, puriri, rewarewa, titoki and kanuka, along with lesser numbers of rimu, tanekaha, karaka, Halls totara, tawa, pukatea, maire and kowhai.

Species diversity was found to be high in the sub-canopy tier throughout the areas with kohekohe, nikau, tawa, ponga, ti kouka and mapou being noted as common. In the understorey tier the vegetation for the most part was found to be abundant and diverse with the only exception being the southern margins of the remnant where stock have had an impact on the understorey vegetation due to the absence of fencing. Nonetheless species diversity and abundance is generally high across the remnants with dense populations of the following species noted as common in the understorey: the small-leaved *Coprosma* species, particularly *Coprosma arborea*, *Coprosma aerolata* and *Coprosma rhamnoides*; the softwoods hangehange, mahoe and pate; the tree ferns mamaku, ponga and wheki; along with mapou, nikau, mingimingi and putaputaweta. Lesser numbers of the following species were also noted in the understorey tier: *Olearia furfuracea*, kawakawa, lacebark, karamu, tree fuschia, the NZ broom, ti kouka and *Rhabdothamnus solandrii*.

True groundcover species such as *Acaena*, *Oplismenus* sp, *Nertera*, *Uncinia uncinata*, *Carex dissata* and *Carex lambertiana* were noted as common throughout the areas, as were the ferns: *Paesia* sp, *Blechnum novae-zelandiae*, *Blechnum fluviatile*, *Pneumatopteris pennigera* (gully fern), *Doodia australis*, *Lastreopsis hispida*, *Asplenium oblongifolium* and *Asplenium flaccidum*.

A relatively high diversity of vine/ epiphytic species were noted across the area including Puawananga *Clematis paniculata*, the NZ passionfruit *Passiflora tetandra*, the rata vines *Metrosideros diffusa*, *M. fulgens* and *M. perforata*, kiekie, supplejack and the climbing fern *Blechnum filiforme*. The perching lily *Collospermum hastatum* and *Astelia solandrii* were also noted as relatively common, as was the orchid *Earina mucronata*.

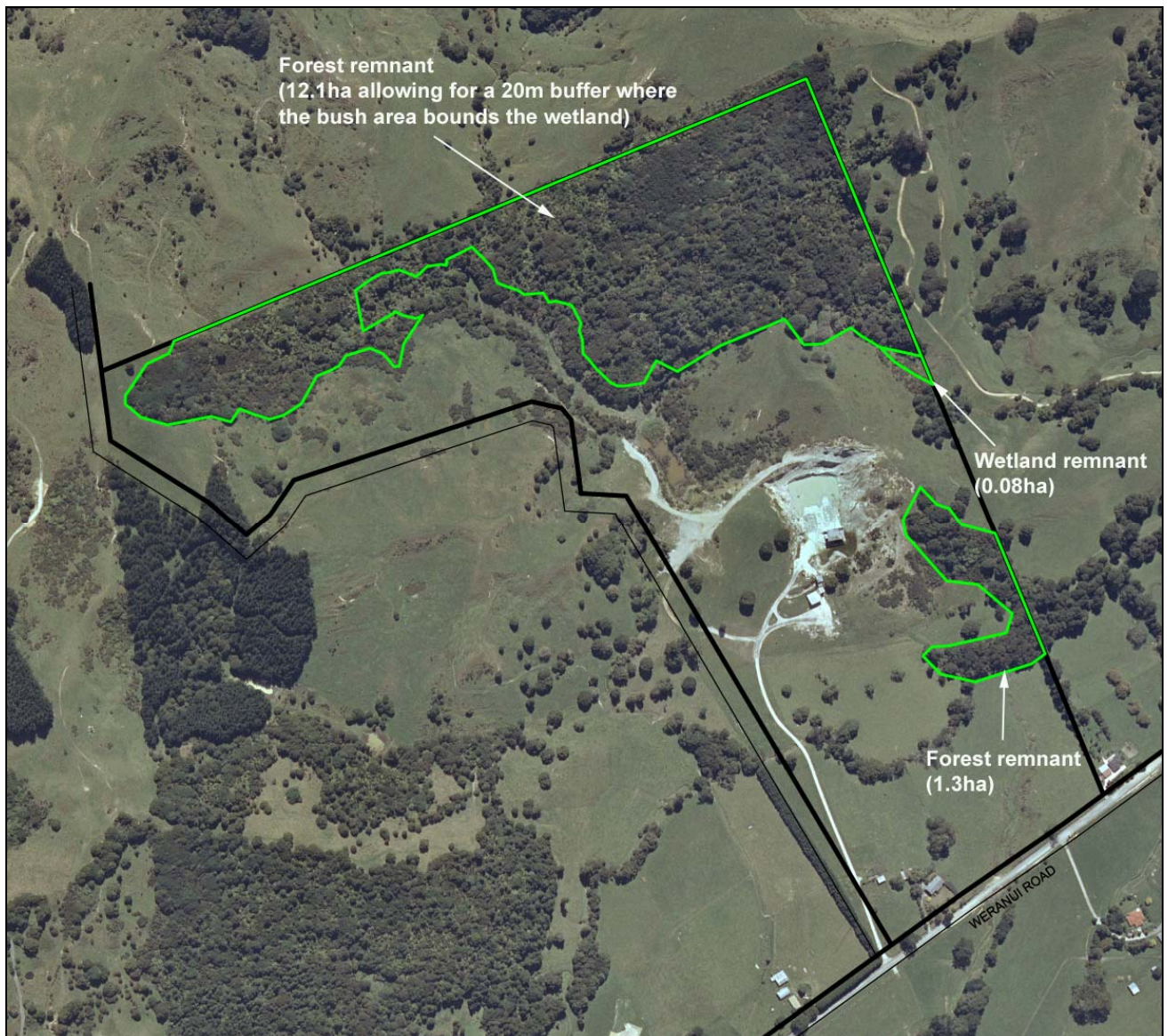


Fig 2: Graphic identifying the extent of the main and minor forest remnant, along with a minor wetland area, proposed for protection on the site.



Fig 3: Looking NE with subject forest area in the foreground and also rising to a high point in background.



Fig 4: Looking N toward the eastern extent of the subject forest area.

3.2 Assessment Site 1

This assessment site was located near the midpoint of the remnant just east of the watercourse that discharges in to the top of a wetland area. The canopy consisted primarily of **totara** and **rewarewa** along with **tanekaha** and **kahikatea**. Ponga, *Coprosma rhamnoides*, lancewood, nikau and mingimingi were common in the understorey tier. In the groundcover tier *Oplismenus*, *Uncinia uncinata*, *Carex virgata*, kiokio, gully fern and seedlings of hangehange, putaputaweta, nikau, taraire and totara were common.



Fig 5: Assessment Site 1.

3.3 Assessment Site 2

This site was located near the remnants south-eastern corner. **Taraire**, **titoki**, **nikau** and **kahikatea** were common in the canopy. The sub-canopy contained nikau, ponga and kohekohe, while vegetation in the understorey was limited to wheki and *Olearia furfuracea*. The groundcover tier supported a good diversity of plant species including the ferns parataniwha, gully fern, rasp fern and the climbing *Blechnum filiforme*, along with the sedges *Uncinia uncinata* and *Carex dissata* and *Oplismenus* and *Metrosideros perforata*. Additional diversity species noted included the orchid *Earina mucronata*, *Asplenium flaccidum* and *Collospermum hastatum*.

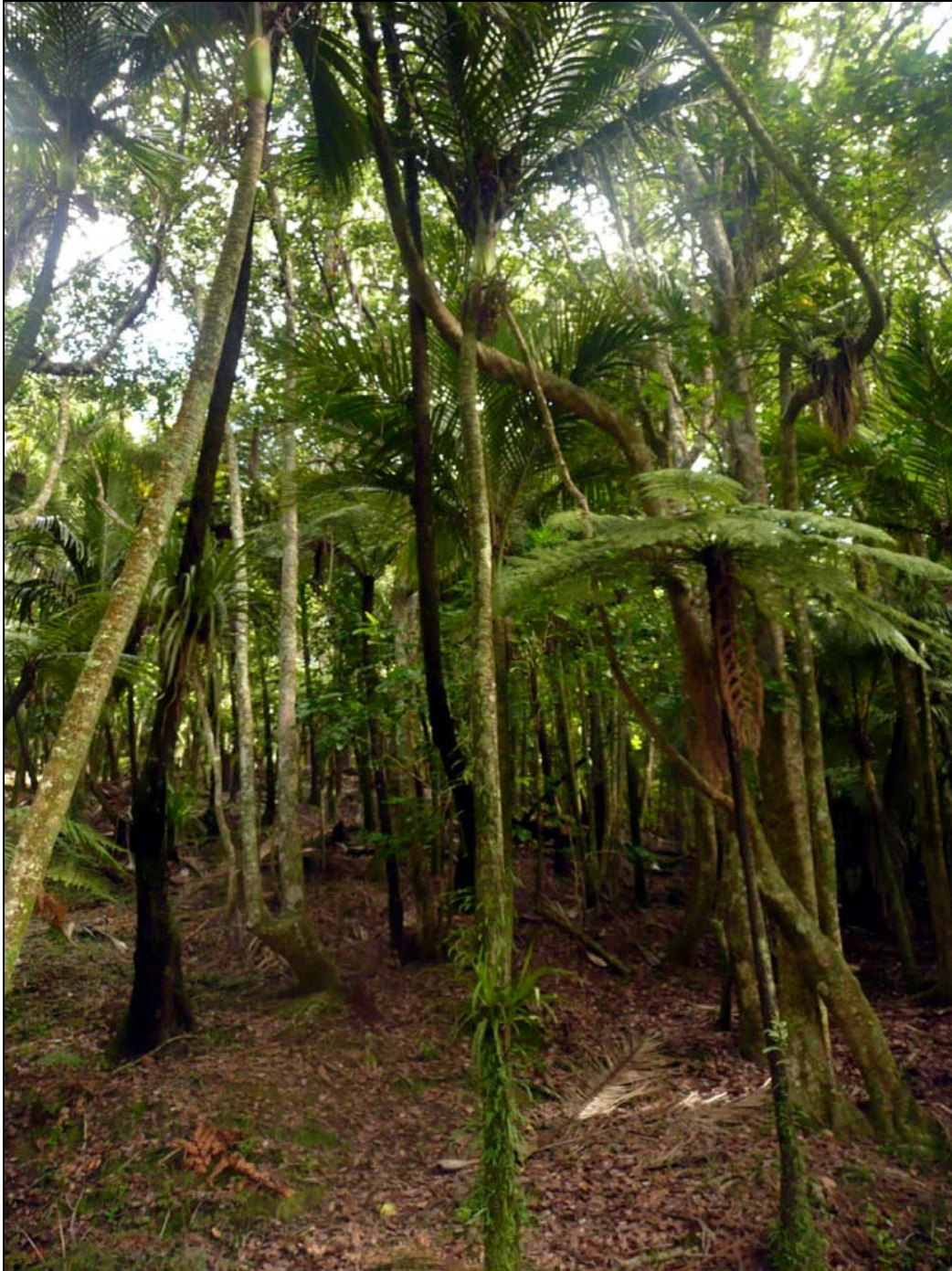


Fig 6. Assessment Site 2.



3.4 Assessment Site 3

Located near the western-most margin of the forest area this assessment site was found to support a canopy consisting of the broadleaves **taraire** (dominant), **puriri**, **kohekohe**, **karaka**, **rewarewa** and the podocarps **totara** and **kahikatea**. The sub-canopy also contained kohekohe, along with nikau and ponga while the understorey was all but absent due to the presence of grazing stock in the locality. The groundcover tier was also relatively bare except for dense taraire leaf litter, minor areas of ground fern sp and an array of seedlings <100mm. The epiphytes *Metrosideros perforata* and *Blechnum filiforme* were noted.



Fig 7. Assessment Site 3.



3.5 Forest Quality Assessment Field Sheet

Scale 1

RANK	4	3	2	1	0
CANOPY					
1. % of natives	81-100%	61-80%	41-60%	25-40%	<25%
2. % of canopy closure	81-100%	61-80%	41-60%	25-40%	<25%
3. Number of species	>12spp	8-11spp	4-7spp	2-3spp	1
4. Height	>8m	6.1-8m	4.1-6m	3.1-4m	<3m
UNDERSTOREY					
5. % of natives	81-100%	61-80%	41-60%	25-40%	<25%
6. % of groundcover	81-100%	61-80%	41-60%	25-40%	<25%
7. Number of species	>12spp	8-11spp	4-7spp	2-3spp	1

Totals for site 1-3

Site 1	Site 2	Site 3
4	4	4
4	4	4
2	2	2
4	4	4
3	0	0
4	3	0
4	4	4
25	21	18

Total A (average of Totals 1-3)

21.33

Scale 2

WEIGHT	10 or 0*	5	0
1. Rare/endangered species	Present	-	Absent
2. Only forest within 1km ²	-	Yes	No
3. Lot size > 8 hectares	-	Yes	No
4. Lot adjoining protected areas	-	Yes	No
5. Aesthetic/unusual value	-	High	Low
6. Potential	-	High	Low

*10 if subdivision will protect rare or endangered species
0 if subdivision will not do so

Total B

5

Total C (Total A+B)

26.33

3.6 Scoring Discussion

Although the forest areas exceed a total of 20 points via Scale 1 and therefore qualify as 'significant' under the PDP criteria, additional points have been added in Scale 2 to illustrate the additional value of the areas. Five (5) points have been added to the scoring due to the size of the area exceeding 8ha.



Fig 8: Intact forest edge on southern margin of remnant.

3.7 Plant & Animal Pests

The only plant pest noted within the bounds of the main forest area proposed for legal and physical protection in association with this report was pine (*Pinus radiata*), which was noted as a single large isolated individual NE of AS2 and visible in Fig 4 of this report.

A low level of possum presence was noted during the field visit suggesting the local possum population must be low. This is attributed to the ARC-led control programme carried out across this block and surrounding areas circa 2 years ago.

Specifications for pest management can be found in the Plant and Animal Pest Management Plan in section 7.0 of this document.

3.8 Summary

The principal forest area proposed for formal protection on the subject property qualifies as SNA under the RDC assessment process.

The area contains circa 12.1ha of podocarp/ broadleaf forest which is worthy of protection for the indigenous biodiversity values contained therein (both actual and potential), along with the erosion protection and soil conservation services the areas provide for.

An additional 1.3ha regenerating totara-dominant remnant, along with a minor 0.08ha wetland remnant is also proposed for protection in association with the application

The main forest remnants (and the minor forest and wetland remnant) are thus recommended for protection.

4.0 Wetland Assessment

4.1 Introduction

The subject wetland area (c.0.8ha) originates within the main native forest remnant proposed for protection on the property. The wetland extends south-eastwards through the property, bounded on its eastern and northern margin by the forest area (Fig 9). The wetland, fed by hillside springs and groundwater, consists of a meandering watercourse/flat. The lower extent of the area is defined by a large dam that was formed as a result of a track being formed over the original watercourse.

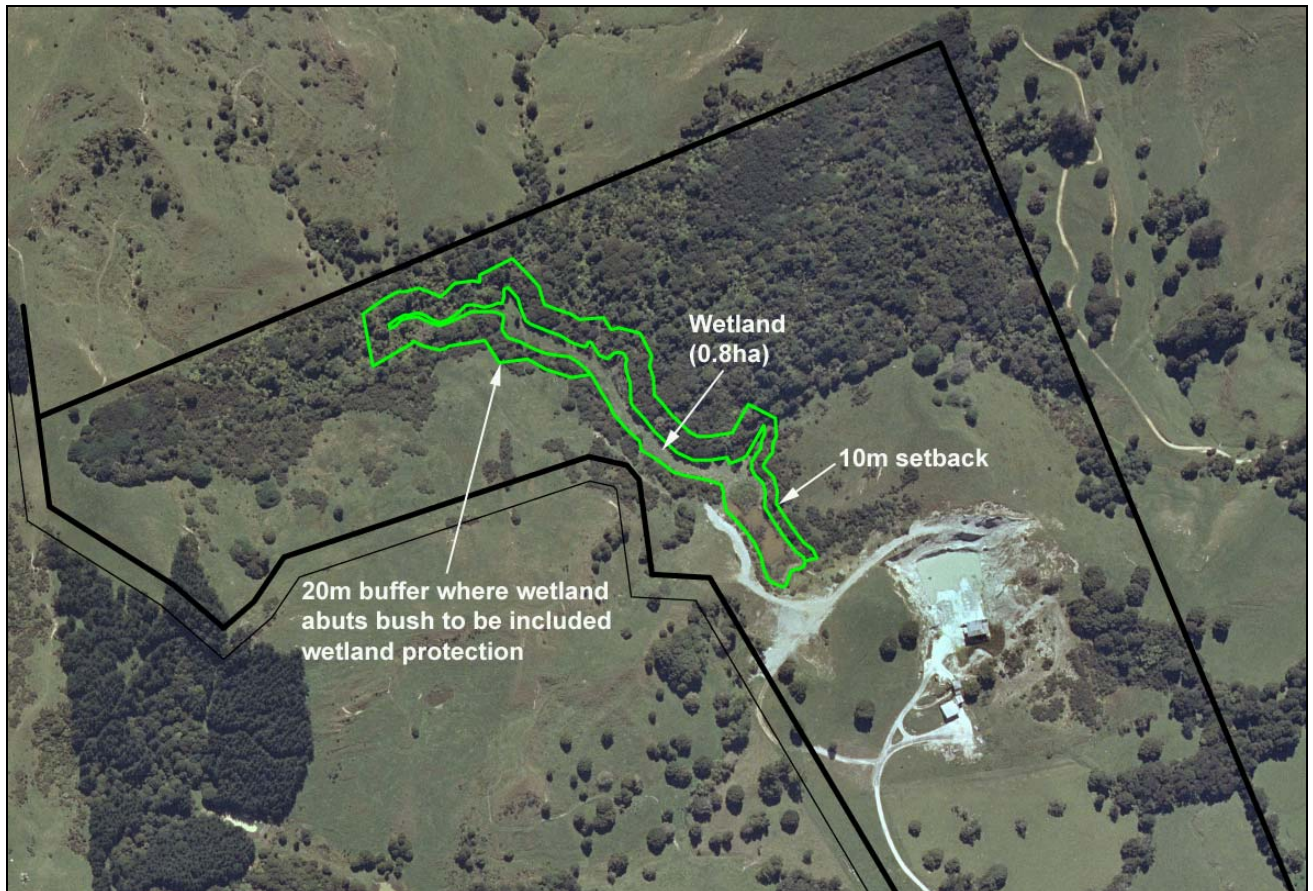


Fig 9: Plan showing the boundaries of the wetland proposed for protection. Also shown is the 20m buffer required where bush abuts wetland, and the 10m fence setback required around the wetland.

N.B. No 10m setback has been shown around the SW margin of the wetland as this area is to be revegetated as part of the 6ha significant enhancement planting component of the application.

4.2 Diversity

4.2.1 Plant diversity

Indigenous plant species diversity was found for the most part to be low within the proposed wetland covenant area. This is due to the presence of the invasive plant pest species reed sweet grass (*Glyceria maxima*), along with the modification that has occurred from prolonged cattle browsing and trampling.

Two areas of remnant indigenous wetland plant value were noted within the area:

- An area of **Carex sedgeland** with putaputaweta and wheki in the semi-enclosed section that runs westward at the northern end of the area,
- An area of **kahikatea swamp forest** midway down the wetlands eastern margin and contiguous with the large bush remnant, and several further discrete areas of the same along the eastern margin and further north.

The area of **Carex sedgeland** was found to be of reasonable health despite ongoing browsing from cattle. Here under a semi-enclosed canopy the small tree putaputaweta was noted as common along with several clusters of mature wheki treeferns and a number of juveniles thereof. Nikau was also recorded as common, along with mature forest trees of titoki, kahikatea, white maire and totara. The groundcover tier consisted mainly of *Carex lesssoniana* and *Carex virgata*, along with patches of the ring fern *Paesia scaberula* and the gully fern *Pneumatopteris pennigera*.

The **kahikatea swamp forest** remnants were found to support a typical selection of wetland plant species, although the abundances of these species have been severely restricted by the encroachment of *Glyceria maxima*. A remnant cluster of c.75 swamp kahikatea form the basis of this remnant (Fig 10 below). Cabbage tree/ ti kouka were noted at low densities growing amid the kahikatea, while isolated individuals of *Carex virgata* and wheki were noted persisting amid the *Glyceria*.

In addition to the two indigenous wetland plant remnants, the following were also noted within the proposed wetland covenant: a patch of raupo within the pond at the down stream terminus of the wetland, the occasional scattered patch of *Carex* sedge, kahikatea (semi-mature & mature), manuka and kiokio.



Fig 10: The remnant kahikatea swamp forest area with *Glyceria* dominant beneath.

4.2.2 Avifaunal diversity

The following bird species were recorded within the wetland during the site visit to the property.

GENUS	SPECIES	COMMON NAME
<i>Circus</i>	<i>approximans gouldi</i>	Kahu/ Harrier hawk
<i>Halcyon</i>	<i>sancta</i>	Kotare
<i>Rhipidura</i>	<i>fuliginosa</i>	Piwakawaka/ Fantail

4.2.3 Aquatic diversity

Although carrying out a survey of the freshwater species within the wetland was beyond the scope of this wetland assessment, it is the opinion of the writer that the range of aquatic species likely to utilise the wetland as habitat would be limited by the physical barrier formed by the farm access track formed historically at the base of the dam/ lake.

4.2.4 Summary

The wetland area was found to support a minimum of 22 indigenous plant species, which is short of the required 30sp threshold noted in the District Plan with regard to 'diverse wetland types'.

The wetland area therefore does not meet the assessment criterion relating to species diversity.



Fig 11: Carex sedgeland with gully fern and nikau, NW wetland 'finger'.

4.3 Rarity

No rare or endangered plant or animal species were recorded within the wetland area.

4.4 Wildlife Habitat

Due to the modified state of the wetland area proposed for protection (as distinct from the adjacent forest area) the subject wetland is considered to possess insufficient wildlife habitat value to qualify via this assessment criterion.

4.5 Naturalness/ Long-term Viability/ Representativeness

A key component in assessing the naturalness of a wetland area is representativeness. Representativeness as an ecological concept refers to the significance placed upon species and communities that are considered to be characteristic of the original natural landscape of an area (Clarkson in RDC, 2002). The two remnant areas of indigenous wetland vegetation noted i.e. *Carex* sedgeland and kahikatea swamp forest (Figure 12), are both recognised by Council as representative wetland type within the Rodney area (RDC, 2002).

A critical component in determining both the naturalness and long-term viability of a wetland is the presence or absence of hydrological functionality, a core requirement for sustaining a wetlands structure and function. The water source for the subject wetland originates in several hillside springs located on the neighbouring property north of the subject forest area. Additional springs and stream tributaries flow in to the wetland from the surrounding forest area. The relative proximity of the source springs from the wetland, and the filtering function of the forest area through which they pass, enhances the hydrological functionality and thus long-term viability of the wetland. It is also noted that with the exception of the dam at the base of the area, no culverts, crossings, drains or dams were noted in the wetland, further insuring the long-term functioning of the area.

A further consideration in determining the naturalness and long-term viability of a wetland is the size and shape of the wetland feature and the presence or absence of buffer margins and buffer vegetation. The subject wetland has an average width of c.16m and a length of c.500m. Such an elongated shape typically results in 'edge effects' influencing much of the area, however with the solid buffer environment offered by the adjacent forest remnant to the east and north, and the proposed revegetation planting along the western margin (as part of the 6ha revegetation project), the area will be well-buffered and 'edge effects' minimised.

The presence of the *Glyceria* infestation that already dominates the lower half of the wetland, severely threatens the long-term viability of this portion of the wetland. However a concerted and strategic control effort is proposed within the Wetland Restoration Plan (Section 5.0) and Plant & Animal Pest Control Plan (Section 7.0), and it is the writers opinion that if the control specifications contained herein are carried out appropriately, the *Glyceria* infestation can be effectively managed. Furthermore enhancement planting, proposed under the 'potential' criterion discussed later in this report, is specified in the Wetland Restoration Plan and this will contribute to the ecological integrity/ long-term viability of the area as the plantings establish.

With the appropriate management intervention to address the *Glyceria* weed issue it is considered that the wetland area meets the naturalness/ long-term viability/ representativeness criterion.



Fig 12: Looking SE down wetland with edge of kahikatea swamp forest and the *Glyceria*-dominant main bulk of the wetland visible.

4.6 Linkages, Corridors, Buffering

Excellent connectivity exists between the subject wetland area and the large forested area to the east and north of the wetland. This linkage also has positive effects as the forest remnant buffers the wetland, an outcome that will also ultimately be achieved to the west of the wetland via the retirement and revegetation of the pasture land under the Significant Enhancement Planting rule (Section 6.0).

These areas together form an advantageous corridor of natural areas proposed for protection, and it is therefore considered that the subject wetland area meets the linkages, corridors and buffering assessment criterion.



Fig 13: Mature kahikatea swamp forest on the edge of the wetland.

4.7 Potential

The wetland area is recognised as 'marginal' due to its heavily modified state, attributable to the aggressive *Glyceria* infestation and long-term browsing and trampling by cattle. A rehabilitation/ restoration planting programme is proposed to restore the modified portions of the wetland to a state whereby the wetland as a whole would qualify as significant under the PDP 2000 assessment standards.

The proposed restoration programme will involve the control of the *Glyceria* infestation in its entirety, followed by the establishment of appropriate indigenous wetland species throughout the area at 1.2 m densities. It is noted that naturally occurring native vegetation may contribute to the required density.

Subject to the implementation of the Wetland Restoration Programme (Section 6.0) it is proposed that the area would qualify under the 'potential' criterion as the area exhibits the biological capacity to improve to an acceptable standard given the right management intervention.

4.8 Plant & Animal Pests

Glyceria was the principal plant pest species noted within the confines of the lower half of the wetland proper. A small area of *poplar* was also noted on the N side of the pond at the base of the wetland. Approximately a dozen *pampas* (*Cortaderia selloana*) plants were noted around the head of the dam at the bottom of the area, although these fall under the area proposed for enhancement planting as per Section 6.0 of this document.

The *Glyceria* was found to be almost exclusively dominant through the lower half of the wetland. Information on the control of this species and the *poplar*, is provided in the Plant & Animal Pest Management Plan appended as Section 7.0.

With regard to animal pests, a low level of possum presence was noted during the field visit suggesting the local possum population must be low. This is attributed to the ARC-led control programme carried out across this block and surrounding areas circa 2 years ago. Control recommendations for the plant and animal pests known to be present on the subject property are provided in the Plant & Animal Pest Management Plan appended as Section 7.0.

4.9 Summary

The subject wetland area proposed for formal protection on the Duck Creek Views Ltd property qualifies as SNA under the RDC wetland assessment process.

The area qualifies via the naturalness/ long-term viability/ representativeness and linkages/ corridors & buffering assessment criteria. The restoration work proposed will also ensure the area qualifies under the potential criterion, therefore 'tipping the balance' with regard to the wetlands significance.

The area is therefore recommended for protection.

5.0 Wetland Restoration Programme

5.1 Introduction

The aim of the wetland restoration work detailed in this section is to restore the subject wetland area to a state in which it would qualify as significant wetland as defined in Rodney District Council's 'Guidelines for the Field Assessment of Wetland Quality'. To achieve such an outcome the restoration programme will need to be implemented in strict accordance with the specifications contained herein, along with the relevant plant pest management specifications included in the Plant & Animal Pest Management Plan included in Section 7.0 of this document.

The wetland restoration programme specifications detailed herein provide basic information on the nature and extent of the proposed weed management, and wetland enhancement plantings, including maintenance requirements.

5.2 Pre-planting assessment

Table 1: Pre-planting assessment of the subject site.

• Ecological District -	Rodney Ecological District
• Soil Characteristics & Drainage -	Silt laden upper profile with peat layer over limestone substrate. Soils heavy.
• Topography & Aspect -	The wetland area is located in the floor of a gully. Aspect is neutral.
• Exposure -	The wetland area/ restoration site is sheltered from all but SE winds. Majority of restoration site is in full sun.
• Presence of Animal Pests and Weeds -	Refer to Section 7.0 for information. <i>Glyceria</i> is the principal pest threat.
• Extent of the Existing Indigenous Vegetation	Within the wetland proper two areas of remnant wetland vegetation were noted, being <i>Carex</i> sedgeland and kahikatea swamp forest. Further detail on species can be found in section 4.1 of this document.
• Distance from established bush and other formerly protected natural areas.	Native bush adjoins the wetland on its eastern and northern sides. Closest covenant area is over a forest remnant on the Wyatt property contiguous with the south-western corner of the reveg area.

5.3 Purpose (objectives) of the plantings

The objectives of the wetland restoration programme are:

- To **restore indigenous wetland vegetation representative of the likely former vegetative cover of the locality** in the portion of the wetland identified for restoration (Fig 14).
- To undertake the systematic and consistent control of the invasive plant pest *Glyceria maxima* within the wetland as per the specifications in the Plant & Animal Pest Management Plan included in Section 7.0 of this document.
- To **encourage (with the aid of revegetation) the natural ecosystem processes** of plant regeneration, establishment and dispersal within the wetland.
- To **utilise indigenous and predominantly early-colonising (pioneer) wetland plant species to establish a 'nurse-crop'** environment throughout the wetland.
- To **enhance the habitat values of the area** for birds and other fauna/ flora.

5.4 Site preparation for planting

a) Fencing

All stock will need to be excluded from the wetland area prior to the weed control and revegetation work commencing.

b) Plant pests

The *Glyceria maxima* infestation present throughout the lower half of the wetland is to be controlled as per the specifications in the Plant & Animal Pest Management Plan included in Section 7.0 of this document. The isolated gorse patches on the wetland flat are also to be controlled as per the recommendations in the above pest plan.

It is critical for the success of this wetland restoration programme that the 'initial control phase' for the *Glyceria* be complete (i.e. zero-density is achieved) prior to any enhancement planting beginning.

c) Spot spraying

No preparatory spot-spraying will be required prior to planting commencing in the bare ground that will result from the *Glyceria* control work. In the upper half of the wetland, where only a minor degree of wetland enhancement planting is proposed, spot-spraying will also be unnecessary as the plants specified for this area will establish readily amid the existing vegetation cover.

d) Animal pests

Refer to the control specifications in Section 7.0 of this document.

5.5 Restoration Areas

Two distinct restoration areas form the basis of the wetland restoration programme (Fig 14 overleaf).

Restoration Area 1 (RA1)

This area consists of the full extent of the *Glyceria maxima* infestation as indicated on the aerial image in Figure 14. This includes almost the entire lower half of the main section of the wetland. Intensive control work is to be undertaken in this area to reduce the *Glyceria* to zero-density over a 3 year 'active control' period. Once zero-density is achieved this area is to be revegetated at 1.2m densities with indigenous wetland plant species.

Restoration Area 2 (RA2)

This area consists of the extent of the main section of wetland north of the *Glyceria* infestation/ RA1. This area already contains discrete areas of remnant wetland species. Wetland enhancement planting is proposed throughout this restoration area (Figure 14).



Fig 14: Aerial identifying the extent and location of the wetland restoration areas (RA1 and RA2).

5.6 Planting Specifications

1. All trees are to be grown from seed sourced from within the **Rodney Ecological District**.
2. Species should be sourced **in a grade no smaller** than that specified in the planting schedule.
3. Planting density will be at **1.2 spacings for RA1, and 1.5m for RA2**.
4. RA1 should be planted at a uniform and consistent density i.e. 1 plant per 1.2m until the area is full. This will provide the fastest close-out time to minimise *Glyceria* regrowth.
RA2 should be planted in more natural wetland clumps of c.10-30 plants, although the number of plants required will be calculated on 1.5m spacing's over all of RA2.
5. It is critical for the success of the wetland restoration programme that the 'initial control phase' and the first-up follow-up visit be completed, and control to zero-density achieved, prior to the proposed enhancement planting work within the wetland commencing.
6. Planting must be undertaken **during late summer (i.e. Jan – Mar)** when the water table is lower and soil temperature up. Planting must be completed by the end of May.
7. **No fertiliser is to be used** due to the high soil moisture levels present seasonally within the wetland and also due to its existing high nutrient status.

8. Only colonising native wetland plant species that are natural to the area and are known to establish well within disturbed open or exposed sites have been specified.

5.7 Plant Schedule

Plant Schedule for Wetland Restoration Areas RA1 & RA2 on the Duck Creek Views Ltd property.					
Plant Species	Common Name	Size	Restoration Area		Totals
			RA1	RA2	
<i>Carex lesssoniana</i>		Pb3/4	500	80	580
<i>Carex secta</i>	purei	Pb3/4	300	20	320
<i>Carex virgata</i>		Pb3/4	500	50	550
<i>Cordyline australis</i>	ti kouka	Pb3/4	230	30	260
<i>Cyperus ustulatus</i>	upokotangata	Pb3/4	450	60	510
<i>Dacrycarpus dacrydoides</i>	kahikatea	Pb3		30	30
<i>Leptospermum scoparium</i>	manuka	Pb3/4	50		50
<i>Phormium tenax</i>	flax	Pb3/4	400	40	440
Total			2430	310	2740
<i>Plant #'s required</i>			2,430	310	2,740
<i>Area (m2)</i>			3500	700	4200
<i>Planting Density</i>			1.2	1.5	
<i>% of Area Total</i>			83%	17%	100%

5.8 Maintenance

1. Regular *Glyceria* follow-up spray applications will be essential if the *Glyceria* infestation is to be maintained at the zero-density levels required to achieve the objectives of the restoration programme. Upon completion of the 'initial control' phase, follow-up *Glyceria* spray work will be required at specific times to be repeated annually as per the specifications in Section 7.0.
2. The plantings proposed for RA1 (upon successful control of *Glyceria* to zero-density levels), will require regular releasing from any *Glyceria* regrowth. This work should be done via a careful combination of hand-releasing and the application of a Glyphosate-based herbicide. Only experienced professionals should undertake to spray release plants due to the high likelihood of non-target damage if the applicator is inexperienced or clumsy.
3. Domestic animals must continue to be excluded from the wetland area. Animal pests (in addition to possums & rats), i.e. rabbits and pukeko's will be controlled as and when necessary.
4. Replacement planting of dead plants should occur in late summer (when water levels are low) following the first plant-out to ensure a minimum 90% survival rate of original planting numbers is achieved.

5.9 Monitoring

An ecologist or plantsman is to visit the area every six-months to assess the success of the restoration programme and to monitor the following:



- *Glyceria* control work (success thereof and any methodology changes/ notes)
- Plant success rates (including growth rates and the number of plants lost)

- Blanking (recommendations for replacement of dead plants)

Such visits will ensure that the appropriate management and maintenance work is undertaken in a timely manner and in accordance with the specifications contained in this document.

Due to the diligence required from the landowner to give effect to the Glyceria control proposed, the monitoring component of this project is particularly vital to the success of the wetland restoration programme.

5.10 Summary

The wetland restoration programme detailed herein provides advice and specifications for the restoration of a modified wetland area on the Duck Creek Views Ltd property in Wainui.

The wetland area will qualify as significant wetland as per RDCs' 'Guidelines for the Field Assessment of Wetland Quality', if the landowner is bound (via consent conditions) to implement the restoration programme detailed herein.

6.0 Significant Enhancement Planting Plan

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6.1 Introduction

This Significant Enhancement Planting Plan provides information on the restoration of 6ha of marginal land on the subject property. The land is to be revegetated in accordance with the Significant Enhancement Planting Rule (7.14.4) in the Rodney Proposed District Plan 2000.

Amendments contained in Decision Report 2141 (TP/14/2/96), which relates to significant enhancement planting and Decision Report 2154 which relates to RDC's Native Revegetation Planting Guidelines (Rule 7.14.2.3) are included in the content of this document.

6.2 Ecological Context

6.2.1 Location and Site Description

N.B. This is a reproduction of Section 2.0

The 38ha site is situated at 1158 Weranui Road, Wainui, approximately 5 km (line of sight) inland from Orewa.

The predominant landuse is pastoral farming with open pasture covering 60% of the property. A now disused limestone quarry is located in the middle of the property. A large native forest remnant extends along the properties northern boundary covering a further 35% of the land area, with minor areas of regenerating native bush also scattered through the pastoral portion of the property (3.5%), along with a wetland area (1.5%) associated with the main forest remnant.

The topography of the site is a mix of flat alluvial pasture land south of the quarry and rolling hills, with a mix of bush and pasture, north thereof. A stream tributary of the Waiwera River runs eastward through the site dissecting the flat land in the southern half of the property.

The site is within the lowland bioclimatic zone of the Rodney Ecological District.

In the pastoral portion of the property, in addition to the minor scattered areas of native bush, gorse was noted becoming common throughout the 'rougher' portions of the land, particularly surrounding and north of the quarry. A minor area of plantation pine was also noted near the properties western-most boundary, while a smaller poplar plantation was noted on the eastern boundary immediately south of the small wetland that abuts the south-eastern corner of the forest remnant.

The natural areas are not recognised in the PDP 200 Planning Maps as SNA's, and no covenants are in place over any of the natural areas within the property.

Further detail on the forest and wetland remnants and the proposed 6ha revegetation area is provided in the relevant sections of this document.

6.2.2 Adjacent Natural Areas

A number of high quality native forest remnants (including covenanted areas) are located in the vicinity of the property, however only one small functional connection was noted with a bush area contiguous with the western-most portion of the proposed 6ha revegetation area.

0.5 kms north of the forest remnant is the start of a large natural area classed moderate quality SNA within the PDP 2000 Planning Maps. 0.5kms north-east of the remnant is another large c.100ha remnant of kauri forest on the Dixon property that is known to be under covenant in association with an RMA application.

6.2.3 DP Assessment criteria (Rule 7.14.4.2)

This section provides further information on the ecological context of the areas proposed for restoration as per the Significant Enhancement Planting assessment criteria specified in Rule 7.14.4.2 of the PDP 2000.

- ***Provide valuable ecological linkages***

The area of proposed planting abuts the c.12.1ha forest remnant and the c.0.8ha wetland remnant proposed for protection as part of the application, thereby achieving significant functional ecological linkages between the natural areas.

For further info on connections with adjacent natural areas see 6.2.2 above.

- ***Provide necessary enhancement of existing natural areas to ensure their long-term viability, health and significance.***

Native vegetation cover will be restored across the 6ha area, thereby sealing the edge of the forest remnant and expanding the overall size of the natural area under legal and physical protection. The proposal will also result in the restoration of indigenous vegetation within the sites natural drainage systems. These outcomes will improve the ecological resilience, health and ultimately the significance of the combined natural areas (forest, wetland and 6ha reveg area).

- ***Result in increases in native species diversity.***

The proposed revegetation programme will result in increases in native species diversity both directly (via planting) and indirectly (via improving conditions for seedling recruitment and establishment).

On going management work including the control of animal and plant pests across the natural areas is proposed to give native floral and faunal species the opportunity to inhabit or establish within the retirement site.

- ***Ensure that the natural processes of regeneration are utilised to ensure that in the long-term natural processes take over.***

The principal focus of any sound restoration programme (as is the case for this site also) is to encourage natural succession processes, thereby ensuring the natural regeneration is the under-pinning driver for the long-term recovery of an area.

Key features of the restoration programme include:

- The full control of all kikuyu prior to planting commencing (and ongoing maintenance control thereof), to ensure this species is eliminated from the revegetation area as it is capable of significantly reducing the likelihood of natural regeneration commencing.
- The use of high proportions of colonising/ pioneer plant species to create a 'nurse' environment,
- The use of a mix of species tailored in detail to the various conditions of the site via the specified planting units,
- The use of a two-stage planting programme to mimic natural succession processes i.e. pioneer species are planted in the first year and secondary/ diversity species in the third year once some cover has been established.
- The use of species that are favoured by, and are able to provide a year round food source for, native avifauna.

- ***Provide significant benefits and improvements to water quality and land stability within a specific catchment.***

The revegetation area contains a single minor spring-fed ephemeral watercourse that runs northward down in to the main bush remnant before discharging into the wetland area. This watercourse is currently grazed and is subsequently degraded. The revegetation work proposed will result in the restoration of this 'feeder' spring/ watercourse which will have positive outcomes in terms of this criterion. The reinstatement of native vegetation (via native revegetation) across the balance of the 6ha area will also result in improvements to water quality and land stability via the removal of nutrient inputs via stock, the improved filtering of rainwater/ overland flow and in time the development of a rooted biomass that is superior to the current pasture cover.

- ***Provide enhancement of any existing watercourses and any wetland areas to ensure their long-term health and vitality.***

As noted above the only watercourse present in the 6ha retirement area is a single minor spring-fed ephemeral watercourse that runs northward down in to the main bush remnant before discharging into the wetland area. This watercourse is to be enhanced through the planting of specific riparian plant species as specified in the Planting Schedule included in Section 6.10 of this document. These riparian species consist mainly of the three common *Carex* sedges, giant umbrella sedge and lesser numbers of toetoe (*C.fulvida*), ti kouka, manuka and putaputaweta. The proposed riparian species and numbers have been selected to form a robust group of species representative of the areas natural riparian environments. The plantings will provide for enhanced riparian services in the form of improved stabilisation of stream banks, enhanced sediment and nutrient filtration and a reduction in overland flows.

The eastern portion of the 6ha revegetation area also extends down to and abuts the edge of the wetland area. The revegetation of the wetlands western buffer will significantly improve the long-term viability of the wetland.

- ***Provide a potentially significant and sustainable forest in its own right.***

In addition to the adjacent c.12.1ha forest remnant and c.0.8ha wetland remnant, the proximity of the two large indigenous forest areas to the planting site (one incl. a large SNA area), further enhances the viability of the revegetation site. An additional connection between the revegetation site and an area of native bush on the adjacent property to the south further secures the long-term viability of the project. The presence of these natural areas in the locality is particularly favourable to the development of the plantings as a significant and sustainable forest ecosystem.

The plantings have been designed to mimic natural regenerative processes and this approach underpins all aspects of the planning specified for this revegetation project.

6.3 Revegetation Area

The 6ha revegetation area has a sound connection with the main native forest and wetland remnants within the property. The bulk of the proposed revegetation area is currently in pasture grass (95%), with a small pocket of remnant forest trees (kahikatea, puriri, taraire and totara) and a minor area of plantation pine (1500m²) making up the balance of the area.

A graphic of the revegetation site is included in Figure 15 below.

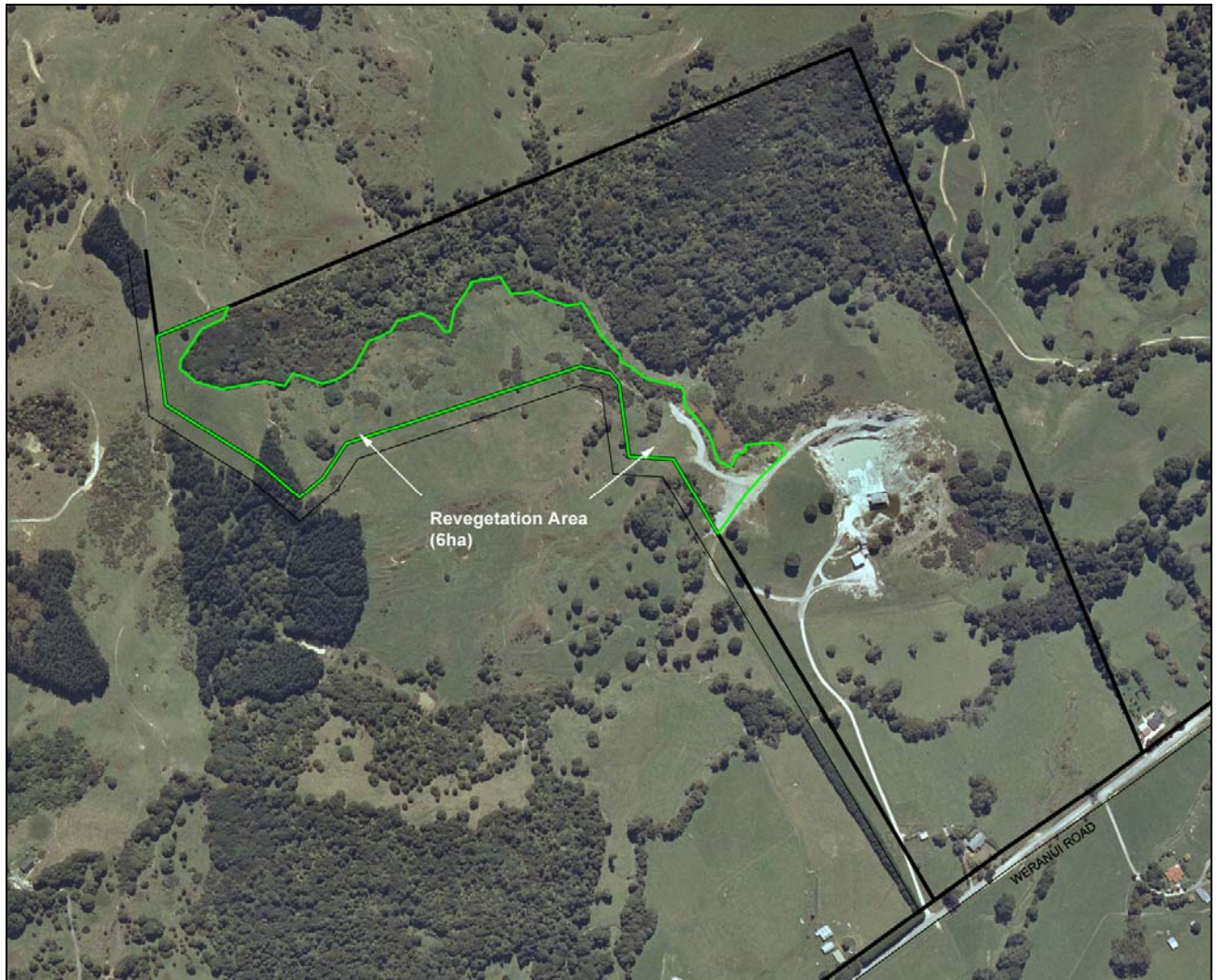


Fig 15: Graphic identifying the location of the proposed 6ha significant enhancement planting/ revegetation area.

6.4 Project Aim & Objectives

The aim of the revegetation project is to:

Retire marginal land on the site and restore and enhance indigenous vegetation throughout to encourage natural ecosystem processes, including the regeneration and dispersal of indigenous flora and fauna.

The aim of the project will be achieved through the implementation of the following objectives:

- a) Undertaking **active management intervention in the form of fencing (to exclude stock), site preparation, revegetation and ongoing maintenance.**
- b) The use of **eco-sourced indigenous and predominantly early-colonising (pioneer) plant species to establish a 'nurse-crop'** in to which light and moisture sensitive species will spread and establish naturally via dispersal by birds.
- c) The **formal protection of the proposed 6ha revegetation area** via land or open space covenant.

6.5 Restoration Guidelines

The following guidelines form the basis of the proposed restoration project.

1. **Pioneer or early-colonising plant species are to be utilised to achieve canopy closure and create a 'nurse' environment.**

Pioneer or early colonising species specialise in establishing on sites exposed via disturbance. They exhibit a wide tolerance to climatic extremes and variations in soil types etc. These species function naturally as a 'nurse crop', providing sheltered conditions within which other species will establish naturally or be planted at a later stage. If the pioneer or colonising species are sufficiently dense that weed seed germination will be reduced significantly on the establishment of canopy closure. This should occur within 3-5 years after planting.

2. **A minor component of forest diversity species are to be used to supplement the pioneer/colonising species cover.**

As there is a high likelihood that forest diversity species will spread throughout the revegetation area via wind and bird dispersal, this natural process is to be encouraged in preference to the planting of large numbers of forest diversity species amid the nurse crop cover. Given the connectivity and expanse of native forest present on and around the subject site even the large seeded broadleaves taraire and tawa will be dispersed via wood pigeons who frequent the forest areas. However a minor component of forest diversity species are to be planted in recognition of the importance of introducing additional diversity species to supplement the mass-plantings from the onset of the programme.

For this project 6 forest diversity species have been specified for the site in recognition of the need to 'kick-start' the dispersal process. The planting is to be two-staged with the forest diversity species to be planted in Year 3 of the programme following the establishment of nursery plantings.

3. **Ensure all planting material is grown from seed eco-sourced from naturally occurring indigenous stock growing within the Rodney Ecological District.**

Eco-sourcing is a principle fundamental to the long-term success of a revegetation programme. The benefits of eco-sourcing include the maintenance of local biodiversity/ genetic variability, the plants are adapted to growing in local conditions, and subsequently the threat of disease is lessened. The principle of eco-sourcing becomes even more significant in relation to revegetation within **ecologically unique and rare habitats**, and also when large plant quantities are involved.

6.6 Pre-Planting Site Assessment

The following pre-planting site assessment is required under the RDC Native Revegetation Planting Guideline.

Table 2: Pre-planting assessment of the subject site.	
• Ecological District -	Rodney Ecological District
• Soil Characteristics & Drainage -	Thin topsoil over limestone substrate.
• Topography & Aspect -	Rolling hillside, mainly north-facing, a single spring-fed watercourse originates in area and runs down to bushline and on to wetland area that defines the eastern boundary of the reveg area.
• Exposure -	The revegetation area is exposed to westerly winds.
• Presence of Animal Pests and Weeds -	Kikuyu, gorse and pampas are present in the proposed revegetation area. The gorse and kikuyu are common, while the pampas was noted on the bank leading down to the dam at the base of the wetland. Information on the distribution of these species is provided in Section 6.8.2 of this document, along with control specifications in Section 7.0.
• Extent of the Existing Indigenous Vegetation	Refer section 6.2.1.
• Distance from established bush and other formerly protected natural areas.	Refer to Section 6.2.2.

6.7 Planting Units

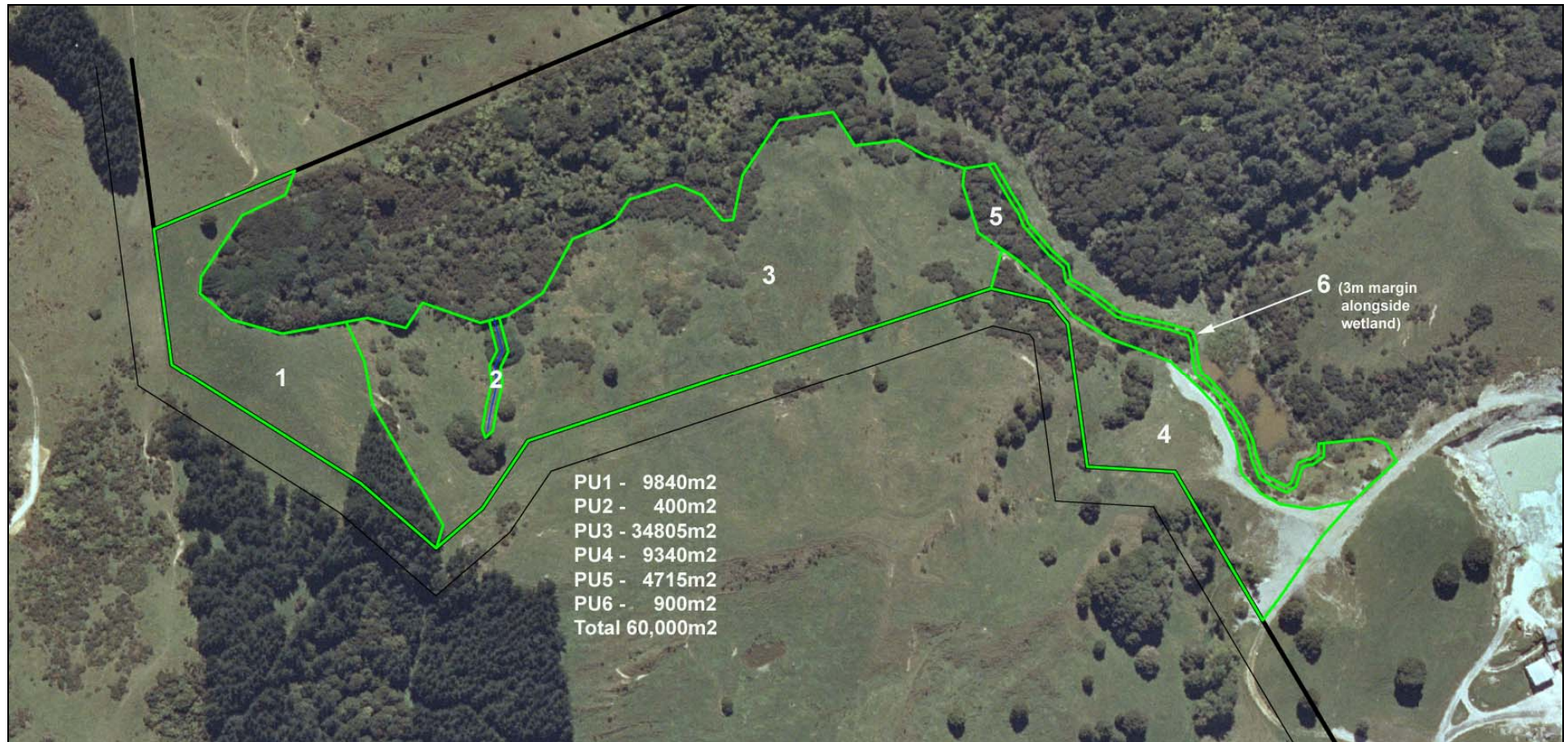


Fig 16: Planting units within the proposed 6ha revegetation area.

The revegetation area has been divided in to six (6) planting units to aid both the allocation of plant diversity within each area and also to enable easier physical implementation of the project on-site.

The planting density across each of these units is set at 1.4m centres, with the only exception being the riparian areas associated with the minor spring-fed tributary and the wetland margin on the eastern side of the revege area (Planting units 2 & 6). In accordance with the RDC Native Revegetation Standard these areas are to be planted at 1m densities for a distance of 3m from either side of the watercourse and 3m out from the edge of the wetland (Figure 16 above).

A plant schedule is provided in section 6.10 of this document.

6.8 Site Preparation

This section addresses the first operational task in a revegetation project, the preparation of the site for planting. The subject site requires the following site preparation: the removal of stock from the site and the stock-proofing of the area via fencing, along with animal and plant pest control.

6.8.1 Stock-proof fencing

Prior to any planting work being undertaken a stock-proof fence needs to be erected (if not already in place) around the bounds of the area proposed for revegetation. The fence should be constructed to a standard that is acceptable to Council i.e. a minimum 7-wire post & batten fence with no gates. However, to enable vehicular access in to the revegetation area for the transportation of plants and the undertaking of maintenance weed control, a temporary gate will be required in to the area for the first 2-3 years of the project.

6.8.2 Plant pest control

Control of the plant pests noted in the area is to occur prior to the commencement of planting operations. The species noted in the area (kikuyu, gorse and pampas) are to be controlled to prevent them from adversely affecting the revegetation programme.

Specifications for the control of these species are included in Section 7.0 of this document.

6.8.3 Animal pest control

Rabbits and pukekos pose a potentially significant threat to revegetation plantings and it is likely that these species visit the site and its surrounds periodically. Upon commencing the planting of the site these species may become frequent visitors and if left uncontrolled they can have a very significant impact on the success of the revegetation project.

Rather than specify rabbit control during site preparation, it is proposed that the planting contractor monitor for the presence of rabbits during the early stages of the revegetation project, either via citings or 45o sliced stems. If rabbits are detected and are found to be having a more than minor effect on the plantings the planting contractor is to implement control measures to ensure any local populations are reduced in number.

Specifications for the control of rabbits are provided in the Plant and Animal Pest Management Plan in Section 7.0 of this document.

Pukekos are difficult to manage due to their status as a game bird species, however the impact of this potentially troublesome pest can be notably reduced through the use of Pb3/4 and Pb3 grade plants (rather than the easily-pulled rootrainer) for species favoured by pukekos and to be planted in the riparian environs they pukekos' favour.



6.8.4 Pasture/ groundcover control

Due to the widespread presence of kikuyu within the revegetation area this species will require blanket spraying with herbicide during the spring/ summer prior to planting and when the plant is in its active growth phase. This preparatory work will require a two-stage spray job as specified in the Plant and Animal Pest Management Plan included in Section 7.0 of this document.


The only area where kikuyu was not noted as common was the ridge top area or Planting Unit 1. The kikuyu present in this area will require control as per the above, but throughout the balance of the unit spot spraying may be used, or alternatively planting may occur directly into the existing pasture cover. The later option is known to discourage the browsing and disturbance of plants via rabbits and pukeko's. Although unavoidable in the remaining planting units it may be wise to avoid spot-spraying or blanket spraying in the 'clean' portions of Planting Unit 1, as this would remove the existing grass sward thereby exposing the soil surface, which would trigger the germination of the seed bank which in this instance would consist almost purely of gorse seed.

6.9 Plant Size Selection

The grade/ size in which revegetation plants are specified and supplied in is an important consideration in ensuring the success of the project. In selecting the grade or size of plants to be utilised for this project the following factors were considered:

- **Budget considerations –**
Plants grown in root trainers are the smallest and therefore the cheapest grade of revegetation plant suitable for planting out. However a higher intensity of maintenance is required, particularly when planting anything other than top grade root trainers.
- **Environmental tolerances –**
As a general principle smaller plants are more tolerant of the environmental extremes experienced during establishment and therefore recover more rapidly from the stress of planting than a larger plant.
- **Bird disturbances –**
Within the watercourse portions of the site (and possibly even on the hillslopes) pukekos pose a potential threat to the plantings. Species preferred by pukekos (i.e. ti kouka, flax and *Carex* sp) are therefore to be planted in larger sizes to prevent pukeko's from pulling them out.
- **Availability from nurseries –**
Specialist revegetation nurseries often only grow large quantities of plants in root trainers or Pb3/4, as they are easier to produce, are proven in the field and are easier to transport etc.

6.10 Plant Schedule

Plant Schedule for the 6ha hillslope area, Duck Creek Views Ltd, 1158 Weranui Road, Wainui.								
Botanical name	Common name	Size	Planting Units					
			1	2	3	4	5	6
<i>Aristotelia serrata</i>	Wineberry	Pb3/4			200	25	20	
<i>Carex lessoniana</i>		Pb3/4		30	8			50
<i>Carex virgata</i>		Pb3/4		50	100			150
<i>Carpodetus serrata</i>	Putaputaweta	Pb3/4		50	300		100	60
<i>Coprosma robusta</i>	Karamu	Pb3/4	900	20	4,000	1,150	700	170
<i>Cordyline australis</i>	Ti kouka/ Cabbage tree	Pb3/4	20	10	300	75	50	40
<i>Cortaderia fulvida</i>	Toetoe	Pb3/4			200	55	100	50
<i>Cyperus ustulatus</i>	Upokotangata	Pb3/4		50	100	50		20
<i>Hebe stricta</i>	Koromiko	Pb3/4			100	50	50	
<i>Hoheria populnea</i>	Lacebark	Pb3/4			250	25		
<i>Kunzea ericoides</i>	Kanuka	RT	2,550		6,000	600		
<i>Leptospermum scoparium</i>	Manuka	RT	1,000	150	5,000	2,100	1,000	250
<i>Melicytus ramiflorus</i>	Mahoe	Pb3/4	200	20	500	400	300	50
<i>Phormium tenax</i>	Flax	Pb3/4						30
<i>Pittosporum tenuifolium</i>	Kohuhu	Pb3/4	50		200	50	20	
Forest diversity species								
<i>Agathis australis</i>	Kauri	Pb3			100	20		
<i>Alectryon excelsus</i>	Titoki	Pb3	100		100	20	30	
<i>Corynocarpus laevigatus</i>	Karaka	Pb3	50		50		6	
<i>Dacrycarpus dacrydoides</i>	Kahikatea	Pb3		20	100	50	30	30
<i>Hedycarya arborea</i>	Pigeonwood	Pb3	100		100	75		
<i>Vitex lucens</i>	Puriri	Pb3	50		50	20		
Total			5,020	400	17,758	4,765	2,406	900
<i>Plant #'s required</i>			5,020	400	17,758	4,765	2,406	900
<i>Area (m2)</i>			9840	400	34805	9340	4715	900
<i>Planting Density</i>			1.4	1	1.4	1.4	1.4	1
<i>% of Area Total</i>			16%	1%	58%	16%	8%	2%

6.11 Maintenance

This section covers the maintenance requirements for the revegetation project.

The subject revegetation programme is to include a combination of maintenance tasks that will need to be implemented until the plantings are deemed to have been successfully established at a density of 5100+ plants/ha and a minimum of 75% canopy closure is achieved.

Maintenance tasks relevant to this project include the releasing of plants (predominantly from kikuyu regrowth), the replacement of dead plants and animal & plant pest maintenance.

6.11.1 Plant Releasing

Plant releasing (primarily from kikuyu growth and or regrowth), will be required within each of the planting units, and will need to occur until the plants in these areas have achieved canopy closure.

Options for 'releasing' include hand/ manual clearing or spray-releasing with herbicide.

- **Hand/ manual clearing –**
(no-low risk to plant health – high labour input)

This approach involves the use of either a scrub-bar or hand tools (machete, spade etc) to cut back grass and weed growth around plants which are about to, or have become, suppressed.

- **Spray-releasing with herbicide –**
(mod-high risk to plant health – moderate labour input)

This is the most common method of plant releasing undertaken by planting/ spraying contractors in maintaining revegetation projects. The actual method adopted depends on the herbicide to be used, the experience/ skill of the operator and the nature of the site.

In the majority of situations a selective herbicide such as Gallant® is able to be applied safely around/ over most native species. However this herbicide will kill monocots such as ti kouka (cabbage tree), harakeke (flax), *Carex* and *Cyperus* species, so these species are typically released by hand.

Using a non-selective herbicide such as Glyphosate to release plants is a high risk activity that is not recommended as spray drift can easily destroy plants, wasting time, effort and money.

In considering the above methodologies for plant releasing it is recommended that spray-releasing with Gallant® be adopted as the principle releasing method due to the scale of the project. Monocot species are to be left un-released due to the risk involved in attempting to release them via spraying and also due to their ability to establish amid tall rank grass.

Release spraying with Gallant® is to occur at the following intervals:

- Two maintenance visits at six month intervals during the first year post-planting, and then
- A maintenance visit annually until the plants have established to the point where >95% have survived and are growing in a self-sustaining manner.

6.11.2 Plant Replacement (blanking)

A plant mortality rate of between 3-5% is common in revegetation projects with reasons for losses including: poorly grown plants; ringbarking/ slicing by rabbits, spray drift, or natural causes such as droughts, frosts, insect damage, and diseases.



In order to ensure project success it is therefore necessary to undertake the replacement planting (also referred to as blanking), of dead plants. This is to occur annually in winter to ensure a minimum 95% survival rate of original planting numbers is achieved.

Plant mortality of 5% is to be budgeted for in the first year after planting with this dropping to 3% in year 2 & 3. Once the plantings are established onsite (i.e. in 2-3 years after the initial planting) and the areas are approaching 'canopy closure', blanking will no longer be required.

6.11.3 Animal Pest Maintenance

Domestic animals will continue to be excluded from the revegetation area. Monitoring will occur to ascertain whether rabbits are having an effect on the revegetation programme and if necessary control will occur as per the specifications provided in Section 7.0.

Possum and rat control will commence in the spring after the plantings are established and be undertaken as per the specifications provided in Section 7.0.

6.11.4 Plant Pest Maintenance

Plant pest control is to remain a consideration throughout the revegetation programme with an emphasis being placed upon the detection (and where necessary the control), of any plant pest species noted establishing within the revegetation site.

The aim of plant pest control being to reduce the impacts plant pest species are likely to have on the aims and objectives of the project. **Particular focus is to be placed on the continued surveillance for, and control of, kikuyu and gorse throughout the planting site.** The control objective for these species during the maintenance phase is to maintain their populations at low densities whereby their impact on the revegetation programme is minimised, whilst enabling any regrowth to be controlled during annual maintenance visits.

Broadleaf weeds such as dock, inkweed, black nightshade, thistle etc provide some shading to the soil surface and do not have a competitive root system. These species are therefore to be left uncontrolled due to the benefits they provide.

6.12 Monitoring

The revegetation programme is to be monitored on a day to day basis by the landowners who will be responsible for checking the area remains stock-proof and the temporary gates required for plant pest maintenance etc remain locked.

It is recommended that the revegetation programme be monitored on a day to day basis by the landowners. An ecologist or experienced plantsman should make a brief visit to the site every 6 months to assess the status of the planting project, while a more detailed monitoring visit is to be undertaken annually (refer RDC supplied Monitoring Sheet in Appendix 3).

Such visits will ensure that the appropriate management and maintenance work is undertaken and that the revegetation programme and specifically the plantings plants are given every opportunity to establish successfully. One of the main focuses of these monitoring visits will be checking for any regrowth in the existing kikuyu sites and for gorse regrowth throughout the planting units.

6.13 Summary

The significant enhancement planting programme proposed for the 6 hectare hillside area, if implemented as per the specifications of this document, will establish to form a dense area of colonising indigenous vegetation interspersed with a diverse selection of canopy and sub-canopy indigenous forest trees.

Once established the area will function as an important stepping stone between remnants in the locality, including an SNA area and several large forest remnants under Council covenants. The revegetation programme will have positive outcomes for local indigenous flora and fauna and also provide additional ecological services such as water quality enhancement, erosion protection and enhanced habitat connectivity.

Section 7.0 Plant & Animal Pest Management Plan

7.1 Introduction

The following Plant & Animal Pest Management Plan has been prepared in association with the assessment and restoration of a series of natural areas on the Duck Creek Views Ltd property, Wainui.

This plan provides specifications for controlling the plant and animal pests known to be present within the various natural areas proposed for protection on the property. The plan is to be implemented by the landowner and involves an on-going programme of pest control.

The landowners compliance with the programme specifications outlined herein is to be a consent condition.

7.2 Plant Pest Management

7.2.1 Invasive Plant Pests/ Weeds – a Definition

For the purpose of this plan a plant pest/ weed is defined as:

'A plant that can significantly and adversely affect the long-term survival of native species, the integrity or sustainability of natural communities, or genetic variation within indigenous species' (S.J. Owen 1998)

7.2.2 Nature of Plant Pests in the Natural Areas

Plant pests were noted within the wetland and proposed revegetation area, along with the smaller of the two forest remnants proposed for protection. The absence of plant pests from the main forest remnant can be attributed to the relative intactness of the remnant and a lack of disturbance in the form of clearings/ lightwells etc. The wetland was found to support an advanced reed sweet grass (*Glyceria maxima*) infestation extending from the lake at the base of the area to approximately halfway up the wetland (and c.50m north of the kahikatea swamp forest remnant). Isolated patches of gorse (*Ulex europaeus*) were also noted in several locations within the bounds of the wetland, and several poplar (*Populus* sp) were noted on the edge of the dam at the base of the area. The proposed revegetation area was found to support extensive areas of kikuyu (*Pennisetum clandestinum*) scattered throughout the majority of the area as large and small patches growing amid pasture. Also noted in this area were extensive small to medium size gorse (*Ulex europaeus*) patches spread across much of the area. Approximately a dozen pampas (*Cortaderia selloana*) plants were noted around the head of the dam that defines the lower end of the wetland, with these being in the bounds of the area proposed for revegetation.

Plant pests noted in the natural areas are listed in the following table:

Table 1: Inventory of plant pest species noted in the natural areas on the Duck Creek Views Ltd property					
Common name	Botanical name	Natural Area			
		Bush		Wetland	Reveg Area
		Main remnant	Minor remnant		
Gorse	<i>Ulex europaeus</i>		√	√	√
Kikuyu	<i>Pennisetum clandestinum</i>		√	√	√
Pampas	<i>Cortaderia selloana</i>				√
Pine	<i>Pinus</i> sp	√			√
Poplar	<i>Populus</i> sp			√	
Reed Sweet Grass	<i>Glyceria maxima</i>			√	

7.2.3 Plant Pest/ Weed Control Specifications

The following section provides control specifications for the plant pest species recorded within the natural areas, while also specifying the recommended control methods and herbicide application rates for the recorded species.

N.B.

- *Recommendations made within this plant pest control specification are in accordance with the Auckland Regional Pest Management Strategy 2002-2007 (ARPMS 2002-07).*
- *The application of herbicides, as specified in this document, is to be undertaken in accordance with the best practise guidelines contained in section 2.4.*
- *Further information on the species listed below can be found at www.weedbusters.co.nz.*

7.2.3.1 Gorse (*Ulex europaeus*)

Within the proposed revegetation area gorse was noted at moderate densities in all the planting units (except PU1). The gorse appears to be regrowth from a prior poisoning programme that would have ceased 3+ years ago. Gorse was also noted at low densities within the wetland area.

The control of all gorse within the proposed revegetation area is required to give the plantings every opportunity to establish in the absence of competition. This spec also recognises the significant affect gorse would have on the long-term success of the revegetation programme if it were left uncontrolled. Likewise the gorse within the wetland area is also to be controlled to prevent its further spread. The gorse infestation within the minor forest remnant is to be left uncontrolled as a means of encouraging native seedling recruitment in the favoured nurse conditions noted developing at this particular site.

Control methodology:

Within the revegetation area **ALL** gorse is to be controlled via foliar-spraying (from a vehicle-mounted unit) to ensure infestations are adequately controlled (95+%) a minimum of 3 months prior to planting commencing. Gorse control is also to occur within the wetland, where control should be focused on those plants out in the open and unlikely to be shaded out. A number of herbicides give effective control of gorse, including Grazon®, Escort®, Trounce®, Tordon®, Tordon Brushkiller® etc. The most reliable results will be obtained when gorse is sprayed between November and February. When spraying herbicide it is important that good coverage is obtained – all foliage through to the centre of the plant should be wet to the point of runoff. Marker dyes can be used to indicate the level of coverage and herbicides should be mixed as per label instructions. To improve herbicide uptake, use a penetrant such as Pulse® or Boost®, or a surfactant like Freeway.

Follow-up control:

Follow-up gorse control work will be required within the revegetation area on an ongoing basis, or until the plants are well-established and have achieved canopy closure i.e. 3-5 years. Prior to planting commencing a follow-up control visit is to occur to pick up any gorse missed in the first session of control.

7.2.3.2 Kikuyu (*Pennisetum clandestine*)

In the open environment of the proposed revegetation area, kikuyu will continue to spread and develop and therefore it is to be controlled to enable the area to be successfully revegetated. As it is in the early stages of invasion, the kikuyu can be controlled effectively prior to planting (although ongoing vigilance will be required as part for the maintenance programme). The minor kikuyu infestations in the wetland and minor bush remnant are also to be controlled.

Control methodology:

Kikuyu is to be controlled via foliar spraying with a Glyphosate-based herbicide (200mls Glyphosate /10L water plus compatible penetrant). Control is to occur during the spring/ summer months. Due to the very aggressive nature of this plant all kikuyu infestations are to be sprayed out in their entirety (and then the regrowth targeted 2-3 months later. Within the proposed 6ha revegetation area **kikuyu is to be controlled a**



minimum of 8 weeks prior to planting commencing, with the control objective being a 95% reduction in the plants current extent.

Follow-up control:

A **follow-up control visit is to be undertaken 4 weeks prior to planting commencing** with the control objective being to locate and spray the remaining 5%.

Ongoing kikuyu control is to occur as per the maintenance programme specified in section 6.2 of this document. Given the strategic kikuyu control work proposed and the ongoing maintenance spraying of any regrowth it is deemed appropriate for the planting density for the revegetation programme to remain at the standard 1.4m density.

7.2.3.3 Pampas (*Cortaderia selloana*)

Pampas was noted on the bank leading down to the dam at the base of the wetland. This species is present at low densities and is to be controlled to prevent further spread through the revegetation area. It would also be advisable for the landowner to control this species across the balance of the property (in the quarry etc) to avoid pampas being an ongoing management issue.

Control methodology:

Pampas is to be controlled via foliar spraying with a Glyphosate-based herbicide (200mls Glyphosate /10L water plus compatible penetrant). For best results control should occur during the spring/ summer months, although for this species this is not essential.

7.2.3.4 Pine (*Pinus* sp)

Within the main forest remnant a single large pine was noted NE of AS2 and visible in Fig 3 of this report. This species is to be controlled to prevent it from seeding into any of the proposed covenant areas on the property.

A small pine plantation (1500m²) was also noted in the SW corner of the proposed revegetation area. This will require felling and removal (or stock pilling and burning) prior to planting commencing to ensure the pines don't become a pest issue and also to ensure the full 6ha area is revegetated in accordance with the PDP 2000 rules.

Control methodology:

The large single pine can either be ringbarked or poisoned via stem-drilling. Ringbarking will require the use of a chainsaw, axe or machete to remove the outer bark layer around the entire trunk circumference. The cut should be a minimum of 5cm wide/high. The method for poisoning the pines is to drill 10-12mm diameter holes at 100-150mm spacing (75mm for smaller trunks), around the base of the trunk with a battery or chainsaw drill. The holes should be drilled approximately 75mm deep and encircle the entire trunk at the suggested spacing. The holes should then be filled with the following herbicide mix, applied from a small 1-2L spray bottle: 10grms Metsulfuron (i.e. Escort®/ Meturon® etc) & 20 mls penetrant/ surfactant per 1L of water.

A timeframe of approximately 3-6 months may be required before defoliation is evident. Overtime the poisoned tree will disintegrate and fall into the forest area.

7.2.3.5 Poplar (*Populus* sp)

Several poplar (*Populus* sp) were noted on the northern side/ edge of the dam at the base of the wetland area. Although these trees are not currently suckering/ spreading they are to be controlled to prevent the potential for this to occur in to the future.

Control methodology:

As per the pine control method specified above. N.B. The poplars should not be felled as this would encourage them to sucker and become a mores serious management issue.

7.2.3.6 Reed sweet grass (*Glyceria maxima*)

The wetland area was found to support an advanced reed sweet grass (*Glyceria maxima*) infestation extending from the lake at the base of the area to approximately halfway up the wetland (and c.50m north of the kahikatea swamp forest remnant). The approximate size of the infestation is 3500m².

Control methodology:

The *Glyceria* is to be foliar-sprayed with a Glyphosate-based herbicide (200mls Glyphosate /10L water plus compatible penetrant). It is vital that control only occurs when the plant is actively growing to ensure the best uptake of herbicide and thus control is to be confined to the months of September – October.

Initial control phase

The focus of the 'initial control phase' will be to significantly reduce both the biomass and extent of the *Glyceria* infestation whereby dieback is achieved across >90+% of the current infestation. Control is to commence during the first spring period post consent being granted, and it is feasible for the >90+% target to be achieved following the initial spray session if the applicator is experienced and careful.

Follow-up control:

A first-up follow-up control visit is to occur during the months of November/ January, with the aim of this first visit being to reduce the remaining *Glyceria* to zero-density (i.e. no live foliage).

It is critical for the success of the wetland restoration programme that the 'initial control phase' and the first-up follow-up visit be completed, and control to zero-density achieved, prior to the proposed enhancement planting work within the wetland commencing.

A further two (2) follow-up visits will be required to ensure the area is ready for planting the following spring. The second follow-up is to be done during March and the third and final pre-planting spray done during September.

Seasonal follow-up spray applications will be essential to maintain the *Glyceria* infestation at the zero-density levels required to achieve the objectives of the wetland restoration programme and to secure the long-term viability of the wetland. A minimum of two (2) follow-up spray visits annually will be undertaken during spring and late summer, for a period of three (3) years from the date consent is granted. This work should be done via a careful combination of hand-releasing (around the wetland enhancement plantings) and the application of herbicide as per the above concentration. Only experienced professionals should undertake to spray release plants due to the high likelihood of non-target damage if the applicator is inexperienced or clumsy.

The landowner will be required to continue with the maintenance/ follow-up visits on an ongoing basis as it is noted RDC stipulate that pest plant infestations need to be reduced to a point at which the current (and any subsequent) landowners are able to complete follow-up control work with 1 x backpack full of herbicide solution applied up to 4 times per annum.

7.2.4 Best Practise Herbicide Use

Herbicides are required for the majority of plant pest control work as non-chemical 'manual' alternatives have high labour demands, and are often ineffective in reducing the weed issue in the long-term.

The control methods specified in this plan aim to efficiently kill plant pests using the smallest possible quantity of the least toxic effective herbicide. Nonetheless the following 'best practice' recommendations should be adhered to in handling and applying herbicide:

- Read the product label carefully and ensure you follow the manufacturer's instructions.
(N.B. Herbicide manufacturers often recommend applying excessive rates of chemical for purely economic reasons. The rates recommended in this plan are based on the writers experience in working on specialist weed control projects for 8+years in and around the Auckland Region).

- Utilize marker dye in all spray mixes to identify those plant pests that have been controlled and to prevent over spraying and/or repeat spraying.
(N.B. Avoid using the very toxic red dyes that garden centers/ hardware stores sell. If possible locate a vegetable-based dye from a horticultural supplier such as Hort-centre).
- Avoid applying chemical when wet weather is eminent as even with the additive Pulse or similar a period of 1-2 hours is required for the herbicide to be rain fast.
- Ensure application equipment is in good working order by testing with water only in the first instance.
- Avoid mixing chemical or washing down equipment adjacent to drains or watercourses.
- Ideally all persons wishing to apply herbicide should be 'Growsafe' certified.

7.2.5 Weed Control Timeframes and Assessment Criteria

It is important that weed control programmes are implemented over a timeframe that enables weed species to be controlled effectively. A number of weed species require a minimum of three follow-up herbicide applications to achieve 'successful control', along with ongoing vigilance to ensure new infestations are controlled on establishing.

For the purposes of this Plant & Animal Pest Management Plan 'successful control' is deemed to be achieved if after the initial control work has been completed:

- Pest plant infestations have been reduced to a point at which the current (and any subsequent) landowners are able to complete follow-up control work with 1 x backpack full of herbicide solution up to 4 times per annum, and/or
- The original plant pest infestation has been reduced by >95%.

Given the nature of the infestations present in the wetland and revegetation areas and the certainty that repeated control work will be required to effectively control the species found therein, an active control timeframe of a minimum of three (3) years is to be adhered to for the purposes of this plan. During this 3-year active control period (dated from consent being granted), the landowner is to undertake active control of the plant pests noted in this plan, with the aim being successful control as defined above.

Upon the completion of this 3-year active control period the landowner (and subsequent landowners) should continue to carryout maintenance control work on any regrowth, and periodically survey for new plant pest species and/or infestations. Weed control should be considered as an ongoing process, whereby the area is revisited and any new species or new populations are controlled on a regular basis.

7.3 Animal Pest Management

7.3.1 Possum & Rat Control

A low level of possum presence was noted in the main forest remnant suggesting the local possum population is currently at relatively low levels. This is attributed to the ARC-led control programme carried out across this block and surrounding areas circa 2 years ago.

The landowner is to establish and operate a basic possum and rat control programme to ensure these pests are maintained at levels whereby their impact on the sites ecological values is minimal.

This work will involve the installation of bait stations along the southern margin of the main forest remnant at c.50m spacings extending from the sites eastern boundary across to the western-most extent of the forest remnant. These stations will be filled regularly with a pellet poison (i.e. Pestoff or equivalent). This cereal bait contains the anti-coagulant poison Brodifacoum, and is highly palatable to possums, while rats only require a small portion to obtain a lethal dose.

The bait stations should be installed where stock and/or pets are unable to access or reach the stations. The stations should be filled and maintained with sufficient bait to ensure that possums can feed over 4 – 5 consecutive nights.

Poisoning should occur in pulses (phases) to increase the impact of the poisoning programme on local possum and rat populations. After 2-3 weeks the stations should be filled again for another 4 – 5 nights, with these two sessions being referred to as a 'pulse'.

In order to reduce possum and rat populations to a level at which their impact on the ecology of the areas is minimal three (3) poisoning 'pulses' spanning 12 months are to be undertaken i.e. at approximately 3-month intervals. In order to maintain populations at this level a minimum of 1 poisoning pulse should be undertaken annually.

7.3.2 Rabbits

The potential exists for rabbits to become a management issue during the revegetation of the 6ha significant enhancement planting area. Rather than specify rabbit control during planting site preparation, it is proposed that the planting contractor monitor for the presence of rabbits during the early stages of the revegetation project, either via citings or 45o sliced stems. If rabbits are detected and are found to be having a more than minor effect on the plantings the planting contractor is to implement control measures to ensure any local populations are reduced in number.

If deemed necessary control is to be via the following methodology.

- Source Pindone® rabbit pellets. During periods of dry weather over-turn a 'sod' of earth and place a small handful of pellets on the overturned earth. Overturn earth and lay poison in at least 3-4 different locations throughout the planting site.
- Follow manufacturer's recommendations for usage and safety.
- A poisoning pulse should occur 1 month prior to planting and then every 2-3 weeks through till the end of spring (i.e. the active breeding time for rabbits).

7.4 Summary

This Plant & Animal Pest Management Plan outlines a control programme for the natural areas within the Duck Creek Views Ltd property. The plan specifies the control approach required (over a 3-year timeframe), to reduce the current and future impact the invasive plant pest species (particularly *Glyceria* and kikuyu) are/ will have on the ecology of the natural areas. Specifications for the control of possums, rats and rabbits are also provided.

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Appendix 1 – Species list for the Wetland Area

Wetland Species Inventory for Duck Creek Farms Ltd, Weranui Rd, Wainui.

Recorded by: Rodney Straka (Scrub Consultants Ltd)

Date: 10 March 2008

N.B. Species in bold refer to those noted within the canopy tier

GENUS	SPECIES	COMMON NAME
<i>Carex</i>	<i>lessoniana</i>	Rautahi
	<i>virgata</i>	
<i>Carpodetus</i>	<i>serratus</i>	Putaputaweta
<i>Centella</i>	<i>uniflora</i>	
<i>Coprosma</i>	<i>rhamnoides</i>	
	<i>robusta</i>	Karamu
<i>Cordyline</i>	<i>australis</i>	Ti kouka/ Cabbage tree
<i>Dacrycarpus</i>	<i>dacrydoides</i>	Kahikatea
<i>Eleocharis</i>	<i>acuta</i>	
<i>Isolepis</i>	<i>prolifer</i>	
	<i>reticularis</i>	
<i>Kunzea</i>	<i>ericoides</i>	Kanuka
<i>Lemna</i>	<i>minor</i>	Karearea
<i>Leptospermum</i>	<i>scoparium</i>	Manuka
<i>Rorippa</i>	<i>palustris</i>	Watercress
<i>Typha</i>	<i>orientalis</i>	Raupo

FERNS & FERN ALLIES

GENUS	SPECIES	COMMON NAME
<i>Blechnum</i>	<i>novae-zelandiae</i>	Kiokio
<i>Cyathea</i>	<i>dealbata</i>	Ponga
<i>Dicksonia</i>	<i>squarrosa</i>	Wheki
<i>Doodia</i>	<i>australis</i>	Pukupuku
<i>Paesia</i>	<i>scaberulus</i>	
<i>Pneumatopteris</i>	<i>pennigera</i>	Gully fern

BIRD SPECIES

GENUS	SPECIES	COMMON NAME
<i>Circus</i>	<i>approximans gouldi</i>	Kahu/ Harrier hawk
<i>Halcyon</i>	<i>sancta</i>	Kotare
<i>Rhipidura</i>	<i>fuliginosa</i>	Piwakawaka/ Fantail

Appendix 2 – Species list for the Forest Area

Indigenous Species Inventory for the forest area at 1185 Weranui Road, Wainui.

Recorded by: Rodney Straka

Date: 10 March 2008


N.B. Species in bold refer to those noted within the canopy tier

Species listed below that were not recorded within assessment sites 1-3, were noted in remainder of area

GENUS	SPECIES	COMMON NAME	SITE 1	SITE 2	SITE 3
<i>Acaena</i>	<i>novae-zelandiae</i>		1	2	
<i>Agathis</i>	<i>australis</i>	Kauri			
<i>Alectryon</i>	<i>excelsus</i>	Titoki		2	
<i>Beilschmedia</i>	<i>taraire</i>	Taraire	1	2	3
	<i>tawa</i>	Tawa			3
<i>Carex</i>	<i>dissita</i>			2	
	<i>lambertiana</i>		1		
	<i>virgata</i>		1		
<i>Carpodetus</i>	<i>serratus</i>	Putaputaweta	1		
<i>Centella</i>	<i>uniflora</i>			2	3
<i>Clematis</i>	<i>paniculata</i>				
<i>Collospermum</i>	<i>hastatum</i>			2	3
<i>Coprosma</i>	<i>aerolata</i>		1		3
	<i>grandifolia</i>	Kanono			
	<i>ramnoides</i>		1	2	3
	<i>robusta</i>	Karamu			
<i>Cordyline</i>	<i>australis</i>	Ti kouka	1		
	<i>banksii</i>	Ti Ngahere			
<i>Corynocarpus</i>	<i>laevigatus</i>	Karaka			3
<i>Dacrycarpus</i>	<i>dacrydoides</i>	Kahikatea	1		3
<i>Dacrydium</i>	<i>cupressinum</i>	Rimu			
<i>Dianella</i>	<i>nigra</i>	Turutu			
<i>Dysoxylum</i>	<i>spectabile</i>	Kohekohe		2	3
<i>Elatostema</i>	<i>rugosum</i>	Parataniwha		2	
<i>Earina</i>	<i>mucronata</i>			2	
<i>Freycinetia</i>	<i>banksii</i>	Kiekie	1		
<i>Fuschia</i>	<i>excorticata</i>	Kotukutuku			
<i>Gahnia</i>	<i>setifolia</i>				
<i>Geniostoma</i>	<i>rupestre</i>				
	<i>var. ligustrifolium</i>	Hangehange	1		3
<i>Hebe</i>	<i>stricta</i>	Koromiko			
<i>Hedycarya</i>	<i>arborea</i>	Pigeonwood			3
<i>Hoheria</i>	<i>populnea</i>	Lacebark			

GENUS	SPECIES	COMMON NAME	SITE 1	SITE 2	SITE 3
<i>Knightia</i>	<i>excelsa</i>	Rewarewa	1		3
<i>Kunzea</i>	<i>ericoides</i>	Kanuka	1	2	
<i>Laurelia</i>	<i>novae-zelandiae</i>	Pukatea			
<i>Leptospermum</i>	<i>scoparium</i>	Manuka			
<i>Leucopogon</i>	<i>fasciculatus</i>	Mingimingi	1		
<i>Melicytus</i>	<i>macrophyllus</i>	Large-leaved mahoe			
	<i>ramiflorus</i>	Mahoe	1	2	
<i>Metrosideros</i>	<i>fulgens</i>				3
	<i>perforata</i>		1	2	3
<i>Myrsine</i>	<i>australis</i>	Mapou	1		
<i>Nertera</i>	<i>dichondrifolia</i>				
<i>Nestegis</i>	<i>lanceolata</i>	Maire			
<i>Olearia</i>	<i>furfuracea</i>			2	
<i>Opismenus</i>	<i>hirtellus</i>				
	<i>subsp. Imbecillis</i>		1	2	3
<i>Phyllocladus</i>	<i>trichomanoides</i>	Tanekaha	1		
<i>Pittosporum</i>	<i>tenuifolium</i>	Kohuhu			
<i>Podocarpus</i>	<i>hallii</i>				
	<i>totara</i>	Totara	1	2	3
<i>Pseudopanax</i>	<i>crassifolius</i>	Horoeka/ Lancewood	1	2	
<i>Pterostylis</i>	<i>banksii</i>	Hooded orchid			
<i>Rhabdothamnus</i>	<i>solandrii</i>	Turepo		2	
<i>Rhopalostylis</i>	<i>sapida</i>	Nikau	1	2	3
<i>Ripogonum</i>	<i>scandens</i>	Supplejack			
<i>Rubus</i>	<i>cissoides</i>		1		
<i>Schefflera</i>	<i>digitata</i>	Pate			
<i>Uncinia</i>	<i>uncinata</i>	Kamo	1	2	
<i>Vitex</i>	<i>lucens</i>	Puriri		2	3

FERNS & FERN ALLIES

GENUS	SPECIES	COMMON NAME			
<i>Asplenium</i>	<i>flaccidum</i>			2	3
	<i>oblongifolium</i>			2	
<i>Blechnum</i>	<i>chambersii</i>				
	<i>filiforme</i>			2	3
	<i>fluviatile</i>				
	<i>novae-zelandiae</i>	Kiokio	1		
<i>Cyathea</i>	<i>dealbata</i>	Ponga	1	2	3
	<i>medullaris</i>	Mamaku			
<i>Deparia</i>	<i>petersenii</i>				
<i>Dicksonia</i>	<i>squarrosa</i>	Wheki	1	2	
<i>Doodia</i>	<i>australis</i>		1	2	3
<i>Lastraea</i>	<i>hispida</i>				
 <i>Lygodium</i>	<i>articulatum</i>	Mangemange			
<i>Microsorium</i>	<i>pustulatum</i>	Mikomiko			3

<i>Paesia</i>	<i>scaberula</i>		1	2
<i>Pneumatopteris</i>	<i>pennigera</i>	Pakauroharoha	1	2
<i>Polystichum</i>	<i>richardii</i>			
<i>Pteridium</i>	<i>esculentum</i>	Bracken		
<i>Pteris</i>	<i>tremula</i>			2

BIRD SPECIES

GENUS	SPECIES	COMMON NAME
<i>Hemiphaga</i>	<i>novaeseelandiae</i>	Kereru/ wood pigeon
<i>Rhipidura</i>	<i>fuliginosa</i>	Piwakawaka/ fantail

Appendix 3 - Annual Monitoring Sheet (as provided by RDC)

ANNUAL MONITORING FIELD SHEET FOR NATIVE PLANTING

These sheets must be completed on an annual basis and submitted to Council for a five year period following the completion of the planting. The release of the various stages of the bond will require the satisfactory completion of these sheets and work as outlined in the maintenance schedule.

Date (d/m/y) _____

Resource consent number _____

Address _____

Property owner and contact details _____

Has property changed owners in the last year, yes or no? _____

If yes, who was previous owner? _____

Survival Rate

Percentage survival _____

Growth estimate (cm/yr) _____

Percent ground cover _____

Fertilisation

Date applied _____

What used _____

Areas applied _____

Quantity used _____

Weed control

Date undertaken _____

Sprays used _____

Weeds targeted _____

Areas targeted _____



Replacement planting

Date undertaken _____

Species being replaced _____

Species planted _____

Number of plants replaced _____

Problems (for example are certain weeds proving difficult to control and detrimental to the planting, are animal pests causing significant problems)

Nature of problem

Possible solutions

Analysis of plant losses (are losses greater than expected, are there any obvious reasons, are losses in certain areas, are certain species showing high losses, what are possible solutions?)