Jan & Feb 2020 Environmental Update for SLEMA Board

March 13, 2020

Outline

1. Mine Update
2. SNP Reports
3. Inspection Reports
4. Update of the Water Licence and Land Use Permit Review Process for Snap Lake Mine Closure
5. Update of the Regulatory Review Process: Unresolved Issues
6. Environmental Agreement Update
7. SLEMA'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
- MVEIRB – Mackenzie Valley Environmental Impact Review Board
- MVLWB – Mackenzie Valley Land and Water Board
- PK – Processed Kimberlite
- SNP – Surveillance Network Program
- TDS – Total Dissolved Solids
- WEMP – Wildlife Effects Monitoring Program
- WTP – Water Treatment Plant
- WMP – Water Management Pond

1. Mine Update

- The Snap Lake Mine is currently in its fourth year of Extended Care and Maintenance (ECM);
- All personnel left the site on September 5th, 2019;
- Remote data collection and monitoring is set up to be carried out during the winter months for the 2019-2020 season;
- Site inspections are scheduled on a monthly basis.

2. SNP Reports for Dec and Jan

Monitoring of Snap Lake Mine was carried out and reported for the months of December and January and included:

- Remote monitoring on a weekly basis of the perimeter sumps, Water Management Pond and Fuel 12M L Tank Farm (by photos)
- Remote monitoring of the East Cell instrumentation and
- Remote monitoring of site specific weather data

2. SNP Reports for Dec and Jan

Monitoring of Snap Lake Mine for the months of December and January included:

- Site Inspections of the North Pile, Perimeter Sumps, Water Management Pond Dams 1&2. Response categories are in yellow for all Sumps and the WMP;
- Site inspections of the 12M Liter, 500,000 Liter, 330,000 Liter, Utility Day, the Far Fuel Tanks and Day Tank Fuel Piping;
- Aerial Photos of Snap Lake;

2. SNP Reports

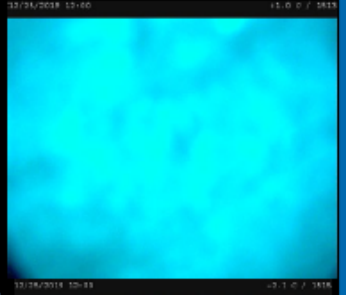
Monitoring of Snap Lake Mine for the months of December and January included

- Wildlife surveillance: no wildlife reported in December or in January;
- Landfill inspection;
- The December monthly visit was on December 16 and 17;
- The January monthly visit was on January 8-10

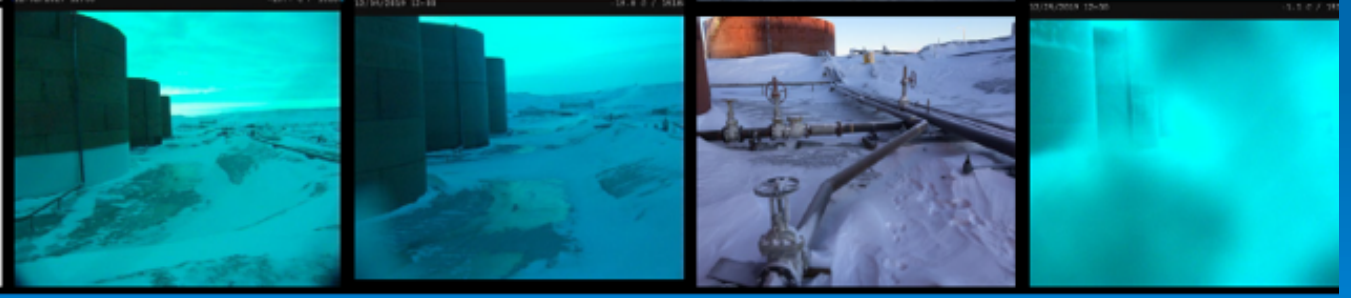
2. SNP Reports

Monitoring of Snap Lake Mine for the months of December and January

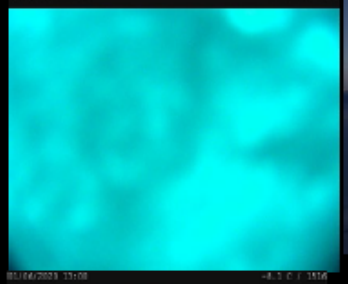
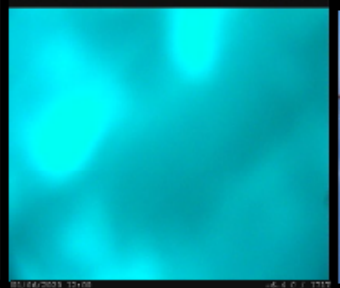
- Perimeter Sump 1, Perimeter Sump 2 and Perimeter Sump 4 cameras were reported as not working in January. DeBeers is working to fix this issue

Water Control Structure	Photos			
	Week 1 (December 01-08)	Week 2 (December 09-16)	Week 3 (December 17-24)	Week 4 (December 25-31)
Perimeter Sump 1	Not Available due to camera malfuction	Not Available due to camera malfuction		Not Available due to camera malfuction
Perimeter Sump 2				
Perimeter Sump 3				
Perimeter Sump 4				

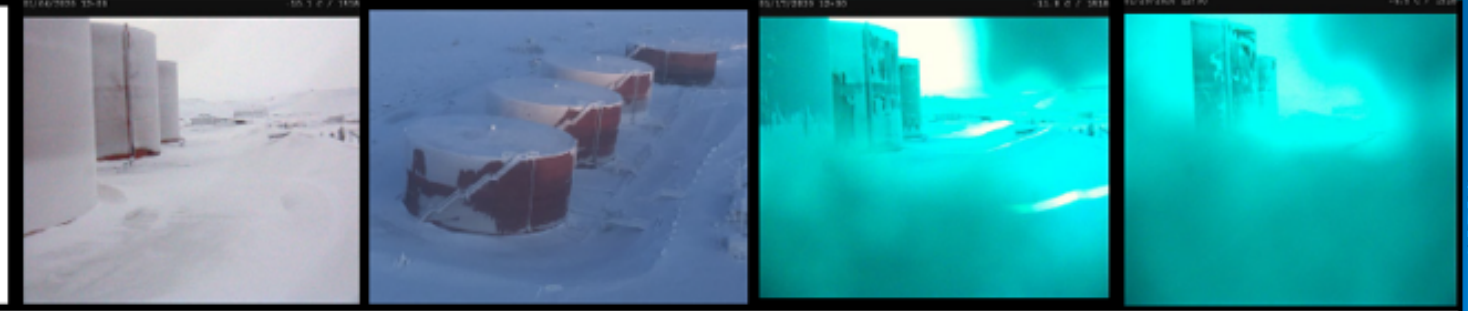
December 2019 Remote Monitoring Site Photos

Water Control Structure	Photos			
	Week 1 (December 01-08)	Week 2 (December 09-16)	Week 3 (December 17-24)	Week 4 (December 25-31)
Perimeter Sump 5				
Water Managemnet Pond				
Fuel Tank				

December 2019 Remote Monitoring Site Photos

Water Control Structure	Photos			
	Week 1 (January 01 - 08)	Week 2 (January 09-16)	Week 3 (January 17-24)	Week 4 (January 25-31)
Perimeter Sump 1			Not Available due to camera malfuction	Not Available due to camera malfuction
Perimeter Sump 2			Not Available due to camera malfuction	Not Available due to camera malfuction
Perimeter Sump 3				
Perimeter Sump 4			Not Available due to camera malfuction	Not Available due to camera malfuction

January 2020 Remote Monitoring Site Photos

Water Control Structure	Photos			
	Week 1 (January 01 - 08)	Week 2 (January 09-16)	Week 3 (January 17-24)	Week 4 (January 25-31)
Perimeter Sump 5				
Water Managemnet Pond				
Fuel Tank				

January 2020 Remote Monitoring Site Photos

3. GNWT Inspection

No inspection report was received during this period (December 2019 & January 2020)

4. Snap Lake Mine Closure: Water Licence and Land Use Permit Review Process Update

- On November 26 & 27, 2019 a Public Hearing (PH) for De Beers submission of the Snap Lake Water Licence and LUP Amendment – Renewal was held in Yellowknife;

- Public Hearing (PH) Interveners: Fisheries and Ocean (DFO), Environment and Climate Change Canada (ECCC) and Government of North West Territories (GMWT)

4. Update of Regulatory Process for Snap Lake WL Amendment – Renewal and LUP Amendment

- Following steps after the Public Hearing (PH):

1. Stakeholders (DFO, ECCC, GNWT and SLEMA) reviewed the WL & LUP drafts, on Jan 30;
2. DeBeers responded to reviewers' comments on Feb 7;
3. Closing arguments from interveners (DFO, ECC, GNWT) submitted on Feb 14

4. Update of Regulatory Process

- Following steps after the PH (cont.):

4. Closing Arguments from Proponent (DeBeers) submitted on Feb 21;
5. Board Decision on Application Mid-March;
6. Water Licence send to GNWT Minister for review mid-March;
7. Final Decision from GNWT Minister on the Water Licence and LUP up to 90 days (current Water Licence expires on June 13 2020)

4. Update of Regulatory Process

- RESOLVED ISSUES: Parties agreed on the following:

1) **Maintaining TDS of 500 mg/L at the edge of the mixing zone(s) in Snap Lake;**
2) **The submission of an Effluent Quality Criteria (EQC) Re-evaluation Report by DeBeers;**
3) **The submission of a Plume Delineation Study by DeBeers;**
4) **The implementation of a site-wide erosion and sediment management plan**

4. Update of Regulatory Process

- RESOLVED ISSUES: Parties agreed on the following:

5) The implementation of an Acid Rock Drainage and Geochemical Characterization and Management Plan;

6) The inclusion of Total Petroleum Hydrocarbons as regulated parameter in the EQC for Closure;

4. Update of Regulatory Process

- UNRESOLVED ISSUES:

1) Effluent Quality Criteria (EQC) for Closure and Post Closure

2) The size of the proposed mixing zone at SL

3) The removal of most of the SNP monitoring stations as proposed by DB

4) The re-submission of the Final Closure Reclamation Plan - FCRP to be revisited by parties

5. Update of Regulatory Process Unresolved Issues #1 - EQC

- What is an Effluent Quality Criteria (EQC)?

An EQC represent the maximum concentration of a contaminant in the effluent that will enable the receiving water to meet Water Quality Objectives (WQO)

In this case:

The effluent is the mine effluent (mainly the drainage from North Pile);

The receiving water is the Snap Lake

5. Update of Regulatory Process – Unresolved Issues #1 EQC

EQC for the Snap Lake Mine Effluent must be set at levels that will ensure that, when Effluent is discharged, water quality objectives for the Snap Lake will be met.

WATER QUALITY OBJECTIVES (WQO) FOR SNAP LAKE: Snap Lake Water Must Be

- Safe to drink and
- Safe for aquatic life

5. Update of Regulatory Process - Unresolved Issues #1 EQC

EQC PROPOSED BY DEBEERS

- DB developed a screening procedure to obtain the EQC for the Effluent discharge at Snap Lake
- DB proposed 2 different sets of EQC in 2 different submissions during the review process

1) First set of EQC submitted in April 2019
2) Second set of EQC submitted in August 2019

5. Update of Regulatory Process – Unresolved Issue #1 EQC

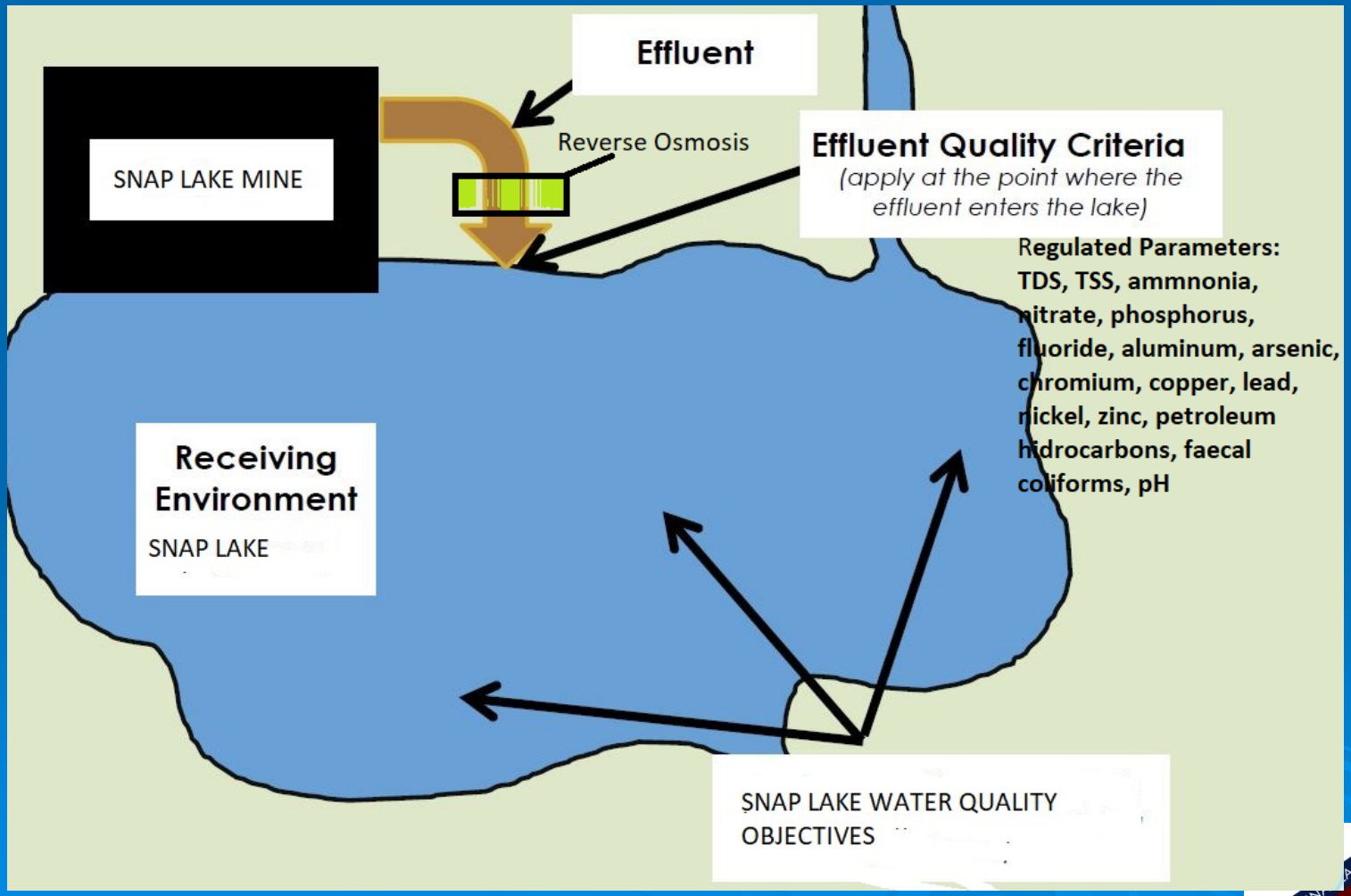
EQC PROPOSED BY DEBEERS in April 2019

a. EQC for Closure: the same EQC that is in the current Water Licence; to be compliant the Effluent requires to be treated by Reverse Osmosis (RO) before discharge

b. EQC for Post-Closure: identifies nitrate as main contaminant of concern; to be compliant the Effluent requires to be treated by wetlands before discharge

5. Update of Regulatory Process Issue #1

EQC FOR CLOSURE PROPOSED BY DEBEERS in April 2019 (first submission)



5. Update of Regulatory Process Unresolved Issue #1 EQC

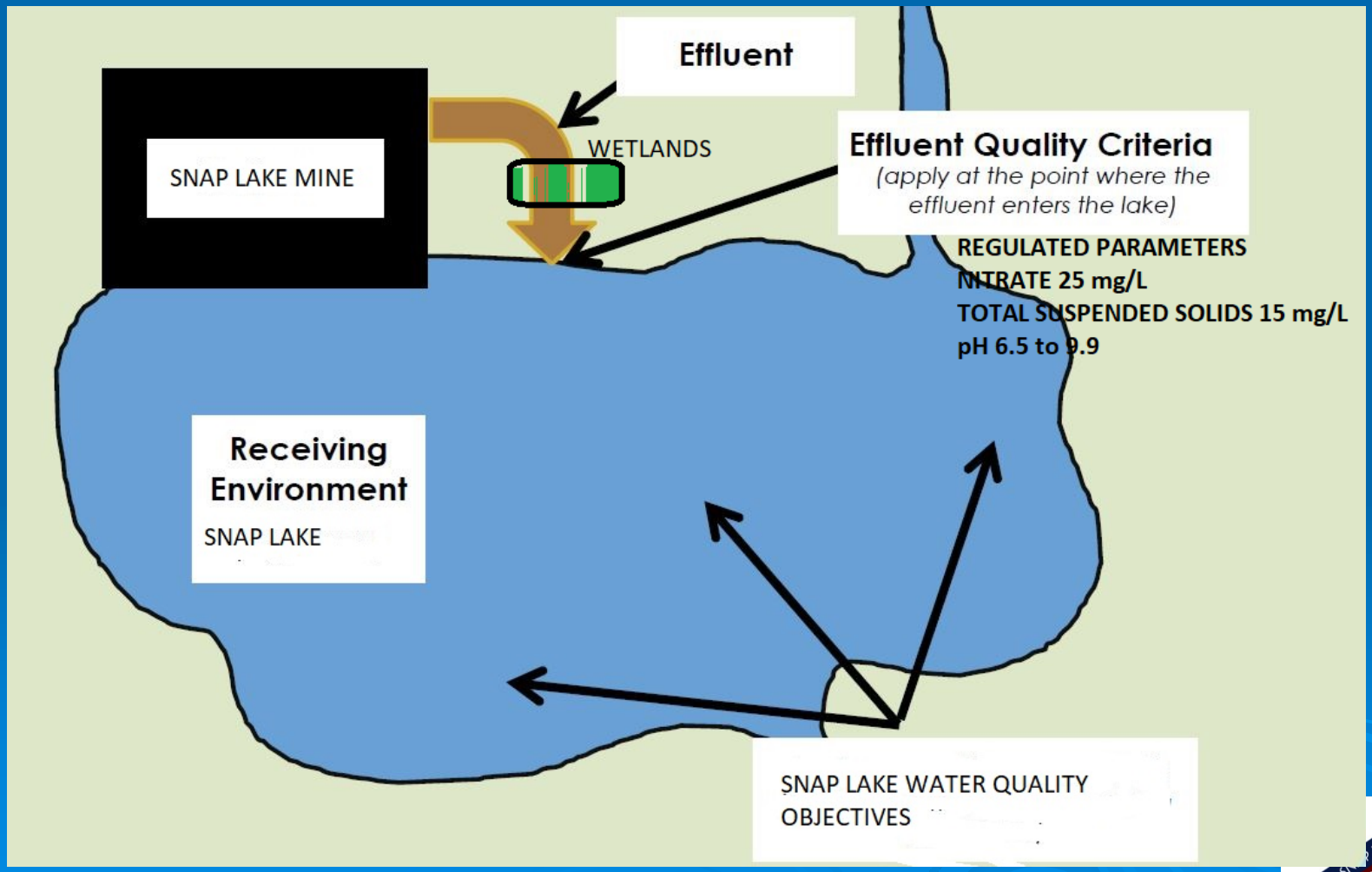
EQC for POST-CLOSURE PROPOSED BY DEBEERS in April 2019

Parameter	Maximum Allowable Concentration (MAC)
Nitrate	25 mg/L
Total Suspended Solids (TSS)	15 mg/L
pH	6-9
Treatment	YES, by wetland

The proposed MAC will ensure that the effluent discharge in the lake has not a deleterious effect and that Snap Lake water is safe to drink and safe for aquatic life (Water Quality Objective for Snap Lake)

5. Update of Regulatory Process Issue #1

EQC FOR POST- CLOSURE PROPOSED BY DEBEERS in April 2019 (first submission)



5. Update of Regulatory Process Issue #1

EQC PROPOSED BY DEBEERS in August 2019

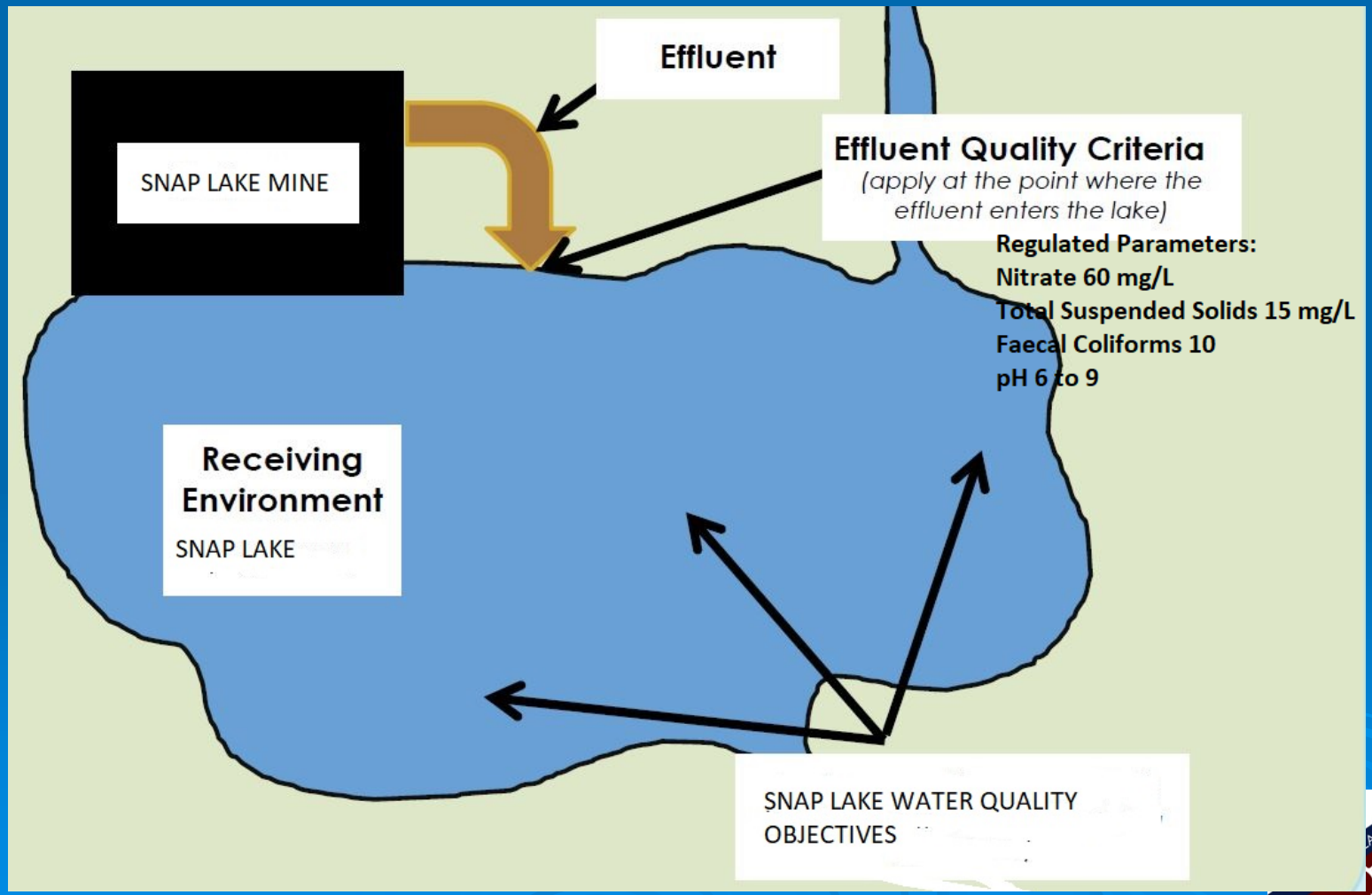
- Proposes Effluent discharge with a higher level of nitrate;

- Proposes to discharge untreated effluent during Closure and Post-Closure;

- EQC for Closure and Post Closure have the same regulated parameters, except for fecal coliform (included for closure)

5. Update of Regulatory Process Issue #1

EQC FOR CLOSURE PROPOSED BY DEBEERS in August 2019 (second submission)



5. Update of Regulatory Process Issue #1

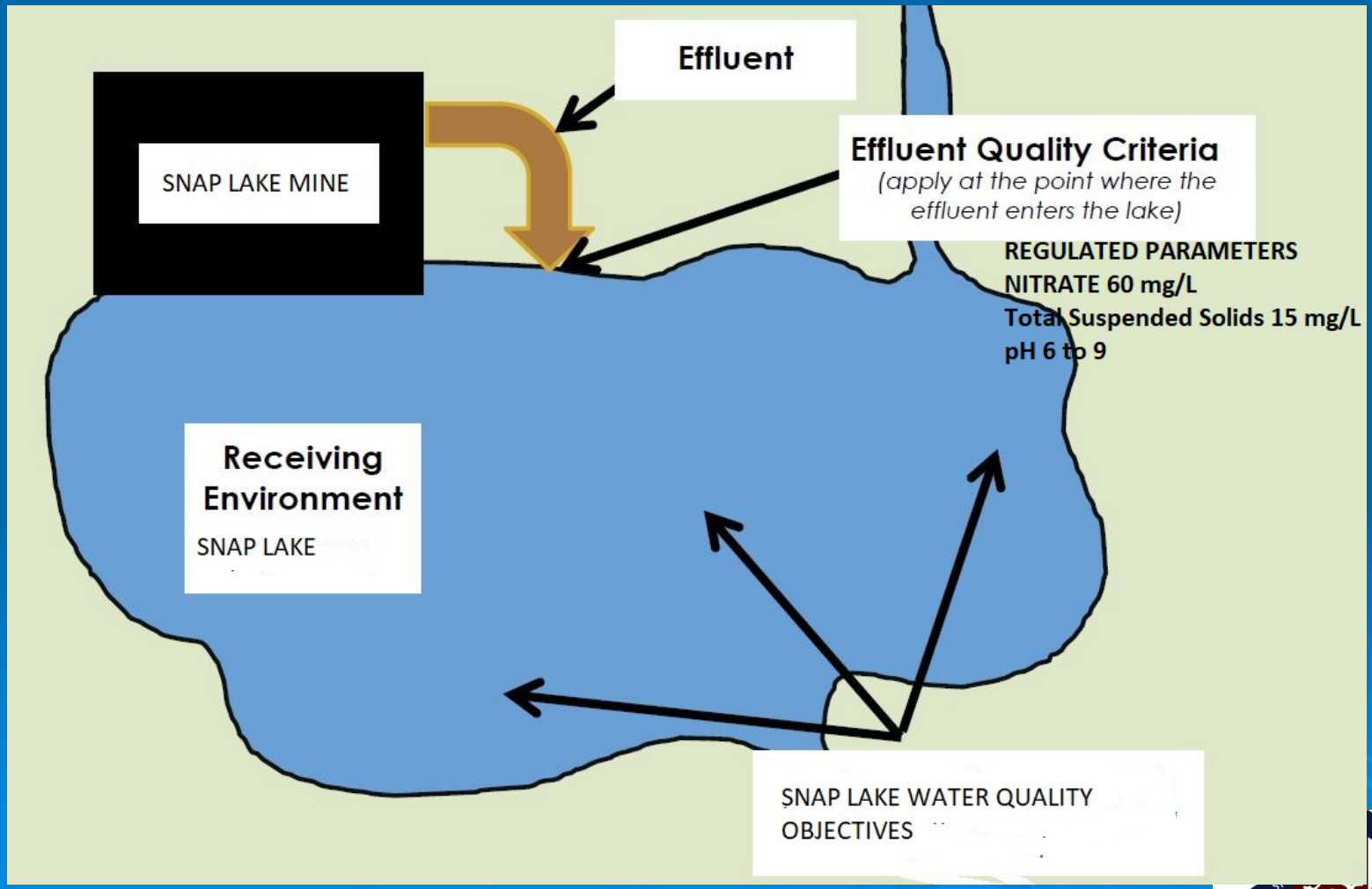
EQC for POST-CLOSURE PROPOSED BY DEBEERS in August 2019

The proposed MAC will ensure that the effluent discharge in the lake has not deleterious effect and that Snap Lake water is safe to drink and safe for aquatic life (Water Quality Objective for Snap Lake)

Parameter	Maximum Allowable Concentration (MAC)
Nitrate	60 mg/L
TotalSuspended Solids - TSS	15 mg/L
pH	6-9
Treatment	Untreated

5. Update of Regulatory Process Issue #1

EQC FOR POST CLOSURE PROPOSED BY DEBEERS in August 2019 (second submission)



5. Update of Regulatory Process – Issue #1

- Unresolved issue – EQC for nitrate proposed by DeBeers

	NITRATE in Effluent – April 2019 Proposal (first submission)	NITRATE in Effluent - August 2019 Proposal (Second submission
Closure	12 mg/L	60 mg/L
Post-Closure	25 mg/L	60 mg/L
Effluent Treatment	YES Reverse Osmosis and Wetlands	NO Treatment

- **At the end of the review period DeBeers stuck with the Nitrate MAC proposed in August 2019 (60 mg/L) and dismissed the first proposal**

5. Update of Regulatory Process – Issue #1

- Unresolved issue – EQC for nitrate proposed by DeBeers
  - According to DeBeers, the discharge of effluent with 60 mg/L of nitrate would still ensure that Snap Lake water is safe to drink and safe for aquatic life (Water Quality Objectives for SL);
  - This assumption is based on calculations of nitrate toxicity;
  - These calculations apply a toxicity modifying factor. That is, when the hardness of the water increases, the toxicity of nitrate decreases

5. Update of Regulatory Process – Issue #1

- Unresolved issue – EQC for Nitrate proposed by DeBeers
  - What is water hardness? Hardness accounts for the dissolved salts of calcium and magnesium in water;
  - According to this, nitrate in the effluent can increase its concentration and still be harmless at higher hardness in the Snap Lake water;

5. Update of Regulatory Process – Issue #1

- Unresolved issue – EQC for Nitrate
  - In other words, at higher hardness (salts of calcium and magnesium) in the lake, nitrate concentration in the effluent discharge can be up to 60 mg/L and the lake's water still be safe to drink and safe for aquatic life;
  - This assumption may be scientifically acceptable but it implies further degradation of the Lake water quality;
  - Therefore, reviewers don't agree to a MAC of 60 mg/L of nitrate in the effluent discharge

5. Update of Regulatory Process – Issue #2 Size of the Mixing Zone

- Unresolved issue #2 – Size of the Mixing Zone

  - When the effluent is discharged into the Snap Lake, it does not completely and instantly mix with the lake water
  - Instead, it forms an “Effluent Plume” starting at the outfall as the Effluent begins to mix with the water Lake
  - The mixing zone is a transitional area within the Lake in which the Effluent discharge is gradually assimilated into the Lake

5. Update of Regulatory Process – Issue #2 Size of the Mixing Zone

- The end of the mixing zone defines the point at which the Lake Water Quality Objectives (WQO) must be met;

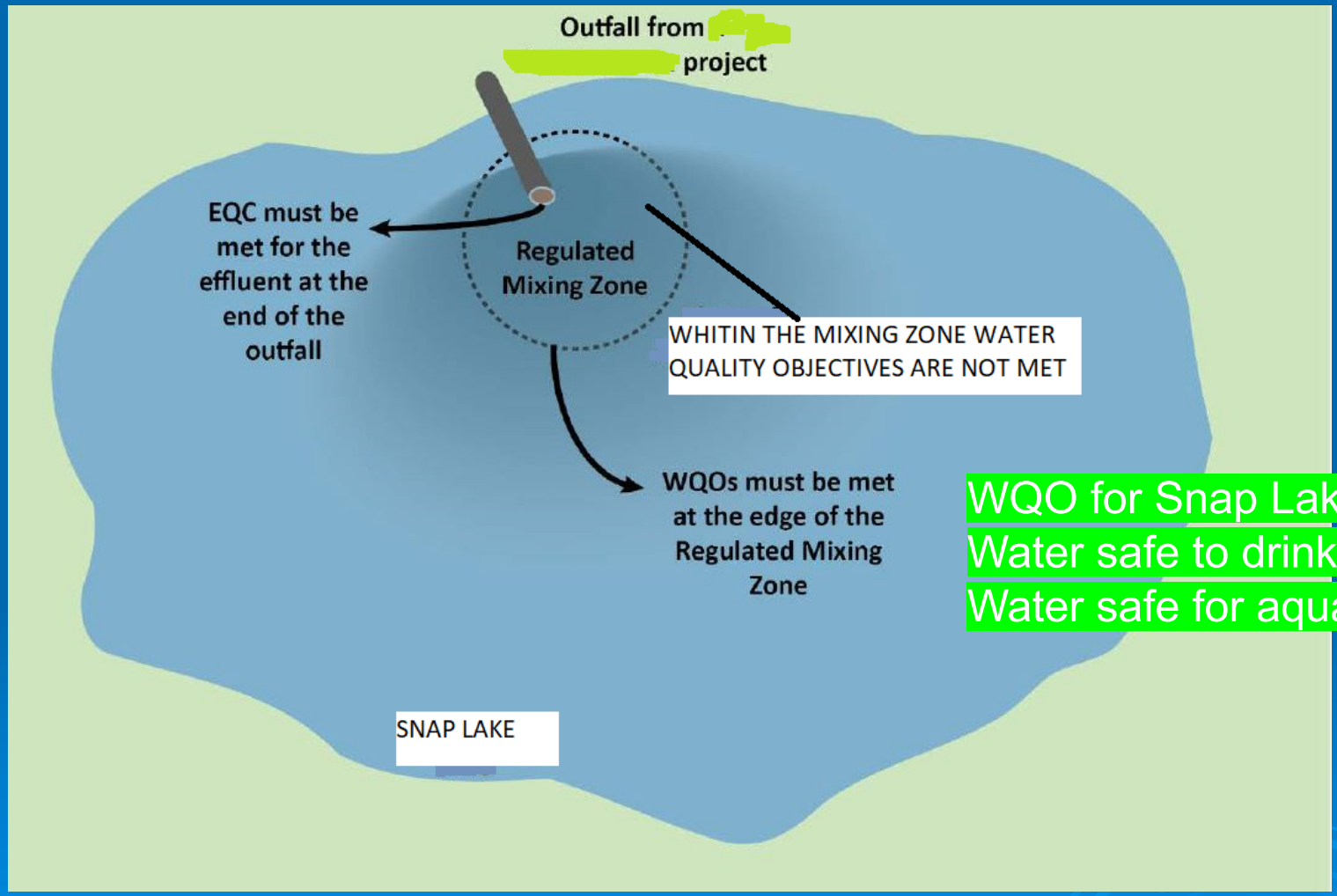
- In – within the area of the Mixing Zone the water lake cannot meet the WQO but the water MUST not be toxic to aquatic life;

- DeBeers proposed a 200 m mixing zone;

5. Update of Regulatory Process – Issue #2 Size of the Mixing Zone

- Reviewers did not agree with the 200 m size of the Mixing Zone;
- The Guidelines state that mixing zones should be as small as reasonably possible (maximum radio of 100 m or 25% of the width of the Lake, whichever is smaller;
- Because of this disagreement, Parties recommended a Plume Delineation Study to be carried out in order to define its size.

5. Update of Regulatory Process – Issue #2 Size of the Mixing Zone



WQO for Snap Lake are
Water safe to drink and
Water safe for aquatic life

Delimitation of Mixing Zone
WQO: Water Quality Objectives

5. Update of Regulatory Process

- OTHER UNRESOLVED ISSUES:

- The removal of most of the SNP monitoring stations as proposed by DB

- The re-submission of the Final Closure Reclamation Plan - FCRP to be revisited by parties

6. Update of Environmental Agreement

- No updates

7. SLEMA ACTIVITIES UPDATE

- 1) SLEMA Participated in the Regulatory Process: On Jan 30 SLEMA submitted comments and recommendations on the Water Licence and Land Use Permit drafts. Main topics commented by SLEMA were:

  - Final Closure and Reclamation Plan;
  - Effluent Quality Criteria for Closure and Post-Closure;
  - Waste management at site and landfill management;

7. SLEMA ACTIVITIES UPDATE

Main topics commented by SLEMA were (Cont.):

- SNP monitoring stations;
- Monitoring frequency;
- Water Licence Definitions related to Mine Closure;
- Recommended topics on the Final Closure Report to be submitted by DeBeers at the end of the Closure Period

7. SLEMA ACTIVITIES UPDATE

- 2) SLEMA reviewed monthly SNP reports submitted by DeBeers and found them sound and according to the regulatory requirements with no major issues.