

# 2021 Annual Wastewater Treatment Plant Report

Resort Municipality of Whistler Wastewater Treatment Plant

Operational Certificate ME-01452



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## 1.0 INTRODUCTION

Per section 3.6 Reporting of the Operation Certificate ME-01452 for the Resort Municipality of Whistler's (RMOW) Waste Water Treatment Plant (WWTP), the intent of this document is to report discharge and receiving environment data for the operating period. The report includes trend analysis data and interpretation from the receiving environment for the reported operating year and in comparison to previous years, in regards to the potential impact to the receiving environment. The report will also outline the past years achievement in regards to source control, water conservation programs, and environmental impact programs.

## 2.0 MONITORING AND REPORTING REQUIREMENTS

Per section 3.0 (Monitoring and Reporting Requirements) of the operational certificate, monitoring samples are taken by staff and collected for the WWTP to monitor discharge, receiving environment outfall and trucked waste.

Table 1 below highlights the samples taken and their frequency.

*Table 1: Discharge Monitoring Sampling Parameters*

Parameter	Unit of measure	Frequency	Sample Type
Chlorine residual *	mg/L	Daily	Grab
TSS	mg/L	5 times per week	Composite
Orthophosphate (as phosphorus)	mg/L	5 times per week	Composite
CBOD5**	mg/L	2 times per week	Composite
Fecal Coliform*	MPN/100mL	2 times per week	Grab
Total phosphorus	mg/L	Weekly	Composite
Iron	mg/L	Monthly	Composite
Fish Bioassay (rainbow trout) 96 hour LC50, %	% survival rate	2 times per year	Grab
Effluent volume discharge	m <sup>3</sup> /day	1 per day over a 24 period	Composite

\*if chlorine is used between May 15 and September 15 only

\*\*COD may be used in place of CBOD<sub>5</sub> if CBOD<sub>5</sub> is examined with every 5<sup>th</sup> sample

Table 2 highlights the sampling parameter requirements for the receiving environment.

*Table 2: Receiving Environment Monitoring Sampling Parameters*

Parameter	Unit of measure	Sample Type	Frequency
<b>pH</b>	-	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Conductivity</b>	µmho/cm	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Turbidity</b>	TU	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Orthophosphate (as phosphorus)</b>	mg/L	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Nitrate nitrogen</b>	mg/L	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Nitrite nitrogen</b>	mg/L	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Ammonia nitrogen</b>	mg/L	3 times per year; winter low flow, spring freshet & fall flow	Grab
<b>Nitrate+Nitrite as N</b>	mg/L	3 times per year; winter low flow, spring freshet & fall flow	Grab

## Permit Excursions

The WWTP tracks and monitors the number of permit excursions that occur during the reporting period (Figure 1). For the reporting period, four (4) permit excursions were recorded per section 1.1.3 Nutrient loading for the discharge from May 15 – September 15 inclusive of Orthophosphate (as phosphorus) 36.6 kg/month maximum. The excursions are discussed further below. The Notices of Non-Compliance is attached in Appendix A.

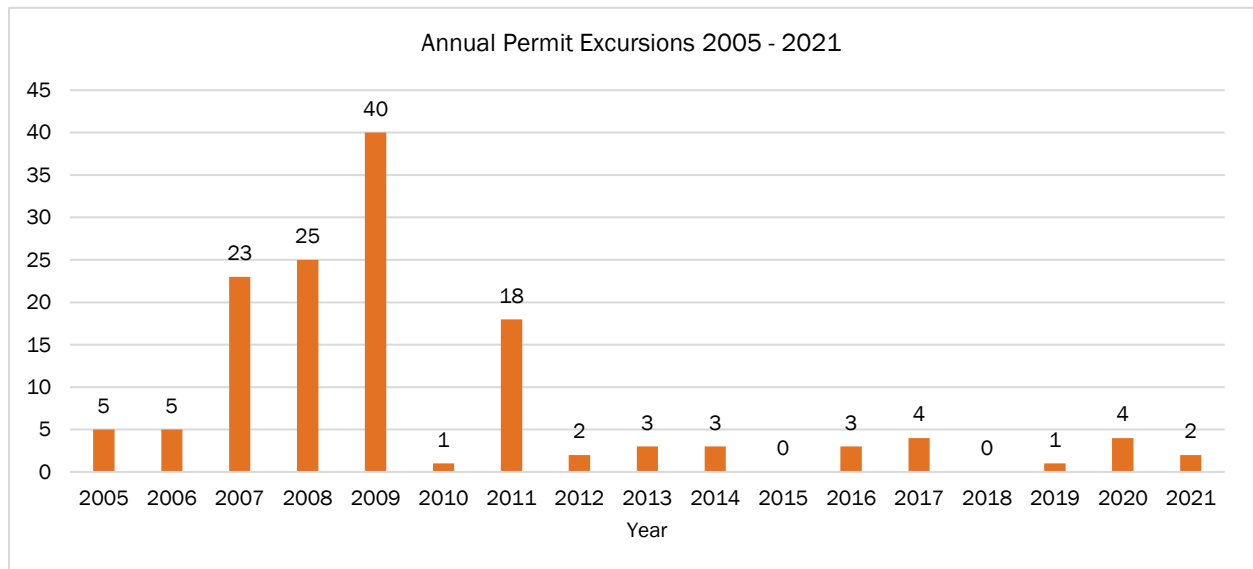


Figure 1: Quantity of Permit Excursions per year 2005-2021

## Outfall Inspections

Section 3.4 of the Operational Certificate requires the outfall to be inspected once every **five** years by independent qualified personnel to ensure that it is in good condition.

The last outfall inspection was conducted by Cascade Environmental Resource Group in 2018. Recommendations from that inspection to cut back shrub vegetation were completed, and this task now forms part of preventative maintenance program for the outfall.

The next outfall inspection will be in 2023.

## Website

Quarterly monitoring data is posted on an annual basis to the Resort Municipality of Whistler's website <https://www.whistler.ca/services/water-and-wastewater/wastewater-treatment-plant>.

## Facility Staffing

The RMOW WWTP facility staff qualifications met EOCP requirements (Table 3) for the report period.

*Table 3: WWTP facility staffing list and certifications*

Name	Position	Certification
Chris Wike	Utilities Group Manager	
Wayne Dennien	Utilities Superintendent	
Jenny James	Chief Operator Wastewater	
Elizabeth Toole	Operator IV	EOCP Level IV Municipal Wastewater Treatment
Hamish (Ty) MacFayden	Operator III	EOCP Level III Municipal Wastewater Treatment
Paul Kozin	Operator III	EOCP Level III Municipal Wastewater Treatment
Ahren Snikvalds	Operator II	EOCP Level I Municipal Wastewater Treatment
Kyle Quesnel	Operator I	EOCP Level I Municipal Wastewater Treatment
Sean Weiss	Operator I	EOCP Level I Municipal Wastewater Treatment
Eric Verreault	Operator I	EOCP Level I Municipal Wastewater Collection
Neil Kearns	Lab Technician	EOCP Level II Municipal Wastewater Treatment
Bruce Eckersley	Millwright	Red Seal Certified Millwright

## Other Achievements

During the report period, no volume of effluent bypassed the WWTP as the raw sewage bypass line had been remove in 2010. Further to this, the operation had no emergency shut downs and zero (0) trucks were turned away due to hazardous waste.

The effluent treated by the WWTP is used to produce heat for the RMOW's District Energy System. This system provides radiant heat through its system to the residents and businesses of Cheakamus Crossing neighborhood of the RMOW.

# 3.0 DISCHARGE DISCUSSION AND ANALYSIS

## Discharge Volume

The year is split into two seasons for purposes of reporting discharge. The dry season runs from May 15 – September 15 (inclusive), while the wet season is defined as January 1 – May 14 and September 16 – December 31.

Maximum allowable discharge during the dry season is 16,000 m<sup>3</sup>/day while the maximum allowable discharge during the wet season is 25,000 m<sup>3</sup>/day.

The average discharge during the dry season was 8,456 m<sup>3</sup>/day and the average discharge during the wet season was 10,261 m<sup>3</sup>/day.

Non-compliance for November 15, 2021 is related to heavy rains which could be described as an “atmospheric river”. Even though the allowable effluent flow was exceeded, it is important to note that the effluent quality remained compliant. A copy of the non-compliance report submitted to the Ministry of Environment is included in Appendix A.

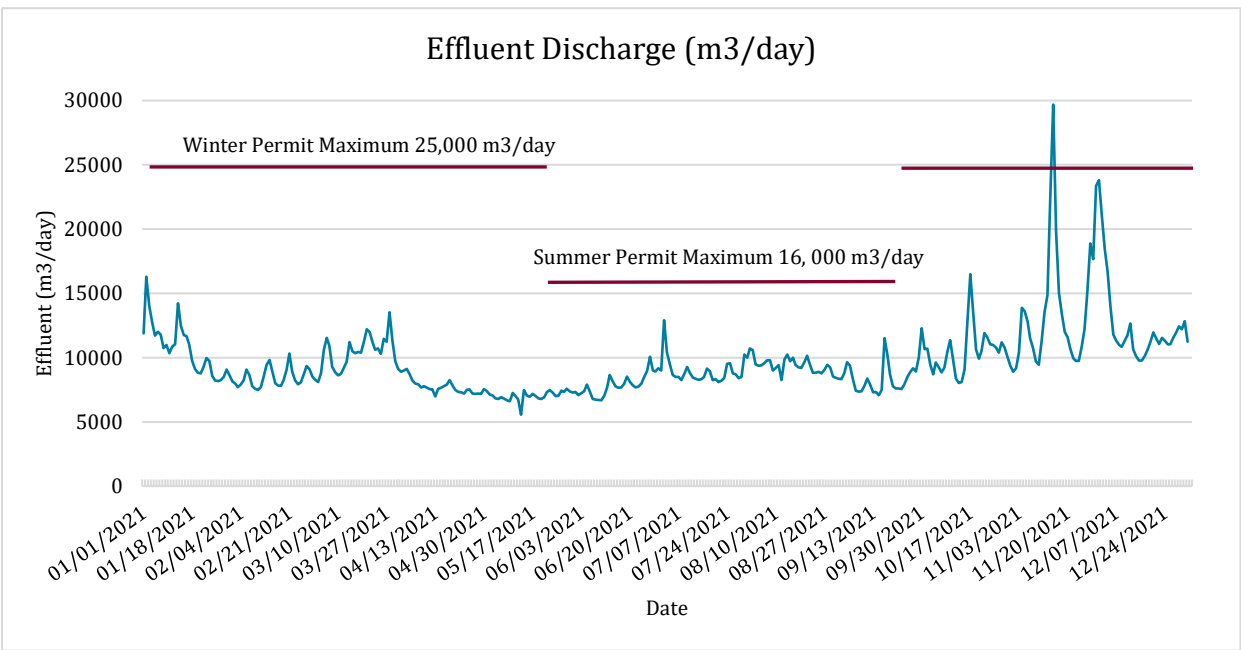


Figure 2: Whistler Wastewater Treatment Plant Daily Effluent Discharge Volume (m<sup>3</sup>/day)

Table 4: Average and maximum daily discharge (m3) wet and dry values by year since 2004

Year	Max Discharge Dry	Max Discharge Wet	Month Max Discharge Dry	Month Max Discharge Wet
2004	10,160	14,681	August	January
2005	12,238	13,720	August	December
2005	11,402	17,174	July	January
2006	13,742	19,731	July	December
2007	13,991	24,247	August	March
2008	12,891	17,568	August	December
2009	11,623	17,859	June	April
2010	12,891	22,855	August	January
2011	12,153	19,472	July	January
2012	13,397	20,575	June	January
2013	12,525	19,351	June	March
2014	11,646	25,070	August	December
2015	11,447	25,019	August	February
2016	12,119	21,284	August	February
2017	11,670	19,852	July	March
2018	11,395	16,927	August	December
2019	11,535	15,670	June	March
2020	10,780	26,793	August	February
2021	12,913	29,686	July	November

## Orthophosphate as Phosphorous P04-P

Orthophosphate as Phosphorous P04-P concentration is permitted in discharge to a maximum of 1.75mg/L.

This was exceeded once on July 25<sup>th</sup> 2021, with a value of 2.04mg/L. This is shown below in Figure 3.

Figure 4 shows the final effluent total for the dry season on a monthly basis (the dry season defined as May 15 – September 15 inclusive). The total nutrient loading maximum for the discharge is 36.6 kg/month. This was exceeded 2 times in 2021:

- July 15 – August 14: Exceeded by 119.1kg for a total sum of 155.7kg
- August 15 – September 15: Exceeded by 14.3kg for a total sum of 50.9 kg

These environmental non-compliances were reported to the Ministry of Environment, and are attached in Appendix A.



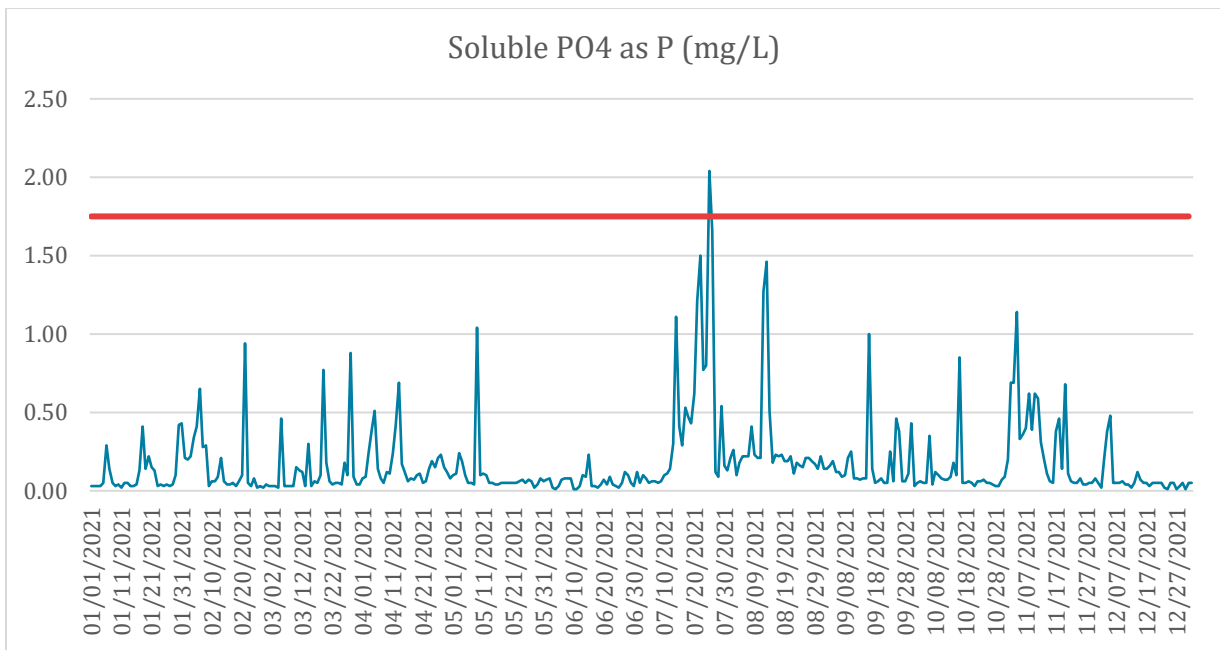


Figure 3: Final effluent daily Phosphorus (PO<sub>4</sub>-P) concentrations (mg/L)

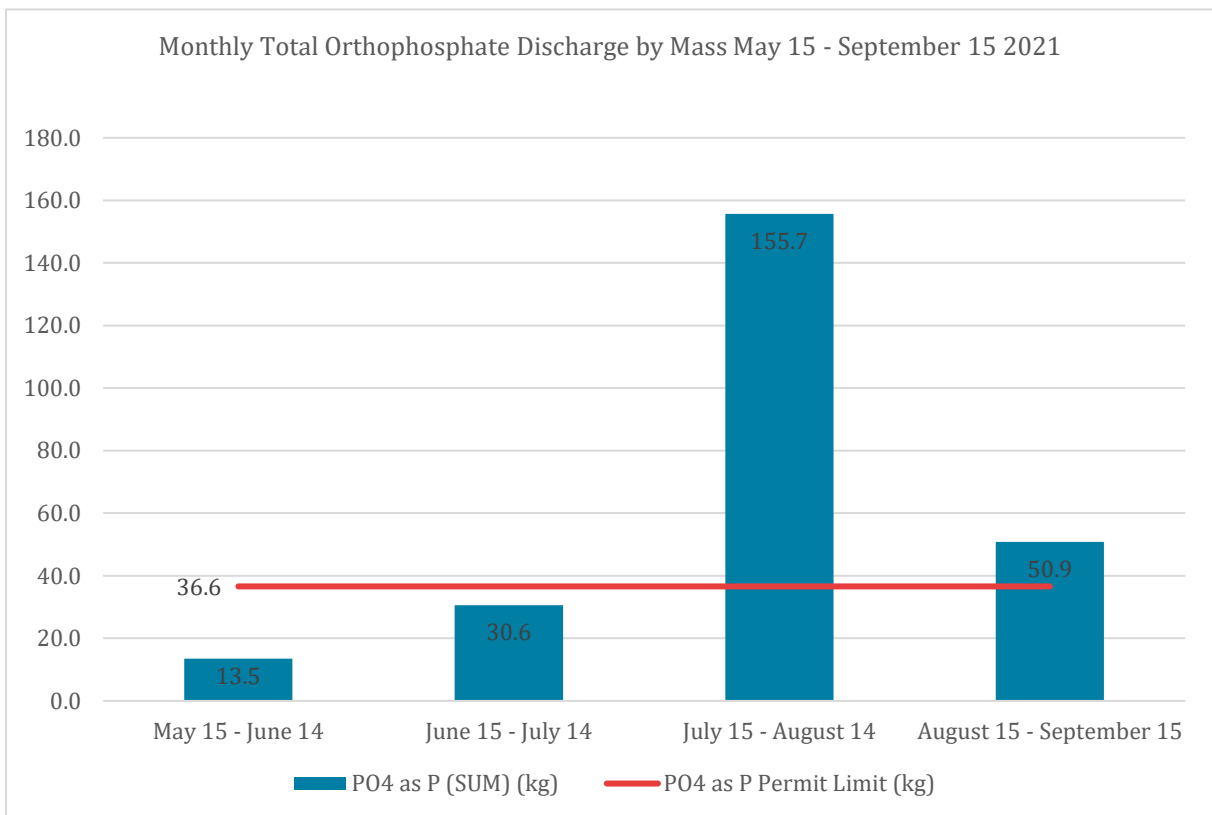


Figure 4: Final effluent total Phosphorus (PO<sub>4</sub>-P) discharge by month May 15 - September 15 2021

## Total Phosphorous – Laboratory Results

Weekly final effluent samples are submitted to a certified laboratory for total phosphorous concentration analysis.

Figure 5 shows the laboratory results when compared to the limit (1.75mg/L). As per the lab results, this limit was reached once but not exceeded. This occurred from the July 21, 2021 sample, with a result of 1.75mg/L (0.0 mg above the limit).

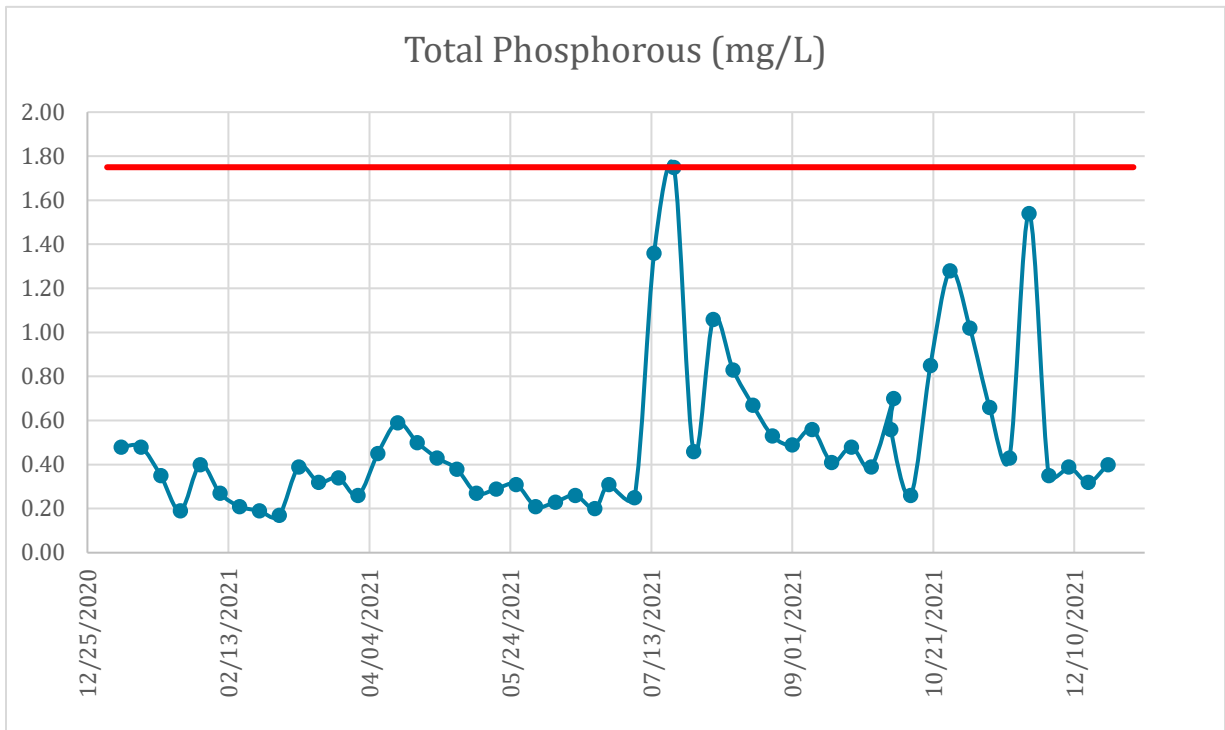


Figure 5: Final Effluent Weekly Phosphorous (PO<sub>4</sub>-P) Concentration Weekly Laboratory Data

## Total Suspended Solids

Total suspended solids in monitored and reported daily. As per Section 1.1.2 of the Operational Certificate, the maximum limit is 40 mg/L.

In 2021 the Total Suspended Solids concentration did not exceed the permitted level, as highlighted in Figure 6. The December 1<sup>st</sup> 2021 sample result was 39mg/L which is 1mg/L below the limit.

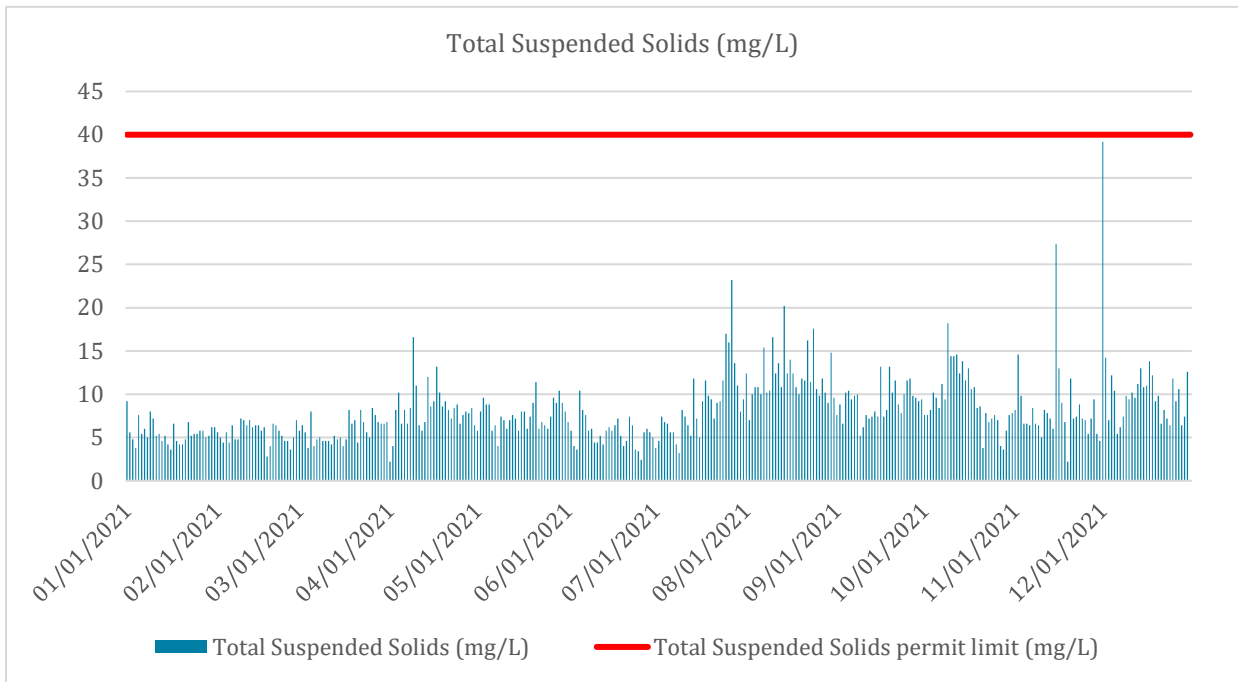


Figure 6: Daily Total Suspended Solids (mg/L) 2021

Figure 7 highlights the average Total Suspended Solids year on year from 2005 to 2021. The average TSS for 2021 was 8 mg/L.

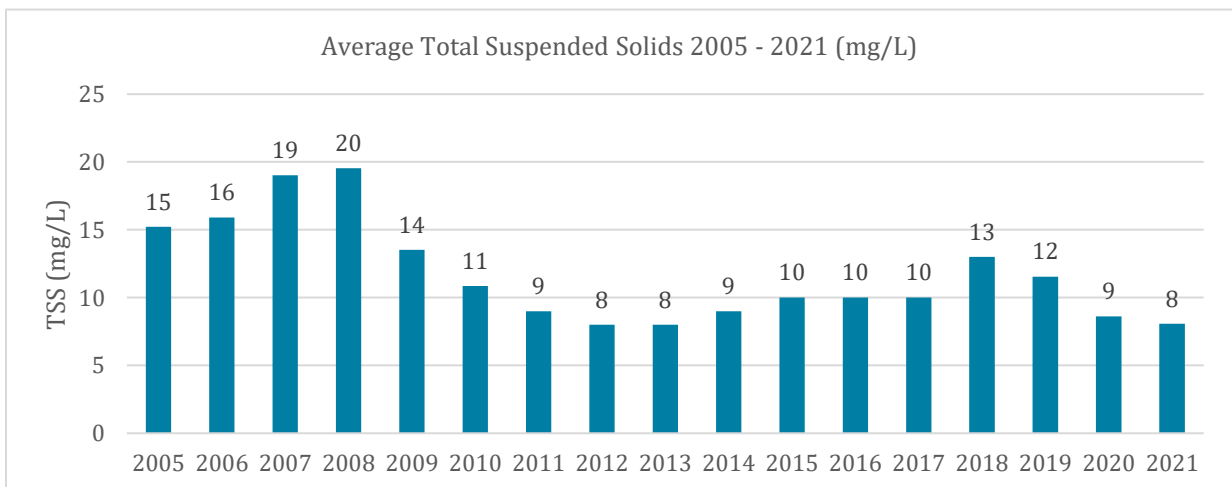


Figure 7: Annual Average Suspended Solids (mg/L) 2005 - 2021

## Carbonaceous Biochemical Oxygen Demand (BOD)

As per section 1.1.2, the maximum Carbonaceous BOD limit is 30mg/L per day for the reporting period.

In 2021 the Carbonaceous BOD concentration did not exceed the permitted level, as highlighted in Figure 8 by the weekly laboratory results.

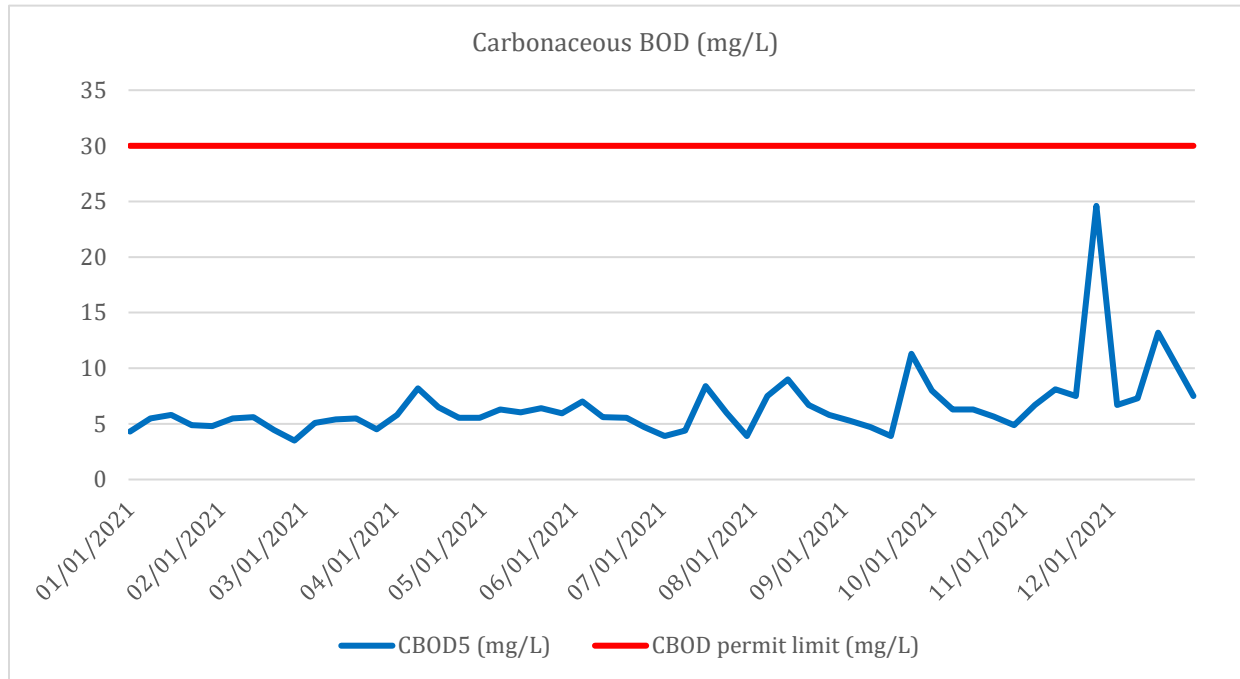


Figure 8: Weekly Carbonaceous BOD (mg/L) 2021

## Effluent Disinfection

As a requirement of the Operational Certificate, the Whistler WWTP is required to disinfect the effluent using UV treatment from May 15 – October 15. The WWTP operates the UV disinfection system 12 months a year. Final effluent samples are taken twice weekly and submitted to a certified laboratory for fecal coliform analysis throughout the disinfection period in order to confirm the effectiveness of the UV disinfection system.

Figure 9 shows the results of the weekly laboratory tests for 2021. There are two outlier samples in August 2021. This was due to the UV system malfunctioning after the secondary tanks were changed.

Note: results determined to be less than detection limit are shown on the graph as the laboratory detection limit of 2.0 cfu/ 100 mL.

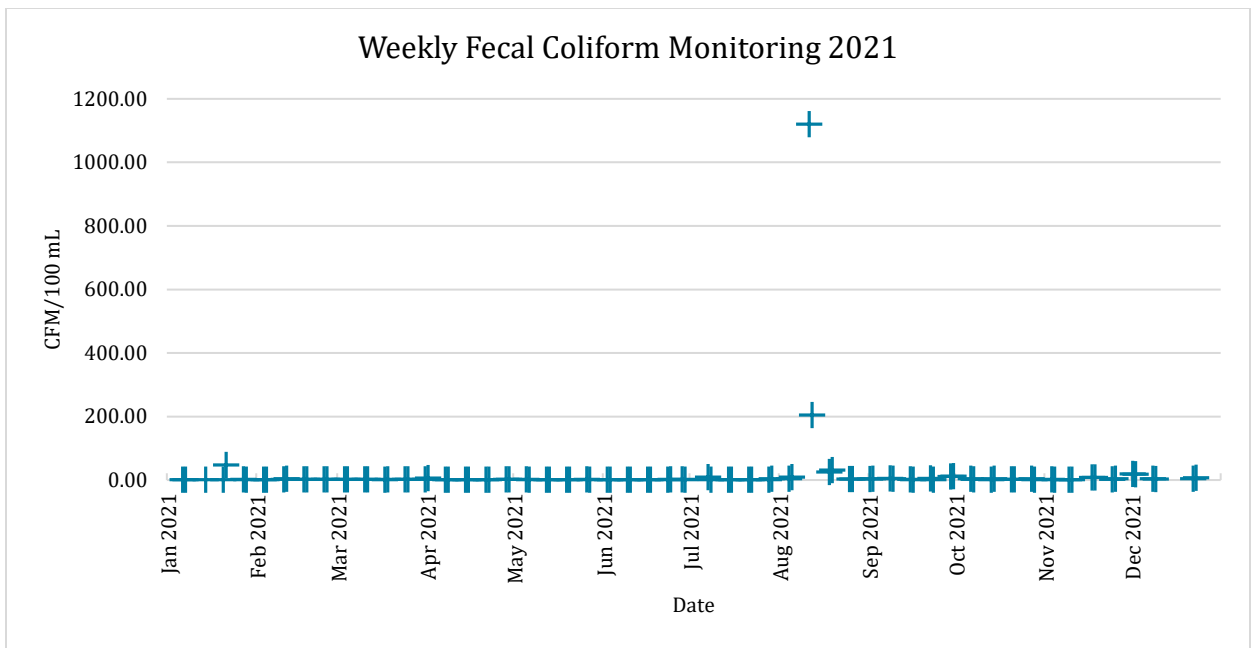


Figure 9: Weekly Fecal Coliform (CFM/mL) lab results 2021

## Effluent Toxicity

Four (4) LC50 toxicity tests were performed during the report period.

Sample dates:

- 25 March 2021
- 17 June 2021
- 23 September 2021
- 9 December 2021

The results are 100% of rainbow trout fry surviving in raw (100% concentration) effluent for 96 hours. See Appendix B for results.

## Receiving Environment Monitoring

The receiving environment (the Cheakamus River) is sampled once per month by WWTP staff, and the samples are submitted to a certified laboratory. Cascade Environmental completed an analysis of the Receiving Environment data for the reporting year and analysis can be found in Appendix E.

The operating certificate requires the RMOW monitor two sampling stations, with samples taken three times per year. The RMOW exceeds this requirement by sampling at three locations (known as Camp, Bridge and Station B) every month of the year.

## 4.0 CONCLUSION

This report fulfills the requirements for the Operational Certificated ME-01452. Any further inquiries can be directed to Chris Wike, Utilities Group Manager at (604) 935-8321 or [cwike@whistler.ca](mailto:cwike@whistler.ca).

## APPENDIX A: NOTICES OF NON-COMPLIANCE



MINISTRY OF ENVIRONMENT  
REGIONAL OPERATIONS BRANCH

NON-COMPLIANCE REPORTING MAILBOX  
NOTIFICATION

**To:** [EnvironmentalNonCompliance@gov.bc.ca](mailto:EnvironmentalNonCompliance@gov.bc.ca)

**Subject:** 2022-01-25 Authorization # ME-01452 Section 1. Authorized Discharge, 1.1.2 Characteristics for Discharge of Orthophosphate (as phosphorus) 1.75 mg/L and 1.1.3 Nutrient Loading for Discharge May 15 - September 15 Orthophosphate (as phosphorus) 36.6 kg/month

**Attention:** Non-compliance Report for ME-01452 Section 1. Authorized Discharge, 1.1.2 Characteristics for Discharge of Orthophosphate (as phosphorus) 1.75 mg/L – 2.04 mg/L exceedance on July 25, 2021 and 1.1.3 Characteristics for Discharge of Orthophosphate (as phosphorus) 36.6 kg/month – 120.7 kg of Orthophosphate (as phosphorus) exceedance for period of July 15 – August 14, 2021.

**Date of Non-compliance:** 2021-07-15 00:00 / 2021-08-15 00:00

**Location of Non-compliance:** 50.08448, -123.041263

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**Nature of Non-compliance:** The maximum orthophosphate (as phosphorus) discharge from May 15 to September 15 shall not exceed 36.6kg/month.

The maximum orthophosphate (as phosphorus) concentration discharged shall not exceed 1.75 mg/L.

For the period of July 15 to August 14, 2021, the monthly limit was exceeded by 120.7 kg. The total orthophosphate (as phosphorus) discharged for the period July 15 to August 14, 2021 was 157.3 kg.

For the period of July 15 to August 14, 2021, the maximum orthophosphate (as phosphorus) concentration discharged exceeded by 0.29 mg/L on July 25. The effluent orthophosphate concentration was 2.04 mgP/L

The non-compliances related to phosphorus discharge (load and concentration) observed in the July 15 to August 14 period were associated to three main factors: 1) chemical dosing adjustment for P removal; 2) an electrical failure in the primary building and 3) a failure of the bioreactor recirculation pump and are detailed below.

- 1) Chemical dosing for P removal: ongoing challenges to maintain a stable enhanced biological phosphorus removal (EBPR) process lead to adjustments to the alum and acetate dosages applied. Initially used at the beginning of the period to compensate for

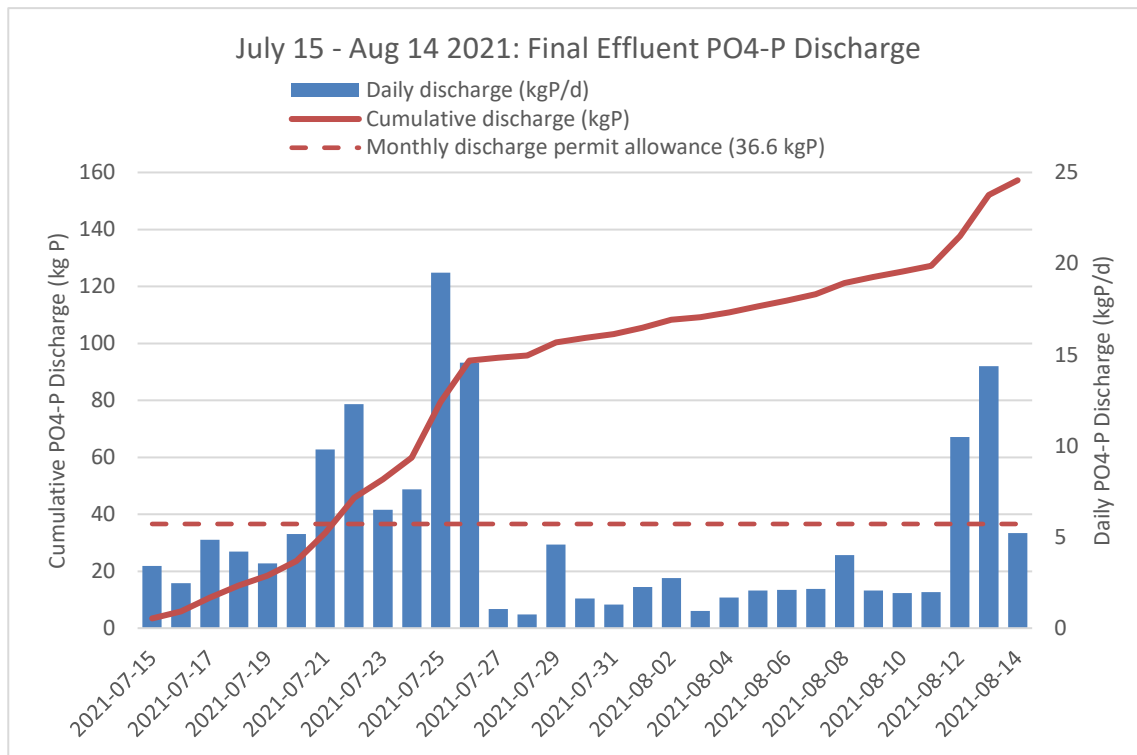




## MINISTRY OF ENVIRONMENT REGIONAL OPERATIONS BRANCH

### NON-COMPLIANCE REPORTING MAILBOX NOTIFICATION

an unstable EBPR, alum dosage was stopped on July 23, and acetic acid dosage increased almost twofold by July 26 compared to the beginning of the period to recover and maintain a stable EBPR process. Due to the adjustments, the discharged P had exceeded 36.6 kg by July 21 as can be seen on graph below.



- 2) At approximately 11 PM on July 25 2021, a 30 KVA electrical transformer failure in the primary building MCC2 caused the influent flowmeters to fail. This resulted in the equalization control to empty both equalization tanks in addition to the regular flow to the bioreactors. The high flow sent to the bioreactor caused dissolved oxygen issues in the bioreactor, which were quickly resolved. However, the impact of the high flows on the secondary clarifiers' performance was longer lasting. The strategy put in place was to dose alum to quickly improve settling in the secondary clarifiers. Despite the operations team's rapid action, the effluent PO<sub>4</sub>-P concentration on July 25 reached 2.04 mgP/L, 0.29 mgP/L above the 1.75 mgP/L.
- 3) The bioreactor recirculation pump failure occurred on August 12 when the recycle pump P318 guide rails failed resulting with a lack of recycle flow. The impact of this incident was a loss of EBPR performance.

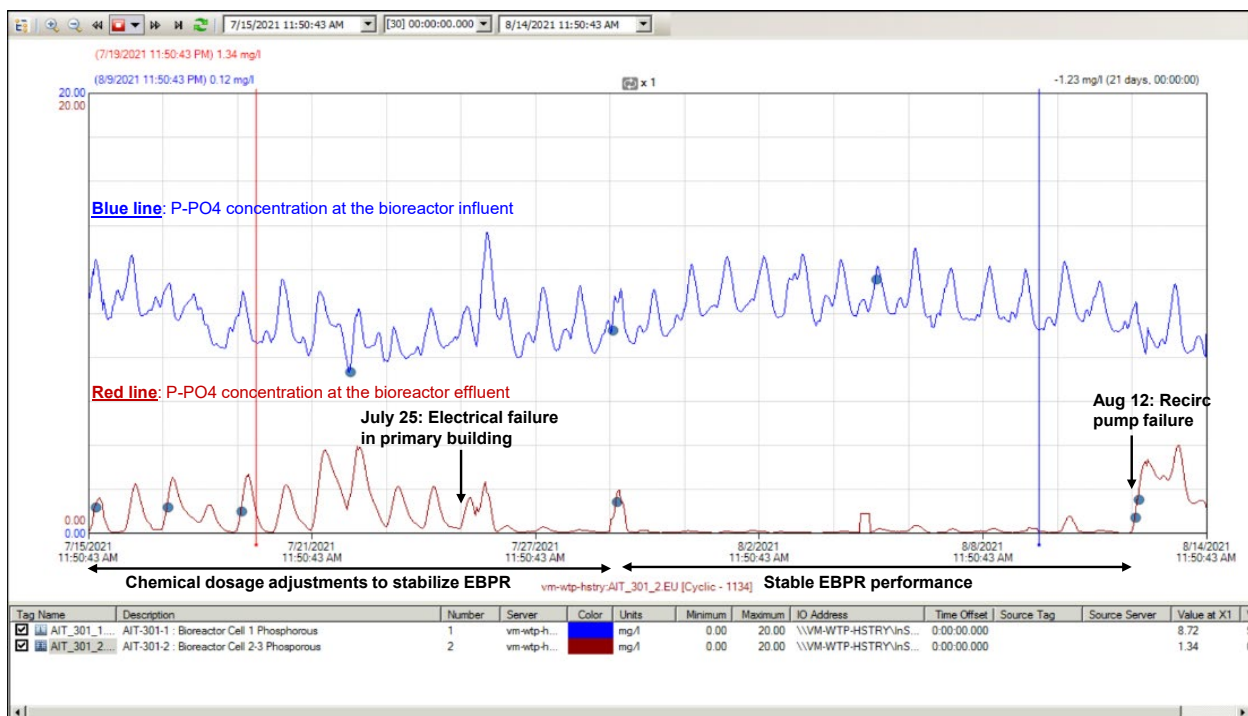


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### NON-COMPLIANCE REPORTING MAILBOX NOTIFICATION

#### Initial Response/Actions taken:

- 1) Chemical dosing for P removal: The operations team worked relentlessly during the July 15 – August 14 period to regain full performance of the bioreactor. Alum dosage was reduced (and completely stopped on July 23) and acetic acid dosage was increased until stable P removal was obtained by the bioreactor. Performance of the bioreactor was carefully monitored during this time and by July 27, stable EBPR was achieved and remained as such until bioreactor recirculation pump failure on August 12, as can be seen in the figure below showing the bioreactor performance.

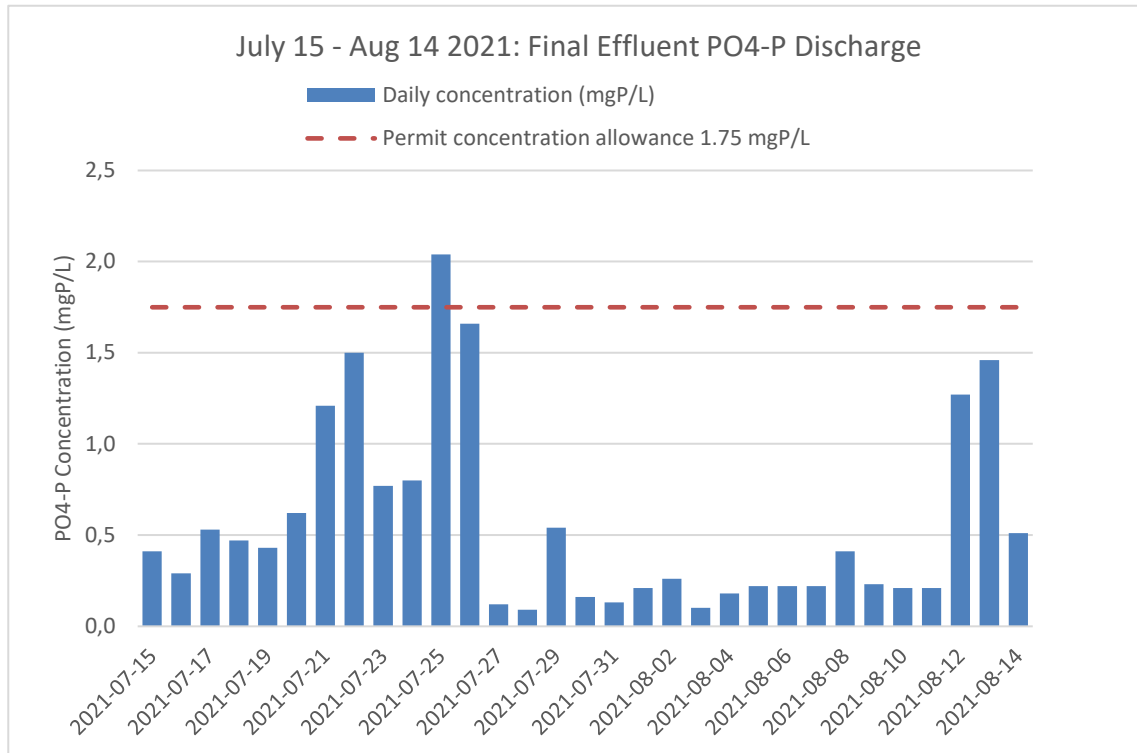


- 2) Electrical failure in primary building: the operations team received a high effluent phosphate alarm at around 11 PM and identified the cause (electrical failure and subsequent dumping of the equalization tanks into the bioreactors). The team connected power back to the influent meters, restoring equalization and bypassing the UPS which had also failed due to the power surge. Alum was dosed to quickly improve settling in the secondary clarifiers, which worked as the discharge limit of 1.75 mgP/L was only exceeded on the day of the incident, as can be seen in the graph below. Thanks to the team's rapid action, the effluent PO4-P discharge quickly recovered and remained below the permit concentration allowance for the rest of the period.



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### NON-COMPLIANCE REPORTING MAILBOX NOTIFICATION



- 1) Bioreactor recycle pump failure: temporary pumps were ordered to replace the bioreactor recycle pump and arrived on August 13. The temporary pumps were operational on August 14. The WWTP operated with these temporary pumps until bioreactors were swapped over on November 12. The delay in swapping over to the other side was due in large part to having to comply with WorkSafe BC confined space entry regulations. The temporary pumps helped partially recover the EBPR performance but not completely: the bioreactor effluent P-PO<sub>4</sub> decreased following the installation of the temporary recycle pumps but not to the level observed prior during the period of stable operation (July 27 – Aug 11).

#### Monitoring conducted:

The operations team and Wastewater Chief Operator closely checked the performance of the bioreactor and the secondary clarifiers to evaluate the impact of chemical dosage adjustments, the July 25 electrical failure and the August 12 recirculation pump failure. Phosphorus (P-PO<sub>4</sub>) concentration was continuously monitored at both the bioreactor influent and effluent and at the final effluent.

The Process Engineer and the operations team met weekly to discuss the challenges faced and operational strategies. Every observation was carefully logged by the operational team.



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**Future action items:**

During the July 15 – August 14 period, the operational team worked on the acetate dosage strategy to improve operational performance and ensure that the August 15 – September 15 2021 effluent quality was optimal and met ME-01452 effluent requirements.

The faulty transformer in the primary building MCC2 was replaced by Corporate electric. The UPS was bridged out until the replacement arrived. To prevent future failures, the equalization program will be reprogrammed to ensure that in the event of an influent flowmeter failure, the equalization valves go to a failsafe position “closed”. The power feed to the influent flowmeters will be rewired and the rake screen level transmitter will be rewired from house power to UPS power.

The RMOW is planning for future capital investment at the WWTP to address operational issues faced by the facility over the past few years. A desktop study performed by an engineering consulting firm is underway with the purpose of identifying the WWTP’s potential deficiencies and assessing the capital investment needs to meet population growth and regulatory compliance.

**Contact information:** For additional information, please contact Chris Wike at 604-935-8321, or via email at [cwike@whistler.ca](mailto:cwike@whistler.ca).



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NON-COMPLIANCE REPORTING MAILBOX  
NOTIFICATION

**To:** [EnvironmentalNonCompliance@gov.bc.ca](mailto:EnvironmentalNonCompliance@gov.bc.ca)

**Subject:** 2022-01-25 Authorization # ME-01452 Section 1. Authorized Discharge, 1.1.3 Nutrient Loading for Discharge May 15 - September 15 Orthophosphate (as phosphorus) 36.6 kg/month

**Attention:** Non-compliance Report for ME-01452 Section 1. Authorized Discharge, 1.1.3 Nutrient Loading for Discharge of Orthophosphate (as phosphorus) 36.6 kg/month – 8.6 kg of Orthophosphate (as phosphorus) exceedance for period of August 15 – September 15, 2021.

**Date of Non-compliance:** 2021-08-15 00:00 / 2021-09-15 00:00

**Location of Non-compliance:** 50.08448, -123.041263

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**Nature of Non-compliance:** The maximum Orthophosphate (as phosphorus) discharge from May 15 to September 15 shall not exceed 36.6kg/month.

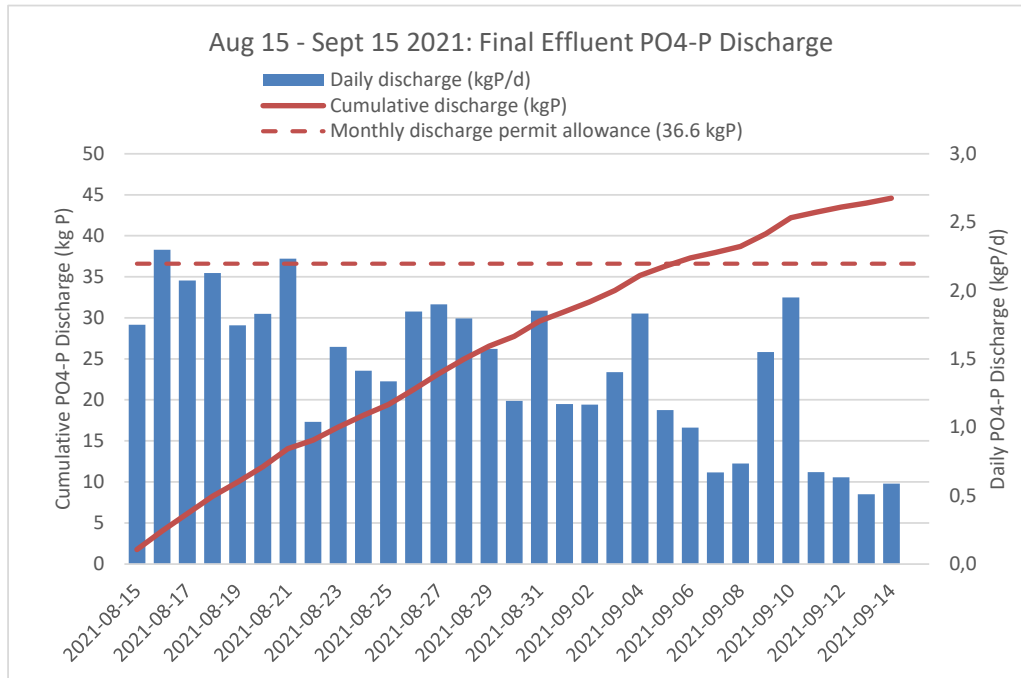
For the period of August 15 to September 15, 2021, the monthly limit was exceeded by 8.6 kg. The total Orthophosphate (as phosphorus) discharged for the period August 15 to September 15, 2021 was 45.2 kg. On September 6, 2021, the maximum allowable PO<sub>4</sub>-P discharge load (36.6 kgP) was reached and was subsequently exceeded for the rest of the period.

Non-compliance for this period is related to the bioreactor recycle pump failure which occurred on August 12, 2021 (previous period). This incident, which affected the bioreactor's phosphorus removal performance, is described in the Non-compliance report for the July 15 – August 14, 2021 period.

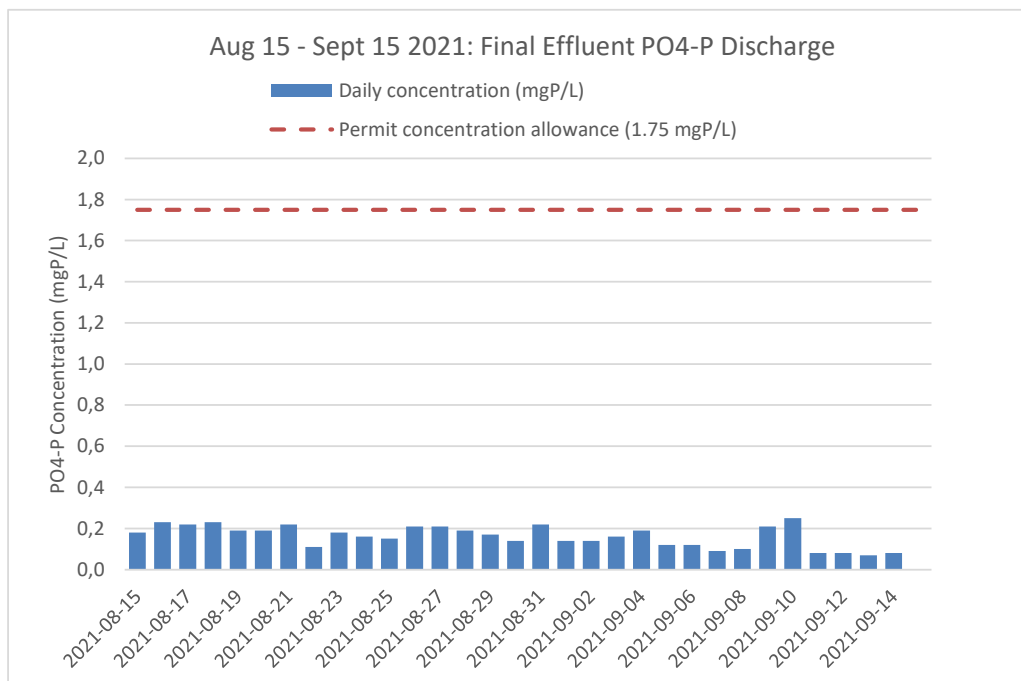


# MINISTRY OF ENVIRONMENT REGIONAL OPERATIONS BRANCH

## NON-COMPLIANCE REPORTING MAILBOX NOTIFICATION



Even though the allowable PO<sub>4</sub>-P load was exceeded, it is important to note that the PO<sub>4</sub>-P allowable effluent concentration was never exceeded as can be seen in the graph below:





# MINISTRY OF ENVIRONMENT REGIONAL OPERATIONS BRANCH

## NON-COMPLIANCE REPORTING MAILBOX NOTIFICATION

### Initial Response/Actions taken:

The bioreactor suffered a loss of enhanced biological phosphorus removal (EBPR) following the pump failure on August 12. Temporary pumps to replace the failed bioreactor recirculation pump were installed on August 14 and, as can be seen on the figure below, helped the bioreactor performance recover. The EBPR performance improved throughout the rest of the period but did not regain the same performance level as what had been achieved during the period of stable operation.

The WWTP operated with these temporary pumps until the bioreactors were swapped over on November 12. The delay in swapping over to the other side was due in large part to having to comply with WorkSafe BC confined space entry regulations.





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NON-COMPLIANCE REPORTING MAILBOX  
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**Monitoring conducted:**

The operations team and Wastewater Chief Operator closely checked the performance of the bioreactor to evaluate the impact of the August 12 recirculation pump failure. Phosphorus (P-PO<sub>4</sub>) concentration was continuously monitored at both the bioreactor influent and effluent and at the final effluent.

The Process Engineer and the operations team met weekly to discuss the challenges faced and operational strategies. Every observation was carefully logged by the operational team.

**Future action items:**

The RMOW is planning for future capital investment at the WWTP to address operational issues faced by the facility over the past few years. A desktop study performed by an engineering consulting firm is underway with the purpose of identifying the WWTP's potential deficiencies and assessing the capital investment needs to meet population growth and regulatory compliance.

**Contact information:** For additional information, please contact Chris Wike at 604-935-8321, or via email at [cwike@whistler.ca](mailto:cwike@whistler.ca).





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NOTIFICATION

**To:** [EnvironmentalNonCompliance@gov.bc.ca](mailto:EnvironmentalNonCompliance@gov.bc.ca)

**Subject:** 2022-01-28 Authorization # ME-01452 Section 1. Authorized Discharge, 1.1.1  
Rate of Discharge 25 000 m<sup>3</sup>/d for September 16 – May 14

**Attention:** Non-compliance Report for ME-01452 Section 1. Authorized Discharge, 1.1.1 Rate of Discharge 25 000 m<sup>3</sup>/d for September 16 – May 14 – 4 686 m<sup>3</sup> exceedance for November 15, 2021.

**Date of Non-compliance:** 2021-11-15 00:00 / 2021-11-16 00:00

**Location of Non-compliance:** 50.08448, -123.041263

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**Nature of Non-compliance:** The maximum authorized rate of discharge is 16 000 m<sup>3</sup>/d from May 15 to September 15 inclusive and 25 000 m<sup>3</sup>/d for the remainder of the year.

For the day of November 15, 2021, the daily effluent flow limit was exceeded by 4 686 m<sup>3</sup>. The total flow discharged on that day was 29 686 m<sup>3</sup>.

Non-compliance for November 15, 2021 is related to heavy rains which could be described as an “atmospheric river”. Even though the allowable effluent flow was exceeded, it is important to note that the effluent quality remained compliant.

**Initial Response/Actions taken:**

The RMOW operations team filled all four primary clarifiers, both bioreactors and all four secondary clarifiers to equalize the effluent flowrate as much as possible. This minimized the exceedance as the total influent flow for November 15, 2021 was 35 307 m<sup>3</sup>. Considering the effluent flowrate was 29 686 m<sup>3</sup>, the operations team prevented 5 621 m<sup>3</sup> from discharging on November 15, 2021 by filling all available tankage.

**Monitoring conducted:**

The operations team and Wastewater Chief Operator closely checked the influent and effluent flowrates and tank levels, which are continuously monitored parameters. This allowed them to make decisions regarding available tanks to fill and take swift action to minimize the effluent flow exceedance.

The Process Engineer and the operations team met monthly to discuss the challenges faced and operational strategies. Every observation was carefully logged by the operational team.

**Future action items:**

The RMOW is planning for future capital investment at the WWTP to address operational issues



MINISTRY OF ENVIRONMENT  
REGIONAL OPERATIONS BRANCH

NON-COMPLIANCE REPORTING MAILBOX  
NOTIFICATION

faced by the facility over the past few years. A desktop study performed by an engineering consulting firm is underway with the purpose of identifying the WWTP's potential deficiencies and assessing the capital investment needs to meet population growth and regulatory compliance.

**Contact information:** For additional information, please contact Chris Wike at 604-935-8321, or via email at [cwike@whistler.ca](mailto:cwike@whistler.ca).

## APPENDIX B: ACUTE LETHALITY TEST RESULTS



## Acute Toxicity Test Results

Sample YVS108FE,  
collected March 25, 2021

Final Report

April 8, 2021

Submitted to: **Resort Municipality of Whistler**  
Whistler, BC

## SAMPLE INFORMATION

Sample ID	Dates		Rainbow trout test initiation	Receipt temperature
	Collected	Received		
YVS108FE	25-Mar-21 at 0900h	25-Mar-21 at 1240h	25-Mar-21 at 1640h	11.6-12.1°C

## TESTS

- Rainbow trout 96-h LC50 test

## RESULTS

### Toxicity test results

Sample ID	LC50 (% v/v)
YVS108FE	>100

LC = Lethal Concentration

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	79.6 (57.6 – 100.5) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	83.3 (29.8 - 232.5) µg/L Zn
Reference toxicant CV	55%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup> Test Date: March 19, 2021, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation



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Report By:  
Ian Cronshaw, B.Sc.  
Laboratory Biologist



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Reviewed By:  
Edmund Canaria, R.P. Bio.  
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

## **APPENDIX A – Summary of test conditions**

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**Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.**

Test species	<i>Oncorhynchus mykiss</i>
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥ 15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥ 90%
Reference toxicant	Zinc (added as ZnSO <sub>4</sub> )



## **APPENDIX B – Toxicity test data**

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## Rainbow Trout Summary Sheet

Client: AMOW

Start Date/Time: Mar 25/21 @ 16:40 h

Work Order No.: 210529

Test Species: Oncorhynchus mykiss

### Sample Information:

Sample ID: YVS108FE  
Sample Date: March 25, 2021  
Date Received: March 25, 2021  
Sample Volume: 2 x 20L  
Other: —

### Test Validity Criteria:

≥ 90% control survival

### WQ Ranges:

T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

### Dilution Water:

Type: Dechlorinated Municipal Tap Water  
Hardness (mg/L CaCO<sub>3</sub>): 14  
Alkalinity (mg/L CaCO<sub>3</sub>): 13

### Test Organism Information:

Batch No.: 022421a  
Source: Lyndon Fish Hatcheries  
No. Fish/Volume (L): 10/12L  
Loading Density (g/L): 0.39  
Mean Length ± SD (mm): 37 ± 4  
Mean Weight ± SD (g): 0.47 ± 0.16

Range: 30 - 42  
Range: 0.21 - 0.70

### Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZnL078  
Stock Solution ID: 20Zn03  
Date Initiated: March 19, 2021  
96-h LC50 (95% CL): 79.6 (57.6 - 100.5) µg/L Zn

Reference Toxicant Mean and Historical Range: 83.3 (29.8 - 232.5) µg/L Zn  
Reference Toxicant CV (%): 55%

Test Results: The 96h LC50 is estimated to be >100% (v/v).

Reviewed by: 

Date reviewed: March 31, 2021

# 96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#:

RNOW

Sample I.D.

YVS108FE

W.O. #

210529

RBT Batch #:

022421A

Date Collected/Time:

Mar 25/21 @ 9:00h

Date Setup/Time:

Mar 25/21 @ 16:40h

CER #:

2

Sample Setup By:

[Signature]

Thermometer: CER2

D.O. meter/probe: D5 / S

Cond./Salinity meter/probe: CP5 / S

pH meter/probe: P5 / S

Number Fish/Volume:

10/12L

7-d % Mortality:

1.95

Total Pre-aeration Time (mins):

30

Aeration rate adjusted to 6.5 ± 1 mL/min/L? (Y/N):

Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	14.0		14.0
D.O. (mg/L)	7.8		8.4
pH	6.6		6.7
Cond. (µS/cm)	538		658
Salinity (ppt)	0.3		0.3

Concentration	# Survivors										Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
(% v/v)																								
Ctrl				10	10	10	10	14.0	14.0	14.0	14.5	14.5	7.8	9.7	9.5	9.6	9.4	7.2	6.9	7.1	6.6	7.1	32	39
6.25				10	10	10	10	14.0	14.0	14.0	14.5	14.5	9.9	9.8	9.5	9.5	9.5	7.2	6.9	7.1	6.6	7.1	72	76
12.5				10	10	10	10	14.0	14.0	14.0	14.5	14.5	10.0	9.6	9.6	9.7	9.5	7.1	7.0	7.2	6.6	7.0	105	109
25				10	10	10	10	14.0	14.0	14.0	14.5	14.5	9.9	9.5	9.5	9.0	8.9	6.9	7.2	7.2	6.6	7.0	166	168
50				10	10	10	10	14.0	14.0	14.0	14.5	14.0	9.7	9.6	9.5	9.8	9.5	6.8	7.3	7.4	6.9	7.1	891	297
100				10	10	10	10	14.0	14.0	14.0	14.5	14.5	8.4	9.4	9.5	9.4	9.5	6.7	7.3	7.3	7.3	7.2	658	644
Initials				The	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time	Time

Sample Description/Comments: Clear yellow odorless liquid w/o particulates

Fish Description at 96 h Remains fish appear normal

Number of Stressed Fish at 96 h 0

Other Observations:

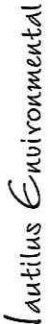
Reviewed by: [Signature]

Date Reviewed: March 31, 2024

## **APPENDIX C – Chain-of-custody form**

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## Chain of Custody

11.6-12.1°C

[illegible]

**Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.**

**END OF REPORT**

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## Acute Toxicity Test Results

Sample YVS108FE,  
collected June 17, 2021

Final Report

July 2, 2021

Submitted to: **Resort Municipality of Whistler**  
Whistler, BC

## SAMPLE INFORMATION

Sample ID	Dates		Rainbow trout test initiation	Receipt temperature
	Collected	Received		
YVS108FE	17-Jun-21 at 0900h	17-Jun-21 at 1311h	22-Jun-21 at 1545h	18.2-19.0°C

## TESTS

- Rainbow trout 96-h LC50 test

## RESULTS

### Toxicity test results

Sample ID	LC50 (% v/v)
YVS108FE	> 100

LC = Lethal Concentration

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	93.3 (75.3 – 115.7) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	88.2 (38.3 - 202.7) µg/L Zn
Reference toxicant CV	44%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup> Test Date: June 18, 2021, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation





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Report By:  
Ian Cronshaw, B.Sc.  
Laboratory Biologist



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Reviewed By:  
Edmund Canaria, R.P. Bio.  
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

## **APPENDIX A – Summary of test conditions**

---

**Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.**

Test species	<i>Oncorhynchus mykiss</i>
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥ 15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥ 90%
Reference toxicant	Zinc (added as ZnSO <sub>4</sub> )

## **APPENDIX B – Toxicity test data**

---

## Rainbow Trout Summary Sheet

Client:

RMOW

Start Date/Time:

June 22/21 @ 1545h

Work Order No.:

21191

Test Species: Oncorhynchus mykiss

### Sample Information:

Sample ID:

YVS108FE

Sample Date:

June 17, 2021

Date Received:

June 17, 2021

Sample Volume:

2 x 20 L

Other:

—

#### Test Validity Criteria:

≥ 90% Control Survival

#### WQ Ranges:

T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

### Dilution Water:

Type:

Dechlorinated Municipal Tap Water

Hardness (mg/L CaCO<sub>3</sub>):

12

Alkalinity (mg/L CaCO<sub>3</sub>):

13

### Test Organism Information:

Batch No.:

060221 B

Source:

Lyndon Fish Hatchery

No. Fish/Volume (L):

10/12 L

Loading Density (g/L):

0.33

Mean Length ± SD (mm):

36 ± 3

Mean Weight ± SD (g):

0.40 ± 0.11

Range: 31 - 40

Range: 0.22 - 0.56

### Zinc Reference Toxicant Results:

Reference Toxicant ID:

21 RIZn L083

Stock Solution ID:

21 Zn02

Date Initiated:

June 18, 2021

96-h LC50 (95% CL) [µg/L Zn]:

93.3 (75.3 - 115.7) µg/L Zn

Reference Toxicant Mean and Historical Range [µg/L Zn]:

88.2 (38.3 - 209.7) µg/L Zn

Reference Toxicant CV (%):

44%

Test Results:

The 96h LC50 is estimated to be >100% (V/V).

Reviewed by:

[Signature]

Date reviewed:

June 30, 2021

# 96-Hour Rainbow Trout Toxicity Test Data Sheet

Client/Project#:

RMOW

Sample I.D.

VV5108EE

W.O. #

21191

RBT Batch #:

000221B

Date Collected/Time:

June 17, 2021 @ 9:00h

Date Setup/Time:

June 22, 2021 @ 15:45h

CER #:

2

Sample Setup By:

HEC

Thermometer: CER2

D.O. meter/probe: DO5/5

Cond./Salinity meter/probe: C-5/5

pH meter/probe: pH2/2

Number Fish/Volume:

10/12L

7-d % Mortality:

0

Total Pre-aeration Time (mins):

30

Aeration rate adjusted to  $6.5 \pm 1$  mL/min/L? (Y/N):

Y

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	15.5	/	15.5
D.O. (mg/L)	6.9	/	7.9
pH	6.8	/	7.0
Cond. (µS/cm)	456	/	457
Salinity (ppt)	0.2	/	0.2

Concentration	# Survivors										Temperature (°C)				Dissolved Oxygen (mg/L)				pH				Conductivity (µS/cm)	
	1	2	4	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	24	48	72	96	0	96
(% v/v)																								
Ctr1				10	10	10	10	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	38
G.2.5				10	10	10	10	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	68
12.5				10	10	10	10	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	83
25				10	10	10	10	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	140
50				10	10	10	10	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	236
100				10	10	10	10	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	432
Initials																								

Sample Description/Comments:

yellow, clear, odorless liquid w/ no particulates.

Fish Description at 96 h

All fish appear normal

Number of Stressed Fish at 96 h

0

Other Observations:

Reviewed by:

HEC

Date Reviewed:

June 30, 2021

## **APPENDIX C – Chain-of-custody form**

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**END OF REPORT**

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# Acute Toxicity Test Results

Sample YVS108FE,  
collected September 23, 2021

Final Report

October 7, 2021

Submitted to: **Resort Municipality of Whistler**  
Whistler, BC

## SAMPLE INFORMATION

Sample ID	Dates		Rainbow trout test initiation	Receipt temperature
	Collected	Received		
YVS108FE	23-Sep-21 at 0900h	23-Sep-21 at 1251h	24-Sep-21 at 1410h	17.3-17.8°C

## TESTS

- Rainbow trout 96-h LC50 test

## RESULTS

### Toxicity test results

Sample ID	LC50 (% v/v)
YVS108FE	> 100

LC = Lethal Concentration

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	78.1 (63.9 – 95.4) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	97.7 (50.2 - 190.1) µg/L Zn
Reference toxicant CV	34%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup> Test Date: September 16, 2021, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation



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Report By:  
Ian Cronshaw, B.Sc.  
Laboratory Biologist



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Reviewed By:  
Edmund Canaria, R.P. Bio.  
Senior Analyst

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

## **APPENDIX A – Summary of test conditions**

---

**Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.**

Test species	<i>Oncorhynchus mykiss</i>
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥ 15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥ 90%
Reference toxicant	Zinc (added as ZnSO <sub>4</sub> )

## **APPENDIX B – Toxicity test data**

---

# Rainbow Trout Summary Sheet

Client: RMOW

Start Date/Time: Sep 24 / 21 @ 1410h

Work Order No.: 211940

Test Species: Oncorhynchus mykiss

## Sample Information:

Sample ID: MS108FE  
Sample Date: September 23, 2021  
Date Received: September 23, 2021  
Sample Volume: 2 X 20L  
Other: -

**Test Validity Criteria:**  
≥ 90% Control Survival  
**WQ Ranges:**  
T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

## Dilution Water:

Type: Dechlorinated Municipal Tap Water  
Hardness (mg/L CaCO<sub>3</sub>): 15  
Alkalinity (mg/L CaCO<sub>3</sub>): 23

## Test Organism Information:

Batch No.: 082521A  
Source: Lyndon Fish Hatchery  
No. Fish/Volume (L): 10/12  
Loading Density (g/L): 0.38  
Mean Length ± SD (mm): 38 ± 3  
Mean Weight ± SD (g): 0.46 ± 0.11

Range: 34 - 41  
Range: 0.31 - 0.58

## Zinc Reference Toxicant Results:

Reference Toxicant ID: RTZnL091  
Stock Solution ID: 21Zn03  
Date Initiated: Sept 16/2021  
96-h LC50 (95% CL) [µg/L Zn]: 78.1 (63.9 - 95.4) µg/L Zn

Reference Toxicant Mean and Historical Range [µg/L Zn]: 97.7 (50.2 - 190.1) µg/L Zn  
Reference Toxicant CV (%): 34%

Test Results: The 96h LC50 is estimated to be >100% (v/v).

Reviewed by: [Signature]

Date reviewed: Oct 6, 2021



**Client/Project#:**

**Sample I.D.**

W.O. #

RBT Batch #:

Date Collected/Time:

**Date Setup/Time:**

CER #:

**Sample Setup By:**

Thermometer: CER 2

D.O. meter/probe: DO515

Cond./Salinity meter/probe: CDS/S

pH meter/probe: 02/2

Number Fish/Volume:

**7-d % Mortality:**

Total Pre-aeration Time (mins):

Aeration rate adjusted to  $6.5 \pm 1$  mL/min/L? (Y/N):

Undiluted Sample WQ			
Parameters	Initial WQ	Adjustment	30 min WQ
Temp °C	16.0		16.0
D.O. (mg/L)	5.8		8.9
pH	6.3		6.4
Cond. (µS/cm)	368		368
Salinity (ppt)	0.2		0.2

Concentration	# Survivors								Temperature (°C)								Dissolved Oxygen (mg/L)								pH								Conductivity (µS/cm)	
	1	2	4	24	48	72	96		0	24	48	72	96		0	24	48	72	96		0	24	48	72	96		0	96						
(% v/v)																																		
Ctrl				10	10	10	10	10	15.5	15.5	15.0	15.0	15.0	9.6	9.4	9.3	9.4	9.4	6.9	6.8	7.3	7.4	7.2			49	58							
6.25				10	10	10	10	10	15.0	15.0	15.0	15.0	15.0	9.4	9.2	9.5	9.3	9.5	6.9	7.0	7.2	7.3	7.0			77	83							
12.5				10	10	10	10	10	15.5	15.0	15.0	15.0	15.0	9.6	9.4	9.4	9.5	9.5	6.8	7.1	7.2	7.3	7.0			96	101							
25				10	10	10	10	10	15.5	15.0	15.0	15.0	15.0	9.5	9.5	9.6	9.4	9.5	6.8	7.3	7.3	7.5	7.0			121	127							
50				10	10	10	10	10	15.5	15.5	15.0	14.5	15.0	9.6	9.7	9.6	9.3	9.4	6.7	7.4	7.2	7.4	7.1			206	214							
100				10	10	10	10	10	16.0	15.5	15.0	15.0	15.0	8.9	9.4	9.5	9.5	9.3	6.4	7.7	7.6	7.6	7.5			368	373							
Initials				Inv	HEC	DA	DA	Inv	HEC	DA	HEC	DA	HEC	DA	Inv	HEC	DA	DA	Inv	Inv	HEC	HEC	DA	DA	Inv	DA	Inv	DA						

Sample Description/Comments:

Brown, clear, odorless liquid w/ brown particulates

Fish Description at 96 h All fish normal

Number of Stressed Fish at 96 h

Other Observations:

Reviewed by:

Date Reviewed:

Oct. 6, 2020

## **APPENDIX C – Chain-of-custody form**

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4340 Vandever Ave.  
San Diego, CA 92120  
Phone 858.587.7333  
Fax 858.587.3961

September 23 2021 1 1

[illegible]

**Additional costs may be required for sample disposal or storage. Payment net 30 unless otherwise contracted.**

**DISTRIBUTION: WHITE - Nautilus Environmental, COLOR - Originator**

**END OF REPORT**

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## Acute Toxicity Test Results

Sample YVS108FE,  
collected December 9, 2021

Final Report

December 23, 2021

Submitted to: **Resort Municipality of Whistler**  
Whistler, BC

## SAMPLE INFORMATION

Sample ID	Dates		Rainbow trout test initiation	Receipt temperature
	Collected	Received		
YVS108FE	09-Dec-21 at 0900h	09-Dec-21 at 1247h	13-Dec-21 at 1350h	11.2-11.3°C

## TESTS

- Rainbow trout 96-h LC50 test

## RESULTS

### Toxicity test results

Sample ID	LC50 (% v/v)
YVS108FE	> 100

LC = Lethal Concentration

## QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	193.2 (145.9 – 255.8) µg/L Zn <sup>1</sup>
Reference toxicant historical mean (2 SD range)	N/A*
Reference toxicant CV	N/A*
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

<sup>1</sup>Test date: December 13, 2021, LC = Lethal Concentration, CL = Confidence Limits, SD = Standard Deviation, CV = Coefficient of Variation, N/A = Not Available

\*Insufficient data to generate baseline values



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Report By:  
Pierre Koelich, B.Sc.  
Laboratory Biologist



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Reviewed By:  
Edmund Canaria, R.P. Bio.  
Senior Analyst

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## **APPENDIX A – Summary of test conditions**

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**Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) LC50 test.**

Test species	<i>Oncorhynchus mykiss</i>
Organism source	Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	20-L glass aquarium
Test volume	10 to 20 L (depending on size of fish)
Test solution depth	≥ 15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	Dechlorinated Metro Vancouver municipal tapwater
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light / 8 hours dark
Aeration	6.5 ± 1 mL/min/L
Test measurements	Temperature, dissolved oxygen and pH measured daily; salinity measured in the undiluted sample at test initiation; conductivity measured at test initiation and termination; survival checked daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 & 2016 amendments
Statistical software	CETIS Version 1.9.4
Test endpoints	Survival (96-hour LC50)
Test acceptability criterion for controls	Survival ≥ 90%
Reference toxicant	Zinc (added as ZnSO <sub>4</sub> )

## **APPENDIX B – Toxicity test data**

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## Rainbow Trout Summary Sheet

Client: RMOW

Start Date/Time: December 13, 2021/13:50 h

Work Order No.: 212493

Test Species: Oncorhynchus mykiss

### Sample Information:

Sample ID: YNS103FE  
Sample Date: December 9, 2021  
Date Received: December 9, 2021  
Sample Volume: 2X20L  
Other: —

#### Test Validity Criteria:

≥ 90% Control Survival

#### WQ Ranges:

T (°C) = 15 ± 1; DO (mg/L) = 7.0 to 10.3; pH = 5.5 to 8.5

### Dilution Water:

Type: Dechlorinated Municipal Tap Water  
Hardness (mg/L CaCO<sub>3</sub>): 22  
Alkalinity (mg/L CaCO<sub>3</sub>): 11

### Test Organism Information:

Batch No.: 112421  
Source: Aqua Farms  
No. Fish/Volume (L): 10/12L  
Loading Density (g/L): 0.22  
Mean Length ± SD (mm): 30 ± 2  
Mean Weight ± SD (g): 0.26 ± 0.04

Range: 27 - 34  
Range: 0.18 - 0.29

### Zinc Reference Toxicant Results:

Reference Toxicant ID: RBTZn03  
Stock Solution ID: 212n04  
Date Initiated: December 13, 2021  
96-h LC50 (95% CL) [µg/L Zn]: 193.2 (145.9 - 255.8) µg/L Zn

Reference Toxicant Mean and Historical Range [µg/L Zn]: Not Available  
Reference Toxicant CV (%): Not Available

Test Results: The 96h LC50 is estimated to be >100% (v/v)

Reviewed by: 

Date reviewed: Dec. 23, 2021

# 96-Hour Rainbow Trout Toxicity Test Data Sheet

**Client/Project#:**

Rmow

Know

**Sample I.D.**

YV5108EE

W.O. #

21249.3

**RBT Batch #:**

17421

Date Collected/Time:

December 9, 2021: 09:00h

Date Setup/Time:

December 13, 2021: 13:50h

CER #:

2

**Sample Setup By:**

HEC

Thermometer: C602

D.O. meter/probe: DO5 / S

51

Cond./Salinity meter/probe: C-S / S

Page: 5-5 / 5

pH meter/probe: pH2 / 2

2

Concentration	# Survivors							Temperature (°C)					Dissolved Oxygen (mg/L)					pH					Conductivity (µS/cm)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Sample Description/Comments:

Clear yellow liquid w/ stale odor and fine white particulates. Inorganic nit

Fish Description at 96 h

All fish appear normal

Number of Stressed Fish at 96 h

Other Observations:

Reviewed by:

11

Date Reviewed:

Dec. 23, 2021

## **APPENDIX C – Chain-of-custody form**

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**END OF REPORT**

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## APPENDIX C: WASTEWATER TREATMENT PLANT DATA

Date	Effluent (m3/day)	Total Suspended Solids (mg/L)	CBOD5 (mg/L)	Soluble PO4 as P (mg/L)	PO4 as P (kg/day)	Total Phosphorous (mg/L)	Fecal Coliform (cfu/100mL)
01/01/2021	11887	9		0.03	0.36		
01/02/2021	16286	6		0.03	0.49		
01/03/2021	14043	5		0.03	0.42		
01/04/2021	12777	4		0.03	0.38		
01/05/2021	11705	8		0.05	0.59		
01/06/2021	12008	5	4	0.29	3.48	0.48	1.00
01/07/2021	11790	6		0.14	1.65		1.00
01/08/2021	10747	5		0.05	0.54		
01/09/2021	10997	8		0.03	0.33		
01/10/2021	10340	7		0.04	0.41		
01/11/2021	10858	5		0.02	0.22		
01/12/2021	11046	5		0.05	0.55		
01/13/2021	14238	5	6	0.05	0.71	0.48	N/A
01/14/2021	12486	5		0.03	0.37		1.00
01/15/2021	11774	4		0.03	0.35		
01/16/2021	11666	4		0.04	0.47		
01/17/2021	11007	7		0.13	1.43		
01/18/2021	9772	5		0.41	4.01		
01/19/2021	9117	4		0.14	1.28		
01/20/2021	8827	4	6	0.22	1.94	0.35	1.00
01/21/2021	8773	5		0.15	1.32		48.00
01/22/2021	9287	7		0.13	1.21		
01/23/2021	9980	5		0.03	0.30		
01/24/2021	9750	5		0.04	0.39		
01/25/2021	8567	5		0.03	0.26		
01/26/2021	8231	6		0.04	0.33		
01/27/2021	8178	6	5	0.03	0.25	0.19	2.00
01/28/2021	8255	5		0.04	0.33		1.00
01/29/2021	8496	5		0.10	0.85		
01/30/2021	9071	6		0.42	3.81		
01/31/2021	8620	6		0.43	3.71		
02/01/2021	8151	6		0.21	1.71		
02/02/2021	7980	5		0.20	1.60		
02/03/2021	7697	4	5	0.22	1.69	0.40	1.00
02/04/2021	7902	6		0.34	2.69		1.00
02/05/2021	8238	4		0.41	3.38		



02/06/2021	9086	6		0.65	5.91		
02/07/2021	8654	5		0.28	2.42		
02/08/2021	7786	5		0.29	2.26		
02/09/2021	7578	7		0.03	0.23		
02/10/2021	7486	7	6	0.06	0.45	0.27	2.00
02/11/2021	7700	6		0.06	0.46		4.50
02/12/2021	8551	7		0.09	0.77		
02/13/2021	9460	6		0.21	1.99		
02/14/2021	9811	6		0.06	0.59		
02/15/2021	8891	6		0.04	0.36		
02/16/2021	8002	6		0.04	0.32		
02/17/2021	7822	6	6	0.05	0.39	0.21	2.00
02/18/2021	7798	3		0.03	0.23		2.00
02/19/2021	8249	4		0.06	0.49		
02/20/2021	9015	7		0.10	0.90		
02/21/2021	10311	6		0.94	9.69		
02/22/2021	8893	6		0.05	0.44		
02/23/2021	8239	5		0.03	0.25		
02/24/2021	7936	5	4	0.08	0.63	0.19	1.80
02/25/2021	8083	5		0.02	0.16		1.80
02/26/2021	8694	4		0.03	0.26		
02/27/2021	9360	5		0.02	0.19		
02/28/2021	9104	7		0.04	0.36		
03/01/2021	8527	6		0.03	0.26		
03/02/2021	8285	6		0.03	0.25		
03/03/2021	8112	6	4	0.03	0.24	0.17	1.80
03/04/2021	8812	4		0.02	0.18		2.00
03/05/2021	10652	8		0.46	4.90		
03/06/2021	11541	4		0.03	0.35		
03/07/2021	10925	5		0.03	0.33		
03/08/2021	9285	5		0.03	0.28		
03/09/2021	8885	5		0.03	0.27		
03/10/2021	8631	5	5	0.15	1.29	0.39	1.80
03/11/2021	8713	5		0.13	1.13		2.00
03/12/2021	9188	4		0.12	1.10		
03/13/2021	9671	5		0.03	0.29		
03/14/2021	11216	5		0.30	3.36		
03/15/2021	10482	5		0.03	0.31		
03/16/2021	10345	4		0.06	0.62		
03/17/2021	10447	5	5	0.05	0.52	0.32	1.00
03/18/2021	10402	8		0.10	1.04		2.00
03/19/2021	11249	7		0.77	8.66		
03/20/2021	12220	7		0.18	2.20		
03/21/2021	11985	4		0.06	0.72		

03/22/2021	11185	8		0.04	0.45		
03/23/2021	10621	7		0.05	0.53		
03/24/2021	10708	6	6	0.05	0.54	0.34	2.00
03/25/2021	10283	5		0.04	0.41		2.00
03/26/2021	11472	8		0.18	2.07		
03/27/2021	11238	8		0.10	1.12		
03/28/2021	13539	7		0.88	11.91		
03/29/2021	11343	7		0.09	1.02		
03/30/2021	9721	7		0.04	0.39		
03/31/2021	9112	7	5	0.04	0.36	0.26	1.80
04/01/2021	8895	2		0.08	0.71		6.10
04/02/2021	8993	4		0.09	0.81		
04/03/2021	9134	8		0.24	2.19		
04/04/2021	8696	10		0.39	3.39		
04/05/2021	8196	7		0.51	4.18		
04/06/2021	7980	8		0.14	1.12		
04/07/2021	7918	7	6	0.08	0.63	0.45	1.00
04/08/2021	7671	8		0.05	0.38		1.00
04/09/2021	7790	17		0.12	0.93		
04/10/2021	7675	11		0.11	0.84		
04/11/2021	7565	6		0.24	1.82		
04/12/2021	7526	6		0.42	3.16		
04/13/2021	6990	7		0.69	4.82		
04/14/2021	7569	12	8	0.17	1.29	0.59	1.00
04/15/2021	7653	9		0.12	0.92		1.00
04/16/2021	7780	9		0.06	0.47		
04/17/2021	7910	13		0.08	0.63		
04/18/2021	8256	10		0.07	0.58		
04/19/2021	7836	9		0.10	0.78		
04/20/2021	7485	9		0.11	0.82		
04/21/2021	7338	8	7	0.05	0.37	0.50	1.00
04/22/2021	7309	7		0.06	0.44		1.00
04/23/2021	7207	8		0.14	1.01		
04/24/2021	7514	9		0.19	1.43		
04/25/2021	7528	7		0.15	1.13		
04/26/2021	7219	8		0.21	1.52		
04/27/2021	7171	8		0.23	1.65		
04/28/2021	7200	8	6	0.15	1.08	0.43	1.80
04/29/2021	7180	8		0.12	0.86		1.80
04/30/2021	7557	6		0.08	0.60		
05/01/2021	7397	6		0.10	0.74		
05/02/2021	7125	8		0.11	0.78		
05/03/2021	7051	10		0.24	1.69		
05/04/2021	6825	9		0.19	1.30		

05/05/2021	6785	9	6	0.10	0.68	0.38	2.00
05/06/2021	6926	6		0.05	0.35		1.00
05/07/2021	6805	6		0.05	0.34		
05/08/2021	6688	4		0.04	0.27		
05/09/2021	6607	7		1.04	6.87		
05/10/2021	7249	7		0.10	0.72		
05/11/2021	7028	6		0.11	0.77		
05/12/2021	6764	7	6	0.10	0.68	0.27	1.00
05/13/2021	5563	8		0.05	0.28		1.00
05/14/2021	7491	7		0.05	0.37		
05/15/2021	7061	6		0.04	0.28		
05/16/2021	6965	8		0.04	0.28		
05/17/2021	7193	8		0.05	0.36		
05/18/2021	7021	6		0.05	0.35		
05/19/2021	6826	7	6	0.05	0.34	0.29	1.00
05/20/2021	6786	9		0.05	0.34		1.00
05/21/2021	6917	11		0.05	0.35		
05/22/2021	7334	6		0.05	0.37		
05/23/2021	7480	7		0.06	0.45		
05/24/2021	7275	6		0.07	0.51		
05/25/2021	7019	6		0.05	0.35		
05/26/2021	7042	7	6	0.07	0.49	0.31	2.00
05/27/2021	7439	10		0.06	0.45		1.00
05/28/2021	7340	9		0.02	0.15		
05/29/2021	7585	10		0.04	0.30		
05/30/2021	7377	9		0.08	0.59		
05/31/2021	7285	8		0.06	0.44		
06/01/2021	7332	7		0.07	0.51		
06/02/2021	7092	6	6	0.08	0.57	0.21	1.00
06/03/2021	7226	4		0.02	0.14		1.00
06/04/2021	7380	4		0.01	0.07		
06/05/2021	7914	10		0.03	0.24		
06/06/2021	7365	8		0.07	0.52		
06/07/2021	6774	8		0.08	0.54		
06/08/2021	6733	6		0.08	0.54		
06/09/2021	6702	6	7	0.08	0.54	0.23	1.00
06/10/2021	6683	4		0.01	0.07		1.00
06/11/2021	7032	4		0.01	0.07		
06/12/2021	7677	5		0.03	0.23		
06/13/2021	8646	4		0.10	0.86		
06/14/2021	8179	6		0.09	0.74		
06/15/2021	7792	6		0.23	1.79		
06/16/2021	7651	6	6	0.03	0.23	0.26	1.00
06/17/2021	7690	6		0.03	0.23		1.00

06/18/2021	7945	7		0.02	0.16		
06/19/2021	8534	5		0.04	0.34		
06/20/2021	8132	4		0.07	0.57		
06/21/2021	7843	5		0.04	0.31		
06/22/2021	7684	7		0.09	0.69		
06/23/2021	7750	6	6	0.04	0.31	0.20	1.00
06/24/2021	7983	4		0.03	0.24		2.00
06/25/2021	8503	3		0.02	0.17		
06/26/2021	8980	2		0.05	0.45		
06/27/2021	10074	6		0.12	1.21		
06/28/2021	9002	6	5	0.10	0.90	0.31	2.00
06/29/2021	8936	6		0.05	0.45		1.00
06/30/2021	9172	5		0.03	0.28		
07/01/2021	8997	4		0.12	1.08		
07/02/2021	12913	5		0.05	0.65		
07/03/2021	10390	7		0.10	1.04		
07/04/2021	9489	7		0.08	0.76		
07/05/2021	8654	7		0.05	0.43		
07/06/2021	8492	6		0.06	0.51		
07/07/2021	8496	6	4	0.06	0.51	0.25	9.00
07/08/2021	8246	4		0.05	0.41		1.00
07/09/2021	8734	3		0.06	0.52		
07/10/2021	9263	8		0.10	0.93		
07/11/2021	8788	7		0.11	0.97		
07/12/2021	8458	6		0.14	1.18		
07/13/2021	8362	5		0.30	2.51		
07/14/2021	8267	12	4	1.11	9.18	1.36	1.00
07/15/2021	8318	7		0.41	3.41		1.00
07/16/2021	8503	5		0.29	2.47		
07/17/2021	9140	9		0.53	4.84		
07/18/2021	8958	12		0.47	4.21		
07/19/2021	8249	10		0.43	3.55		
07/20/2021	8323	9		0.62	5.16		
07/21/2021	8106	7	8	1.21	9.81	1.75	1.00
07/22/2021	8200	9		1.50	12.30		1.00
07/23/2021	8434	9		0.77	6.49		
07/24/2021	9524	12		0.80	7.62		
07/25/2021	9561	17		2.04	19.50		
07/26/2021	8778	16		1.66	14.57		
07/27/2021	8704	23		0.12	1.04		
07/28/2021	8413	14	6	0.09	0.76	0.46	1.00
07/29/2021	8513	11		0.54	4.60		4.00
07/30/2021	10234	8		0.16	1.64		
07/31/2021	9999	9		0.13	1.30		

08/01/2021	10727	12		0.21	2.25		
08/02/2021	10600	7		0.26	2.76		
08/03/2021	9468	10		0.10	0.95		
08/04/2021	9375	11	4	0.18	1.69	1.06	4.00
08/05/2021	9394	11		0.22	2.07		9.00
08/06/2021	9560	10		0.22	2.10		
08/07/2021	9784	15		0.22	2.15		
08/08/2021	9797	10		0.41	4.02		
08/09/2021	9009	10		0.23	2.07		
08/10/2021	9199	17		0.21	1.93		
08/11/2021	9424	12	8	0.21	1.98	0.83	1120.00
08/12/2021	8257	14		1.27	10.49		205.00
08/13/2021	9851	11		1.46	14.38		
08/14/2021	10250	20		0.51	5.23		
08/15/2021	9723	12		0.18	1.75		
08/16/2021	9987	14		0.23	2.30		
08/17/2021	9420	12		0.22	2.07		
08/18/2021	9249	11	9	0.23	2.13	0.67	25.00
08/19/2021	9191	10		0.19	1.75		31.00
08/20/2021	9629	12		0.19	1.83		
08/21/2021	10149	12		0.22	2.23		
08/22/2021	9454	16		0.11	1.04		
08/23/2021	8823	11		0.18	1.59		
08/24/2021	8831	18		0.16	1.41		
08/25/2021	8900	11	7	0.15	1.34	0.53	3.00
08/26/2021	8786	10		0.21	1.85		3.00
08/27/2021	9045	12		0.21	1.90		
08/28/2021	9451	10		0.19	1.80		
08/29/2021	9258	9		0.17	1.57		
08/30/2021	8522	15		0.14	1.19		
08/31/2021	8416	10		0.22	1.85		
09/01/2021	8358	8	6	0.14	1.17	0.49	3.00
09/02/2021	8318	9		0.14	1.16		4.00
09/03/2021	8773	7		0.16	1.40		
09/04/2021	9641	10		0.19	1.83		
09/05/2021	9377	10		0.12	1.13		
09/06/2021	8317	9		0.12	1.00		
09/07/2021	7432	10		0.09	0.67		
09/08/2021	7345	10	5	0.10	0.73	0.56	5.00
09/09/2021	7380	5		0.21	1.55		4.00
09/10/2021	7795	6		0.25	1.95		
09/11/2021	8386	8		0.08	0.67		
09/12/2021	7910	7		0.08	0.63		
09/13/2021	7295	7		0.07	0.51		

09/14/2021	7340	8		0.08	0.59		
09/15/2021	7085	7	5	0.08	0.57	0.41	2.00
09/16/2021	7482	13		1.00	7.48		1.00
09/17/2021	11503	7		0.14	1.61		
09/18/2021	10194	8		0.05	0.51		
09/19/2021	8706	13		0.06	0.52		
09/20/2021	7780	10		0.08	0.62		
09/21/2021	7598	12		0.05	0.38		
09/22/2021	7606	9	4	0.05	0.38	0.48	5.00
09/23/2021	7564	8		0.25	1.89		1.00
09/24/2021	7918	10		0.06	0.48		
09/25/2021	8484	12		0.46	3.90		
09/26/2021	8885	12		0.38	3.38		
09/27/2021	9173	10		0.06	0.55		
09/28/2021	8936	10		0.06	0.54		
09/29/2021	10025	9	11	0.11	1.10	0.39	11.00
09/30/2021	12292	9		0.43	5.29		12.00
10/01/2021	10677	8		0.03	0.32		
10/02/2021	10700	8		0.05	0.54		
10/03/2021	9442	8		0.06	0.57		
10/04/2021	8689	10		0.05	0.43		
10/05/2021	9611	10		0.05	0.48		
10/06/2021	9280	8	8	0.35	3.25	0.70	4.50
10/07/2021	8845	11		0.04	0.35		2.00
10/08/2021	9226	9		0.12	1.11		
10/09/2021	10417	18		0.10	1.04		
10/10/2021	11363	14		0.08	0.91		
10/11/2021	9883	14		0.07	0.69		
10/12/2021	8375	15		0.07	0.59		
10/13/2021	8028	12	6	0.09	0.72	0.56	1.00
10/14/2021	8106	14		0.18	1.46		4.00
10/15/2021	9077	12		0.10	0.91		
10/16/2021	12837	13		0.85	10.91		
10/17/2021	16498	11		0.05	0.82		
10/18/2021	13501	11		0.05	0.68		
10/19/2021	10620	8		0.06	0.64		
10/20/2021	9913	9	6	0.05	0.50	0.26	2.00
10/21/2021	10514	4		0.03	0.32		1.80
10/22/2021	11917	8		0.06	0.71		
10/23/2021	11593	7		0.06	0.70		
10/24/2021	11040	7		0.07	0.77		
10/25/2021	10996	8		0.05	0.55		
10/26/2021	10787	7		0.05	0.54		
10/27/2021	10385	4	6	0.04	0.42	0.85	4.00

10/28/2021	11195	4		0.03	0.34		1.00
10/29/2021	10787	6		0.03	0.32		
10/30/2021	10079	8		0.07	0.71		
10/31/2021	9363	8		0.09	0.84		
11/01/2021	8897	8		0.20	1.78		
11/02/2021	9185	15		0.69	6.34		
11/03/2021	10406	10	5	0.69	7.18	1.28	2.00
11/04/2021	13876	7		1.14	15.82		1.00
11/05/2021	13613	7		0.33	4.49		
11/06/2021	12806	6		0.36	4.61		
11/07/2021	11489	8		0.40	4.60		
11/08/2021	10743	7		0.62	6.66		
11/09/2021	9685	6		0.39	3.78		1.00
11/10/2021	9460	5	7	0.62	5.87	1.02	1.00
11/11/2021	11309	8		0.59	6.67		
11/12/2021	13546	8		0.31	4.20		
11/13/2021	14843	7		0.20	2.97		
11/14/2021	22578	6		0.11	2.48		
11/15/2021	29686	27		0.06	1.78		
11/16/2021	19804	13		0.05	0.99		
11/17/2021	15032	9	8	0.38	5.71	0.66	7.80
11/18/2021	13403	7		0.46	6.17		7.80
11/19/2021	11999	2		0.14	1.68		
11/20/2021	11599	12		0.68	7.89		
11/21/2021	10635	7		0.11	1.17		
11/22/2021	9934	7		0.06	0.60		
11/23/2021	9753	9		0.05	0.49		
11/24/2021	9759	7	8	0.05	0.49	0.43	2.00
11/25/2021	10831	7		0.08	0.87		4.00
11/26/2021	12241	5		0.04	0.49		
11/27/2021	15232	7		0.04	0.61		
11/28/2021	18879	9		0.05	0.94		
11/29/2021	17672	5		0.05	0.88		
11/30/2021	23352	5		0.08	0.08		
12/01/2021	23818	39	25	0.05	1.19	1.54	19.00
12/02/2021	21041	14		0.02	0.42		18.00
12/03/2021	18493	7		0.21	3.88		
12/04/2021	16703	12		0.38	6.35		
12/05/2021	13957	10		0.48	6.70		
12/06/2021	11799	5		0.05	0.59		
12/07/2021	11315	6		0.05	0.57		
12/08/2021	10996	7	7	0.05	0.55	0.35	4.00
12/09/2021	10853	10		0.06	0.65		3.00
12/10/2021	11286	9		0.04	0.45		

12/11/2021	11731	10		0.04	0.47		
12/12/2021	12660	10		0.02	0.25		
12/13/2021	10636	11		0.05	0.53		
12/14/2021	10126	13		0.12	1.22		
12/15/2021	9766	11	7	0.07	0.68	0.39	4.00
12/16/2021	9776	11		0.05	0.49		7.00
12/17/2021	10130	14		0.05	0.51		
12/18/2021	10606	12		0.03	0.32		
12/19/2021	11238	9		0.05	0.56		
12/20/2021	11972	10		0.05	0.60		
12/21/2021	11490	7		0.05	0.57		
12/22/2021	11058	8	13	0.05	0.55	0.32	10.00
12/23/2021	11534	7		0.02	0.23		8.00
12/24/2021	11324	6		0.01	0.11		
12/25/2021	11052	12		0.05	0.55		
12/26/2021	11046	9		0.05	0.55		
12/27/2021	11544	11		0.01	0.12		
12/28/2021	11941	6		0.03	0.36		
12/29/2021	12426	7	8	0.05	0.62	0.40	
12/30/2021	12213	13		0.01	0.12		6.00
12/31/2021	12824	11		0.05	0.64		
12/31/2020	11239	6.0		0.05	0.56		



## APPENDIX D: RECEIVING ENVIRONMENT MONITORING



**DATE:** April 27, 2022  
**TO:** Brett Jenaway, Resort Municipality of Whistler  
**FROM:** Macaila Wagner, B.I.T., Cascade Environmental Resource Group Ltd.  
Margot Webster, R.P.Bio., Cascade Environmental Resource Group Ltd.  
**RE:** 2021 Whistler Wastewater Treatment Plant Report: Receiving Environment Data Analysis  
**FILE #:** 013-34-10

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## Introduction

The Resort Municipality of Whistler (RMOW) retained Cascade Environmental Resource Group Ltd. (Cascade) to conduct the data analysis of the Receiving Environment Monitoring section of the 2021 Annual Wastewater Treatment Plant Report. The Whistler Wastewater Treatment Plant (WWTP) is operated by the RMOW under the operational certificate ME-01452 under the provisions of the *Environmental Management Act*, which requires the RMOW to sample the WWTP discharge effluent and the receiving environment in the Cheakamus River and summarize the sample data in an annual report.

## Receiving Environment Monitoring

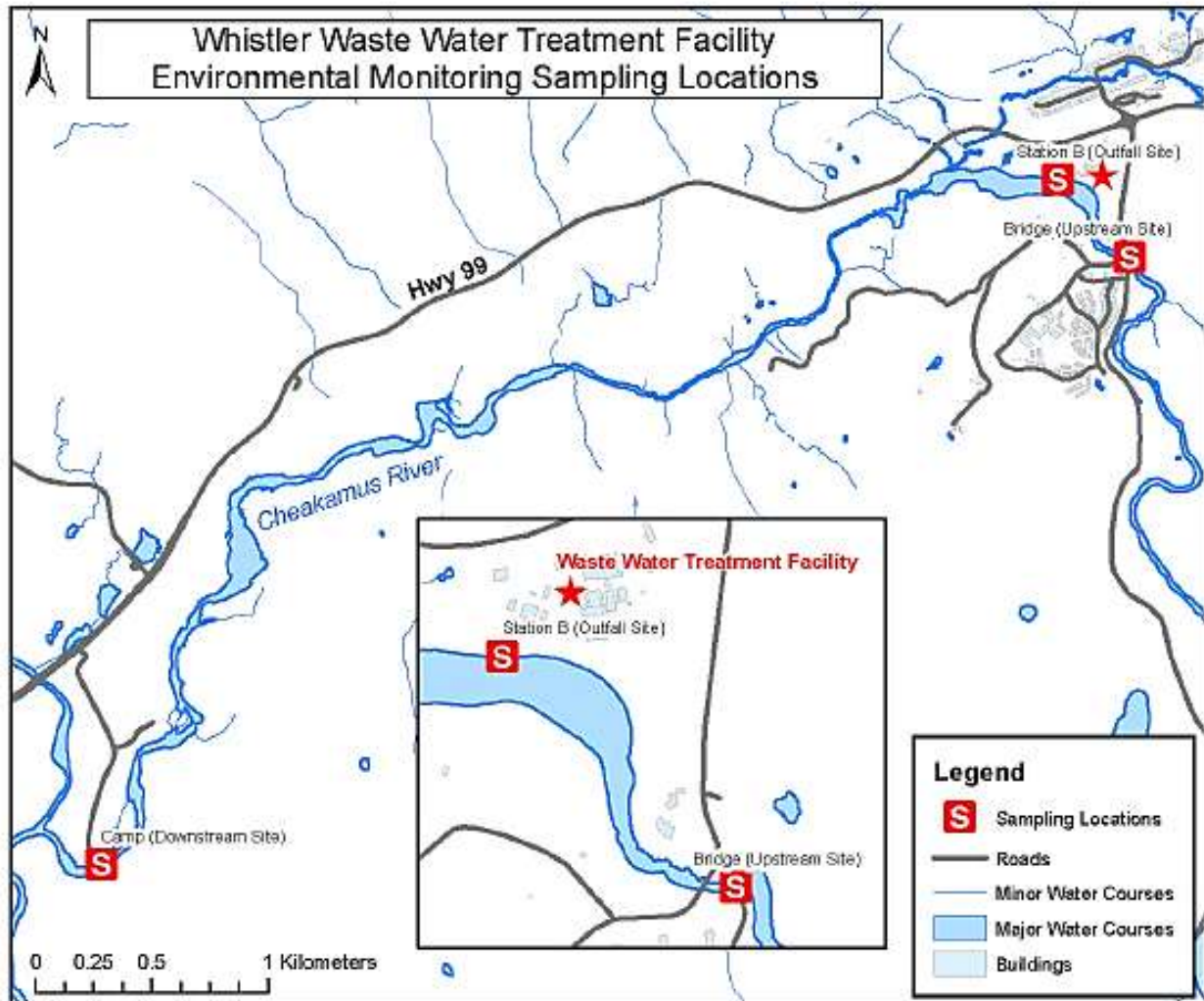
The receiving environment (the Cheakamus River) is sampled once per month by WWTP staff, and the samples are submitted to a certified laboratory. The operational certificate requires the RMOW to monitor two sampling stations, with a grab sample taken three times per year. The RMOW exceeds this requirement by sampling at three locations, every month of the year.

The monitored parameters are compared at three sampling locations: Upstream, Outfall and Downstream (see Map 1). The sample locations are as follows: the upstream sampling location is at the 'bridge', approximately 100 metres upstream of the outfall; the outfall location is also referred to as 'Station B'; and the downstream sampling location is also known as 'camp', which is approximately 4 kilometres downstream of the outfall.

Parameters required for sample analysis in the receiving environment by the operational certificate are pH, conductivity, turbidity, orthophosphate (as phosphorous), nitrate nitrogen, nitrite nitrogen, and ammonia nitrogen. Results that fall below the laboratory detection limit are represented graphically in this report as equal to the laboratory detection limit.

This report is intended to meet the operational certificate reporting requirements to be provided by a qualified professional that includes a compendium of both discharge and receiving environment data, a trend analysis review and interpretation of analytical data for results of the 2021 sample year and comparisons with past years in terms of potential impact to the receiving environment.

**Map 1: Whistler Wastewater Treatment Plant Environmental Monitoring Sampling Locations**



## Water Quality Guidelines

Receiving environment sample results were compared to several water quality guidelines to determine compliance. Several guidelines exist for many of the sample parameters: the operational certificate (ME-01452), current British Columbia approved water quality guidelines (BC WQG), and the Province of BC *Environmental Management Act* Contaminated Sites Regulation (CSR) - Schedule 3.2 – Generic Numerical Water Standards. The BC WQGs provide policy direction and are used as the basis for determining the allowable limits in waste discharge authorizations, however they do not have direct legal standing. The CSR standards are legally upheld in BC. The operational certificate requirements must be met to maintain legal authorization to operate the WWTP. All water quality standards used in this report are for the protection of freshwater aquatic life. Legally binding guidelines will be used (operational certificate and CSR) where possible and the most conservative guideline will be prioritized.

**Table 1: Guidelines for Water Samples in the Receiving Environment**

Parameter	Unit	Operational Certificate	CSR	BC WQG
Ammonia-N	mg/L		1.3 (pH $\geq$ 8.5) 3.7 (pH 8.0 – 8.5) 11.3 (pH 7.5 – 8.0) 18.5 (pH 7.0 – 7.5) 18.4 (pH $<$ 7.0)	Varies with temperature and pH
Conductivity		No guideline or standard for conductivity - typical range in Western Canadian surface waters is 4.8 to 84,600 $\mu$ S/cm (NAQUADAT, 1985)		
Nitrate-N	mg/L		400	3.0
Nitrite-N	mg/L		0.2 (Cl $<$ 2 mg/L) 0.4 (Cl 2 – 4 mg/L) 0.6 (Cl 4 – 6 mg/L) 0.8 (Cl 6 – 8 mg/L) 1.0 (Cl 8 – 10 mg/L) 2.0 (Cl $>$ 10 mg/L)	0.02 (when Cl $\leq$ 2 mg/L) 30 day average 0.06 (Cl $\leq$ 2 mg/L) short-term
Nitrate + Nitrite	mg/L		400	3.0
Orthophosphate (as phosphorus)	mg/L	1.75 mg/L		0.01* (for recreational use)
pH				6.5-9.0
Turbidity	NTU			$\pm$ 8 (clear water/ 24 hours) $\pm$ 2 (clear water/ 30 days) $\pm$ 5 (background is 8-50) $\pm$ 10% (background is $>$ 50)



## pH in the Receiving Environment

The provincial water quality guidelines state that pH should measure between 6.5 and 9.0. Sample results from 2021 are displayed in Figure 1, which show that all samples comply with the guideline range (displayed in red) and do not exhibit a change throughout the year with minimal variation. The average pH measurements for 2021 are 7.11 upstream, 7.11 at the outfall, and 7.18 at the downstream.

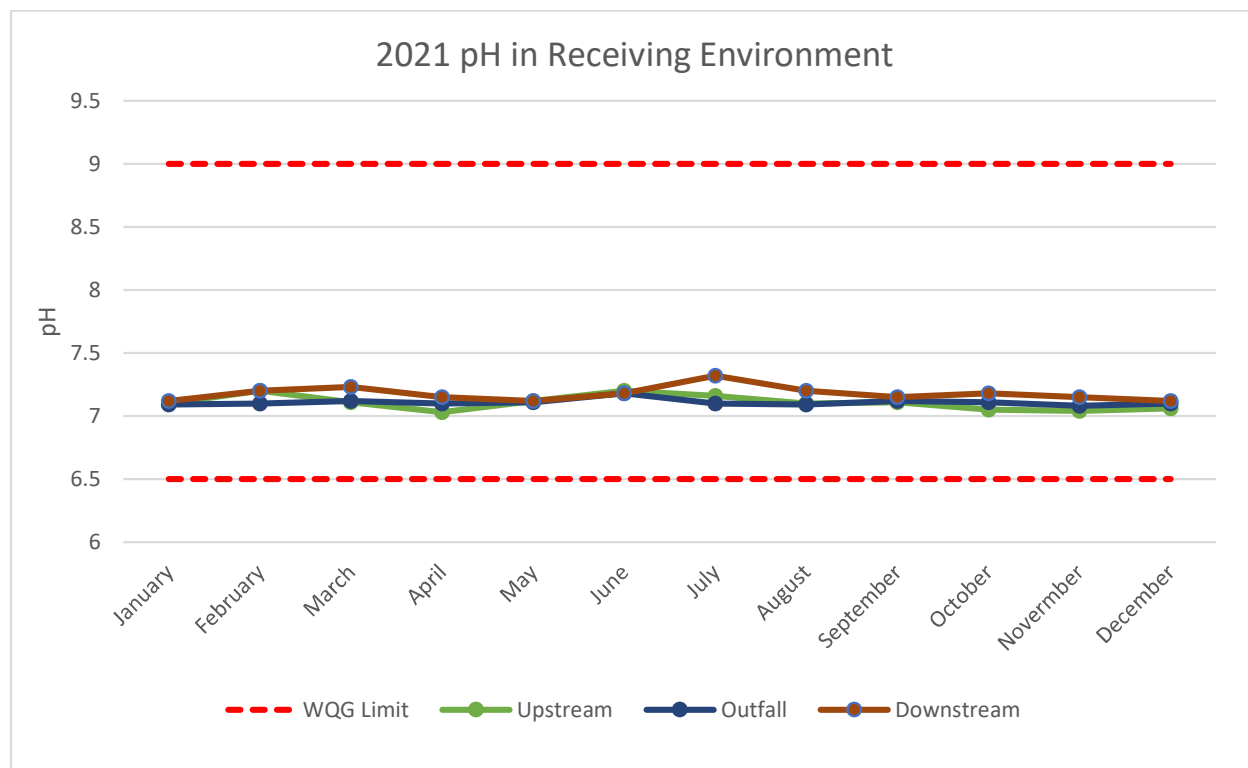
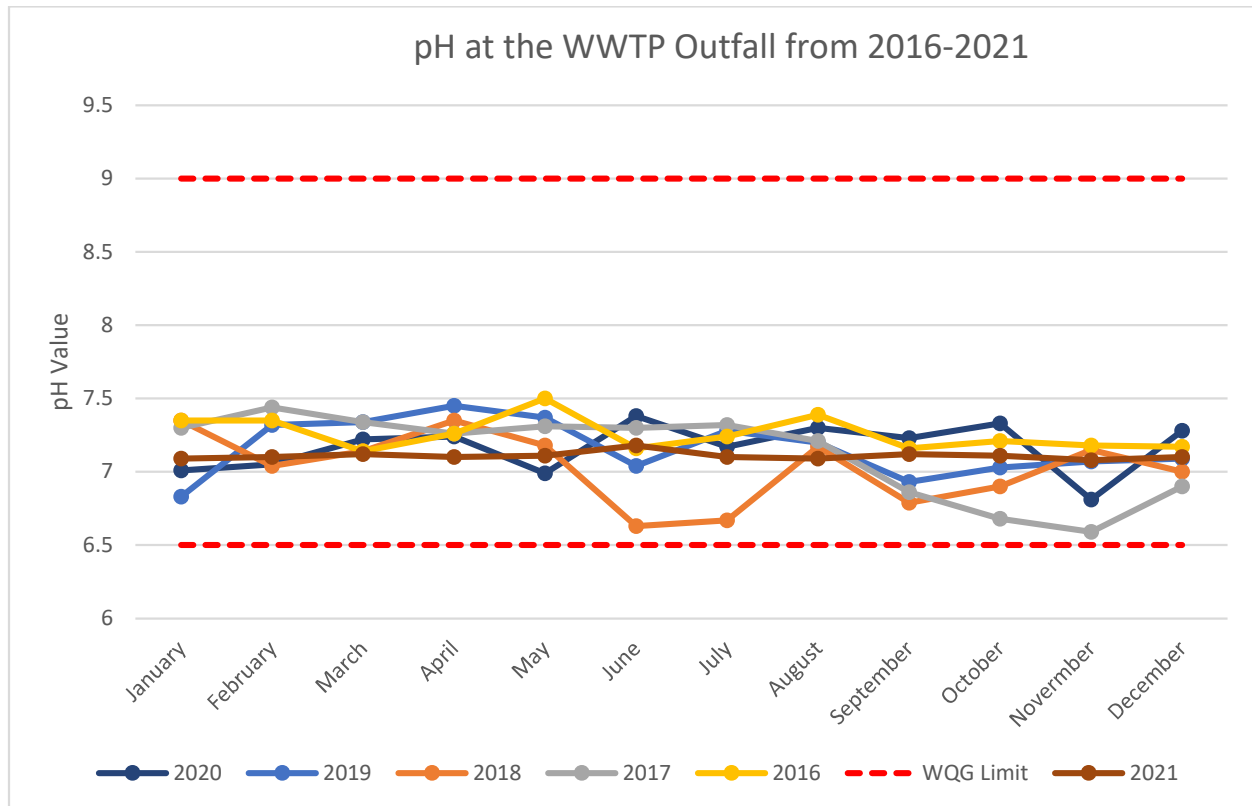


Figure 1: Whistler Wastewater Treatment Plant pH Monitoring in the Receiving Environment for 2021.



Figure 2 compares the pH sample results from 2016 to 2021 at the outfall location, to the provincial water quality guidelines graphed in red. The pH has remained within the WQG for all years sampled, except for one measurement of 6.1, not identified on the graph, taken at the downstream sample location in October 2017. However, the recorded pH at the outfall during this same sample event was 6.68 which complies with the guidelines.



**Figure 2: pH at the Whistler WWTP Outfall on the Cheakamus River from 2016-2021.**

## Conductivity in the Receiving Environment

The water quality samples from the Cheakamus River receiving environment in 2021 demonstrated an electrical conductivity range of 26 to 54.7  $\mu\text{S}/\text{cm}$  at all sample locations. This is in alignment with the data from 2016 to 2020 that had an overall range of 28.7 to 121  $\mu\text{S}/\text{cm}$  (Figure 3). Conductivity typically ranges from 4.8 to 84,600  $\mu\text{S}/\text{cm}$  in Western Canada surface waters (NAQUADAT, 1985), therefore all conductivity results are within range.

Figure 3 displays conductivity results from the outfall location with a general trend as higher in the winter months (December to April) and lower in summer months (May to November). Increased conductivity may be due to increased salts and minerals present during months with higher precipitation. The average conductivity at the outfall during the winter of 2021 is 49.59  $\mu\text{S}/\text{cm}$  and 34.8  $\mu\text{S}/\text{cm}$  in the summer. This trend is consistent with the previous years.

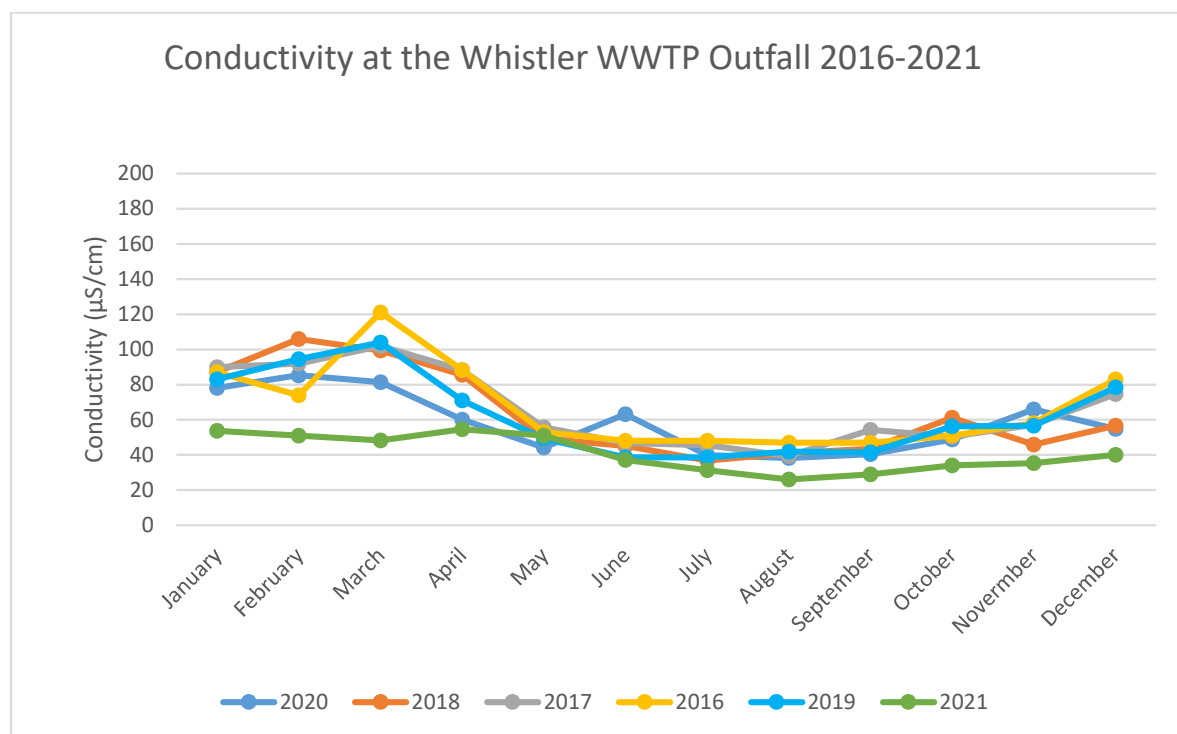


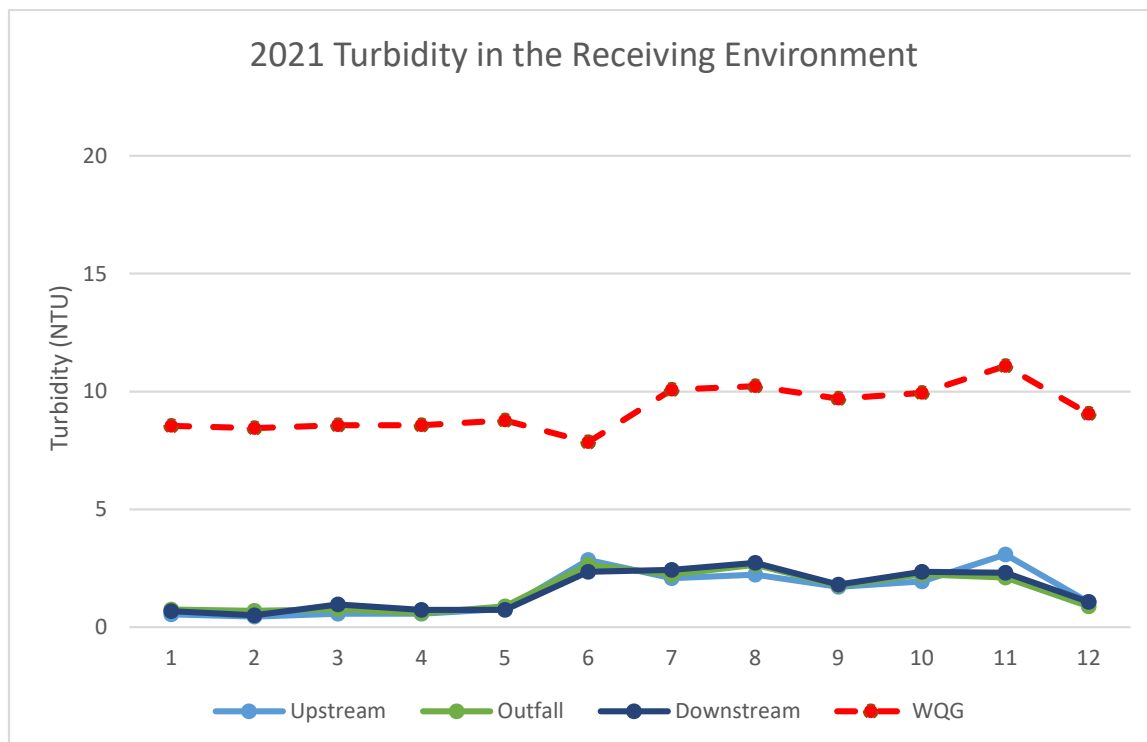
Figure 3: Conductivity Sample Results from the Whistler WWTP Outfall on the Cheakamus River from 2016-2021.



## Turbidity in the Receiving Environment

There are no operational certificates or CSR guidelines for the turbidity of water. The BC WQG states that in clear waters (less than 8 NTU) the allowable turbidity is a short-term change of 8 NTU from background. When background is between 8 to 50 NTU, the allowable change is 5 NTU, and when background is over 50 NTU the allowable change is 10% from background. The upstream sample location will provide the background turbidity measurement.

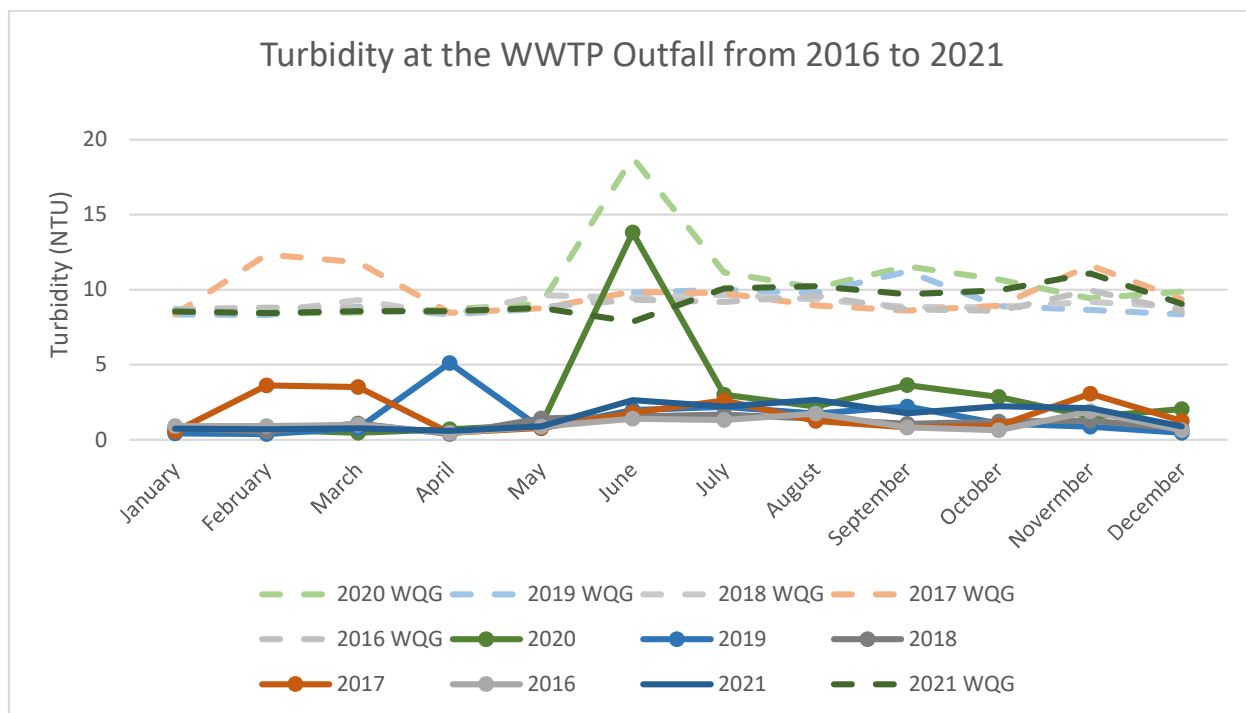
Figure 4 displays the results for turbidity samples in the receiving environment for the year 2021 with the BC WQG displayed in red. The BC WQG is 8 NTU above the upstream sample values (background). There is no sample event for the year 2021 that exceeds the BC WQG for turbidity. All sample locations display the same natural variations throughout the year.



**Figure 4: 2021 Turbidity Sample Results of the Whistler WWTP Receiving Environment.**



Figure 5 depicts the results of turbidity samples from the years 2016 to 2021 at the Whistler WWTP Outfall sample location. There is no sample event that has exceeds the BC WQG, although increases in turbidity exist at varying sample events. Due to reflected increases in upstream turbidity, it is assumed these spikes are from natural causes, such as high rain events.



**Figure 5: Turbidity Results at the Whistler WWTP Outfall from 2016 to 2021 and Guidelines.**

## Phosphorous in the Receiving Environment

There are no water quality guidelines for phosphate, orthophosphate or total phosphorous by the BC WQG or CSR for the protection of freshwater aquatic life, as this is non-toxic to aquatic organisms at levels and forms present in the environment. Most phosphorous in freshwater occurs as organic phosphates (95%), whereas orthophosphate is inorganic. The operational certificate specifies a maximum limit of 1.75 mg/L of ortho-phosphate (as phosphorous) for WWTP discharge. The total phosphorous does not exceed the limit of 1.75 mg/L, therefore orthophosphate also does not exceed the limit for any sample event within the receiving environment.

The Canadian Council of Ministers of the Environment (CCME) provide water quality guidelines for all of Canada. The CCME guideline displayed in Figure 6 provides a recommended framework for total phosphorous in the freshwater aquatic environment (CCME, 2004). Phosphorous loading in the environment can cause eutrophication and oxygen depletion. To evaluate this, baseline conditions have been established based on phosphorous concentrations from 2016 to 2021. Based on phosphorous annual average and median concentrations, the environment is typically Oligotrophic (0.004 to 0.01 mg/L) but is often in the range of Mesotrophic (0.01 to 0.02 mg/L) with the range limits outlined in red for Figure 6.

Figure 6 displays the total phosphorous results of 2021. The CCME guideline is not exceeded however provides information on the natural conditions of phosphorous in the environment. The sample spikes are correlated with rain events, which can temporarily increase the phosphorous concentration in watercourses.

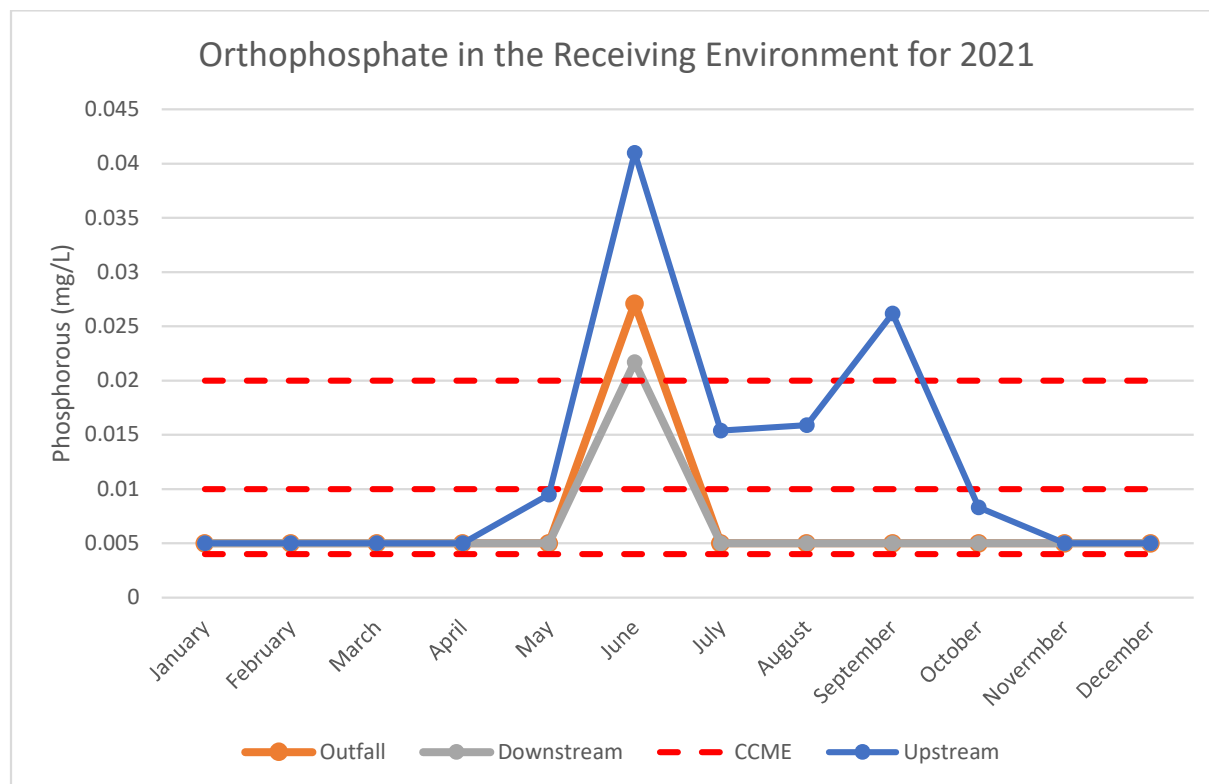


Figure 6: Orthophosphate Sample Results for the year 2020 in the Receiving Environment

Figure 7 displays the orthophosphate sample results from the outfall location in the receiving environment for the years 2016 to 2021. The operational certificate has a limit of 1.75 mg/L of orthophosphate which is not exceeded at any sample event.

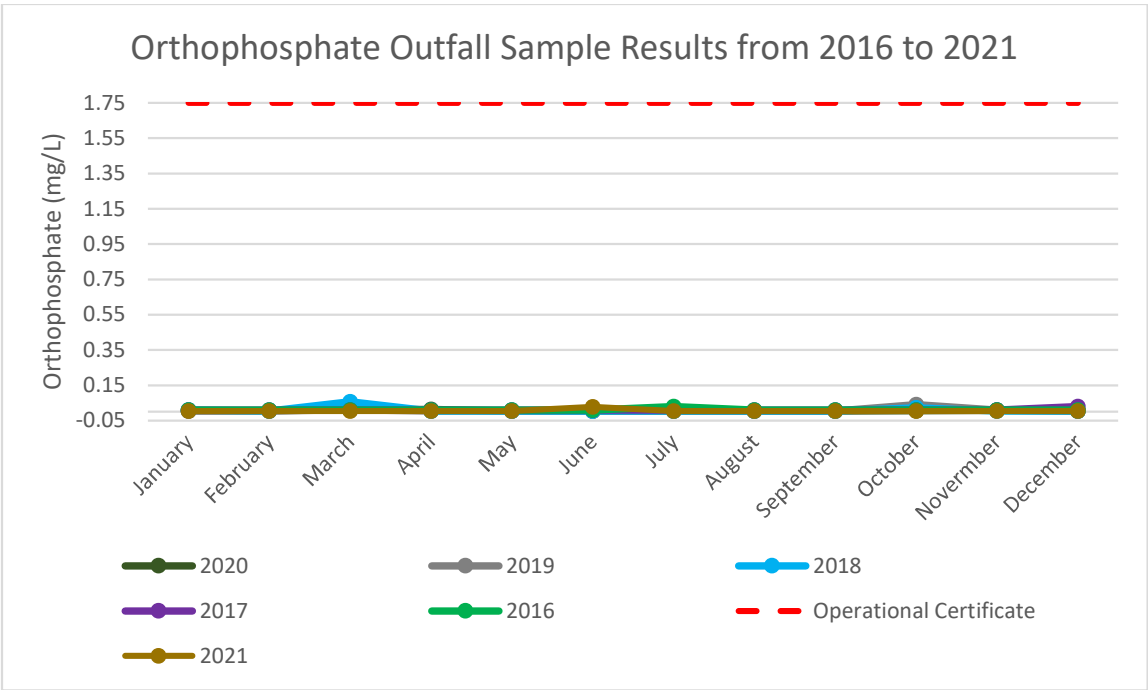


Figure 7: Orthophosphate Sample Results from the Outfall Location between 2016 to 2021.

## Nitrogen in the Receiving Environment

### Nitrate Nitrogen

The CSR guideline for nitrate nitrogen is 400 mg/L and this is not exceeded for any sample event between 2016 to 2021. Figure 8 and Figure 9 display the BC WQG of 3.0 mg/L which is also not exceeded for any sample event between 2016 to 2021 in the receiving environment.

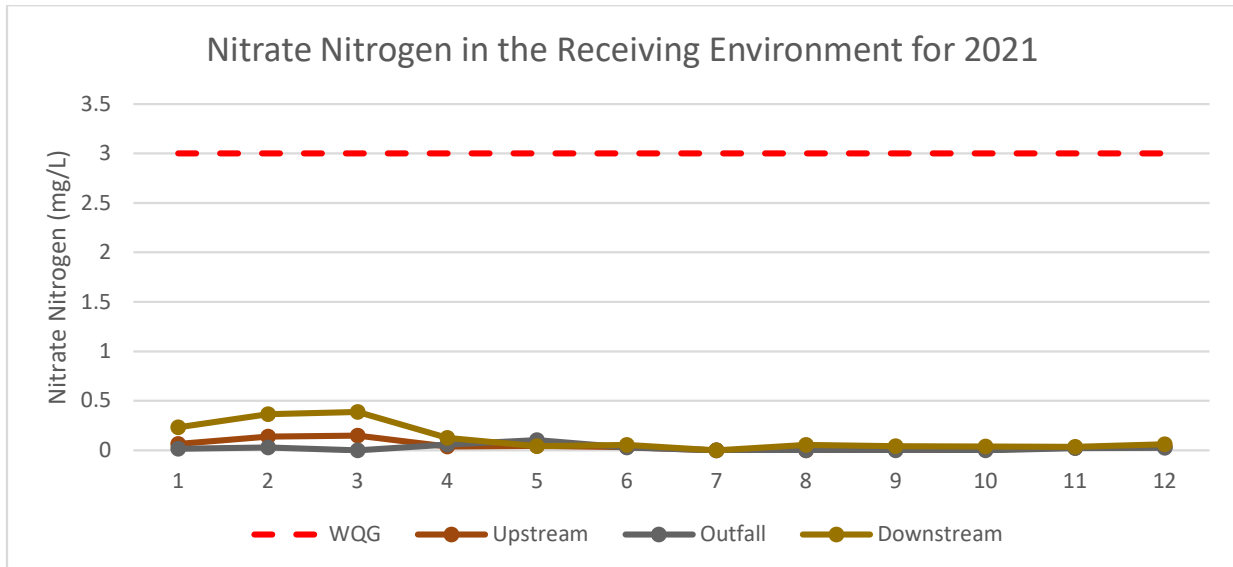


Figure 8: Nitrate Nitrogen Sample Results in the Receiving Environment for 2021.

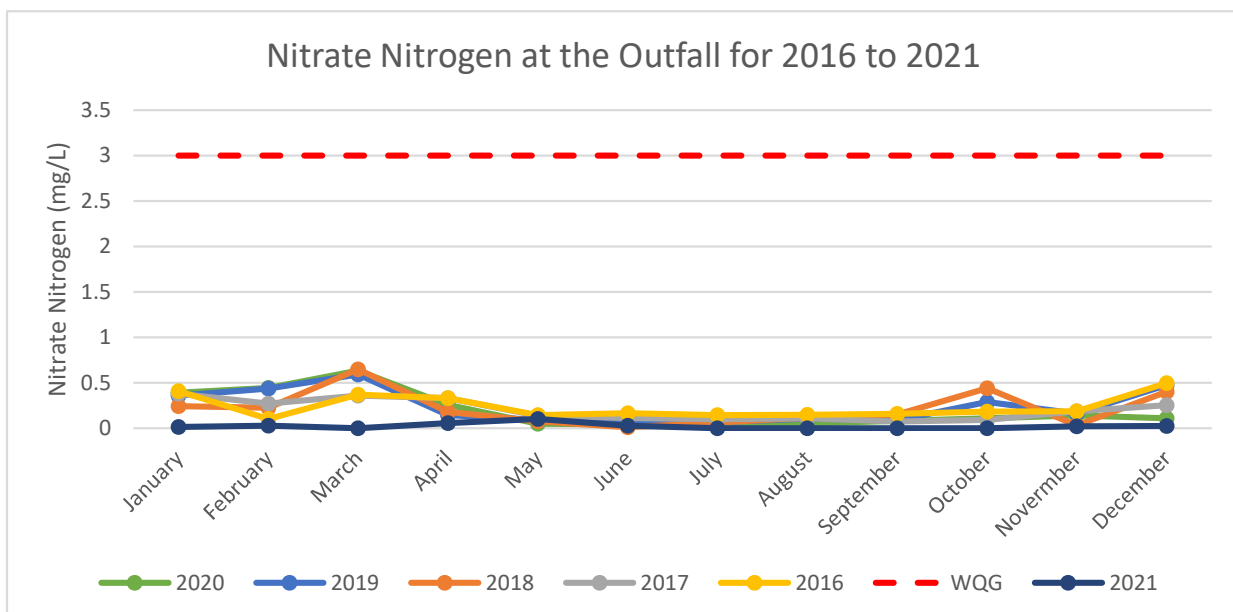


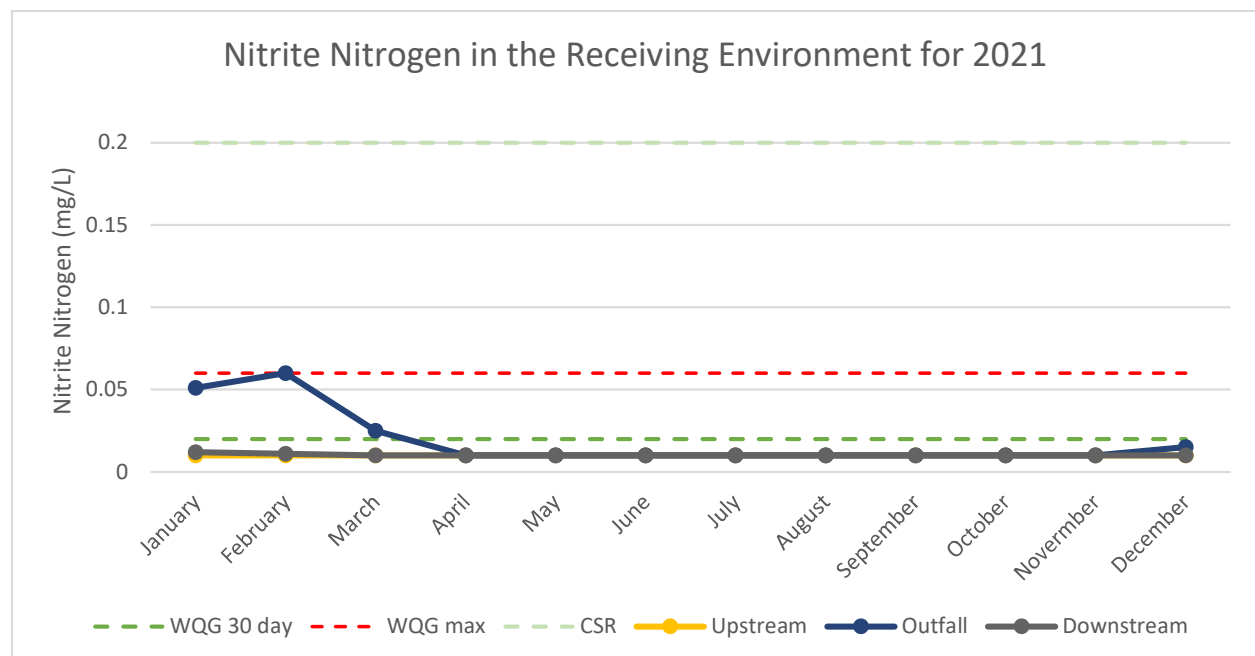
Figure 9: Nitrate Nitrogen Sample Results at the Outfall Sample Location between 2016 and 2021.

## Nitrite Nitrogen

The CSR guideline is 0.2 mg/L for nitrite nitrogen, determined from chlorine concentrations. No sample event from 2016 to 2021 in the receiving environment exceeds the CSR guideline.

The BC WQG when chlorine is less than 2 mg/L is 0.02 mg/L of nitrite nitrogen for a 30-day period (long-term) and 0.06 mg/L for a short-term maximum concentration of nitrite nitrogen. Chlorine sampling was initiated in June of 2020 following the recommendations from the 2019 Wastewater Treatment Plant Report. As the chlorine results for 2020 range from <0.02 mg/L to 0.07 mg/L, the guidelines provided in Figure 10 assume that the chlorine concentrations are below 2 mg/L for the entire year. Chlorine sampling should continue to be conducted for all sample events when nitrite nitrogen is sampled.

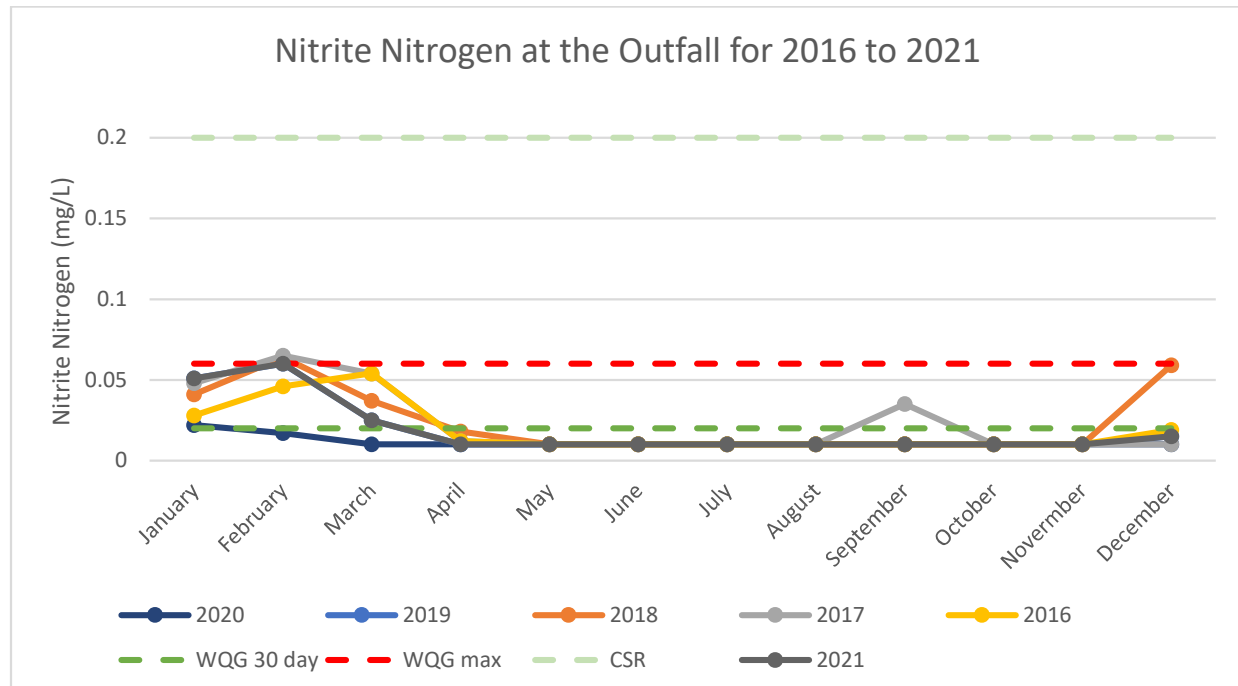
Figure 10 displays the nitrite nitrogen sample results for the year 2021. One sample event met the short-term maximum BC WQG of 0.06 mg/L, but no sample events exceeded it. Three sample events in January, February and March of 2021 exceed the 30-day BC WQG at the outfall. The BC WQG is exceeded during winter months at the outfall as displayed below. There are no BC WQG at the downstream location in 2021.



**Figure 10: Nitrite Nitrogen Sample Results of the Receiving Environment for 2021.**

Figure 11 displays the nitrite nitrogen sample results at the outfall location from the years 2016 to 2021. The CSR guidelines of 0.2 mg/L nitrite nitrogen have not been exceeded at any sample event.

The BC 30-day WQG of 0.02 mg/L is exceeded in 2016 to 2021 typically in winter months at the outfall location (December to March). The BC WQG maximum limit of 0.06 mg/L is exceeded in February of 2017 and February of 2018. Winter increases in nitrite nitrogen are not reflected in background (upstream) sample results, which suggests nitrite concentration increases may not be due to natural causes. There are no exceedances in BC WQG at the downstream sample location.



**Figure 11: Nitrite Nitrogen Sample Results at the Outfall between 2016 to 2021.**

## Ammonia Nitrogen

The CSR guideline for ammonia nitrogen varies based on pH. The most conservative CSR guideline value for the 2021 sampling year was 18.5 mg/L which was not exceeded for any sample event.

Figure 12 displays the BC WQG in red for ammonia nitrogen, that varies based on temperature and pH. The BC WQG was not exceeded at any sample event in 2021. Temperature and pH should be recorded whenever ammonia is sampled.

Figure 13 displays the results for ammonia nitrogen in the receiving environment for the sample years 2019 to 2021. The WQG differs for each sample event based on the pH and temperature. No sample event exceeds the BC WQG.

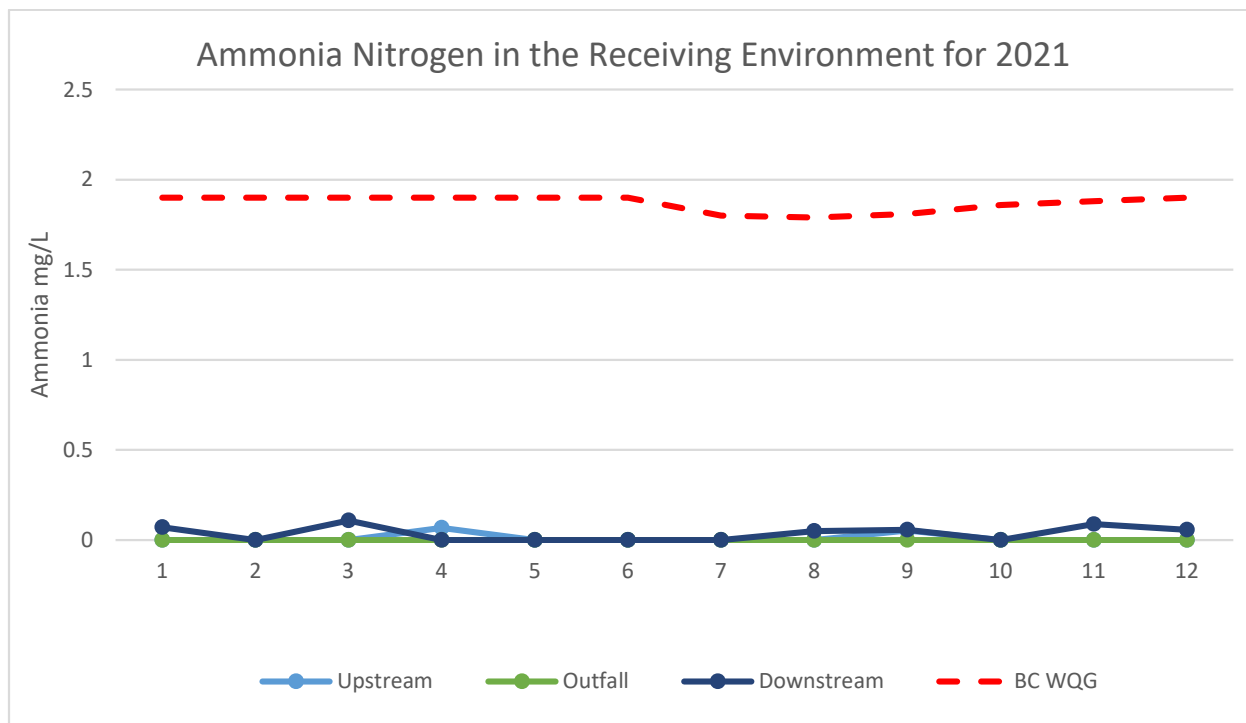


Figure 12: Ammonia Nitrogen in the Receiving Environment for 2021.

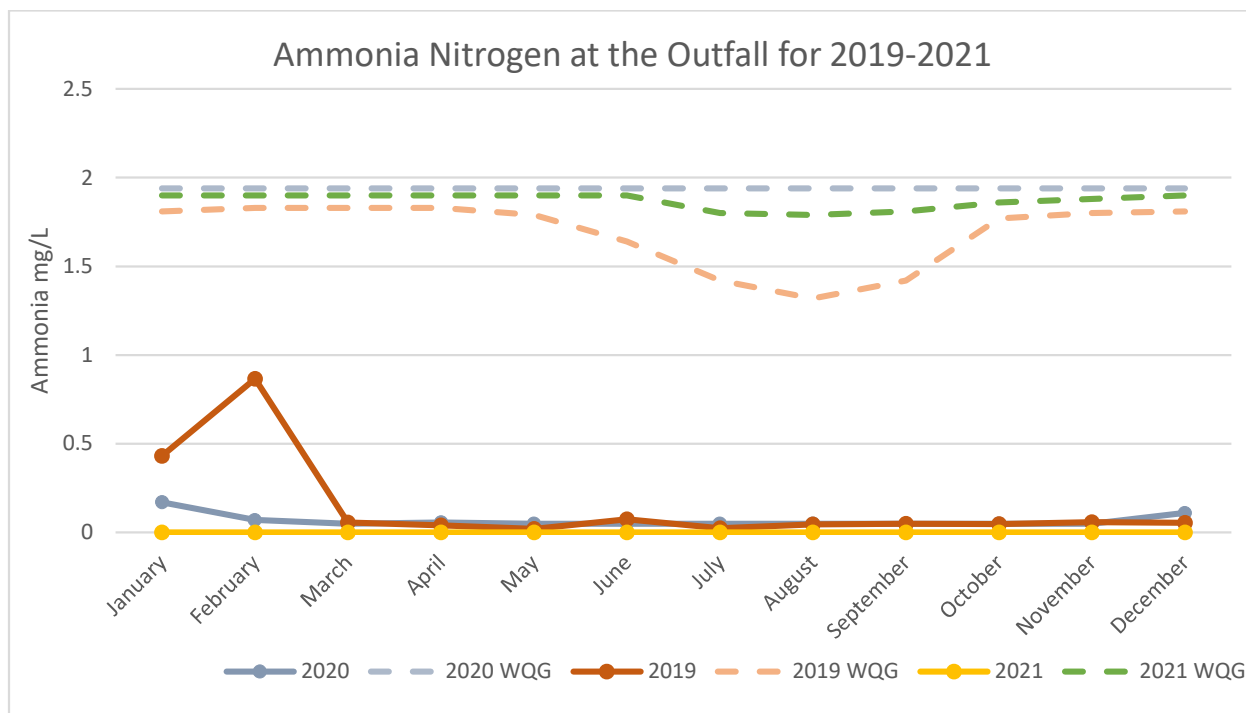


Figure 13: Ammonia Nitrogen Sample Results at the Outfall for 2019-2021.

## Conclusions and Recommendations

The monthly samples taken by the RMOW from the Cheakamus River receiving environment in the year 2021 all comply with the CSR Standards and the operational certificate sampling standards for the following sample parameters: orthophosphate (as phosphorous), nitrate nitrogen, nitrite nitrogen and ammonia nitrogen. All sample events for the year 2021 comply with the BC water quality guidelines (WQG) for turbidity and pH. No guidelines or standards are available for conductivity, however conductivity measurements throughout 2021 are all within the natural range of western Canadian surface waters (NAQUADAT, 1985) and align with annual trends from the years 2016 to 2020.

The BC WQG was exceeded for the maximum allowable nitrite nitrogen in February 2017 and February 2018, and the 30-day average was exceeded for winter months in 2016 to 2021. Increases in nitrite nitrogen were not reflected in background (upstream) measurements, which suggests the wastewater treatment plant may be associated with the increased concentrations in winter months. Potential sources of nitrite nitrogen include wastewater treatment plants and chemical fertilizer. Low flows of the Cheakamus River in winter months or increased WWTP discharge may result in higher effluent concentrations. There are no downstream nitrite concentrations that exceed WQG for the years 2016 to 2021. The exceedances of nitrite nitrogen above BC WQG are localized at the outfall location during winter months and dissipate before reaching the downstream sample location. The CSR standard is not exceeded at any time.

Orthophosphate results comply with the operational certificate for all sample events from 2016 to 2021. The CCME guideline provides a framework to observe the total phosphorous concentrations that may be outside of the natural range of the Cheakamus River. Increases in phosphorous concentrations are seen throughout the year 2021. The increases in June and September are likely due to high rain events, as seen in the upstream results, and are not a concern for the WWTP.

It is recommended that the RMOW continue to include chlorine measurements and field temperature measurements whenever samples are taken in the receiving environment for nitrite nitrogen and ammonia nitrogen due to the guideline requirements.

Should you have any questions regarding this report or would like further information, please do not hesitate to contact the Cascade Whistler office.

Prepared by:



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Reviewed by:



Margot Webster, B.Sc., R.P.Bio.,  
Biologist  
Cascade Environmental Resource Group Ltd.





## References

- BC Government, 2020. Contaminated Sites Regulation (*Environmental Management Act*). B.C. Reg. 375/96. Schedule 3.2.  
[http://www.bclaws.ca/civix/document/id/complete/statreg/375\\_96\\_08#Schedule3.2](http://www.bclaws.ca/civix/document/id/complete/statreg/375_96_08#Schedule3.2). Accessed May 11, 2021.
- Canadian Council of Ministers of the Environment, 2004. Phosphorous: Canadian Guidance Framework for the Management of Freshwater Systems. <https://ccme.ca/en/res/phosphorus-en-canadian-water-quality-guidelines-for-the-protection-of-aquatic-life.pdf>. Accessed May 11, 2021.
- Ministry of Environment & Climate Change Strategy, Water Protection & Sustainability Branch, 2019. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg\\_summary\\_aquaticlife\\_wildlife\\_agri.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/wqg_summary_aquaticlife_wildlife_agri.pdf). Accessed May 11, 2021.
- Ministry of Environment & Climate Change Strategy, 2019. Recreational Water Quality Guidelines. [https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/drinking-water-and-recreation/recreational\\_water\\_quality\\_guidelines\\_bcenv.pdf](https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/waterquality/water-quality-guidelines/approved-wqgs/drinking-water-and-recreation/recreational_water_quality_guidelines_bcenv.pdf). Accessed May 11, 2021.
- Ministry of Water, Land and Air Protection, 2005. Operational Certificate ME-01452 Resort Municipality of Whistler.
- NAQUADAT 1985. National Water Quality Data Bank. Water Quality Branch, Inland Waters Directorate, Environment Canada, Ottawa.