2017 OPERATING CARE & MAINTENANCE ANNUAL REPORT

Denison Mines Inc.

Submitted to the

Canadian Nuclear Safety Commission

March 29, 2018

Denison Mines

Denison Mines Inc.
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March 28, 2018

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

Dear Dr. Lange:

RE: Denison Mines Inc. 2017 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 2017. 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.

Janet Lowe

General Manager

Enclosure

Distribution

Elliot Lake Joint Review Group 2017

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Additional Distribution 2017

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Denison Mines Inc. David Cates President & CEO Dcates@denisonmines.com 416-979-1991	

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1 ORGANIZATIONAL INFORMATION

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

1.1 Board of Directors

Table 1.1 lists the names and titles of the Directors of Denison Mines Inc. as of December 31, 2017. All persons listed below may be contacted via the aforementioned licensee address.

Table 1.1 Denison Mines Inc. Directors as of December 31, 2017

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

1.2 List of Officers

Table 1.2 lists the names and titles of the Officers of Denison Mines Inc. as of December 31st, 2017. All persons listed below may be contacted via the aforementioned licensee address.

Table 1.2 Denison Mines Inc. Officers as of December 31, 2017

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 2023.

3 LICENCE AND MONITORING PROGRAM MODIFICATIONS

Denison Mines Inc. closed sites in Elliot Lake currently operate and are monitored within the scope of work outlined in UMDL-Minemill-Denison.01/indf and UMDL-Minemill-Stanrock.02/indf, as well as Certificate of Approval (C of A) No. 4-0067-74-766, C of A No. 4-0019-72-006, and C of A No. 4-034-76-006. No changes to these documents have been made in 2017.

There were approved changes/modifications to the Source Area Monitoring Program (SAMP) and the Tailings Operational Monitoring Program (TOMP) in 2015, which are presented in the *Cycle 4 Study Design for the Serpent River Water Management Program (SRWMP), SAMP and TOMP* (Minnow Environmental Inc.(Minnow), 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 remains an important part of Denison Mines Inc. and practices to support this are consistently implemented to ensure safety in the workplace. Throughout 2017, training and education in matters relating to health and safety continued to be provided at monthly safety meetings and daily line-ups for Denison staff.

4.1.2 Gamma Dosimetry

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

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. At the end of the wearing period, the dosimeters are sent to the Radiation Protection Bureau (RPB) Health Canada for processing. Denison's designate is 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. Radon is 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. Between forty to ninety minutes after the sample collection, alpha radiation is measured with an alpha counter. 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. 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 Canadian Nuclear Safety Commission (CNSC) under separate cover.

4.2 Water Quality Monitoring Program

4.2.1 Program Requirements

Water quality monitoring requirements and criteria as per the aforementioned licences are fulfilled through the approved SAMP, TOMP, and SRWMP. Furthermore, approved recommendations for modifications to the SAMP and TOMP that were implemented in 2015 are presented in the *Cycle 4 Study Design* for the SRWMP, SAMP and TOMP (Minnow, 2016). A summary of approved changes is provided in Appendix I. It is important to note that water quality data included in this report from Denison monitoring locations are part of the Serpent River Watershed (SRW), which is a shared watershed with Rio Algom Limited (RAL) sites and their monitoring locations. In order to obtain a full understanding of the results that comprise this report, it should be read in conjunction with the SRWMP 2017 Annual Water Quality Report (RAL & Denison, 2018).

The 2017 SAMP and TOMP followed program requirements (sampling locations, frequencies, parameters, and analytical protocols) as recommended and approved in the *Cycle 4 Study Design for the SRWMP, SAMP and TOMP* (Minnow, 2016). Appendix II provides a map of the sampling stations included in the water quality program. Tables in Appendix II provide a brief description of each location, the sampling frequency, and parameters monitored as well as non-SAMP and TOMP regulatory drivers.

4.2.2 Data Quality Objectives

Targeted Method Detection Limits (MDLs) and Data Quality Objectives (DQOs) for SAMP and TOMP requirements are provided in Table 4.2.2 which were derived from the Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow, 2016). Laboratory data quality assessment is provided in Section 3.1 of the *Serpent River Watershed Monitoring Program 2017 Annual Water Quality Report* (RAL & Denison, 2018).

4.2.3 Changes in Analytical Methods

There were no changes in analytical methodology in 2017.

4.2.4 Data Screening and Assessment Conventions

Data validation was conducted on SAMP and TOMP water quality data throughout the year. The data validation assessment-screening process flags all data points outside a rolling minimum 12 value mean $\pm$ 3 standard deviations.

As part of the TOMP, field quality assurance and quality control sampling was extended to the groundwater monitoring program in 2006. Data quality assessment involves monthly screening of field duplicate and field blank sample data against SAMP and TOMP 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 are contracted to Canadian Association of Laboratory Accreditation (CALA) certified laboratories. Laboratory QA/QC reports are provided in the *Serpent River Watershed Monitoring Program 2017 Annual Water Quality Report* (RAL & Denison, 2018).

Flagged data and short-term response plans are then reported monthly to the CNSC, Ministry of the Environment & Climate Change (MOECC) and Environment Canada (EC) in the monthly water quality report. Monthly data validation of flagged data for 2017 can be found in Appendix III.

Annual water quality reporting is 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 is included in the *Serpent River Watershed Cycle 4 (2010 to 2014) State of the Environment Report (SOE)* (Minnow, 2016). Data validation, as documented in Data Validation Procedures, ensures prompt response to upset conditions or unusual results. Appendix IV includes all 2017 water quality monitoring results with surface water results compared to Table 4.2.2 Assessment Criteria (AC) for the receiving environment. Five years of groundwater quality data are also included in Appendix IV. It should be noted that elevation measurements for Denison sites were changed from feet to meters in 2015.

Table 4.2.2 Assessment Criteria and Data Quality Objectives

		Assessement Criteria[1]	Data Quality Objectives [2]							
Parameter	**Units**	**Receiving Environment Criteria**	**Targeted Detection Limit**	**Minimum Detectable Difference**	**Field Blank Criteria**	**Laboratory Blank Criteria**	**Field Precision**	**Laboratory Precision**	**Laboratory Spikes**	**Laboratory Accuracy (CRM)**
Field Parameters										
Conductivity	µmho/cm	-	0.1	0.05	-	-	20%	-	-	-
Flow	L/s	-	method	method	-	-	-	-	-	-
pH	pH units		0.1	0.01 or 0.02	-	-	20%	-	-	-
Lake		6.5								
Wetland/stream		5.2								
Laboratory Parameters										
Acidity	mg/L	-	1.0	-	2	2	20%	10%	-	20%
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%
Iron	mg/L			-	0.04	0.04	20%	10%	20%	20%
Lake		0.49	0.02							
Wetland/stream		1.69	0.02							
Manganese [3]	mg/L	0.8	0.002	-	0.004	0.004	20%	10%	20%	20%
Radium	Bq/L	1.0	0.005	-	0.01	0.01	20%	20%	20%	-
Sulphate [3]	mg/L	128-429	0.1	-	0.2	0.2	20%	10%	20%	20%
TSS	mg/L	-	1	-	2	-	20%	10%	-	20%
Uranium	mg/L	0.0150	0.0005	-	0.001	0.001	20%	10%	20%	20%

Notes:

1. Table 4.5 Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow, 2016)
2. Table 5.2 Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow, 2016)
3. Sulphate and manganese criteria taken from Table B.1, Appendix B, Cycle 4 Study Design for the SRWMP, SAMP and TOMP (Minnow, 2016). Parameters are hardness dependent.

5 RESULTS AND DISCUSSION

5.1 Health and Safety

5.1.1 Health and Safety Injury Statistics

Throughout 2017, training and education in health and safety related matters continued to be provided at monthly safety meetings and daily line-ups. All care and maintenance workers have Workplace Hazardous Materials Information System (WHMIS), Cardiopulmonary Resuscitation (CPR) and First Aid certification and have completed the Annual Radiation Safety training. Furthermore, many workers have additional training and certifications ensuring their qualification for specialty/specific tasks and jobs related to care and maintenance at the Elliot Lake sites. In 2015, there was one incident requiring medical aid. The individual required 12 stitches due to a laceration between the base of the thumb and wrist. In 2017, another incident required medical aid, which was the result of a foreign body to the right eye. Although both incidents required medical aid, there were no lost time accidents reported between 2015 and 2017 at the Elliot Lake sites (Table 5.1.1).

Table 5.1.1 Health & Safety Injury Statistics

Category	*2017*		*2016*		*2015*	
	Number	*Frequency*	*Number*	*Frequency*	*Number*	*Frequency*
Medical Aid	1	4.1	0	0.0	1	3.9
Lost Time	0	0.0	0	0.0	0	0.0
Total	**1**	**4.1**	**0**	**0.0**	**1**	**3.9**
Person-Hours Worked	**48,270**		**50, 417**		**51,312**	

* Frequency is calculated as: Number / Person-hours Worked * 200,000

5.1.2 Gamma Dosimetry

Dose reports 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 2017. Quarterly values for individual ETPs are reported in the following subsections.

5.1.3.1 Denison TMA-1 ETP

Quarterly radon progeny monitoring was conducted at the Denison TMA-1 in accordance with licence requirements. Radon progeny monitoring results for the year 2017 confirmed WLs remained well below the action level criteria of 0.10 WL (Table 5.1.3.1).

Table 5.1.3.1 Denison TMA-1 ETP Radon Progeny Monitoring Results 2017

Quarter	Radon (WL)
1	0.0030
2	0.0165
3	0.0004
4	0.0003

5.1.3.2 Denison Lower Williams Lake ETP

Quarterly radon progeny monitoring was conducted at the LW ETP in accordance with licence requirements. Radon progeny monitoring results for the year 2017 confirmed WLs remained well below the action level criteria of 0.10 WL (Table 5.1.3.2).

Table 5.1.3.2 Denison Lower Williams ETP Radon Progeny Monitoring Results 2017

Quarter	Radon (WL)
1	0.0210
2	0.0063
3	0.0035
4	0.0059

5.1.3.3 Stanrock ETP

Quarterly radon progeny monitoring was conducted at the Stanrock ETP in accordance with licence requirements. Radon progeny monitoring results for the year 2017 confirmed WLs remained well below the action level criteria of 0.10 WL (Table 5.1.3.3).

Table 5.1.3.3 Stanrock ETP Radon Progeny Monitoring Results 2017

Quarter	Radon (WL)
1	0.0132
2	0.0147
3	0.0046
4	0.0051

5.2 Water Quality Monitoring Program

The objective of the annual data review is to identify anomalous data and provide evaluation and short-term annual averages at select locations. Step changes and anomalies are identified by reviewing and compiling the last five years of annual average data for all SAMP and TOMP locations. Unusual individual results are routinely investigated in accordance with the *Water Quality Assessment and Response Plan,* which is included in Appendix A of the most recent SOE Report (Minnow, 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 and comparison to AC, as per *The Cycle 4 Study Design for the SRWMP, SAMP and TOMP* (Minnow, 2016). Surface water quality data is reported monthly to the following regulatory bodies: CNSC, MOECC, and EC.

The sulphate field blank DQO of 0.2 mg/L was exceeded in one of 12 samples at 0.7mg/L. This concentration DQO exceedance was confirmed by repeat analysis. Although there is evidence of slight contamination, this location indicates elevated sulphate concentrations ranging from 140 mg/L to 320 mg/L in 2017. Therefore, the exceedance does not impact interpretation of sulphate water quality results. All other DQOs were met for all parameters in all samples in 2017.

Although the majority of the field blank DQOs were met, there were several discrepancies identified with field precision results in 2017. These anomalies were specific to samples collected in the months of February and April, when the standard precision DQO of 20% was exceeded for multiple parameters ranging from 21% to 71%. Laboratory repeat analysis in the primary and duplicate samples confirmed all the original results, suggesting the issue was not a laboratory error but rather an improper sample collection. Further investigation revealed that there was a slight deviation in standard sample collection protocols, which may have resulted in contamination between samples. All designated staff responsible for sample collection were retrained in proper sampling procedures, and several job observations were performed to ensure all protocols were being followed correctly. The retraining process proved effective in improvement of field precision results, as there was a much better agreement between primary and duplicate results following the retraining events.

The TSS field precision objective of 20% was exceeded in three of 12 samples all at 67%. The exceedances all occurred at a concentration of 2 mg/L and are indicative of the lack of precision at low TSS concentrations, and do not influence performance monitoring data integrity. The overall annual percent difference was 17%.

The radium field precision DQO of 20% was exceeded in five of 12 samples ranging from 21% to 67%. The exceedances were not a result of improper sampling protocol, but rather are consistent with the variability observed in radium concentrations. All results were within values typically observed at this location and therefore do not affect the interpretation of radium water quality results. The annual average percent difference was slightly above the DQO at 21%.

The barium field precision DQO of 20% was also exceeded slightly in three of 12 samples ranging from 27% to 71%. However, all results were within values typically observed at this location, and the annual average percent difference remained below the DQO at 14%.

The iron and manganese field precision DQOs, both 20%, each exceeded three times in 12 samples. Two of the exceedances for each parameter were likely the result of the issue described above. The third exceedance for each parameter was likely due to laboratory error. Repeat results

for both parameters in both the primary and duplicate samples did not confirm the original results. All results, however, fell within the typical range of values observed at this location, and therefore do not affect interpretation of water quality results. The annual average percent differences for iron and manganese were below the DQOs at 13% and 17% respectively.

Uranium and cobalt field precision DQOs (20% each) each exceeded once in 12 samples each at 21% and 63%, respectively. Precision was likely influenced by the same issues described above (uranium in April and cobalt in February). The annual average percent difference, however, remained well below DQOs at 5% and 8%, respectively.

A summary of 2017 surface water field blank and field precision data is presented in Table 5.2.1.

Table 5.2.1 2017 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	12	12	12	12	12	12	12	12	12	12
Average	5.6	<1	<0.5	0.2	0.007	<0.0005	<0.005	<0.0005	<0.02	<0.002
Max	6.6	<1	<0.5	0.7	0.009	<0.0005	<0.005	<0.0005	0.04	<0.002
Min	5.2	<1	<0.5	<0.1	<0.007	<0.0005	<0.005	<0.0005	<0.02	<0.002
Field Blank Exceedances										
Criteria [1]		2	1.0	0.2	0.01	0.001	0.01	0.001	0.04	0.004
# Exceedances		0	0	**1**	0	0	0	0	0	0
Field Duplicate Statistics										
Count	12	12	12	12	12	12	12	12	12	12
Average	1%	17%	3%	2%	21%	5%	14%	8%	13%	17%
Max	1%	67%	17%	15%	67%	21%	71%	53%	42%	86%
Min	0%	0%	0%	0%	3%	0%	0%	0%	0%	0%
Field Precision Exceedances										
Criteria [1]	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
# Exceedances	0	**3**	0	0	**5**	**1**	**3**	**1**	**3**	**3**

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

Bold Indicates an exceedance of the Blank Criteria

5.2.1.1 Denison TMA-1

Site-specific water quality monitoring at the Denison TMA-1 facility was completed in accordance with SAMP and TOMP design documents. Detailed water quality results are provided in Appendix IV.

TMA-1 basin performance is monitored at station D-1. Review of the TOMP dataset over the last five years indicates gradually increasing annual average radium concentrations, likely due to decreasing sulphate concentrations in the TMA (Table 5.2.1.1a). The elevated radium may be attributed to dissolution of the barium or calcium sulphate compound to which the radium is associated, whereby radium is released from the tailings (Minnow, 2016). Hardness continues to be measured internally for the purpose of assessing sulphate concentrations, and similar to sulphate, hardness concentrations appear to be decreasing over time. It is important to note that sulphate is hardness-dependent, in that the AC for sulphate increases as water hardness increases (Minnow, 2016). Therefore, taking into account the average hardness at this station, all sulphate annual averages meet the appropriate AC derived from British Columbia Ministry of Environment (BCMOE) guidelines for this station (Table 5.2.1.1a). Annual average uranium concentrations have exceeded AC in four out of the last five years of monitoring at this station. Barium, iron, and manganese concentrations have consistently remained low while acidity and cobalt remain near or below detection levels (Table 5.2.1.1a). Annual average pH values have consistently met AC each year, and have remained relatively neutral.

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

PARAMETER UNITS	ACID mg/L	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
Assessment Criteria[A]	**-**	**-**	**5.2/6.5[B]**	**309[C]**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2013	<1	226.8	7.8	170.0	**1.325**	0.074	0.0006	0.09	0.071	**0.0274**
2014	<1	163.8	7.4	118.5	**1.204**	0.068	<0.0005	0.06	0.049	**0.0172**
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**
Annual Summary Statistics [J]										
Average	<1	157.5	7.6	110.5	1.449	0.071	0.0006	0.08	0.039	0.0176
Maximum	<1	226.8	7.8	170.0	1.764	0.095	0.0006	0.10	0.071	0.0274
Minimum	<1	117.2	7.4	78.0	1.204	0.047	<0.0005	0.05	0.013	0.0118

[A]Criteria are benchmarks based on the most recent federal, Ontario, and BCMOE water quality guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the 5-year annual average of hardness at this station.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

[J]Statistics based on five year annual average, maximum and minimum.

Bolded values indicate an Assessment Criteria limit exceedance

TMA-1 Final Discharge is monitored at the Stollery Settling Pond Outlet (D-2). Review of annual average concentrations for SAMP and TOMP parameters for the last five years indicate annual average radium concentrations have consistently remained well below the Ministry of Environment and Energy (MOEE) Provincial Water Quality Objectives (PWQO) of 1.0 Bq/L (Table 5.2.1.1b). The pH at this station remains neutral, and iron and manganese concentrations consistently meet receiving environment AC. Although uranium concentrations consistently exceeds AC each year within the last five years, they do appear to be generally decreasing over time. Cobalt remains slightly above method detection limits, thus meeting its respective AC (0.0025 mg/L) each year (Table 5.2.1.1b). Hardness and sulphate concentrations have been variable and relatively elevated over the last five years. TSS concentrations have remained stable over time at 1 mg/L (Table 5.2.1.1b). Barium concentrations have shown variability over the last five years, but have remained well below its AC.

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

PARAMETER UNITS	Hardness 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
Assessment Criteria[A]	**-**	**5.2/6.5[B]**	**-[C]**	**-**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2013	331.8	7.3	261.7	1	0.127	0.169	0.0008	0.20	0.241	**0.0522**
2014	259.0	7.1	215.0	1	0.175	0.206	0.0008	0.18	0.209	**0.0367**
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**
Annual Summary Statistics[J]										
Average	296.2	7.2	235.3	1	0.138	0.185	0.0007	0.21	0.191	0.0418
Maximum	331.8	7.3	261.7	1	0.175	0.206	0.0008	0.27	0.241	0.0522
Minimum	259.0	7.1	215.0	1	0.113	0.140	0.0006	0.18	0.134	0.0367

[A]Criteria are benchmarks based on the most recent federal, Ontario, and BCMOE water quality guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and since the 5-year annual average for hardness exceeds the highest hardness tested (i.e. the upper bound), a site-specific assessment would be required to accurately determine the AC for sulphate at this location.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

[J]Statistics based on five year annual average, maximum and minimum.

Bolded values indicate an Assessment Criteria limit exceedance

As per SAMP requirements, toxicity is monitored for Denison TMA-1 at the final discharge D-2 (Stollery Settling Pond Outlet) to estimate the potential effects on biological components. In 2017, toxicity testing was done semi-annually and included acute *Daphnia magna* and rainbow trout as well as sub lethal *Ceriodaphnia dubia.* In 2017, 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} and >100% LC_{50} result for *Ceriodaphnia dubia* was achieved during

both sampling events in 2017, signifying a non-toxic effluent for reproduction and survival reproduction of the test organism respectively (Appendix IV).

5.2.1.1.1 Discharge Compliance – Denison TMA-1 Final Discharge

In 2017, TMA-1 effluent quality at the final point of control, D-2, was in compliance with the discharge criteria in the licence (Table 5.2.1.1.1).

Table 5.2.1.1.1 2017 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.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
May	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	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.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	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.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
YTD	52	0 of 52	0 of 12	0 of 52	0 of 12	0 of 52	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

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

Seepage from Dam 1 is monitored at the Lower Williams Influent (D-22). Review of annual average concentrations for TOMP parameters indicates variability for all parameters over the last five years. Water quality at D-22 shows slightly below, but near neutral pH (Table 5.2.1.2a). Sulphate concentrations have been variable from year to year, but have remained relatively low compared to other stations within TOMP (Appendix IV). Radium, uranium, barium, and cobalt concentrations have all consistently remained below their respective AC. Iron concentrations have seen a slight increase each year up until 2017, at which point a significant decrease in concentration was observed at D-22 (Table 5.2.1.2a). The elevated annual average manganese concentrations in 2015 and 2016 were likely influenced by seasonal spikes observed in July of both years when precipitation was minimal and conditions were very dry; no impact was observed downstream at the final discharge (D-3). The lower annual average concentrations for most parameters in 2017 can likely be attributed to the greater than average rainfall that occurred throughout the year as evidenced by the volume of water treated in 2017; 505,000,000 L compared to 207,000,000 L in 2016 (Table 5.3.2.2.1).

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

PARAMETER UNITS	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
Assessment Criteria[A]	**5.2/6.5[B]**	**-**	**1.0[C]**	**1.0[D]**	**0.0025[E]**	**0.49/1.69[F]**	**0.8[G]**	**0.015[H]**
2013	6.9	95.0	0.262	0.034	0.0005	**3.51**	0.444	0.0014
2014	6.7	80.3	0.479	0.035	0.0010	**3.90**	0.635	0.0017
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
Annual Summary Statistics [I]								
Average	6.7	95.0	0.393	0.036	0.0009	3.71	0.812	0.0018
Maximum	6.9	118.8	0.604	0.047	0.0011	5.43	1.603	0.0030
Minimum	6.7	72.0	0.171	0.023	0.0005	1.39	0.186	0.0008

[A]Criteria are benchmarks based on the most recent federal, Ontario, and BCMOE water quality guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]PWQO for Radium (Minnow, 2016)

[D]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[E]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[F]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[G]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[H]Canadian Council of Ministers of the Environment limit (CCME, 2013)

[I]Statistics based on five year annual average, maximum and minimum.

Bolded values indicate an Assessment Criteria limit exceedance

The discharge from Lower Williams is monitored at the Final Discharge Point (D-3). Review of annual average concentrations for SAMP and TOMP parameters (Table 5.2.1.2b) indicate that all parameters appear to be generally stable, and have consistently remained well below receiving environment AC over the past five years. As previously mentioned, sulphate AC is hardness-dependent, and based on the 5-year annual average hardness concentration, all yearly average sulphate concentrations meet the calculated AC of 309 mg/L (Table 5.2.1.2b). Furthermore, cobalt concentrations have remained at or below method detection limits over the 5-year trend. There are no other discernible trends in the data set.

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

PARAMETER UNITS	Hardness 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
Assessment Criteria[A]	**-**	**5.2/6.5[B]**	**309[C]**	**-**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2013	120.1	7.4	74.3	1	0.119	0.242	<0.0005	0.09	0.015	0.0070
2014	101.6	7.1	66.8	1	0.127	0.320	0.0005	0.20	0.049	0.0039
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
Annual Summary Statistics [J]										
Average	115.3	7.1	74.2	1	0.118	0.251	0.0006	0.14	0.030	0.0046
Maximum	122.2	7.4	82.7	1	0.127	0.320	0.0006	0.24	0.063	0.0070
Minimum	101.6	7.0	66.8	1	0.101	0.211	<0.0005	0.06	0.006	0.0031

[A]Criteria are benchmarks based on the most recent federal, Ontario, and BCMOE water quality guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the 5-year annual average of hardness at this station.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

[J]Statistics based on five year annual average, maximum and minimum.

Bolded values indicate an Assessment Criteria limit exceedance

5.2.1.2.1 Discharge Compliance – Lower Williams Final Discharge

In 2017, Lower Williams effluent quality at the final point of control, D-3, was in compliance with the discharge criteria in the licence (Table 5.2.1.2.1).

Table 5.2.1.2.1 2017 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.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
May	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	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.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	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.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
YTD	52	0 of 52	0 of 12	0 of 52	0 of 12	0 of 52	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 TMA are all monitored at the Stanrock Treatment Plant Influent (DS-2). Based on a review of the annual averages of the last five years of data, annual average radium concentrations appear to be relatively stable and consistently remain below the AC of 1.0 Bq/L, while annual average barium concentrations remain well below the AC of 1.0 mg/L (Table 5.2.1.3a). Both sulphate and acidity concentrations are relatively high compared to other monitoring stations in the program, and have been variable over time. Iron concentrations are elevated at DS-2 as well, continuously exceeding AC (Table 5.2.1.3a). Furthermore, cobalt, manganese, and uranium concentrations are relatively stable, but remain above their receiving environment AC of 0.0025 mg/L, 0.8 mg/L, and 0.015 mg/L respectively (Table 5.2.1.3a). Depressed pH values are consistently apparent at this location due to the nature of the monitoring station being influenced by the TMA.

Table 5.2.1.3a Stanrock Influent (DS-2)

PARAMETER UNITS	ACID 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
Assessment Criteria[A]	**-**	**5.2/6.5[B]**	**-**	**1.0[C]**	**1.0[D]**	**0.0025[E]**	**0.49/1.69[F]**	**0.8[G]**	**0.015[H]**
2013	234	**3.0**	584.8	0.158	0.015	**0.1000**	**38.72**	**1.857**	**0.0348**
2014	156	**3.0**	422.5	0.188	0.028	**0.0589**	**30.35**	**1.426**	**0.0188**
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**
Annual Summary Statistics[I]									
Average	210	2.9	544.5	0.172	0.024	0.0764	37.98	1.659	0.0269
Maximum	235	3.0	632.5	0.188	0.030	0.1000	46.65	1.939	0.0348
Minimum	156	2.8	422.5	0.152	0.015	0.0589	28.80	1.349	0.0188

[A]Criteria are benchmarks based on the most recent federal, Ontario, and BCMOE water quality guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]PWQO for Radium (Minnow, 2016)

[D]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[E]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[F]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[G]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[H]Canadian Council of Ministers of the Environment limit (CCME, 2013)

[I]Statistics based on five year annual average, maximum and minimum.

Bolded values indicate an Assessment Criteria limit exceedance

Water quality at the Stanrock Final Point of Control is designated and monitored at Orient Lake Outlet (DS-4). Based on a review of water quality data at DS-4 for the last five years, annual average sulphate and hardness concentrations are relatively high for a final discharge point, but are consistent with the Denison final discharge values (Tables 5.2.1.1b & 5.2.1.3b). Since the average hardness concentration at DS-4 exceeds the upper bound hardness value tested for the determination of an AC for sulphate, then sulphate cannot be accurately compared to an AC at

this location. In the future, a site-specific study would be beneficial in determining an AC for sulphate for DS-4 to be able to identify anomalous sulphate values at the final discharge. All metal concentrations consistently meet receiving water AC, with cobalt approaching detections levels (Table 5.2.1.3b). Furthermore, pH is neutral at the Stanrock final discharge monitoring station, consistently meeting the receiving environment AC, and TSS remains consistently low at 1 mg/L over the last five years.

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

PARAMETER UNITS	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
Assessment Criteria[A]	**-**	**5.2/6.5[B]**	**- [C]**	**-**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2013	383.9	7.3	355.8	1	0.045	0.033	0.0008	0.15	0.042	0.0023
2014	316.1	7.1	292.5	1	0.054	0.045	0.0007	0.15	0.049	0.0016
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
Annual Summary Statistics [J]										
Average	324.9	7.2	289.3	1	0.061	0.044	0.0007	0.14	0.049	0.0029
Maximum	383.9	7.3	355.8	1	0.073	0.050	0.0008	0.17	0.067	0.0043
Minimum	292.5	7.1	258.3	1	0.045	0.033	0.0006	0.10	0.042	0.0016

[A]Criteria are benchmarks based on the most recent federal, Ontario, and BCMOE water quality guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and since the 5 year annual average for hardness exceeds the highest hardness tested (i.e. the upper bound), a site-specific assessment would be required to accurately determine the AC for sulphate at this location.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

[J]Statistics based on five year annual average, maximum and minimum.

Bolded values indicate an Assessment Criteria limit exceedance

As per SAMP requirements, toxicity is monitored for the Stanrock site at the final discharge (DS-4). In 2017, toxicity testing was done semi-annually (spring and fall), and included the same tests as was done at the Denison final effluent. The 2017 toxicity results 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} and a 55% IC_{25} result for *Ceriodaphnia dubia* was confirmed in both the spring and fall sampling events respectively (Appendix IV). The average >77% IC_{25} for *Ceriodaphnia dubia* at DS-4 concludes that the effluent is of low-toxicity for reproduction of the test organism, in that a 25% reproduction inhibition on the test population only occurred at effluent concentration >77% (Appendix IV). Survival results were >100% LC_{50} for both sampling events, signifying the effluent is non-toxic to the survival of the test organism.

5.2.1.3.1 Discharge Compliance – Stanrock Final Discharge

In 2017, Stanrock TMA effluent quality at the final point of control, DS-4, was in compliance with the discharge criteria in the licence (Table 5.2.1.3.1).

Table 5.2.1.3.1 2017 Stanrock Tailings Management Area 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.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
May	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	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.	5	0 of 5	0 of 1	0 of 5	0 of 1	0 of 5	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.	4	0 of 4	0 of 1	0 of 4	0 of 1	0 of 4	0 of 1
YTD	52	0 of 52	0 of 12	0 of 52	0 of 12	0 of 52	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. Appendix III contains detailed groundwater QA/QC results against DQOs while Appendix IV contains groundwater station-specific five-year annual data. The 2017 groundwater field blank and field precision data summary is presented in Table 5.2.2.

The iron field blank DQO of 0.04 mg/L was slightly exceeded in two of three samples at 0.08 mg/L and 0.07 mg/L. Although there is evidence of slight contamination, both locations indicate slightly elevated to high iron concentrations (ranging from 21.90 mg/L to 651 mg/L) and these results are consistent with previous values in the last five years. Therefore, the exceedances are not attributed to the contamination, and do not impact interpretation of iron groundwater quality results.

The acidity field blank DQO of 2 mg/L was slightly exceeded in two of three samples at 4.0 mg/L and 3.0 mg/L. Although field blank samples indicate minimal contamination, likely the result of improper rinsing between samples, it appears that there was little impact on primary groundwater results and therefore the issue does not affect interpretation of water quality results. All related sample results were consistent with previous values in the last five years and confirmed by the duplicates.

The field precision DQOs were met for all parameters in all samples in 2017. The annual percent differences for all parameters were at or below 18% at all locations.

Table 5.2.2 2017 Groundwater Field Blank and Field Precision Data Summary

	pH	SO4 mg/L	Acidity mg/L	Iron mg/L
Field Blank Statistics				
Count	3	3	3	3
Average	5.6	0.2	3	0.06
Max	5.7	0.2	4	0.08
Min	5.5	<0.1	<1	<0.02
Field Blank Exceedances				
Criteria [1]		0.2	2	0.04
# Exceedances	0	0	**2**	**2**
Field Duplicate Statistics				
Count	3	3	3	3
Average	6%	5%	3%	3%
Max	18%	12%	5%	7%
Min	0%	0%	0%	0%
Field Precision Exceedances				
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, 2016)
Bold Indicates an exceedance of the Blank Criteria

5.2.2.1 Denison TMA-1 Groundwater Results

At the east end of the TMA, downstream of Dam 17 on the North Abutment (BH91 D1A and BH91 D1B), review of the data for these monitoring wells for the last five years indicates slightly elevated iron concentrations at depth with acidity levels remaining below the method detection limit (Appendix IV). Near surface, iron concentrations have remained relatively low every year up until the 2017 program, when iron concentrations increased by more than an order of magnitude at 1.73 mg/L (Appendix IV). This increase was confirmed by repeat analysis. It is possible the increase in iron concentration is related to the gradually decreasing pH observed over the last five years.

Downstream of Dam 17 in the North Valley (BH91 D3A and BH91 D3B), data from the past five years for these monitoring wells indicates gradually improving water quality, which can be observed by near neutral pH values (Appendix IV). Although acidity and iron concentrations are relatively high in both wells, they have consistently been decreasing over time showing a sign of improving water quality (Appendix IV).

Downstream of Dam 10 (BH91 DG4B) groundwater is characterized by slightly depressed pH, gradually increasing sulphate concentrations, and acidity below detection limits (Appendix IV). Iron concentrations have significantly increased in the last three years, but are consistent with values prior to 2013.

5.2.2.2 Denison Lower Williams Lake

Groundwater monitoring results downstream of Dam 1 on the North Ridge (BH91 D9A) indicate near neutral pH levels over the last five years. Iron and acidity concentrations have been moderately elevated, but gradually decreasing over the same time period (Appendix IV). Sulphate concentrations continue to remain elevated at this station.

5.2.2.3 Stanrock

Groundwater quality is measured at Stanrock downstream of the following dams: Dam A (BH91 SG1A), Dam B (BH98-16A), Dam C (BH98-15A), and Dam D (BH91-SG2 and BH91-SG3). Dam A groundwater is characterized by depressed pH with elevated sulphate, acidity, and iron concentrations (Appendix IV). Despite spikes in concentrations of sulphate, acidity, and iron in 2015, overall concentrations have been decreasing over time in groundwater downstream of Dam A (Figure 5.2.2.3. 1). At Dam B, groundwater quality results have been variable over the past five years. Groundwater quality at this location is characterized by depressed pH, with relatively high acidity, iron, and sulphate concentrations (Appendix IV). Furthermore, acidity, iron, and sulphate concentrations have risen and fallen alternatively each year since 2013 (Figure 5.2.2.3. 2). Groundwater quality at this location is characterized by mildly depressed pH values with elevated sulphate, acidity, and iron concentrations (Appendix IV). Groundwater quality monitored downstream of Dam C indicates slightly depressed pH with elevated concentrations of sulphate, acidity and iron (Appendix IV). However, sulphate, acidity, and iron concentrations appear to be gradually decreasing over time (Figure 5.2.2.3. 3). There has been no recharge in most wells at Dam D, with the exception BH91-SG2A, where groundwater quality results show near neutral pH values with elevated concentrations of all other parameters (Appendix IV). Groundwater results

at this well have been variable over the past five years. Station BH91-SG3 was able to be sampled in 2017 for the first time in five years. Similar to other stations in the program, groundwater quality at this station showed depressed pH values accompanied by elevated sulphate, acidity, and iron concentrations (Appendix IV). However, when compared to other groundwater stations on the Stanrock site, values and concentrations were significantly lower than all other locations.

Figure 5.2.2.3. 1 Sulphate, acidity, and iron concentrations at Station BH91 SG1A downstream of Dam A, 2013-2017

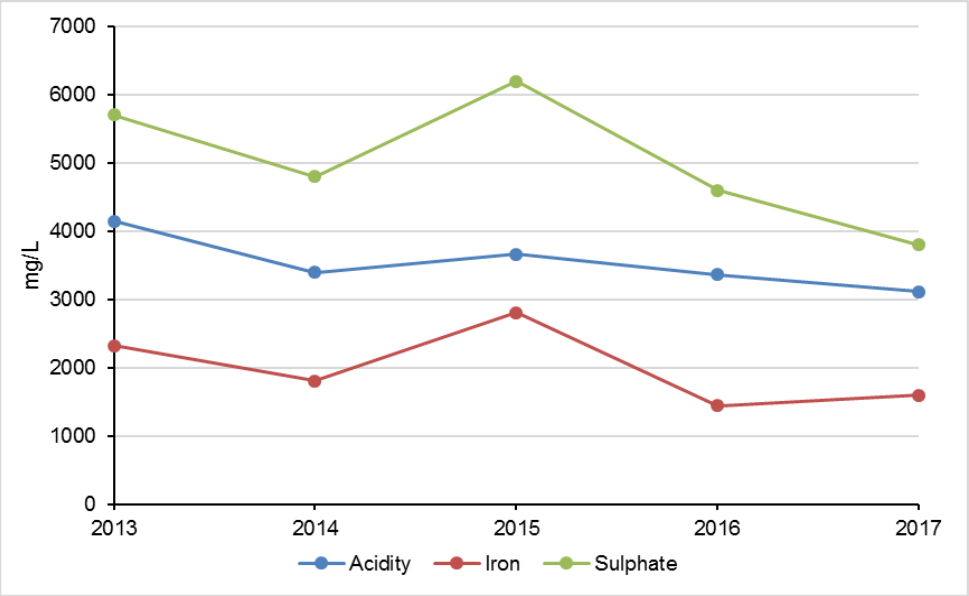


Figure 5.2.2.3. 2 Sulphate, acidity, and iron concentrations at Station BH98-16A downstream of Dam B, 2013-2017

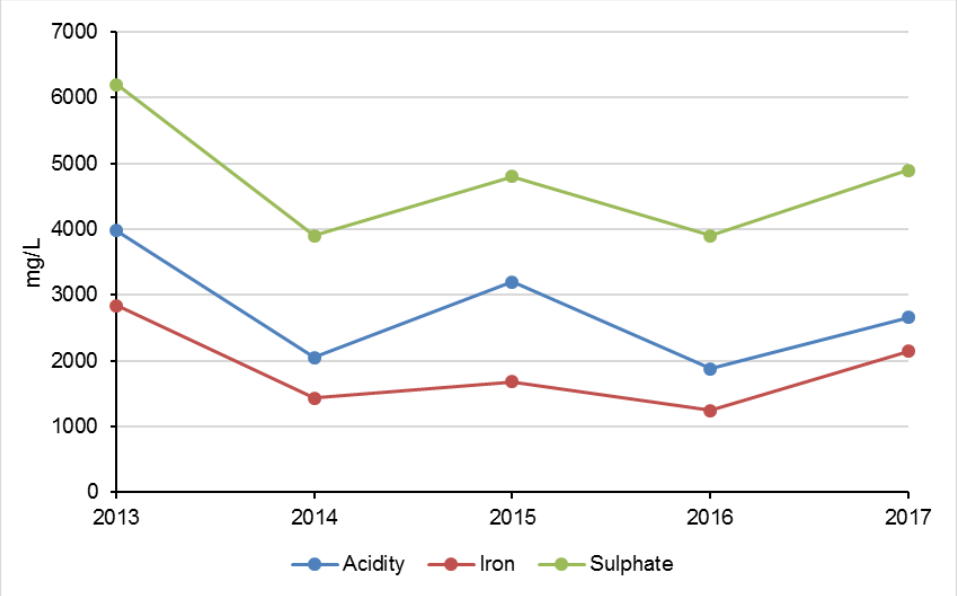
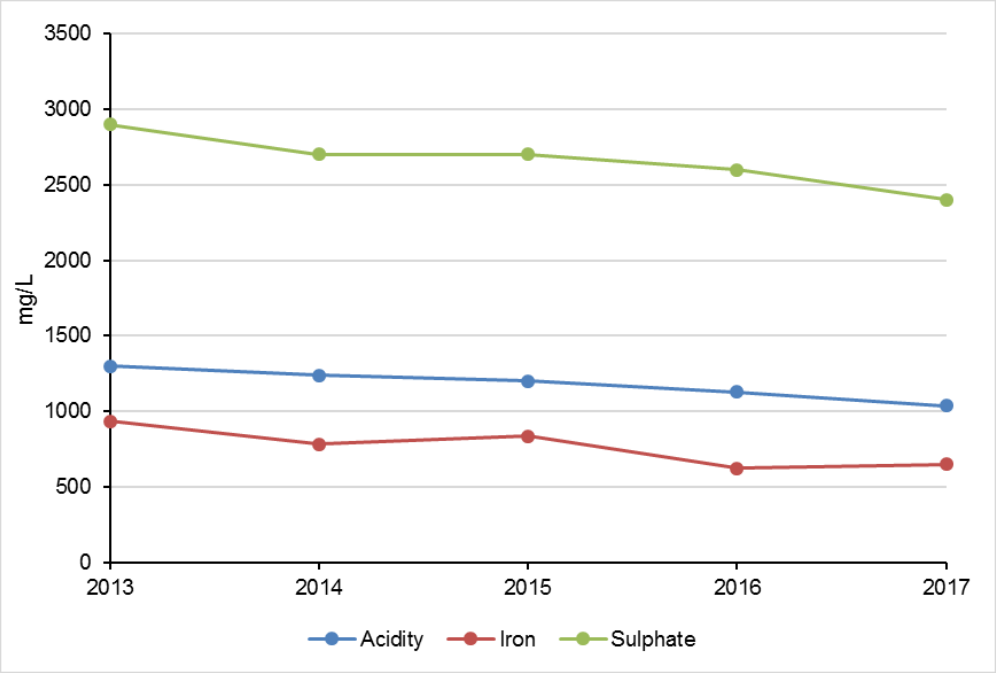


Figure 5.2.2.3. 3 Sulphate, acidity, and iron concentrations at Station BH98-15A downstream of Dam C, 2013-2017



5.2.3 Porewater Quality

Stanrock porewater overall, as measured at Dam A (ST3-P3, 5, 6, and 8), is characterized by depressed pH with elevated acidity, sulphate, and iron concentrations. Concentrations of acidity, iron, and sulphate increase significantly with depth at the aforementioned stations (Figures 5.2.3. 1 to 5.2.3. 3). Therefore, as you reach near surface stations, iron, sulphate, and acidity decrease significantly in concentration. When reviewing the data over the last five years, there appears to be no significant trends in pH at either station. pH values at all stations appear to remain relatively stable over time, with little changes (Figure 5.2.3. 4). The same can be concluded with the other parameters measured, as can be observed in the following figures.

Figure 5.2.3. 1 Acidity Concentrations at ST3 P3, ST3 P5, ST3 P6, and ST3 P8, 2013-2017

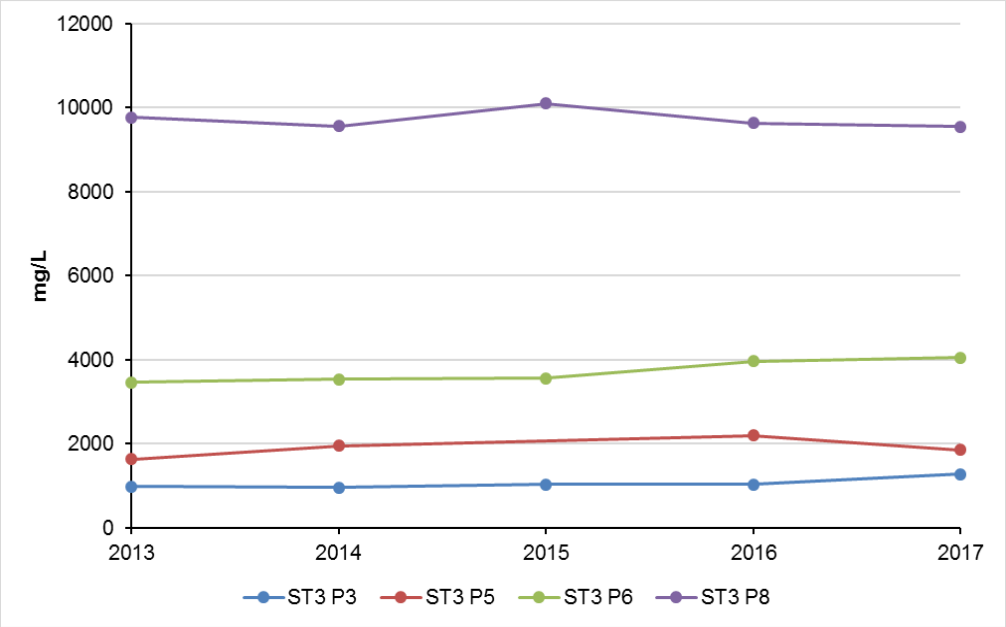


Figure 5.2.3. 2 Iron Concentrations at ST3 P3, ST3 P5, ST3 P6, and ST3 P8, 2013-2017

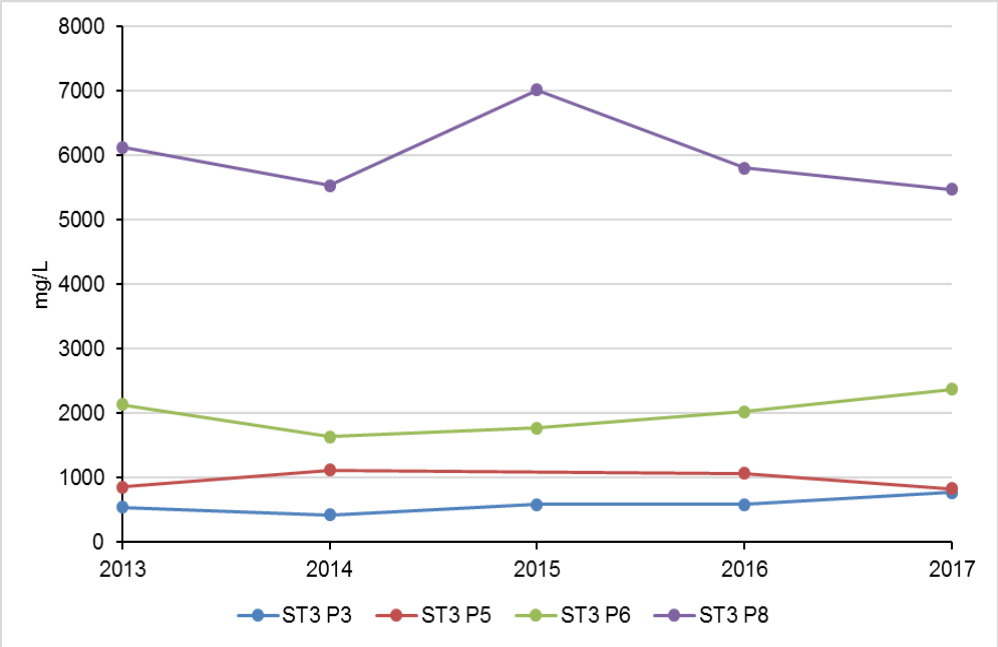


Figure 5.2.3. 3 Sulphate Concentrations at ST3 P3, ST3 P5, ST3 P6, and ST3 P8, 2013-2017

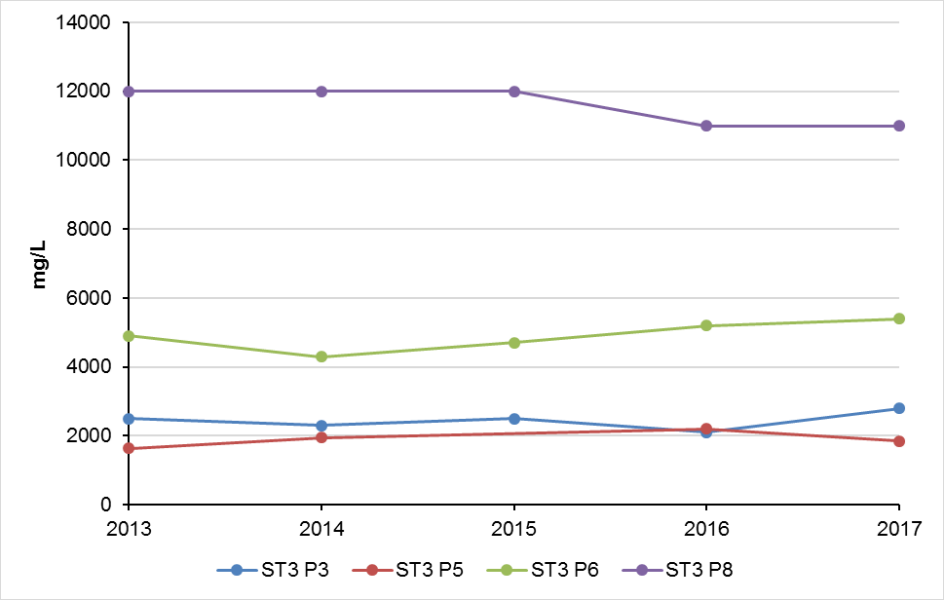
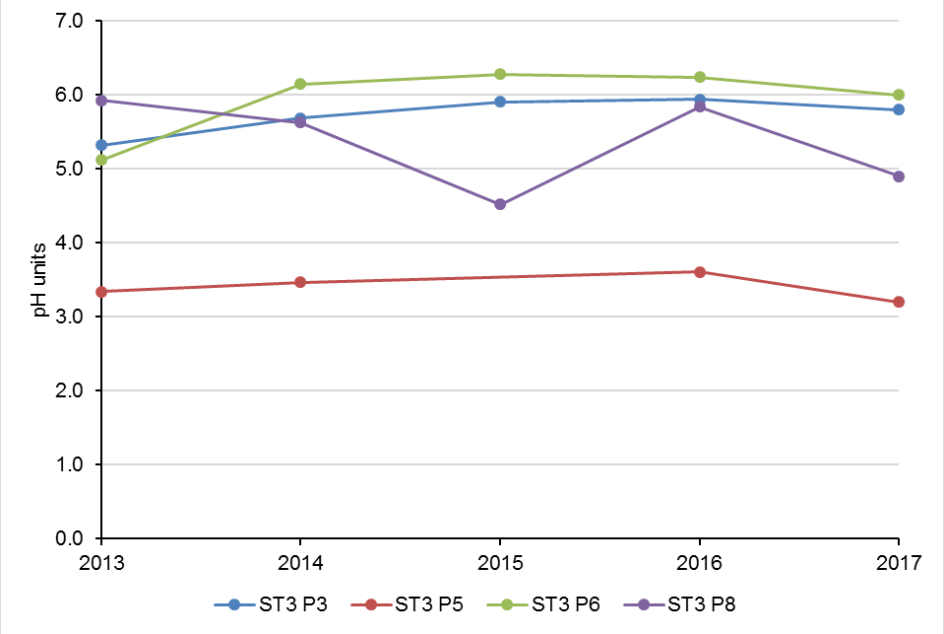


Figure 5.2.3. 4 pH at ST3 P3, ST3 P5, ST3 P6, and ST3 P8, 2013-2017



5.3 Site Specific Maintenance and Operations Program

Site-specific program reports are provided in the following sections in accordance with the SAMP and TOMP 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 inspection and preventative maintenance was performed as required.

In 2017, groundwater and dam instrumentation well elevations were resurveyed as well as dam crest elevations.

5.3.1.2 ETP Operations

The ETP at the TMA-1 spillway (D-1) operated for 217 days in 2017 at a monthly average daily flow rate of 89 L/s and a total volume of 1,675,000,000 L treated. For treatment purposes in 2017, the amount of sodium hydroxide consumed was 783 kg at the end of the year, and the amount of barium chloride that was consumed was 5027 kg. An estimated 1,933,000,000 L was discharged from the final point of control at the Stollery Settling Pond Outlet, D-2, over a total of 365 discharge days (Table 5.3.1.2.1).

5.3.1.2.1 Operating Summary

The ETP operated periodically throughout the year as required depending on the water level of the TMA basin. The use of siphons for TMA drawdown was effective 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 further helped maximize the settling capabilities of radium in the Stollery Lake Settling Pond. In 2017, barium chloride continued to be the primary treatment reagent at the ETP for the entire year. However, sodium hydroxide was re-introduced as a pH-controlling agent in the month of March. Barium chloride continued to assist in radium removal, while sodium hydroxide was used in addition to help increase pH, which in turn helped with the precipitation of radium at the Stollery Settling Pond. pH downstream of the ETP at station D-1A was monitored closely throughout the sodium hydroxide treatment period in order to evaluate the success of the treatment.

For the purpose of this treatment, the original sodium hydroxide tank that had been converted into a flocculent (floc) mixing and dispensing station in 2016, was thoroughly cleaned and converted back to its original sodium hydroxide reagent tank in March 2017. The addition of sodium hydroxide as a treatment reagent continued until mid-June. As a result, the average pH level at D-1A during the treatment period was 8.1. Furthermore, the radium concentration at the final discharge (D-2) remained well below the licensed grab sample discharge criteria of 1.11 Bq/L with an annual average concentration of 0.123 Bq/L.

A few minor operational issues that were present in 2016 continued throughout the beginning of 2017. The blocking of the siphon intake screens occurred often due to organic matter plugging them up during operation. This debris blockage often resulted in the shutdown of the siphons. During this time, Denison fixed the plugged lines by blowing out the lines with the use of a compressor and re-establishing the siphons rather quickly, within a day in most cases. To solve this ongoing problem, Denison acquired and installed new siphon screens with larger holes in the spring and summer of 2017. The replacement of these screens has created a significant reduction in the time, effort, and cleaning frequency required to clear the siphons of debris. The siphons only required clearing with the compressor once every few months as opposed to the lines having to be blown out monthly, which has been the case in the past. Furthermore, the larger holed siphon screens have ensured optimum flow rates, even in the event that small amounts of debris become built up in the line.

Table 5.3.1.2.1 2017 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. 2017	Y.T.D. 2016
PLANT OPERATIONS														
Operating Days	0	7	31	30	31	28	21	0	0	8	30	31	217	141
Maximum Daily Plant Flow (L/s D-1)	0	64	130	109	80	134	118	0	0	115	113	112	134	173
Minimum Daily Plant Flow (L/s @ D-1)	0	45	37	29	44	48	109	0	0	108	100	99	0	0
Monthly Average Daily Plant Flow (L/s @ D-1)	0	51	77	60	64	103	114	0	0	114	110	109	89	108
Total Volume Treated (ML)	0	31	207	157	171	248	206	0	0	79	285	291	1675	1310
Barium Chloride Consumption														
total kg/month	0	97	634	468	519	727	603	0	0	235	865	879	5027	3232
monthly average mg/litre	0.00	3.15	3.06	2.98	3.04	2.93	2.92	0.00	0.00	2.99	3.04	3.02	3.00	2.47
Sodium Hydroxide Consumption														
total kg/month	0	0	35	306	302	141	0	0	0	0	0	0	783	0
monthly average mg/litre	0.00	0.00	0.17	1.95	1.76	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00
EFFLUENT														
Discharge Days	31	28	31	30	31	30	31	31	30	31	30	31	365	366
Maximum Daily Discharge Flow (L/s D-2)	27	39	240	194	66	87	115	21	17	203	81	194	240	173
Minimum Daily Discharge Flow (L/s D-2)	17	9	66	52	39	17	9	17	14	12	81	39	9	0
Monthly Average Daily Discharge Flow (L/s D-2)	21	19	144	111	47	52	66	19	15	67	81	92	61	42
Total Volume Discharged (ML)	56	45	386	286	126	135	177	50	38	178	210	245	1933	1326

5.3.2 Denison Lower Williams Lake

5.3.2.1 TMA Maintenance

Routine inspection and preventative maintenance were performed at the Lower Williams Lake site as required.

5.3.2.2 Summary of ETP Operations

The treatment plant, as monitored at station D-22, operated 365 days at an average operating flow rate of 16 L/s in 2017. An estimated 505,000,000 L of water was treated, and the same amount was discharged from the final point of control, D-3, over a total of 365 discharge days. Barium chloride consumption for the year at the LW ETP was 647 kg by the end of 2017 (Table 5.3.2.2.1).

5.3.2.2.1 Operating Summary

The treatment plant at Lower Williams Lake operated throughout 2017 solely for the control of radium levels; neutralization for pH control has not been required since 2002. Unlike 2016, water quantity never became too low over the year, thus flow to the ETP continued year-round, and the treatment plant continued to run all year as well.

There were no process or design changes to the LW ETP in 2017.

Table 5.3.2.2.1 2017 Lower Williams ETP Flow Rates, Operating Days, and Discharge Days

ITEM	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	Y.T.D. 2017	Y.T.D. 2016
PLANT OPERATIONS														
Operating Days	31	28	31	30	31	30	31	31	30	31	30	31	365	346
Maximum Daily Plant Flow (L/s @ D-22)	10	10	30	96	18	30	18	21	3	92	18	149	149	46
Minimum Daily Plant Flow (L/s @ D-22)	1	1	10	5	3	3	1	1	1	3	6	10	1	0
Monthly Average Daily Plant Flow (L/s @ D-22)	4	5	15	45	10	11	8	6	2	29	11	47	16	7
Total Volume Treated (ML)	10	11	40	117	26	27	21	17	5	78	29	125	505	207
Barium Chloride Consumption														
total kg/month	55	50	56	55	58	53	55	54	54	53	51	52	647	590
monthly average mg/litre	5.42	4.56	1.40	0.47	2.26	1.96	2.59	3.14	11.81	0.69	1.80	0.41	1	3
Sodium Hydroxide 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	31	31	30	31	30	31	365	274
Maximum Discharge Flow (L/s @ D-3)	10	10	30	96	18	30	18	21	3	92	18	149	149	46
Minimum Discharge Flow (L/s @ D-3)	1	1	10	5	3	3	1	<1	1	3	6	10	1	0
Monthly Average Discharge Flow (L/s @ D-3)	4	5	15	45	10	11	8	6	2	29	11	47	16	9
Total Volume Discharged (ML)	10	11	40	117	26	27	21	17	5	78	29	125	505	207

5.3.3 Stanrock TMA

5.3.3.1 TMA Maintenance

In 2017, routine inspection and preventative maintenance were performed as required.

Groundwater and dam instrumentation well elevations were resurveyed as well as dam crest elevations.

In response to a public comment made on May 21, 2015 regarding the strange colouration of an unnamed water body adjacent to the Stanrock closed mine site, Denison has since been proactive in developing and conducting a series of monitoring programs including field observations, measurements, and sampling. These monitoring efforts were made in order to better assess the water quality and to determine effects with seasonal variability on parameter concentrations. Monitoring programs implemented thus far included quarterly monitoring of the pond (DSP), monthly monitoring of the pond seepage (DSP-2), and quarterly monitoring of the outflow area on the edge of Quirke Lake (DSP-3). Results of the programs determined minimal seepage into Quirke Lake (<1L/s), as well as depressed pH values and elevated metal concentrations for all three stations. Results from these monitoring efforts between 2015 and 2017 are included in Appendix V.

In the summer of 2016, Denison submitted a follow-up report to the CNSC. The report provided results of the aforementioned monitoring program for 2015 and 2016, historical review of the suspected source of the contamination and concluded that the pond would need to be treated. As part of the treatment plan there was a commitment to continue monitoring for a period of one more year after treatment to determine the effect on water quality. While in the process of determining a treatment option, continued discussions with CNSC determined that the Un-named Pond is on crown land and that provincial permitting will be required prior to treatment of the pond. It was then agreed that Denison would submit a detailed treatment plan to CNSC who would then seek the necessary permits required to allow treatment to be undertaken.

Denison has continued to monitor the Un-named Pond throughout 2017 while developing the treatment plan option. Results from 2017 monitoring program have been comparable to the initial monitoring program executed in 2015, and have not shown significant changes over time. Also, there continues to be no appreciable loading into Quirke Lake from the Un-named Pond even with the varied weather conditions over the past few years.

Denison is currently working on a detailed treatment plan for the Un-named Pond that will be submitted to CNSC in 2018.

5.3.3.2 Summary of ETP Operations

The Stanrock ETP, as monitored at DS-3, operated 201 days in 2017 at an average daily flow rate of 142 L/s. Approximately 2,458,000,000 L was treated at the Stanrock ETP in 2017. In 2017 at the Stanrock ETP, lime consumption was 205.16 tonnes, and barium chloride consumption was 1257 kg. Furthermore, 1,933,000,000 L was discharged from the final point of control, DS-4, over a total of 365 discharge days (Table 5.3.3.2.1).

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 are most often present during these times of the year (Table 5.3.3.2.1).

This year, approximately 105,331,180 L of water was siphoned from Beaver Lake to Dam G collection Pond and pumped to the Stanrock ETP. This ensured better pH control of Moose Lake and the final discharge water quality.

The Dam G pumps operated throughout the year to ensure the Dam G Seepage Collection Pond level remained well below spillway elevation. In 2017, an estimated 203,072,788 L of water was pumped from the Dam G Collection Pond to the ETP for treatment.

The Dam M Pond pumps operated throughout the year to ensure the Dam M Seepage Collection Pond level remained well below spillway elevation. An estimated 208,697,330 L of water was discharged to the Dam G Seepage Collection Pond.

Similar to 2016, the Dam G and Dam M pumps experienced several issues in 2017. The pumps experienced both mechanical and electrical failures. Spares were installed as required to maintain operation, and faulty pumps were sent away for repairs. Although surge and phase loss protection had been installed, issues with the pumps at these locations continued throughout 2017. Denison investigated other pumping options at the beginning of 2017, and new pumps were ordered from a new supplier. These pumps were installed later in 2017, and have been successful in avoiding the ongoing operating issues. The change in supplier has ensured equipment performance objectives are being met.

Table 5.3.3.2.1 2017 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. 2017	Y.T.D. 2016
PLANT OPERATIONS														
Operating Days	14	14	20	26	16	12	8	12	8	26	24	21	201	114
Maximum Daily Plant Flow (L/s @ DS-2)	162	156	161	209	185	165	152	152	144	208	230	204	230	192
Minimum Daily Plant Flow (L/s @ DS-2)	117	101	114	105	134	122	104	85	89	78	88	110	78	0
Monthly Average Daily Plant Flow (L/s @ DS-2)	143	132	138	160	163	148	131	123	113	134	135	150	142	128
Total Volume Treated (ML)	173	159	239	360	225	153	91	128	78	301	279	272	2458	1264
Barium Chloride Consumption														
total kg/month	59	55	104	177	98	57	54	72	41	250	168	122	1257	653
monthly average mg/litre	0.34	0.35	0.43	0.49	0.43	0.37	0.59	0.56	0.53	0.83	0.60	0.45	0.51	0.52
Lime Consumption														
total dry tonnes/month	14.06	15.12	23.77	25.79	20.00	14.55	8.16	11.85	6.05	30.51	19.04	16.26	205.16	117.08
monthly average g/litre	0.08	0.09	0.10	0.07	0.09	0.09	0.09	0.09	0.08	0.10	0.07	0.06	0.08	0.09
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	14.06	15.12	23.77	25.79	20.00	14.55	8.16	11.85	6.05	30.51	19.04	16.26	205.16	117.1
EFFLUENT														
Discharge Days	31	28	31	30	31	30	31	31	30	31	30	31	365	366
Maximum Daily Discharge Flow (L/s @ DS-4)	47	47	105	324	105	47	67	47	9	400	51	299	400	191
Minimum Daily Discharge Flow (L/s @ DS-4)	9	17	47	83	9	13	1	9	6	17	35	25	1	1
Monthly Average Daily Discharge Flow (L/s @ DS-4)	25	26	69	205	46	28	26	18	8	137	46	100	61	27
Total Volume Discharged (ML)	66	62	185	531	124	73	69	49	19	367	119	268	1933	859

6 REFERENCES

Minnow Environmental Inc., 2016a. 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., 2016b. Serpent River Watershed Cycle 4 (2010 to 2014) State of the Environment Report. Prepared for Rio Algom Limited and Denison Mines Inc. March 2016.

Minnow Environmental Inc., 2017. Serpent River Watershed Cycle 4 (2010 to 2014) State of the Environment Report. Prepared for Rio Algom Limited and Denison Mines Inc. November 2017.

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APPENDIX I
Summary of Cycle 4 Changes

Denison Mines

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

TMA	TOMP Stations	Station Type/Purpose	Parameters and Frequencies[a]												Change
			Elevation	Flow	pH	Conductivity	Sulphate	Total Radium-226	Lime or NaOH Consumption	Barium Chloride Consumption	TSS	Acidity	Iron	SAMP Metals[b]	
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)

Denison Mines

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.

Denison Mines

Rio Algom

March 9, 2016
via e-mail

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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.
Stanrock Site
SAMPLE LOCATION MAP

Rev. 2016-00
March 2016

SCALE 0 0.5 kms

N W E S

5148000 N
381000 E

NELSON LAKE QUARRY
Nelson Lake
Main Gate
STANROCK MINE
Canmet Gate
Quellette Lake
Quirke Lake
Dam A Gate
DAM 'B'
TMA
DAM 'C'
DAM 'A'
PN-ST3
BH98-16A
DS-12 Weir
DS-12
COLLECTION POND PUMP HOUSE
DS-13 Weir
DS-13
ST-3A
ST-3A Weir
SPILLWAY
DAM 'G'
BH98-15A
BH91-SG2A,D
HEADPOND
BH91-SG1
RUNOFF COLLECTION POND
DAM 'M'
PUMP HOUSE
DS-16
ST-3
ST-1
DS-16 Weir
ST-4
Dam G Pumping Line
Beaver Lake Siphon Line
DAM 'D'
DS-14
BH91-SG3A,B
DS-11
DS-1 Weirs
DS-11
SPILLWAY Weir
DAM 'J'
ST-1A Weir
ST-1A
Beaver Lake
HOLDING POND
TREATMENT PLANT
SPILLWAY DS-2
DAM 'L'
DS-3
Halfmoon Wetland
DS-4 Weir
DS-4
OUTLET BERM
BERMS
Halfmoon Lake
DS-1 Weir
DS-1
SPILLWAY
ORIENT LAKE POLISHING POND
SPILLWAY
BH98-17A
DAM 'F'
DS-6 Weir
DS-6
DAM 'K'
MOOSE LAKE SETTLING POND
DS-5
DS-5 Flume
STANROCK ROAD
Moose Lake Gate
BUCKLES TOWNSHIP
384000 E
5146000 N
5146000 N
381000 E
Quirke Lake

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

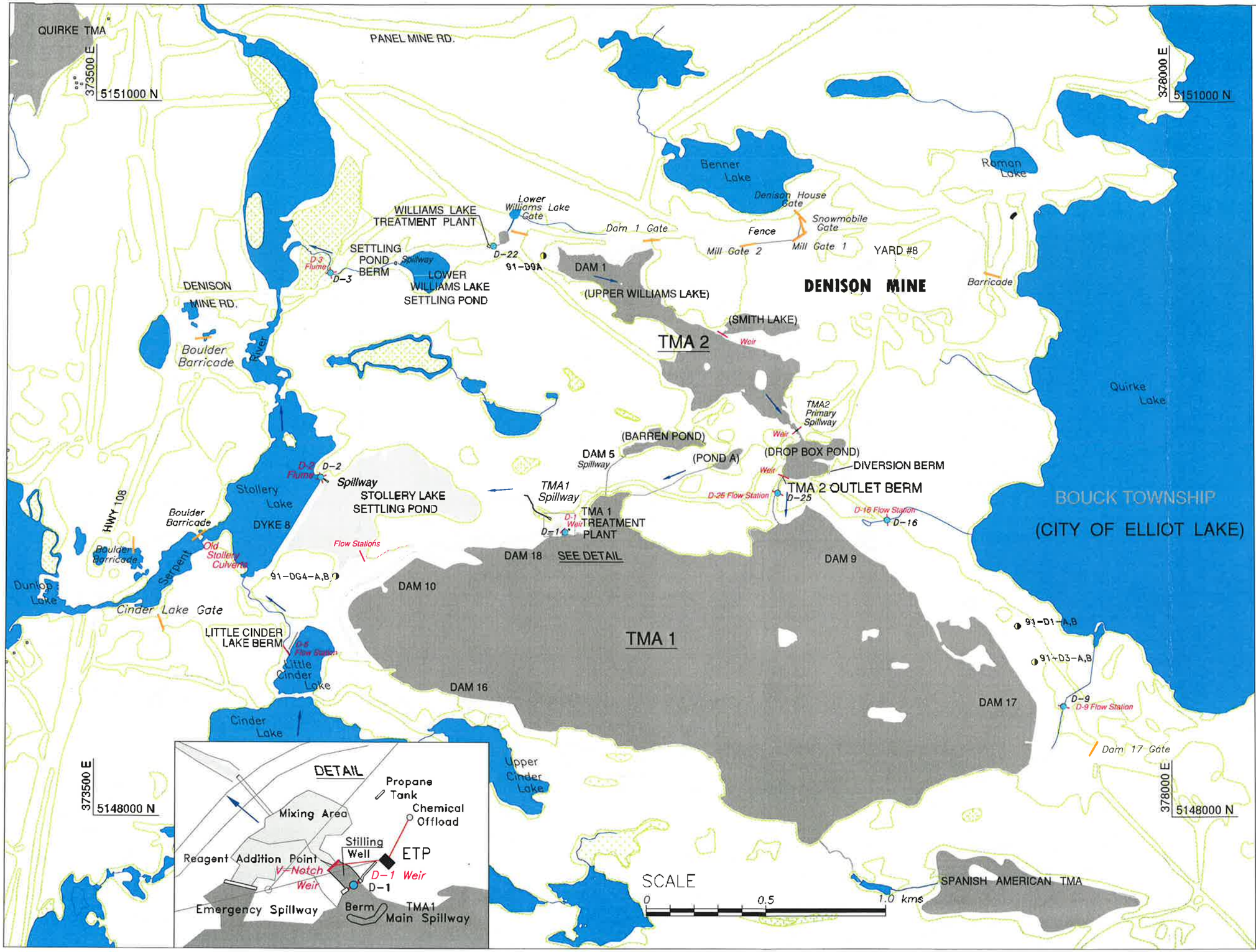
Notes

- 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).

Issued on: _____

Issued by: _____

Denison Responsible Authority



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).

Issued on: _____

Issued by: _____

Denison Responsible Authority

Denison Mines

Stanrock C of A Sampling Requirements (Parameters & Frequency)

Performance Monitoring 2017

Sampling Station	Location / Description	Coordinates	Purpose	Flow	pH	Conductivity	Sulphate	^{226}Radium (Total)	Acidity	Alkalinity	Hardness	DOC	Iron	SAMP METALS			
														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 AD	N 5146658 E 381360	MOE	4	4	4											
DS-18	Halfmoon Lake Outlet	N 5145050 E 383761	MOE	4	4		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											
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											
ST-4	Within Quirke Lake Delta	N 5146606 E 380354	MOE		4	4	4	4	4	4	4	4	4	4	4	4	4

Denison Mines

Denison TOMP/SAMP Sampling Requirements (Parameters & Frequency)

Surface Water Performance Monitoring 2017

Sampling Station	Location / Description	Coordinates	Purpose	Elevation	Flow	pH	Conductivity	Sulphate	^{226}Radium (Total)	TSS	Acidity	Hardness	Iron	SAMP METALS				Toxicity		
														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		4		4	4	4	4	4			
D-2	TMA-1 Stollery Lake Overflow	N 5149421 E 374446	TOMP		52	52			52	52										
D-3	TMA-2 Effluent	N 5150280 E 374485	TOMP		52	52			52	52										
D-22	TMA-2 ETP Influent	N 5150391 E 375169	TOMP			52		4	12				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		4		4	4	4	4	4			
DS-3	Stanrock ETP Effluent	N 5146424 E 382483	TOMP			261			12											
DS-4	Stanrock Final Discharge @ Orient Lake Outlet	N 5146327 E 383888	TOMP		52	52			52	52										
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					838	655		14	210	156	10		14	12	12	12	12	0	0	0
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			
Denison SAMP Sites Sample Subtotal					168	168		48	48	0	0		48	48	48	48	48	4	4	4
Denison Total Samples					1006	823		62	258	156	10	48	62	60	60	60	60	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			

Denison Mines

Denison Groundwater Sampling Requirements (Parameters & Frequency)

Performance Monitoring 2017

Sampling Station	Location / Description	Coordinates	Type	Purpose	Elevation	Conductivity	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
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
D-3	TSS	2017-01-03	1	2	3 mg/L	Results are slightly above the high flag limits but still consistent with previous values over the last five years at this location.
	U	2017-01-10	0	0.0096	0.0130 mg/L	
ST-3	pH	2017-01-12	3.2	3.8	3.1	Results is slightly below the low flag limit but still consistent with previous values over the last five years at this location.
BSDST	Co	2017-02-14	0.0001	0.0010	0.0019 mg/L	Result is above the high flag limit , confirmed by repeat analysis, but still consistent with previous values in the last 6 years at this location.
	Fe	2017-02-14	0	0.61	0.62 mg/L	Result is above the high flag limit, confirmed by repeat analysis, but still consistent with previous values in the last 5 years at this location.
	Mn	2017-02-14	0	0.283	0.406 mg/L	Result is above the high flag limit, confirmed by repeat analysis, but still consistent with previous values in the last 4 years at this location.
D-13	FLOW	2017-02-14	6.1	16.3	16.8 L/s	Result is slightly above the high flag limit but still consistent with previous values in the last five years at this location.

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
BSDST	TSS	2017-03-21	1	1	2 mg/L	Result is slightly above the high flag limit but still consistent with previous values in the last year at this location.
D-2	FLOW	2017-03-14	0	142	173 L/s	Result is slightly above the high flag limit but still consistent with seasonal values at this location.
DS-2	Ra	2017-03-21	0.136	0.234	0.100 Bq/L	Result is slightly below the low flag limit but still consistent with previous values in the last two years at this location.
DS-4	Co	2017-03-21	0.0003	0.0008	0.0010 mg/L	Results are slightly above the high flag limits but still consistent with previous values in the last two years at this location.
	Fe	2017-03-21	0	0.24	0.25 mg/L	
DS-6	FLOW	2017-03-08	0	224	232 L/s	Result is slightly above the high flag limit but still consistent with seasonal values at this location.
D-1	Ra	2017-04-11	0.691	3.125	0.581 Bq/L	Result is a 7-year low but only slightly below the low flag limit. Concentration is consistent with seasonal low values during heavy rain and snowmelt and dilution..
	SO4	2017-04-11	23.3	177.6	16 mg/L	Result is slightly below the low flag limit but still consistent with seasonal values and dilution during rain and snowmelt.

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
D-2	FLOW	2017-04-11	0	168.4	194 L/s	Result is slightly above the high flag limit but consistent with seasonal values during rain and snowmelt.
D-25	Fe	2017-04-19	0.18	0.19	0.32 mg/L	Result is slightly above the high flag limit but still consistent with previous values in the last two years at this location.
D-3	Fe	2017-04-11	0	0.10	0.11 mg/L	Result is slightly above the high flag limit but still consistent with previous values in the last two years at this location.
	FLOW	2017-04-04	0	33	96 L/s	Results are slightly above the high flag limits but consistent with seasonal values during rain and snowmelt.
		2017-04-11	0	33	73 L/s	
DS-1	FLOW	2017-04-03	0	177	195 L/s	Results are slightly above the high flag limits but consistent with seasonal values during rain and snowmelt.
		2017-04-05	0	177	262 L/s	
		2017-04-06	0	177	214 L/s	
		2017-04-10	0	177	717 L/s	
		2017-04-12	0	177	181 L/s	
		2017-04-17	0	177	181 L/s	
DS-16	FLOW	2017-04-04	0	5	17 L/s	Result is above the high flag limit but consistent with seasonal values during rain and snowmelt.

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
DS-4	Co	2017-04-12	0.0005	0.0005	0.0008 mg/L	Result is slightly above the high flag limit but still consistent with previous values over the last two years at this location.
	FLOW	2017-04-04	0	124.4	324 L/s	Results are slightly above the high flag limits but consistent with seasonal values during rain and snowmelt.
		2017-04-12	0	124.4	255 L/s	
		2017-04-18	0	124.4	158 L/s	
	TSS	2017-04-04	1	1	2 mg/L	Result is slightly above the high flag limit but still consistent with previous values over the last year at this location.
DS-6	FLOW	2017-04-03	0	201	232 L/s	Results are slightly above the high flag limits but consistent with seasonal values during rain and snowmelt.
		2017-04-04	0	201	261 L/s	
		2017-04-05	0	201	356 L/s	
		2017-04-06	0	201	232 L/s	
		2017-04-07	0	201	203 L/s	
		2017-04-10	0	201	232 L/s	
		2017-04-12	0	201	203 L/s	
		2017-04-13	0	201	203 L/s	
		2017-04-17	0	201	203 L/s	
		2017-04-20	0	201	292 L/s	

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
D-25	FLOW	2017-05-09	0	17	174 L/s	Result is above the high flag limit but consistent with seasonal values during rain and snowmelt.
D-1	FLOW	2017-06-01	0	123	134 L/s	Results are slightly above the high flag limits but consistent with operational adjustments made in response to rising water levels.
		2017-06-02	0	123	126 L/s	
		2017-06-03	0	123	125 L/s	
DS-6	pH	2017-06-27	6.2	8.3	8.4	Results are slightly above the high flag limits but consistent with operational adjustments in pH set point upstream at the Stanrock treatment plant.
		2017-06-28	6.2	8.3	8.4	
ST-1	pH	2017-07-12	3.6	4.3	5.0	Result is a historic high, confirmed by repeat measurement, but consistent with a gradually increasing trend. Will continue to monitor at the current quarterly frequency.
D-3	Fe	2017-08-08	0	0.13	0.27 mg/L	Results are above the high flag limits, confirmed by repeat analysis, but still consistent with previous values over the last five years at this location.
	Mn	2017-08-08	0	0.014	0.031 mg/L	
D-2	FLOW	2017-10-25	0	190	203 L/s	Result is above the high flag limit but consistent with seasonal values at this location.

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
D-3	Ba	2017-10-10	0.076	0.301	0.333 mg/L	Result is slightly above the high flag limit but consistent with previous values in the last two years.
	FLOW	2017-10-25	0	63	92 L/s	Result is above the high flag limit but consistent with seasonal values at this location.
DS-1	FLOW	2017-10-24	0	258	416 L/s	Results are above the high flag limits but consistent with seasonal values at this location.
		2017-10-25	0	258	356 L/s	
DS-16	FLOW	2017-10-25	0	6.4	19.4 L/s	Result is above the high flag limit but consistent with seasonal values at this location.
DS-4	FLOW	2017-10-25	0	219	400 L/s	Result is above the high flag limit but consistent with seasonal values at this location.
DS-4	Ra	2017-10-25	0	0.151	0.193 Bq/L	Result is a nine-year high. Operational adjustments made in response reduced concentrations to 0.069 mg/L by the following week.
DS-6	FLOW	2017-10-24	0	253	356 L/s	Results are above the high flag limits but consistent with seasonal values at this location.
		2017-10-25	0	253	356 L/s	

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
FBDST	Fe	2017-10-12	0.02	0.03	0.04 mg/L	Result, which is typically below the detection limit, is slightly above the high flag limit and confirmed by repeat analysis. However, the value is at the laboratory data quality objective of 0.04 mg/L. No further action required.
FBDST	SO4	2017-10-12	0	0.3	0.7 mg/L	Result, which is typically below the detection limit, is above the high flag limit and confirmed by repeat analysis. This is inconsistent with field blank water quality and well above the laboratory Data quality objective of 0.2 mg/L. The value cannot be attributed to laboratory error so it is likely the sample bottle was contaminated. All other field blank parameters met the data quality objectives.
D-3	FLOW	2017-12-05	0	73	149 L/s	Result is above the high flag limit but consistent with heavy rain and some snowmelt.
DS-1	FLOW	2017-12-05	0	306	416 L/s	Result is above the high flag limit but consistent with heavy rain and some snowmelt.
DS-16	FLOW	2017-12-05	0	8	14 L/s	Result is above the high flag limit but consistent with heavy rain and some snowmelt.
DS-4	Ba	2017-12-12	0	0.079	0.090 mg/L	Result is slightly above the high flag limit but still consistent with previous values in the last two years.

Denison Mines Inc.

SAMP/TOMP Flagged Data
2017

Denison Mines

Location	Analyte	Date	Low	Hi	Result	Comment
DS-4	Fe	2017-12-12	0	0.31	0.41 mg/L	Result is an 18-year high, confirmed by repeat analysis, but close to previous values in the last three years. The result is representative of the iron precipitate found in the upstream Moose Lake Polishing Pond (DS-1) where a period of heavy rain caused a sudden increase in flow under ice cover resulting in short circuiting and flushing. Iron concentrations decrease to 0.22 mg/L by the following month.
	FLOW	2017-12-05	0	285	299 L/s	Result is above the high flag limit but consistent with heavy rain and some snowmelt.

SAMP and TOMP DATA QUALITY REPORTING
Field Blank 2017
Revision 2016-01

Denison Mines

Registry: RC8.5.4-02

	Date	pH	TSS mg/L	Hardness mg/L as CaCO3	Uranium mg/L	Sulphate mg/L	Radium Bq/L	Barium mg/L	Cobalt mg/L	Iron mg/L	Manganese mg/L
Blank Criteria											
	SAMP [1]	-	-	1.0	0.001	0.2	0.01	0.01	0.001	0.04	0.004
	TOMP [1]	-	2	-	0.001	0.2	0.01	0.01	0.001	0.04	0.004
FBDST	2017.01	6.9	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.02	6.2	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.03	7.0	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.04	6.3	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.05	6.4	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.06	6.1	1	< 0.5	< 0.0005	0.2	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.07	6.3	1	< 0.5	< 0.0005	< 0.1	0.009	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.08	6.5	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.09	6.5	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.10	6.0	1	< 0.5	< 0.0005	**0.7**	< 0.007	< 0.005	< 0.0005	0.04	0.002
FBDST	2017.11	6.5	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
FBDST	2017.12	6.5	1	< 0.5	< 0.0005	< 0.1	< 0.007	< 0.005	< 0.0005	< 0.02	< 0.002
Count		12	12	12	12	12	12	12	12	12	12
# Exceedances		0	0	0	0	1	0	0	0	0	0
Average		6.4	1	< 0.5	< 0.0005	0.2	0.007	< 0.005	< 0.0005	0.02	0.002
Max		7.0	1	< 0.5	< 0.0005	0.7	0.009	< 0.005	< 0.0005	0.04	0.002
Min		6.0	1	< 0.5	< 0.0005	0.1	0.007	< 0.005	< 0.0005	0.02	0.002

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

Bold Indicates an exceedance of the Blank Criteria

SAMP and TOMP DATA QUALITY REPORTING
Field Precision 2017
Revision 2016-01

Denison Mines

Registry: RC8.5.4-02

Location	Date	pH	TSS	Hardness	Sulphate	Radium (total)	Uranium	Barium	Cobalt	Iron	Manganese
			mg/L	mg/L	mg/L	Bq/L	mg/L	mg/L	mg/L	mg/L	mg/L
D-2	2017.01	6.9	< 1	376.0	320.0	0.045	0.0550	0.057	0.0009	0.31	0.214
BSDST		6.9	1	377.0	320.0	0.032	0.0576	0.042	0.0008	0.31	0.193
variance		0%	0%	0%	0%	**34%**	5%	**30%**	12%	0%	10%
D-2	2017.02	7.1	1	421.0	320.0	0.046	0.0615	0.067	0.0011	0.44	0.251
BSDST		7.0	1	419.0	320.0	0.092	0.0620	0.141	0.0019	0.62	0.406
variance		1%	0%	0%	0%	**67%**	1%	**71%**	**53%**	**34%**	**47%**
D-2	2017.03	7.0	1	298.0	200.0	0.292	0.0414	0.409	0.0007	0.54	0.168
BSDST		7.0	2	301.0	200.0	0.302	0.0433	0.406	0.0007	0.56	0.162
variance		0%	**67%**	1%	0%	3%	4%	**1%**	0%	4%	4%
D-2	2017.04	7.0	1	209.0	140.0	0.174	0.0239	0.261	0.0007	0.61	0.172
BSDST		6.9	1	177.0	120.0	0.125	0.0193	0.198	0.0006	0.49	0.138
variance		1%	0%	17%	15%	**33%**	**21%**	**27%**	15%	**22%**	**22%**
D-2	2017.05	7.5	1	356.0	240.0	0.121	0.0393	0.161	0.0006	0.32	0.182
BSDST		7.5	2	354.0	230.0	0.115	0.0408	0.161	0.0006	0.30	0.183
variance		0%	**67%**	1%	4%	5%	4%	0%	0%	6%	1%
D-2	2017.06	7.5	< 1	297.0	220.0	0.150	0.0375	0.217	< 0.0005	0.15	0.129
BSDST		7.5	1	292.0	220.0	0.122	0.0387	0.226	< 0.0005	0.14	0.119
variance		0%	0%	2%	0%	**21%**	3%	4%	0%	7%	8%
D-2	2017.07	7.3	1	290.0	200.0	0.108	0.0335	0.235	< 0.0005	0.13	0.117
BSDST		7.4	1	295.0	210.0	0.130	0.0335	0.245	< 0.0005	0.13	0.117
variance		1%	0%	2%	5%	18%	0%	4%	0%	0%	0%
D-2	2017.08	7.2	< 1	281.0	220.0	0.100	0.0326	0.147	< 0.0005	0.14	0.089
BSDST		7.3	1	267.0	220.0	0.089	0.0317	0.148	< 0.0005	0.12	0.097
variance		1%	0%	5%	0%	12%	3%	1%	0%	15%	9%
D-2	2017.09	7.5	2	294.0	240.0	0.064	0.0388	0.105	< 0.0005	0.20	0.125
BSDST		7.5	1	300.0	240.0	0.059	0.0367	0.094	< 0.0005	0.13	0.050
variance		0%	**67%**	2%	0%	8%	6%	11%	0%	**42%**	**86%**

Location	Date	pH	TSS	Hardness	Sulphate	Radium (total)	Uranium	Barium	Cobalt	Iron	Manganese
			mg/L	mg/L	mg/L	Bq/L	mg/L	mg/L	mg/L	mg/L	mg/L
D-2	2017.10	7.4	< 1	349.0	270.0	0.055	0.0399	0.097	< 0.0005	0.12	0.109
BSDST		7.4	< 1	357.0	260.0	0.043	0.0386	0.087	< 0.0005	0.11	0.092
variance		0%	0%	2%	4%	**24%**	3%	**11%**	0%	9%	**17%**
D-2	2017.11	7.5	< 1	278.0	210.0	0.205	0.0328	0.333	0.0006	0.13	0.178
BSDST		7.4	< 1	282.0	210.0	0.212	0.0313	0.329	0.0007	0.14	0.186
variance		1%	0%	1%	0%	3%	5%	1%	15%	7%	4%
D-2	2017.12	7.3	1	221.0	190.0	0.231	0.0318	0.370	0.0006	0.20	0.150
BSDST		7.2	1	224.0	190.0	0.192	0.0324	0.379	0.0006	0.21	0.151
variance		1%	0%	1%	0%	18%	2%	2%	0%	5%	1%
Count		12	12	12	12	12	12	12	12	12	12
Average		1%	17%	3%	2%	21%	5%	14%	8%	13%	17%
Max		1%	67%	17%	15%	67%	21%	71%	53%	42%	86%
Min		0%	0%	0%	0%	3%	0%	0%	0%	0%	0%
Criteria[1]		20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
# Exceedances		0	3	0	0	5	1	3	1	3	3

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

Bold Indicates an exceedance of the field precision criteria

SAMP and TOMP DATA QUALITY REPORTING
Groundwater Field Precision
Revision 2016.01

Denison Mines

Registry: RF8.5.4-02

Location	Date	pHF	Sulphate	Acidity	Iron
			mg/L	mg/L	mg/L
98-15A	2017.08	5.4	2400.0	1040.0	651.00
BSD-GW2		6.5	2500.0	1090.0	700.00
variance		18%	4%	5%	7%
BH91 DG4B	2017.08	6.2	730.0	< 1.0	21.90
BSD-GW3		6.2	820.0	< 1.0	21.70
variance		0%	12%	0%	1%
BH91-SG2A		6.3	4400.0	2450.0	1450.00
BSD GW4	2018.08	6.4	4400.0	2370.0	1430.00
variance		2%	0%	3%	1%
Count		3	3	3	3
Average		6%	5%	3%	3%
Min		0%	0%	0%	1%
Max		18%	12%	5%	7%
Criteria[1]		20%	20%	20%	20%
# Exceedances		0	0	0	0

1. SAMP and TOMP field Precision criteria taken from Table 5.2 of the Cycle 4 Study Design for SRWMP, SAMP and TOMP (Minnow, 2016)
Bold Indicates an exceedance of the field precision criteria

Issued by, Environmental Manager

Issued on: March 31, 2016
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Report Form: RF8.5.4-01

SAMP and TOMP DATA QUALITY REPORTING
Groundwater Field Blank
Revision 2016.01

Denison Mines

Date			Acidity	Sulphate	pHF	Iron
			mg/L	mg/L		mg/L
Blank Criteria		TOMP [1]	2			0.04
2017.08	FBD-GW2		< 1	0.2	5.6	**0.08**
2017.08	FBD-GW3		**4**	0.2	5.7	**0.07**
2017.08	FBD-GW4		**3**	< 0.1	5.5	< 0.02
Count			3	3	3	3
# Exceedances			**2**	0	**0**	**2**
Average			3	0.2	5.6	0.06
Max			4	0.2	5.7	0.08
Min			< 1	< 0.1	5.5	0.02

1 SAMP and TOMP field Precision criteria taken from Table 5.2 of the Cycle 4 Study Design for SRWMP, SAMP and TOMP (Minnow, 2016)

Bold Indicates an exceedance of the Blank Criteria

Issued by, Environmental Manager

Issued on: March 31, 2016
Expires on: March 31, 2020

APPENDIX IV
Water Quality Results

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: BSDST

Parameter Units	Flow L/s	Hardness 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
Assessment Criteria[A]	-	-	**5.2/6.5[B]**	**-[C]**	-	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01	17	377.0	6.9	320	1	0.032	0.042	0.0008	0.31	0.193	**0.0576**
2017-02	9	419.0	7	320	1	0.092	0.141	0.0019	**0.61**	0.406	**0.062**
2017-03	240	301.0	7	200	2	0.302	0.406	0.0007	**0.56**	0.162	**0.0433**
2017-04	194	177.0	6.9	120	1	0.125	0.198	0.0006	0.49	0.138	**0.0193**
2017-05	52	354.0	7.5	230	2	0.115	0.161	0.0006	0.3	0.183	**0.0408**
2017-06	17	292.0	7.5	220	1	0.122	0.226	<0.0005	0.14	0.119	**0.0387**
2017-07	69	295.0	7.4	210	1	0.13	0.245	<0.0005	0.13	0.117	**0.0335**
2017-08	17	267.0	7.3	220	1	0.089	0.148	<0.0005	0.12	0.097	**0.0317**
2017-09	14	300.0	7.5	240	1	0.059	0.094	<0.0005	0.13	0.05	**0.0367**
2017-10	16	357.0	7.4	260	<1	0.043	0.087	<0.0005	0.11	0.092	**0.0386**
2017-11	81	282.0	7.4	210	<1	0.212	0.329	0.0007	0.14	0.186	**0.0313**
2017-12	81	224.0	7.2	190	1	0.192	0.379	0.0006	0.2	0.151	**0.0324**
Count	12	12	12	12	12	12	12	12	12	12	12
High	240	419.0	7.5	320	2	0.302	0.406	0.0019	0.61	0.406	0.062
Low	9	177.0	6.9	120	<1	0.032	0.042	<0.0005	0.11	0.05	0.0193
Mean	67.25	303.8	7.3	228.3	1	0.126	0.205	0.0007	0.27	0.158	0.0388
High Limit			8.5	-	10	1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	0	0	0	0	0	2	0	12
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	100%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and since the annual average for hardness for 2017 exceeds the highest hardness tested (i.e. upper bound), a site-specific assessment would be required to accurately determine the AC for sulphate at this location.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-1

Parameter Units	ACID mg/L	BaCl2(D) kg/day	BaCl2(T) kg/month	ELEV m	FLOW L/s	NaOH(D) kg/day	NaOH(T) kg/month	Odays day	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
Assessment Criteria[A]	-	-	-	-	-	-	-	-	-	**5.2/6.5[B]**	**309[C]**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01			0	386.83	0		0	0									
2017-02		14.21	97.02	386.88	12.75	0	0	7		7.2	97	**2.317**					
2017-03	<1		634.3	386.94	77.39		34.65	31	195.0	7.1	110	**2.811**	0.119	<0.0005	**0.04**	0.016	**0.031**
2017-04	<1		468	387.05	60.5		306.3	30	32.1	6.8	16	0.581	0.027	<0.0005	0.06	0.012	0.0043
2017-05			519.06	387.08	63.82		301.56	31		7.9	87	**2.299**					
2017-06			726.9	387.02	95.67		140.7	28		8.1	91	**2.156**					
2017-07	<1		602.97	386.94	77.1		0	21	136.0	8.1	87	**1.837**	0.074	<0.0005	**0.02**	0.011	**0.0168**
2017-08			0	386.95	0		0	0									
2017-09			0	386.95	0		0	0									
2017-10			235	386.92	29.32		0	8	128.0	7.4		**1.591**					
2017-11			865	387.09	109.87		0	30		7.6	83	**1.92**					
2017-12	<1		878.9	387.14	108.77		0	31	112.0	7.3	65.5	**1.063**	0.065	<0.0005	**0.07**	0.011	0.0107
Count	4	1	12	52	365	1	12	12	5	13	9	10	4	4	4	4	4
High	<1	14.21	878.9	387.16	134	0	306.3	31	195.0	8.1	110	2.811	0.119	<0.0005	0.07	0.016	0.031
Low	<1	14.21	0	386.57	0	0	0	0	32.1	6.8	16	0.581	0.027	<0.0005	0.02	0.011	0.0043
Mean	<1	14.21	418.93	386.98	53.11	0	65.27	18	120.6	7.5	78	1.764	0.071	<0.0005	0.05	0.013	0.0157
High Limit										8.5	309	1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	2
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.8	0%	0%	0%	0%	50%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)
[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)
[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the annual average of hardness at this station for 2017
[D]PWQO for Radium (Minnow, 2016)
[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)
[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)
[G]0.49 mg/L based on upper limit of background concentrations for lakes: 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)
[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)
[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)
Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-16

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
Assessment Criteria[A]	-	-	**5.2/6.5[B]**	**429[C]**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01	**1**	279	**6.1**	240	0.015	0.021	0.0009	**0.7**	0.662	<0.0005
2017-04	1.8	129	**6.3**	110	<0.007	0.018	0.0008	0.15	0.225	<0.0005
2017-07	0.23	220	**6.3**	180	0.014	0.02	0.002	**3.76**	**2.9**	<0.0005
2017-10	0.73	197	6.5	150	0.027	0.03	**0.0037**	**9.89**	**6.3**	<0.0005
Count	4	4	4	4	4	4	4	4	4	4
High	1.8	279	6.5	240	0.027	0.03	0.0037	9.89	6.3	<0.0005
Low	0.23	129	6.1	110	<0.007	0.018	0.0008	0.15	0.225	<0.0005
Mean	0.94	206.3	6.3	170	0.016	0.022	0.0019	3.62	2.522	<0.0005
High Limit			8.5	429	1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	3	0	0	0	1	3	2	0
Frequency	0%	0%	75%	0%	0%	0%	25%	75%	50%	0%
10x Lim Ex	0	0	0	0	0	0	0	1	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	25%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the annual average of hardness at this station for 2017

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-2

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
Assessment Criteria[A]	-	-	5.2/6.5[B]	-[C]	-	-	-	-	1.0[D]	1.0[E]	0.0025[F]	0.49/1.69[G]	0.8[H]	0.015[I]
2017-01	21	376	7	320	1				0.034	0.057	0.0009	0.31	0.214	**0.055**
2017-02	18.5	421	6.9	320	1				0.053	0.067	0.0011	0.44	0.251	**0.0615**
2017-03	144	298	7	200	1				0.218	0.409	0.0007	**0.54**	0.168	**0.0414**
2017-04	110.5	209	7	140	2				0.155	0.261	0.0007	**0.61**	0.172	**0.0239**
2017-05	47	356	7.4	240	1	100	0	0	0.142	0.161	0.0006	0.32	0.182	**0.0393**
2017-06	52	297	7.6	220	1				0.139	0.217	<0.0005	0.15	0.129	**0.0375**
2017-07	66.25	290	7.4	200	1				0.12	0.235	<0.0005	0.13	0.117	**0.0335**
2017-08	18.6	281	7.4	220	1				0.082	0.147	<0.0005	0.14	0.089	**0.0326**
2017-09	14.75	294	7.4	240	2				0.052	0.105	<0.0005	0.2	0.125	**0.0388**
2017-10	66.6	349	7.3	270	1	100	0	0	0.116	0.097	<0.0005	0.12	0.109	**0.0399**
2017-11	81	278	7.4	210	1				0.165	0.333	0.0006	0.13	0.178	**0.0328**
2017-12	91.5	221	7.3	190	1				0.232	0.37	0.0006	0.2	0.15	**0.0318**
Count	52	12	52	12	52	2	2	2	52	12	12	12	12	12
High	240	421	7.6	320	2	100	0	0	0.306	0.409	0.0011	0.61	0.251	0.0615
Low	9	209	6.8	140	<1	100	0	0	0.019	0.057	<0.0005	0.12	0.089	0.0239
Mean	59.23	305.8	7.3	230.8	1	100	0	0	0.123	0.205	0.0006	0.27	0.157	0.039
High Limit			8.5		10				1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	0	0	0	0	0	0	0	0	2	0	12
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	17%	0%	100%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and since the annual average for hardness for 2017 exceeds the highest hardness tested (i.e. upper bound), a site-specific assessment would be required to accurately determine the AC for sulphate at this location.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-22

Parameter Units	ACID L/s	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
Assessment Criteria[A]	-	-	-	**5.2/6.5[B]**	-	**1.0[C]**	**1.0[D]**	**0.0025[E]**	**0.49/1.69[F]**	**0.8[G]**	**0.015[H]**
2017-01	<1	55.2	31	**6.1**	130	0.128	0.029	<0.0005	**0.53**	0.233	0.0006
2017-02		49.6	28	6.6		0.061					
2017-03		56.4	31	6.7		0.07					
2017-04	<1	55.2	30	6.6	23	0.032	0.01	<0.0005	0.08	0.022	<0.0005
2017-05		58.03	31	6.9		0.118					
2017-06		53.4	30	6.8		0.236					
2017-07	<1	55.4	31	6.8	88	0.429	0.037	<0.0005	**4.29**	0.371	0.0014
2017-08		53.83	31	6.9		0.472					
2017-09		53.57	30	7.1		0.294					
2017-10	<1	53.4	31	7	47	0.088	0.018	<0.0005	**0.65**	0.118	<0.0005
2017-11		51.38	30	6.8		0.054					
2017-12		51.5	31	6.7		0.066					
Count	4	12	12	18	4	12	4	4	4	4	4
High	<1	58.03	31	7.1	130	0.472	0.037	<0.0005	4.29	0.371	0.0014
Low	<1	49.6	28	6.1	23	0.032	0.01	<0.0005	0.08	0.022	<0.0005
Mean	<1	53.91	30	6.7	72	0.171	0.024	<0.0005	1.39	0.186	0.0007
High Limit				8.5		1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	1	0	0	0	0	3	0	0
Frequency	0%	0%	0%	6%	0%	0%	0%	0%	75%	0%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]PWQO for Radium (Minnow, 2016)

[D]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[E]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[F]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[G]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[H]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-25

Parameter Units	ACID mg/L	pH pH units	SO4 mg/L	Ra Bq/L	Fe mg/L
Assessment Criteria[A]	**-**	**5.2/6.5[B]**	**-**	**1.0[C]**	**0.49/1.69[D]**
2017-04	<1	7.3	63	0.308	0.32
2017-10	<1	7.3	120	0.293	0.13
Count	2	2	2	2	2
High	<1	7.3	120	0.308	0.32
Low	<1	7.3	63	0.293	0.13
Mean	<1	7.3	91.5	0.3	0.22
High Limit		8.5	128	1	0.49
Lim Ex	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%
10x Lim Ex	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]PWQO for Radium (Minnow, 2016)

[D]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-3

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
Assessment Criteria[A]	-	-	**5.2/6.5[B]**	**309[C]**	-	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01	3.8	181	7	130	1	0.083	0.148	<0.0005	<0.02	<0.002	0.013
2017-02	4.5	163	7.1	110	1	0.078	0.144	<0.0005	<0.02	<0.002	0.0079
2017-03	15	135	7	100	1	0.058	0.178	<0.0005	0.05	0.006	0.0045
2017-04	45	44.9	6.9	26	1	0.066	0.164	<0.0005	0.11	0.011	0.0016
2017-05	9.6	123	7.1	74	1	0.119	0.242	<0.0005	0.04	0.002	0.0042
2017-06	10.5	119	7.1	65	1	0.156	0.215	<0.0005	0.04	0.007	0.0027
2017-07	8	129	7	64	1	0.156	0.247	<0.0005	0.09	0.01	0.0038
2017-08	6.4	123	7.2	59	1	0.176	0.199	<0.0005	0.27	0.031	0.0045
2017-09	1.75	107	7.3	51	1	0.154	0.22	<0.0005	0.17	0.028	0.0044
2017-10	29	113	7.2	60	1	0.144	0.333	<0.0005	0.1	0.013	0.0063
2017-11	11	77.5	7.3	44	1	0.116	0.323	<0.0005	0.25	0.035	0.003
2017-12	46.75	49.6	7.1	35	1	0.125	0.32	<0.0005	0.31	0.037	0.0016
Count	52	12	52	12	52	52	12	12	12	12	12
High	149	181	7.4	130	3	0.187	0.333	<0.0005	0.31	0.037	0.013
Low	<1.00	44.9	6.8	26	<1	0.043	0.144	<0.0005	<0.02	<0.002	0.0016
Mean	15.65	113.8	7.1	68.2	1	0.12	0.228	<0.0005	0.12	0.015	0.0048
High Limit			8.5	309	10	1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the annual average of hardness at this station for 2017

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: D-9

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
Assessment Criteria[A]	-	-	**5.2/6.5[B]**	- [C]	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01	1.5	567	6.9	410	<0.007	0.012	**0.0031**	**1.55**	**1.46**	0.0124
2017-04	2.5	339	6.9	240	<0.007	0.013	0.0017	**0.62**	0.794	0.0082
2017-07	2	682	6.9	550	<0.007	0.015	**0.0036**	**1.53**	**2**	0.0125
2017-10	1.92	593	6.8	500	<0.007	0.017	**0.0029**	**1.34**	**1.45**	0.0113
Count	4	4	4	4	4	4	4	4	4	4
High	2.5	682	6.9	550	<0.007	0.017	0.0036	1.55	2	0.0125
Low	1.5	339	6.8	240	<0.007	0.012	0.0017	0.62	0.794	0.0082
Mean	1.98	545.3	6.9	425	<0.007	0.014	0.0028	1.26	1.426	0.0111
High Limit			8.5		1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	0	0	0	3	4	3	0
Frequency	0%	0%	0%	0%	0%	0%	75%	100%	75%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and since the annual average for hardness for 2017 exceeds the highest hardness tested (i.e. upper bound), a site-specific assessment would be required to accurately determine the AC for sulphate at this location.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results
Station: DS-1

Parameter Units	FLOW L/s	pH pH units	Ra Bq/L
Assessment Criteria[A]	-	**5.2/6.5[B]**	**1.0[C]**
2017-01	17.8	6.9	0.014
2017-02	17.75	6.9	
2017-03	73.25	7.1	
2017-04	119.75	7.2	0.036
2017-05	37.6	7.3	
2017-06	23	7.5	
2017-07	23.5	7.8	0.023
2017-08	11.6	7.5	
2017-09	4.75	7.6	
2017-10	166	7.3	0.009
2017-11	37.75	7.4	
2017-12	121	7.3	
Count	52	52	4
High	416	8	0.036
Low	<0.00	6.7	0.009
Mean	54.77	7.3	0.02
High Limit		8.5	1
Lim Ex	0	0	0
Frequency	0%	0%	0%
10x Lim Ex	0	0	0
Frequency	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]PWQO for Radium (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-16

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
Assessment Criteria[A]	-	-	**5.2/6.5[B]**	**128[C]**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-03	0.2	40.9	6.7	29	<0.007	0.012	<0.0005	0.04	0.027	<0.0005
2017-05	0									
2017-09	0									
2017-12	14	15.7	6.4	9.5	<0.007	0.007	<0.0005	0.09	0.022	<0.0005
Count	4	2	4	2	2	2	2	2	2	2
High	14	40.9	6.7	29	<0.007	0.012	<0.0005	0.09	0.027	<0.0005
Low	0	15.7	6.4	9.5	<0.007	0.007	<0.0005	0.04	0.022	<0.0005
Mean	3.55	28.3	6.6	19.3	<0.007	0.009	<0.0005	0.07	0.025	<0.0005
High Limit			8.5	128	1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	1	0	0	0	0	0	0	0
Frequency	0%	0%	50%	0%	0%	0%	0%	0%	0%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the annual average of hardness at this station for 2017

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-2

Parameter Units	ACID mg/L	FLOW L/s	Freeboard m	pH pH units	SO4 mg/L	Ra Bq/L	Ba mg/L	Co mg/L	Fe mg/L	Mn mg/L	U mg/L
Assessment Criteria[A]	-	-		**5.2/6.5[B]**	-	**1.0[C]**	**1.0[D]**	**0.0025[E]**	**0.49/1.69[F]**	**0.8[G]**	**0.015[H]**
2017-01	234	59.87	1.1184	**2.8**	570	0.169	0.017	**0.0799**	**44.2**	**1.86**	0.0308
2017-02		65.81	1.1394	**2.8**		0.17					
2017-03		92.15	1.2473	**2.9**		0.1					
2017-04	96	122.87	2.0325	**2.7**	200	0.136	0.019	**0.0411**	**22.3**	0.444	0.0227
2017-05		84.13	1.6925	**2.7**		0.172					
2017-06		59.1	1.6044	**2.5**		0.205					
2017-07	248	33.87	1.8378	**2.6**	740	0.237	0.018	**0.0899**	**27.7**	**1.77**	0.0355
2017-08		47.61	1.6862	**2.7**		0.237					
2017-09		30.07	1.6262	**2.5**		0.232					
2017-10	196	112.45	1.6843	**2.9**	500	0.199	0.019	**0.062**	**21**	**1.32**	0.0192
2017-11		106.83	1.3139	**3**		0.166					
2017-12		96.71	1.187	**3.1**		0.16					
Count	4	364	293	15	4	12	4	4	4	4	4
High	248	230	2.93	3.1	740	0.237	0.019	0.0899	44.2	1.86	0.0355
Low	96	0	0.62	2.5	200	0.1	0.017	0.0411	21	0.444	0.0192
Mean	194	75.87	1.4636	2.8	502.5	0.182	0.018	0.0682	28.8	1.349	0.027
High Limit				8.5		1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	13	0	0	0	4	4	3	4
Frequency	0%	0%	0%	100%	0%	0%	0%	100%	100%	75%	100%
10x Lim Ex	0	0	0	0	0	0	0	4	4	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]PWQO for Radium (Minnow, 2016)

[D]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[E]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[F]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[G]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[H]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-3

Parameter Units	BaCl2T kg/month	CaOT onnes/mont	Odays days	pH[C] pH units
Assessment Criteria[A]	-	-	-	**5.2/6.5[B]**
2017-01	59.3	14.06	14	**10.7**
2017-02	55.4	15.1	14	**10.6**
2017-03	103.6	23.77	20	**10.7**
2017-04	177.06	22.36	26	**10.7**
2017-05	97.82	20	16	**10.7**
2017-06	57.4	14.6	12	**10.5**
2017-07	53.5	78.96	8	**10.5**
2017-08	71.7	11.9	12	**10.6**
2017-09	41.08	6.05	8	**10.8**
2017-10	249.8	30.5	26	**10.9**
2017-11	168	18.35	24	**10.8**
2017-12	122.1	16.3	21	**10.8**
Count	12	12	12	271
High	249.8	78.96	26	11.2
Low	41.08	6.05	8	10.3
Mean	104.73	22.66	17	10.7
High Limit				8.5
Lim Ex	0	0	0	170
Frequency	0%	0%	0%	100%
10x Lim Ex	0	0	0	0
Frequency	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]pH values exceed High Limit criteria

Bolded values Indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-4

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
Assessment Criteria[A]	-	-	5.2/6.5[B]	-[C]	-	-	-	-	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01	24.8	326	7.1	280	1				0.059	0.026	<0.0005	0.14	0.027	0.0097
2017-02	25.5	388	7.1	330	1				0.049	0.027	<0.0005	0.17	0.041	0.0064
2017-03	69.25	365	7.1	310	1				0.032	0.038	0.001	0.25	0.076	0.003
2017-04	205	186	7	160	1				0.039	0.057	0.0008	0.22	0.04	0.001
2017-05	46.4	319	7.2	250	1	100	0	0	0.061	0.057	<0.0005	0.14	0.031	0.0033
2017-06	28	335	7.1	270	2				0.085	0.051	<0.0005	0.08	0.04	0.0026
2017-07	19.25	373	7.1	290	1				0.084	0.047	<0.0005	0.08	0.067	0.0025
2017-08	18.2	346	7.2	300	1				0.104	0.035	<0.0005	0.1	0.052	0.0038
2017-09	7.5	343	7.3	300	1				0.107	0.03	<0.0005	0.07	0.035	0.0063
2017-10	137	378	7.2	300	1	55	0	0	0.121	0.023	<0.0005	0.17	0.032	0.0071
2017-11	46	354	7.3	290	1				0.057	0.055	0.0006	0.18	0.039	0.0035
2017-12	100	268	7.1	250	1				0.039	0.09	0.0008	0.41	0.043	0.0017
Count	52	12	52	12	52	2	2	2	52	12	12	12	12	12
High	400	388	7.5	330	2	100	0	0	0.193	0.09	0.001	0.41	0.076	0.0097
Low	0	186	6.9	160	<1	55	0	0	0.029	0.023	<0.0005	0.07	0.027	0.001
Mean	60.27	331.8	7.2	277.5	1	77	0	0	0.071	0.045	0.0006	0.17	0.044	0.0042
High Limit			8.5		10				1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and since the annual average for hardness for 2017 exceeds the highest hardness tested (i.e. upper bound), a site-specific assessment would be required to accurately determine the AC for sulphate at this location.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results
Station: DS-5

Parameter Units	CONDF µmho/cm	FLOW L/s	Head ft	pH pH units
Assessment Criteria[A]	-	-	-	**5.2/6.5[B]**
2017-01	134	1		**3.5**
2017-04	92	10.42	0.3	**3.8**
2017-07	244.8	0.22	0	**3.8**
2017-10	175	0.89	0.1	**3.9**
Count	4	4	3	4
High	244.8	10.42	0.3	3.9
Low	92	0.22	0	3.5
Mean	161.4	3.13	0.1	3.8
High Limit	69.5			8.5
Lim Ex	4	0	0	4
Frequency	100%	0%	0%	100%
10x Lim Ex	0	0	0	0
Frequency	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-6

Parameter Units	FLOW L/s	pH pH units
Assessment Criteria[A]	-	**5.2/6.5[B]**
2017-01	19.75	7.1
2017-02	5	6.9
2017-03	93.25	7.2
2017-04	163	7.5
2017-05	47	7.5
2017-06	22.25	8.1
2017-07	15.5	8.4
2017-08	12.2	7.7
2017-09	0	
2017-10	130.8	7.8
2017-11	44.5	7.4
2017-12	63.5	7.1
Count	51	51
High	356	8.4
Low	0	6.8
Mean	52.1	7.5
High Limit		8.5
Lim Ex	0	0
Frequency	0%	0%
10x Lim Ex	0	0
Frequency	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: 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
Assessment Criteria[A]	**5.2/6.5[B]**	**-**	**128[C]**	**-**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-01	6.9	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-02	**6.2**	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-03	7	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-04	**6.3**	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-05	**6.4**	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-06	**6.1**	<0.5	0.2	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-07	**6.3**	<0.5	<0.1	<1	0.009	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-08	6.5	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-09	6.5	<0.5	<0.1	1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-10	**6**	<0.5	0.7	<1	<0.007	<0.005	<0.0005	0.04	0.002	<0.0005
2017-11	6.5	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
2017-12	6.5	<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	<0.5	0.7	1	0.009	<0.005	<0.0005	0.04	0.002	<0.0005
Low	6	<0.5	<0.1	<1	<0.007	<0.005	<0.0005	<0.02	<0.002	<0.0005
Mean	6.4	<0.5	0.2	1	0.007	<0.005	<0.0005	0.02	0.002	<0.0005
High Limit	8.5		128	10	1	1	0.0025	0.49	0.8	0.015
Lim Ex	6	0	0	0	0	0	0	0	0	0
Frequency	50%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the annual average of hardness at this station for 2017

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results
Station: DS-11

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
Assessment Criteria[A]	-	-	**5.2/6.5[B]**
2017-01	356	0.32	**6.4**
2017-04	381.9	0.8	**4.3**
2017-07	464	0.45	**3.9**
2017-10	326	0.92	6.7
Count	4	4	4
High	464	0.92	6.7
Low	326	0.32	3.9
Mean	382	0.62	5.3
High Limit	69.5		8.5
Lim Ex	4	0	3
Frequency	100%	0%	75%
10x Lim Ex	0	0	0
Frequency	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-12

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
Assessment Criteria[A]	-	-	5.2/6.5[B]
2017-01	442	0.6	**4.9**
2017-04	495.5	0.5	**3.7**
2017-07	512	0.01	**4.3**
2017-10	449	1.54	**4.1**
Count	4	4	4
High	512	1.54	4.9
Low	442	0.01	3.7
Mean	474.6	0.66	4.3
High Limit	69.5		8.5
Lim Ex	4	0	4
Frequency	100%	0%	100%
10x Lim Ex	0	0	0
Frequency	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-13

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
Assessment Criteria[A]	-	-	**5.2/6.5[B]**
2017-01	514	0	**6.4**
2017-04	509	0.09	6.7
2017-07	663	0.09	6.7
2017-10	610	0.13	6.7
Count	4	4	4
High	663	0.13	6.7
Low	509	0.09	6.4
Mean	574	0.1	6.6
High Limit	69.5		8.5
Lim Ex	4	0	1
Frequency	100%	0%	25%
10x Lim Ex	0	0	0
Frequency	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: DS-14

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
Assessment Criteria[A]	-	-	**5.2/6.5[B]**
2017-01		0	
2017-04		0	
2017-07		0	
2017-10			
Count	4	4	4
High		0	
Low		0	
Mean		0	
High Limit	69.5		8.5
Lim Ex	0	0	0
Frequency	0%	0%	0%
10x Lim Ex	0	0	0
Frequency	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: ST-1

Parameter Units	CONDF µmho/cm	pH pH units
Assessment Criteria[A]	-	**5.2/6.5[B]**
2017-01	99	**3.9**
2017-04	82.8	**4.1**
2017-07	111	**5**
2017-10	69.4	**5.8**
Count	4	4
High	111	5.8
Low	69.4	3.9
Mean	90.6	4.7
High Limit	69.5	8.5
Lim Ex	3	4
Frequency	75%	100%
10x Lim Ex	0	0
Frequency	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: ST-1A

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
Assessment Criteria[A]	-	-	5.2/6.5[B]
2017-01			
2017-04	49	0.04	**4.7**
2017-07		0	
2017-10		0	
Count	4	4	4
High	49	0.04	4.7
Low	49	0	4.7
Mean	49	0.01	4.7
High Limit	69.5		8.5
Lim Ex	0	0	1
Frequency	0%	0%	100%
10x Lim Ex	0	0	0
Frequency	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: ST-3

Parameter Units	CONDF µmho/cm	pH pH units
Assessment Criteria[A]	**-**	**5.2/6.5[B]**
2017-01	610	**3.1**
2017-04	512	**3.4**
2017-07	718	3
2017-10	728	**3.3**
Count	4	4
High	728	3.4
Low	512	3
Mean	642	3.2
High Limit	69.5	8.5
Lim Ex	4	4
Frequency	100%	100%
10x Lim Ex	2	0
Frequency	50%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: ST-3A

Parameter Units	CONDF µmho/cm	FLOW L/s	pH pH units
Assessment Criteria[A]	-	-	5.2/6.5[B]
2017-01	893	0.05	**4.9**
2017-04	957	0.18	**4.1**
2017-07	1085	0.14	**4.2**
2017-10	1007	0.15	**5.1**
Count	4	4	4
High	1085	0.18	5.1
Low	893	0.05	4.1
Mean	985.5	0.13	4.6
High Limit	69.5		8.5
Lim Ex	4	0	4
Frequency	100%	0%	100%
10x Lim Ex	4	0	0
Frequency	100%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guideline for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

Bolded values indicate an Assessment Criteria limit exceedance

DENISON MINES Inc.
2017 Performance Monitoring Results

Station: ST-4

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
Assessment Criteria[A]	-	-	-	-	**5.2/6.5[B]**	**128[C]**	**1.0[D]**	**1.0[E]**	**0.0025[F]**	**0.49/1.69[G]**	**0.8[H]**	**0.015[I]**
2017-02	<1	6	86.5	43.6	6.5	32	0.04	0.039	<0.0005	0.11	0.024	0.0015
2017-05	<1	7	83.6	44.3	6.9	31	0.021	0.036	<0.0005	<0.02	0.005	0.0012
2017-08	<1	6	102.6	34.9	7.2	30	0.029	0.035	<0.0005	0.02	0.004	0.0015
2017-11	<1	7	86.6	41.2	6.7	30	0.017	0.037	<0.0005	<0.02	0.005	0.0011
Count	4	4	4	4	4	4	4	4	4	4	4	4
High	<1	7	102.6	44.3	7.2	32	0.04	0.039	<0.0005	0.11	0.024	0.0015
Low	<1	6	83.6	34.9	6.5	30	0.017	0.035	<0.0005	<0.02	0.004	0.0011
Mean	<1	6.5	89.8	41	6.8	30.8	0.027	0.037	<0.0005	0.04	0.009	0.0013
High Limit			69.5		8.5	128	1	1	0.0025	0.49	0.8	0.015
Lim Ex	0	0	4	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%
10x Lim Ex	0	0	0	0	0	0	0	0	0	0	0	0
Frequency	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

[A]Criteria are benchmarks based on the most recent federal, Ontario, or BCMOE guidelines for the protection of aquatic life or the upper limit of background concentrations (between 2003-2013), whichever is higher (Minnow, 2016)

[B]The lower limit of pH is used as the benchmark to identify potential mine-related reductions in pH in the receiving environment. pH 5.2 is the receiving environment criteria used for wetland/stream locations; pH 6.5 is criteria used for lake locations (Minnow, 2016)

[C]Ambient Water Quality Guidelines (BCMOE, 2013). The guideline is hardness dependent and the value calculated for this station is based on the annual average hardness at this station in 2017.

[D]PWQO for Radium (Minnow, 2016)

[E]Guideline taken from the Water Quality Working Guidelines (BCMOE, 2006)

[F]Guideline taken from Environment Canada's Federal Water Quality Guidelines (Environment Canada, 2013)

[G]0.49 mg/L based on upper limit of background concentrations for lakes; 1.69 mg/L is upper limit of background concentration for wetlands (Minnow, 2016)

[H]Guideline taken from the Water Quality Working Guidelines, and is hardness dependent. The value calculated for the SRWMP is based on the average hardness at Station D-6, which is the only mine-exposed station where manganese is monitored (Minnow, 2016)

[I]Canadian Council of Ministers of the Environment limit (CCME, 2013)

Bolded values indicate an Assessment Criteria limit exceedance

Denison Mines Inc. Elliot Lake Division
2017 Denison Tailings Management Area
Environmental Monitoring Results

BH91 D1A 218.00 ft

Year	Elevation [1] (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	9065.10	7.3	830.0	<1	37.90
2014	9060.10	7.2	870.0	<1	38.80
2015	359.73	7.1	980.0	<1	33.30
2016	360.60	6.8	790.0	<1	32.00
2017	363.16	7.3	830.0	<1	33.60

BH91 D1B 149.20 ft

Year	Elevation [1] (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	9068.82	8.1	580.0	<1	0.05
2014	9061.52	8.1	570.0	<1	<0.02
2015	360.16	7.7	690.0	2	0.10
2016	360.75	7.6	570.0	<1	0.02
2017	363.67	7.3	620.0	<1	1.73

1. 2015 elevation changed from feet to meters.

Denison Mines Inc. Elliot Lake Division
2017 Denison Tailings Management Area
Environmental Monitoring Results

BH91 D3A 159.00 ft

Year	Elevation [1] (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	9059.95	7.0	1800.0	312	301.00
2014	9054.71	7.1	1800.0	266	258.00
2015	361.22	6.7	1800.0	278	277.00
2016	361.07	6.5	1800.0	223	190.00
2017	363.62	6.6	1600.0	176	190.00

BH91 D3B 69.00 ft

Year	Elevation [1] (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	9093.37	7.1	1800.0	469	344.00
2014	9090.89	6.8	1800.0	405	279.00
2015	370.30	6.3	1500.0	277	214.00
2016	370.37	6.3	1300.0	245	125.00
2017	370.99	6.4	1400.0	215	171.00

1. 2015 elevation changed from feet to meters.

Denison Mines Inc. Elliot Lake Division
2017 Denison Tailings Management Area
Environmental Monitoring Results

BH91 D9A 72.20 ft

Year	Elevation [1] (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	9178.19	7.1	1700.0	258	295.00
2014	9177.41	7.4	1700.0	262	221.00
2015	395.62	6.3	1700.0	256	204.00
2016	395.64	6.3	1800.0	224	189.00
2017	396.25	6.6	1600.0	238	223.00

1. 2015 elevation changed from feet to meters.

Denison Mines Inc. Elliot Lake Division
2017 Denison Tailings Management Area
Environmental Monitoring Results

BH91 DG4B 35.80 ft

Year	Elevation [1] (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	9055.29	6.2	520.0	<1	3.02
2014	9054.58	6.6	580.0	<1	2.27
2015	358.02	6.3	710.0	<1	10.50
2016	358.49	6.2	700.0	<1	10.40
2017	358.40	6.2	730.0	<1	21.90

1. 2015 elevation changed from feet to meters.

Denison Mines Inc. Elliot Lake Division
2017 Stanrock Tailings Management Area
Environmental Monitoring Results

BH91 SG1A 5.49 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	388.09	4.3	5700.0	4150	2320.00
2014	387.89	4.5	4800.0	3400	1810.00
2015	387.98	4.0	6200.0	3660	2810.00
2016	387.90	4.2	4600.0	3360	1440.00
2017	387.98	4.0	3800.0	3110	1600.00

Denison Mines Inc. Elliot Lake Division
2017 Stanrock Tailings Management Area
Environmental Monitoring Results

BH91 SG2A 33.31 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	401.31	6.3	4800.0	2290	1670.00
2014	400.41	6.5	4600.0	2290	1400.00
2015	400.78	6.5	4500.0	2200	1330.00
2016	400.48	6.0	4000.0	2260	1160.00
2017	401.22	6.3	4400.0	2450	1450.00

BH91 SG2D 4.39 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	405.19	No sample collected (no recharge)			
2014	404.32	No sample collected (no recharge)			
2015	404.37	No sample collected (no recharge)			
2016	404.52	No sample collected (no recharge)			
2017	404.39	No sample collected (no recharge)			

Denison Mines Inc. Elliot Lake Division
2017 Stanrock Tailings Management Area
Environmental Monitoring Results

BH91 SG3A 8.78 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	399.56	No sample collected (no recharge)			
2014	399.77	No sample collected (no recharge)			
2015	399.52	No sample collected (no recharge)			
2016	399.29	No sample collected (no recharge)			
2017	399.69	No sample collected (no recharge)			

BH91 SG3B 5.85 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	399.10	No sample collected (no recharge)			
2014	399.45	No sample collected (no recharge)			
2015	399.26	No sample collected (no recharge)			
2016	398.81	No sample collected (no recharge)			
2017	399.22	3.9	1700.0	901	295.00

Denison Mines Inc. Elliot Lake Division
2017 Stanrock Tailings Management Area
Environmental Monitoring Results

BH98 15A 7.86 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	392.24	6.1	2900.0	1300	935.00
2014	392.24	5.9	2700.0	1240	786.00
2015	392.24	6.4	2700.0	1200	838.00
2016	392.24	6.0	2600.0	1130	626.00
2017	392.21	5.4	2400.0	1040	651.00

Denison Mines Inc. Elliot Lake Division
2017 Stanrock Tailings Management Area
Environmental Monitoring Results

BH98 16A 5.49 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	396.58	5.9	6200.0	3980	2840.00
2014	396.28	5.9	3900.0	2050	1430.00
2015	395.96	6.1	4800.0	3200	1680.00
2016	396.15	5.7	3900.0	1880	1240.00
2017	396.35	5.6	4900.0	2660	2140.00

Denison Mines Inc. Elliot Lake Division
2017 Stanrock Tailings Management Area
Environmental Monitoring Results

PN ST3 P3 5.94 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	404.57	5.3	2500.0	980	543.00
2014	404.20	5.7	2300.0	954	427.00
2015	404.37	5.9	2500.0	1030	586.00
2016	404.17	5.9	2100.0	1030	589.00
2017	404.61	5.8	2800.0	1280	771.00

PN ST3 P5 2.64 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	404.51	3.3	3000.0	1640	853.00
2014	404.25	3.5	3200.0	1950	1120.00
2015	404.34	No sample collected (no recharge)			
2016	404.18	3.6	2800.0	2200	1070.00
2017	404.08	3.2	3000.0	1850	827.00

PN ST3 P6 11.58 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	404.62	5.1	4900.0	3460	2140.00
2014	404.02	6.2	4300.0	3540	1640.00
2015	404.29	6.3	4700.0	3560	1770.00
2016	404.06	6.2	5200.0	3970	2030.00
2017	404.54	6.0	5400.0	4050	2370.00

PN ST3 P8 20.91 m

Year	Elevation (m)	Field pH	Sulphate (mg/L)	Acidity (mg/L)	Iron (mg/L)
2013	402.68	5.9	12000.0	9770	6130.00
2014	402.00	5.6	12000.0	9560	5540.00
2015	402.36	4.5	12000.0	10100	7020.00
2016	401.89	5.8	11000.0	9630	5810.00
2017	402.68	4.9	11000.0	9550	5480.00

APPENDIX V
Stanrock Un-named Pond Report

Table 1. Surface Water Quality Results at DSP, 2015-2017

Month	COND (µmho/cm)	Hardness (mg/L)	pH	SO4 (mg/L)	TSS (mg/L)	Ra (Bq/L)	Al (mg/L)	Co (mg/L)	Fe (mg/L)	Mn (mg/L)	U (mg/L)
2015.06	520	204	**3.7**	250		0.017		**0.0478**	**0.52**	**4.81**	0.0001
2015.07	584	240	**3.7**	260	2	0.025	5.31	**0.0588**	**0.4**	**5.26**	0.0002
2015.09	505		**3.8**	290	1		4.92	**0.0512**	**0.31**	**5.29**	<0.0005
2015.12	43	19	**4.3**	24	9		0.79	**0.0068**	**0.32**	0.409	<0.0005
2016.03	288.6	166	**4.2**	190	1		3.27	**0.0329**	**0.75**	**3.4**	<0.0005
2016.06	594	259	**3.8**	290	1		5.94	**0.0528**	**0.43**	**4.89**	<0.0005
2016.09	601	285	**3.7**	350	2		5.44	**0.0531**	**0.34**	**5.67**	<0.0005
2017.06	562	256	**3.8**	280	2		6.48	**0.0539**	**0.47**	**5.58**	<0.0005
2017.09	96.1	248	**3.7**	280	1		5.88	**0.055**	**0.6**	**4.91**	<0.0005
PWQO/IPWQO[1]			6.5-8.5			1	0.015[A]	0.0009	0.3		0.005[B]
WQG[2]			**6.5**	**429[C]**		**1**		**0.0025**	**0.3**	**0.8**	**0.015**
CCME[3]			6.5-9.0		*		0.005[D]		0.3		0.015
Lake Background[4]			6.6	6.4		0.008			0.49	0.099	<0.0005
Wetland Background[5]			5.2	4.4		0.006			1.69	0.067	<0.0005
Count	10	9	10	9	9	2	9	9	9	9	9
High	601	285	4.3	350	9	0.025	6.48	0.0588	0.75	5.67	<0.0005
Low	43	19	3.7	24	1	0.017	0.79	0.0068	0.31	0.409	0.0001
Mean	421.5	209.6	3.9	246	2	0.021	4.75	0.0458	0.46	4.469	0.0004

[1]Provincial Water Quality Objectives (PWQO) and Interim Provincial Water Quality Objectives (IPWQO) (MOE 1994, 1999)

[2]Most recent Ontario, British Columbia, or federal water quality guidelines for the protection of aquatic life (Minnow, 2016)

[3]Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (CCME)

[4]Upper limit of background concentration based on data collected from lake reference stations in the SRWMP (D-4, SR-18, SR-19) between 2003-2013 (Minnow, 2016)

[5]Upper limit of background concentration based on data collected from wetland reference stations in the SRWMP (SR-16, SR-17) between 2003-2013 (Minnow, 2016)

[A]At pH 4.5 to 5.5 IPWQO is 0.015 mg/L based on inorganic monomeric aluminum measured in clay-free samples

[B]IPWQO for U set to meet emergency needs & is applied with due caution

[C]WQG for sulphate is hardness dependent

[D]CCME WQG for Al when pH is <6.5

*CCME WQG is maximum average increase of 5 mg/L from background levels for longterm exposure (for example inputs lasting between 24 hours and 30 days)

Shaded: indicates concentration exceeds the PWQO/IPWQO

Bolded: indicates concentration exceeds WQG limits

Red: indicates concentration exceeds CCME limits

Table 2. Surface Water Quality Results at DSP-2, 2015-2017

Month	COND (µmho/cm)	FLOWL/s	Hardness (mg/L)	pH	SO4 (mg/L)	TSS (mg/L)	Ra (Bq/L)	Al (mg/L)	Co (mg/L)	Fe (mg/L)	Mn (mg/L)	U (mg/L)
2015.07	470	<1.00	206	4	230	1	0.033		**0.0713**	**15.7**	**6.71**	0.0001
2015.08	466	<1.00	220	4.5	260	19	0.026	0.87	**0.0713**	**15.7**	**6.71**	0.0001
2015.09	491	<1.00		4.5	280	2	0.037	0.71	**0.0633**	**10.8**	**6.26**	<0.0005
2015.10	484	<1.00	187	4.6	280	1	0.031	0.56	**0.0454**	**8.33**	**4.43**	<0.0005
2015.11	227.9	<1.00	128	4.3	140	<1	0.03	0.92	**0.0209**	**0.41**	**2.74**	<0.0005
2015.12	199.7	<1.00	142	4.4	150	1	0.018	0.96	**0.0214**	**0.71**	**2.94**	<0.0005
2016.01	213.7	<1.00	144	4.8	160	<1	0.025	0.88	**0.0262**	**1.08**	**3.13**	<0.0005
2016.02	395.9	<1.00	161	4.4	180	1	0.017	1.04	**0.0276**	**1.37**	**3.37**	<0.0005
2016.03	285	<1.00	174	4.2	180	2	0.016	1.11	**0.0281**	**1.55**	**3.48**	<0.0005
2016.04	164.4	<1.00	103	4.9	110	1		0.97	**0.0144**	0.25	**1.92**	<0.0005
2016.05	317.6	<1.00	168	4.4	190	<1	0.027	1.44	**0.037**	**0.61**	**3.55**	<0.0005
2016.06	492	<1.00	253	3.9	270	1	0.031	2.25	**0.0501**	**1.24**	**4.99**	<0.0005
2016.07	542	<1.00	247	4.2	300	2	0.025	1.88	**0.0558**	**4.3**	**5.98**	<0.0005
2016.08	556	<1.00	267	3.7	304	3	0.033	0.94	**0.0659**	**6.35**	**6.26**	<0.0005
2016.09	561	<1.00	278	3.9	330	4	0.031	0.37	**0.0489**	**9.67**	**5.71**	<0.0005
2016.10	524	<1.00	260	4.4	300	3	0.047	0.54	**0.0391**	**4.98**	**5.85**	<0.0005
2016.11	405.2	<1.00	240	4.4	250	4	0.042	0.55	**0.037**	**2.39**	**5.04**	<0.0005
2017.05	406.2	<1.00	240	4.2	240	<1	0.023	3.62	**0.0445**	**0.33**	**4.72**	<0.0005
2017.06	485	<1.00	261	4	270	<1	0.043	3.57	**0.0553**	**0.59**	**6.63**	<0.0005
2017.07	522	<1.00	258	3.8	270	<1	0.03		**0.0724**	**1.08**	**6.29**	<0.0005
2017.08	568	<1.00	240	3.6	270	<1	0.037	2.5	**0.0907**	**1.43**	**6.93**	<0.0005
2017.09	538	<1.00	264	3.6	270	<1	0.037	2.94	**0.142**	**0.83**	**9.37**	<0.0005
2017.10	529	<1.00	211	3.6	220	<1	0.024	2.17	**0.0773**	**0.65**	**6.09**	<0.0005
2017.11	498		183	3.8	190	1		1.71	**0.0414**	**0.7**	**4.11**	<0.0005
PWQO/IPWQO[1]				6.5-8.5			1	0.015[A]	0.0009	0.3		0.005[B]
WQG[2]				**6.5**	**429[C]**		**1**		**0.0025**	**0.3**	**0.8**	**0.015**
CCME[3]				6.5-9.0		*		0.005[D]		0.3		0.015
Lake Background[4]				6.6	6.4		0.008			0.49	0.099	<0.0005
Wetland Background[5]				5.2	4.4		0.006			1.69	0.067	<0.0005
Count	25	25	24	25	24	24	24	24	24	24	24	24
High	568	<1.00	278	4.9	330	19	0.047	3.62	0.142	15.7	9.37	<0.0005
Low	164.4	<1.00	103	3.6	110	<1	0.016	0.37	0.0144	0.25	1.92	0.0001
Mean	430.9	1	210.2	4.2	235.2	2	0.03	1.48	0.052	3.79	5.134	0.0005

[1]Provincial Water Quality Objectives (PWQO) and Interim Provincial Water Quality Objectives (IPWQO) (MOE 1994, 1999)

[2]Most recent Ontario, British Columbia, or federal water quality guidelines for the protection of aquatic life (Minnow, 2016)

[3]Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (CCME)

[4]Upper limit of background concentration based on data collected from lake reference stations in the SRWMP (D-4, SR-18, SR-19) between 2003-2013 (Minnow, 2016)

[5]Upper limit of background concentration based on data collected from wetland reference stations in the SRWMP (SR-16, SR-17) between 2003-2013 (Minnow, 2016)

[A]At pH 4.5 to 5.5 IPWQO is 0.015 mg/L based on inorganic monomeric aluminum measured in clay-free samples

[B]IPWQO for U set to meet emergency needs & is applied with due caution

[C]WQG for sulphate is hardness dependent

[D]CCME WQG for Al when pH is <6.5

*CCME WQG is maximum average increase of 5 mg/L from background levels for longterm exposure (for example inputs lasting between 24 hours and 30 days)

Shaded: indicates concentration exceeds the PWQO/IPWQO

Bolded: indicates concentration exceeds WQG limits

Red: indicates concentration exceeds CCME limits

Table 3. Surface Water Quality Results at DSP-3, 2015-2017

Month	COND (µmho/cm)	Hardness (mg/L)	pH	SO4 (mg/L)	TSS (mg/L)	Ra (Bq/L)	Al (mg/L)	Co (mg/L)	Fe (mg/L)	Mn (mg/L)	U (mg/L)
2015.08	113.8	44.2	6.9	34	<1	0.023		0	0.01	0.004	0.0013
2015.09	101.6		7.1	36	<1		0.02	<0.0005	<0.02	0.004	0.0011
2015.12	66.1	45.3	6.9	37	<1		0.02	<0.0005	0.25	0.009	0.0014
2016.03	78	45.2	6.7	33	<1		0.03	<0.0005	0.04	0.008	0.0012
2016.06	102.3	44.9	6.9	33	1		0.01	<0.0005	<0.02	0.011	0.0014
2016.09	97.9	42.3	6.9	34	<1		0	<0.0005	<0.02	0.003	0.0012
2017.06	94.3	41.1	7	30	1		0.01	<0.0005	0.02	0.008	0.0014
2017.09	591	45.8	6.9	32	<1		0.01	<0.0005	0.03	0.007	0.0012
PWQO/IPWQO[1]			6.5-8.5			1	0.075[E]	0.0009	0.3		0.005[B]
WQG[2]			**6.5**	**128[C]**		**1**		**0.0025**	**0.3**	**0.8**	**0.015**
CCME[3]			6.5-9.0		*		0.1[D]		0.3		0.015
Lake Background[4]			6.6	6.4		0.008			0.49	0.099	<0.0005
Wetland Background[5]			5.2	4.4		0.006			1.69	0.067	<0.0005
Count	9	8	9	8	8	1	8	8	8	8	8
High	591	45.8	7.1	37	1	0.023	0.03	<0.0005	0.25	0.011	0.0014
Low	66.1	41.1	6.7	30	<1	0.023	0	0	0.01	0.003	0.0011
Mean	155.6	44.1	6.9	33.6	1	0.023	0.02	0.0004	0.05	0.007	0.0013

[1]Provincial Water Quality Objectives (PWQO) and Interim Provincial Water Quality Objectives (IPWQO) (MOE 1994, 1999)

[2]Most recent Ontario, British Columbia, or federal water quality guidelines for the protection of aquatic life (Minnow, 2016)

[3]Canadian Council of Ministers of the Environment Water Quality Guidelines for the Protection of Aquatic Life (CCME)

[4]Upper limit of background concentration based on data collected from lake reference stations in the SRWMP (D-4, SR-18, SR-19) between 2003-2013 (Minnow, 2016)

[5]Upper limit of background concentration based on data collected from wetland reference stations in the SRWMP (SR-16, SR-17) between 2003-2013 (Minnow, 2016)

[B]IPWQO for U set to meet emergency needs & is applied with due caution

[C]WQG for sulphate is hardness dependent

[D]CCME WQG for Al when pH is ≥6.5

[E]At pH >6.5 to 9.0, the IPWQO is 0.075 mg/L based on total aluminum measured in clay-free samples

*CCME WQG is maximum average increase of 5 mg/L from background levels for longterm exposure (for example inputs lasting between 24 hours and 30 days)

Shaded: indicates concentration exceeds the PWQO/IPWQO

Bolded: indicates concentration exceeds WQG limits

Red: indicates concentration exceeds CCME limits