

**SCHEDULE 1**

1.	<b>Authorised activity (including approved quantities wildlife collection methods). (clause 2)</b>	Catch, handle and transfer herpetofauna, which includes: <ul style="list-style-type: none"> <li>- Shore skink (<i>Oligosoma smithi</i>);</li> <li>- Copper skink (<i>Oligosoma aeneum</i>);</li> <li>- Auckland green gecko (<i>Naultinus e. elegans</i>); and</li> <li>- Any other herpetofauna encountered during the survey work</li> </ul> <p>from capture location (within earthworks footprint) to a safe and appropriate habitat along the Te Arai dune system within approximately 500m of capture site for species management and monitoring.</p>
2.	<b>The Location (clause 2)</b>	Te Arai Coastal Park
3.	<b>Authorised Personnel (clause 3)</b>	Jonathan Ruffell; Dr Leigh Bull; Dr Vaughan Keesing; Rachel Turner; and Field assistants yet to be determined.
4.	<b>Term (clause 4)</b>	Commencing on and including 1 September 2013 and ending on and including 30 September 2018.
5.	<b>Authority Holder's address for notices (clause 8)</b>	The Authority Holders address in New Zealand is: Level 3 18 Shortland Street Auckland 1143 Phone: 04 3859315 Email: <a href="mailto:Leigh.bull@boffamiskell.co.nz">Leigh.bull@boffamiskell.co.nz</a> <b>NB: Use street address only</b>



# Earthworks & Revegetation Management Plan (including Weed & Pest Control)

Prepared for Tara Iti Holdings NZ



20 May 2014



Boffa Miskell



## Document Quality Assurance

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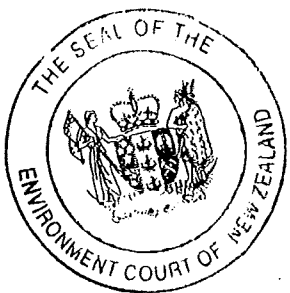
## Appendices

Appendix 1: Te Arai Ecological Values

Appendix 2: Reservoir Vegetation Management Plan

Appendix 3: Potential Weed Control Methods







## 1.0 Introduction

The Te Arai property is a 616 ha parcel of coastal land, to the north of Te Arai Point which contains Mangawhai Forest, a commercial production forest (exotic pine species) since the 1960's. This land comprises rolling dune formations which have been stabilised as a result of the forestry. Areas of ecological value and sensitivity have been identified on the Te Arai site that either provide habitat (or a buffer) for *Threatened* and *At Risk* species, or are examples of representative habitat types within the Rodney Ecological District (Rodney ED). At a broad scale, such areas (and associated biota) include the dune complex, the saline and freshwater wetlands, the Te Arai Stream mouth and associated intertidal area. A list of these ecologically valuable species and habitats are provided in Appendix 1.

This *Earthworks and Revegetation Management Plan (ERMP)* accompanies and is given effect to by the conditions of resource consent **REG60900 & L60899** issued by the Auckland Council to authorise further earthworks over an area of 39 ha in Stage 2 of the Tara Iti golf course, located on Lot 2 (DP 453130), the northern-most land parcel of Te Arai. The resource consent includes methods for the mitigation of potential adverse effects on the environment. These methods are to be implemented in accordance with this ERMP.

## 2.0 ERMP Objectives

The objectives of the ERMP are:

- a) To minimise and control sand, dust and sediment run-off and sand erosion that may arise from the works;
- b) To provide appropriate grass cover on greens, tees and fairways on land where works that are the subject of this consent occur;
- c) To plant in appropriate species (native or non-native) the bunded sides of the reservoir;
- d) To plant in appropriate native species the balance of the land disturbed by activities authorised by the Environment Court's decision [2014] NZEnvC 98 (including within 10m of any seep) where works that are the subject of this consent occur in order to maintain and enhance the natural character and indigenous biodiversity of the area;
- e) To protect the biodiversity through an active pest management programme;
- f) Prepare a methodology and programme for the retention of pine and/or gradual conversion to long term sustainable tree species to enable the reservoir to be screened from public external views.

The methods to achieve these objectives are set out in the following sections of this ERMP.



### 3.0 General provisions

The ERMP will be implemented on a progressive basis, with works occurring as soon as practicable following the completion of earthworks in a particular area (but no later than the following planting season in relation to revegetation and no later than 90 days following completion of earthworks in relation to regrassing).

The hours of work for undertaking the earthworks and site rehabilitation/re-vegetation will be between 7am and 6pm, Monday to Saturday. No such works shall occur on Sundays or public holidays. Works will continue until the development is completed and the site is rehabilitated to a satisfactory standard.

### 4.0 Sand movement & dust control management

There is the potential for sand movement and associated dust to occur during the undertaking of earthworks activities. This potential could arise from:

- Disturbance of ground, including minor dune remodelling and 'sculpturing' and exposed ground prior to revegetation;
- Transportation of excavated material within the site;
- Movement of heavy machinery within the site;
- Stockpiling of material; and
- General vehicle movement.

A Sand Erosion Management Plan (SEMP) has been prepared<sup>1</sup> for the site. The following measures will be adopted for minimising **sand movement**:

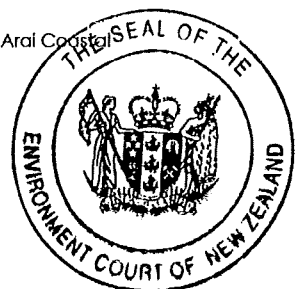
- Existing grasses and vegetation (native/exotic) will be retained where appropriate.
- All earthworked areas will be re-vegetated as soon as possible, in accordance with Section 5.0 below.
- Work will not be undertaken during periods of heavy rain and/or high wind events affecting the site.

The following measures will be adopted for any **dust control** necessary:

- The potential for sand movement during works will be monitored visually on a daily basis by the consent holder/works supervisor during periods of operation.

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<sup>1</sup> Te Arai Development: Sand Erosion Management Plan. Prepared by Erosion Management Limited for Te Arai Coastal Lands Development Trust Ltd. Dated 14 November 2012.



- In dry conditions, adequate plant for the application of water will be brought to the site to control any particulate nuisance.
- Works should be avoided in periods of high winds.
- The re-vegetation of all disturbed ground (except for the formation of bunkers or open sand areas) will immediately follow the earthworks in accordance with Section 5.0 below.

## 5.0 Revegetation Methodology & Operations

The objective is to revegetate the worked areas (except the golf course bunker areas or open sand areas) to:

- Maintain and enhance the natural character and indigenous biodiversity of the area; and
- Control coastal erosion and wind erosion.

The revegetation strategy promotes a phased planting regime of up to 3 years plus a minimum of 4 years post-planting monitoring, active maintenance, infill planting and management, and pest management, for 7 years in total (following planting). On-going management as part of the golf course operations will also monitor and implement a strategy for replacement of failed planted (if required) over the life of the facility.

An appropriate arrangement of species is to be achieved, to ensure species compatibility with habitat and landform. Project layout is to be undertaken by experienced planting supervisors. Plants shall be set out and appropriately spaced in an informal manner avoiding straight lines and regular geometric patterns, whilst ensuring an even cover across the planting area.

All planting shall be undertaken based on established best practice revegetation techniques in relation to matching species with site conditions, soil type, soil/moisture conditions, aspect, exposure and recognition of individual species relationships and growth habit.

Planting shall be undertaken in the autumn and winter months, or as directed in irrigated zones of the site. All planting operations shall be suspended during periods of severe storms, drought and persistent drying or severe winds.

Revegetation will initially consist of the prompt introduction of grasses appropriate to the playing surface for links course tees and greens. These areas will be hydro-seeded using a wood-fibre mulch to enable quick establishment of the grass cover and to mitigate any movement of material from golf course earthworks. These are to be irrigated to ensure sward establishment.

In addition, in order to cover and hold any associated disturbed ground/dune systems in place on the margins of the grassed golf areas, intensive (dense) plantings of appropriate indigenous grass/sedge and ground cover species will be implemented. The species combinations will be appropriate to the site specific location, on both the secondary and inner duneland systems. This planting will be undertaken as soon as practical following works affecting that ground/dune. This would normally occur following completion of the stage of the earthworks but no later than the first planting season (normally commencing May/June) following the works in relation to revegetation, and no later than 3 months following completion of earthworks in relation to regrassing.

The species selection for the revegetation is based on:







- Suitable native species that are likely to have grown naturally in the locality and are sourced from within the Pakiri (Eastern Rodney) Ecological District. Plant selection shall take into account the suitability of local threatened plant species for planting;
- Their appropriateness to the site and the surrounding coastal character and their contribution to enhancing the existing ecosystems on site; and
- Their likelihood of survival in the prevailing environmental conditions, and their tolerance to periods of drought, high winds and potential coastal inundation; and
- Their contribution to the amenity planting for the golf course area.

The plant material selection is purposefully restricted to a relatively low number of plant species. The selected species can be utilised across the entire suite of sites for management of disturbed dune areas associated with the tee and green formation, and any other open space where low-growing hardy (and attractive) ground cover management is required. Fairways will be sown immediately in indigenous grass species.

The proposed planting will comprise selections from species listed in Table 1. Areas greater than approximately 100 m<sup>2</sup> to be replanted in native species will include a mixture of species with higher growth form (i.e. >2m), annotated in Table 1 by an asterisk. These higher growth form species will make up 30% of the plantings in areas greater than approximately 100 m<sup>2</sup>; however the proportion of these species may be lower if they are likely to interfere with lines of sight for the playing of golf. The mix of these species will change depending on the specific site conditions (e.g. slope, aspect, location)

Table 1: Native species to be included in areas of revegetation planting. (\* = greater than 2 m in height)

SPECIES		GROWTH FORM	HEIGHT
<i>Apodasmia similis</i>	Jointed wire rush (oi oi)	Rush	1 m
<i>Austrofestuca littoralis</i>	Sand tussock	Tussock	0.5 m
<i>Carex testacea</i>	Bronze tussock	Grass	0.3 m
<i>Calystegia solanella</i>	Shore bindweed	Ground cover	0.2 m
<i>Coprosma acerosa</i>	Sand coprosma	Ground cover	0.5 m
<i>Ficinia spiralis</i>	Pingao	Sedge	0.5 m
<i>Ficinia nodosa</i>	Knobbly clubrush	Rush	1 m
<i>Muehlenbeckia complexa</i>	Small-leaved pohuehue	Ground cover / vine	1 m
<i>Pimelia villosa</i>	Sand daphne	Low-growing shrub	0.2 m
<i>Spinifex sericeus</i>	Spinifex	Grass	0.5 m
<i>Austroderia splendens</i> *	Toetoe	Large grass	3 m
<i>Coprosma robusta</i> *	Karamu	Tree	5 m
<i>Cordyline australis</i> *	Cabbage tree	Tree	17 m
<i>Kunzea ericoides</i> var. <i>linearis</i> *	Rawiri	Shrub / tree	8 m
<i>Leptospermum scoparium</i> *	Manuka	Shrub / tree	8 m
<i>Leucopogon fasciculatus</i> *	Mingimingi	Shrub	2 m
<i>Metrosideros excelsa</i> *	Pohutukawa	Tree	25 m
<i>Phormium tenax</i> *	Harakeke / flax	Herb	2-3 m
<i>Pittosporum crassifolium</i> *	Karo	Tree	10 m

<i>Olearia solandri</i> *	Coastal tree daisy	Shrub	2 m
<i>Pseudopanax lessoni</i>	Coastal five finger	Tree	7 m

All species perform well in the traditional range of nursery production containers at a range of container size. Planting density specification will be subject to detail selection.

The pines surrounding the reservoir identified on the plan provided by Darby Partners Limited titled "795 Hearing – Reservoir: Vegetation Management Plan" TA\_11\_2 dated 8/5/14 (attached as Appendix 2) shall be retained until a detailed planting and pine management plan is approved outlining the transition from pine to predominantly native species in accordance with Condition 21 of the Environment Court's decision [2014] NZEnvC 98.

## 5.1 Fertiliser

Given that slow release fertiliser has been shown to enhance survival rates of planted dune plants<sup>2</sup>:

- Slow release fertiliser shall be applied at the time of planting to each planting hole in accordance with the manufacturer's recommendations.
- Fertiliser application is to improve the competitiveness of plants compared with weed species; particularly in the first 12 months following planting.
- Fertiliser will not be spread over the entire planting site as this will encourage weed growth.

## 5.2 Monitoring and maintenance

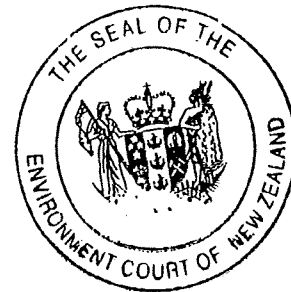
- The maintenance and management responsibility of all active and passive revegetation areas shall rest with the consent holder for the 7 year establishment period.
- 90% plant survival is to be achieved at all times. Replacement plantings shall be of a grade commensurate with planting requirements identified in the appropriate upcoming planting season.
- Site inspections shall be undertaken monthly over the growing seasons for the first two seasons and less frequently over the winter months. These inspections shall identify any management issues as they arise (e.g. weed/pest problems, releasing requirements, replacement planting requirements). Any such issues will be addressed accordingly.
- After 7 years little maintenance should be required and natural succession will enable plants endemic to the area to colonise and establish on the disturbed areas of re-vegetation. Ongoing maintenance and replacement is part of the on-going golf course operations.

## 6.0 Weed Control

Weed species compete with native plants for light, nutrients and moisture; thus making their presence adverse to revegetation process and goals. Outlined in the following sections are the

<sup>2</sup> <http://www.dunetrust.org.nz/>





proposed control methodologies for those species that have the potential to out-compete the golf course revegetation. The long-term objectives for the weed control associated with the golf course site are:

- To control woody weeds and pampas completely (i.e. 0% of total vegetation cover) within revegetated areas.
- To control all other weed species to a level of less than 5% of total vegetation cover within revegetated areas.

The site is expected to require active management for up to 7 years following the initial weed control operations. An adaptive approach will be taken to the maintenance programme so that it may be altered in order to meet the above objectives. Following this 7 year period, any reinvasions of the key environmental weeds will be undertaken as part of the routine golf course maintenance operations.

## 6.1 Planning of Control Operations

Prior to the commencement of a weed control programme it is important to consider the following:

1. Establish and map the environmental weed<sup>3</sup> species present and their relative abundances and priorities to manage.
2. Establish a monitoring / action and reporting system, along with a calendar of management actions.
3. Work in stages, controlling outlying weed patches first to slow the rate of weed spread before starting on the worst areas. Replace weeds with natives or non-weedy plants as work progresses.
4. Timing of control operations to occur before weeds fruit or seed.
5. Prevent the spread of seeds or fragments that could resprout. Decide on the best disposal method before commencement of work.

In instances where chemical control is used, there will be a minimum period of time (recommended by the herbicide manufacturer) between herbicide application and enhancement planting. When cleared patches cannot be planted promptly, mulching the cleared ground will reduce weed invasion and conserve soil moisture.

## 6.2 Control Methods

Weed control may be carried out by hand, machine, herbicide or a combination of the three. The appropriate method will vary according to the growth form of the weed, the level of infestation, and the context in terms of existing habitat and vegetation. The following are general principles for control methods for the different growth forms:

- **Herbaceous groundcover weeds** – Apply herbicide sprays in accordance with manufacturers' recommendations on herbaceous and groundcover weeds. Spot spraying or hand removal techniques in instances of close proximity to protected vegetation, and areas of native or non-invasive groundcover in order to eradicate environmental weeds and accommodate new plantings.

<sup>3</sup> Environmental weeds are invasive plants which Cronk & Fuller (1995) define as "an alien plant spreading naturally (without the direct assistance of people) in natural or seminatural habitats, to produce a significant change in terms of composition, structure or ecosystem processes".



- **Shrub weeds** – Remove the top part of shrub weeds for access. Cut the base of the plant close to ground with a straight flat cut, and apply herbicide immediately as the sap ceases to flow using a paintbrush. Coppice or mulch the plants that will not grow vegetatively. Remove any branches that have seed heads attached or that may sprout.
- **Mature weed trees** – Ring-barking of wilding pine and wilding Tasmanian blackwood is the recommended method of culling these tree species, especially within wetland areas where direct felling would cause significant damage to the existing wetland habitats. Where trees are likely to resprout, make deep cuts and drill holes into sapwood at regular intervals around the base of trees. Immediately apply herbicide, using a paint brush or squeeze bottle. Remove any material that may sprout. Where trees are not likely to resprout and can be removed safely, fell the tree, making the lowest cut below the lowest branch.

If herbicides are to be used, it is important to use chemicals that are species-specific. Furthermore, given the coastal nature of the property spray drift could potentially be an issue and as such direct application methods (e.g., cut and stump painting, spot spraying, drill and inject) should be employed in order to minimise non-target effects and the volume of herbicide used.

Works are to comply with all relevant legislation and regulations. All materials shall be of a high standard, and workmanship shall be that of appropriately qualified persons performing all labours in the best practice to the specified level of effectiveness.

Likely target weed species known to occur on the site are listed in Appendix 3.

### 6.3 Surveillance & Monitoring

Surveillance is an important component of weed control. This allows new invasions to be caught and controlled early, and for the success of projects to be tracked. As such, following the initial round of weed control, six-monthly monitoring should be conducted over the establishment period (7 years) of the revegetation planting, with a triggered level of response related to the monitoring measures.

Monitoring should measure the change in weed abundance following weed control, whereby the long term objectives are to:

- Control woody weeds and pampas to 0% of total vegetation cover; and
- To control all other weed species to a level of less than 5% of total vegetation cover.

### 6.4 Control Programme

Possible control programmes for each of the target weed species are outlined Appendix 3. However the final methodology will be determined on a site-by-site basis, and be dependent on plant size and habitat context. Control operations should be undertaken during the main growing season of weeds (i.e. between October to May).

## 7.0 Animal Pest Control

Herbivore and omnivore species present on the Te Arai site which may browse and damage the revegetation planting include rabbits, possums, pigs, goats and pukeko. The following sections





provide species-specific guidelines for herbivore species control for the golf course revegetation areas. In addition, the control of cats, rodents, mustelids and hedgehogs will also be undertaken as part of a co-ordinated wider site control programme, with a component occurring on the golf course site.

## 7.1 Planning of Control Operations

Prior to the commencement of pest control:

1. The presence and abundance of each pest species should be established in order to determine the level of control necessary to protect the revegetation planting.
2. Establish a monitoring programme for the revegetation planting which should record the levels of observed pest damage.
3. Establish a reporting system along with a calendar of management actions.

## 7.2 Control Methods

A combination of trapping, shooting and poisoning will be used to control animal pests on the site. In all cases, works are to comply with all relevant legislation and regulations. All materials shall be of a high standard, and workmanship shall be that of appropriately qualified persons performing all labours in the best practice to the specified level of effectiveness. All pesticides shall be transported to and from the site in an appropriate manner, which is recognised for the transport of hazardous substances.

### 7.2.1 Possums

**Methods:** Traps are an effective method for controlling on a local basis. Night-shooting also be conducted to assist with controlling possums on the site.

**Spacing and Placement:** Traps or bait stations should be placed at intervals of 100-150 m, and sited in all areas of possum sign (e.g. scratching and droppings, near den sites and preferred food sources, bush/pasture margins), but must be placed at least 10 m from a path edge. Traps should be attached to the dry sides of trees or on fence posts at least 0.7 m off the ground (to avoid ground-based non-target species).

**Lures / Bait:** Flour/cinnamon.

**Timing:** Traps should be situated throughout the site year round. Control will be required when indices exceed 5% RTC.

**Management Target:** Trapping will be conducted daily until the catch rate is a minimum of 5% of the catch rate obtained on the first night of the operation.

### 7.2.2 Rabbits

**Methods:** For wild rabbits, pindone pellets are suitable as poison. Prior to applying pindone, a pre-feed with anon-toxic pollard should occur. Pindone should be laid on fresh turf splits where rabbits are affecting plantings. Night-shooting may also be conducted to assist with controlling rabbits on the site.

**Timing:** As required. Apply bait around areas where rabbit scat and environmental damage is present. The bait should be applied twice at 3-4 day intervals in all areas where the rabbits graze

or feed. It is important to lay enough bait for 2 days, feeding all the rabbits in the area; the recommended application rate is 2–3 kg/ha/feed, however higher rates will be required when rabbit numbers are at sufficient level that signs of damage are observed on the revegetation planting.

### 7.2.3 Pigs and goats

For wild pigs and goats, professional hunters should be used when pig or goat sign is seen.

### 7.2.4 Pukeko

Pukeko can cause serious problems in new plantings. They pull small sized plants out of the ground, feeding on roots or the insects associated with them. Options for controlling pukeko or waterfowl are limited, however it is possible to reduce their potential impact through the use of larger potted plants (PB3) or placing protective sleeves over revegetation plants.

Pukeko will generally stop removing plants about six weeks after planting (ARC 2008), so control will not always be necessary.

### 7.2.5 Cats, rats, mustelids and hedgehogs

A wider site control programme is occurring for these species, including along the coastal frontage of the Te Arai property and the northern boundary (adjacent to the Mangawhai Wildlife Refuge). A component of this will occur on the golf course site to the extent necessary to offset any effects associated with the works related to the consented earthworks activities. As such, a trapping system will be set along the northern boundary of the site using kill traps for cats and DOC250 traps for all other species.

## 7.3 Surveillance & Monitoring

The control of animal pest species at the site will be ongoing. Regular (6 monthly) monitoring of revegetation planting should be undertaken to identify the presence of browse damage, or any other sign of animal pest species. A trigger level of response related to these monitoring measures will be established and the necessary control levels implemented to reduce the population levels of the relevant animal pests.

## 7.4 Quarterly Reporting

A quarterly report will be prepared outlining the control programme activities undertaken during that period, as well as the results which will then be used to guide the requirements of the subsequent (following quarter) control programme. All quarterly reports will be provided to the relevant consents manager at Council.



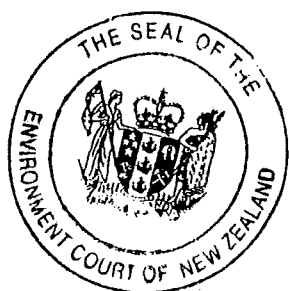
## 8.0 References

ARC (2008). *Making the most of Auckland's stormwater ponds, wetlands and rain gardens*. Auckland Regional Council.

BML (2009a): *Te Arai Special Zone – DRAFT Vegetation and Pest Management Guidelines*. Prepared by Boffa Miskell Ltd for Te Arai Coastal Lands Trust, March 2009.

BML (2009b): *Te Arai Subdivision – Marsden Road North West Wetland Rehabilitation Plan*. Prepared by Boffa Miskell Ltd for Te Arai Coastal Lands Trust, July 2009.

Cronk, Q. C. B. & Fuller, J. L. (1995). *Plant Invaders: the threat to natural ecosystems*. Chapman and Hall, London. 165pp



## Appendix 1: Te Arai Ecological Values





Distribution of notable native species within and adjacent to the Te Arai property

SPECIES	THREAT CLASSIFICATION	LOCATION
AVIFAUNA (Robertson et al., 2013)		
Northern NZ dotterel	Nationally Vulnerable <sup>CD Inc</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth and coastal frontage (breeding)</li> <li>Tara Iti golf course (breeding)</li> <li>MWR (breeding)</li> </ul>
Variable oystercatcher	Recovering <sup>Inc</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth (breeding)</li> <li>MWR</li> </ul>
Pied Stilt	Declining <sup>SO</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth</li> <li>MWR</li> </ul>
NZ fairy tern	Nationally Critical <sup>CD RR</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth (attempted breeding 2012)</li> <li>MWR (breeding)</li> </ul>
Banded dotterel	Nationally Vulnerable <sup>DP</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth</li> <li>MWR (breeding)</li> </ul>
Caspian tern	Nationally Vulnerable <sup>SO Sp</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth</li> <li>MWR (breeding)</li> </ul>
White-fronted tern	Declining <sup>DP</sup>	<ul style="list-style-type: none"> <li>Te Arai Stream mouth</li> <li>MWR (breeding)</li> </ul>
Australasian bittern	Nationally Endangered <sup>DP Sp TO</sup>	Utilising wetland and riparian network at Te Arai and the wider landscape.
NZ pipit	Declining	Utilising coastal dune.
Black shag	Naturally Uncommon <sup>SO Sp</sup>	Utilising wetland and riparian network.
Pied shag	Nationally Vulnerable	Utilising wetland and riparian network.
FLORA (de Lange et al., 2013)		
Pingao	Declining <sup>PD RR</sup>	Te Arai frontal dune system (including Lot 2)
Spinifex	Not Threatened	Te Arai frontal dune system (including Lot 2)
Sand coprosma	Declining <sup>DP</sup>	Te Arai back dune (including Lot 2)
Rawiri	Declining	<ul style="list-style-type: none"> <li>Upper-most (western) 800 m of Pacific Road</li> <li>Southern side of the Te Arai Stream</li> </ul>
Sand tussock	Declining <sup>SO</sup>	Foredune at the Te Arai Stream mouth
HERPETOFAUNA (Hitchmough et al., 2013)		
Shore skink	Not Threatened	Te Arai foredunes
Auckland green gecko	Declining	Within rawiri along Pacific Road
INVERTEBRATES (Slivd et al., 2012)		
Katipo	Declining <sup>RR</sup>	Te Arai frontal dune system
FRESHWATER FISH (Allibone et al., 2010)		
Longfin eel	Declining	Te Arai Stream
Inanga	Declining	Te Arai Stream
Shortfin eel	Not Threatened	Te Arai Stream
Common bully	Not Threatened	Te Arai Stream



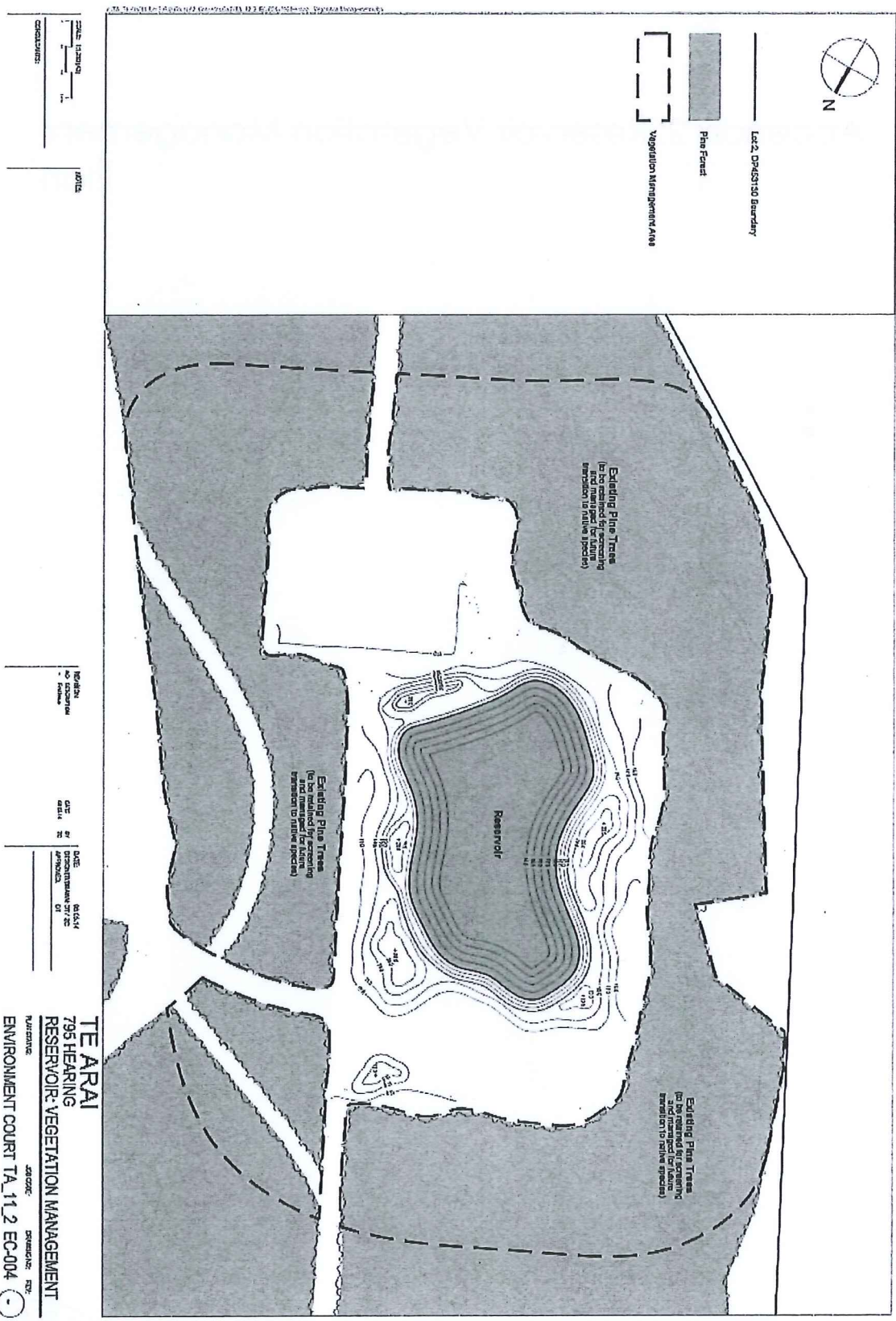
### Te Arai Natural Features & Ecological Value

LOCATION	FEATURE	DESCRIPTION	ECOLOGICAL VALUE
Lot 2	Fore-dune and immediate lee	The entire foredune stretching along the coastal frontage of the property from Te Arai Point to Mangawhai Spit. Presence of Threatened flora and fauna.	High
	Harbour Rd wetland	Relatively large and diverse wetland straddling the western boundary of the property.	Moderate
	Marsden Rd north-west wetland	Largest, best quality and most diverse wetland remaining on property – probable vestige of former peat swamps of the local area.	High
	Mangawhai Forest Pine Plantation	Pine plantation at various stages of the growth-harvest-replant cycle. Occupies most of the land inland from the foredune.	Low
	Dune seeps	A series of small modified seeps (fed by ground water) which run behind the secondary dune.	Moderate
Wider Te Arai property	Te Arai Stream	Stream flowing through the pine plantation from the western property boundary to near its mouth. Presence of Threatened fauna.	Moderate
	Te Arai Stream mouth lagoon	Open water and saline wetlands immediately above the mouth of the Te Arai stream. Presence of Threatened flora and fauna.	Moderate-High
	Te Arai Stream mouth dune fields	Flat sandy beach dunes above MHWS at the mouth. Presence of Threatened fauna and flora.	Very High
	Te Arai stream tributary wetland	Small raupo wetland with much sweet grass but with a diverse headwaters area.	Moderate
	Canal Rd swale wetland	Predominantly exotic grasses but with a small patch of <i>Baumea</i> at its southern end.	Low
	Pacific Road shrublands	Predominantly manuka-kanuka bush (but with weed issues) at the entry to the Te Arai property on Pacific Road. Presence of Threatened fauna (Auckland green gecko) and flora (rawiri).	High



## Appendix 2: Reservoir Vegetation Management Plan

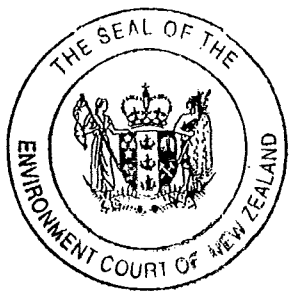




**TE ARA I**  
**795 HEARING**  
**RESERVOIR VEGETATION MANAGEMENT**  
**ENVIRONMENT COURT TA\_11.2 EC-004**







## Appendix 3: Potential Weed Control Methods



Weed Species	Possible Control Methods <sup>4</sup>	Site Management
<i>Acacia melanoxylon</i> Wilding Tasmanian blackwood	<ul style="list-style-type: none"> <li>Hand-pull or dig seedlings (all year round). Ensure minimum soil disturbance.</li> <li>Cut and squirt (all year round): Make 1 cut every 100 mm around the trunk, apply triclopyr 600 EC (5ml) per cut.</li> <li>Bore and fill (all year round): Make 1 hole every 200 mm around the trunk, apply metsulfuron-methyl 600g/kg (3mg) or triclopyr 600 EC (10ml) per hole.</li> <li>Cut down and paint stump (all year round): triclopyr 600 EC (100ml/L) or Yates Hydrocotyle Killer (500ml/L) or metsulfuron-methyl 600g/kg (5g/10L) or Vigilant gel.</li> </ul>	<ul style="list-style-type: none"> <li>Maintain native groundcover at all times in the treatment area.</li> </ul>
<i>Cortaderia selloana</i> Pampas	<ul style="list-style-type: none"> <li>Dig or grub out seedlings or small plants. Chainsaw small plants. Compost or leave on site to rot down. Burn or bury any flower heads.</li> <li>Spray (summer and autumn): Gallant (150ml/10l + crop oil) for most sites (i.e. if overspray of native species is likely) ..</li> </ul>	<ul style="list-style-type: none"> <li>Seed banks reinfest bare, burnt and sprayed sites, and grazed plants resprout.</li> <li>Pampas recedes as shade increases, so encourage weed replacement (planting, regeneration) as control is carried out.</li> </ul>
<i>Lupinus arboreus</i> Lupin	<ul style="list-style-type: none"> <li>Slash tall plants close to ground (all year round). Mulch.</li> <li>Hand pull or dig small plants (all year round). Mulch.</li> <li>Stump swab (all year round): glyphosate 20%, or Grazon 10%, or Escort 1 g /L.</li> <li>Weed wiper (all year round): Escort 1 g /L; or glyphosate 33%; or Grazon 20%. Add penetrant in all cases.</li> <li>Spray: Versatill or Grazon at label rates (during active growing period).</li> </ul>	<ul style="list-style-type: none"> <li>Cut stumps occasionally resprout.</li> <li>Persistent seedbank.</li> <li>Sites with strong tall regeneration can usually be left for falling light levels to eliminate. This process can be assisted by slashing and/or interplanting.</li> <li>Control probably only necessary in low-growing plant communities (eg coastal dunes).</li> </ul>
<i>Phytolacca octandra</i> Inkweed	<ul style="list-style-type: none"> <li>Pull out small plants: Leave on site to rot down, minimise disturbance.</li> <li>Slash stems close to ground. Leave on site to rot down.</li> <li>Cut down and paint stump (all year round): metsulfuron-methyl 600g/kg (1g/L).</li> </ul>	<ul style="list-style-type: none"> <li>Control this weed only where it is rare, habitat is vulnerable, or where disturbance has caused dense sites. Regenerating shady sites (or where groundcover is becoming dense) can normally be left as the weed will be crowded out.</li> </ul>

<sup>4</sup> Best method will depend on plant size and site context.



Weed Species	Possible Control Methods <sup>4</sup>	Site Management
<i>Solanum mauritianum</i> Woolly nightshade	<ul style="list-style-type: none"> <li>• Pull up all small plants (easiest in winter). Leave on site to rot down.</li> <li>• Cut and squirt (all year round): make cuts at regular intervals around the trunk, apply undiluted Tordon Brushkiller (1.5ml per cut).</li> <li>• Cut and paint stumps (all year round): Tordon Brushkiller or triclopyr 600 EC (100ml/L) or Vigilant gel.</li> <li>• Frilling (all year round): Tordon Brushkiller (100ml /L) or triclopyr 600 g/L (100ml/L) or Yates Woody Weedkiller (200ml/L).</li> <li>• Injection method: use either 10 mm wide holes drilled at 45 degree angle down into trunk 50 mm deep spaced at 50 mm around trunk, or a series of 80 mm wide blazes cut to a depth of 15-20 mm, spaced at 20-40 mm. Fill each with Vigilant gel.</li> <li>• Spray: Tordon Brushkiller (25ml/10L) or triclopyr 600 EC (60ml/10L) or triclopyr 300 EC (12ml/L).</li> </ul>	<ul style="list-style-type: none"> <li>• Reseeds profusely in bare sites within 1-2 years.</li> <li>• Rarely invades intact habitats.</li> <li>• Maintain shade by planting dense cover.</li> <li>• Usually short-lived seed, follow-up three years.</li> </ul>
<i>Ulex europaeus</i> Gorse	<ul style="list-style-type: none"> <li>• Stump swab: glyphosate (250ml/L) or metsulfuron-methyl 600g/kg (2g/L) or triclopyr 600 EC (250ml/L) or Tordon Brushkiller (100ml/L) or Vigilant gel.</li> <li>• Spray (spring-summer): triclopyr 600 EC (20ml/10L) or triclopyr 300 EC (40ml/10L).</li> <li>• Spray (autumn-winter): metsulfuron-methyl 600g/kg (5g/10L+ penetrant (knapsack) or 20g/100L + penetrant (spraygun) or Tordon Brushkiller (250ml/100L (spraygun).</li> <li>• Frilling: With a sharp chisel or axe, make a deep cut into the sapwood at regular intervals around the base of the tree, taking care not to ring-bark the plant. Immediately saturate each cut with undiluted Tordon Brushkiller.</li> <li>• Injection method: As each hole is drilled saturate it with undiluted Tordon Brushkiller using a sheep drench pack with a spraygun.</li> </ul>	<ul style="list-style-type: none"> <li>• Stumps resprout quickly.</li> <li>• Only use glyphosate spray when all vegetation on site is to be bared for replanting (generally not recommended).</li> <li>• Maintain humus layer.</li> <li>• Sites with appropriate tall forest species present can usually be left to be overtopped; can speed by selective slashing, stump swabbing or planting.</li> <li>• Maintain roadsides, cuttings and other vectors, check road gravel and fill.</li> </ul>
<i>Ammophila arenaria</i> Marram grass	<ul style="list-style-type: none"> <li>• Dig out small patches and dispose of (all year round).</li> <li>• Spray: Gallant (150ml/10L) + crop oil) (all year round).</li> </ul>	<ul style="list-style-type: none"> <li>• Use Gallant where pingao or sedges are present (note that Gallant will kill spinifex but only stunt pingao).</li> <li>• Follow up required annually.</li> <li>• Begin control at windward end of infestation, or where native vegetation is best represented.</li> <li>• Prevent physical damage of marram at existing sites to prevent rhizome migration.</li> </ul>







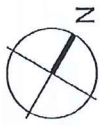
**TE ARAI**  
**795 HEARING - AREA OF WATER USE**  
**(GOLF COURSE STAGES 1 AND 2)**

**DATE:** 22.10.13  
**DESIGNED/DRAWN BY:** JH / JZ  
**APPROVED BY:** DT

**REVISION:**  
 NO DESCRIPTION  
 A. Minor Road Widening Action

**DATE:** 20.11.13  
**BY:** JH / JZ


**PLAN STATUS:** JOB CODE: DRAWING NO: REF: ENVIRONMENT COURT TA\_11.2 EC-001 **A**



Lot 2, DP453130 Boundary

Pine Forest

Vegetation Management Area





**TE ARAI**  
795 HEARING  
RESERVOIR: VEGETATION MANAGEMENT

PLAN STATUS: \_\_\_\_\_  
JOB CODE: \_\_\_\_\_  
DRAWING NO: \_\_\_\_\_  
REV: \_\_\_\_\_

DATE: 08.05.14  
DESIGNED/DRAWN BY: DT  
APPROVED: \_\_\_\_\_

DATE: 08.05.14  
BY: DT

REVISION:  
NO DESCRIPTION  
- Volume

SCALE: 1:250 (A3)

CONSULTANTS:

NOTES: