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memorandum

TO	Sophia Edmead	FROM	Oliver Hunt, Cameron Jasper, Neeraj Pratap, Deborah Ryan, Laura Drummond, Daryl Irvine & Hilary Lough
	Hawke's Bay Regional Council	DATE	25 May 2021
RE	Takapau WWTP Discharge Consent Review		

1.0 Introduction

The Central Hawke's Bay District Council (CHBDC) currently operates a pond system for wastewater treatment servicing the township of Takapau with discharge via a wetland drain to the Makaretu River. CHBDC is applying for replacement consents which include a change to the existing wastewater management systems for Takapau. Specifically the application seeks the following consents for a term of 35 years:

- *Discharge Permit to discharge treated wastewater to land*: treated wastewater discharge to land relating to a low rate land application system (irrigation).
- *Discharge Permit to discharge treated wastewater to land where it may enter water*: treated wastewater discharge to land where it may enter water relating to a continuation of the existing surface water discharge and the future intermittent indirect surface water discharge via a high rate land passage system.
- *Discharge Permit to discharge aerosols and odour to air*: discharge of aerosols and odour to air associated with the receipt, treatment, storage and discharge of wastewater from the Takapau Wastewater Treatment Plant and land application system (irrigation).
- *Land Use Permit*: use of production land within the Tukituki River catchment that does not comply with Rule TT2 of Plan Change 6 to Hawke's Bay Regional Resource Management Plan – Tukituki River Catchment.

The CHBDC submitted the *Takapau Treatment Plant Discharge Resource Consent Application and AEE* (the AEE, April 2021) in support of the application. Pattle Delamore Partners has been engaged to review the following aspects of the application:

- Treatment, irrigation, and soils;
- Groundwater;
- Surface water and ecology;
- Odour and air; and,
- Natural hazards.

The information in the AEE and supporting documentation has been relied upon for this review.

2.0 Treatment and Discharge

2.1 Activity Description

CHBDC owns and operates the Takapau wastewater treatment plant (WWTP) located north of Takapau and adjacent to the Makaretu River. The WWTP currently discharges treated effluent to the Makaretu River via a wetland. The proposed changes to the system involve construction of a high rate land passage system (HRLP) to replace the existing wetland discharge and to install a centre pivot irrigator to apply treated wastewater to land.

The applicant has proposed three stages for the consent:

1. From commencement of the consent to three years following commencement the existing wetland/surface water discharge to the Makaretu River may be maintained. Up to 100% of treated wastewater will be discharged to the Makaretu River.
2. From up to three years after commencement to five years after commencement, at least 5 ha of land will be irrigated with wastewater. Approximately 40% of treated wastewater is predicted to be discharged to the Makaretu River in an average year.
3. From five years after commencement of the consent, at least 20 ha of land will be irrigated with wastewater. Approximately 10% of the predicted 2048 flows is expected to be discharged to the Makaretu River in an average year. 2048 flow rates are based on predicted wastewater volumes estimated from monitoring of the current influent flowrate and population increase forecasts.

2.2 Treatment

The applicant has provided 20 sample results for nutrients in the effluent in addition to the large number of samples for BOD, TSS and faecal coliforms. Minimal details have been provided on the construction or design of the existing pond-based treatment system. Based on the sampling results the pond appears to be generally effective at removing a reasonable proportion of nutrients, albeit with some large spikes of ammoniacal nitrogen. However, the TSS and faecal coliform levels, measured in 238 and 356 sampling events respectively, are higher than might be expected for a well performing pond-based system. The applicant should provide further details on the design, construction, and treatment capacity of the WWTP, including at the 2048 predicted flowrates.

2.3 Irrigation and Leaching

Generally, the proposed wastewater hydraulic and nutrient loading rates over the irrigated area appear to be suitable. However, the proposal to maintain the ability to supplement wastewater nutrient application with synthetic fertiliser over the irrigated area (modelled up to 250 kg N/ha/y) means the overall leaching is reasonably high. The proposed leaching from the irrigation area (a target loss of 95 kg N/ha/y) is higher than the rate of wastewater nitrogen application (84 kg N/ha/y) as per Sections 4.5 to 4.7 of the LEI Land AEE (2021:T:D:10). Despite the reduction in direct discharge to surface water, the use of supplementary fertilisers results in only a net 10% decrease in total nitrogen load on the catchment. The cropping and grazing regimes proposed do not appear to maximise plant nitrogen uptake or minimise leaching. A ryegrass pasture cut and carry operation (which is included as an option together with cropping in table 4.10) with supplementary fertiliser only as required for plant health would be expected to result in significantly lower leaching rates.

We note that the majority of land to be irrigated is Class 3 land with a permitted nitrogen leaching rate of 24.8 kg N/ha/y as per Rule TT2 of the Tukituki Plan. Of the 26 ha of total irrigated land, 5.65 ha is classed as Class 2 land which has a permitted nitrogen leaching rate of 27.1 kg N/ha/y. The proposed leaching

from the irrigated area is up to 95 kg N/ha/y with the currently unirrigated areas bringing the average leaching down to 60 kg/ha/y. These rates are significantly above the permitted baseline, resulting in the classification of a non-complying activity. Furthermore, water permit AUTH-125346-01 allows for freshwater irrigation over the entire 42.4 ha to 2031. If areas outside the wastewater application area are irrigated, this is likely to further increase leaching from the site. The existing groundwater monitoring on the downgradient borders of the site shows high levels of nitrate-nitrogen in shallow groundwater. This is discussed further below, however, the proposed irrigated farming regime is predicted to increase leaching by approximately 25%, which is expected to further exacerbate the poor groundwater quality.

Generally, the proposed wastewater irrigation rates appear to be well suited to the land. However, PDP has concerns over the proposed cropping/grazing regimes instead of solely a pasture cut and carry system as well as the use of potentially large quantities of supplementary nitrogen fertiliser causing high leaching rates within the irrigated area. Further information has been recommended to be requested below to understand the alternatives available, the rationale for selecting the proposed systems as the best practical option and the potential for additional improvements.

2.4 Soils

Based on the information provided we agree with the applicant that the risk of adverse effects on soils due to wastewater irrigation is likely to be low. However, the reports requested below will provide further useful information on the soils and proposed farming practices and the assessment of a low risk of potential effects on soils may need to be reconsidered following the s92 request.

2.5 Clarification and Further Information for Treatment and Discharge

PDP recommends the following information is sought in relation to the treatment and discharge aspects of the proposal:

- The following reports which have been mentioned and information provided in them relied upon but are not attached to the AEE. Please provide copies of the following reports:
  - Evaluation of Soils to Receive Takapau Wastewater (LEI, 2020:T.B15)
  - Best Practicable Option Report (LEI, 2021:T:C.12)
  - Current Farming System (LEI, 2021:T:B.13)
  - Existing/Future Farming System and OverseerFM Analysis (LEI, 2021:T:C.14a)
  - Drummond Overseer & Planning Assessment (LEI, 2021:T:C.14b)
- A summary and comparison of the cut and carry regime mentioned in LEI, 2021:T:C.14a versus the proposed cropping and grazing 'business as usual' regime.
- If different to the cut and carry regime mentioned in LEI, 2021:T:C.14a, provide information on leaching from ryegrass pasture cut and carry only system implemented across the entire irrigated area with no/minimal supplementary fertilisers. Compare the leaching associated with this ryegrass cut and carry regime to the proposed grazed/cultivated regime.
- An assessment of the land area and storage volume required to irrigate 100% of the wastewater to land. This should include an assessment of available land near the WWTP, including the 11 ha of pivot area which has not been included in the leaching assessment, and evidence why it is not practical to irrigate a larger area of land available near the WWTP. This assessment should consider the potential to irrigate the areas of the site not covered by the pivot with alternative methods, e.g., k-line, post-mounted sprinklers etc.

- A description of the arrangement between CHBDC and the landowners (Drummond and Dalby) including any legal obligations for WW irrigation to continue if farm management changes or the land is sold?
- Provide a description and concept plans of the proposed HRLP system including potential treatment capacity, if any. Describe what is meant by an indirect discharge to surface water. Will the wastewater pass through land before reaching surface water?
- Evidence it is feasible to install the centre pivot irrigator over 4-6 m high terraces. 2021:T:D.10 states recontouring may need to occur while 2021:T:C.15 states no recontouring will be required.
- An explanation for the staggered approach to irrigation area. Why is it not possible to irrigate the full 20 ha area if 5 ha can be irrigated with a centre pivot? Will the pivot only operate over a limited arc during Stage 1 with the remaining 25 ha unirrigated?
- Provide information on the existing WWTP such as volume, aeration capacity, design flowrate/population served and an assessment of the existing WWTP's capacity to treat 2048 flows to the effluent quality requirements.
- Has there been an assessment to identify leakage from the pond? Provide details of the pond design including the liner (if present), seepage rate, and conclusions from a drop test or downgradient wells?
- Please confirm the dwellings to the south of the application area are on a community supply or supplied by rainwater tanks, rather than supplied by bores.
- Information on causes of high ammoniacal nitrogen and TSS effluent concentrations reported, e.g., high influent flowrate, high BOD load, septage receival.
- Water Permit AUTH-125346-01 allows for irrigation of the 45 Burnside Rd block and the entire 4292 SH2 block. Section 4.6 of the LEI Land AEE references use of a lower leaching rate from the 4292 block which reduces average leaching from 95 kg N/ha/y from the irrigated area to 60 kg N/ha/y for the combined 45 Burnside Rd block and 4292 SH2 block area. Will AUTH-125345-01 be surrendered or varied prior to the irrigation of wastewater to exclude these areas or is there potential for future increases in leaching to occur as a result of new irrigation? Comment on the potential for increases in total and average areal leaching as a result of irrigation with freshwater on the remaining land area.
- If 90% of the 2048 wastewater will be irrigated, what percentage of the flows at the start of stage two will be irrigated?
- Consider the capacity of the soils to receive irrigation with up to 50 mm of rainfall within the previous 24 hours but avoiding saturation. What percentage of wastewater could be irrigated under this regime (2048 flows)? Could this reduce the overall environmental impact on surface water and groundwater?
- It is stated that UV disinfection will be installed for flows from the treatment pond. Please provide the following information:
  - Details of the position of this treatment system in relation to the existing oxidation pond, the proposed storage pond, the HRLP discharge and the irrigation discharge;
  - Which stage of the consent the UV systems will be installed in; and,
  - A PFD of the system.

- Please provide comment on the expected *E. Coli* and faecal coliform concentrations in the effluent applied to land and discharged to the HRLP. Consider the high levels of TSS, E. Coli, and faecal coliforms recorded in the effluent monitoring data and the proposed UV disinfection.
- Provide further comment on the high TP groundwater concentrations recorded in the monitoring bores. This should include:
  - Comment on the high solids concentrations reported in some samples;
  - Comparison to DRP concentrations measured.

3.0 Water Quality

3.1 Groundwater

The applicant has provided an assessment of the interpreted geologic and hydrogeologic setting in the southern Ruataniwha Plains relevant to the existing discharge to the Makaretu River and the proposed discharge of wastewater to land on the alluvial terrace of the Makaretu River.

Six shallow (up to 5.8 m deep) groundwater level monitoring piezometers were installed within and around the site in 2020. The installation of the piezometers shows that the older (Late Pleistocene) gravelly alluvium on the south side of the site (on the upper terrace above the extent of the lower terrace of younger, Holocene age, gravelly alluvium bounding the Makaretu River) is noted to have higher clay content and interpreted to have relatively lower hydraulic conductivity as evident from the slow recovery of groundwater levels observed after purging. The piezometers located closer to the Makaretu River within the lower terrace of younger alluvium on the northern side of the site show fast recovery after purging.

These observations appear to be generally consistent with what could be expected according to the geology previously mapped by GNS (Lee, et al., 2011, Geology of the Hawkes Bay Area), which designates the younger alluvium as poorly consolidated river gravels with sand and mud and the older alluvium as poorly to moderately sorted river gravels with sand and silt with some minor fan deposits and loess.

Infiltration test results provided also provide some indication of hydraulic conductivity within the upper metre of soil, which also indicate generally higher permeabilities on the lower, younger, terrace and lower permeabilities on the upper, older, terrace.

The applicant has assessed groundwater levels/elevations within and around the site and determined a general west to east groundwater flow direction within the shallow aquifer system. The site is located within the Makaretu River catchment within the greater Tukituki River catchment. A previous study (Johnson, 2011) is presented by the applicant that suggests that the Makaretu River loses to groundwater across the extent of the site and to its confluence with the Tukipo River. This study also suggests that the Porangahau Stream gains from flow from shallow groundwater in the vicinity of Takapau to the south of the site down to its confluence with Maharakeke Stream, which also is interpreted to gain from shallow groundwater up to its confluence with the Makaretu River in close vicinity to the confluence with the Tukipo River above. The applicant's conceptual hydrogeologic model with groundwater flow directions interpreted from groundwater elevation data and river/stream elevation data corroborates the findings of the previous study above, where shallow groundwater in the vicinity of the site is interpreted to generally flow east-southeast (towards the gaining streams noted above and away from the losing/mounded reach of the Makaretu River also noted above). The conceptual model and interpreted groundwater flow directions provided suggest groundwater continues to flow east beyond the Maharakeke Stream, however this is inconsistent with our understanding of the Ruataniwha Basin aquifer system where shallow and deep groundwater flows are constrained by the underlying bedrock associated with the ranges to the west and, in the long term, emerge as surface water/underflow through the two main surface

water/groundwater outlets of the aquifer basin where the Tukituki River and Waipawa River are incised through the bounding bedrock.

The applicant has reasonably estimated a west to east lateral hydraulic gradient of about 0.005 m/m and interpreted groundwater flows predominantly east out of the site area. Along the south side of the losing reach of the Makaretu River near the site, some groundwater flows are interpreted to be locally southeast, which can be reasonably expected due to evident mounding effects in the vicinity of river. Overall, groundwater within and around the site is expected to flow towards the east-southeast (away from the Takapau Water Supply Bore Source Protection Zone) and in the long term emerge as surface water and/or underflow within the gaining surface waterways noted above. The estimated groundwater elevation contours provided also generally bend upstream (suggesting gaining conditions) along the extents of the Tukipo River and Porangahau Stream estimated as gaining reaches by the previous study (Johnson, 2011). Given the assessment provided of surface water and groundwater elevations and the previous study noted above, at present we expect that the Porangahau Stream is the most likely receiving environment of the wastewater discharge to ground in the long term, although it is possible that more information may indicate that at times the Makaretu River could gain from groundwater given the shallow depth to groundwater observed at the site.

The proposed wastewater irrigation area is expected to increase the current nitrogen leaching (2,097 kg/yr, current Stage 0 to 2,530 kg/yr Stage 2 with wastewater irrigation) into the shallow gravelly aquifer system where groundwater flows generally east-southeast and in the long term eventually is expected to emerge within the Porangahau Stream/ lower Maharakeke Stream. The applicant has noted no clear gradients, but there is some evidence of downward vertical gradients between the shallow and deep groundwater systems around/downgradient of the site according to the HBRC well database (such as the deep bore 4838 downgradient of the site with an initial static water level of 18 m bgl further described below) compared to shallower groundwater levels around the site taken from the six shallow (up to 5.8 m deep) piezometers. Given the significant sequences of confining strata, the system is interpreted as highly vertically anisotropic. The significance of this is that nitrate-nitrogen within the shallow aquifer system arising from the discharge could migrate downward to deeper groundwater, emerging in the long term in the down-gradient streams unless denitrification occurs.

The applicant has assessed impacts to bores within 2 km of the discharge. The only known bore directly downgradient of the proposed discharge within 2 km is bore 4838 (800 m east of the proposed discharge) with a top screened depth of 80 m under a highly vertically anisotropic sequence of multiple gravels, claybound gravels, and clays. We have recommended in the previous section that further information be provided on the potential for other bores at down-gradient dwellings.

Bores within around 2 to 2.5 km from a wastewater discharge have greater potential to be impacted by pathogens (although the extent of impacts from this specific discharge will be reduced by the treatment, proposed UV and discharge via irrigation). An assessment of effects on pathogens in soil is included in the LEI Land AEE (2021:T:D:10), but this refers to the Beca AEE for groundwater effects, and that does not appear to specifically cover groundwater effects from pathogens, although a conclusion is made that there are no down-gradient receptors.

All down-gradient bores may be impacted by a small degree as a result of the contribution to nitrate-nitrogen concentrations in groundwater. Groundwater quality data provided by the applicant for the six monitoring piezometers around the site indicates that shallow groundwater already has elevated nitrate-nitrogen on the south and east side of the site (17124 at 18.2 mg/L and 17126 at 13.1 mg/L). Piezometer 17052 located within the transitional area between the younger and older alluvium shows some impacts at 5.52 mg/L nitrate-nitrogen while the other monitoring piezometers located along the south side of the Makaretu River show relatively lower concentrations that progressively increase in the downstream direction (17125 at 0.57 mg/L, 17053 at 0.64 mg/L, and 17054 at 1.4 mg/L). The nitrate-nitrogen

concentrations above may be influenced by dilution effects occurring in the vicinity of the losing Makaretu River in the younger alluvium.

Groundwater deeper than 10 m at and downgradient of the site appears to already be impacted by nitrate-nitrogen with the current observations (at slightly shallower depths) exceeding the limits in Tukituki PC6 Policy TT2, shown below.

POL TT2 GROUNDWATER QUALITY LIMITS

1. For groundwater Hawke's Bay Regional Council will:

   (a) Manage the adverse effects of activities likely to affect the quality of groundwater located 10m or more below ground level in accordance with the limits for aesthetic, organic and inorganic determinands; *Escherichia coli* and nitrate-nitrogen set in Table 5.9.2;

Table 5.9.2: Groundwater Water Quality Limits and Indicators Applicable 10m or More Below Ground Level in Productive Aquifer Systems

Aesthetic determinands	*E. coli*	Nitrate-nitrogen	Nitrate-nitrogen Indicator	All other determinants
Guideline value for any aesthetic determinand [Drinking-Water Standards for New Zealand (DWSNZ)]	Maximum concentration of Escherichia coli per 100 millilitres	Maximum 95th percentile concentration of nitrate-nitrogen (mg NO_3-N /L)	Maximum annual average concentration of nitrate-nitrogen (mg NO_3-N /L)	All other inorganic or organic determinands of health significance [DWSNZ]
Within guideline	<1	11.3	5.65	Maximum acceptable value (MAV)[25]

3.1 Clarification and Further Information for Groundwater

In addition to confirmation of down-gradient bores (outlined in the previous section and which may require further assessment depending on whether further bores are identified) we recommend that the applicant provide further information on effects on down-gradient drinking water supply bores with respect to nitrate-nitrogen, including a comparison of the groundwater impacts with the limits in Table 5.9.2 and pathogens, allowing for a degree of uncertainty and variability in groundwater flow directions.

3.2 Surface Water

As discussed in the Surface Water Assessment of Effects report, the proposed approach will result in a reduction in contaminants (in particular phosphorus) entering the Makaretu River which is a positive outcome as past monitoring has shown increased downstream concentrations, in particular under low flow scenarios. PDP's groundwater review indicates that groundwater beneath the proposed irrigation areas is likely to travel in a east-southeast direction and resurface within gaining reaches of the Porangahau Stream. As the AEE states that *"The Tukituki River is considered to be the receiving environment for the diffuse discharge from land"* therefore, there is concern that effects to receiving environments have not been fully considered.

Nutrient concentrations in the Porangahau Stream are higher than those recorded in the Makaretu River, with long term surface water quality monitoring results at Porangahau Stream (at Oruawharo Road east of Takapau), where groundwater gains are interpreted to possibly start (as described above) and at its downstream extent (upstream of the confluence with Maharakeke Stream), showing an increase in total nitrogen in terms of a 5-year median from 1.395 to 3.8 mg/L (LAWA). This suggests that as this stream gains from groundwater along its extent downgradient of the site that its quality becomes degraded.

Given the assessment of groundwater/surface water interactions above, it is possible that in the long term, that the majority of the diffuse discharge would be received by Porangahau Stream across its gaining/downgradient extent, rather than the Makaretu River. As the Porangahau Stream upstream of the confluence with Maharakeke Stream is above the NPS-FM (2020) national bottom line for total nitrogen (used as a proxy for nitrate) and DRP is approaching the Attribute Band D, conditions need to be either maintained or improved. There is concern that the proposed groundwater leaching will contribute to a

cumulative increase in nutrients at this site which may not be considered less than minor, albeit the relative contribution from the site may be relatively small.

Nitrate is the primary nutrient of concern, due to the relatively low reduction across stages, as shown in the table and figure provided by BECA in the application.

Table 9.1: Total Nitrogen and Total Phosphorus mass load calculations for each development stage with comparisons to Tukituki at Tapairu and Tukituki at Red Bridge HBRC monitoring locations (Beca, 2021: T:D.25)

Discharge Scenario	Total Nitrogen	% of Tapairu	% of Red Bridge	Total Phosphorous	% of Tapairu	% of Red Bridge
Stage 0 (current)	2.95 T/yr	0.39	0.29	0.23 T/yr	1.33	0.61
Stage 1	2.81 T/yr	0.37	0.28	0.09 T/yr	0.52	0.24
Stage 2	2.63 T/yr	0.35	0.26	0.05 T/yr	0.26	0.12

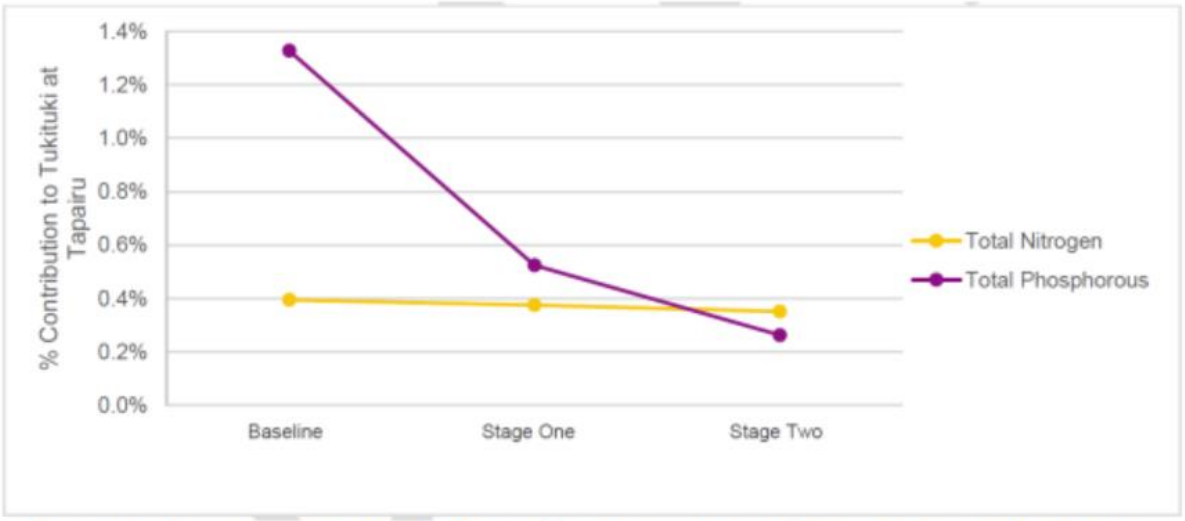

Figure 9.1: Downstream contaminant mass load percentage contribution to Tapairu Bridge HBRC Monitoring Location for each development stage (Beca, 2021: T:D.25)

3.1 Clarification and Further Information for Surface Water

Further information is requested for the following:

- An assessment of effects regarding Porangahau Stream water quality.
- Provide evidence Tukituki at Tapairu Rd and the Makaretu River at Burnside Rd (WWTP) and/or SH50 are strongly correlated.
- Monitoring of surface water quality is only proposed for the months of November, March and July. Provide reasoning for why this is not to be conducted monthly to determine current state and track trends.
- The proposed irrigation area (as shown in Figure A1: Takapau Site Location) is located along the right bank of the Makaretu River. An irrigation buffer distance of 20 m to sensitive receiving environments is provided in the land discharge concept design report (Section 7.2) but is not specific to the river and is not discussed in the surface water report or the conditions. Further details are requested on the suitability of this buffer.

- Aerial imagery shows a drainage channel along the toe of the terrace and through the proposed irrigation areas. An assessment is required to determine potential effects of irrigation to land to this channel, as well as its receiving environment.
- The Tukituki Plan Change (RRMP PC6) requires water quality targets to be achieved by 1 July 2030 and the consent term requested is 35 years. The proposed reduction in nitrogen load to the catchment is approximately 10% according to Table 6.8 in the CHBDC AEE Summary. Please provide comment on whether this is appropriate given the target for the Middle Tukituki River and Tributaries above Tapairu Rd is 0.8 mg/L DIN and the 5-year median for the Tukituki at Tapairu Rd was 1.49 mg/L DIN (2014-2019).
- An assessment of effects on all downstream drinking water supplies, including shallow groundwater supplies connected to the receiving surface waterways. This should include a consideration of mitigation measures in the event of a system failure (i.e., pond failure).

3.2 Ecology

Review of the Surface Water Assessment of Effects report indicates that the existing discharge is not having an environmentally meaningful effect on macroinvertebrate communities or levels of periphyton in the Makaretu River, and it is expected that the reduced direct discharge proposed will result in an improvement to instream ecological values. Proposed consent monitoring of the Makaretu River upstream and downstream of the discharge point are considered appropriate, based on the information currently supplied, and will be reviewed once staged discharge volume reductions are implemented.

3.1 Clarification and Further Information for Ecology

Further information is requested for the following, related to the surface water comments above:

- An assessment of effects regarding ecological values in the Porangahau Stream from an increase in diffuse discharge.
- No detail is provided on the current overland flow path and wetland, comments on current values and effects from the proposed staged reduction in direct discharges are requested.
- No detail is provided on the current ecological values of the drainage channels that are present within the proposed irrigation land and potential effects to this receiving environment.

4.0 Air Quality

4.1 Assessment Summary

The AEE includes an assessment of effects on air quality. Appendix G of the AEE is a report by Lowe Environmental Impact (LEI) that also considered the effects of discharges to air titled *Assessment of Environmental Effects: Land* (the LEI report, 2021).

The existing oxidation pond system is described in the AEE as 2 km to the northeast of Takapau township. Two land parcels are being sought for irrigating the treated wastewater, as illustrated in Figure 3.2 of the LEI report. The applicant identifies that the WWTP has no dwellings within 400 m of the plant boundaries and that the nearest dwelling to the edge of the irrigation area is 120 m away.

Section 9.7 of the AEE addresses the effects of the proposal on air quality. The applicant identifies that odours from treated wastewater are generally low intensity; and that if odours are apparent then this indicates a significant process failure. PDP agrees with this assessment. The applicant states that the operators will become aware of process failures and will generally be able to remedy these before odour is apparent. While PDP agrees this is likely to be the case, we would seek that further

information be provided to identify the likely failure scenarios, and contingency actions/procedures that will be followed.

Section 5.6 of the LEI report considers the potential effects of the discharges to air from the land irrigation as from aerosols and odour. LEI reports that the pond has been in operation since 1982 and that there are no known complaints of odour during that time. LEI identifies that sludge management is needed to ensure that anaerobic conditions do not occur, and that sludge management could result in temporary odours for which consents would be sought, if necessary, at the time of any desludging activity.

LEI identifies that an additional pond is proposed for this proposal to store/balance wastewater. LEI indicates that the pond will be deeper and therefore could be prone to anaerobic conditions. LEI identifies the need for turnover of storage pond wastewater with 5 days storage indicated as a likely maximum. LEI considers the risk of odour from the balance pond is low. PDP agrees that a balance pond containing treated wastewater has low potential for odour due to the turnover of wastewater, natural aeration of the surface and the relatively low strength (BOD/COD) of treated wastewater.

LEI identifies that irrigation of wastewater will have minimal odour when irrigated in an aerobic state. LEI identifies the potential that wastewater may become anaerobic if it sits in irrigation lines for long periods during events, and states that if this is the case flushing with clean water through the lines will be undertaken. It is unclear from the description whether the intention is for this to be done directly after irrigation for events where the applicant is aware that no irrigation will take place for a "long period;" or if the intention is to flush with water in the event that lines have been sitting unused for a long period.

4.2 Mitigation

Mitigation measures are identified in the AEE and the LEI report for odour and aerosols as follows:

- *Maintain aerobic conditions in the treatment and storage ponds;*
- *UV treatment of wastewater to reduce pathogen levels;*
- *Adoption of separation distances, being:*
  - *20 m from property boundaries;*
  - *150 m from the nearest residential buildings, public place and amenity area where people congregate, or education facility;*
  - *50 m separation distance from the sites of cultural significance known to exist at the time of developing the concept design;*
  - *50 m from rare habitats, threatened habitats or at-risk habitats; and*
  - *20 m from surface water including the Makaretu River.*
- *The irrigation Site is located in a down-wind position from the township based on the predominant wind directions;*
- *The selection of an irrigation system (system pressure and nozzle size) to produce droplets greater than 200 µm in size to limit spray drift; and*
- *Automatic shut-down of irrigation when wind speed reaches an average of 4 m/s in the direction of dwellings within 300 m of the irrigation wetted radius (noting that the wetted radius can be shortened by using less sprinklers on the pivot boom), and shut-down of irrigation when wind speed reaches an average of 12 m/s in any direction.*

PDP is in general agreement that these proposed measures are appropriate for managing the nature and scale of the potential effects of air discharges from normal operations to less than minor levels.

4.3 Proposed Conditions related to Air

Appendix E of the AEE sets out the proposed conditions of consent. Selected conditions relevant to managing air discharges are identified below:

- Condition 9 provides a minimum 150 m separation distance of the treated wastewater discharge when a building on a neighbouring property is downwind**.**
- Condition 16 is a standard effects-based condition relating to odour and spray drift.
- Condition 17 relates to installing an on-site weather station that will assist with managing the irrigation in accordance with the proposed mitigation.
- Condition 18 is to address the potential for aerosols containing bacteria to impact beyond the site. The basis for the condition is not described in the AEE, although PDP understands similar conditions have been applied to limit the irrigation of wastewater with higher bacterial loads to minimise the potential for health effects. PDP notes that the condition has an upper wind speed of 10 m/s whereas the mitigation described in the AEE has an upper wind speed of 12 m/s.
- Condition 47 requires an operation and maintenance plan, which addresses key elements of the management system relating to air discharges e.g. part (h) flushing of irrigation lines and (i) ensuring treated wastewater remains aerobic.
- Conditions 58 to 60 address a management system for recording and responding to any complaints, including as may be relevant for air discharges.

PDP is in general agreement that the proposed conditions of consent are appropriate to manage the effects of the discharges on air quality to less than minor levels.

4.4 Clarifications and Further Information for Air

PDP recommends the following information is sought in relation to the proposal and the potential effects on air quality:

- The applicant identifies that operators will become aware of process failures and take remedial action before odour becomes apparent. Could the applicant please provide information of the possible failure scenarios that could result in odour and the contingency actions or procedures that will be followed to avoid or minimise an adverse odour event. Please include measures to avoid ponding and wastewater dissolved oxygen monitoring and management.
- Please clarify how/when the need to flush irrigation lines to manage odour will be undertaken, and in particular, what constitutes a "long period" as referred to in the Appendix G?
- Please provide information and/or an explanation to support the derivation of the parameters for proposed Condition 18.

5.0 Natural Hazards

5.1 Assessment Summary

The applicant has provided an assessment of effects on natural hazards in section 9.9 of the AEE. The applicant has stated that the operation of the current Takapau discharge will not have an impact on natural hazards, however, natural hazards may impact on the system.

The most significant impact from natural hazards has been identified as flooding. The lower terrace is within the HBRC 1 in 100 year (1% annual exceedance probability) flood plain. The impact of flooding in the lower terraces is expected to be inundation of the irrigation area. It is stated that easily applied mitigation measures will allow the area to be quickly remediated. These measures or what will require remediation have not been specified.

The proposed primary storage pond is located in the flood plain, north east of the existing pond. The applicant has stated that numerous control measures to ensure sufficient protection can be applied and that these will be addressed as part of detailed design and land designation process. The measures and protection of the bund during a flood event have not been specified.

During periods of high river flows, the applicant has stated that discharge through the HRLP system can be used while the irrigation area is being remediated. Figure A1 of Appendix A shows the existing overland flow path discharging to the Makaretu River however, the location of the HRLP has not been explicitly shown. In a flood event, the risk to the HRLP has not been assessed.

5.2 Clarification and Further Information for Natural Hazards

PDP recommends the following information is sought in relation to the proposal and the potential effects on natural hazards:

- The applicant should provide an assessment of the impact of flooding on the irrigation areas and identify the proposed mitigation measures and remediation and the likely timeframe for these measures.
- Control measures to protect the storage pond from flood flows have not been provided. Could the applicant please provide proposed measures (e.g. bunding around the pond) which will be incorporated to protect the storage pond during a flood event.
- Identify the location of the HRLP and provide an assessment of effects if flood water would inundate the system.

6.0 Summary

PDP has reviewed the application and proposed activities. The application provides good detail in many areas, however, some key information on the consideration of alternative discharges and farming systems has not been provided. Furthermore, an assessment of effects on the Porangahau Stream has not been provided.

A range of clarification items and further information have been requested under each section of the review. This information should be requested from the applicant to provide a better understanding of the proposed systems and potential environmental effects.

7.0 Limitations

This memorandum has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Hawke's Bay Regional Council and others (not directly contracted by PDP for the work), including Lowe Environmental Impact Ltd and Beca Ltd. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the memorandum. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

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