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4 June 2020

Horizons Regional Council
Private Bag 11025
Manawatu Mail Centre
PALMERSTON NORTH 4442

Attention: **Sara Wescott**
Senior Consents Planner

Dear Sara

RESOURCE CONSENT APPLICATION NO. 107258, 107259 and 107260 RANGATAUA WWTP

Please find **attached** a table and associated attachments providing our response to the request for further information on the above consent applications.

I trust the attached satisfies your request, however, should you have any follow up questions please contact myself or Deborah Kissick on deborah@traverse.co.nz or 02102651357.

Yours sincerely

Stuart Watson
ENVIRONMENTAL MANAGER

Attachment One:
Table 1: Response to s.92 request for further information

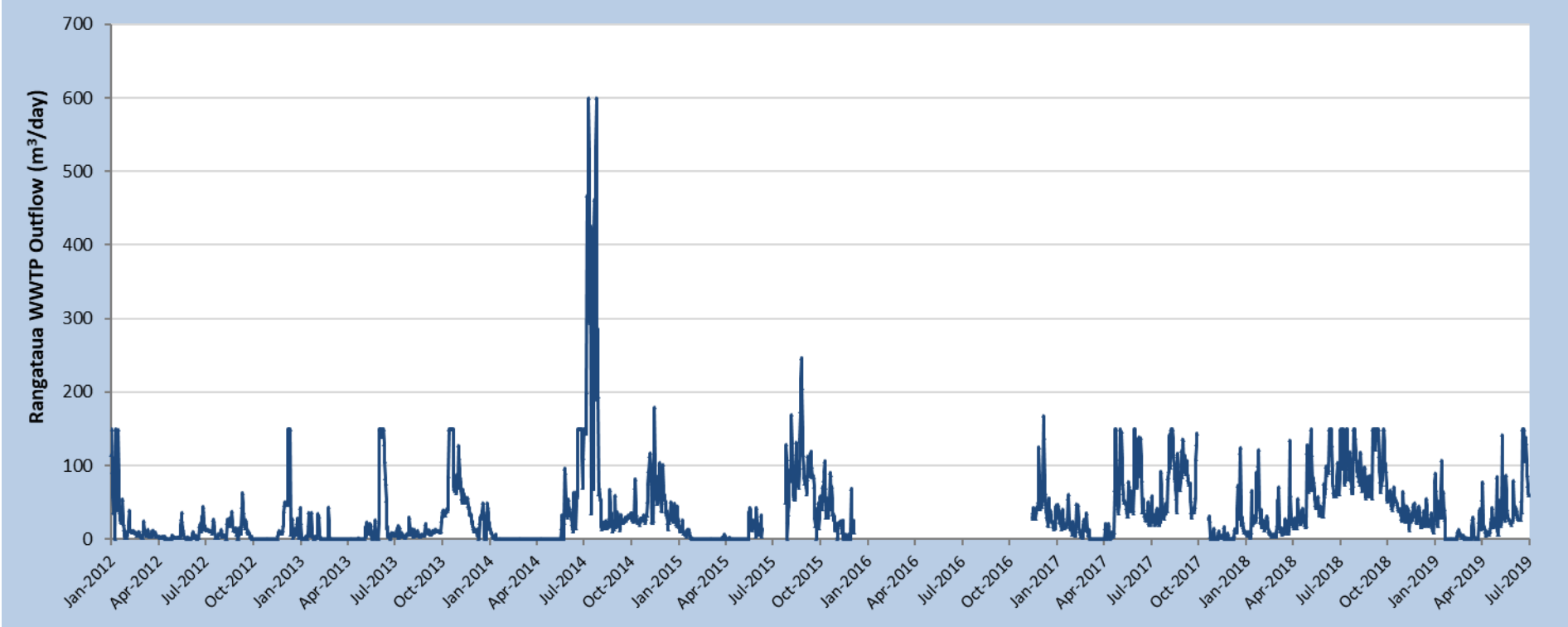
Attachment Two:
Memo from Aquanet Consulting re: Potential effects of discharge load increases (dated 29 October 2019)

Attachment Three:
Proposed draft load conditions

Attachment One:

Table 1: Response to s.92 Request for Further Information

Horizons Information Request / Comment		RDC response
Email from Sara Wescott, 30 August 2017		
1	Has there been any changes to the system, volumes and management of the plant since 2014?	There have not been any major changes in the treatment process at the Rangataua WWTP since 2014. Discharge volume has been monitored since January 2012. Data does not indicate any marked trend. Data indicates: • Regular, prolonged periods of time when the discharge volume is very low or nil, typically in summer; • The dataset also contains a large number of unexplained "0" values during periods when discharge is expected to have occurred. This is thought to be due to equipment failure (solar power), and the operator (Veolia) advised that they should be considered with caution and are unlikely to represent actual "no discharge" days. These were replaced in the dataset by the average of previous/next day; • There are gaps in the dataset (12/06/2015-25/07/2015 and 6/12/2015 – 13/11/2016) • Wet weather flows are in the order of 150 m^3/day, but with occasional peaks over 200 m^3/d (August 2015) and up to 600 m^3/day (June/July 2014); • 12-months rolling median flow varied between 3 and 53 m^3/day; • 24-months rolling median flow varied between 5 and 42 m^3/day; • 12-months rolling 95th percentile flow varied between 26 and 194 m^3/day; • 24-months rolling 95th percentile flow varied between 70 and 171 m^3/day. Any limits placed on effluent flow should incorporate typical error of measurement, expected to be in the 10-15% range. If limits were to be placed on effluent discharge volumes, the upper end of the above ranges (plus 10-15% to account for error of measurement) may be considered as representative of the existing discharge. However, as explained later in this response, it is considered preferable to set "end of pipe" controls based on effluent loads rather than effluent

	Horizons Information Request / Comment	RDC response
		volumes to provide for flexibility in response to growth, whilst providing long-term certainty with regards to in-stream effects.
		
2	Can you please confirm the ecological status of the wetland (both at the site of the WWTP and downstream to the confluence with the Mangaehuehu Stream) – is this a Schedule F habitat?	One Plan Schedule F defines criteria for "Rare", "Threatened" or "At Risk" Habitats. Schedule F2b defines exclusions.

Horizons Information Request / Comment		RDC response
		The "wetland" to which the treated effluent is discharged is a depression between the wastewater plant and a grazed paddock, and vegetation is dominated by exotic wetland grass species with a few relatively small willows (refer to Attachment 1A). It is considered that it falls under the Schedule F2b exclusions (e.g. damp gully heads, or paddocks subject to regular ponding, dominated* by pasture or exotic species in association* with wetland^ sedge and rush species), and therefore does not constitute a Rare, Threatened or At Risk Habitat as defined in One Plan Schedule F. It is also noted that the construction of the wetland was authorised by consent 4926 (variation 2), granted on 14 December 2000. Schedule F2b specifically excludes "Areas of wetland^ habitat maintained in relation to the implementation of any resource consent^ conditions^", i.e. any planting of native species undertaken by or on behalf of Ruapehu District Council will not result in the "wetland" falling under the Schedule F definitions of "Rare", "Threatened" or "At Risk" Habitats. It is RDC's position that the wetland does not constitute a Schedule F habitat.
3	With respect to the treatment of the effluent – has the impact of the entire length of the wetland been assessed or just the portion of the wetland adjacent to the ponds?	It is unclear what is meant by this question. The current consent conditions identify the Mangaehuehu Stream as the receiving environment for the discharge and require sampling upstream and downstream of the point where the wetland flows into the Mangaehuehu Stream. The assessment of in-stream effects provided in the AEE is based on comparison of upstream/downstream data and thus de facto includes the whole length of the "wetland" (and any contaminant inputs to the wetland downstream of the discharge).
4	Since the application was lodged in 2014, Accelerate25 has been developed. Can you please advise if this will impact predicted growth rates and therefore effluent volume and loading rates?	The exact impact of Accelerate 25, or other growth-related initiatives, on permanent or visitor population is difficult to predict; however, it is considered essential that the resource consent conditions do not unnecessarily preclude growth opportunities. To achieve this, it is suggested that conditions should focus on controlling actual effects on stream water quality/ecology and the risk of effects from the discharge. The risks of effects posed by a point-source discharge on water quality/ecology are primarily associated with the contaminant loads in the discharge (as opposed to the discharge volume or concentration of contaminants in the discharge).

<table>
<tr><th colspan="2">Horizons Information Request / Comment</th><th>RDC response</th></tr>
<tr><td></td><td></td><td>
In-stream data shows that effects of the discharge on water quality and ecology have generally been undetectable, thus well within the One Plan targets since 2013.
In principle, as long as the contaminant loads in the discharge do not increase, the effects on water quality/ecology should remain similar to what they currently are.
Given that effects are currently undetectable, and that the treatment wetland will be improved to follow the recommendations of Mr McGibbon (refer to Attachment 1A), it is also likely that some increase in loads coming out of the oxidation ponds could occur without effects on the receiving environment (the Mangaehuehu Stream) becoming more than minor.

On the basis of the above, RDC proposes conditions requiring:
• Triggers based on daily loads of contaminants in the discharge, based on rolling 24-months median and 95th percentile values calculated on the basis of historical data, as follows:
o A 24-month rolling median load of no more than X kg/day
o A 24-month rolling 95th percentile load of no more than Y kg/day;
o X and Y values for each parameter are given in the table below

<table>
<tr><th></th><th>TSS (kg/day)</th><th>Ammoniacal-N (kg/day)</th><th>ScBOD$_5$ (kg/day)</th><th>DRP (kg/day)</th></tr>
<tr><td>24 month rolling Median</td><td>1.5</td><td>0.5</td><td>0.4</td><td>0.1</td></tr>
<tr><td>24 month rolling 95th %ile</td><td>6.5</td><td>2.5</td><td>0.8</td><td>0.3</td></tr>
</table>
NB: numbers are based on combined Horizons and RDC data, for the period January 2012 to October 2019
</td></tr>
</table>

Horizons Information Request / Comment		RDC response
		• Alternatively, the load triggers could be based on actual data, using the NZ wastewater monitoring guideline approach (i.e. no more than X out of Y consecutive samples exceeding Z kg/day (e.g. The daily load of TSS shall not exceed 2.3 kg/day in more than 15 out of any 24 consecutive calculated daily loads, and shall not exceed 6.5 kg/day in more than 3 out of any 24 consecutive calculated daily loads) • Comparison with the load triggers to be based on daily loads calculated monthly, on the basis of daily discharge volume and monthly discharge quality samples • To keep track of any increase in contaminant loads from the discharge, a condition requiring: o An assessment of the impact of any changes and/or trends over time in contaminant loads from the WWTP; o Whether those changes / trends indicate a risk to meeting the load triggers over the following 12-month period, including the identification of any contributing factors to those risks (e.g. expectations of growth in visitor numbers, industry, residents etc); and o Whether or not the Permit Holder considers that WWTP treatment improvements are necessary to avoid ongoing exceedance of the load triggers, including a Best Practical Option Assessment should improvements be identified as necessary. • To date, in stream monitoring has not detected any effect of the discharge. On this basis, we consider further in-stream monitoring should only be required in the instance where the load triggers are exceeded. We welcome discussion with Horizons on this point.
5	With respect to Accelerate25, has this resulted in any other alternatives being considered, such as piping the effluent to Ohakune?	No, this alternative has not been considered specifically. RDC considers this option would have very limited environmental benefits (given the lack of measurable environmental effects from the Rangataua WWTP on the receiving environment, i.e. the Mangaehuehu Stream) and very significant capital expenditure, and thus would score poorly in any cost-benefit assessment.
Letter dated 2 September 2014		

Horizons Information Request / Comment		RDC response
6	It is mentioned in the application that the ponds are self-sealed. Are you able to provide evidence that the have self- sealed? Please provide the dimensions of the wastewater treatment ponds (depth, surface area at the top of the ponds, surface area at the bottom of the ponds)	Detailed records of the construction of the ponds are not available (lost in a fire), but plans of the ponds are available and are provided as Attachment 1B to this response.
7	The application states that there will be triggers that will initiate the need for reviews and then potentially upgrades but there are no triggers provided in the application. What are these triggers to be?	Please refer to response to point 4 above. It is proposed that triggers for upgrades be based on identification of risk factors (expectations of growth in visitor numbers, industry, residents etc.) and exceeding contaminant load triggers.
8	The application states that the reviews will involve a matrix of various factors. However, the matrix is not provided and the wording in the application implies that economic considerations will have the most weight. How do we have certainty around effects in the long-term given the consent applications	Please refer to response to point 4 above.
9	The proposed review also proposes that 3rd parties are tied into the review. Has affected party approval been sought for this to occur?	This will need to be discussed once consent conditions have been developed and circulated for discussion.
10	Confirmation in terms of the number of households that feed into the treatment plant? Is it 189 or 210?	There are 189 households that feed into the treatment plant currently; however there are an extra 21 sections available to be developed (i.e. with subdivision in place).
11	The application has proposed no effluent standards for the discharge, is it proposed that the current discharge will represent the future discharge?	See response to point 4 above
12	Are the triggers for ecological effects in stream based on the schedule D/Schedule AB values Proposed One Plan targets?	It is expected that in-stream targets will be based on One Plan Schedule D targets.
13	Is the effluent screened prior to entering the ponds?	No

Horizons Information Request / Comment		RDC response
14	You have stated that the Department of Conservation support the extension of the wetland into their lands in the future, does this mean that the proposal is to continue the wetland down to the river	No, the proposal does not include wetland development within land owned/administered by DoC. The proposal only includes wetland planting and fencing within land owned by RDC. Whilst RDC and DoC might work together in the future to enhance conservation values of the wetland in DoC's land, this does not form part of the proposal and should not be required by way of consent conditions. The existing wetland has been assessed by wetland specialist Roger McGibbon (refer Attachment 1A). The assessment concludes that the wetland area within RDC land is sufficient to provide effective polishing of wastewater discharge from the plant with some minor alterations.
15	Is it reasonable to use a high average wet weather flow factor of 5 when you have stated in the application that the pipework is in good condition and the flow monitoring data never shows peaks this high in the system? Or is the plan to allow the pipes to worsen over time.	See responses to points 1 and 4
16	On p 35 of the application it states that a nominal sum of money is to be set aside every two years for the wetland, how much is this and what will it achieve, for example X amount of plantings and weeding etc.	Planting and maintenance of the wetland will follow Mr McGibbon's recommendations (refer to Attachment 1A): - The upper wetland area will be planted with locally sourced native sedges and rushes, at a density of 2 plants/m2 (0.7m centres) - There is no need to replace the existing exotic grass vegetation in the lower section of the wetland - Regenerating willows will be poisoned, and wetland margins will be retained as low stature shrubs and flaxes to avoid shading wetland vegetation.
17	Are there plans to exclude stock from the wetland? The removal of stock will improve the functioning of the wetland and we are not sure if the discharge will meet the definition of being safe for stock drinking water	Livestock are already excluded from the areas of wetland developed /planted by RDC within RDC-owned land. The functioning of the wetland has been assessed by wetland expert Roger McGibbon (refer to Attachment 1A).

Horizons Information Request / Comment		RDC response
18	How realistic are the proposed discharge rates give the current volumes and the reasonably good condition of the pipe network? Our understanding is that Rangataua is not on reticulated water and the future modelling is assuming a use of 250 litres per person per day which seems high. The application is proposing a dry weather flow of up to 535 m3/day and no maximum however the maximum flow that has been discharged since 2005 is 473.6 m3/day and has decreased over the last few years to 150 m3/day since some of the stormwater has been remove.	See responses to points 1 and 4
	Can you please clarify why there have been different factors applied to the average number of households in table 4 page 40 of the application. For the 2.5 household it is proposed to double but the 7 households are proposed to go up by a factor of 10. Can you please explain the reason for this difference to the calculated effluent volumes.	See responses to points 1 and 4

Attachment 1A:

Tonkin + Taylor Report : Rangataua Wetland Assessment

Attachment 1B:

Wastewater Treatment Pond Plans

270 RL. 100.18

300 RL. 99.30 126° 11' 40"

330 RL. 099.27

PEG N7
350 RL 098.28

80 mm CLASS B UPVC RISING MAIN

THRUST BLOCK

LAY RISING MAIN 5.00M FROM FENCE LINE

5.00

LEGAL ROAD BOUNDARY 126° 24' 00"

EXISTING FENCE LINE

11 M (APPROX)

30.00M

1/21

126° 24' 00" (70M)

5M 5M

22M

216° 24' 00"

INLET STRUCTURE / REFER SHEET 21

1/21

R 8M

R 10 M

3/22 TYPICAL WALL SECTION

35M

PRIMARY POND
W.L. 100.05
OR 100.15

1608m² @ WL
1200 M² Bottom

1896 m³
1:35

2/22

R 12 M

TRANSFER STRUCTURE

R 8M

216° 24' 00"

3.00

20.00M

126° 24' 00" (52.5M)

C/22

C/22

DISCHARGE PIPE

R 6M

2/22

R 10M

TERTIARY POND
W.L 100.05

1:5 1089.5 m² @ WL
715 m² @ Bottom

1163m³

R 10M

R 8M

126° 24' 00" (38M)

35M

SMALL STREAM

MANGAEHUEHU STREAM

DETAILS OF THE STREAM DISCHARGE STRUCTURE ARE TO BE CONFIRMED ON SITE BY THE ENGINEER WITH THE CONTRACTOR

NO.	REVISIONS	BY	APP'D	DATE
0				

NOTES:

PAYNE SEWELL LTD
CONSULTING ENGINEERS · SURVEYORS · PLANNERS
WANGANUI PALMERSTON NORTH LEVIN MARTON NEW PLYMOUTH HAWERA

OXIDATION POND RANGATAUA TOWNSHIP

WAIMARINO COUNTY COUNCIL

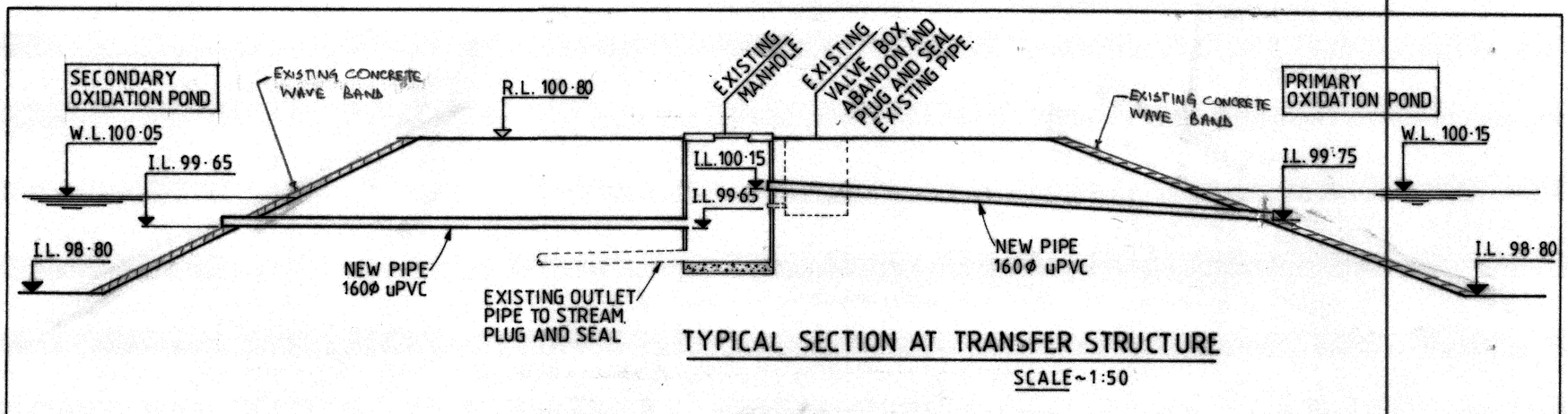
SCALE 1:200		
THE CONTRACTOR SHALL CHECK ALL DIMENSIONS ON SITE		
DESIGNED DL SMART	DRAWN ANDREW CAMERON	CHECKED
APPROVED		DATE 5.88
SHEET 20 OF 26 SHEETS		
REV. 0	JOB NO. 0102172	

1:10 0 1 2

1:20 0 1 2 3 4

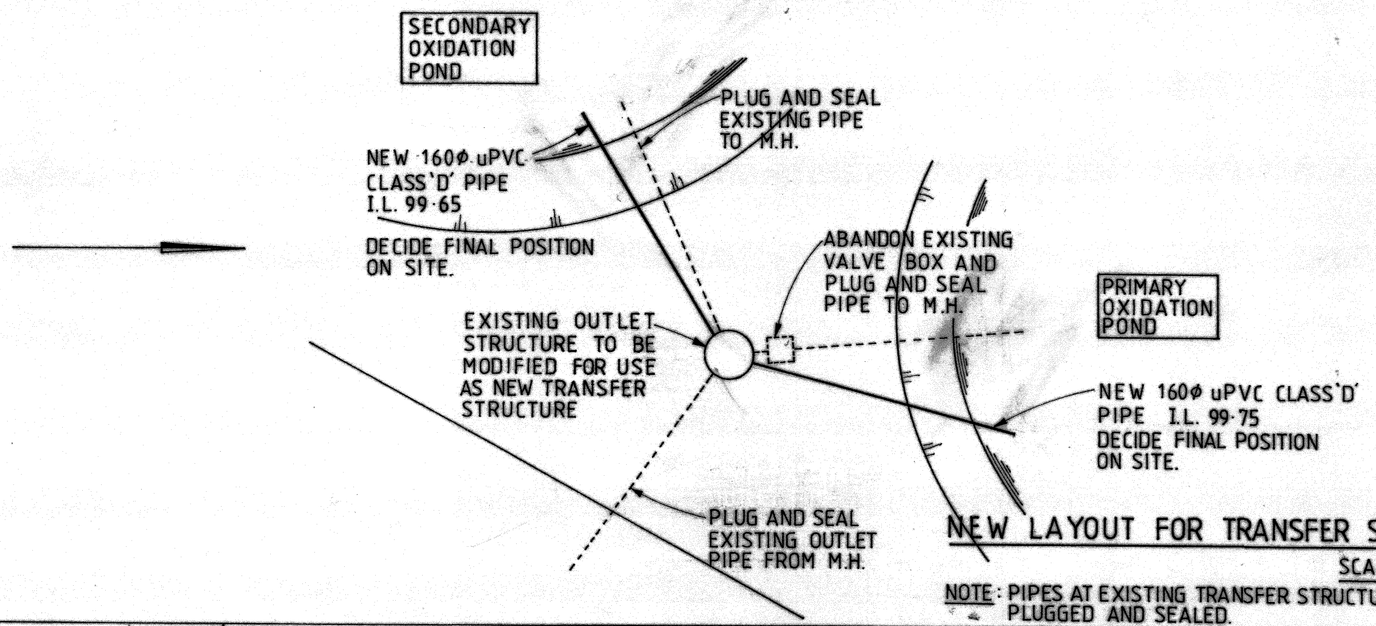
1:50 0 5 10

272



TYPICAL SECTION AT TRANSFER STRUCTURE

SCALE~1:50



NEW LAYOUT FOR TRANSFER STRUCTURE

SCALE~1:100

NOTE: PIPES AT EXISTING TRANSFER STRUCTURE SHALL BE PLUGGED AND SEALED.

Date	Amendment	Initials

RUAPEHU DISTRICT COUNCIL

Approved .....
Date .....

RANGATAUA SEWAGE TREATMENT PLANT UPGRADE

NEW LAYOUT FOR TRANSFER STRUCTURE

	Name	Date
Design		
Drawn	FBT	03-01
Checked	AC	04-01

Scale : AS SHOWN
Horiz.
Vert.
Sheet No. 4 of 4 Sheets

Plan No. 272

Attachment 2:

Memo from Aquanet Consulting re: Potential effects of discharge load increases (dated 29 October 2019)

Tonkin+Taylor

Job No: 1008249.1000
15 April 2019

Ruapehu District Council
Private Bag 1001
Taumarunui 3946

Attention: Anne-Marie Westcott, Environmental Manager

Rangataua WWTP Wetland Assessment

1 Introduction

Tonkin & Taylor Ltd (T+T) has been engaged by Ruapehu District Council to provide, based on a visual inspection, an assessment of the functionality of the wetland area that receives the discharge from the Rangataua wastewater treatment plant at Rangataua in the Ruapehu District. In particular, T+T has been asked to give consideration to the suitability of the wetland as a nutrient polishing device for the wastewater discharge before it flows down a drainage channel through farm land. This work has been undertaken as an extension to the T+T engagement for this project for Ruapehu District Council as set out in our letter of 26 November 2018.

Roger MacGibbon from T+T visited the Rangataua WWTP site on 29 August 2018 and viewed the receiving wetland. Subsequently we have been supplied with discharge flow data from the WWTP up to 27/9/17.

This brief report is our assessment of the suitability of the wetland as a polishing device based on visual observations during the single site visit by Roger MacGibbon and our experience of how wetland systems typically function. No water samples were taken or analysed and consequently we cannot provide any information of how the wetland is actually functioning. However, we comment on the shape, size and vegetation of the wetland and from this assessment we are able to provide an indication as to whether the wetland is likely to have any nutrient removal function.

2 Wetlands as nutrient polishing devices for wastewater discharges

Shallow surface flow wetlands that have a complete coverage of sedges, rushes and reeds can be effective at removing nitrates from receiving waters and as such can be useful nutrient polishing devices when positioned between wastewater treatment plant outlets and rivers or streams. Nitrate extraction occurs by a process called denitrification and requires the presence of denitrifying bacteria that "consume" nitrate molecules and break them down to atmospheric nitrogen (N_2) and water molecules. Nitrate removal is most effective when the water retention time is at least 2 to 3 days and the interaction of water (and nitrate molecules) with organic matter and denitrifying bacteria is maximised. Some well-constructed wetlands are achieving in excess of 95% nitrate

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extraction during summer months[1]. Well vegetated wetlands can also serve to filter out solids from a WWTP discharge and reduce faecal bacteria levels.

Wetlands also potentially address Maori cultural requirements for the management of wastewater discharge by achieving a high degree of water – organic matter interaction.

3 Rangataua WWTP discharge and minimum wetland requirements

The Rangataua WWTP is small compared to the plants at Ohakune and Raetihi. In the period 14 November 2016 to 27 September 2017 (the most recent period of consecutive discharge flow readings available) the Rangataua plant discharged an average of 46.45 m^3 per day. The peak daily flow was 168m^3 on 5 December 2016.

The average daily flow rate appears to be lower in years preceding 2016.

To achieve effective nitrate removal the objective should be to retain average flows within the wetland for at least 3 days and peak flows (or 95th percentile flows) for at least one day (24 hours). Surface flow wetlands should not be deeper than 500mm with 300mm the optimum depth for good plant growth. At an average depth of 300mm the Rangataua wetland would need to have a surface area of at least 465m^2 to retain average flows for at least 3 days and 560m^2 to retain the peak flow for at least one day.

4 Rangataua wetland

4.1 Current state

The existing Rangataua wetland sits beside the oxidation ponds and is, in effect, a widened drainage channel (Figure 1). The lower half of the wetland area is flat bottomed with very gentle fall to the south and is fully covered with exotic wetland grass species (Figure 2). Some self-regenerating willows are growing along the edges. The existing Rangataua WWTP wetland is likely to be 500mm deep or deeper in some places and shallower in others, with the deepest portions created by small cross-flow bunds that were built in the past to hold water back[2]. The bunds are currently buried beneath a heavy cover of exotic grasses. Although covered with exotic grasses, rather than native sedges and rushes, this section of wetland is likely to be effective at removing nitrogen and filtering out any suspended solids.

[1] The constructed wetland at Owl Farm near Cambridge (a Lincoln University sponsored demonstration farm) is an example of a constructed wetland that is achieving in excess of 95% nitrate extraction in summer months.
[2] Anne-Marie Westcott, Ruapehu DC, pers comm

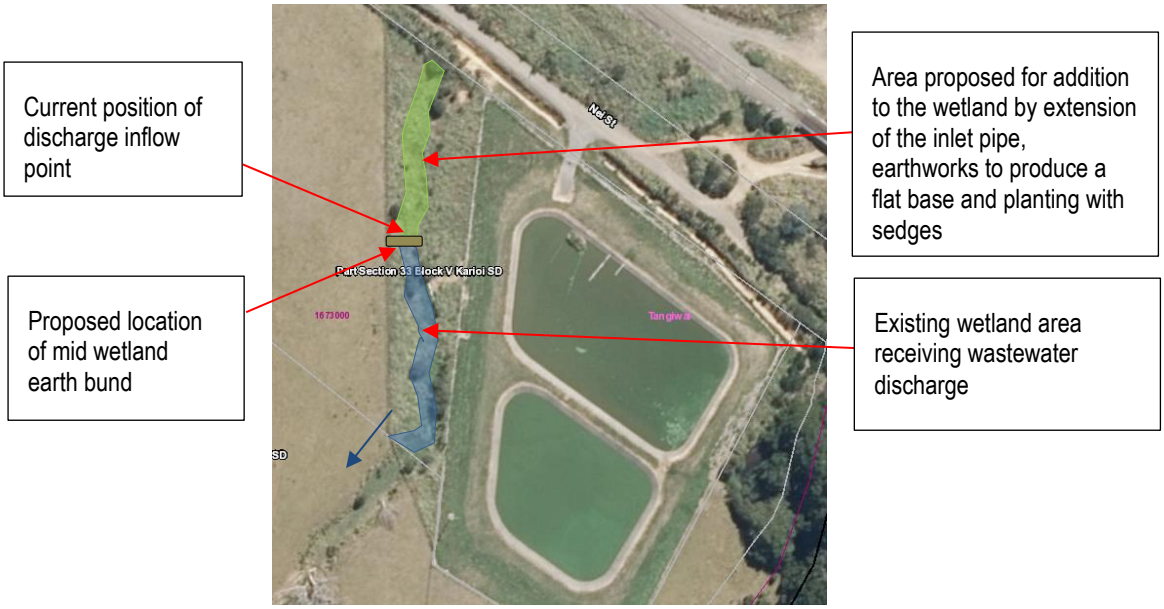

Figure 1: Rangataua WWTP showing location of the wetland

Currently the discharge pipe from the ponds enters the wetland about half way down its length.

The upper portion of the wetland area, above the inlet pipe, is more V-shaped than the lower half of the wetland (Figure 3) and as a consequence is less well suited, in its current state, to remove nitrate.

Figure 2: View of the wetland looking downstream from the discharge inlet pipe

Figure 3: View of the wetland are looking upstream of the discharge inlet pipe

Downstream of the wetland area that lies on RDC land the wetland water flows into an unfenced drainage channel that passes through at least 500m of farmland before joining a stream. This channel appears to remain dry for a large part of the summer with the wetland water (i.e. wastewater discharge) filtering down into the ground soon after it leaves the RDC wetland block of land. The fact that the discharge water passes through earth , especially in summer, is likely to significantly improve nitrate extraction effectiveness (because denitrifying bacteria live in the organic soil zone) and increase faecal bacteria mortality.

4.2 Suitability as a wastewater nutrient polishing wetland

4.2.1 Size

The wetland surface area (i.e. the area over which water flows) is about 550m^2 in size (110m long by 5m wide) with about 260m^2 of that downstream of the current pipe inlet. To achieve more than 3 days' retention of the average daily flow and close to one day's retention of the 95th percentile of peak flow the inlet pipe needs to be extended to the upstream end of the wetland to make full use of the 550m^2 wetland area potentially available.

The upper portions of the wetland area (i.e. those sections above the current inlet pipe) will also require some earthworks to create a more flat bottomed, 5m wide profile to the existing channel (as shown in Figure 4). The amount of earthworks required to improve the form of this section is minor.

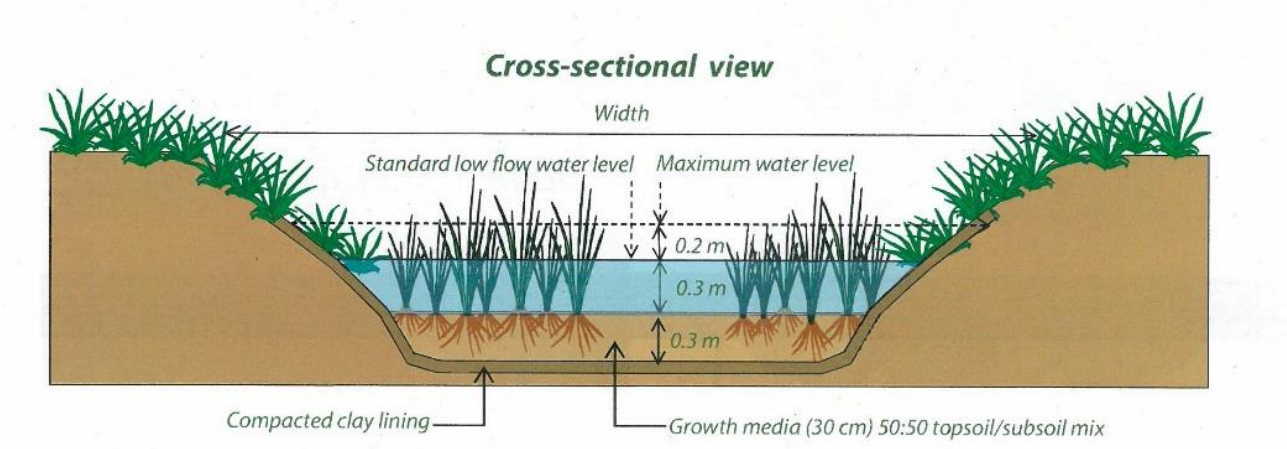

Figure 4: Cross-sectional view of surface flow wetland design (Sourced from Tanner et al 2010[3])

4.2.2 Shape

Normally surface flow wetlands are constructed so that their width to length ratio lies between 1:3 and 1:10. Proportionately wider wetlands tend not to have full and even dispersion of water across the surface whereas narrower wetlands tend to encourage water to flow through them too quickly. In the Rangataua case the low flow volume, the gentle gradient of the wetland and the existence of bunds to hold back water mean this is less likely to be a problem provided a thick sward of sedges, rushes and grasses is retained on the wetland floor at all times. Construction of an additional bund across the wetland channel midway down its length (see proposed bund position in Figure 1), and possibly another further upstream, will improve retention time. These bunds will complement those already in place in the lower half of the wetland.

The bund(s), which could be built with earth generated from the excavation work that creates the flat bottomed upper portion, should not be any higher than 500mm on the upstream side so that

[3] Tanner, C.C.; Sukias, J.P.S.; Yates, C.R. 2010. *New Zealand guidelines: Constructed wetland treatment of tile drainage*. NIWA Information Series No. 75. National Institute of Water & Atmospheric Research Ltd.

water depths can never exceed 500m (see Figures 5 and 6 below). It is recommended that any bunds that are constructed should be covered in coconut fibre and sown with grass to reduce erosion potential (see Figure 6).

Figure 5: Wetland under construction with earth bund mid wetland. The bund overflow sill has been installed at 500mm above the base of the upstream wetland bay so that water depth never exceeds 500mm.

Figure 6: Constructed wetland showing wetland bays with coconut fibre reinforced sills set 500mm above the base of the upstream bay.

4.2.3 Vegetation

As stated above, the existing exotic grass vegetation growing in the lower section of the wetland is as effective at promoting denitrification and filtering out solids as native sedges would be. Consequently, there is no need to replace this vegetation unless there is a wish to make the wetland site vegetation entirely indigenous.

Because the upper wetland area needs some earthworks to improve its shape it is recommended that locally sourced native sedges (especially *Carex secta*) and rushes (*Juncus* spp) are planted on the reformed areas. These plants should be planted at 2 plants per square metre (i.e. 0.7m centres). The planted native sedges will need to be regularly released from competing exotic grasses for the first two years following planting but after that period they should be resistant to competition.

The regenerating willows should be removed from the site and the wetland margin vegetation retained as low stature shrubs and flaxes. This is to ensure the wetland grasses and sedges are not shaded (shade reduces sedge and grass vigour and denitrification performance).

4.2.4 Supervision of earthworks and planting

While the earthworks and planting required to improve the performance of the wetland are relatively straight forward it is recommended that a person with recognised constructed wetland expertise should oversee the work.

5 Summary: assessment of suitability of the Rangataua wetland as a suitable polishing device for the WWTP discharge

The wetland area adjacent to the Rangataua WWTP is, with some minor alterations, of a size and shape suitable to provide effective polishing of the wastewater discharge from the plant. Once some excavation is undertaken to create a more flat-bottomed profile to the upper wetland area, one or more bunds are built between the upper and lower sections of the wetland, and the inlet pipe is extended upstream to carry discharge to the top end of the wetland the wetland area will be approximately 550m^2 in size which is sufficient to hold average flows for at least 3 days and 95th percentile peak flows for 24 hours. Once sedge/rush/grass vegetation is fully established across the base of the wetland nitrate extraction could be expected to exceed 70% in summer and 50% in winter when flows are close to average levels. Nitrate extraction will be further enhanced during summer months when the discharge soaks down through the soil surface rather than flowing along the channel surface.

As is the case for all wetlands that perform a nutrient polishing function for WWTP discharges, a plant maintenance programme should be developed and implemented annually with the objectives of excluding weed invasion and maintaining wetland plant vigour and cover.

6 Applicability

This report has been prepared for the exclusive use of our client Ruapehu District Council and the Wai Group who advise RDC, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

Tonkin & Taylor Ltd

Environmental and Engineering Consultants

Report prepared by:

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Roger MacGibbon
Principal Environmental Consultant

Authorised for Tonkin & Taylor Ltd by

.....

Tony Bryce
Project Director

Roger MacGibbon
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Appendix A : Existing Rangataua WWTP wetland photos

Photo 1 (above): View of the Rangataua WWTP wetland looking downstream from the inlet point

Photo 2: View of the Rangataua WWTP wetland looking upstream from the inlet point

Attachment 3:

Proposed draft load conditions

aquanet consulting ltd

Date: 11 May 2020

To: Stuart Watson
Acting Environmental Manager
Ruapehu District Council

Rangataua WWTP

Potential effects of discharge load increases.

Dear Stuart,

As requested, I considered the potential effects of a theoretical increase of 20% in contaminant loads being discharged from the Rangataua WWTP on water quality of the Mangaehuehu Stream.

1.1 Discharge loads

Current daily loads of key contaminants were estimated on the basis of available discharge quality (Horizons data) and quantity (Veolia data) data for the period January 2012 to September 2017. Table 1 below summarises the daily loads triggers proposed by Ruapehu District Council on the basis of estimated loads.

Table 1 also provides the daily loads used in this analysis, based on a nominal 20% increase in contaminant loads in the discharge

Table 1: Proposed discharge load triggers for the Rangataua WWTP, and theoretical contaminant loads based on a nominal 20% increase.

		TSS (kg/day)	Ammoniacal-N (kg/day)	$ScBOD_5$ (kg/day)	DRP (kg/day)
Current Load Triggers	Median	1.5	0.5	0.4	0.1
	95th %ile	6.5	2.5	0.8	0.3
Current loads + 20%	Median	1.8	0.6	0.5	0.1
	95th %ile	7.8	3.0	1.0	0.4

1.2 Stream flows

Treated effluent from the Rangataua WWTP is discharged through a constructed wetland before flowing through a natural channel to the Mangaehuehu Stream. The Mangaehuehu Stream is considered the receiving environment for this discharge.

There are no flow recorders on the Mangaehuehu Stream. For the purpose of this exercise, modelled flow statistics were sourced from the NIWA "Shiny Rivers" website[1].

The nearest flow recorder is on the Tokiahuru Stream at Junction. Modelled data for this site were also sourced and crossed-checked against actual flow statistics for this site[2], to provide some degree of cross validation of the NIWA modelled data for the area. There was reasonable agreement between the NIWA modelled and actual flow statistics, providing some comfort about the reliability of the modelled data for the Mangaehuehu Stream.

Table 2: Flow statistics used in this assessment.

	Source	NZ Reach	MALF (m^3/s)	Median (m^3/s)	Mean (m^3/s)
Mangaehuehu at Rangataua	NIWA	7017318	0.406	0.808	1.12
Tokiahuru at Junction	NIWA	7019277	4.8	6.74	7.71
Tokiahuru at Junction	Horizons		4.15	6.37	7.6

1.3 Predicted in-stream concentration increases

Predicted concentration increases were calculated on the basis of two scenarios:

- Scenario 1: Median contaminant load (both current trigger and assuming a 20% increase) from the discharge when the Mangaehuehu Stream is at Mean Annual Low Flow (MALF); and
- Scenario 2: 95th percentile load (both current trigger and assuming a 20% increase) from the discharge when the Mangaehuehu Stream is at median flow.

These scenarios are considered worst case situations, on the basis that:

- During periods of extended dry weather (which would be prevailing conditions when the stream is at MALF), observations indicate that the discharge from the Rangataua WWTP infiltrates into the ground and does not reach the Mangaehuehu Stream by way of surface flow discharge;
- A high percentile (95th) of discharge loads was assumed when the stream is at median flow. In reality, high percentiles of discharge loads are highly likely to occur during or immediately following wet weather; stream flows are also likely to be high at these times.
- The mass balance calculations assume that all of the contaminant loads exiting the oxidation ponds enter directly the Mangaehuehu Stream; i.e. both scenarios assume zero attenuation/removal by passage through the constructed wetland. This is a highly

[1] Booker, D.J., Whitehead, A.L. (2017). NZ River Maps: An interactive online tool for mapping predicted freshwater variables across New Zealand. NIWA, Christchurch. https://shiny.niwa.co.nz/nzrivermaps/

[2] Henderson R. and Diettrich J. (2007). Statistical analysis of river flow data in the Horizons Region. Prepared for Horizons Regional Council. NIWA Client report CHC2006-154. NIWA, Hamilton, New Zealand.

conservative assumption, particularly during periods of dry weather when there is little or no direct surface discharge to the stream.

Table 3: Predicted concentration increases caused by the Rangataua WWTP discharge in the Mangaehuehu Stream after full mixing under scenarios 1 and 2.

Discharge loads	Scenarios	TSS g/m^3	Ammoniacal-N g/m^3	ScBOD$_5$ g/m^3	DRP g/m^3
Current Load Triggers	Scenario 1	0.043	0.014	0.011	0.0029
	Scenario 2	0.093	0.036	0.011	0.0043
Current loads + 20%	Scenario 1	0.051	0.017	0.014	0.0034
	Scenario 2	0.112	0.043	0.014	0.0052
	One Plan target	**N/A**	**0.400**	**2.0**	**0.0060**

1.4 Interpretation

Existing monitoring data collected in the Mangaehuehu Stream indicates that there are no detectable changes in concentrations of any of key discharge constituents in the stream.

It is noted that the One Plan target for DRP is largely exceeded upstream of the discharge (average concentrations in the order of 0.020 g/m^3). This is consistent with data collected in other streams and rivers in the central plateau area, where volcanic geology causes naturally elevated DRP concentrations.

Under the current situation, the discharge is considered to have less than minor effects on water quality and ecology of the Mangaehuehu Stream.

Predicted concentration increases in TSS, ammoniacal N and ScBOD$_5$ are very small under all scenarios (including assuming a 20% increase) and would not be expected to be detected against natural background levels using conventional water quality techniques. The effects of the discharge on these variables is expected to be less than minor under both the current and theoretical 20% load increase situations.

With regards to DRP, the mass balance calculations predict maximum concentration increases in the order of 0.004 g/m^3 under the existing situation to 0.005 g/m^3 under the theoretical 20% increase situation.

These predicted concentration increases need to be placed in the context of naturally elevated DRP concentrations in central plateau rivers. These concentrations increases might be detectable at times if they were to occur against very low background concentrations; however, it is doubtful whether they would be detectable against the naturally elevated DRP concentrations.

As mentioned above these concentrations increase are worst-case predictions which certainly appear to over-estimate the current actual effects. It seems reasonable to assume that the predictions equally overestimate the actual effects resulting from a 20% load increase.

On that basis it appears unlikely that a 20% increase in contaminant loads discharged from the Rangataua WWTP would result in more than minor effects on water quality or ecology in the Mangaehuehu Stream. However, it would be prudent to initiate additional monitoring if /when any material increase in contaminant loads were to occur, to assess its actual effects on the basis of monitoring data.

Prepared by:

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<tr><th>Draft condition wording for discussion</th><th>Desired outcome</th></tr>
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Condition 1 –Effluent contaminant load triggers

The Permit Holder shall take monthly grab samples of the treated effluent to assess compliance with the load targets in Table 1 below.

Table 1 – Treated Effluent Contaminant Load Triggers

<table>
<tr><th></th><th>TSS (kg/day)</th><th>Ammoniacal-N (kg/day)</th><th>ScBOD$_5$ (kg/day)</th><th>DRP (kg/day)</th></tr>
<tr><td>24 month rolling Median</td><td>1.5</td><td>0.5</td><td>0.4</td><td>0.1</td></tr>
<tr><td>24 month rolling 95th %ile</td><td>6.5</td><td>2.5</td><td>0.8</td><td>0.3</td></tr>
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Advice Note: This condition requires the Consent Holder to monitor effluent quality against triggers for contaminant loads in the discharge. An exceedance of any of the triggers will require additional assessment under Condition 2A.

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Existing in-stream monitoring data shows that any changes in water quality downstream of the discharge have been generally undetectable and as a result, well within the One Plan targets since 2013.

RDC seek to implement a suite of conditions that reflects the actual risk of environmental effects given historic data.

The concept is to reduce unnecessary monitoring costs while the plant is operating within known parameters that have been shown through substantive historic data to be avoiding environmental effects.

If the trigger is exceeded (Condition 1b) additional monitoring would be required to determine whether there is a corresponding environmental effect.

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Condition 2A – Supplementary Monitoring in response to any effluent load trigger being exceeded

In the event of exceedance of any of the Treated Effluent Contaminant Load Triggers specified in Condition 1, the Permit Holder shall undertake an assessment to consider:

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Condition 2A requires additional assessment to determine whether further supplementary monitoring is required, in the event of any load trigger being exceeded. RDC are keen to discuss the details of this.

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a. Whether the trigger exceedance and/or the trends in effluent contaminant load over time indicate a risk to meeting the load triggers over the following 12-month period; and b. Any contributing factors such as expectations of growth in visitor numbers, industry, residents etc; and c. If a significant risk of exceeding any of the Treated Effluent Contaminant Load Triggers on an ongoing basis is identified, the Permit Holder shall initiate Supplementary Monitoring [Standard in-stream water quality monitoring].	
Condition 2B – Supplementary Monitoring Outcomes Where Supplementary Monitoring is required by Condition 2A, the Permit Holder shall assess the outcome of this monitoring to determine whether WWTP treatment improvements are necessary to ensure that the load triggers are met on an ongoing basis.	Where further monitoring is required, this condition requires that the monitoring be used to determine whether improvements to the WWTP are necessary.
Condition 2C – Best Practicable Option Assessment If WWTP treatment improvements are considered necessary under Condition 2B, the Permit Holder shall undertake a Best Practicable Option Assessment to: a. Evaluate the range of options available to avoid an on-going exceedance of the Treated Effluent Contaminant Load Trigger(s) for the relevant parameter(s); and b. Identify the best practicable option to avoid on-going exceedance of the Treated Effluent Contaminant Load Trigger(s) for the relevant parameter(s), having regard to the following:	This condition identifies what should be considered when the consent holder undertakes a Best Practicable Option Assessment for the parameter(s) in the event that WWTP improvements are necessary.

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<td>i. the financial implications and the effects on the environment, of that options when compared with other options;

ii. the current state of technical knowledge and the likelihood that the option can be successfully applied.</td>
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<td>Condition 2D – Load Trigger Reporting

Any assessments undertaken under Conditions 2A-2C shall be provided to the Regulatory Manager within 20 working days of each assessment being completed.</td>
<td>This condition requires that the results of any assessment under previous conditions being provided to Horizons once completed.</td>
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<td>Condition 3 – Load limits

The Permit Holder shall manage effluent quality to ensure that monthly grab samples taken of the treated wastewater meet the standards in Table 2 below.

Table 2 – Treated Effluent Quality Limits
<table>
<tr><th></th><th>TSS (kg/day)</th><th>Ammoniacal-N (kg/day)</th><th>ScBOD$_5$ (kg/day)</th><th>DRP (kg/day)</th></tr>
<tr><td>24 month rolling Median</td><td>1.8</td><td>0.6</td><td>0.48</td><td>0.12</td></tr>
<tr><td>24 month rolling 95th %ile</td><td>7.8</td><td>3</td><td>0.96</td><td>0.36</td></tr>
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<td>Condition 3 outlines the Load limits that must not be exceeded by discharge from the WWTP.</td>
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