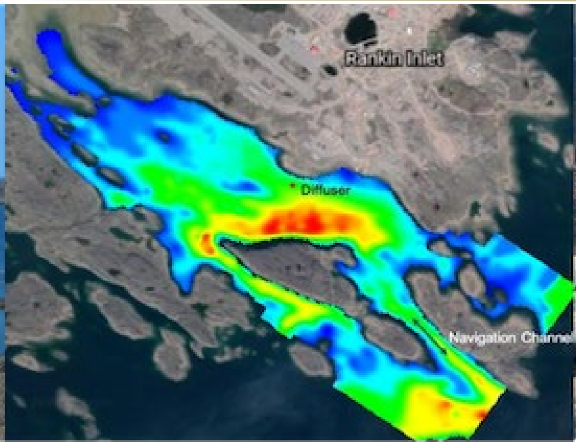
Meliadine Extension 3-D Hydrodynamic Modelling of Itivia Harbour



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Tetra Tech Canada Inc.
Suite 1000 – 10th Floor, 885 Dunsmuir Street
Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

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SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) is retained by Agnico Eagle Mines Ltd. (Agnico Eagle) to conduct a three-dimensional hydrodynamic modelling of an effluent discharge to Itivia Harbour near Rankin Inlet, Nunavut, in support of the Meliadine Mine Extension (Meliadine Extension). The discharge will be conducted through a diffuser and will be part of the Meliadine Mine operations, located north-west of Rankin Inlet. A waterline will convey the water from the mine site down to a coastal facility located near Rankin Inlet's airport and along the shores of Itivia Harbour.

As part of the Meliadine Waterline Project (Tetra Tech, 2020a and 2020b; Tetra Tech, 2021), Tetra Tech developed a model of the coastal areas of Rankin Inlet encompassing Itivia Harbour and covering the entirety of Melvin Bay. The model simulated the discharge, mixing and transport of the proposed saline effluent discharge during the open-water season. Three scenarios of different effluent discharge rates (6,000 m^3/day, 12,000 m^3/day and 20,000 m^3/day) were modelled, respectively.

These three scenarios identified strong flushing occurring due mostly to the tides, which resulted in no significant "pooling" of effluent over time in the bay, but also a rapid return to prior-to-discharge conditions once the discharge stopped at the end of the open-water season. Impact of the effluent discharge on effluent concentrations, ocean temperature and salinity were limited and complied with the regulatory guidelines.

The 3-D model has been updated for the extended operations phase proposed for the Meliadine Extension: building on the past Waterline Itivia modelling Project in 2020, a sea ice module has been developed and coupled to the existing 3-D hydrodynamic model. Very good validation was obtained with regards to ice formation and decay process as well as ice thickness. Therefore, multiple consecutive years were simulated into one single simulation, covering both ice and ice-free seasons, instead of focusing only on the open-water season, when the discharge occurs (from June to end of September). Three years, deemed conservative, were selected to model with respect to high effluent discharge rate (20,000 m^3/day) and various effluent TDS levels (either very high or very low, as this would lead to the most potential difference with ambient conditions):

- Simulation Year 1 (Year 2025 of the Lorax [2021] Water Balance Model): effluent discharge of 20,000 m^3/day and TDS concentrations ranging from 34 to 40,193 mg/L.
- Simulation Year 2 (Year 2028 of the Lorax [2021] Water Balance Model): effluent discharge 20,000 m^3/day and TDS concentrations ranging from 366 to 40,457 mg/L.
- Simulation Year 3 (Year 2042 of the Lorax [2021] Water Balance Model): effluent discharge 20,000 m^3/day and TDS concentrations ranging from 706 to 7,243 mg/L.

As this is a single and continuous simulation, these different combinations of TDS concentration levels allowed to assess a wide range of TDS transport and mixing with the ambient water. The primary results are:

- This multiyear simulation confirmed the results of the past single year simulation undertaken as part of the waterline application in 2020: The Itivia Harbour met-ocean conditions lead to very efficient flushing capacity of the study area that easily satisfies the various regulations and guidelines on effluent discharge of the studied simulated scenarios.
- The receiving embayment does not fluctuate by more than 10% with respect to salinity from the effluent discharge. Also, the target dilution factor of 11:1 or target tracer concentration of 0.09 at the 100-m mixing zone is always satisfied during or post the discharge season. In fact, the minimum dilution observed at the edge of the mixing zone throughout the multiyear simulation is 49:1.

- Temperature and salinity changes due to effluent discharge are well below the regulated threshold values respectively at the 100-m mixing zone throughout and post the discharge season.
- Based on simulated conditions, the system takes less than a month following the end of the discharge to recover to a near pre-effluent-discharge state.

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APPENDICES

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Appendix B HHERA Itivia Spreadsheet

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Agnico Eagle Mines and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Agnico Eagle Mines, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) has been retained by Agnico Eagle Mines Ltd. (Agnico Eagle) to conduct a three-dimensional hydrodynamic modelling in Itivia Harbour in support of the Meliadine Extension at the Meliadine Gold Mine near Rankin inlet, NU. The purpose of this modelling is to characterize the mixing and transport of the released effluent in the waters of Itivia Harbour. Summary of previously conducted modelling and updates to the current modelling are as follows.

1.1 Meliadine Extension

Agnico Eagle is proposing an extension (referred to as the Meliadine Extension) to the Approved Meliadine Mine located approximately 25 kilometers north of Rankin Inlet, and 80 kilometers southwest of Chesterfield Inlet in the Kivalliq region of Nunavut.

The Meliadine Extension proposes to include underground mining and associated saline water management infrastructures at the Pump, F zone, and Discovery deposits; this saline water will be managed and discharged to Itivia Harbour seasonally through the waterline. There are no changes proposed to the Rankin Inlet facilities for the Meliadine Extension. The current life of mine includes operations to 2032. Through the Meliadine Extension, the life of the mine would be extended by an additional 11 years until 2043, closure will occur from 2044 to 2050, and post-closure from 2051 to 2060.

1.2 Summary of Waterline Itivia Harbour Modelling Project

As part of the Meliadine Waterline Project in 2020, Tetra Tech developed a model of the coastal areas of Rankin Inlet encompassing Itivia Harbour and covering the entirety of Melvin Bay. The model simulated the discharge, mixing and transport of the proposed saline effluent discharge during open-water season. Three scenarios of different effluent discharge rates (6,000 m^3/day, 12,000 m^3/day and 20,000 m^3/day) were modelled, respectively.

This modelling identified strong flushing occurring due mostly to the tides, which resulted in no significant “pooling” of effluent over time in the bay, but also a rapid return to prior-to-discharge conditions once the discharge stopped at the end of the open-water season. Impact of the effluent discharge on ocean temperature and salinity is limited and comply with the regulatory guidelines.

1.3 General Updates to Itivia Harbour Modelling

Building on the modelling framework developed during the Waterline Expansion Project, this present work focuses on the extended operation phase proposed for the Meliadine Extension and now investigates the fate and behaviour of the discharged effluent in the entire Itivia Harbour within three consecutive model years:

- Simulation Year 1 (Year 2025 of the Lorax [2021] Water Balance Model): effluent discharge of 20,000 m^3/day and TDS concentrations ranging from 34 to 40,193 mg/L;
- Simulation Year 2 (Year 2028 of the Lorax [2021] Water Balance Model): effluent discharge 20,000 m^3/day and TDS concentrations ranging from 366 to 40,457 mg/L; and
- Simulation Year 3 (Year 2042 of the Lorax [2021] Water Balance Model): effluent discharge 20,000 m^3/day and TDS concentrations ranging from 706 to 7,243 mg/L.

Each model year consists of an open-water season followed by a freeze-up season. Therefore, a complete cycle of Itivia Harbour conditions, i.e. ice-free, growth of ice and ice decay, can be simulated. This work is built on the work conducted to-date.

A sea-ice module is developed and integrated into the ocean model to simulate hydrodynamic conditions and effluent mixing year-around, including during the freeze-up season. This work investigates the potential accumulation of the effluent concentration over time, as well as the effluent dispersion due to spatially- and temporally-varying ocean currents in the vicinity of the diffuser.

1.4 Report Structure

This report first presents the model configuration in Section 2 and shows the model validation in terms of water level, ocean currents and ice conditions in Section 3. Section 4 describes the scenarios investigated as part of this study. Section 5 presents the results on the characteristics of ocean currents at the diffuser, effluent accumulation in the Harbour. The conclusion of this study is drawn in Section 6.

2.0 MODEL CONFIGURATION

2.1 Model Overview

Tetra Tech's proprietary three-dimensional hydrodynamic and sediment transport model, H3D, is used to carry out this study. The same H3D model was used during the Waterline Project with the Itivia Harbour Modelling Study (2020) as well as during the design of the now-existing diffuser in Meliadine Lake.

The H3D model is an implementation of the numerical model developed by Backhaus (1983; 1985), which has had numerous applications to the European continental shelf, (Duwe et al., 1983; Backhaus and Meir Reimer, 1983), Arctic waters (Kampf and Backhaus, 1999; Backhaus and Kampf, 1999) and deep estuarine waters (Stronach et al., 1993). Locally, H3D has been used to model the temperature structure of Okanagan Lake (Stronach et al., 2002), the transport of scalar contaminants in Okanagan Lake, (Wang and Stronach, 2005), sediment movement and scour/deposition in the Fraser River, ocean currents and spill assessment in the Salish Sea (Stronach et al, 2015 and Hospital et al, 2015), circulation and wave propagation in Seymour and Capilano dams, salinity movement in the lower Fraser River and recent coastal ocean modelling along the entire BC coast (Hospital et al, 2019), in the Gulf of the St Lawrence and in the Bay of Fundy.

The H3D model forms the basis of the model developed by Saucier and co-workers for the Gulf of St. Lawrence (Saucier et al., 2003), and has been applied to the Gulf of Mexico (Rego et al., 2010). H3D and its hydrocarbon transport and weathering module have been used in environmental assessment applications before the appropriate regulatory agencies. H3D was used to do oil spill modelling for the environmental and engineering assessments for the proposed Gateway project involving oil shipment out of Kitimat. The modelling work forms part of the information package submitted to the National Energy Board. Similarly, H3D was used to assess the fate of accidental fuel spills arising from a proposed jet fuel terminal in the Fraser River. Recent National Energy Board applications were linked with H3D simulating currents and oil spill as part of the Energy East and Trans Mountain projects. A sea-ice module is coupled with H3D to study the formation and ablation of sea ice. It is based on the ice model of Patterson and Hamblin (1988) and calibrated with Itivia Harbour observed ice thickness data.

2.2 Model Grid

H3D is a three-dimensional hydrodynamic model, which means that the model is discretized in both horizontal and vertical directions: each cell covering the Itivia Harbour domain is divided in different vertical layers throughout the water column to capture various coastal and oceanic processes. Figure 2.1 illustrates a typical 3-D model grid.

The model domain covers the entire Itivia Harbour and Melvin Bay, extends southeastward with open boundaries in Hudson Bay to allow water exchange between the interior of the Bay and the open ocean (Figure 2.2). The model has a grid resolution of 20-m by 20-m and 16 vertical layers. Bathymetry in the vicinity of the proposed diffuser and nautical charts are interpolated onto the model grid, creating a 3- D model domain, as shown in Figure 2.2.

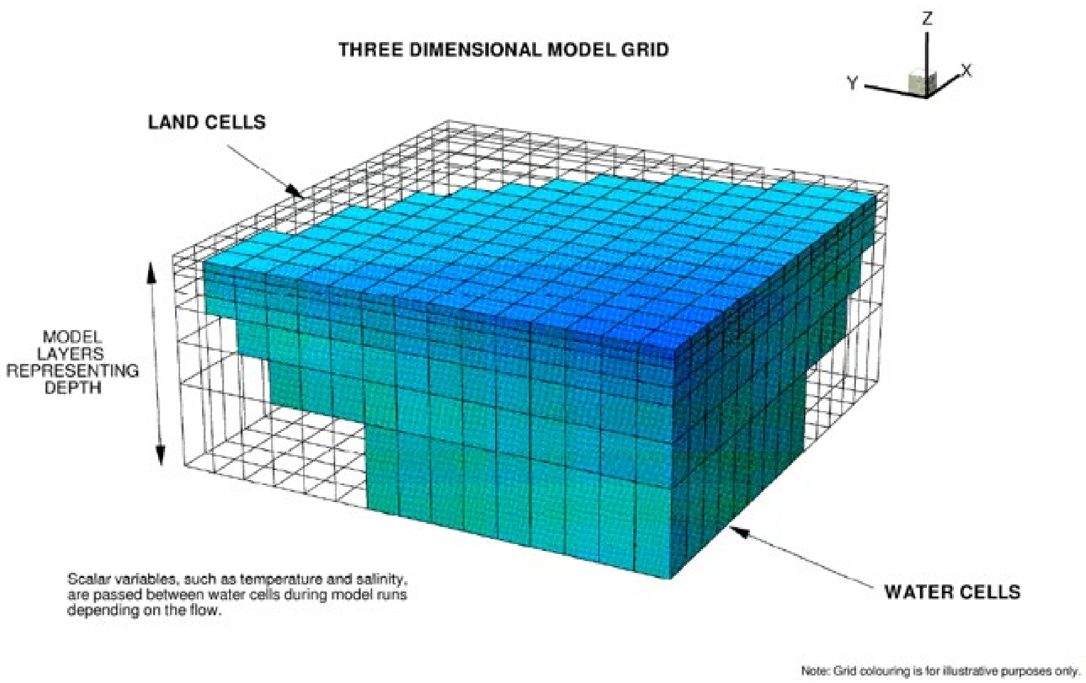


Figure 2.1: Typical 3-D Hydrodynamic Model Grid

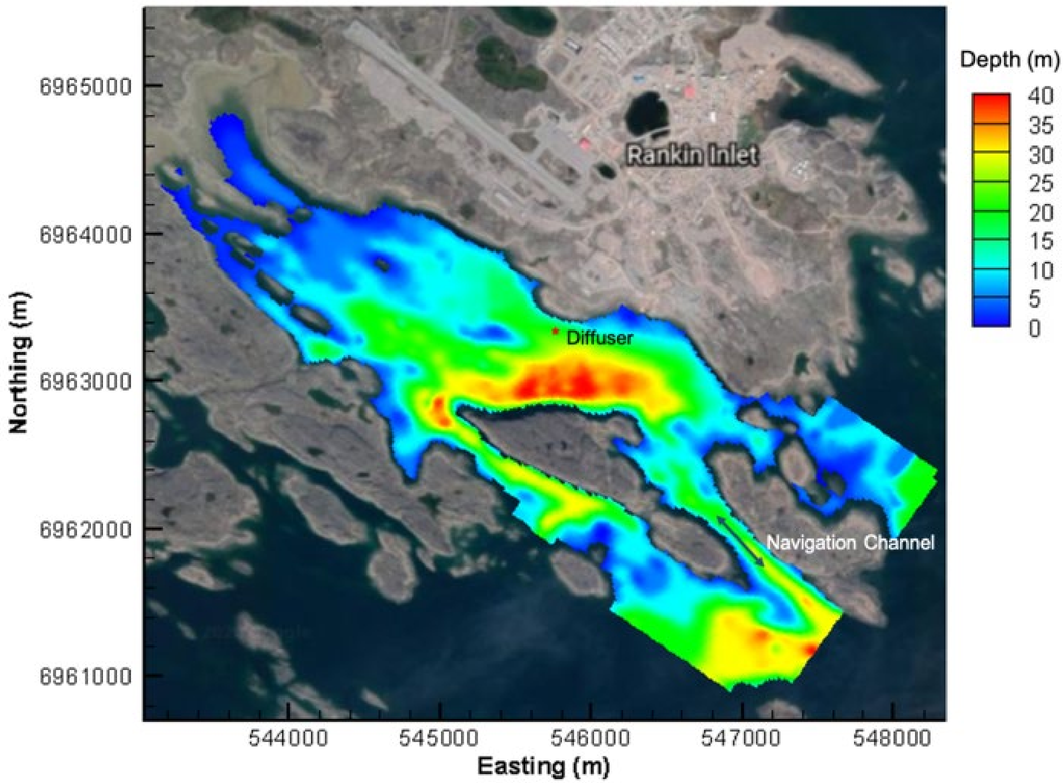


Figure 2.2: Bathymetry of the Model

2.3 Tidal and Atmospheric Forcing

It is understood that tidal conditions are the main drivers for currents in Itivia Harbour. Tidal variables are extracted from the TOPEX Poseidon database, allowing to provide tidal information at the open boundaries of the model.

Wind-driven current is an integral part of the surface circulation in the bay. Meteorological forcing, such as air temperature, solar radiation and relative humidity, influences sea water temperature and potentially affects stratification. Both wind and meteorological forcing data are extracted from ECCC weather station location at Rankin Inlet airport. Over 30 years of data were collected (January 15, 1981 to present) and a statistical analysis was conducted to determine the representative meteorological years, i.e., years which adhere well to the average wind conditions.

Figure 2.3 presents the outcome of the statistical analysis. The top panel shows a statistical distribution of wind speed: the red line indicates the average conditions, while the green (year 2013), black (year 2014) and blue (year 2015) lines show three years very close to average conditions. The lines in light grey represent all other years on record. Similarly, the bottom panel presents wind roses with the left panel showing the rose for 1982 to 2020 and the right panel presenting the rose corresponding to year 2014. The full period of record wind rose clearly indicates that the predominant wind direction is coming from the northwest and the north. This predominant direction is also well observed in year 2014.

As a result, the selected meteorological conditions for the simulation time corresponds to 2013, 2014 and 2015, all being very close to average conditions. Therefore, these met data can be used as part of the modelling, providing representative conditions to the bay.

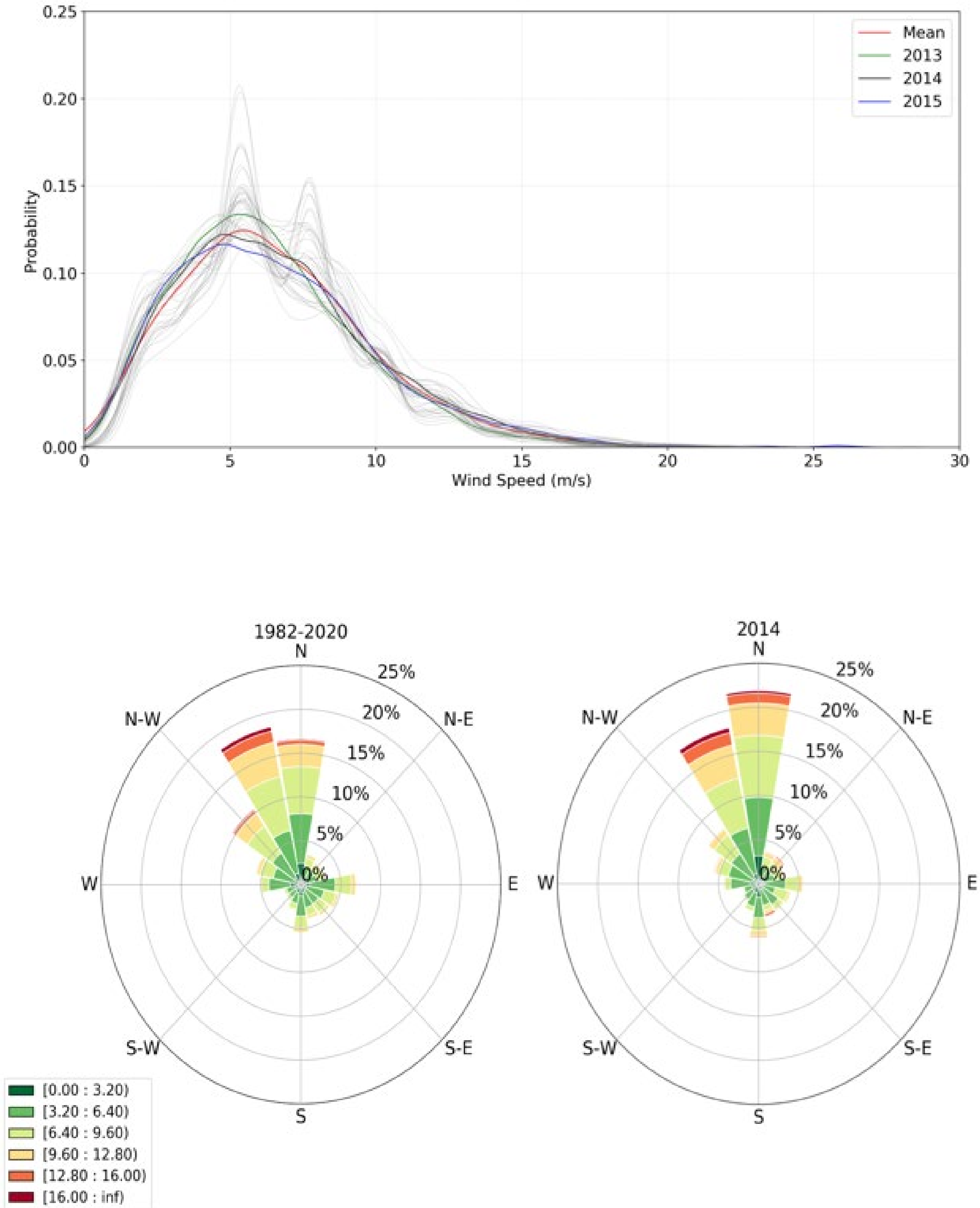


Figure 2.3: Wind Speed Statistical Distribution (Top Panel) and Wind Roses (Bottom Panel: Left 1982-Present and Right: Year 2014) – Meteorological Convention, i.e. coming from

2.4 Initial and Open Boundary Conditions

The ambient (i.e. ocean) initial temperature and salinity correspond to the mean temperature and salinity, extracted from the HYCOM forecasting system (www.hycom.org). Since sea waters are exchanged daily between Itivia Harbour and Hudson's Bay, monthly-varying temperature and salinity conditions were applied to the open boundary of the model. These temperature and salinity conditions were set to correspond to HYCOM monthly means. As a result, the temperature and salinity in the interior of the embayment fluctuate due to met conditions (cooling and warming of the surface layer) but also with changes at the open boundaries.

3.0 MODEL VALIDATION

The model is validated in terms of water level, ocean currents, and the formation and ablation of sea ice. Temperature and salinity in the Itivia Harbour model were modulated by those from Hudson's Bay through the HYCOM global ocean model. The accuracy of reproduction of temperature and salinity in Itivia Harbour in the Itivia model is better than the HYCOM global ocean model, as Itivia Harbour model has a much higher resolution of 20-m, compared to the global ocean model, HYCOM, presenting a resolution of 0.04° (>4 km) in the Itivia Harbour area.

3.1 Water Level

There is no available observational data of water level from 2013 to 2015 in Itivia Harbour to the best of our knowledge. Water level in the Itivia Harbour model is validated against predictions (i.e. modelled water level) from Fisheries and Oceans Canada (DFO). Tidal analysis is carried out using DFO's predictions of water level at Rankin Inlet from 2018 to 2020 (https://www.waterlevels.gc.ca/eng/data/table/2018/wlev_sec/5100?pedisable=true#s0). Water level at Rankin Inlet in 2013 is hindcast using the DFO's tidal analysis result. In parallel, the 3-D hydrodynamic model is run and both water level curves are compared and shown in Figure 3.1.

Phases of tidal water level from the Itivia Harbour model are in perfect sync with the prediction from DFO's dataset. There is a slight mismatch of water level at low tide. It is worth mentioning that the DFO predictions are only based on a 3-year long dataset and do not represent actual observed water level but are only predictions. Therefore, the validation for the water level, acknowledging the limitations in the DFO dataset, is deemed very good, as the phase is near-perfect and the amplitude correctly reproduced.

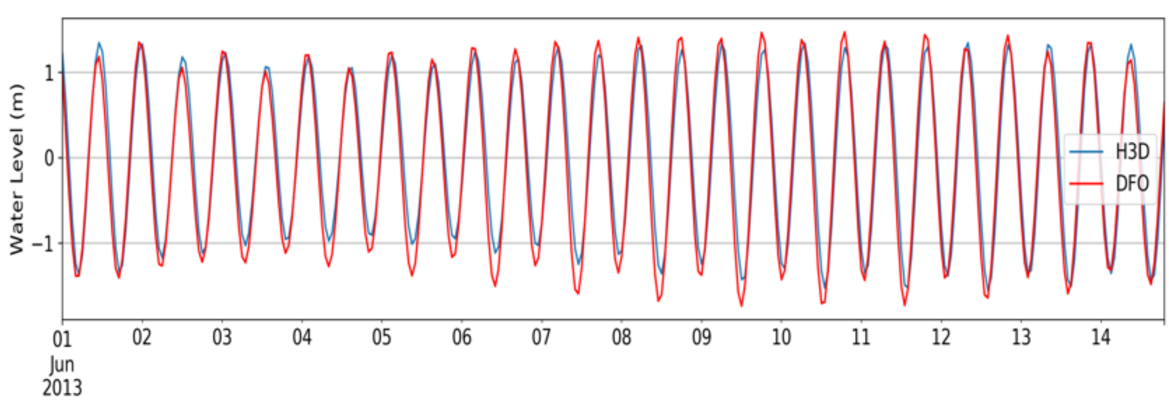


Figure 3.1: Water Levels from H3D and Predictions based on DFO's Dataset

3.2 Ocean Currents

Nautical chart indicates that the maximum current speed within the navigation channel (entering Itivia Harbour) is about 0.5 knots (or about 0.25 m/s). The model reproduces well such current. Figure 3.2 shows a snapshot in time when the flood current entering the navigation channel reaches a maximum speed of about 0.25 m/s in agreement with the nautical chart indication.

Figure 3.3 presents a statistical analysis of currents in the navigation channel and over the water column. The current through the navigation channel tends to be vertically coherent (barotropic). The median velocity throughout the water column is around 0.1 m/s. The maximum speed in the top layers are slightly higher and can reach up to 0.35 m/s.

Current rose is a direct way to show the general current direction and speed during a certain period of time. The circular format of the current rose shows the direction the current flows to and the length of each "spoke" around the circle shows how often the current flows to that direction. The different colors of each spoke provide details on the speed. As shown in the current rose plot, the current direction at the navigational channel is controlled by the topography of the narrow channel and follows isolines (Figure 3.4). Current in the middle and bottom layers flow northwestward 50% of the time and southeastward in the rest of the time, confirming the main driver for water exchanges in Itivia Harbour is tidal. Surface current shifts around the NW-SE direction slightly, due to wind effects. The “spokes” of flood and ebb currents in the current roses are like mirror-images, indicating comparable, if not equal, flood and ebb current speeds.

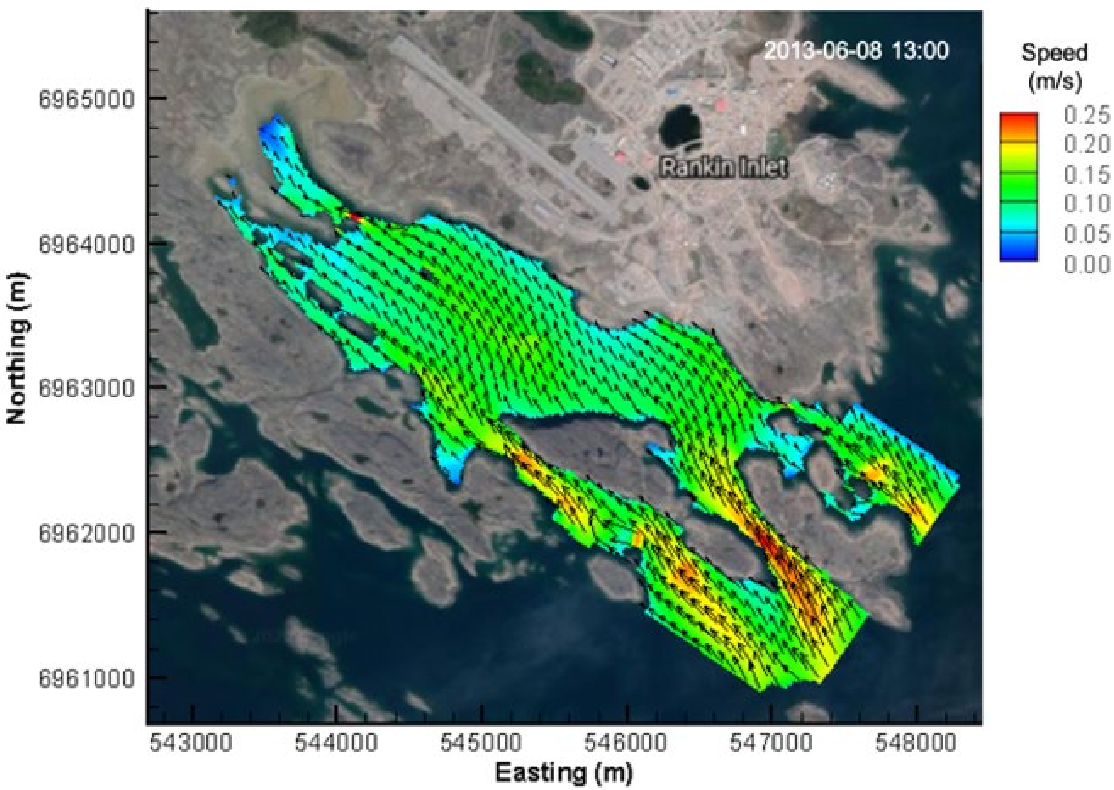


Figure 3.2: Surface Flood Current in the Model Domain at 13:00 PM on June 8, 2013

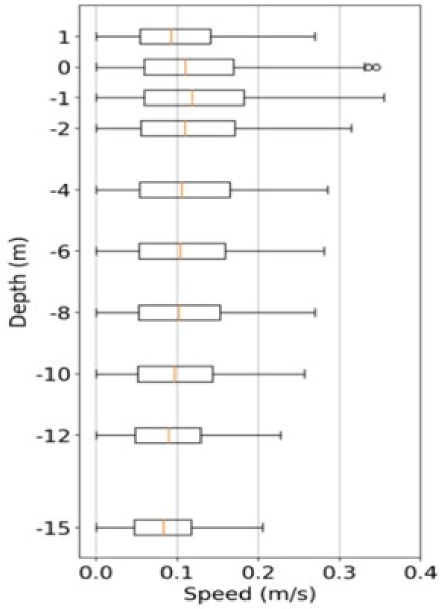


Figure 3.3: Boxplot of Current Speed throughout the Water Column in the Middle of the Navigational Channel from June to October 2013

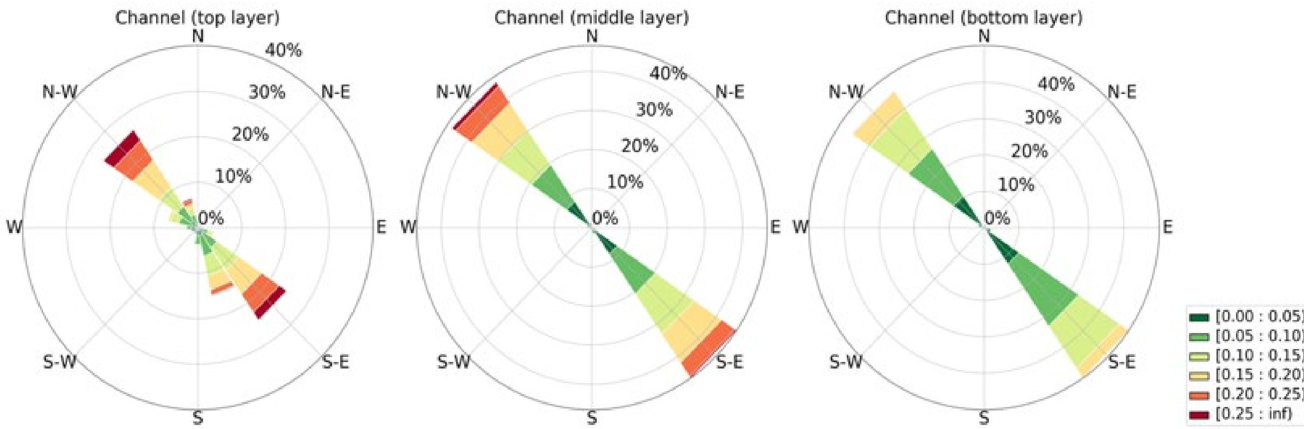


Figure 3.4: Current Roses Representing Surface, mid-Water Column and near Seabed Currents in the Middle of the Navigation Channel from June to October 2013

3.3 Sea Ice

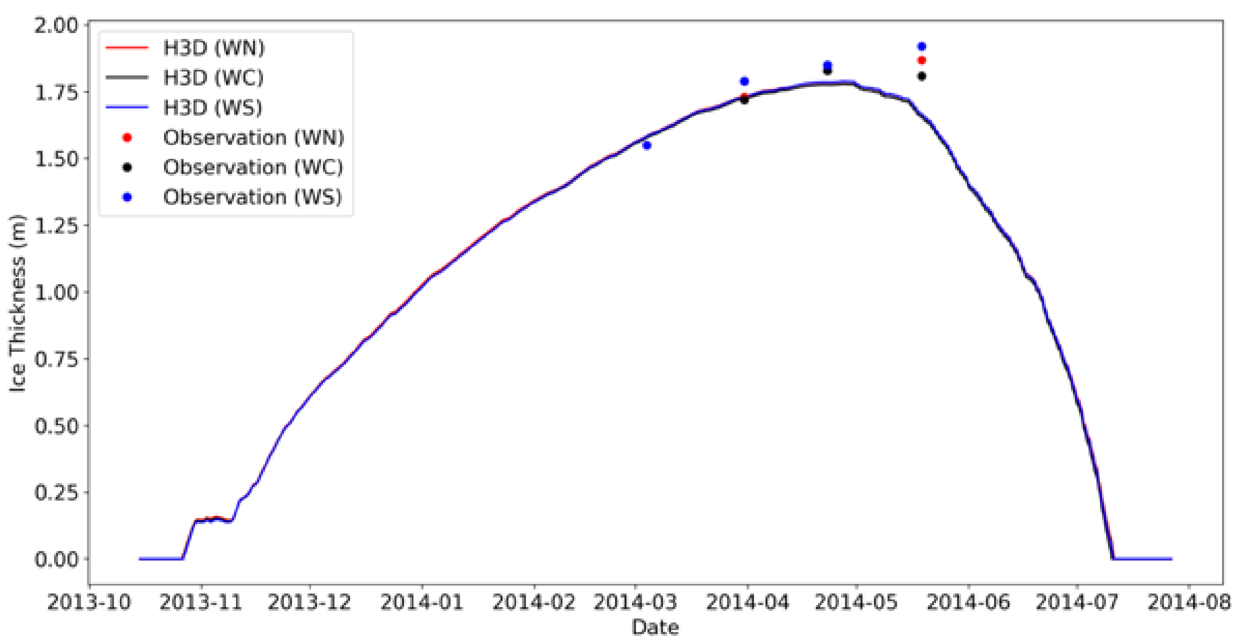
The sea ice module is validated against ice thickness observations, as well as in terms of the formation and demise cycle of ice cover. The validation model was run over the freezing season, considering October 2013 to July 2014 for the meteorological conditions.

Table 3.1 shows observations of ice thickness at three stations from 4 different dates from March to May 2019. The observed ice thickness increases from about 1.6 m to 1.8 m from March to April. No consistent trend from late April to late May can be drawn on the ice thickness change at the three stations. Figure 3.5 shows the time series of modelled ice thickness at the three stations on top of the observed values. Generally, the modelled ice thickness agrees well with the observation before May with only differences on the scale of a few centimeters. The model shows ice thickness peaks in late April, after which ice melts at an accelerated rate. The modelled ice thicknesses are about 10 cm to 20 cm thinner than the observed values at the three stations on May 19, 2019.

Table 3.1: Observations of Ice Thickness at Three Stations in 2019

Station Label	Station Location		Ice Thickness on Four Observation Dates (m)			
	Easting (m)	Northing (m)	2019-Mar-04	2019-Mar-31	2019-Apr-23	2019-May-19
MWE-2/WN	546014	6963391	1.55	1.73	1.83	1.87
MWE-1/WC	546002	6963295	1.55	1.72	1.83	1.81
MWE-3/WS	545981	6963176	1.55	1.79	1.85	1.92

Source: AEM 2019 MWE-1WC/2WN/3WS Ice Thickness and Depth Profiling spreadsheets



Source: AEM 2019 MWE-1WC/2WN/3WS Ice Thickness and Depth Profiling spreadsheets

Figure 3.5: Modelled (curves) and Observed (dots) Ice Thickness at Three Stations

The ice formation- demise cycle is also validated against ice charts from Canadian Ice Service. Daily ice chart in Northern Hudson Bay (https://iceweb1.cis.ec.gc.ca/Archive/page1.xhtml) provides information on ice type, ice coverage and ice thickness. Note that the ice module does not have the capability to simulate difference ice types or ice coverages. Nevertheless, the module is able to capture the ice formation-demise cycle by simulating ice thickness change with an ice coverage of 100%.

Ice charts show that ice starts to form but then recedes in Itivia Harbour typically in late October to early November. The presence of ice is constant after mid November. Ice charts show that Itivia Harbour is covered by fast ice with ice coverage of 9+ typically before early July; then ice type becomes floes. Itivia Harbour is ice free by around mid-July. In 2021, there was ice in the Bay in mid-June, 2021 (Figure 3.6), and the bay was ice free around July 4, 2021 (Agnico Eagle, pers. Comm.). Figure 3.6 shows a view of Itivia Harbour in mid-June 2021.

To summarize, there is a good agreement between modelled ice thickness and observations. The model is also capable to capture the formation-demise cycle of ice shown in ice charts and first-hand information from AEM, where ice tends to start forming around late October/early November and melts totally in early July each year.

Figure 3.6: Itivia Harbour on June 13, 2021 (Photo from Agnico Eagle)

4.0 DISCHARGE CONFIGURATION

This study investigates the scenario of an effluent discharge spanning over multiple years, each year presenting different effluent flow rates, TDS concentrations, and schedule of release.

Tetra Tech was provided with the saline effluent quality predictions from year 2021 to 2043 from Lorax (2021). Knowing the anticipated rapid flushing of the bay, three representative years from the effluent prediction dataset were selected for the multi-year Meliadine Extension FEIS simulation. The selection was based on identifying years with predicted high effluent discharge rate associated with either very high TDS content or very low TDS content, as this would have the most potential to generate a difference with ambient ocean conditions.

Specifically, daily discharged effluent volume and discharged TDS concentration time series for each selected year of the multi-year simulation presented from Figure 4.1 to Figure 4.3 are as follows:

- Year 1 (Year 2025 from the Lorax [2021] Water Balance Modelling) – corresponding to a high volume of effluent discharge (i.e., 20,000 m^3/day) during open-water season associated with high concentration of discharged TDS (i.e., 40,000 mg/L or 40 PSU salinity) in June and July and subsequent very low TDS concentration (i.e., less than 5,000 mg/L or 5 PSU salinity) spanning from late July to end of September when discharge stops (Figure 4.1);
- Year 2 (Year 2028 from the Lorax [2021] Water Balance Modelling) – corresponding to a high volume of effluent discharge most of the time associated with high TDS concentration in June and July and subsequent oscillating discharged TDS concentrations ranging between 366 mg/L and 40,000 mg/L (Figure 4.2); and
- Year 3 (Year 2042 from the Lorax [2021] Water Balance Modelling) – corresponding to a high volume of effluent discharge associated with very low TDS concentrations at all times (Figure 4.3).

Different combinations of TDS concentration levels allow to assess a wide range of TDS in dispersion and mixing with the ambient water. Similar with the past Itivia Waterline Modelling Project conducted in year 2020, each selected effluent discharge period spans over four months starting from June until the end of September, known as the open-water season. The timing of the discharge has been spanned over four months on purpose: to conservatively assess the impact of the discharge. Since now the 3-D model incorporates the sea ice module and is able to reproduce the realistic process of ice formation and decay in the Itivia Harbour, the 3-D model runs consecutively for three full years with active effluent discharge during the open-water season representative of years 2025 (Year 1 in the 3-D simulation), 2028 (Year 2 in the 3-D simulation) and 2042 (Year 3 in the 3-D simulation). The three-year cycle simulation allows to capture the warming/cooling of water and impact of ice on the mixing and transport of discharged effluent in the Harbour.

The effluent temperature in each month is set to be 3 °C higher than the monthly mean air temperature from the meteorological forcing data as provided in Table 4.1 for June to August, representing the potential heating of the effluent during overland transport through the HDPE waterline. Effluent temperature for September is based on site MEL-14 measurement in the Meliadine Lake, which is about 8 °C higher than the monthly mean air temperature from the meteorological forcing data.

Table 4.1: Effluent Monthly Discharge Temperature

Month	June	July	August	September
Average Air Temperature[a]	5.40	11.27	10.21	3.50
Temperature (°C)	8.40	14.27	13.21	11.50

a – (Rankin Inlet Airport air temperature from Environment Canada)

The model was initiated nine months prior to June 2025 (when the discharge period starts), allowing for any initial transient to dissipate, as well as allowing the model to develop realistic temperature, salinity distribution and ice conditions throughout the bay.

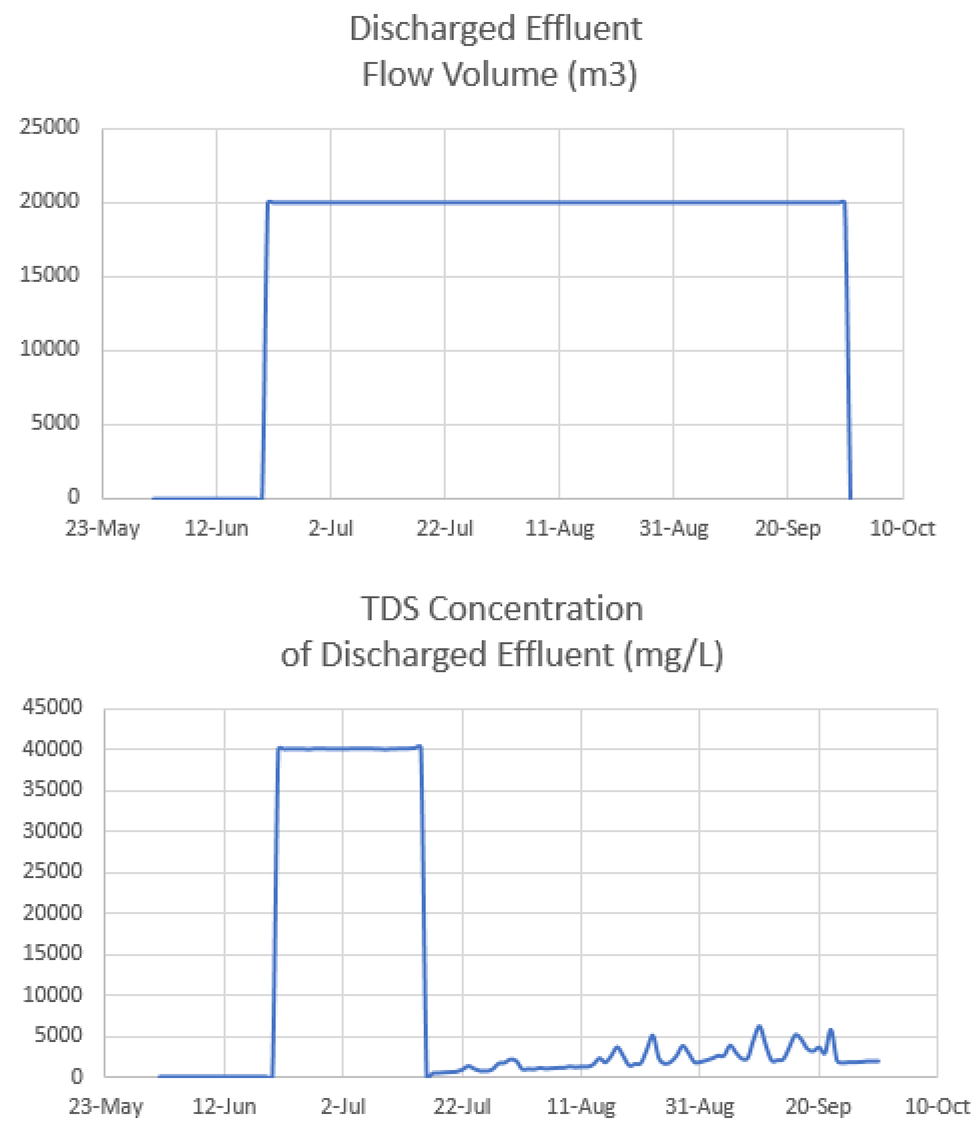


Figure 4.1: Daily Effluent Discharge Rate (Upper Panel) and Daily Discharged TDS Concentration (Lower Panel) for Simulation Year 1

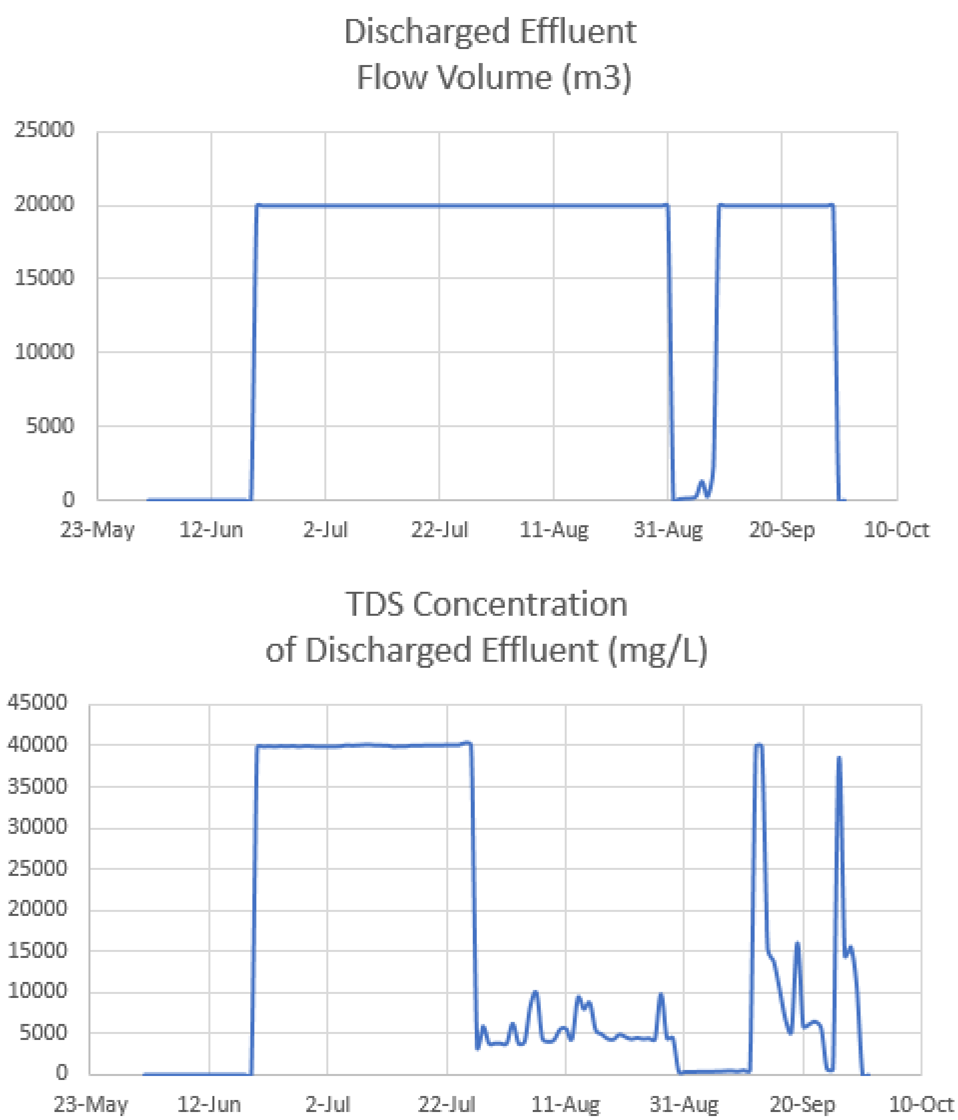


Figure 4.2: Daily Effluent Discharge Rate (Upper Panel) and Daily Discharged TDS Concentration (Lower Panel) for Simulation Year 2

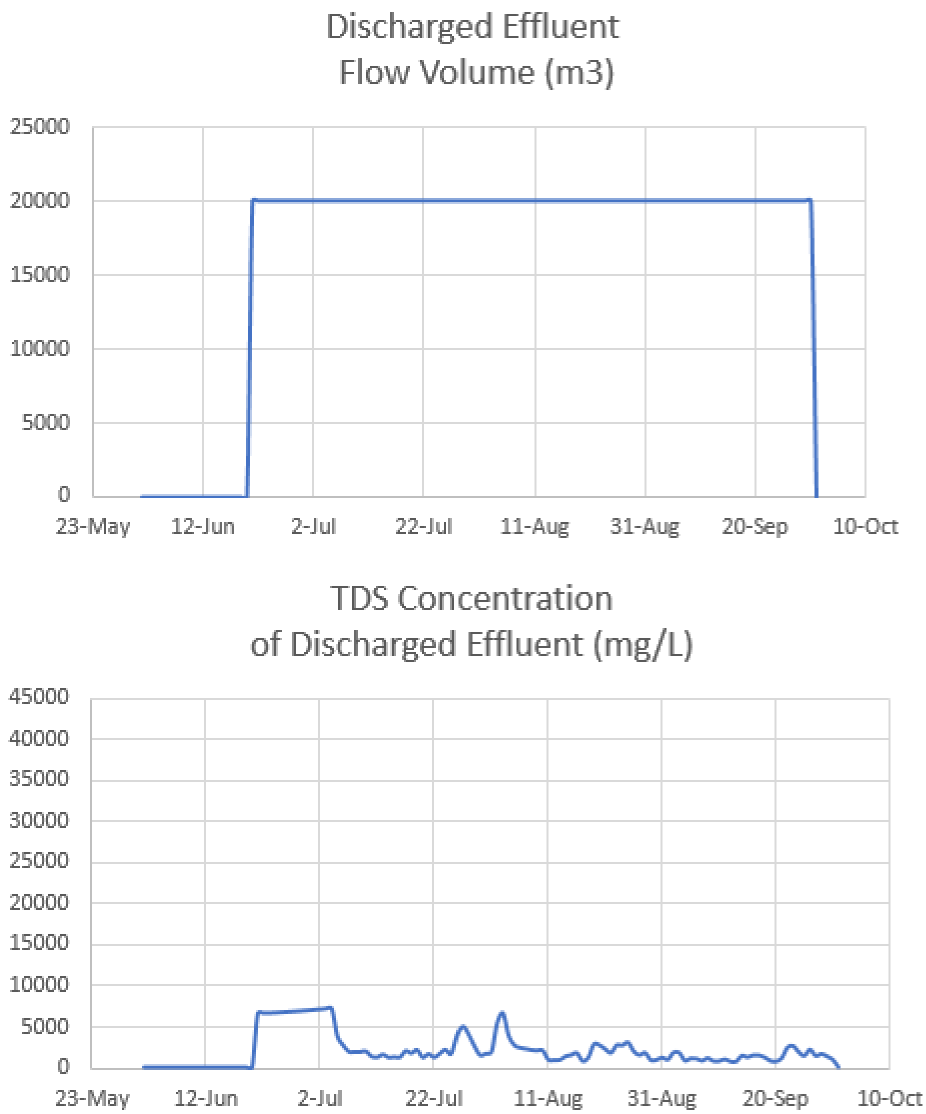


Figure 4.3: Daily Effluent Discharge Rate (Upper Panel) and Daily Discharged TDS Concentration (Lower Panel) for Simulation Year 3

5.0 RESULTS

5.1 Effluent Accumulation and Concentration

A total of about 2,040,000 m^3, 1,884,483 m^3 and 2,040,000 m^3 effluent are discharged during open-water season for 3-D model consecutive simulation years 1, 2, and 3 (corresponding to years 2025, 2028 and 2042 in the Lorax [2021] Water Balance Model), respectively. As a comparison, the amount of water in the Harbour exceeds 50,000,000 m^3, without accounting for the thousands of cubic meters of water exchanged daily through tides. The following discussion in this section show results for the consecutive three years of modelling.

5.1.1 Effluent Accumulation in the Domain

The amount of effluent present in the model domain is primarily determined by discharge rate, as well as met-ocean conditions (i.e. current in the embayment and water exchange between Itivia Harbour, Melvin Bay and Hudson Bay through the tides).

The amount of effluent present within the domain and its percentage of the total released effluent as a function of time are shown in Figure 5.1. As one can see, the effluent volume present in the Harbour increases significantly upon the start of discharge for each year in early June, and then fluctuates around a mean level in each subsequent month in response to effluent exiting the Harbour and met-ocean conditions. Note that maximum quantity of effluent only reaches about 0.12 Mm^3 in the Harbour that contains over 50 Mm^3 of water (0.24%).

The tidal conditions in Itivia Harbour shows very promising flushing capacity. The system recovers to a pre-effluent-discharge state at a great speed after the discharge stops by the end of September for each year. By October 17 of the last simulated year (2.5 weeks after discharge was stopped), there is less than 0.002% of the total released effluent (119 m^3) that remains in the Harbour. In conclusion, by each subsequent year of active discharge, the harbour has no longer experienced any impact of the discharge from the previous year. Within a month following the end of the effluent discharge, the bay comes back to initial conditions, with no effluent present in the bay.

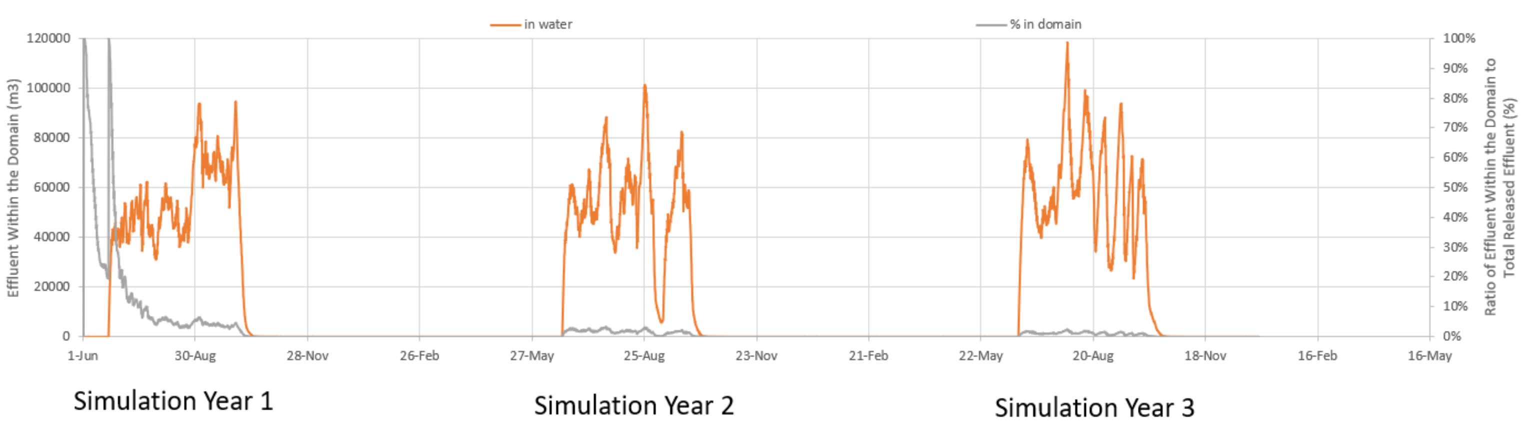


Figure 5.1: Effluent within Itivia Harbour (orange curve) and Ratio of Effluent (grey curve) within the Harbour to Total Released Effluent as a Function of Time

5.1.2 Effluent Concentration

A conservative target dilution of 11:1 for the effluent was identified at the 100-m regulated mixing zone during the Waterline Project. This target dilution is the threshold value that is required to comply with the British Columbia Ministry of the Environment guideline for chloride (2017), which states:

"Human activity should not cause the chloride of marine and estuarine waters to fluctuate by more than 10% of the natural level expected at that time and depth."

In the 3-D model, the different constituents of the effluent are represented as a passive tracer with an initial concentration of 1. Following the effluent release, this tracer becomes dispersed, mixed and advected based on ocean currents and water column properties. The target dilution of 11:1 then corresponds to a target tracer concentration value of 0.09 in the modelling results.

Figure 5.2 presents the daily maximum and average tracer concentration time series for all three years at the edge of the mixing zone (i.e., 100-m radius mark from the diffuser location). Dashed line represents the target/threshold concentration of 0.09. As one can see, both the maximum concentration (blue curve) and average concentration (green curve) are well below the threshold during the entire three years of simulation. Oscillations within each year of the tracer concentration occur, reflecting changes in the discharge and metocean conditions. This result illustrates the impact of the effluent discharge, even considering conservative conditions, complies with the regulatory guideline.

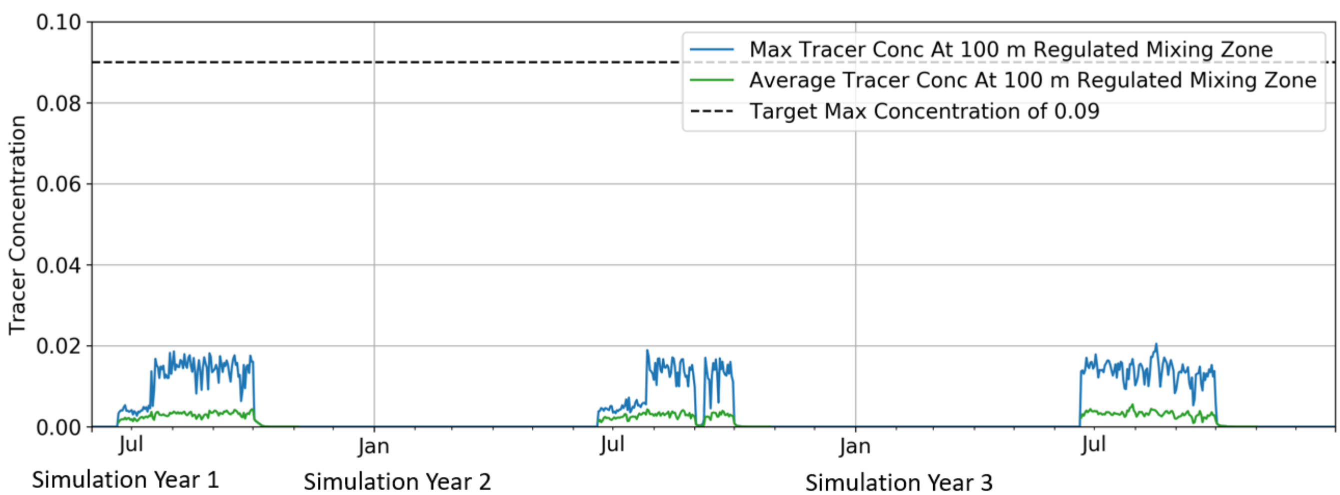


Figure 5.2: Time series of Daily Maximum and Average Tracer Concentration at the 100-m Regulated Mixing Zone for All Three Years. Dashed Line Indicates the Threshold Concentration Value 0.09.

Furthermore, Figure 5.3 presents the daily minimum and average dilution time series at the 100-m regulated mixing zone for all three years, based on daily maximum and average tracer concentration. Both minimum (blue curve) and average dilution (green curve) are well above the threshold regulatory dilution of 11:1 throughout all three years. Also note that dilution increases dramatically to 1000:1 and above after about 1 to 5 days after the discharge ceases by end of September, showing the great flushing capacity of the Harbour.

Table 5.1 provides the statistics of minimum dilution and average dilution at the edge of the mixing zone for each individual year over the open-water season. As one can see, minimum dilution reaches 51:1 over the three years of effluent discharge, much higher than the 11:1 target dilution.

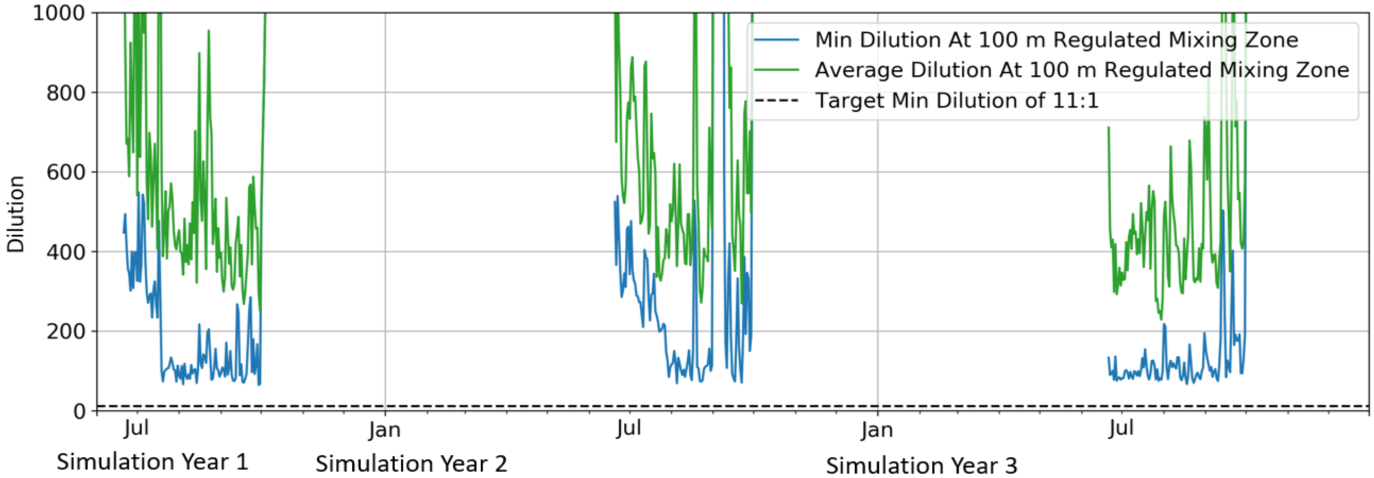
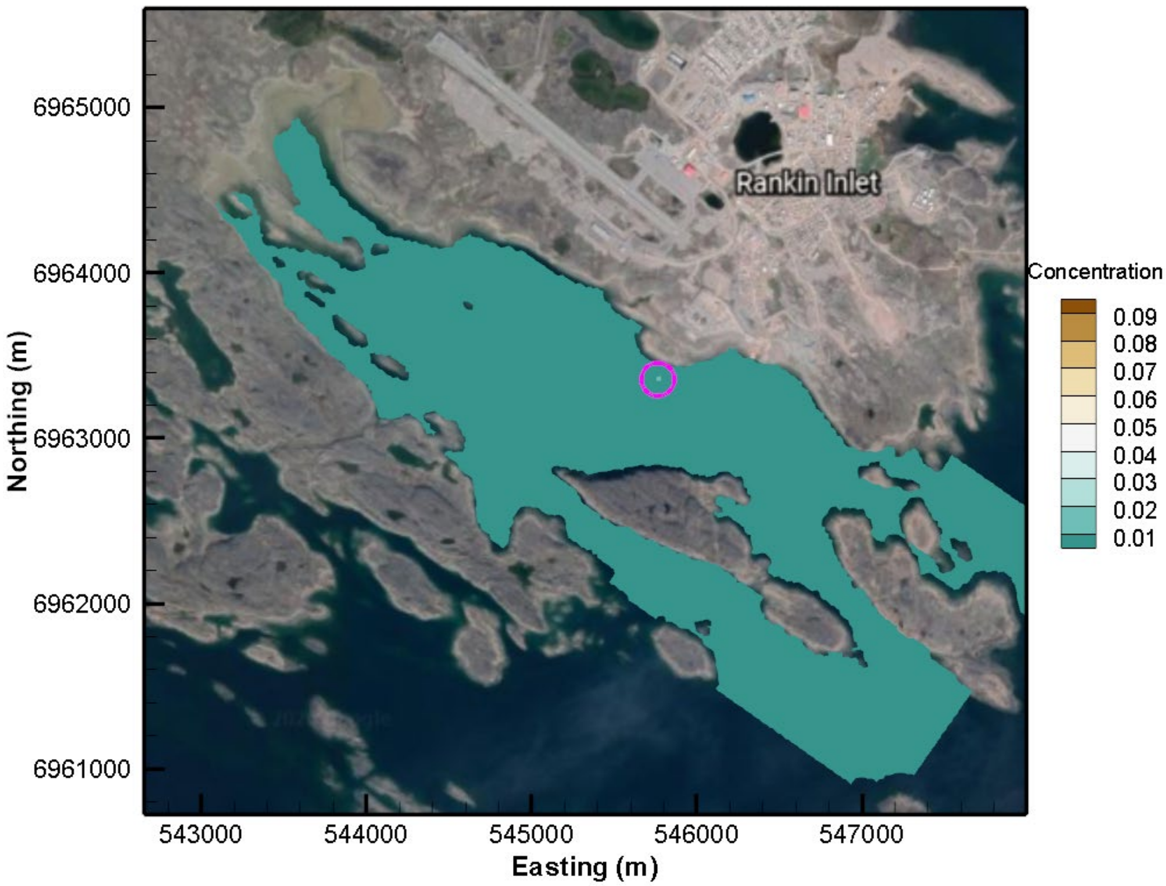


Figure 5.3: Time series of Daily Minimum and Average Dilution at the 100-m Regulated Mixing Zone for All Three Years.

Table 5.1: Statistics of Minimum and Average Dilution at the 100-m Regulated Mixing Zone for Each Year

Simulated Year	Minimum Dilution	Average Dilution
Year 1 (2025)	54:1	378:1
Year 2 (2028)	53:1	586:1
Year 3 (2042)	49:1	339:1

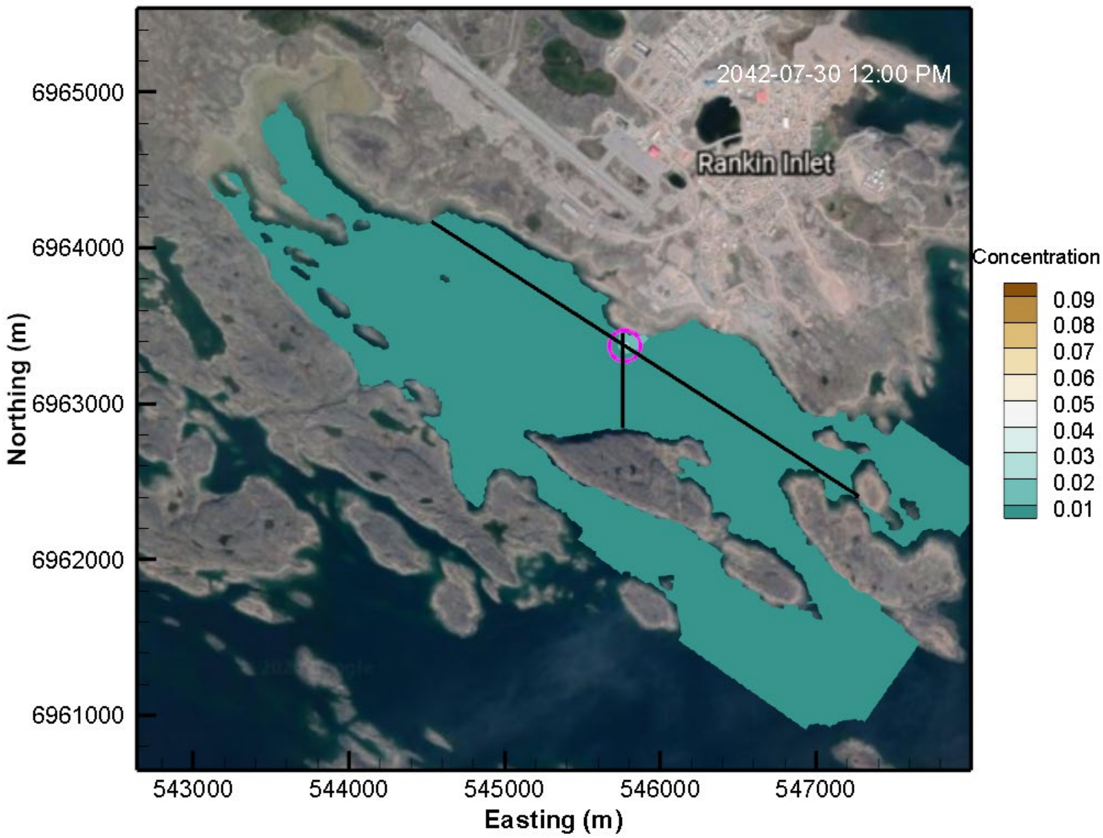
Figure 5.4 presents the monthly mean of maximum concentration in July for simulation Year 2 (2028). The legend was selected in order to reflect the threshold concentration (i.e., tracer concentration of 0.09) as brown color. As one can observe, the entire bay shows in green, indicating tracer concentrations are much smaller than the threshold concentration. As a fact, maximum tracer concentration is predicted as 0.015 (about 67:1) in the vicinity of the diffuser during the effluent discharge season.



Note: Pink Circle Represents the 100-m Mixing Zone Mark.

Figure 5.4: Monthly Mean of Maximum Tracer Concentration Occurring in July of Simulation Year 2 (2028).

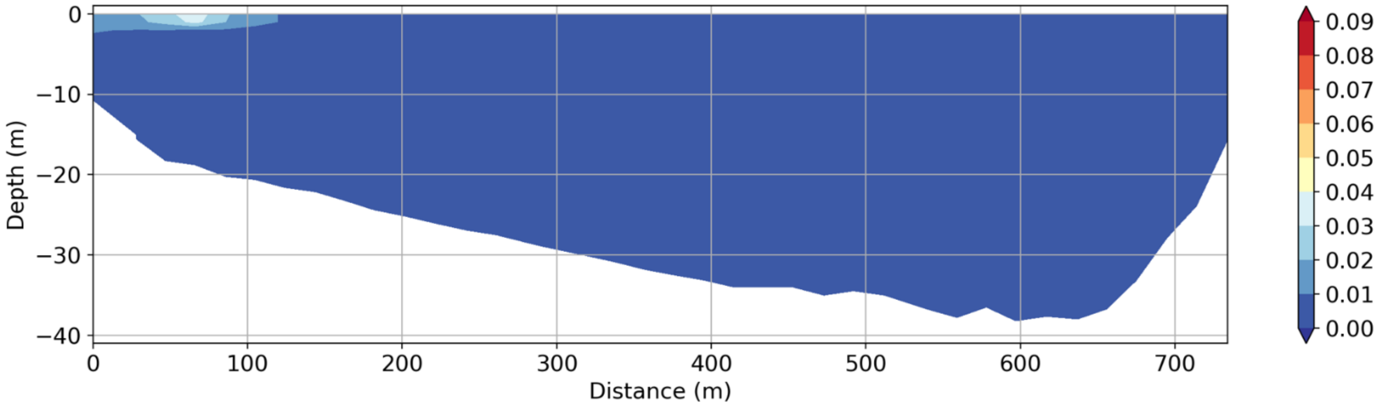
Figure 5.5 presents the snapshot of the maximum concentration throughout the water column plan-view map on July 30, 2042 (Simulation Year 3). This snapshot (happening to be on July 30, 2042 during the Simulation Year 3) was identified as the time with the largest amount of effluent within the Harbour during three years of discharge, reaching about 0.12 Mm^3 as shown in Figure 5.1. The striking feature is that the majority area of the Harbour appears in uniform green color, indicating the concentrations are still well below the threshold value. Relative higher concentration is predicted to occur around the diffuser area, reaching a maximum concentration of 0.036 (about 27:1) at the diffuser location at this instantaneous time. This can be seen as the worse case condition. Note that this 27:1 is within the mixing zone, and that a 49:1 dilution is reached at the edge of the mixing zone.



Note: Pink Circle Represents the 100-m Mixing Zone Mark. Vertical Line is the Cross Section Plotted in Figure 5.6, and Slanted Line is the Cross Section Plotted in Figure 5.7.

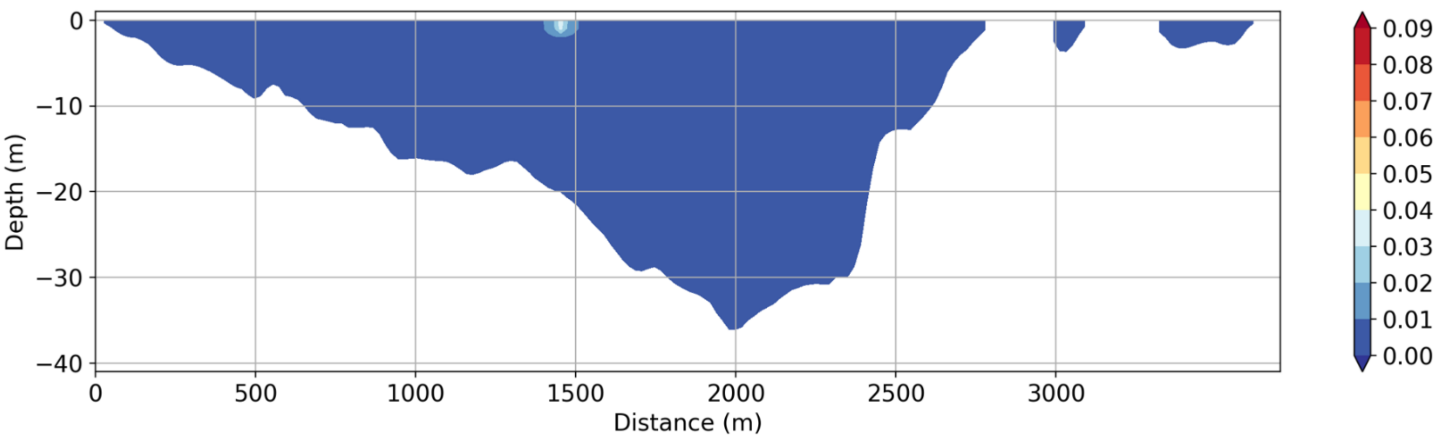
Figure 5.5: Instantaneous Maximum Tracer Concentrations within the Water Columns on July 30 Simulation Year 3 (2042).

Figures 5.6 and 5.7 show two vertical profiles of tracer concentration taken on July 30 2042 (Simulation Year 3) (maximum quantity of effluent within the Harbour). It can be seen that most transects are shown in green and are well below the threshold concentration, resulting from a strong immediate mixing. Maximum concentration for both vertical profiles is trapped near the diffuser location in the surface layer. This is mostly due to the fact that much-reduced TDS effluent is discharged during year 2042 (Simulation Year 3) (i.e., less than 10,000 mg/L TDS). This effluent is therefore buoyant and thus tends to rise at the surface quickly.



Note: Cross Sections Shown in Figure 5.5

Figure 5.6: Vertical Profiles of Tracer Concentration



Note: Cross Sections Shown in Figure 5.5

Figure 5.7: Vertical Profiles of Tracer Concentration

To summarize, the target dilution of 11:1, corresponding to the tracer concentration value of 0.09, is met at all time at the 100-m regulated mixing zone during the full three years. The system recovers to a pre-effluent-discharge state at a great speed after the discharge stops by the end of September. There is less than 0.002% of the total released effluent (119 m^3) that exists in the system by October 17.

5.2 Temperature and Salinity Change

Similar with effluent concentration and dilution criteria, the same regulatory guideline for temperature and salinity as the recent submitted waterline modelling in 2020 was adopted:

"Max of +/- 1 degree change from ambient background temperature."

Therefore, temperature change at the 100-m regulated mixing zone due to effluent discharge is required to comply with the British Columbia Ministry of the Environment guideline for temperature (BC MOE, 2017) as stated above.

Figure 5.8 shows the time series of temperature change at the 100-m regulated mixing zone for all three years. While not shown in Figure 5.8, the actual background seawater temperature ranges from -1.8°C to +10°C in general throughout each year. The magnitude of the maximum change in the background seawater temperature is well below 0.5°C throughout and post all the discharge seasons, which is well below the threshold value of 1°C.

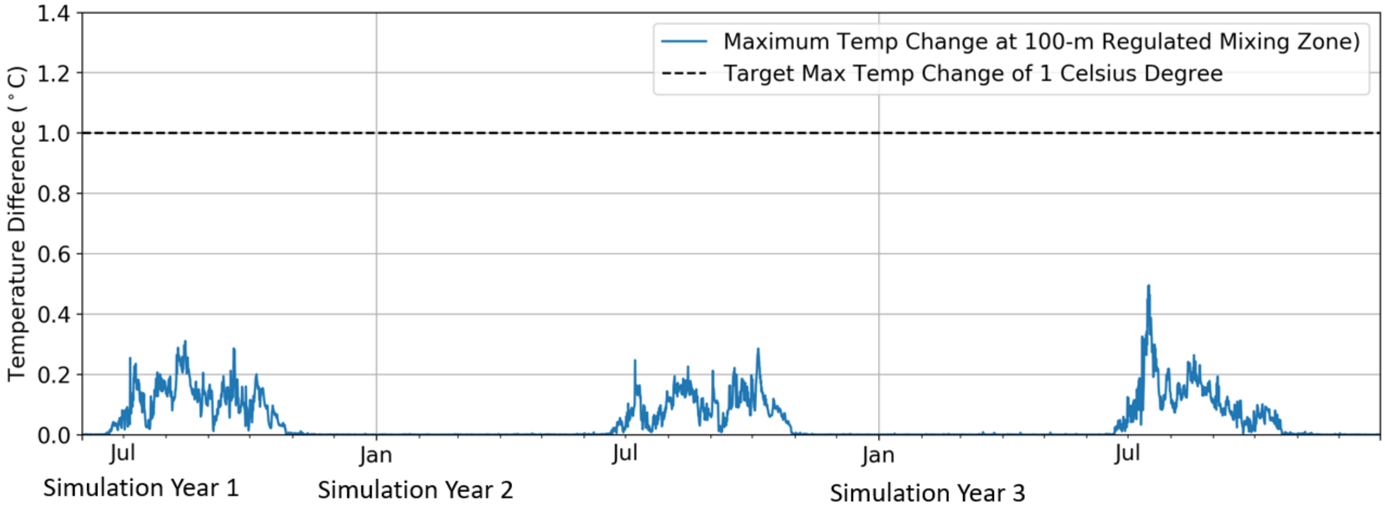


Figure 5.8: Time Series of the Magnitude of Maximum Temperature Change at the 100-m Regulated Mixing Zone for All Three Years

Similarly, salinity change at the 100-m regulated mixing zone due to effluent discharge is required to comply with the Department of Environment guideline for salinity (1972):

"24-hour change in salinity should not exceed 4 parts per thousand if natural salinity is 13.5 to 35 parts per thousand (PSU)."

Figure 5.9 shows the time series of salinity change at the 100-m regulated mixing zone for all three years. The magnitude of the maximum change in the background seawater salinity is below 0.2 PSU throughout and post all discharge seasons, which is well below the threshold value of 4 PSU and given the fact of the actual background seawater salinity is between 30 and 35 PSU throughout all three years. As respected higher discharge rate leads to greater changes in the ambient salinity.

Figure 5.10 presents the time series of percentage change in salinity at the 100-m regulated mixing zone for all three years, which are well below 1% throughout and after the effluent discharge seasons.

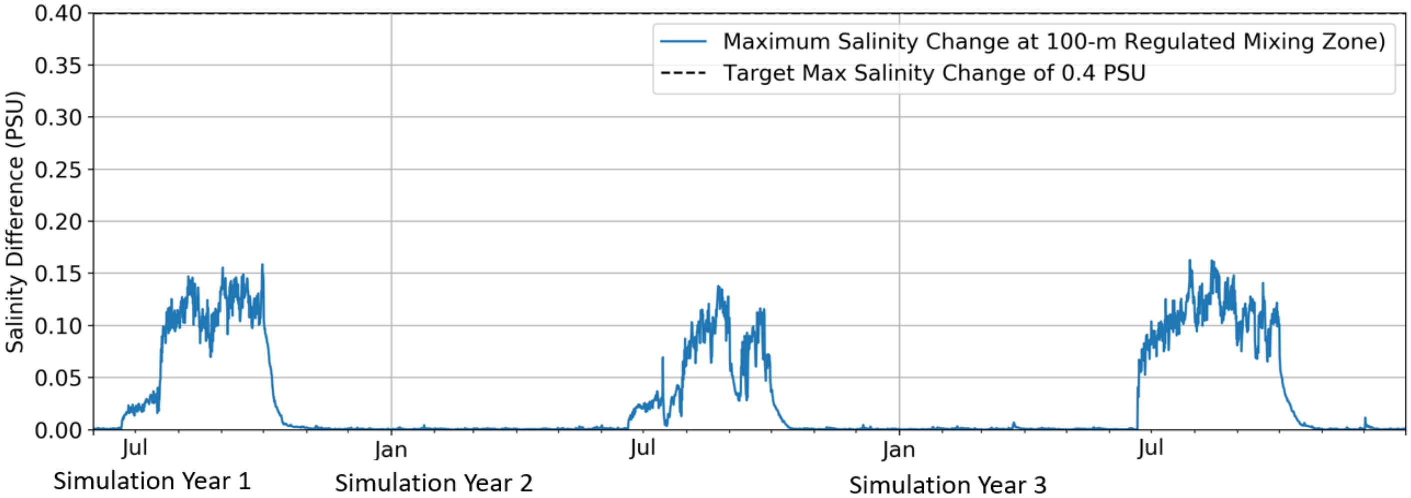


Figure 5.9: Time Series of the Magnitude of Maximum Salinity Change at the 100-m Regulated Mixing Zone for All Three Years

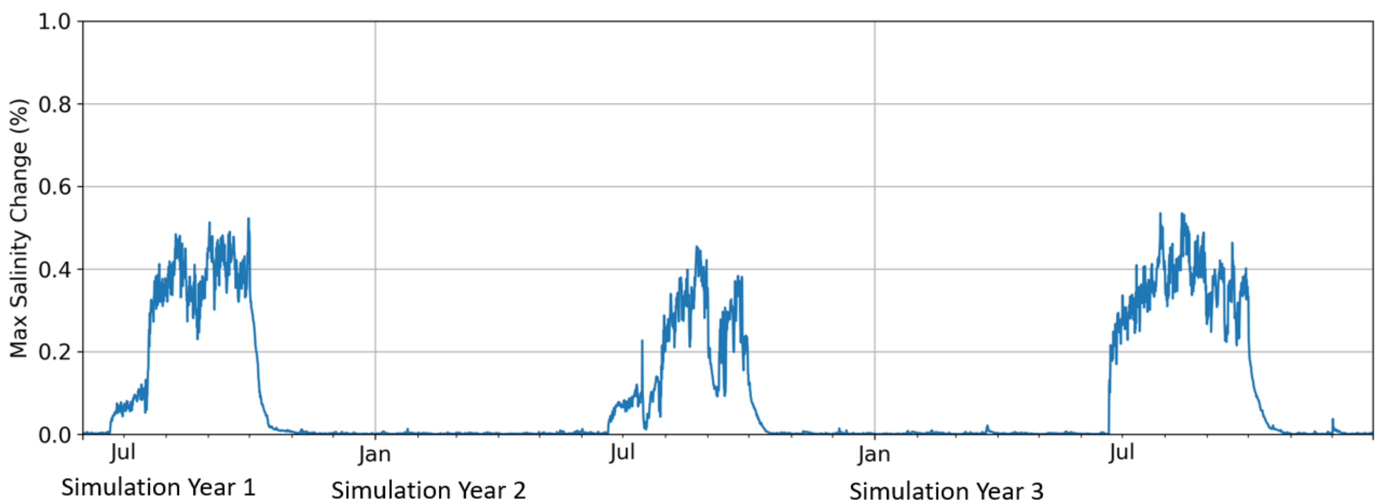


Figure 5.10: Time Series of the Magnitude of Maximum Salinity Change at the 100-m Regulated Mixing Zone for All Three Years

5.3 Other Constituents

Through the 3-D model for Itivia Harbour, predictions were developed for temperature and salinity (Section 5.2) but also for the full suite of constituents expected in the effluent. Results for the other constituents are evaluated in the Meliadine Extension FEIS Addendum in Section 9.2 (Marine Environment Assessment) and Section 10 (Human Health and Ecological Risk Assessment). These evaluations were completed to determine if changes in water quality may influence the ability to drink the water, the continued opportunity for use of surface water for traditional and non-traditional uses, and continued healthy aquatic life.

6.0 CONCLUSION

This modelling study investigates the fate and behaviour of discharged effluent in Itivia Harbour, as part of the Meliadine Extension. Effluent is discharged at the proposed diffuser location (545789 m E, 6963370 m N) and at a depth of 20 m Chart Datum.

The 3-D hydrodynamic Itivia Harbour model has been updated for the extended operations phase proposed for the Meliadine Extension: building on the past Waterline Itivia Modelling Project in 2020, a sea ice module has been developed and coupled to the existing 3-D hydrodynamic model. Very good validation was obtained with regards to ice formation and decay process as well as ice thickness. Therefore, multiple consecutive years were simulated into one single simulation, covering both ice- and ice-free seasons, instead of a simulation focusing on open-water season only.

The discharge season is from June to end of September. A single and multi-year-long simulation was conducted. Three years, deemed conservative, were selected to model with respect to high effluent discharge rate (20,000 m^3/day) and various effluent TDS levels (either very high or very low, as this would lead to the most potential difference with ambient conditions):

- Year 1 (Year 2025 from the Lorax [2021] Water Balance Modelling): high volume of effluent discharge associated with high concentration of TDS and then very low TDS levels.
- Year 2 (Year 2028 from the Lorax [2021] Water Balance Modelling): high volume of effluent discharge associated with high concentration of TDS and then fluctuating TDS levels.
- Year 3 (Year 2042 from the Lorax [2021] Water Balance Modelling): high volume of effluent discharge associated with very low TDS concentrations.

These different combinations of TDS concentration levels allowed to assess a wide range of TDS transport and mixing with the ambient water. The primary results are:

- This multi-year simulation confirmed the results of the past single year simulation undertaken as part of the Waterline Project in 2020: a very efficient flushing, mostly due to tides, is observed in Itivia Harbour and the entire Melvin Bay, leading to no effluent left in the bay within a month following the end of the discharge.
- The receiving embayment does not fluctuate by more than 10% with respect to salinity from the effluent discharge. Also, the target dilution factor of 11:1 or target tracer concentration of 0.09 at the 100-m mixing zone is always satisfied during or post the discharge season. In fact, the minimum dilution observed at the edge of the mixing zone throughout the multiyear simulation is 49:1. In comparison with the 2020 Waterline Itivia Modelling, very similar results were obtained with a minimum dilution of 55:1 at the edge of the mixing zone.
- Temperature and salinity changes due to effluent discharge are well below the regulated threshold values respectively at the 100-m mixing zone throughout and post the discharge season.
- Based on simulated conditions, the system takes less than a month following the end of the discharge to recover to a near pre-effluent-discharge state.
- The Itivia Harbour met-ocean conditions lead to very efficient flushing capacity of the study area that easily satisfies the various regulations and guidelines on effluent discharge of the studied simulated scenarios.

Results from this updated model reflecting proposed operations as part of the Meliadine Extension do not change from those presented in the Waterline FEIS Addendum (Agnico Eagle 2020) and thus the conclusions for the waterline assessment do not change.

7.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

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Prepared by:
Jie Liu, M.Sc., EPt.
Oceanographer
Air, Coastal and Lake Engineering
Direct Line: 778.945.5888
Jie.Liu@tetratech.com

Reviewed by:
Aurelien Hospital, M.Eng., M.Sc.
Group Manager and Physical Oceanographer
Air, Coastal and Lake Engineering
Direct Line: 778.945.5747
Aurelien.Hospital@tetratech.com

JL/AH/cy

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APPENDIX A

LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

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It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design, in consideration of the level of the hydrotechnical information that was reasonably acquired to facilitate completion of the design.

APPENDIX B

HHERA ITIVIA SPREADSHEET

Other Constituents Predictions for Total Concentration			Simulation Year 1 (2025)											
	Unit	Background Lake Concentration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average of Minimum Dilution (ratio)			Infinity	Infinity	Infinity	Infinity	Infinity	250:1	167:1	70:1	74:1	8176764:1	Infinity	Infinity
Waterline[TDS]	mg/L	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.422E+04	3.421E+04	3.384E+04	3.388E+04	3.430E+04	3.430E+04	3.430E+04
Waterline[NH3_N]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.328E-02	3.532E-02	3.612E-02	4.466E-02	Unavailable	Unavailable	Unavailable
Waterline[NO3_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.707E+00	3.001E+00	2.702E+00	2.737E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[NO2_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.497E+00	2.501E+00	2.469E+00	2.472E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[Cl]	mg/L	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.008E+04	2.008E+04	1.986E+04	1.989E+04	2.013E+04	2.013E+04	2.013E+04
Waterline[F]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.409E-05	3.469E-04	9.338E-04	8.718E-04	Unavailable	Unavailable	Unavailable
Waterline[SO4]	mg/L	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.882E+03	2.880E+03	2.851E+03	2.854E+03	2.890E+03	2.890E+03	2.890E+03
Waterline[T_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	6.957E-05	1.563E-04	4.544E-05	5.945E-05	Unavailable	Unavailable	Unavailable
Waterline[WAD_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	8.682E-06	2.187E-05	1.679E-05	1.764E-05	Unavailable	Unavailable	Unavailable
Waterline[Ag]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.430E-07	3.288E-07	1.336E-07	1.463E-07	Unavailable	Unavailable	Unavailable
Waterline[Al]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.772E-03	5.670E-03	1.335E-02	1.267E-02	Unavailable	Unavailable	Unavailable
Waterline[As]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.575E-04	3.559E-04	1.376E-04	1.728E-04	Unavailable	Unavailable	Unavailable
Waterline[B]	mg/L	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.772E+00	4.764E+00	4.724E+00	4.728E+00	4.790E+00	4.790E+00	4.790E+00
Waterline[Ba]	mg/L	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.028E-02	1.070E-02	1.030E-02	1.038E-02	1.000E-02	1.000E-02	1.000E-02
Waterline[Be]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.980E-04	4.971E-04	4.932E-04	4.936E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Ca]	mg/L	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.039E+02	4.050E+02	3.993E+02	4.000E+02	4.040E+02	4.040E+02	4.040E+02
Waterline[Cd]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.980E-04	4.972E-04	4.933E-04	4.937E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Co]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.300E-06	6.536E-06	1.769E-05	1.767E-05	Unavailable	Unavailable	Unavailable
Waterline[Cr]	mg/L	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	4.982E-02	4.974E-02	4.933E-02	4.937E-02	5.000E-02	5.000E-02	5.000E-02
Waterline[Cu]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.653E-06	1.041E-05	2.911E-05	2.897E-05	Unavailable	Unavailable	Unavailable
Waterline[Fe]	mg/L	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.021E-01	6.035E-01	6.083E-01	6.079E-01	6.000E-01	6.000E-01	6.000E-01
Waterline[Hg]	mg/L	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	4.981E-05	4.975E-05	4.946E-05	4.949E-05	5.000E-05	5.000E-05	5.000E-05
Waterline[K]	mg/L	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.929E+02	3.926E+02	3.887E+02	3.891E+02	3.940E+02	3.940E+02	3.940E+02
Waterline[Mg]	mg/L	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.305E+03	1.302E+03	1.292E+03	1.293E+03	1.310E+03	1.310E+03	1.310E+03
Waterline[Mn]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.016E-02	2.074E-02	2.131E-02	2.123E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Mo]	mg/L	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.124E-02	1.132E-02	1.108E-02	1.111E-02	1.120E-02	1.120E-02	1.120E-02
Waterline[Na]	mg/L	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.084E+04	1.083E+04	1.072E+04	1.073E+04	1.087E+04	1.087E+04	1.087E+04
Waterline[Ni]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.329E-05	1.258E-04	7.910E-05	8.673E-05	Unavailable	Unavailable	Unavailable
Waterline[P]	mg/L	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	5.976E+00	5.966E+00	5.920E+00	5.924E+00	6.000E+00	6.000E+00	6.000E+00
Waterline[Pb]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.672E-07	1.077E-06	2.712E-06	2.129E-06	Unavailable	Unavailable	Unavailable
Waterline[Sb]	mg/L	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.020E-03	1.048E-03	9.992E-04	1.005E-03	1.000E-03	1.000E-03	1.000E-03
Waterline[Se]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	1.993E-02	1.990E-02	1.972E-02	1.974E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Sr]	mg/L	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.281E+00	7.316E+00	7.190E+00	7.204E+00	7.270E+00	7.270E+00	7.270E+00
Waterline[Tl]	mg/L	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	1.993E-04	1.992E-04	1.976E-04	1.977E-04	2.000E-04	2.000E-04	2.000E-04
Waterline[U]	mg/L	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.098E-03	3.096E-03	3.074E-03	3.077E-03	3.110E-03	3.110E-03	3.110E-03
Waterline[V]	mg/L	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.011E-03	4.966E-03	4.971E-03	5.000E-03	5.000E-03	5.000E-03
Waterline[Zn]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.358E-05	9.860E-05	5.649E-05	6.034E-05	Unavailable	Unavailable	Unavailable
Waterline[Ra226]	Bq/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.674E-04	5.930E-04	1.227E-04	1.809E-04	Unavailable	Unavailable	Unavailable

Other Constituents Predictions for Total Concentration			Simulation Year 2 (2028)											
	Unit	Background Lake Concentration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average of Minimum Dilution (ratio)			Infinity	Infinity	Infinity	Infinity	Infinity	230:1	188:1	73:1	571:1	14248977:1	Infinity	Infinity
Waterline[TDS]	mg/L	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.422E+04	3.430E+04	3.390E+04	3.425E+04	3.430E+04	3.430E+04	3.430E+04
Waterline[NH3_N]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.587E-02	4.676E-02	5.617E-02	9.902E-03	Unavailable	Unavailable	Unavailable
Waterline[NO3_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.681E+00	3.044E+00	2.784E+00	2.573E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[NO2_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.495E+00	2.503E+00	2.473E+00	2.497E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[Cl]	mg/L	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.008E+04	2.013E+04	1.990E+04	2.011E+04	2.013E+04	2.013E+04	2.013E+04
Waterline[F]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.361E-05	1.809E-04	8.341E-04	1.297E-04	Unavailable	Unavailable	Unavailable
Waterline[SO4]	mg/L	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.881E+03	2.885E+03	2.855E+03	2.886E+03	2.890E+03	2.890E+03	2.890E+03
Waterline[T_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.364E-05	1.536E-04	6.611E-05	1.510E-05	Unavailable	Unavailable	Unavailable
Waterline[WAD_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	7.034E-06	2.081E-05	1.720E-05	2.868E-06	Unavailable	Unavailable	Unavailable
Waterline[Ag]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.661E-07	4.753E-07	2.477E-07	5.014E-08	Unavailable	Unavailable	Unavailable
Waterline[Al]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.103E-03	5.069E-03	1.283E-02	1.665E-03	Unavailable	Unavailable	Unavailable
Waterline[As]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.356E-04	3.834E-04	1.909E-04	4.775E-05	Unavailable	Unavailable	Unavailable
Waterline[B]	mg/L	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.771E+00	4.769E+00	4.728E+00	4.782E+00	4.790E+00	4.790E+00	4.790E+00
Waterline[Ba]	mg/L	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.035E-02	1.106E-02	1.052E-02	1.011E-02	1.000E-02	1.000E-02	1.000E-02
Waterline[Be]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.979E-04	4.975E-04	4.935E-04	4.992E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Ca]	mg/L	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.041E+02	4.071E+02	4.006E+02	4.037E+02	4.040E+02	4.040E+02	4.040E+02
Waterline[Cd]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.979E-04	4.975E-04	4.936E-04	4.992E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Co]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.814E-06	8.725E-06	1.821E-05	4.013E-06	Unavailable	Unavailable	Unavailable
Waterline[Cr]	mg/L	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	4.980E-02	4.978E-02	4.937E-02	4.992E-02	5.000E-02	5.000E-02	5.000E-02
Waterline[Cu]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.483E-06	9.595E-06	3.160E-05	4.466E-06	Unavailable	Unavailable	Unavailable
Waterline[Fe]	mg/L	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.023E-01	6.031E-01	6.079E-01	6.010E-01	6.000E-01	6.000E-01	6.000E-01
Waterline[Hg]	mg/L	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	4.979E-05	4.977E-05	4.949E-05	4.993E-05	5.000E-05	5.000E-05	5.000E-05
Waterline[K]	mg/L	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.928E+02	3.934E+02	3.892E+02	3.934E+02	3.940E+02	3.940E+02	3.940E+02
Waterline[Mg]	mg/L	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.304E+03	1.304E+03	1.293E+03	1.308E+03	1.310E+03	1.310E+03	1.310E+03
Waterline[Mn]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.029E-02	2.096E-02	2.132E-02	2.035E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Mo]	mg/L	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.122E-02	1.134E-02	1.114E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02
Waterline[Na]	mg/L	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.084E+04	1.086E+04	1.074E+04	1.085E+04	1.087E+04	1.087E+04	1.087E+04
Waterline[Ni]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	6.644E-05	1.859E-04	1.376E-04	2.734E-05	Unavailable	Unavailable	Unavailable
Waterline[P]	mg/L	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	5.974E+00	5.969E+00	5.924E+00	5.990E+00	6.000E+00	6.000E+00	6.000E+00
Waterline[Pb]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.494E-07	9.420E-07	2.965E-06	4.071E-07	Unavailable	Unavailable	Unavailable
Waterline[Sb]	mg/L	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.024E-03	1.075E-03	1.021E-03	1.005E-03	1.000E-03	1.000E-03	1.000E-03
Waterline[Se]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	1.992E-02	1.991E-02	1.974E-02	1.997E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Sr]	mg/L	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.285E+00	7.364E+00	7.221E+00	7.268E+00	7.270E+00	7.270E+00	7.270E+00
Waterline[Tl]	mg/L	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	1.993E-04	1.993E-04	1.976E-04	1.997E-04	2.000E-04	2.000E-04	2.000E-04
Waterline[U]	mg/L	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.098E-03	3.098E-03	3.079E-03	3.107E-03	3.110E-03	3.110E-03	3.110E-03
Waterline[V]	mg/L	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.002E-03	5.029E-03	4.984E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03
Waterline[Zn]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.156E-05	1.386E-04	8.505E-05	1.552E-05	Unavailable	Unavailable	Unavailable
Waterline[Ra226]	Bq/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.263E-04	9.208E-04	3.213E-04	7.182E-05	Unavailable	Unavailable	Unavailable

Other Constituents Predictions for Total Concentration			**Simulation Year 3 (2042)**											
	Unit	**Background Lake Concentration**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Monthly Average of Minimum Dilution (ratio)			**Infinity**	**Infinity**	**Infinity**	**Infinity**	**Infinity**	**68:1**	**72:1**	**72:1**	**86:1**	**15245204:1**	**Infinity**	**Infinity**
Waterline[TDS]	mg/L	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.384E+04	3.387E+04	3.386E+04	3.392E+04	3.430E+04	3.430E+04	3.430E+04
Waterline[NH3_N]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.831E-02	7.570E-02	7.661E-02	4.513E-02	Unavailable	Unavailable	Unavailable
Waterline[NO3_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	3.000E+00	3.058E+00	3.065E+00	2.827E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[NO2_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.475E+00	2.478E+00	2.474E+00	2.475E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[Cl]	mg/L	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	1.986E+04	1.988E+04	1.987E+04	1.991E+04	2.013E+04	2.013E+04	2.013E+04
Waterline[F]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.185E-04	1.566E-03	1.682E-03	1.441E-03	Unavailable	Unavailable	Unavailable
Waterline[SO4]	mg/L	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.850E+03	2.854E+03	2.854E+03	2.859E+03	2.890E+03	2.890E+03	2.890E+03
Waterline[T_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.380E-05	3.117E-05	4.477E-05	2.839E-05	Unavailable	Unavailable	Unavailable
Waterline[WAD_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	7.806E-06	1.425E-05	1.487E-05	1.039E-05	Unavailable	Unavailable	Unavailable
Waterline[Ag]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.767E-07	5.983E-07	4.440E-07	1.741E-07	Unavailable	Unavailable	Unavailable
Waterline[Al]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.372E-02	1.305E-02	1.306E-02	1.095E-02	Unavailable	Unavailable	Unavailable
Waterline[As]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.425E-04	1.833E-04	2.474E-04	1.550E-04	Unavailable	Unavailable	Unavailable
Waterline[B]	mg/L	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.722E+00	4.727E+00	4.727E+00	4.737E+00	4.790E+00	4.790E+00	4.790E+00
Waterline[Ba]	mg/L	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.027E-02	1.044E-02	1.043E-02	1.026E-02	1.000E-02	1.000E-02	1.000E-02
Waterline[Be]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.930E-04	4.934E-04	4.935E-04	4.945E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Ca]	mg/L	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	3.993E+02	3.998E+02	3.998E+02	4.001E+02	4.040E+02	4.040E+02	4.040E+02
Waterline[Cd]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.931E-04	4.939E-04	4.940E-04	4.949E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Co]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.059E-05	3.977E-05	5.435E-05	3.640E-05	Unavailable	Unavailable	Unavailable
Waterline[Cr]	mg/L	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	4.931E-02	4.935E-02	4.935E-02	4.946E-02	5.000E-02	5.000E-02	5.000E-02
Waterline[Cu]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.470E-05	4.438E-05	4.822E-05	4.166E-05	Unavailable	Unavailable	Unavailable
Waterline[Fe]	mg/L	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.077E-01	6.079E-01	6.079E-01	6.066E-01	6.000E-01	6.000E-01	6.000E-01
Waterline[Hg]	mg/L	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	4.936E-05	4.956E-05	4.957E-05	4.964E-05	5.000E-05	5.000E-05	5.000E-05
Waterline[K]	mg/L	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.886E+02	3.890E+02	3.890E+02	3.897E+02	3.940E+02	3.940E+02	3.940E+02
Waterline[Mg]	mg/L	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.291E+03	1.292E+03	1.293E+03	1.295E+03	1.310E+03	1.310E+03	1.310E+03
Waterline[Mn]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.214E-02	2.362E-02	2.500E-02	2.340E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Mo]	mg/L	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.109E-02	1.111E-02	1.110E-02	1.110E-02	1.120E-02	1.120E-02	1.120E-02
Waterline[Na]	mg/L	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.072E+04	1.073E+04	1.073E+04	1.075E+04	1.087E+04	1.087E+04	1.087E+04
Waterline[Ni]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.152E-04	1.977E-04	2.216E-04	1.759E-04	Unavailable	Unavailable	Unavailable
Waterline[P]	mg/L	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	5.913E+00	5.920E+00	5.920E+00	5.934E+00	6.000E+00	6.000E+00	6.000E+00
Waterline[Pb]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.303E-06	3.294E-06	3.224E-06	2.467E-06	Unavailable	Unavailable	Unavailable
Waterline[Sb]	mg/L	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.005E-03	1.016E-03	1.012E-03	1.007E-03	1.000E-03	1.000E-03	1.000E-03
Waterline[Se]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	1.972E-02	1.974E-02	1.974E-02	1.978E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Sr]	mg/L	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.189E+00	7.200E+00	7.195E+00	7.199E+00	7.270E+00	7.270E+00	7.270E+00
Waterline[Tl]	mg/L	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	1.974E-04	1.978E-04	1.978E-04	1.981E-04	2.000E-04	2.000E-04	2.000E-04
Waterline[U]	mg/L	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.082E-03	3.093E-03	3.095E-03	3.096E-03	3.110E-03	3.110E-03	3.110E-03
Waterline[V]	mg/L	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	4.969E-03	4.979E-03	4.979E-03	4.979E-03	5.000E-03	5.000E-03	5.000E-03
Waterline[Zn]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.362E-05	7.346E-05	6.802E-05	4.844E-05	Unavailable	Unavailable	Unavailable
Waterline[Ra226]	Bq/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.499E-04	1.638E-04	1.205E-04	5.310E-05	Unavailable	Unavailable	Unavailable

Other Constituents Predictions for Dissolved Concentration			**Simulation Year 1 (2025)**											
	Unit	**Background Lake Concentration**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Monthly Average of Minimum Dilution (ratio)			**Infinity**	**Infinity**	**Infinity**	**Infinity**	**Infinity**	**250:1**	**167:1**	**70:1**	**74:1**	**8176764:1**	**Infinity**	**Infinity**
Waterline[TDS]	mg/L	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.422E+04	3.421E+04	3.384E+04	3.388E+04	3.430E+04	3.430E+04	3.430E+04
Waterline[NH3_N]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.328E-02	3.532E-02	3.612E-02	4.466E-02	Unavailable	Unavailable	Unavailable
Waterline[NO3_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.707E+00	3.001E+00	2.702E+00	2.737E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[NO2_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.497E+00	2.501E+00	2.469E+00	2.472E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[Cl]	mg/L	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.008E+04	2.008E+04	1.986E+04	1.989E+04	2.013E+04	2.013E+04	2.013E+04
Waterline[F]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.409E-05	3.469E-04	9.338E-04	8.718E-04	Unavailable	Unavailable	Unavailable
Waterline[SO4]	mg/L	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.882E+03	2.880E+03	2.851E+03	2.854E+03	2.890E+03	2.890E+03	2.890E+03
Waterline[T_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	6.957E-05	1.563E-04	4.544E-05	5.945E-05	Unavailable	Unavailable	Unavailable
Waterline[WAD_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	8.682E-06	2.187E-05	1.679E-05	1.764E-05	Unavailable	Unavailable	Unavailable
Waterline[Ag]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.396E-07	3.237E-07	1.215E-07	1.349E-07	Unavailable	Unavailable	Unavailable
Waterline[Al]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.176E-05	6.800E-05	9.723E-05	1.200E-04	Unavailable	Unavailable	Unavailable
Waterline[As]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.536E-04	3.501E-04	1.238E-04	1.596E-04	Unavailable	Unavailable	Unavailable
Waterline[B]	mg/L	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.772E+00	4.764E+00	4.724E+00	4.728E+00	4.790E+00	4.790E+00	4.790E+00
Waterline[Ba]	mg/L	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.027E-02	1.068E-02	1.025E-02	1.033E-02	1.000E-02	1.000E-02	1.000E-02
Waterline[Be]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.980E-04	4.971E-04	4.931E-04	4.934E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Ca]	mg/L	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.039E+02	4.050E+02	3.993E+02	3.999E+02	4.040E+02	4.040E+02	4.040E+02
Waterline[Cd]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.980E-04	4.971E-04	4.932E-04	4.936E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Co]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.218E-07	3.880E-06	1.141E-05	1.172E-05	Unavailable	Unavailable	Unavailable
Waterline[Cr]	mg/L	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	4.981E-02	4.972E-02	4.930E-02	4.934E-02	5.000E-02	5.000E-02	5.000E-02
Waterline[Cu]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.450E-07	4.124E-06	1.423E-05	1.489E-05	Unavailable	Unavailable	Unavailable
Waterline[Fe]	mg/L	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	5.977E-01	5.969E-01	5.926E-01	5.931E-01	6.000E-01	6.000E-01	6.000E-01
Waterline[Hg]	mg/L	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	4.981E-05	4.974E-05	4.944E-05	4.947E-05	5.000E-05	5.000E-05	5.000E-05
Waterline[K]	mg/L	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.929E+02	3.926E+02	3.887E+02	3.891E+02	3.940E+02	3.940E+02	3.940E+02
Waterline[Mg]	mg/L	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.305E+03	1.302E+03	1.292E+03	1.293E+03	1.310E+03	1.310E+03	1.310E+03
Waterline[Mn]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.011E-02	2.067E-02	2.113E-02	2.106E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Mo]	mg/L	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.124E-02	1.132E-02	1.108E-02	1.111E-02	1.120E-02	1.120E-02	1.120E-02
Waterline[Na]	mg/L	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.084E+04	1.083E+04	1.072E+04	1.073E+04	1.087E+04	1.087E+04	1.087E+04
Waterline[Ni]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.901E-05	1.194E-04	6.397E-05	7.240E-05	Unavailable	Unavailable	Unavailable
Waterline[P]	mg/L	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	5.976E+00	5.966E+00	5.920E+00	5.924E+00	6.000E+00	6.000E+00	6.000E+00
Waterline[Pb]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.730E-08	4.352E-07	1.193E-06	6.907E-07	Unavailable	Unavailable	Unavailable
Waterline[Sb]	mg/L	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.020E-03	1.047E-03	9.990E-04	1.004E-03	1.000E-03	1.000E-03	1.000E-03
Waterline[Se]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	1.993E-02	1.990E-02	1.972E-02	1.974E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Sr]	mg/L	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.280E+00	7.316E+00	7.190E+00	7.204E+00	7.270E+00	7.270E+00	7.270E+00
Waterline[Tl]	mg/L	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	1.993E-04	1.992E-04	1.975E-04	1.976E-04	2.000E-04	2.000E-04	2.000E-04
Waterline[U]	mg/L	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.098E-03	3.095E-03	3.074E-03	3.077E-03	3.110E-03	3.110E-03	3.110E-03
Waterline[V]	mg/L	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	4.993E-03	4.999E-03	4.939E-03	4.946E-03	5.000E-03	5.000E-03	5.000E-03
Waterline[Zn]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.852E-05	9.104E-05	3.860E-05	4.340E-05	Unavailable	Unavailable	Unavailable
Waterline[Ra226]	Bq/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.674E-04	5.930E-04	1.227E-04	1.809E-04	Unavailable	Unavailable	Unavailable

Other Constituents Predictions for Dissolved Concentration			Simulation Year 2 (2028)											
	Unit	Background Lake Concentration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average of Minimum Dilution (ratio)			Infinity	Infinity	Infinity	Infinity	Infinity	230:1	188:1	73:1	571:1	14248977:1	Infinity	Infinity
Waterline[TDS]	mg/L	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.422E+04	3.430E+04	3.390E+04	3.425E+04	3.430E+04	3.430E+04	3.430E+04
Waterline[NH3_N]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.587E-02	4.676E-02	5.617E-02	9.902E-03	Unavailable	Unavailable	Unavailable
Waterline[NO3_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.681E+00	3.044E+00	2.784E+00	2.573E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[NO2_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.495E+00	2.503E+00	2.473E+00	2.497E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[Cl]	mg/L	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.008E+04	2.013E+04	1.990E+04	2.011E+04	2.013E+04	2.013E+04	2.013E+04
Waterline[F]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.361E-05	1.809E-04	8.341E-04	1.297E-04	Unavailable	Unavailable	Unavailable
Waterline[SO4]	mg/L	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.881E+03	2.885E+03	2.855E+03	2.886E+03	2.890E+03	2.890E+03	2.890E+03
Waterline[T_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.364E-05	1.536E-04	6.611E-05	1.510E-05	Unavailable	Unavailable	Unavailable
Waterline[WAD_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	7.034E-06	2.081E-05	1.720E-05	2.868E-06	Unavailable	Unavailable	Unavailable
Waterline[Ag]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.624E-07	4.707E-07	2.362E-07	4.864E-08	Unavailable	Unavailable	Unavailable
Waterline[Al]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.885E-05	8.897E-05	1.134E-04	1.922E-05	Unavailable	Unavailable	Unavailable
Waterline[As]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.314E-04	3.782E-04	1.776E-04	4.602E-05	Unavailable	Unavailable	Unavailable
Waterline[B]	mg/L	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.771E+00	4.769E+00	4.728E+00	4.782E+00	4.790E+00	4.790E+00	4.790E+00
Waterline[Ba]	mg/L	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.034E-02	1.104E-02	1.047E-02	1.010E-02	1.000E-02	1.000E-02	1.000E-02
Waterline[Be]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.979E-04	4.974E-04	4.934E-04	4.992E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Ca]	mg/L	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.041E+02	4.071E+02	4.006E+02	4.037E+02	4.040E+02	4.040E+02	4.040E+02
Waterline[Cd]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.979E-04	4.975E-04	4.936E-04	4.992E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Co]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.882E-06	6.364E-06	1.218E-05	3.232E-06	Unavailable	Unavailable	Unavailable
Waterline[Cr]	mg/L	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	4.979E-02	4.977E-02	4.934E-02	4.992E-02	5.000E-02	5.000E-02	5.000E-02
Waterline[Cu]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	9.107E-07	4.006E-06	1.733E-05	2.620E-06	Unavailable	Unavailable	Unavailable
Waterline[Fe]	mg/L	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	5.975E-01	5.972E-01	5.928E-01	5.991E-01	6.000E-01	6.000E-01	6.000E-01
Waterline[Hg]	mg/L	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	4.979E-05	4.976E-05	4.947E-05	4.993E-05	5.000E-05	5.000E-05	5.000E-05
Waterline[K]	mg/L	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.928E+02	3.934E+02	3.892E+02	3.934E+02	3.940E+02	3.940E+02	3.940E+02
Waterline[Mg]	mg/L	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.304E+03	1.304E+03	1.293E+03	1.308E+03	1.310E+03	1.310E+03	1.310E+03
Waterline[Mn]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.023E-02	2.090E-02	2.115E-02	2.032E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Mo]	mg/L	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.122E-02	1.134E-02	1.114E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02
Waterline[Na]	mg/L	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.084E+04	1.086E+04	1.074E+04	1.085E+04	1.087E+04	1.087E+04	1.087E+04
Waterline[Ni]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	6.179E-05	1.802E-04	1.231E-04	2.546E-05	Unavailable	Unavailable	Unavailable
Waterline[P]	mg/L	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	5.974E+00	5.969E+00	5.924E+00	5.990E+00	6.000E+00	6.000E+00	6.000E+00
Waterline[Pb]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	8.230E-08	3.711E-07	1.507E-06	2.185E-07	Unavailable	Unavailable	Unavailable
Waterline[Sb]	mg/L	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.024E-03	1.075E-03	1.021E-03	1.005E-03	1.000E-03	1.000E-03	1.000E-03
Waterline[Se]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	1.992E-02	1.991E-02	1.974E-02	1.997E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Sr]	mg/L	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.285E+00	7.364E+00	7.221E+00	7.268E+00	7.270E+00	7.270E+00	7.270E+00
Waterline[Tl]	mg/L	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	1.993E-04	1.993E-04	1.976E-04	1.997E-04	2.000E-04	2.000E-04	2.000E-04
Waterline[U]	mg/L	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.098E-03	3.098E-03	3.079E-03	3.107E-03	3.110E-03	3.110E-03	3.110E-03
Waterline[V]	mg/L	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	4.994E-03	5.018E-03	4.958E-03	4.996E-03	5.000E-03	5.000E-03	5.000E-03
Waterline[Zn]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.606E-05	1.319E-04	6.788E-05	1.330E-05	Unavailable	Unavailable	Unavailable
Waterline[Ra226]	Bq/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.263E-04	9.208E-04	3.213E-04	7.182E-05	Unavailable	Unavailable	Unavailable

Other Constituents Predictions for Dissolved Concentration			Simulation Year 3 (2042)											
	Unit	Background Lake Concentration	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Average of Minimum Dilution (ratio)			Infinity	Infinity	Infinity	Infinity	Infinity	68:1	72:1	72:1	86:1	15245204:1	Infinity	Infinity
Waterline[TDS]	mg/L	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.430E+04	3.384E+04	3.387E+04	3.386E+04	3.392E+04	3.430E+04	3.430E+04	3.430E+04
Waterline[NH3_N]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	4.831E-02	7.570E-02	7.661E-02	4.513E-02	Unavailable	Unavailable	Unavailable
Waterline[NO3_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	3.000E+00	3.058E+00	3.065E+00	2.827E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[NO2_N]	mg/L	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.500E+00	2.475E+00	2.478E+00	2.474E+00	2.475E+00	2.500E+00	2.500E+00	2.500E+00
Waterline[Cl]	mg/L	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	2.013E+04	1.986E+04	1.988E+04	1.987E+04	1.991E+04	2.013E+04	2.013E+04	2.013E+04
Waterline[F]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.185E-04	1.566E-03	1.682E-03	1.441E-03	Unavailable	Unavailable	Unavailable
Waterline[SO4]	mg/L	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.890E+03	2.850E+03	2.854E+03	2.854E+03	2.859E+03	2.890E+03	2.890E+03	2.890E+03
Waterline[T_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.380E-05	3.117E-05	4.477E-05	2.839E-05	Unavailable	Unavailable	Unavailable
Waterline[WAD_CN]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	7.806E-06	1.425E-05	1.487E-05	1.039E-05	Unavailable	Unavailable	Unavailable
Waterline[Ag]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	5.643E-07	5.866E-07	4.323E-07	1.643E-07	Unavailable	Unavailable	Unavailable
Waterline[Al]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	7.827E-05	1.537E-04	1.692E-04	1.274E-04	Unavailable	Unavailable	Unavailable
Waterline[As]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.282E-04	1.698E-04	2.339E-04	1.437E-04	Unavailable	Unavailable	Unavailable
Waterline[B]	mg/L	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.790E+00	4.722E+00	4.727E+00	4.727E+00	4.737E+00	4.790E+00	4.790E+00	4.790E+00
Waterline[Ba]	mg/L	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.000E-02	1.021E-02	1.039E-02	1.038E-02	1.021E-02	1.000E-02	1.000E-02	1.000E-02
Waterline[Be]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.929E-04	4.933E-04	4.934E-04	4.944E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Ca]	mg/L	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	4.040E+02	3.993E+02	3.998E+02	3.998E+02	4.001E+02	4.040E+02	4.040E+02	4.040E+02
Waterline[Cd]	mg/L	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	5.000E-04	4.930E-04	4.938E-04	4.939E-04	4.948E-04	5.000E-04	5.000E-04	5.000E-04
Waterline[Co]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	2.413E-05	3.366E-05	4.824E-05	3.127E-05	Unavailable	Unavailable	Unavailable
Waterline[Cr]	mg/L	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	5.000E-02	4.928E-02	4.933E-02	4.932E-02	4.943E-02	5.000E-02	5.000E-02	5.000E-02
Waterline[Cu]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	9.390E-06	2.991E-05	3.375E-05	2.952E-05	Unavailable	Unavailable	Unavailable
Waterline[Fe]	mg/L	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	6.000E-01	5.916E-01	5.927E-01	5.926E-01	5.938E-01	6.000E-01	6.000E-01	6.000E-01
Waterline[Hg]	mg/L	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	5.000E-05	4.934E-05	4.954E-05	4.955E-05	4.963E-05	5.000E-05	5.000E-05	5.000E-05
Waterline[K]	mg/L	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.940E+02	3.886E+02	3.890E+02	3.890E+02	3.897E+02	3.940E+02	3.940E+02	3.940E+02
Waterline[Mg]	mg/L	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.310E+03	1.291E+03	1.292E+03	1.293E+03	1.295E+03	1.310E+03	1.310E+03	1.310E+03
Waterline[Mn]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.196E-02	2.345E-02	2.482E-02	2.325E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Mo]	mg/L	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.120E-02	1.109E-02	1.111E-02	1.110E-02	1.110E-02	1.120E-02	1.120E-02	1.120E-02
Waterline[Na]	mg/L	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.087E+04	1.072E+04	1.073E+04	1.073E+04	1.075E+04	1.087E+04	1.087E+04	1.087E+04
Waterline[Ni]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	9.960E-05	1.829E-04	2.068E-04	1.635E-04	Unavailable	Unavailable	Unavailable
Waterline[P]	mg/L	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	6.000E+00	5.913E+00	5.920E+00	5.920E+00	5.934E+00	6.000E+00	6.000E+00	6.000E+00
Waterline[Pb]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	7.391E-07	1.816E-06	1.746E-06	1.227E-06	Unavailable	Unavailable	Unavailable
Waterline[Sb]	mg/L	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.000E-03	1.005E-03	1.016E-03	1.012E-03	1.007E-03	1.000E-03	1.000E-03	1.000E-03
Waterline[Se]	mg/L	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	2.000E-02	1.972E-02	1.974E-02	1.974E-02	1.978E-02	2.000E-02	2.000E-02	2.000E-02
Waterline[Sr]	mg/L	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.270E+00	7.189E+00	7.200E+00	7.195E+00	7.199E+00	7.270E+00	7.270E+00	7.270E+00
Waterline[Tl]	mg/L	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	2.000E-04	1.973E-04	1.978E-04	1.978E-04	1.981E-04	2.000E-04	2.000E-04	2.000E-04
Waterline[U]	mg/L	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.110E-03	3.082E-03	3.093E-03	3.095E-03	3.096E-03	3.110E-03	3.110E-03	3.110E-03
Waterline[V]	mg/L	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	5.000E-03	4.941E-03	4.953E-03	4.952E-03	4.957E-03	5.000E-03	5.000E-03	5.000E-03
Waterline[Zn]	mg/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	3.521E-05	5.606E-05	5.062E-05	3.384E-05	Unavailable	Unavailable	Unavailable
Waterline[Ra226]	Bq/L	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	Unavailable	1.499E-04	1.638E-04	1.205E-04	5.310E-05	Unavailable	Unavailable	Unavailable