

## **Appendix 19**

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### **Whale Tail 2019 Dike Construction and Dewatering Monitoring Report**

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MEADOWBANK GOLD PROJECT

**2019 Water Quality Monitoring for Dike Construction  
and Dewatering Report**

In Accordance with NIRB Project Certificate No.008  
and  
NWB Type A Water License 2AM-WTP1826

Prepared by:  
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March, 2020

## EXECUTIVE SUMMARY

Construction of two dewatering dikes (Whale Tail Dikey and Mammoth Dikey) is required as a component of water management activities for the Whale Tail Pit project. The Water Quality Monitoring and Management Plan for Dikey Construction and Dewatering (the Plan; January, 2017) was developed to provide details of water quality monitoring and management actions for dikey construction and dewatering activities. TSS (Total Suspended Sediments) and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during construction and dewatering.

In-water construction of the Whale Tail Dikey concluded in 2018, but monitoring for related construction activities was conducted from January – February, 2019.

In-water construction of Mammoth Dikey began on February 15 and was completed on March 17, 2019.

Dewatering of Whale Tail Lake – North Basin began on March 5, 2019, and continued through the end of the year.

The objective of this report is to:

- Describe the implementation of mitigation measures that were planned in conjunction with dikey construction and dewatering to control the release of total suspended solids (TSS) in the environment and thereby avoid and mitigate serious harm to fish and fish habitat;
- Describe results of water quality and lake level monitoring that were conducted in accordance with the Plan; and
- Describe any supplemental management actions that were implemented to mitigate impacts to fish and fish habitat.

Results of water quality monitoring during dikey construction are compared to NWB Type A Water License criteria for TSS. Monitoring occurred in five general locations: upstream and downstream of the Whale Tail Dikey, downstream of the Mammoth Dikey, as well as broad survey locations in Whale Tail Lake (South Basin) and Mammoth Lake. For each location, turbidity depth profiles were recorded at four monitoring stations using a handheld meter, and values were converted to TSS using a site-specific, -approved regression equation. All turbidity/TSS monitoring results for all compliance stations were within NWB Water License criteria, so no supplemental management actions were required to be implemented.

Complete laboratory water quality analysis (major ion, nutrients, metals) was conducted periodically at dikey monitoring stations. A few exceedances of CCME guidelines occurred, which is similar to construction of the Bay-Goose and East Dikes. As in 2018, most exceedances occurred in the impounded area of Whale Tail Lake - North Basin, so impacts to the receiving environment are considered unlikely. The 2019 CREMP report provides a complete analysis of receiving environment water quality impacts.

Water quality monitoring for dewatering effluent occurred at the water intake pump or after TSS treatment, as required. Results indicated four isolated incidents when individual TSS or turbidity concentrations exceeded NWB Type A Water License criteria for the short-term maximum (STM). One duplicate sample exceeded the STM for total aluminum. The Maximum Monthly Mean (MMM) was not exceeded for any parameter. Based on standard operating procedures identified in the Plan, supplemental management actions were not required.

Due to record rainfall, water levels in the Whale Tail South flood zone exceeded FEIS predictions for July, 2019. Active pumping of water from Whale Tail South Basin to Mammoth Lake began in October,

and by mid-November, water levels declined below predictions. Construction of the Whale Tail South Channel between Lake A20 and Mammoth Lake is underway. This channel will passively manage water levels in WTS moving forward, and ensure they don't exceed the maximum predicted level of 156 masl. While FEIS predictions were not available for quantitative comparison to measured water levels in Mammoth Lake, values in 2019 were within the range of baseline values observed in 2015.



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## **SECTION 1 • INTRODUCTION**

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In 2018, Agnico Eagle Mines Ltd. (Agnico) was issued NIRB Project Certificate No. 008 and NWB Type A Water License 2AM-WTP1826 for development of the Whale Tail site, a satellite deposit at the Meadowbank Mine. Construction of two dewatering dikes (Whale Tail Dike and Mammoth Dike) is required as a component of water management for the Whale Tail Pit project. The Water Quality Monitoring and Management Plan for DiKE Construction and Dewatering (January, 2017; the Plan) was developed to provide details of water quality monitoring and management actions for dike construction and dewatering activities at Whale Tail Pit. Water quality monitoring includes several parameters (e.g., nutrients and metals), but TSS (Total Suspended Sediments) and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during dike construction and dewatering.

On July 27 2018, construction of the Whale Tail DiKE began. In-water construction was complete in 2018, but water quality monitoring was conducted in relation to associated construction activities in January and February, 2019. In-water construction of the Mammoth DiKE occurred from February 15 - March 17, 2019.

Dewatering of Whale Tail Lake – North Basin began on March 5, 2019, and continued through the end of the year.

The objective of this report is to:

- Describe the implementation of planned mitigation measures for the protection of fish and fish habitat during dike construction and dewatering;
- Describe the results of water quality monitoring in 2019 in accordance with the Plan; and
- Describe the implementation of any supplemental mitigation measures that were required to control the release of total suspended solids (TSS) in the environment.

Results of compliance monitoring stations are compared to NWB Water License criteria as described in Part D, Item 7 of Type A Water License 2AM-WTP1826. Results of receiving environment and broad survey locations are compared to CCME Guidelines for the Protection of Aquatic Life, for reference.

## **SECTION 2 • STANDARDS FOR THE PROTECTION OF FISH AND FISH HABITAT**

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During dike construction and dewatering, standards for the protection of fish and fish habitat (mitigation measures) will be maintained to manage TSS.

In addition to the FEIS-planned mitigation measures described below, supplemental mitigation actions are triggered based on results of the monitoring programs described in Section 3. Complete SOPs for monitoring and management of suspended sediment during dike construction and dewatering are provided in Sections 4 and 5 of the Plan.

### **2.1 DIKE CONSTRUCTION**

During dike construction, both the dike material itself as well as the disturbed material on the lake floor (particularly in the deep areas of the lakes) will contribute to increases in concentrations of suspended sediments in the water column. In the absence of sediment control measures, suspended sediment

plumes would be expected to migrate to the southeast with wind-driven (prevailing winds from the northwest) currents. The key means for minimizing suspended sediment discharges from the dike construction zones during dike construction include the deployment of turbidity curtains and water treatment.

In 2018, in-water Whale Tail Dike construction occurred from July 27 – August 27. Prior to dike construction, three turbidity curtains were installed on the south side of the dike. As a supplementary measure to protect fish remaining in the Whale Tail North Basin during the fishout, two turbidity curtains were also deployed prior to the start of the construction on the north side of the dike. Southern turbidity curtains were removed in September, after in-water construction was complete.

In 2019, in-water construction of the Mammoth Dike occurred from February 15 - March 17. No turbidity curtains were required to be installed for this winter dike construction period. A series of photos of Mammoth Dike construction and TSS mitigation measures is provided in Appendix A.

Mitigation plans to control TSS release during dike construction as described in the Plan are shown in Table 1, along with a commentary on implementation in 2018 and 2019.

**Table 1. Mitigation measures to control release of TSS during construction of dewatering dikes, as described in the Water Quality Monitoring and Management Plan for Dike Construction and Dewatering, Section 4.1 (January, 2017).**

Planned Mitigation Measure	Implementation	
	Whale Tail Dike (July 27 – August 27, 2018)	Mammoth Dike (February 15 - March 17, 2019)
Deploy one length of turbidity curtains downstream of the dike and ensure curtains are situated in appropriate locations to minimize escape of sediments below the curtains.	Completed – three sets of turbidity curtains were deployed downstream of the dike.	Not required
Minimize water current out of the construction area to reduce potential for outflow of turbid water; this will be done by 1), if permits are received, slow-pace winter construction of a causeway about 25 m wide (the downstream portion of the dike), and 2) open-water installation of pumps in front of the rock platform deposition creating a no-current to inward-current zone inside the curtains. This should create an average negative pressure and will cause 'clean' water to move through the causeway into the trench, that will be backfilled with gravel to form the cutoff wall.	Completed (open water construction occurred) - water was pumped during causeway construction, and treated for TSS prior to discharge to Whale Tail North Basin	No current – fully frozen conditions on both sides of the construction zone.

Planned Mitigation Measure	Implementation	
	Whale Tail Dike (July 27 – August 27, 2018)	Mammoth Dike (February 15 - March 17, 2019)
Provide a wind-breaker to protect turbidity curtains against the effects of high winds; this will be achieved by winter construction of the causeway or by rapidly advancing the platform immediately once the lake is open water. Since the causeway is the downstream portion of the dike, it will be the same height as the dike. The concept of the causeway was developed based on observations from the 2009 wind storm event that the integrity of the inner curtain portion closer to the rock platform was not affected by wind activity.	Wind breaker was not needed. Curtains were inspected daily and adjusted if needed.	N/A
Following the construction of the causeway, install curtains that have a reduced height and length to make them less prone to breakage from wind action; this will be achieved by 1) installation of the inner turbidity curtains in small cell-like patterns along the causeway to prevent wholesale breakage of the curtain due to effect of high winds, and 2) installation of outer curtains, as much as possible, in depths of no more than 10 m to reduce the effects of high winds.	Curtains were installed prior to work and inspected as above.	N/A
Reduction of the TSS loading inside the turbidity curtains; this is achieved by 1) the above mentioned pumping of water in front of the rock platform construction, and 2) pumping of water from the trench (the water with the highest TSS concentrations), both to be treated at the dewatering water treatment plant.	Completed - pumping and treating of water during causeway construction was conducted as described above.	N/A – fully frozen conditions
Winter-only: Advance the rock platform at a very slow rate (approx. 2400 tonnes/d).	N/A	N/A – fully frozen conditions

Planned Mitigation Measure	Implementation	
	Whale Tail DiKE (July 27 – August 27, 2018)	Mammoth DiKE (February 15 - March 17, 2019)
Winter-only: Use a shovel to deposit rock through the ice openings.	N/A	N/A – fully frozen conditions

## 2.2 DEWATERING

During dewatering of the Whale Tail Lake (North Basin), there is potential for sediments to become suspended as exposed substrates slump. Suspended sediments could then enter the water pipe(s) and be discharged to Mammoth Lake and/or Whale Tail Lake (South Basin). In addition, the discharge itself could disturb the bottom sediments in the lakes and lead to increased levels of suspended sediments. The following plans will mitigate against possible problems with suspended sediments and other key parameters (i.e., pH and aluminum) during dewatering:

- Intake pipe(s) will be located at a sufficient distance from shore (minimum 10 meters) and, to the extent possible, in areas with highest water depth. As dewatering progresses, intakes can only be located in deep basins.
  - o Intake pipes were adjusted frequently to ensure limited impacts were controlled and to ensure sufficient pumping capacity in water withdrawals.

## SECTION 3 • MONITORING METHODS

### 3.1 DIKE CONSTRUCTION

In-water construction of the Whale Tail DiKE was complete in 2018, monitoring in 2019 occurred weekly while grout curtain installation was ongoing (January - February, 2019). In accordance with the Plan, this program generally consisted of weekly depth profiles for turbidity, and water sample collection for laboratory analysis of nutrients, major ions and metals. Sample points were located upstream and downstream of the dike (Whale Tail South and Whale Tail North, respectively). Turbidity monitoring was also conducted on one occasion (February 7) for broad survey (receiving environment) locations in Whale Tail South and Mammoth Lake.

The in-water construction of Mammoth DiKE started on February 15 and was completed on March 17, 2019. Water quality monitoring consisted of weekly depth profiles for turbidity at four locations downstream of the dike in Mammoth Lake (weather permitting). All water near the footprint of the dike was frozen to the bottom and Agnico does not expect any impact on the receiving environment.

#### 3.1.1 Monitoring Locations

##### 3.1.1.1 Whale Tail Lake – South Basin (WT-DC-1, 2, 3, 4)

For the purposes of compliance with NWB Type A Water License requirements (Section 3.3.1) and as described in the Plan, water quality monitoring during dike construction was conducted in four stations downstream (south) of the Whale Tail DiKE, as shown in Figure 1 (stations WT-DC-1,2,3,4). GPS

coordinates are provided in Table 2. These stations were approximately 50 – 100 m south of the original southern turbidity curtain, which was removed in September, 2018 after in-water construction was complete.

As described in Section 3.1.2, field-measured turbidity is used to calculate TSS, and this measurement is the major driver of compliance requirements and management actions related to dike construction and dewatering.

For stations WT-DC-1, 2, 3, and 4, turbidity depth profiles at 1 m intervals were measured weekly while grout curtain installation was ongoing during January and February, 2019. For all depth profiles, additional parameters recorded by the water quality sonde were: temperature, pH, conductivity, and dissolved oxygen. Field measurements of TSS were also performed by Agnico's onsite assay laboratory using standard methods.

Accredited laboratory analysis for nutrients, major ions, and metals (full suite) was also conducted near-weekly for surface (under ice) grab samples at WT-DC-2.

#### **3.1.1.2 Mammoth Lake (WT-DC-5, 6, 7, 8)**

During construction of the Mammoth Dike, water quality monitoring was conducted at four stations downstream (west) of the construction zone, as shown in Figure 1 (stations WT-DC-5, 6, 7, 8). GPS coordinates are provided in Table 2.

For these stations, turbidity depth profiles (1 m intervals) were measured weekly, weather permitting, during in-water dike construction (February 15 – March 17, 2019). A full suite laboratory analysis was also conducted near-weekly for surface (under ice) grab samples at WT-DC-6.

As described in the Plan, water quality monitoring for dike construction occurring during the lake ice-up period was planned to consist of moving stations around the deposition area as close as safety permits, on either side of the causeway and in front of the causeway. These stations were planned to move in conjunction with work development. However, water around the Mammoth Dike construction zone was frozen to the bottom, so water quality sampling was conducted as near as possible to the construction zone, in Mammoth Lake.

#### **3.1.1.3 Whale Tail Lake – North Basin (WTN-DC-1, 2, 3, 4)**

Supplemental water quality monitoring was conducted immediately north of the northern turbidity curtains in Whale Tail Lake (North Basin) (Figure 1) during grout curtain installation for the Whale Tail Dike in January and February, 2019. GPS coordinates are provided in Table 2.

For these stations, turbidity depth profiles (1 m intervals) were recorded near weekly, weather permitting. A full suite laboratory analysis was also conducted for surface (under ice) grab samples at WTN-DC-2.

The North Basin of Whale Tail Lake was fished out in 2018 and was impounded by ice at the Mammoth Lake inlet during the 2019 construction period, so results of water quality monitoring may be useful for planning of dewatering and to understand any impacts on fish remaining in the basin, but they were not required to be reported monthly to NWB for compliance purposes.

#### **3.1.1.4 Broad Survey Locations (WTS-BS-1, 2, 3, 4 & MAM-BS-1, 2, 3, 4)**

Supplemental field monitoring for turbidity/TSS was conducted at both up- and down-stream of the Whale Tail Dike construction zone, in Whale Tail Lake (South Basin) and Mammoth Lake (Figure 1). GPS coordinates are provided in Table 2. Although according to the Plan, broad survey locations were



only planned to be monitored during summer construction, under-ice depth profiles (1 m intervals) for pH, conductivity, temperature, DO, turbidity, and TSS were recorded for these stations once during 2019 construction of the Whale Tail Dike (February 7, 2019).

Results of monitoring at these stations will provide an indication of how far any sediment plumes may have travelled in the event of an exceedance of NWB Type A Water License requirements at monitoring stations closer to dike construction.

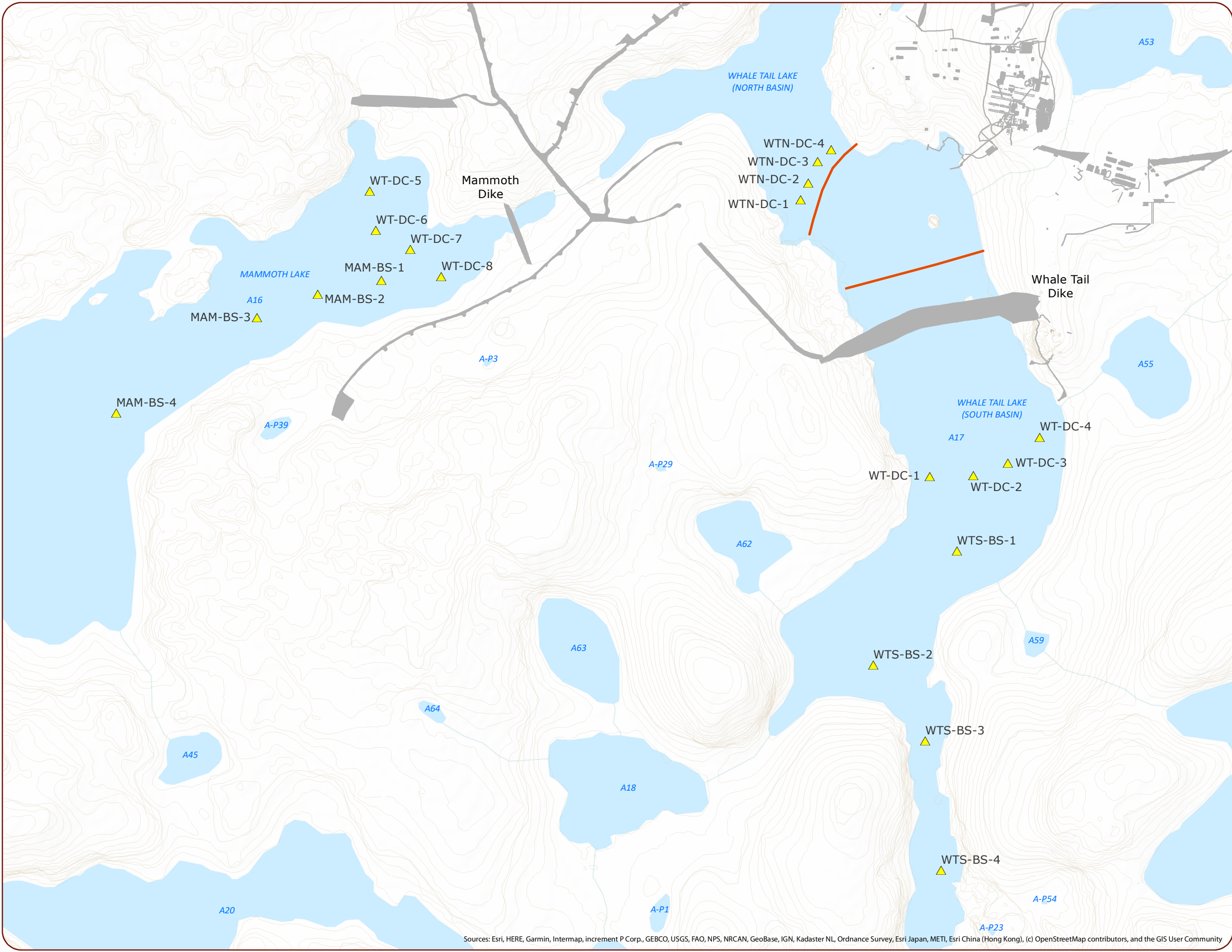
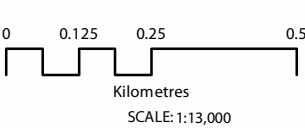


Figure 1: Monitoring Locations for Dike Construction

- Legend**
- Turbidity Monitoring Stations
  - Turbidity Curtains
  - Infrastructure



**AGNICO EAGLE**

**Disclaimer:**  
The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation.

**Table 2. UTM coordinates of Whale Tail dike construction monitoring stations in 2019 (NAD 83).**

Location	Station ID	UTM
Whale Tail South Basin (south side of Whale Tail Dike)	WT-DC-1	14 W 607408 7254176
	WT-DC-2	14 W 607565 7254178
	WT-DC-3	14 W 607690 7254225
	WT-DC-4	14 W 607804 7254317
Mammoth Lake (downstream of Mammoth Dike construction)	WT-DC-5	14W 605389 7255204
	WT-DC-6	14W 605412 7255062
	WT-DC-7	14W 605536 7254994
	WT-DC-8	14W 605647 7254896
Whale Tail North Basin (north side of Whale Tail Dike)	WTN-DC-1	14 W 606942 7255172
	WTN-DC-2	14 W 606970 7255233
	WTN-DC-3	14 W 607004 7255311
	WTN-DC-4	14 W 607052 7255352
Whale Tail South Basin broad survey location	WTS-BS-1	14 W 607506 7253906
	WTS-BS-2	14 W 607204 7253497
	WTS-BS-3	14 W 607391 7253223
	WTS-BS-4	14 W 607449 7252757
Mammoth Lake broad survey location	MAM-BS-1	14 W 605431 7254881
	MAM-BS-2	14 W 605203 7254833
	MAM-BS-3	14 W 604984 7254747
	MAM-BS-4	14 W 604476 7254405

### 3.1.2 Parameters

#### 3.1.2.1 TSS/Turbidity (Field Measured)

TSS and turbidity (primarily as a surrogate for TSS) are the major drivers of management actions during dike construction. The TSS/turbidity focus allows for direct monitoring of the major potential stressor, thus allowing timely identification and mitigation of potential issues. Based on experience at the Meadowbank Mine, this is not possible using TSS as a direct measure, because of the time required to analyze TSS in the field. Consequently, and consistent with the recommendations of the DFO (DFO, 2000), Agnico Eagle has developed a relationship between turbidity and TSS, allowing the use of turbidity as a surrogate for TSS and obtaining real time results. The TSS-turbidity relationship was developed using paired data collected across a range of TSS sources and concentrations and previously approved in the, Whale Tail Pit - Water Quality Monitoring and Management Plan for Dike Construction and Dewatering (January 2017). The resulting linear regression was as follows:

$$\log_{10}(\text{turbidity}) = 0.62196 + (0.95619 * \log_{10}(\text{TSS})) \text{ [} p < 0.001; r^2\text{-adj} = 0.81 \text{]}$$

where turbidity is measured in NTUs in the field using an Analite NEP 160 meter, and TSS is measured in the lab as mg/L.

Turbidity assessments for dike construction monitoring locations were performed using a handheld turbidity meter, and converted to TSS using the above regression equation.

Raw turbidity data was handled in the following manner to facilitate comparisons to the maximum allowable TSS concentrations (Section 2.2.3):

### **Comparisons to Short-Term Maximum (STM)**

1. Calculate the 24-hr station mean for turbidity for each station based on the measured maximum values over the past 24 hours.
2. Use the TSS-turbidity regression (using the site-specific TSS:Turbidity) to estimate 24-hr mean TSS.
3. Calculate the moving average of each station.
4. Compare to appropriate STM value.

*Example: Maximum turbidity values of 2.4, 3.0 and 1.2 NTUs were measured in depth profiles at Station Y over the last 24 hours, for a 24-hr mean of 2.2 NTU. Using the TSS:Turbidity relationship, the 24-hr mean TSS concentration would be 6.6 mg/L.*

### **Comparisons to Maximum Monthly Mean (MMM)**

1. Calculate the 30-day moving average of each stations (24-hr mean TSS values) for the previous 30 days.
2. Compare this to the appropriate MMM value.

#### **3.1.2.2 Full Suite (Laboratory Measured)**

Samples for laboratory water quality analysis were collected weekly (weather permitting) using a clean diaphragm pump at a depth of 3 meters (approx. 1 m under ice). Analysis included:

- Conventional parameters: hardness, pH, total alkalinity, TSS, TOC, DOC, TDS;
- Major ions: bicarbonate alkalinity, carbonate alkalinity, chloride, hydroxide, sulphate, reactive silica;
- Nutrients: total nitrogen, total phosphorus, total orthophosphate, total ammonia, un-ionized ammonia; and
- Total and dissolved metals.

H2Lab (Val d'Or) provided all of the sampling containers and appropriate preservatives for the water and filter samples. All samples were stored in the dark and kept on ice immediately following collection and during transport to the laboratory. A completed chain-of-custody form accompanied the samples during transport. Samples collected for QA/QC purposes included field blanks, travel blanks, and field duplicates (see Section 3.4).

## **3.2 DEWATERING**

For the purposes of lake dewatering and as described in the Plan, water was discharged from Whale Tail North Basin to both Whale Tail South Basin and Mammoth Lake in 2019.

### **3.2.1 Water Quality**

Monitoring during dewatering is primarily focused at the water intake pumps or at the outlets of the water treatment plant (if treatment is required), but also includes the receiving environment of Mammoth Lake and/or Whale Tail Lake (South Basin). Unlike monitoring during dike construction, where turbidity is used solely as a real-time surrogate for estimating TSS, turbidity measurements during dewatering are used two-fold: as a surrogate for TSS (using an established site-specific relationship) and directly as an indicator of water clarity – i.e. compliance criteria for both turbidity and

TSS are established by NWB in the Type A Water License (Section 3.3). Criteria are also established for pH and total aluminum.

#### **3.2.1.1 Effluent (ST-DD-7, ST-DD-9)**

In accordance with the Plan, daily water quality samples were collected by opening a valve at the Whale Tail North water intake pumps (ST-DD-7 for water pumped to Whale Tail South Basin; ST-DD-9 for water pumped to Mammoth Lake).

Field-measured turbidity and conventional parameters were recorded daily during dewatering for these stations.

Laboratory analyses were also completed approximately daily for turbidity, TSS, pH and weekly for total aluminum, according to Type A Water License requirements. H2Lab (Val d'Or) provided all of the sampling containers and appropriate preservatives for the water and filter samples. All samples were stored in the dark and kept on ice immediately following collection and during transport to the laboratory. A completed chain-of-custody form accompanied the samples during transport. Samples collected for QA/QC purposes included field blanks, travel blanks, and field duplicates (see Section 3.4).

The MMM for turbidity, TSS, pH, and total aluminum were calculated as described in Section 3.1.2 for stations ST-DD-7 and ST-DD-9.

#### **3.2.1.2 Receiving Environment (ST-DD-8, ST-DD-10)**

For Whale Tail Lake dewatering, water samples were collected approximately weekly (weather permitting) in the receiving environment at a distance of 30-100 m from water discharge locations (ST-DD-8 in Whale Tail South Basin; ST-DD-10 in Mammoth Lake – see Section 4.2.2, Figure 5). Samples were collected using a clean diaphragm pump at a depth of 3 meters.

Receiving environment samples were analyzed in the field for turbidity, TSS, and conventional parameters. Laboratory analyses were also completed for TSS and/or turbidity.

H2Lab (Val d'Or) provided all of the sampling containers and appropriate preservatives for the water and filter samples. All samples were stored in the dark and kept on ice immediately following collection and during transport to the laboratory. A completed chain-of-custody form accompanied the samples during transport. Samples collected for QA/QC purposes included field blanks, travel blanks, and field duplicates (see Section 3.4).

**Table 3. UTM coordinates of Whale Tail dewatering monitoring stations in 2019 (NAD 83).**

Activity	Location	Station ID	UTM
Whale Tail North Dewatering	Intake in WTN for discharge to WTS	ST-DD-7	NA
	Whale Tail South Basin receiving environment	ST-DD-8	14W 607686 7254521
		Diffuser location	Approx. 14W 607629 7254674
	Intake in WTN for discharge to Mammoth Lake	ST-DD-9	NA
	Mammoth Lake receiving environment	ST-DD-10	14W 605493 7254813
		Diffuser location	Approx. 14W 605567 7254908

### 3.2.2 Lake Levels

#### 3.2.2.1 Water Level Surveys

Mammoth Lake and Whale Tail Lake (South Basin) water levels were surveyed at locations of sufficient distance from their outlets to limit potential lake level drawdown effects. Lake water levels were planned to be monitored weekly during the freshet and ice-free period, and weekly during the ice-up period, dependent of the ice conditions and worker safety. However, piezometers were installed in Whale Tail Lake South Basin area for the purposes of water level analysis, and measurements were recorded every 3 – 6 hours beginning on February 19, 2019. Water levels were also recorded occasionally by GPS survey beginning August 3, 2018. Frequency of these surveys has varied from daily to monthly.

In addition to monitoring in Whale Tail South Basin and Mammoth Lake, water levels were surveyed weekly using previously installed staff gauges for all lakes within the Whale Tail South flood zone (A62, A63, A18, A19, A-P1, A65, A20, A21, A22) throughout the open water season of 2019 (July 5, - September 22).

Locations for all the water level monitoring stations are provided in Section 4.2.2.

#### 3.2.2.2 Visual Inspections

The outlet of the raised Whale Tail Lake (South Basin) and Mammoth Lake are visually inspected to confirm that no significant erosion of the channel bed or channel banks, or ice damming has occurred. Significant ice damming observed within the outlets will be removed as soon as possible to minimize potential reductions in channel capacity. The regular inspection program occurs during the freshet and ice free period at a minimum of once every two weeks.

Results are reported in the 2019 Annual Report under Erosion Management. This program will continue in 2020.

### 3.3 REGULATORY CRITERIA

#### 3.3.1 NWB Water License Criteria

In accordance with the Plan, during dike construction activities for the Project, maximum monthly mean (MMM) and short term maximum (STM) TSS concentrations are required to be met in accordance with the NWB Type A Water Licence (Table 4).

**Table 4. Maximum allowable TSS concentrations during dike construction (Meadowbank Mine Type A 2AM WTP1826 Part D Item 6). \*Reference number for use in the text of this document.**

Reference Number*	Parameter	Maximum Monthly Mean (mg/L)	Short Term Maximum (mg/L)
Criteria 1	TSS in areas where there is spawning habitat and at times when eggs or larvae are expected to be present	6	25
Criteria 2	TSS in all other areas and at times when eggs/larvae are not present	15	50
Criteria 3	TSS in impounded areas (e.g. North Basin of Whale Tail Lake) at all times in all areas	15	50

As per Type A Water License Part D Item 7, the effluent from Whale Tail North Basin (ST-DD-7, ST-DD-9) dewatering shall not exceed the following quality limits:

**Table 5. Maximum allowable water quality concentrations for effluent from dewatering of Whale Tail North Basin.**

Parameter	Maximum Monthly Mean	Short Term Maximum
Total Suspended Solids	15 mg/L	22.5 mg/L
Turbidity	15 NTU	30 NTU
pH	6.0 – 9.0	6.0 – 9.0
Total Aluminum	1.5 mg/L	3.0 mg/L

Management actions are associated with trigger values based on the MMM and STM. Should measured concentrations exceed the trigger values during either dike construction or dewatering, a management action plan is initiated. For summer dike construction (i.e. when a turbidity curtain is installed), management actions are triggered if any single sample for any sampling station exceeds the STM in Table 4. For winter construction (i.e. no turbidity curtain), management actions are initiated when a single sample exceeds ½ the STM. Additional management actions are initiated if the 24-h average for any single station exceeds the STM, or if the 7-d moving average for any station exceeds the MMM. For dewatering, management actions are triggered if any single sample exceeds the STM in Table 5.

Full management action plans are described in Sections 4 and 5 of the Plan.

### 3.3.2 CCME Water Quality Guidelines

Results of the full-suite laboratory water quality analyses are compared to CCME Water Quality Guidelines for the Protection of Aquatic Life, where available, for reference. These guidelines are intended to provide a conservative level of protection to freshwater aquatic life from anthropogenic contaminants or other physical changes.

### 3.4 QA/QC METHODS

The objective of QA/QC is to assure that data collected are representative of the media being sampled, are of known quality, are properly documented, and are scientifically defensible. Data quality was assured throughout the collection and analysis of samples by using standardized procedures, by the employment of laboratories that have been certified for all applicable methods, and by staffing the program with experienced technicians.

Field-level QA procedures are described below.

Turbidity Monitoring – Field QA included consistently adhering to the monitoring program and using properly maintained and calibrated instruments.

Water Sampling – Throughout routine water quality sampling, field QA standards, as documented in Agnico Eagle's QA/QC Plan (Version 4, March, 2019) were maintained. This included thoroughly flushing the flexible tubing and pump to prevent cross-contamination between stations and rinsing the sample containers with site water prior to sample collection. Field duplicates, equipment blanks and trip blanks were collected at a subset of stations.

The field duplicates were used to assess sampling variability and sample homogeneity; a Relative Percent Difference (RPD) of 50% for concentrations that exceed 10x the MDL is considered acceptable. The equation used to calculate RPD is:

$$RPD = (A - B) / ((A + B) / 2) \times 100$$

where: A = analytical result; B = duplicate result.

Trip blanks and field blanks were used to assess whether any travel-related or equipment-related cross contamination may have occurred.

## SECTION 4 • 2019 MONITORING RESULTS

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### 4.1 DIKE CONSTRUCTION

#### 4.1.1 Water Quality

##### 4.1.1.1 TSS/Turbidity

###### 4.1.1.1.1 *Whale Tail Lake - South Basin (WT-DC-1, 2, 3, 4)*

Calculated TSS values for WT-DC-1, 2, 3, 4 are provided in Appendix B (Table B-1), along with 24-h, 7-d and 30-d means for comparison to NWB Type A Water License criteria. Results for all field-measured parameters are provided in Appendix B, Table B-2. Calculated TSS results are compared to Criteria 1 – “TSS in areas where there is spawning habitat and at times when eggs or larvae are expected to be present” since it is unknown whether spawning occurs in this area (STM of 25 mg/L). Daily maximum concentrations of TSS for each station are shown in Figure 2.

No exceedances of the Water License criteria (Table 4, Criteria 1) occurred for any station, with a maximum recorded individual value of 3.4 mg/L.



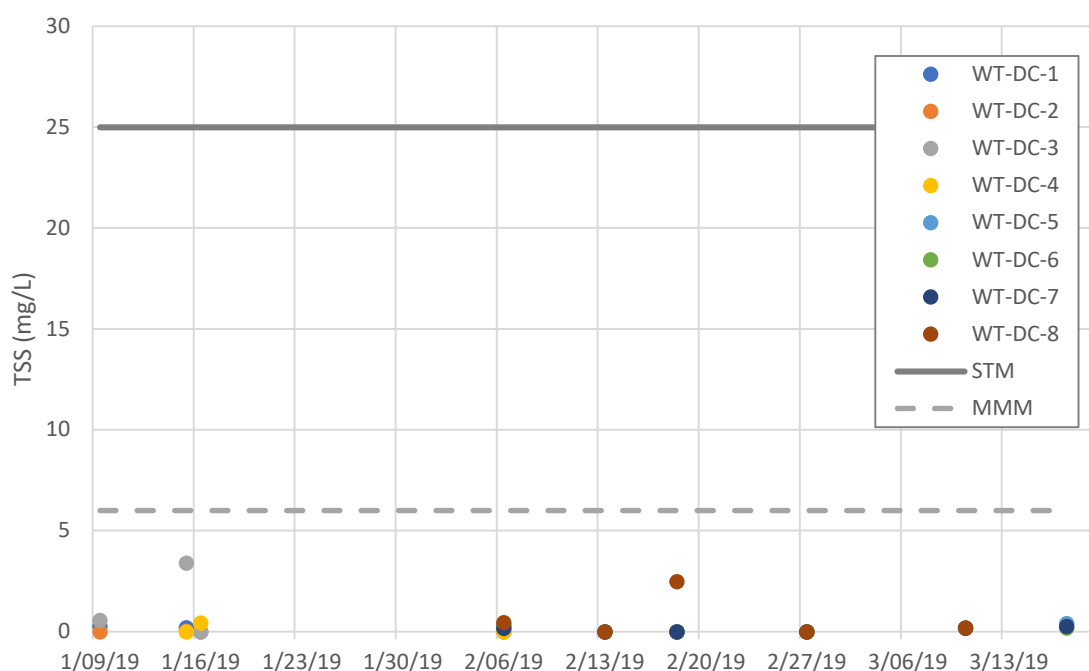
All results were reported monthly to the NWB in the Whale Tail Project's Monitoring Program Summary Report.

#### 4.1.1.1.2 Mammoth Lake (WT-DC-5, 6, 7, 8)

Calculated TSS values for WT-DC-5, 6, 7, 8 are provided in Appendix B (Table B-1), along with 24-h, 7-d and 30-d means for comparison to NWB Type A Water License criteria. Results for all field-measured parameters are provided in Appendix B, Table B-2. Calculated TSS results are compared to Criteria 1 – “TSS in areas where there is spawning habitat and at times when eggs or larvae are expected to be present” since it is unknown whether spawning occurs in this area (STM of 25 mg/L). Daily maximum concentrations of TSS for each station are shown in Figure 2.

No exceedances of the Water License criteria (Table 4, Criteria 1) occurred for any station, with a maximum recorded individual value of 2.5 mg/L.

All results were reported monthly to the NWB in the Whale Tail Project's Monitoring Program Summary Report.



**Figure 2. Calculated 24-h maximum concentrations of TSS for dike construction stations WT-DC-1, 2, 3, 4, 5, 6, 7 & 8. Solid line indicates the NWB short-term maximum (STM) and dashed line indicates the NWB maximum monthly mean (MMM).**

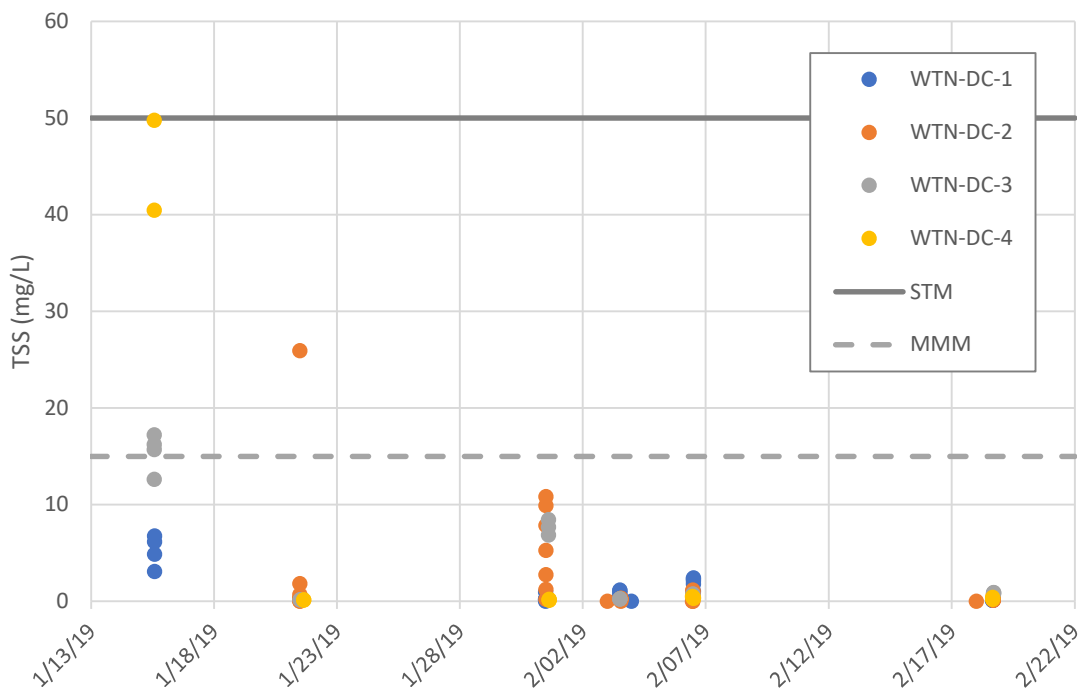
#### 4.1.1.1.3 Whale Tail Lake – North Basin (WTN-DC-1, 2, 3, 4)

Field-measured values of TSS for WTN-DC-1, 2, 3, 4 are shown in Figure 3 (all results in Appendix B, Table B-2). These values were not required to be reported monthly to NWB for compliance purposes. Since the fishout of Whale Tail Lake North basin was complete in 2018, and the area was impounded by ice at the channel to the downstream lake (Mammoth Lake), no impacts to fish are anticipated. However, field-measured values of TSS are compared to Criteria 3 – “TSS in impounded areas (e.g. North Basin of Whale Tail Lake) at all times in all areas” for reference.

No exceedances of the Water License criteria STM (50 mg/L) occurred for any station, with a maximum recorded individual value of 49.8 mg/L. Monthly mean concentrations are shown in Table 6, calculated as described in Section 3.1.2.1. No monthly mean concentrations exceeded the Water License criteria MMM of 15 mg/L.

**Table 6. Calculated 30-d mean concentrations of TSS for dike construction monitoring stations in Whale Tail North Basin.**

Station	30-d Period Start Date	
	1/15/19	1/21/19
WTN-DC-1	2.29	0.96
WTN-DC-2	-	7.77
WTN-DC-3	4.48	2.11
WTN-DC-4	10.09	0.28



**Figure 3. Field-measured concentrations of TSS for dike construction stations WNT-DC-1, 2, 3, & 4. Solid line indicates the NWB short-term maximum (STM) and dashed line indicates the NWB maximum monthly mean (MMM).**

#### 4.1.1.1.4 Broad Survey Locations (WTS-BS-1, 2, 3, 4 & MAM-BS-1, 2, 3, 4)

Field-measured TSS values for Mammoth Lake monitoring locations (MAM-BS-1, 2, 3, 4) and Whale Tail Lake (South Basin) monitoring locations (WT-BS-1, 2, 3, 4) as measured on February 7 are shown in Table 7. These values were not required to be reported monthly to NWB for compliance purposes, but a comparison to CCME guidelines for long-term exposure (background + 5 mg/L) was conducted to understand TSS concentrations in these near-field receiving environments. Maximum background concentrations measured in baseline studies in this area were 1 mg/L.

No exceedances of CCME guidelines occurred for any station. The maximum recorded value was 0.290 mg/L in Whale Tail Lake (South Basin) and 0.106 mg/L in Mammoth Lake, indicating that estimated TSS concentrations in these areas are in the range of measured baseline concentrations.

**Table 7. Measured concentration of TSS (mg/L) at broad survey monitoring locations during Whale Tail Dike construction on February 7, 2019.**

Station	Depth (mbs)						
	1	2	3	4	5	6	7
MAM-BS-1	0.061	0.097	0.063				
MAM-BS-2	0.088	0.106	0.066	0			
MAM-BS-3	0	0	0	0	0		
MAM-BS-4	0	0					
WT-BS-1	0.29	0.193	0.099	0.024	0		
WT-BS-2	0	0	0	0	0	0	0
WT-BS-3	0	0	0	0	0	0	
WT-BS-4	0	0	0	0	0		

#### **4.1.1.2 Full Suite (Laboratory Measured)**

Results of the weekly laboratory analyses for water quality conducted at WT-DC-2 (Whale Tail South), WT-DC-5 (Mammoth Lake), and WTN-DC-2 (Whale Tail North) are provided in Appendix C. These results were not required to be provided to NWB for compliance purposes. Values are compared to CCME water quality guidelines, where available, for context. Results are discussed here by parameter group.

**TSS** – Laboratory-measured concentrations of TSS were at or very near detection limits (1 mg/L) for the majority of samples. No samples exceeded the CCME long-term guideline of 5 mg/L above background (i.e. 6 mg/L), or the CCME short-term guideline of 25 mg/L above background.

**Major Ions and Nutrients** – For Mammoth Lake and Whale Tail Lake North Basin, total phosphorus exceeded the CCME guideline for ultra-oligotrophic lakes in several samples for each location, but the laboratory detection limit (0.01 mg/L) was also above the guideline (0.004 mg/L). No results were >10x the MDL (QAQC standard), with a maximum measured value of 0.2 mg/L.

**Total and Dissolved Metals** – For total metals, one or more samples exceeded CCME guidelines for several parameters at each station. Parameters exceeding the guidelines for total metals were: copper (1 sample in all locations); selenium (2 samples in Whale Tail North); thallium and zinc (1 sample each in Mammoth Lake).

While no CCME guidelines are available for any dissolved metal except aluminum, results of the dissolved metals analysis were compared to guidelines for total metals where exceedances occurred, as in the Bay-Goose Dike construction monitoring report (Azimuth, 2010). Typically, it is the dissolved fraction which presents the greatest potential for toxicity, since particulate-bound metals are less bioavailable. Dissolved metals only marginally exceeded CCME guidelines in three cases: one sample of copper and two samples of selenium in Whale Tail Lake North Basin. All of these results were < 10x the MDL (QAQC standard). Since this area was impounded at the time and incidents were isolated, direct toxic effects to aquatic life in the receiving environment are considered unlikely.

The 2019 CREMP report provides a complete analysis of water quality monitoring results for the receiving environment.

#### **4.1.1.3 QA/QC**

In total, four field duplicates, four field blanks and two trip blanks were analyzed during dike construction water quality monitoring in 2019.

Field duplicate results for dike construction monitoring were generally consistent with the original samples (Appendix C). For samples in which both the parent and duplicate values exceeded 10x the MDL, all RPDs were less than 50%.

Results of trip and field blanks are also provided in Appendix C. Technically, no parameter measured in a trip or field blank should exceed detection. Exceedances indicate the potential for cross contamination of samples, which may result in higher measured concentrations than actually occur in the environment. In line with CREMP protocols, samples were flagged (underlined) when the associated trip or field blank exceeded the MDL and the sample result was less than 5x the measured trip or field blank result.

For dike construction samples in 2019, analytes flagged were zinc, nickel, copper, boron, arsenic, reactive silica, bicarbonate, and total phosphorus.

Analysis of water quality results was done on the complete dataset, including the flagged data. No analyte that was flagged exceeded the CCME guideline for the corresponding sample date. Therefore overall, potential cross-contamination is considered unlikely to bias interpretation of dike construction water quality results.

## **4.2 DEWATERING**

Dewatering of Whale Tail North Basin to Whale Tail South Basin (sample location ST-DD-7) occurred from March 5 – April 9, 2019, May 3 – 17, May 24 – 29, June 17, June 22 – 30, July 9 – 18, and October 4 – December 31. Treatment of effluent at the water treatment plant (WTP) prior to discharge occurred in November and December in association with dike seepage discharge.

Dewatering of Whale Tail North Basin to Mammoth Lake (sample location ST-DD-9) occurred from July 1 – 8, July 13 – September 28, and October 2 – 26. Water was treated at the WTP for TSS prior to discharge.

### **4.2.1 Water Quality**

#### **4.2.1.1 Effluent (ST-DD-7, ST-DD-9)**

All results of daily effluent sampling for compliance with NWB Type A Water License Part D Item 7 are provided in Appendix D.

For Whale Tail Lake dewatering, one or two non-compliance events occurred in May, August and October (described in detail below). All were isolated instances of turbidity or TSS exceedance of the STM by a single daily sample, and no supplemental management actions were required. No exceedances of the MMM as determined by 30-d moving average values were observed for any parameter.

May (ST-DD-7):

Whale Tail North Basin dewatering effluent was sampled on May 29, 2019 at 9 am as required by the Water License 2AM-WTP1826. At 9:50 am, another water sample was taken as required by the MDMER regulations. The discharge was already planned to be stopped during the day of May 29. At 10:00 am the pumps were shut down and remained inactive for the rest of the month. On June 6, 2019 Agnico Eagle was reviewing preliminary results and noted that the level of TSS at ST-MDMER-5 discharge was at 30 mg/L for the sample taken at 9 am and 88 mg/L for the one taken at 9:50 am on May 29. Based on a total flow of 500 m<sup>3</sup> between May 29, 9 am and May 29 10 am, the quantity of TSS is estimated at 45 kg. The event was reported to regulators on June 6.

August (ST-DD-9):

One non-compliance was observed in August. TSS results for August 18 (30 mg/L) was above the Short Term Maximum limit of 22.5 mg/L. Agnico is of the opinion that the high result is related to a punctual event given the results before and after August 18.

October (ST-DD-7):

Two non-compliance was observed in October:

TSS results for October 10 (91 mg/L) was above the Water License Short Term Maximum limit of 22.5 mg/L and MDMER TSS limit of 30 mg/L

Turbidity exceedance on October 28 (80.1 NTU) was above the Water License Short Term Maximum limit of 30 NTU. On October 29, TSS result (26 mg/L) exceed the Water License Short Term Maximum Limit of 22.5 mg/L.

**4.2.1.2 Receiving Environment (ST-DD-8, ST-DD-10)**

All results of receiving environment sampling for effluent discharge are provided in Appendix D.

Samples were analyzed in the field for turbidity and conventional parameters. Laboratory analyses were also completed for TSS for all samples.

These values were not required to be reported monthly to NWB for compliance purposes, but results are compared to CCME guidelines, for reference. No exceedances occurred.

**4.2.1.3 QA/QC**

In total, 38 duplicates, 35 trip blanks, and 28 field blanks were analyzed for dewatering effluent in 2019.

For receiving environment samples associated with dewatering, 9 duplicates, 5 trip blanks, and 3 field blanks were analyzed in 2019.

All results of QA/QC analysis for dewatering water quality samples are provided in Appendix D.

In total, two RPDs exceeded 50%, and both of these were for total aluminum at ST-DD-7 (March 11 and May 27). Of these, one duplicate sample exceeded the NWB Water License criteria for total aluminum (3 mg/L), at 11 mg/L. However, the corresponding original sample result for total aluminum was well under the criteria, at 0.14 mg/L. The TSS result was also elevated compared to the original sample result (15 and 8 mg/L, respectively). These did not exceed the NWB Water License criteria (22.5 mg/L), but laboratory-measured TSS results did exceed criteria two days later (May 29), as described above in Section 4.2.1.1. Since dewatering had ceased at 10am on May 29 (prior to receipt

of results), the event was not investigated further. No other exceedances of the total aluminum criteria occurred during the dewatering of Whale Tail North Basin.

Data screening based on trip blanks and field blanks was conducted as described in Section 4.1.1.3. Briefly, samples were flagged (underlined) when the associated trip or field blank exceeded the MDL and the sample result was less than 5x the measured trip or field blank result. Two samples for effluent dewatering were flagged as a result of this screening (one for TSS and one for total aluminum). Analysis of water quality results was done on the complete dataset, including the flagged data. No analyte that was flagged exceeded the CCME guideline for the corresponding sample. Therefore overall, potential cross-contamination is considered unlikely to bias interpretation of dike construction water quality results.

## 4.2.2 Lake Levels

### 4.2.2.1 Discharge

Total volumes of water discharged to Whale Tail Lake South Basin and Mammoth Lake during dewatering of Whale Tail Lake North Basin in 2019 are shown in Table 8, along with FEIS predictions.

While more water was discharged to Mammoth Lake and less was discharged to Whale Tail South Basin than predicted, overall, the total dewatering discharge volume was within 7% of the predicted value.

**Table 8. Dewatering volumes to Mammoth Lake during the dewatering phase (FEIS App. 6-E, Section 5.2). \*Dike seepage, not dewatering discharge – discussed with and reported to NWB but not included in total for comparison to FEIS prediction.**

Date	Whale Tail Lake South Basin		Mammoth Lake	
	Predicted Volume (m <sup>3</sup> )	Actual Volume (m <sup>3</sup> )	Predicted Volume (m <sup>3</sup> )	Actual Volume (m <sup>3</sup> )
February 2019	3,064,850			
March 2019		1,045,966		
April 2019		296,645		
May 2019		598,603		
June 2019			720,000	147,552
July 2019		207,328	689,829	427,192
August 2019			32,002	747,074
September 2019			137,031	865,282
October 2019		(186,230*)		604,556
November 2019		(397,748*)		
December 2019		(353,131*)		
<i>Total</i>	3,064,850	2,148,542	1,578,862	2,791,656

### Comparison to FEIS Prediction

Total FEIS Predicted Discharge	Total Discharged
4,643,712 m <sup>3</sup>	4,940,198 m <sup>3</sup>

#### **4.2.2.2 Water Levels**

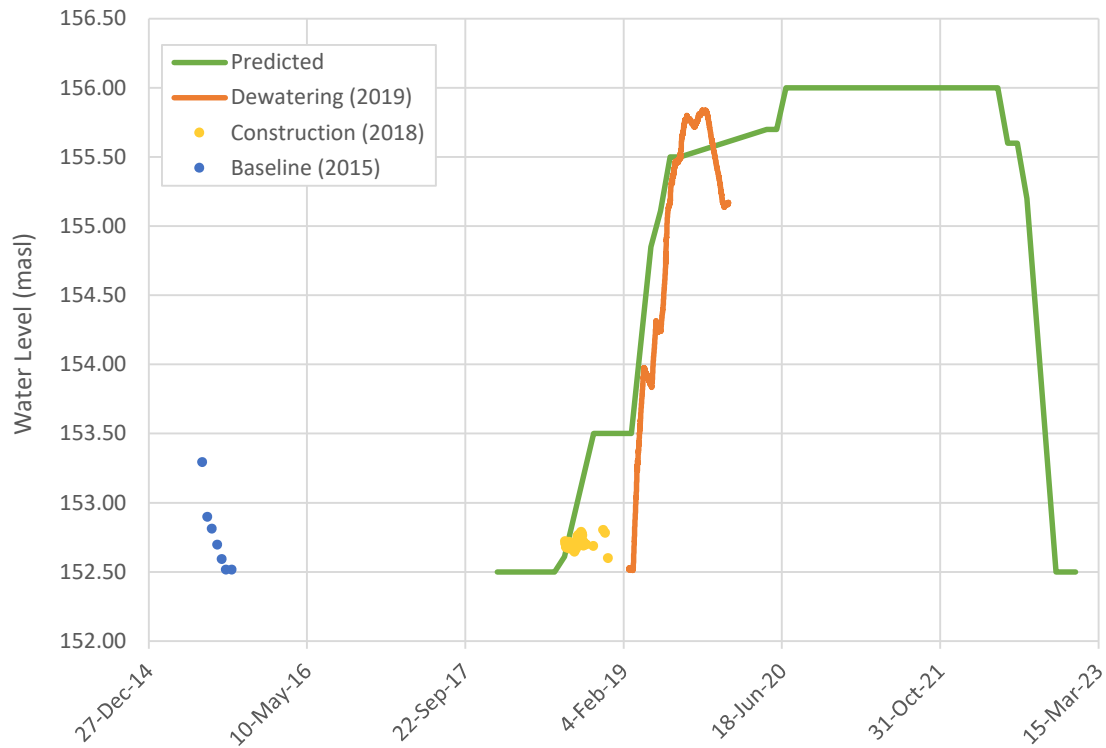
##### **4.2.2.2.1 Whale Tail Lake**

Water levels in Whale Tail Lake South Basin as measured throughout 2019 using piezometric data are shown in Figure 4, along with measurements during the construction phase (2018; measured by GPS survey), available baseline measurements (2015), and FEIS predictions (from FEIS Appendix 6-F).

Maximum predicted water levels in the Whale Tail South flood zone are shown in Figure 5, along with measured peak flood levels in 2019, and final water levels (December, 2019).

Due to record rainfall, peak water levels in 2019 exceeded predictions in July, but did not reach the maximum predicted final flood level of 156.0 masl, which was planned to occur in 2020. Following discussions with NWB, Agnico temporarily pumped non-contact water from the Whale Tail South (WTS) flood zone directly to Mammoth Lake. This pumping activity was planned to lower and then maintain water level in WTS in order to allow for the construction of the Whale Tail South Channel (SWTC) and preserve dike integrity. This activity temporarily substituted for the passive flow which will eventually occur through the SWTC, and complied with the original intent of the approved water balance and Water License 2AM-WTP1826 (same origin and destination of water). Water quality monitoring was conducted in accordance with Water License 2AM-WTP1826 Part F Item 6 and Schedule I Table 1 - Group 3, as required for water flowing through the SWTC. These results are reported under the Water Quality and Flow Monitoring Plan.

Beginning on October 21, 2019, 332,239 m<sup>3</sup> were pumped from Whale Tail Lake South Basin to Mammoth Lake. Construction of the SWTC began in December 2019, and is expected to be completed prior to freshet in 2020, which will ensure water levels remain within the maximum predicted range of 156.0 masl.



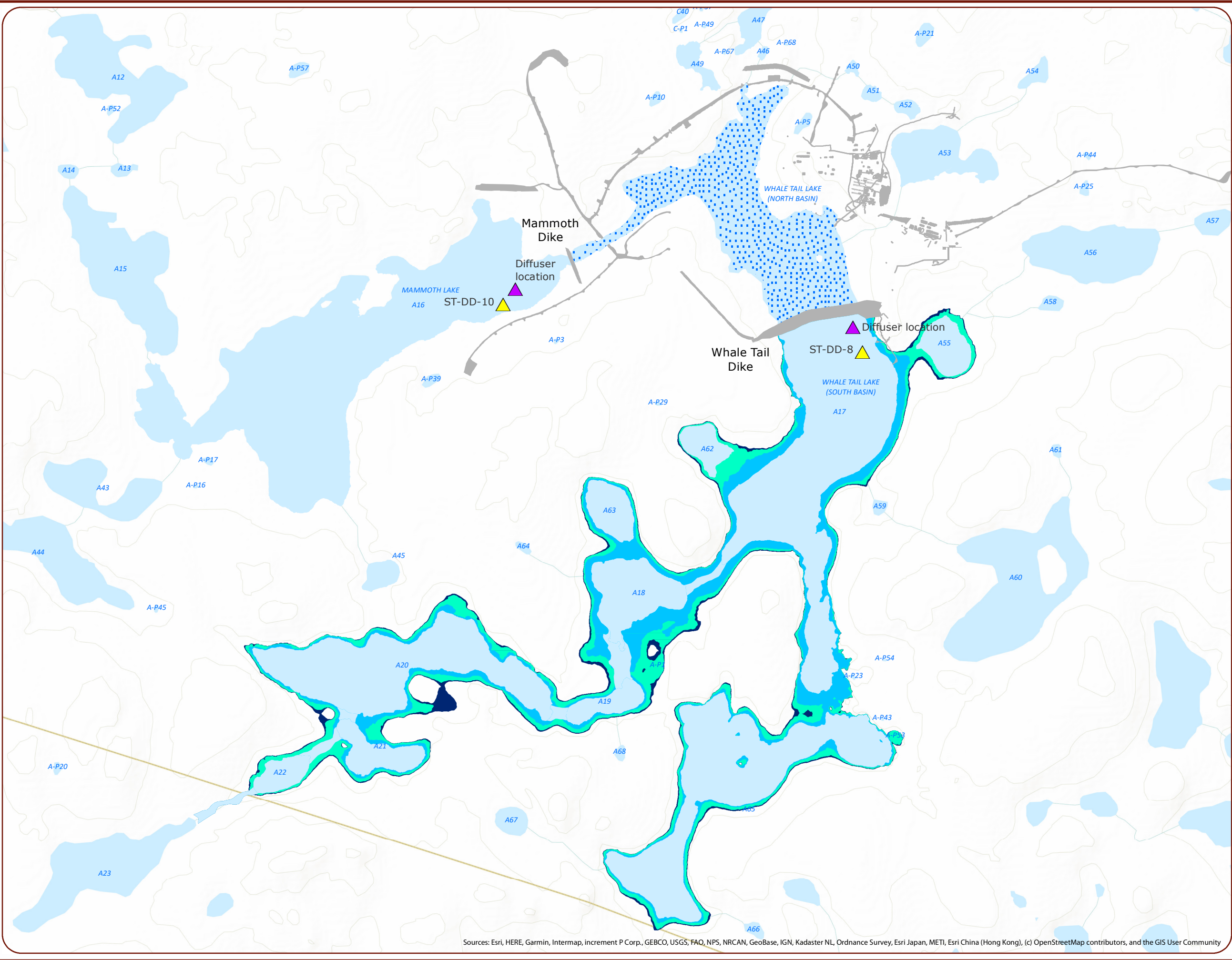
**Figure 4. Measured and FEIS-predicted water levels in Whale Tail Lake South. Predicted water levels from FEIS Appendix 6-F.**

Water levels as measured by staff gauge for each lake within the Whale Tail South flood zone are shown in Table 9. Estimated margin of error is +/- 5 cm.



**Table 9. Measured water levels (by installed staff gauge) throughout the Whale Tail South flood zone in 2019.**

Date	UTM (14W)	5-Jul	13-Jul	21-Jul	30-Jul	10-Aug	6-Sep	4-Sep	22-Sep
Whale Tail (A17)	607881 7254508	155.50	155.42	155.44	155.43	155.70	155.73	155.73	155.75
A62	606569 7254024	155.54	155.53	155.52	155.55	155.63	155.72	155.73	155.75
A63	606208 725370	155.33	155.45	155.49	155.55	155.71	155.79	155.81	155.87
A18	606366 7253292	155.37	155.36	155.50	155.54	155.76	155.85	155.86	155.91
A19	606325 7252503	155.26	155.38	155.43	155.43	155.65	155.74	155.73	155.76
A-P1	606443 7252548	155.69	155.67	155.67	155.67	155.71	155.75	155.75	155.78
A65-a	607769 7251991	155.33	155.46	155.50	155.50	155.72	155.84	-	155.84
A65-b	606891 7251750	155.33	155.46	155.51	155.52	155.63	155.82	-	155.84
A20	605512 7252440	155.36	155.47	155.51	155.53	155.74	155.74	155.82	155.85
A21	604942 7251969	155.26	155.49	155.53	155.54	155.75	155.84	155.85	155.88
A22	604261 7251907	155.37	155.43	155.46	155.48	155.71	155.77	155.79	155.80



### Figure 5: Whale Tail South Flood Zone Water Levels

#### Legend

- Dewatering Monitoring Locations
- Diffuser location
- Infrastructure
- Dewatered Lake

#### South Whale Tail Lake Elevations

- Baseline Water Level
- 2019 Final Water Level (155.17 masl)
- 2019 Peak Water Level (155.84 masl)
- Max Predicted Water Level (156 masl)

Kilometres  
SCALE: 1:22,000

UTM Zone 17N NAD83

**AGNICO EAGLE**

Disclaimer:  
The information displayed on this map has been compiled from various sources. While every effort has been made to accurately depict the information, this map should not be relied on as being a precise indicator of locations, features, or roads, nor as a guide to navigation.

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#### 4.2.2.2.2 Mammoth Lake

Water levels in Mammoth Lake as measured throughout 2018 (construction period) and 2019 (dewatering period) by GPS survey are shown in Figure 6, along with available baseline measurements (2015).

As shown in Table 10, FEIS predictions (FEIS Appendix 6-F) indicated that mean monthly water levels in Mammoth Lake would decline up to 12 cm below baseline values during the dewatering period (2019). However, measured baseline data for Mammoth Lake is only available for 3 time points in 2015, and baseline water levels were not modeled as a component of the FEIS. As a result, quantitative comparisons of measured values to FEIS predictions are not feasible.

Overall, however, measured water levels in 2019 were within the range of measured baseline values (2015).

**Table 10. Predicted change in water levels compared to baseline in Mammoth Lake during the dewatering phase (2019). From FEIS Appendix 6-E.**

Project Phase	June	July	August	September	October
Construction	-0.16	-0.16	-0.11	-0.14	-0.13
Dewatering (2019)	-0.12	-0.04	-0.05	-0.09	-0.10
Operations (2020+)	+0.01	-0.02	0.00	+0.01	0.00

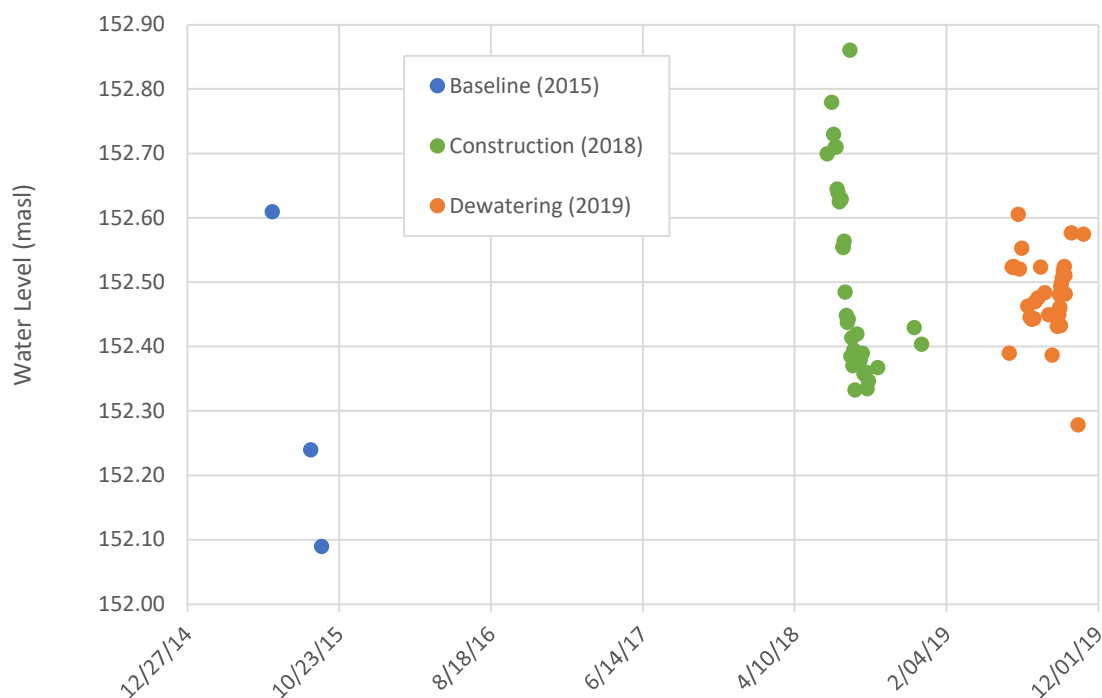


Figure 6. Measured water levels in Mammoth Lake.

## SECTION 5 • CONCLUSION

### 5.1 DIKE CONSTRUCTION

Monitoring of TSS/turbidity during construction of the Whale Tail Dike and Mammoth Dike in 2019 indicated that measures to avoid and mitigate serious harm to fish and fish habitat were successful, since all calculated concentrations of TSS were within NWB Water License criteria at compliance monitoring stations.

Field-measured TSS concentrations in Whale Tail Lake North Basin and broad survey monitoring locations (Whale Tail Lake South Basin, Mammoth Lake) were also below NWB Water License criteria and CCME Guidelines for the Protection of Aquatic Life, respectively.

Results of the complete laboratory water quality analysis (major ions, nutrients, metals) indicated low potential for direct toxicity to aquatic life, based on comparisons to available CCME guidelines. This conclusion is supported by the 2019 CREMP analysis.

No supplemental management actions were therefore required to be implemented.

## 5.2 DEWATERING

Water quality monitoring for dewatering effluent from Whale Tail Lake North Basin indicated four isolated incidents when individual TSS or turbidity concentrations exceeded NWB Type A Water License criteria for the short-term maximum (STM). One duplicate sample exceeded the total aluminum criterion for the STM. However, each exceedance only occurred for one sampling event, and the maximum monthly mean (MMM) was not exceeded, so no supplemental management actions were required.

Due to record rainfall in 2019, water levels in the Whale Tail South flood zone exceeded FEIS predictions for the end of July, 2019. Active pumping of water from Whale Tail South to Mammoth Lake began in October, and by mid-November, water levels declined below predictions. Construction of the SWTC between Lake A20 and Mammoth Lake is underway. This channel will passively manage water levels in WTS moving forward, and ensure they don't exceed the maximum predicted level of 156 masl.

While FEIS predictions were not available for quantitative comparison to measured water levels in Mammoth Lake, values in 2019 were within the range of baseline values observed in 2015.

## REFERENCES

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Azimuth (Azimuth Consulting Group Partnership), 2010. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring 2009, Meadowbank Gold Project, Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico-Eagle Mines Ltd., Vancouver BC. March 2010.

Azimuth (Azimuth Consulting Group Partnership), 2009. Aquatic Effects Monitoring Program – Targeted Study: Dike Construction Monitoring, Meadowbank Gold Project. Report prepared by Azimuth Consulting Group Inc., Vancouver, BC for Agnico-Eagle Mines Ltd., Vancouver BC. March 2009.

## **APPENDIX A**

### **Photos of Dike Construction and TSS Management Activities in 2019**

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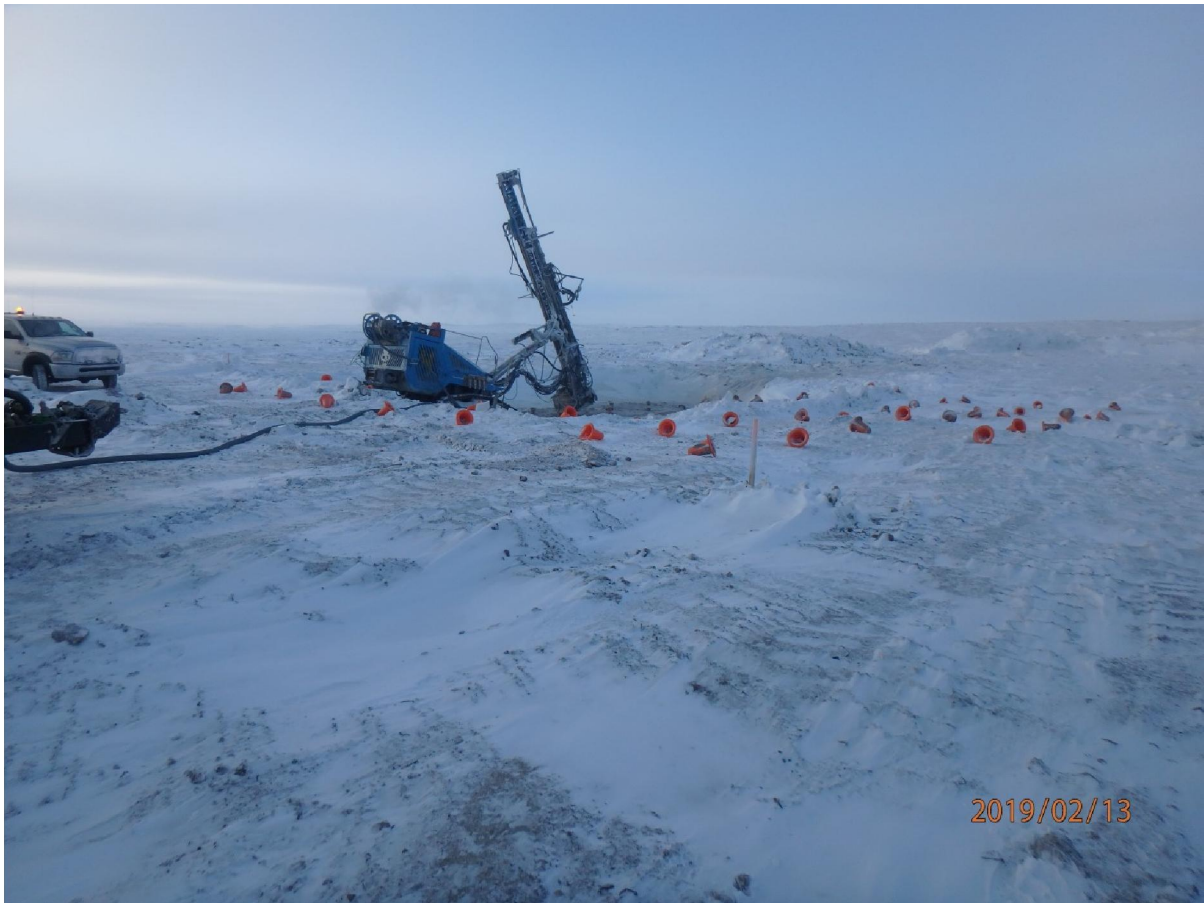


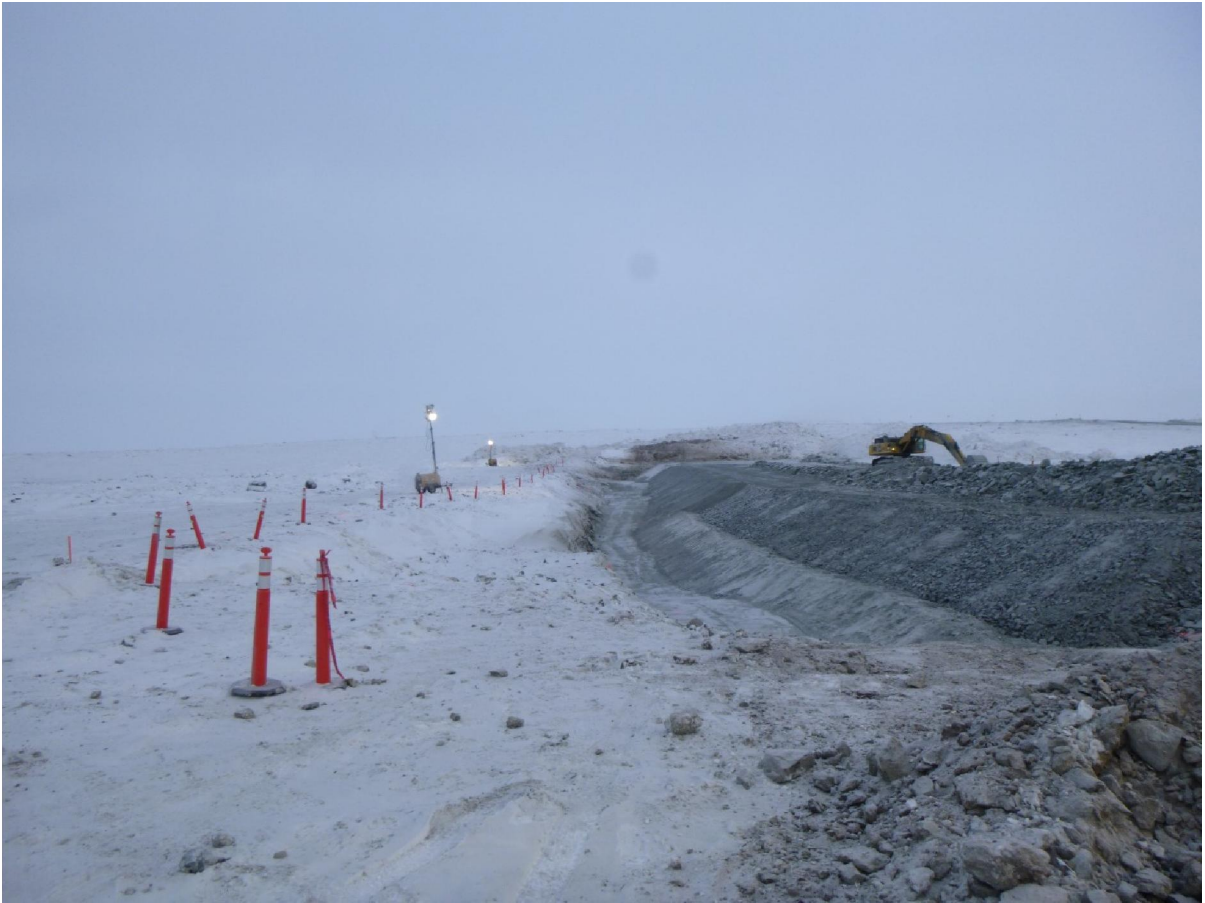
Figure A- 1. Whale Tail Dike construction – February 13, 2019.





**Figure A- 2. Mammoth Dike construction – March 4, 2019.**





**Figure A- 3. Mammoth Dike construction – March 8, 2019.**



Figure A- 4. Mammoth Dike construction – March 9, 2019.

## **APPENDIX B**

### **TSS/Turbidity Monitoring Results**

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Table B-1. Calculated TSS concentrations (mg/L) for dike construction monitoring locations measured by handheld turbidity meter and converted to TSS using site-specific relationship. As reported monthly to NWB.

Date	Station	Depth (m)								Calculated STM and MMM (mg/L)			
		1	2	3	4	5	6	7	8	Max TSS 24H	Mean TSS 24H	Mean TSS 7 d	Mean TSS 30 d
1/09/19	ST-WT-DC1	0.00	0.27	0.12						0.27	0.13	0.32	0.18
	ST-WT-DC2	0.00	0.00	0.00	0.00	0.00				0.00	0.00	0.23	0.16
	ST-WT-DC3	0.11	0.56	0.42	0.32					0.56	0.35	0.78	0.29
	ST-WT-DC4	Probe malfunction	NA	NA	NA	NA							
1/15/19	ST-WT-DC1	Probe malfunction	0.20	0.17	0.30	0.19							
	ST-WT-DC2	Probe malfunction	0.02	0.01	0.23	0.17							
	ST-WT-DC3	Probe malfunction	3.40	2.37	0.73	0.29							
	ST-WT-DC4	Probe malfunction	0.00	0.00	0.26	0.29							
2/06/19	ST-WT-DC1		0.00	0.00	0.00					0.00	0.00	0.32	0.17
	ST-WT-DC2		0.27	0.27	0.11	0.00	0.00			0.27	0.11	0.25	0.15
	ST-WT-DC3		0.16	0.16	0.11					0.16	0.11	0.79	0.28
	ST-WT-DC4		0.00	0.00						0.00	0.00	0.30	0.27
2/13/19	ST-WT-DC1	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC2	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC3	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC4	Probe malfunction	NA	NA	NA	NA							
2/18/19	ST-WT-DC1		0.00	0.00						0.00	0.00	0.31	0.16
	ST-WT-DC2		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.24	0.14
	ST-WT-DC3	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC4	Probe malfunction	NA	NA	NA	NA							
2/27/19	ST-WT-DC1	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC2	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC3	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC4	Probe malfunction	NA	NA	NA	NA							
2/06/19	ST-WT-DC5	NA								50.00	50.00	15.00	15.00
	ST-WT-DC6		0.16	0.34	0.26	0.18							
	ST-WT-DC7		0.16	0.00						0.34	0.24		
	ST-WT-DC8		0.29	0.46						0.16	0.08		
2/13/19	ST-WT-DC5	Probe malfunction	NA	NA	NA	NA				0.46	0.38		
	ST-WT-DC6	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC7	Probe malfunction	NA	NA	NA	NA							

Table B-1. Calculated TSS concentrations (mg/L) for dike construction monitoring locations measured by handheld turbidity meter and converted to TSS using site-specific relationship. As reported monthly to NWB.

Date	Station	Depth (m)								Calculated STM and MMM (mg/L)			
		1	2	3	4	5	6	7	8	Max TSS 24H	Mean TSS 24H	Mean TSS 7 d	Mean TSS 30 d
	ST-WT-DC8	Probe malfunction	NA	NA	NA	NA							
2/18/19	ST-WT-DC5		0.00	0.00	0.00								
	ST-WT-DC6		0.00	0.00	0.00	0.00				0.00	0.00	0.00	0.00
	ST-WT-DC7		0.00	0.00						0.00	0.00	0.12	0.12
	ST-WT-DC8		2.49							0.00	0.00	0.04	0.04
2/27/19	ST-WT-DC5	Probe malfunction	NA	NA	NA	NA				2.49	2.49	1.43	1.43
	ST-WT-DC6	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC7	Probe malfunction	NA	NA	NA	NA							
	ST-WT-DC8	Probe malfunction	NA	NA	NA	NA							
3/10/19	ST-WT-DC5		0.00	0.17	0.00					0.17	0.06	0.06	0.06
	ST-WT-DC6		0.00	0.19	0.00	0.00				0.19	0.05	0.28	0.28
	ST-WT-DC7		0.00	0.19						0.19	0.10	0.18	0.18
	ST-WT-DC8		0.00	0.19						0.19	0.10	2.96	2.96
3/17/19	ST-WT-DC5			0.41						0.41	0.41	0.47	0.47
	ST-WT-DC6			0.19						0.19	0.19	0.47	0.47
	ST-WT-DC7			0.27						0.27	0.27	0.45	0.45
	ST-WT-DC8	Probe malfunction		NA								2.96	2.96

Table B-2. Field-measured parameters for dike construction monitoring stations.

Sample Date	Sample Name	Sample Depth	pH	Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids
			-	uS/cm	°C	mg/L	NTU	mg/L
1/09/19	ST-WT-DC-1	1 m		6.48	42.9	0.04	16.79	0
1/09/19	ST-WT-DC-1	2 m		6.49	55.7	0.66	17.01	1.19
1/09/19	ST-WT-DC-1	3 m		6.46	52.6	1.37	17.21	0.54
1/15/19	ST-WT-DC-1	1 m	-	-	-	-	19.04	-
1/15/19	ST-WT-DC-1	2 m	-	-	-	-	26.01	-
1/15/19	ST-WT-DC-1	3 m	-	-	-	-	23.79	-
1/15/19	ST-WT-DC-1	4 m	-	-	-	-	12.21	-
1/16/19	ST-WT-DC-1	1 m	7.07	62.3	0.17	17.32	70	-
1/16/19	ST-WT-DC-1	2 m	6.99	56.8	1.02	17.85	52.43	-
1/16/19	ST-WT-DC-1	3 m	6.89	53.9	1.36	17.61	5	-
2/06/19	ST-WT-DC-1	1 m	7.58	55.5	0.86	16.18	0	0
2/06/19	ST-WT-DC-1	2 m	7.4	53.4	1.33	16.8	0	0
2/18/19	ST-WT-DC-1	1 m	6.61	59.2	0.45	14.41	0	0
2/18/19	ST-WT-DC-1	2 m	6.54	59.1	1.25	15.55	0	0
1/09/19	ST-WT-DC-2	1 m	8.24	60.4	0.35	16.75	0	0
1/09/19	ST-WT-DC-2	2 m	8.06	35.9	0.69	17.46	0	0
1/09/19	ST-WT-DC-2	3 m	7.88	51.9	1.31	17.3	0	0
1/09/19	ST-WT-DC-2	4 m	7.75	50.4	1.64	16.91	0	0
1/09/19	ST-WT-DC-2	5 m	7.62	47.7	1.94	16.04	0	0
1/09/19	ST-WT-DC-2	6 m	7.25	47.2	1.99	15.3	0	0
1/15/19	ST-WT-DC-2	1 m	-	-	-	-	-	0
1/15/19	ST-WT-DC-2	2 m	-	-	-	-	-	0
1/15/19	ST-WT-DC-2	3 m	-	-	-	-	-	0
1/15/19	ST-WT-DC-2	4 m	-	-	-	-	-	0
1/15/19	ST-WT-DC-2	5 m	-	-	-	-	-	0
1/15/19	ST-WT-DC-2	6 m	-	-	-	-	-	0
1/15/19	ST-WT-DC-2	7 m	-	-	-	-	-	0.172
1/15/19	ST-WT-DC-2	8 m	-	-	-	-	-	0.131
1/15/19	ST-WT-DC-2	9 m	-	-	-	-	-	0.2
1/16/19	ST-WT-DC-2	1 m	7.24	61.2	0.13	16.38	0	0
1/16/19	ST-WT-DC-2	2 m	7.18	55.1	0.95	16.28	0	0
1/16/19	ST-WT-DC-2	3 m	7.08	52.2	1.45	16.36	0	0
1/16/19	ST-WT-DC-2	4 m	6.98	50.5	1.79	17.08	0	0
1/16/19	ST-WT-DC-2	5 m	6.91	48.4	1.96	16.83	0	0
1/16/19	ST-WT-DC-2	6 m	6.84	46.9	2.12	16.41	0	0
2/06/19	ST-WT-DC-2		7.04	51.6	1.3	16.39	0.95	-
2/06/19	ST-WT-DC-2	1 m	7.12	53.5	1	16.44	1.21	0.273
2/06/19	ST-WT-DC-2	2 m	7.04	51.6	1.3	16.39	0.95	0.212
2/06/19	ST-WT-DC-2	3 m	6.93	50.5	1.72	16.38	0.21	0.044
2/06/19	ST-WT-DC-2	4 m	6.85	49.5	1.89	16.19	0	0
2/06/19	ST-WT-DC-2	5 m	6.81	47.9	2.05	15.98	0	0
2/18/19	ST-WT-DC-2	1 m	6.67	59.8	0.31	11.94	0	0
2/18/19	ST-WT-DC-2	2 m	6.46	54.8	0.97	12.96	0	0

Table B-2. Field-measured parameters for dike construction monitoring stations.

Sample Date	Sample Name	Sample Depth	pH	Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids
			-	uS/cm	°C	mg/L	NTU	mg/L
2/18/19	ST-WT-DC-2	3 m	6.32	52	1.63	14.05	0	0
2/18/19	ST-WT-DC-2	4 m	6.2	50.6	1.98	15.51	0	0
2/18/19	ST-WT-DC-2	5 m	5.92	49.3	2.2	16.81	0	0
2/18/19	ST-WT-DC-2	6 m	5.71	47.8	2.28	16.04	0	0
1/09/19	ST-WT-DC-3	1 m	7.79	61	0	15.94	0.5	0.108
1/09/19	ST-WT-DC-3	2 m	7.49	55.6	0.74	17.93	2.4	0.559
1/09/19	ST-WT-DC-3	3 m	7.4	52.9	1.25	17.78	1.83	0.421
1/09/19	ST-WT-DC-3	4 m	7.32	49.7	1.68	17.29	1.39	0.316
1/15/19	ST-WT-DC-3	1 m	-	-	-	-	-	16.232
1/15/19	ST-WT-DC-3	2 m	-	-	-	-	-	17.221
1/15/19	ST-WT-DC-3	3 m	-	-	-	-	-	15.702
1/15/19	ST-WT-DC-3	4 m	-	-	-	-	-	12.608
1/16/19	ST-WT-DC-3	1 m	7.05	58.3	0.18	17.16	0	0
1/16/19	ST-WT-DC-3	2 m	6.98	53.9	1.2	17.1	0	0
1/16/19	ST-WT-DC-3	3 m	6.89	52.4	1.49	17.04	0	0
2/06/19	ST-WT-DC-3	1 m	7.34	56.2	0.87	17.36	0.73	0.161
2/06/19	ST-WT-DC-3	2 m	7.21	54.6	1.21	17.7	0.62	0.136
2/06/19	ST-WT-DC-3	3 m	7.09	51.5	1.59	17.77	0.09	0.018
1/16/19	ST-WT-DC-4	1 m	7.03	60.8	0.26	17.19	0.48	0.104
1/16/19	ST-WT-DC-4	2 m	6.94	54.8	1.12	17.26	1.93	0.445
1/16/19	ST-WT-DC-4	3 m	6.84	55.1	1.43	17.28	1.4	0.318
2/06/19	ST-WT-DC-4	1 m	7.13	27.4	0.8	17.41	0	0
2/06/19	ST-WT-DC-4	2 m	-	34.3	1.7	17.43	0	0
1/17/19	ST-WT-DC-5	1 m	6.86	151.1	1.16	17.16	0	0
1/17/19	ST-WT-DC-5	2 m	6.72	150.4	1.88	17.12	0.03	0.006
1/17/19	ST-WT-DC-5	3 m	6.58	157.7	2.09	16.61	0	0
2/18/19	ST-WT-DC-5	1 m	6.88	165.7	0.91	18.72	0	0
2/18/19	ST-WT-DC-5	2 m	6.87	159.8	1.96	18.82	0	0
2/18/19	ST-WT-DC-5	3 m	6.77	168	2.17	18.64	0	0
3/10/19	ST-WT-DC-5	1 m	6.45	181.6	0.67	18.66	-	-
3/10/19	ST-WT-DC-5	2 m	6.44	175.3	1.94	18.71	0.77	0.17
3/10/19	ST-WT-DC-5	3 m	6.29	182.6	2.36	17.63	-	-
3/17/19	ST-WT-DC-5	2 m	6.59	174.8	5.71	14.09	1.77	0.41
1/09/19	ST-WT-DC-6	1 m	7.01	155	0.89	17.75	2.44	0.568
1/09/19	ST-WT-DC-6	2 m	6.83	146	1.5	17.77	2.65	0.62
1/09/19	ST-WT-DC-6	3 m	6.66	181.9	1.93	17.15	1.86	0.428
1/09/19	ST-WT-DC-6	4 m	6.42	181.6	2.01	15.17	0	0
1/09/19	ST-WT-DC-6	5 m	6.49	187	2.12	16.02	0.55	0.12
1/17/19	ST-WT-DC-6	1 m	6.79	152.5	0.84	16.19	0.1	0.02
1/17/19	ST-WT-DC-6	2 m	6.76	147	1.76	16.91	0.06	0.012
1/17/19	ST-WT-DC-6	3 m	6.68	150.5	2.01	16.83	0.12	0.024
1/17/19	ST-WT-DC-6	4 m	6.51	174.6	2.26	15.7	0.2	0.042
2/06/19	ST-WT-DC-6		6.93	158.1	1.38	17.03	1.48	-

Table B-2. Field-measured parameters for dike construction monitoring stations.

Sample Date	Sample Name	Sample Depth	pH	Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids
			-	uS/cm	°C	mg/L	NTU	mg/L
2/06/19	ST-WT-DC-6	1 m	7.07	163.4	0.67	15.99	0.73	0.161
2/06/19	ST-WT-DC-6	2 m	6.93	158.1	1.38	17.03	1.48	0.337
2/06/19	ST-WT-DC-6	3 m	6.79	159.4	1.99	17.42	1.16	0.261
2/06/19	ST-WT-DC-6	4 m	6.7	176.3	2.2	17.41	0.83	0.184
2/18/19	ST-WT-DC-6	1 m	6.8	161.3	0.69	18.26	0	0
2/18/19	ST-WT-DC-6	2 m	6.9	162	1.58	18.47	0	0
2/18/19	ST-WT-DC-6	3 m	6.8	178.1	2.15	18.86	0	0
2/18/19	ST-WT-DC-6	4 m	6.73	179.1	2.53	18.96	0	0
3/10/19	ST-WT-DC-6	1 m	6.49	185.7	0.21	18.18	0	-
3/10/19	ST-WT-DC-6	2 m	6.44	176.1	1.95	18.02	0.87	0.19
3/10/19	ST-WT-DC-6	3 m	6.4	191.4	2.22	18.7	-	-
3/10/19	ST-WT-DC-6	4 m	6.38	189.9	2.66	19.4	-	-
3/17/19	ST-WT-DC-6		6.55	175.2	6.39	13.13	0.89	0.2
1/17/19	ST-WT-DC-7	1 m	7.03	180.8	0.46	15.64	1.2	0.271
1/17/19	ST-WT-DC-7	2 m	6.82	220.1	1.53	16.62	0.7	0.154
2/06/19	ST-WT-DC-7	1 m	6.98	180.02	0.8	18.89	0.73	0.161
2/06/19	ST-WT-DC-7	2 m	6.69	210.2	1.35	18	0	0
2/18/19	ST-WT-DC-7	1 m	6.83	186.5	0.78	17.8	0	0
2/18/19	ST-WT-DC-7	2 m	6.65	216.5	1.65	18.36	0	0
3/10/19	ST-WT-DC-7	1 m	6.51	143.7	0.27	18.5	-	-
3/10/19	ST-WT-DC-7	2 m	6.27	230.2	2.01	18.15	0.85	0.19
3/17/19	ST-WT-DC-7		6.47	227.8	5.85	13.48	1.19	0.27
1/17/19	ST-WT-DC-8	1 m	6.97	173.2	0.82	16.64	0	0
1/17/19	ST-WT-DC-8	2 m	6.85	173.6	1.31	17.49	0	0
2/06/19	ST-WT-DC-8	1 m	6.96	182.5	0.78	19.1	1.3	0.294
2/06/19	ST-WT-DC-8	2 m	6.64	179.8	1.17	19.28	1.99	0.459
2/18/19	ST-WT-DC-8	1 m	6.51	190.1	0.55	17.68	10.02	2.49
3/10/19	ST-WT-DC-8	1 m	6.53	141.3	0.62	18.22	0	-
3/10/19	ST-WT-DC-8	2 m	6.39	200.6	1.29	17.81	0.87	0.19
1/15/19	ST-WTN-DC-1	1 m	7.4	244.4	0.18	16.62	19.04	4.874
1/15/19	ST-WTN-DC-1	2 m	7.32	234.4	1.03	16.86	26.01	6.753
1/15/19	ST-WTN-DC-1	3 m	7.24	232.7	1.4	16.79	23.79	6.152
1/15/19	ST-WTN-DC-1	4 m	6.92	231.5	1.47	15.7	12.21	3.062
1/21/19	ST-WTN-DC-1	1 m	7.07	239.3	1.06	16.29	0.75	0.166
1/21/19	ST-WTN-DC-1	2 m	7.01	236.2	1.32	16.77	0.71	0.156
1/21/19	ST-WTN-DC-1	3 m	6.96	236.1	1.56	16.49	0.72	0.159
1/21/19	ST-WTN-DC-1	4 m	6.89	238.6	1.89	16.01	0.7	0.154
1/31/19	ST-WTN-DC-1	1 m	6.9	263	0.06	16.24	-	0.24
1/31/19	ST-WTN-DC-1	2 m	6.87	246.8	0.71	16.61	1.07	0.186
1/31/19	ST-WTN-DC-1	3 m	6.83	239.2	1.34	16.85	0.84	0.166
1/31/19	ST-WTN-DC-1	4 m	6.79	235.3	1.62	17.21	0.75	0.136
1/31/19	ST-WTN-DC-1	5 m	6.7	235.8	2	17.23	0.62	0.953
1/31/19	ST-WTN-DC-1	6 m	6.46	237.7	2.12	13.68	4	-



Table B-2. Field-measured parameters for dike construction monitoring stations.

Sample Date	Sample Name	Sample Depth	pH	Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids
			-	uS/cm	°C	mg/L	NTU	mg/L
2/03/19	ST-WTN-DC-1	1 m	-	257.4	0.55	14.99	4.87	1.171
2/03/19	ST-WTN-DC-1	2 m	-	247.6	1.16	15.97	4.57	1.096
2/03/19	ST-WTN-DC-1	3 m	-	243.1	1.46	16.44	3.79	0.901
2/03/19	ST-WTN-DC-1	4 m	-	241.6	1.78	16.76	2.86	0.671
2/03/19	ST-WTN-DC-1	5 m	-	-	-	-	2.86	-
2/06/19	ST-WTN-DC-1	1 m	6.88	234.9	0.86	16.28	9.7	2.407
2/06/19	ST-WTN-DC-1	2 m	6.86	243.7	1.24	16.25	9.4	2.329
2/06/19	ST-WTN-DC-1	3 m	6.85	241	1.47	16.29	8.61	2.125
2/06/19	ST-WTN-DC-1	4 m	6.83	238	1.83	16.2	7.29	1.786
2/06/19	ST-WTN-DC-1	5 m	6.7	234.4	2.23	14.24	4.3	1.028
2/18/19	ST-WTN-DC-1	1 m	-	-	-	-	-	0.086
2/18/19	ST-WTN-DC-1	2 m	-	-	-	-	-	0.104
2/18/19	ST-WTN-DC-1	3 m	-	-	-	-	-	0.106
2/18/19	ST-WTN-DC-1	4 m	-	-	-	-	-	0.09
1/15/19	ST-WTN-DC-2	1 m	6.96	254.9	0.17	16.48	6.05	-
1/15/19	ST-WTN-DC-2	2 m	6.96	240.6	0.93	16.75	4.6	-
1/15/19	ST-WTN-DC-2	3 m	6.93	236.2	1.26	16.8	4.3	-
1/15/19	ST-WTN-DC-2	4 m	6.88	243	1.55	16.17	2.72	-
1/15/19	ST-WTN-DC-2	5 m	6.82	261.6	1.71	15.12	1.23	-
1/15/19	ST-WTN-DC-2	6 m	6.74	311.8	1.72	14.01	0.86	-
1/15/19	ST-WTN-DC-2	7 m	6.72	319	1.78	13.3	0.78	-
1/15/19	ST-WTN-DC-2	8 m	6.79	325.2	1.88	12.73	0.6	-
1/15/19	ST-WTN-DC-2	9 m	6.64	224.8	2	12.01	0.76	-
1/21/19	ST-WTN-DC-2	1 m	7.27	200	0.56	14.99	94.09	25.912
1/21/19	ST-WTN-DC-2	2 m	7.19	244.5	1.27	15.86	7.38	1.809
1/21/19	ST-WTN-DC-2	3 m	7.1	248.4	1.62	15.38	1.37	0.311
1/21/19	ST-WTN-DC-2	4 m	7.02	261.5	1.66	14.79	1.49	0.339
1/21/19	ST-WTN-DC-2	5 m	6.91	292.7	1.75	13.55	2.91	0.683
1/21/19	ST-WTN-DC-2	6 m	6.86	311	1.79	13.2	1.02	0.228
1/21/19	ST-WTN-DC-2	7 m	6.8	321.5	1.91	12.53	0.16	0.033
1/21/19	ST-WTN-DC-2	8 m	6.73	320	2.04	11.88	1.49	-
1/31/19	ST-WTN-DC-2	1 m	7.14	248.7	0.71	16.57	40.82	10.82
1/31/19	ST-WTN-DC-2	2 m	7.08	245.3	1.3	16.75	37.45	9.889
1/31/19	ST-WTN-DC-2	3 m	7	250.5	1.45	17.08	30.02	7.846
1/31/19	ST-WTN-DC-2	4 m	6.9	254.9	1.69	17.23	20.46	5.254
1/31/19	ST-WTN-DC-2	5 m	6.79	299.7	1.7	16.99	10.95	2.733
1/31/19	ST-WTN-DC-2	6 m	6.72	305.2	1.87	16.58	5.02	1.209
1/31/19	ST-WTN-DC-2	7 m	6.62	308.9	1.96	15.42	0.87	0.193
2/03/19	ST-WTN-DC-2		-	255.5	1.15	16.2	0.75	0
2/03/19	ST-WTN-DC-2	1 m	-	258	0.65	15.95	0.82	0.182
2/03/19	ST-WTN-DC-2	2 m	-	255.5	1.15	16.2	0.75	0.166
2/03/19	ST-WTN-DC-2	3 m	-	253	1.46	16.39	0.82	0.182
2/03/19	ST-WTN-DC-2	4 m	-	258.7	1.65	16.39	1.36	0.308

Table B-2. Field-measured parameters for dike construction monitoring stations.

Sample Date	Sample Name	Sample Depth	pH	Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids
			-	uS/cm	°C	mg/L	NTU	mg/L
2/03/19	ST-WTN-DC-2	5 m	-	296.5	1.69	15.93	1.23	0.278
2/03/19	ST-WTN-DC-2	6 m	-	300.5	1.86	15.15	1.25	0.282
2/03/19	ST-WTN-DC-2	7 m	-	308	1.97	14.05	0.9	0.2
2/03/19	ST-WTN-DC-2	8 m	-	307.7	2.1	12.8	0.9	-
2/06/19	ST-WTN-DC-2		7.12	256.5	1.15	16.56	4.42	0
2/06/19	ST-WTN-DC-2	1 m	7.22	257.7	0.66	16.49	4.87	1.171
2/06/19	ST-WTN-DC-2	2 m	7.12	256.5	1.15	16.56	4.42	1.058
2/06/19	ST-WTN-DC-2	3 m	7.07	254.7	1.38	16.63	4.04	0.963
2/06/19	ST-WTN-DC-2	4 m	7.03	252.1	1.56	16.64	3.77	0.896
2/06/19	ST-WTN-DC-2	5 m	6.96	290.8	1.67	16.24	2.98	0.701
2/06/19	ST-WTN-DC-2	6 m	6.92	297.3	1.86	15.7	2.55	0.595
2/06/19	ST-WTN-DC-2	7 m	6.85	306	2	14.69	1.75	0.402
2/06/19	ST-WTN-DC-2	8 m	6.78	305.5	2.12	13.12	1.14	-
2/18/19	ST-WTN-DC-2	1 m	6.89	267.5	0.78	16.5	0.74	0.163
2/18/19	ST-WTN-DC-2	2 m	6.79	260.8	1.32	16.65	0.83	0.184
2/18/19	ST-WTN-DC-2	3 m	6.73	258.5	1.52	16.79	1.25	0.282
2/18/19	ST-WTN-DC-2	4 m	6.77	256.8	1.67	16.62	2.67	0.625
2/18/19	ST-WTN-DC-2	5 m	6.57	284.9	1.79	15.67	0.92	0.205
2/18/19	ST-WTN-DC-2	6 m	6.48	299	1.97	15	0.55	0.12
2/18/19	ST-WTN-DC-2	7 m	6.36	303.3	2.09	13.49	0.45	0.097
2/18/19	ST-WTN-DC-2	8 m	6.25	302.7	2.27	11.98	0.55	0.12
1/15/19	ST-WTN-DC-3	1 m	7.46	265.8	0.11	16.15	60.16	16.232
1/15/19	ST-WTN-DC-3	2 m	7.49	251.5	0.82	16.91	63.66	17.221
1/15/19	ST-WTN-DC-3	3 m	7.32	247.4	1.16	17	58.28	15.702
1/15/19	ST-WTN-DC-3	4 m	7.19	245.4	1.44	17.03	47.25	12.608
1/21/19	ST-WTN-DC-3	1 m	7.2	256.1	1.09	16.3	0.64	0.14
1/21/19	ST-WTN-DC-3	2 m	7.14	250.4	1.41	16.4	0.76	0.168
1/31/19	ST-WTN-DC-3	1 m	6.98	262.8	0.72	16.21	32.17	8.435
1/31/19	ST-WTN-DC-3	2 m	6.88	255.7	1.2	16.93	29.38	7.671
1/31/19	ST-WTN-DC-3	3 m	6.83	254.3	1.37	17.2	21.39	6.857
2/03/19	ST-WTN-DC-3	1 m	-	270.6	0.79	17.13	1.1	0.247
2/03/19	ST-WTN-DC-3	2 m	-	266.7	1.08	17.04	1.24	0.28
2/03/19	ST-WTN-DC-3	3 m	-	261.6	1.44	17.13	0.99	0.221
2/06/19	ST-WTN-DC-3	1 m	7.33	239	0.69	15.57	2.16	0.5
2/06/19	ST-WTN-DC-3	2 m	7.22	247.4	1.13	16.16	2.3	0.534
2/06/19	ST-WTN-DC-3	3 m	7.03	249.1	1.37	16.27	3.25	0.767
2/18/19	ST-WTN-DC-3	2 m	6.59	217	0.45	16.33	3.35	0.792
2/18/19	ST-WTN-DC-3	3 m	6.55	258	1.12	16.85	3.75	0.891
2/18/19	ST-WTN-DC-3	4 m	6.51	254	1.53	17.09	3.82	0.908
1/15/19	ST-WTN-DC-4	1 m	7.37	256	0.08	16.58	175.6	49.763
1/15/19	ST-WTN-DC-4	2 m	7.25	253.6	0.71	16.97	144	40.439
1/21/19	ST-WTN-DC-4	1 m	7.37	265.7	1.16	12.47	0.66	0.145
1/21/19	ST-WTN-DC-4	2 m	7.32	257.5	1.25	15.85	0.54	0.117

Table B-2. Field-measured parameters for dike construction monitoring stations.

Sample Date	Sample Name	Sample Depth	pH	Conductivity	Temperature	Dissolved Oxygen	Turbidity	Total Suspended Solids
			-	uS/cm	°C	mg/L	NTU	mg/L
1/31/19	ST-WTN-DC-4	1 m	6.97	278	0	16.17	0.71	0.156
1/31/19	ST-WTN-DC-4	2 m	6.93	267.6	0.55	16.53	0.84	0.186
1/31/19	ST-WTN-DC-4	3 m	6.86	259.4	1.18	16.81	0.53	0.115
2/06/19	ST-WTN-DC-4		-	-	-	-	-	0.5
2/06/19	ST-WTN-DC-4	1 m	7.2	268.7	0.6	16.58	1.65	0.378
2/06/19	ST-WTN-DC-4	2 m	7.13	264.4	1	16.68	1.32	0.299
2/18/19	ST-WTN-DC-4	1 m	6.71	277.6	0.5	13.21	13.21	0.191
2/18/19	ST-WTN-DC-4	2 m	6.54	268.1	1.17	15.98	15.98	0.406

## **APPENDIX C**

### **Laboratory Water Quality Monitoring Results**

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Table C-1. Results of laboratory water quality analysis for dike construction monitoring stations. Results exceeding CCME guidelines are shaded grey.

Sample Date		Guideline^	1/09/19	1/16/19	2/06/19	2/18/19	1/09/19	1/17/19	2/06/19	2/18/19	3/10/19	3/17/19	1/15/19	1/21/19	2/03/19	2/18/19
Sample Name			ST-WT-DC-2 (Whale Tail South)				ST-WT-DC-6 (Mammoth Lake)				ST-WTN-DC-2 (impounded Whale Tail North)					
Parameter	Units															
Conventional Parameters																
pH	N/A	6.5-9	6.71	6.73	6.74	6.7	6.68	6.9	6.7	6.67	6.68	6.65	6.98	6.93	7.07	6.85
Hardness	mg CaCO3/L		17	18	13	20	54	51	45	57	56	55	81	82	77	94
Total alkalinity, as CaCO3	mg CaCO3/L		9	11	12	14	12	13	16	17	18	20	18	19	18	21
Total suspended solids	mg/L	26**	<1	1	1	<1	1	<1	1	3	<1	<1	1	5	2	2
Total organic carbon	mg/L		2	2.4	1.8	1.9	2.1	2.1	1.9	1.7	2.6	2.5	2.5	2.8	1.9	2
Dissolved organic carbon	mg/L		2	2.3	1.8	1.7	1.7	2.1	1.5	1.6	2.6	2.4	2.3	2	1.6	1.3
Total Dissolved Solids	mg/L		30	31	32	35	76	87	85	90	91	105	113	121	112	156
Major Ions																
Bicarbonate	mg CaCO3/L		9	11	12	14	12	13	16	17	18	20	18	19	18	21
Carbonate	mg CaCO3/L		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloride	mg/L		8	8.1	8.3	8.4	29.7	31.2	32.7	32.1	35.7	36.1	45.7	53.3	54.7	59
Hydroxide, as CaCO3	mg CaCO3/L		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Sulphate	mg/L		1.7	1.3	2.9	4.2	3.7	5.1	7.8	6.5	6	10.3	5.1	5.8	10.5	7.7
Reactive silica	mg/kg		1.08	0.77	0.72	0.83	1.99	1.36	1.39	1.48	1.55	1.27	1.88	1.94	2.01	2.07
Nutrients																
Total nitrogen	mg/L	0.004	<0.05	0.17	<0.05	<0.05	0.1	0.13	<0.05	<0.05	0.26	0.16	0.34	0.41	0.48	0.22
Total phosphorus	mg/L		<0.01	<0.01	<0.01	<0.01	0.2	0.03	<0.01	<0.01	0.01	<0.01	0.04	0.02	0.02	0.01
Total orthophosphate (as phosphorus)	mg/L		<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01
Total ammonia as NH4	mg/L		<0.01	<0.01	0.03	0.01	0.03	0.01	0.02	<0.01	<0.01	<0.01	0.21	0.3	0.33	0.22
Un-ionized Ammonia, calculated	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Total Metals																
Aluminum	mg/L	0.1	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	0.02	<0.005	0.057	0.023	<0.005	0.033
Antimony	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002	0.0001	<0.0001	<0.0001
Arsenic	mg/L	0.005	<0.0005	0.0025	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	0.0018	0.0022
Barium	mg/L		0.0077	0.0103	0.0049	0.0107	0.0277	0.0226	0.0211	0.0275	0.0261	0.0283	0.0392	0.039	0.0363	0.0446
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L	1.2*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.00004	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002
Chromium	mg/L	0.001	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006
Copper	mg/L	0.002	0.0008	<0.0005	0.0012	0.007	0.0008	<0.0005	0.0013	0.0046	0.001	<0.0005	<0.0005	<0.0005	0.0007	0.0219
Iron	mg/L	0.3	0.03	<0.01	<0.01	0.01	0.21	<0.01	<0.01	0.04	<0.01	<0.01	0.06	0.04	0.03	0.17
Lead	mg/L	0.001	<0.0003	<0.0003	<0.0003	<0.0003	0.0013	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003
Lithium	mg/L		<0.005	<0.005	<0.005	<0.005	0.006	<0.005	0.005	0.006	0.008	0.007	0.01	0.011	0.013	0.015
Manganese	mg/L	0.6578*	0.0012	<0.0005	<0.0005	<0.0005	0.0019	<0.0005	0.001	0.0021	0.0014	0.002	0.0323	0.0338	0.0309	0.0378
Mercury	mg/L	0.00026	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001
Molybdenum	mg/L	0.073	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0023	0.004	0.0033	0.004
Nickel	mg/L	0.025	0.001	<0.0005	0.0008	0.0008	0.0019	0.0017	0.0018	0.0021	0.0015	0.0021	0.0035	0.0036	0.0029	0.0034
Selenium	mg/L	0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0007	<0.0005	0.0006	<0.0005	<0.0005	0.0013	0.0019	<0.0005	0.0008
Silver	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.001
Strontium	mg/kg		0.037	0.036	0.026	0.031	0.151	0.153	0.112	0.13	0.142	0.178	0.282	0.306	0.244	0.261
Thallium	mg/L	0.0008	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0024	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Tin	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.03	<0.01	<0.01
Uranium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	0.03	0.003	<0.001	<0.001	0.001	0.009	<0.001	<0.001	<0.001	0.058	<0.001	<0.001	<0.001	<0.001	0.002
Dissolved Metals																
Aluminum	mg/L		<0.0005	<0.005	<0.0005	<0.005	<0.0005	<0.005	<0.0005	<0.005	<0.005	<0.0005	<0.005	<0.005	<0.0005	0.028
Antimony	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.001	<0.0001	<0.0001	<0.0001
Arsenic	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0005	<0.0005	0.0018	0.0018
Barium	mg/L		0.0064	0.0067	0.0049	0.0081	0.0232	0.0214	0.0223	0.0271	0.03	0.0271	0.0409	0.0389	0.0348	0.0436
Beryllium	mg/L		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Boron	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L		<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002	0.00002	0.00003	<0.00002	<0.00002
Chromium	mg/L		<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	0.0008	<0.0006	<0.0006

Table C-1. Results of laboratory water quality analysis for dike construction monitoring stations. Results exceeding CCME guidelines are shaded grey.

Sample Date		Guideline^	1/09/19	1/16/19	2/06/19	2/18/19	1/09/19	1/17/19	2/06/19	2/18/19	3/10/19	3/17/19	1/15/19	1/21/19	2/03/19	2/18/19
Sample Name			ST-WT-DC-2 (Whale Tail South)				ST-WT-DC-6 (Mammoth Lake)				ST-WTN-DC-2 (impounded Whale Tail North)					
Parameter	Units															
Copper	mg/L	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005	< 0.0005	0.001	0.0054	0.0006	0.0017
Iron	mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	0.01	< 0.01	0.08
Lead	mg/L		< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003
Lithium	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	0.005	0.006	0.006	0.008	0.006	0.01	0.013	0.012	0.013
Manganese	mg/L		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0014	< 0.0005	< 0.0005	0.0307	0.0366	0.0281	0.0093
Mercury	mg/L	0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0024	0.0042	0.0031	0.0031
Nickel	mg/L		0.0005	0.0005	0.0007	0.0006	0.0015	0.0021	0.0016	0.002	0.0015	0.0019	0.004	0.0041	0.0021	0.0027
Selenium	mg/L		< 0.0005	0.0005	< 0.0005	< 0.0005	< 0.0005	0.0007	0.0005	< 0.0005	< 0.0005	< 0.0005	0.002	0.0026	0.0006	0.0006
Silver	mg/L		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001
Strontium	mg/L		0.03	0.037	0.03	0.031	0.128	0.142	0.137	0.131	0.165	0.172	0.288	0.313	0.272	0.267
Thallium	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.0026	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Tin	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Titanium	mg/L		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.03	< 0.01	< 0.01
Uranium	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Vanadium	mg/L	0.03	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Zinc	mg/L		< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	< 0.001	0.008	< 0.001	< 0.001	< 0.001

^CCME Water Quality Guideline for the Protection of Aquatic Life, unless otherwise indicated.

Guidelines for total metals are applied equally for dissolved metals, except for Al.

\*BC MOE guideline: [www.env.gov.bc.ca](http://www.env.gov.bc.ca)

\*\*short term limit, 25 mg/L above background (<24 h)

Table C-2. QA/QC for laboratory water quality analyses at dike construction monitoring stations.

Sample Date		MDL	1/09/19					1/09/19		
Sample Name			ST-WT-DC-2					ST-WT-DC-6		
Parameter	Units		Trip Blank	Field Blank	Duplicate	Original	RPD	Field Blank	Duplicate	Original
Conventional Parameters										
pH	N/A	-	5.77	5.47	6.74	6.71	-0.4	5.47	6.69	6.68
Hardness	mg CaCO3/L	1	< 1	< 1	18	17	-5.7	< 1	53	54
Total alkalinity, as CaCO3	mg CaCO3/L	2	3	3	10	9	-10.5	4	12	12
Total suspended solids	mg/L	1	< 1	< 1	1	< 1		< 1	< 1	1
Total organic carbon	mg/L	0.2	0.2	0.6	2.3	2	-14.0	0.3	2	2.1
Dissolved organic carbon	mg/L	0.2	< 0.2	< 0.2	2.3	2	-14.0	< 0.2	1.8	1.7
Total Dissolved Solids	mg/L	1	1	1	30	30	0.0	1	78	76
Major Ions										
Bicarbonate	mg CaCO3/L	2	3	3	10	9	-10.5	4	12	12
Carbonate	mg CaCO3/L	2	< 2	< 2	< 2	< 2		< 2	< 2	< 2
Chloride	mg/L	0.5	< 0.5	< 0.5	8.2	8	-2.5	< 0.5	29.3	29.7
Hydroxide, as CaCO3	mg CaCO3/L	2	< 2	< 2	< 2	< 2		< 2	< 2	< 2
Sulphate	mg/L	0.6	< 0.6	< 0.6	1.1	1.7	NA	2	5.6	3.7
Reactive silica	mg/kg	0.01	< 0.01	0.13	0.91	1.08	17.1	0.03	1.87	1.99
Nutrient										
Total nitrogen	mg/L	0.05	0.12	< 0.05	< 0.05	< 0.05		< 0.05	0.14	0.1
Total phosphorus	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	0.2
Total orthophosphate (as phosphorus)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
Total ammonia as NH4	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	0.02	0.03
Un-ionized Ammonia, calculated	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
Total Metals										
Aluminum	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005
Antimony	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001		< 0.0001	< 0.0001	< 0.0001
Arsenic	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Barium	mg/L	0.0005	0.0006	< 0.0005	0.0108	0.0077	-33.5	< 0.0005	0.0273	0.0277
Beryllium	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Boron	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
Cadmium	mg/L	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002		< 0.00002	< 0.00002	< 0.00002
Chromium	mg/L	0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006		< 0.0006	< 0.0006	< 0.0006
Copper	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	0.0008		< 0.0005	< 0.0005	0.0008
Iron	mg/L	0.01	< 0.01	0.01	0.02	0.03	NA	0.03	0.08	0.21
Lead	mg/L	0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003		< 0.0003	< 0.0003	0.0013
Lithium	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005	0.006	0.006
Manganese	mg/L	0.0005	< 0.0005	< 0.0005	0.0008	0.0012	NA	< 0.0005	0.0015	0.0019
Mercury	mg/L	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001		< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Nickel	mg/L	0.0005	< 0.0005	< 0.0005	0.0008	0.001	22.2	< 0.0005	0.0018	0.0019
Selenium	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Silver	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001		< 0.0001	< 0.0001	< 0.0001
Strontium	mg/kg	0.005	< 0.005	< 0.005	0.038	0.037	-2.7	< 0.005	0.15	0.151
Thallium	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002
Tin	mg/kg	0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001
Titanium	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
Uranium	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001
Vanadium	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Zinc	mg/L	0.001	0.002	0.001	0.003	0.003	0.0	0.003	0.003	0.009
Dissolved Metals										
Aluminum	mg/L	0.0005	< 0.0005	< 0.0005	< 0.005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Antimony	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001		< 0.0001	< 0.0001	< 0.0001
Arsenic	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Barium	mg/L	0.0005	< 0.0005	< 0.0005	0.0085	0.0064	-28.2	< 0.0005	0.0209	0.0232
Beryllium	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Boron	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
Cadmium	mg/L	0.00002	< 0.00002	< 0.00002	< 0.00002	< 0.00002		< 0.00002	< 0.00002	< 0.00002
Chromium	mg/L	0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006		< 0.0006	< 0.0006	< 0.0006
Copper	mg/L	0.0005	0.0009	0.0008	< 0.0005	< 0.0005		0.0011	< 0.0005	< 0.0005
Iron	mg/L	0.01	< 0.01	< 0.01	0.02	< 0.01		< 0.01	< 0.01	< 0.01
Lead	mg/L	0.0003	< 0.0003	< 0.0003	0.0003	< 0.0003		< 0.0003	< 0.0003	< 0.0003
Lithium	mg/L	0.005	< 0.005	< 0.005	< 0.005	< 0.005		< 0.005	< 0.005	< 0.005
Manganese	mg/L	0.0005	< 0.0005	< 0.0005	0.001	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Mercury	mg/L	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001		< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Nickel	mg/L	0.0005	0.001	0.0007	0.0013	0.0005	NA	0.0044	0.0013	0.0015
Selenium	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Silver	mg/L	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001		< 0.0001	< 0.0001	< 0.0001

Table C-2. QA/QC for laboratory water quality analyses at dike construction monitoring stations.

Sample Date		MDL	1/09/19					1/09/19		
Sample Name			ST-WT-DC-2					ST-WT-DC-6		
Parameter	Units		Trip Blank	Field Blank	Duplicate	Original	RPD	Field Blank	Duplicate	Original
Strontium	mg/L	0.005	< 0.005	< 0.005	0.032	0.03	-6.5	< 0.005	0.122	0.128
Thallium	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002
Tin	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001
Titanium	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01
Uranium	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001
Vanadium	mg/L	0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005
Zinc	mg/L	0.001	0.002	0.002	0.012	< 0.001		< 0.001	< 0.001	< 0.001

Trip and field blanks exceeding MDL are in **bold**.

Samples and duplicates are underlined when the associated trip or field blank exceeded the MDL and the sample result was less than

MDL = method detection limit

RPD = relative percent difference



Table C-2. QA/QC for laboratory water quality analyses at dike construction monitoring stations.

Sample Date		3/17/19					1/15/19				
Sample Name		ST-WT-DC-6					ST-WTN-DC-2				
Parameter	Units	RPD	Field Blank	Duplicate	Original	RPD	Trip Blank	Field Blank	Duplicate	Original	RPD
<b>Conventional Parameters</b>											
pH	N/A	-0.1	5.47	6.65	6.65	0.0	5.29	5.52	6.99	6.98	-0.1
Hardness	mg CaCO <sub>3</sub> /L	1.9	< 1	63	55	-13.6	< 1	< 1	79	81	2.5
Total alkalinity, as CaCO <sub>3</sub>	mg CaCO <sub>3</sub> /L	0.0	7	20	20	0.0	4	4	18	18	0.0
Total suspended solids	mg/L		< 1	< 1	< 1		< 1	< 1	1	1	0.0
Total organic carbon	mg/L	4.9	0.6	2.7	2.5	-7.7	< 0.2	0.2	2.4	2.5	4.1
Dissolved organic carbon	mg/L	-5.7	0.2	2.3	2.4	4.3	< 0.2	0.2	2.4	2.3	-4.3
Total Dissolved Solids	mg/L	-2.6	1	106	105	-0.9	1	1	115	113	-1.8
<b>Major Ions</b>											
Bicarbonate	mg CaCO <sub>3</sub> /L	0.0	7	20	20	0.0	4	4	18	18	0.0
Carbonate	mg CaCO <sub>3</sub> /L		< 2	< 2	< 2		< 2	< 2	< 2	< 2	
Chloride	mg/L	1.4	< 0.5	38.8	36.1	-7.2	< 0.5	< 0.5	48.7	45.7	-6.4
Hydroxide, as CaCO <sub>3</sub>	mg CaCO <sub>3</sub> /L		< 2	< 2	< 2		< 2	< 2	< 2	< 2	
Sulphate	mg/L	NA	< 0.6	10.4	10.3	-1.0	< 0.6	1.1	7.7	5.1	NA
Reactive silica	mg/kg	6.2	1.22	1.49	1.27	-15.9	8.65	< 0.01	1.91	1.88	-1.6
<b>Nutrient</b>											
Total nitrogen	mg/L	NA	0.12	0.23	0.16	NA	< 0.05	< 0.05	0.32	0.34	6.1
Total phosphorus	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	0.02	0.03	0.04	28.6
Total orthophosphate (as phosphorus)	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	
Total ammonia as NH <sub>4</sub>	mg/L	NA	< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	0.22	0.21	-4.7
Un-ionized Ammonia, calculated	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	
<b>Total Metals</b>											
Aluminum	mg/L		< 0.005	< 0.005	< 0.005		< 0.005	< 0.005	0.056	0.057	1.8
Antimony	mg/L		< 0.0001	< 0.0001	< 0.0001		< 0.0001	0.0003	0.0003	0.0002	NA
Arsenic	mg/L		< 0.0005	< 0.0005	< 0.0005		0.0019	< 0.0005	0.0006	< 0.0005	
Barium	mg/L	1.5	< 0.0005	0.0266	0.0283	6.2	0.0009	< 0.0005	0.0377	0.0392	3.9
Beryllium	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Boron	mg/L		< 0.01	< 0.01	< 0.01		0.05	< 0.01	< 0.01	< 0.01	
Cadmium	mg/L		< 0.00002	< 0.00002	< 0.00002		< 0.00002	< 0.00002	< 0.00002	< 0.00002	
Chromium	mg/L		< 0.0006	< 0.0006	< 0.0006		< 0.0006	< 0.0006	< 0.0006	< 0.0006	
Copper	mg/L		0.0422	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Iron	mg/L	NA	< 0.01	< 0.01	< 0.01		< 0.01	0.01	0.06	0.06	0.0
Lead	mg/L		< 0.0003	< 0.0003	< 0.0003		< 0.0003	< 0.0003	< 0.0003	< 0.0003	
Lithium	mg/L	0.0	< 0.005	0.008	0.007	-13.3	< 0.005	< 0.005	0.01	0.01	0.0
Manganese	mg/L	23.5	< 0.0005	0.0016	0.002	22.2	< 0.0005	< 0.0005	0.0299	0.0323	7.7
Mercury	mg/L		< 0.00001	< 0.00001	< 0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	
Molybdenum	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	0.0021	0.0023	9.1
Nickel	mg/L	5.4	0.0007	0.0026	0.0021	-21.3	< 0.0005	< 0.0005	0.0032	0.0035	9.0
Selenium	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	0.0012	0.0013	8.0
Silver	mg/L		< 0.0001	< 0.0001	< 0.0001		< 0.0001	< 0.0001	< 0.0001	< 0.0001	
Strontium	mg/kg	0.7	< 0.005	0.19	0.178	-6.5	< 0.005	< 0.005	0.281	0.282	0.4
Thallium	mg/L		< 0.0002	< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002	< 0.0002	
Tin	mg/kg		< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001	< 0.001	
Titanium	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	0.02	0.02	0.0
Uranium	mg/L		< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001	< 0.001	
Vanadium	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Zinc	mg/L	NA	0.075	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001	< 0.001	
<b>Dissolved Metals</b>											
Aluminum	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.005	< 0.005	< 0.005	< 0.005	
Antimony	mg/L		< 0.0001	< 0.0001	< 0.0001		< 0.0001	0.0012	0.0001	0.001	NA
Arsenic	mg/L		< 0.0005	< 0.0005	0.0006		< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Barium	mg/L	10.4	< 0.0005	0.0256	0.0271	5.7	< 0.0005	< 0.0005	0.0393	0.0409	4.0
Beryllium	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Boron	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	
Cadmium	mg/L		< 0.00002	< 0.00002	0.00002		< 0.00002	< 0.00002	< 0.00002	0.00002	
Chromium	mg/L		< 0.0006	< 0.0006	< 0.0006		< 0.0006	< 0.0006	< 0.0006	< 0.0006	
Copper	mg/L		0.0045	< 0.0005	< 0.0005		< 0.0005	< 0.0005	0.0005	0.001	NA
Iron	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	< 0.01	< 0.01	
Lead	mg/L		< 0.0003	< 0.0003	< 0.0003		< 0.0003	< 0.0003	< 0.0003	< 0.0003	
Lithium	mg/L		< 0.005	0.007	0.006	-15.4	< 0.005	< 0.005	0.009	0.01	10.5
Manganese	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	0.0296	0.0307	3.6
Mercury	mg/L		< 0.00001	< 0.00001	< 0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	
Molybdenum	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	0.0022	0.0024	8.7
Nickel	mg/L	14.3	< 0.0005	0.0023	0.0019	-19.0	< 0.0005	< 0.0005	0.0036	0.004	10.5
Selenium	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	0.0019	0.002	5.1
Silver	mg/L		< 0.0001	< 0.0001	< 0.0001		< 0.0001	< 0.0001	< 0.0001	< 0.0001	

Table C-2. QA/QC for laboratory water quality analyses at dike construction monitoring stations.

Sample Date		3/17/19					1/15/19				
Sample Name		ST-WT-DC-6					ST-WTN-DC-2				
Parameter	Units	RPD	Field Blank	Duplicate	Original	RPD	Trip Blank	Field Blank	Duplicate	Original	RPD
Strontium	mg/L	4.8	< 0.005	0.171	0.172	0.6	< 0.005	< 0.005	0.293	0.288	-1.7
Thallium	mg/L		< 0.0002	< 0.0002	< 0.0002		< 0.0002	< 0.0002	< 0.0002	< 0.0002	
Tin	mg/L		< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001	< 0.001	
Titanium	mg/L		< 0.01	< 0.01	< 0.01		< 0.01	< 0.01	0.02	0.02	0.0
Uranium	mg/L		< 0.001	< 0.001	< 0.001		< 0.001	< 0.001	< 0.001	< 0.001	
Vanadium	mg/L		< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	
Zinc	mg/L		<b>0.005</b>	<u>&lt; 0.001</u>	<u>&lt; 0.001</u>		0.001	< 0.001	< 0.001	0.008	

Trip and field blanks exceeding MDL are

Samples and duplicates are underlined 5x the measured trip or field blank result.

MDL = method detection limit

RPD = relative percent difference

## **APPENDIX D**

### **Effluent Water Quality Monitoring Results for Whale Tail Lake Dewatering**

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Table D-1. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-7. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
06/03/2019	7.15	<1	6.47	0.098				
07/03/2019	8.35	<1	6.87		7.75	0.50	6.67	0.098
08/03/2019	6.55	1	6.82		7.35	0.67	6.72	
09/03/2019	7.29	1	6.76		7.34	0.75	6.73	
10/03/2019	7.52	1	6.52		7.37	0.80	6.69	
11/03/2019	7.12	2	6.84	0.117	7.33	1.00	6.71	0.108
12/03/2019	5.71	2	NA		7.10	1.14	6.71	
13/03/2019	5.86	4	NA		6.94	1.50	6.71	
14/03/2019	7.7	<1	6.80		7.03	1.39	6.73	
15/03/2019	14.4	2	6.78		7.77	1.45	6.73	
16/03/2019	5.41	1	7.10		7.55	1.41	6.77	
17/03/2019	5.08	<1	6.90		7.35	1.33	6.79	
18/03/2019	NA	1	NA	0.081	7.35	1.31	6.79	0.099
19/03/2019	5.07	1	6.93		7.17	1.29	6.80	
20/03/2019	4.73	1	6.82		7.00	1.27	6.80	
21/03/2019	5.03	3	6.98		6.86	1.38	6.81	
22/03/2019	5.15	4	6.92		6.76	1.53	6.82	
23/03/2019	4.08	9	6.95		6.60	1.94	6.83	
24/03/2019	4.64	<1	6.78		6.49	1.87	6.83	
25/03/2019	2.51	2	NA	0.042	6.28	1.88	6.83	0.085
26/03/2019	3.39	2	NA		6.14	1.88	6.83	
27/03/2019	3.83	2	NA		6.03	1.89	6.83	
28/03/2019	3.01	3	NA		5.89	1.93	6.83	
29/03/2019	3.73	<1	7.33		5.80	1.88	6.86	
30/03/2019	3.19	<1	6.82		5.69	1.82	6.86	
31/03/2019	3.37	2	6.60		5.59	1.83	6.84	
01/04/2019	3.28	1	6.69	0.096	5.59	1.83	6.84	0.087
02/04/2019	3.85	1	6.47		5.59	1.83	6.84	
03/04/2019	4.74	3	6.81		5.56	1.87	6.84	
04/04/2019	5.59	3	6.48		5.56	1.91	6.84	
05/04/2019	6.26	3	6.71		5.50	2.00	6.86	
06/04/2019	7.42	3	6.58		5.38	2.09	6.86	
07/04/2019	7.94	3	6.50		5.33	2.16	6.84	
08/04/2019	8.01	4	6.53	0.060	5.36	2.27	6.83	0.079
03/05/2019	NA	NA	NA					
04/05/2019	12.27	9	6.86	0.129	10.14	4.17	6.63	0.095
05/05/2019	12.95	9	6.82		11.08	5.17	6.68	
06/05/2019	11.06	7	6.86	0.090	11.07	5.83	6.71	0.093
07/05/2019	11.49	3	6.90		11.16	5.83	6.75	
08/05/2019	11.35	3	6.77		11.19	5.83	6.79	
09/05/2019	7.91	4	6.93		11.17	5.83	6.86	
10/05/2019	8.34	7	6.88		10.77	6.00	6.86	
11/05/2019	9.76	6	6.78		10.64	6.00	6.85	
12/05/2019	9.95	8	6.83		10.56	6.22	6.85	
13/05/2019	9.74	8	6.63	0.105	10.48	6.40	6.83	0.108
14/05/2019	8.73	8	6.72		10.32	6.55	6.82	
15/05/2019	10.95	11	6.74		10.38	6.92	6.81	
16/05/2019	13.89	9	6.87		10.65	7.08	6.81	
17/05/2019	16.07	12	6.68		11.03	7.43	6.81	
18/05/2019		No discharge						
19/05/2019		No discharge						
20/05/2019		No discharge						
21/05/2019		No discharge						
22/05/2019		No discharge						
23/05/2019		No discharge						
24/05/2019	16.4	<1	6.91		11.39	6.97	6.81	
25/05/2019	13.7	9	7.30		11.54	7.09	6.84	
26/05/2019	9.91	11	6.80		11.44	7.32	6.84	

Table D-1. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-7. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
27/05/2019	14.48	8	6.79	0.140	11.61	7.36	6.84	0.116
28/05/2019	10.8	8	7.01		11.57	7.39	6.85	
29/05/2019	26.6	30	7.03		12.32	8.53	6.86	
29/05/2019	22.43	88	7.15		12.58	11.93	6.85	
30/05/2019		No discharge			12.80	12.31	6.87	
31/05/2019		No discharge						
01/06/2019		No discharge						
02/06/2019		No discharge						
03/06/2019		No discharge						
04/06/2019		No discharge						
05/06/2019		No discharge						
06/06/2019		No discharge						
07/06/2019		No discharge						
08/06/2019		No discharge						
09/06/2019		No discharge						
10/06/2019		No discharge						
11/06/2019		No discharge						
12/06/2019		No discharge						
13/06/2019		No discharge						
14/06/2019		No discharge						
15/06/2019		No discharge						
16/06/2019		No discharge						
17/06/2019		No discharge						
18/06/2019		No discharge						
19/06/2019		No discharge						
20/06/2019		No discharge						
21/06/2019		No discharge						
22/06/2019		No discharge						
23/06/2019		No discharge						
24/06/2019		No discharge						
25/06/2019		No discharge						
26/06/2019		No discharge						
27/06/2019		No discharge						
28/06/2019		No discharge						
29/06/2019		No discharge						
30/06/2019		No discharge						
01/07/2019		No discharge						
02/07/2019		No discharge						
03/07/2019		No discharge						
04/07/2019		No discharge						
05/07/2019		No discharge						
06/07/2019		No discharge						
07/07/2019		No discharge						
08/07/2019		No discharge						
09/07/2019	9.9	6	7.01		9.90	6.00	7.01	
10/07/2019	12.5	7	6.7	0.145	11.20	6.50	6.86	0.145
11/07/2019	16.1	3	6.84		12.83	5.33	6.85	
12/07/2019	17.87	10	6.66		14.09	6.50	6.80	
13/07/2019	15.1	4	6.22		14.29	6.00	6.69	
14/07/2019	15.25	7	7.28		14.45	6.17	6.79	
15/07/2019	14.81	3	7.14	0.082	14.50	5.71	6.84	0.114
16/07/2019	13.86	4	6.72		14.46	5.50	6.82	
17/07/2019	14.71	11	6.83		14.46	6.11	6.82	
18/07/2019	15.18	6	6.85		14.53	6.10	6.83	
19/07/2019		No discharge						
20/07/2019		No discharge						
21/07/2019		No discharge						
22/07/2019		No discharge						

Table D-1. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-7. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
23/07/2019		No discharge						
24/07/2019		No discharge						
25/07/2019		No discharge						
26/07/2019		No discharge						
27/07/2019		No discharge						
28/07/2019		No discharge						
29/07/2019		No discharge						
30/07/2019		No discharge						
31/07/2019		No discharge						
01/10/2019		No discharge						
02/10/2019		No discharge						
03/10/2019		No discharge						
04/10/2019	6.96	8	7.35	0.110	6.96	8.00	7.35	0.110
05/10/2019	5.39	4	7.74		6.18	6.00	7.55	
06/10/2019	4.84	3	7.80		5.73	5.00	7.63	
07/10/2019	5.51	4	7.62	0.120	5.68	4.75	7.63	0.115
08/10/2019	5.34	<1	7.54		5.61	3.90	7.61	
09/10/2019	4.80	<1	7.78		5.47	3.33	7.64	
10/10/2019	29.3	91	7.53		8.88	15.86	7.62	
11/10/2019	4.76	5	7.36	0.103	8.36	14.50	7.59	0.111
12/10/2019	4.54	11	7.43		7.94	14.11	7.57	
13/10/2019	4.90	2	7.67		7.63	12.90	7.58	
14/10/2019	3.50	10	7.44	0.072	7.26	12.64	7.57	0.101
15/10/2019	4.74	4	7.79		7.05	11.92	7.59	
16/10/2019	4.11	9	7.24		6.82	11.69	7.56	
17/10/2019	4.98	3	7.34	0.130	6.69	11.07	7.55	0.107
18/10/2019	5.61	6	7.85		6.62	10.73	7.57	
19/10/2019	6.69	6	7.41		6.62	10.44	7.56	
20/10/2019	4.08	8	7.68		6.47	10.29	7.56	
21/10/2019	3.41	3	7.68	0.041	6.30	9.89	7.57	0.096
22/10/2019	3.49	5	7.07		6.16	9.63	7.54	
23/10/2019	3.80	5	7.89		6.04	9.40	7.56	
24/10/2019	3.32	3	7.68	0.084	5.91	9.10	7.57	0.094
25/10/2019	4.61	4	7.34		5.85	8.86	7.56	
26/10/2019	4.63	2	7.39		5.80	8.70	7.55	
27/10/2019	3.38	6	7.89		5.70	8.58	7.56	
28/10/2019	8.42	17	7.36	0.259	5.80	8.92	7.55	0.115
28/10/2019	80.1	NA	NA		8.73	8.96	7.56	
29/10/2019	11.9	26	7.32		8.78	9.58	7.55	
30/10/2019	5.66	8	7.35		8.67	9.52	7.54	
31/10/2019	4.41	11	7.51	0.111	8.52	9.57	7.54	0.115
01/11/2019	4.43	4	7.59		8.39	9.38	7.54	
02/11/2019	4.18	7	7.37		8.29	9.34	7.54	
03/11/2019		No discharge			8.39	9.54	7.53	
04/11/2019		No discharge			8.52	9.78	7.52	
05/11/2019		No discharge			8.63	10.00	7.52	
06/11/2019		No discharge			8.76	10.38	7.52	
07/11/2019	16.6	17	7.16	0.279	9.21	11.04	7.49	0.135
08/11/2019	15.7	4	7.77		8.69	7.56	7.50	
09/11/2019	4.21	9	7.19		8.67	7.72	7.50	
10/11/2019	5.23	4	7.31		8.70	7.44	7.49	
11/11/2019	4.48	6	6.9	0.036	8.68	7.60	7.46	0.127
12/11/2019	3.28	4	7.18		8.67	7.36	7.45	
13/11/2019	1.20	3	7.08		8.54	7.32	7.42	
14/11/2019	0.96	8	6.31	0.025	8.41	7.28	7.38	0.121
15/11/2019	3.35	4	6.88		8.35	7.32	7.37	
16/11/2019	0.77	1	6.89		8.17	7.12	7.33	
17/11/2019	0.77	<1	7.30		7.94	6.90	7.32	

Table D-1. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-7. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
18/11/2019	0.93	<1	6.97	0.006	7.82	6.60	7.30	0.105
19/11/2019	1.61	4	6.90		7.75	6.64	7.26	
20/11/2019	3.31	9	7.17		7.74	6.80	7.27	
21/11/2019	2.03	6	6.75	0.045	7.67	6.84	7.22	0.106
22/11/2019	1.95	1	6.86		7.62	6.76	7.19	
23/11/2019	2.13	3	6.86		7.52	6.72	7.17	
24/11/2019	2.05	2	6.80		7.42	6.60	7.15	
25/11/2019	1.95	2	6.90	0.010	7.37	6.44	7.11	0.096
26/11/2019	1.70	<1	6.57		7.11	5.78	7.08	
27/11/2019	2.66	2	6.80		4.13	5.63	7.07	
28/11/2019	3.29	<1	6.87		3.80	4.65	7.05	
29/11/2019	0.70	4	7.10	<0.005	3.61	4.50	7.04	0.064
30/11/2019	0.95	3	7.03		3.48	4.19	7.02	
01/12/2019	0.71	1	7.07		3.33	4.08	7.00	
02/12/2019	1.18	<1	7.12	0.006	3.22	3.83	6.99	0.051
03/12/2019	2.76	7	6.73		3.20	3.94	6.98	
04/12/2019	0.63	7	7.40		3.11	4.05	7.00	
05/12/2019	0.54	9	7.28	<0.005	3.02	4.22	7.01	0.046
06/12/2019	0.67	9	7.10		2.94	4.38	7.01	
07/12/2019	2.55	5	7.42		2.48	3.98	7.02	
08/12/2019	0.83	5	7.62		1.98	4.02	7.01	
09/12/2019	1.13	5	7.05	<0.005	1.88	3.88	7.01	0.015
10/12/2019	0.72	2	7.06		1.73	3.82	7.00	
11/12/2019	0.81	2	7.20		1.60	3.68	7.01	
12/12/2019	0.76	3	7.00	<0.005	1.52	3.65	7.00	0.011
13/12/2019	0.74	3	6.93		1.50	3.65	7.00	
14/12/2019	0.74	4	6.79		1.50	3.52	7.01	
15/12/2019	0.59	3	6.97		1.41	3.48	7.02	
16/12/2019	0.37	3	7.47	<0.005	1.39	3.55	7.04	0.009
17/12/2019	0.37	7	7.42		1.38	3.77	7.04	
18/12/2019	0.59		6.78		1.37	3.88	7.03	
19/12/2019	0.48	1	7.72	<0.005	1.33	3.78	7.06	0.008
20/12/2019	1.54	2	6.73		1.27	3.53	7.05	
21/12/2019	0.84	1	7.03		1.23	3.36	7.06	
22/12/2019	0.96	2	6.97		1.20	3.40	7.06	
23/12/2019	1.13	1	6.96	<0.005	1.16	3.33	7.06	0.004
24/12/2019	1.51	<1	6.60		1.15	3.28	7.06	
25/12/2019	0.84	<1	7.29		1.11	3.22	7.07	
26/12/2019	0.83	<1	7.13		1.08	3.22	7.09	
27/12/2019	0.85	1	7.29		1.02	3.19	7.10	
28/12/2019	0.56	<1	6.95		0.93	3.19	7.11	
29/12/2019	0.81	1	7.05		0.93	3.09	7.11	
30/12/2019	0.91	<1	7.11		0.93	3.00	7.11	
31/12/2019	0.94	2	7.09		0.94	3.03	7.11	

1 - Field-measured

2- Laboratory-measured

1/2 detection limit use in the mean calculation

Table D-2. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-9. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminium <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
17/06/2019	0.04	NA	6.66					
22/06/2019	0.52	2	6.60		0.28	2.00	6.63	
23/06/2019	0.17	1	6.44		0.24	1.50	6.57	
24/06/2019	0.01	2	6.42	< 0.005	0.19	1.67	6.53	0.0025
25/06/2019	0.3	3	6.74		0.21	2.00	6.57	
26/06/2019	0.72	5	6.60		0.29	2.60	6.58	
27/06/2019	0.99	5	6.65		0.39	3.00	6.59	
28/06/2019	1.04	1	6.53		0.47	2.71	6.58	
29/06/2019	Pump shut down in the morning before sampling				0.47	2.71	6.58	
30/06/2019	0.21	5	6.56	< 0.005	0.44	3.00	6.58	0.0025
01/07/2019		No sampling			0.44	3.00	6.58	
02/07/2019	0.02	3	6.61	0.039	0.40	3.00	6.58	0.0147
03/07/2019	0	2	7.26		0.37	2.90	6.64	
04/07/2019	1.03	12	6.84		0.42	3.73	6.66	
05/07/2019	3.05	9	6.49		0.62	4.17	6.65	
06/07/2019	0	5	6.60		0.58	4.23	6.64	
07/07/2019	0.16	1	6.51		0.55	4.00	6.63	
08/07/2019	0.46	5	6.53	0.034	0.55	4.07	6.63	0.0195
09/07/2019		No discharge			0.55	4.07	6.63	
10/07/2019		No discharge			0.55	4.07	6.63	
11/07/2019		No discharge			0.55	4.07	6.63	
12/07/2019		No discharge			0.55	4.07	6.63	
13/07/2019	12.91	6	6.66		1.27	4.19	6.63	
14/07/2019	15.68	2	7.27		2.07	4.06	6.67	
15/07/2019	13.71	8	7.09	0.113	2.69	4.28	6.69	0.0382
16/07/2019	12.95	7	6.79		3.20	4.42	6.69	
17/07/2019	14.34	11	6.79		3.73	4.75	6.70	
18/07/2019	15.34	8	6.72		4.26	4.90	6.70	
19/07/2019	14.86	7	6.91		4.72	5.00	6.71	
20/07/2019	15.07	7	7.19		5.15	5.09	6.73	
21/07/2019	13.76	3	6.82		5.72	5.00	6.73	
22/07/2019	14.42	3	6.94	< 0.005	6.30	5.04	6.75	0.0323
23/07/2019	12.2	5	7.23		6.80	5.21	6.78	
24/07/2019	17.82	6	6.67		7.54	5.38	6.79	
25/07/2019	NA	9	7.1		7.86	5.63	6.81	
26/07/2019	12	7	7.13		8.35	5.71	6.83	
27/07/2019	8.4	7	7.05		8.67	5.79	6.85	
28/07/2019	8.18	8	6.93		8.98	6.08	6.86	
29/07/2019	9.15	8	6.96	0.14	8.99	6.16	6.87	0.0552
30/07/2019	9.7	10	7		9.38	6.36	6.88	
31/07/2019	14.1	10	6.93		9.57	6.50	6.89	
01/08/2019	14.24	5	6.8		10.14	6.58	6.89	
02/08/2019	14.53	9	7.31		10.72	6.85	6.89	
03/08/2019	18.48	8	6.6		11.42	6.69	6.89	
04/08/2019		No discharge			11.77	6.60	6.90	
05/08/2019	18.96	12	6.92	0.133	12.56	6.88	6.91	0.0845
06/08/2019	18.52	14	6.96		13.32	7.40	6.93	
07/08/2019	22.01	8	6.67		14.22	7.52	6.94	
08/08/2019	18.6	9	6.74		14.40	7.58	6.93	
09/08/2019	13.8	9	7.03		14.37	7.63	6.93	
10/08/2019	15.3	8	7.19		14.41	7.64	6.94	
11/08/2019	14.5	8	6.88		14.41	7.66	6.94	
12/08/2019	13.8	8	7.37	0.172	14.44	7.72	6.97	0.1121
13/08/2019	19.2	6	6.99		14.57	7.86	6.96	
14/08/2019	12.7	9	6.73		14.53	7.90	6.94	
15/08/2019	12.4	7	6.59		14.51	7.90	6.94	



Table D-2. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-9. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminium <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminum <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
16/08/2019	1.91	8	6.55		14.07	7.79	6.93	
17/08/2019	1.69	21	6.64		13.58	8.24	6.93	
18/08/2019	2.22	30	6.65		13.13	9.03	6.92	
19/08/2019	2.74	<1	6.40	0.023	12.69	8.81	6.89	0.0941
20/08/2019	3.46	15	6.65		12.32	9.22	6.88	
21/08/2019	3.59	14	7.36		11.94	9.60	6.90	
22/08/2019	3.71	7	7.25		11.63	9.67	6.90	
23/08/2019	4.69	NA	6.79		11.16	9.80	6.90	
24/08/2019	2.71	2	6.92		10.87	9.55	6.90	
25/08/2019	2.44	4	7.35		10.54	9.45	6.90	
26/08/2019	2.72	4	7.19	< 0.005	10.35	9.34	6.91	0.0941
27/08/2019	1.39	4	7.25		10.11	9.20	6.92	
28/08/2019	3.01	5	7.5		9.90	9.09	6.94	
29/08/2019	3.64	4	7.54		9.69	8.88	6.96	
30/08/2019	2.35	6	7.46		9.29	8.73	6.98	
31/08/2019	1.50	NA	6.99		8.85	8.87	6.98	
01/09/2019	2.88	3	7.19		8.45	8.65	6.98	
02/09/2019	3.71	4	6.86	0.042	7.94	8.50	6.99	0.0745
03/09/2019	4.39	5	7.26		7.82	8.38	7.00	
04/09/2019	6.33	6	7.31		7.40	8.16	7.01	
05/09/2019	1.62	4	7.08		6.83	7.80	7.01	
06/09/2019	3.12	7	7.15		6.20	7.77	7.03	
07/09/2019	1.80	5	6.31		5.64	7.63	7.01	
08/09/2019	7.88	6	7.08		5.45	7.52	7.02	
09/09/2019	1.92	8	6.83	< 0.005	5.00	7.52	7.00	0.0484
10/09/2019	1.96	16	7.43		4.58	7.80	7.02	
11/09/2019	1.98	6	7.26		4.19	7.73	7.02	
12/09/2019	3.73	NA	6.71		3.67	7.80	7.01	
13/09/2019	1.46	11	6.44		3.30	7.87	7.00	
14/09/2019	2.70	15	7.27		2.98	8.17	7.02	
15/09/2019	2.35	14	7.16		2.99	8.39	7.04	
16/09/2019	16.9	18	7.01		3.50	8.28	7.06	
17/09/2019	15.7	13	7.41	0.12	3.95	7.65	7.08	0.0380
18/09/2019	2.68	9	8.04		3.94	7.96	7.14	
19/09/2019	1.68	5	7.25		3.88	7.59	7.16	
20/09/2019	2.5	6	7.37		3.85	7.30	7.16	
21/09/2019	3.26	5	7.29		3.83	7.22	7.16	
22/09/2019	2.11	3	6.54		3.75	7.07	7.15	
23/09/2019	2.01	7	6.83		3.72	7.25	7.15	
24/09/2019	4.28	8	6.92		3.79	7.39	7.13	
25/09/2019	1.39	7	6.57		3.74	7.50	7.11	
26/09/2019	1.46	6	6.9		3.74	7.57	7.10	
27/09/2019	3.01	3	6.73		3.74	7.50	7.07	
28/09/2019	1.48	5	6.89		3.67	7.54	7.05	
29/09/2019		No discharge			3.72	7.59	7.04	
30/09/2019		No discharge			3.80	7.59	7.04	
01/10/2019		No discharge			3.83	7.77	7.03	
02/10/2019	2.38	4	6.80	0.056	3.78	7.77	7.03	0.0595
03/10/2019	5.93	7	6.95		3.84	7.85	7.02	
04/10/2019	5.98	7	7.61		3.82	7.88	7.03	
05/10/2019	2.51	5	7.53		3.86	7.92	7.05	
06/10/2019	2.15	7	7.14		3.82	7.92	7.05	
07/10/2019	3.14	5	7.18	0.053	3.87	7.92	7.08	0.0579
08/10/2019	2.89	<1	6.96		3.69	7.71	7.07	
09/10/2019	3.59	<1	7.41		3.75	7.42	7.10	
10/10/2019	2.41	2	6.87		3.77	6.88	7.08	

Table D-2. Water quality monitoring results and calculated means for comparison to NWB Water License criteria for dewatering effluent station ST-DD-9. As reported monthly to NWB in 2019.

Date	Daily Measurements				30-d Mean			
	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminium <sup>2</sup>	Turbidity <sup>1</sup>	TSS <sup>2</sup>	pH <sup>1</sup>	Total Aluminium <sup>2</sup>
	NWB Water License Criteria (STM)				NWB Water License Criteria (MMM)			
	30 NTU	22.5 mg/L	6.0 - 9.0	3 mg/L	15 NTU	15 mg/L	6.0 - 9.0	1.5 mg/L
11/10/2019	5.08	4	7.10		3.88	6.81	7.07	
12/10/2019	5.74	4	7.16		3.95	6.70	7.09	
13/10/2019	1.37	15	7.26		3.95	6.85	7.12	
14/10/2019	1.13	18	7.10	0.043	3.89	6.96	7.11	0.0680
15/10/2019	1.74	3	7.44		3.87	6.56	7.12	
16/10/2019	1.84	16	7.01		3.31	6.48	7.12	
17/10/2019	4.30	6	6.92		2.89	6.22	7.10	
18/10/2019	1.73	4	7.12		2.86	6.04	7.07	
19/10/2019	1.85	3	7.03		2.86	5.96	7.06	
20/10/2019	1.37	1	7		2.82	5.78	7.05	
21/10/2019	1.37	4	6.66	0.017	2.75	5.74	7.02	0.0423
22/10/2019	1.77	4	6.74		2.74	5.78	7.03	
23/10/2019	2.76	6	6.86		2.76	5.74	7.03	
24/10/2019	1.60	7	6.88		2.67	5.70	7.03	
25/10/2019	2.14	7	6.69		2.69	5.70	7.03	
26/10/2019	1.03	9	6.97		2.68	5.81	7.04	
27/10/2019		No discharge						
28/10/2019		No discharge						
29/10/2019		No discharge						
30/10/2019		No discharge						
31/10/2019		No discharge						
		...						
31/12/2019		No discharge						

1 - Field-measured

2- Laboratory-measured

1/2 detection limit use in the mean calculation

Table D-3. QA/QC results for water quality analysis at dewatering effluent station ST-DD-7.

ST-DD-7 QAQC	Sample Date	MDL	3/11/19			3/18/19			4/01/19		4/08/19			5/13/19		
Parameter	Unit		Duplicate	Original	RPD	Duplicate	Original	RPD	Duplicate	Original	Duplicate	Original	RPD	Duplicate	Original	RPD
Conventional Parameters																
pH	pH units		-	-		-	-		6.79	6.78	-	-		-	-	
Total suspended solids	mg/L	1	2	2		1	1		1	1	3	4		8	8	
Turbidity	NTU		3.41	3.31		1.98	2.22		2.08	2.28	3.95	4.37		5.64	6.39	
Total Metals																
Aluminum	mg/L	0.005	0.055	0.117	72.09	0.087	0.081	-7.14	0.045	0.096	0.054	0.06	10.53	0.148	0.105	-33.99

ST-DD-7 QAQC	Sample Date	MDL	5/27/19			10/04/19					10/11/19			10/31/19		
Parameter	Unit		Duplicate	Original	RPD	Trip Blank	Field Blank	Duplicate	Original	RPD	Field Blank	Duplicate	Original	Field Blank	Duplicate	Original
Conventional Parameters																
pH	pH units		-	-		-	-	-	-		-	-	-	-	-	-
Total suspended solids	mg/L	1	15	8		1	1	8	8		1	8	5	1	10	11
Turbidity	NTU		2.9	5.53		-	-	-	-		0.16	2.95	3.24	-	-	-
Nutrients and Chlorophyll a																
Total phosphorus	mg/L	0.01	-	-		-	-	-	-		-	-	-	-	-	-
Total Metals																
Aluminum	mg/L	0.005	11.05	0.14	-195.00	0.01	0.01	0.14	0.11	-24.00	-	-	0.103	-	-	0.111

ST-DD-7 QAQC	Sample Date	MDL	11/01/19			11/08/19		11/11/19			11/14/19		11/18/19		
Parameter	Unit		Trip Blank	Duplicate	Original	Duplicate	Original	Trip Blank	Duplicate	Original	Duplicate	Original	Trip Blank	Duplicate	Original
Conventional Parameters															
pH	pH units		-	-	-	-	-	-	-	-	-	-	-	-	-
Total suspended solids	mg/L	1	2	4	4	17	4	1	6	6	4	8	1	1	1
Turbidity	NTU		-	-	-	7.58	20.8	0.75	2.68	2.5	2.25	2.43	0.5	1.24	1.5
Nutrients and Chlorophyll a															
Total phosphorus	mg/L	0.01	-	-	-	-	-	0.01	0.01	0.01	-	-	-	-	-
Total Metals															
Aluminum	mg/L	0.005	-	-	-	-	-	0.005	0.068	0.036	0.018	0.025	0.005	0.007	0.006

ST-DD-7 QAQC	Sample Date	MDL	12/03/19			12/09/19			12/12/19		
Parameter	Unit		Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original
Conventional Parameters											
pH	pH units		-	-	-	-	-	-	-	-	-
Total suspended solids	mg/L	1	1	7	7	1	7	5	1	5	3
Turbidity	NTU		-	-	-	-	-	-	0.42	1.13	1.43
Nutrients and Chlorophyll a											
Total phosphorus	mg/L	0.01	-	-	-	0.01	0.01	0.01	-	-	-
Total Metals											
Aluminum	mg/L	0.005	-	-	-	0.005	0.005	0.005	0.005	0.005	0.005

Table D-3. QA/QC results for water quality analysis at dewatering effluent station ST-DD-7.

ST-DD-7 QAQC	Sample Date	MDL	12/16/19			12/22/19			12/31/19		
Parameter	Unit		Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original
Conventional Parameters											
pH	pH units		-	-	-	-	-	-	-	-	-
Total suspended solids	mg/L	1	1	3	3	1	2	2	1	1	2
Turbidity	NTU		0.38	1.17	0.91	0.07	0.94	1.05	0.08	1.2	1.27
Nutrients and Chlorophyll a											
Total phosphorus	mg/L	0.01	-	-	-	-	-	-	-	-	-
Total Metals											
Aluminum	mg/L	0.005	0.005	0.005	0.005	-	-	-	-	-	-

Trip and field blanks exceeding MDL are in **bold**.

Samples and duplicates are underlined when the associated trip or field blank exceeded the MDL and the sample result was less than 5x the measured trip or field blank result.

MDL = method detection limit

RPD = relative percent difference (calculated when duplicate and original samples are >10x MDL)

Table D-4. QA/QC results for water quality analysis at dewatering effluent monitoring location ST-DD-9.

ST-DD-9 QA/QC	Sample Date	MDL	6/09/19		6/24/19			6/30/19		7/02/19		7/08/19		7/22/19			
Parameter	Units		Trip Blank	Original	Trip Blank	Duplicate	Original	Duplicate	Original	Duplicate	Original	Duplicate	Original	Trip Blank	Duplicate	Original	RPD
<b>Conventional Parameters</b>																	
Total suspended solids	mg/L	1	2	3	1	3	2	4	5	3	3	4	5	1	4	3	-28.6
Turbidity	NTU		-	-		-	-	-	-	-	-	-	-		-	-	
<b>Nutrients and Chlorophyll a</b>																	
Total phosphorus	mg/L	0.01	-	-		-	-	-	-	-	-	-	-		-	-	
<b>Total Metals</b>																	
Aluminum	mg/L	0.005	0.029	0.008	0.005	0.198	0.005	0.005	0.005	0.005	0.039	0.037	0.034	0.005	0.076	0.09	16.9

ST-DD-9 QA/QC	Sample Date	MDL	8/05/19				8/06/19				8/12/19				8/19/19		
Parameter	Units		Trip Blank	Duplicate	Original	RPD	Trip Blank	Duplicate	Original	RPD	Trip Blank	Duplicate	Original	RPD	Trip Blank	Duplicate	Original
<b>Conventional Parameters</b>																	
Total suspended solids	mg/L	1	1	14	12	-15.4	1	13	14	7.4	1	9	8	11.76	1	2	1
Turbidity	NTU			-	-			-	-			-	-	-		-	-
<b>Nutrients and Chlorophyll a</b>																	
Total phosphorus	mg/L	0.01		-	-			-	-			-	-	-		-	-
<b>Total Metals</b>																	
Aluminum	mg/L	0.005	0.005	0.142	0.133	-6.5	-	-	-		0.005	0.19	0.172	9.94	0.01	0.034	0.023

ST-DD-9 QA/QC	Sample Date	MDL	8/29/19			9/03/19			9/05/19		9/09/19			9/26/19		
Parameter	Units		Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original	Trip Blank	Original	Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original
<b>Conventional Parameters</b>																
Total suspended solids	mg/L	1	1	5	4	1	4	5	1	4	1	20	8	1	5	6
Turbidity	NTU			-	-		-	-		-		-	-		-	-
<b>Nutrients and Chlorophyll a</b>																
Total phosphorus	mg/L	0.01		-	-		-	-		-		0.01	0.02		-	-
<b>Total Metals</b>																
Aluminum	mg/L	0.005	-	-	-	-	-	-	-	-	0.005	0.044	0.005	-	-	-

ST-DD-9 QA/QC	Sample Date	MDL	10/02/19			10/03/19		10/08/19			10/10/19	
Parameter	Units		Trip Blank	Duplicate	Original	Trip Blank	Original	Trip Blank	Duplicate	Original	Trip Blank	Original
<b>Conventional Parameters</b>												
Total suspended solids	mg/L	1	1	5	4	1	7	1	2	1	1	2
Turbidity	NTU			-	-		-		-	-		-
<b>Nutrients and Chlorophyll a</b>												
Total phosphorus	mg/L	0.01		-	-		-		-	-		-
<b>Total Metals</b>												
Aluminum	mg/L	0.005	-	-	0.056	-	-	-	-	-	-	-

Table D-4. QAQC results for water quality analysis at dewatering effluent monitoring location ST-DD-9.

ST-DD-9 QAQC	Sample Date	MDL	10/14/19				10/19/19		
Parameter	Units		Trip Blank	Duplicate	Original	RPD	Field Blank	Duplicate	Original
Conventional Parameters									
Total suspended solids	mg/L	1	1	56	37	40.86	1	2	3
Turbidity	NTU			-	-	-	0.34	3.2	3.36
Nutrients and Chlorophyll a									
Total phosphorus	mg/L	0.01		-	0.02	-		-	-
Total Metals									
Aluminum	mg/L	0.005	0.005	0.062	0.043	36.19		-	-

Trip and field blanks exceeding MDL are in **bold**.

Samples and duplicates are underlined when the associated trip or field blank exceeded the MDL and the sample result was less than 5x the measured trip or field blank result.

MDL = method detection limit

RPD = relative percent difference (calculated when duplicate and original samples are >10x MDL)

Table D-5. Water quality monitoring results for dewatering effluent station ST-DD-8 (field- and laboratory-measured).

ST-DD-8	Sample Date	Guideline <sup>^</sup>	3/11/19	3/17/19	4/07/19	5/05/19	5/05/19	5/13/19	5/25/19	7/13/19	7/17/19	10/04/19	11/08/19	11/13/19	11/18/19	11/25/19
	Sample Depth															
Parameter	Unit															
<b>Field Measured</b>																
pH	pH units	6.5-9	-	-	6.51	-	-	6.62	-	6.92	6.92	7.34	7.43	7.35	7.06	6.99
Conductivity	uS/cm		-	-	152	-	-	136.8	-	114.7	109.2	75	83.1	76.3	77	84.3
Temperature	°C		-	-	1.22	-	-	3.68	-	6.41	12.78	2.39	1.22	1.71	0.96	0.91
Dissolved oxygen	mg/L		-	-	13.8	-	-	15.12	-	11.5	9.81	13.31	12.1	12.9	13.65	13.22
Dissolved oxygen	%		-	-	-	-	-	-	-	95.5	95.2	99.7	90.8	92	94.9	92.3
Total dissolved solids	ppm		-	-	-	-	-	-	-	1.7	-	-	-	-	-	-
Turbidity	NTU		2.24	-	1.55	-	-	0.25	-	0	0	3.7	1.74	1.2	0.9	0.83
Total Suspended Solids, field measured	mg/L	26**	-	-	-	-	-	-	-	-	2	4	-	-	-	-
<b>Conventional Parameters</b>																
Total suspended solids	mg/L	26**	1	< 1	2	17	13	4	< 1	< 1	9	3	1	10	2	< 1

<sup>^</sup>CCME Guideline for the Protection of Aquatic Life

\*\*short term limit, 25 mg/L above background (<24 h)

Table D-5. Water quality monitoring results for dewatering effluent station ST-DD-8 (field- and laboratory-measured).

ST-DD-8	Sample Date	Guideline <sup>^</sup>	11/25/19	11/25/19	11/25/19	11/25/19	11/25/19	11/25/19	11/25/19	12/06/19	12/12/19	12/12/19	12/12/19	12/12/19	12/12/19	12/12/19
	Sample Depth		1-2 m	2-3 m	3-4 m	4-5 m	5-6 m	6-7 m				1-2 m	2-3 m	3-4 m	4-5 m	5-6 m
Parameter	Unit															
<b>Field Measured</b>																
pH	pH units	6.5-9	7	7	6.99	6.94	7	7.03	7.54	6.62	6.77	6.66	6.62	6.62	6.62	6.61
Conductivity	uS/cm		84.6	83.1	84.3	86.1	85.3	86.5	91	96.5	91.7	84.6	96.5	104.4	106.9	
Temperature	°C		0.62	0.87	0.91	0.94	1.01	1.12	0.5	0.86	0.35	0.85	0.86	0.89	0.82	
Dissolved oxygen	mg/L		13.6	13.26	13.22	13.2	13.16	13.14	14.58	13.62	13.81	13.72	13.62	13.55	13.48	
Dissolved oxygen	%		-	-	-	-	-	-	101.4	85.4	-	-	-	-	-	
Total dissolved solids	ppm		-	-	-	-	-	-	-	-	-	-	-	-	-	
Turbidity	NTU		-	-	0.83	-	-	-	0.77	1.15	-	-	1.15	-	-	
Total Suspended Solids, field measured	mg/L	26**	-	-	0.18	-	-	-	-	-	-	-	0.26	-	-	
<b>Conventional Parameters</b>																
Total suspended solids	mg/L	26**	-	-	-	-	-	-	4	3	-	-	-	-	-	

<sup>^</sup>CCME Guideline for the Protection of Aquatic Life

\*\*short term limit, 25 mg/L above background (<24 h)



Table D-5. Water quality monitoring results for dewatering effluent station ST-DD-8 (field- and laboratory-measured).

ST-DD-8	Sample Date	Guideline <sup>^</sup>	12/12/19	12/16/19	12/16/19	12/16/19	12/16/19	12/16/19	12/16/19	12/16/19	12/16/19	12/28/19	12/28/19	12/28/19	12/28/19	12/28/19
	Sample Depth		6-7 m	1-2 m	2-3 m	3-4 m	4-5 m	5-6 m	6-7 m				2-3 m	3-4 m	4-5 m	5-6 m
Parameter	Unit															
<b>Field Measured</b>																
pH	pH units	6.5-9	6.6	6.57	6.64	6.57	6.53	6.48	6.39	6.97	6.92	6.89	6.81	6.77	6.78	
Conductivity	uS/cm		104	92.2	85	97.8	96.6	96.1	97.1	99.8	96.9	97.2	106.4	108.8	105.8	
Temperature	°C		1.05	0.26	2.78	0.82	0.92	1.02	1.16	0.72	0.27	0.58	0.72	0.85	0.99	
Dissolved oxygen	mg/L		13.38	15.7	13.18	13.07	13.91	12.86	12.88	13.22	14.41	13.98	14.24	14.12	13.94	
Dissolved oxygen	%		-	-	-	-	-	-	-	92.6	99.5	97.9	99.5	99.1	97.9	
Total dissolved solids	ppm		-	-	-	-	-	-	-	-	-	-	-	-	-	
Turbidity	NTU		-	-	-	0.55	-	-	-	0.55	0.58	-	0.58	-	-	
Total Suspended Solids, field measured	mg/L	26**	-	-	-	0.12	-	-	-	-	0	-	0.13	-	-	
<b>Conventional Parameters</b>																
Total suspended solids	mg/L	26**	-	-	-	-	-	-	-	5	< 1	-	-	-	-	

<sup>^</sup>CCME Guideline for the Protection of Aquatic Life

\*\*short term limit, 25 mg/L above background (<24 h)

Table D-5. Water quality monitoring results for dewatering effluent station ST-DD-8 (field- and laboratory-measured).

ST-DD-8	Sample Date	Guideline <sup>^</sup>	12/29/19	12/29/19	12/29/19	12/29/19	12/29/19	12/29/19
	Sample Depth			2-3 m	3-4 m	4-5 m	5-6 m	6-7 m
Parameter	Unit							
<b>Field Measured</b>								
pH	pH units	6.5-9	6.78	6.75	6.63	6.64	6.64	6.64
Conductivity	uS/cm		104.1	88.2	99.1	104.5	108.9	109.3
Temperature	°C		1.49	0.7	0.72	0.91	1	1.18
Dissolved oxygen	mg/L		12.69	13.64	13.64	13.42	13.44	13.35
Dissolved oxygen	%		91.2	95.3	94.9	94.2	94.6	94.3
Total dissolved solids	ppm		-	-	-	-	-	-
Turbidity	NTU		0.65	-	0.65	-	-	-
Total Suspended Solids, field measured	mg/L	26**	4	-	0.14	-	-	-
<b>Conventional Parameters</b>								
Total suspended solids	mg/L	26**	< 1	-	-	-	-	-

<sup>^</sup>CCME Guideline for the Protection of Aquatic Life

\*\*short term limit, 25 mg/L above background (<24 h)

Table D-6. Water quality monitoring results for dewatering effluent station ST-DD-10 (field-and laboratory-measured).

ST-DD-10	Sample Date	Guideline^	7/03/19	7/07/19	7/17/19	7/25/19	7/25/19	7/25/19	7/25/19	7/25/19	7/25/19	7/25/19	7/29/19	7/29/19	7/29/19	7/29/19
	Sample Depth						0-1 m	1-2 m	2-3 m	3-4 m	4-5 m		0-1 m	1-2 m	2-3 m	
Parameter	Unit															
Field Measured																
pH	pH units	6.5-9	-	6.87	6.89	7.04	7.2	7.2	7.2	7.2	7.2	6.92	6.79	6.85	6.88	
Conductivity	uS/cm		-	117	104.2	134	134.6	133.8	134.3	134.1	135.8	112.6	108.6	106.4	112.5	
Temperature	°C		-	5.79	14.16	13.43	12.1	12.09	12.1	12.1	12.1	9.95	9.96	9.97	9.96	
Dissolved oxygen	mg/L		-	11.4	9.57	10.28	10.77	10.74	10.73	10.73	10.74	11.18	10.93	11.5	11.14	
Dissolved oxygen	%		-	93.1	95.6	101.5	-	-	-	-	-	101.3	-	-	-	
Turbidity	NTU		-	1.34	0	0	0	0	0	0	0	0.57	0.64	0.6	0.77	
Total Suspended Solids, field measured	mg/L	26**	-	0.4	1.5	1.5	-	-	-	-	-	-	0.14	0.13	0.17	
Conventional Parameters																
Total suspended solids	mg/L	26**	2	1	1	2	-	-	-	-	-	1	-	-	-	

^CCME Guideline for the Protection of Aquatic Life

\*\*short term limit, 25 mg/L above background (<24 h)

Table D-6. Water quality monitoring results for dewatering effluent station ST-DD-10 (field-and laboratory-measured).

ST-DD-10	Sample Date	Guideline^	7/29/19	8/05/19	8/12/19	8/19/19	8/28/19	9/02/19	9/11/19	9/16/19	12/08/19
	Sample Depth		3-4 m								
Parameter	Unit										
<b>Field Measured</b>											
pH	pH units	6.5-9	6.92	6.93	-	6.9	7.12	7.1	7.18	7.86	6.98
Conductivity	uS/cm		112.6	108.4	-	119.9	126.7	141.3	155.8	145.1	115.4
Temperature	°C		9.95	12.05	-	11.23	14.38	6.39	8.94	6.9	11.95
Dissolved oxygen	mg/L		11.18	9.58	-	9.95	10.08	10.74	11.46	11.22	10.11
Dissolved oxygen	%		-	92.1	-	92.7	100.9	88.6	101	94.4	95.6
Turbidity	NTU		0.57	1.63	-	2.28	2.23	1.5	1.56	9.1	2.91
Total Suspended Solids, field measured	mg/L	26**	0.12	0.7	-	2.5	0.8	0.5	1	-	3.5
<b>Conventional Parameters</b>											
Total suspended solids	mg/L	26**	-	2	1	2	1	1	-	4	-

^CCME Guideline for the Protection of Aquatic Life

\*\*short term limit, 25 mg/L above background (<24 h)

Table D-7. QAQC results for water quality monitoring at dewatering effluent station ST-DD-8.

ST-DD-8 QAQC	Sample Date	MDL	3/11/19			4/07/19			10/04/19					12/06/19			
Parameter	Unit		Duplicate	Original	RPD	Duplicate	Original	RPD	Trip Blank	Field Blank	Duplicate	Original	RPD	Trip Blank	Duplicate	Original	RPD
<b>Conventional Parameters</b>																	
Total suspended solids	mg/L	1	1	1	NA	1	2	NA	1	1	4	3	NA	1	9	4	NA
Turbidity	NTU		1.16	0.95	NA	0.59	0.56	NA	-	-	-	-		-	-	-	
<b>Nutrients and Chlorophyll a</b>																	
Total phosphorus	mg/L	0.01	-	-		-	-		-	-	-	0.01	NA	0.01	0.01	0.01	NA
<b>Total Metals</b>																	
Aluminum	mg/L	0.005	-	-		-	-		0.01	0.01	0.054	0.073	29.9	0.005	0.005	0.005	NA

Trip and field blanks exceeding MDL are in **bold**.

Samples and duplicates are underlined when the associated trip or field blank exceeded the MDL and the sample result was less than 5x the measured trip or field blank result.

MDL = method detection limit

RPD = relative percent difference

Table D-8. QAQC results for water quality monitoring at dewatering effluent station ST-DD-10.

ST-DD-10 QAQC	Sample Date	MDL	7/07/19		8/12/19			8/28/19			9/16/19		
Parameter	Unit		Duplicate	Original	Field Blank	Duplicate	Original	Trip Blank	Duplicate	Original	Trip Blank	Duplicate	Original
Conventional Parameters													
Total suspended solids	mg/L	1	2	1	1	2	1	1	1	1	1	4	4

No results are > 10x MDL so RPD cannot be calculated.