2019 OPERATING CARE & MAINTENANCE ANNUAL REPORT

Denison Mines Inc.

Submitted to the

Canadian Nuclear Safety Commission

March 30, 2020

Denison Mines Inc.
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March 30, 2020

Mr. Ron Stenson, Senior Project Officer
Canadian Nuclear Safety Commission
Wastes and Decommissioning Division
280 Slater Street
PO Box 1046, Station B
Ottawa, Ontario
K1P 5S9

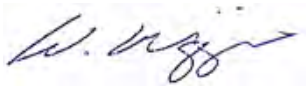
Dear Mr. Stenson:

RE: Denison Mines Inc. 2019 Operating Care and Maintenance Annual Report

Denison Mines Inc. is pleased to submit one copy of the Denison Mines Inc. Operating Care and Maintenance Annual Report for 2019. This document has been completed in accordance with: UMDL-Minemill-Denison.01/indf; and UMDL-Minemill-Stanrock.02/indf; and CofA No. 4-0067-74-766; CofA No. 4-0019-72-006; and CofA No. 4-034-76-006.

Yours truly,

Denison Mines Inc.



Wade Wiggins

Interim Director of Closed Mines Operations

Enclosure

Distribution

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1 ORGANIZATIONAL INFORMATION

1.1 Licencee

DENISON MINES INC.
1100-40 University Avenue
Toronto, Ontario
M5G 1T1

1.2 Board of Directors

Table 1.1 contains the list of names and titles of the Directors of Denison Mines Inc. as of December 31, 2019. All persons listed below may be contacted via the licensee address.

Table 1.1 Denison Mines Inc. Directors as of December 31, 2019

Name	Office
David Cates	Director, President and Chief Executive Officer
Gabriel (Mac) McDonald	Director, Chief Financial Officer

1.3 List of Officers

Table 1.2 contains the list of names and titles of the Officers of Denison Mines Inc. as of December 31, 2019. All persons listed below may be contacted via the licencee address.

Table 1.2 Denison Mines Inc. Officers as of December 31, 2019

Name	Office
David Cates	Director, President and Chief Executive Officer
Gabriel (Mac) McDonald	Director and Chief Financial Officer
Amanda Willett	Canadian Counsel and Corporate Secretary
Mary Jo Smith	Director, Internal Audit

2 FINANCIAL GUARANTEES

Federal and Provincial regulations which apply to the decommissioning programs of Denison Mines Inc. (Denison) in Elliot Lake require mine operators to provide adequate and secure

resources to meet current and future responsibilities with respect to mine closure and long-term care and maintenance.

All expenditures are funded through a reclamation trust fund where Denison is required to maintain a balance in the trust equivalent to six years of the estimated current annual costs. Sufficient funds are currently in the reclamation trust to meet all monitoring costs through 2024.

3 LICENCE AND MONITORING PROGRAM MODIFICATIONS

Denison Closed Mine Sites in Elliot Lake currently operate and are monitored within the scope of work outlined within a licence regulated by the Federal Canadian Nuclear Safety Commission (CNSC). Currently Denison is the licencee for two Uranium Mine Decommissioning Licences:

1) Denison sites (TMA-1 and TMA-2) UMDL-Minemill-Denison.01/indf; and
2) Stanrock site UMDL-Minemill-Stanrock.02/indf

Sample stations that require monitoring under the Licences include:

1) Stollery Lake Outlet (D-2) for Denison TMA-1;
2) Lower Williams Lake (LWL) Outlet (D-3) for Denison TMA-2; and
3) Orient Lake Outlet (DS-4) for Stanrock TMA

Provincially, Denison is the permittee for three Compliance Approvals (C of A) regulated by the Ministry of Environment, Conservation and Parks (MECP):

1) Denison Site TMA-1: C of A No. 4-0019-72-006;
2) Denison Site TMA-2 (Lower Williams): C of A No. 4-034-76-006; and
3) Stanrock Site: C of A No. 4-0067-74-766

There were no changes to any of these documents in 2019.

A State of the Environment Report for the Serpent River Watershed for Denison and Rio Algom Limited (RAL) is produced by Minnow Environmental Inc. (Minnow) every five years based on the monitoring database. This report includes the monitoring programs for the Serpent River Watershed Monitoring Program (SRWMP), Source Area Monitoring Program (SAMP) and the Tailings Management Area (TMA) Operational Monitoring Program (TOMP). There were approved changes to the SAMP and TOMP in 2015 that included approval from Environment and Climate Change Canada (ECCC), CNSC. Ministry of Labour (MOL), Ministry of Natural Resources and Forestry (MNRF) and Ministry of Northern Development and Mines (MNDM), which were presented in the *Cycle 4 Study Design for the Serpent River Water Management Program* (Minnow Environmental Inc., 2016). A summary of approved changes is provided in Appendix I.

4 METHODOLOGY

4.1 Health and Safety

4.1.1 Health and Safety Injury Statistics

Health and safety in the workplace continue to be an important part of Denison, and practices to support this continue to be implemented to ensure safety is maintained in the workplace. In 2019, monthly safety meetings and daily line-ups were conducted to provide Denison personnel with adequate training and education in matters relating to health and safety. Denison staff are provided with additional training as required for the work. This practice continues to be an integral part of Denison's safety program.

4.1.2 Gamma Dosimetry

Denison has continued to voluntarily participate in the gamma dosimetry program. The program applies to all employees whose job responsibilities require them to work in and around the Licenced sites, which include the tailings management areas (TMAs). These workers are classified as Nuclear Energy Workers (NEWs). The program does not apply to visitors visiting the sites or employees who do not actively work at the Licenced sites; however, sometimes sub-contractors may be issued visitor badges should the work involve specific earthworks projects over an extended period of time.

The type of gamma dosimetry badges used are Optically Stimulated Luminescence (OSL) dosimeters, which have a wearing period of three months. Badges are issued in the first calendar month of the year and each quarter going forward. Each worker is issued a pre-labelled badge with its own unique dosimeter number that is designated for each worker. At the end of the wearing period, the dosimeters are sent to the Radiation Protection Bureau (RPB) Health Canada for processing. The RPB will issue a Radiation Exposure Report, to Denison's designate who is thereafter responsible for reviewing the information, reporting any anomalies to workers, and maintaining the company records.

4.1.3 Radon Progeny Monitoring

Radon progeny monitoring at all Denison Effluent Treatment Plants (ETPs) is conducted on a quarterly basis, as part of the quarterly health and safety inspections. Radon results are reported in Working Level (WL) units.

Radon level is measured by calculating alpha radiation from radon decay products. The sample is first collected on membrane filters with an air-sampling pump by walking through the entire ETP over a 5-minute period, simulating a normal work routine. The ETP should be ventilated as per routine work practice before the walkthrough. Alpha radiation is measured with an alpha counter between forty to ninety minutes after the sample has been collected. WL is then calculated based on the counts, count duration, sampling duration, sampling flow rate, decay factor, filter self-absorption value, background count, and efficiency factor.

The reportable action limit for radon exposure at all ETPs is 0.1 WL (Action level as indicated in Control Limit Registry companion document (Table 7.1 of Appendix A) in Minnow 2017 Cycle 4 State of the Environment Report). To ensure radon levels stay below the reportable action limit, an internal investigation limit of 0.05 WL has been established to trigger a response whereby mitigating measures are implemented in order to ensure worker exposure to radon gas is reduced and controlled. Mitigating measures include but are not limited to the purchase of a radon fan and/or posting signage to employ longer ventilation time before ETP work begins.

The gamma and radon data are then used to calculate individual annual dose estimates for Care and Maintenance workers classified as NEWs. A worker dose estimate report is submitted annually to the CNSC under separate cover.

4.2 Water Quality Monitoring Program

4.2.1 TOMP, SAMP and SRWMP

As part of the closure and decommissioning process, an integrated performance monitoring framework had been developed for Denison and RAL sites for water quality monitoring activities through three integrated programs: TOMP, SAMP and SRWMP. These programs have been described in the Cycle 4 Study Design by Minnow.

4.2.1.1 TMA Operational Monitoring Program (TOMP)

The TOMP was designed to track the performance of the TMAs and generate data used to make decisions for management and compliance of the TMAs. The program included water quality monitoring within the TMA basins and groundwater quality, to reflect the operational and treatment performance. The data collected in the program could be used as references for water quality trend and improvement for Serpent River watershed receiving environment, however the water quality from Denison and Stanrock TMA sites must comply with the regulatory criteria for the effluents from the treatment plants specified in the licences and C of As (Sample points: D-2, D-3 and DS-4).

4.2.1.2 Source Area Monitoring Program (SAMP)

The SAMP was designed to monitor the nature and quantity of potential contaminants being discharged from the TMAs to the Serpent River Watershed. Some monitoring stations for the SAMP program were also the TOMP effluent stations, and requirements have been harmonized to serve both programs. The data collected in the program could be used as references for water quality trend and performance for the Serpent River watershed receiving environment.

4.2.1.3 Serpent River Watershed Monitoring Program (SRWMP)

The SWRMP was designed to provide an integrated monitoring approach to assess the cumulative effects and watershed-level changes over time, in order to evaluate the recovery of the receiving environment following the implementation of the decommissioning plans. The SRWMP assessed water and sediment chemistry, as well as benthic invertebrates in downstream and reference lakes within the watershed. Water quality data collected in the program was compared to the benchmarks established for the SRWMP. The objectives of the SRWMP were:

- Evaluation of cumulative effects of mine discharges on the Serpent River Watershed;
- Evaluation of the effectiveness of mine decommissioning plans; and
- Assessment of long-term trends in environmental quality in the watershed.

The SRWMP report was prepared and submitted under a separate cover. Results are not presented in this annual report.

4.2.2 Program Requirements

Water quality monitoring requirements and criteria as per the licences were fulfilled through the approved TOMP, SAMP and SRWMP. The water quality monitoring locations in this report made up part of the Serpent River Watershed (SRW), which is a shared watershed with RAL sites and their monitoring locations. Therefore, to obtain an overall understanding of the data in this report,

this report should be read in conjunction with the *Serpent River Watershed Monitoring Program 2019 Annual Water Quality Report* (RAL & Denison, 2019).

The 2019 TOMP and SAMP followed program requirements specific to the following: sampling locations, frequencies, parameters, and analytical protocols. These requirements have been recommended and approved in the *Cycle 4 Study Design for the SRWMP, SAMP and TOMP* (Minnow Environmental Inc., 2016). Appendix II in this report provides maps of the sampling stations of the water quality program. Tables in Appendix II provide a brief description of each location, the sampling frequency, and parameters monitored, as required by TOMP and SAMP as well as the C of As and decommissioning licences as identified in Section 3.

4.2.3 Data Quality Objectives

Targeted Detection Limits (TDL) and Data Quality Objectives (DQOs) for TOMP and SAMP requirements were provided in Table 4.2.2 which were derived from the Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow Environmental Inc., 2016). Laboratory data quality assessment was provided under a separate cover in the *Serpent River Watershed Monitoring Program 2019 Annual Water Quality Report.*

4.2.4 Changes in Analytical Methods

There were no changes in analytical methodology in 2019.

4.2.5 Data Screening and Assessment Conventions

Data validation was conducted on TOMP and SAMP water quality data throughout the year. The data validation assessment screening process within the electronic database flagged all data points entered or imported that had values outside a rolling minimum 12 value mean $\pm$ 3 standard deviations. Prior to being accepted in the database, all flagged data was reviewed and validated through a quality assurance process.

As part of the TOMP, field quality assurance and quality control sampling were extended to the groundwater monitoring program in 2006. Data quality assessment involved monthly screening of field duplicate and field blank sample data against TOMP and SAMP DQOs found in Table 4.2.2. Detailed surface water and groundwater quality assurance and quality control (QA/QC) results are included in Appendix III of this report.

Laboratory analyses were contracted to Canadian Association of Laboratory Accreditation (CALA) certified laboratories. Laboratory QA/QC reports were provided under separate cover in the *Serpent River Watershed Monitoring Program 2019 Annual Water Quality Report* (RAL & Denison).

In November 2019, Denison was notified that the CALA Accreditation Laboratory used for analysis of Radium 226 lost their accreditation due to an administrative oversight. Denison notified MECP and CNSC of the issue. The laboratory was able to complete the administrative requirement and obtain accreditation within four months. In the meantime, the laboratory continued to follow the same analytical procedures as required by the ISO:17025 accreditation. In addition, they have continued to maintain and pass regular proficiency testing required under the standard, incorporate the same quality control samples and follow the same acceptance criteria established. The laboratory was maintaining identical procedures to those under the accreditation and would continue to meet the requirements for regulatory reporting. This issue was closely monitored by Denison, MECP and CNSC. No concerns were raised that this issue compromised human, environmental and public safety.

Flagged data and short-term response plans were reported to the CNSC, MECP and Environment Canada (EC) in the monthly water quality report. Monthly data validation of flagged data for 2019 can be found in Appendix III.

Annual water quality reporting was designed to be concise and focused on the presentation of data in a standardized format with limited interpretation. Detailed statistical evaluation of water quality trends was included in the *Serpent River Watershed Cycle 4 (2010 to 2014) State of the Environment Report (SOE)* (Minnow Environmental Inc., 2017). Data validation, as documented in Data Validation Procedures, ensured prompt response to upset conditions or unusual results. Appendix IV includes all 2019 water quality monitoring results with surface water results and five years of groundwater quality results.

Surface water stations within the TMAs, as well as effluent, seepages, and downstream surface water stations were compared to SRWMP benchmarks (Table 4.5 in Minnow Environmental, 2016) for receiving water quality. Mine sources (i.e. TOMP and SAMP stations) were not expected to achieve the benchmarks that were set for the receiving environment, but these comparisons were made to identify potential variables or sources of concern relative to the downstream receiving environment. Therefore, water quality data in this report is compared to benchmarks established for the SRWMP (Table 4.5 in Minnow Environmental 2016). These benchmarks were based on water quality criteria for the protection of aquatic life or the upper range of background concentrations (except for pH for which the lower background range was relevant). The most recent federal and provincial (Ontario) guideline was used to determine these benchmarks (or British Columbia Ministry of Environment (BCMOE) water quality guidelines were applied if none existed). In this report, benchmarks are presented in Table 4.2.2.

Table 4.2.2 Water Quality Benchmarks for SRWMP and Data Quality Objectives for TOMP, SAMP and SRWMP

		Benchmarks for SRWMP[1]	Data Quality Objectives[2] (DQO) for TOMP, SAMP and SRWMP						
Parameter	**Units**	**Receiving Environment Criteria**	**Targeted Detection Limit**	**Field Blank**	**Laboratory Blank**	**Field Precision**	**Laboratory Precision**	**Laboratory Spikes**	**Laboratory Accuracy (CRM)**
Field Parameters									
Conductivity	µmho/cm	-	0.1	-	-	10%	-	-	-
Flow	L/s	-	mothod	-	-	30%	-	-	-
pH			0.1	-	-	10%	-	-	-
Lake		6.5							
Wetland/Stream		5.2							
Laboratory Parameters									
Acidity	mg/L	-	1.0	2.0	2.0	20%	10%	-	-
Barium	mg/L	1.0	0.005	0.01	0.01	20%	10%	20%	20%
Cobalt	mg/L	0.0025	0.0005	0.001	0.001	20%	10%	20%	20%
Hardness	mg/L	-	0.5	1.0	1.0	20%	10%	-	-
Iron	mg/L		0.02	0.04	0.04	20%	10%	20%	20%
Lake		0.49							
Wetland/Stream		1.69							
Manganese[3]	mg/L	0.8	0.002	0.004	0.004	20%	10%	20%	20%
Radium	mg/L	1.0	0.005	0.01	0.01	20%	10%	20%	-
Sulphate[3]	mg/L	128-429	0.1	0.2	0.2	20%	10%	20%	20%
TSS	mg/L	-	1.0	2.0	-	20%	10%	-	-
Uranium	mg/L	0.015	0.0005	0.001	0.001	20%	10%	20%	20%

Notes:
1. Table 4.5 Water Quality Benchmarks for SRWMP stations in the Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow Environmental Inc., 2016)
2. Table 5.2 Data Quality Objectives (DQO) in the Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow Environmental Inc., 2016)
3. Sulphate and manganese criteria taken from Table B.1, Appendix B, for SRWMP stations in the Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow Environmental Inc., 2016). Parameters are hardness related.

5 RESULTS AND DISCUSSION

5.1 Health and Safety

5.1.1 Health and Safety Injury Statistics

In 2019, health and safety related training and education continued to be an integral part of monthly safety meetings and daily line-ups for care and maintenance workers working at the Denison Closed Mines Operations in Elliot Lake. All care and maintenance workers continued to hold the following certifications and/or had completed the following training: Workplace Hazardous Materials Information System (WHMIS), Cardiopulmonary Resuscitation (CPR) and First Aid certification, as well as the Annual Radiation Safety training. Furthermore, many workers had completed additional training and certifications to ensure their qualifications for specialty/specific tasks and jobs related to care and maintenance at the Denison Closed Mines in Elliot Lake. Denison ensured that all training/certifications were kept up to date and workers were re-certified and trained when required. There were 2 medical aids in 2019 and one medical aid in 2017. No lost time accidents were reported between 2017 and 2019 at the Elliot Lake sites (Table 5.1.1).

Table 5.1.1 Health & Safety Injury Statistics

Category	2019		2018		2017	
	Number	Frequency	Number	Frequency	Number	Frequency
Medical Aid	2	9.49	0	0.0	1	4.1
Lost Time	0	0	0	0.0	0	0.0
Total	**2**	**9.49**	**0**	**0.0**	**1**	**4.1**
Person-Hours Worked	**42,147**		**45,385**		**48,270**	

Frequency is Calculated as: Number/Person-hours worked*200,000

5.1.2 Gamma Dosimetry

Dose reports for gamma dosimetry will be provided to the Canadian Nuclear Safety Commission (CNSC) under separate cover.

5.1.3 Radon Progeny Monitoring

There were no radon progeny action level exceedances in 2019. The action level criteria is specific to the Elliot Lake area (Action level as indicated in Control Limit Registry companion document (Table 7.1 of Appendix A) in Minnow 2017 Cycle 4 State of the Environment Report). Working Levels (WLs) remained well below the action level criteria of 0.10 WL for the Denison TMA-1 ETP (Table 5.1.3.1), Denison LWL (TMA-2) ETP (Table 5.1.3.2) and the Stanrock ETP (Table 5.1.3.3). Quarterly values for individual ETPs are provided in the following subsections.

Table 5.1.3.1 Denison TMA-1 ETP Radon Progeny Monitoring Results 2019

Quarter	Radon (WL)
1	0.0017
2	0.0030
3	0.0144
4	0.0050

Table 5.1.3.2 Denison LWL ETP Radon Progeny Monitoring Results 2019

Quarter	Radon (WL)
1	0.0527
2	0.0059
3	0.0170
4	0.0062

Table 5.1.3.3 Stanrock ETP Radon Progeny Monitoring Results 2019

Quarter	Radon (WL)
1	0.0049
2	0.0134
3	0.0015
4	0.0117

5.2 Water Quality Monitoring Program

The objective of the annual data review was to identify anomalous data and provided evaluation and short-term annual averages at select locations. Step changes and anomalies were identified by reviewing and compiling the last five years of annual average data for all TOMP and SAMP locations. Unusual individual results were routinely investigated in accordance with the *Water*

Quality Assessment and Response Plan, which was included in Appendix A of the most recent SOE Report (Minnow Environmental Inc., 2017).

5.2.1 Surface Water Quality

Appendix III contains detailed QA/QC results against DQOs while Appendix IV contains surface water station-specific annual data reported as monthly averages including annual statistics. Surface water quality data was reported monthly to the following regulatory bodies: CNSC, MECP, and ECCC.

All field blank DQOs were met for all parameters in all samples in 2019.

Although all field blank DQOs were met, there were three field precisions results which did not meet DQOs in 2019 (Table 5.2.1).

The TSS field precision DQO of 20% was exceeded in 3 out of the 12 samples all at 67%. The exceedances occurred at concentrations between 1 and 2 mg/L and were indicative of the lack of precision at low TSS concentrations and did not influence performance monitoring data integrity. The overall annual percent difference for TSS field precision was below the DQO at 17% (Table 5.2.1).

The radium field precision DQO of 20% was also slightly exceeded in 1 out of the 12 samples at 23%. The exceedances were not a result of improper sampling protocol, but rather were consistent with the variability observed in radium concentrations with each sample taken. All results were within values typically observed at this location and therefore did not affect the interpretation of radium water quality results. Despite the one exceedance, the annual average percent difference was only 11% (Table 5.2.1).

The iron field precision DQO of 20% was slightly exceeded in 1 of the 12 samples at 21%. Iron concentrations between the primary and duplicate samples for this exceedance were relatively low and were values typically observed at this location. The annual average percent difference was well below the 20% DQO at 7% (Table 5.2.1).

Table 5.2.1 2019 Surface Water Field Blank and Field Precision Data Summary

	pH	TSS (mg/L)	Hardness (mg/L)	SO4 (mg/L)	Ra(T) Bq/L)	U (mg/L)	Ba (mg/L)	Co (mg/L)	Fe (mg/L)	Mn (mg/L)
Field Blank Statistics										
Count	16	12	12	12	12	12	12	12	12	12
Average	6.4	1	<0.5	<0.1	<0.007	<0.0005	<0.005	<0.0005	<0.02	<0.002
Max	7.0	1	<0.5	<0.1	<0.007	<0.0005	<0.005	<0.0005	<0.02	<0.002
Min	5.7	1	<0.5	<0.1	<0.007	<0.0005	<0.005	<0.0005	<0.02	<0.002
Field Blank Exceedances										
DQO Criteria [1]		2	1.0	0.2	0.01	0.001	0.01	0.001	0.04	0.004
# Exceedances		0	0	0	0	0	0	0	0	0
Field Duplicate Statistics										
Count	12	12	12	12	12	12	12	12	12	12
Average	1%	17%	2%	2%	11%	3%	2%	5%	7%	7%
Max	7%	67%	8%	6%	23%	7%	9%	18%	21%	19%
Min	0%	0%	0%	0%	6%	1%	1%	0%	0%	0%
Field Precision Exceedances										
DQO Criteria [1]	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
# Exceedances	0	**3**	0	0	**1**	0	0	0	**1**	0

[1] TOMP and SAMP field blank and field precision DQO criteria taken from Table 5.2 of the Cycle 4 Study Design for SRWMP, SAMP, TOMP (Minnow Environmental Inc., 2016)
Bold indicates an exceedance in the field blank or field precision criteria

5.2.1.1 Denison TMA-1

Site-specific water quality monitoring at the Denison TMA-1 facility was completed in accordance with TOMP and SAMP design requirements. Water quality data from all the sites of the monitoring programs were compared to SRWMP benchmarks (Table 4.2.2) to demonstrate improving water quality, identify potential variables or sources of concern relative to the downstream receiving environment as well as to monitor treatment performance. Mine sources were not expected to meet these benchmarks. The monthly average detailed water quality results are provided in Appendix IV.

Basin performance of TMA-1 was monitored at the ETP influent at station D-1 as part of the TOMP program. pH, acidity and cobalt levels were consistent over the last 5 years, where pH had remained near neutral and acidity and cobalt remained near or below their respective Targeted Detection Limits (TDL) (Table 4.2.2). Sulphate levels continue to show a decreasing trend while uranium and hardness concentrations resulted in variable results over the last five years with the highest concentration in 2018 (Table 5.2.1.1a). Barium, iron and manganese concentrations show variability over time (Table 5.2.1.1a) but remain below the SRWMP benchmark (Table 4.2.2). Radium concentrations remained relatively stable and slightly elevated above the benchmark (1.0 Bq/L in Table 4.2.2) (Table 5.2.1.1a).

Table 5.2.1.1a Annual Average Concentrations ETP Influent (D-1)

PARAMETER UNITS	ACID mg/L	Hardness mg/L	pH	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2015	<1	159.3	7.6	103.0	1.331	0.095	<0.0005	0.08	0.024	0.0157
2016	<1	117.2	7.5	83.0	1.622	0.047	0.0006	0.10	0.037	0.0118
2017	<1	120.6	7.5	78.0	1.764	0.071	<0.0005	0.05	0.013	0.0157
2018	<1	126.3	7.5	71.0	1.375	0.066	<0.0005	0.12	0.020	0.0166
2019	<1	123.0	7.7	70.7	1.847	0.049	<0.0005	0.13	0.022	0.0125
Annual Summary Statistics										
Average	<1	129.3	7.6	81.1	1.588	0.066	0.0006	0.10	0.023	0.0145
Maximum	<1	159.3	7.7	103.0	1.847	0.095	0.0006	0.13	0.037	0.0166
Minimum	<1	117.2	7.5	70.7	1.331	0.047	<0.0005	0.05	0.013	0.0118

Note: Five-year annual average, maximum and minimum statistics

The final point of control at TMA-1 facility was monitored at the Stollery Settling Pond Outlet (station D-2). Review of the annual average concentrations for TOMP and SAMP parameters for the last five years indicated consistent TSS concentrations and near neutral pH values, both meeting discharge limits in the licence. Radium concentrations also remained well below the grab sample limit of 1.11 Bq/L and the monthly mean discharge limit of 0.37 Bq/L. Uranium concentrations remained stable with a slight decrease over time since 2015. Barium concentrations have been increasing over the last five years but can be associated with the increased barium chloride treatment required upstream at the D-1 influent for radium control. Iron concentrations were variable and remained below the benchmarks. Sulphate concentrations are elevated compared to influent water quality but indicates a decreasing trend over the last five years, similar to sulphate levels in the influent. (Table 5.3.1.2.1). Cobalt concentrations had remained well below the SRWMP benchmark and had remained stable over time. Radium and manganese concentrations were variable over time but remained below SRWMP benchmarks.

Table 5.2.1.1b Final Discharge at Stollery Settling Pond Outlet (D-2)

PARAMETER UNITS	Hardness mg/L	pH	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2015	296.8	7.2	241.7	1	0.113	0.140	0.0006	0.18	0.212	0.0416
2016	287.8	7.1	227.5	1	0.153	0.206	0.0006	0.22	0.134	0.0396
2017	305.8	7.3	230.8	1	0.123	0.205	0.0006	0.27	0.157	0.0390
2018	246.5	7.2	189.8	1	0.161	0.266	0.0006	0.27	0.157	0.0304
2019	236.1	7.2	179.2	1	0.152	0.338	0.0006	0.22	0.201	0.0325
Annual Summary Statistics										
Average	274.6	7.2	213.8	1	0.140	0.231	0.0006	0.23	0.172	0.0366
Maximum	305.8	7.3	241.7	1	0.161	0.338	0.0006	0.27	0.212	0.0416
Minimum	236.1	7.1	179.2	1	0.113	0.140	0.0006	0.18	0.134	0.0304

Note: Five-year annual average, maximum and minimum statistics

Toxicity was monitored for Denison TMA-1 at the final discharge station D-2 (Stollery Settling Pond Outlet) in order to estimate the potential effects that the effluent might have on biological components. Toxicity sampling was completed semi-annually in 2019 as per SAMP requirements and included the following tests: acute *Daphnia magna* and Rainbow Trout and sub lethal *Ceriodaphnia dubia.* In 2019, results confirmed 0% acute mortality/lethality for both *Daphnia magna* and rainbow trout at station D-2 in both sampling events (Appendix IV). Furthermore, a 100% IC_{25} result for *Ceriodaphnia dubia* was achieved during both sampling events in 2019, signifying a non-toxic effluent for the test organism (Appendix IV).

5.2.1.1.1 Discharge Compliance – Denison TMA-1 Final Discharge

In 2019, TMA-1 effluent quality at the final point of control, D-2, was in compliance with the discharge limit established in the decommissioning licence (Table 5.2.1.1.1).

Table 5.2.1.1.1 2019 TMA-1 Compliance with Discharge Limits at Final Point of Control (D-2)

Month	Samples Required	Number of Times Discharge Limits Were Exceeded					
		pH pH units		TSS mg/L		Ra(T) Bq/L	
		Grab Sample Limit[1]: Upper 9.5 Lower 5.5	Monthly Arithmetic Mean[1]: Upper 9.5 Lower 6.5	Grab Sample Limit[1]: Upper 50 Lower N/A	Monthly Arithmetic Mean[1]: Upper 25 Lower N/A	Grab Sample Limit[1]: Upper 1.11 Lower N/A	Monthly Arithmetic Mean[1]: Upper 0.37 Lower N/A
Jan.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Feb.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Mar.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Apr.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
May	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
June	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
July	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Aug.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Sept.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Oct.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Nov.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Dec.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
YTD	53	0 of 53	0 of 12	0 of 53	0 of 12	0 of 53	0 of 12

[1]Limits established in the Licence UMDL-MINEMILL-DENISON.01/indf issued December 15, 2004.

5.2.1.2 Denison Lower Williams Lake (TMA-2)

Site-specific water quality monitoring at the Denison LWL ETP was completed in accordance with TOMP and SAMP requirements. Detailed monthly average results are provided in Appendix IV.

LWL Influent station (D-22) is used to monitor seepage from Dam 1. Review of annual average concentrations for TOMP parameters at this station indicates variability for all parameters over the last five years. Water quality at D-22 shows slightly below neutral pH values (Table 5.2.1.2a), but slightly above the SRWMP benchmark pH lower limit. Sulphate concentrations are variable over time but show a decrease in concentration in the last five years. Radium, uranium, barium, and cobalt concentrations are variable, but all consistently remained below receiving environment benchmarks for SRWMP (Table 5.2.1.2a). Iron concentrations in 2019 decreased from 2018 but were consistent with previous years. Manganese concentrations were elevated in 2018 but decreased in 2019. Manganese concentrations were generally lower in 2019 potentially attributing to the relation of greater rainfall with an increase flow of 349, 000, 000 L treated in 2019 (Table 5.3.2.2.1). In 2019, all water quality data at D-22 appeared to be lower than concentrations reported in previous years not including 2017.

Table 5.2.1.2a Denison Lower Williams Lake ETP Influent (D-22)

PARAMETER UNITS	pH	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2015	6.7	118.8	0.449	0.047	0.0011	4.31	1.194	0.0030
2016	6.7	109.0	0.604	0.043	0.0009	5.43	1.603	0.0019
2017	6.7	72.0	0.171	0.023	<0.0005	1.39	0.186	0.0008
2018	6.7	93.0	0.485	0.041	0.0014	5.24	1.315	0.0019
2019	6.7	59.3	0.250	0.029	0.0006	2.54	0.374	0.0008
Annual Summary Statistics								
Average	6.7	90.4	0.392	0.037	0.0010	3.78	0.934	0.0017
Maximum	6.7	118.8	0.604	0.047	0.0014	5.43	1.603	0.0030
Minimum	6.7	59.3	0.171	0.023	0.0006	1.39	0.186	0.0008

Note: Five year annual average, maximum and minimum statistics

The final discharge from LWL is monitored near the Denison Access Road at Station D-3. Review of annual average concentrations for TOMP and SAMP parameters from the last five years demonstrated slight variability in concentrations of all parameters over time (Table 5.2.1.2b). Despite variability, concentrations have been low, and all parameters have consistently been below the benchmarks set for the SRWMP, as well as met compliance limits set out in the licence for the associated parameters (TSS, pH, and Ra) (Table 5.2.1.2.1). Annual average sulphate concentrations in 2019 indicate a decreasing trend over the last five years and were below the SRWMP reference lake benchmark of 128 mg/L calculated for SRWMP. In addition, cobalt concentrations have remained below assessment criteria.

Table 5.2.1.2b Lower Williams Final Discharge at Denison Access Road (D-3)

PARAMETER UNITS	Hardness mg/L	pH	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2015	118.6	7.1	79.1	1	0.124	0.254	0.0006	0.24	0.063	0.0041
2016	122.2	7.0	82.7	1	0.101	0.211	<0.0005	0.06	0.006	0.0031
2017	113.8	7.1	68.2	1	0.120	0.228	<0.0005	0.12	0.015	0.0048
2018	109.7	7.2	65.6	1	0.126	0.282	<0.0005	0.12	0.016	0.0048
2019	90.3	7.1	53.9	1	0.137	0.321	0.0005	0.21	0.040	0.0038
Annual Summary Statistics[J]										
Average	110.9	7.1	69.9	1	0.122	0.259	0.0006	0.15	0.028	0.0041
Maximum	122.2	7.2	82.7	1	0.137	0.321	0.0006	0.24	0.063	0.0048
Minimum	90.3	7.0	53.9	1	0.101	0.211	<0.0005	0.06	0.006	0.0031

Note: Five year annual average, maximum and minimum statistics

5.2.1.2.1 Discharge Compliance – Lower Williams Final Discharge

In 2019, LWL effluent quality at the final point of control, D-3, was in compliance with the discharge limit established in the decommissioning licence (Table 5.2.1.2.1).

Table 5.2.1.2.1 2019 Lower Williams Compliance with Discharge Limits at Final Point of Control (D-3)

Month	Samples Required	Number of Times Discharge Limits Were Exceeded					
		pH pH units		TSS mg/L		Ra(T) Bq/L	
		Grab Sample Limit[1]: Upper 9.5 Lower 5.5	Monthly Arithmetic Mean[1]: Upper 9.5 Lower 6.5	Grab Sample Limit[1]: Upper 50 Lower N/A	Monthly Arithmetic Mean[1]: Upper 25 Lower N/A	Grab Sample Limit[1]: Upper 1.11 Lower N/A	Monthly Arithmetic Mean[1]: Upper 0.37 Lower N/A
Jan.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Feb.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Mar.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Apr.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
May	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
June	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
July	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Aug.	1	0 of 1	0 of 1	0 of 1	0 of 1	0 of 1	0 of 1
Sept.	3	0 of 3	0 of 1	0 of 3	0 of 1	0 of 3	0 of 1
Oct.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Nov.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Dec.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
YTD	48	0 of 48	0 of 12	0 of 48	0 of 12	0 of 48	0 of 12

[1]Limits established in the Licence UMDL-MINEMILL-DENISON.01/indf issued December 15, 2004.

5.2.1.3 Stanrock

Discharge, runoff, and seepage from the Stanrock TMA reports to a small holding pond where the ETP Influent station is monitored. Samples were analyzed within the holding pond prior to treatment (DS-2) to closely monitor water quality at the final discharge station (DS-4). A review of the annual averages at DS-2 over the last five years indicated relatively depressed pH values combined with elevated acidity and iron concentrations compared to other influent monitoring stations at the Denison sites in Elliot Lake, which was characteristic of the Stanrock TMA. Sulphate concentrations at DS-2 were also high in comparison to other monitoring stations in the program. Annual average radium concentrations at DS-2 appeared to be relatively stable and consistently remained below the SRWMP benchmark of 1.0 Bq/L, however, 2019 annual average radium concentrations were the highest of the last five years. Barium levels have been relatively lower in the last three years as compared with previous data, and continued to remain below the SRWMP benchmark of 1.0 mg/L. Furthermore, cobalt and uranium concentrations were relatively stable, but remained above receiving environment benchmarks for SRWMP of 0.0025 mg/L and 0.015 mg/L respectively (Table 5.2.1.3a). Manganese concentrations were elevated in 2018 compared to previous years' annual average concentrations but lowered again in 2019 (Table 5.2.1.3a).

Table 5.2.1.3a Stanrock Influent (DS-2)

PARAMETER UNITS	ACID mg/L	pH	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2015	231	2.9	632.5	0.152	0.029	0.0763	46.65	1.939	0.0220
2016	235	2.9	580.0	0.182	0.030	0.0786	45.40	1.724	0.0321
2017	194	2.8	502.5	0.182	0.018	0.0682	28.80	1.349	0.0270
2018	231	2.9	595.0	0.231	0.019	0.0787	47.10	2.117	0.0188
2019	197	2.8	490.0	0.267	0.016	0.0647	33.35	1.305	0.0241
Annual Summary Statistics[1]									
Average	218	2.9	560.0	0.203	0.022	0.0733	40.26	1.687	0.0248
Maximum	235	2.9	632.5	0.267	0.030	0.0787	47.10	2.117	0.0321
Minimum	194	2.8	490.0	0.152	0.016	0.0647	28.80	1.305	0.0188

Note: Five year annual average, maximum and minimum statistics

Water quality at the Stanrock Final Point of Control is monitored at Orient Lake Outlet (DS-4). A review of water quality data at DS-4 for the last five years indicated generally stable pH values and TSS levels, comparable to other final discharge stations, and consistently met the discharge limits set out in the licence (Table 5.2.1.3.1). Annual average sulphate and hardness concentrations were relatively high for a final discharge point but were consistent with Denison final discharge values over the last five years (Table 5.2.1.3b). All metal concentrations consistently meet receiving environment benchmarks for SRWMP. Uranium and radium concentrations were relatively low, and radium continued to remain well below the monthly mean discharge criteria of 0.37 Bq/L set in the decommissioning licence. All other parameters appeared to be relatively stable over time with no real outliers observed in the five-year annual average dataset (Appendix IV).

Table 5.2.1.3b Orient Lake Outlet Stanrock Final Point of Control (DS-4)

PARAMETER UNITS	Hardness mg/L	pH	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2015	292.5	7.1	258.3	1	0.062	0.050	0.0006	0.13	0.067	0.0021
2016	300.0	7.1	262.5	1	0.073	0.047	0.0006	0.10	0.044	0.0043
2017	331.8	7.2	277.5	1	0.072	0.045	0.0006	0.17	0.044	0.0042
2018	303.8	7.1	248.3	1	0.081	0.065	0.0006	0.15	0.052	0.0042
2019	294.7	7.2	251.7	1	0.083	0.060	0.0005	0.14	0.045	0.0460
Annual Summary Statistics[J]										
Average	304.6	7.1	259.7	1	0.074	0.053	0.0006	0.14	0.050	0.0122
Maximum	331.8	7.2	277.5	1	0.083	0.065	0.0006	0.17	0.067	0.0460
Minimum	292.5	7.1	248.3	1	0.062	0.045	0.0005	0.10	0.044	0.0021

Note: Five year annual average, maximum and minimum statistics

Toxicity was monitored for the Stanrock site at the final discharge (DS-4) as per SAMP requirements. In 2019, toxicity testing was done in the spring and fall, and included the same tests that were completed at the Denison TMA-1 final effluent (D-2). Results of the 2019 toxicity tests at DS-4 confirmed 0% acute mortality/lethality for both *Daphnia magna* and Rainbow Trout for both sampling events (Appendix IV). Furthermore, a 100% IC_{25} result for *Ceriodaphnia dubia* was confirmed in both the spring and fall sampling events at DS-4 (Appendix IV). Overall, results are indicative of a non-toxic environment for aquatic life.

5.2.1.3.1 Discharge Compliance – Stanrock Final Discharge

In 2019, Stanrock TMA effluent quality at the final point of control (DS-4), was in compliance with the discharge criteria established in the decommissioning licence (Table 5.2.1.3.1).

Table 5.2.1.3.1 2019 Stanrock TMA Compliance with Discharge Limits at Final Point of Control (DS-4)

Month	Samples Required	Number of Times Discharge Limits Were Exceeded					
		pH pH units		TSS mg/L		Ra(T) Bq/L	
		Grab Sample Limit[1]: Upper 9.5 Lower 5.5	Monthly Arithmetic Mean[1]: Upper 9.5 Lower 6.5	Grab Sample Limit[1]: Upper 50 Lower N/A	Monthly Arithmetic Mean[1]: Upper 25 Lower N/A	Grab Sample Limit[1]: Upper 1.11 Lower N/A	Monthly Arithmetic Mean[1]: Upper 0.37 Lower N/A
Jan.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Feb.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Mar.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Apr.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
May	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
June	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
July	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Aug.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Sept.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Oct.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
Nov.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
Dec.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	0 of 1
YTD	53	0 of 53	0 of 12	0 of 53	0 of 12	0 of 53	0 of 12

[1]Limits established in the Licence UMDL-Minemill-Stanrock.02/indf issued September, 2010.

5.2.2 Groundwater Quality

Field quality assurance and quality control sampling was extended to the groundwater monitoring program in 2006. Detailed groundwater QA/QC results against DQOs are included in Appendix III and groundwater station-specific five-year annual data are included in Appendix IV. The 2019 groundwater field blank and field precision data summary is presented in Table 5.2.2.

The field blank and precision DQOs were met for all parameters in all samples in 2019.

Table 5.2.2 2019 Groundwater Field Blank and Field Precision Data Summary

		pH pH units	SO_4 mg/L	Acidity mg/L	Fe mg/L
Field Blank Statistics					
	Count	2	2	2	2
	Average	6.4	0.1	2.0	0.02
	Min	6.3	0.1	2	0.01
	Max	6.5	0.1	2	0.03
Field Blank Exceedances					
	DQO Criteria[1]	-	0.2	2	0.04
	# Exceedances	0	0	0	0
Field Precision Statistics					
	Count	2	2	2	2
	Average	2%	0%	2%	0%
	Min	1%	0%	0%	0%
	Max	3%	0%	5%	0%
Field Precision Exceedances					
	DQO Criteria[1]	20%	20%	20%	20%
	# Exceedances	0	0	0	0

[1]Field criteria taken from Table 5.2 of the Cycle 4 Study Design for SRWMP, SAMP and TOMP (Minnow Environmental Inc., 2016)

5.2.2.1 Denison TMA-1 Groundwater Results

Review of the data at the east end of the TMA-1, downstream of Dam 17 on the North Abutment at monitoring stations BH91 D1A and BH91 D1B for the last five years indicated elevated iron and sulphate concentrations in the deeper well station BH91 D1A (total depth = 218.00 ft), comparing to the lower concentrations near the surface overall at BH91 D1B (total depth = 149.20 ft) (Appendix IV). Acidity concentrations at both monitoring stations were low compared to other stations in the program and were near or below the TDL (Table 4.2.2). pH was near neutral at both stations. No samples were able to be collected at station BH91 D1B in 2018 and 2019 and BH91 D1A in 2019 due to lack of recharge.

Groundwater quality downstream of Dam 17 in the North Valley (BH91 D3A and BH91 D3B) could be characterized by having stable pH values with relatively high acidity, iron, and sulphate concentrations. Concentrations of all parameters at these stations were variable each year. No sample was able to be collected at BH91 3A due to a lack of recharge.

Downstream of Dam 10 (BH91 DG4B) groundwater was characterized by near neutral pH, variable sulphate concentrations, and low acidity (Appendix IV). Iron concentrations were variable slightly increasing from 2016.

5.2.2.2 Denison Lower Williams Lake

A review of the last five years of groundwater monitoring results downstream of Dam 1 on the North Ridge (BH91 D9A) indicated relatively stable and near neutral pH levels. Both iron and acidity concentrations have been variable (Appendix IV). Sulphate concentrations appeared to be variable and elevated at this station over the last five years.

5.2.2.3 Stanrock

Groundwater quality was measured at Stanrock downstream of the following dams: Dam A (BH91 SG1A), Dam B (BH98-16A), Dam C (BH98-15A), and Dam D (BH91-SG3). Dam A groundwater was characterized by low pH with elevated sulphate, acidity, and iron concentrations (Appendix IV). Although concentrations were elevated compared to other monitoring wells, overall, concentrations of most of these parameters have been decreasing over time in groundwater downstream of Dam A (Figure 5.2.2.3 1).

Dam B groundwater quality was similar to Dam A, with depressed pH and elevated sulphate, acidity and iron concentrations (Appendix IV). All parameters appeared to fluctuate from year to year, increasing and decreasing from year to year (Figure 5.2.2.3 2).

Groundwater quality monitored downstream of Dam C at BH98 15A indicated slightly depressed pH with elevated concentrations of sulphate, acidity and iron (Appendix IV). (Figure 5.2.2.3 3).

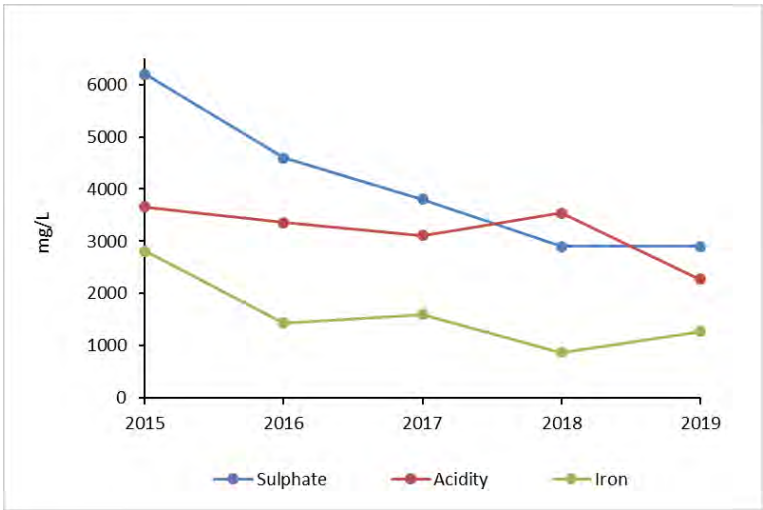


Figure 5.2.2.3. 1 Sulphate, acidity, and iron concentrations at Station BH91 SG1A downstream of Dam A, 2015-2019

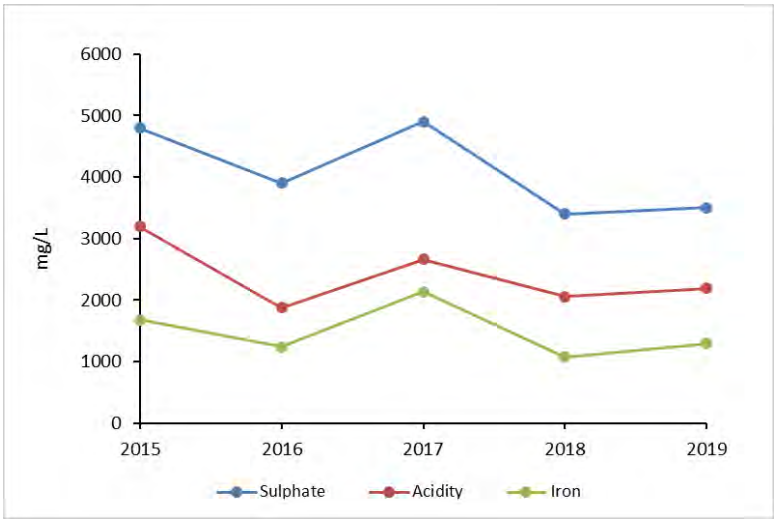


Figure 5.2.2.3. 2 Sulphate, acidity, and iron concentrations at Station BH98-16A downstream of Dam B, 2015-2019

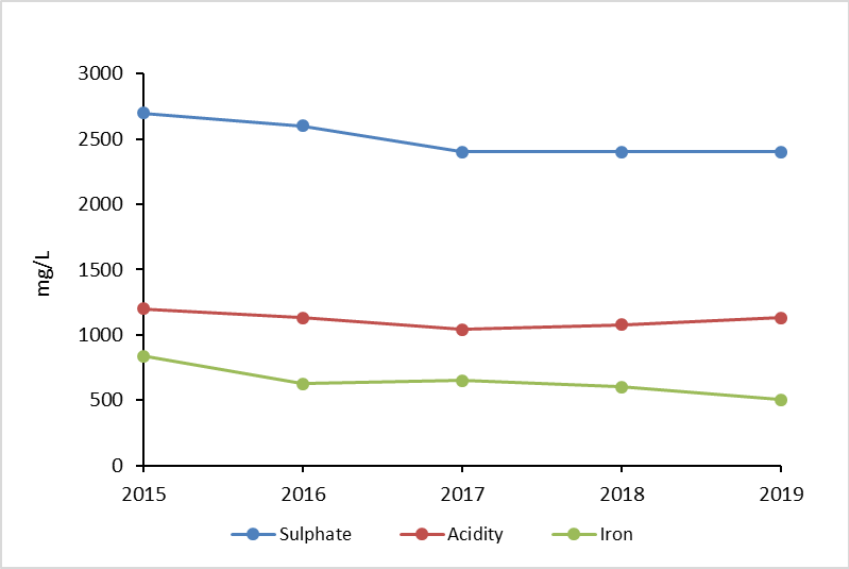


Figure 5.2.2.3. 3 Sulphate, acidity, and iron concentrations at Station BH98-15A downstream of Dam C, 2015-2019

5.2.3 Porewater Quality

Porewater quality at the Stanrock site was monitored upstream of Dam A at the following stations: ST3 P3 (total depth = 5.94 m), ST3 P5 (total depth = 2.64 m), ST3 P6 (total depth = 11.58 m), and ST3 P8 (total depth = 20.91m), and upstream of Dam D at BH91 SG2A (total depth = 33.31 m), BH91 SG2D (total depth = 4.39 m). Overall, visual review of the porewater quality data at these stations demonstrated low pH values combined with elevated acidity, sulphate, and iron concentrations (Appendix IV). Concentrations of acidity, iron, and sulphate were higher at deeper well locations (i.e. ST3 P6 and ST3 P8), with lower concentrations in the shallower wells (ST3 P3 and ST3 P5). The review of temporal trends at each station indicated that concentrations of each parameter did vary over time at station ST3 P3 and ST3 P5, but most parameters were gradually increasing at ST3 P6 (Figures 5.2.3. 1,2,3,4). pH values appeared to remain relatively stable at all stations, showing little variability over time (Figure 5.2.3. 4). Furthermore, acidity at station ST3 P8 was gradually decreasing over time (Figure 5.2.3. 1).

Monitoring wells located downstream of Dam D had not collected data over the last five years due to no recharge of the wells, with the exception of BH91 SG2A. Porewater quality results obtained at this station were variable over the last five years, with slightly depressed pH, and elevated concentrations of iron, acidity, and sulphate, very similar to all other monitoring stations at Stanrock (Figure 5.2.3. 5). Samples were able to be collected at BH91 SG3B in 2017, however it was difficult to characterize groundwater quality at this station with only one set of data points. The data demonstrated low pH, with elevated concentrations of acidity, sulphate, and iron, with no real discernible trends in the dataset.

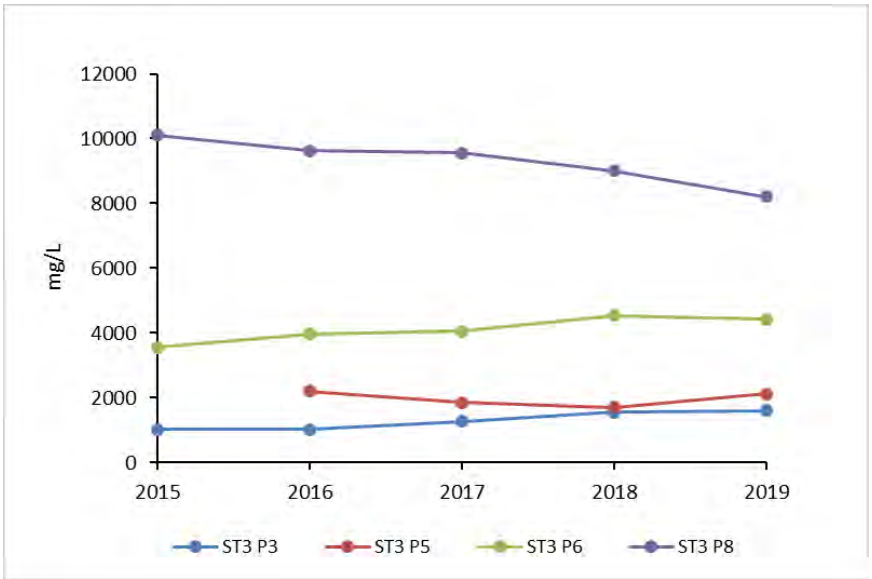


Figure 5.2.3. 1 Acidity Concentrations at ST3 P3 (5.94 m), ST3 P5 (2.64 m), ST3 P6 (11.58 m), and ST3 P8 (20.91 m), 2015-2019

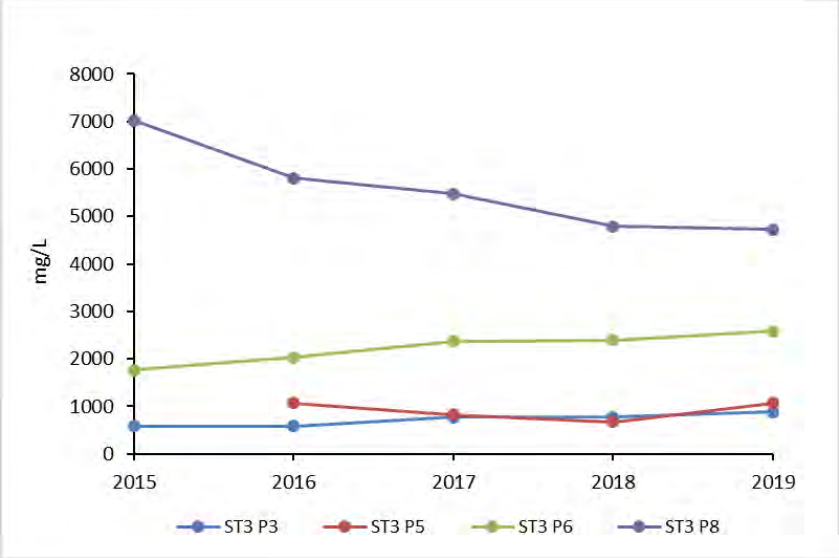


Figure 5.2.3. 2 Iron Concentrations at ST3 P3 (5.94 m), ST3 P5 (2.64 m), ST3 P6 (11.58 m), and ST3 P8 (20.91 m), 2015-2019

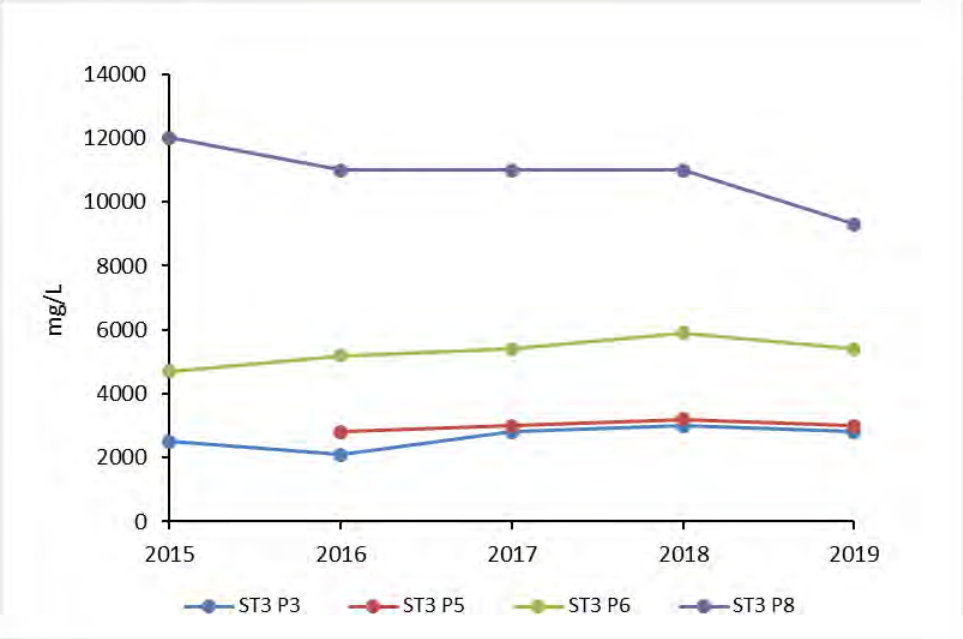


Figure 5.2.3. 3 Sulphate Concentrations at ST3 P3 (5.94 m), ST3 P5 (2.64 m), ST3 P6 (11.58 m), and ST3 P8 (20.91 m), 2015-2019

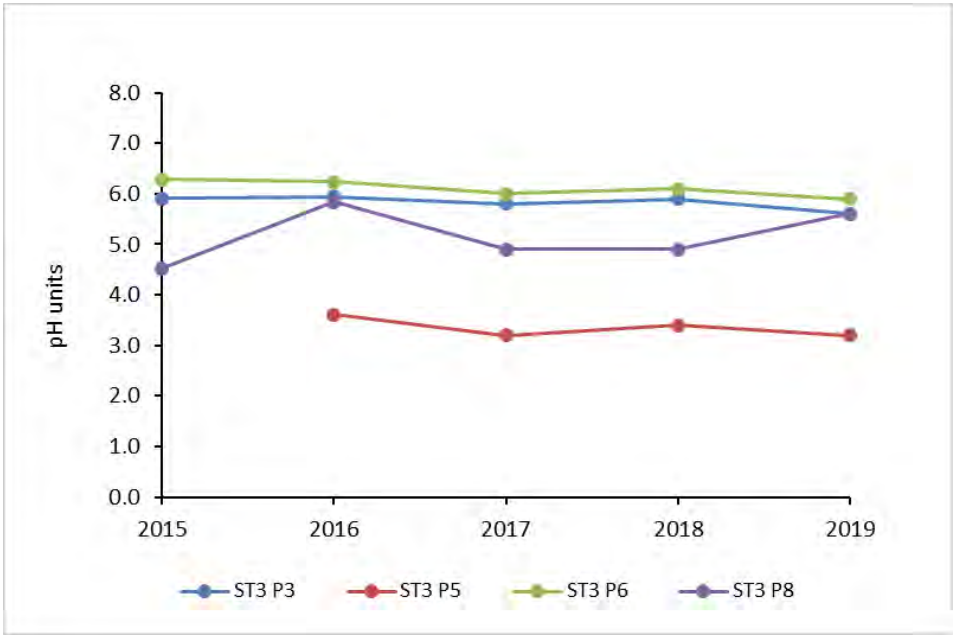


Figure 5.2.3. 4 pH at ST3 P3 (5.94 m), ST3 P5 (2.64 m), ST3 P6 (11.58 m), and ST3 P8 (20.91 m), 2015-2019

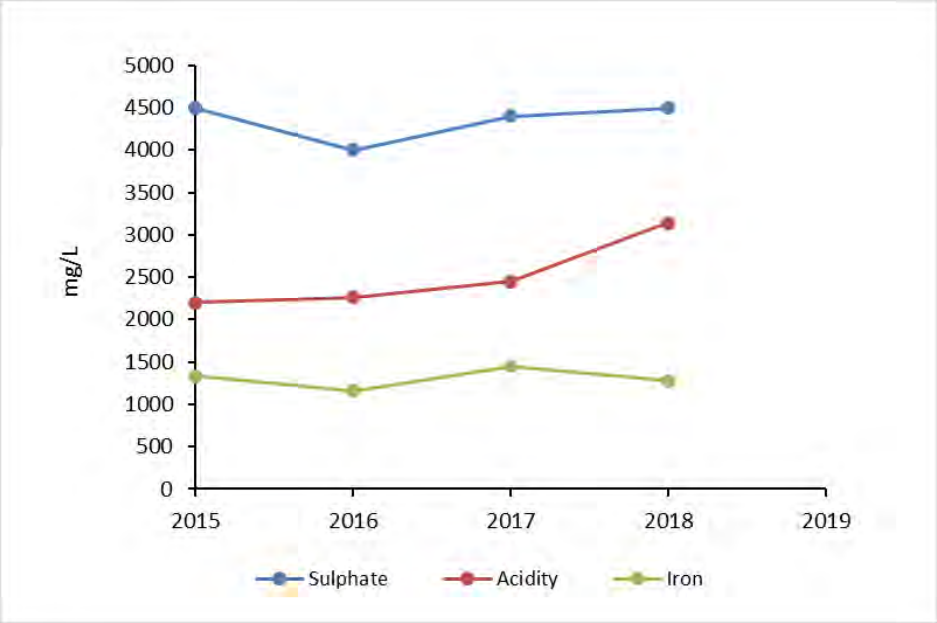


Figure 5.2.3. 5 Sulphate, acidity and iron concentrations at Station BH91 SG2A upstream of Dam D, 2015-2019

5.3 Site Specific Maintenance and Operations Program

Site-specific program reports are provided in the following sections in accordance with the TOMP and SAMP Annual Reporting Requirements. Each section provides the following information:

- Summary of tailings management area (TMA) maintenance
- Summary of effluent treatment plant (ETP) operations

5.3.1 Denison TMA-1

5.3.1.1 TMA Maintenance

Routine inspections and preventative maintenance activities were performed as required. Any equipment that was able to be repaired either on-site or sent out was done so, and anything that was damaged/worn beyond repair was replaced with a new unit. All maintenance was completed to ensure continued efficiency and safe operations on site. Furthermore, proper calibration of monitoring equipment was conducted on a regular basis and logged accordingly.

Care and maintenance highlights in 2019 were as follows:

- As a result of the increased consumption of barium chloride, the NaOH tank was thoroughly cleaned and is now being used to store additional barium chloride for treatment.

- The well located in the storage building used to obtain the TMA-1 water elevation was covered and insulated. A heat lamp was also installed to prevent freezing of the well throughout the winter months. This eliminated the requirement to replace the propane heater and heat the entire storage building.
- A platform was installed at the treatment plant to allow for safe delivery of reagents to the site.
- Dam maintenance on site included the flushing/power cleaning of the Dam 10 toe drains with the use of a specialized contractor.
- A broken hydro pole was repaired by Hydro One. Although the power lines did not contact the ground, the area was cordoned off, secured and power was temporarily disconnected to the ETP. Power was restored to the ETP following the pole replacement.

5.3.1.2 ETP Operations

The ETP located at the TMA-1 spillway (D-1) operated for 220 days in 2019 (Table 5.3.1.2.1). The ETP treated approximately 2,192,000,000L of water, with a monthly average daily plant flow of 115 L/s. The total amount of barium chloride that was consumed was 11,207kg. Sodium Hydroxide (NaOH) was not utilized in 2019 because pH was not a concern at D-2 (Table 5.3.1.2.1). An estimated 2,229,000,000L was discharged from the final point of control at the Stollery Lake Settling Pond Outlet (D-2). Although the plant only operated for 220 days, discharge at D-2 occurred for 365 days in 2019 (Table 5.3.1.2.1). Annual monthly average daily discharge flow was 71 L/s.

5.3.1.2.1 Operating Summary

In 2019, the TMA-1 ETP operated every month except January, August and September due to low water levels. Siphons were used to drawdown the TMA to ensure the pond level remained below spillway elevation as well as to maintain a controlled release of water from TMA-1. This controlled release of water from TMA-1 ensured that radium settling in the Stollery Lake Settling Pond was maximized. However, in 2019 elevated radium levels were recorded at the beginning of the year, prompting doubling the dosing rate of barium chloride through the Spring freshet. Typically, at this time of year, the influent pH decreased while radium increased at the final discharge. Although this year elevated radium concentrations were observed, the radium concentrations at the final point of control (D-2) met all licenced discharge criteria (1.11 Bq/L for a grab sample and 0.37 Bq/L for a monthly mean). Annual average concentration of radium at D-2 was 0.152 Bq/L.

No major operational issues occurred during 2019. A few minor operational issues that took place were taken care of in a timely manner. Routine operational maintenance occurred on the siphons when they became blocked due to build-up of debris.

Table 5.3.1.2.1 2019 TMA-1 Effluent Treatment Plant Flow Rates, Operating Days, and Discharge Days

ITEM	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	Y.T.D. 2019	Y.T.D. 2018
PLANT OPERATIONS														
Operating Days	0	24	31	30	31	30	5	0	0	8	30	31	220	163
Maximum Daily Plant Flow (L/s @ D-1)	0	115	150	182	193	197	180	0	0	48	49	48	197	177
Minimum Daily Plant Flow (L/s @ D-1)	0	43	108	126	164	177	170	0	0	40	39	46	0	0
Monthly Average Daily Plant Flow (L/s @ D-1)	0	67	128	159	176	184	175	0	0	42	47	46	115	92
Total Volume Treated (ML)	0	139	343	411	472	477	76	0	0	29	121	124	2192	1295
Barium Chloride Consumption														
total kg/month	0	446	1860	2511	2813	2100	347	0	0	107	466	557	11207	3931
monthly average mg/litre	0.00	3.22	5.42	6.10	5.96	4.40	4.59	0.00	0.00	3.72	3.87	4.48	5.11	3.04
Caustic Soda Consumption														
total kg/month	0	0	0	0	0	0	0	0	0	0	0	0	0	1551
monthly average mg/litre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20
EFFLUENT														
Discharge Days	31	28	31	30	31	30	31	31	30	31	30	31	365	365
Maximum Daily Discharge Flow (L/s @ D-2)	17	97	97	340	203	133	122	16	17	130	106	72	340	115
Minimum Daily Discharge Flow (L/s @ D-2)	16	9	52	104	133	97	16	12	9	17	39	52	9	8
Monthly Average Daily Discharge Flow (L/s @ D-2)	17	34	76	185	166	112	43	14	14	62	65	60	71	39
Total Volume Discharged (ML)	45	83	204	480	443	291	116	37	36	165	168	160	2229	1228

5.3.2 Denison Lower Williams Lake

5.3.2.1 TMA Maintenance

Routine inspection, calibrations, and preventative maintenance activities were performed at the LWL site as required.

5.3.2.2 Summary of ETP Operations

Treatment plant operations were monitored at station D-22. In 2019, the LWL ETP operated to control radium levels, operating for a total of 365 days. An estimated 354,000,000L of water was treated, and 349,000,000L was discharged from the final point of control, D-3. Discharge at the final point of control only occurred for 326 days in 2019. Barium chloride consumption for the year at the LWL ETP was 526kg (Table 5.3.2.2.1).

5.3.2.2.1 Operating Summary

Treatment conditions at LWL were for the sole purpose of controlling radium levels in the influent. Neutralization treatment has not been required at this site since 2002. Discharge occurred in all months of 2019, with only 7 days of discharge in August. Flow to the ETP continued year-round, and the treatment plant continued to run all year.

Aside from routine maintenance of the ETP, a containment unit was fabricated and installed where barium chloride is delivered to the LWL ETP.

Table 5.3.2.2.1 2018 Lower Williams Lake ETP Flow Rates, Operating Days, and Discharge Days

ITEM	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	Y.T.D. 2019	Y.T.D. 2018
PLANT OPERATIONS														
Operating Days	31	28	31	30	31	30	31	31	30	31	30	31	365	358
Maximum Daily Plant Flow (L/s @ D-22)	5	1	5	113	28	25	3	1	6	70	23	14	113	55
Minimum Daily Plant Flow (L/s @ D-22)	1	1	1	8	14	4	1	1	2	2	6	6	1	1
Monthly Average Daily Plant Flow (L/s @ D-22)	2	1	3	49	18	11	2	1	4	23	13	9	11	7
Total Volume Treated (ML)	6	2	7	128	48	28	5	3	10	62	33	24	354	204
Barium Chloride Consumption														
total kg/month	42	37	42	46	41	45	42	41	44	55	49	42	526	566
monthly average mg/litre	7.20	15.12	6.32	0.36	0.85	1.62	8.94	15.31	4.65	0.90	1.47	1.73	1	3
Caustic Soda Consumption														
total kg/month	0	0	0	0	0	0	0	0	0	0	0	0	0	0
monthly average mg/litre	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EFFLUENT														
Discharge Days	31	28	31	30	31	30	24	7	22	31	30	31	326	273
Maximum Discharge Flow (L/s @ D-3)	5	1	5	113	28	25	3	1	6	70	23	14	113	55
Minimum Discharge Flow (L/s @ D-3)	1	1	1	8	14	4	1	1	2	2	6	6	1	0
Monthly Average Discharge Flow (L/s @ D-3)	2	1	3	49	18	11	2	1	4	23	13	9	12	9
Total Volume Discharged (ML)	6	2	7	128	48	28	4	1	7	62	33	24	349	204

5.3.3 Stanrock TMA

5.3.3.1 TMA Maintenance

In 2019, routine inspection and preventative maintenance activities were performed as required. Proper calibration of monitoring equipment was conducted on a regular basis. The following non-routine maintenance occurred on the TMA:

- Over the years, there had been an accumulation of debris throughout the ditch drainage systems on the TMA. Ditch cleaning was completed to improve drainage from the TMA and better convey water to the head pond and treatment plant.

5.3.3.2 Summary of ETP Operations

The Stanrock ETP operated periodically throughout the year for the purpose of pH and radium level control. The ETP, which was monitored at station DS-3, operated a total of 181 days, with an annual monthly average daily plant flow of 130L/s. Throughout 2019, an estimated 2,038,000,000L of water was treated with barium chloride and lime. Barium chloride and lime consumption at the Stanrock ETP in 2019 was 938kg and 166.15 dry tonnes respectively. Furthermore, 1,291,000,000L was discharged from the final point of control, DS-4, over a total of 365 discharge days (Table 5.3.3.2.1). Annual monthly average daily discharge flow at DS-4 was 41L/s for 2019.

5.3.3.2.1 Operating Summary

The Stanrock ETP operated as required throughout the year to maintain discharge compliance and control of the Holding Pond water levels. The majority of the operating days were during spring and fall as runoff and rainfall conditions respectively were most often present during these times of the year (Table 5.3.3.2.1). High water levels throughout the spring caused the overflow of Beaver Lake to the Moose Lake Settling Pond. To help neutralize the acidity entering the Moose Lake Settling Pond, sodium hydroxide (NaOH) was dispensed into Orient Creek via gravity feed. A total of 124kg was dispensed to help maintain compliance at the DS-4 final discharge location.

Table 5.3.3.2.1 2019 Stanrock ETP Flow Rates, Operating Days, and Discharge Days

ITEM	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	Y.T.D. 2019	Y.T.D. 2018
PLANT OPERATIONS														
Operating Days	11	6	14	27	31	18	8	2	5	24	20	15	181	126
Maximum Daily Plant Flow (L/s @ DS-2)	138	137	137	190	155	156	126	122	131	151	167	146	190	198
Minimum Daily Plant Flow (L/s @ DS-2)	99	108	95	98	90	87	82	95	66	65	98	106	65	0
Monthly Average Daily Plant Flow (L/s @ DS-2)	120	124	120	169	122	122	107	109	106	126	137	129	130	126
Total Volume Treated (ML)	114	64	145	394	326	190	74	19	46	262	236	168	2038	1370
Barium Chloride Consumption														
total kg/month	34	10	36	179	249	87	29	4	18	150	93	50	938	479
monthly average mg/litre	0.29	0.15	0.25	0.45	0.76	0.46	0.39	0.21	0.38	0.57	0.39	0.30	0.46	0.35
Lime Consumption														
total dry tonnes/month	9.06	4.77	15.33	29.00	23.31	17.44	8.54	2.52	3.60	26.37	16.90	9.31	166.15	108.14
monthly average g/litre	0.08	0.07	0.11	0.07	0.07	0.09	0.12	0.13	0.08	0.10	0.07	0.06	0.08	0.08
NEUTRALIZATION														
Lime Consumption														
Beaver Lake total dry tonnes/month	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Site total including ETP Operations	9.06	4.77	15.33	29.00	23.31	17.44	8.54	2.52	3.60	26.37	16.90	9.31	166.15	108.1
Caustic Soda Consumption														
Orient Creek total kg/month	0	0	0	124	0	0	0	0	0	0	0	0	124	0
EFFLUENT														
Discharge Days	31	28	31	30	31	30	31	31	30	31	30	31	365	365
Maximum Daily Discharge Flow (L/s @ DS-4)	35	21	47	254	105	67	11	6	9	162	120	67	254	211
Minimum Daily Discharge Flow (L/s @ DS-4)	13	9	13	35	51	9	1	1	1	17	35	17	1	1
Monthly Average Daily Discharge Flow (L/s @ DS-4)	23	16	25	127	75	34	5	3	6	76	69	33	41	25
Total Volume Discharged (ML)	61	39	66	329	202	87	14	8	16	204	178	88	1291	777

6 REFERENCES

Minnow Environmental Inc. and Beak International Incorporated, 2001. Serpent River Watershed Monitoring Program – 1999 Study. April 2001.

Minnow Environmental Inc., 2016. The Cycle 4 Study Design for the SRWMP, SAMP and TOMP. Prepared for Rio Algom Limited and Denison Mines Inc. February 2016.

Minnow Environmental Inc., 2017. Serpent River Watershed Cycle 4 (2014 to 2019) State of the Environment Report. Prepared for Rio Algom Limited and Denison Mines Inc. November 2017.

Denison Mines Inc. and Rio Algom Limited. Serpent River Watershed Monitoring Program 2019 Annual Water Quality Report. (Rio Algom Limited and Denison Mines Inc.) March 2020.

APPENDIX I
Summary of Cycle 4 Changes

Table 5.1: Cycle 4 TOMP substances and frequency of data collected (2015 to 2019)

Denison Mines

			Parameters and Frequencies[a]												
TMA	TOMP Stations	Station Type/Purpose	Elevation	Flow	pH	Conductivity	Sulphate	Total Radium-226	Lime or NaOH Consumption	Barium Chloride Consumption	TSS	Acidity	Iron	SAMP Metals[b]	Change
Denison	D-1[g]	Basin performance (primary), ETP operations	W	D	M		Q	M	M	M		Q		Q	Flow W to D; pH D to M
	D-22[g]	ETP operations			W		Q	M		M		Q		Q	
	D-3[g]	Effluent		W[c]	W		M	W			W			M[c]	Flow D to W
	D-2[g]	Effluent		W[c]	W		M	W			W			M[c]	Flow D to W
	D-25	Basin performance (secondary)			S		S	S				S	S		
	BH91-D1A,B, BH91-D3A,B, BH91-DG4B, BH91-D9A	Groundwater			A		A					A	A		
Stanrock	DS-2[g]	Basin performance (primary), ETP operations		D	M		Q	M	M	M		Q		Q	pH D to M
	DS-3[g]	ETP operations			D										
	DS-4[g]	Effluent		W[c]	W		M	W			W			M[c]	
	DS-1[g]	Additional pH control, radium monitoring		W	W			Q							
	DS-6[g]	Additional pH control		W	W										
	DS-5	Seepages and surface water internal to TMA		Q	Q	Q									
	PN-ST3-P3,5,6,8; BH91-SG2A,D	Porewater			A		A					A	A		
	BH91-SG1A, BH98-16A, BH98-15A, BH91-SG3A,B	Groundwater			A		A					A	A		

[a] D - Work days, W - Weekly, M - Monthly, S - Semi-annually, A - Annually, Q-Quarterly.

[b] SAMP metals are barium, cobalt, iron, manganese and uranium.

[c] Monitoring requirement of SAMP.

[e] Spanish-American.

[f] During the snow-free period (April - November).

[g] Sampled when treatment plant is operating.

Table 5.2: Cycle 4 SAMP stations, parameters and frequencies (2015 to 2019)

TMA	Location	Type	Description	Frequency[a]						Change
				Flow	pH	Sulphate	Radium-226	SAMP metals[b]	Toxicity[c]	
Denison	D-2[d,e]	Primary	Stollery Lake Outlet	W	W	M	M	M	S	flow D to W
	D-3[d,e]	Primary	TMA-2 Effluent at Denison Mine access road	W	W	M	M	M		flow D to W
	D-9	Seepage	Seepage at Dam 17	Q	Q	Q	Q	Q		none
	D-16	Seepage	Seepage at Dam 9	Q	Q	Q	Q	Q		none
Stanrock	DS-4	Primary	Orient Lake Outlet (Final Point of Control)	W	W	M	M	M	S	none
	DS-16	Drainage	Quirke Lake Delta	Q	Q	Q	Q	Q		none
Reference	SR-16	Reference	Fox Creek at Highway 108		Q	Q	Q	Q		
	SR-17	Reference	Unnamed Creek from Lake Three at Highway 108		Q	Q	Q	Q		

[a] D =daily, W = weekly, M = monthly, Q = quarterly, S = semi-annual (twice per year).

[b] SAMP metals - barium, cobalt, iron, manganese, uranium.

[c] Toxicity includes: acute (*Daphnia magna* and rainbow trout) and sub lethal (*Ceriodaphnia dubia*) testing following Environment Canada (2000 and 2007 a, b) methods.

[d] This station is also TOMP effluent station and requirements have been harmonized to serve both programs.

[e] Sampled when treatment plant is operating.

[f] P-14 will revert to P-36 upon ETP shut down.

[g] Flow is based on influent flow to the ETP at P-13.

March 9, 2016
via e-mail

Karina Lange
Project Officer for Wastes and Decommissioning Division
Canadian Nuclear Safety Commission
280 Slater Street
P.O. Box 1046, Station B
Ottawa, ON, K1P 5S9

Dear Ms. Lange:

Re: Serpent River Watershed Cycle 4 State of the Environment Report

Denison Mines Inc. (DMI) and Rio Algom Limited (RAL) are pleased to submit the Serpent River Cycle 4 State of the Environment (SOE) Report (2010 to 2014). The report presents and integrates the monitoring data obtained through the Elliot Lake closed mines monitoring programs, namely the Serpent River Watershed Monitoring Program (SRWMP), the Source Area Monitoring Program (SAMP) and the TMA Operational Monitoring Program (TOMP). The report covers the period of January 1, 2010 to December 31, 2014 although historical data has been considered for trend analysis.

This report represents the completion of the fourth cycle of the SRWMP. A complete list of all study design and interpretive reports prepared since the start of Cycle 1 is provided in Table 1. This table also summarizes the time frame covered for each cycle and the key changes to each of the monitoring programs over time.

We are also distributing this Cycle 4 State of the Environment Report to the members of the Joint Regulatory Review Group (JRG; distribution attached). We look forward to your review of the report and the opportunity to address and any questions or comments you may have.

Yours very truly,

Denison Mines Inc.

Ian Ludgate,
Manager

Rio Algom Limited

Debbie Berthelot,
Reclamation Manager

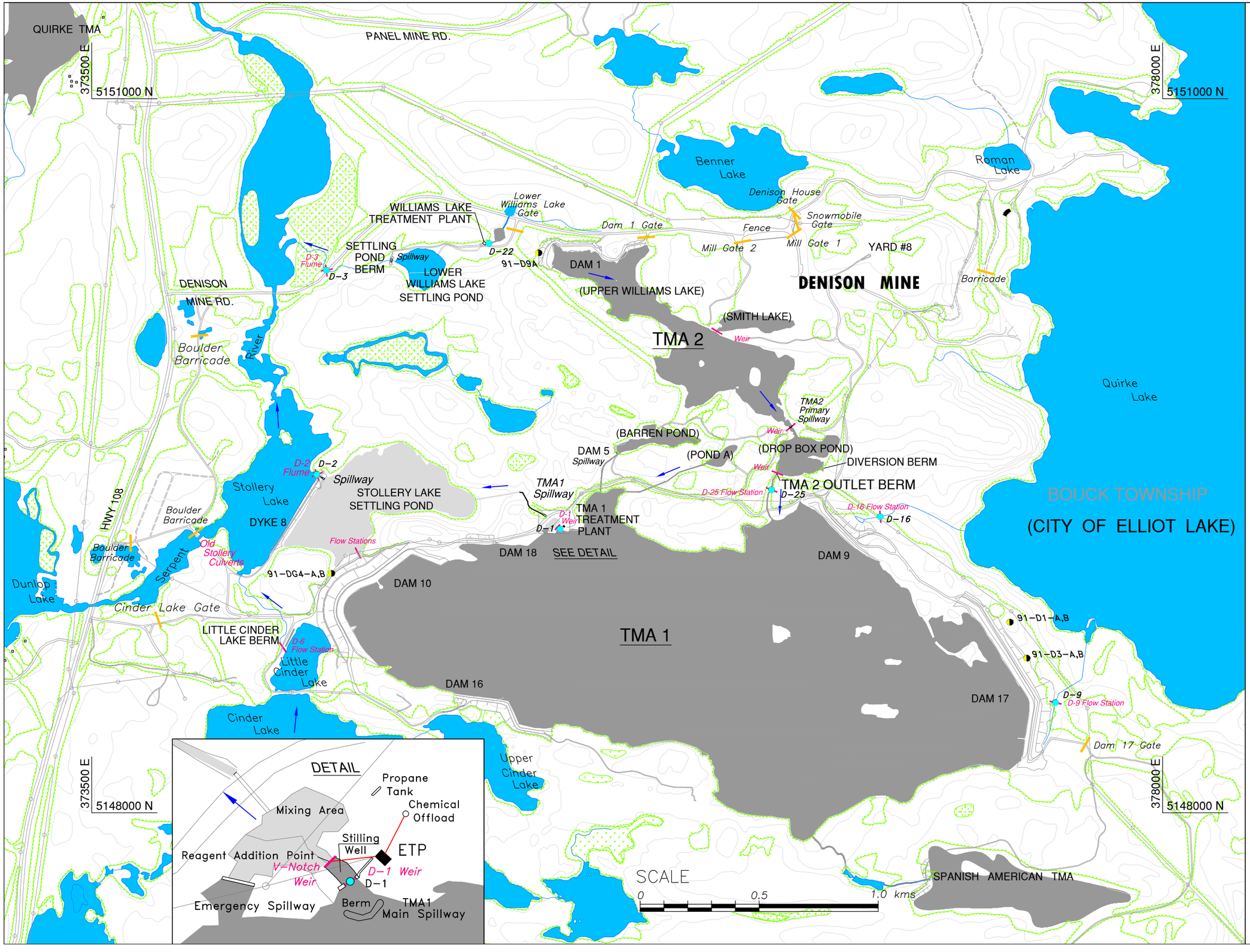
cc: Distribution List

Table 1: Summary of the Elliot Lake monitoring programs; documents produced and changes to the programs during each cycle.

Cycle	Report Title	Year	Period Covered	Description Of Changes To The Monitoring Programs Within Each Cycle
Cycle 1	Serpent River Watershed Monitoring Program Framework Document.	1999	historical monitoring data	SRWMP, IBMP, SAMP and TOMP were developed based on program objectives and existing monitoring data collected over the period of operations and decommissioning.
	In-Basin Monitoring Program Report	1999		
	Serpent River Watershed and In-Basin Monitoring Program – Implementation Document.	1999		
	Serpent River Watershed Monitoring Program -1999 Study	2001	1999 - 2000	
	In-Basin Monitoring Program for the Uranium Tailings Areas - 1999 Study.	2001		
Cycle 2	Overview of Elliot Lake Monitoring Programs and Source Area Monitoring Program Design.	2002	2000 -2004	**Changes only SRWMP** most associated with optimization after first cycle of program was complete: - monitoring substances reduced to mine indicator parameters (barium, cobalt, DOC, iron, manganese, Ra-226, selenium, silver, sulphate and uranium), - addition of two lake reference stations (Summers and Semiwite lakes) and 3 stream reference areas (SR-16, SR-17 and SR-18); - removal of shallow lakes for sediment and benthic sampling (Westner, Grassy, Halfmoom, Upper Cinder and Horne lakes); - removal of some stream sediment and benthic stations (D-15, SC-03 and SR-07); - removal of Depot Lake and Serpent Harbour; addition of May Lake; - the transfer of some SRWMP stations to SAMP or TOMP (N-12, ECA-131, P-11, MPE and Q-23); - fish health assessment eliminated based on performance, fish community assessment added for McCabe Lake and fish tissue monitoring reduced in scope based on performance.
	TMA Operational Monitoring Program Design (TOMP).	2002		
	Cycle 2 Study Design – Serpent River Watershed and In-Basin Monitoring Programs.	2004		
	Serpent River Watershed Monitoring Program: Cycle 2 Interpreative Report	2005		
	Serpent River In-Basin Monitoring Program: Cycle 2 Interpretive Report - 2004 Study.	2005		
	Serpent River Watershed State of the Environment	2009		
Cycle 3	Monitoring Framework For Closed Uranium Mines Near Elliot Lake	2009	2005- 2009	**IBMP** eliminated based on objectives of program being achieved. **SAMP and TOMP:** - removal of silver, selenium based on performance and removal of conductivity based on redundancy with sulphate; - DOC, hardness and flow added at selected stations. **SRWMP:** - removal of selenium and sliver based on performance, - removal of station SR-12, ELO, SR-09, SR-15, SR-02, SR-03, SR-11, P-01, QL-01 and SR-16 and SR-17 based on performance; - monthly monitoring frequency reduced to quarterly; - sediment and benthic monitoring removed from Whiskey, Evans and Cinder Lakes based on redundancy, - depositional streams (Q-20, D-6, SR-06, M-01 and SR-08) based on very high natural variability masking results; - fishing in McCabe Lake and fish tissue monitoring eliminated based on performance.
	In Basin Monitoring Program, Cycle 3 Study Design	2009		
	Serpent River Watershed Monitoring Program: Cycle 3 Study Design	2009		
	Source Area Monitoring Program Revised Study Design.	2009		
	Tailing Management Area Monitoring Program (TOMP) Revised Study Design	2009		
	Serpent River Watershed State of the Environment Report.	2011		
Cycle 4	Cycle 4 Study Design For the SRWMP, SAMP and TOMP.	2014[a]	2010 - 2014	Minor changes to SAMP and TOMP. **SRWMP:** - elimination of reference stations SR-05, P-222 and SR-14; - removal of cobalt as substance for monitoring, addition of DOC; - far-field lakes removed from the program (Hough, Pecors and McCarthy); - removal of Rochester Lake as a sediment and benthic reference area; - reduction in benthic and sediment sampling to 1/10 years based on measured deposition rates.
	Serpent River Watershed Cycle 4 State of the Environment	2016		

[a] Study Design was submitted to CNSC and JRG in 2014 but reissued with agency comments in 2016.

APPENDIX II
Site Maps, Sampling Requirements



Denison Mines

Denison Mines Inc.
Denison
SAMPLE LOCATION MAP

Rev. 2016-00
March 2016

Legend

- water covered tailings.
- settling ponds.
- surface water sample location.
- groundwater sample location.
- flow direction.
- roads or trails.
- power line.
- flow station or weir.
- pipeline.
- gate.
- wetlands.

Notes

- OBM © Queens Printer for Ontario, 2008.
- Mine structures and property limits were derived from Denison Mines records.
- Mapping export parameters = NAD83 WGS_1984_UTM Zone_17N (Central Meridian = 81°W).
- Contour Interval = 10 metres.
- File 9.3.2 (Sample Location Map).

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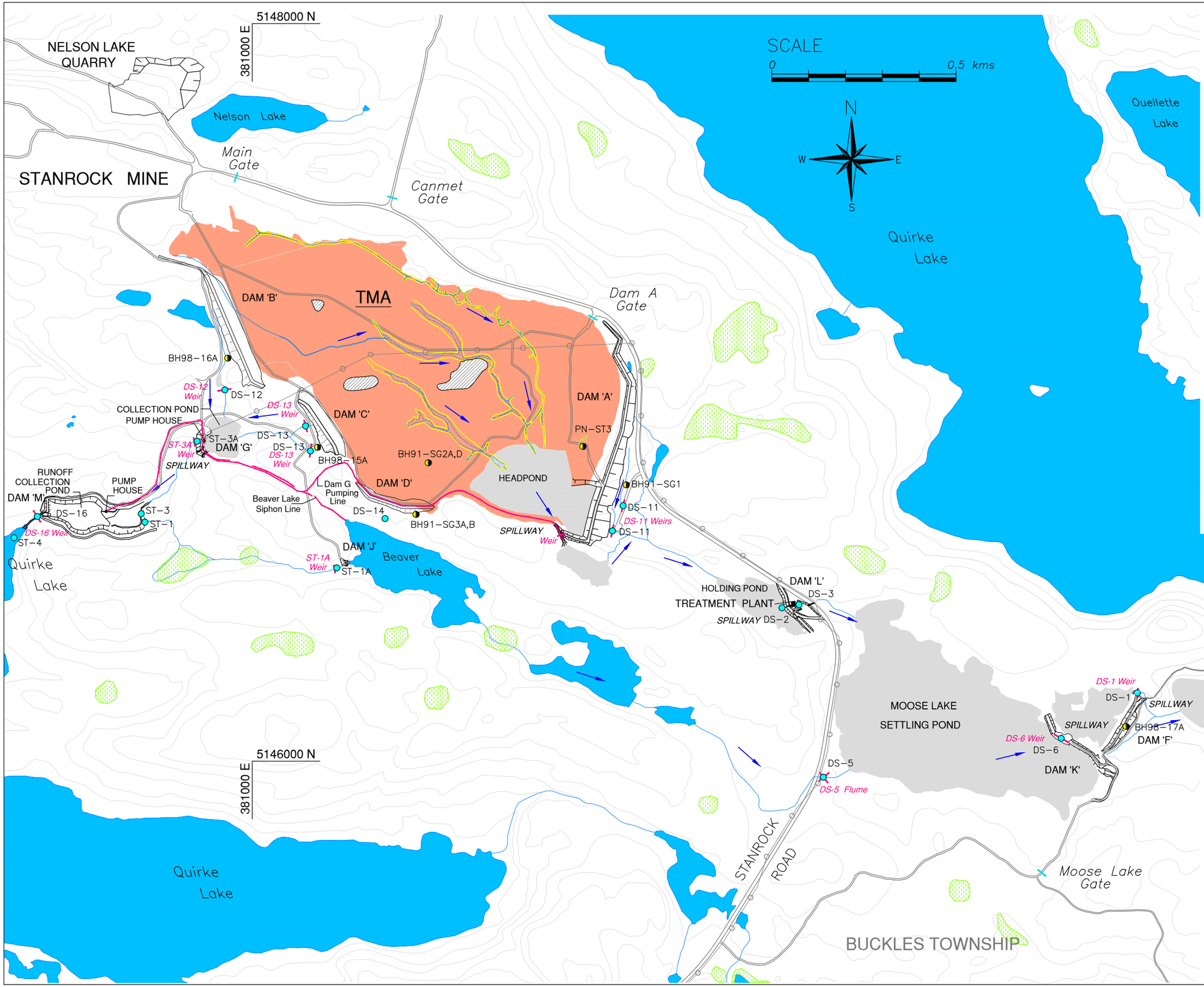
Denison Responsible Authority



Denison Mines

Denison Mines Inc.
Stanrock Site
SAMPLE LOCATION MAP

Rev. 2016-00
March 2016

Legend

- vegetated tailings.
- collection or settling ponds.
- surface water sample location.
- groundwater sample location.
- flow direction.
- roads or trails.
- power line.
- siphon line.
- pipeline.
- wetlands.
- exposed bedrock

Notes

- OBM©Queens Printer for Ontario, 2007.
- Mine structures and property limits were derived from Denison Mines records.
- Mapping export parameters = NAD83 WGS_1984_UTM Zone_17N (Central Meridian = 81°W).

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Denison Responsible Authority

Denison TOMP/SAMP
Surface Water Performance Monitoring 2019

Denison Mines

Sampling Station	Location / Description	Coordinates	Purpose	Elevation	Flow	pH	Conductivity	Sulphate	^{226}Radium (Total)	Lime or NaOH Consumption	Barium Chloride Consumption	TSS	Acidity	Hardness	SAMP METALS					Toxicity		
															Iron	Barium	Cobalt	Manganese	Uranium	Acute *Rainbow Trout*	Acute *Daphnia magna*	Chronic *Ceriodaphnia dubia*
D-1	TMA-1 Overflow	N 5149191 E 375468	TOMP	52	261	12		4	12	12	12		4		4	4	4	4	4			
D-2	TMA-1 Stollery Lake Overflow	N 5149421 E 374446	TOMP		52[a]	52		12[a]	52			52			12[a]	12[a]	12[a]	12[a]	12[a]			
D-3	TMA-2 Effluent	N 5150280 E 374485	TOMP		52[a]	52		12[a]	52			52			12[a]	12[a]	12[a]	12[a]	12[a]			
D-22	TMA-2 ETP Influent	N 5150391 E 375169	TOMP			52		4	12		12		4		4	4	4	4	4			
D-25	TMA-2 Overflow into TMA-1	N 5149357 E 376357	TOMP			2		2	2				2		2							
DS-1	Stanrock Moose Lake Outlet to Orient Lake	N 5146185 E 383401	TOMP		52	52			4													
DS-2	Stanrock ETP Influent	N 5146416 E 382437	TOMP		261	12		4	12	12[c]	12[c]		4		4	4	4	4	4			
DS-3	Stanrock ETP Effluent	N 5146424 E 382483	TOMP			261																
DS-4	Stanrock Final Discharge @ Orient Lake Outlet	N 5146327 E 383888	TOMP		52[a]	52		12	52			52			12[a]	12[a]	12[a]	12[a]	12[a]			
DS-5	Orient Creek Discharge into Moose Lake	N 5145956 E 382549	TOMP		4	4	4															
DS-6	Moose Lake Narrows upstream of Dam K	N 5146062 E 383194	TOMP		52	52																
Denison TOMP Sites Sample Subtotal					786	655	4	50	198	24	36	156	14		50	48	48	48	48			
D-2	TMA-1 Stollery Lake Overflow	N 5149421 E 374446	SAMP		52	52		12	12					12	12	12	12	12	12	2	2	2
D-3	TMA-2 Effluent	N 5150280 E 374485	SAMP		52	52		12	12					12	12	12	12	12	12			
D-9	Denison TMA-1; Dam 9 Seepage	N 5148462 E 377550	SAMP		4	4		4	4					4	4	4	4	4	4			
D-16	Denison TMA-1; Dam 17 Seepage	N 5149244 E 376814	SAMP		4	4		4	4					4	4	4	4	4	4			
DS-4	Stanrock Final Discharge @ Orient Lake Outlet	N 5146327 E 383888	SAMP		52	52		12	12					12	12	12	12	12	12	2	2	2
DS-16	Stanrock TMA; Dam M Seepage; Quirke Lake Delta	N 5146663 E 380417	SAMP		4	4		4	4					4	4	4	4	4	4			
SR-16	Reference - Fox Creek at Highway 108		SAMP			4		4	4					4	4	4	4	4	4			
SR-17	Reference - Unnamed Creek from Lake Three at Highway 108		SAMP			4		4	4					4	4	4	4	4	4			
Denison SAMP Sites Sample Subtotal					168	176		56	56					56	56	56	56	56	56	4	4	4
Denison Total Samples					954	831		106	254	24	36	156	14	48	106	104	104	104	104	4	4	4
FB	Field Blank							12	12			12		4	12	12	12	12	12			
BS	Blind Sample							12	12			12		4	12	12	12	12	12			

[a]Monitoring requirement of SAMP (Minnow Environmental Inc., 2016)

[b]This station is also a TOMP effluent station and requirements have been harmonized to serve both programs (Minnow Environmental Inc., 2016)

[c]Values captured under DS-3

Sampling Station	Location / Description	Coordinates	Purpose	Flow	pH	Conductivity	Sulphate	^{226}Radium (Total)	Acidity	Alkalinity	Hardness	DOC	SAMP METALS				
													Iron	Barium	Cobalt	Manganese	Uranium
DS-11	Seepage of Dam A	N 5146624 E 381977 N 5146692 E 382006	MOE	4	4	4											
DS-12	Seepage of Dam B	N 5147007 E 380926	MOE	4	4	4											
DS-13	Seepage of Dam C	N 5146909 E 381145 N 5146841 E 381158	MOE	4	4	4											
DS-14	Seepage of Dam D	N 5146658 E 381360	MOE	4	4	4											
DS-18[A]	Halfmoon Lake Outlet	N 5145050 E 383761	MOE	4	4		4	4					4	4			4
ST-1	Downstream of Dam G	N 5146648 E 380709	MOE		4	4											
ST-1A	Dam J at toe of dam	N 5146524 E 381229	MOE	4	4	4											
ST-3	Downstream of Dam G	N 5146671 E 380699	MOE		4	4											
ST-3A	Dam G at toe of dam	N 5146867 E 380850	MOE	4	4	4											
ST-4	Within Quirke Lake Delta	N 5146606 E 380354	MOE		4	4	4	4	4	4	4	4	4	4	4	4	4

[A]Station is part of the SRWMP and the data is provided and discussed in detail in the SRWMP Annual Water Quality Report

Denison Groundwater
Performance Monitoring 2019

Denison Mines

Sampling Station	Location / Description	Coordinates	Type	Purpose	Elevation	Sulphate	pH	Acidity	Iron
BH91-D1	Dam 17 North Abutment	N 5148801 E 377359	Groundwater (2 wells)	TOMP	2	2	2	2	2
BH91-D3	Dam 17 North Valley, Toe	N 5148649 E 377430	Groundwater (2 wells)	TOMP	2	2	2	2	2
BH91-D9	Dam 1 North Ridge, Toe	N 5150352 E 375379	Groundwater (1 well)	TOMP	1	1	1	1	1
BH91-DG4	Below Dam 10	N 5149006 E 374508	Groundwater (1 well)	TOMP	1	1	1	1	1
BH91-SG2	Upstream of Dam D	N 5146809 E 381477	Porewater (2 wells)	TOMP	2	2	2	2	2
PN-ST3	Upstream of Dam A	N 5146853 E 381897	Porewater (4 wells)	TOMP	4	4	4	4	4
BH91-SG1	Downstream of Dam A	N 5146749 E 382014	Groundwater (1 well)	TOMP	1	1	1	1	1
BH91-SG3	Downstream of Dam D	N 5146669 E 381444	Groundwater (2 wells)	TOMP	2	2	2	2	2
BH98-15	Downstream of Dam C	N 5146851 E 381177	Groundwater (1 well)	TOMP	1	1	1	1	1
BH98-16	Downstream of Dam B	N 5147093 E 380933	Groundwater (1 well)	TOMP	1	1	1	1	1

APPENDIX III
Flagged Data & QA/QC Results

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result	Comment
BSDST	Mn	2019-02-12	0	0.344	0.423 mg/L	Result is above the high flag limit, but consistent with the primary sample result and previous values in the last eight years.
D-1	Ba	2019-02-12	0	0.195	2.34 mg/L	Result is more than an order of magnitude above the high flag limit, confirmed by repeat analysis. This is inconsistent with typical values in the TMA, which are generally below 0.1 mg/L. Investigation into the anomalous result did not reveal a field or laboratory error and a source for the spike could not be determined. The result was therefore, deemed to be an outlier and removed from the data set.
D-2	Mn	2019-02-12	0	0.329	0.429 mg/L	Result is above the high flag limit, but consistent with the duplicate sample result and previous values in the last eight years.
D-2	Ba	2019-04-16	0	0.856	0.859 mg/L	Result are above the high flag limits, but consistent with the increased barium chloride addition rates that were required to treat elevated radium concentrations.
		2019-04-29	0	0.856	1.13 mg/L	

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result		Comment
	FLOW	2019-04-09	0	131.7	194.0	L/s	Results are above the high flag limits, but consistent with seasonal values during spring freshet and heavy rain.
		2019-04-22	0	131.7	173.0	L/s	
		2019-04-29	0	131.7	340.0	L/s	
	Ra	2019-04-16	0	0.382	0.401	Bq/L	Result is above the high flag limit, but consistent with seasonal values during increased flow under ice cover and reduced retention time. In response, barium chloride addition rates were increased and by the following week, radium concentrations decreased to 0.236 Bq/L.
D-25	Fe	2019-04-09	0.05	0.18	0.324	mg/L	Result is above the high flag limit, but still consistent with previous values in the last year.
	Ra	2019-04-09	0.089	0.5238	0.606	Bq/L	Result is an 18-year high, but likely the result of flushing from TMA 2. Values are consistent withprevious historic values (pre-2001) and only slightly above the high flag limit. Will continue to monitor at the current quarterly frequency.

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result		Comment
D-3	Co	2019-04-09	0.0005	0.0005	0.0007	mg/L	Results are above the high flag limits, but consistent with increased flow and slightly elevated TSS. Results are also consistent with seasonal values in the last five years.
	Fe	2019-04-09	0	0.23	0.52	mg/L	
	Mn	2019-04-09	0	0.037	0.148	mg/L	
	TSS	2019-04-09	0.27	2	3	mg/L	
	FLOW	2019-04-09	0	40.2	113	L/s	Results are above the high flag limits, but consistent with seasonal values during spring freshet and heavy rain.
		2019-04-22	0	40.2	73	L/s	
DS-1	FLOW	2019-04-18	0	261.54	301	L/s	Results are above the high flag limits, but consistent with seasonal values during spring freshet and heavy rain.
		2019-04-19	0	261.54	301	L/s	
		2019-04-23	0	261.54	301	L/s	
		2019-04-24	0	261.54	356	L/s	
	pH	2019-04-19	6.3	8.1	8.3	(blank)	Results are slightly above the high flag limits, but consistent with
		2019-04-23	6.3	8.1	8.9	(blank)	
		2019-04-24	6.3	8.1	8.7	(blank)	
DS-16	FLOW	2019-04-09	0	8.0	11.3	L/s	Results are above the high flag limits, but consistent with seasonal values during spring freshet and heavy rain.

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result		Comment
DS-3	BaCl2D	2019-04-23	0	9.00	9.77	kg/day	Results are consistent with treatment adjustments made in response to increased flow to ensure radium and pH control in the final discharge.
	CaO	2019-04-18	0	1.86	2.03	tonnes/day	
	pH	2019-04-23	10.2	11.4	12.3		Results are consistent with adjustments made in pH setpoint during a period of high flow and bypass through the spillway to ensure compliance at the final discharge. Once the bypass was finished, the setpoint was lowered for a short period then returned to normal (about 10.8).
		2019-04-24	10.2	11.4	9.6		
DS-4	FLOW	2019-04-22	0	144.48	254.0	L/s	Result is above the high flag limits, but consistent with seasonal values during spring freshet and heavy rain.
DS-6	FLOW	2019-04-19	0	261.5	574.0	L/s	Results are above the high flag limits, but consistent with seasonal values during spring freshet and heavy rain.
		2019-04-23	0	261.5	292.0	L/s	
		2019-04-24	0	261.5	574.0	L/s	
		2019-04-25	0	261.5	323.0	L/s	
		2019-04-26	0	261.5	292.0	L/s	

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result		Comment
	pH	2019-04-30	6.1	8.5	8.8		Result is above the high flag limit, but consistent with operational adjustments made upstream at the ETP (DS-3) to ensure pH compliance at the final discharge. This was done during a period of high flow and bypass through the Holding Pond Spillway.
DS-3	BaCl2D	2019-05-07	0	10.08	11.10	kg/day	Results are slightly above the high flag limits, but consistent with the increased reagent use requried during Spring melt when flow is much higher.
		2019-05-22	0	10.08	10.21	kg/day	
	BaCl2T	2019-05-28	0	239.09	248.51	kg/mont	
DS-6	pH	2019-05-01	6.0	8.6	9.1		Results are slighly above the high flag limits, but consistent with seasonal values during Spring melg and high flows.
		2019-05-02	6.0	8.6	8.8		
		2019-05-03	6.0	8.6	8.8		
BSDST	TSS	2019-06-11	1	1	2	mg/L	Result is above the high flag limit, but consistent with the primary sample result. Result is also consistent with previous values in the last year.
D-3	Ba	2019-06-11	0.152	0.355	0.463	mg/L	Result is above the high flag limit, but consistent with previous values in the last five years.

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result		Comment
DS-3	CaO	2019-06-27	0	1.91	2.36	tonnes/day	Result is above the high flag limit, but consistent with previous values in the last five years.
DS-4	Ba	2019-06-11	0.015	0.086	0.097	mg/L	Result is above the high flag limit, but consistent with previous values in the last five years.
DS-3	CaO	2019-07-04	0	2.00	2.49	tonnes/day	Result is slightly above the high flag limit, but still consistent with previous values when the Effluent Treatment Plant (ETP) is running and lime is added for pH control.
DS-6	pH	2019-07-05	5.9	9.0	9.1		Result is slightly above the high flag limit, but consistent with previous values when lime is added upstream at the ETP for pH control.
D-3	Ra	2019-08-13	0.038	0.193	0.215	Bq/L	Result is slightly above the high flag, but still consistent with previous values in the last year.
DS-2	pH	2019-08-27	2.6	3.1	2.5		Result is below the low flag limit, but still consistent with previous values in the last two years. This is also consistent with seasonal lows observed when the water level in the Holding Pond is low and conditions are drier.

Denison Mines Inc.

SAMP/TOMP Flagged Data
February 2019

Location	Analyte	Date	Low	Hi	Result		Comment
	Ra	2019-08-27	0	0.413	0.797	Bq/L	Result is above the high flag limit, but still consistent with previous values in the last year. This is also consistent with seasonal spikes observed when the water level in the Holding Pond is low and conditions are drier.
D-3	FLOW	2019-10-22	0	68.4	70.0	L/s	Result is slightly above the high flag limit, but consistent with previous values in the last year.
	Ra	2019-10-01	0.026	0.216	0.222	Bq/L	Result is slightly above the high flag limit, but still consistent with previous values in the last five years.
D-1	Fe	2019-11-12	0	0.18	0.25	mg/L	Result is above the high flag limit but was not confirmed by the repeat result of 0.433 mg/L. However, the original result is consistent with previous values in the last seven years and all other parameter results were consistent with typical values on the sample day. Will continue to monitor at the current quarterly frequency.

APPENDIX IV
Water Quality Results

BSDST

Parameter Units	Flow L/s	Hardness mg/L	pH	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	17	313	7	270	1	0.056	0.055	0.0008	0.21	0.262	0.048
2019-02	14	281	7.1	230	1	0.059	0.084	0.0008	0.15	0.423	0.0565
2019-03	66	223	7.4	150	1	0.25	0.468	0.0007	0.53	0.193	0.0295
2019-04	194	209	7.4	150	1	0.279	0.626	0.0006	0.34	0.223	0.0234
2019-05	153	165	7.3	120	1	0.159	0.373	0.0006	0.23	0.237	0.0188
2019-06	122	183	7.6	130	2	0.231	0.688	<0.0005	0.20	0.187	0.0192
2019-07	39	179	7.4	120	1	0.191	0.647	<0.0005	0.11	0.107	0.0185
2019-08	14	205	7.2	160	1	0.063	0.224	<0.0005	0.08	0.073	0.0241
2019-09	14	264	7.5	190	<1	0.042	0.12	<0.0005	0.08	0.05	0.0322
2019-10	17	284	7.2	220	1	0.069	0.101	<0.0005	0.10	0.181	0.0437
2019-11	39	258	7.2	220	1	0.151	0.182	0.0007	0.17	0.210	0.0467
2019-12	57	250	7.1	170	1	0.235	0.463	0.0006	0.36	0.186	0.0340
Count	12	12	12	12	12	12	12	12	12	12	12
High	194	313	7.6	270	2	0.279	0.688	0.0008	0.53	0.423	0.0565
Low	14	165	7	120	<1	0.042	0.055	<0.0005	0.08	0.05	0.0185
Mean	62.17	234.5	7.3	177.5	1	0.149	0.336	0.0006	0.21	0.194	0.0329

D-1: Denison TMA-1 Overflow (Influent and ETP Operations)

Parameter Units	ACID mg/L	BaCl2(T) kg/month	ELEV m	FLOW L/s	Hardness mg/L	NaOH(T) kg/month	Odays day	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01		0	387	0		0	0								
2019-02	<1	446.24	387.06	57.29	133	0	24	7.4	77	1.888		<0.0005	0.03	0.007	0.0186
2019-03		1859.5	387.06	128.03		0	31	7.3		2.165					
2019-04	<1	2511	387.09	158.73	127	0	30	7.2	71	1.891	0.072	<0.0005	0.11	0.045	0.015
2019-05		2813.1	387.17	176.23		0	31	7.9		1.697					
2019-06		2100	387.04	184.34		0	30	8.7		1.757					
2019-07		347.3	386.89	28.26		0	5	7.3		2.227					
2019-08		0	386.82	0		0	0								
2019-09		0	386.82	0	113	0	0								
2019-10		107	386.96	12.1		0	8	7.7		1.743					
2019-11	<1	466.2	387.11	46.5	119	0	30	7.9	64	1.583	0.026	<0.0005	0.25	0.013	0.0038
2019-12		557	387.15	46.39		0	31	7.6		1.673					
Count	3	12	53	364	4	12	12	11	3	9	3	3	3	3	3
High	<1	2813.1	387.19	197	133	0	31	8.7	77	2.227	0.072	<0.0005	0.25	0.045	0.0186
Low	<1	0	386.79	0	113	0	0	7.2	64	1.583	0.026	<0.0005	0.03	0.007	0.0038
Mean	<1	933.95	387.01	69.31	123	0	18	7.7	70.7	1.847	0.049	<0.0005	0.13	0.022	0.0125

D-16: Denison TMA-1 Dam 17 Seepage

Parameter Units	FLOW L/s	Hardness mg/L	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	0.67	227	6.8	220	0.011	0.021	0.001	0.67	0.872	<0.0005
2019-05	2.1	130	6.3	130	<0.007	0.017	<0.0005	0.23	0.159	<0.0005
2019-07	0.83	229	6.7	170	0.024	0.023	0.0027	2.74	4.72	<0.0005
2019-10	1.4	173	6.8	140	0.019	0.021	0.0011	1.83	1.09	<0.0005
Count	4	4	4	4	4	4	4	4	4	4
High	2.1	229	6.8	220	0.024	0.023	0.0027	2.74	4.72	<0.0005
Low	0.67	130	6.3	130	<0.007	0.017	<0.0005	0.23	0.159	<0.0005
Mean	1.25	189.8	6.7	165	0.015	0.021	0.0013	1.37	1.71	<0.0005

D-2: Denison TMA-1 Stollery Lake Settling Pond Outlet (Final Discharge)

Parameter Units	FLOW L/s	hard mg/L	pH pH units	SO4 mg/L	TSS mg/L	TOXCD IC25	TOXDM %	TOXRT %	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	16.8	310	7.1	260	1				0.043	0.056	0.0008	0.21	0.26	0.0472
2019-02	34.25	290	7.2	240	1				0.105	0.081	0.0009	0.18	0.429	0.0555
2019-03	76	227	7.4	150	2				0.267	0.474	0.0007	0.54	0.198	0.0299
2019-04	185.2	205	7.2	150	1				0.299	0.616	0.0007	0.34	0.223	0.0225
2019-05	165.5	154	7.3	120	2	100	0	0	0.139	0.368	0.0005	0.22	0.226	0.0176
2019-06	112.25	185	7.5	130	2				0.237	0.696	0.0005	0.21	0.201	0.0197
2019-07	43.2	180	7.2	120	1				0.164	0.667	<0.0005	0.12	0.129	0.0176
2019-08	14	204	7.1	160	2				0.056	0.221	<0.0005	0.09	0.084	0.023
2019-09	14	264	7.3	190	2				0.042	0.118	<0.0005	0.08	0.045	0.0334
2019-10	61.6	286	7.1	230	1				0.110	0.102	<0.0005	0.11	0.191	0.0447
2019-11	65	279	7.2	220	1	100	0	0	0.137	0.200	0.0008	0.21	0.241	0.0458
2019-12	59.8	249	7.1	180	1				0.210	0.460	0.0006	0.36	0.182	0.0325
Count	53	12	53	12	53	2	2	2	53	12	12	12	12	12
High	340	310	7.6	260	3	100	0	0	0.401	0.696	0.0009	0.54	0.429	0.0555
Low	9	154	6.7	120	<1	100	0	0	0.032	0.056	<0.0005	0.08	0.045	0.0176
Mean	70.89	236.1	7.2	179.2	1	100	0	0	0.152	0.338	0.0006	0.22	0.201	0.0325

D-22: Denison TMA-2 ETP (Influent and ETP Operations)

Parameter Units	ACID mg/L	BaCl2T kg/month	ODays day	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	<1	42.4	31	6.8	95	0.09	0.026	<0.0005	0.33	0.175	<0.0005
2019-02		36.59	28	6.6		0.333					
2019-03		42.3	31	6.6		0.087					
2019-04	<1	46.2	30	6.6	13	0.014	0.013	<0.0005	0.24	0.085	0.0005
2019-05		41	31	6.7		0.068					
2019-06		45.1	30	6.8		0.032					
2019-07	<1	41.9	31	6.7	74	0.765	0.057	0.0007	8.71	1.07	0.0018
2019-08		41	31	6.7		1.128					
2019-09		44.2	30	6.6		0.181					
2019-10	<1	55.3	31	6.9	55	0.123	0.02	<0.0005	0.89	0.167	<0.0005
2019-11		48.6	30	6.7		0.113					
2019-12		41.7	31	6.7		0.060					
Count	4	12	12	53	4	12	4	4	4	4	4
High	<1	55.3	31	7.1	95	1.128	0.057	0.0007	8.71	1.070	0.0018
Low	<1	36.59	28	6.5	13	0.014	0.013	<0.0005	0.24	0.085	<0.0005
Mean	<1	43.86	30	6.7	59.3	0.250	0.029	0.0006	2.54	0.374	0.0008

D-25: Denison TMA-2 Overflow into TMA-1

Parameter Units	ACID mg/L	pH pH units	SO4 mg/L	Ra Bq/L	Fe mg/L
2019-04	<1	7.4	83.0	0.606	0.32
2019-10	<1	7.7	90.0	0.263	0.09
Count	2	2	2	2	2
High	<1	7.7	90.0	0.606	0.32
Low	<1	7.4	83.0	0.263	0.09
Mean	<1	7.6	86.5	0.435	0.21

D-3: Denison TMA-2 Effluent (Final Discharge)

Parameter Units	FLOW L/s	hard mg/L	pH pH units	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	2.2	103	7.2	77	1	0.107	0.223	<0.0005	0.1	0.008	0.0035
2019-02	1	122	7.1	78	1	0.113	0.237	<0.0005	0.11	0.027	0.0086
2019-03	2.5	163	7.3	94	1	0.116	0.271	<0.0005	0.04	0.004	0.0124
2019-04	49.2	52.8	7.1	40	1	0.081	0.232	0.0007	0.52	0.148	0.0022
2019-05	18	68.5	7.2	44	1	0.123	0.295	<0.0005	0.11	0.012	0.0013
2019-06	10.75	95.4	6.9	60	2	0.142	0.463	<0.0005	0.11	0.023	0.0035
2019-07	1.4	33.9	6.9	17	1	0.16	0.11	0.0006	0.46	0.126	0.001
2019-08	0.25	90.8	7	44	1	0.215	0.286	<0.0005	0.26	0.051	0.0018
2019-09	2.75	97	7.1	51	1	0.168	0.302	<0.0005	0.12	0.011	0.0026
2019-10	23	102	7.2	54	1	0.183	0.349	<0.0005	0.12	0.011	0.0029
2019-11	12.75	73.1	7.2	42	1	0.138	0.512	<0.0005	0.25	0.032	0.0032
2019-12	9	82.3	7.3	46	1	0.170	0.57	<0.0005	0.28	0.029	0.0026
Count	53	12	53	12	48	48	12	12	12	12	12
High	113	163	7.5	94	3	0.222	0.57	0.0007	0.52	0.148	0.0124
Low	0	33.9	6.7	17	<1	0.058	0.11	<0.0005	0.04	0.004	0.001
Mean	11.62	90.3	7.1	53.9	1	0.137	0.321	0.0005	0.21	0.040	0.0038

D-9: Denison TMA-1 Dam 9 Seepage

Parameter Units	FLOW L/s	hard mg/L	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	2.8	602	6.9	550	<0.007	0.016	0.0028	1.45	1.76	0.02
2019-05	4	253	7.3	190	<0.007	0.012	0.0007	0.27	0.398	0.0058
2019-07	3.13	709	6.9	620	0.011	0.017	0.0034	1.08	1.79	0.0171
2019-10	0.17	680	6.9	530	<0.007	0.019	0.0025	0.93	1.53	0.014
Count	4	4	4	4	4	4	4	4	4	4
High	4	709	7.3	620	0.011	0.019	0.0034	1.45	1.79	0.02
Low	0.17	253	6.9	190	<0.007	0.012	0.0007	0.27	0.398	0.0058
Mean	2.53	561	7	472.5	0.008	0.016	0.0024	0.93	1.369	0.0142

DS-1: Stanrock Moose Lake Settling Pond Outlet to Orient Lake Polishing Pond

Parameter Units	FLOW L/s	pH pH units	Ra Bq/L
	28.4	7.2	0.023
2019-02	9.5	7.1	
2019-03	20	7.2	
2019-04	159.4	7.4	0.038
2019-05	104.5	7.3	
2019-06	30	7.5	
2019-07	5.6	7.5	0.029
2019-08	5.25	7.3	
2019-09	2.25	7.4	
2019-10	86.6	7.4	0.025
2019-11	87	7.2	
2019-12	38.8	7.2	
Count	53	53	4
High	253	8	0.038
Low	1	6.9	0.023
Mean	49.58	7.3	0.029

DS-16: Stanrock TMA, Seepage from Dam M at Quirke Lake Delta

Parameter Units	FLOW L/s	hard mg/L	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-03	0									
2019-05	1.3	26.1	6.6	18	<0.007	0.009	<0.0005	0.08	0.014	<0.0005
2019-08	0									
2019-09	0									
2019-10	5.8	22.6	6.6	12	<0.007	0.011	<0.0005	0.07	0.012	<0.0005
Count	5	2	5	2	2	2	2	2	2	2
High	5.8	26.1	6.6	18	<0.007	0.011	<0.0005	0.08	0.014	<0.0005
Low	0	22.6	6.6	12	<0.007	0.009	<0.0005	0.07	0.012	<0.0005
Mean	1.42	24.4	6.6	15	<0.007	0.01	<0.0005	0.07	0.013	<0.0005

DS-2: Stanrock ETP Influent

Parameter Units	ACID mg/L	FLOW L/s	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	229	42.65	2.8	580	0.181	0.016	0.0781	49.5	1.59	0.0315
2019-02		26.54	2.8		0.136					
2019-03		50.29	2.9		0.155					
2019-04	207	152.10	2.9	470	0.123	0.01	0.0723	43.4	1.03	0.0353
2019-05		121.65	3		0.163					
2019-06		71.52	2.9		0.196					
2019-07	196	27.68	2.8	460	0.387	0.018	0.0562	21.2	1.25	0.0154
2019-08		7.00	2.5		0.797					
2019-09		17.63	2.8		0.431					
2019-10	154	97.81	2.6	450	0.25	0.019	0.0521	19.3	1.35	0.0141
2019-11		91.23	2.7		0.188					
2019-12		62.65	3.3		0.195					
Count	4	364	12	4	12	4	4	4	4	4
High	229	190	3.3	580	0.797	0.019	0.0781	49.5	1.590	0.0353
Low	154	0	2.5	450	0.123	0.01	0.0521	19.3	1.030	0.0141
Mean	197	64.14	2.8	490	0.267	0.016	0.0647	33.35	1.305	0.0241

DS-3: Stanrock pH Probe Control (ETP Operations)

Parameter Units	BaCl2T kg/month	CaOT tonnes/month	NaOH(T) kg/month	Odays days	pH pH units
2019-01	33.6	9.1	0	11	10.9
2019-02	9.71	4.77	0	6	11.0
2019-03	36.2	15.3	0	14	10.9
2019-04	179.2	29	0	27	10.8
2019-05	248.51	23.31	0	31	10.7
2019-06	87.3	17.4	0	18	10.8
2019-07	28.8	8.5	0	8	10.8
2019-08	4	2.5	0	2	10.8
2019-09	17.5	3.6	0	5	10.7
2019-10	150.4	26.4	0	24	10.8
2019-11	92.6	16.9	0	20	10.8
2019-12	50.3	9.3	0	15	10.8
Count	12	12	12	12	305
High	248.51	29	0	31	12.3
Low	4	2.5	0	2	9.6
Mean	78.18	13.84	0	15	10.8

DS-4: Stanrock Orient Lake Polishing Pond Outlet (Final Discharge)

Parameter Units	FLOW L/s	hard mg/L	pH pH units	SO4 mg/L	TSS mg/L	TOXCD IC25	TOXDM %	TOXRT %	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	22.6	315	7.2	270	1				0.065	0.046	<0.0005	0.13	0.03	0.0045
2019-02	16	315	7.1	280	1				0.076	0.056	<0.0005	0.1	0.043	0.0056
2019-03	24.5	369	7.3	280	1				0.066	0.056	<0.0005	0.16	0.061	0.0052
2019-04	127	274	7.1	270	2				0.045	0.041	0.0008	0.31	0.088	0.0028
2019-05	75.25	184	7.1	160	2	100	0	0	0.056	0.079	<0.0005	0.14	0.024	0.0013
2019-06	33.5	260	7.2	240	1				0.075	0.097	<0.0005	0.10	0.028	0.0028
2019-07	5.4	307	7	250	1				0.117	0.072	<0.0005	0.04	0.046	0.0017
2019-08	3	300	7	260	1				0.128	0.056	<0.0005	0.06	0.062	0.0044
2019-09	6.25	307	7.3	250	2				0.143	0.049	<0.0005	0.11	0.055	0.0081
2019-10	76.2	314	7.4	260	1				0.120	0.046	<0.0005	0.12	0.036	0.0112
2019-11	68.5	296	7.2	260	2	100	0	0	0.066	0.052	<0.0005	0.17	0.028	0.0050
2019-12	33	295	7.2	240	1				0.050	0.069	<0.0005	0.24	0.035	0.0021
Count	53	12	53	12	53	2	2	2	53	12	12	12	12	12
High	254	369	7.5	280	2	100	0	0	0.174	0.097	0.0008	0.31	0.088	0.0112
Low	1	184	6.8	160	<1	100	0	0	0.039	0.041	<0.0005	0.04	0.024	0.0013
Mean	42.06	294.7	7.2	251.7	1	100	0	0	0.083	0.060	0.0005	0.14	0.045	0.0046

DS-5: Stanrock Orient Creek Discharge into Moose Lake

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
2019-01	123.7	1.00	3.8
2019-05	128.8	2.57	3.9
2019-07		0.00	
2019-10	186.5	2.57	3.7
Count	4	4	4
High	186.5	2.57	3.9
Low	123.7	0.00	3.7
Mean	146.3	1.53	3.8

DS-6: Stanrock Moose Lake Settling Pond Narrows, Upstream of DS-1

Parameter Units	FLOW L/s	pH pH units
2019-01	25.8	7.3
2019-02	2.25	7.0
2019-03	24.00	7.3
2019-04	150.2	7.3
2019-05	121.75	7.7
2019-06	59.25	8.1
2019-07	0.20	8.9
2019-08	0.00	
2019-09	0.00	
2019-10	97.6	7.9
2019-11	102.75	7.3
2019-12	37.20	7.4
Count	53	53
High	261	8.9
Low	0	6.8
Mean	52.74	7.5

FBDST

Parameter Units	pH pH units	Hard mg/L	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-01	5.9	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-02	6.5	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-03	6.5	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-04	6.5	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-05	7.0	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-06	6.6	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-07	6.3	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-08	6.3	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-09	6.3	<0.5	<0.1	1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-10	6.5	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-11	7.0	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2019-12	5.7	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
Count	12	12	12	12	12	12	12	12	12	12
High	7.0	<0.5	<0.1	1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
Low	5.7	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
Mean	6.4	<0.5	<0.1	1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005

SR-16: Fox Creek at Highway 108 (Reference Station)

Parameter Units	Hardness mg/L	pHF	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-03	8.8	5.8	1.3	1	<0.007	0.008	0.0005	1.00	0.040	<0.0005
2019-05	4.7	5.9	1.1	2	<0.007	<0.005	<0.0005	0.27	0.013	<0.0005
2019-08	10.2	5.3	0.7	6	<0.007	0.008	0.0008	1.48	0.056	<0.0005
2019-11	6.9	6.0	1.1	1	<0.007	0.006	<0.0005	0.45	0.026	<0.0005
Count	4	4	4	4	4	4	4	4	4	4
High	10.2	6	1.3	6	<0.007	0.008	0.0008	1.48	0.056	<0.0005
Low	4.7	5.3	0.7	1	<0.007	<0.005	<0.0005	0.27	0.013	<0.0005
Mean	7.7	5.8	1.1	3	<0.007	0.007	0.0006	0.80	0.034	<0.0005

SR-17: Unnamed Creek from Lake Three at Highway 108 (Reference Station)

Parameter Units	Hardness mg/L	pHF	SO4 mg/L	TSS mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-02	13.6	6.3	3.4	3.4	<0.007	0.039	0.0008	0.57	0.055	<0.0005
2019-05	6.2	6.3	2.6	2.6	<0.007	0.015	<0.0005	0.25	0.020	<0.0005
2019-08	10.9	5.5	1.4	1.4	<0.007	0.018	0.0008	1.06	0.046	<0.0005
2019-11	7.9	5.8	2.6	2.6	<0.007	0.013	0.0005	0.48	0.036	<0.0005
Count	4	4	4	4	4	4	4	4	4	4
High	13.6	6.3	3.4	5	<0.007	0.039	0.0008	1.06	0.055	<0.0005
Low	6.2	5.5	1.4	1	<0.007	0.013	<0.0005	0.25	0.020	<0.0005
Mean	9.7	6.0	2.5	3	<0.007	0.021	0.0006	0.59	0.039	<0.0005

DS-11: Stanrock Seepage of Dam A

Parameter	CONDF	FLOW	pH
Units	µmho/cm	L/s	pH units
2019-01	382.7	0.26	6.0
2019-05	358.8	0.72	6.7
2019-07	473.9	0.33	6.2
2019-10	442.0	0.62	6.9
Count	4	4	4
High	473.9	0.72	6.9
Low	358.8	0.26	6.0
Mean	414.4	0.48	6.4

DS-12: Stanrock Seepage from Dam B

Parameter	CONDF	FLOW	pH
Units	µmho/cm	L/s	pH units
2019-01	514	0.4	3.9
2019-05	425.2	1.6	3.5
2019-07	509.9	0.05	3.6
2019-10	521.0	0.52	4.8
Count	4	4	4
High	521	1.6	4.8
Low	425.2	0.05	3.5
Mean	492.5	0.64	4.0

DS-13: Stanrock Seepage from Dam C

Parameter	CONDF	FLOW	pH
Units	µmho/cm	L/s	pH units
2019-01		0.00	
2019-05	571	0.13	7.0
2019-07	945	0.04	6.9
2019-10	576	0.13	6.9
Count	4	4	4
High	945	0.13	7.00
Low	571	0	6.9
Mean	697.3	0.08	6.9

DS-14: Stanrock Seepage from Dam D

Parameter	CONDF	FLOW	pH
Units	µmho/cm	L/s	pH units
2019-01		0	
2019-05		0	
2019-07		0	
2019-10		0	
Count	4	4	4
High		0	
Low		0	
Mean		0	

ST-1: Stanrock Downstream of Dam G

Parameter	CONDF	pH
Units	µmho/cm	pH units
2019-01	97.7	4.2
2019-05	102.2	4.2
2019-07		
2019-10	83.5	4.3
Count	4	4
High	102.2	4.3
Low	83.5	4.2
Mean	94.5	4.2

ST-1A: Stanrock Seepage from Dam J at Toe of Dam

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
2019-01		0	
2019-05		0	
2019-07	119.7	0.10	3.8
2019-10	118.4	0.17	3.9
Count	4	4	4
High	119.7	0.17	3.9
Low	118.4	0.00	3.8
Mean	119.1	0.07	3.8

ST-3: Stanrock Downstream of Dam G

Parameter Units	CONDF µmho/cm	pH pH units
2019-01	682	3.3
2019-05	576	3.5
2019-07	910	3.3
2019-10	1010	3.4
Count	4	4
High	1010	3.5
Low	576	3.3
Mean	794.5	3.4

ST-3A: Stanrock Dam G at Toe of Dam

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
2019-01	984	0.06	3.9
2019-05	1031	0.24	4.7
2019-07	1083	0.07	3.5
2019-10	1542	0.10	3.8
Count	4	4	4
High	1542	0.24	4.7
Low	984	0.06	3.5
Mean	1160	0.12	4.0

ST-4: Stanrock within Quirke Lake Delta

Parameter Units	ACID mg/L	ALK mg/L	CONDF µmho/cm	hard mg/L	pH mg/L	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
2019-02	<1	8	73.2	31.5	6.6	22	0.017	0.034	<0.0005	0.05	0.005	0.0013
2019-05	<1	11	59.7	30.2	6.9	24	0.02	0.026	<0.0005	0.02	0.004	0.0010
2019-08	<1	8	97.1	34.0	7.1	26	0.027	0.038	<0.0005	<0.02	0.005	0.0011
2019-11	<1	7	67.3	36.7	7	26	0.017	0.039	<0.0005	<0.02	0.004	0.0012
Count	4	4	4	4	4	4	4	4	4	4	4	4
High	<1	11	97.1	36.7	7.1	26	0.027	0.039	<0.0005	0.05	0.005	0.0013
Low	<1	7	59.7	30.2	6.6	22	0.017	0.026	<0.0005	<0.02	0.004	0.0010
Mean	<1	8.5	74.3	33.1	6.9	24.5	0.020	0.034	<0.0005	0.03	0.005	0.0012

Denison Mines Inc. Elliot Lake Division
2019 Stanrock Tailings Management Area
Groundwater Performance Monitoring Results

BH91 SG1A 5.49 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	387.98	4.0	6200.0	3660	2810
2016	387.90	4.2	4600.0	3360	1440
2017	387.98	4.0	3800.0	3110	1600
2018	387.68	4.1	2900.0	3540	875
2019	387.81	4.1	2900.0	2270	1270

BH91 SG2A 33.31 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	400.78	6.5	4500.0	2200	1330
2016	400.48	6.0	4000.0	2260	1160
2017	401.22	6.3	4400.0	2450	1450
2018	400.96	6.4	4500.0	3140	1280
2019	400.54	No sample collected (no recharge)			

BH91 SG2D 4.39 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	404.37	No sample collected (no recharge)			
2016	404.52	No sample collected (no recharge)			
2017	404.39	No sample collected (no recharge)			
2018	404.29	No sample collected (no recharge)			
2019	404.76	No sample collected (no recharge)			

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BH91 SG3A 8.78 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	399.52	No sample collected (no recharge)			
2016	399.29	No sample collected (no recharge)			
2017	399.69	No sample collected (no recharge)			
2018	399.39	No sample collected (no recharge)			
2019	399.75	No sample collected (no recharge)			

BH91 SG3B 5.85 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	399.26	No sample collected (no recharge)			
2016	398.81	No sample collected (no recharge)			
2017	399.22	3.9	1700.0	901.0	295.0
2018	399.01	No sample collected (no recharge)			
2019	399.43	No sample collected (no recharge)			

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BH98 15A 7.86 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	392.24	6.4	2700.0	1200	838
2016	392.24	6.0	2600.0	1130	626
2017	392.21	5.4	2400.0	1040	651
2018	392.24	6.2	2400.0	1080	601
2019	392.03	6.0	2400.0	1130	504

BH98 16A 5.49 m

Parameter Units	Elevation m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	395.96	6.1	4800.0	3200	1680
2016	396.15	5.7	3900.0	1880	1240
2017	396.35	5.6	4900.0	2660	2140
2018	396.43	5.7	3400.0	2060	1080
2019	396.58	5.8	3500.0	2190	1300

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PN ST3 P3 5.94 m

Parameter	Elevation	Field pH	Sulphate	Acidity	Iron
Units	m	pH units	mg/L	mg/L	mg/L
2015	404.37	5.9	2500.0	1030	586
2016	404.17	5.9	2100.0	1030	589
2017	404.61	5.8	2800.0	1280	771
2018	404.25	5.9	3000.0	1560	767
2019	404.29	5.6	2800.0	1610	887

PN ST3 P5 2.64 m

Parameter	Elevation	Field pH	Sulphate	Acidity	Iron
Units	m	pH units	mg/L	mg/L	mg/L
		No sample collected (no recharge) for 2015			
2015	404.34				
2016	404.18	3.6	2800.0	2200	1070
2017	404.08	3.2	3000.0	1850	827
2018	403.85	3.4	3200.0	1700	668
2019	404.30	3.2	3000.0	2130	1070

PN ST3 P6 11.58 m

Parameter	Elevation	Field pH	Sulphate	Acidity	Iron
Units	m	pH units	mg/L	mg/L	mg/L
2015	404.29	6.3	4700.0	3560	1770
2016	404.06	6.2	5200.0	3970	2030
2017	404.54	6.0	5400.0	4050	2370
2018	404.37	6.1	5900.0	4540	2400
2019	404.14	5.9	5400.0	4430	2580

PN ST3 P8 20.91 m

Parameter	Elevation	Field pH	Sulphate	Acidity	Iron
Units	m	pH units	mg/L	mg/L	mg/L
2015	402.36	4.5	12000.0	10100	7020
2016	401.89	5.8	11000.0	9630	5810
2017	402.68	4.9	11000.0	9550	5480
2018	402.38	4.9	11000.0	9010	4790
2019	402.29	5.6	9300.0	8210	4730

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Station: BH91 D1A 218.00 ft

Parameter Units	Elevation[A] m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	359.73	7.1	980.0	<1	33.3
2016	360.60	6.8	790.0	<1	32
2017	363.16	7.3	830.0	<1	33.6
2018	359.89	6.9	770.0	<1	22.2
2019	360.41	No sample collected (no recharge)			

[A]elevation changed from feet to meters in 2015

Station: BH91 D1B 149.20 ft

Parameter Units	Elevation[A] m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	360.16	7.7	690.0	2	0.1
2016	360.75	7.6	570.0	<1	0.02
2017	363.67	7.3	620.0	<1	1.73
2018	360.34	No sample collected (no recharge)			
2019	360.96	No sample collected (no recharge)			

[A]elevation changed from feet to meters in 2015

Station: BH91 D3A 159.00 ft

Parameter Units	Elevation[A] m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	361.22	6.7	1800.0	278	277
2016	361.07	6.5	1800.0	223	190
2017	363.62	6.6	1600.0	176	190
2018	361.17	6.6	1700.0	209	205
2019	361.37	No sample collected (no recharge)			

[A]elevation changed from feet to meters in 2015

Station: BH91 D3B 69.00 ft

Parameter Units	Elevation[A] m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	370.30	6.3	1500.0	277	214
2016	370.37	6.3	1300.0	245	125
2017	370.99	6.4	1400.0	215	171
2018	370.20	6.6	1500.0	204	185
2019	370.26	6.6	1400.0	228	140

[A]elevation changed from feet to meters in 2015

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Station: BH91 D9A 72.20 ft

Parameter Units	Elevation[A] m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	395.62	6.3	1700.0	256	204
2016	395.64	6.3	1800.0	224	189
2017	396.25	6.6	1600.0	238	223
2018	396.04	6.6	1600.0	220	202
2019	396.12	6.5	1500.0	196	201

[A]elevation changed from feet to meters in 2015

Station: BH91 DG4B 35.80 ft

Parameter Units	Elevation[A] m	Field pH pH units	Sulphate mg/L	Acidity mg/L	Iron mg/L
2015	358.02	6.3	710.0	<1	10.5
2016	358.49	6.2	700.0	<1	10.4
2017	358.40	6.2	730.0	<1	21.9
2018	358.28	6.6	560.0	<1	13.90
2019	358.52	6.2	670.0	<1	13.80

[A]elevation changed from feet to meters in 2015