IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF Private Plan Change 95 Pencarrow Estate Pongakawa to the Western Bay of Plenty District Plan

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STATEMENT OF EVIDENCE OF KIRSTIN BROWN

Introduction, qualifications and experience

1. My full name is Kirstin Brown. I am an Associate Geotechnical Engineer at CMW Geosciences. I have been at CMW Geosciences for nine years.

2. I have a BSc from the University of Otago, MEngSc (Geotechnical) from the University of New South Waves, CMEngNZ, CPEng (Geotechnical) and am approved Bay of Plenty Regional Council (**BOPRC**) OSET system designer (specialising in assessing suitability from geotechnical prospective). I have 12 years' experience working as a geotechnical consultant including onsite wastewater disposal suitability assessments for various sites. Before CMW Geosciences, I was previously employed as an engineering geologist at Coffey Geotechnics (now Tetra Tech).

Code of Conduct for Expert Witnesses

3. I confirm that I have read the Environment Court's Code of Conduct for Expert Witnesses, as contained in section 9 of the Environment Court's Practice Note 2023, and I agree to comply with it.

4. The data, information, facts and assumptions that I have considered in forming my opinions are set out in my evidence that follows. The reasons for the opinions expressed are also set out in the evidence that follows.

5. I confirm that the matters addressed in this brief of evidence are within my area of expertise, with the exception of where I confirm that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my opinions expressed in this brief of evidence. I have specified where my opinion is based on limited or partial information and I have identified any assumptions I have made in forming my opinions.

6. CMW have been engaged by the applicants since November 2021 to provide geotechnical advice to assist with the plan change.

Scope of evidence

7. My evidence will cover the following items responding to points raised concerning wastewater in submissions and the s42A report:

   (a) The suitability of the soil at the indicated location of the proposed wastewater disposal field, and confirmation of area to be allowed for based on soil conditions.

   (b) The depth of groundwater table with respect to the disposal field.

   (c) Effects of the proposed system and disposal field in the proposed location.

   (d) Potential for expansion of the wastewater system.

8. I have read and am familiar with the proposed wastewater servicing details included with the private plan change application, the geotechnical context, submission concerns and the s 42A report concerns regarding the location and feasibility of the wastewater system and disposal location.

Proposed wastewater system (designed by Innoflow) - Overview

9. The plan change is expected to yield a maximum of 130 dwellings and a small commercial area (3700m^2). On-site wastewater infrastructure specialist suppliers Innoflow have been engaged by the applicant and have recommended the use of their Prelos (Pressurised Liquid Only Sewer) Community System to service the development to be enabled by the plan change. Innoflow have further advised the expected maximum daily flows for the development are 140,000 litres/day.

10. The Prelos Community System includes three-stages of treatment prior to land disposal, summarised as follows:

    (a) Prelos processor tanks within each lot delivering primary treatment and transmission of liquid effluent to a low pressure sewer pipe in road reserve;

    (b) Low pressure sewer pipe conveys all primary treated effluent to an advanced secondary treatment system (comprising pre-anoxic treatment, multiple stages of circulation and settlement through packed bed reactor pods, and aeration);

    (c) Treated effluent following primary and advanced secondary treatment passes through tertiary treatment in the form of UV filtration and disinfection; prior to discharge through pressure-compensating drip line irrigation into a land disposal field.

11. The proposed wastewater disposal field location (and parallel reserve field location) is to the north-eastern margins of the plan change site, see area marked A in **Figure 1** below and structure plan drawings attached to the evidence of Mr Murphy.

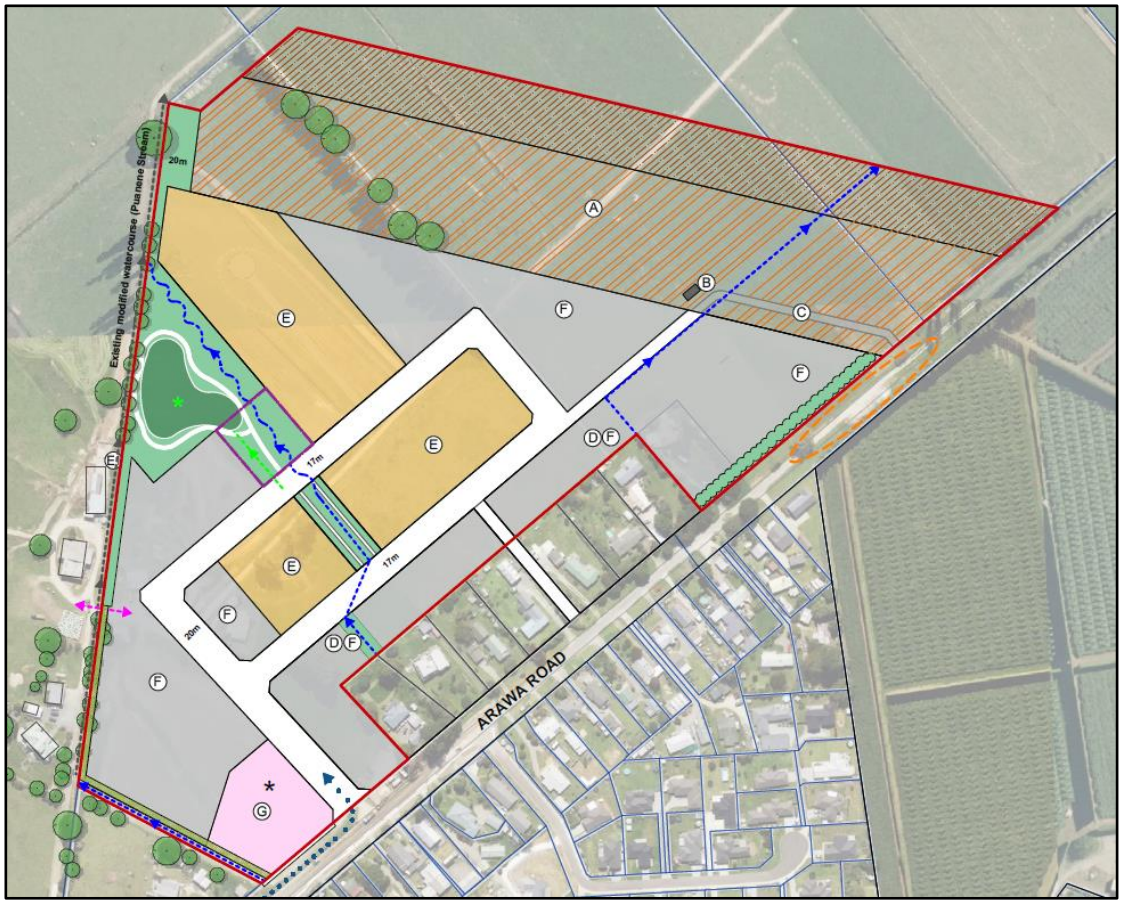

Figure 1: The proposed plan change on the north-eastern side of Arawa Road residential settlement. Area A to the north-east is the proposed wastewater disposal field location, Point B is the location of advanced and tertiary treatment features of the proposed Prelos Community System.

Soil Suitability and Necessary Land Area

12. The geotechnical investigation for the site undertaken by CMW in February 2022 included eleven Cone Penetrometer Tests (CPTs) and twenty test pits (TPs) to evaluate soil and groundwater conditions. Test pits (TPs) 1, 2, 3, 13, 14 and CPTs 1 to 4 were within the proposed wastewater area, whilst TPs 4 to 13 and 15 to 20 and CPTs 5 to 11 were across the developable area of the site in the central/south.

13. An assessment of the soil profile encountered at the proposed wastewater field location indicates the soil is likely to be classified as Category 3 – Loam as per AS/NZS 1547:2012. In accordance with AS/NZS 1547:2012 (Table M1) a design irrigation rate of 4mm/day (or 4L/m^2) is recommended for drip irrigation systems (ie. the system proposed by Innoflow).

14. Based on this design irrigation rate and the maximum daily flow rate recommended by Innoflow, a wastewater disposal field area of 3.5ha is required. This is provided for at the north-eastern portion of the plan change site (totalling 3.53ha, as reflected on the Structure Plan drawings).

15. The BOPRC submission recommended a 50% reserve field location also be provided in the instance of unanticipated problems or system failure. As such based on the above, a reserve area of 1.75ha is required. A total wastewater disposal area including reserve area of 5.25ha is therefore required.

16. Buried or partially wastewater infrastructure is proposed to be located in the north of the site over the peat soils. The inflow designs include anti-buoyancy rings. Consideration will be given to detailed design items including load compensation and specific foundations/preparation at a later date.

Impact of groundwater table

17. The impact of the groundwater table below the wastewater disposal field has been raised as a risk of this project in terms of potential leaching of effluent into the underlying groundwater table[1].

18. The TPs and CPTs undertaken by CMW in the location of the wastewater field generally encountered groundwater at depths of between 1.2m to 2.0m below existing ground level at the time of our investigations (February 2022).

19. It is acknowledged that this geotechnical testing was undertaken during summer conditions. Due to concerns about the potential for winter groundwater level fluctuations, an additional TP was excavated in the proposed wastewater field location by the applicant's in August 2024. This encountered groundwater at 1.5m below ground level, indicating no to very little seasonal fluctuations in groundwater level are likely.

[1] Paragraph 14.31, s.42A report.

20. Groundwater levels, based on the existing landform, are therefore anticipated to be between 1.2m to 2.0m below the existing ground level at the location of the proposed wastewater field throughout most of the year. BOPRC OSET Plan requires a vertical separation distance of at least 0.6m between the bottom of the wastewater disposal field and the winter groundwater table. It is understood that very small areas of fill placement within the location of the wastewater disposal field would be required to ensure a flat surface (ie. backfill of existing drains). Drip irrigation lines are typically installed at a depth of 150mm to 200mm from the surface as such the vertical distance between the dripper lines and the groundwater table is expected to be greater than 0.6m.

Wastewater field location effects

21. It is noted that the proposed wastewater disposal field has been separated from the Puanene Stream to the west by a minimum of 20m as required by the BOPRC OSET Plan. It is understood that the existing farm drains situated within the proposed wastewater disposal area will be backfilled as part of subdivision earthworks with the intention to provide a minimum of 20m separation distance as required by the BOPRC OSET plan. It is noted that backfilling the existing farm drains could have an effect on groundwater regime and therefore it is recommended that groundwater monitoring is undertaken as part of these works to confirm minimum vertical offsets to the groundwater table required by the BOPRC OSET plan are maintained. It is anticipated that groundwater monitoring would comprise at least No. 4 standpipes to depths of up to 5m below existing ground levels. Water level loggers would be installed to provide continuous recordings at set intervals during the monitoring period. It is recommended monitoring commences a year prior to earthworks commencing for the development to establish a baseline seasonal ground level, with monitoring to continue during earthworks.

22. It is noted that submissions have been raised concerning the potential for inundation and floodwater transport of discharged effluent from the disposal field. BOPRC OSET requirements seek to avoid placement of wastewater disposal fields below the 1 in 20-year flood contour[2]. This risk is addressed in the engineering evidence of Mr Hight, partner and engineering team leader at Lysaght engineering consultants, who advises that the wastewater disposal field is largely elevated above the 1 in 100-year flood contour (as depicted on the Western Bay District Council GIS). It is noted that no specific flood modelling has been undertaken for the 1 in 20-year flood event. Minor detailing as to the precise layout of dripline infrastructure or otherwise shallow filling to low spots could be undertaken to locate the entire dripline infrastructure is above the 20-year flood contour.

Potential for the expansion of the system in the future

23. The feasibility and implications of connecting existing Arawa Road and Penelope Place residents to the wastewater system in the future is recommended to be assessed in the s.42A report[3].

24. From a review of the published geological map of the area[4], soil types when tracking north-east from the wastewater disposal field location are expected to be similar to those within the current wastewater field location, which would be the logical direction in which to expand i.e. continuation of current shape and design of wastewater disposal field.

25. There is approximately a total of 9ha of land north-east of the proposed residential zone, including the location of the proposed wastewater disposal field. In accordance with the BOPRC OSET plan, 3.5ha of primary field and 1.75ha of reserve field space is required to service the plan change. Should the

[2] See Schedules 2 and 4 of BOPRC OSET plan for example – containing performance conditions for new septic tanks/aerated wastewater treatment systems.
[3] Paragraph 14.58. s.42A report.
[4] Leonard, Begg, Wilson (2010). Geology of the Rotorua Area. GNS Geological Map 5.

rest of the Arawa Road settlement sought to be serviced, this would add approximately 80,000 litres/day of wastewater, requiring 2ha for a primary disposal field and 1ha reserve area. A total wastewater disposal area including reserve area of 8.25ha is therefore anticipated to service the plan change area and existing Arawa Road community of which there appears to be sufficient land area available to the north east, however this would be subject to further investigations and BOPRC OSET consenting processes. Expansion would also be subject to land purchase and rating considerations which are beyond the scope of this evidence and my expertise.

Conclusions

26. It is my professional opinion that proposed wastewater disposal field to service the development has considered appropriate design irrigation rates for the soils likely to be encountered within the proposed wastewater field location.

27. The proposed wastewater disposal field is considered to be suitably separated from the standing groundwater table, which has been verified during summer and winter investigations to be between 1.2m to 2.0m below the ground level of the wastewater disposal field location. A distance of only 0.6m is strictly sought in BOPRC OSET consenting. The wastewater disposal field would also be suitably distanced from the Puanene Stream maintaining a minimum of 20m of separation as required by BOPRC OSET. It is noted that earthworks proposed as part of the development, including backfilling of existing drains, may have an impact of the groundwater regime as such it is recommended that that groundwater monitoring is undertaken as part of these works to confirm minimum vertical offsets to the groundwater table required by the BOPRC OSET plan are maintained.

28. I defer to Mr Hight regarding susceptibility of flooding to the wastewater disposal field, however it appears that the field would be suitably located

above the 100-year floodplain (noting no specific flood assessment has been undertaken for the 20-year flood event).

29. It appears feasible that the same location could service the entire Arawa Road settlement. This is based on desktop information only and would be subject to further investigation and BOPRC OSET consenting. This would also be subject to agreement between WBOPDC, the landowner, and existing settlement residents.

Kirstin Brown
24th October 2024