March 2019 Environmental Update for SLEMA Board

April 4, 2019

Outline

1. Mine Update
2. Reports
3. Regulators' Update
4. Aboriginal Update
5. Stakeholders' Update
6. Agency's Activities

Acronyms

- AEMP – Aquatic Effects Monitoring Program
- ARD – Acid Rock Drainage
- DFO – Fisheries and Oceans Canada
- ECCC – Environment and Climate Change Canada
- ECM – Extended Care and Maintenance
- ENR – Department of Environment and Natural Resources, GNWT
- EQC – Effluent Quality Criterion
- GNWT – Government of the Northwest Territories
- INAC – Indigenous and Northern Affairs Canada (formerly Aboriginal Affairs and Northern Development Canada [AANDC])
- MVEIRB – Mackenzie Valley Environmental Impact Review Board
- MVLWB – Mackenzie Valley Land and Water Board
- PK – Processed Kimberlite
- SLEMA – Snap Lake Environmental Monitoring Agency
- SNP – Surveillance Network Program
- SSWQO – Site-Specific Water Quality Objective
- TDS – Total Dissolved Solids
- WEMP – Wildlife Effects Monitoring Program
- WTP – Water Treatment Plant
- WMP – Water Management Pond

1. Mine Update for Feb 2019

- The Snap Lake Mine remained in suspended operations (Extended Care and Maintenance) and Zero Occupancy period during the month of February;

- Zero occupancy was completed on March 4, 2019 as Snap Lake Mine resumed Care and Maintenance activities on that date;

1. Mine Update for Feb 2019

- Feb 2019:

  - No water use or wastewater discharge at site was reported;
  - No treated water was discharged into Snap Lake;
  - No water sampling reported;

1. Mine Update for Feb 2019

- Feb 2019:
  - No spill reported
  - Monitoring performed as per approved Surveillance Network Program (SNP) for Care and Maintenance

2. Reports

- 2.1 De Beers Feb 2019's SNP Reports:

  - Monitoring activities during Jan, February & March (partial) 2019 were reported in the SNP Reports submitted by De Beers on February, 28 and March 31;

2. Reports

2.1 De Beers Feb 2019's SNP Reports

During that period, monitoring at Snap Lake Mine included the following:

- Fuel tank inspections;
- Monthly North Pile, ditch and perimeter sump monitoring;

2. Reports

2.1 De Beers Feb 2019's SNP Reports

- North Pile Thermistor and Piezometer monitoring;
- Dams and Water Management Pond monitoring;
- Main camp building Inspection;
- Meteorological data downloads;

2. Reports

2.1 De Beers Feb 2019's SNP Reports

The following remote monitoring was conducted :

- The perimeter sumps, WMP and 12M L tank farm were monitored continuously through remote monitoring cameras. The weekly photos are included in the SNP report;
- Remote monitoring of the East Cell instrumentation and site specific weather data is ongoing;

2. Reports

2.1 De Beers Feb 2019 SNP Reports

- A contingency plan to allow de-icing to lower the sump or WMP water levels based on inspection is in place;

- Snow clearance was not required in February;

2. Reports
2.1 De Beers Feb 2019 SNP Reports

- During February, De Beers staff mobilized to site on the following date:

  - February 13, 2019;
  - Photos of the inspected structures for the campaign are included in the report.

2.1 De Beers Feb 2019 SNP Reports

- Remote monitoring and Water Licence(WL) compliance :

  - In February, De Beers reportedly submitted to the Inspector weekly records of the remote images of the Water Management Pond, sumps, and the 12 million liter tank farm;

2.1 De Beers February 2019 SNP Reports

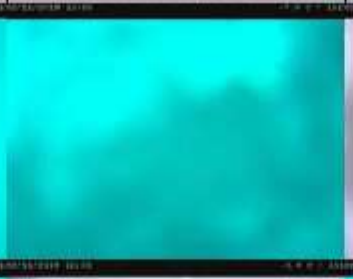
- Remote monitoring and WL compliance:

  - The February submission of the Remote Monitoring Report was attached as an appendix of the SNP Report;

  - The March remote monitoring photos of the facilities are also attached to the February SNP Report;

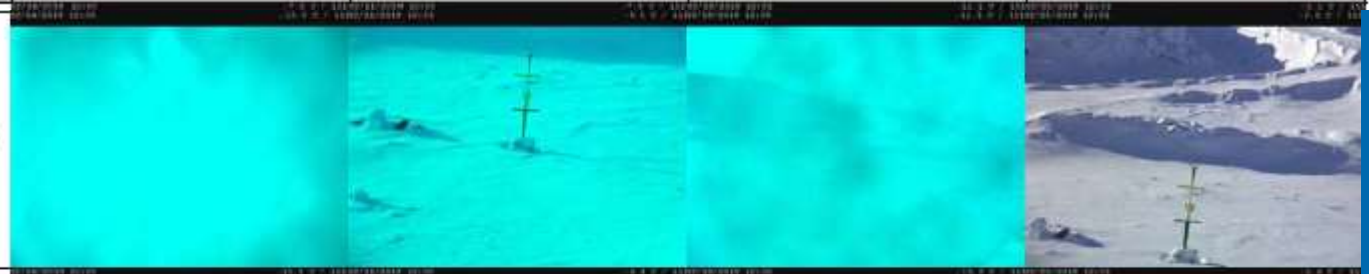
  - A log of camera icing and ice mitigation is included in the appendix of the report;

2.1 De Beers Feb 2019 SNP Report

Water Control Structure	Photos			
	Week 19 Feb 3-9, 2019	Week 20 Feb 10-16, 2019	Week 21 Feb 17-23, 2019	Week 22 Feb 24-Mar 2, 2019
Perimeter Sump 1				
Perimeter Sump 2				
Perimeter Sump 3				
Perimeter Sump 4				

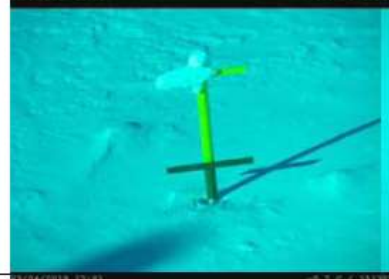
Remote Monitoring Photos at Snap Lake Site, Feb 2019

2.1 De Beers Feb 2019 SNP Report

Water Control Structure	Photos			
	Week 19 Feb 3-9, 2019	Week 20 Feb 10-16, 2019	Week 21 Feb 17-23, 2019	Week 22 Feb 24-Mar 2, 2019
Perimeter Sump 5				
Water Management Pond				
Fuel Tank				

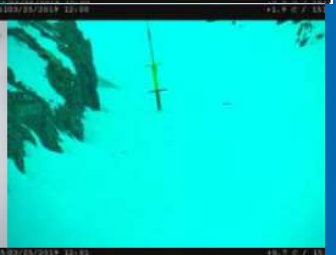
Remote Monitoring Photos at Snap Lake Site, Feb 2019

2.1 De Beers Feb 2019 SNP Reports

Water Control Structure	Photos			
	Week 23 Mar 3-9, 2019	Week 24 Mar 10-16, 2019	Week 25 Mar 17-23, 2019	Week 26 Mar 24-30, 2019
Perimeter Sump 1				
Perimeter Sump 2				
Perimeter Sump 3				

Remote Monitoring Photos at Snap Lake Site, March 2019

2.1 De Beers Feb 2019 SNP Report

Water Control Structure	Photos			
	Week 23 Mar 3-9, 2019	Week 24 Mar 10-16, 2019	Week 25 Mar 17-23, 2019	Week 26 Mar 24-30, 2019
Perimeter Sump 4				
Perimeter Sump 5				
Water Management Pond				
Fuel Tank				

Remote Monitoring Photos at Snap Lake Site, March 2019

2.1 De Beers Feb 2019 SNP Report

Photo at Snap Lake Site during De Beers visit, Feb 13 2019

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Photo at Snap Lake Site during De Beers visit, Feb 13 2019

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Photo at Snap Lake Site during De Beers visit, Feb 13 2019

2. Reports

- 2.2 Jan & Feb 2019's Inspection Reports

  - No Regulatory inspections were conducted during Jan & Feb 2019.

3. Regulator's Update

- 1. On March 5,2019 the MVLWB and the GNWT-ENR announced the release of Guidelines for Aquatic Effects Monitoring Programs (the AEMP Guidelines). All Guidelines' related documents are now available on the Boards' website.

- 2. On March 12, 2019 the MVLWB organized the Workshop on Guidelines for Hydrocarbon Contaminated Soil Treatment Facilities in the NWT.

3. Regulator's Update

1. Guidelines for Aquatic Effects Monitoring Programs (AEMP):

- The Guidelines for AEMP clarify the role of the AEMP in water licensing and describe the expectations of the Boards and the GNWT for AEMP design, implementation, and adaptive management;
- The Guidelines will generally be required for mining/milling, oil/gas production, and other undertakings that require a Type A water licence;

3. Regulator's Update

1. Guidelines for Aquatic Effects Monitoring Programs (AEMP):

- Water licences for projects that require an AEMP will contain a series of conditions that, collectively, allow the Board to adaptively manage a project's water licence in a formal and systematic manner based on monitoring results;

- The Guidelines apply to new applications and submissions made to a Board after the effective date.

3. Regulator's Update

2. Guidelines for Hydrocarbon Contaminated Soil Treatment Facilities in the NWT:

- The ENR – GNWT, the Inuvialuit Water Board, and the MVLWB formed a working group to develop a Guideline for Hydrocarbon Contaminated Soil Treatment Facilities (also known as Landfarms, Biotreatment Pads, etc.) in the Northwest Territories;

3. Regulator's Update

2. Guidelines for Hydrocarbon Contaminated Soil Treatment Facilities in the NWT:

- The Guideline is intended for large and/or commercial facilities that accept contaminated soil for continual treatment from various sources and/or require the management of water from the facilities;

3. Regulator's Update

2. Guidelines for Hydrocarbon Contaminated Soil Treatment Facilities in the NWT:

- The goal of the AEMP Guideline is to set clear and consistent expectations and guidance for the siting, design, construction, operation, maintenance and closure of soil treatment facilities throughout the NWT;

- The document includes best practices that can be considered for any contaminated soil treatment operation.

4. Aboriginal Update

- No news related to aboriginal activities.

5. Stakeholders' Update: ENR – GNWT & De Beers & SLEMA

1. Snap Lake Mine Air Quality and Emissions Monitoring and Management Plan V.3 Draft (Snap Lake AQEMMP Draft)

- On March 6, 2019 a meeting with the object to follow up comments to the Snap Lake AQEMMP draft was organized by ENR – GNT;

- Sarah McLean, Colleen Prather and others for De Beers, LeeAnn Malley and Loretta Ransom for the ENR- GNT, and Philippe Di Pizzo (by phone) and Sonia Aredes for SLEMA att[illegible]de the one hour meeting

5. Stakeholders' Update: ENR – GNWT & De Beers & SLEMA

1. Draft of Snap Lake AQEMMP

- On March 8, 2019, following the meeting De Beers informed that:
  - The revised AQEMMP will be submitted with the rest of the Water Licence application package on March 29th;
  - The following items agreed to at the meeting would be incorporated in the revised AQEMMP:

5. Stakeholders'Update: ENR – GNWT & De Beers & SLEMA

1. <u>Draft of Snap Lake AQEMMP</u>

- In the Annual Report the PM2.5 data collected from communications building would be compared to that historically collected from the airstrip and emulsion plan locations. "*Because there was very little data from 2018 at the new location, the first comparison would be for the 2019 data*";
- The closure and post-closure timeframes would be clarified;

5.1Stakeholders'Update: ENR – GNWT & De Beers & SLEMA

1. Draft of Snap Lake AQEMMP

- A summary/table of the dust monitoring station locations and rationale for why select stations are being removed/discontinued in the closure and post-closure phases would be included;

- Vegetation dustfall stations would be included in the AQEMMP as well;

5. Stakeholders'Update: ENR – GNWT & De Beers & SLEMA

1. Draft of Snap Lake AQEMMP

- An additional text to justify that SO2 and NO2 need not be measured post closure based on the reasoning that the emissions are reduced compared to operations would be added.

5. Stakeholders' Update: De Beers

2. Snap Lake Mine Water Licence Renewal Workshop

- With representatives from Indigenous groups, DFO, EC, GNWT, MVLWB, and SLEMA, De Beers held a Workshop on March 7 2019;
- The Workshop's purpose was to discuss the Type A Water Licence renewal application for the Snap Lake Mine;

5. Stakeholders' Update: De Beers

2. Snap Lake Mine Water Licence Renewal Workshop

- Workshop Objectives:
  - "to present and discuss the proposed treatment wetland, updates to water model predictions, effluent quality criteria, and the aquatic effects monitoring plan";
  - "Input received will be reviewed and incorporated where possible into the Water Licence r[illegible] application".

5. Stakeholders' Update: De Beers

3. De Beers Requests to Cease Hydrology Monitoring Program (Hydrology Program) under the Environmental Agreement

- On March 25,2019, De Beers requested to cease monitoring and reporting under the Hydrology Program through the Environmental Agreement;
- The Hydrology Program is, between others, required by the Snap Lake Environmental Agreement (items 7.1 b and 7.2g)

5. Stakeholders' Update: De Beers

3. De Beers Requests to Cease Hydrology Program

In its letter De Beers informs that it has reviewed the Hydrology Program in light of the future activities planned at the Mine (closure and post-closure);

And it found that:

- The only remaining requirements of the Hydrology Plan are managed under other Programs such as AEMP, SNP, AQEMMP

5. Stakeholders' Update: De Beers

3. De Beers Requests to Cease Hydrology Program

- "The Hydrology Program is entirely redundant with other requirements";
- Therefore, De Beers "respectfully requests to cease monitoring and reporting under cover of the Hydrology Program through the Environmental Agreement".

5. Stakeholders' Update: De Beers

De Beers Submissions in March:

- 4. On March 26, 2019 De Beers submitted the Snap Lake Mine 2018 Water License Annual Report as required by the Type A Water License, Part B, Item 7 in accordance with Schedule 1, item 1 (MV2011L2-0004);

- 5. On March 26, 2019 De Beers submitted the Vegetation Monitoring Program, which has been updated to align with closure and post-closure activities planned for Snap Lake Mine;

5. 2 Stakeholders' Update: De Beers

De Beers Submissions in March:

- 6. On March 29, 2019, successfully meeting deadline set by MVLWB, De Beers submitted the Application for renewal of Water Licence Type A MV2011L2-0004 along with all of the associated environmental monitoring and management plans;

5. Stakeholders' Update: De Beers

9. <u>De Beers Announcement with Respect to the LUP:</u>

- On March 30, 2019 De Beers notified SLEMA its intention to apply for an amendment to the Land Use Permit to support the closure of Snap Lake Mine. The Beers pointed out that:

  - "As De Beers transitions the Mine from ECM to Closure, some modifications to the Mine site will be required. Specifically, De Beers will modify the water control structures at the North Pile to allow for the passive flow of seepage and [illegible] water through storage ponds and if require[illegible]

5. 2 Stakeholders' Update: De Beers

9. De Beers announcement with respect to the LUP

- "These modifications are contemplated in the updated Security Estimate submitted along with the application for renewal of the Water Licence on March 29, 2019";
- The modifications trigger the need to amend the LUP
- The L.U.P. amendment application will be submitted to the MVLWB by April 15, 2019

5. 2 Stakeholders' Update: De Beers

9. De Beers announcement with respect to the LUP

- Additional changes to conditions within the LUP are not anticipated at this time;

- "However, they could occur as part of the review process administered by the Mackenzie Valley Land and Water Board (MVLWB)". "It is also possible that the MVLWB will advise that a new land use permit is required, rather than an amendment".

6. Agency's activities

- On March 6, 2019 SLEMA's Executive Director (by phone) and Environmental Analyst attended the meeting on the updated AQEMMP draft;

- On March 7, 2019 SLEMA, Chairperson Johnny Weyallon in person, Philippe Di Pizzo by phone, and Sonia Aredes in person, attended the Workshop Snap Lake Mine, Type A Water Licence Renewal;

6. Agency's activities

- On March 12, 2019 SLEMA Environmental Analyst attended the Workshop on the Guideline for Hydrocarbon Contaminated Soil Treatment Facilities in the NWT.

7. Case Study: An Overview of Water Quality at Snap Lake Mine Site During C&M

An Overview of Water Quality at Snap Lake Mine Site During C&M

- Why is runoff water quality important?
- One of the closure objectives in a mine site related to runoff and seepage is that runoff and seepage do not increase loading and degrade water quality in the surrounding lakes;
- Disturbed areas generally produce runoff of poorer water quality compared to runoff from undisturbed areas (clean runoff).

An Overview of Water Quality at Snap Lake Mine Site During C&M

- The water quality parameter concentrations in some of the runoffs at Snap Lake have historically been elevated compared to undisturbed areas but have generally met water quality limits;

- Runoff water quality varies over a wide range depending on season and degree and type of material contacted;

An Overview of Water Quality at Snap Lake Mine Site During C&M

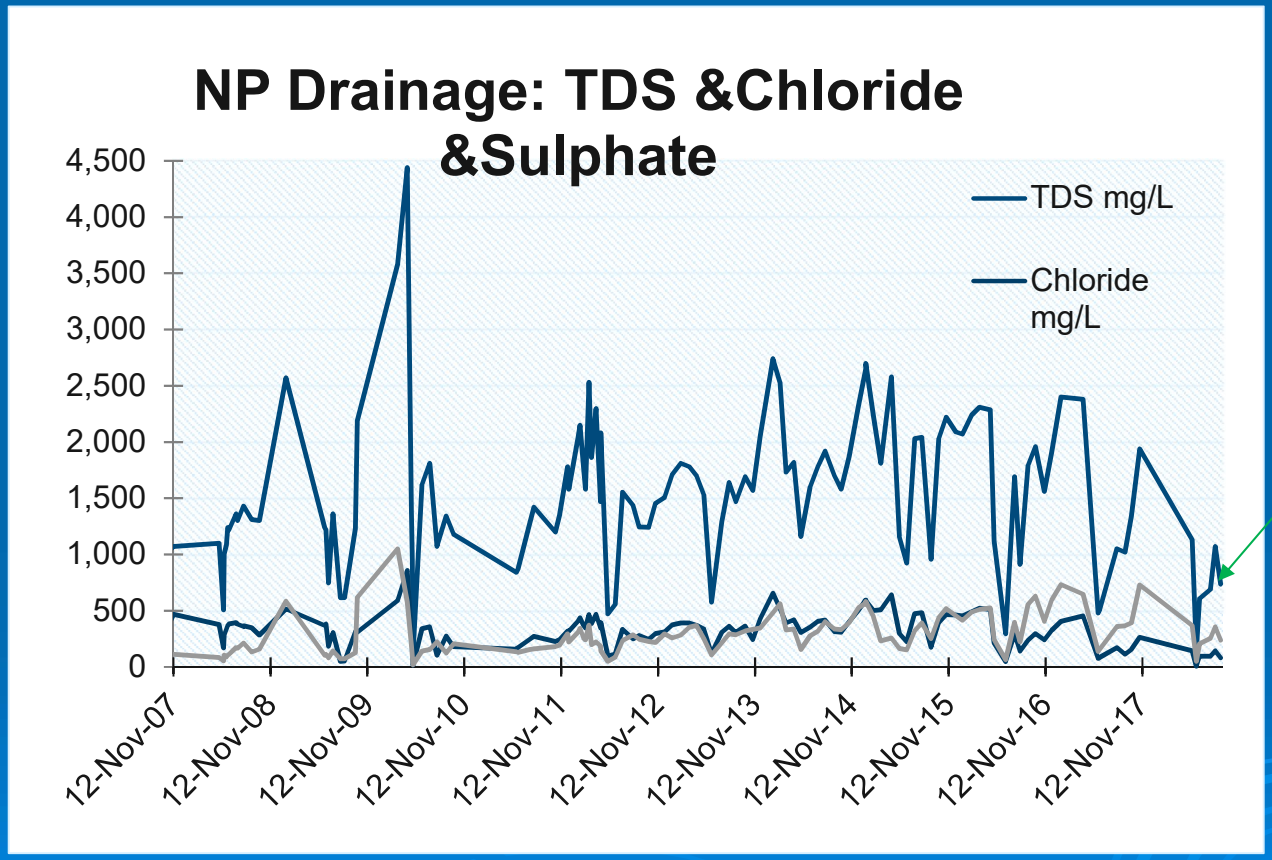
- Why is the water quality of the North Pile drainage important?
- Because it may be flowing after closure into the Snap Lake
- Water quality at the North Pile (SNP MS 2-2) is primarily influenced by the quality of the process water deposited, reactions within the pile, and pore water (highly saline water);

An Overview of Water Quality at Snap Lake Mine Site During C&M

- Deposition of PK in the North Pile began in 2007 continued until December 2015, after which point the Mine entered into Extended Care and Maintenance phase and all deposition stopped.

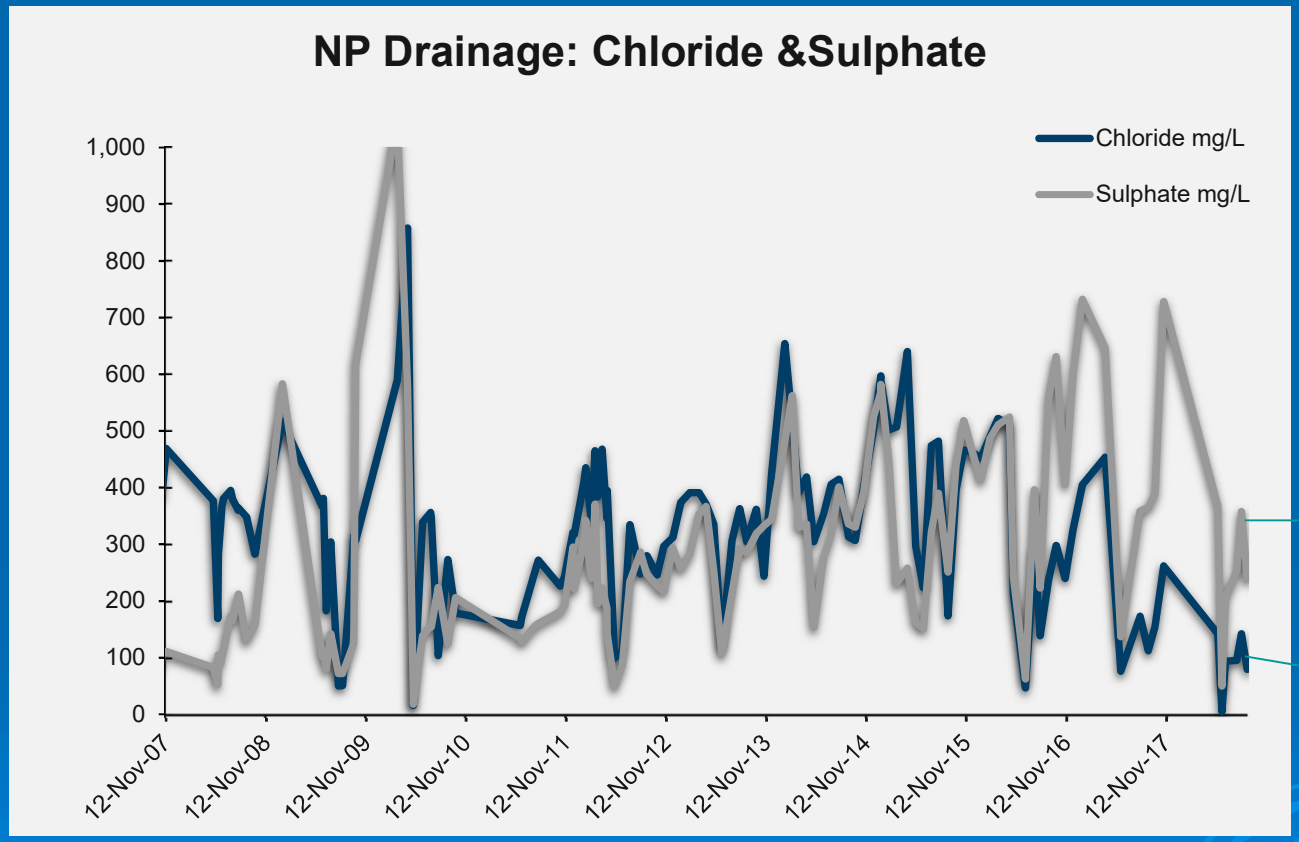
- Notably, North Pile drainage water quality shows a significant change in the chemical composition from the point of cease of operation up to now (status of C&M).

An Overview of Water Quality at Snap Lake Mine Site During C&M



Sept 2018
TDS 735 mg/L

An Overview of Water Quality at Snap Lake Mine Site During C&M



Sept 2018

Sulphate
238 mg/L

Chloride
80 mg/L

An Overview of Water Quality at Snap Lake Mine Site During C&M

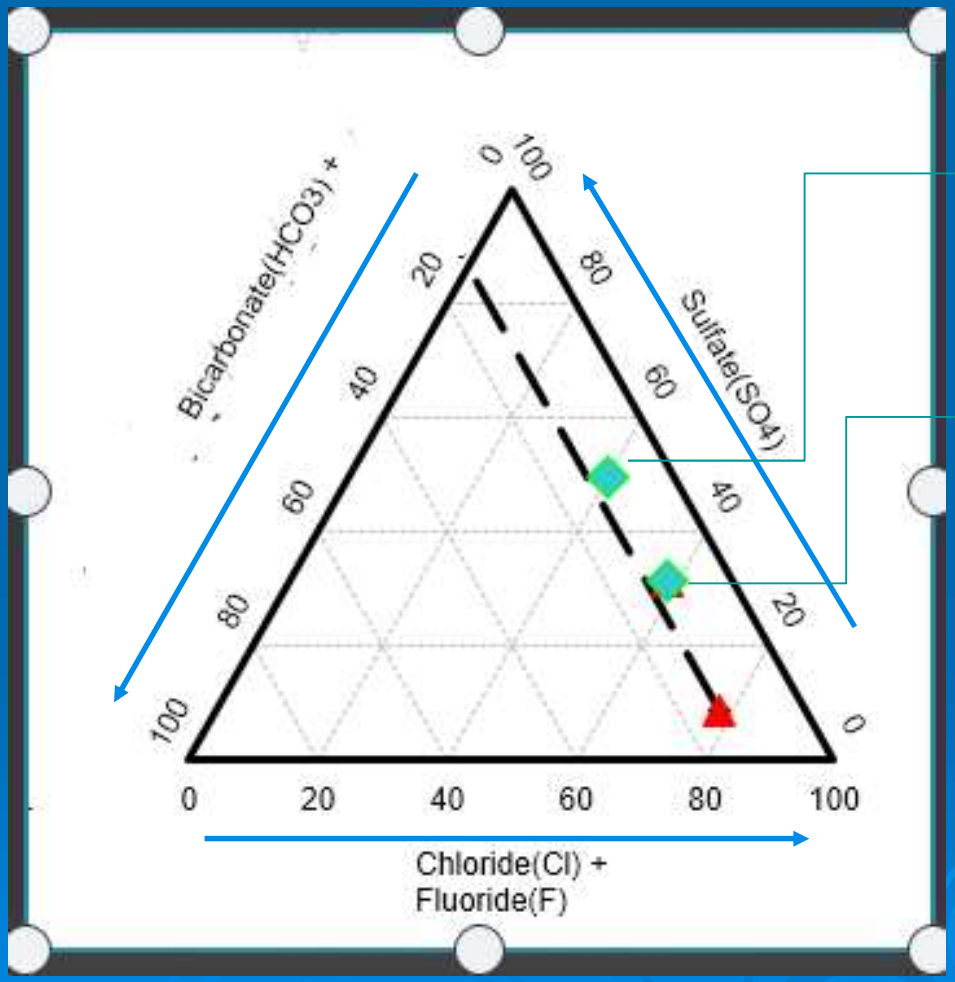
Table 1: Water Quality at SNP MS 2-2 Comparison of Averages for the Operational and CM Status of the Mine

	Average Jun 2007 – Dec 2015	Average Jan 2016– Sept 2018
TDS mg/L	1,498	1,371
Calcium mg/L	183	175
Chloride mg/L	330	232
Sulfate mg/L	241	386

An Overview of Water Quality at Snap Lake Mine Site During C&M

- The Piper diagram is a tool commonly used to classify waters as per their cation and anion composition;
- The underground mine water predominant anion is chloride (77%) shown in the plot by a red triangle;
- Likewise, the NP drainage water predominant anion during slurry deposition (operations) is also chloride (58%)
- The NP drainage water predominant anion during C&M is sulphate (50%)

An Overview of Water Quality at Snap Lake Mine Site During C&M

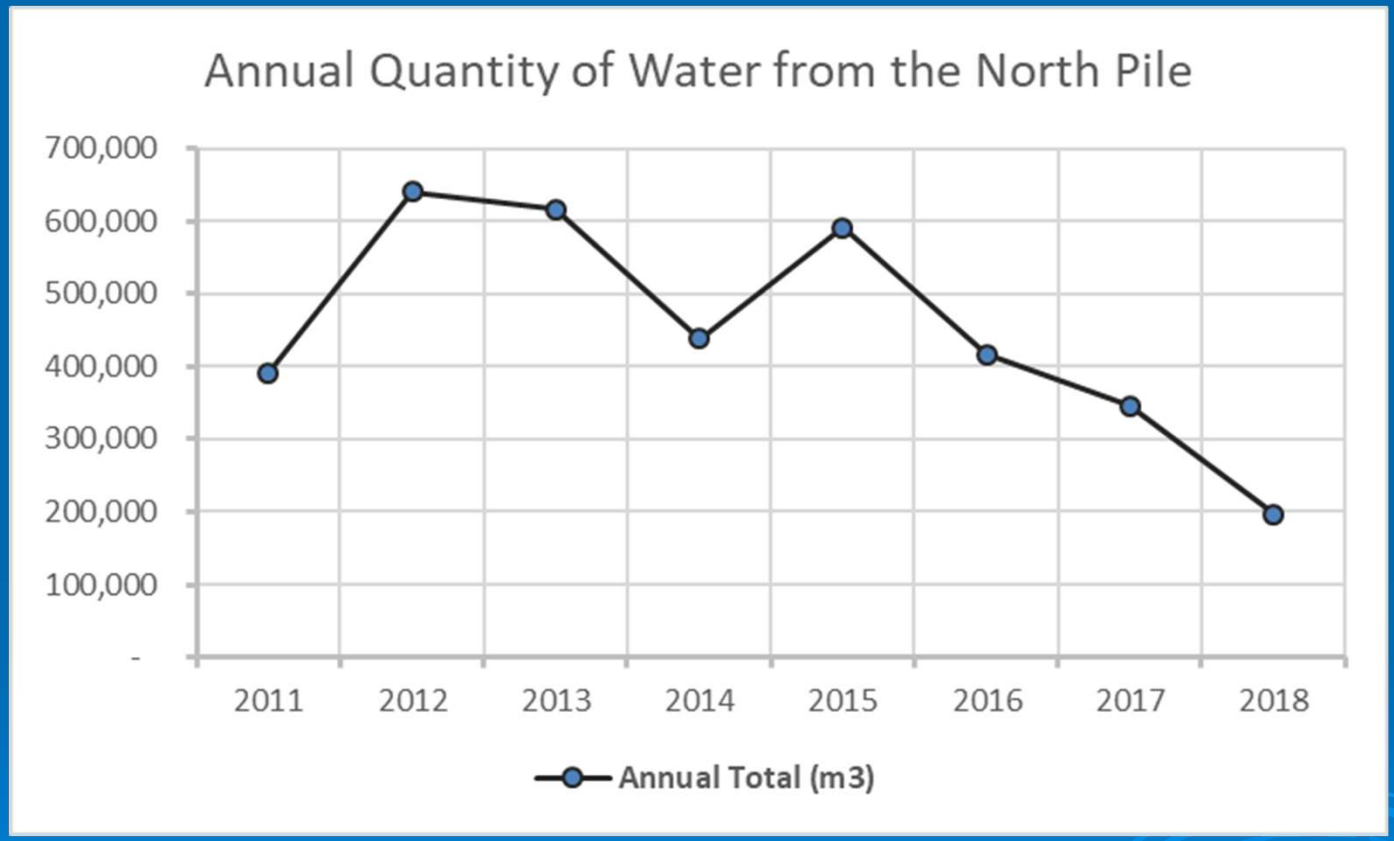


SNP 2-2 C&M
41% Chloride
50% Sulphate

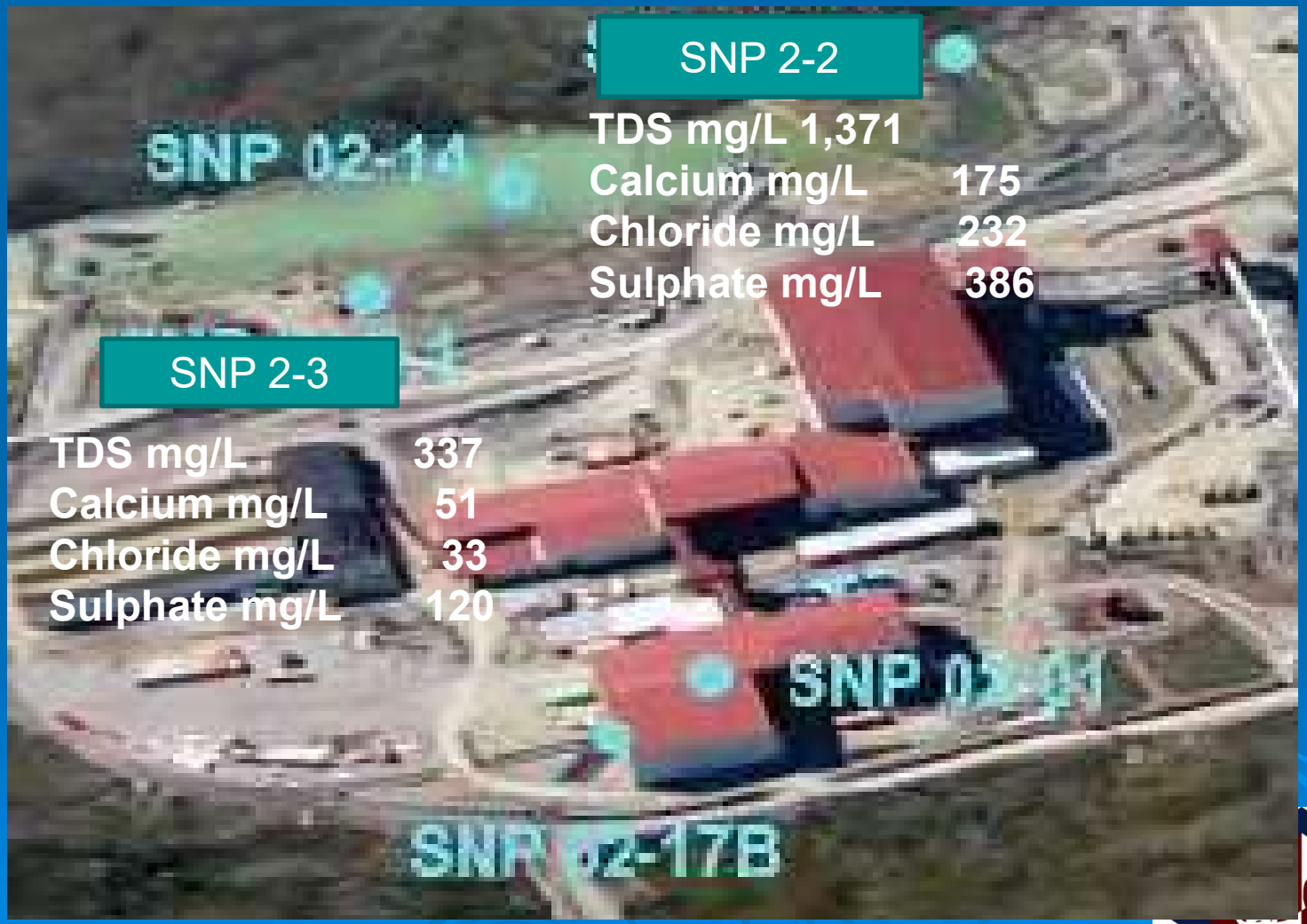
SNP 2-2 Operation
58% Chloride
31% Sulphate

Mine Water
77% Chloride
8% Sulphate

An Overview of Water Quality at Snap Lake Mine Site During C&M

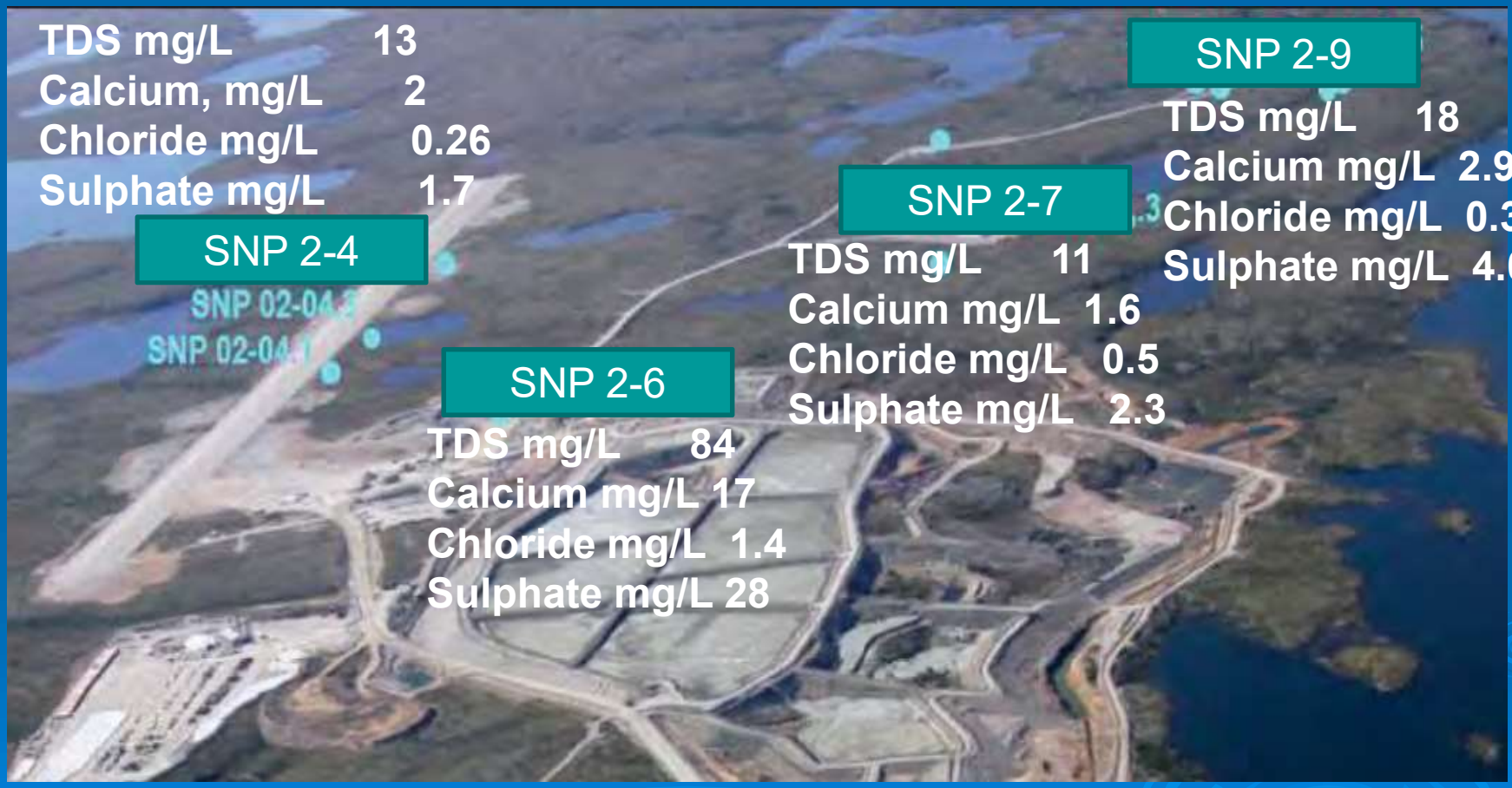


7. Water Quality at SNAP Lake During the C&M Status of the Mine



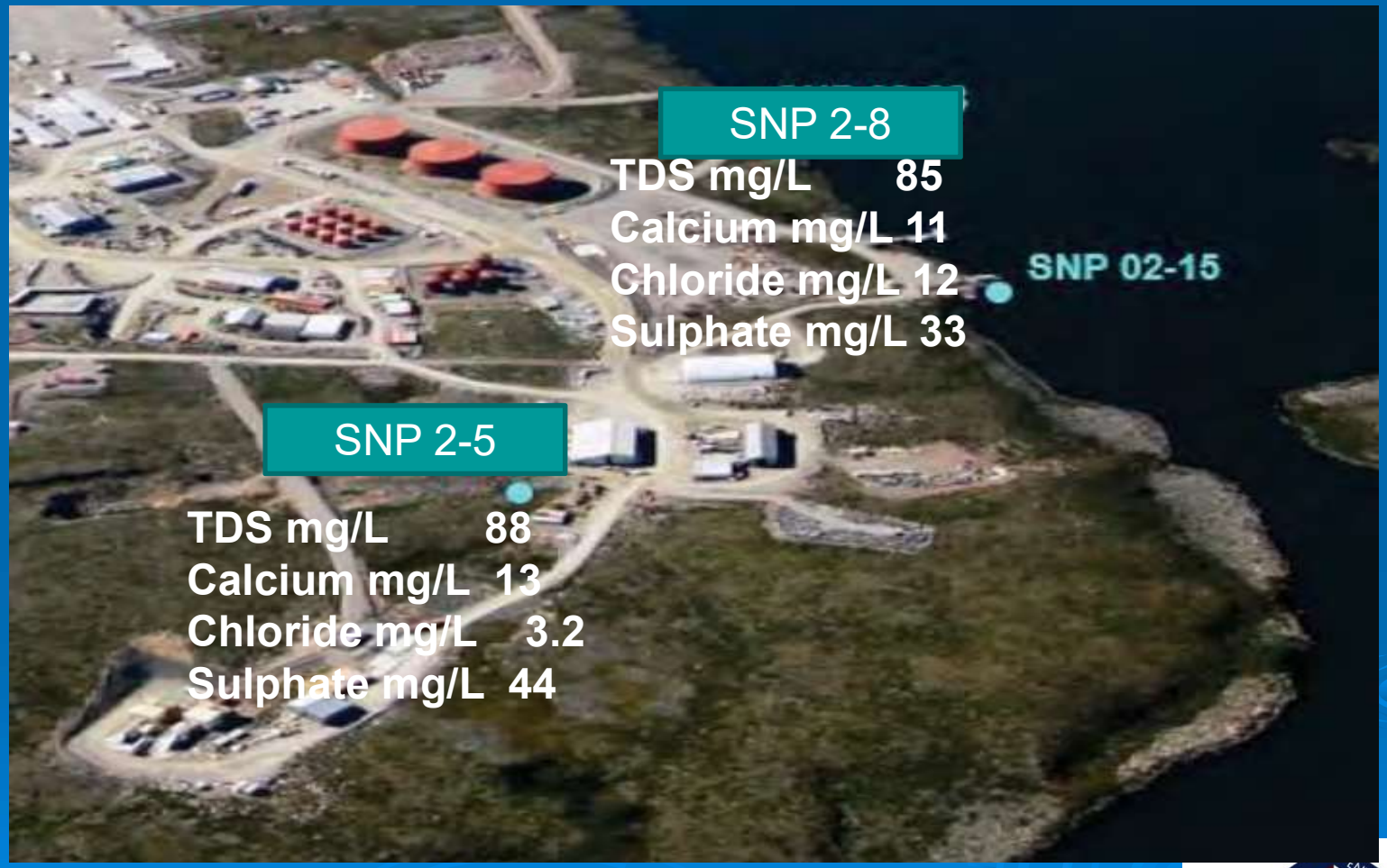
Average concentrations from 2016 to 2018 (C&M Status)

7. Water Quality at SNAP Lake During the C&M Status of the Mine



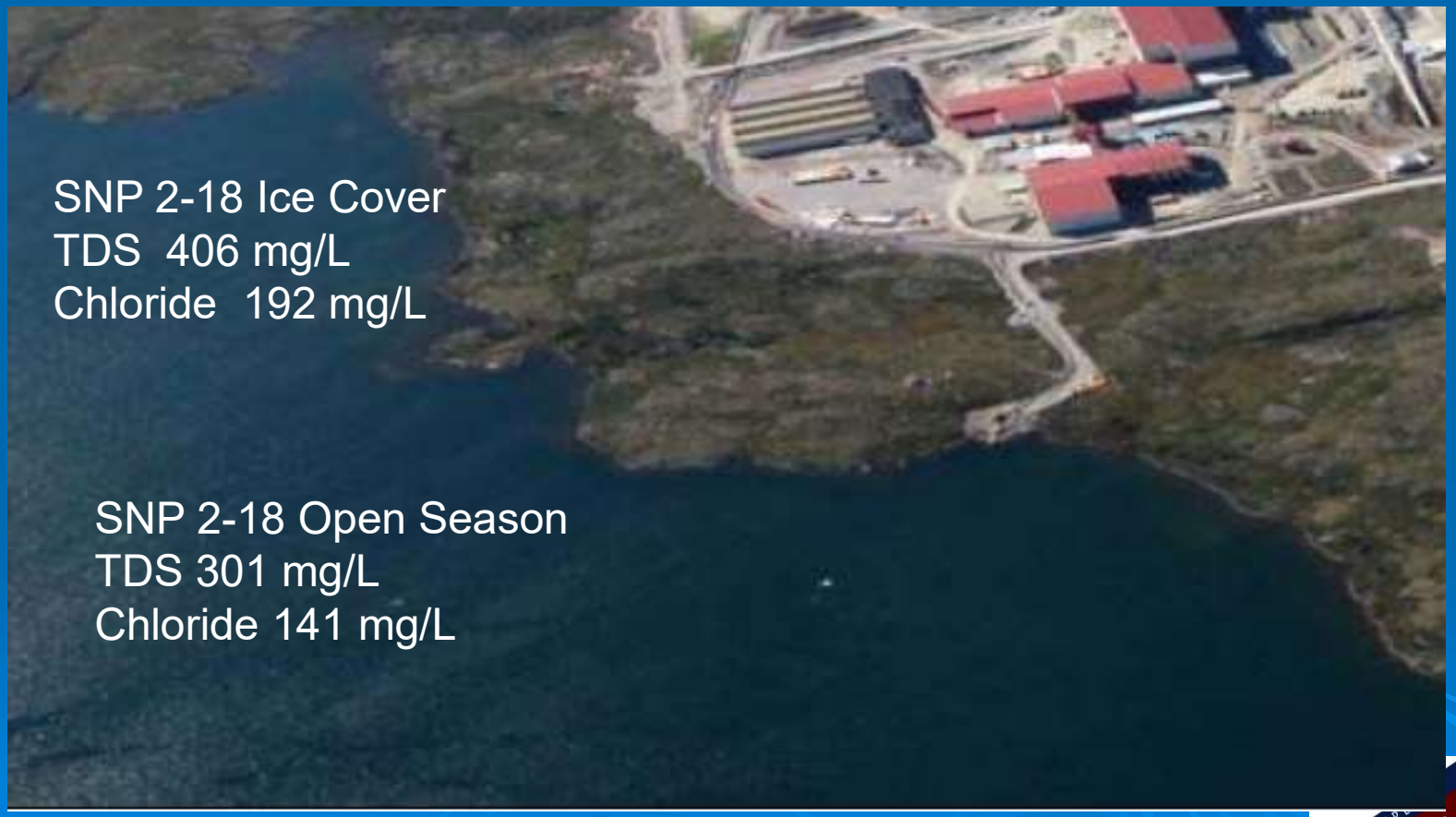
Average concentrations from 2016 to 2018 (C&M Status)

7. Water Quality at SNAP Lake During the C&M Status of the Mine



Average concentrations from 2016 to 2018 (C&M Status)

7. Water Quality at SNAP Lake During the C&M Status of the Mine



2018 Average Concentrations for Snap Lake of Total Dissolved Solids and Chloride

7. Water Quality at SNAP Lake During the C&M Status of the Mine

SNP STATION	DESCRIPTION
02-01	Final mine water collection sump- Dirty minewater from underground stopped pumping to WTP as part of flooding operations in Extended Care & Maintenance.
02-02	North Pile drainage collection ditch
02-03	Core Facilities area collection ditch near Water Management Pond
02-04	Uncontrolled surface runoff at culvert by airstrip (3)
02-05	Uncontrolled surface runoff at Bulk Sample Mine Rock Pad
02-06	Uncontrolled surface runoff at Quarry Site
02-07	Uncontrolled surface runoff at Road to Bulk Emulsion Plant (6)
02-08	Uncontrolled surface runoff at Winter Access Road
02-09	Uncontrolled surface runoff at Emulsion Plant Area (6)