

BEFORE THE HEARING PANEL

IN THE MATTER the Resource
Management Act 1991 (the Act)

AND

IN THE MATTER of applications by
Tararua District Council to Horizons
Regional Council for application **APP-
2005011178.01** for resource consents
associated with the operation of the
Eketahuna Wastewater Treatment Plant,
including a discharge into the Makakahi
River, a discharge to air (principally odour),
and a discharge to land via pond seepage,
Bridge Street, Eketahuna.

REPORT TO THE COMMISSIONERS

**DR BRENT COWIE (CHAIR), MR REGINALD PROFFIT AND MR PETER
CALLANDER**

SECTION 42A REPORT TIM MICHAEL BAKER - GROUNDWATER

7 March 2017

A. INTRODUCTION

Qualification and Experience

1. My full name is Timothy Michael Baker.
2. I hold a Master of Science Degree with Honours in Physical Geography from Victoria University of Wellington and I am a member of the New Zealand Hydrological Society, WasteMinz and ALGA.
3. I have 14 years' of experience in groundwater resource management. I am currently an Associate Hydrogeologist employed by Jacobs New Zealand Limited (formerly Sinclair Knight Merz) who I have been with for the past four years. Previously, I spent five years as a Groundwater Quality Resource Officer and Scientist with the Wellington Regional Council and five years as a Hydrogeologist for Engineering Consultancies based in the UK.
4. I have experience in groundwater quality impact studies related to discharges to land. My experience includes assessment of effects and/or consent authority review for: Foxton Wastewater Treatment Plant (WWTP), Feilding WWTP, Carterton and Masterton WWTP, several small community wastewater treatment systems and Reid's Piggery in Carterton.
5. I have read the Code of Conduct for Expert Witnesses as contained in the Environment Court's Practice Note (2014), and I agree to comply with it as if this hearing were before the Environment Court. My qualifications are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.
6. I am engaged by the Manawatu-Wanganui Regional Council (Horizons) to provide technical advice on the groundwater quality aspects for the application by the Tararua District Council (TDC) for a discharge to land where it may enter water for the Eketahuna wastewater treatment plant (APP-2005011178.01).

7. I undertook a site visit of the Eketahuna WWTP with Horizons staff on the 23rd February 2017. I have read the assessment of environmental effects (AEE) of the treatment plant discharges TDC supplied in support of its application for resource consents¹.
8. I have read the S42A report prepared by Fiona Morton and the recommended conditions for the application, dated 7 March 2017. In my view, the recommended conditions are appropriate to address the potential adverse effects from the TDC discharges to groundwater.

Background

9. The Tararua District Council (TDC) has applied for consent (APP-2005011178.01) to discharge treated wastewater to land where it may enter water (via leakage from the oxidation ponds) for its existing wastewater treatment plant operation at Eketahuna. The consent is to replace the existing consent held for the discharge of treated wastewater to land, and is applied for as a discretionary activity under Rule 14-30 of the One Plan for the Manawatu-Wanganui Region.
10. TDC supplied an assessment of environmental effects (AEE) of the treatment plant discharges in support of its application for resource consents. The AEE was prepared by Opus and focused on water related matters including effects on the water quality of the Makakahi River and consideration of alternative methods of treatment and disposal.
11. Regarding effects on groundwater the applicant did not address any in the original AEE. The Regional Council issued a Section 92 request (24 June 2015) for further information on groundwater effects and related issues. This request included a description of the hydrogeological setting, information on pond leakage and potential lining and whether or not the pond had been de-sludged.
12. A Section 92 response was received on 11 December 2015. No information on the hydrogeological setting or current pond leakage was provided. Information on the proposed lining methodology and construction was however provided.

¹ OPUS, Eketahuna waste water treatment plant, Discharge of treated waste water, 2015

Site Visit

13. During the site visit, I made a number of observations relevant to the groundwater aspects of the application. These observations were:
- a. There did not appear to be any outflow meter at the discharge point of the pond;
 - b. The ponds are located very close (within five (5) metres) of the edge of a historic river terrace. The terrace is at least ten (10) metres, but no more than twenty (20) metres, above the level of the river
 - c. Historically the site was used as a landfill, with waste being dumped over the edge of the river terrace onto the lower terrace that is just above river level
14. A conceptual cross section of the site is presented as Attachment 1.

B. OUTLINE OF EVIDENCE

15. My evidence is largely structured around the assumption that the Applicant is intending to line the two ponds in the very near future (the Applicant's consultant, Opus, stated this would occur in March 2017, however it is understood this has now been delayed until no later than 1 July 2018).
16. The lining of the ponds is key to the assessment of effects on groundwater. At present, it is likely that the ponds leak to groundwater that flows beneath the site into the Makakahi River. The Applicant has agreed with this conceptualisation². The Applicant has stated their intention is to install a synthetic liner into the ponds. I consider this will have a positive impact on groundwater quality, as a properly constructed and verified liner should be impermeable.
17. I am aware that the ponds were first proposed to be lined in 2011, but for reasons unknown to me this has been delayed over time. Given this, I have proposed a monitoring regime that can be used pre and post lining.

² OPUS, Response to Further Information Request APP-2005011178.01 – Eketahuna Wastewater Treatment Plant – 11 December 2015

C. THE ACTIVITY

18. A description of the operational aspects of the WWTP is provided in the AEE prepared by the Applicant, and is summarised in my S42a Technical Report on Groundwater. For brevity, it is not repeated here. However the key points relevant to the assessment of groundwater effects are:
- a. The ponds are not lined, and any reduction in permeability is due to natural lining from sludge contained within the ponds;
 - b. The Applicant stated in the s92 response that the ponds were due to be lined in March 2017; and
 - c. No estimations of pond leakage were provided in the AEE.
19. The two ponds at the WWTP are unlined and as a result are highly likely to leak wastewater from the base of the ponds. The rate of leakage is typically calculated by comparing the inflows to the outflows and adjusting them to reflect evaporative losses off the pond surface. Unfortunately this information has not been collected by the Applicant. In my experience, it is not uncommon for unlined ponds located adjacent to rivers to lose between 5 and 20% of their inflow.
20. The Applicant is unable to provide actual inflow data for the existing ponds as there are no flow meters at the WWTP; however a value of 400 m³/day for the dry weather flow and 3,200 m³/day for the wet weather flow were adopted for the AEE. Based on these figures, indicative figures for pond leakage could range from 20 to 80 m³/day in dry weather, and up to 640 m³/day in wet weather.

D. RECEIVING ENVIRONMENT

21. No conceptualisation or description of the local groundwater environment was provided in the AEE or s92 response. As such, there is no site specific data in respect to groundwater depth, flow direction or quality.

22. Based on a review of geological maps and topographical maps, subsequently reinforced by my site visit, my interpretation of the hydrogeological setting is as follows:
- a. Groundwater is likely to be present in an unconfined aquifer beneath the site.
 - b. According to the 1:250,000 QMAP³ the unconfined aquifer comprises late Pleistocene river deposits which typically consist of poorly to moderately sorted gravels with sands and silts.
 - c. Groundwater flow direction is likely to reflect topography and flow from west to east across the site i.e. from the Golf Course to the river.
 - d. Based on the height of the terrace above the river, groundwater is likely to be in the region of ten (10) to fifteen (15) metres below the pond level.
 - e. Groundwater quality beneath the site is unknown.
23. Downgradient groundwater users are potentially at risk from the contaminated groundwater. I requested a bore search from Horizon's Regional Council which indicates that there is only one well (ID 366067) within a 1 km radius. This well is located approximately 820m to the west of the WWTP and is across the river.
24. The historic landfill located to the immediate west of the WWTP ponds, may also influence groundwater quality before it discharges to the river. This historic landfill is not monitored.

³ 1:250 000 Geological Map of New Zealand (QMAP) produced by GNS

E. SUBMISSIONS RECEIVED

25. The application was publically notified with twelve submissions received. A single submission referencing groundwater was received from Kahungunu ki Tamaki nui-a-rua Trust. The trust requested the implementation *'of a groundwater monitoring programme that incorporates a monthly monitoring frequency for 2 years, then quarterly thereafter, with monitoring of the groundwater below and adjacent to the oxidation pond to gauge groundwater quality and ground water flow direction'*.

F. EFFECTS ASSOCIATED WITH THE ACTIVITY

26. There is only the single well within a one (1) km radius of the WWTP. This well is located on the opposite side of the Makakahi River to the WWTP. I do not consider this well to be downgradient of the WWTP and therefore conclude that other groundwater users are unlikely to be at risk from the WWTP groundwater discharge.
27. Assuming the groundwater beneath the WWTP does discharge to the river, the discharge is likely to be indirectly measured as part of the river water monitoring programme, albeit in a diluted and attenuated state. It is important to bear in mind that leakage from the ponds has not had the full treatment that the pond system provides, and therefore has the potential to be of a poorer quality than the treated discharge.
28. As such, the most likely effects from the proposal are on instream ecological values as a result of pond leakage affecting groundwater that discharges into the Makakahi River. These effects are addressed in the evidence of Mr Logan Brown.
29. The Applicant has not made an estimation of the proportion of nutrients entering the river from groundwater. Given the lack of any site specific data this would be difficult, if not highly uncertain. Additionally, should the ponds be lined in the near future as stated by the applicant, the effects from the groundwater discharge should have a limited duration.

G. MONITORING AND MANAGEMENT PROCEDURES

30. The applicant is reluctant to install monitoring wells given the proposed re-lining. The applicant considers the ponds will be compliant with the permitted activity rule and that they are not required to demonstrate ongoing compliance with the permitted activity.
31. As an alternative, the applicant proposes to monitor groundwater beneath the ponds from a manhole that will be installed as part of the gas venting/pond leakage detection system. I support this idea, and in addition suggest it would be prudent to include the sampling of surface water at base flows as part of the surface water monitoring programme.

H. DISCUSSION AND CONCLUSION

32. In summary, there are likely to be effects on the quality of the Makakihī River as a result of leakage from the base of the ponds entering groundwater and then flowing into the river. The applicant has not attempted to quantify this effect, largely due to the absence of any site specific groundwater data and WWTP inflow and outflow data.
33. The greatest effects on groundwater are likely to occur up until the time when the ponds are re-lined. The applicant has stated this should now occur by 1 July 2018.
34. So long as the re-lining takes place in the near future, I am comfortable with the Applicant not installing monitoring wells, and implementing a monitoring regime post-lining of the leakage detection system.
35. Having visited the site, I observed that it would be difficult, but not impossible, to install a useful down-gradient monitoring well between the edge of the pond and the terrace. This is due to the proximity of the ponds to the terrace edge. There is only five (5) to ten (10) metre strip along which a borehole could be installed. It would also need to be drilled to a depth close to the elevation of the river, potentially between ten (10) and fifteen (15) metres below ground level.

36. In addition, because of the presence of unknown landfill waste, there is the potential for the quality of groundwater down-gradient of the ponds to be impacted by the waste.
37. Given the preceding two points, I would agree with the Applicant that, subject to the re-lining being confirmed, the installation of monitoring wells to measure impacts from the existing ponds is not warranted.
38. However, in lieu of groundwater monitoring for the period prior to re-lining, I recommend a condition requiring the applicant to calculate pond leakage on a daily basis, reported quarterly. This would be achieved through the monitoring of inflow and outflows and the creation of a basic water balance. In order to achieve this, a condition requiring the installation of flow meters within the near future would be required.
39. However, should there be continued delays in re-lining, or the Applicant chooses not to install liners on the ponds, I recommend that conditions requiring the installation of a single up-gradient and two down-gradient wells are implemented.

I. RECOMMENDATIONS

40. To address the potential effects of the leakage to groundwater from the plant, I support conditions of consent to address the following:
 - a. A daily rate of leakage determination (based on a water balance calculation incorporating monitored daily WWTP pond influent and effluent flows and daily climate data (rainfall and evaporation)).
 - b. Provision of that information to the Regional Council in a format that is compatible with the Manawatu-Wanganui Regional Council data system.
 - c. Completing proposed pond lining by **1 July 2018**.
 - d. Ongoing monitoring of a sub-liner drainage/leakage detection system on a six monthly basis.
 - e. Samples collected under (d) shall be analysed for the following parameters:

- i. Total Phosphorus (TP)
 - ii. Dissolved Reactive Phosphorus (DRP)
 - iii. Total Nitrogen (TN)
 - iv. Nitrate Nitrogen (NO₃-N)
 - v. Nitrite Nitrogen (NO₂-N)
 - vi. Ammoniacal Nitrogen (NH₄-N)
 - vii. Escherichia coli (E. coli)
 - viii. Dissolved oxygen (field measurements)
 - ix. Electrical Conductivity (EC) (field measurements)
 - x. Chloride
 - xi. Static water level
 - xii. pH (field measurement and laboratory measurement)
 - xiii. Soluble Carbonaceous Biological Oxygen Demand (ScBOD₅)
- f. Monitoring results should be provided to the Regional Council in a timely manner.
- g. Results should be collated, analysed and interpreted and included in an Annual Report.
- h. A fall-back plan should be implemented should the consent holder not complete the pond lining within the specified timeframe of **1 July 2018**. If the lining is not undertaken then a plan should be put in place to install and monitor groundwater at one up-gradient and two down-gradient monitoring wells (final site location to be determined in consultation with the Regional Council). Groundwater shall be monitored six (6)-monthly for the suite of analytes listed above and shall commence no later than **1 September 2018**.

41. I consider that provided the applicant complies with conditions which include the above criteria, then any effects associated with pond seepage will be likely to have an effect on the environment that is no more than minor.
42. I have viewed the conditions in Appendix one of Ms Morton's report relating to the discharge to land permit. I consider that these conditions address the points noted above (a-h).

ATTACHMENT A – Site Conceptual Cross Section



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 By TB Date 29/02/2017

