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Waikite Valley¹

Site Number:	SNA574
Ecological District:	Atiamuri
Source of Information:	Wildland Consultants (2014a)
Digital Scale:	1:5,000
Data Source:	WRAPS 2007
Regional Council:	Waikato
1998 Site Number:	None. U16/6 in Wildland Consultants (2004b)
Current Tenure:	Unprotected
Site Area:	4.9 ha
Altitude Range:	350-410 m
Bioclimatic Zone:	Lowland
Grid Reference:	NZTM E1888600, N5752693
Description and Assessment:	The description and assessment below covers the entire natural area, which is mainly within three protected areas (Waikite Valley Scenic Reserve; Otamakokore Stream Marginal Strip; Waikite Wildlife Management Reserve). The Waikite Valley SNA comprises several small unprotected areas within the larger Waikite Valley natural area and these are shown on the SNA site map. The significance assessment is based on the ecological values of the entire natural area which the Waikite Valley SNA is a part of. Note: vegetation types not present in the SNA are not shown in this site sheet, however they are presented in Wildland Consultants 2014a.

VEGETATION		LANDFORM	EXTENT
CODE	TYPE		
2	Rautāwhiri/rank exotic grass treeland An incomplete canopy of planted rautāwhiri (<i>Pittosporum colensoi</i>) c.1.5 m height is present over rank grassland dominated by Yorkshire fog on the margins of a stream. <i>Christella</i> aff. <i>dentata</i> (“thermal”) is abundant on the banks of the stream with locally common ring fern (<i>Paesia scaberula</i>), and occasional <i>Cyperus ustulatus</i> , <i>Carex secta</i> , and <i>C. virgata</i> .	Stream margin	<0.1 ha
3	Grey willow/harakeke-Cyperus ustulatus treeland Grey willow forms a discontinuous canopy over harakeke, and <i>Cyperus ustulatus</i> . Swamp kiokio, <i>Carex secta</i> , and <i>C. virgata</i> are also present. (This area was viewed from the margins as it was not safe to enter.)	Wetland	c.0.4 ha
5	Blackberry-bracken scrub Dense scrub dominated by blackberry and bracken is present along the margins of the main stream within the site. Kiokio and <i>Hypolepis ambigua</i> are common within this type with occasional <i>Cyperus ustulatus</i> and karamū (<i>Coprosma robusta</i>). There are local patches of kōhūhū and occasional emergent barberry (<i>Berberis glaucocarpa</i>). Scattered plants of <i>Christella</i> aff. <i>dentata</i> (“thermal”) and occasional <i>Cyclosorus interruptus</i> are also present.	Stream margins	<0.1 ha
6	Prostrate kānuka shrubland Prostrate kānuka forms a canopy 0.5-1.5 m height around loamfields, fumaroles, and boiling mud. Scattered mingimingi and occasional Spanish heath are also present. Mats of moss (<i>Campylopus</i> sp. and <i>Sphagnum cristatum</i>) with local patches of <i>Nephrolepis flexuosa</i> and wild portulaca (<i>Portulaca oleracea</i>) form a sparse groundcover. A few patches of <i>Cheilanthes sieberi</i>	Flat, gentle slopes, scarp	<0.1 ha

¹ The information for this site is based on Wildland Consultants Ltd (2007b), which includes protected vegetation as part of a much larger site of 17.6 ha.

VEGETATION		LANDFORM	EXTENT
CODE	TYPE		
	are present in one part of this type. Parts of this type are surrounded by pasture and are grazed by domestic stock.		
7	<p>Mixed indigenous species/Yorkshire fog shrubland</p> <p>Planted woody indigenous species form an incomplete canopy over rank Yorkshire fog grassland on the margins of the Otamakokore Stream. The stream banks have local patches of water fern and <i>Hypolepis ambigua</i>, and scattered patches of <i>Christella</i> aff. <i>dentata</i> (“thermal”). Planted indigenous tree species include tī kōuka (<i>Cordyline australis</i>), kōhūhū (<i>Pittosporum tenuifolium</i>), tarata (<i>Pittosporum eugenioides</i>), rautāwhiri, mānuka, and harakeke. Occasional patches of naturally occurring prostrate kākūka and whēkī are also present within this type.</p>	Riparian margin	c.0.8 ha
8	<p>Blackberry shrubland</p> <p>West of the Corbett Road Bridge, the margins of Otamakokore Stream are dominated by blackberry, with bracken and cocksfoot (<i>Dactylis glomerata</i>) common. Patches of <i>Carex geminata</i>, ring fern, kiokio, <i>Muehlenbeckia australis</i>, <i>Deparia petersenii</i>, and swamp millet are locally common. Clumps of mature <i>Christella</i> aff. <i>dentata</i> (“thermal”) are scattered along the stream margins with local patches of <i>Nephrolepis flexuosa</i>. Other species occurring along the stream margin include <i>Hypolepis distans</i>, <i>H. ambigua</i>, water fern, ivy, feijoa (<i>Feijoa sellowiana</i>), Lawson’s cypress, Lombardy poplar (<i>Populus nigra</i> ‘Italica’), and pampas, with local barberry, kōhūhū, karamū, and tī kōuka. The site margins are fenced and a small section has been planted in indigenous species, predominantly tī kōuka, kōhūhū, and harakeke.</p> <p>Small areas of Yorkshire fog-cocksfoot grassland are present within this type but are too small to map separately.</p>	Stream margins	c.2.2 ha
9	<p>Mixed fernland</p> <p>A mosaic of several fern species, including <i>Nephrolepis flexuosa</i>, <i>Dicranopteris linearis</i>, <i>Deparia petersenii</i>, and water fern surround the Te-Manaroa Hot Spring and the margins of the stream that flows from the spring. Scattered <i>Christella</i> aff. <i>dentata</i> (“thermal”) are present downstream of the spring. Local patches of <i>Lycopodiella cernua</i>, bracken, kiokio, and <i>Hypolepis ambigua</i> are also present in this area, with occasional kōhūhū, karamū, whauwhaupaku (<i>Pseudopanax arboreus</i>), and kāmahi (<i>Weinmannia racemosa</i>) on higher, cooler areas. Blackberry and bracken become more abundant along stream margins downstream of the Waikite Pools. In places along the stream margins <i>Cyperus involucratus</i> and ivy have spread into indigenous geothermal vegetation.</p>	Stream gully	c.0.3 ha
13	<p>Lake clubrush-Carex virgata-Yorkshire fog sedgeland</p> <p>Lake clubrush and <i>Carex virgata</i> sedgeland is present on the margins of a geothermally influenced stream. Yorkshire fog is common.</p>	Riparian margin	<0.1 ha
15	<p>Nonvegetated raw-soilfield</p> <p>Thermally altered clay and fumaroles. Occasional prostrate kākūka, <i>Cyperus ustulatus</i>, <i>Lycopodiella cernua</i>, and mosses are present in parts of this type. Narrow-leaved carpet grass and Yorkshire fog are common on the cooler margins in parts of this type. In Area A, occasional <i>Cheilanthes sieberi</i> and wild portulaca are present on the non-vegetated raw-soilfield, and <i>Nephrolepis flexuosa</i> is present beneath Spanish heath on the upper margins.</p>	Hillslopes, gentle slope	<0.1 ha

VEGETATION		LANDFORM	EXTENT
CODE	TYPE		
17	(Mānuka)/harakeke-Cyperus ustulatus flaxland Scattered mānuka are present over harakeke, and <i>Cyperus ustulatus</i> , with local patches of raupō, <i>Machaerina juncea</i> , and lake clubrush. Swamp kiokio, <i>Carex secta</i> , and <i>C. virgata</i> are also present. Grey willow is common on the southern margin of this type. Blackberry, bracken, <i>Hypolepis ambigua</i> , creeping buttercup (<i>Ranunculus repens</i>), and exotic grasses occur on dryer, cooler soils. Seepages of hot water are scattered throughout. <i>Christella</i> aff. <i>dentata</i> (“thermal”) occurs near several of these seepages. <i>Cyperus involucratus</i> is locally common on the southern margin of this area.	Wetland	c.0.9 ha
18	Geothermal water Hot springs, geothermally influenced ponds and streams.	Flat, gully	<0.1 ha

Indigenous Flora:

Seven ‘At Risk’ indigenous plant species are present within this site: *Christella* aff. *dentata* (“thermal”) (At Risk-Naturally Uncommon), *Cyclosorus interruptus* (At Risk-Declining), *Dicranopteris linearis* (At Risk-Naturally Uncommon), *Hypolepis dicksonioides* (At Risk-Naturally Uncommon), geothermal kānuka (At Risk-Naturally Uncommon), *Nephrolepis flexuosa* (At Risk-Declining), and *Thelypteris confluens* (At Risk-Naturally Uncommon).

A large population of *Christella* aff. *dentata* (“thermal”) is present at this site. Bycroft and Beadel (2007) estimated that there were c.400 plants at this site in 2007. One hundred and sixty-two clumps of *Christella* aff. *dentata* (“thermal”) were noted at this site in 2014 but this does not represent the entire extent of the population at the site as undertaking a detailed inventory of the population was outside of the scope of the current project.

Scattered populations of *Nephrolepis flexuosa* are present alongside stream margins, Waikite scarp, within geothermal kānuka shrubland, and beside geothermal wetlands at the site. Bycroft and Beadel (2007) estimated that there were c.100 clumps of *N. flexuosa* at the Waikite site. In 2014, *N. flexuosa* was particularly abundant around the Te Manaroa hot spring and on stream margins near E1889533, N5753311. The stream margin population of *N. flexuosa* mentioned previously has increased significantly since a fence has been erected along the stream margins to exclude domestic stock.

Also present within the site are small populations of *Dicranopteris linearis* and *Hypolepis dicksonioides*. Bycroft and Beadel (2007) recorded ten plants of *H. dicksonioides* from this site in 2007 and nine were recorded in 2014. All plants recorded were located downstream of the Corbett Road Bridge. Bycroft and Beadel (2007) also estimated that there were about 20 clumps of *D. linearis* spread between Te Manaroa Hot Spring and Waikite Scarp. *D. linearis* is known from only c.23 sites in New Zealand.

Several populations of *Cyclosorus interruptus* and *Thelypteris confluens* are present. Generally these populations cover small areas but are often relatively healthy within those areas, e.g. over 800 fronds of *Thelypteris confluens* occurred in over two distinct areas of c.10 m² (Bycroft and Beadel 2007). Although the populations of *T. confluens* were not found in 2014, they are likely to still be present, as this species is inconspicuous or not visible after dieback in winter. Some of the *Cyclosorus interruptus* plants are threatened by stock. Bycroft and Beadel (2007) identified two distinct populations of *C. interruptus* at this site: sixteen clumps were recorded in Waikite Wildlife Management Reserve, while another eight clumps were recorded on Waikite Landcorp Farm. The Landcorp Farm plants were threatened by grazing, but

more recently stock have been excluded from most of this area, protecting most of these plants from grazing by stock.

Geothermal kānuka and *Campylopus clavatus*, which are both endemic and restricted to geothermal areas, occur at this site.

One *Psilotum nudum* plant was observed in an area of geothermal kānuka shrubland in the northeast of the site (Waikite Wildlife Management Reserve) in 2014; *P. nudum* had previously only been recorded from this site historically (Ecroyd and Coham 1976). *Lycopodiella cernua*, *Cheilanthes sieberi*, *Machaerina juncea*, *M. arthropphylla*, arrow grass, wīwī, and *Doodia australis* also occur here.

Fauna:

North Island fernbird (At Risk-Declining) were recorded from the site in 2014 along with several common indigenous and introduced bird species including tomtit, whitehead, welcome swallow, bellbird, pukeko, grey warbler, Australasian harrier, paradise shelduck, fantail, spur-winged plover, common pheasant, Australian magpie, and mallard. Based on the 2014 survey, the population of North Island fernbird appeared healthy in the wetland and scrub upstream of the Corbett Road Bridge. Other bird species previously recorded at the site include spotless crane (At Risk-Relict), pied stilt (At Risk-Declining), grey duck (Threatened-Nationally Critical), silvereye, greenfinch, yellowhammer, and Eurasian blackbird.

Pig sign (scat and rooting), rabbit sign (scat), hares (observed), and goat sign (scat) were observed within the site.

Notes on Overall Condition:

The geothermal vegetation ranges from very high ecological quality to moderately poor quality. The areas where vegetation quality is poor is predominantly due to a high density of adventive species. The geothermal vegetation is discontinuous and is often surrounded by vegetation dominated by adventive species. Although many key geothermal areas are fenced, the margins are heavily infested with blackberry. Some populations of thermal ferns are open to stock access.

Part of the fenced paddock adjacent to the rediverted geothermal stream is reverting to predominantly indigenous-dominated vegetation. Invasive pest plant species are present in this area but are currently present at low density and cover. The vegetation composition of this area is likely to continue to change over the next five to ten years. The location of the stream rediversion is thought to reflect the original location of the stream prior to human modification.

Blackberry is locally invading geothermal habitat around some drains, and competing for habitat with 'At Risk' ferns. The entire length of the main geothermal stream that passes through the site has been fenced to exclude stock. Some restoration planting with indigenous species has been undertaken. As a result of fencing of the stream margins, many areas of 'At Risk' ferns previously threatened by stock grazing and tramping on stream margins are now recovering and are in good health.

Change Relative to Shaw and Beadel (1998):

Probable continued decline by drainage of wetland habitat, grazing by cattle and sheep, and other land management.

Threats/Modification/Vulnerability:

Invasive Exotic Plants: Invasive exotic plants are common within the site. Estimates of the percentage of cover of invasive pest plants given here are an average cover for the entire site. Locally, covers may therefore be much larger than what is represented here. Blackberry is common to locally abundant throughout (c.20% cover) and grey willow is locally dominant (c.2% cover). Other invasive pest plant species present include broom (<1% cover), barberry (c.1% cover), Chinese privet (<1% cover), common alder (*Alnus glutinosa*) (c.1% cover), *Cyperus involucratus* (c.2% cover), elephant's ear (*Alocasia brisbanensis*) (<1% cover), ivy (c.2% cover), Japanese honeysuckle (*Lonicera japonica*) (<1% cover), Khasia berry (<1% cover), Lombardy poplar (2% cover), pampas (<1% cover), Spanish heath (c.1% cover), and tradescantia (*Tradescantia fluminensis*) (<1% cover).

The *Cyperus involucratus* population near the Te Manaroa spring has spread noticeably since 2011, and reaches 90% cover on some stream banks within the site. However the geothermal stream may be acting as a barrier to the further spread of this species, as *C. involucratus* does not appear to have spread to the opposite bank of the stream; this indicates that this species is spreading vegetatively at the site. Ivy has also spread noticeably within this area since 2007.

Human Impacts: Human impacts associated with the public thermal baths are the responsibility of the Rotorua District Council who has specific management policies for its biological features (Rotorua District Council 1994). Geothermal water is used in the swimming and bathing pools at the site.

A path is present from the public thermal baths to Te-Manaroa Spring. A small amount of rubbish was present around this path.

A portion of the thermal stream has been rediverted and some restoration planting has occurred on the margins (see above). Vegetation composition change is likely to occur in this area over time.

Grazing Impacts: The entire length of the main geothermal section of Otamakokore Stream within this site has been fenced to exclude domestic stock. Most of this fencing has taken place since 2007. The central wetland north and north-east of the pool complex is also fenced.

Stock are excluded from most parts of Waikite Scarp.

The wetland near the pool complex and Te Manaroa Hot Springs are not grazed by stock.

The northernmost parts of the site are not fenced and many geothermal features are grazed to the margins.

Risk Assessment:

Grazing: Risk to site - medium; Timeframe - high.

Pest plants: Risk to site - high; Timeframe - high.

Significance Level:

National (Appendix 7 - Table 1 - Criteria 3, 4, 5, 6, 7, 9; Table 2 - Factor H).

Significance Justification: This site is nationally significant because it contains good quality, high diversity, and representative examples of geothermal habitat types that are nationally uncommon (fumaroles, geothermal streamsides, geothermally heated dry ground) (Williams *et al.* 2007; Holdaway *et al.* 2012). The site also contains a large population of an ‘At Risk’ plant species (*Christella* aff. *dentata* (“thermal”)) that is known at only 15 sites in the North Island. Six other ‘At Risk’ plant species are also present. Three ‘At Risk’ indigenous bird species are also present at the site: Spotless crane, North Island fernbird, and pied stilt.

Field work Required: No field work required.

Notes: This site comprises three areas ranked in Given (1996): “Waikite Valley”, “Paeroa Scarp”, and “Otamakokore Stream”; these sites were ranked as Category A, Category B, and Category B respectively.

References: Beadel (1995a); Beadel and Bill (2000); Bycroft and Beadel (2007); Ecroyd and Coham (1976); Given (1995 & 1996); Miller and Ecroyd (1993); Rotorua District Council (1994); Wildland Consultants (2004b, 2004c, 2007a, 2007b, 2007c, 2009, 2012 & 2014).