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INTER-AGENCY ACTION PLAN FOR LAKE AREARE



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to sustain and improve our environments*

Inter-Agency Action Plan for Lake Areare

Contract Report No. 2995

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Prepared for:

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Department of Conservation

Waikato-Tainui

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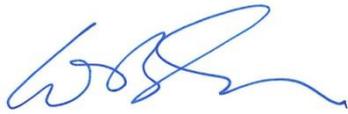
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1. INTRODUCTION

The Waikato District Lakes and Wetlands Memorandum of Agreement (MOA) represents a formal commitment by Auckland Waikato Fish and Game Council (AWFG), Department of Conservation (DOC), Waikato District Council (WDC), Waikato Regional Council (WRC), and Waikato-Tainui to recognise the values of the freshwater lakes and wetlands of the Waikato District, and to protect, enhance and restore these through alignment of their activities when working with communities, landowners, tangata whenua, and interested parties.

Lake Areare has been identified as a key site for future collaboration under the MOA. Waikato Regional Council, on behalf of the MOA group, commissioned Wildland Consultants to prepare an Inter-Agency Action Plan for Lake Areare. The purpose of the plan is to identify current values, threats and opportunities for collaborative management and to identify and assign actions to protect, enhance, and restore Lake Areare.

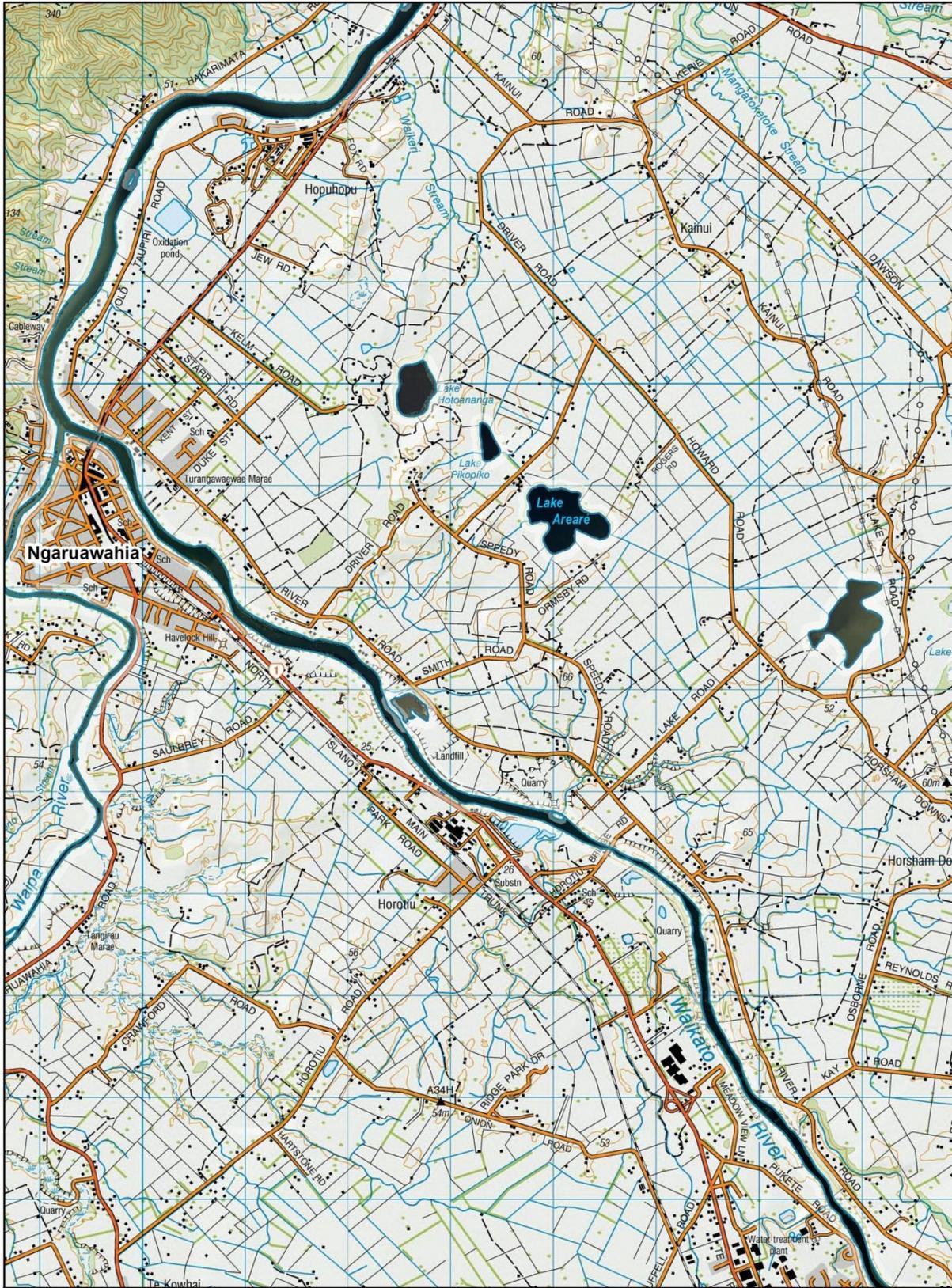
This plan was put together using information supplied to Wildland Consultants by members of the MOA group. On 25 September 2012, members of the MOA group, representatives from Taupiri Marae and Wildland Consultants undertook a site visit to Lake Areare, followed by a meeting at AWFG to share and review information on values and threats to Lake Areare and to discuss potential actions and priorities. On 28 September 2012, Tahi Rangiawha (Waikato-Tainui's representative on the MOA group) and Paula Reeves (Wildland Consultants) met with representatives of Taupiri Marae and Turangawaewae Marae to share information about Lake Areare and to discuss the goals of Tangata whenua for the lake.

2. LOCATION AND GENERAL DESCRIPTION

Lake Areare (33 ha) is located 6 km south-east of Ngaruawahia (Figure 1). It is the largest of eight peat lakes associated with the historic Kainui Bog which are collectively known as the Horsham Downs Peat Lakes. The Natural Heritage Management System (NHMS) used by DOC to identify conservation priorities, ranked the Horsham Downs Peat Lakes as the highest place for conservation management within the Waikato Area Office jurisdiction. WRC prioritised Lake Areare 33rd out of 96 lakes in the Waikato Region for biodiversity management (Wildland Consultants 2011), just behind Lake Hotananga, the highest ranked of the Horsham Downs Peat Lakes.

The present catchment is 268.2 ha (Figure 2) and zoned 'Rural' under the Waikato District Plan. Land cover is mostly pasture with wetland vegetation confined to a narrow margin around the edge of Lake Areare. Most of the catchment is used for dairy and beef farming (Jenkins and Vant 2007), with lifestyle blocks having become more common in recent years.

Peat soils are predominant on the flats on the eastern and southern sides of the lake while loams and peaty loams dominate the western and northern sides of the lake (<http://smap.landcareresearch.co.nz/smap#home>, accessed 30/9/12).



Data Acknowledgment

Imagery Source: WARP5 2007

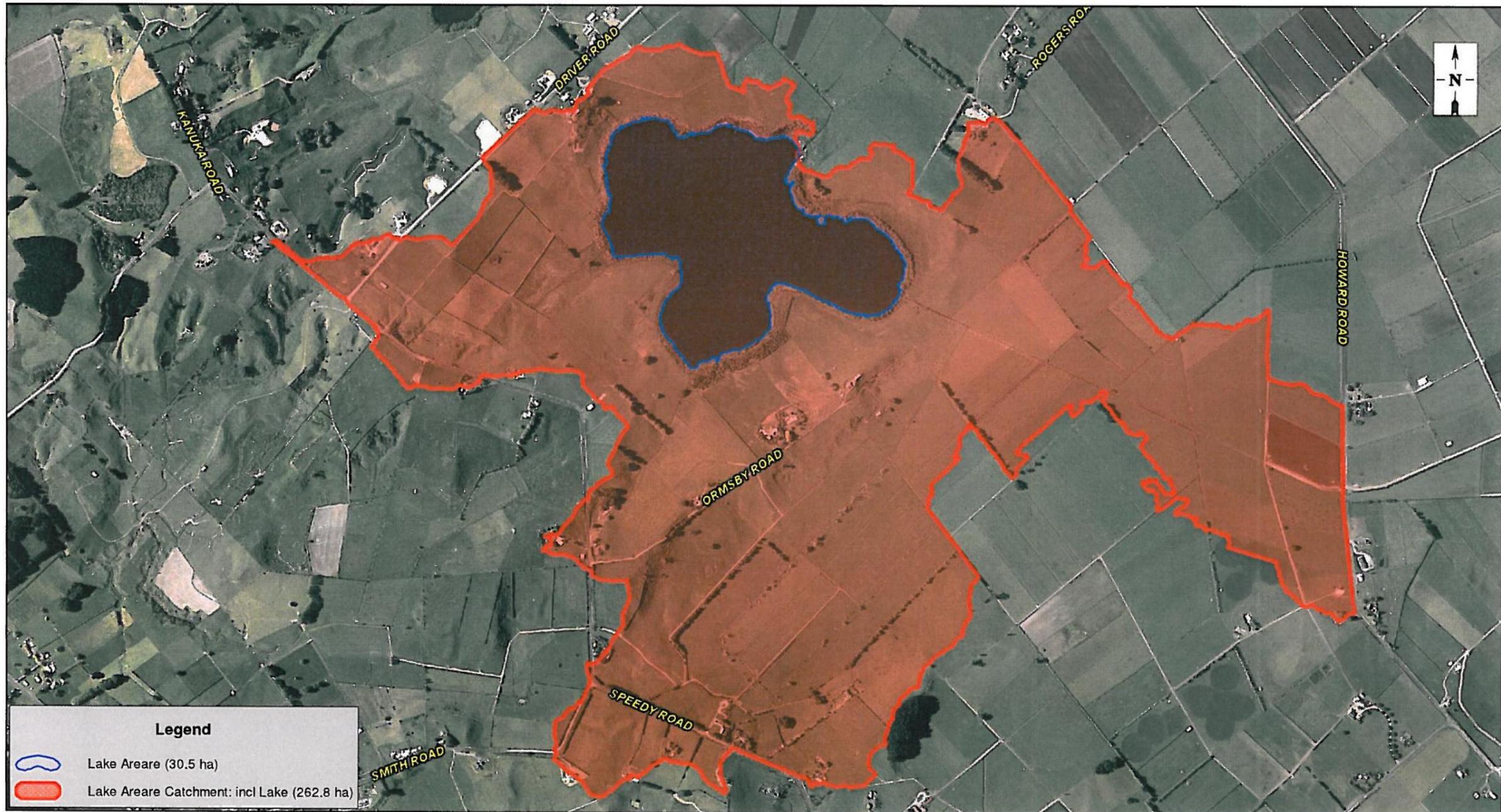
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Figure 1: Location of Lake Areare.

0 1,250 2,500 m

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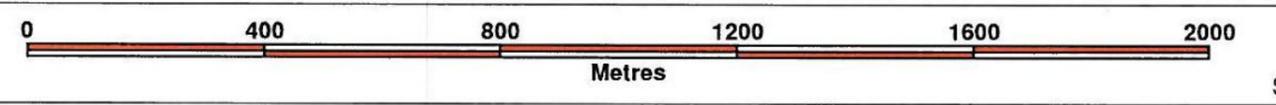
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Legend

-  Lake Areare (30.5 ha)
-  Lake Areare Catchment: incl Lake (262.8 ha)

Lake Areare and Catchment



Scale - 1:10,000 **A3**

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Figure 2: Lake Areare and catchment.

The lake has four natural inflows and a drain on the western side (Figure 4). An artificial drain on the south-eastern side drains c.140 ha of peat that has been converted to pasture to the east and south of the lake. Originally the lake would have had no outlet however a drain has been constructed on the north-eastern margin of the lake which discharges to the Waikeri Stream near Hopuhopu and then to the Waikato River.

Waikato Regional Council installed a weir on the lake outlet in 2005, to raise minimum summer water levels. The weir started to fail after two years and a new weir was built c.0.5 m downstream in 2008. Maximum depth of the lake is 5.1 m (Fergie 2003) and water levels now fluctuate up to 0.8 m (Figure 3). The topography of land around the lake indicates that the lake was probably larger in the past.

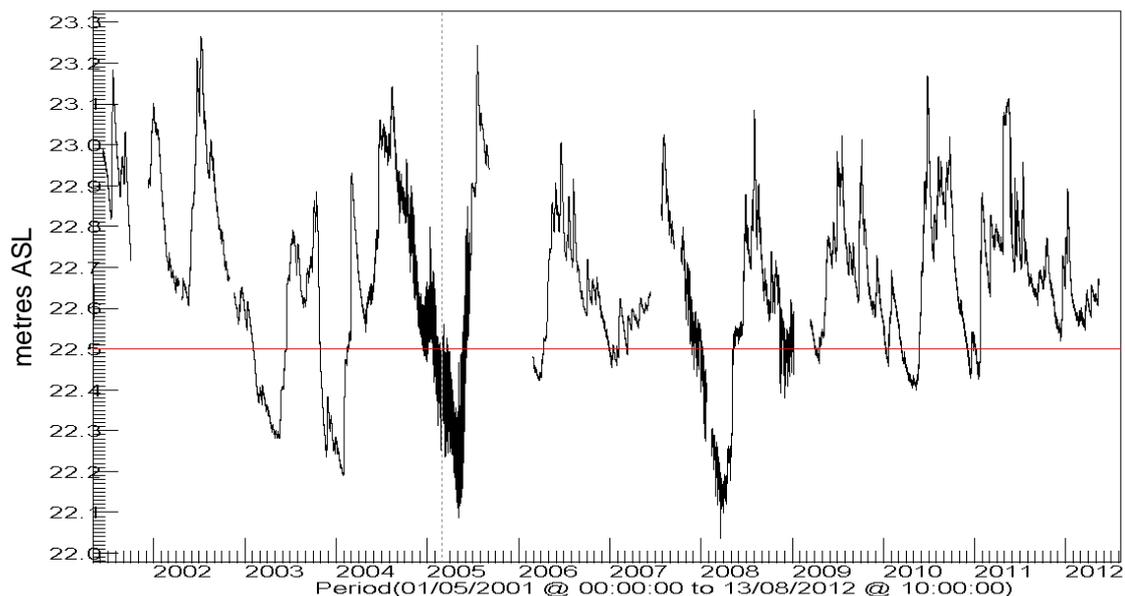


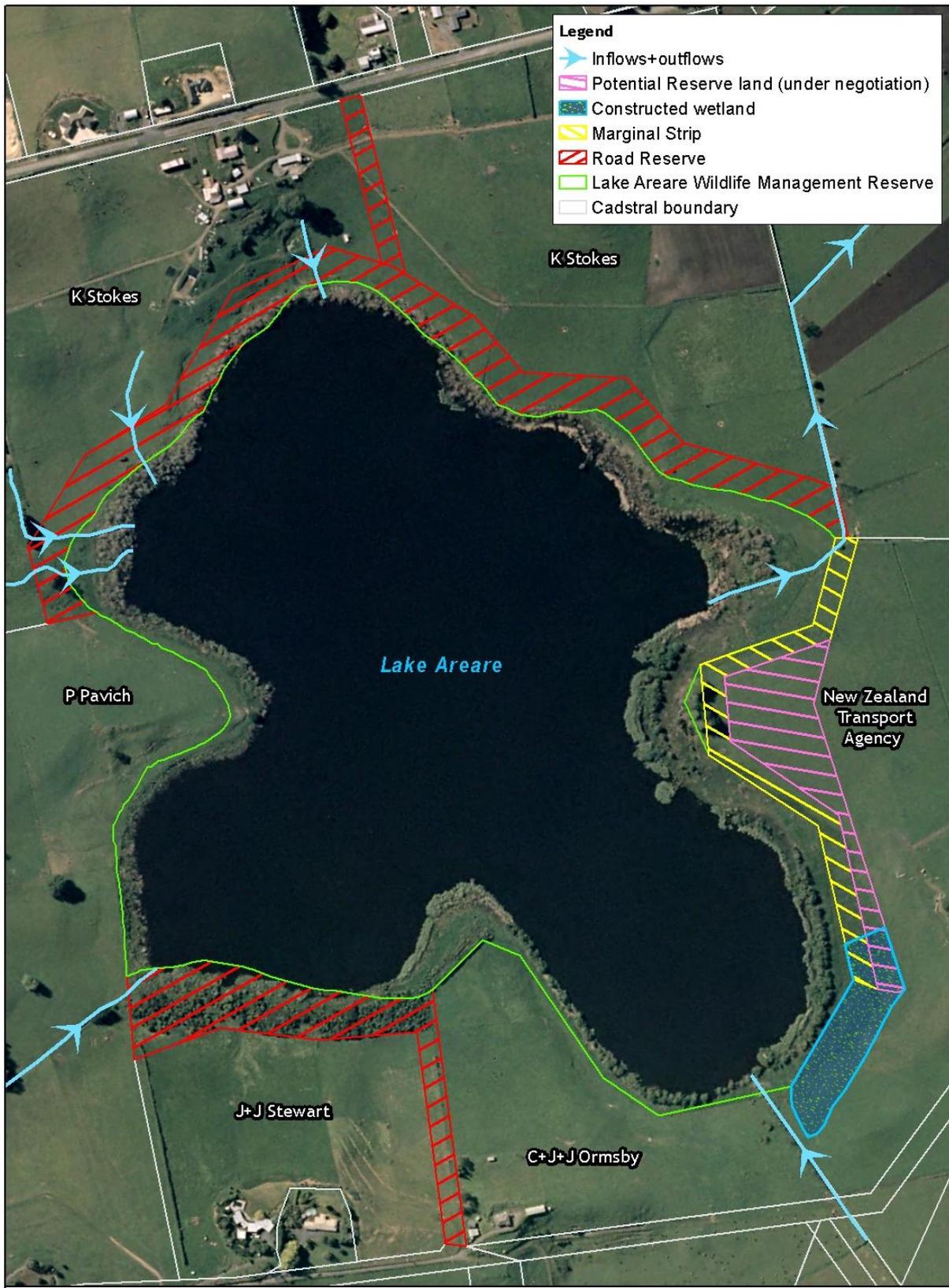
Figure 3: Time series plot of water levels at Lake Areare between 1/5/02 and 13/8/12. The weir was established on the outflow in April 2005 however it was not wide enough to prevent water from flowing around the sides and a wider weir was built c.0.5 m downstream in May 2008. Since then minimum water levels have rarely fallen below the target minimum water level of 22.5 m ASL (red line).

3. STATUS AND ADMINISTRATION

3.1 Land status

Lake Areare occurs within the Lake Areare Wildlife Management Reserve (39.96 ha) which is classified as Government Purpose reserve under the Reserves Act 1977 (Figure 4). The Department of Conservation administers this reserve and under the Reserves Act is required to:

- Protect and manage wildlife populations and wildlife habitats;
- Protect and manage scenic, historic, archaeological, biological and geological features; and
- Provide for public access.



Data Acknowledgment

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Figure 4: Reserve land, land currently being negotiated for inclusion within the reserve, location of proposed constructed wetland, lake inflows and outflows and adjoining landowners

0 100 200 m

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There are two unformed road reserves that provide public access to the lake from Driver Road and Ormsby Road (Figure 4). Waikato District Council is responsible for their management and administration.

Waikato District Council and Department of Conservation have signed a Memorandum of Understanding (Appendix 1) which records their relationship arrangements in regard to Lake Areare. Their mutual goal is to restore and enhance the natural values of the land each administers on the lake margin and to enable enjoyment of these values. They have successfully worked together to fence the paper road associated with Driver Road and to establish a metalled track that provides access for vehicles from Driver Road to Lake Areare Wildlife Management Reserve. Other future projects under the Memorandum of Understanding include WDC changing the status of the Driver Road paper road to Esplanade Reserve and working together on preparing a joint management plan for Lake Areare.

3.2 Waikato Expressway

In 1999 Transit New Zealand (now New Zealand Transport Agency, NZTA) lodged notices of requirements for new designations and alterations to existing designations for the construction of a new section of State Highway between Taupiri and Horotiu, to bypass Ngaruawahia, known as the Waikato Expressway. The expressway comes within 100 m of Lake Areare and will impact on the values of the lake. Affected parties include DOC, AWFG, and Waikato-Tainui.

AWFG have an MOU agreement with Transit (signed in 2002) that outlines appropriate measures that will avoid, remedy or mitigate potential adverse effects in respect of Lake Areare. They involve planting, fencing and weed control of a buffer area between the expressway and the lake.

Waikato-Tainui were commissioned by NZTA to produce a cultural impact assessment report (Ngataki and Rangiawha 2010) The report provides '*a starting point for further consultation and a dialogue for any future engagements that might be arranged*' and identifies the issues of concern to Tangata whenua in regard to the Ngaruawahia section of the Waikato Expressway. Mitigation recommendations are given in the report and the following apply to Lake Areare:

- NZTA will provide financial contribution to Lake Areare and develop a plan with Waikato-Tainui to restore, plant and fence those areas including all of Lot C DP18540 (eastern side of lake, shown as land owned by NZTA in Figure 4).
- Resources are provided by NZTA for the restoration and limited access to Lake Areare for Tangata whenua to undertake customary activities.
- Any surface water runoff from the Ngaruawahia section of the Waikato Expressway is collected and treated through a wetland before discharge into open water bodies.

DOC has also been involved in seeking mitigation for the effects of the Waikato Expressway on Lake Areare. This has focused on extending the area of reserve around Lake Areare (Figure 4) and providing public access to Lake Pikopiko.

4. CURRENT CHARACTER AND VALUES

4.1 Vegetation

Historically (c.1840), the catchment of the lake is likely to have comprised wetland shrub/sedgeland and restiad wetland dominated by *Empodisma robustum* on the alluvial flats, and secondary vegetation (i.e. manuka, flax, rushes, sedges with small enclaves of kahikatea) on the rolling hills (Clarkson and Wallace 2004; Leathwick *et al.* 1995).

The first comprehensive vegetation survey of Lake Areare Wildlife Management Reserve was undertaken in January 1990 and November 1991 (Champion *et al.* 1993). Eighty-six species were recorded at the lake, of which 50 species were indigenous (Appendix 2). Submerged vegetation was present at two of six sites surveyed and consisted of a sparse cover of the charophyte *Nitella* aff. *cristata* and one shoot of *Myriophyllum propinquum*. Kuta (*Eleocharis sphacelata*) was the most common emergent plant at the lake, forming beds that covered 56% of the lake margin followed by raupo (*Typha orientalis*) at 34%. Lake marginal vegetation was dominated by grey willow (*Salix cinerea*) and crack willow (*Salix fragilis*) with occasional pockets of manuka (*Leptospermum scoparium*) and gorse (*Ulex europaeus*) scrub, and low herbaceous sedgelands dominated by *Isolepis distigmatus*, *Eleocharis acuta*, *E.gracilis* and *Schoenus maschalinus*. The effects of grazing were reflected in the depauperate *Salix* understorey and the predominance of the unpalatable *Juncus edgariae* (Champion *et al.* 1993).

A comprehensive vegetation survey has not been undertaken since the 1990-91 survey however significant changes have occurred since then and were noted during the site visits on 20 and 25 September, 2012. Emergent vegetation is now dominated by raupo with kuta confined to a very small area on the western side of the lake. Kuta tends to be replaced by raupo when peat lakes become nutrient-enriched (de Winton and Champion 1993). Large areas of grey willow and crack willow have been aerielly sprayed and c.30,000 indigenous plants have been planted, providing a buffer around 60% of the lake margin (Figure 5). Revegetation species are also listed in Appendix 2.

Most of the older plantings have reached canopy closure, with the oldest plantings (established in 2002) having developed a 3-4 m tall canopy with a localised self-introduced understorey of mahoe, karamu, and ground ferns. *Eleocharis acuta* now dominates the herbaceous sedgelands on the lake margin although the invasive gypsywort (*Lycopus europaeus*) appears to be more common than described previously by Champion *et al.* (1993). Wet areas that have recently been fenced from grazing are dominated by a mix of indigenous and exotic rushes, grasses and herbs.

Vegetation is highly modified, with characteristic remnants confined to localised kuta reedland, *Eleocharis acuta* dominated sedgeland and a pocket of *Macherina teretifolia* sedgeland near the outlet. No threatened plant species or plant communities have been recorded at Lake Areare.



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Figure 5: Location of indigenous vegetation plantings, 2011 willow control area, current extent of grey willow and weeping willow, current extent of emergent vegetation

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4.2 Fauna

Fish

A fish survey was undertaken in April 2003 using five fyke nets, eight minnow traps and one trammel net (Fergie 2003). Only four species were recorded (Table 1). Mosquito fish was recorded as abundant and a total of 25 short-finned eels were captured (NIWA Freshwater Fish Database, accessed 30/8/12). It is likely that other fish species are also present in the lake including the threatened black mudfish (*Neochanna diversus*), bully (*Gobiomorphus cotidianus*), and the exotic rudd (*Scardinius erythrophthalmus*). The pest fish koi carp (*Cyprinus carpio*) has never been observed in Lake Areare although no recent fish surveys have been undertaken to confirm these observations. It is possible that there is a fish barrier present between the lake and the Waikato River.

Table 2: Fish species recorded at Lake Areare.

Common Name	Scientific Name	Threat Classification ¹
Short-finned eel	<i>Anguilla australis</i>	
Long-finned eel	<i>Anguilla dieffenbachi</i>	At Risk –Declining
Goldfish*	<i>Carassius auratus</i>	
Mosquito fish*	<i>Gambusia affinis</i>	
Catfish*	<i>Ictalurus nebulosus</i>	

¹ Threat classification as listed in Hitchmough *et al.* (2007). *Introduced species.

Birds

A number of bird species were recorded at Lake Areare by Fergie (2003). These are listed in Table 1 along with other bird species that have been observed at the lake by DOC staff, members of the MOA group and game bird hunters. Eight threatened bird species have been recorded at the lake, including the nationally critical white heron which resides at the lake for three months every year (Kevin Hutchinson, DOC, pers. comm.). None of the threatened bird species have been confirmed as breeding at the lake.

Table 3: Bird species recorded at Lake Areare.

Common Name	Scientific Name	Threat Classification ¹
Grey duck	<i>Anas superciliosa</i>	Threatened-Nationally Critical
White heron	<i>Ardea modesta</i>	Threatened-Nationally Critical
Australasian bittern	<i>Botaurus poiciloptilus</i>	Threatened-Nationally Endangered
NZ dabchick	<i>Poliiocephalus rufopectus</i>	Threatened-Nationally Vulnerable
Banded rail	<i>Gallirallus philippensis assimilis</i>	At Risk-Naturally Uncommon
Black shag	<i>Phalacrocorax carbo novaehollandiae</i>	At Risk-Naturally Uncommon
Little black shag	<i>Phalacrocorax sulcirostris</i>	At Risk-Naturally Uncommon
Royal spoonbill	<i>Platalea regia</i>	At Risk-Naturally Uncommon
Little egret	<i>Egretta garzetta immaculata</i>	
Grey teal	<i>Anas gracilis</i>	
Paradise shelduck	<i>Tadorna variegata</i>	
Australasian shoveler	<i>Anas rhynchotis</i>	
Pukeko	<i>Porphyrio melanotus melanotus</i>	

Common Name	Scientific Name	Threat Classification ¹
Black swan	<i>Cygnus atratus</i>	
Spur-winged plover	<i>Vanellus miles novaehollandiae</i>	
Welcome swallow	<i>Hirundo neoxena neoxena</i>	
North Island fantail	<i>Rhipidura fuliginosa placabilis</i>	
Swamp harrier	<i>Circus approximans</i>	
Mallard*	<i>Anas platyrhynchos platyrhynchos</i>	
Canada goose*	<i>Branta canadensis maxima</i>	
Common pheasant*	<i>Phasianus colchicus</i>	

¹ Threat classification as listed in Miskelly *et al.* (2008). *Introduced species.

4.3 Water quality

Water quality was surveyed at Lake Areare in December 2010, February 2011, and May 2011 by WRC. Results (Table 4) indicate that the lake is hypertrophic with poor water clarity. This is consistent with the recent occurrence of algal blooms observed by lake users.

Table 4: Water quality at Lake Areare. Source: Waikato Regional Council.

Water Quality Measure	Value	Water Quality Guidelines
Mean secchi (m)	0.48	> 1.6 m for human recreational use ¹
pH	6.63	4.6- 5.5 for a pristine peat lake ²
Turbidity (NTU)	18.7	< 5 NTU for plant growth ¹
Mean Chl a (mg/m3)	45	
Mean TN (mg/m3)	2,500	< 40 to prevent nuisance plant growth ¹
Mean TP (mg/m3)	150	< 500 to prevent nuisance plant growth ¹
Trophic Level Index	6.35	> 6 = hypertrophic ³

¹ Tulagi 2011. ² Waipa District Council 2007. ³ Burns *et al.* 1999.

4.4 Recreational values

Signage and vehicle access to the lake reserve was not established until recently and there are currently few facilities to attract passive recreational users. For more than 60 years the main recreational activity at Lake Areare has been game bird hunting. Approximately 50 hunters are currently estimated to use the lake and there are 19 maimai present on the lake margin.

Only non-motorised boats are allowed on the lake and there are few boat facilities. A jetty and boatshed have been built by adjoining landowners on the south-western margin of the lake, within the Ormsby Road road reserve.

Community involvement in restoration of natural areas is becoming a more common recreational pastime. In 2011, Lake Areare became part of the community conservation project 'Living Legends' a joint venture between Project Crimson, the Tindall Foundation, DOC, and Meridian to celebrate and leave a legacy of New Zealand's hosting of the Rugby World Cup. The project involves the public in planting days at 17 sites around New Zealand and aims to plant 170,000 plants by 2015. Two plantings days have been held at Lake Areare over the last two years, attracting over 100 people to each event and another is planned for 2013. Eight

thousand plants have been planted so far under the Living Legends project at Lake Areare.

4.5 Cultural values

Waikato-Tainui recognise Lake Areare and its waters, banks, beds and other associated attributes as part of the Waikato River. 'Areare' means open or clear of obstruction and probably relates to the belief by tangata whenua that the lake was bottomless.

The Horsham Downs area was used for food production purposes. A pa site was located close to Lake Areare and Lake Pikopiko, and contained a reasonable sized population. Lake Areare was utilised for spiritual purposes (Waikato District Council 2011).

5. THREATS

5.1 Drainage and peat settlement

The natural hydrological regime of Lake Areare has been altered through drainage in the catchment and the excavation of artificial drains into and out of the lake. Drainage of peat inevitably leads to peat shrinkage as it oxidises and this is accelerated by the addition of fertilisers. Construction of the weir on the lake outlet in 2005 to maintain minimum water levels is a significant step towards reducing the impacts of drainage and peat settlement around the lake.

5.2 Contaminants

The ecological health of Lake Areare has deteriorated over time as a result of contaminants (e.g. fertilisers, sediment, bacteria, viruses, pesticides, and herbicides) being transported into the lake from surrounding land.

Jenkins and Vant (2007) estimated that 1.7 tonnes of nitrogen, 0.11 tonnes of phosphorus and 4,000 tonnes of sediment are annually exported into Lake Areare. These figures were based on an erroneous catchment area of 123 ha. The correct catchment area is 262.8 ha and therefore nutrient and sediment loads could be > 100 % of those estimated.

The Waikato Expressway is currently being constructed close to the eastern side of Lake Areare (Figure 6). This will increase the amount of impervious surface within the catchment by 1.5% and introduce new contaminants (e.g. heavy metals and particulates from brake linings, tyres, fuel emission, and road surface wear) into the catchment. Stormwater contaminants can cause chronic adverse effects on sensitive species and ecosystems as well as affect the amenity, cultural and recreational values of waterways (Kessels & Associates Ltd 2012).

New Zealand Transport Agency (NZTA) proposes to treat all stormwater run-off from the expressway into Lake Areare using grass swales with catchpits to prevent litter debris entering Lake Areare (Kessels & Associates Ltd 2012). It is anticipated that 70-90% of suspended solids and 60-90% of heavy metals will be removed by the swales.

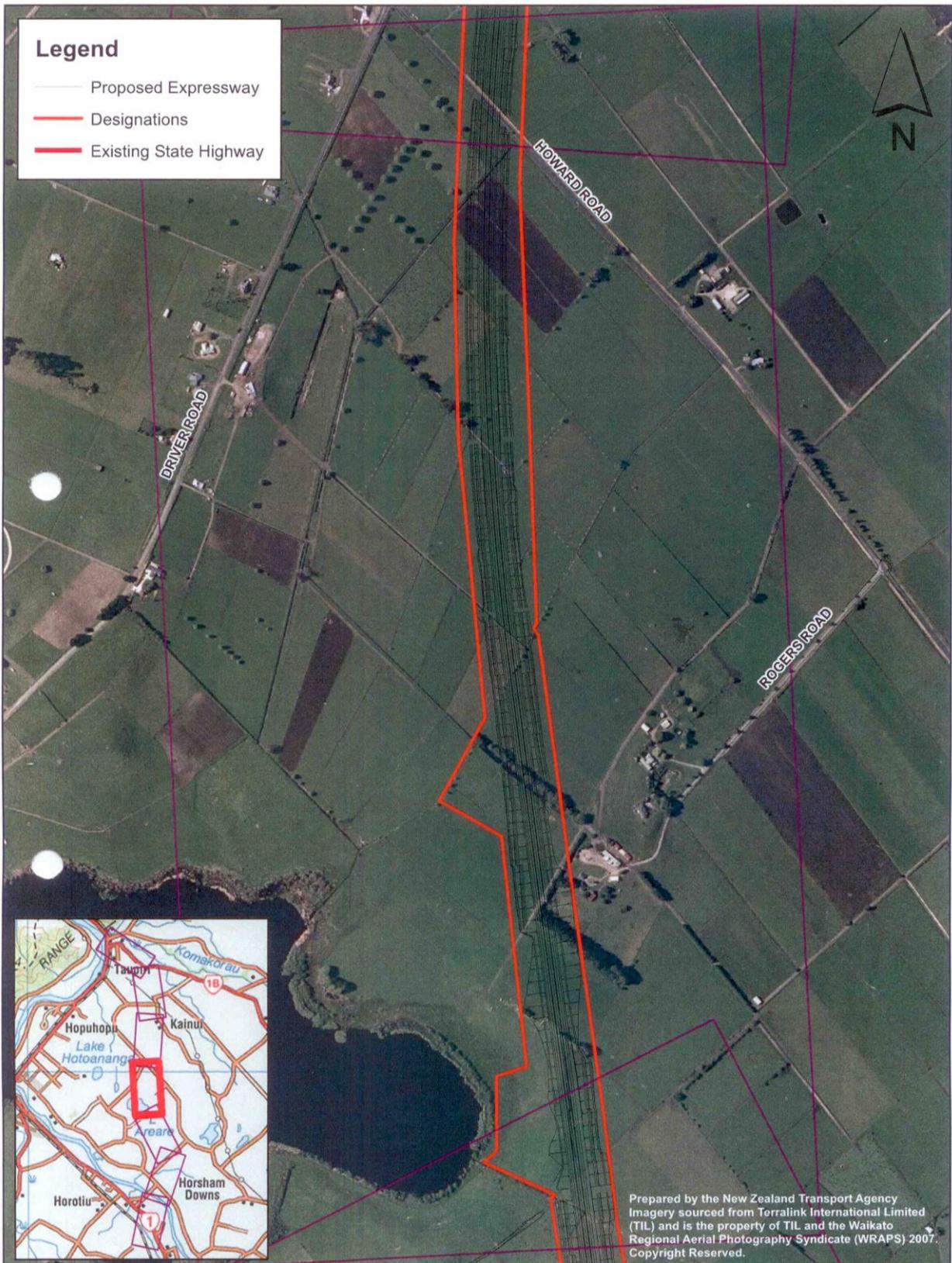


Figure 6: Location of the Waikato Expressway. Source: www.nzta.govt.nz/projects/ngaruawahia/.

Water from the swales will be directed into a constructed wetland which is being contracted by NZTA as mitigation for effects of the expressway on Lake Areare (location shown in Figure 4). The main purpose of the constructed wetland is to capture sediment and other contaminants from surrounding farm run-off before it reaches Lake Areare during normal flows and less than 5 year flood events. The constructed wetland is based on the Auckland Regional Council's TP10 guidelines (Auckland Regional Council 2003) however the size of the wetland (0.56% of the catchment) is below the 1-2.5% recommended by McKergow *et al.* (2007) for substantially reducing nutrient and sediment loads from pastoral catchments.

5.3 Pest plants

A range of pest plants are present at Lake Areare. These are listed in Table 3 along with their pest status according to the Waikato Regional Pest Management Strategy (Environment Waikato 2008). Priority for control/eradication of these pest plants has been estimated based on their current extent and the threat they pose to restoration of indigenous plant communities around the lake.

Table 3: Plant pests at Lake Areare and their pest status in the Waikato Regional Council Pest Management Strategy (WRCPMS) 2008-2013.

Species	Common Name	Pest Status in the WRCPMS 2008-2013	Priority for Control/Eradication
<i>Bidens frondosa</i>	beggars tick		Low
<i>Cortaderia selloana</i>	pampas	Containment	Medium
<i>Lycopus europaeus</i>	gypsywort		Low
<i>Paspalum distichum</i>	Mercer grass		Low
<i>Rubus fruticosus</i>	blackberry		High
<i>Salix babylonica</i>	weeping willow		Low
<i>Salix cinerea</i>	grey willow	Containment	High
<i>Salix fragilis</i>	crack willow	Containment	Medium
<i>Ulex europaeus</i>	Gorse	Containment	High

A significant amount of pest plant control work has been undertaken at Lake Areare, focusing on willow species, blackberry, and gorse. This has largely been successful and most revegetation areas have low occurrences of these pest plants. Ongoing control of grey willow saplings will be essential to prevent grey willow from again becoming the dominant vegetation type around the lake.

5.4 Pest fish

Several pest fish species are present in Lake Areare and include catfish, mosquito fish, and goldfish. There are other pest fish present in the Waikato River system that are detrimental to the water quality of lakes (e.g. koi carp and rudd). To date these have not been recorded in Lake Areare but could be illegally introduced into the lake by coarse fisherman or into drains that lead to Lake Areare.

5.5 Pest mammals

Mammalian predators such as stoat (*Mustela erminea*), ferret (*M. furo*), brush-tailed possum (*Trichosurus vulpecula*), house cat (*Felis catus*), brown rat (*Rattus norvegicus*) and European hedgehog (*Erinaceus europeasu occidentalis*) all favour wetland habitats where they can have significant detrimental effects on indigenous wildlife, particularly ground-nesting bird species. To date no mammalian pest control has been undertaken at Lake Areare.

6. MANAGEMENT OPPORTUNITIES AND PRIORITIES

Lake Areare has many attributes that confer a wide range of possibilities for enhancing and restoring natural, cultural, and recreational values in accordance with the objectives of the MOA. These include the following:

- In close proximity to Ngaruawahia and Hamilton, providing opportunities for recreation and educational opportunities;
- Lake is large enough to suit a variety of recreational activities;
- Public land surrounds all of the lake, allowing establishment of a circuit track;
- Two current access points to the lake (Driver Road and Ormsby Road) and the potential to link to a cycle lane that will be part of the Waikato Expressway;
- In close proximity to Lake Pikopiko (c.500 m), Lake Hotoananga (c.1.5 km) and Lake Kainui (c.2.5 km);
- All of the public land has been fenced and c. 60% of the margin has already been revegetated;
- Lake size, sinuous shape, and moderate diversity of plant communities provides good habitat for a wide range of bird species;
- Does not contain some of the worst freshwater pest species in the Waikato Region (e.g. koi, rudd, alligator weed, yellow flag iris, royal fern);
- Minimum summer lake levels have been restored;
- A constructed wetland to treat less than 5 year flood events from the largest lake inflow will be built within the next 12 months.

DOC recently commissioned a concept plan for improvement of recreational facilities and the natural values of the lake (Figure 7), which identifies the possibility for a range of opportunities at Lake Areare:

- Improved carparking facilities (10 space permanent carpark with overflow carparking);
- Picnic area with interpretive signage and seating;

- Walking/cycling track around the lake;
- Viewing platforms on highest points around the lake;
- Three jetties with seating and interpretive signage;
- Walkway/cycleway linkages to Lake Pikopiko and the cycle lane proposed along the Waikato Expressway;
- Further revegetation; and
- Silt traps on lake inflows.

Turangawaewae Marae and Taupiri Marae are in close proximity to the lake. Representatives from both marae have identified the following opportunities for Lake Areare:

- Improvement of water quality through treatment wetlands, lake buffers and encouraging good land management in the catchment to reduce contaminants before they enter waterways;
- Vehicle access to the lake at the end of Ormsby Road to provide suitable access for kaumatua to undertake customary practices;
- Establish varieties of harakeke suitable for weaving and rongoa rakau (medicinal plants) that can be harvested by tangata whenua;
- An educational place for learning customary practices;
- Waka Ama training if there was better access for non-powered boats. While Waka Ama is currently undertaken on the Waikato River many regattas are held in lakes and therefore being able to train on Lake Areare would be beneficial.

Other opportunities that build on some of the current or planned initiatives at Lake Areare that would enhance habitat include:

- Enhancement planting in some of the older areas of revegetation to establish a more diverse understorey and to fill in canopy gaps where plants have died or haven't been planted in sufficient densities;
- Where possible extend the extent of emergent reed beds particularly of kuta and *Macherina articulata* to provide more habitat for New Zealand dabchick, Australasian bittern and banded rail;
- Continue to control, and if possible eradicate high and medium priority pest plants (Table 3);
- Establish a diversity of plant community types that are characteristic of peat lakes including restiad wetland if technically feasible.
- Increase size of the proposed constructed treatment wetland to enable it to improve its capacity to remove contaminants, particularly for events greater than 5 year flood flows.

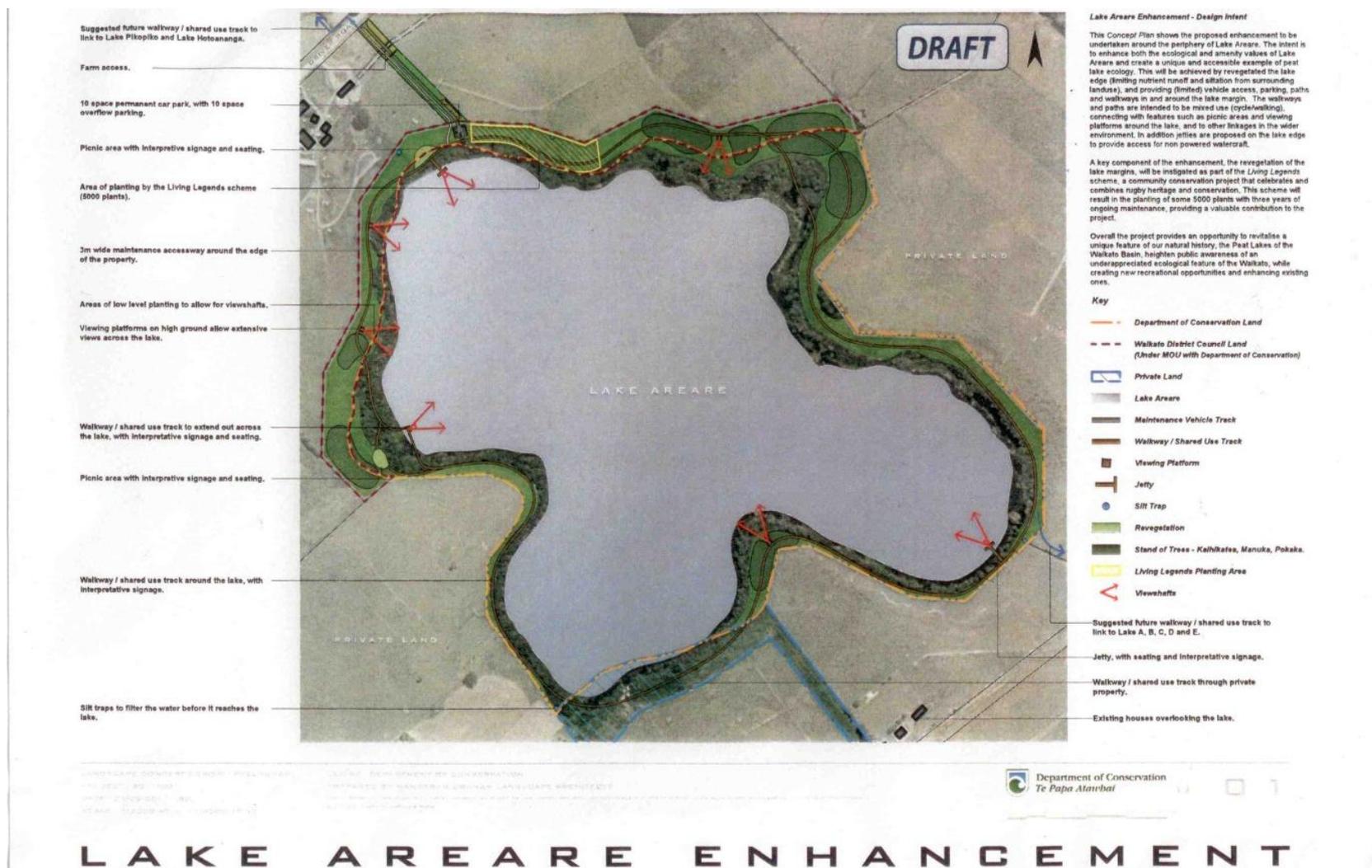
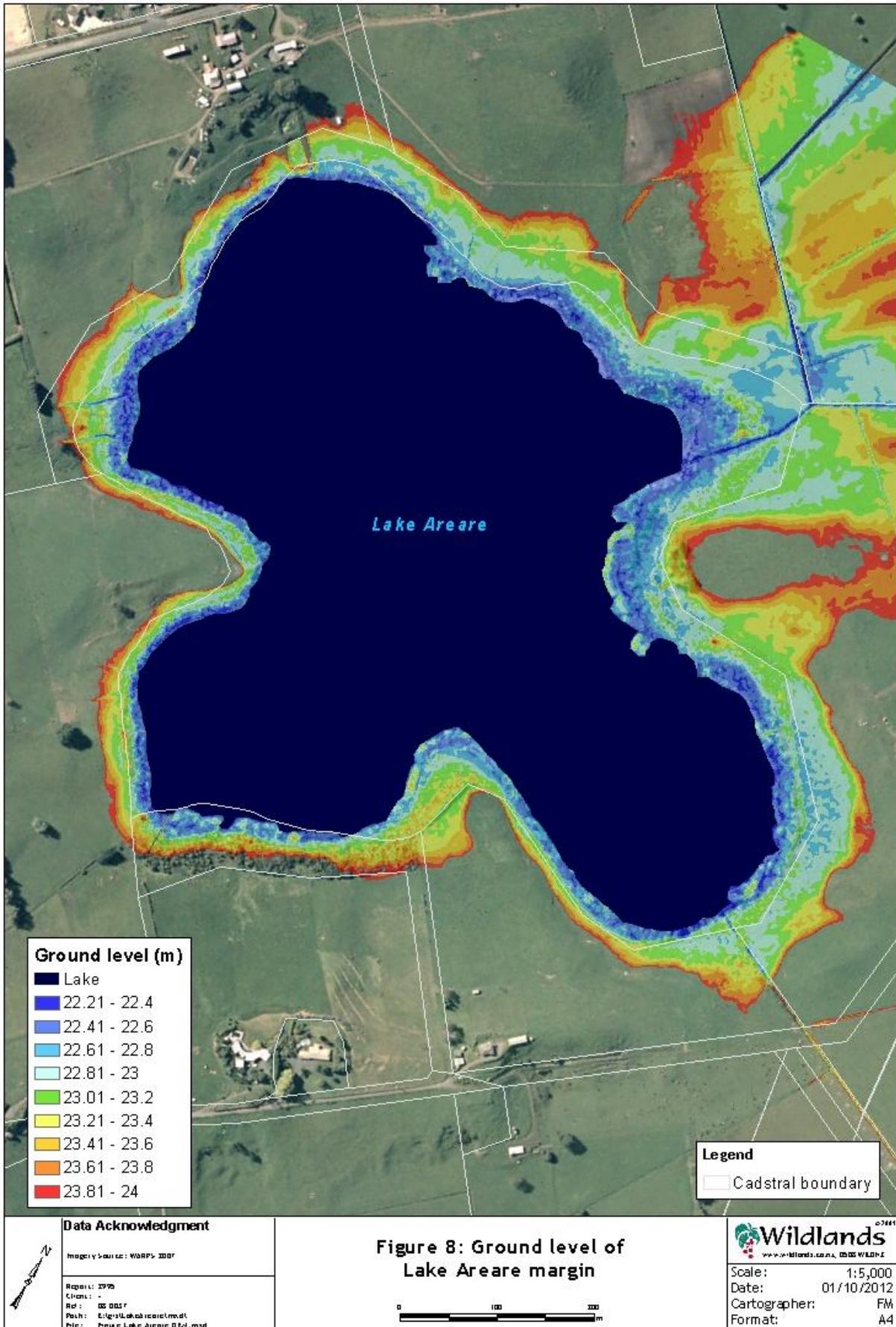


Figure 7: Concept plan for enhancing the natural values and recreational opportunities at Lake Areare. Note that the Ormsby Road paper road (shown in blue) has been incorrectly identified as private land.

- Trapping of pest animals, particularly mustelids and feral cats, that pose the greatest risk to wetland birds;
- Create tall stands of trees at suitable sites around the lake that will create suitable roosting and nesting habitat for black shag and little black shag. The small stand of tall oak trees planted by hunters on the eastern side of the lake could form the centre of a suitable planting.
- Establish plant and animal communities that are regionally or nationally threatened or at risk and which were historically present at the site.

In the long-term, extending the buffer around Lake Areare would help to reduce peat shrinkage and reduce contaminants reaching the lake from overland flow. Esplanade reserves could be added to the reserves if the remaining two properties adjacent to the lake are subdivided in the future. Low-lying land should be a priority for land acquisition or covenanting. Figure 8 shows the areas of low-lying land around the lake.

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7. INTEGRATED ACTION PLAN

This section of the report brings together a range of actions that could be taken to address threats to Lake Areare. It also includes actions that progress opportunities identified in the previous section. Actions are listed in Table 5 in order of priority. A lead agency for initiating actions is given along with other parties that are likely to have a role on its' implementation. External funding sources are also identified. These include the Waikato River Clean Up Trust (WRCUT) and the Waikato Catchment Ecological Enhancement Trust (WCEET) both of which allow government agencies to apply for funding. Other funds are limited to non-profit organisations or charitable trusts.

Table 5: Priority actions for enhancement of the natural, recreational, and cultural values of the lake, listed in order of decreasing priority, with possible funding sources indicated.

Action	Timing	Lead Agency	Other MOU Parties	Other Stakeholders	Possible Funding Sources if Applicable
Increase the size and design of the constructed wetland treating the main inflow to the lake to optimise the removal of contaminants before water reaches the lake.	Next 6 months	AWFG	DOC, W-T	NZTA	
Fish survey to improve current knowledge of fish species within the lake.	Next 6 months	DOC	AWFG		
Develop a habitat enhancement plan to guide future restoration of marginal habitat at the lake that seeks to improve habitat for rare birds, increase habitat complexity and includes suitable plant varieties for cultural harvesting.	Next 6 months	DOC	AWFG, W-T, WDC, WRC		WRCUT, WCEET
Ensure that vehicle access is provided next to the constructed wetland so that the south-eastern end of the lake can be accessed for customary practices, game bird hunting and restoration activities.	Next 6 months	AWFG/W-T	DOC	NZTA	
Ongoing surveillance of pest fish species.	Biennial	DOC			
Establish the need for a fish barrier to prevent koi and rudd establishing within the lake.	1-2 years	DOC	WRC		
Hold preliminary meetings to establish stakeholder interest in a landcare group.	1-2 years	DOC/WRC	AWFG, W-T	Catchment residents, hunters.	
Investigate options for reducing contaminants from other inflows.	1-2 years	DOC	WRC, AWFG, W-T, WDC		WRCUT, WCEET
Implement habitat enhancement plan.	1-10 years	DOC	AWFG, W-T, WDC	Landcare group	WRCUT, WCEET
Seek opportunities to extend the buffer area around the lake through covenanting, land purchase, subdivision/ esplanade provisions in WDC District Plan.	1-10 years	DOC/WDC			

Action	Timing	Lead Agency	Other MOU Parties	Other Stakeholders	Possible Funding Sources if Applicable
Upgrade carparking facilities at Driver Rd entrance.	2-3 years	WDC	DOC		
Develop picnic area with interpretive signage near Driver Road entrance.	2-3 years	DOC/WDC	W-T		
Implement options for reducing contaminants from other inflows.	2-3 years	DOC / WRC	AWFG, W-T, WDC		WRCUT, WCEET
Farm management planning within the local catchment to reduce contaminants reaching waterways.	2-5 years	WRC		Landowners within the catchment	WRCUT
Pest animal control particularly of mustelids and feral cats that pose the greatest risk to wetland birds.	2-10 years	DOC	AWFG	Landcare group	
Establish walkway/cycle track around lake with link to cycle lane on Waikato Expressway.	2-5 years	DOC/WDC		NZTA	WRCUT
In-lake water quality monitoring to determine whether management actions targeted at water quality improvements are effective.	2-10 years	WRC	DOC, AWFG, W-T		
Establish suitable facilities for launching non-powered boats near Driver Rd entrance.	3-5 years	DOC	WDC, AWFG, W-T		
Develop a walking/cycling trail between Lake Areare and nearby lakes (e.g. Pikopiko, Hotoananga).	5-10 years	DOC	WDC		

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ACKNOWLEDGMENTS

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**MEMORANDUM OF
UNDERSTANDING BETWEEN
DIRECTOR-GENERAL OF
CONSERVATION AND WAIKATO
DISTRICT COUNCIL**



Department of Conservation
Te Papa Atawhai

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING IS MADE THIS 14th DAY OF MAY 2010.

PARTIES:

1. **DIRECTOR-GENERAL OF CONSERVATION** ("the Director-General")
2. **WAIKATO DISTRICT COUNCIL**

BACKGROUND

- A. The Department of Conservation *Te Papa Atawhai* ("DOC") is the central government organisation charged with conserving the natural and historic heritage of New Zealand on behalf of and for the benefit of present and future New Zealanders.
- B. DOC's Statement of Intent 2008-2011 in relation to Working with Others states:
The Department works increasingly with others. This means both working in a whole of government context, and working with others beyond the central government sector – including tangata whenua, landowners, regional and local government, recreation, outdoor and conservation organisations, and businesses
- C. DOC has developed a 'Conservation with Communities Strategy' to work towards its goal of working with recreation, outdoor and conservation organisations and businesses.
- D. DOC values relationships with other Parties with a strong interest in conservation and from time to time its Director-General enters into relationship arrangements with them.
- E. The Parties wish to record their relationship arrangements in this document and its Schedule(s).

OPERATIVE PARTS

1. The Parties agree that the arrangements set out in Schedule 1 of this document are the basis on which they wish to base their relationship.

SIGNED on behalf of the Director-General of Conservation by Mathew Cook, Waikato Area Manager acting under delegated authority:

A copy of the instrument of delegation may be inspected at the Director-General's office.

SIGNED by Bruce Airey, Facilities Manager Waikato District Council:

BO Airey, Facilities Manager



MOU Lake Areare DM-543197

Schedule 1

Background

1. The Director- General administers the Lake Areare Wildlife Management Reserve and adjoining this waterbody, Waikato District Council administers a Road Reserve.
2. The Parties wish to undertake programmes of work that restores and enhances the natural values of the land each administers on the lake margin and to enable public enjoyment of those values.
3. The Parties have each agreed to undertake works jointly and separately to progress lake restoration.
4. The Director- General agrees to grant Waikato District Council a sum to meet the cost of fencing the legal boundary between the private landowner and the Road Reserve. Waikato District Council will maintain the fence and construct and maintain the accessway.
5. Waikato District Council shall progress the changing the status of the Road Reserve to Esplanade Reserve.
6. The Director- General shall be the principal contact between adjoining landowners of the road reserve and members of public including duck shooters.
7. The Director- General may determine that the lands contained in the reserve may be lightly grazed or mown for hay so long as natural values are not compromised. Any revenue derived from commercial use of the land shall be used to support restoration costs.
8. The Director- General and Waikato District Council shall jointly prepare a Management Plan for the whole lake including plan for and undertake pest plant control, planting and other works. The sharing of costs and application for funding shall be agreed annually.

Nature of relationship

9. The Parties wish to conduct their relationship ("the relationship") on the basis of good faith and respect for each other's views.
10. Either Party may refer to the relationship in their dealing with others as 'working with the other'.

Term

11. The term of the relationship is 5 years , unless either Party wishes to withdraw before then. It may do so by giving 4 weeks written notice to the other Party.

Communication

12. The Parties agree to meet at least twice a year to discuss issues of mutual interest, including the Department of Conservation's business and work planning and new research and knowledge. This may also be by telephone conference or in a series of e-mail messages.
13. If matters arise that may be of interest to either Party, a contact person designated by each Party is to be informed. That person should develop an effective working relationship with the other Party.

MOU Lake Areare DM-543197

14. If the contact person changes in either organisation, there should be a handover process so that the new person can quickly settle into the role.
15. In the interests of clear communication, any public statements must be made only after agreement with the other Party.

Management agreements or other contractual arrangements

16. Should the Parties wish to work together on projects to achieve conservation objectives they agree to enter into a management agreement or other contractual arrangement that will deal with each project.

Health and Safety

17. All agreements entered into under clause 12 will include health and safety provisions.
18. Should any conservation work be carried out on public conservation land on an ad hoc basis, or the work is not the subject of a specific agreement as anticipated in clause 12, Waikato District Council agrees to prepare a safety plan for its members and to comply with the Department of Conservation's health and safety requirements and any specific procedures relating to the work being done.

Intellectual Property and Data Sharing

19. All intellectual property brought to the relationship by each Party will remain vested in that Party.
20. If a project is undertaken, ownership and management of any intellectual property developed in relation to it will be dealt with in the management agreement or other contractual arrangement relating to the project.
21. Should either Party contribute resources that are not related to a specific project the other must acknowledge their ownership and their contribution.
22. Use of logos or other corporate identification must be agreed by each Party on a case by case basis.
23. Standards for data management and protocols for data sharing will also be dealt with in the management agreement or other contractual arrangement relating to the project.

Confidentiality

24. Confidential information means proprietary scientific, technical and business information disclosed in the course of the relationship.
25. Neither of the Parties shall disclose directly or indirectly the confidential information received from the other Party to any third party without written consent, unless required by the processes under the Official Information Act 1982 in which case the Director- General will inform the other party prior to disclosure.

Dispute Resolution

26. Any dispute concerning the subject matter of this document will be settled by full and frank discussion and negotiation between the Parties. Should the dispute not be resolved satisfactorily by these means, the Parties agree that they will engage in mediation conducted in accordance with the terms of the LEADR New Zealand Inc Standard Mediation Agreement.

VASCULAR SPECIES LIST

Species recoded by Champion et al. (1993) and revegetation species (*).

INDIGENOUS SPECIES

Gymnosperms

<i>Dacrycarpus dacrydioides</i> *	kahikatea
<i>Dacrydium cupressinum</i> *	rimu
<i>Podocarpus totara</i> var. <i>totara</i> *	totara

Monocot. trees and shrubs

<i>Cordyline australis</i>	tī kōuka, cabbage tree
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Dicot. trees and shrubs

<i>Alectryon excelsus</i> subsp. <i>excelsus</i> *	tītoki
<i>Coprosma</i> × <i>cunninghamii</i> (<i>Coprosma propinqua</i> × <i>C. robusta</i>)	
<i>Coprosma robusta</i> *	karamū, kāramuramu
<i>Coprosma tenuicaulis</i> *	hukihuki, swamp coprosma
<i>Leptospermum scoparium</i> agg.*	mānuka
<i>Melicytus ramiflorus</i> subsp. <i>ramiflorus</i> *	māhoe
<i>Sophora tetraptera</i> *	kōwhai

Dicot. lianes

<i>Calystegia sepium</i>	
<i>Muehlenbeckia australis</i>	puka

Ferns

<i>Blechnum minus</i>	swamp kiokio
<i>Dicksonia squarrosa</i>	whekī
<i>Histiopteris incisa</i>	mātātā, water fern
<i>Hypolepis distans</i>	
<i>Paesia scaberula</i>	mātātā
<i>Pteridium esculentum</i>	rārahu, bracken

Grasses

<i>Isachne globosa</i>	swamp millet
<i>Lachnagrostis filiformis</i>	

Sedges

<i>Carex lessoniana</i>	toetoe-rautahi
<i>Carex maorica</i>	
<i>Carex secta</i> *	pūrei
<i>Carex virgata</i> *	pūrei
<i>Cyperus ustulatus</i> f. <i>ustulatus</i>	toetoe upoko-tangata
<i>Eleocharis acuta</i>	spike sedge
<i>Eleocharis gracilis</i>	
<i>Eleocharis sphacelata</i>	giant spike sedge, ngāwhā,
<i>Isolepis distigmatosa</i>	
<i>Isolepis inundata</i>	
<i>Isolepis prolifera</i>	
<i>Isolepis reticularis</i>	
<i>Machaerina articulata</i>	
<i>Machaerina teretifolia</i>	
<i>Schoenus maschalinus</i>	

Rushes

<i>Juncus australis</i>	wi, wīwī
<i>Juncus distegus</i>	
<i>Juncus edgariae</i>	wi, wīwī
<i>Juncus planifolius</i>	

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

<i>Dianella nigra</i>	tūrutu
<i>Lemna minor</i>	karearea
<i>Phormium tenax</i> *	harakeke, flax
<i>Typha orientalis</i>	raupō

Dicot. herbs

<i>Centella uniflora</i>	
<i>Drosera binata</i>	sundew, wahu
<i>Gonocarpus micranthus</i>	piripiri
<i>Hydrocotyle pterocarpa</i>	
<i>Lobelia anceps</i>	punakura
<i>Lobelia angulata</i>	pānakenake
<i>Myriophyllum propinquum</i>	
<i>Nertera scapanioides</i>	
<i>Persicaria decipiens</i>	
<i>Potamogeton cheesemanii</i>	manihi
<i>Potamogeton ochreatus</i>	

NATURALISED AND EXOTIC SPECIES

Dicot. trees and shrubs

<i>Salix babylonica</i>	weeping willow
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<i>Salix cinerea</i>	grey willow
<i>Salix fragilis</i>	crack willow
<i>Ulex europaeus</i>	gorse

Ferns

<i>Azolla pinnata</i>	fernny azolla
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Grasses

<i>Agrostis stolonifera</i>	creeping bent
<i>Cortaderia selloana</i>	pampas
<i>Glyceria fluitans</i>	floating sweet grass
<i>Holcus lanatus</i>	Yorkshire fog
<i>Paspalum distichum</i>	Mercer grass
<i>Schedonorus arundinaceus</i>	tall fescue

Sedges

<i>Carex ovalis</i>	oval sedge
<i>Cyperus eragrostis</i>	umbrella sedge
<i>Isolepis marginata</i>	little clubrush
<i>Isolepis sepulcralis</i>	

Rushes

<i>Juncus acuminatus</i>	sharp-fruited rush
<i>Juncus articulatus</i>	jointed rush
<i>Juncus bufonius</i> var. <i>bufonius</i>	toad rush
<i>Juncus bulbosus</i>	bulbous rush
<i>Juncus dichotomus</i>	forked rush
<i>Juncus effusus</i> var. <i>effusus</i>	soft rush, leafless rush
<i>Juncus flavidus</i>	leafless rush
<i>Juncus fockei</i>	
<i>Juncus tenuis</i> var. <i>tenuis</i>	track rush

Monocot. herbs (other than orchids, grasses, sedges, and rushes)

<i>Egeria densa</i>	egeria
<i>Landoltia punctata</i>	purple-backed duckweed

Dicot. herbs

<i>Aster subulatus</i>	sea aster
<i>Bidens frondosa</i>	beggars' ticks
<i>Callitriche stagnalis</i>	starwort
<i>Galium palustre</i>	marsh bedstraw
<i>Euchiton involucratus</i>	
<i>Lotus pedunculatus</i>	lotus

<i>Ludwigia palustris</i>	water purslane
<i>Ludwigia peploides</i>	primrose willow
<i>Lycopus europaeus</i>	gypsy wort
<i>Lythrum hyssopifolia</i>	hyssop loosestrife
<i>Mentha pulegium</i>	penny royal
<i>Myosotis laxa</i> subsp. <i>caespitosa</i>	water forget-me-not
<i>Persicaria hydropiper</i>	spearwort
<i>Ranunculus flammula</i>	blackberry
<i>Rubus</i> sp. (<i>R. fruticosus</i> agg.)	clustered dock
<i>Rumex conglomeratus</i>	

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