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Attention: Nicholas Woodley

Dear Nicholas

## **Huia Water Treatment Plant Ecological Assessment**

### **1 Background**

Watercare Services Ltd (Watercare) is investigating options for re-developing and enlarging the water treatment plant at Huia, located off Woodlands Park Road, Titirangi. Potential options for further extending the plant include areas that currently support indigenous vegetation to the North, East and West of the existing site. Tonkin & Taylor Ltd (T&T) has been engaged by Watercare (as per our Letter of Engagement dated 22 February 2012 and variations dated 3 April 2012 and 17 July 2012) to carry out a general terrestrial ecological assessment to help determine options for site development.

### **2 Scope**

Our scope of work included:

- A site visit to undertake a broadly based assessment of ecological values of the areas being considered for development (“the study area”, as shown on the figures in Appendix B);
- A written report outlining the fieldwork findings and assessing these findings against the Auckland Council Regional Policy Statement (ACRPS) significance criteria; and
- An assessment of the vegetation values within the study area and comment on the potential adverse effects and mitigation options.

#### **2.1 Desktop assessment**

The Natural Areas Map in the Auckland District Plan: Waitakere Section and the Waitakere Ecological District: Survey Report for the Protected Natural Areas Programme<sup>1</sup> were used to determine the current protection and management status of the vegetation / habitats within the study area.

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<sup>1</sup> Denyer K, Cutting M, Campbell G, Green C, Hilton M 1993. Waitakere ecological district: survey report for the protected natural areas programme. Auckland, Auckland Regional Council. 285 p.



Methods used to assess the vegetation surrounding the Huia water treatment plant included the assessment of ecological significance using the Natural Heritage Significance Criteria listed in the ACRPS as a guide.

## 2.2 Field assessment

Fieldwork was conducted on 15 March, 5 April and 22 August 2012. Specific vegetation / habitat types and their extent were assessed and mapped on an aerial photograph to visually depict the types, locations and amount of vegetation / habitat type and determine approximate areas of each (Figure 1, Appendix B). Individual trees greater than 60 cm Diameter at Breast Height (DBH) (or 1.30 m above the ground) were recorded using GPS to further refine the delineation between vegetation types and our assessment of ecological significance<sup>2</sup>. A small stream located on site was also mapped by collecting GPS tracking points along the stream length within the study area.

To assess the ecological condition of each vegetation type we used the nationally accepted FORMAK forest monitoring and assessment methodology<sup>3</sup>. The FORMAK site assessment provides a scoring system on a range of criteria to collectively determine the diversity and health of the vegetation. Each criterion is scored and an overall numerical total (out of 100) is provided. Twelve FORMAK assessments were conducted within the study area (Appendix A, raw data not included in report but is available on request). Numbers on the site plan (Figure 1, Appendix B) can be matched up with the FORMAK data in Appendix A<sup>4</sup>.

Vegetation types were assessed for their value and importance as potential habitats for threatened plants and indigenous fauna including bats, birds, reptiles and amphibians, and invertebrates. Additionally to quantify bird values we conducted six 5-minute bird counts. The bird counts were positioned across the site in a spatially representative manner (Figure 1, Appendix B & C).

## 3 Site overview

The study area is approximately 13 ha, consisting of the Huia water treatment plant with a footprint of approximately 2.1 ha and the remainder of the area in forest totalling approximately 10.9 ha.

Vegetation surrounding the Huia water treatment plant is a matrix of early to late succession forest types ranging from low stature exotic scrub to tall, mature and more biologically diverse kauri forest. The vegetation can be divided into seven forest types which are discussed in the following sections.

## 4 Ecological characteristics

### 4.1 Vegetation

#### 4.1.1 Forest types

The following forest types have been identified within the study area: kauri forest (approx 4.0 ha), kahikatea swamp forest (ephemeral) (approx 0.1 ha), kanuka forest (approx 3.7 ha), mahoe / kohekohe forest (approx 0.6 ha), mahoe forest (approx 0.2 ha), exotic / native scrub (approx 1.4 ha) and exotic scrub (approx 0.9 ha) (Figure 1, Appendix B). Images of selected forest types are included in Appendix D.

<sup>2</sup> While every effort was made to locate all individual trees greater than 60 cm DBH, it is possible that some trees within the survey area may have been missed.

<sup>3</sup> FORMAK n.d. The forest monitoring and assessment kit (Formak). <http://dataversity.org.nz/guide/systems/formak> (accessed March 2012).

<sup>4</sup> Two additional vegetation types were recorded following further habitat mapping during a subsequent site visit. FORMAK assessments were not conducted for these vegetation types as they were previously part of other assessed vegetation

- **Kauri forest** occurs in both large and small patches throughout the study area. The largest kauri trees over the surveyed area were identified in this forest type (Image 1 & 2, Appendix D). Less common canopy emergents include rimu, totara, tanekaha and kahikatea.
- **Kahikatea swamp forest (ephemeral)** is found in two small areas within kauri forest. Floodplain areas of the small stream running through the area comprises large kahikatea trees, iconic of kahikatea swamp forests.
- **Kanuka forest** is found in variable sized patches across the site. Kanuka forest consists of a primarily kanuka canopy with occasional trees emerging above the canopy such as kauri, totara, kahikatea, rimu and pohutakawa.
- **Mahoe / kohekohe forest** is found on steep slopes along the northern boundary of the study area. It comprises a canopy of predominantly mahoe and kohekohe but also features karaka and some kanuka.
- **Mahoe forest** is found in a small patch on a steep slope adjacent to Woodlands Park Road towards the east of the study area. It comprises a canopy of predominantly mahoe but also includes some kanuka and mapou.
- **Exotic / native scrub** is found in one large area adjacent to kanuka forest and surrounding areas of exotic scrub. Native species such as kanuka, mahoe and tree ferns make up the canopy as do a number of exotic species such as gorse and woolly nightshade.
- **Exotic scrub** is situated in several patches, with variable sizes, across the study area. Exotic species such as blackberry, pampas, hydrangea, montbretia and gorse dominate the area with occasional native species such as karamu and kanuka present.

#### 4.1.2 Threatened plants

Several plant species listed as Nationally threatened or at risk have been recorded within the Waitakere Ecological District<sup>5</sup>. The vegetation survey carried out was a general assessment of the vegetation only and did not include targeted threatened plant surveys or assessments. Although unlikely, there is potential that one or more Nationally threatened or at risk plant species are present within the study area but were not detected in this survey.

## 4.2 Fauna

### 4.2.1 Bats

The threatened long-tailed bat is present in the Waitakere Ranges<sup>1</sup> and could possibly use these mature forest habitats for roosting.

### 4.2.2 Birds

Five native and seven introduced bird species were heard or observed at the site during the six 5-minute bird counts. The most abundant species were the native tui, fantail, kingfisher, greywarbler and exotic myna and thrush. The following species were also heard or observed outside the 5-minute bird counts: native kereru and shining cuckoo, and exotic pheasant. The birds recorded on site were typical of forested habitats surrounded by light urban / residential development. More introduced species were identified than native species; however the total abundance of individual native birds was higher than exotic birds.

<sup>5</sup> Lindsay H, Wild C, Byers S 2009. Auckland protection strategy: a report to the nature heritage fund committee. Wellington, Nature Heritage Fund. 85 p.

Although not observed, nationally threatened birds such as the North Island kaka, and long-tailed cuckoo are known to be present within the Waitakere Ranges<sup>1</sup> and it is possible that these birds periodically use the more mature forest habitats within the site.

#### 4.2.3 Herpetofauna

A herpetofaunal (reptile and amphibian) assessment was not undertaken at the site. All forest types dominated by native vegetation are likely to support skinks and geckos. Native lizards possibly present include pacific gecko (Nationally at risk), Auckland green gecko (Nationally at risk) and forest gecko, and ornate skink (Nationally at risk) and copper skink. Furthermore, streams and stream margins could also include Hochstetter's frogs. All native herpetofauna are protected under the Wildlife Act (1953).

#### 4.2.4 Invertebrates

There are unlikely to be any threatened invertebrates within the study area.

### 4.3 Freshwater tributaries

Two freshwater tributaries were located in the surveyed area (Figure 1, Appendix B). Photographs of the two tributaries can also be found in Appendix D (Images 13 & 14). No assessment of the freshwater tributaries was undertaken and during the site visit it was difficult to determine if one of the tributaries was permanent or intermittent. If a development was to extend near the watercourses further investigation would be required and there may be a requirement for ecological compensation to be provided in accordance with Auckland Council's Stream Ecological Valuation Technical Report (TR 2011/009).

## 5 Ecological significance assessment

The study area is shown as being Managed and General Natural Area on the Auckland District Plan: Waitakere Section. Managed Natural Areas covers areas which are characterised by significant native vegetation, wildlife habitats and water systems, while General Natural Areas covers developed parts of the City, generally with low or little native vegetation cover. The study area is not recommended for protection according to the Waitakere Ecological District Survey Report for the Protected natural areas programme.

However, we assess six of the seven vegetation types as Ecologically Significant under the ACRPS significance criteria (ACRPS Section 6.4.7.1) as they meet key criteria discussed below. Different vegetation types vary in their degree of ecological significance. The following, as well as Figure 2 in Appendix B, identifies which vegetation / habitat types we consider to have high, medium, low or no ecological significance (bracketed roman numerals denote the significance criterion):

- **Kauri forest and kahikatea swamp forest (ephemeral)** have high ecological significance as they meet the following four criteria:
  - Representativeness (one of best remaining examples) and characteristic of rare indigenous community type in the Ecological District (i).
    - o Kauri forest has declined to only 9% of its former extent in the Auckland Region and 14% in the Waitakere Ecological District; and
    - o Freshwater wetland and wetland forest, which includes kahikatea swamp forest (ephemeral) has also declined to 4% of its former extent in the Auckland Region, although 51% remains in the Waitakere Ecological District;
  - Likely presence of a threatened species (e.g ornate skink and Auckland green gecko) (ii);

- Natural diversity of species of flora and fauna, biological communities and ecosystems (high diversity of large mature trees and array of fauna) (vi); and
- Extent to which an area is still reflective of its original natural character and quality (large mature trees illustrate natural character of forest) (viii).
- **Kanuka forest, mahoe / kohekohe forest and mahoe forest** are of medium ecological significance as they meet the following two criteria:
  - Likely presence of a threatened species (e.g. ornate skink and Auckland green gecko) (i); and
  - Relationship the area has with its surrounding landscape, including its role as an ecological corridor and extent of buffering and protection from external adverse effects (provide an important role as an ecological corridor between mature forest as well as providing a buffer and protecting adjacent mature forest integrity) (v).
- **Exotic / native scrub** is of low ecological significance as it meets the following single criteria:
  - Likely presence of a threatened species (e.g. ornate skink and Auckland green gecko) (i).
- **Exotic scrub** is not considered to be ecologically significant as it does not fit any of the significance criteria in the ACRPS.

## 6 Potential ecological effects and implications for development

### 6.1 Potential ecological effects

Likely adverse ecological effects associated with the development within the study area centre on the direct loss of vegetation and habitat types, mortality of wildlife (particularly sessile species such as lizards), and the degradation of vegetation and habitat types that remain through edge effects. Edge effects increase the susceptibility of the remaining habitat to invasive exotic plant species, greater fluctuations and changes to abiotic conditions, and exposure to construction and operational activities such as increased noise and general disturbance.

### 6.2 Assessment of effects

The level of such effects will depend on a number of factors, most notably the ecological significance of the habitats within the project footprint, the magnitude (extent and intensity) of effects and the potential to adequately avoid, remedy, or mitigate effects. This potential is largely influenced by the issues, constraints, and opportunities for mitigation.

We assess the potential adverse effects of development in each vegetation/ habitat type below. Recommended measures for avoiding, remedying or mitigating the potential adverse effects are provided in Section 6.3.

#### **High Ecological Significance: Kauri forest and Kahikatea Swamp Forest (ephemeral)**

Based on the site assessment, the ecological effects associated with clearing areas of high ecological significance (Figure 2, Appendix B) are likely to be high. The loss of mature indigenous kauri forest and kahikatea swamp forest (ephemeral) would be considered a significant effect predominately because this habitat type is threatened with 9% and 4% (respectively) of its original extent in the Auckland Region, it is likely to contain threatened and / or at risk species, and require a high degree of mitigation due to the age and irreplaceability of the forest and the high natural diversity of both fauna and flora.

### **Medium Ecological Significance: Kanuka, mahoe/kohekohe and mahoe forest**

Loss of kanuka, mahoe / kohekohe and mahoe forest is considered less significant than the loss of kauri forest or kahikatea swamp forest (ephemeral), and adverse effects are likely to be moderate. Kanuka, mahoe / kohekohe and mahoe forest may include threatened species and provides protection to adjacent mature vegetation. However there is more potential to mitigate effects because the habitat types are not threatened, the forest types are younger and therefore revegetation at mitigation sites will take less time to recover, and threatened species that may be present can potentially be salvaged and relocated to safer areas.

### **Low Ecological Significance: Exotic / native scrub**

The loss of exotic / native scrub is considered less significant than kanuka, mahoe / kohekohe and mahoe forest, and adverse effects are likely to be minor-moderate. Although this habitat type is also likely to harbour threatened species, mitigation is likely to be relatively easy because a large proportion of this habitat is comprised of exotic vegetation, including invasive species.

### **No Ecological Significance: Exotic scrub**

The habitat type is not considered ecologically significant and the effects of clearance are assessed as being less than minor. We do not expect any mitigation to be required.

## **6.3 Recommendations and possible mitigation requirements and options**

Our recommendations for managing effects from proposed development include the following;

- Development in areas of high ecological significance (kauri forest and kahikatea swamp forest (ephemeral)) will require greater levels of mitigation relative to other recorded vegetation types. Development within these areas should only be considered once all other options have been exhausted and if deemed necessary. If development was to occur in these areas, where possible it should be directed towards small fragmented sites in the first instance. Small fragmented sites are more exposed and vulnerable to edge effects;
- Development in areas of medium ecological significance (kanuka forest, mahoe / kohekohe forest and mahoe forest) will require mitigation, however, the degree of mitigation required is likely to be less than that required for sites noted as high ecological significance (kanuka forest, mahoe / kohekohe forest and mahoe forest); and
- Where possible development should focus on areas of no ecological significance (exotic scrub) and areas of low ecological significance (exotic / native scrub) in the first instance.

Options or potential requirements for mitigating the potential loss of habitat and threatened fauna include:

- Onsite native revegetation of available open areas and along new forest edges to minimise edge effects;
- Onsite weed management and animal pest control;
- Lizard (e.g. threatened reptiles) salvage and relocation to suitable offsite location;
- Offsite native revegetation, weed or animal pest control; and
- Offsite legal protection through covenanting.

If Watercare progress the development and expansion of the facility and ecological impacts were anticipated, then a detailed ecological assessment of the affected areas is likely to be required by

Council. Depending on the location, scale, and intensity of anticipated effects, the ecological assessment could include:

- Incorporation of collected vegetation and habitat data from the proposed project footprint;
- A Stream Ecological Valuation (SEV);
- Herpetofauna assessment;
- Bat survey; and
- Proposed measures to avoid, remedy, or mitigate adverse effects.

Additional to above it may be necessary to conduct an Arboricultural assessment if a proposed development involved pruning or works within the rootzone of trees.

## 7 Applicability

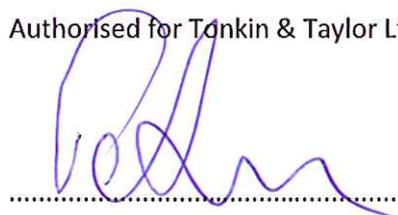
This report has been prepared for the benefit of Watercare Services Limited with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

Authorised for Tonkin & Taylor Ltd by:



Kieran Miller

Peter Roan

Terrestrial ecologist

Project Director

Technical review undertaken by Dr. Matt Baber.

9-Oct-12  
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**Appendix A:           Analysed FORMAK data**

FORMAK Site Assessment.<sup>1</sup>

Vegetation type (Area #)	Area (Ha)	Vegetation assessment criteria (/#)					Total (100)
		From overview site (16)	On the forest edge (20)	Moving through the forest (24)	Canopy gaps (8)	Threats (32)	
Kauri (1)	1.65	10	16	21	8	29	<b>84</b>
Kauri (12)	0.60	9	16	22	7	29	<b>83</b>
Kauri (7)	1.67	10	15	19	7	26	<b>77</b>
Kanuka (8)	0.59	9	15	20	6	25	<b>75</b>
Kanuka (2)	1.53	9	14	18	6	26	<b>73</b>
Mahoe (9)	0.16	9	16	17	6	25	<b>73</b>
Kauri (5)	0.30	8	13	19	6	26	<b>72</b>
Mahoe/Kohekohe (3)	0.57	8	14	18	5	26	<b>71</b>
Kanuka (10)	2.25	10	13	19	6	22	<b>70</b>
Kanuka (6)	0.61	10	15	17	5	21	<b>68</b>
Exotic scrub (4)	0.46	8	10	17	4	21	<b>60</b>
Exotic scrub (11)	0.47	8	12	15	4	21	<b>60</b>

<sup>1</sup> Vegetation types have since been added (kahikatea semi-swamp forest) and refined (exotic /native scrub) since the initial FORMAK assessment. Kahikatea semi-swamp forest is part of kauri (1) FORMAK assessment while exotic / native scrub is part of kanuka (10). Exotic / native scrub (4 & 11) has been re-named exotic scrub.



*Gorse				5							5	
*Hydrangea				25					10		10	
*Jasmine				10								
*Montbretia				10							7	
*Pampas				10								
*Wandering jew												
*Woolly nightshade											5	

\* denotes exotic species.

Note that not all species were listed in each category only those that were the most prominent. If no species were listed in an entire category that part of the forest structure was not present.

**Appendix B:            Figures of vegetation & significance types**



**LEGEND**

▲ Bird count station  
● Freshwater tributary

**Forest types:**

- Kauri
- Kanuka
- Mahoe / Kohekohe
- Mahoe
- Exotic scrub
- Exotic / Native scrub
- Kahikatea swamp forest

1 - 12 See Report for FORMAK assessment scores

SCALE 1:2000  
0 20 40 60 80 100 (m)

Aerial photo sourced from Auckland Council website.  
Property boundaries sourced from Land Information New Zealand data as at 7-Feb-2012 (Crown Copyright Reserved).

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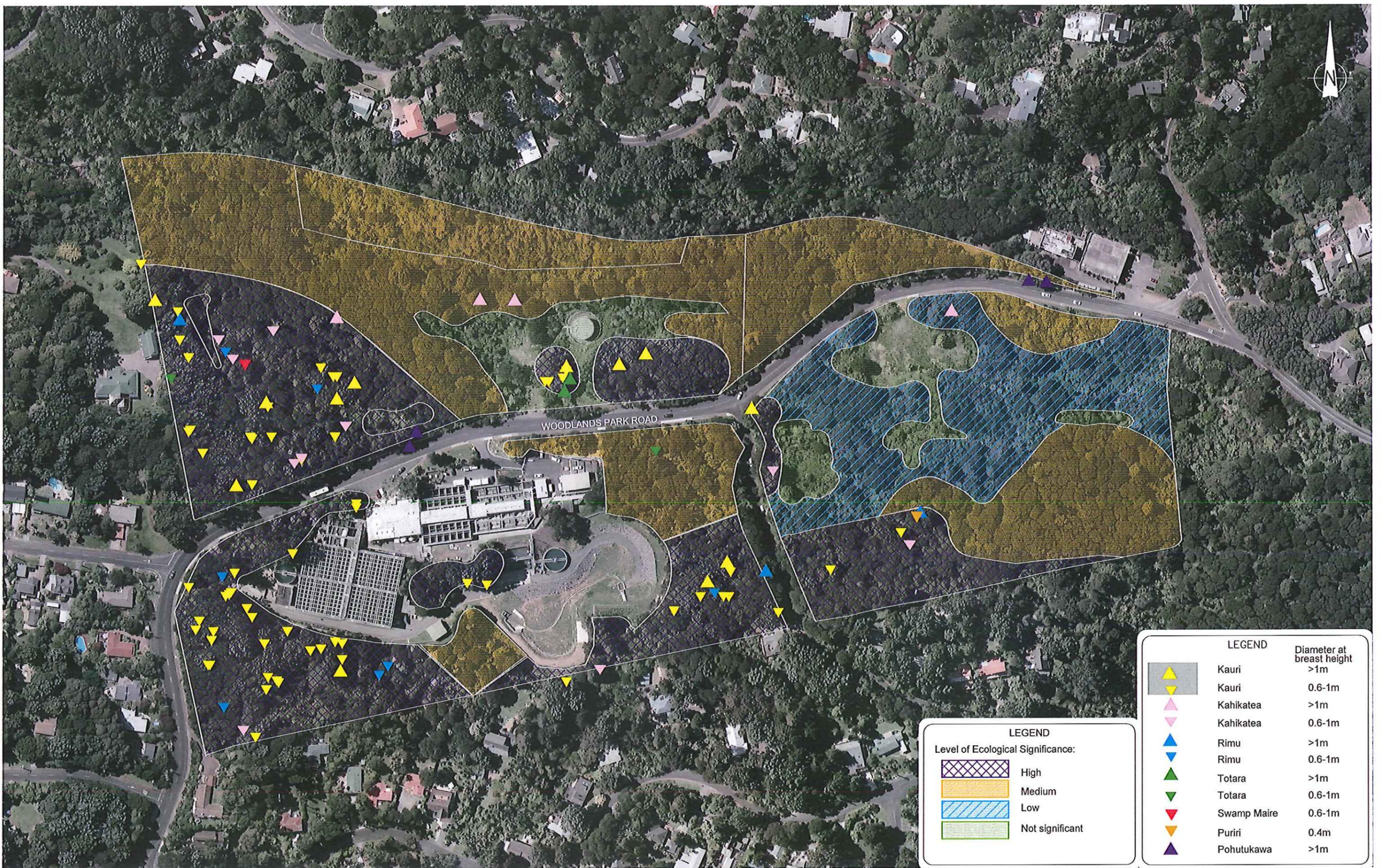
DRAWN	RBS	Aug. 12
DRAFTING CHECKED	ad	10/12
APPROVED	UMI	PKC
CADFILE : 28433.001-VA-F1.dwg		
SCALES (AT A3 SIZE)		
1:2000		
PROJECT No. 28433		

**waterCare** services limited  
**HUIA WATER TREATMENT PLANT VEGETATION ASSESSMENT**  
Site Plan

FIG. No. Figure 1

REV. 0

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SCALE 1:2000  
0 20 40 60 80 100 (m)

Aerial photo sourced from Auckland Council website.  
Property boundaries sourced from Land Information New Zealand data as at 7-Feb-2012 (Crown Copyright Reserved).

**LEGEND**  
Level of Ecological Significance:

	High
	Medium
	Low
	Not significant

**LEGEND**

		Diameter at breast height
	Kauri	>1m
	Kauri	0.6-1m
	Kahikatea	>1m
	Kahikatea	0.6-1m
	Rimu	>1m
	Rimu	0.6-1m
	Totara	>1m
	Totara	0.6-1m
	Swamp Maire	0.6-1m
	Puriri	0.4m
	Pohutukawa	>1m

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DRAWN	RBS	Aug. 12
DRAFTING CHECKED		18/12
APPROVED		10/12
CADFILE : 28433.001-VA-F2.dwg		
SCALES (AT A3 SIZE)		
1:2000		
PROJECT No. 28433.001		

**waterCare** services limited  
HUIA WATER TREATMENT PLANT VEGETATION ASSESSMENT  
Ecological Significance

FIG. No. Figure 2

REV. 0

**Appendix C: Raw & analysed bird data**





**Seen and Heard**

Birds that are first heard should be entered under **H** (even if they are later seen), birds that are first seen should be entered under **S**. Adding H and S should give the total number of birds observed

**Temperature**

1 freezing < 0°C

2 cold 0-5 °C

3 cool 6-10 °C

4 mild 11-15 °C

5 warm 16-22 °C

6 hot > 22 °C

**Wind**

The average for each five-minute count on a modified Beaufort scale:

0 Leaves still or move without noise (Beaufort 0 and 1)

1 Leaves rustle (Beaufort 2)

2 Leaves and branches in constant motion (Beaufort 3 and 4)

3 Branches or trees sway (Beaufort 5, 6 and 7)

**Other Noise**

i.e. Other than wind, the average for the five minutes

0 not important

1 moderate

2 loud

**Sun (0-5)**

Record approximate duration, in minutes, of bright sun on the canopy immediately overhead

**Precipitation type**

Average for each count

N None

M Mist

R Rain

H Hail

S Snow

**Precipitation value**

0 None

1 Dripping foliage

2 Drizzle

3 Light

4 Moderate

5 Heavy

5-minute bird count results.

Species recorded during five minute bird counts	Number recorded
<b><u>Native:</u></b>	
Fantail	14
Greywarbler	6
Kingfisher	8
Tui	14
Silvereye	3
<b><u>Exotic:</u></b>	
Blackbird	2
Chaffinch	2
Myna	13
Rosella	2
Sparrow	2
Thrush	5
Yellowhammer	1

Species also observed/heard outside the 5-minute bird counts include; kereru, pheasant and shining cuckoo.

**Appendix D: Site photographs**

**Kauri forest photographs.**



Image 1: Large kauri tree (with GPS for scale) located in kauri (1) forest.



Image 2: Large kauri tree (with GPS for scale) located in kauri (2) forest.



Image 3: Stand of large emergent trees (kauri & rimu) within kauri forest.



Image 4: Large kauri trees within kauri forest.

## Kanuka forest photographs



Image 5: Stand of kanuka trees near the roadside.



Image 6: Kanuka forest.

**Mahoe / Kohekohe forest photographs**



Image 7: Edge of mahoe / kohekohe forest with nikau approaching canopy.



Image 8: Mahoe trees with kanuka present in the background.

## Mahoe forest photographs



Image 9: Mahoe forest with diverse native species present.



Image 10: Mahoe forest in the foreground.

**Exotic / Native scrub photographs**



**Image 11: Pampas in exotic scrub area and kanuka forest in the background.**



**Image 12: Exotic jasmine climber smothering vegetation in exotic scrub.**

**Freshwater tributary photographs.**



Image 13: Freshwater tributary located to the north of the Huia water treatment plant across the road.



Image 14: Freshwater tributary located to the south of the Huia water treatment plant.