Hawea Wastewater Treatment Plant

Annual Report 2016 - 2017

December 2017

QUEENSTOWN LAKES DISTRICT COUNCIL

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Report	2016 - 2017 Annual Monitoring Report				
Date	December 2017				
		Document Reference:			
Version	**Author**	**Reviewed**	**Signature**	**Date**	**Distribution**
Draft	J McGirr (QLDC)			11/12/17	
Final	J McGirr (QLDC)			12/12/17	S Mason (QLDC), R Bond (Veolia), Otago Regional Council Compliance Team

1. Background

The Hawea Oxidation Pond started operation in 1988 and treats wastewater from wastewater originating from the Hawea township and the Tims Field subdivision. Discharge Permits RM10.308.01 and RM10.308.02 were issued by the Otago Regional Council (ORC) on the 15 November 2010 and took effect immediately.

The Hawea Oxidation Pond is located adjacent to the true left bank of the Hawea River, approximately 600m south of the intersection of Domain Road and Cemetery Road. The legal description of the land at the point is discharge is Lot 1 DP 20555. The map reference for the oxidation ponds is NZMS 260 G40: 128-137.

The wastewater is discharged to land via a spray irrigation system and a low pressure disposal trench.

Veolia operates and maintains the oxidation ponds as part of the 3-Waters operations and maintenance contract.

Figure 1-1 : Hawea Oxidation Pond, Associated Pump Stations and Reticulation

2. Purpose and Scope of Report

The purpose of this report is to report to the ORC in accordance with Condition 13 of Resource Consent RM10.308.02 and covers the period 1 December 2016 to 30 November 2017 (refer to Table 2-1).

The scope of the Annual Report comprises of the following:

- Summary of the yearly analytical results of the wastewater from the ponds, and an interpretation of the wastewater quality results in context of Resource Consent RM10.308.02 trigger levels;
- Comments on compliance with the conditions of the discharge permits;
- Summary of any malfunctions or breakdowns and the corrective action taken; and
- Summary of any complaints received, the validity of each complaint and the corrective action taken.
- Condition 13 of RM10.308.02 also requires "*details of the cut and carry operation, including the calculations for nitrogen loading in the spray irrigation land, number of harvests, dry matter and total nitrogen content of the harvest and nitrogen balance for this site*". This has been addressed within a separate report, as described in Condition 12.

Table 2-1 : Discharge Permits

Consent No.	Description	Issue Date	Expiry Date	Conditions
RM10.308.01	To discharge contaminants to air for the purpose of discharging treated wastewater.	15 Nov 2010	12 Nov 2022	Refer to Appendix A
RM10.308.02	To discharge contaminants to land for the purpose of discharging treated wastewater.	15 Nov 2010	12 Nov 2022	Refer to Appendix A

3. Monitoring Requirements

Resource Consent RM10.308.02 Condition 10 requires that the wastewater discharged from the outlet of the oxidation pond is sampled for a total of six parameters on a monthly frequency (Table 3-1). Condition 9 requires that a record of daily volumes of wastewater discharged to the disposal field is kept.

Table 3-1 : Wastewater Quality Parameters to be Analysed

Parameter	Frequency	Resource Consent Trigger Level	Reporting Requirements
Flow (wastewater)	Daily	N/A	Annual
Total Nitrogen	Monthly*	Mean: 35 mg/L 95th percentile**: 40 mg/L	Monthly
Ammoniacal Nitrogen	Monthly*	Mean: 25 mg/L 95th percentile**: 30 mg/L	Monthly
Total Phosphorus	Monthly*	Mean: 8 mg/L 95th percentile**: 10 mg/L	Monthly
BOD_5	Monthly*	N/A	Monthly
Total Suspended Solids	Monthly*	N/A	Monthly
Escherichia coli	Monthly*	95th percentile: 250,000 cfu/100 mL	Monthly

**Last week of each month ** Rolling 12 month 95th percentile*

All sample collection for the wastewater prior to discharge is carried out by Watercare to the required Standards specified in Condition 11 (Watercare Laboratory Services is IANZ accredited to NZS/ISO/IEC 17025).

Resource Consent RM10.308.02 does not require any surface water monitoring and analysis.

4. Results, Discussion and Resource Consent Compliance

4.1 *Wastewater Discharge to Land*

The results of the wastewater quality monitoring for the 2016/17 sampling period is presented in tabular format in Appendix B.

A copy of the laboratory results received from Watercare Laboratories for the 2016/17 period is presented in Appendix C.

The daily wastewater flow rates (m^3/day) from the oxidation pond are tabulated in Appendix D and graphically represented in Figure 4-1. Appendix D also provides the breakdown of wastewater volumes discharged via the trench method and the spray irrigation method.

The wastewater discharge flow rate is consented to a maximum of 775 cubic metres per day. A peak of 779 m^3/day was recorded on one day in January 2017, with all other days recording a flow of less than the consent limit. The annual average was 204 m^3/day for the 2016/17 monitoring period.

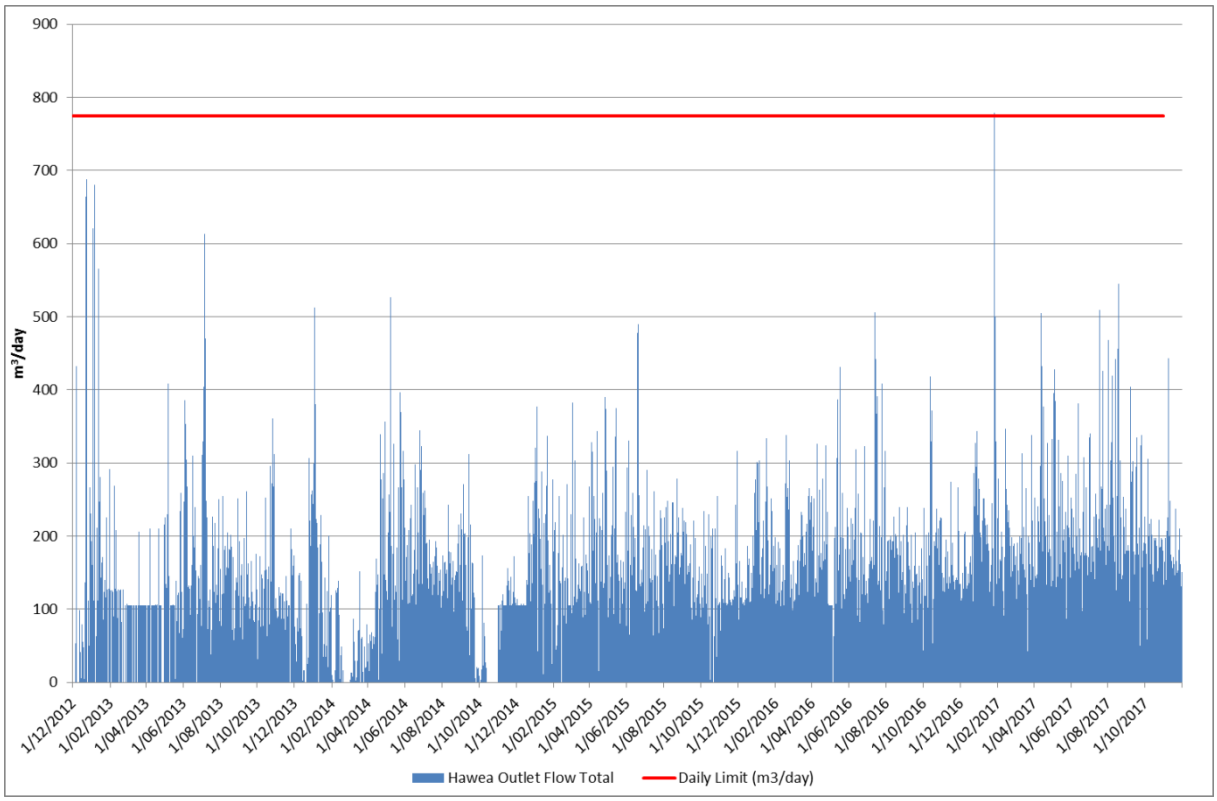

Figure 4-1: Wastewater Discharge Outlet Flow

The treated wastewater from the outlet is required to have a representative sample analysed for a total of six parameters (total Ammoniacal nitrogen, total phosphorus, total nitrogen, total suspended solids, BOD5 and E. *coli*) as per Resource Consent RM10.308.02. Those parameters that have consent limits in Resource Consent RM10.308.02 are presented in tabular (refer to Table 4-1) and graphical (Figure 4-2 and 4-7) format.

Table 4-1: Summary of Wastewater Monitoring Results for 2016/17

Parameter	Consent Limit	Rolling Percentile mg/L	Annual Mean mg/L	Max mg/L	Min mg/L
Total Nitrogen	Mean: 35 mg/L 95th percentile*: 40 mg/L	64	37	69	19
Total Phosphorus	Mean: 8 mg/L 95th percentile*: 10 mg/L	8	7	8.2	6.0
Ammoniacal Nitrogen	Mean: 25 mg/L 95th percentile*: 30 mg/L	44	22	50.0	<0.4
E. *coli*	95th percentile: 250,000 cfu/100 mL	123,500	49,583	140,000	7,000

** Rolling 12 month 95th percentile*

The rolling 12 month 95th percentile for E. *coli* remained well within the consent limit of 250,000 CFU/100ml during the 2016/17 monitoring period (refer to Figure 4-2). The maximum concentration of E. *coli* over the year was 140,000 cfu/100 mL with an annual mean of 49,583 cfu/100 mL.

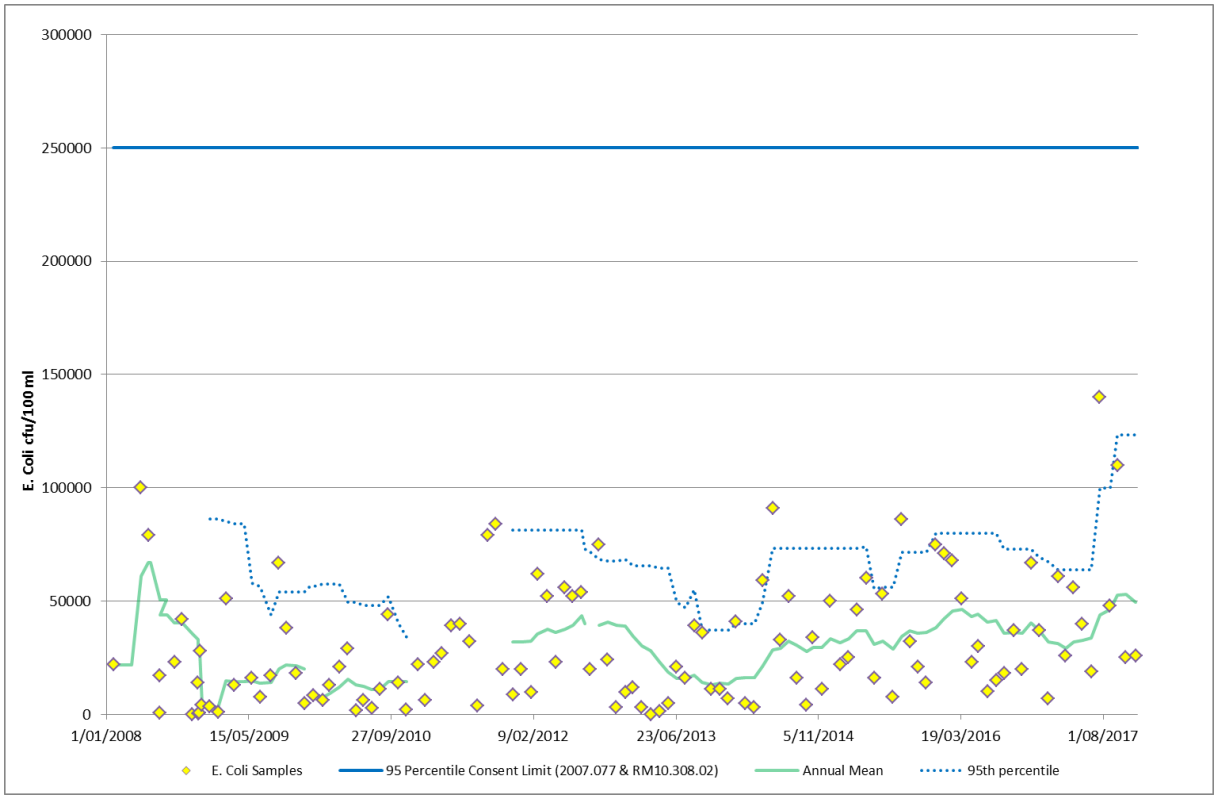

Figure 4-2: E. *coli* in Wastewater

The rolling 12 month 95th percentile of 44 mg/L for total Ammoniacal nitrogen exceeded the consent limit (30 mg/L) in the 2016/17 monitoring period (refer to Figure 4-3). The annual mean of 22 mg/L was within the consent limit of 25 mg/L at the end of the 2016/17 monitoring period, although the rolling mean did slightly exceed the consent limit from July to October 2017.

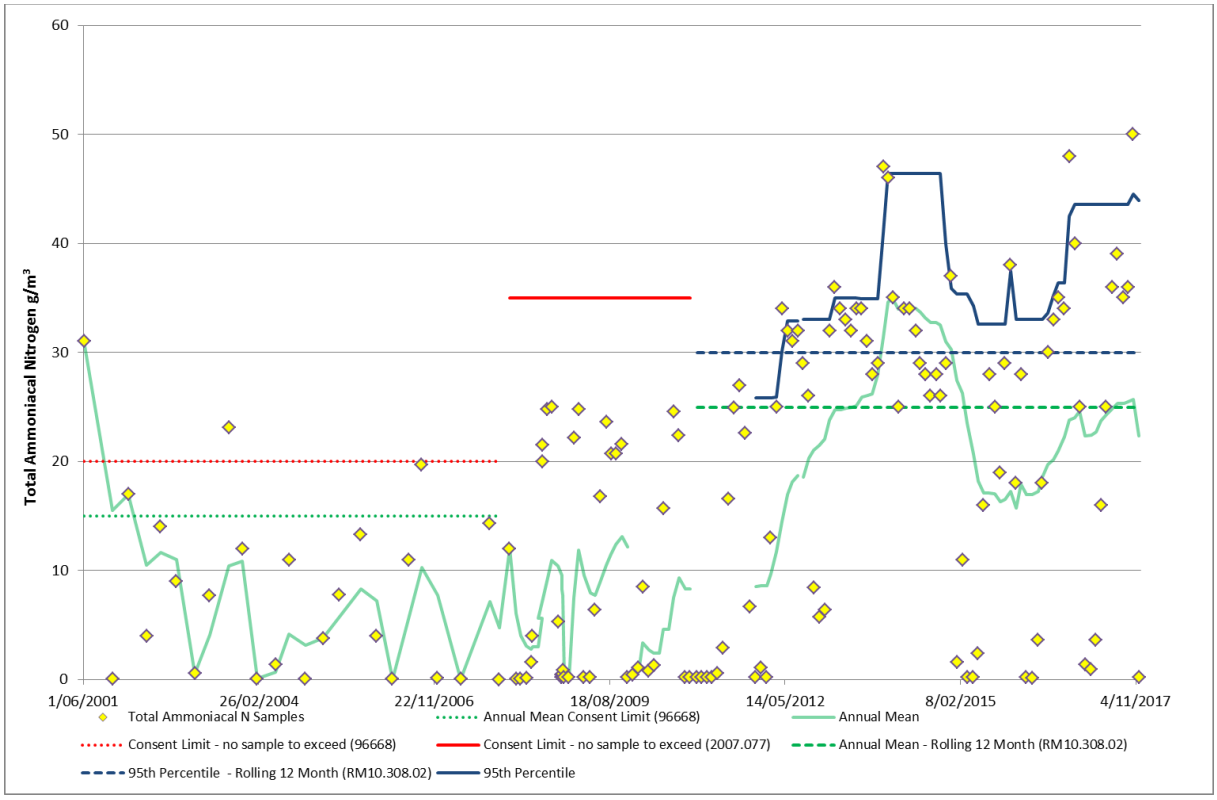

Figure 4-3: Total Ammoniacal Nitrogen in Wastewater

The rolling 12 month 95th percentile of 64 mg/L for total nitrogen exceeded the consent limit (40 mg/L) in the 2016/17 monitoring period (refer to Figure 4-4). The maximum concentration of total nitrogen over the year was 69 mg/L with an annual mean of 37 mg/L.

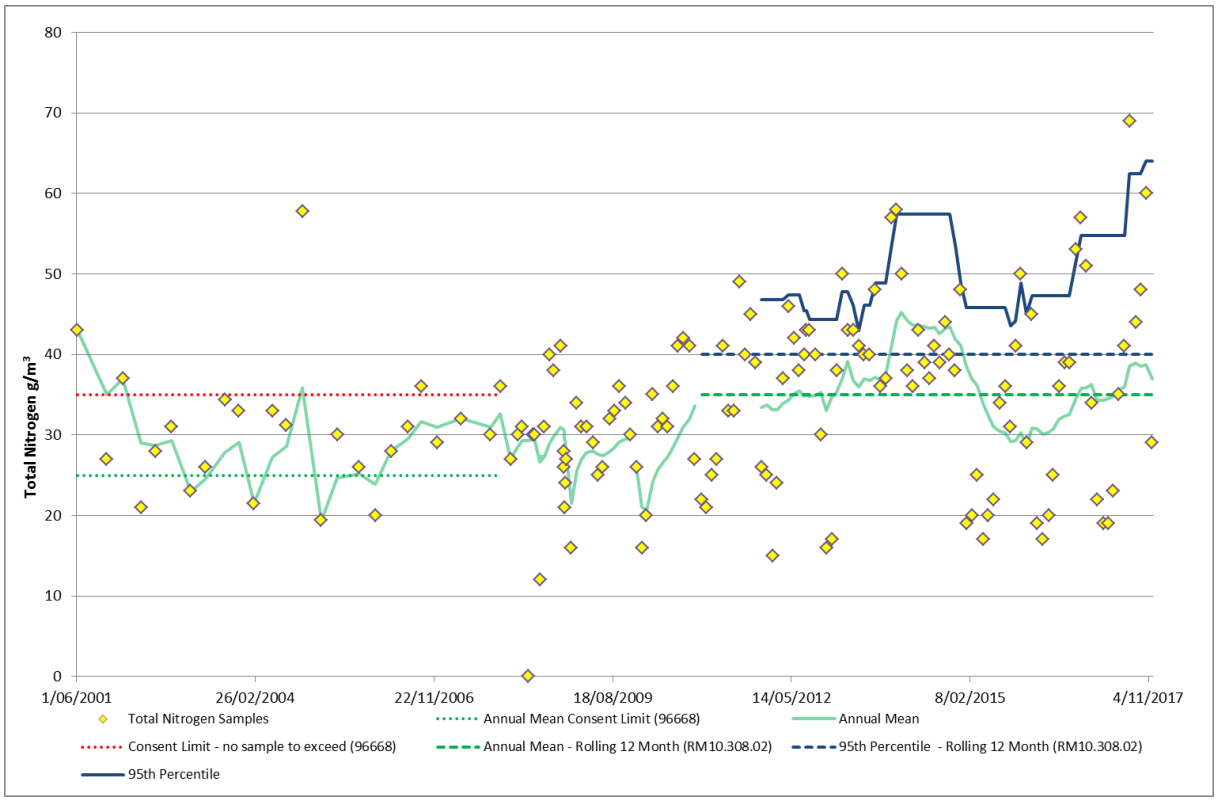

Figure 4-4: Total Nitrogen in Wastewater to Land

Total suspended solids, total phosphorus and BOD_5 are consistent with the results in previous years (refer to Figure 4-5 to 4-7). Total phosphorus remained compliant with the rolling 95th percentile and the annual mean. There are no consent limits for total suspended solids and BOD_5. Previous Resource Consent (96668) trigger levels are presented in the graphs as reference for the years the trigger levels are applicable to.

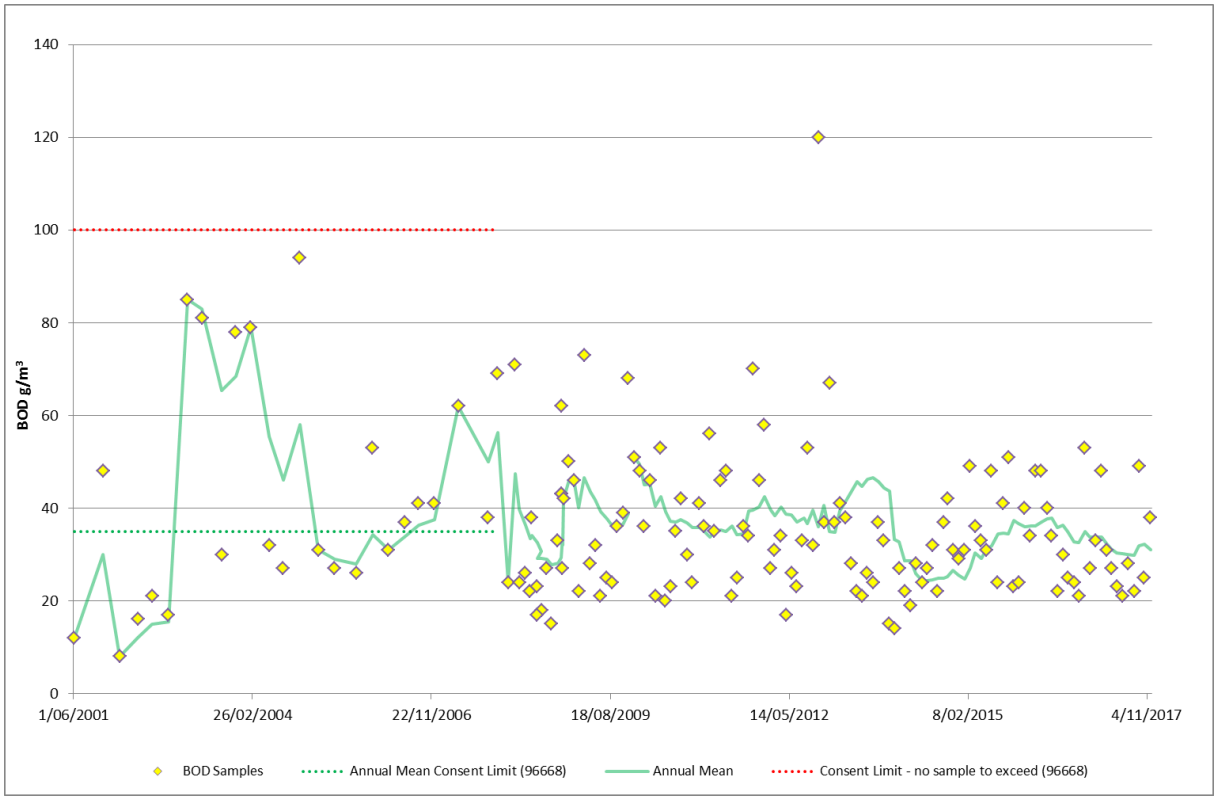

Figure 4-5: BOD_5 in Wastewater to Land

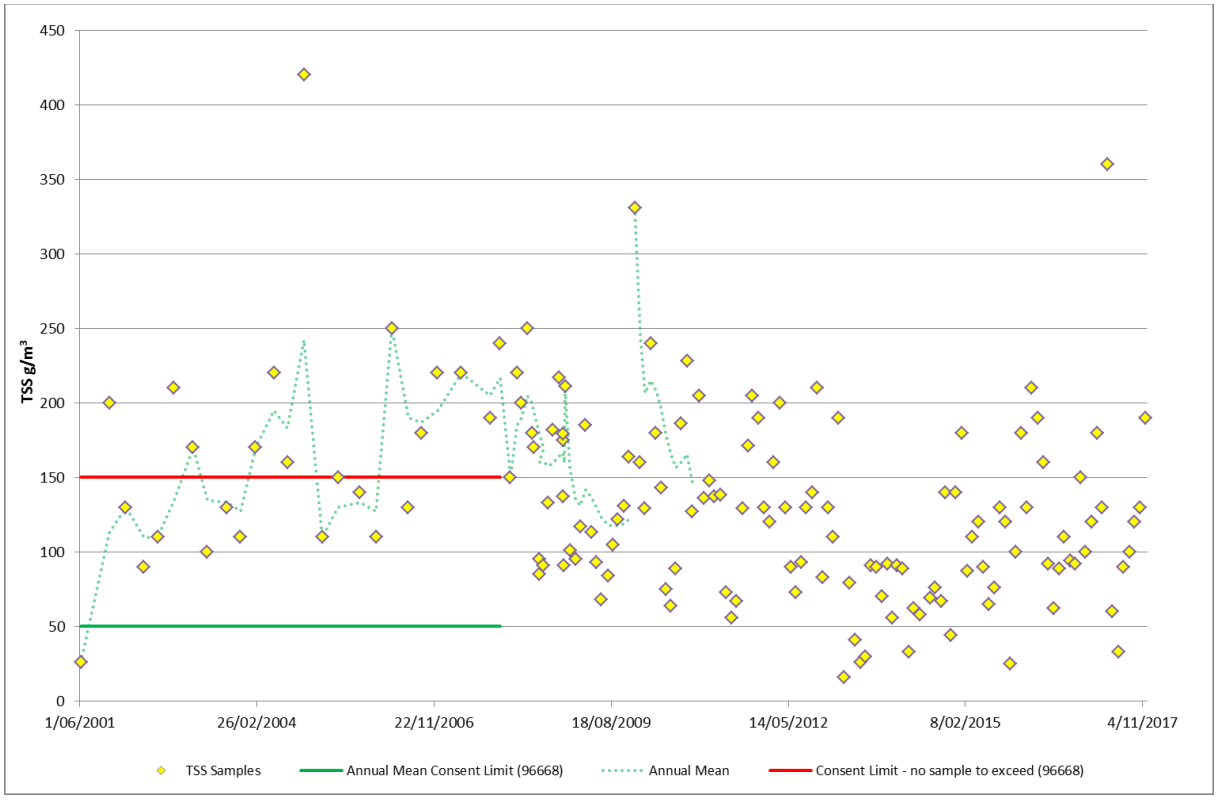

Figure 4-6: Total Suspended Solids in Wastewater to Land

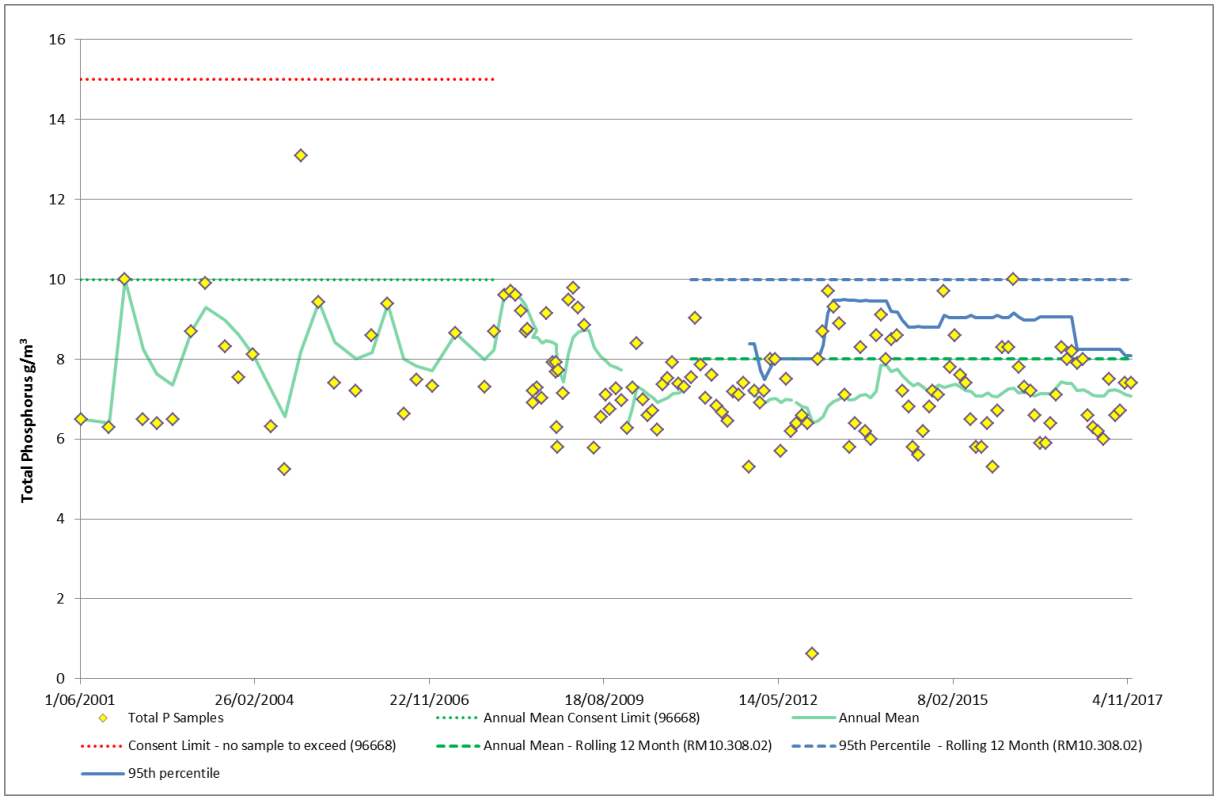

Figure 4-7: Total Phosphorus in Wastewater to Land

4.2 *Spray Irrigation System*

Condition 12 of Resource Consent RM10.308.02 requires that a nitrogen mass balance for the spray irrigation land application area is prepared annually. This is to include the following:

- *The nitrogen mass balance shall consist as a minimum the total nitrogen applied to land and crop removal of nitrogen.*
- *The total nitrogen applied to the spray irrigation land shall be estimated from the total volume of wastewater applied and the average of monthly concentration of total nitrogen in the land applied wastewater.*
- *The crop removal of nitrogen from the spray irrigation land shall be estimated by obtaining dry matter content and total nitrogen content after each crop/plant harvest.*
- *The nitrogen mass balance from condition 12(a) and any other factors such as ammonia volatilisation and denitrification shall be used to calculate the mass of nitrogen leached from the site, using a model acceptable to the consent authority.*

This information is presented in a separate report completed by Lowe Environmental Impact, as per previous years.

4.3 *Resource Consent Requirements and Compliance*

Compliance with Resource Consents RM10.308.01 and RM10.308.02 is displayed in Tables 4-2 and 4-3 by condition.

Table 4-2: Discharge to Air Permit RM.10.308.01 Conditions

Condition #	Clause Condition	Comments	Compliance
1	This consent shall only be exercised in conjunction with Discharge Permit RM10.308.02.		**Achieved**
2	The discharge to air shall be as described in the consent application submitted to the Consent Authority on 31 August 2010 and any subsequent information provided.		**Achieved**
3	Wind cloth shall be installed on the western, southern and eastern-most boundaries of the area on which treated wastewater is to be applied by spray irrigation. This wind cloth shall be maintained until the screen foliage required under condition 4 is fully established.	Installed prior to 1 December 2012.	**Achieved**
4	Suitable screening foliage, that shall be at least 3 metres high but not exceed 6 metres in height, shall be planted on the western, southern and eastern-most boundaries of the area on which treated wastewater is applied by spray irrigation.	Planted and irrigated prior to 1 December 2012.	**Achieved**
5	A weather station shall be installed in an appropriate location to record, as a minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation.	Installed in August 2011.	**Achieved**
6	The spray irrigation system shall not be operated in conditions where wind speed, as measured at the on-site station installed under condition 5, exceeds 29.9 km/hour.	Control system installed to meet this condition.	**Achieved**
7	The consent holder shall keep a record of any complaints received regarding discharges of odour from the site. The record shall, as a minimum, include the following: (a) the time and place at which the complaint was generated; (b) the nature of the complaint; (c) operating conditions at the time of the complaint, including any malfunctioning or breakdown of control equipment; (d) wind and weather conditions at the time of the complaint; and (e) corrective action taken by the consent holder to minimise the risk and extent of the recurrence of the causes of the complaint. The consent holder shall submit a copy of the written record of the complaint to the consent authority within two weeks after any complaint occurring, together with the details of the corrective actions taken.	No odour complaints from the Hawea Oxidation Ponds in the 2016/17 year.	**Achieved**
8	There shall be no discharge of odour, as a result of the exercise of this consent, that is noxious, dangerous, offensive or objectionable to the extent that it causes an adverse effect beyond the boundary of the site, in the opinion of an authorised officer of the Consent Authority.	No odour complaints from the Hawea Oxidation Ponds in the 2016/17 year.	**Achieved**

**Conditions 1 and 9 are 'general' resource consent conditions that do not require compliance monitoring*

Table 4-3: Discharge to Land Permit RM10.308.02 Conditions

Condition #	Clause Condition	Comments	Compliance
2	The volume of effluent discharged shall not exceed 775 cubic metres per day.	Refer to Appendix D. Generally compliant, with only one day in January 2017 recorded in excess of the consent limit, at 779 m^3/day.	**Non-compliant**
3	The distance the site boundary from any part of the wastewater treatment and disposal system shall no less than 5 metres.	Compliant.	**Achieved**
4	By no later than 1 December 2012, the consent holder shall ensure that the trench utilised for wastewater disposal: a) is at least 150 metres long and 2 m wide in total; and b) is intermittently dosed; and c) is not used for the disposal of wastewater for more than 4 months in total in any one calendar year.	The trench is utilised for more than 4 months per calendar year.	**Non-compliant**
5	By no later than 1 December 2012, the consent holder shall install and commission a spray irrigation system for the land application of treated wastewater. The spray irrigation system shall meet the following criteria: (a) the total area on which treated wastewater is applied by spray irrigation shall be no less than 2.5 hectares; (b) treated wastewater shall be applied evenly by spray irrigation to the area defined in appendix I only; (c) the area on which treated wastewater is applied by spray irrigation shall be fenced with a 2 metre high deer fence with appropriate signage warning the general public of the hazard; (d) a weather station shall be installed in an appropriate location to record, as a minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation; (e) wastewater shall not be applied to land by spray irrigation system during the hours outside of 11 pm to 5 am; (f) nozzle pressure must not exceed 400 kilopascals (kpa); (g) there shall be no irrigation of treated wastewater using k-line irrigation systems.	Spray irrigation system installed 5 December 2012. The system was commissioned 20 December 2012 after pump failures. This extension (to January 2013) was agreed upon with Sarah Ibbotson and Martin King of the ORC. The spray irrigation continues to operate within this criteria.	**Achieved**
6	The area on which treated wastewater is to be applied using spray irrigation shall be planted in high growth and nitrogen uptake vegetation (such as Lucerne or ryegrass) and shall be managed as far as practicably possible to optimise nutrient removal. A minimum of three harvests per year shall be undertaken.	A harvest occurred in March 2017, with another scheduled for December 2017.	**Non-compliant**
7	The total nitrogen applied to the spray irrigation area shall not exceed 1,223 kilograms of nitrogen per hectare per year.	The nitrogen mass balance is provided in a separate report.	**Achieved**
8	The treatment and disposal system shall be constructed and installed in accordance with the details and plans supplied with the consent application submitted to the consent authority on 31 August 2010, and attached to this consent as appendix I.	Spray irrigation system installed 5 December 2012.	**Achieved**
9	The consent holder shall install a flow meter on the outlet pipe from the treatment system and continually measure and record the daily volume (based on a no more than weekly average) of effluent being discharged to the disposal field. The consent holder shall forward the record for the previous 12-month period to the consent authority by 1 December each year, and upon request.	Refer to Appendix D.	**Achieved**

<table>
<tr><th>Condition #</th><th>Clause Condition</th><th>Comments</th><th>Compliance</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>(A) from the first exercise of this consent, the consent holder shall collect representative samples of the treated wastewater from the outlet of the oxidation pond in the last week of each month. The samples shall be analysed for: (i) five day total biochemical oxygen demand (bod_5); and (ii) total suspended solids; and(iii) total nitrogen; and (iv) total Ammoniacal nitrogen; and (v) total phosphorous; and (vi) Escherichia coli.
(b) from the first exercise of this consent, wastewater discharged from the oxidation pond shall comply with the following criteria:
<table>
<tr><td></td><td>Mean*</td><td>95th percentile (mg/l)*</td></tr>
<tr><td>Ammoniacal nitrogen</td><td>25 (mg/l)</td><td>30 (mg/l)</td></tr>
<tr><td>Total nitrogen</td><td>35 (mg/l)</td><td>40 (mg/l)</td></tr>
<tr><td>Total phosphorous</td><td>8 (mg/l)</td><td>10 (mg/l)</td></tr>
<tr><td>Escherichia coli</td><td>-</td><td>2.5 x 10^5 cfu/100 ml</td></tr>
</table>
*the mean and 95th percentile applies to a rolling 12 month period.
(c) the analytical sample results from the sampling under condition 9(a) of this consent shall be submitted to the consent authority by 1 Dec each year &upon request.</td><td>Refer to Appendices B and C for all results.

Elevated results received for 95th percentile and annual mean for total nitrogen and total Ammoniacal nitrogen.</td><td>Non-compliant</td></tr>
<tr><td>11</td><td>All sampling techniques shall be acceptable to the consent authority. All analysis carried out in connection with this consent shall be performed by a laboratory that meets ISO 17025 standards, or otherwise as specifically approved by the consent authority.</td><td>Sampling and lab analysis performed monthly by Watercare Laboratories to meet required standards.</td><td>Achieved</td></tr>
<tr><td>12</td><td>The following information shall be provided in writing to the consent authority by 1 December each year, and upon request, following the commencement of the exercise of the consent:
(a) the nitrogen mass balance for the spray irrigation land application area, which shall be determined annually. the nitrogen mass balance shall consist as a minimum the total nitrogen applied to land and crop removal of nitrogen.
(b) the total nitrogen applied to the spray irrigation land shall be estimated from the total volume of effluent applied and the average of monthly concentration of total nitrogen in the land applied effluent.
(c) the crop removal of nitrogen from the spray irrigation land shall be estimated by obtaining dry matter content and total nitrogen content after each crop/plant harvest.
(d) the nitrogen mass balance from condition 12(a) and any other factors such as ammonia volatilisation and denitrification shall be used to calculate the mass of nitrogen leached from the site, using a model acceptable to the consent authority</td><td>The nitrogen mass balance is presented in a separate report.</td><td>Achieved</td></tr>
<tr><td>13</td><td>The consent holder shall forward an annual report in writing to the consent authority by 1 December each year. The annual report shall cover the preceding 12 month period (from 1 December the preceding year until 30 November of the current year) and shall report on compliance with this consent. As a minimum, the report shall include:
(a) a summary of all analytical results for the year; and (b) a summary of the year's monitoring results, in context of previous years' results; and (c) comments on compliance with the conditions of this discharge permit; and (d) a summary of any complaints received, the validity of each complaint and the corrective action taken; and (e) a summary of any malfunctions of breakdowns and the corrective action taken; and (f) details of the cut and carry operation, including the calculations for nitrogen loading in the spray irrigation land, number of harvests, dry matter and total nitrogen content of the harvest and nitrogen balance for this site. (g) any other issues considered relevant by the consent holder.</td><td>Annual Report submitted for the period 1 December 2016 – 30 November 2017 on 12th December 2017.

Please note that the unrealistic wording of this condition requires an annual report to be submitted only one day following the end of the monitoring period.</td><td>Achieved</td></tr>
<tr><td>14</td><td>By no later than 1 December 2012, the consent holder shall prepare and forward to the consent authority an operations and management manual for the wastewater treatment and disposal system to ensure its effective and efficient operation at all times. The system shall be operated in accordance with this manual, which shall be updated as appropriate. The manual and include, as a minimum,:
(a) a brief description of the treatment and disposal system, including a site map indicating the location of the treatment and disposal system, points of discharge and any monitoring sites; (b) key operational matters, including weekly, monthly and annual maintenance checks; (c) monitoring requirements and procedures including a nitrogen balance sheet for the purpose of managing nitrogen inputs and outputs including nitrogen leaching losses; (d) a management plan for the cut and carry operation including procedures for harvesting grass from the site, and maximising grass growth and nitrogen uptake by grass such as soil tests, supplementary nutrient additions and pest and weed control; (e) management and dosing of trenches (f) contingency plans in the event of system malfunctions or breakdowns; and (g) the means of receiving and dealing with any complaints; and (h) emergency contact phone numbers.</td><td>The first O&M manual was sent to the ORC on the 7 May 2008, with an updated O&M manual sent 8 August 2008. A revised O&M manual by VW was sent to the ORC in April 2010 with the Annual Report 2009/10.

Updated O&M Manual submitted to the ORC on 6th December 2017.</td><td>Achieved</td></tr>
<tr><td>15</td><td>No ponding or surface run-off of effluent shall occur as a result of the exercise of this consent.</td><td>No ponding or surface run-off of wastewater.</td><td>Achieved</td></tr>
<tr><td>16</td><td>There shall be no odour emission resulting from the treatment and disposal system that is offensive or objectionable to such an extent that it has an adverse effect on the environment beyond the boundary of the property on which the consent is exercised.</td><td>No odour complaints received within the 2016/17 year.</td><td>Achieved</td></tr>
<tr><td>17</td><td>This permit does not authorise the discharge of sludge to land or water.</td><td>No sludge discharged to land or water.</td><td>Achieved</td></tr>
</table>

**Conditions 1 is a 'general' resource consent conditions that do not require compliance monitoring*

4.4 *WWTP Performance & Future Works*

Veolia is the 3-waters (water, wastewater and storm water) operators and maintenance contractor for QLDC. In the 1 December 2016 to 30 November 2017 period there were no major breakdowns. Veolia manages programmed maintenance and work orders/ requests for service for breakdowns.

A blockage of the pond outlet pipe was identified and subsequently cleared in January 2017, resulting in a slight exceedance of the consented flow rate on 26/01/17. The outlet pipe had become blocked, resulting in only a minimal discharge for the preceding two days, and then a larger than usual discharge once the blockage was cleared.

QLDC employed the services of Gilles Altner of Global Environmental Engineering Ltd in December 2015 to carry out a plant performance investigation. A number of short to mid-term recommendations were made. Veolia also completed a performance review of the plant in 2015. Following the recommendations of these reports, efforts have been made to optimise the operation of the plant to reduce nutrient levels.

As stated in previous reports, it has been determined that the plant is not suitable for the current resource consent conditions. There is no design basis for it to remove nutrients reliably. Consideration needs to be given to significant capital upgrade to this facility. Some options to consider for cost-effectiveness would be to:

- Pipe the waste to Project Pure (refer to 2013/14 Annual Report).
- Retrofit additional treatment into existing site.

QLDC is committed to implementing a long term solution. The draft QLDC Long Term Plan includes budget to either upgrade the Hawea WWTP or pipe the waste to Project Pure, in 2021 – 2023.

5. Summary and Conclusions

The interpretation of and conclusion about, the monitoring results from the Hawea WWTP and consent compliance are as follows:

- The volume of wastewater discharged generally remained below the consent limit of 775 m^3/day, with only one day recorded in excess of this, at 779 m^3/day in January 2017. The annual average was 204 m^3/day.

- The rolling 12 month 95th percentile of 44 mg/L for total Ammoniacal nitrogen exceeded the consent limit (30 mg/L) throughout the 2016/17 monitoring period, with the rolling mean also exceeding the consent limit during July to October 2017.

- The rolling 12 month 95th percentile of 64 mg/L for total nitrogen exceeded the consent limit (40 mg/L) in the 2016/17 monitoring period. The annual mean consent limit was also exceeded.

- The results for E. *coli* remained below the consent limit. Total phosphorus, total suspended solids and BOD5 are consistent with results from previous years. Total phosphorus was compliant with consent limits, while total suspended solids and BOD5 do not have consent limits.

Compliance with Resource Consents RM10.308.01 and RM10.308.02 was achieved in the 2016/17 monitoring year for a number of the consent conditions, however a number of issues still remain, similar to previous years. The monitoring results for total nitrogen and total Ammoniacal nitrogen were elevated above consent limits, as in previous years, despite efforts to optimise plant performance. Although it is noted that the November 2017 results were improved from previous months.

The N Mass Balance Report produced by Lowe Environmental Impact recommends regular monitoring of aeration performance and alkalinity levels in the pond to determine if this is the reason for low nitrification, with alkalinity added if considered necessary.

There have been no odour complaints for the Hawea oxidation ponds during the 2016/17 year.

Veolia and QLDC will continue to monitor the plant and improve performance where possible. Currently the system appears to be constrained to a spray irrigation discharge of 105 m^3/day, with the remainder being discharged via the trench. This may be influenced by consent restrictions related to allowable discharge time periods and wind speed, however there may be opportunity to discharge greater volumes of wastewater via the spray irrigation, to further minimise usage of the trench. This will be investigated further and implemented when possible.

Harvesting frequency should also be increased. Harvests have been infrequent during recent years due to the difficulty finding a contractor willing to complete the work. This is because the disposal area is small in comparison to other competing jobs, and the above ground sprinkler system makes harvesting the block challenging. Note that while only one harvest was completed during the 2016/17 monitoring year, harvests also occurred in November 2016 and December 2017 just slightly outside of the period that this report covers.

The longer term solution for Hawea wastewater compliance, is to either upgrade the existing treatment facility, or construct a pipe to Project Pure, and this has been budgeted for 2021-2023.

Glossary of Terms

BOD	Biological Oxygen Demand (BOD) measures the rate of oxygen uptake by micro-organisms in a sample of water at a temperature of 20°C and over an elapsed period of five days in the dark.
cfu	Colony Forming Units (cfu) is a measure of the concentration of bacteria usually expressed as per 100 millimetre sample.
COD	The Chemical Oxygen Demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water. Most applications of COD determine the amount of organic pollutants found in surface water (e.g. lakes and rivers), making COD a useful measure of water quality. It is expressed in milligrams per litre (mg/L), which indicates the mass of oxygen consumed per litre of solution.
Conductivity	An indication of the level of dissolved salts in a sample, usually measured at 20°C and expressed in mS/m
Wastewater	Discharge from the WWTP (in this case, treated wastewater).
g/m³	grams per cubic meter, equivalent to milligrams per litre (mg/L). In water this is also equivalent to parts per million (ppm).
pH	pH is a numeric measure of the acidity or basicity of a solution. It is defined as the cologarithm of the activity of dissolved hydrogen ions (H^+). Neutral is pH 7. Numbers lower than 7 are increasingly acidic and higher than 7 are increasingly alkaline. The scale is logarithmic i.e. a change of 1 represents a ten-fold change in strength, for example, a pH of 4 is 10 times more acidic than a pH of 5.
Resource Consent	refers to Section 87 of the RMA. Resource consents include land use consents, coastal permits, water permits and discharge permits.
RMA	Resource Management Act 1991 and subsequent amendments.
WWTP	Wastewater Treatment Plant (WWTP) is the process of removing contaminants from wastewater and household sewage, both runoff and domestic. It includes physical, chemical, and biological processes to remove physical, chemical and biological contaminants. Its objective is to produce a waste stream (or treated wastewater) and a solid waste or sludge suitable for discharge or reuse back into the environment.

Appendix A Resource Consents

Consent No. RM10.308.01

Our Reference: A296715

DISCHARGE PERMIT

Pursuant to Section 104B of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Queenstown Lakes District Council

Address: 10 Gorge Road, Queenstown

To discharge contaminants to air for the purpose of discharging treated wastewater.

For a term expiring: 12 November 2022

Location of consent activity: Lake Hawea, approximately 600 metres south of the intersection of Domain Road and Cemetery Road

Legal description of consent location: Lot 1 DP 20555

Map Reference: NZTM E1302846 N5052016 NZ260 G40 128 137

Conditions

Specific

1. This consent shall only be exercised in conjunction with Discharge Permit RM10.308.02.

2. The discharge to air shall be as described in the consent application submitted to the Consent Authority on 31 August 2010 and any subsequent information provided

3. Wind cloth shall be installed on the western, southern and eastern-most boundaries of the area on which treated wastewater is to be applied by spray irrigation. This wind cloth shall be maintained until the screen foliage required under Condition 4 is fully established.

4. Suitable screening foliage, that shall be at least 3 metres high but not exceed 6 metres in height, shall be planted on the western, southern and eastern-most boundaries of the area on which treated wastewater is applied by spray irrigation.

5. A weather station shall be installed in an appropriate location to record, as a minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation.

6. The spray irrigation system shall not be operated in conditions where wind speed, as

measured at the on-site station installed under Condition 5, exceeds 29.9 km/hour;

Performance Monitoring

7. The consent holder shall keep a record of any complaints received regarding discharges of odour from the site. The record shall, as a minimum, include the following:
(a) The time and place at which the complaint was generated;
(b) The nature of the complaint;
(c) Operating conditions at the time of the complaint, including any malfunctioning or breakdown of control equipment;
(d) Wind and weather conditions at the time of the complaint; and
(e) Corrective action taken by the consent holder to minimise the risk and extent of the recurrence of the causes of the complaint.

The consent holder shall submit a copy of the written record of the complaint to the Consent Authority within two weeks after any complaint occurring, together with the details of the corrective actions taken.

General

8. There shall be no discharge of odour, as a result of the exercise of this consent, that is noxious, dangerous, offensive or objectionable to the extent that it causes an adverse effect beyond the boundary of the site, in the opinion of an authorised officer of the Consent Authority.

9. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within three months of each anniversary of the commencement of this consent, for the purpose of:
(a) Determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the consent; or
(b) Ensuring the conditions of this consent are consistent with any National Environmental Standards; or
(c) Requiring the consent holder to adopt the best practicable option to remove or reduce any adverse effect on the environment arising as a result of the exercise of this consent.

Notes to Consent Holder

1. *If you require a replacement consent/permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*

Issued at Dunedin this 15th day of November 2010
Marian Weaver
RM Procedural Specialist

Our Reference: A296715

Consent No. RM10.308.02

DISCHARGE PERMIT

Pursuant to Section 104B of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Queenstown Lakes District Council

Address: 10 Gorge Road, Queenstown

To discharge contaminants to land for the purpose of discharging treated wastewater.

For a term expiring: 12 November 2022

Location of consent activity: Lake Hawea, approximately 600 metres south of the intersection of Domain Road and Cemetery Road

Legal description of consent location: Lot 1 DP 20555

Map Reference: NZTM E1302846 N5052016 NZ260 G40 128 137

Conditions

Specific

1. The discharge shall only be treated domestic wastewater, as described in the consent application submitted to the Consent Authority on 31 August 2010 and any subsequent information provided.

2. The volume of effluent discharged shall not exceed 775 cubic metres per day.

3. The distance the site boundary from any part of the wastewater treatment and disposal system shall no less than 5 metres.

4. By no later than 1 December 2012, the consent holder shall ensure that the trench utilised for wastewater disposal:
   a) is at least 150 metres long and 2 m wide in total; and
   b) is intermittently dosed; and
   c) is not used for the disposal of wastewater for more than 4 months in total in any one calendar year.

5. By no later than 1 December 2012, the consent holder shall install and commission a spray irrigation system for the land application of treated wastewater. The spray irrigation system shall meet the following criteria:
   (a) The total area on which treated wastewater is applied by spray irrigation shall be no less than 2.5 hectares;
   (b) Treated wastewater shall be applied evenly by spray irrigation to the area defined in Appendix I only;
   (c) The area on which treated wastewater is applied by spray irrigation shall be fenced with a 2 metre high deer fence with appropriate signage warning the general public of the hazard;
   (d) A weather station shall be installed in an appropriate location to record, as a

minimum, rainfall and wind conditions at the site where treated wastewater is to be applied by spray irrigation;
(e) Wastewater shall not be applied to land by spray irrigation system during the hours outside of 11 pm to 5 am; (f) Nozzle pressure must not exceed 400 kilopascals (kPa);
(g) There shall be no irrigation of treated wastewater using K-Line irrigation systems.

6. The area on which treated wastewater is to be applied using spray irrigation shall be planted in high growth and nitrogen uptake vegetation (such as Lucerne or Ryegrass) and shall be managed as far as practicably possible to optimise nutrient removal. A minimum of three harvests per year shall be undertaken.

7. The total nitrogen applied to the spray irrigation area shall not exceed 1,223 kilograms of nitrogen per hectare per year.

Performance Monitoring

8. The treatment and disposal system shall be constructed and installed in accordance with the details and plans supplied with the consent application submitted to the Consent Authority on 31 August 2010, and attached to this consent as Appendix I.

9. The consent holder shall install a flow meter on the outlet pipe from the treatment system and continually measure and record the daily volume (based on a no more than weekly average) of effluent being discharged to the disposal field. The consent holder shall forward the record for the previous 12-month period to the Consent Authority by 1 December each year, and upon request.

10. (a) From the first exercise of this consent, the consent holder shall collect representative samples of the treated wastewater from the outlet of the oxidation pond in the last week of each month. The samples shall be analysed for:
(i) Five day total biochemical oxygen demand (BOD_5); and
(ii) Total suspended solids; and (iii) Total nitrogen; and (iv) Total Ammoniacal nitrogen; and (v) Total phosphorous; and (vi) *Escherichia coli*.

(b) From the first exercise of this consent, wastewater discharged from the oxidation pond shall comply with the following criteria:

	Mean*	95th Percentile (mg/L)*
Ammoniacal Nitrogen	25 (mg/L)	30 (mg/L)
Total Nitrogen	35 (mg/L)	40 (mg/L)
Total Phosphorous	8 (mg/L)	10 (mg/L)
Faecal Coliforms	-	2.5 x 10^5 cfu/100 mL

*The mean and 95th percentile applies to a rolling 12 month period.

(c) The analytical sample results from the sampling under Condition 9(a) of this consent shall be submitted to the Consent Authority by 1 December each year, and upon request.

11. All sampling techniques shall be acceptable to the Consent Authority. All analysis carried out in connection with this consent shall be performed by a laboratory that meets ISO 17025 standards, or otherwise as specifically approved by the Consent Authority.

12. The following information shall be provided in writing to the Consent Authority by 1 December each year, and upon request, following the commencement of the exercise of the consent:
(a) The nitrogen mass balance for the spray irrigation land application area, which shall

be determined annually. The nitrogen mass balance shall consist as a minimum the total nitrogen applied to land and crop removal of nitrogen.

(b) The total nitrogen applied to the spray irrigation land shall be estimated from the total volume of effluent applied and the average of monthly concentration of total nitrogen in the land applied effluent.

(c) The crop removal of nitrogen from the spray irrigation land shall be estimated by obtaining dry matter content and total nitrogen content after each crop/plant harvest.

(d) The nitrogen mass balance from Condition 12(a) and any other factors such as ammonia volatilisation and denitrification shall be used to calculate the mass of nitrogen leached from the site, using a model acceptable to the Consent Authority

13. The consent holder shall forward an annual report in writing to the Consent Authority by 1 December each year. The annual report shall cover the preceding 12 month period (from 1 December the preceding year until 30 November of the current year) and shall report on compliance with this consent. As a minimum, the report shall include:

(a) A summary of all analytical results for the year; and
(b) A summary of the year's monitoring results, in context of previous years' results; and
(c) Comments on compliance with the conditions of this discharge permit; and
(d) A summary of any complaints received, the validity of each complaint and the corrective action taken; and
(e) A summary of any malfunctions of breakdowns and the corrective action taken; and
(f) Details of the cut and carry operation, including the calculations for nitrogen loading in the spray irrigation land, number of harvests, dry matter and total nitrogen content of the harvest and nitrogen balance for this site.
(g) Any other issues considered relevant by the consent holder.

14. By no later than 1 December 2012, the consent holder shall prepare and forward to the Consent Authority an Operations and Management Manual for the wastewater treatment and disposal system to ensure its effective and efficient operation at all times. The system shall be operated in accordance with this manual, which shall be updated as appropriate. The manual and include, as a minimum,:
(a) A brief description of the treatment and disposal system, including a site map indicating the location of the treatment and disposal system, points of discharge and any monitoring sites;
(b) Key operational matters, including weekly, monthly and annual maintenance checks;
(c) Monitoring requirements and procedures including a nitrogen balance sheet for the purpose of managing nitrogen inputs and outputs including nitrogen leaching losses;
(d) A management plan for the cut and carry operation including procedures for harvesting grass from the site, and maximising grass growth and nitrogen uptake by grass such as soil tests, supplementary nutrient additions and pest and weed control;
(e) Management and dosing of trenches
(f) Contingency plans in the event of system malfunctions or breakdowns; and
(g) The means of receiving and dealing with any complaints; and
(h) Emergency contact phone numbers.

General

15. No ponding or surface run-off of effluent shall occur as a result of the exercise of this consent.

16. There shall be no odour emission resulting from the treatment and disposal system that is offensive or objectionable to such an extent that it has an adverse effect on the

environment beyond the boundary of the property on which the consent is exercised

17. This permit does not authorise the discharge of sludge to land or water.

18. If the consent holder:
(a) discovers koiwi tangata (human skeletal remains), waahi taoka (resources of importance), waahi tapu (places or features of special significance) or other Maori artefact material, the consent holder shall without delay:
(i) notify the Consent Authority, Tangata whenua and New Zealand Historic Places Trust and in the case of skeletal remains, the New Zealand Police.
(ii) stop work within the immediate vicinity of the discovery to allow a site inspection by the New Zealand Historic Places Trust and the appropriate runanga and their advisors, who shall determine whether the discovery is likely to be extensive, if a thorough site investigation is required, and whether an Archaeological Authority is required.
Any koiwi tangata discovered shall be handled and removed by tribal elders responsible for the tikanga (custom) appropriate to its removal or preservation. Site work shall recommence following consultation with the Consent Authority, the New Zealand Historic Places Trust, Tangata whenua, and in the case of skeletal remains, the New Zealand Police, provided that any relevant statutory permissions have been obtained.
(b) discovers any feature or archaeological material that predates 1900, or heritage material, or disturbs a previously unidentified archaeological or heritage site, the consent holder shall without delay:
(i) stop work within the immediate vicinity of the discovery or disturbance and
(ii) advise the Consent Authority, the New Zealand Historic Places Trust, and in the case of Maori features or materials, the Tangata whenua, and if required, shall make an application for an Archaeological Authority pursuant to the Historic Places Act 1993 and
(iii) arrange for a suitably qualified archaeologist to undertake a survey of the site. Site work shall recommence following consultation with the Consent Authority.

19. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent within three months of each anniversary of the commencement of this consent, for the purpose of:
(a) determining whether the conditions of this consent are adequate to deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the consent; or
(b) ensuring the conditions of this consent are consistent with any National Environmental Standards; or
(c) requiring the consent holder to adopt the best practicable option, in order to remove or reduce any adverse effect on the environment arising as a result of the exercise of this consent.

Notes to Consent Holder

1. *If you require a replacement consent/permit upon the expiry date of this permit, any new application should be lodged at least 6 months prior to the expiry date of this permit. Applying at least 6 months before the expiry date may enable you to continue to exercise this permit until a decision is made, and any appeals are resolved, on the replacement application.*

Issued at Dunedin this 15th day of November 2010
Marian Weaver
RM Procedural Specialist

Appendix I – Area on which Treated Wastewater is to be applied using Spray Irrigation

Appendix B Effluent Results Tables

	TSS	BOD5		Total Phosphorus			Total Nitrogen			Ammoniacal Nitrogen			*E. Coli*		
	mg/L	mg/L		mg/L			mg/L			mg/L			cfu/100 mL		
				Annual Mean	95th percentile		Annual Mean	95th percentile		Annual Mean	95th percentile		Annual Mean	95th percentile
Consent Limit				8	10		35	40		25	30			250,000
30/12/2010	205	41	7.6			22			0.2			22,000		
25/01/2011	136	36	9			21			0.2			6,300		
24/02/2011	148	56	7.9			25			0.2			23,000		
24/03/2011	137	35	7			27			0.2			27,000		
27/04/2011	138	46	7.6			41			0.6			39,000		
27/05/2011	73	48	6.8			33			2.9			40,000		
28/06/2011	56	21	6.7			33			16.6			32,000		
27/07/2011	67	25	6.5			49			24.9			3,700		
31/08/2011	129	36	7.2			40			27			79,000		
30/09/2011	171	34	7.1			45			22.6			84,000		
25/10/2011	205	70	7.4			39			6.7			20,000		
28/11/2011	190	46	5.3	7	8	26	33	47	0.2	9	26	8,600	32,050	81,250
28/12/2011	130	58	7.2	7	8	25	34	47	1.1	9	26	20,000	31,883	81,250
31/01/2012	120	27	6.9	7	8	15	33	47	0.2	9	26	9,900	32,183	81,250
23/02/2012	160	31	7.2	7	7	24	33	47	13	10	26	62,000	35,433	81,250
28/03/2012	200	34	8	7	8	37	34	47	25	12	26	52,000	37,517	81,250
27/04/2012	130	17	8	7	8	46	34	47	34	15	30	23,000	36,183	81,250
28/05/2012	90	26	5.7	7	8	42	35	47	32	17	33	56,000	37,517	81,250
26/06/2012	73	23	7.5	7	8	38	36	47	31	18	33	52,000	39,183	81,250
26/07/2012	93	33	6.2	7	8	40	35	45	32	19	33	54,000	43,375	81,250

6/08/2012						43	35	45					40,136	73,000
24/08/2012	130	53	6.4	7	8	43	35	44	29	19	33	20,000		71,900
25/09/2012	140	32	6.6	7	8	40	35	44	26	20	33	75,000	39,318	68,500
26/10/2012	210	120	6.4	7	8	30	35	44	8	21	33	24,000	40,718	67,850
26/11/2012	83	37	0.6	6	8	16	33	44	6	21	33	3,100	39,182	67,850
27/12/2012	130	67	8	6	8	17	35	44	6	22	33	9,600	39,155	68,500
23/01/2013	110	37	8.7	7	8	38	35	44	32	24	33	12,000	34,609	65,500
22/02/2013	190	41	9.7	7	9	50	37	48	36	25	35	3,000	30,155	65,500
26/03/2013	16	38	9.3	7	9	43	39	48	34	25	35	*45*	28,068	65,500
26/04/2013	79	28	8.9	7	9	43	37	46	33	25	35	1,400	23,104	64,500
27/05/2013	41	22	7.1	7	10	41	36	43	32	25	35	4,700	18,804	64,500
25/06/2013	26	21	5.8	7	9	40	37	46	34	25	35	21,000	15,804	49,500
25/07/2013	30	26	6.4	7	9	40	37	46	34	26	35	16,000	15,820	46,950
26/08/2013	91	24	8.3	7	9	48	37	49	31	26	35	39,000	17,404	55,200
24/09/2013	90	37	6.2	7	9	36	37	49	28	26	35	36,000	14,154	37,350
25/10/2013	70	33	6	7	9	37	37	49	29	28	35	11,000	13,070	37,350
25/11/2013	92	15	8.6	7	9	57	41	53	47	31	41	11,000	13,729	37,350
23/12/2013	56	14	9.1	8	9	58	44	57	46	35	46	7,100	13,520	37,350
20/01/2014	91	27	8	8	9	50	45	57	35	35	46	41,000	15,937	39,900
20/02/2014	89	22	8.5	8	9	38	44	57	25	34	46	4,900	16,095	39,900
25/03/2014	33	19	8.6	8	9	36	44	57	34	34	46	3,000	16,342	39,900
23/04/2014	62	28	7.2	8	9	43	44	57	34	34	46	59,000	21,142	49,100
29/05/2014	58	24	6.8	7	9	39	44	57	32	34	46	91,000	28,333	73,400
24/06/2014		27	5.8	7	9	37	43	57	29	34	46	33,000	29,333	73,400
23/07/2014	69	32	5.6	7	9	41	43	57	28	33	46	52,000	32,333	73,400
21/08/2014	76	22	6.2	7	9	39	43	57	26	33	46	16,000	30,417	73,400
24/09/2014	67	37	6.8	7	9	44	43	57	28	33	46	4,200	27,767	73,400
16/10/2014	140	42	7.2	7	9	40	44	57	26	33	46	34,000	29,683	73,400

17/11/2014	44	31	7.1	7	9	38	42	54	29	31	40	11,000	29,683	73,400
17/12/2014	140	29	9.7	7	9	48	41	49	37	30	36	50,000	33,258	73,400
20/01/2015	180	31	7.8	7	9	19	39	46	2	27	35	22,000	31,675	73,400
19/02/2015	87	49	8.6	7	9	20	37	46	11	26	35	25,000	33,350	73,400
20/03/2015	110	36	7.6	7	9	25	36	46	0.2	23	35	46,000	36,933	73,400
22/04/2015	120	33	7.4	7	9	17	34	46	0.2	21	34	60,000	37,017	73,950
20/05/2015	90	31	6.5	7	9	20	32	46	2	18	33	16,000	30,767	55,600
19/06/2015	65	48	5.8	7	9	22	31	46	16	17	33	53,000	32,433	56,150
24/07/2015	76	24	5.8	7	9	34	31	46	28	17	33	7,600	28,733	56,150
24/08/2015	130	41	6.4	7	9	36	30	46	25	17	33	86,000	34,567	71,700
22/09/2015	120	51	5.3	7	9	31	29	44	19	16	33	32,000	36,883	71,700
20/10/2015	25	23	6.7	7	9	41	29	44	29	17	33	21,000	35,800	71,700
19/11/2015	100	24	8.3	7	9	50	30	49	38	17	37	14,000	36,050	71,700
22/12/2015	180	40	8.3	7	9	29	29	45	18	16	33	75,000	38,133	79,950
20/01/2016	130	34	10.0	7	9	45	31	47	28	18	33	71,000	42,217	79,950
18/02/2016	210	48	7.8	7	9	19	31	47	0.2	17	33	68,000	45,800	79,950
22/03/2016	190	48	7.3	7	9	17	30	47	0.1	17	33	51,000	46,217	79,950
26/04/2016	160	40	7.2	7	9	20	30	47	4	17	33	23,000	43,133	79,950
19/05/2016	92	34	6.6	7	9	25	31	47	18	19	33	30,000	44,300	79,950
21/06/2016	62	22	5.9	7	9	36	32	47	30	20	34	10,000	40,717	79,950
22/07/2016	89	30	5.9	7	9	39	32	47	33	20	35	15,000	41,333	79,950
18/08/2016	110	25	6.4	7	9	39	33	47	35	21	36	18,000	35,667	72,800
22/09/2016	94	24	7.1	7	9	53	34	51	34	22	36	37,000	36,083	72,800
20/10/2016	92	21	8.3	7	9	57	36	55	48	24	43	20,000	36,000	72,800
21/11/2016	150	53	8.0	7	9	51	35.8	55	40	24	44	67,000	40,417	72,800
19/12/2016	100	27	8.2	7	9	34	36	55	25.0	25	44	37,000	37,250	69,350
20/01/2017	120	33	7.9	7	8	22	34	55	1.4	22	44	7,000	31,917	67,450
23/02/2017	180	48	8.0	7	8	19	34	55	1.0	22	44	61,000	31,333	63,700

22/03/2017	130	31	6.6	7	8	19	35	55	3.6	23	44	26,000	29,250	63,700
19/04/2017	360	27	6.3	7	8	23	35	55	16.0	24	44	56,000	32,000	63,700
19/05/2017	60	23	6.2	7	8	35	36	55	25.0	24	44	40,000	32,833	63,700
21/06/2017	33	21	6.0	7	8	41	36	55	36.0	25	44	19,000	33,583	63,700
20/07/2017	90	28	7.5	7	8	69	39	62	39.0	25	44	140,000	44,000	99,850
25/08/2017	100	22	6.6	7	8	44	39	62	35.0	25	44	48,000	46,500	99,850
20/09/2017	120	49	6.7	7	8	48	39	62	36.0	25	44	110,000	52,583	123,500
20/10/2017	130	25	7.4	7	8	60	39	64	50.0	26	45	25,000	53,000	123,500
23/11/2017	190	38	7.4	7	8	29	37	64	*0.2*	22	44	26,000	49,583	123,500

Italic and underlined = results below the detection limit and halved for analysis

Appendix C Watercare Laboratory Certificates

Watercare Laboratory Services

Auckland
52 Aintree Ave,
PO Box 107028,
Auckland Airport,
Tel: (09) 539 7614
Fax: (09) 539 7601

Invercargill
142 Esk Street,
PO Box 747,
Invercargill, 9840
(03) 214 4040
(03) 214 4041

Queenstown
74 Glenda Drive,
PO Box 2614,
Wakatipu,
(03) 409 0559

www.watercarelabs.co.nz
clientsupport@water.co.nz

Certificate of Analysis
Laboratory Reference:161219-102

Attention:	Operations .	*Final Report:*	**209395-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**28-Dec-2016**
Address:		*Received Date:*	**20-Dec-2016**
Client Reference:	**Hawea Ponds Monthly December 2016**		
Purchase Order:	**PO525608**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**161219-102-1**
Client Sample ID:		
Sample Date/Time:		19/12/2016
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	25
CBOD5	mg/L	27
Total Nitrogen (as N)	mg/L	34
Total Phosphorus (as P)	mg/L	8.2
Total Suspended Solids	mg/L	100
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	37000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Di	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 28/12/2016

Annie Cox
KTP Signatory

Watercare Laboratory Services

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52 Aintree Ave,
PO Box 107028,
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Certificate of Analysis
Laboratory Reference:170120-068

Attention:	Operations .	*Final Report:*	**213213-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**31-Jan-2017**
Address:		*Received Date:*	**21-Jan-2017**
Client Reference:	**Hawea Ponds Monthly January 2017**		
Purchase Order:	**PO525838**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**170120-068-1**
Client Sample ID:		
Sample Date/Time:		20/01/2017
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	1.4
CBOD5	mg/L	33
Total Nitrogen (as N)	mg/L	22
Total Phosphorus (as P)	mg/L	7.9
Total Suspended Solids	mg/L	120
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	7000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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ACCREDITED LABORATORY

Report Signatory 31/01/2017

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Certificate of Analysis
Laboratory Reference:170223-084

Attention:	Operations .	*Final Report:*	**217565-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**03-Mar-2017**
Address:		*Received Date:*	**24-Feb-2017**
Client Reference:	**Hawea Ponds Monthly February 2017**		
Purchase Order:	**PO526035**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**170223-084-1**
Client Sample ID:	
Sample Date/Time:	23/02/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	0.96
CBOD5	mg/L	48
Total Nitrogen (as N)	mg/L	19
Total Phosphorus (as P)	mg/L	8.0
Total Suspended Solids	mg/L	180

Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	61000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

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Report Signatory 03/03/2017

Marina Fisher
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Certificate of Analysis
Laboratory Reference:170322-104

Attention:	Operations .	*Final Report:*	**221979-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**07-Apr-2017**
Address:		*Received Date:*	**23-Mar-2017**
Client Reference:	**Hawea Ponds Monthly March 2017**		
Purchase Order:	**PO525267**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**170322-104-1**
Client Sample ID:	
Sample Date/Time:	22/03/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	3.6
CBOD5	mg/L	31
Total Nitrogen (as N)	mg/L	19
Total Phosphorus (as P)	mg/L	6.6
Total Suspended Solids	mg/L	130
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	26000

*Results marked with * are not accredited to International Accreditation New Zealand*

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

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ACCREDITED LABORATORY

Report Signatory 07/04/2017

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KTP Signatory

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Certificate of Analysis
Laboratory Reference:170419-122

Attention:	Operations .	*Final Report:*	**224468-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**28-Apr-2017**
Address:		*Received Date:*	**20-Apr-2017**
Client Reference:	**Hawea Ponds Monthly April 2017**		
Purchase Order:	**PO526495**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**170419-122-1**
Client Sample ID:	
Sample Date/Time:	19/04/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	16
CBOD5	mg/L	27
Total Nitrogen (as N)	mg/L	23
Total Phosphorus (as P)	mg/L	6.3
Total Suspended Solids	mg/L	360
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	56000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

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Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

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Report Signatory 28/04/2017

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Certificate of Analysis
Laboratory Reference:170519-085

Attention:	Operations .	*Final Report:*	**228324-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**27-May-2017**
Address:		*Received Date:*	**20-May-2017**
Client Reference:	**Hawea Ponds Monthly May 2017**		
Purchase Order:	**PO526658**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**170519-085-1**
Client Sample ID:	
Sample Date/Time:	19/05/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	25
CBOD5	mg/L	23
Total Nitrogen (as N)	mg/L	35
Total Phosphorus (as P)	mg/L	6.2
Total Suspended Solids	mg/L	60

Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	40000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

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Report Signatory 27/05/2017

Marina Fisher
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Certificate of Analysis
Laboratory Reference:170621-095

Attention:	Operations .	*Final Report:*	**232844-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**30-Jun-2017**
Address:		*Received Date:*	**22-Jun-2017**
Client Reference:	**Hawea Ponds Monthly June 2017**		
Purchase Order:	**PO526963**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**170621-095-1**
Client Sample ID:		
Sample Date/Time:		21/06/2017
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	36
CBOD5	mg/L	21
Total Nitrogen (as N)	mg/L	41
Total Phosphorus (as P)	mg/L	6.0
Total Suspended Solids	mg/L	33
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	19000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

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Report Signatory 30/06/2017

Chandra Sharma
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Certificate of Analysis
Laboratory Reference:170720-064

Attention:	Operations .	*Final Report:*	**236630-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**03-Aug-2017**
Address:		*Received Date:*	**21-Jul-2017**
Client Reference:	**Hawea Ponds Monthly July 2017**		
Purchase Order:	**PO527171**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**170720-064-1**
Client Sample ID:	
Sample Date/Time:	20/07/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	39
CBOD5	mg/L	28
Total Nitrogen (as N)	mg/L	69
Total Phosphorus (as P)	mg/L	7.5
Total Suspended Solids	mg/L	90

Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	140000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

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Report Signatory 03/08/2017

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Certificate of Analysis
Laboratory Reference:170823-100

Attention:	Operations .	*Final Report:*	**240087-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**04-Sep-2017**
Address:		*Received Date:*	**26-Aug-2017**
Client Reference:	**Hawea Ponds Monthly August 2017**		
Purchase Order:	**PO527366**	*Quote Reference :*	**42**

Sample Details		WATERS
Lab Sample ID:		**170823-100-1**
Client Sample ID:		
Sample Date/Time:		25/08/2017
Description:		Hawea Effluent (RM 10.308.02)
General Testing		
Ammoniacal Nitrogen (as N)	mg/L	35
CBOD5	mg/L	22
Total Nitrogen (as N)	mg/L	44
Total Phosphorus (as P)	mg/L	6.6
Total Suspended Solids	mg/L	100
Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	48000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher. For more information please contact the Operations Manager.

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ACCREDITED LABORATORY

Report Signatory 04/09/2017

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Certificate of Analysis
Laboratory Reference:170920-139

Attention:	Operations .	*Final Report:*	**242923-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**29-Sep-2017**
Address:		*Received Date:*	**21-Sep-2017**
Client Reference:	**Hawea Ponds Monthly September 2017**		
Purchase Order:	**PO527657**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**170920-139-1**
Client Sample ID:	
Sample Date/Time:	20/09/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	36
CBOD5	mg/L	49
Total Nitrogen (as N)	mg/L	48
Total Phosphorus (as P)	mg/L	6.7
Total Suspended Solids	mg/L	120

Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	110000

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Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 29/09/2017

Chandra Sharma
KTP Signatory

Watercare
Laboratory Services

Auckland	Invercargill	Queenstown
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Certificate of Analysis
Laboratory Reference:171020-078

Attention:	Operations .	*Final Report:*	**246114-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**26-Oct-2017**
Address:		*Received Date:*	**21-Oct-2017**
Client Reference:	**Hawea Ponds Monthly October 2017**		
Purchase Order:	**PO7300016023**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**171020-078-1**
Client Sample ID:	
Sample Date/Time:	20/10/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	50
CBOD5	mg/L	25
Total Nitrogen (as N)	mg/L	60
Total Phosphorus (as P)	mg/L	7.4
Total Suspended Solids	mg/L	130

Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	25000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

For more information please contact the Operations Manager.

Samples, with suitable preservation and stability of analytes, will be held by the laboratory for a period of two weeks after results have been reported, unless otherwise advised by the submitter.

Watercare Laboratory Services is a division of Watercare Services Limited .

ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 26/10/2017

Marina Fisher
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Certificate of Analysis
Laboratory Reference:171123-070

Attention:	Operations .	*Final Report:*	**250377-0**
Client:	**VEOLIA WATER**	*Report Issue Date:*	**30-Nov-2017**
Address:		*Received Date:*	**24-Nov-2017**
Client Reference:	**Hawea Ponds Monthly November 2017**		
Purchase Order:	**PO527893**	*Quote Reference :*	**42**

Sample Details	WATERS
Lab Sample ID:	**171123-070-1**
Client Sample ID:	
Sample Date/Time:	23/11/2017
Description:	Hawea Effluent (RM 10.308.02)

General Testing		
Ammoniacal Nitrogen (as N)	mg/L	<0.4
CBOD5	mg/L	38
Total Nitrogen (as N)	mg/L	29
Total Phosphorus (as P)	mg/L	7.4
Total Suspended Solids	mg/L	190

Microbiology		
Escherichia coli by Membrane Filtration		
Escherichia coli	cfu/100 mL	26000

*Results marked with * are not accredited to International Accreditation New Zealand*

Where samples have been supplied by the client they are tested as received. A dash indicates no test performed.

Reference Methods
The sample(s) referred to in this report were analysed by the following method(s)

Analyte	Method Reference	MDL	Samples	Location
General Testing				
Ammoniacal Nitrogen (as N) by Colorimetry/Discrete Analyser	HMSO (1981) ISBN 0117516139	0.4 mg/L	All	Auckland
Carbonaceous Biochemical Oxygen Demand, CBOD5 by Electrode	APHA (online edition) 5210 B (modified)	0.5 mg/L	All	Auckland
Total Nitrogen (as N) by Persulphate Digestion and Flow Analysis	APHA (online edition) 4500-P J (modified), 4500-NO3 I	0.010 mg/L	All	Auckland
Total Phosphorus (as P) by Persulphate Digestion and Colorimetry/Discrete Analyser	APHA (online edition) 4500-P J (modified)	0.004 mg/L	All	Auckland
Total Suspended Solids by Gravimetry	In House based on APHA (online edition) 2540 D, E	1 mg/L	All	Auckland
Microbiology				
Escherichia coli by Membrane Filtration				
Escherichia coli	USEPA Method 1603	2 cfu/100 mL	All	Auckland

The method detection limit (MDL) listed is the limit attainable in a relatively clean matrix. If dilutions are required for analysis the detection limit may be higher.

For more information please contact the Operations Manager.

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ilac-MRA IANZ ACCREDITED LABORATORY

Report Signatory 30/11/2017
 Marina Fisher KTP Signatory

Appendix D Daily Effluent Flow Data

Date	Discharge to trench (m3)	Irrigation discharge (m3)	Total discharge (m3)
1/12/2016	14	107	121
2/12/2016	7	105	112
3/12/2016	10	105	115
4/12/2016	45	105	150
5/12/2016	23	105	128
6/12/2016	0	105	105
7/12/2016	98	105	203
8/12/2016	101	105	206
9/12/2016	53	105	158
10/12/2016	14	105	119
11/12/2016	23	105	128
12/12/2016	27	105	132
13/12/2016	44	105	149
14/12/2016	38	105	143
15/12/2016	136	0	136
16/12/2016	164	0	164
17/12/2016	172	0	172
18/12/2016	148	0	148
19/12/2016	121	0	121
20/12/2016	202	0	202
21/12/2016	111	0	111
22/12/2016	286	0	286
23/12/2016	225	0	225
24/12/2016	241	0	241
25/12/2016	327	0	327
26/12/2016	295	0	295
27/12/2016	238	0	238
28/12/2016	343	0	343
29/12/2016	229	0	229
30/12/2016	279	0	279
31/12/2016	238	0	238
1/01/2017	264	0	264
2/01/2017	205	0	205
3/01/2017	198	0	198
4/01/2017	165	0	165
5/01/2017	97	0	97
6/01/2017	116	105	221
7/01/2017	147	105	252
8/01/2017	126	105	231
9/01/2017	146	105	251

10/01/2017	119	105	224
11/01/2017	110	105	215
12/01/2017	84	105	189
13/01/2017	111	105	216
14/01/2017	89	105	194
15/01/2017	85	105	190
16/01/2017	75	105	180
17/01/2017	19	105	124
18/01/2017	16	105	121
19/01/2017	33	105	138
20/01/2017	56	105	161
21/01/2017	126	105	231
22/01/2017	140	105	245
23/01/2017	78	105	183
24/01/2017	103	1	104
25/01/2017	82	0	82
26/01/2017	245	534	779
27/01/2017	222	279	501
28/01/2017	225	105	330
29/01/2017	30	105	135
30/01/2017	119	105	224
31/01/2017	34	105	139
1/02/2017	174	105	279
2/02/2017	37	105	142
3/02/2017	29	105	134
4/02/2017	63	105	168
5/02/2017	61	105	166
6/02/2017	101	105	206
7/02/2017	80	105	185
8/02/2017	58	105	163
9/02/2017	20	105	125
10/02/2017	90	1	91
11/02/2017	171	0	171
12/02/2017	211	0	211
13/02/2017	347	0	347
14/02/2017	262	2	264
15/02/2017	138	105	243
16/02/2017	114	105	219
17/02/2017	41	105	146
18/02/2017	130	105	235
19/02/2017	106	105	211
20/02/2017	82	105	187
21/02/2017	54	105	159
22/02/2017	39	105	144

23/02/2017	93	105	198
24/02/2017	47	105	152
25/02/2017	81	105	186
26/02/2017	16	105	121
27/02/2017	85	105	190
28/02/2017	55	105	160
1/03/2017	57	105	162
2/03/2017	63	109	172
3/03/2017	9	105	114
4/03/2017	86	105	191
5/03/2017	48	105	153
6/03/2017	46	105	151
7/03/2017	29	105	134
8/03/2017	94	105	199
9/03/2017	71	105	176
10/03/2017	92	105	197
11/03/2017	61	105	166
12/03/2017	208	105	313
13/03/2017	57	105	162
14/03/2017	107	105	212
15/03/2017	92	105	197
16/03/2017	49	105	154
17/03/2017	38	105	143
18/03/2017	24	105	129
19/03/2017	161	105	266
20/03/2017	16	105	121
21/03/2017	43	0	43
22/03/2017	61	105	166
23/03/2017	85	115	200
24/03/2017	86	105	191
25/03/2017	57	105	162
26/03/2017	35	105	140
27/03/2017	233	105	338
28/03/2017	104	105	209
29/03/2017	116	105	221
30/03/2017	53	105	158
31/03/2017	19	105	124
1/04/2017	25	105	130
2/04/2017	148	105	253
3/04/2017	40	105	145
4/04/2017	37	105	142
5/04/2017	33	105	138
6/04/2017	42	105	147
7/04/2017	136	105	241

8/04/2017	115	105	220
9/04/2017	87	105	192
10/04/2017	29	105	134
11/04/2017	191	105	296
12/04/2017	400	105	505
13/04/2017	327	105	432
14/04/2017	272	105	377
15/04/2017	74	105	179
16/04/2017	272	105	377
17/04/2017	146	105	251
18/04/2017	225	6	231
19/04/2017	220	0	220
20/04/2017	199	0	199
21/04/2017	28	105	133
22/04/2017	222	105	327
23/04/2017	128	105	233
24/04/2017	73	105	178
25/04/2017	124	105	229
26/04/2017	35	105	140
27/04/2017	77	105	182
28/04/2017	67	105	172
29/04/2017	26	105	131
30/04/2017	228	105	333
1/05/2017	67	105	172
2/05/2017	34	105	139
3/05/2017	291	105	396
4/05/2017	428	0	428
5/05/2017	280	105	385
6/05/2017	175	105	280
7/05/2017	25	105	130
8/05/2017	101	105	206
9/05/2017	39	105	144
10/05/2017	95	0	95
11/05/2017	332	0	332
12/05/2017	241	0	241
13/05/2017	162	0	162
14/05/2017	96	0	96
15/05/2017	286	0	286
16/05/2017	142	0	142
17/05/2017	275	0	275
18/05/2017	139	0	139
19/05/2017	194	0	194
20/05/2017	209	0	209
21/05/2017	178	0	178

22/05/2017	156	0	156
23/05/2017	233	0	233
24/05/2017	87	0	87
25/05/2017	215	0	215
26/05/2017	197	0	197
27/05/2017	310	0	310
28/05/2017	211	0	211
29/05/2017	198	0	198
30/05/2017	143	0	143
31/05/2017	87	0	87
1/06/2017	253	0	253
2/06/2017	237	0	237
3/06/2017	184	0	184
4/06/2017	216	0	216
5/06/2017	226	0	226
6/06/2017	176	0	176
7/06/2017	153	0	153
8/06/2017	74	0	74
9/06/2017	285	0	285
10/06/2017	200	0	200
11/06/2017	165	0	165
12/06/2017	356	0	356
13/06/2017	381	0	381
14/06/2017	155	0	155
15/06/2017	210	0	210
16/06/2017	173	0	173
17/06/2017	178	0	178
18/06/2017	172	0	172
19/06/2017	98	0	98
20/06/2017	233	0	233
21/06/2017	123	0	123
22/06/2017	308	0	308
23/06/2017	173	0	173
24/06/2017	177	0	177
25/06/2017	267	0	267
26/06/2017	132	0	132
27/06/2017	173	0	173
28/06/2017	145	1	146
29/06/2017	171	0	171
30/06/2017	244	0	244
1/07/2017	335	0	335
2/07/2017	340	0	340
3/07/2017	151	0	151
4/07/2017	185	0	185

5/07/2017	136	0	136
6/07/2017	186	0	186
7/07/2017	165	0	165
8/07/2017	207	3	210
9/07/2017	227	0	227
10/07/2017	141	0	141
11/07/2017	258	0	258
12/07/2017	202	0	202
13/07/2017	230	0	230
14/07/2017	197	0	197
15/07/2017	184	0	184
16/07/2017	223	0	223
17/07/2017	335	0	335
18/07/2017	509	0	509
19/07/2017	180	0	180
20/07/2017	268	0	268
21/07/2017	245	0	245
22/07/2017	264	1	265
23/07/2017	426	0	426
24/07/2017	211	0	211
25/07/2017	193	0	193
26/07/2017	189	0	189
27/07/2017	237	0	237
28/07/2017	160	0	160
29/07/2017	243	0	243
30/07/2017	157	0	157
31/07/2017	187	0	187
1/08/2017	468	0	468
2/08/2017	180	0	180
3/08/2017	243	0	243
4/08/2017	106	0	106
5/08/2017	303	0	303
6/08/2017	328	0	328
7/08/2017	419	0	419
8/08/2017	185	0	185
9/08/2017	253	0	253
10/08/2017	201	0	201
11/08/2017	165	0	165
12/08/2017	321	0	321
13/08/2017	442	0	442
14/08/2017	126	0	126
15/08/2017	255	0	255
16/08/2017	128	0	128
17/08/2017	456	0	456

18/08/2017	545	0	545
19/08/2017	149	0	149
20/08/2017	304	0	304
21/08/2017	165	0	165
22/08/2017	225	0	225
23/08/2017	141	0	141
24/08/2017	116	0	116
25/08/2017	146	0	146
26/08/2017	254	0	254
27/08/2017	213	0	213
28/08/2017	176	0	176
29/08/2017	87	0	87
30/08/2017	237	0	237
31/08/2017	180	0	180
1/09/2017	180	0	180
2/09/2017	158	1	159
3/09/2017	188	0	188
4/09/2017	180	0	180
5/09/2017	111	0	111
6/09/2017	404	0	404
7/09/2017	176	0	176
8/09/2017	274	0	274
9/09/2017	288	0	288
10/09/2017	302	0	302
11/09/2017	159	0	159
12/09/2017	179	0	179
13/09/2017	147	0	147
14/09/2017	175	0	175
15/09/2017	295	0	295
16/09/2017	192	0	192
17/09/2017	335	0	335
18/09/2017	190	0	190
19/09/2017	167	0	167
20/09/2017	175	0	175
21/09/2017	211	0	211
22/09/2017	50	0	50
23/09/2017	324	0	324
24/09/2017	127	0	127
25/09/2017	338	0	338
26/09/2017	157	0	157
27/09/2017	180	0	180
28/09/2017	140	0	140
29/09/2017	191	0	191
30/09/2017	227	0	227

1/10/2017	190	0	190
2/10/2017	176	0	176
3/10/2017	89	0	89
4/10/2017	59	0	59
5/10/2017	306	0	306
6/10/2017	90	110	200
7/10/2017	92	105	197
8/10/2017	112	105	217
9/10/2017	57	105	162
10/10/2017	118	105	223
11/10/2017	67	105	172
12/10/2017	97	105	202
13/10/2017	43	105	148
14/10/2017	33	105	138
15/10/2017	70	105	175
16/10/2017	92	105	197
17/10/2017	89	105	194
18/10/2017	92	105	197
19/10/2017	82	105	187
20/10/2017	43	105	148
21/10/2017	47	105	152
22/10/2017	51	105	156
23/10/2017	117	105	222
24/10/2017	76	105	181
25/10/2017	79	105	184
26/10/2017	184	1	185
27/10/2017	197	0	197
28/10/2017	195	0	195
29/10/2017	113	0	113
30/10/2017	180	0	180
31/10/2017	133	0	133
1/11/2017	165	0	165
2/11/2017	40	105	145
3/11/2017	92	105	197
4/11/2017	31	109	140
5/11/2017	102	105	207
6/11/2017	121	105	226
7/11/2017	120	105	225
8/11/2017	420	23	443
9/11/2017	94	105	199
10/11/2017	143	105	248
11/11/2017	122	105	227
12/11/2017	70	105	175
13/11/2017	61	105	166

14/11/2017	51	105	156
15/11/2017	46	105	151
16/11/2017	66	105	171
17/11/2017	57	105	162
18/11/2017	41	105	146
19/11/2017	132	105	237
20/11/2017	30	105	135
21/11/2017	61	105	166
22/11/2017	45	105	150
23/11/2017	48	105	153
24/11/2017	41	105	146
25/11/2017	76	105	181
26/11/2017	105	105	210
27/11/2017	54	105	159
28/11/2017	57	105	162
29/11/2017	26	105	131
30/11/2017	46	105	151