Before the Independent Hearings Panel
at Far North District Council

under: the Resource Management Act 1991

in the matter of: Submissions and further submissions in relation to the proposed Far North District Plan

and: Energy, Infrastructure, Transport & Designations

and: **Lucklaw Farm Limited**

Statement of Evidence of Melanie Robyn Dixon (Ecology)

Hearing 11 (Designations) - Lucklaw Farm Limited S551

Dated: 14 April 2025

STATEMENT OF EVIDENCE OF MELANIE ROBYN DIXON

INTRODUCTION

1 My full name is Melanie Robyn Dixon.

2 I am an ecologist with over 25 years of experience, first for local government then as a consultant. I have a particular focus on wetland ecology. I am employed as the Principal Ecologist for Collaborations, a small consultancy that works across a range of environmental, land and water science fields.

3 I have a BSc. in ecology and botany and a diploma in environmental science, both from Auckland University.

CODE OF CONDUCT

4 Although this is not an Environment Court hearing, I note that in preparing my evidence I have reviewed the code of conduct for expert witnesses contained in part 9 of the Environment Court Practice Note 2023. I have complied with it in preparing my evidence. I confirm that the issues addressed in this statement of evidence are within my area of expertise, unless otherwise noted. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

5 In my evidence I will, briefly, address:

5.1 The ecological values of the Puwheke Beach, the Rangikawau lakes and surrounds and their vulnerability to any contaminants in treated (on untreated) water discharged from Rangiputa Wastewater Treatment Plant (WWTP).

5.2 The possible contaminants from Rangitputa WWTP and the risk that these may be entering wetland areas (including dune lakes).

6 Further detail, include a plan showing the WWTP in relation to Puwheke Beach and dunes lakes is found in **Appendix A** of the **attached** memo commissioned by Lucklaw Farm, titled *Rangiputa Wastewater Treatment Plan (WWTP): Potential impact on Ecological Features* (14 April 2025).

7 My evidence provides context to discussions regarding the management and possible future upgrade of the WWTP. This is relevant as high-level objectives in the proposed district plan seeking to minimise adverse effects from infrastructure on natural and coastal values.

ECOLOGICAL VALUES OF WETLANDS & THEIR VULNERBALITY TO INCREASED NUTRIENTS

8 Numerous studies and reports, commissioned by public agencies[1] and by Lucklaw Farm[2] have found that Puwheke Beach, Rotokawau Lakes and surrounds are of very high ecological value.

9 Puwheke Beach, Rotokawau Lakes and surrounds support several important freshwater wetlands including the dune lakes (Lake Rotokawau East and West), areas of coastal peatland and gumland[3]. The presence of wetlands is an important (but by no means the only) reason for the area's high ecological value; wetlands are a threatened ecosystem both nationally and, in the Northland Region, where wetland loss exceeds 95%[4].

10 The Puwheke Beach, Rotokawau Lakes and surrounds wetlands are vulnerable to increased nutrients.

10.1 The dune lakes are relatively shallow with limited surface water inflows and outflows, and therefore have a limited capacity to assimilate any contaminants, which can accumulate in the system.

10.2 The peatlands and gumlands have acidic, low-nutrient soils. Any increase in nutrients can lead to localised extinction of low-nutrient adapted plants, changes in microbial communities and changes to nutrient and carbon processing.

11 Nutrients may also come from stock grazing and fertiliser use. In recognition of the high-ecological values of the acidic, low-nutrient wetland systems present, the managers of Lucklaw Farm have reduced stocking rates, stopped fertilising paddocks and have upgraded fencing[5].

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[1] Conning L., and Holland W. (2003). Natural areas of Aupouri Ecological District: Reconnaissance survey report for the Protected Natural Areas Programme. Department of Conservation, Whangarei, New Zealand Protected Natural Areas Programme Series: 372 pp.

Wildlands (2019) Significant Indigenous Vegetation and Habitats of the Far North District -Volume 1. Contract Report No. 4899d. Report prepared for the Farm North District Council.

[2] Boffa Miskell (2022) Memorandum on the Puwheke Beach ecological values. 8pp. Prepared for Lucklaw Farm.

Wildlands (2023) Assessment of Indigenous Biodiversity at Rotokawau Lakes and Environs, Karikari Peninsula, Northland. Report prepared for John and Andrea Sturgess, Lucklaw Farm.

[3] Gumlands are a seasonally dry wetland type. See: https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/gumlands/

[4] The current extent of wetlands is estimated to be 14,291 ha, or about 3.2% of historic extent (453,251 ha). See Clarkson, B.R. and Price, R.J. (2022) A framework for monitoring Northland wetlands. Manaaki Whenua – Landcare Research report (Envirolink Grant 2205-NLRC228. Available at: https://www.envirolink.govt.nz/assets/Envirolink/2205-NLRC228-A-framework-for-monitoring-Northlands-wetlands.pdf

[5] John Sturgess, pers comm.

POSSIBLE CONTAMINANTS IN TREATED WASTEWATER AND THE RISK THAT IT MAY BE ENTERING WETLANDS

12 Whilst a detailed study has not been undertaken, the topographical contours of the area indicate that the flow of surface water and potential groundwater from the WWTP is broadly towards the wetlands, which are located about 750 metres away in a north-easterly direction[6].

13 The bores are monitored (as per the terms of the consent). I have discussed the monitoring results with Gavin Sole, an independent engineer who has reviewed the WWTP. Whilst these monitoring results do not indicate issues with nutrient removal across the majority of quarterly samples, uncertainties remain. A preliminary review by Collaborations[7] was not able to find information on the location and depth of the monitoring well. It is also unlikely that monitoring is frequent enough to identify 'peaks' associated with highest occupancies at Rangiputa.

14 Anecdotally, the previous owner of the farm noted that seepage was extending from the ponds into his property (to the northeast), and that he had observed on a number of occasions ponds 1 and 2 overflowing[8]. The current owners have undertaken water quality monitoring. Whilst I have been unable to verify the data, both dry and wet weather samples indicate elevated concentrations of *E.coli* in surface water bodies downgradient of the WWTP[9]. Further study would be needed to confirm the origin of the *E.coli* is human waste (i.e., the WWTP), stock, or birds.

15 In short, further work is required to understand the scale and potential impact of the Rangiputa WWTP on wetlands located on Lucklaw Farm and what measures are required in order to mitigate the risks given the very high value of the wetlands and their vulnerability to nutrient discharges (if any).

CONCLUSION

16 The wetlands associated with Puwheke Beach, Rotokawau Lakes and surrounds (located on Lucklaw Farm and adjacent crown land) are types that are naturally low in fertility. As such they are uniquely threatened by any increase in nutrients that may be associated with wastewater discharges (which would be additional to the existing neighbouring landuse contributions).

17 Further work is required to understand the discharges from the WWTP plant, and the impact. However, given the significance of the wetlands and coast it would be prudent for wastewater treatment to meet current best practice.

Dated: 14 April 2025

[6] See Appendix A in the attached memo.

[7] As detailed in the attached memo. This review was undertaken with assistance from James Blyth, Water Scientist and Director at Collaborations.

[8] Saunders, B (2008). Submission to Northland Regional Council on Rangiputa Wastewater Treatment Plant.

[9] Although E.coli levels have not been tested in above the WWTP, the catchment above is fairly limited.

Melanie Robyn Dixon

ATTACHED

Rangiputa Wastewater Treatment Plan (WWTP): Potential impact on Ecological Features (14 April 2025). Memo prepared by Collaborations Limited for Lucklaw Farm.

Subject:	Rangiputa Wastewater Treatment Plan (WWTP): Potential impact on Ecological Features
Attention:	John Sturgess, Lucklaw Farm
From:	Melanie Dixon, Principal Ecologist
Date:	14 April 2025
Copies to:	Marcus Langman, Planning Consultant
Attachments:	Appendix A: Rangiputa WWTP Location Appendix B: SNA report extract

1 Introduction

Collaborations Limited have been engaged by Lucklaw Farm Limited to review the potential impact of the Rangiputa Wastewater Treatment Plant (WWTP), Karikari Peninsula on significant ecological features (i.e., wetlands) in the WWTP's catchment. This is to get a broad understanding of the potential issues ahead of Far North District Council's District Plan Hearing 11, which relates to Energy, Infrastructure, Transport & Designations.

2 Background

2.1 Ecology

The Karikari Peninsula is located in the Aupōuri Ecological District. The Aupōuri Ecological District encompasses the Aupōuri and Karikari Peninsulas and is characterised by 'shifting and consolidated sand dunes interspersed with small lakes, marshy hollows and peat swamps, and three large harbours'. Acidic, low fertility soils (relating to the impact of the former Kauri forest) is also a feature of this district, and (where vegetated) these support heathlands[1], and unusual and low growing 'scrub' vegetation generally dominated mānuka. (Conning and Holland, 2003).

Puwheke Beach, Rotokawau Lakes and surrounds are a recognised area of ecological significance within the ecological district. The beach itself contains largely intact native dune vegetation

[1] Gumlands are a subset of these heathlands and are considered a seasonally dry wetland type. See: https://www.landcareresearch.co.nz/publications/naturally-uncommon-ecosystems/wetlands/gumlands/

communities on the foredune and mid-dune[2]. Behind the dunes is a small estuary and dune swales, all dominated by native vegetation.

Two dune lakes that formed on a hard sand pan (Lake Rotokawau West and the smaller Lake Rotokawau East[3]) are further behind the beach, including a large, vegetated wetland (a coastal peatland) located on the northern boundary of the eastern lake. All three of these wetlands have been identified as being part of the top 150 wetlands[4] in the Northland region. As well as numerous small wetlands, there is another larger freshwater wetland (also a coastal peatland) at the western end of the beach[5].

This diversity of habitats, ecological sequence (from freshwater to shrubland and dune vegetation), Threatened and At Risk species present[6], and presence of wetlands (noting that >95% of wetlands in the region have been converted to other land uses[7]) means that the area is considered to have **very high ecological value**. A 412 hectare area is mapped as a Significant Natural Ecological Area (FN411) by Far North District Council's consultants (Wildlands 2019). A separate detailed investigation of the flora and fauna of the central portion of Lucklaw Farm was also undertaken by Wildlands in 2023.

The Significant Natural Area shown is shown in the plan provided in **Appendix A,** and a copy of the extract relating to the area is included in **Appendix B**.

[2] Described in Boffa Miskell (2022)

[3] Naming follows that adopted by Northland Regional Council. Rotokawau is a name given to several lakes (roto) in the Northland region. Kawau is te reo for shag (cormorant).

[4] Collectively ranked 15th out of 304 identified wetlands in Northland. (Wildlands 2011).

[5] This identified as a High Natural Character Area (HNC-96).

[6] Surveys of the beach and surrounds (Boffa Miskell 2022, Wildlands 2023) found the area a range of indigenous species that are listed as Threatened or At Risk, for example, shorebirds, wetland birds (including matuku – Australasian bittern) a shore skink and several plants.

[7] The current extent of wetlands is estimated to be 14,291 ha, or about 3.2% of historic extent (453,251 ha). See Clarkson and Price (2022).

2.2 Rangitupa WWTP

The Rangiputa WWTP serves the Rangiputa township on the Karikari peninsula. The township has a reported winter population of about 100, rising up to 400 in summer. It consists of three large oxidation ponds providing secondary (biological) treatment for approximately 58 m^3 of wastewater each day (~0.7 L/s over a 24 hour period). The treated WWTP appears to seep out into the environment from the last pond[8].

The location of the WWTP in relation to the dune lakes and wetlands discussed above is shown in **Appendix A.**

3 Potential Impacts of Wastewater Discharges

3.1 Possible Contaminants in Wastewater

The Rangiputa WWTP has a resource consent for discharge of wastewater (Consent CON20070263501) issued 17th July 2008 with an expiry of 30th November 2032. The consent requires four-monthly monitoring of groundwater quality and reporting of this information on an annual basis. The WWTP consists of three ponds. The consent is for discharge to land indicating that WWTP design is for treated wastewater to seep out into the surrounding environment from the third pond.

The WWTP is an older style treatment plant constructed in the late 1970s or early 1980s.The WWTP design and performance has been briefly investigated by environmental engineer, Gavin Sole from Tiaki Environmental Limited. Mr Sole found that current consent does not have limits for the discharge to ground for Biochemical Oxygen Demand (BOD), Total Suspended Solids (TSS), Total Nitrogen (TN), Total Phosphorus (TP) or Faecal Coliforms (FC). This is likely to change with the renewal of the resource consent in 2032 (or potentially beforehand, if required by a change government legislation). Mr Sole found the pond was performing well for BOD and dissolved oxygen, has not provided comment around nutrients or FC.

However, no information was available on the location of the groundwater monitoring wells, including geological profiles or the aquifer depth the monitoring bore has been screened for. In addition, quarterly monitoring of groundwater (as required by the consent) would not capture any event-based flows which may occur during heavy rainfall or surcharges in population over summer and easter holiday periods. Saunders (2008) provided information to the Northland Regional Council that seepage was extending from the ponds into his property (to the northeast), and that he had observed on a number of occasions ponds 1 and 2 overflowing.

Monitoring data for discharges from the system were summarised in Mr Sole's hearing evidence, however, only nitrate-nitrogen and FC were presented as environmental contaminants. In general, WWTP of this kind (which treat only to a secondary standard) can be expected to discharge water

[8] Council's website references discharge to deep bores, but this is looks to be incorrect. see: https://www.fndc.govt.nz/services/wastewater-and-stormwater/Wastewater/wastewater-treatment-plants/Rangiputa-Wastewater-Treatment-Plant.

following treatment with contaminants at roughly the levels outlined in **Table 1**. Note the levels in Table 1 are respective of discharge concentrations rather and will differ from receiving environment concentrations depending on where the sampling point is located and level of environmental treatment (and dilution) that occurs. Table 1 concentrations are considerably higher than would be discharged by a modern WWTP, and often many times higher than the level which will negatively impact aquatic ecosystems, depending on the level of connectivity to a waterbody. For example, the NPS-FM 2020 bottom line for lake health for Total Phosphorus is 0.05 (50 mg/m^3) while the 95th percentile Ammonia-toxicity national bottom line in freshwater is 0.4 mg/L.

Table 1: Typical effluent quality following treatment with pond-based WWTP (with no additional treatment) (taken from Table 8 GHD, Beca, and Boffa Miskell (2020)), compared with NPS-FM (where available).

Contaminant (mg/L unless indicated)	Typical quality on discharge
TSS (Total Suspended Solids)	15-50
cBOD5 (Biological Oxygen Demand)	15-50
Ammonia – N	5-30
TIN (Total Inorganic Nitrogen)	25-50
TP (Total Phosphorus)	5-8
E.coli cfu/100mL	10^3 - 10^4

Mr Sole's investigation found that the WWTPs performance is impacted by (amongst other things) (1) the lack of screening of wastewater before it enters the first of three ponds (there is a screen on site but is not used or connected) and (2) high levels of infiltration i.e., water entering the pond, especially when it rains. The concentrations presented for FC's indicate low median concentrations, but 95th percentiles of 1,132 cfu/100 mL, and maximum concentrations of up to 188,000 cfu/100 mL, the latter a clear indicator of wastewater contamination in the shallow groundwater. Nitrate-nitrogen concentrations appear to be low, with a median of 0.007 mg/L and maximum of 0.732 mg/L. As the wastewater ponds seep into the shallow aquifer, there are indications from limited monitoring records and anecdotal statements from Saunders (2008) that there is a potential contamination pathway which has greater probability of interacting with the wetlands and surface water features.

3.2 Vulnerability of Dune Lakes and Wetlands to Wastewater Contaminants

Dune lakes, coastal peatland and gumlands are all wetland types vulnerable to increased nutrients. The dune lakes present are relatively shallow with limited surface water inflows and outflows (the eastern lake appears to have no natural outflow[9]). As such they have limited capacity to assimilate

[9] There is, however, pipe that carries water under the road when lake levels are high (J. Sturgess *per comm.*)

any contaminants; whilst the source of these is generally from farming (e.g., stock grazing and fertiliser use), Champion and de Winter (2012) recommended further evaluations of the impacts of wastewater on dune lakes. The vegetated wetland to the north of the Lake Rotokawau East is a coastal peatland, that is, a naturally acidic (with a pH of approximately 3.5-5) and low-nutrient wetland system. In such systems increased nutrient availability can lead to the localised extinction of low-nutrient adapted plants, shifts in microbial communities, increased decomposition, and altered carbon and nutrient cycling.

3.3 Are Wastewater Contaminants Entering Wetlands?

Whilst a detailed study has not been undertaken, the topographical contours of the area indicate that the flow of surface water and potential groundwater from the WWTP is broadly towards the wetlands, which are located about 750 metres away in a north-easterly direction (as shown in **Appendix A**).

Water quality monitoring is undertaken by Lucklaw Farms Limited and samples are tested by an accredited water testing laboratory (Far North Labs, Taipa) the same day in order to assess the overall risk of faecal contamination or wastewater nutrient loading, with *E.coli* results. Whilst I have been unable to verify the data, both dry and wet weather samples indicate elevated concentrations exist in surface water bodies downgradient of the WWTP, particularly at a small pond that is the closest downstream sampling location to the WWTP shown in **Figure 1,** next page. Note that sources of *E. coli* may be from human wastewater discharges, stock effluent, bird droppings and stormwater run-off, and no data is available to confirm the source of the *E.coli.*

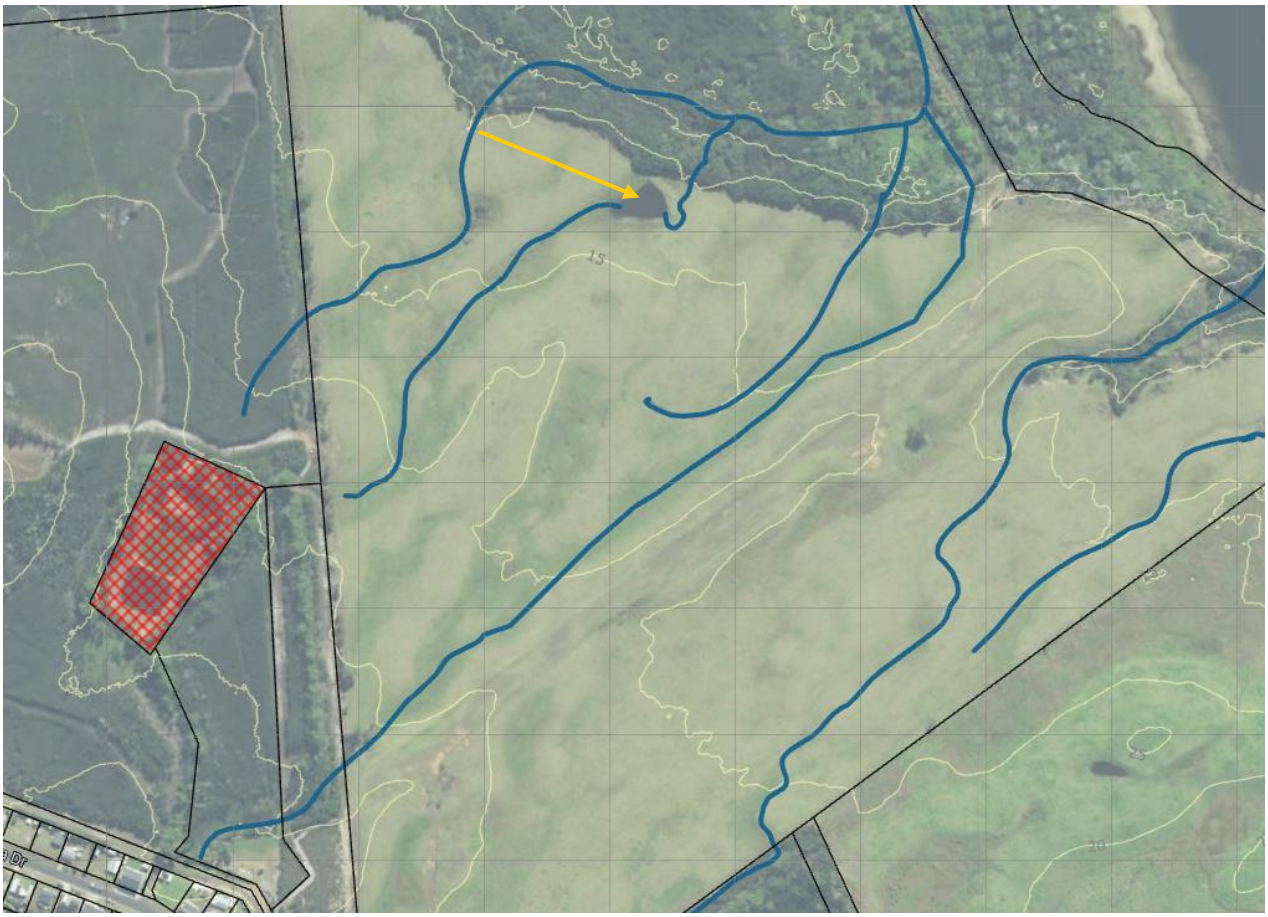

Figure 1: The wastewater treatment plant (red cross hatching), 5m contours (light yellow) and approximate surface (and near surface) water flows in dark blue. The yellow arrow points to the small pond where water quality samples have been taken. Rotokawau Lake (west) is just visible in the top right hand corner.

With respect to nutrient impacts, a brief site visit undertaken by Melanie Dixon on 27 March 2025 and a review of available aerial photography did not find any changes in wetland vegetation that could be clearly linked to excess nutrients from the WWTP plant. Lake Rotokawau East and Lake Rotokawau West appear to have already been impacted by high nutrients, but the source of these may be farming in the catchment. Wells and Champion (2013) noted poor water quality due to nutrient enrichment of the lakes and more recently Wildlands (2023) noted that the water was turbid in both lakes during the surveys with the water quality of the smaller eastern dune noticeably poorer than that of the larger lake.

Areas of brighter green areas on the aerial photography (indicating more lush grass growth) associated with overland flow paths downslope of the WWTP may relate to nutrients (given the fields are not fertilised), but equally this could relate to a higher water table in these areas.

Further assessment would be necessary to better understand wastewater contamination risk (if present).

4 Conclusion

Wetlands on the Lucklaw Farm and adjacent crown land are types that are naturally low in fertility. As such they are uniquely threatened by any increase in nutrients that may be associated with wastewater discharges (additional to the existing neighbouring land use contributions). The peatland wetland could additionally be threatened by an increase in pH (alkalinity). Whilst nutrients can come from fertiliser use and stock in the catchment, the current WWTP is an older style treatment plant that treats wastewater to a secondary standard.

This preliminary investigation has found uncertainties in the existing monitoring dataset for the WWTP of the WTP's operation, groundwater monitoring data and potential for discharges to adversely impact the wetlands. Further work is required given the to understand the scale and potential impact of the Rangiputa WWTP on the wetlands located on Lucklaw Farm and adjacent crown land.

5 References

Boffa Miskell (2022) Memorandum on the Puwheke Beach ecological values. 8pp. Prepared for Lucklaw Farm.

Champion P., and de Winton, M. (2012) Northland Lake Strategy. Report prepared for Northland Regional Council. NIWA Client Report HAM2012-121.

Clarkson, B.R. and Price, R.J. (2022) A framework for monitoring Northland wetlands. Manaaki Whenua – Landcare Research report (Envirolink Grant 2205-NLRC228. Available at: https://www.envirolink.govt.nz/assets/Envirolink/2205-NLRC228-A-framework-for-monitoring-Northlands-wetlands.pdf

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GHD, Beca, and Boffa Miskell (2020) The New Zealand Wastewater Sector, report prepared for Ministry for the Environment, Wellington. Available at https://environment.govt.nz/publications/the-new-zealand-wastewater-sector/

GHD, Beca, and Boffa Miskell (2020) The New Zealand Wastewater Sector, report prepared for the Ministry for the Environment, Wellington. Available at https://environment.govt.nz/publications/the-new-zealand-wastewater-sector/

National Policy Statement for Freshwater Management (NPS-FM) 20020 (amended 2024). Available at: https://environment.govt.nz/acts-and-regulations/national-policy-statements/national-policy-statement-freshwater-management/

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Wells R. and Champion P. 2013: Northland lakes ecological status 2013. National Institute of Water and Atmospheric Research Ltd, Hamilton, New Zealand. 294pp. Prepared for Northland Regional Council. Available at: https://www.nrc.govt.nz/resource-library-archive/research-and-reports-archive/lakes-research-and-reports-archive/northland-lakes-ecological-status-2013/.

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Wildlands (2019) Significant Indigenous Vegetation and Habitats of the Far North District -Volume 1. Contract Report No. 4899d. Report prepared for the Farm North District Council.

Wildlands (2023) Assessment of Indigenous Biodiversity at Rotokawau Lakes and Environs, Karikari Peninsula, Northland. Report prepared for John and Andrea Sturgess, Lucklaw Farm.

6 Limitations

This memorandum has been produced based on a scope of work agreed between Lucklaw Farm Limited and Collaborations Limited. Use of this report by any third party is at that party's own risk as it may be outside of the memo's intended purpose. This memo has been prepared based on publicly available information and observations made during a site visit on 27 March 2025 and the reports referred to in the reference section. It is by its nature a high-level assessment of potential impacts based on currently available information.

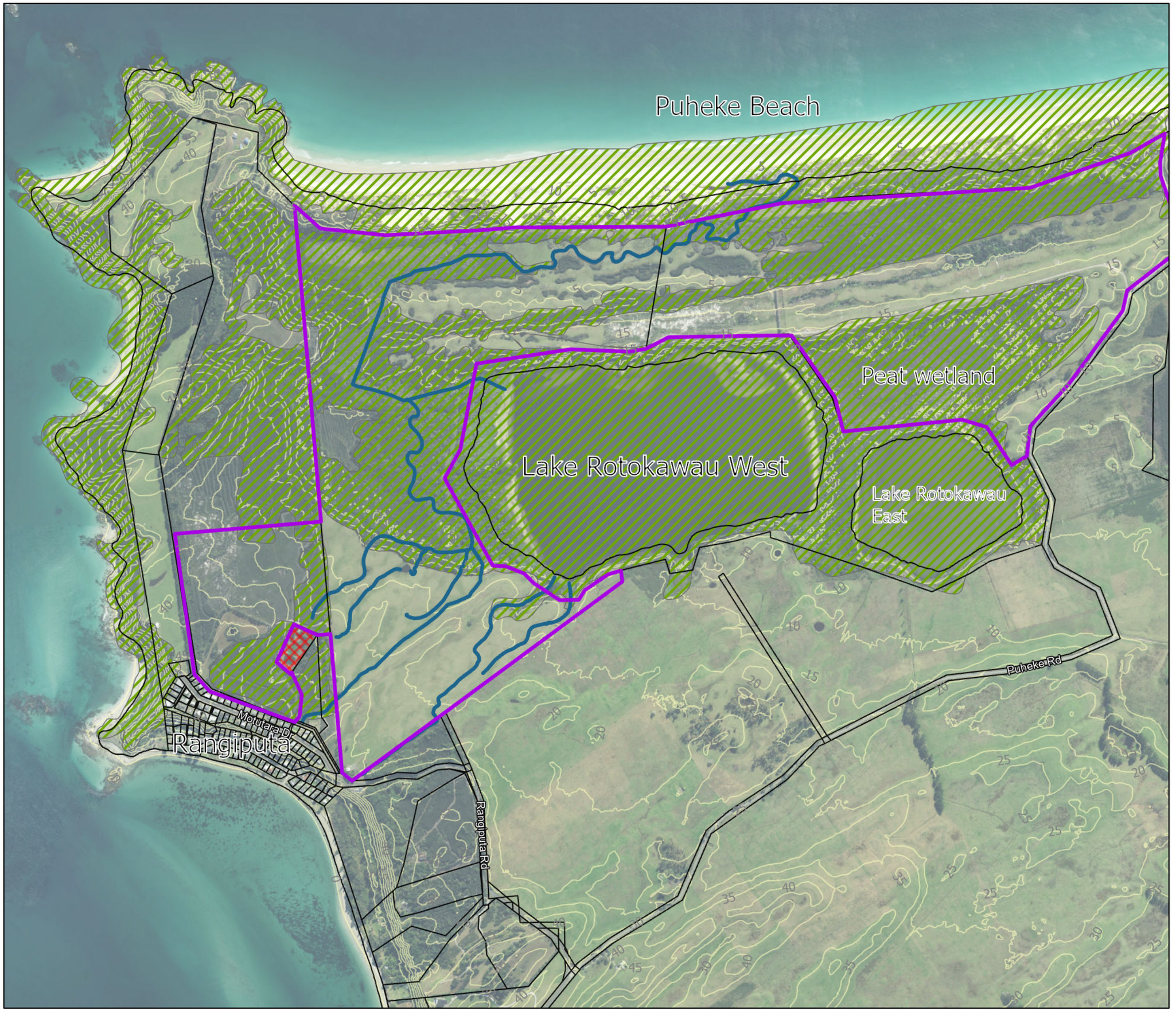
Prepared by:
Melanie Dixon

Principal Ecologist
027 241 0479
melanie@collaborations.co.nz

Reviewed by:
James Blyth, CEnvP

Water Resources Scientist and Director
027 338 4426
James@collaborations.co.nz

Appendix A: Rangiputa WWTP Location Plan



Property Boundaries
Lucklaw Farm
Contours (LiDAR) 5m
Surface (or near surface) water flow
Rangiputa WWTP Ponds
SNA FN411 Puwheke Beach and Rotokawau Lakes

N

0 300 600 Meters

Rangiputa WWTP Location

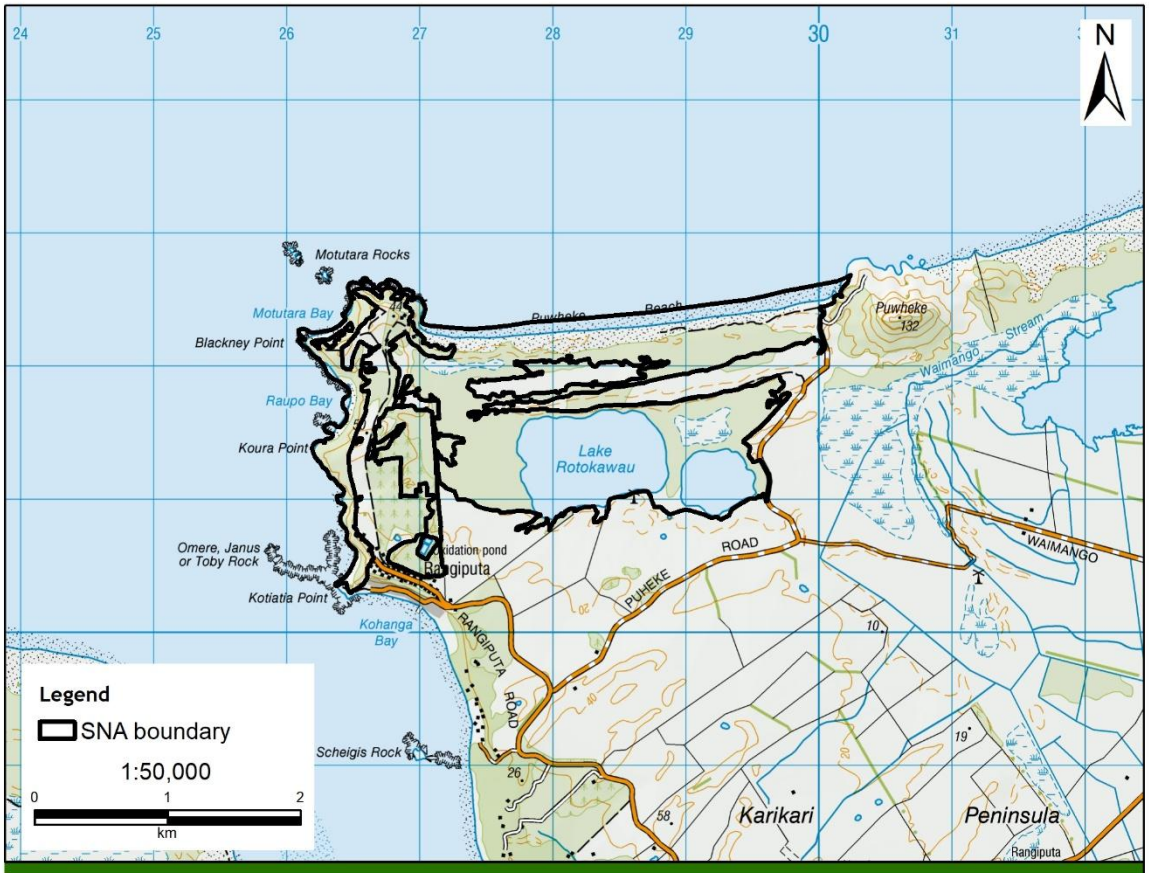
Project:	FNDC	Author	MD
Client:	Lucklaw	Date	11/4/25
Ref:	004	Size	A3

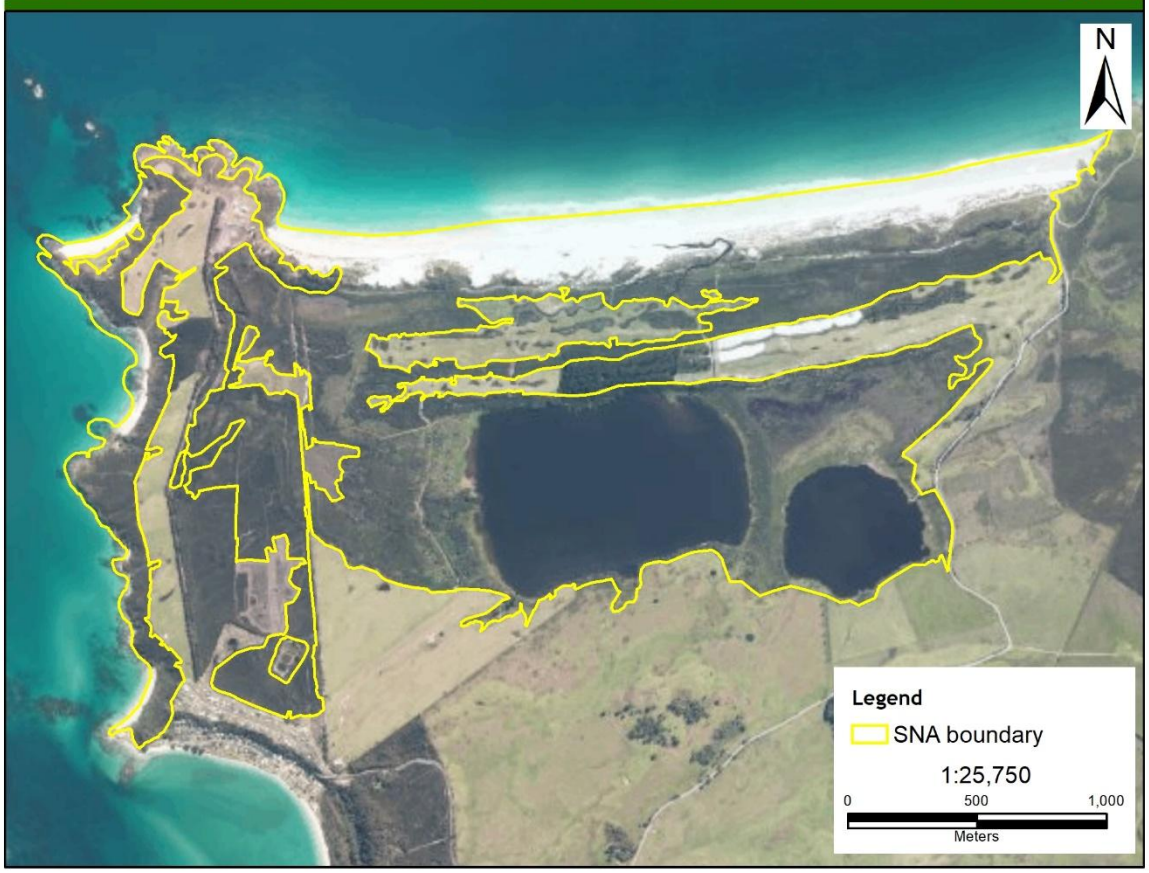
Collaborations

Appendix B: SNA extract

FN411

Puwheke Beach and Rotokawau Lakes





PUWHEKE BEACH AND ROTOKAWAU LAKES

SNA ID:	FN411
Protection Status:	Includes Public Conservation Land (Puwheke Recreation Reserve, Marginal Strip - Lake Rotokawau, Marginal Strip - Puwheke Beach)
Area (ha):	412.16
Altitude Range (m):	0 - 43
Ecological District:	Aupōuri
Grid Reference:	E1628098, N6141647

VEGETATION TYPE	LANDFORM
Open water	Dune lake
Pōhutukawa coastal association	Lake margin
Mānuka swamp scrub	Interdune flats and hollows
Kānuka-mānuka scrub	Dunes and consolidated dunes
Pīngao sedgeland	Dunes
Spinifex grassland	Foredune
Coprosma acerosa-pohuehue association	Dunes
Coprosma acerosa-oioi-pohuehue association	Dunes
Raupō reedland	Dune hollow
Gorse-kānuka scrub	Dunes
Oioi rushland	Sand flats and dune hollow
Harakeke flaxland	Dune hollow
Coprosma tenuicaulis-mānuka swamp scrub	Alluvium
Conning and Holland (2003)	

Flora[1,2]:	*Thelymitra* (a) (WELT SP79140; Ahipara) (Threatened-Nationally Critical), bog clubmoss (*Lycopodiella serpentine*; Threatened-Nationally Vulnerable), *Todea barbara* (Threatened-Nationally Vulnerable), kānuka (*Kunzea* sp.; Threatened-Nationally Vulnerable), *Pimelea villosa* (At Risk-Declining), pōhutukawa (*Metrosideros excelsa*; Threatened-Nationally Vulnerable), pīngao (*Ficinia spiralis*; At Risk-Declining), *Cyclosorus interruptus* (At Risk-Declining; 1978 record), *Pellaea falcata* (At Risk-Declining), mānuka (*Leptospermum scoparium*; At Risk-Declining), *Utricularia delicatula* (At Risk-Relict), wire rush (*Empodisma minus*; regionally significant), *Veronica diosmifolia* (regionally significant), and *Cryptostylis subulata* (Non Resident Native - Coloniser) (Conning and Holland 2003).
Fauna:	Bird species include Australasian bittern (*Botaurus poiciloptilus*; Threatened-Nationally Critical), Caspian tern (*Hydroprogne caspia*; Threatened- Nationally Vulnerable), white-fronted tern (*Sterna striata striata*; At Risk-Declining), North Island fernbird (*Bowdleria punctata vealeae*; At Risk-Declining), spotless crake

[1] Three indigenous plant species (pōhutukawa, kānuka, mānuka) in the Myrtaceae family were recorded at the site. All of the Myrtaceae species are at risk of infection by myrtle rust (*Austropuccinia psidii*), a potentially devastating rust which has no known treatment. Along with other species in the Myrtaceae family, the threat status of the species present has been elevated as a precautionary measure based on the potential threat posed by myrtle rust (see de Lange *et al.* 2018). However, the Myrtaceae species found at the site were not assessed against the ecological significance criteria because these species are common and widespread in the Aupōuri Ecological District.

[2] The 2014 *Kunzea* revision (de Lange 2014), split the *Kunzea ericoides* complex into ten separate species of *Kunzea*. There are three *Kunzea* species in Northland: *Kunzea amathicola*, *Kunzea linearis*, and *Kunzea robusta*, which are all ranked as Threatened-Nationally Vulnerable (de Lange *et al.* 2018). There has been no field inspection of this site since the revision and the *Kunzea* species present at the site is not known.

(*Porzana tabuensis tabuensis*; At Risk-Declining), marsh crake (*Porzana pusilla affinis*; At Risk-Declining), Northern New Zealand dotterel (*Charadrius obscurus aquilonius*; At Risk-Recovering), New Zealand dabchick (*Poliocephalus rufopectus*; At Risk-Recovering), variable oystercatcher (*Haematopus unicolor*; At Risk-Recovering), pied shag (*Phalacrocorax varius varius*; At Risk-Recovering), black shag (*Phalacrocorax carbo novaehollandiae*; At Risk-Naturally Uncommon), little black shag (*Phalacrocorax sulcirostris*; At Risk-Naturally Uncommon) and New Zealand scaup (*Aythya novaeseelandiae*; regionally significant) (Conning and Holland 2003).

Aquatic fauna species include black mudfish (*Neochanna diversus*; At Risk-Declining; 1999 record), inanga (*Galaxias maculatus*; At Risk-Declining), and the Not Threatened common bully (*Gobiomorphus cotidianus*), and shortfin eel (*Anguilla australis*) (Conning and Holland 2003).

Snail species include the Archey's dune snail (*Succinea archeyi*; Threatened-Nationally Endangered) (Conning and Holland 2003).

Notes/Comments: Contains coastal wetlands, dune lakes, and heathlands (Conning and Holland 2003).

Significant: Yes

Significance Justification:

Criteria Met	Justification
1a(i)	Contains representative coastal associations, scrub, sedgeland, and reedland vegetation types.
1a(ii)	Contains representative *Machaerina articulata* reedland vegetation types which would have existed circa 1840.
1a(iii)	Contains a representative assemblage of water bird and freshwater fish species.
1b(i)	A large area of wetland and dune lake habitats at the Ecological District scale.
1b(ii)	Does not appear to be substantially degraded by anthropogenic activities.
2a(i)	The site occurs on a 'Chronically Threatened' land environment.
2a(ii)	Duneland vegetation has been much reduced in the Northland Region.
2a(iii)	Contains a mosaic of bog and fen habitats which exceed the minimum threshold sizes for these wetland types.
2b	Supports 'Threatened', 'At Risk' and regionally significant flora and fauna species.
2d(i)	Coastal pōhutukawa associations adjacent to dune lakes comprise a very rare ecological unit in Northland.
3a(i)	Contains a high diversity of vegetation and habitat types.
3a(ii)	Contains a good diversity of species.
3b	Contains vegetation types which reflect variations in moisture levels.
4a	Part of a complex of lakes and wetlands which provide an important link in the chain of habitats on the Aupōuri Peninsula.
4c	Provides important freshwater fish and waterbird habitat.

Threats/Modifications/ Vulnerability (Desktop Assessment):	This site contains willow-leaved hakea, willow weed, gorse, Sydney golden wattle, pampas, black wattle, brush wattle, pine, buffalo grass, apple of Sodom, and kikuyu (Conning and Holland 2003).
References:	Conning and Holland (2003).
Assessment for Significance Based On:	Northland 0.1 metre Urban Aerial Photos (2017) and existing information as cited above.
Boundary Changes Since 1999:	Boundaries adjusted to follow the extent of indigenous vegetation based on 2017 digital aerial photographs.
Field Work Required?	No
Assessment Date:	31/5/2019