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 James Mitchell Blyth (Hydrology)

Dated: 22 April 2025

STATEMENT OF EVIDENCE OF JAMES MITCHELL BLYTH

INTRODUCTION

1 My full name is James Mitchell Blyth.

2 I am a Water Resource Scientist and Director at Collaborations, a small consultancy that works across a range of environmental, land and water science fields. I have 15 years' experience, including working internationally in over seven countries.

3 I have an MSc (1st Class Honours) from the University of Waikato. My thesis was on the ecohydrology of Whangamarino Wetland. I continue to be involved in a range of national projects relating to wetland hydrology, restoration and effects assessments.

4 I have developed many wetland and shallow lake water balance models for a range of purposes, including water take assessments, general hydrological characterisation and restoration design.

CODE OF CONDUCT

5 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

6 In my evidence I will briefly address:

6.1 The hydrology of Lakes Rotokawau (west and east) on the Karikari Peninsula and their surrounding wetland extents,

6.2 The potential connectivity of contaminants out of the Rangiputa Wastewater Treatment Plant (WWTP) with reference to recent wet weather monitoring of overflow pathways.

7 Further ecological detail of the lakes and wetlands has been included in Miss Dixons statement of evidence[i], which includes a technical memorandum titled *Rangiputa Wastewater Treatment Plan (WWTP): Potential impact on Ecological Features* (14 April 2025). A plan showing the WWTP in relation to Puheke Beach and dunes lakes within this memo[i] has been reproduced in this evidence in **Appendix A**.

CONCEPTUAL HYDROLOGY OF THE LAKES AND WETLANDS

8 The Karikari Peninsula is described as a low-lying tombolo of dunes, interdune wetlands and lakes connecting to the mainland[ii].

9 The peninsula was identified as having little groundwater storage due to the presence of podzolised soils with iron/silica pans that results in poor drainage and limited groundwater recharge to the deeper aquifer, the latter of which has thick sequences of clay rich sediments at depth with increasing sand content closer to the surface[ii].

10 Topographical contours presented in **Appendix A** show north of Rangiputa Coastal Settlement, ground elevations are approximately 45 m, with elevation declining in a northeast direction towards the lakes, which sit at an elevation of <10 mAMSL. The WWTP is located within the surface water catchment that would drain towards the wetlands and lakes, rather than southwest towards the coast.

11 Mr Soles evidence[iii] identifies that the WWTP discharges to ground via soakage to the shallow aquifer through pond 3.

12 While limited hydrological monitoring data is available, it is reasonable to theorise that based on the topography and presence of the iron pan, these lakes and connected lacustrine wetlands[iv] would receive the majority of their hydrological inputs via direct rainfall, and the catchments localised surface water runoff (that may be ephemeral in nature) and some groundwater seepage from the shallow aquifer above the iron pans.

13 Outputs from these systems would be via direct open water evaporation, and evapotranspiration from vegetated extents. The presence of the elevated (>15 mAMSL) former dunes between the two lakes and Puheke Beach restricts surface water outflows to the west, as discussed below in paragraph 15. Groundwater seepage out of the wetlands and lakes are likely limited by iron pans (see paragraph 14), although some lateral seepage towards the coast may occur depending on groundwater heads and sea level.

14 Niwa[v] identified Lake Rotokawau (East) and West (lakes 95 and 96) as being ~1 m and 12 m deep, respectively, both with a hard iron pan base overlaid by sand. Their description, however, identifies that both lakes have no inflows or outflows. In my opinion, it is likely that there are localised surface water inputs under heavy rainfall, and due to the topographical contours and iron pan, shallow groundwater seepage may be entering the lakes and wetland.

15 This is supported by assessments of ground elevation LiDAR data (see **Appendix A**) identifying a number of natural and modified surface water flow pathways draining to both lakes, and an outlet channel that drains to Puheke Beach from the wetlands near Lake Rotokawau West. The lake would also drain via this channel at higher water levels.

E. COLI MONITORING DATA

16 Mr Sole presents *E. coli* monitoring data from the bore associated with the WWTP consent[iii]. It is unknown where this bore is located, or what depth it is screened at.

16.1 Median concentrations over a ~12 year period were 10 cfu/100 mL, 95th percentiles of 1132 cfu/100 mL and maximum values of 188,000 cfu/100 mL.

17 Further analysis of the groundwater monitoring data is presented in the technical memorandum in Appendix A of Miss Dixons evidence[i]. This includes an overview of *E.coli* surface water sampling conducted by Lucklaw Farms Limited.

18 Lucklaw Farms Limited conducted additional *E. coli* monitoring at ephemeral surface water pathways draining near the WWTP (as identified in **Appendix A** and **Appendix B**) on the 16th and 17th of April 2025 following ~67 mm of rainfall (as measured at Kaitaia airport from the 16-17 April).

19 Results showed all samples exceeded 2,420 MPN/100mL[1] on day 1 (16th April) of the monitoring, the limit of detection at this laboratory.

20 By Day 2 (17th April), Spot 1 (pond) was >2,420 MPN/100 mL, Spot 2 within 70 m of the WWTP was 387.3 MPN/100 mL and Spot 3 (near the airfield/WWTP boundary) was 1,733 MPN/100 mL. See **Appendix B** for locations.

21 While I did not conduct this monitoring, I have the following comments:

21.1 High concentrations of *E. coli* in surface water are not uncommon during rain events and can be due to a range of animal, avian and human inputs.

21.2 These samples (except Spot 1 – pond) were taken upgradient and outside of fenced paddocks, so are likely to have limited ruminant inputs.

21.3 The laboratory limit of detection restricts a complete understanding of potential wastewater contamination, but does identify that concentrations were high on a number of samples, and that this was consistent towards the wetlands and lakes.

22 It is recommended that any outcome of this hearing process should consider further *E. coli* samples taken from surface water monitoring be sent to an accredited laboratory with a higher detection limit, and that faecal source tracking (FST) and pathogen testing be undertaken to verify potential wastewater contamination risk entering the wetlands and lakes via shallow groundwater and/or surface water during heavy rainfall.

23 Recommended approaches for FST has been detailed extensively in ESR (2021)[vi] with a decision tree and response to identification of human contaminants from wastewater presented in Figure 1.

[1] Most probable number (MPN) is the result output measured statistically from the method and is typically comparable in a 1:1 relationship to colony forming units (CFU), the latter of which individual colonies are counted quantitatively. See this link for more information. https://www.eurofinsus.com/food-testing/resources/what-is-the-difference-between-reporting-microbiology-testing-per-cfu-or-mpn/

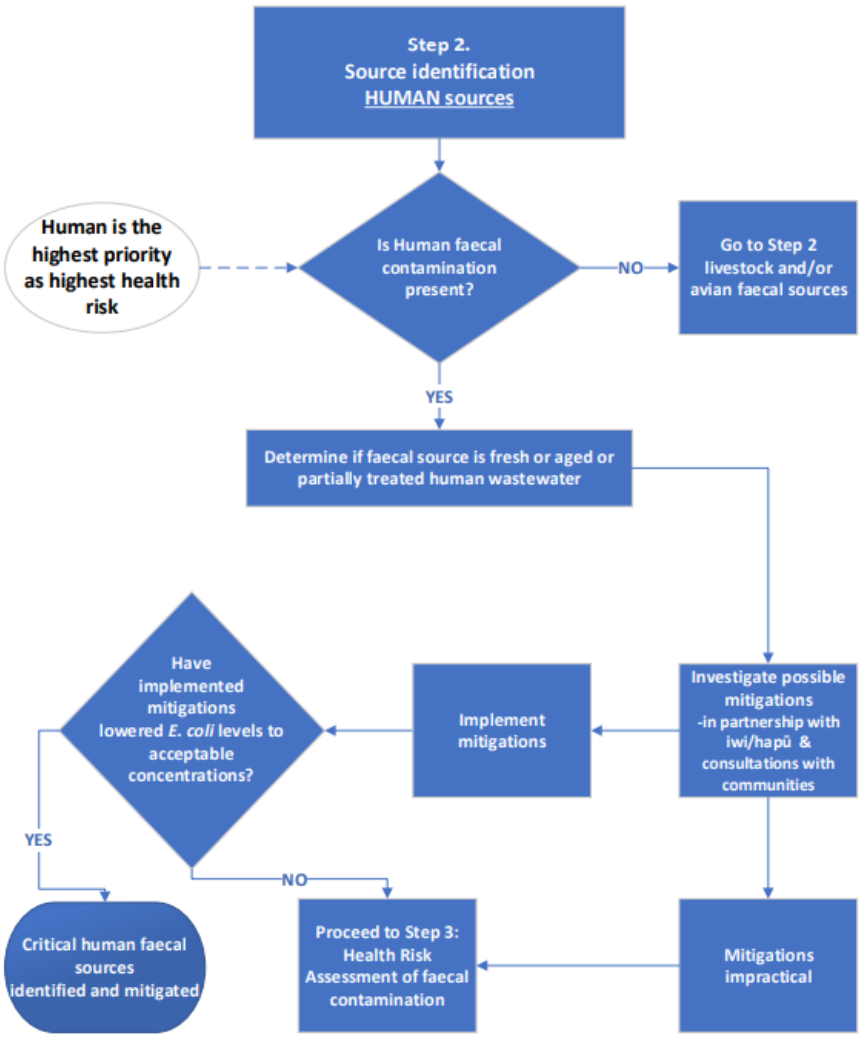

Figure 1. Decision tree following FST identifying human wastewater contaminants (ESR 2021[vi]).

CONCLUSION

24 Localised studies and the presence of an iron pan indicates that groundwater recharge to deeper aquifers is limited on the Karikari Peninsula. The natural topography results in a catchment with ephemeral surface water flow paths that drains from approximately 45 mAMSL near the Rangiputa Settlement to <10 mAMSL towards the northeast (Lake Rotokawau West). This catchment encompasses the Rangiputa WWTP discharge field.

25 The wetland and lake complex's hydrological inputs are likely via direct rainfall, ephemeral surface water inflows and some shallow groundwater seepage (above the iron pan). Outputs are likely to be via direct open water evaporation, evapotranspiration and surface water drainage of Lake Rotokawau West towards Puheke Beach.

26 Discharges of wastewater via soakage from pond 3 of the Rangiputa WWTP to the shallow aquifer may contribute contaminants to the wetland and lake environments.

27 Surface water samples collected near the WWTP, outside of farmland showed a number of *E.coli* results at laboratory detection limit of >2,420 MPN/100 mL. Further investigation including faecal source tracking is recommended to better understand potential contamination risks from this soakage field to the receiving environment.

Dated: 22 April 2025

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James Mitchell Blyth – Director at Collaborations

[i] Dixon, M. 2025. Statement of Evidence of Melanie Robyn Dixon (Ecology) – hearing 11 (designations) – Lucklaw Farms Limited S551. Far North District Plan Change.

[ii] Northland Regional Council. 1991. Aupouri Peninsula Water Resources Assessment. Technical Report.

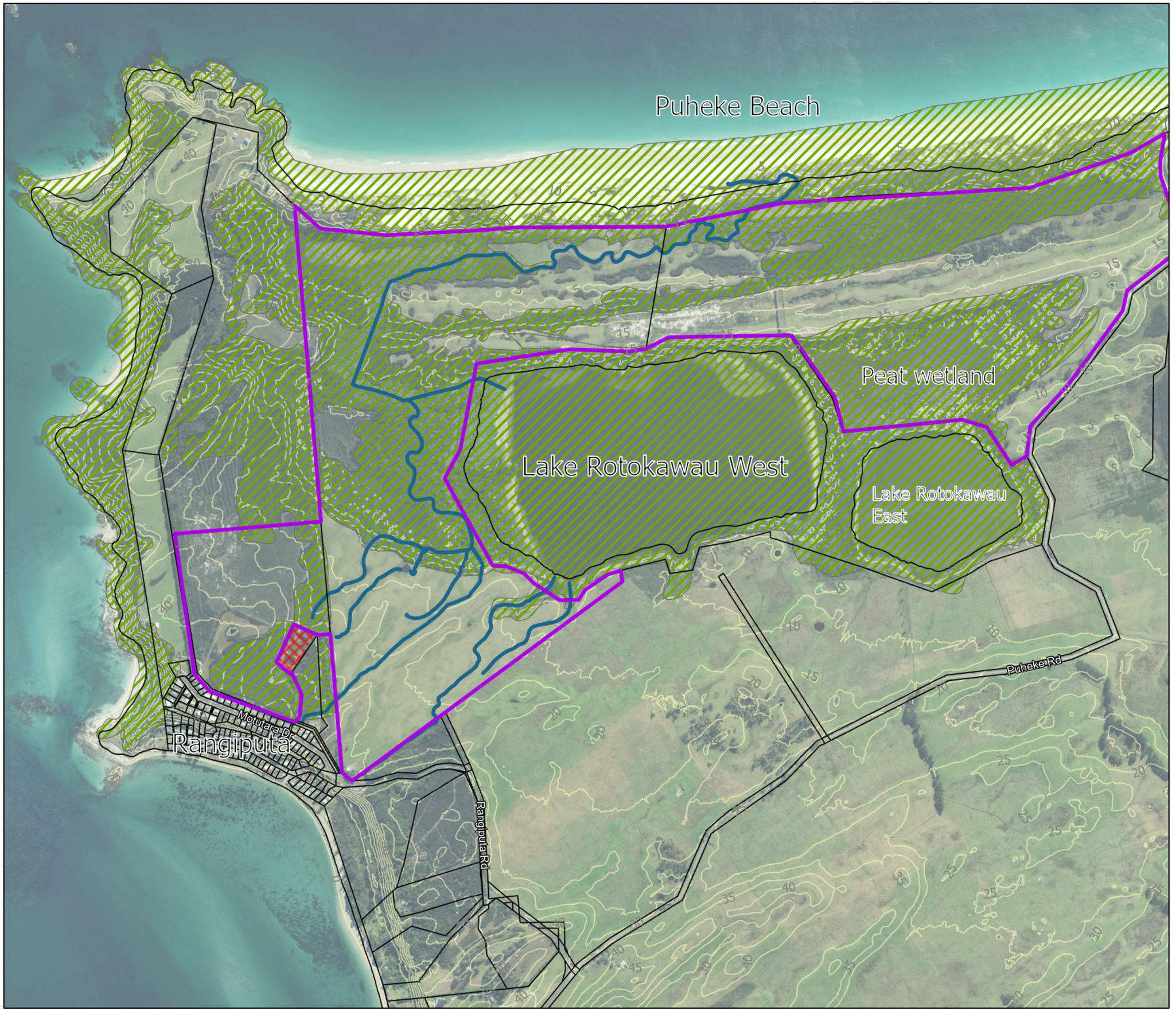
[iii] Sole, G. 2024. Statement of Evidence of Gavin Michael Sole (Wastewater Treatment Assessment) – hearing 11 (designations) – Lucklaw Farms Limited S551. Far North District Plan Change

[iv] Wildlands. 2011. Ranking of the top wetlands in the Northland Region – Stage 4 – Ranking for 304 wetlands. Prepared for Northland Regional Council. Report 2489.

[v] Niwa. 2010. Northland Lakes Ecological Status 2010 – Lake Rotokawau East and West.

[vi] ESR. 2021. Refinement of the Framework for Assessment of Recreational Water Quality. Prepared for National Sciences Challenge: Our Land and Water. Report No. FW21020.

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 – LUCKLAW FARMS E. COLI MONITORING 16-17 APRIL 2025

Lucklaw Farm – Water Sample Points 17 and 18 April 2024

A – Spot 1 (pond)

B – Spot 2

C – Spot 3 (airfield)

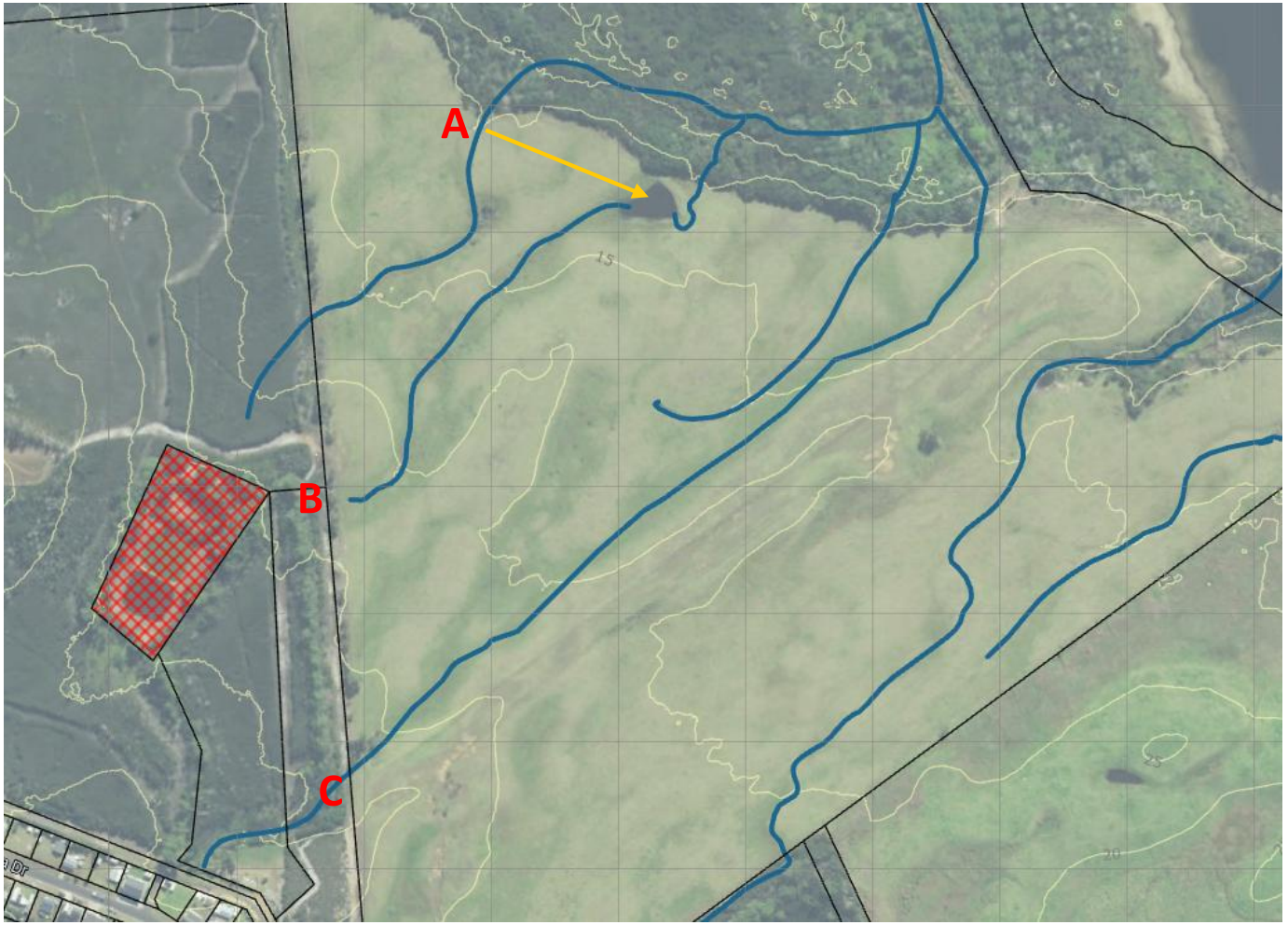


Figure 1: The wastewater treatment plant (red cross hatching), 5m contours (light yellow) and approximate surface (and near surface) water flows in dark blue. The yellow arrow points to the small pond where water quality samples have been taken. Rotokawau Lake (west) is just visible in the top right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

C – Spot 3 (airfield)

B – Spot 2