IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of applications for consents (APP-1995014433.02, 2005011178.01, 2016200772.00, 2017201455.00) by the TARARUA DISTRICT COUNCIL to the HORIZONS REGIONAL COUNCIL for resource consents associated with the operation of the Pahiatua Wastewater Treatment Plant, including earthworks, a discharge into Town Creek (initially), then to the Mangatainoka River, a discharge to air (principally odour), and discharges to land via seepage, Julia Street, Pahiatua.

STATEMENT OF SUPPLEMENTARY EVIDENCE OF DR OLIVIER MICHEL NICOLAS AUSSEIL (FRESHWATER QUALITY) ON BEHALF OF TARARUA DISTRICT COUNCIL

23 May 2017

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1. INTRODUCTION

1.1 My name is Olivier Michel Nicolas Ausseil (pronounced “O-Say”).

1.2 I have the qualifications and experience set out in my Statement of Evidence dated 5 April 2017

1.3 My evidence is given in relation to the application for resource consents for the discharges from the Pahiatua Wastewater Treatment Plant (WWTP) lodged by Tararua District Council (TDC).

1.4 I confirm that I have read the 'Code of Conduct' for expert witnesses, now contained in the Environment Court Practice Note 2014 and that both my Statement of Evidence and this Supplementary Evidence have been prepared in compliance with that Code.

2. SCOPE OF EVIDENCE

2.1 My evidence addresses the following matters:

(a) Additional water data recently gathered on Town Creek, the small stream to which the discharge from the Pahiatua WWTP is currently discharged;

(b) Amended wetland and discharge location (as described in Mr McGibbon’s Supplementary Evidence), and implications for water quality and ecological monitoring;

(c) Response to and clarification of, points raised in the evidence of Mr Adam Canning for Fish and Game and Mr Percy for Rangitāne o Tamaki nui a Rua.

(d) Additional comments on the potential effects of the discharge on Dissolved Oxygen (DO) in the Mangatainoka River.

3. WATER QUALITY IN TOWN CREEK

3.1 As I explained in my evidence, the discharge of treated effluent from the Pahiatua WWTP is currently to Town Creek, a small, but permanently flowing tributary of the Mangatainoka River.

3.2 Given the lack of data on Town Creek, I asked TDC to undertake some limited water quality sampling upstream and downstream of the WWTP. The intent of this sampling was to provide some information on:

(a) The effects of the discharge on Town Creek’s water quality; and

(b) The relative inputs of contaminants to the Mangatainoka River from the Pahiatua WWTP and from Town Creek itself.

3.3 Three rounds of samples were collected in April 2017, upstream and downstream of the WWTP and the discharge. Key results are summarised

in Table 1 below. In considering these results, one must bear in mind that they only relate to a short period of time, and are therefore not representative of the full range of environmental (in particular flows) conditions. They do However provide some useful insight.

3.4 The main observations I draw from these results are:

(a) The discharge caused a significant increase in DRP concentrations, from c. 0.035 mg/L to c. 0.300mg/L;

(b) The discharge contributed approximately 90% of the DRP measured in Town Creek downstream of the discharge;

(c) Town Creek presents elevated concentrations of SIN upstream of the WWTP, in the order of 2 mg/L, well in excess of the One Plan target of 0.444 g/m^3. Most of this SIN was under nitrate-nitrogen form

(d) There was an increase in SIN downstream of the discharge to c. 2.3 mg/L. The discharge contributed approximately 14% of the SIN measured in Town Creek downstream of the discharge;

(e) There was an increase in ammoniacal nitrogen downstream of the discharge, although to concentrations well below the One Plan target for chronic (0.400mg/L) or acute (2.1 mg/L) toxicity.

3.5 It is particularly interesting to note that the discharge's SIN inputs to the Mangatainoka are considerably smaller than those from the Town Creek catchment. By contrast, most of the DRP reaching the Mangatainoka River via Town Creek is from the discharge.

Table 1: Summary of April 2017 water quality monitoring results for Town Creek, upstream and downstream of the Pahiatua WWTP.

	DRP (mg/l)		SIN (mg/l)		Ammoniacal-N (mg/l)		*E. coli* (/100mL)	
Date	u/s	d/s	u/s	d/s	u/s	d/s	u/s	d/s
18 April 2017	0.035	0.314	1.93	2.31	0.028	0.085	-	-
21 April 2017	0.036	0.297	2.07	2.37	0.030	0.101	480	390
24 April 2017	0.035	0.329	1.98	2.34	0.023	0.144	130	260

4. AMENDED WETLAND AND DISCHARGE LOCATION

4.1 Mr McGibbon has described an amended design for the wetland and discharge location. I have considered the new proposed discharge location and am satisfied that adequate water quality and ecological monitoring sites can be identified upstream and downstream of the discharge point. The conclusions reached in paragraph 3 of the 12 April S92 response, including the location of the upstream and downstream monitoring sites are unaffected by these proposed amendments.

5. EVIDENCE OF MR PHILIP PERCY

5.1 In paragraph 20 of his evidence, Mr Percy sates that there is a "significant lack of information on the receiving environment and the actual and potential effects of the activity on it".

5.2 With specific regards to the effects of the discharge on the Mangatainoka River, being the main surface water receiving environment for the Pahiatua WWTP, I am of the opinion that Mr Percy's statement is not supported by the facts. There is a significant amount and range of data and information available on which to base a robust assessment of the discharge on water quality and ecology of the Mangatainoka River. The monitoring data include monthly water quality monitoring upstream and downstream of the discharge since 2007, monthly periphyton monitoring since 2008 and annual macroinvertebrate monitoring since 2008.

5.3 In my experience of having been involved, in one capacity or another, in the re-consenting of most WWTPs in the Horizons Region (and a number in neighbouring regions), the level of information available on the effects of the Pahiatua WWTP on water quality and ecology of the receiving environment is actually quite high. In particular, whilst it is common to have upstream/downstream water quality data in relation to point-source discharges, it is unusual to have 8 years of monthly periphyton and annual macroinvertebrate data. Eight years is a considerable time span, which is likely to have covered most, if not all, climatic condition patterns, and provides a strong evidential basis on which to base an assessment of the current effects of the discharge.

5.4 With specific regard to the provisions of S107(1), the following conclusions can be drawn on the basis of monitoring data:

(a) S107(1)(d) (conspicuous change in water clarity or colour): as covered in paragraph 7.5 of my evidence, there is no evidence of any consistent effect on visual clarity since 2015 (based on comparison of upstream/downstream visual clarity measurements). Any current effect on visual clarity is expected to be further reduced as a result of the proposed upgrades (clarification, filtration and wetland). In my opinion, the S107(1)(d) standard is currently met and will continue to be met following commissioning of the upgrades;

(b) S107(1)(g) (significant adverse effect on aquatic life): Macroinvertebrates are commonly considered as an overall indicator of stream ecosystem health. There does not seem to be any disagreement among experts on this point[1]. The One Plan target relative to QMCI change (20% reduction) was specifically developed to provide an applicable numerical translation of the S107(1)(g)

[1]. Mr Canning's Evidence, paragraph 5.

narrative standard. The 8 years of monitoring data consistently show that the effects of the discharge on macroinvertebrate communities are relatively minor and well within the One Plan QMCI target. Again, there does not seem to be any disagreement on this conclusion [2]. In my opinion, the S107(1)(g) standard is currently met and will continue to be met following commissioning of the upgrades.

(c) I am not aware of any particular issues regarding S107(1)(c) (oil or grease films, scums or foams, or floatable or suspended material), and expect this to continue following the proposed upgrades;

(d) Lastly, as I explain in paragraph 7.3 of my evidence, I expect that the effects of the discharge on in-river *E.coli* concentrations to be of no material concern following the full commissioning of the UV plant. I thus expect S107(1)(f) (rendering freshwater unsuitable for consumption by farm animals) to be met following the proposed upgrades with regards to microbiological water quality.

5.5 In paragraph 105, Mr Percy considers that "there is currently insufficient information on the characteristics and effects of the discharges to enable a complete s107 assessment to be completed". Lastly in paragraph 115, Mr Percy states that "there is no certainty as to whether those requirements are likely to be achieved within the reasonably foreseeable future". I disagree with Mr Percy's statement, as set out above.

5.6 However, when considering Mr Percy's paragraph 104 (which paragraph 105 draws on), it appears that the only S107 issue Mr Percy is specifically referring to relates to the potential effects of the discharge on dissolved oxygen levels. I discuss this aspect below in this evidence.

6. EVIDENCE OF MR ADAM CANNING

6.1 In paragraph 7c of his evidence, Mr Canning states that periphyton is the primary driver of poor macroinvertebrate and fish community. As I have explained in relation to the Eketahuna WWTP, this statement is incomplete and somewhat misleading. Whilst it is well documented that excessive periphyton growth can have detrimental effects on macroinvertebrate community, it is but one of the many mechanisms that can affect macroinvertebrate and fish communities. The influence of other factors, such as temperature[3], deposited fine sediment[4] or direct toxicity (e.g. from metals[5]) is abundantly documented in the scientific literature. In the

[2] Mr Canning's Evidence, paragraph 7.a. and Mr Patterson's evidence, paragraph 85.
[3] Quinn J. and Hickey, C. (1990). Characterisation and classification of benthic invertebrate communities in 88 New Zealand rivers in relation to environmental factors. New Zealand Journal of Marine and Freshwater Research, 1990, Vol. 24: 387 – 409
[4]Clapcott, J., Young, R., Harding, J., Matthaei, C., Quinn, J. and Death, R. (2011). Sediment Assessment Methods. Protocols and guidelines for assessing the effects of deposited fine sediment on in-stream values. Research for the New Zealand Ministry for the Environment, Wellington
[5] Hickey, C. Clements, W.(1998). Effects of heavy metals on benthic macroinvertebrate communities in New Zealand Streams. Environmental toxicology and chemistry 17: 2338-2346.

specific context of a point-source discharge from oxidation pond systems, the deposition of particulate organic matter is another well-documented, although often underestimated, cause of direct effects on benthic macroinvertebrate communities[6].

6.2 Mr Canning then goes on to suggest that the maximum periphyton biomass should be maintained below 50 mg/m^2 in order to meet the One Plan "state of the environment" target of an MCI score of 120 (paragraph 7e), and that average SIN should be between 0.02-0.1mg/L and DRP between 0.0039-0.008mg/l to achieve that (paragraph 7f). Mr Canning then compares the current nutrient outputs from the Pahiatua WWTP to these theoretical in-stream concentrations (paragraph 7g).

6.3 In my opinion, here are several flaws with the above reasoning:

(a) It ignores the range of factors other than periphyton that influence the state of macroinvertebrate communities in a river;

(b) The One Plan periphyton target of 120 mg/m^2 was determined specifically to protect the regionally significant trout fishery values the Mangatainoka River is recognised for in Schedule B of the One Plan, and a maximum periphyton biomass of 50 mg/m^2 may not be beneficial to maintaining trout fisheries values. In fact, the most productive trout fisheries often have moderate levels of enrichment, as explained in the technical report underpinning the development of the periphyton Attribute State of the NPSFM (2014)[7]:

"It must first be acknowledged that increased primary production at sites having maximum periphyton biomass greater than 50 mg/m^2 may increase the productivity of salmonid fisheries, with only small reductions in the occurrence of sensitive invertebrate taxa. The MFE guidelines (Biggs 2000b) suggest productive trout fisheries are maintained at maximum chlorophyll a values up to 120 mg/m2 (for filamentous periphyton taxa) and 200 mg/m^2 (for diatom taxa)."

(c) The nutrient concentrations recommended by Mr Canning are very low, in fact comparable to, or less than, concentrations measured at "reference" (i.e. not impacted by human activities) sites across the region. It seems very doubtful that these concentrations are achievable in the Mangatainoka River, especially within the term of the consent applied for. This is particularly the case for SIN, given that in-river SIN inputs are typically mostly from groundwater, and typical long groundwater travel times.

[6]Quinn J. and Hickey, C. (1993), Effects of sewage waste stabilisation lagoon effluent on stream Invertebrates. Aquatic Ecosystem Health 2: 205 –219

[7] Snelder T., Biggs B., Kilroy C. and Booker D. (2013) National Objective Framework for Periphyton. Prepared for the Ministry for the Environment. November 2013. p10.

(d) The comparison of the WWTP's current inputs to the nutrient concentration limits recommended by Mr Canning (at paragraph 7g) are therefore of little practical relevance to this consent application.

6.4 In Paragraph 3 of his Supplementary Evidence (last sub-paragraph), Mr Canning states that "*the proposal were to change (from its current form) in a way that substantially reduces phosphorus loading (especially during low flows), then substantial reductions in periphyton biomass could also be expected (especially during low flows)*". I find this statement confusing, given that the proposal does in fact include phosphorus removal, with an expected 3-fold reduction compared to current performance after full commissioning of the upgrades[8].

6.5 However, on the principle of the argument, I agree with Mr Canning: given the current nutrient profile of the Mangatainoka, it is likely that any effect of the discharge on periphyton growth is primarily driven by phosphorus. Consequently, reductions in phosphorus in the discharge are likely to lead to a reduction in the degree of effects of the discharge on periphyton growth. The WWTP, and in particular its phosphorus removal, has not yet been fully commissioned, which means that the periphyton data available relates to the effects of the discharge prior to commissioning of the upgrades, and thus that improvements are expected from this baseline.

6.6 I note that Mr Canning has assumed[9] that the nutrient load estimates presented in the S92 response dated 12 April 2017 include the potential improvements from the proposed upgrades (last page, second-to-last paragraph). This is incorrect, the nutrient load estimates provided in the section 92 response all relate to current performance of the WWTP. Further improvements, particularly with regards to DRP concentrations are expected and will have to occur in practice in order to comply with the proposed end of pipe standard.

7. DISSOLVED OXYGEN

7.1 In his evidence, Mr Patterson points to continuous Dissolved Oxygen (DO) monitoring data held by Horizons for the "Mangatainoka at Town Bridge" monitoring site annually since 2012. Mr Patterson also states that the periphyton biomass and cover are similar between this site and the downstream of the Pahiatua WWTP discharge site, suggesting DO conditions may be exacerbated downstream of the discharge relative to upstream. In paragraph 2(i) of his evidence, Mr Canning states that "increased nutrient inputs by the WWTP would likely exacerbate existing diurnal fluctuations and further reduce ecological health". This issue is also

[8] As explained in paragraph 7.5(c) of my evidence dated 28 April 2017. In fact, this assessment is likely to be somewhat pessimistic as it is based on a comparison of the current, measured concentration with the proposed standard. The actual DRP concentration in the effluent will have to be less than the proposed standard in order to comply.
[9] Mr Canning's supplementary evidence, last page, second to last paragraph.

discussed in the Planning reports of Mrs Morton and Mr Percy, as discussed above.

7.2 I have since sighted graphs relating to the continuous monitoring data (provided by Mr Patterson). The patterns I have seen are, in my opinion, consistent with the effects of active in-stream photosynthesis. Put in simple terms, plants release oxygen during the day, leading to DO "peaks" during the day and consume oxygen during the night, leading to DO "troughs" during the night. This is a normal and natural pattern seen in most streams and rivers. However, excessive biomass can lead to an increase in the amplitude of the diurnal pattern (i.e. larger peaks and troughs).

7.3 I note that DO was not raised as an issue of concern in either of the S92 requests for further information, or in the monitoring memo jointly produced with Horizons' experts (refer to appendix B to my evidence), in spite of the continuous DO data being available since 2012. The issue was only raised a few weeks before the hearing, when it was too late to undertake any meaningful monitoring[10] to assess the significance of the potential issue.

7.4 I also note that it would be unusual to require continuous DO data to be collected as part of a resource consent application. Requirements to measure continuous DO are sometimes imposed by way of consent conditions, but, in my experience, this is only done rather infrequently, and only when significant issues with either the organic load of the discharge or its effects on periphyton growth are identified. Continuous DO monitoring is relatively complex and expensive.

7.5 Conceptually, I agree with the mechanism of potential effects described by Mr Patterson and Mr Canning, i.e. that if the discharge causes a significant increase in periphyton growth, it may cause an increase in the diurnal peak/though patterns in DO concentrations, which may in turn cause adverse effects on aquatic life.

7.6 However, and importantly, this describes a potential effect, and does not provide any indication of the likeliness or scale of any actual effects. For actual, significant adverse effects to occur, the discharge would have to (1) cause a significant increase in periphyton growth and (2) that increase would have to be large enough to cause a significant change in DO patterns in the river and (3) the change in DO concentrations (in particular during the night-time "troughs") would have to be large enough to cause a significant adverse effect on aquatic life.

7.7 Any condition requiring continuous DO monitoring should, in my view, follow the above logical steps, i.e. require an assessment of whether there

[10] Even if monitoring could have been organised in such short timeframe, it was already too late in the season, as continuous DO monitoring should be undertaken during low flow conditions to capture periods of higher periphyton biomass.

are any differences in DO concentrations between upstream and downstream of the discharge, whether these differences are significant, and whether they are likely to cause a significant adverse effect on aquatic life.

7.8 No upstream/downstream" monitoring data are available on which to base a direct assessment of the effects of the historical or current discharge on DO concentrations in the river; however, existing water quality and ecological data can provide some insight on the current level of effects:

(a) Whilst the historical/current discharge causes a mild increase in periphyton data, this has not translated into any more than minor effects on macroinvertebrate communities, taken as a key indicator of ecological health;

(b) The DO data referred to by Mr Patterson relates to the Town Bridge site, located some 1.5km upstream of the discharge point. This site has more periphyton than the site located immediately downstream of the discharge point[11]. It is therefore likely that any effect of the discharge on DO would be less than those measured at the Town Bridge site.

7.9 As explained above, the proposed effluent standards will ensure at least a 3-fold reduction in the DRP loads discharged to the River. This is likely to result in a significant reduction in the effects of the discharge on periphyton growth compared to the current situation. Any effects on DO concentration should also be reduced.

Dr Olivier Michel Nicolas Ausseil

23 May 2017

[11] Based on Mr Patterson's Table 14