

# 2018-2019 ANNUAL REPORT

Technical Language

INDEPENDENT ENVIRONMENTAL  
MONITORING AGENCY

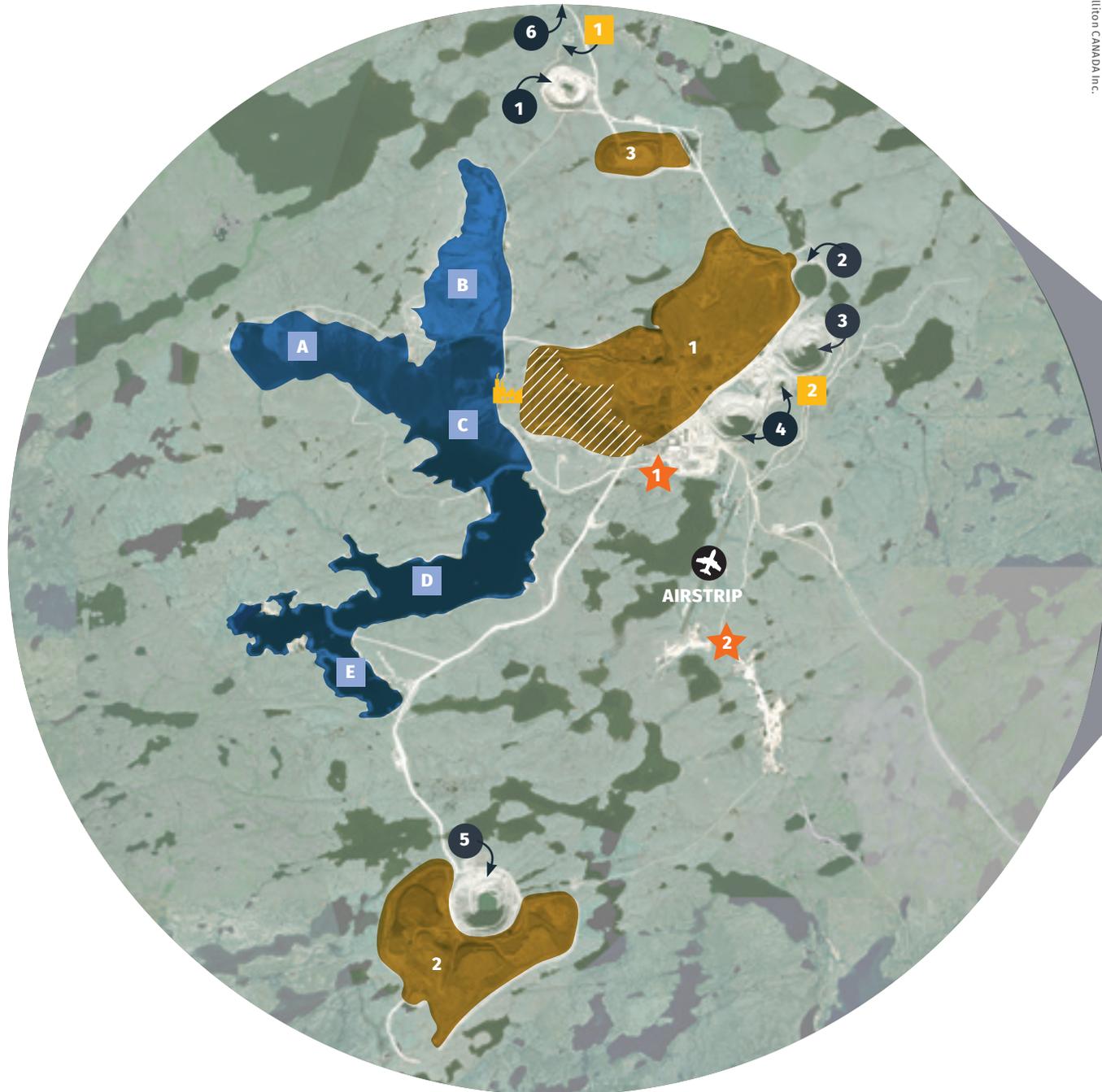


A public watchdog for environmental management at EKATI DIAMOND MINE

# EKATI DIAMOND MINE

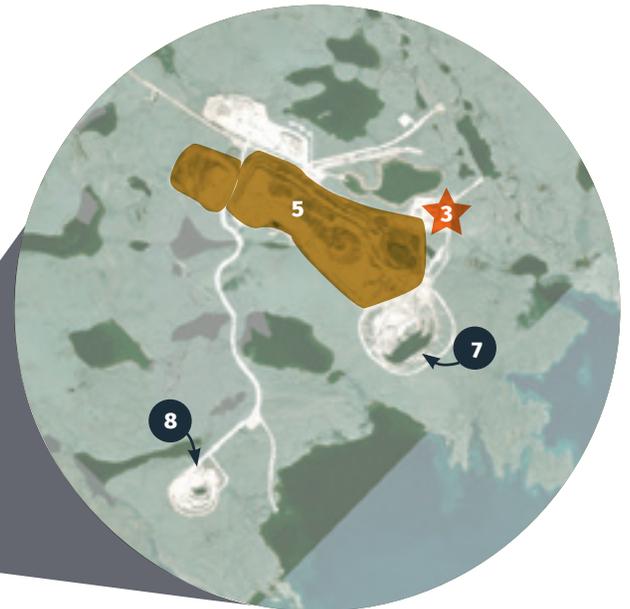
## LEGEND

-  1 WASTE ROCK PILE (PANDA-KOALA-BEARTOOTH WRSA)
-  2 WASTE ROCK PILE (FOX WRSA)
-  3 WASTE ROCK PILE (PIGEON WRSA)
-  4 WASTE ROCK PILE (SABLE WRSA)
-  5 WASTE ROCK PILE (MISERY AND LYNX WRSA)
-  6 WASTE ROCK PILE (PROPOSED JAY WRSA)
-  COARSE KIMBERLITE REJECTS STORAGE AREA
-  1 PIGEON PIT
-  2 BEARTOOTH PIT
-  3 PANDA PIT
-  4 KOALA AND KOALA NORTH PIT
-  5 FOX PIT
-  6 SABLE PIT
-  7 MISERY PIT
-  8 LYNX PIT
-  9 JAY PROJECT (PROPOSED)
-  LONG LAKE CONTAINMENT FACILITY (CELLS A-E)
-  INCINERATORS
-  1 PIGEON STREAM DIVERSION
-  2 PANDA DIVERSION CHANNEL
-  1 MAIN SITE
-  2 OLD CAMP
-  3 MISERY CAMP
-  AIRSTRIP





- NORTHWEST TERRITORIES
- NUNAVUT



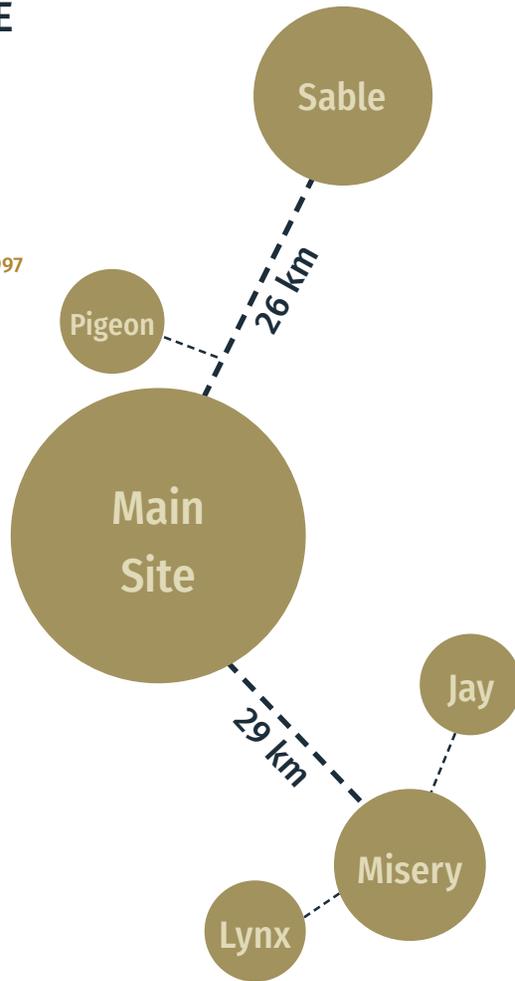
# LAND DISTURBANCE AND ROAD LENGTH

## LAND DISTURBANCE

### EKATI MINE



Direct habitat loss caused by the Ekati mine project since 1997  
**38 km<sup>2</sup>**



## LAND DISTURBANCE

### YELLOWKNIFE



City of Yellowknife estimated footprint (area shaded brown)  
**30 km<sup>2</sup>**



Total roads at Ekati

**141 km**



LAND DISTURBANCE

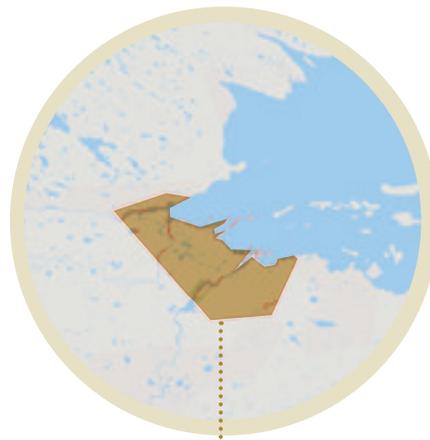
**BEHCHOKÒ**



Behchokò estimated footprint (area shaded brown)  
**2.4 km<sup>2</sup>**

LAND DISTURBANCE

**KUGLUKTUK**



Town of Kugluktuk estimated footprint (area shaded brown)  
**2.5 km<sup>2</sup>**

	Approx Land Disturbance	How much bigger is the Ekati mine?
YELLOWKNIFE	30 km <sup>2</sup>	x 1.3
KUGLUKTUK	2.5 km <sup>2</sup>	x 15
BEHCHOKO	2.4 km <sup>2</sup>	x 16
CAMBRIDGE BAY	1.6 km <sup>2</sup>	x 24
ŁUTSELK'E	1.3 km <sup>2</sup>	x 29
WHATI	0.8 km <sup>2</sup>	x 47
GAMETI	0.8 km <sup>2</sup>	x 47
WEKWEETI	0.5 km <sup>2</sup>	x 76

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## MESSAGE FROM THE CHAIR

I am pleased to present the 2018-19 annual report of the Independent Environmental Monitoring Agency (Agency). The report summarizes the Agency's activities and offers recommendations for Dominion Diamond Mines ULC (Dominion) and for regulators.

2018 marked 20 years of production at the Ekati mine and the company commemorated with a celebration in August at the mine site and in Yellowknife. The Agency congratulates Dominion on this significant achievement.

The major focus for the Agency over the past year has been participating in the review of Interim Closure and Reclamation Plan (ICRP) v3.0. This document has not been revised since 2011, and recognizing the importance of closure of the mine to our Aboriginal Society Members, the Agency travelled to five communities to host Information Sessions where we presented a summary of the ICRP. These sessions not only informed the community members about what is in the document and the Agency's concerns, but also provided an opportunity for open discussion and for the Agency to hear community concerns. As part of the review process the Agency also participated in the WLWB-sponsored technical workshop and provided comments and recommendations to the WLWB including a recommendation that the ICRP v3.0 should not be approved in its current form as the plan lacks detail in many important areas.

This past year the Agency also participated in the review and evaluation of a number of important documents providing comments on the 2017 Air Quality Monitoring Program Report, Dust Suppressant Pilot Study Report (2016/17), Sable Waste Rock Storage Area Design Plan, Waste Water Processed Kimberlite Management Plan and Waste Rock and Ore Management Plan Version 9.0 and 10.0. Our main concerns and recommendations focused on seepage, risk mitigation for potentially acid generating waste rock, the use of the term "non-acid generating", and the use of diabase as a construction material on site.

Over the next year the Agency will continue to review and provide recommendations on Dominion's environmental management and monitoring plans and activities to ensure that there is good environmental performance at the mine site. Please feel free to contact the Agency at any time with your comments and concerns, or if you wish for us to visit your community.

**Jaida Ohokannoak**

[www.monitoringagency.net](http://www.monitoringagency.net)



# RECOMMENDATIONS & RESPONSES

 Each year the Agency provides recommendations to Dominion Diamond Mines ULC, the Wek'èezhìi Land and Water Board, and applicable federal and territorial government departments based on the review of information and comments from the past 12 months.

This section includes Agency recommendations from the past year and the responses we received to those recommendations.

## TO WEK'ÈEZHÌI LAND AND WATER BOARD

### Waste Rock – Effective Neutralizing Potential

#### RECOMMENDATION

# 1

*The Wek'èezhìi Land and Water Board undertake a review to determine the most effective and efficient approach to testing and determining the neutralization, acid rock drainage and metal leaching potential of waste rock at the Ekati mine and other northern mine sites.*

### Wek'èezhìi Land and Water Board Response

The Wek'èezhìi Land and Water Board (WLWB or the Board) met on June 13, 2019 and considered the Independent Environmental Monitoring Agency (IEMA)'s May 27, 2019 e-mail (see attached). IEMA identified that its upcoming Environmental Agreement Annual Report will include a recommendation for the WLWB regarding effective neutralizing potential (NP) at the Ekati mine site, and requested the Board provide a response to be incorporated into its Annual Report.

The Board is aware that IEMA has raised similar concerns previously, including in its comments on the WROMP Version 9.0<sup>1</sup> and 10.0<sup>2</sup>. The Board has communicated that it agrees “additional discussion of effective NP for all waste rock at the Ekati mine site is warranted” and previously directed Dominion to discuss the use of effective NP in the interim Closure and Reclamation Plan (ICRP) Version 3.0<sup>3</sup>. In addition, the Board has stated that “given the ongoing review of the Effective NP [Memorandum] and the ICRP Version 3.0, it is most appropriate to consider any necessary actions (e.g., expert review, technical workshop, resulting WROMP revisions) in consideration of the ICRP Version 3.0.”<sup>4</sup>

IEMA has referenced the technical memorandum submitted by Dominion as part of the ongoing ICRP Version 3.0 proceeding, however, the Board understands that IEMA's recommendation to the WLWB was not provided as part of a specific proceeding. As a matter of procedural fairness, the Board cannot respond to a recommendation on a proponent's submission outside of the proceeding for that submission.

<sup>1</sup> See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP - Version 10.0 - Review Summary and Attachments - Mar 22\_19.pdf; IEMA comment 3 and 4

<sup>2</sup> See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP V9 and Sable WRSA Design Report V2 - Review Summary and Attachments - Jun 4\_18.pdf; IEMA comment 3

<sup>3</sup> See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP - Version 9.0 - Board Directive and RFD - June 27\_18.pdf

<sup>4</sup> See WLWB Online Registry for W2012L2-0001 - Ekati - WROMP - Version 10.0 - Reasons for Decision - Apr 24\_19.pdf



Photo courtesy of Dominion Diamond Mines ULC

## TO DOMINION DIAMOND MINES ULC

### Waste Rock – Adaptive Management Strategy for Seepage

#### RECOMMENDATION

## 2

*Dominion should develop and implement an adaptive management strategy for seepage from waste rock storage areas that defines appropriate monitoring indicators, benchmarks and response plans.*

#### Dominion Response

Dominion believes that adaptive management is an appropriate approach to managing WRSA seepage and have implemented adaptive management on a continuous basis. The current Waste Rock and Ore Management Plan (WROMP) V.10.0 contains the most recent iteration of the Waste Rock Storage Area (WRSA) Seepage adaptive management process, which was developed by Dominion in 2018. This process provides an appropriate and effective system that ensures continued protection of the Receiving Environment in a transparent manner and addresses the recommendations raised by IEMA.

Updated seepage quality screening criteria, as described in the Ekati mine's WROMP, are designed to prevent negative impacts on the Receiving Environment. The screening criteria are conservative, based on current information, and increase the transparency of seepage management at the Ekati mine. The screening criteria are conservative because they are applied where the sample is collected, which in most cases is at the toe of the WRSA (i.e., as compared to the point of entry to the Receiving Environment). This means that many factors that could mitigate the potential effects of seepage, such as attenuation, are not taken into account when considering the adaptive

management of any particular seep. These criteria are used in conjunction with Seepage Monitoring Reports to verify or identify Seeps of Potential Concern, summarize response actions that are already underway, and identify appropriate additional response actions. Dominion anticipates that where appropriate, screening criteria may continue to be refined going forward, on the basis of new scientific research, continued data collection and professional judgement.

It should be noted that the implementation of screening and response programs for WRSA seepage is not new at the Ekati mine. Dominion has undertaken numerous actions in direct response to observed seepage quality and a number of response actions are actively being implemented by Dominion, which include:

- Silt curtains in seepage flow paths;
- Increased frequency of monitoring;
- Focused intensive flow monitoring programs;
- Monitoring of the local Receiving Environment;
- Refined identification of Receiving Environments;
- Mapping of seepage flowpaths; and
- Refinement of seepage data analysis, interpretation and screening.

## Aquatics

### RECOMMENDATION

# 3

*Given the exceedance of Health Canada guidelines of mercury in lake trout in Kodiak Lake, the Agency recommends that Dominion should:*

- I. Investigate and report on the source of mercury contamination of trout in Kodiak Lake within the next year, and*
- II. Increase the frequency of non-lethal contaminants monitoring of trout in Kodiak Lake.*

## Dominion Response

As specified in the current Ekati mine Water Licence W2012L2-0001, Schedule 8, Condition 4c, the Response Plan (i.e., for fish) will include “a description of likely causes of the Action Level exceedance”. The timeline for submission of the Fish Response Plan Version 1.3 is 31 October 2019, as approved by the Wek’èezhìi Land and Water Board (the Board). The Aquatic Response Framework and associated Aquatic Response Plans do allow for the implementation of special studies where and when applicable however, Dominion understands the appropriate place to address frequency of constituent monitoring in the Receiving Environment is the AEMP Re-evaluation, which is due to be finalized and submitted to the Board in December 2019.

## Wildlife

### RECOMMENDATION

# 4

*Dominion should intensify efforts to document specific measurable thresholds that trigger wildlife management activities (i.e., intensified mitigation), and to conduct and document follow-up monitoring to determine effectiveness.*

## Dominion Response

Wildlife management activities undertaken at the Ekati Diamond Mine have evolved throughout the life of the mine, based on engagement, monitoring program results and the subsequent adaptive management decisions made over a number of years (See Adaptive Management Decision Tree for the Ekati Diamond Mine, Figure 2.2-1 in the approved Wildlife Effects Monitoring Plan, 2017).

In most cases, the trigger for wildlife management activities is the observation and/or reporting of wildlife to the Environment Department by site personnel (i.e., site wildlife notifications). The procedures (i.e., Wildlife Protection Fatal Risk Control Procedures), program work instructions, site-wide policies, and WEMP Plan that Dominion has in place dictate other management actions (i.e., short and long-term road closures required as per

the Caribou Road Mitigation Plan, work stoppage procedures in work instructions, and training/ presentations for onboarding or to meet annual training requirements i.e., grizzly bear safety training). These controls are in place to ensure the safety of wildlife and site personnel alike.

The most appropriate way to measure the success of the management actions is to evaluate the number of management actions undertaken (i.e., 515 actions in 2018) relative to the number of mortalities (14) and incidents (25) that occurred for the same period. Arguably, for each occasion where wildlife were observed that did not result in a human-wildlife interaction or incident, the management action was successful. Understanding the cause and effect and extent to which controls and mitigation measures directly influence the outcome of each management action is not possible.

**Wildlife**

RECOMMENDATION  
**5**

*Dominion should integrate analysis of caribou monitoring techniques (such as incidental sightings with collar movements and road surveys) for management and to determine relative efficiency and spatial coverage of monitoring.*

**Dominion Response**

Dominion agrees that it could be useful to combine the caribou collar locations (especially geo-fence collar data), road traffic data, road survey data and camera data into an integrated analysis. However, the actual practice of combining all of these different data in a way that produces ecologically relevant results is an extremely complicated process to undertake. Dominion is open to any suggestions from IEMA regarding processes by which all of this information could be integrated to provide results that would inform the assessments of the effectiveness of mitigations or provide ecologically meaningful results to inform onsite and range wide management of caribou.

**Recommendation Themes + Recipients Overview**

The Agency provides recommendations every year to relevant parties (Dominion Diamond Mines ULC, the Wek’èezhìi Land and Water Board, and applicable federal and territorial government departments) based on the review of information and comments from the past 12 months. Figure 1 provides an overview of the general themes and topics our annual recommendations have covered over the past 21 years.

RECIPIENTS	# OF RECOMMENDATIONS
Dominion Diamond Ekati ULC (proponent)	102
Government (GNWT, Government of Nunavut, Government of Canada)	21
Water Boards (NWT Water Board, Mackenzie Valley Land and Water Board, and Wek’èezhìi Land and Water Board)	12
Environmental Agreement signatories	3
Aboriginal Society Members and Dominion Diamond	3
Aboriginal Society Members	1
All Agency Society Members	1
<b>Total</b>	<b>134</b>

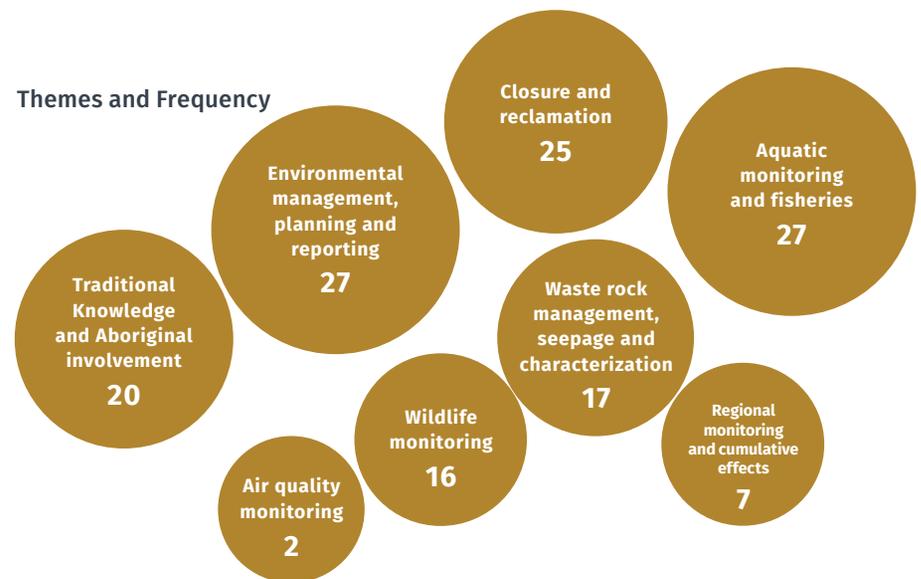


Figure 1: Agency Recommendation Themes 1997-2018

# CURRENT CONDITIONS & EXPLORATION

## HIGHLIGHTS

-  The Jay Project was postponed by Dominion pending completion of project mining optimization studies.
-  Exploration continued on specific drill targets on the Ekati mine claim block, as well as long term programs at Glowworm Lake and near Courageous Lake.



# MINE UPDATE

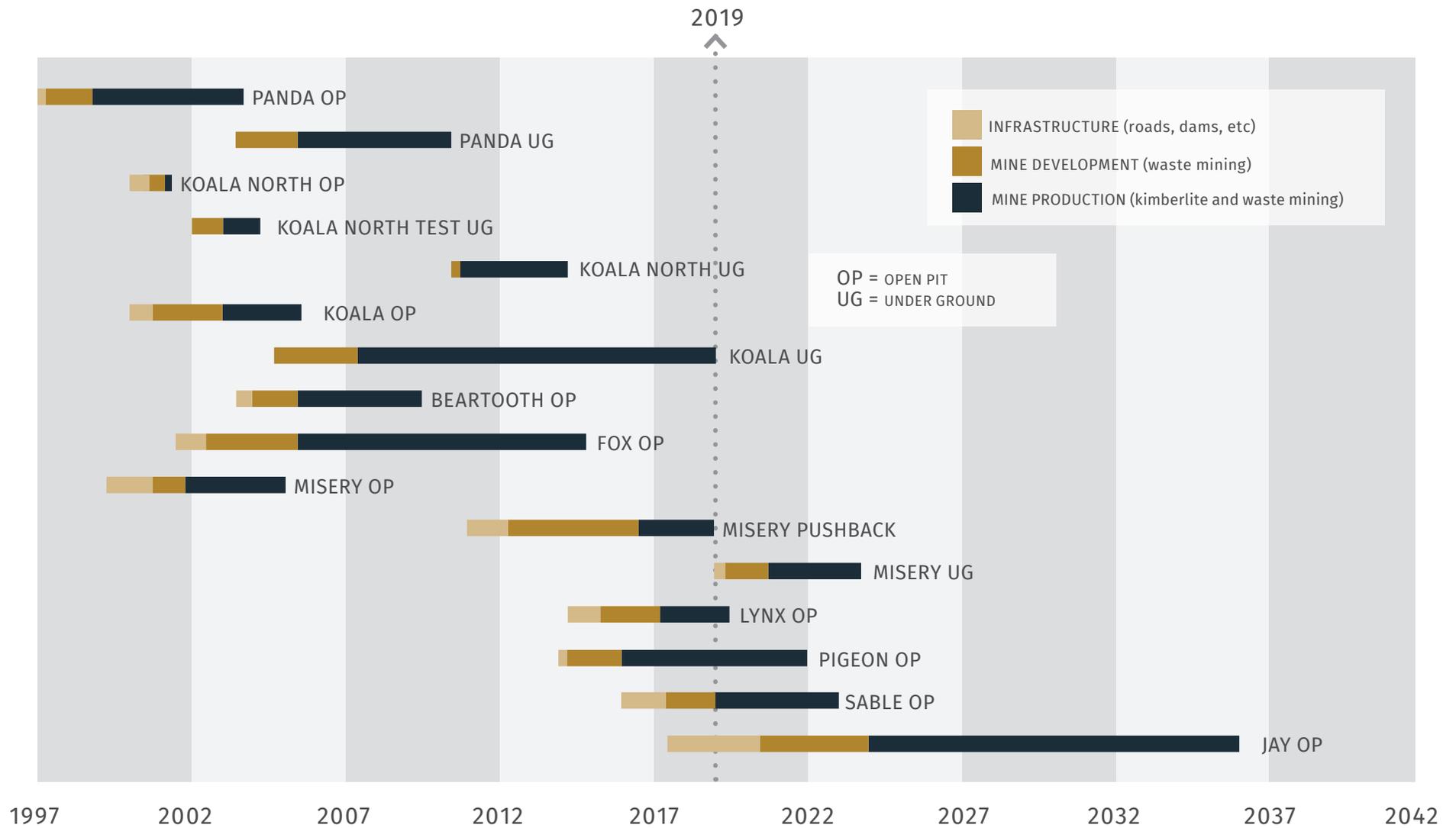


Figure 2: The Ekati Diamond Mine: Life of Mine Plan

## JAY PROJECT

Jay Pipe is located on the west side of Lac du Sauvage, about 6 km northeast of Misery Pit. Mining of Jay pipe would require construction of a horseshoe shaped dike in Lac du Sauvage to isolate the ore body from the lake, pumping of water within the diked area to Lac du Sauvage and Misery pit, and removal of overburden.

In May 2018, Dominion postponed all work related to the Jay Project, pending consideration of the results of the mining optimization study of the project. If development does proceed, the Jay Project is expected to extend the current end of mine life at the Ekati mine by approximately 10 years.

## Misery Underground (UG)

Dominion applied for a water license amendment for underground mining of Misery pit in August 2017. The NWT Minister of Environment and Natural Resources approved the amendment on August 24, 2018.

Mining of Misery pit ended in March 2018. Development of the underground mine development started in July 2018 and is ongoing. Mining of ore at Misery UG is expected to start in early 2020.

## EXPLORATION FOR NEW ORE BODIES

Ongoing mineral exploration by Dominion during 2018/19 included drilling at various locations on the main the Ekati mine claim blocks. The 2018 program included 6 sites near Main Camp, and 10 large diameter holes in Horseshoe Lake and Point Lake located near Misery pit. A further 48 holes were drilled at various main claims block locations.

Longer term exploration programs were also active further afield in the Glowworm Lake area (65 km east of the Ekati mine main camp) and near Courageous Lake. The 2017-22 Glowworm Lake program has been permitted for up to 200 drill locations, with 25 bulk ore samples per year. The Courageous Lake 5 year drill program was extended to 2020. Summer 2018 drilling included 31 large diameter and 7 diamond drill holes. Dominion intends to conduct further drilling in summer 2019 at various locations.

## AGENCY ASSESSMENT

The Agency believes that development of kimberlite pipes in new areas of exploration represents a significant geographical expansion of mine operations. This year's exploration activities included drilling within the Ekati mine claim block as well as sites further east of the Ekati mine (Glowworm and Courageous Lakes). The Agency continues to monitor exploration activities in order to track potential future developments.



Photo courtesy of Dominion Diamond Mines ULC



# AGENCY ACTIVITIES

## HIGHLIGHTS

-  The Agency participated in 18 Wek'èezhìi Land and Water Board review processes over the last year.
-  Community Information Sessions were held in five NWT and Nunavut communities to discuss the proposed Ekati Interim Closure and Reclamation Plan V 3.0.
-  Conducted our annual site visit to the Ekati mine in September of 2018.

## ACTIVITIES 2018-19

The Agency held three board meetings in Yellowknife during the 2018-19 fiscal year and our Annual General Meeting in December of 2018. Due to lack of quorum at the Annual General Meeting, a Special Meeting of Society Members was held on December 13, 2018 to complete official business and consider formal motions, including retaining the services of a financial auditor.

In conjunction with our 101<sup>st</sup> Board Meeting, the Agency conducted our annual site visit to the Ekati mine on September 18, 2018. The Agency needed to prioritize its time on site due to a one-day site visit. Observations included the Sable Road and pit (highlighting constructed caribou crossings on the road), the waste facility (where we saw how the site composts its organic waste and sorts recycling), the Long Lake Containment Facility, including reclamation plots, and the Panda Diversion Channel.

The Agency was invited by the community of Łutsël K'é to participate in a community career fair in June of 2018. Beyond interacting with children and adults alike at the career fair, the visit enabled Director Tim Byers to update members of Łutsël K'é Dene First Nation's (LKDFN) Lands and Environment Committee. A highlight of this community visit included presenting the translated Agency video to community members for the first time in the Chipewyan language.

A highlight of the Agency's activities this year was holding public Information Sessions in five Society Member communities to provide participants with an update on Dominion Diamond Mines ULC's (Dominion) closure and reclamation planning, specifically the proposed update of the Interim Closure and Reclamation Plan (ICRP). The ICRP is a complex and long



Agency site visit to the Ekati mine, September 2018.

document, and for Society Members to effectively participate in the formal review process and January 2019 Technical Workshop the Agency created a summary presentation and outreach materials to take to communities. Agency Staff and selected Directors visited five communities during January: Whatì, Behchokò, Dettah, Łutsël K'é, and Kugluktuk. The goal was not only to inform community members of what was in the proposed ICRP v3.0, but also to encourage participation in the commenting period through the WLWB. More generally, it is always beneficial for the Agency to bring information directly to Society Member communities, as it helps to strengthen relationships and increase communication.

For more information on the Agency's community engagement, see the *Traditional Knowledge and Engagement* chapter in this report.

## TECHNICAL REVIEW AND INPUT

The Agency participated in 18 reviews over the last year.

**Waste Rock and Ore Management Plan Versions 8.0, 9.0 and 10.0** – The Agency had a number of concerns regarding proposed updates to the Waste Rock and Ore Management Plans (WROMPs). Spanning all updated versions, the Agency's concerns involved seepage quality, risk mitigation for potentially acid generating waste rock, the specific method used by Dominion to determine the acid generating potential of waste rock, including diabase, and using diabase from Lynx pit as a construction material. For more information on WROMPs, see the *Waste Rock Management* chapter in this report.

**Interim Closure and Reclamation Plan, Version 3.0** – The Agency made a substantial submission to the WLWB on the proposed updated Interim Closure

and Reclamation Plan, Version 3.0 (ICRP V 3.0). Overall, we concluded the document should not be approved in its current form as it lacks sufficient detail in many important areas. These areas include numerical closure criteria for water, hydrocarbon contaminated soil and Waste Rock Storage Area (WRSA) seepage, closure designs for wildlife, water quality predictions, open pit littoral zones and WRSA thermal and water quality monitoring.

The Agency’s full submission can be viewed on the WLWB Online Review System at: <https://bit.ly/2UH44pq>. To read more about the Agency’s work on this topic, see the *Closure and Reclamation* chapter in this report.

**Studies and Reports** – The Agency provided comments on numerous other reports and proposed plans at the Ekati mine in 2018-19 including:

- 2017 Wildlife Effects Monitoring Program Report (August 1, 2018)
- 2017 Aquatic Effects Monitoring Program Report (September 11, 2018)

- Dust Suppressant Pilot Study Report (September 14, 2018)
- Response Framework Version 3.0 (October 4, 2018)
- Wastewater and Processed Kimberlite Management Plan V 8.0 (November 29, 2018)
- Panda & Koala Deposition Study (November 29, 2018)
- Ekati - Cujo Lake Outflow Special Study Design - V 1.0 (March 26, 2019)

## AGENCY COMMUNICATIONS

**Website** – The Agency’s website continues to improve as resources are added and design changes are made. The most notable update was reconfiguring how our listed information is viewed. Information is now easily sortable in accordion-style drop down menus, making each page more accessible.

**The Ekati mine Timeline** – A central feature of the IEMA website, the Ekati mine Timeline has been overhauled and redesigned with a more pleasing look and a more navigable format. The Timeline

continues to be added to and tailored based on community and public interests.

**Social Media** – The Agency’s presence on social media continues to see more interaction with followers. Facebook follower numbers are increasing, and interaction with followers is becoming more consistent. Expanding to increase the Agency’s presence on Twitter is the next step.

**The Ekati mine Monitor** – The Agency published one issue of our newsletter this year. The design has been revamped to have a sleeker look, for an easier and more enjoyable read. The format is also being converted to a digital format, so those who sign up on the Agency’s website will receive the newsletter in their inbox. It should be noted that the distribution list for the Ekati mine Monitor was updated, and certain high schools in the north have requested more copies of the twice-annual newsletter for science classes and reading activities.

Date and Location	Purpose	Main Issues
April 24-26, 2018 Yellowknife, NT	Slave Geological Province Regional Wildlife Monitoring Workshop	Hosted by GNWT’s ENR – Wildlife Division, Marc Casas, Kim Poole, and Ron Allen attended this workshop. The workshop is part of a series of on-going workshops held annually or bi-annually since 2009 to discuss and set objectives for wildlife monitoring conducted primarily by the diamond mines and government. The focus is typically on sharing results of monitoring activities, harmonizing monitoring objectives and the development of monitoring protocols.
May 1-3, 2018 Yellowknife, NT	Annual Report Writing Session	Directors and staff gathered to review assigned chapters and discuss the content of our 2018-2019 Annual Report.
September 18, 2018 Ekati Diamond Mine	Site Visit to Ekati	Annual site visit to the mine site. Itinerary had to be prioritized, as the visit was reduced to a day trip. See “Activities 2018-2019” section for more details.
September 19-20, 2018 Yellowknife, NT	Agency Board Meeting	Following our annual Ekati site visit, the Agency held its 101st board meeting.

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<b>Date and Location</b>	<b>Purpose</b>	<b>Main Issues</b>
<i>December 4-5, 2018</i> Yellowknife, NT	<b>Agency Board Meeting</b>	Leading up to the Annual General Meeting, the Agency held its 102nd board meeting.
<i>December 5, 2018</i> Yellowknife, NT	<b>Annual General Meeting</b>	Quorum not met for motions or votes – deferred to Special Meeting of Society Members. Directors were acclaimed in their executive roles.
<i>December 13, 2018</i> Yellowknife, NT & conference call	<b>Special Meeting of Society Members</b>	Quorum met – required motions made and moved.
<i>January 8, 2019</i> Whatì, NT	<b>Whatì ICRP Info Session</b>	34 people attended the session at the Community Hall in Whatì.
<i>January 10, 2019</i> Yellowknife, NT	<b>Informal ICRP Discussion with NSMA</b>	Regulatory Analysts with the North Slave Metis Association met with IEMA staff to discuss Version 3.0 of the ICRP.
<i>January 10, 2019</i> Dettah, NT	<b>Dettah ICRP Info Session</b>	15 people attended the session held at Chief Drygeese Centre in Dettah.
<i>January 14, 2019</i> Behchokò, NT	<b>Behchokò ICRP Info Session</b>	IEMA discussed the ICRP with 33 attendees at the Community Hall in Behchokò.
<i>January 22-23, 2019</i> Yellowknife, NT	<b>Ekati Interim Closure and Reclamation Plan – Version 3.0 Technical Workshop</b>	This workshop was designed through the WLWB’s hope that an open and collaborative discussion would increase each party’s understanding of the issues and the perspectives of others as parties prepared to submit comments and responses on Version 3.0 of the ICRP.
<i>January 28, 2019</i> Kugluktuk, NU	<b>Kugluktuk ICRP Info Session</b>	23 people joined the session at the Community Hall in Kugluktuk, NU.
<i>February 5, 2019</i> Łutselk’e, NT	<b>Łutselk’e ICRP Info Session</b>	30 people attended the session at the Community Hall in Łutselk’e.
<i>February 15, 2019</i> Yellowknife, NT	<b>Requested Meeting with Tlicho Reps</b>	Follow up from the ICRP Community Info Sessions
<i>March 5-6, 2019</i> Yellowknife, NT	<b>Agency Board Meeting</b>	The 103rd board meeting was held in Yellowknife. The board discussed the upcoming annual report writing session.

Table 1. Main Agency Activities 2018-19



# WILDLIFE EFFECTS

## HIGHLIGHTS

- 🐾 3,347 caribou were observed at the mine in 2018, which included caribou from the Beverly/Ahiak and Bathurst herds during the winter.
- 🐾 Under general wildlife management actions and the Caribou Road Mitigation Plan, roads were closed and blasting deferred or cancelled on 20 occasions to reduce exposure to caribou.
- 🐾 Dominion should intensify efforts to integrate and analyze the monitoring used to link specific thresholds to trigger a management activity (intensified mitigation) and subsequent monitoring to determine effectiveness.

## ACTIVITIES 2018-19

Dominion's Wildlife Effects Monitoring Program (WEMP) documents wildlife presence and wildlife management responses at the Ekati mine. There is less detailed reporting on the effectiveness of wildlife mitigation. The 2018 WEMP is the 21st annual report and focuses on wildlife habitat and caribou, grizzly bears, wolves, wolverines, foxes, raptors and breeding birds. The report has detailed compilations of incident reports and road surveys, caribou behavioural surveys and pit nesting surveys. However, the camera sightings will not be reported until 2020 and the use of the caribou collars is limited. Monitoring the operation of the 69 kV Misery Road power line is in its second year. Intensive efforts – daily road surveys – were undertaken as part of general monitoring and for the Caribou Road Management Plan (CRMP) and led to road closures to traffic and delays in blasting.

### The Ekati Mine Footprint

An additional 183 ha of surface area of habitat were disturbed at the Ekati mine due to mine development and operations during the 2018 reporting period, including development of the Lynx, Pigeon and Sable pits, and transitioning of Misery Pit to Misery Underground. The total amount of direct habitat loss caused by the project footprint since 1997 is now 3,819 ha (38 km<sup>2</sup>). As of 2018, 141 km of roads have been constructed.

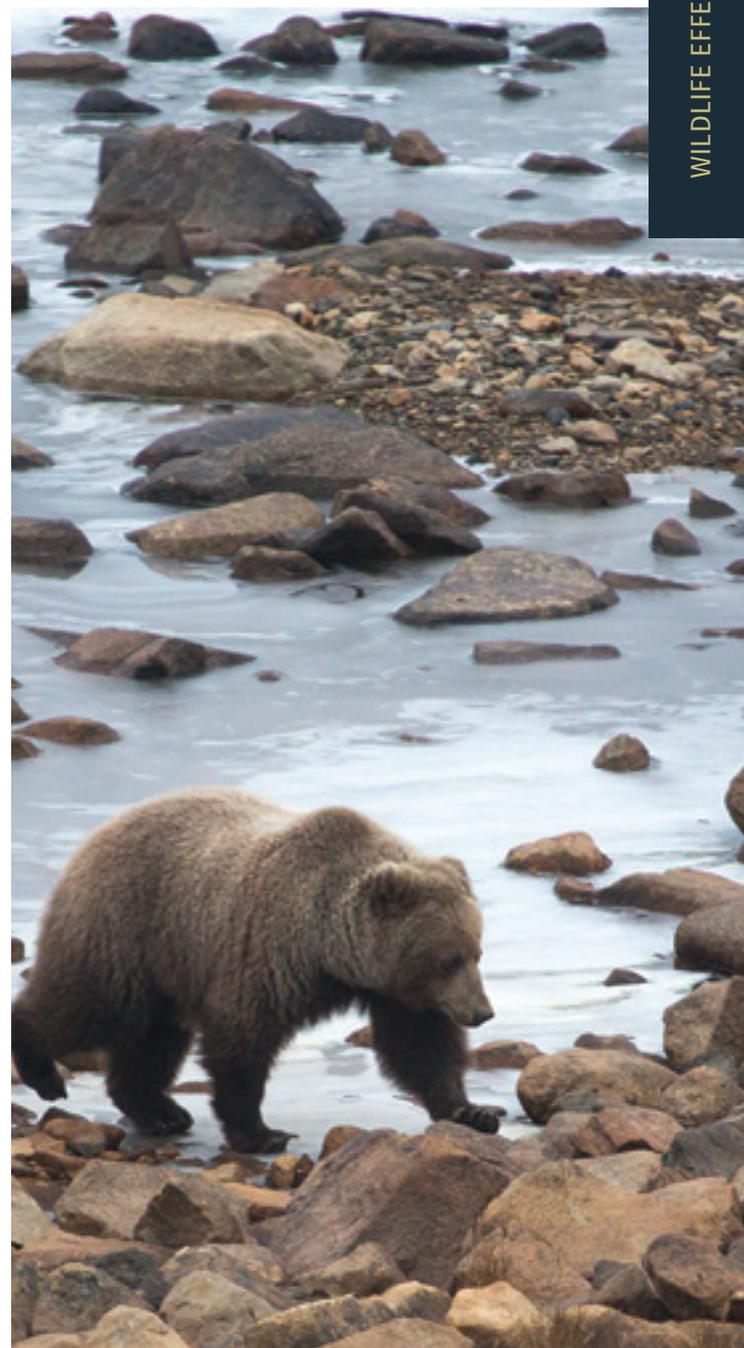
### Waste Management

Dominion continues its efforts to improve waste management practices and reduce attractants at landfills, to reduce wildlife incidents, and to deter wildlife from areas of danger (e.g., airstrip, high traffic areas, active pits). Intensified efforts to educate employees about the need for effective waste management disposal practices at the mine site has worked as overall occurrence of wildlife

attractants or misdirected wastes (e.g., food, food packaging, and oil-related waste) and the percent of surveys with wildlife sightings in 2018 are among the lowest recorded. Over one million kg of solid waste was shipped off site and 200,000 kg of biodegradable material was composted, the latter saving nearly 300,000 l of diesel fuel.

### Wildlife Incidents and Mortalities

Wildlife incidents involve direct interaction between wildlife and humans or infrastructure. There were 25 wildlife incidents reported at the Ekati mine over the last year, including 17 involving grizzly bears, higher than numbers reported from 2011 to 2017 (1-9 annually). Ten of the incidents involving grizzly bears required use of deterrents. Reports of caribou near mine infrastructure resulted in increased alert levels and on 14 occasions, work stoppages or temporary road closures. On six occasions, blasting at pits was postponed or cancelled due to the presence of caribou within 1 km. The number of vehicle-related wildlife mortalities reported during 2018 was lower than recent years (three Arctic hare and one ptarmigan). No caribou mortalities as a result of mine activities have occurred in recent years.



Grizzly, photo courtesy of Dominion Diamond Mines ULC

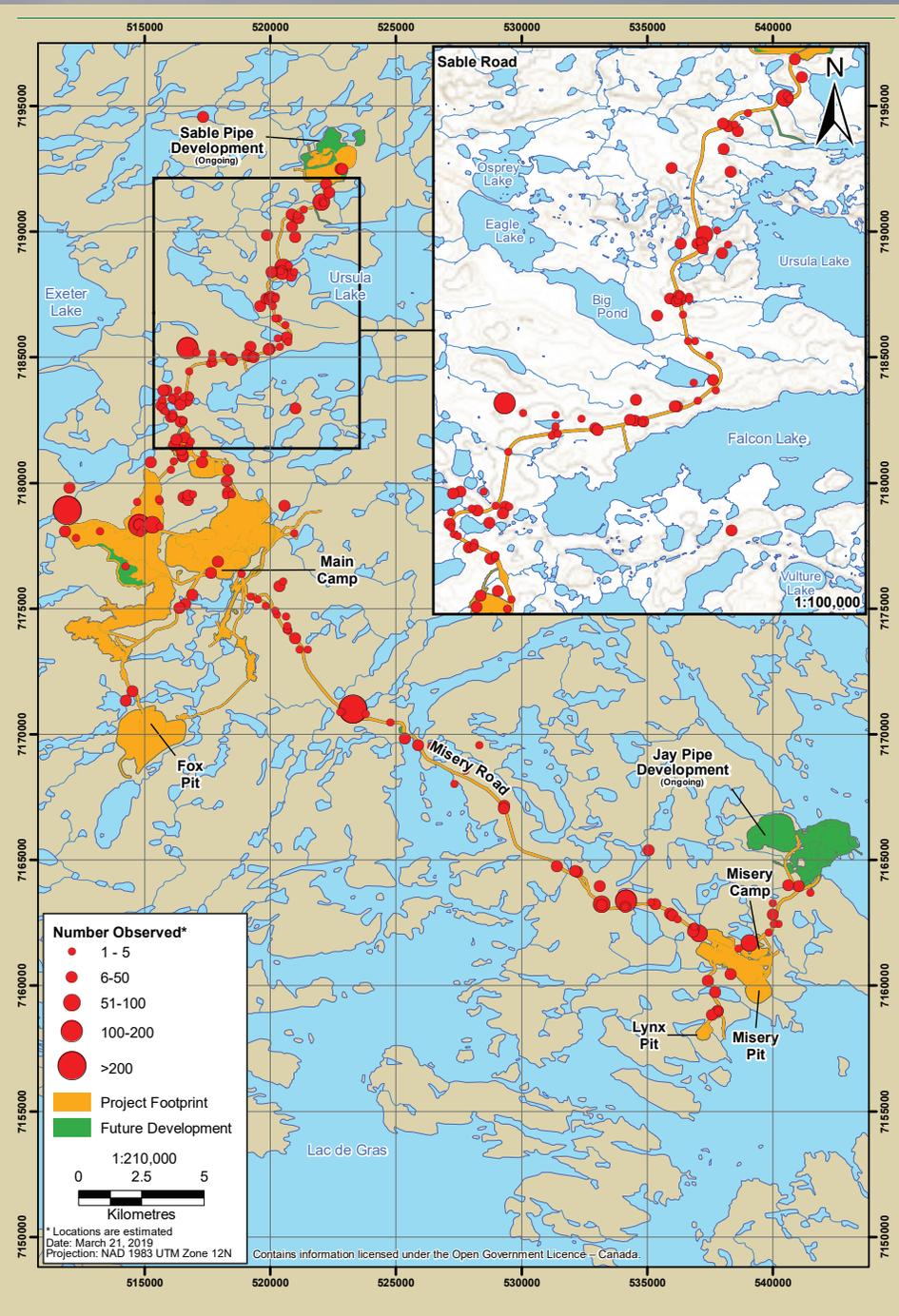


Figure 3. Incidental caribou observations at the Ekati Diamond Mine, 2018



Photo: courtesy of Dominion Diamond Mines ULC

## Caribou Monitoring

Caribou monitoring activities for 2018 included some information on distribution from satellite collared cows collected by Government of the Northwest Territories – Environment and Natural Resources (GNWT-ENR), incidental caribou observations, behaviour surveys, Long Lake Containment Facility (LLCF) monitoring, dedicated road surveys, and wildlife camera monitoring.

In 2018, 3,347 caribou were recorded during 205 ground-based incidental reports on 102 separate days, with half occurring during spring migration and the remainder occurring during winter. Collar data from GNWT-ENR also indicated that caribou from both the Bathurst and Beverly/Ahiak herds were present at the Ekati mine during winters of 2017-18 and 2018-19, unusual occurrences compared with past distribution. Consistent with past trends, most of the caribou were observed along the Sable Road, with a smaller number in the Misery area.

Fifteen behavioural focal surveys (to quantify the types of behaviours used by individuals) and 19 scan surveys (essentially behaviour at the group level) were conducted within 1.5 km of mine infrastructure in 2018 to obtain information on the proportion of time an animal or group is engaged in different behaviour (e.g., bedding, feeding, running). These results were compared with 55 surveys conducted close to infrastructure at Diavik resulting in Dominion concluding that caribou showed “some tolerance for areas in close proximity to the mine”.

Road traffic volume data were presented for 2018 for Misery (approx. 23,000 trips by heavy vehicles and 3,200 trips by medium vehicles) and Sable roads (900 heavy, 3,300 medium), but no data were presented for light vehicles (mainly pickup trucks).

The Wildlife Camera Monitoring Study initiated by Dominion in 2011 uses motion-triggered cameras to better understand how caribou respond to mine infrastructure and in particular to roads. Eighty-nine infrared motion-triggered cameras were deployed in 2018 along Misery, Sable and Jay roads, as well as at the Narrows between Lac du Sauvage and Lac de Gras. A few preliminary results from cameras located near Misery/Jay in 2018 are included but due to the time required to process the photographs, no comprehensive analyses were presented from 2017 or in 2018, and now Dominion states they will next produce a camera report in 2020. Relatively low detection rates and “logistical delays in processing camera data” were cited as reasons for the delay in reporting.

Dominion held a workshop in September 2018 to continue discussions with communities to develop a Traditional Knowledge based research program for studying the drivers of the caribou zone of influence. Actual research has not yet occurred. Dominion supplied financial support for Bathurst caribou collars and in-kind support for the 2018 calving ground survey. In 2018 Dominion ended support for Natural Resources Canada’s on-going studies examining visibility of mining activities, noise, dust, soil pH and vegetation cover.

## Grizzly Bear Monitoring

Grizzly bears were monitored at the Ekati mine through incidental observations. There were 210 individuals sighted on 145 occasions, including 37 observations of family groups (any group of two or more bears). This is the second highest number of sightings since 2001 and follow an annually variable but increasing trend over time. Observations occurred across the mine site with higher occurrences around the Misery camp/pit area and main mine complex.

A regional hair snagging DNA study was undertaken in 2017 in collaboration with Diavik, duplicating hair snagging programs conducted in 2012-13. Results suggest a stable to possibly increasing population since 2012, with recent densities in the range of 5.5 – 7.5 bears/1,000 km<sup>2</sup>.

## Other Wildlife

In 2018, 139 wolves were sighted on 79 occasions, also following an increasing trend over time. There was no monitoring of known wolf denning activity in the Ekati study area in 2018, however wolf packs with pups were observed on 5 occasions in late summer. Wolf observations were distributed relatively evenly throughout the mine site with a slightly higher concentration in the Misery camp/pit area. Twenty-three incidental sightings of wolverines occurred in 2018, similar to the long-term average. Fox occurrence at Ekati mine is an ongoing concern because of potential attraction to human activity and the risk of transmission of rabies. In 2018, there were 146 foxes sighted, a little lower than average. Interestingly, in 2018 about 96% of foxes identified to species were red foxes, while most foxes observed during the first decade of the project were Arctic foxes. There were no suspected cases of rabies during 2016-18. Eight incidental moose sightings, likely the same individual, occurred near mine infrastructure in 2018.

Successful raptor nesting occurred in three of the pits in 2018, with several of these producing nestlings (peregrine falcon, rough-legged hawk, and raven [a functional raptor]). Nesting was also successfully deterred from several active pits to minimize conflict with mining activities. The North American Breeding Bird Survey was conducted for the 16th year with the number of species observed (28) and the number of individual birds recorded (431) in 2018 fairly typical.

## AGENCY ASSESSMENT

The 2018 WEMP is well-produced with detailed reporting on waste management and wildlife incidents. Tables and figures are notable for their clarity in displaying trends since 2001 (although there is no reference to pre-2001 information including baseline). A separate report on the grizzly bear DNA population assessment was comprehensive and well done. However, there are disappointments. The camera report has been delayed two years and details of caribou movements are missing. Road traffic data are incomplete, are not provided temporally (daily), and are not compared to previous years. Road surveys were conducted daily, but no data were presented (except presumably observations were included in incidental observations). Adaptive management is mentioned but remains incompletely reported. The reporting does not link specific thresholds to trigger a management activity and subsequent follow-up monitoring to determine effectiveness. No comparisons against impact predictions were provided, although these have been promised for the next Environmental Impact Report reporting period.

The 2018 WEMP substantiates the change in caribou distribution which includes caribou from the Beverly/Ahiak herd using the Ekati site and a shift in the Bathurst herd towards winter, spring migration and fall presence at the Ekati mine. The report relies on 50% or 95% kernel maps to reveal the shift in distribution but does not measure trends in distribution, such as use of centroids or moving windows. Additionally, individual trajectories of movements are not provided nor is there an assessment of how geofence collars improve the resolution of movement thresholds. This is a missed opportunity to analyze how the incidental

sightings reflect caribou distribution relative to the distribution of the sampling effort. Although the report comments on the difficulty of using GNWT's collar maps to trigger intensified monitoring and mitigation at site, there is no explanation how this will be resolved in future years.

An example of not integrating datasets is that incidental sightings documented more caribou groups (13) within the Long Lake Containment Facility (LLCF) compared to only two groups reported from the road surveys during LLCF monitoring. The concern about caribou and their behaviour at the LLCF is that with the change from summer to winter distribution, the nature of the caribou's use of the LLCF may have changed. Dominion should indicate that instead of caribou potentially using the LLCF for insect relief, in winter caribou, especially cows, will seek out sources of sodium. The kimberlite from Fox pit introduced high sodium levels (DDEC 2016) to the LLCF.

The report concludes that despite the increase in caribou around the Ekati mine in winter, the CRMP monitoring and mitigation protocols were working. But the report also states that when caribou on the roads are hard to see during severe weather, the roads are also closed to non-emergency traffic and so there is no threat to the caribou. Dominion states that further testing of infrared imagery will be undertaken to detect caribou during blizzards. The 2018 report could have included the frequency and duration of blizzard-caused road closures relative to closures triggered by caribou presence, and the implications of Dominion's adaptation to the closures through stock-pile management. This comment highlights the weakness of the 2018 report in integrating among different information sets.

Dominion refers to the 'potential' zone of influence (ZOI) and has shifted from funding ZOI research to determining the factors causing the ZOI. In terms of practical monitoring, despite the change in caribou abundance and distribution, Dominion did not provide updates about the ZOI (last surveyed and estimated in 2012) by undertaking aerial surveys.

The report has a useful summary attributing the large increase in management to improved documentation and reporting but also more grizzly bear management actions and increased caribou presence near roads in 2016 to 2018. Caribou management actions doubled between 2017 and 2018 to 183. However, details are still lacking. For example, the summary of blast postponement or cancellation due to caribou describes the six incidences when caribou were within 1 km of a proposed blast and the duration of the delay, but not how often caribou were sighted outside the 1 km threshold, how the caribou behaved, and why the blast suspension times varied so widely.

The report does not acknowledge the on-going lack of statistical power in using the Behavioural Surveys (Activity Budgets and Response to Stressors) given that sample size in 2018 was so limited. This raises the question of continuing monitoring which is unlikely to be powerful enough to detect effect size. A consequence of weak detection is the unsupported generalities such as caribou "tolerating" disturbance. Tolerance is a specific type of response and should not be used without statistical rigor.

# AQUATIC EFFECTS

## HIGHLIGHTS

- 🐾 The Land and Water Boards of the Mackenzie Valley and the Government of the Northwest Territories (GNWT) released Guidelines for Aquatic Effects Monitoring Programs (AEMP).
- 🐾 Dominion's Water License was amended to increase potassium effluent quality criteria.
- 🐾 Selenium and mercury in harvestable fish have reached levels of concern in lakes downstream of the mine.



## BACKGROUND

Each year Dominion Diamond Mines ULC (Dominion) carries out a number of programs and studies to determine if changes in the aquatic environment downstream of its operations are occurring as a result of mining activities. There are five watersheds which may be affected by the mining operation (Koala-Lac de Gras, King-Cujo, Desperation-Carrie Pond, Pigeon-Fay-Upper Exeter and Horseshoe). Lakes and streams in these systems, as well as background sites, are sampled each year under the Aquatic Effects Monitoring Program (AEMP), which is a requirement specified in Dominion's Water License. Using information collected through the AEMP, any changing trends in water and sediment quality, benthic macroinvertebrate communities, phytoplankton and zooplankton, as well as fish populations and health, can be identified.

## MAJOR ACTIVITIES 2018-19

Fine Processed kimberlite (FPK), treated sewage and surface sump water continued to be discharged into the Long Lake Containment Facility (LLCF) in 2018. Once the slurry has settled out and separated, the process water is pumped back to Cell C of the LLCF. Between June and October 2018, 1,463,000 m<sup>3</sup> of decanted surface minewater was pumped from Beartooth Pit to Cell C. The process plant recycled 4,665,000 m<sup>3</sup> of water from Cell D of the LLCF. No water was released from the LLCF in 2018.

A second source of effluent discharge to the receiving environment is from the Misery and Lynx sites into the King-Cujo watershed. A total of 145,776 m<sup>3</sup> of water from the King Pond Settling Facility (KPSF) was pumped into Cujo Lake in July 2018.

A third point of discharge began with the release of wastewater from the new Two-Rock Sedimentation Pond at Sable on August 14, 2018, the first potential water quality impact in the Horseshoe watershed. A total of 339,154 m<sup>3</sup> of minewater was discharged to Horseshoe Lake during August and September.

### Aquatic Effects Monitoring Program

The Land and Water Boards of the Mackenzie Valley and the GNWT released new Guidelines for Aquatic Effects Monitoring Programs in March 2019. These guidelines set out the role of the AEMP in water monitoring and detail expectations for program design, implementation, and adaptive management. The new guidelines must be considered when the AEMP is re-evaluated in 2019. Of particular significance, the guidelines advise that all three tiers of response (Low, Medium and High action levels) in reaction to benchmark exceedances should be developed when Response Frameworks are first established, rather than higher action levels only being developed sometime after a Low action level is exceeded.

### Water Quality

The Agency reviews the annual AEMP data each year for any changes of note in water quality. The results are summarized in Table 2. Overall, concentrations of all water quality variables remain elevated above baseline levels. However, relative to the three previous years, no significant increases in parameters were evident in 2018.

### Plankton

As in previous years, changes to plankton community composition in lakes downstream of the LLCF have been identified that are thought to be caused by the mine, with zooplankton changes in Leslie, Moose and Nema lakes stabilizing. Taxonomic change is also occurring in the phytoplankton community of Kodiak Lake, with

density of the total organisms making up the community increasing. An increase in chlorophyll a in Cujo Lake is linked by the company to an increase in total phosphorus in the water, likely from King Pond.

### Fish

Results from the 6-year large body fish study was included as part of the 2018 AEMP report. The results suggest there are emerging issues related to levels of mercury and selenium in fish downstream of the mine.

**Mercury:** In Kodiak Lake trout muscle, mean mercury levels have exceeded Health Canada guideline for human consumption. Seven fish of 20 sampled exceeded the guideline in Kodiak Lake, up from 1 fish in 30 sampled between 2002 and 2012 (a 30 yr-old in 2007). This represents the first time that an impacted lake (Kodiak) has been reported to have trout mean mercury levels (0.518 mg/kg) above Health Canada guideline for human consumption (0.500 mg/kg). The high mercury body burdens were not confined to older trout as is usually the case, since mercury levels accumulate in the body overtime. Five younger fish aged 6 to 8 years old were found to be above Health Canada guidelines. In lakes with non-toxic levels of mercury, juvenile and young adult fish normally haven't lived long enough to accumulate the amount of mercury necessary to push their mercury levels above the levels considered hazardous to human health. In Ekati lakes, historically this has been seen in lake trout of a minimum 12 years old.

The mean concentration and number of trout with above-guideline mercury levels in small plugs of muscle taken from live fish (non-lethal sampling) might even be higher than reported, if muscle fillets had been sampled. An Ekati mine

investigation (RESCAN, 2012) compared trout muscle fillet samples to tissue plugs and showed that Kodiak Lake trout muscle fillets had 3 times higher mercury concentrations than plugs from the same fish. The source of mercury loading in Kodiak Lake trout is unclear.

**Selenium:** In slimy sculpin, mean whole-body selenium (9.63 mg/kg dry weight) exceeded the USEPA guideline for fish health (8.5 mg/kg) in Leslie Lake (20 fish out of 29, up from 2 out of 26 fish in 2015). This represents the first time that the majority of sampled sculpin (69%) in an AEMP lake had selenium levels above the guideline. It is noteworthy that the 2017 AEMP Evaluation of Effects Report found that selenium concentrations in Leslie Lake sediment had reached a level at which “there may be a potential for adverse effects to aquatic life”.

In Leslie Lake (downstream of LLCF), one whitefish muscle sample exceeded the USEPA guideline for selenium (11.3 mg/kg dry weight) for fish health and 13 of 20 whitefish livers were above BC Ministry of Environment human health guidelines for fish eaters (14.5 mg/kg for moderate fish consumption — 0.11 kg/day). Selenium in whitefish was higher in livers than muscle. Although there is no direct consumption of whitefish livers, burbot livers are sometimes consumed by harvesters. The Agency is concerned that Burbot, which are not monitored under the AEMP, could have elevated levels of selenium similar to whitefish in effected lakes downstream of the LLCF. Also, liver selenium may affect the most sensitive fish tissue, the ovaries. Transport and uptake of a protein enriched with selenium from the liver to ovaries determines the ultimate selenium dose received by eggs, an excess of which produces larval deformities. According to the USEPA, excess selenium in eggs/ovaries should be considered more adverse than that in muscle.



Long Lake Containment Facility discharge point in Cell E

Although selenium levels do not currently appear to be of concern in relation to whitefish tissue consumption, they should continue to be looked at closely as it may have negative effects on fish reproductive health.

In Cujo Lake, selenium concentrations in whitefish livers exceeded the Fish Response Plan’s Low Action Level in 2018. Overall, selenium in whitefish livers show an increasing trend through time in impacted lakes (Cujo and Koala watershed lakes), while it has been decreasing in whitefish of reference lakes.

**EROD induction:** EROD (ethoxyresorufin-o-deethylase) is an enzyme in fish that is sensitive to certain contaminants. EROD activity is induced by exposure to either hydrocarbons or organochlorines such as dioxins, furans and PCBs. Levels of EROD activity in both round whitefish and slimy sculpin are substantially lower than levels reported in both 2012 (whitefish & sculpin) and 2015 (sculpin). Previous monitoring years attributed this EROD activity in fish to hydrocarbon exposure.

**Parasites:** Data in the 2018 AEMP indicates that there was a decreasing rate of internal parasite infestation in whitefish and slimy sculpin in Leslie and Moose lakes. This conclusion is complicated because the 2007 and 2012 parasite results were evaluated based on a single species of tapeworm while the 2018 results are reported for all internal parasites regardless of species. Meanwhile, parasite infestation in Cujo Lake whitefish was reduced from previous years to no monitored fish being infected, the same as reference lakes.

## AQUATIC RESPONSE FRAMEWORK

The Aquatic Response Framework is an early warning mechanism to alert Dominion and regulators to changes in the environment downstream of the Ekati mine that reach levels that require attention before they reach benchmark levels that can adversely impact aquatic life. The three tiers of action levels for water quality variables other than dissolved oxygen are Low (LAL - when the variable exceeds 50% of a benchmark), Medium (MAL - variable exceeds 70% of a benchmark) and High (HAL - exceeds 100% of a benchmark).

The following water quality variables exceeded Low Action Levels (or higher levels, where stated):

- Dissolved Oxygen under-ice in Cujo Lake (less than benchmark and at least 10% less than any baseline year);
- Phosphorus in open water in Cujo Lake;
- Chloride under-ice in Leslie (MAL) and Moose lakes;
- Potassium under-ice (HAL) and in open water in Leslie Lake; under-ice in Moose Lake (MAL); under-ice in Cujo.

Phytoplankton and zooplankton community composition in Leslie, Moose and Kodiak lakes exceeded LAL for the third straight year. According to Dominion, the likely driver of this exceedance, macronutrients (nitrate, nitrate and phosphorus), have stabilized or decreased and community composition changes are not continuing to advance towards the MAL. Management of the problem through the Nitrogen RP therefore seems to be functioning as intended and there is no need for a plankton RP revision.

Actions taken by Dominion to address these exceedances:

- A revised Dissolved Oxygen Response Plan (RP) was approved in April 2018, activated by below-Canadian Council of Ministers of Environment (CCME) levels under-ice in Cujo Lake. Dominion implemented mitigation measures (snow clearing off lake ice and water column aeration) which appear to be effective but their ultimate success can't as yet be quantified using available data. The Agency looks forward to seeing these results covered in the 2019 AEMP Re-Evaluation report, as per Dominion's commitment.
- An updated Phosphate RP v1.3 was submitted in August 2018. It includes an analysis of the probability of exceeding 50% and 100% benchmark thresholds as well as clarification on the rationale for the MAL. Dominion previously determined the potential for ecological effects from exceeding phosphorus benchmarks is minimal because LAL exceedance occurred during under-ice conditions when stimulation of phytoplankton growth is unlikely and because excess phosphorus is not toxic to aquatic life.
- A revised Chloride RP (Version 1.2) was submitted in August 2018 to address the LAL and MAL exceedances in Leslie and Moose lakes in 2017 and 2018.
- The Potassium HAL under-ice exceedance in Leslie Lake was mitigated by delaying discharge from the LLCF during the 2018 open-water season, resulting in only the LAL being exceeded in Leslie Lake during summer. As well, potassium was measured more frequently under ice in Leslie and Moose lakes during the 2018/2019

ice-covered season. A revised Response Plan v2.1 includes conducting potassium toxicity studies that will inform response planning.

- The WLWB did not approve Dominion's updated Fish RP v2.1 submitted in June 2018. The Board determined that a revised Plan must:
  - Propose MAL and HAL for all LAL exceedances;
  - Lay out the possible options for MAL exceedances;
  - Discuss recommended changes to the current monitored variables for organochlorines, including dioxin and furan, and
  - Specific to selenium in fish:
    - Set HAL when either the USEPA guideline for protection of aquatic life is met (H1) or mean fish tissue concentration in the portion of fish eaten by people (i.e., muscle and/or eggs) exceeds a site-specific human consumption guideline (H2);
    - Set MAL to 50% of USEPA guideline.
- Updates to the Fish Response Plan incorporating mercury in fish tissue will now also be required based on the 2018 LAL exceedance for mercury in whitefish.



Panda Diversion Channel

Uranium has been measured at steadily increasing concentrations in whitefish livers in Cujo Lake over years, a trend not seen in reference lakes. This mirrors a steady increase in lakewater concentrations over the same period, although not reaching levels known to adversely affect fish. King Pond effluent appears to be the source.

In summary, the following contaminants exceeded LAL based on a conclusion of mine-caused increase in fish tissue concentrations:

- **Mercury** - In round whitefish muscle (Kodiak, Leslie and Moose lakes) and liver (Kodiak and Moose lakes); in Cujo Lake round whitefish muscle and liver;
- **Selenium** - In trout muscle and round whitefish muscle and liver in Leslie and Moose lakes; in Cujo Lake round whitefish muscle and liver;
- **Uranium**: In Cujo Lake round whitefish liver.

### AEMP Sampling

In a December 2018 WLWB directive, Dominion was directed to explain why some AEMP sampling events were missed in 2017 and 2018. The following reasons were given by Dominion: unsafe working conditions, administrative errors or operational errors (operational errors were unexplained).

In 2017 Water quality and limnology measurements in Pigeon-Fay and Upper Exeter Watershed were not taken in July (scheduling error) and in September (sampling deferred to October-bad weather). In 2018, Nema-Martine stream was not sampled in June (wildlife danger); Fay Bay and Upper Exeter Lake secchi depths and water samples were not taken in June (operational errors). The planned measures to eliminate future missing samples involve improvements to sample scheduling, field data sheets, and communication with field crews on these changes, which will be in place for the 2019 sampling program.

## MISSED SAMPLING EVENTS

### Surveillance Network Program (SNP) Sampling

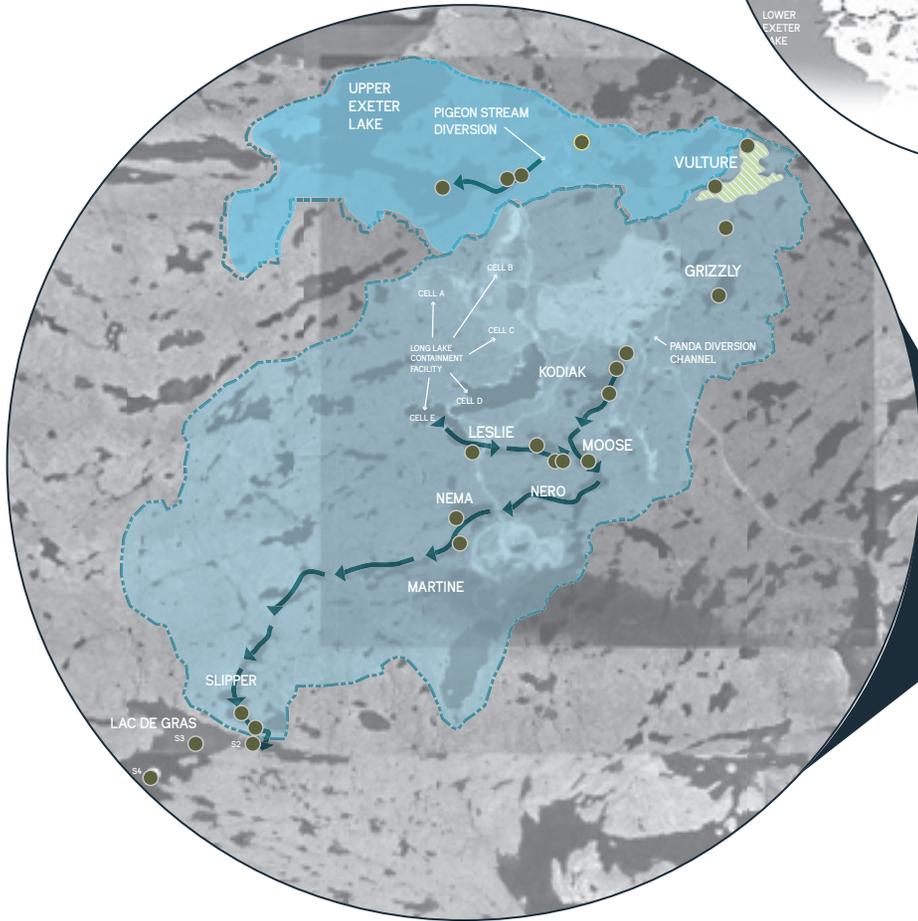
The SNP is a water quality monitoring program established as part of the water licence to monitor sources of water pollution to ensure Effluent Quality Criteria (EQC) are being met. Some of the scheduled sample events planned for the Sable facility as part of the SNP were missed in 2018, including:

- Discharge from Two Rock Sedimentation Pond (SNP 0008-Sa10) on July 31, August 7, 14 and 21;
- Chronic toxicity testing on the first week of discharge; and,
- Two SNP samples in Horseshoe Lake (0008-Sa6 and 0008 Sa9) because of an earlier-than-expected freeze up.

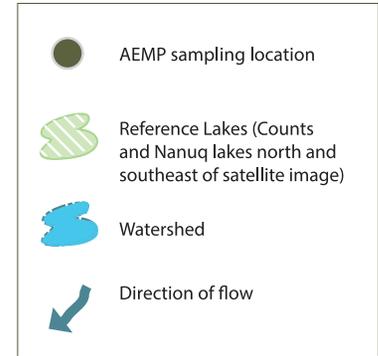
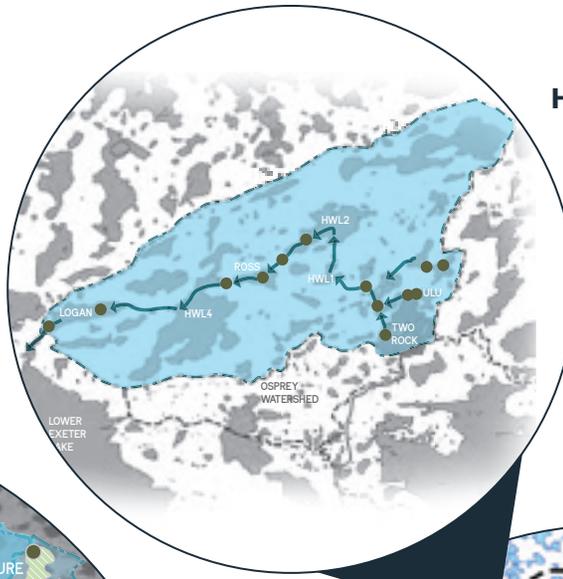
The missed sampling and toxicity testing were attributed by Dominion to slight differences in the requirements of the Ekati water licence SNP for Sable and the Metal and Diamond Mining Effluent Regulations (MDMER), which are regulations under the Fisheries Act governing the deposit of substances harmful to aquatic life from metal and diamond mines.

Dominion's proposed to minimize the likelihood of missing future sampling events by: synthesizing the MDMER and SNP sampling programs at Two-Rock Sedimentation Pond, which currently require many of the same variables to be sampled at similar, but not always synchronized times; improvements to the computerized sample scheduling system including earlier scheduling of September sampling to avoid early freeze-up; and better communication with field crews on these changes.

Koala Watershed & Pigeon Watershed



Horseshoe Watershed



King Kujo & Carrie Pond Watershed

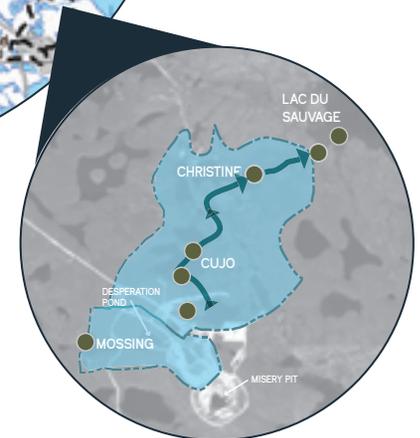


Figure 4. Ekati mine watershed map with flows and sampling sites

Parameters Monitored	Variables elevated in Koala watershed Long Lake Containment Facility → Lac de Gras									Variables elevated in King-Cujo watershed King Pond → Lac du Sauvage			
	Leslie	Leslie-Moose	Moose	Moose-Nero	Nema	Nema-Martine	Slipper	Slipper-Lac de Gras	Lac de Gras (S2)	Cujo	Cujo Outflow	Christine-Lac du Sauvage	Lac du Sauvage
pH	●	●	●	●	●	●	●	●	●	●	●	●	
Alkalinity	●	●	●	●	●	●	●	●	●	●	●	●	
Hardness	●		●	●	●	●	●	●	●	●	●	●	
Total Dissolved Solids	●	●	●	●	●	●	●	●	●	●	●	●	
Chloride	●	●	●	●	●	●	●	●	●	●	●	●	
Sulphate	●	●	●	●	●	●	●	●	●	●	●	●	
Potassium	●★	●	●★	●	●	●	●	●	●	●	●	●	
Total Ammonia	●		●	●	●		●			●	●		
Nitrite	●						●						
Nitrate	○	○	○	○	○	○	○				●		
Total Phosphate-P	●◆	●	●◆				●★		●★	◆	●		
Total Organic Carbon	●	●	●	●	●	●	●	○		●	○	○	●
Antimony	●	●	●	●	○	○							
Arsenic	●	●	●	●	●	●	●	●		●	○		
Barium	●	●	●	●	●	●	●	●	●	●	●	●	
Boron	●	●	●	●	●	●	●			●	●	○	
Molybdenum	●	●	●	●	●	●	●	●	●	●	●	●	
Nickel	●	●	●	●	●	●	●	●		●	●	●	
Selenium	●	●	●										
Strontium	●	●	●	●	●	●	●	●	●	●	●	●	●
Uranium	●	●	●	●	●	●	●	●		●	●		

Table 2: Mining effects on water quality flowing through the Koala and King-Cujo Watersheds

This table is adapted from the AEMP report with additions resulting from the Agency's review of the monitoring results.

## Water License Amendment for Potassium

Dominion applied for an amendment to its Water License EQC for potassium in July 2017. This was to address elevated concentrations of potassium in the LLCF and in discharge to lakes downstream that would be difficult to maintain below license limits. Dominion explained that the elevated concentrations were caused by processing of Misery ore and requested an increase in the potassium EQC from 41 mg/L (maximum average) and 82 mg/L (maximum grab) to 64 and 103 mg/L, respectively. Following the review process the WLWB recommended that the potassium EQC limit be revised to 53 mg/L (maximum average) and 103 mg/L (maximum grab) to optimize both protection of aquatic life and achievability. The amendment was approved by the GNWT Minister of Environment and Natural Resources in July 2018.

The plan to deposit fine processed kimberlite into the Panda-Koala containment area (refer to the Waste Processed Kimberlite chapter for more information) should lead to reduced potassium concentrations in the LLCF and downstream compliance concerns, at least in the short-term. The LLCF will no longer be receiving high potassium process water directly from the process plant. As the Panda-Koala containment area fills, the discharge of process water to the LLCF will resume, which is predicted to increase potassium levels in the LLCF.

## Jay AEMP Design Plan and Aquatic Response Framework

Dominion is required to develop an AEMP and Aquatic Response Framework (ARF) for the Jay project to address the newly effected watershed (Lac du Sauvage) and possible effects pathways unique to the Jay Project relative to the rest of the Ekati mine. The Agency provided the WLWB with recommendations for the Jay AEMP Design Plan and ARF, which included:

- Questioning the adequacy of baseline data collection for harvestable fish species proposed by Dominion, which does not include selenium in tissue nor spatial trend analysis for slimy sculpin;
- Including the Tibbett-Contwoyto Winter Road into Jay AEMP monitoring plans for cumulative impacts, as this road crosses over Lac du Sauvage in close proximity to Jay AEMP sample stations;
- Using a sediment corer rather than Ekman dredge to sample lake sediments; and
- Include sediment quality ARF action levels for selenium and any other parameters that indicate a connection between sediment quality and fish tissue.

In its May 21, 2019 decision, the WLWB did not approve the proposed Jay AEMP Design Plan. We will follow up in 2020 on the next version of this design plan.

The use of a sediment corer for sediment sampling is now required by the WLWB in the water license, as a corer provides for better definition through sediment layers to identify contaminants in the most recently deposited sediments. A sediment corer was used in 2017 and 2018 in Jay baseline sampling, which turned out to be more challenging to use compared to the previously-used Ekman dredge due to the nature of the sediments (mostly dense clay). As a result, Dominion requested that the WLWB remove the requirement to use a sediment corer. The request was not accepted by the WLWB but agreed with the Agency and other reviewers that there are ways to modify corer sampling to make it feasible to use in conjunction with Ekman dredge sampling.

## Two-Rock Outfall Design Report and Sable Diffuser Construction Plan

The design plan to build and set up a diffuser to safely discharge minewater from Two-Rock Sedimentation Pond into Horseshoe Lake was approved by the WLWB in April 2018. A diffuser at the end of the effluent pipe, similar to the process used at Diavik, was determined to be the best means of maximizing dilution of the effluent out of the pipe through the lake water column before flowing further into the lake.

The Agency's concerns centred on total suspended solids (TSS) levels in Horseshoe Lake generated by construction of the pipe and diffuser within the lake. As a result, the WLWB mandated that a physical barrier (such as silt curtains) was to be used while the construction work is done to keep TSS levels from rising above license limits in Horseshoe Lake.



Pigeon Diversion Channel

## AGENCY ASSESSMENT

Mercury concentrations above safe consumption guideline levels in Kodiak Lake trout are a concern for the Agency. This is likely to also be of concern to Aboriginal Society members who have a great stake in ensuring fish from lakes affected by the Ekati mine are safe to eat once the mine closes. The Agency believes it is important that Dominion investigate the source of mercury contamination in the Kodiak Lake trout population. The concerns have been discussed above and include mean concentrations in trout muscle that are above guidelines and increasingly found in fish as young as 6 years old.

Dominion reports that selenium increases in sculpin and whitefish from Leslie Lake are an effect from LLCF discharge. The source of the selenium contamination in Leslie Lake is likely the sediments since a steadily increasing temporal trend in sediment selenium concentrations has been identified in all Koala watershed lakes including Leslie Lake (2017 AEMP) while water concentrations remain low. A significant correlation between fish tissue and sediment concentrations was determined in the 2012 AEMP.

Toxic levels of selenium adversely affect fish larval development (Lemly 1993, Chapman et al. 2010)<sup>1</sup>. Now that selenium levels in some slimy sculpin and lake whitefish in Leslie Lake are exceeding the USEPA guideline for fish health and BC Ministry of

Environment human health guidelines, monitoring of selenium in fish (for round whitefish at least) should be expanded to measure selenium concentrations in female ovarian tissue. While the BCMOE guideline for safe fish consumption does not specifically apply to whitefish livers that are not consumed by humans, the Agency believes it could be relevant for fish species such as burbot, whose livers are consumed. Therefore, the Agency recommends that the AEMP investigate the selenium levels of burbot liver and muscle tissues to address this potential issue.

The Agency believes the company may be underestimating zooplankton diversity and density in AEMP lakes due to the mesh size of collecting nets being too large and allowing smaller species, especially rotifers, to pass through. While a finer 80 µm mesh plankton net will be used to collect zooplankton samples in Lac du Sauvage for the Jay AEMP when construction of the Jay Project is initiated, the 118 µm net continued to be used in Ekati-wide AEMP sampling in 2018. The Agency believes that Dominion should switch to the finer meshed net for all AEMP sampling.

Dominion is to be commended in its updates to ARF response plans water quality and plankton. They are improving with each new version submitted to the WLWB.

Lemly, A.D. 1993. Teratogenic effects of selenium in natural populations of freshwater fish. *Ecotoxicol. Environm. Safety*. 26:181-204.;

Chapman, P., Adams, W.J., et al. 2010. *Ecological Assessment of Selenium in the Aquatic Environment*. 141 p. CRC Press.



# TRADITIONAL KNOWLEDGE & ENGAGEMENT

## HIGHLIGHTS



Agency conducted Community Information Sessions on the Interim Closure and Reclamation Plan

## ACTIVITIES 2018-19

### Agency Community Information Sessions

The Agency's community engagement in 2018-2019 focused primarily on providing communities with information on the draft Interim Closure and Reclamation Plan Version 3.0 (ICRP). The ICRP had not been revised since v2.4 was approved in 2011. Recognizing the importance of closure of the mine to Aboriginal Society Members, staff and Directors of the Agency travelled to five communities (Łutselk'e, Kugluktuk, Behchoko, Whati and Dettah) to host Community Information Sessions and present a summary of the ICRP and supporting outreach materials (maps and posters explaining closure plans for various mine components). The Agency's goal was to inform community members about what was being proposed by the company at closure, summarize the Agency's concerns, have an open discussion about community concerns and answer any questions community members may have about the eventual closure of the mine.

Some of the general feedback we heard during the community sessions is summarized below:

- All communities are very concerned about the declining caribou numbers. Wildlife is very important part of indigenous communities and planning for the continued health and abundance of wildlife once the mine closes remains a critical part of closure planning.
- At each information session communities expressed the need to see Traditional Knowledge (TK) and community knowledge used in closure planning and in particular in relation to wildlife and the closure of roads and waste rock storage areas. This is also evident from the Indigenous Society members' formal comments to the Wek'èezhii Land and Water Board on the ICRP.

- The need to ensure water quality is maintained downstream of the mine site over the long-term was consistently raised by communities, especially Kugluktuk which is located on the Coppermine River downstream of Lac de Gras.
- Communities do not like the landfills in the waste rock piles or anything left underground. They would like to see garbage, buildings, vehicles and other debris taken off site upon closure.
- Concern was expressed over open pits being filled with water and the potential effects of this on fish. Several participants suggested rock to be put back in the pits.

### Community Engagement Plan (Version 4.1)

The Agency reviewed Dominion's Community Engagement Plan Version 4.1 in July. This plan guides Dominion's communication and outreach activities with affected parties, outlining engagement for on-going operations and engagement techniques for specific projects which include TK. In this latest version, Dominion has developed and implemented new dispute resolution and community question follow-up procedures.

### Use of Traditional Knowledge in Operations

Dominion notes in its 2018 Annual Report that it is committed to incorporating oral and recorded TK into decision making at the Ekati mine. Dominion has developed a Traditional Knowledge Management Framework with input from communities and the Traditional Knowledge Elder's Group (TKEG). The Framework outlines how Dominion will collect, store, manage, and use TK in a respectful way and was approved by the TKEG.

### Traditional Knowledge Elders Group

The Ekati TKEG was originally established to provide TK input into the design and operations (including closure) of the Jay Project. Since that time however, the scope of the TKEG has expanded and the knowledge gathered is now applied to the entire mine site.

The TKEG held one meeting during 2018 in September at the Ekati mine. During their site visit members were able to observe caribou crossing the Sable Haul Road and held discussions on various Ekati mine topics including waste management, air quality, dust suppression, the culture camp, caribou mitigation plan, the Interim Closure and Reclamation Plan and the Kugluktuk Traditional Knowledge Project.

### **Kugluktuk Traditional Knowledge Project (Hamlet of Kugluktuk Reclamation Program)**

In 2017 Kugluktuk Elders visited the Cell B Long Lake Containment Facility (LLCF) Reclamation Research Area and shared some of their TK about grasses, sedges and shrubs that are common along the shores of the Arctic Ocean. Fine Processed kimberlite deposited in the LLCF is somewhat analogous to the shores of the Arctic Ocean in that it provides similar substrates and challenges for the growth of plants, including bare saline substrates, coarse materials on beaches, and exposed finer substrates on the muddy backwater sediments. In August 2018, community members from Kugluktuk assisted Dominion researchers to locate specific species of plants on the coast of the Coronation Gulf near Kugluktuk. The local seeds were collected for reclamation studies in sodium-rich soils at the LLCF. This program replaced the Student Seed Reclamation Program activities usually held each year at the Ekati Mine.

### **Environmental Monitors**

Dominion continues to provide opportunities for Aboriginal community members to become familiar with the Ekati mine environmental monitoring programs. From March to July 2018, community members helped Dominion conduct monitoring of cliff-nesting birds that attempted to establish nests in and close to the Misery, Lynx, Pigeon and Sable pit walls.

### **TK in Sable AEMP Design Plan**

From March to October 2018, community members participated in and used local knowledge and experience to successfully capture, sample and release fish for the Aquatic Effects Monitoring Program.

### **Culture Camp**

A Culture Camp was determined to be a good means to provide the company with Indigenous community members' assistance in monitoring on-the-land mining disturbances using Indigenous techniques for information gathering. Unfortunately, the location originally chosen for establishing a camp was ultimately determined to be unsuitable due to swampy conditions. Dominion worked with the TKEG during winter of 2018/19 to identify a more suitable location. The creation of the Culture Camp was a requirement of the Jay Project Environmental Assessment, the construction of the camp has been delayed pending a decision on the Jay Project.

## **COMMUNITY-BASED TRADITIONAL KNOWLEDGE PROJECTS**

### **Tłıchǫ Boots-on-the-Ground Caribou Monitoring**

Boots-on-the-Ground is a caribou monitoring program where Elders and caribou harvesters use traditional methods and knowledge to assess current conditions of the Bathurst caribou herd's summer range. It focuses on caribou and their habitat, predators and industrial disturbance.

## **ENGAGEMENT WORKSHOPS**

Dominion conducted community meetings from April – July 2018 in each of the Impact Benefit Agreement communities (with the exception of Wekweètì) to discuss the Interim Closure and Reclamation Plan.

Dominion held a Caribou Engagement Workshop in September 2018. As part of the Caribou Roads Mitigation Plan Dominion committed to providing grant funding towards caribou research. Workshop participants discussed research objectives and the process by which successful research proposals will be selected.



Community closure and reclamation Information Session in Behchoko January 2019

## AGENCY ASSESSMENT

The Agency heard during their community information sessions that community members were not satisfied with the results of Dominion's ICRP community engagement. Dominion indicated in their 2018 Annual Report that "The community meetings were focused on obtaining traditional knowledge on the closure and reclamation plans of the waste rock storage areas". The comments received by the Agency indicate that Dominion did not conduct adequate consultations with the communities, since community members did not seem fully aware of the updated plan presented in ICRP v3.0 in particular some of the proposed changes to the roads and waste rock storage areas based on caribou movement patterns. The Agency believes input by the Aboriginal Society members can help provide relevant biophysical and cultural information, help identify potential environmental effects and strengthen mitigation measures; which leads to better closure decisions.

The TK and community programs that Dominion support vary year-to-year, based on requests from communities and annual reviews. No long-standing programs were discontinued by Dominion in 2018.

In the past Dominion produced a quarterly newsletter with the goal to keep in touch with the communities and provide updates on their programs. This newsletter was widely distributed and provided updates in plain language for community members and the public. Dominion did not produce their newsletters this past year and the Agency encourages Dominion to re-introduce them.

An essential part of the Agency's mandate under the Environmental Agreement is to disseminate information to Indigenous Peoples and the general public on matters pertaining to the Agency's mandate. The Agency also provides an effective means to bring the concerns of Indigenous Peoples and the general public about the Ekati mine to Dominion and regulators. To help fulfill its mandate, the Agency is interested in meeting with the TKEG during one of their meetings with Dominion, to have informal discussions on subjects such as closure, waste rock piles, caribou and other subjects of interest. Requests for such a meeting have been made to Dominion staff on several occasions, with a response that they would forward our request to the TKEG. The Agency has not yet received a reply.



# AIR QUALITY

## HIGHLIGHTS

- 🐾 No ambient air quality or dustfall standards or guidelines were exceeded.
- 🐾 Results from the 2016-17 dust suppressant study indicate EnviroKleen™ is effective at reducing dust.

## ACTIVITIES 2018-19

The Ekati Air Quality Monitoring Program (AQMP) was initiated in 1998 and the results are reported every three years, in concert with the snow and lichen sampling program. The purpose of the program is to monitor ambient air quality and to assess the effectiveness of air quality management plans for maintaining good air quality. The next full report is expected in 2021.

### Air Quality Monitoring Results 2018

The 2018 AQMP Report presents and assesses the results of meteorological and air quality monitoring data collected in 2018 as well as the emissions of greenhouse gases (GHG) and air contaminants.

#### Air Emissions

The sources of GHG emissions at the Ekati mine include combustion of diesel used for power generation, building heat, operating mobile equipment, and blasting; combustion of used oil for heating buildings; combustion of Jet A-1 fuel by on-site helicopters, and emissions from waste and wastewater facilities. Every year Dominion calculates air emissions resulting from burning of diesel fuel and reports them to the National Pollutant Release Inventory and the Greenhouse Gas Emissions Reporting Program. In 2018 there was a 1.8% decrease in diesel fuel consumption due to the reduction in power generation and Diesel engine fuel use.

#### Meteorological Monitoring

Meteorological data at the Ekati mine are collected daily from the airport when personnel are on duty and from the Koala meteorological station year-round and the Polar Lake station during open water season.

#### Temperature

Monitoring temperature is an important component of the AQMP as day-to-day ambient temperatures control the rate of chemical reactions that generate or transform a number of secondary air pollutants (e.g., ozone (O<sub>3</sub>) and nitrogen oxides (NO<sub>x</sub>)) as well as thermal convection, which can affect dispersion of air quality pollutants.

In 2018 the annual average temperature was -9.6°C, which is 0.7°C lower than the historical record average (1995 to 2018). Warmer than average temperatures were experienced in June and July. The onset of winter was earlier in 2018 starting in mid-September, compared to the historical record, where below 0°C temperatures typically start by early October.

#### Precipitation

In 2018, the annual precipitation amount was 169 mm, the lowest on record, making 2018 a very dry year (historical average 331 mm). A trend of lower total annual precipitation has been occurring over the last few years.

#### Wind

Wind speed and wind direction are important for assessing how air emissions from the mine will be distributed to the local area and surrounding region. Winds at the mine site are from all directions, however, the dominant direction is from the northwest.

#### Ambient Air Quality Monitoring

Ambient air quality is monitored at two Partisol sampling stations (Grizzly and Cell B) as well as the Continuous Air Monitoring Building (CAMB). Partisol stations are operated for a 24-hour period every six days. The six-day sampling schedule follows the National Air Pollution Surveillance Program six-day sampling schedule for total suspended particulate matter (TSP) and particulate matter with aerodynamic diameter less than 2.5 µm (PM<sub>2.5</sub>). The Continuous Air Monitoring (CAM) station contains analyzers which continuously measure concentrations of sulphur dioxide, nitrogen oxides (NO, NO<sub>2</sub>, NO<sub>x</sub>), TSP, and PM<sub>2.5</sub>, as well as ambient temperature, wind speed, and wind direction.

#### Total Suspended Particulate

In 2018 there were no TSP exceedances of the 24-hour or the annual Government of the Northwest Territories (GNWT) standards of 120 µg/m<sup>3</sup> or 60 µg/m<sup>3</sup>, respectively. Similarly, there were no daily or annual fine particulate matter PM<sub>2.5</sub> exceedances.

#### Nitrogen Dioxide and Sulphur Dioxide

The hourly, daily, and annual concentrations of nitrogen dioxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>) measured at the CAMB in 2018 were below the applicable GNWT standards. SO<sub>2</sub> and NO<sub>x</sub> concentrations were higher in the winter compared to the summer, likely due to seasonal fuel usage for heating.

## Dustfall Monitoring

Dust deposition (dustfall) monitoring was conducted at 31 locations, including two control sites. Total dustfall, acid deposition and metal deposition were sampled.

In 2018, dustfall concentrations at 300 metres (m) from the haul roads were below the GNWT interim dustfall objective of 1.53 mg/dm<sup>2</sup>/d. In general, acid deposition (nitrate and sulphate concentrations) were greatest at stations close to the Misery haul road but were also elevated along the Lynx haul road in July-August, the Jay road in August-September, and at the Sable Road (measured at 30 m upwind and 30 m downwind from the road). All concentrations were below the established critical soil load for several provinces. Metal deposition concentrations are proportional to the amount of total dustfall and were highest at locations close to the Lynx and Misery haul roads.

## Dust Suppression

Dust suppression methods are used on roads at the Ekati mine to mitigate dispersion of fugitive dust. Historic dust management practices at the Ekati mine have primarily relied on the use of DL-10 (a chemical dust suppressant) and road watering, both of which have limitations in their use and ability to suppress dust. Starting in 2015 Dominion began pilot research along the Misery Haul Road on an alternative dust suppression product called EnviroKleen™. EnviroKleen had been previously used at Ekati in underground operations (since 2009).

The objectives of the dust suppression study were to:

- Compare the relative effectiveness of EnviroKleen and DL-10 on a large scale, and inform a decision to expand the use of EnviroKleen;
- Determine the degree to which EnviroKleen migrates into the surrounding environment to inform the decision on whether an application buffer is needed near waterbodies; and
- Investigate EnviroKleen's potential for toxicity to both the terrestrial and aquatic environments.

The Agency reviewed the results of the 2016-2017 Dust Suppression Study. EnviroKleen was applied along the entire length of the Misery Haul Road, except 15 m buffer areas surrounding water bodies which were treated solely with water. Dust deposition measurements were taken from dustfall monitors installed in transects along the haul road as part of the Air Quality Emissions Monitoring and Mitigation Plan (AQEMMP). Additionally, two Casella Microdust Dust Detectives were installed along the road to collect real-time TSP data resulting from differences in road usage, road conditions and/or weather-related events such as rainfall and wind. These data were paired with real-time visual monitoring through cameras and staff observations of specific dust generation events such as the types of equipment and traffic on the haul road (e.g., light vehicle, road train, vs haul max), allowing for a qualitative assessment of the fugitive dust generated by the various types of traffic on site.

The study indicated that EnviroKleen appears to be an effective dust suppressant and is able to maintain a sustained suppression of dust with repeated applications over the year and proper road maintenance. Suppression effectiveness appears to be comparable to that of DL-10 and water on initial application, but visual observations show that EnviroKleen does not break down as quickly and lasts longer. Dominion notes that each of the various dust suppressant products have their limitations; for water, the frequency of application needed and the subsequent loss of road fines (fine particulates on the road surface), and for both DL-10 and EnviroKleen, the fact that these treated road surfaces break down with heavy use and road grading. Comparisons of the effectiveness of various dust suppression products is affected not only by variations in mine activity (e.g., amount and type of traffic) but also by natural factors (i.e., relative humidity, amount and frequency of precipitation, wind speed and direction).

Soil sampling showed that EnviroKleen may be transported up to 10 m off the road, however it is not expected to pose a risk to humans, animals, plant life and aquatic species as it is readily biodegradable in natural environments. In response to concerns expressed by the Lutsel K'e Dene First Nation, Dominion conducted toxicity testing and demonstrated that it is neither acutely nor chronically toxic to various aquatic species.

Following the results of the first three years of the pilot program (2015-2017), Dominion stated that they planned to continue with the Dust Suppression Pilot Study in 2018, applying EnviroKleen along the entire length of the Misery Haul Road, except 15 m buffer areas surrounding water bodies which were watered. Results of the 2018 Dust Suppression Study have not been received.

## AGENCY ASSESSMENT

In 2016, the Agency reviewed the Air Quality Emissions Monitoring and Mitigation Plan (AQEMMP) for the Jay Project. At the time Dominion committed to amalgamate the Ekati Air Quality Monitoring Plan with the Jay Project AQEMMP into a single sitewide plan by 2017. To date the Agency has not received the site wide plan. The Agency considers this amalgamation to be important as it would consolidate and ensure consistency between the air quality monitoring programs across the mine site. In addition, an amalgamated plan would implement the thresholds and triggers site wide for  $\text{NO}_x$ ,  $\text{PM}_{2.5}$ , and TSP that have been developed as part of an adaptive management framework required from the AQEMMP.

The Agency and others have repeatedly raised concerns about the effects of fugitive and finer dust on vegetation and caribou, including possible links with the zone of influence for the mine on caribou distribution and abundance. As described in the Developers Assessment Report for the Jay Project, Dominion was required to implement a Caribou Offset and Mitigation Plan that would incorporate an enhanced dust mitigation study including a pilot test on the application of dust suppressants and a dustfall sampling program. Dominion was to report on the results and propose improvements to be incorporated into the AQEMMP. If dust management improvements were identified they were to be applied to all roads at the Ekati mine. As a result, Dominion conducted research on alternative dust suppression products, methods, and best management practices.

Following the results of the first three years of this dust suppression pilot program, Dominion noted that they planned to continue with the Dust Suppression Pilot Study in 2018, applying EnviroKleen along the entire length of the Misery haul road while implementing a number of improvements recommended in previous years. Dominion noted that the 2018 results and an accompanying best practices document, describing optimal methods for the application of maintenance of EnviroKleen in the Arctic would be distributed for review by January 31st, 2019. The Agency has yet to receive this report. The Agency encourages Dominion to provide this report as soon as possible. Additionally, based on the 2016-2017 report indicating there are significant advantages of applying EnviroKleen compared to DL-10 and water, the Agency encourages Dominion to apply EnviroKleen to all roads at Ekati, especially the Sable Road where caribou are most abundant.

Rock ptarmigan, photo courtesy of Dominion Diamond Mines ULC





# WASTE ROCK

## HIGHLIGHTS

-  The Sable Waste Rock Storage Area (WRSA) has been re-designed.
-  Significant questions persist over the use of 'total neutralization potential' to evaluate the ability of waste rock to neutralize acidic conditions.
-  Eight problematic seeps from WRSAs were identified in 2018.

## WASTE ROCK STORAGE AREAS

Waste Rock Storage Areas (WRSA) are designed to contain the large quantities of waste rock and overburden excavated during the mining of kimberlite ore. They are permanent landscape structures that will remain in place following the completion of mining and are designed to be physically stable, both during mine operations and in the long term; promote the establishment of permafrost; and achieve a reasonable balance between surface footprint area and height.

There are currently five WRSAs at the Ekati mine: Panda/Koala/Beartooth, Fox, Sable, Pigeon and Misery/Lynx. A sixth WRSA is planned with development of the Jay Project. In addition, the Coarse Kimberlite Rejects Storage Area (CKRSA) which is comprised of rejected kimberlite ore from the process plant, is located adjacent to the Panda/Koala/Beartooth WRSA. A description of each WRSA and the CKRSA has been provided in Table 3.

Twenty-nine million tonnes (mt) of waste rock were deposited at the various WRSAs in 2018. The largest quantity was deposited at Sable (19.4 mt) followed by Pigeon (7.4 mt), Misery/Lynx (2.1 mt) and Panda/Koala/Beartooth (0.1 mt).

## DESIGN, MANAGEMENT AND STUDIES

### Re-design of the Sable WRSA

The Sable Project is located approximately 20 km north of the Ekati main camp. Removal of overburden and mining of the open pit commenced in August 2017 and is expected to continue through 2022 during which approximately 103 mt of granite and diabase waste rock will be deposited at the adjacent WRSAs.

The original WRSA design consisted of two designated piles, both of which were to be located adjacent to the Two Rock Settlement Pond (TRSP). Upon further consideration, Dominion Diamond Mines ULC (Dominion) determined that the required 100 m setback from the TRSP would require either expansion of the planned piles and disturbances outside the Horseshoe watershed or redesign of the pit to reduce the volume of waste rock mined. A re-design plan was submitted in April 2018 which proposed construction of the West WRSA and an enlarged South WRSA with a 30 m, instead of a 100 m, setback to the TRSP along with a new East WRSA. The re-design is intended to provide additional storage capacity while reducing possible impacts on the adjacent Ulu Lake watershed.

The Wek'èezhìi Land and Water Board (WLWB) approved the re-design in June 2018 but directed that waste rock not be placed in the East WRSA until the South and West WRSAs reach their maximum designed capacities.

### Use of Lynx Diabase Waste Rock as Construction Materials

Dominion had previously notified the WLWB of the presence of an unknown diabase dyke in the Lynx Pit. Because diabase waste rock is considered by Dominion to be non-potentially acid generating (non-PAG), approval was sought for its use as a construction material in the same manner as granite is currently used.

During its review, the Agency expressed concern over Dominion's continued use of 'total neutralization potential' when determining the geochemical characteristics of diabase and other waste rock. The Agency also noted that concentrations of several metals exceeded the accepted reference criteria in the majority of diabase samples tested for metal leaching while the median concentration of sulphur exceeded that of granite by five times. These results suggest uncertainty in Dominion's conclusion that diabase is non-PAG and raise concerns that acid rock drainage and metal leachate could result from the use of diabase as a construction material.

	Panda/Koala/ Beartooth	Fox	Sable	Pigeon	Misery/Lynx	Coarse Kimberlite Rejects	Jay
Operational Status	Complete	Complete	Active	Active	Active	Active	Future
Rock Types Contained	Granite, Diabase	Granite, Diabase, Kimberlite	Granite, Diabase	Granite, Diabase, Metasediment, Till	Granite, Diabase, Metasediment	Coarse Processed Kimberlite	Granite, Diabase, Metasediment
Final Designed Area (ha)	341	320	182	66	151	115	227
Final Designed Height (m)	50	50	65	70	65	50	65
Current Volume (million tonnes)	169 (inactive)	214 (inactive)	19.4 (active)	7.4 (active)	99 (active)	38.2 (active)	155 (planned)
Other Features	Landfarm, Solid Waste Landfill	None	None	None	Solid Waste Landfill	None	None

Table 3. Ekati Mine Waste Rock and Coarse Kimberlite Rejects Storage Areas

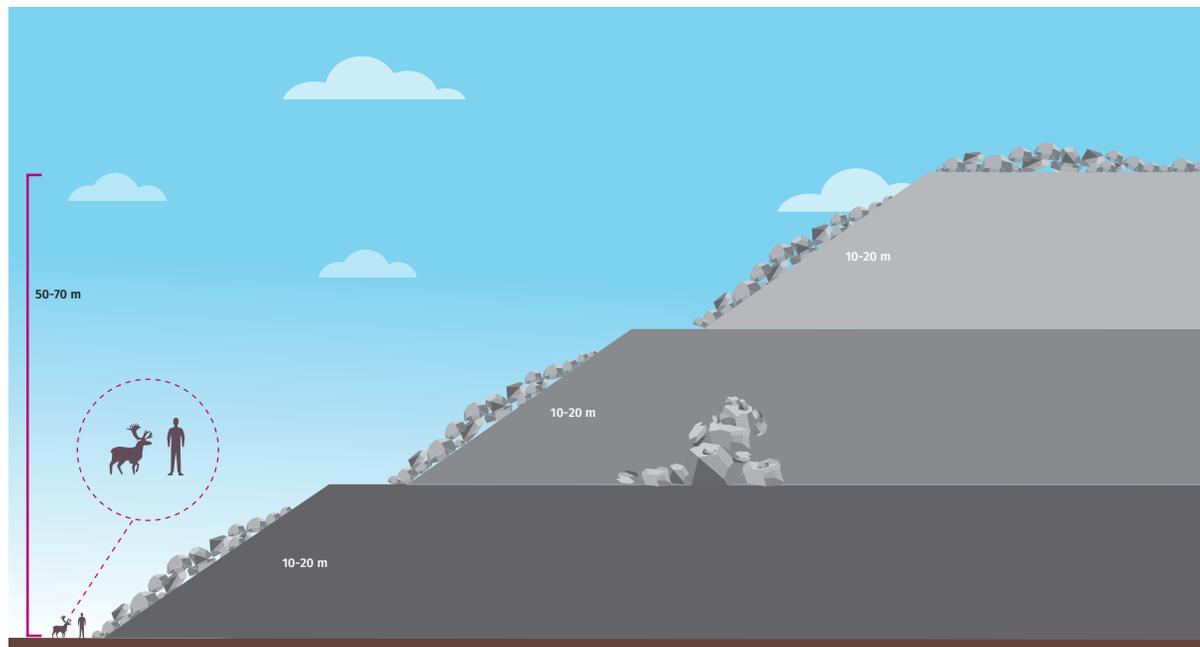
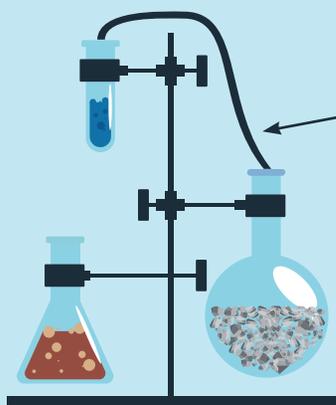


Diagram 1: Waste rock storage area illustration

**TOTAL NEUTRALIZATION POTENTIAL (TNP)****In the lab**

Controlled conditions  
"Best case scenario"



Controlled conditions  
allow us to  
measure maximum  
neutralization  
potential

**VS****EFFECTIVE NEUTRALIZATION POTENTIAL (ENP)****At the mine site**

Taking place in WRSAs  
"The reality on the land"

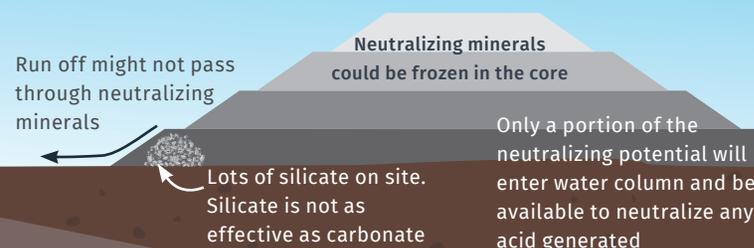


Diagram 2: Neutralization Potential

## WHAT IS NEUTRALIZATION POTENTIAL AND WHY IS IT IMPORTANT?

The formation of mine acid drainage and the contaminants associated with it has been described by some as the largest long term environmental problem facing the mining industry. It is a difficult and costly problem as acid generated through oxidation of sulphides and other natural minerals in waste rock can cause metals such as copper and cadmium to leach from WRSAs into adjacent lakes and streams. Fortunately, if sufficient neutralizing minerals are also found in the rock, the acid can effectively be neutralized and the problems associated with acid mine drainage reduced or eliminated.

Carbonate, silicate, aluminium and iron hydroxides and oxides, and aluminosilicate are among the common minerals capable of contributing to the neutralization of acidic solutions, but their reactions and reaction rates vary widely. What specific minerals are present in the rock, their concentrations and the weathering mechanisms taking place under the site specific conditions determine the waste rock's potential to neutralize the cumulative rates of generated acid.

Waste rock at Ekati generally has low amounts of carbonate minerals and relies on silicates to neutralize acid. In general, silicate minerals react slower to acid conditions than carbonate minerals.

Total Neutralization Potential (TNP) is a measure of the total, or cumulative, acid a material is capable of neutralizing. The testing involves dissolving and quantifying all the neutralizing minerals in a rock sample including those that may not contribute similar acid neutralization properties under actual field conditions.

Effective Neutralization Potential (ENP) is a measure of the actual, or effective, neutralization potential residing in rock under the environmental conditions it resides in. Unfortunately, no single available testing method can accurately simulate all the factors that determine actual drainage chemistry under field conditions. This makes the testing difficult, time consuming and more costly.

## Jay WRSA Co-placement Study

In October 2017, Dominion submitted a study to the WLWB that outlined how the co-placement of PAG and non-PAG waste rock within the proposed Jay WRSA pile will be optimized so as to ensure acid rock drainage and metal leachate are eliminated. The Jay WRSA Co-placement Study Design suggested geochemical testing and a waste rock placement and monitoring system, along with a geochemical and geothermal monitoring program on the reported analogous Misery WRSA.

In its September 2018 decision, the WLWB did not approve the Study Design. The Board agreed with the Agency that the proposed study would not adequately assess the 'effective neutralization potential' of Jay waste rock and the sensitivity of the pile to imperfect co-placement, or mixing, of PAG and non-PAG material. Dominion was also directed to assess the need for, and potential value of, operating field-scale tests concurrent with construction of the Jay WRSA and to re-submit a revised Study Design.

## Misery WRSA Geotechnical Investigation

The Misery WRSA geotechnical investigation was conducted in February and March 2018. One borehole was drilled from the 515 m bench to a final depth of 59 m below ground surface (mbgs). Although the planned depth was 75 mbgs, all metasediment layers of the WRSA are believed to have been intersected. Nine granite and 16 metasediment samples were collected, photographed, logged and sampled during drilling, and a series of temperature, moisture and groundwater monitoring instruments were installed in the borehole. Unfortunately, the deep thermistor and hole casing were damaged below 21 mbgs during backfilling, which means deep temperature and water monitoring were not possible.

Monitoring results obtained up until November 2018 suggest the following:

- The near-surface summer active layer extends to a depth of 4 m, which is within the constructed 5 m thick cover of non-PAG material.
- Preliminary water flow velocity estimates indicate porewater in the active layer may be flushed from the WRSA every two to four years.

- All waste rock between the 4 m active layer and the maximum depth of monitoring at 21 mbgs remained frozen throughout the monitoring period.
- The *in situ* weathering of waste rock within the pile has been very slight with frozen ground temperature contributing to the slow rate of weathering and helping to immobilize the weathering products.

## Seepage Monitoring

A summary graphic showing how water interacts or moves through (seepage) with a given waste rock pile is presented in Diagram 3 at the end of this chapter.

Dominion is required to monitor seepage coming from WRSAs and report findings each year. The 2018 Waste Rock and Waste Rock Storage Area Seepage Survey Report (Seepage Survey Report) was submitted to the WLWB in April 2019. In addition, Dominion is required every three years to complete a detailed analysis of seepage trends over time. The next 3 Year Seepage Survey Report is expected to be submitted in 2020.

Pigeon pit



Seepage samples are obtained each year during spring freshet and the fall from any seeps that have a measurable flow. A total of 49 seeps were sampled in 2018 including 26 which were not previously identified. As in previous years, seepage occurred at some laydown areas, the CKRSA and each WRSA, except the new Sable WRSA where no seepage was found.

Most previously sampled seeps showed similar concentrations and trends as observed in previous years. Some exceptions were noted including high Total Suspended Solid concentrations at most Lynx seeps relative to those reported at other WRSA; higher concentrations of almost all measured parameters in the seep downstream of the Lynx crusher pad; and seeps around the CKRSA showing higher peaks in conductivity and total concentrations during freshet as compared to the fall, some above the maximum reported to date.

Eight problematic seeps were identified in 2018 as compared to six during the previous year. A problematic seep is one that exceeds Water License effluent quality criteria for more than one year or shows poor water quality compared to what is typical at that location for more than one year. Once a problematic seep has been identified, sampling frequency is increased and, depending on results, adaptive management strategies to protect surrounding lakes and streams may need to be developed.

The following is a summary of the problematic seeps identified in 2018 along with the receiving environment: Panda/Koala/Beartooth WRSA (Bearclaw Lake and Pelzer Lake); Fox WRSA (Three Hump Lake (2) and South Fox Lake); Lynx Crusher Pad (Cujo Lake); and Lynx WRSA (Mossing Lake and an unnamed lake).

In all reported cases, elevated concentrations of constituents of concern within the seep tended to be rapidly diluted along the flow path. This resulted in concentrations at the shoreline where the seep entered an adjacent lake being lower than the seep concentrations and similar to, or only slightly greater than, open-water concentrations.

## AGENCY ASSESSMENT

The management of waste rock and processed kimberlite represents one of the most significant challenges for the eventual closure and reclamation of the Ekati mine. The large storage areas will be permanent fixtures on the Lac de Gras landscape long after mining operations have ended and, once completed, will be difficult and costly to modify. It is important therefore, that short term and long term aspects of waste rock behavior is carefully considered in the design and operation of WRSA, and all reasonable efforts be made to 'get it right the first time'.

Much of the Agency's efforts in 2018 focussed on waste rock management and Dominion's continued use of Total Neutralization Potential (TNP) as a measure of the rocks' ability to neutralize acid generated through oxidation of sulphides and other acid-producing minerals (Diagram 2). While the Agency believes the use of Effective Neutralization Potential (ENP) is a more accurate means of determining the ability of waste rock to neutralize internal and external acidity, we acknowledge that no single analytical procedure can accurately simulate all the factors which determine waste rock drainage chemistry under actual field conditions. This makes testing for ENP more difficult, time consuming and costly than testing for TNP.

However, the Agency believes the issue is of such significance and that sufficient uncertainty has been demonstrated over Dominion's use of TNP for determining the neutralization potential of waste rock under field conditions that it should no longer be the only method used. It is for these reasons we have recommended that the Wek'eezhii Land and Water Board undertake an expert review to examine the most effective and efficient means of testing and determining the neutralization, acid rock drainage and metal leaching potential of waste rock at Ekati and other northern mines.

The Agency acknowledges Dominion's efforts to reduce uncertainties related to the geothermal and geochemical processes taking place within the Misery/Lynx WRSA. Unfortunately, the deep thermistor and PVC casing were damaged in the single borehole prepared as part of the geotechnical investigation making it not possible to profile the thermal regime and obtain water samples below the depth of 21 m. As the Misery/Lynx WRSA has a final designed height of 65 m, this means the lower two thirds of the pile cannot be monitored. The Agency encourages Dominion to install a replacement deep thermistor and water sampling casing in a separate bore hole in the future.

Geothermal and geochemical processes within the WRSA are affected by convective and conductive cooling (winter) and heating (summer), particularly in areas located adjacent to the exposed shoulder slopes. The Agency notes that the current borehole is located in the approximate centre of the WRSA which may not accurately reflect conditions and processes occurring around the perimeter of the pile.

Additional boreholes may be required to accurately estimate the long term geothermal and geochemical performance of the entire WRSA and closure cover.

The Agency supported Dominion's request to reduce the standard 100 m setback between the South Sable WRSA and Two Rock Settlement Pond to 30 m as a means of providing additional protection for the adjacent Ulu watershed. This support should not however, be interpreted as

supporting a general 30 m setback as the Agency believes a 100 m setback is more protective of lakes and streams as it better provides sufficient room for any necessary adaptive management facilities to be constructed.

Where water, fish and plankton and benthos community quality exceed pre-determined action levels, Dominion has implemented an Adaptive Management Framework and Response Plans which are intended to address and mitigate the

exceedance (refer to the Aquatic Effects chapter of this report). While results from the 2018 survey confirm that seepage quality from some WRSAs exceed current surface water quality limits established through the Water Licence, a similar adaptive management program has not been initiated. Given the potential long term impacts seeps may have on water quality in adjacent lakes and streams, the Agency believes a similar adaptive management approach should be developed for WRSA seepage.

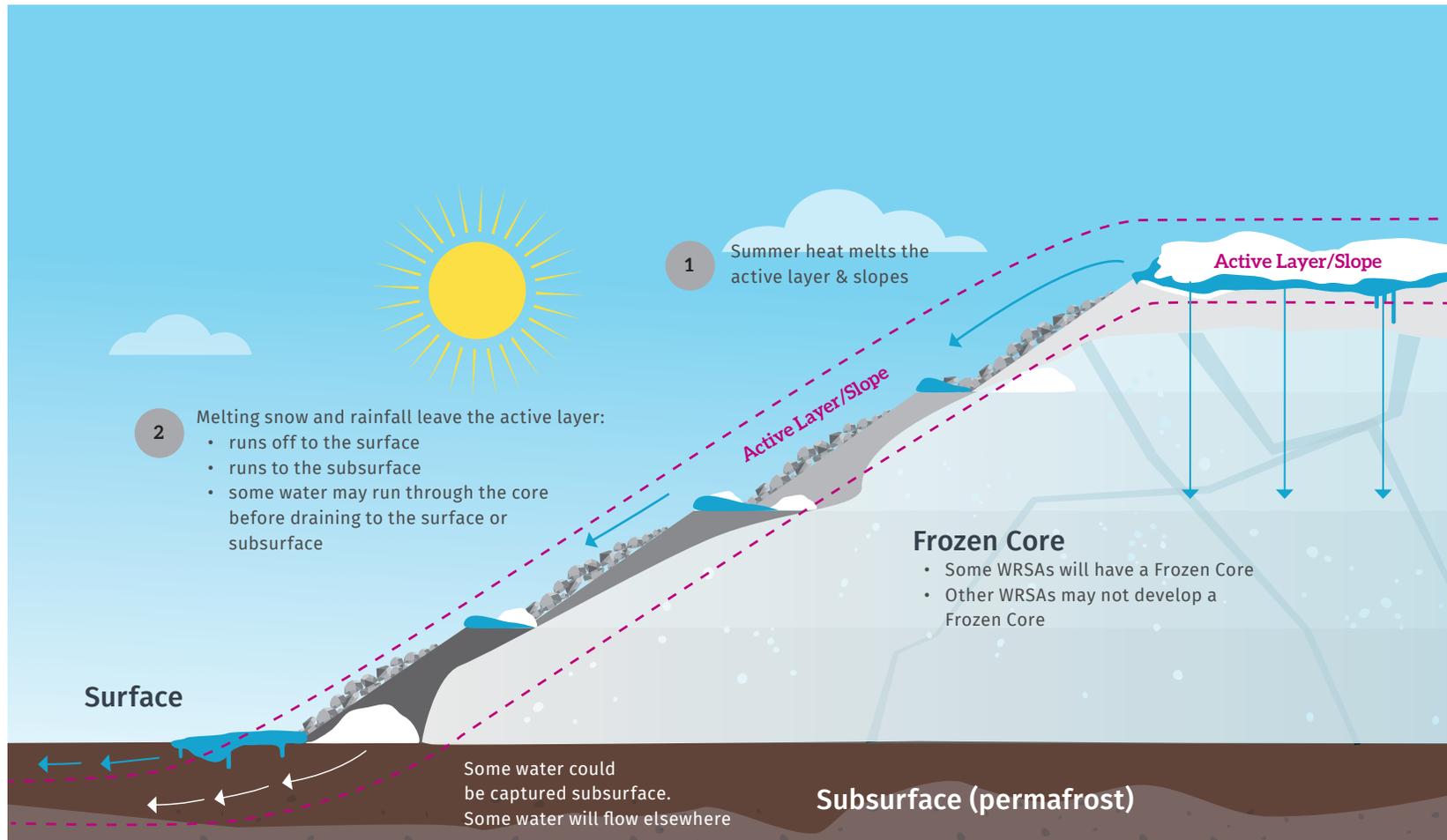


Diagram 3: Seepage

# WASTEWATER AND PROCESSED KIMBERLITE MANAGEMENT

## HIGHLIGHTS

-  Dominion updated the Wastewater and Processed Kimberlite Management Plan (WPKMP) to incorporate the Panda-Koala Processed Kimberlite Containment Area (PKCA) as the primary location for deposit of Fine Processed Kimberlite (FPK).
-  Mining of Koala underground is complete, making the Panda-Koala-Koala North Pits available for deposit of FPK.
-  Further research is needed to support a decision about the depth of freshwater cap required above FPK in the Panda-Koala PKCA.



## WASTEWATER AND FINE PROCESSED KIMBERLITE

Operation of the Ekati mine requires Dominion to manage several different types of wastewater, including water that contacts various mine facilities and wastes, and sewage. Also, the diamond recovery process produces large quantities of Processed Kimberlite (PK) – material rejected from the process

plant after the extraction of diamonds. This includes Fine Processed Kimberlite (FPK) that leaves the process plant as a slurry of fine ground up rock (sand/silt/clay sized particles) mixed with water. The large volume of water associated with FPK means that wastewater management and FPK management

are closely linked activities. The WPKMP describes site-wide wastewater management and FPK disposal. Table 4 summarizes the types of wastewater and PK at the Ekati mine site. Diagram 4 shows the flows & destinations of water and processed kimberlite at the Ekati mine site.

Category	Type	Description/Source
<i>Minewater</i> Runoff from facilities and water pumped from mines	Surface Minewater	Water that flows or is pumped from surface mine infrastructure, e.g., roads, waste storage areas, truck wash bays, collection sumps.
	Open Pit Minewater	Water that flows or is pumped from open pits.
	Underground Minewater	Water that flows or is pumped from underground workings.
<i>Sewage</i> Toilet waste and greywater	Sewage – Main Site	Sanitary sewage system at the main site.
	Sewage – Remote Sites	Sewage from remote work sites, e.g., Fox Pit, Misery Camp.
<i>Processed Kimberlite</i> Material rejected from the process plant	Coarse Processed Kimberlite	Coarse kimberlite (> 0.5 mm diameter particles) rejected from the process plant. Trucked to waste rock storage areas (See Waste Rock section of this report for more information).
	Fine Processed Kimberlite	Fine kimberlite (< 0.5 mm diameter particles) discharged from the process plant in a slurry mixture of FPK and water.

Table 4. Wastewater and processed kimberlite at the Ekati mine site

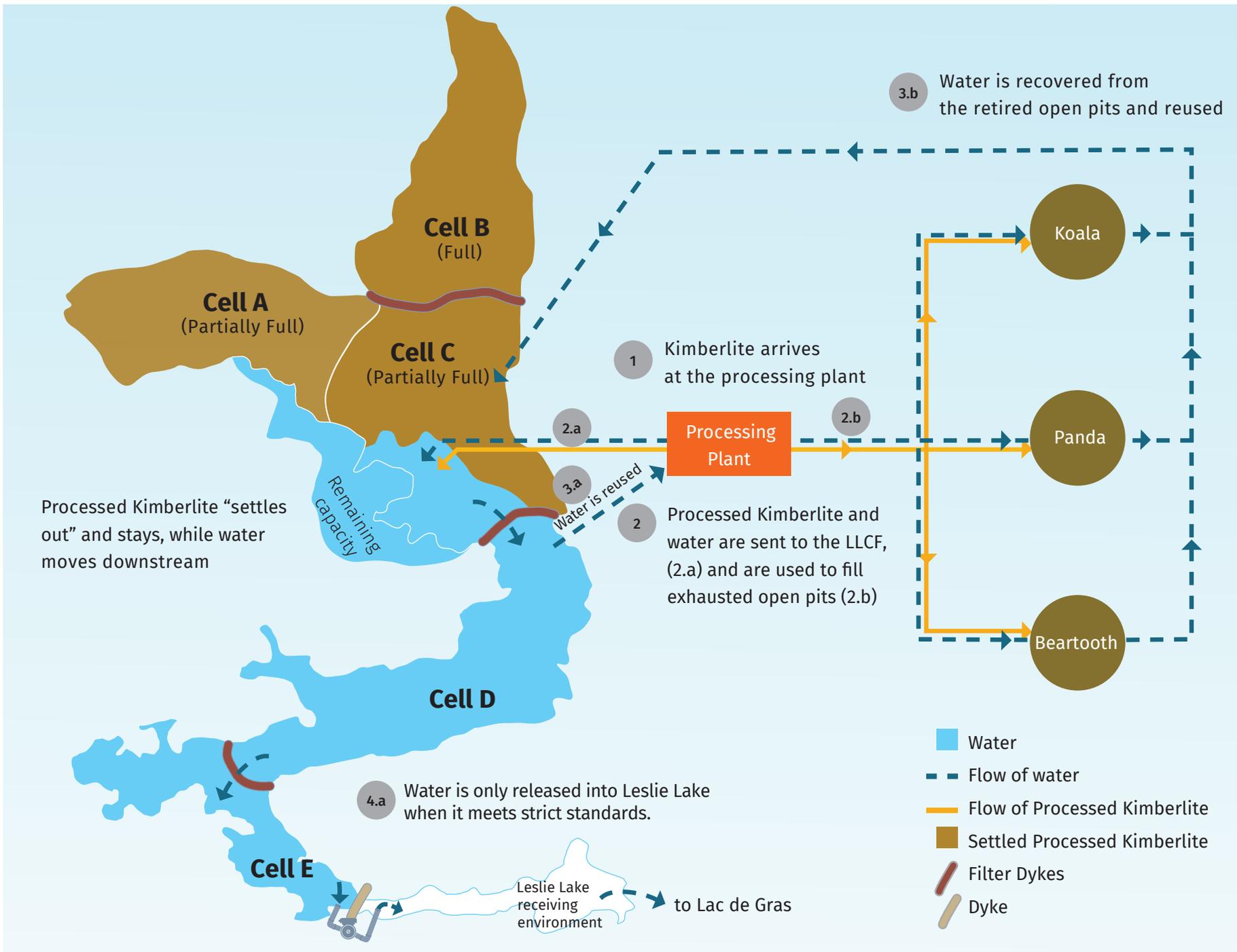


Diagram 4: Wastewater and processed kimberlite at the Ekati mine site

## WASTEWATER MANAGEMENT

All minewater must meet effluent quality criteria (EQC) specified in the Water Licence before the water can be discharged to the receiving environment. Ekati mine currently relies on three water management facilities as the primary discharge locations, where Dominion collects and analyzes water samples to confirm compliance with the EQC before discharge.

- Two Rock Sedimentation Pond (TRSP) manages water from the Sable site, with discharge to Horseshoe Lake in the Horseshoe watershed.
- Long Lake Containment Facility (LLCF) manages water from the Main Camp, Panda/Koala/Beartooth area, Ammonium Nitrate Storage Facility, Polar Explosive Building, Fox site and Pigeon site, with discharge to Leslie Lake in the Koala watershed. Water management in this area sometimes relies on temporary storage in the Beartooth PKCA before discharge through the LLCF.
- King Pond Settling Facility (KPSF) at the Misery site manages water from the Misery and Lynx sites, with discharge to Cujo Lake in the King-Cujo watershed.

In future, Dominion plans to use the Misery Pit to manage water from the Jay project, with discharge to Lac du Sauvage.

Dominion manages most surface minewater by temporary collection in sumps, followed by pumping or trucking to one of the three primary water management facilities. Surface minewater runoff from some roads, laydowns, and waste rock storage areas follows natural flow paths or is directed into the tundra. The Waste Rock and Ore Storage Management Plan dictates that roads and laydowns can only be constructed using materials that are non-potentially acid-generating with low metal leaching potential.

Panda Waste Rock Storage Area Photo Courtesy of Dominion Diamond Mines ULC



The management of open pit and underground water in 2018 is summarized in Table 5.

Mine Area	Source	Water Management	2018 Volumes (m3)
Panda, Koala, Koala North	Open Pit	Pumped to LLCF.	274,677
	Underground	Pumped to LLCF or Beartooth PKCA. Discontinued in early 2019 when mining and underground reclamation completed.	262,918 to LLCF 0 to Beartooth PKCA
Beartooth	Open Pit	Pumped to LLCF.	1,462,770
		Currently used for FPK storage and temporary storage of water from other sources.	
Fox	Open Pit	Pumped to LLCF during operation. Currently accumulating in pit.	0
Pigeon	Open Pit	Pumped or trucked to LLCF or Beartooth PKCA.	15,760 to LLCF 19,520 to Beartooth PKCA
	Open Pit	Pumped or trucked to KPSF.  Future storage of non-compliant water from KPSF	43,408 to KPSF
Sable	Open Pit	Pumped or trucked to TRSP.	44,507
Misery	Open Pit	Pumped to KPSF.	0
	Underground	Pumped to KPSF or Lynx Pit.	Not operational in 2018.
Jay	Open Pit	Pumped to Misery Pit.	Not operational in 2018.

Table 5 – 2018 Open Pit and Underground Water Management

All sewage wastewater from the site is treated in the sanitary sewage treatment plant located at the main camp. Sewage from washroom facilities across the site is trucked to the sewage treatment plant. Treated effluent from the sewage treatment plant flows through a pipeline to the process plant, where it is mixed with FPK and then discharged to one of the PKCAs. In 2018, Dominion discharged 81,140 m<sup>3</sup> of sewage effluent to the LLCF with the FPK slurry.

## FINE PROCESSED KIMBERLITE MANAGEMENT

Dominion's current FPK deposition plan uses the LLCF as the primary FPK storage location and the Beartooth PKCA as the secondary storage location. Dominion pumps FPK to the LLCF and Beartooth PKCA as a slurry, with approximately 40% solids by mass (i.e., 60% water). In 2018, Dominion did not place any FPK in the Beartooth PKCA. The Beartooth PKCA also serves as a minewater retention pond when water quality conditions make it beneficial to divert certain minewater sources away from the LLCF. For example, water with elevated nitrate, chloride

and potassium concentrations may be directed to the Beartooth PKCA where it can mix with other water before discharge to the LLCF. As approved by the Wek'èezhìi Land and Water Board in its February 2019 decision, the Panda-Koala pits and underground will be used as the main FPK storage area beginning in spring of 2019.

The LLCF has five cells (A through E) separated by two filter dikes, with the most downstream cell (Cell E) retained by the Outlet Dam, where Dominion monitors compliance with the Water

Licence Effluent Quality Criteria before discharge to Leslie Lake can be granted by the inspector. Dominion has deposited PK only in Cells A, B and C. Cell B has been filled to capacity while Cells A and C have remaining space for FPK storage. Cell D has pumping facilities to recycle water for use in the process plant. Table 6 lists the volumes of FPK and process plant water placed into the LLCF, Beartooth PKCA and water used by process plant from Cell D in 2018.

Facility	Process Plant Solids FPK (m <sup>3</sup> )	Process Plant Solids FPK (m <sup>3</sup> )
LLCF	1,082,087	5,995,091
Beartooth PKCA	0	0

Table 6. FPK and Water Volumes for PK Containment Facilities in 2018

Haul Train, photo courtesy of Dominion Diamond Mines ULC



## PANDA-KOALA PROCESSED KIMBERLITE CONTAINMENT AREA

As part of the licensing for the Jay Project, Dominion received conditional approval of a conceptual plan to deposit FPK into the Panda, Koala and Koala North Pits after completion of underground mining. Part H, Clause 2 of the Water Licence requires submission and approval of an updated WPKMP that incorporates the results of a freshwater cap optimization study, and Part H, Clause 32 requires completion of the “Panda and Koala Deposition Study” intended to “investigate how FPK behaves once deposited into mined-out pits and the quality of the resulting supernatant water” and “include an updated Panda and Koala Pits predictive water quality model.”

Dominion submitted the updated WPKMP v8.0 in September 2018, incorporating plans for FPK deposition in Panda, Koala and Koala North pits. Under the revised FPK deposition plan, Dominion proposes that the Panda-Koala PKCA will become the primary FPK storage facility, with the LLCF and Beartooth PKCA as secondary storage facilities. As water levels rise in the Beartooth and Panda-Koala PKCA's the water will be decanted to the LLCF.

Dominion believes these pits provide physically secure and long-term storage for large volumes of FPK and therefore have benefits for post-closure physical stability at the site. However, they rely on freshwater caps overlying the FPK to address potential long-term water quality concerns. During its review, the Agency expressed concern that

there is outstanding uncertainty about the depth of freshwater cap that is required to achieve acceptable post-closure water quality conditions. Dominion's water quality modelling predicts that the proposed 30 m depth of freshwater cap will have long-term concentrations of some parameters that exceed the current operational water quality benchmarks. As discussed in the Closure and Reclamation section of this report, the operational water quality benchmarks may not be appropriate for evaluating closure conditions. The results of the water quality modelling identify WRSAs as the primary source of loading that causes the predicted exceedances. Dominion has proposed a research plan to evaluate the optimal depth for the freshwater cap to achieve acceptable post-closure conditions.

WPKMP v8.0 lacked a section describing planned closure and reclamation for PK containment facilities, something that had been included in previous versions. In February 2019, the WLWB approved the disposal of FPK into the Panda/ Koala PKCA, but directed Dominion to provide an additional updated version of the WPKMP clarifying that the freshwater cap depth requires further research and incorporating a description of closure and reclamation plans. Dominion submitted WPKMP v9.0 in March 2019 to address these requirements. Review is ongoing.

Dominion also submitted the Panda and Koala Deposition Study, including the results of water quality modelling and FPK consolidation modelling, in September 2018. In its review of the Deposition Study, the Agency expressed concern about the lack of detail provided about modelling inputs, assumptions and methods. It also identified specific concern about the methods used to estimate loading from WRSAs, the lack of site-specific data for runoff from disturbed areas, and the reliance on median concentrations to estimate loading from mine sources.

Dominion completed underground mining in Koala in November 2018. A GNWT inspection report dated March 12, 2019 states that the Panda-Koala underground decommissioning had been completed.

## AGENCY ASSESSMENT

The use of the Panda-Koala PKCA as the primary location for deposition of FPK is a fundamental change in the management plan for FPK at the Ekati mine. This change will have implications for long-term water quality in Panda, Koala and Koala North Pits and their post-closure pit lakes. Discontinuing ongoing discharge of FPK to the LLCF will lead to changes in water quality and water levels in that facility.

The water quality modelling for the pit lakes relies on many assumptions and on estimates of loading from a variety of sources including FPK porewater, and WRSA runoff and seepage. There are limited or no data to support estimates of source loading for some contaminant sources, e.g., runoff from disturbed areas like roads and laydowns. The estimates of loading from WRSAs assume that current runoff and seepage conditions are representative of long-term

conditions. There is little evidence to support this assumption because Dominion has not completed detailed water and energy balances for WRSAs. Also, estimates of key source loads are based on data that represent the median of measured conditions. There is a strong possibility that more adverse conditions will exist at some times. Overall, these assumptions and estimates leave significant uncertainty about the long-term predictions of water quality in pit lakes, and may underestimate future loading and concentrations. The Agency considers timely and robust monitoring and research programs to support future modelling and predictions to be critical as the deposit of FPK into the facilities proceeds.

The uncertainty about water quality predictions leads to uncertainty about the depth of freshwater cap that is required above the FPK in pit lakes to protect the receiving environment.

The modelling indicates that WRSA sources may be ongoing sources of contaminants that could lead to post-closure exceedance of current water quality benchmarks. The Agency considers further research about optimal depth for a freshwater cap over FPK stored in pits as a critical step in the closure planning process.

Misery Pit, camp and Waste Rock Storage Area, photo courtesy of Dominion Diamond Mines ULC



# CLOSURE & RECLAMATION

## HIGHLIGHTS

- 🐾 The submitted Interim Closure and Reclamation Plan v3.0 has several critical flaws that need to be addressed before it is approved.
- 🐾 More work and engagement is needed to support Dominion's proposals to reduce closure efforts aimed at mitigating effects on wildlife, e.g., roads and WRSAs.
- 🐾 Legal and administrative issues related to financial securities at the Ekati mine are impediments to appropriately managing public liability and risk for mine closure.

## CLOSURE PLANNING STATUS

The Wek'èezhìi Land and Water Board (WLWB) requires Dominion to have an approved Interim Closure and Reclamation Plan (ICRP) during active mining operations, and to annually report on reclamation progress and any revisions to reclamation planning. Dominion's reclamation planning is guided by the following goal:

*“Return the Ekati mine site to viable, and wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment, human activities, and the surrounding environment.” (ICRP v2.4 and v3.0)*

In August 2018, Dominion submitted ICRP v3.0, the first comprehensive update of the ICRP since 2011. The WLWB has initiated the review process. The Agency participated in a WLWB ICRP Technical Workshop in January 2019 and submitted comments to the WLWB in March 2019. As of the end of 2018, ICRP v2.4 remains as the approved plan for closure and reclamation.

In January 2019, Dominion submitted its 2018 Closure and Reclamation Progress Report, including information about reclamation research program progress and results, and progressive reclamation activities.

## CLOSURE AND RECLAMATION PLANS

For the most part, the basic closure concepts did not change between ICRP v2.4 and v3.0. However, v3.0 does include substantial changes with respect to details of some proposed closure activities.

### Open Pits

The proposed closure plan for open pits involves flooding the pits and connected underground mines with freshwater to create new pit lakes. Dominion expects to reconnect pit lakes with their surrounding watersheds when the water quality meets appropriate standards. For most pits, reconnection will involve inflow and outflow channels, but for Jay pit Dominion will breach the dike to allow reconnection with Lac du Sauvage. For pits that contain mine water, Dominion plans to layer freshwater on top of denser mine water, so that the mine water remains permanently at the bottom of the pits.

The plan proposes construction of berms around all pits except Jay pit, to deter wildlife from entering the flooded pits.

Both versions of the ICRP propose establishment of littoral zones around pit lakes to provide favourable conditions for the development of self-sustaining ecosystems. ICRP v3.0 concludes that littoral zones are only practical in small areas of the Panda, Koala, Koala North and Beartooth pits, indicating a substantial reduction from the objectives for littoral zones in ICRP v2.4.

Both versions of the ICRP propose establishment of means for wildlife to safely escape from pits, but ICRP v3.0 proposes no active remediation efforts to achieve this objective. Instead it proposes that egress will be facilitated by inflow and outflow channels, pit ramps and, in some pits, littoral areas.

### Underground Mines

Underground mines are all associated with pits and will eventually be filled with water or processed kimberlite (PK) as part of mine operations and pit closure. Nonetheless, underground mines require

additional reclamation and closure activities. The closure and reclamation plan for underground mines begins with removal of all hazardous materials and equipment, and materials with potential for chemical degradation. Dominion plans to leave equipment underground if it is not salvageable and will not negatively affect water quality. All underground portals and fresh air raises will be protected against inadvertent access by animals and humans, either by constructing plugs/seals, or because they will be submerged under pit lake water and/or PK.

### Waste Rock and Coarse Kimberlite Storage Areas

All of the Waste Rock Storage Areas (WRSAs) on site (i.e., Sable, Pigeon, Panda/Koala/Beartooth, Fox, and Misery/Lynx and the future Jay) will remain in place after mining operations have ceased. Areas of exposed metasediment rock at the Misery/Lynx and Jay WRSAs are to be covered with 5 m of non acid-generating waste rock. Based on the results of thermal modelling, Dominion predicts that 5 m covers will be thicker than the active layer that thaws in the summer, so that the underlying waste rock material will be permanently frozen. Keeping any potentially acid-generating or metal leaching waste rock permanently frozen below the active layer is the primary mechanism for controlling acid rock drainage and metal leaching for WRSAs.

The approved design for the Pigeon WRSA envisioned a cover composed of 3 m of till overlain by 1 m of non acid-generating waste rock. ICRP v3.0 proposes that further research is needed to determine whether the geochemistry of Pigeon waste rock warrants placement of a cover (i.e., whether the Pigeon waste rock is potentially acid-generating or may leach metals).

Covers are not proposed for Panda/Koala/Beartooth, Fox (non-kimberlite portion), Sable or Lynx WRSAs because Dominion has concluded that the rock on the surface of these facilities is not potentially acid-generating and will not leach metals. Therefore, it considers these materials to be suitable as part of the active layer (i.e., subject to seasonal thaw).

Dominion proposes that the closure geometry of WRSAs will be similar to their current configuration: angle of repose rock slopes with a series of flat benches to establish physically stable overall slopes. The designs include stepped profiles and flat tops (intended to reduce snow build-up). Pigeon WRSA is the only potential exception to this closure geometry. If Pigeon WRSA is covered with till, the placement of the till will require re-grading to create flatter slopes. Dominion expects that the WRSAs will become permanently frozen over the long term.

Coarse PK stored at the Fox WRSA and the Coarse Kimberlite Rejects Containment Area needs protection from erosion. The closure plan entails either covering with non-acid generating waste rock or active re-vegetation of the PK materials.

One important difference between ICRP v2.4 and ICRP v3.0 relates to plans for wildlife access to WRSAs. ICRP v2.4 includes an objective for providing safe access and egress to/from WRSAs, and identifies the construction of access ramps for wildlife as a closure activity for all WRSAs. ICRP v3.0 does not identify any objectives related to access/egress on WRSAs and proposes that the need for providing safe access/egress for wildlife should be determined by evaluating recent and historical caribou movement patterns, nearby habitat types, and proximity of WRSAs to caribou movement corridors. Dominion has proposed a reclamation

research plan to support decision-making about “the need to facilitate wildlife access/egress and the number and location of access points” (ICRP v3.0, Section 5.5.4.3). Based on its preliminary evaluation included in ICRP v3.0, Dominion did not identify any WRSA with a high priority for establishment of access/egress ramps and identified moderate priority for only Sable, Pigeon, Misery and Lynx WRSAs.

### **Fine Processed Kimberlite Containment Areas**

The ICRP proposes reclamation of the Long Lake Containment Facility (LLCF) surface using a combination of vegetation and rock placement (Diagram 5). Both of these activities are intended to stabilize the surface and provide protection from erosion by wind and water. Closure water management in the LLCF involves the construction of new drainage channels and improvement of existing drainage channels to drain residual ponds and safely convey water off of the LLCF. Dominion plans to construct spillways through existing dikes and dams to allow water to flow from one cell to the next through the LLCF. Dominion is undertaking reclamation research intended to support decisions about final design of surface stabilization measures and water management.

The closure and reclamation plan for fine processed kimberlite (FPK) stored in the Beartooth and the Panda/Koala processed kimberlite containment areas (PKCA) involves the establishment of freshwater caps above the FPK. These freshwater caps are intended to result in water quality that meets post-closure water quality benchmarks, which Dominion has not yet defined. The water quality modelling predicts that post-closure concentrations of some contaminants

in the Panda/Koala PKCA may exceed existing operational water quality benchmarks with a 30 m freshwater cap. Dominion has proposed a research plan to evaluate the depth of freshwater cap required to meet water quality objectives.

### **Roads**

The closure and reclamation for roads is one area where ICRP v2.4 and ICRP v3.0 differ substantially. ICRP v2.4 proposed scarifying the surface, removing culverts and flattening safety berms on all roads that are not required to support access for long-term monitoring activities. Roads that are required for monitoring would be closed in the same way once they are no longer required. ICRP v3.0 on the other hand, proposes that:

*“...some roads maybe left in place as travel corridors, and if required, road berms will be knocked down to facilitate access and egress by wildlife. Where roads are not left in place, they will be selectively scarified and vegetated to promote natural vegetation.”*  
(ICRP v3.0, Section 5.8.1.2.3)

Dominion envisions that the roads, if left in place, may facilitate wildlife movement as “potential esker complexes” (e.g., ICRP v3.0, Section 5.8.5.3.2). It proposes reclamation research and engagement activities to support final decision-making about which roads should be left in place or reclaimed.

### **Surface Infrastructure**

All buildings, storage tanks, power lines, water pipelines and other physical structures are to be removed and either buried in a landfill or shipped off site. Lay down pads and the airstrip are to remain in place and be decommissioned so they are safe for human and wildlife use after the mine is closed.

## Waste Rock Placement Methods at the Ekati Mine

Dominion Diamond’s proposed construction methodology for the Jay waste rock pile differs from the method currently used at the Ekati mine of building the WRSA from the original ground surface up in horizontal layers or lifts. The proposed approach would see diagonal layers built by end-dumping waste rock from the full height of the pile.

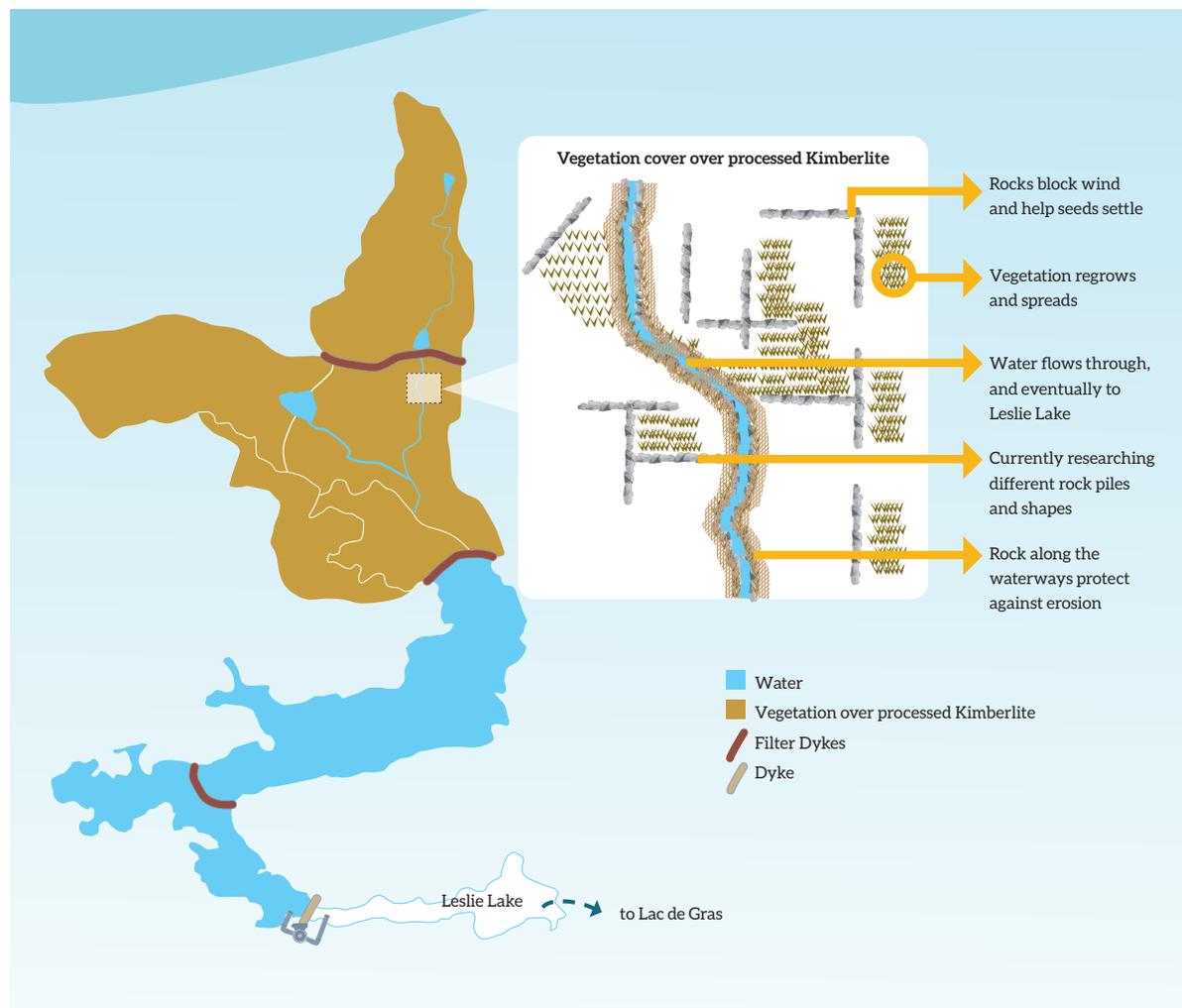


Diagram 5 : LLCF plan closure and reclamation

## PROGRESSIVE CLOSURE AND RECLAMATION ACTIVITIES

In 2018, Dominion conducted progressive reclamation activities at Old Camp and the Panda-Koala Underground. These activities are described in the 2018 Closure and Reclamation Progress Report, and summarized below. Dominion also conducted monitoring of previously completed progressive reclamation work, and identified any maintenance requirements.

### Old Camp

Old Camp reclamation activities began in 2014 and continued through 2018. Sampling following hydrocarbon soil excavation in 2017 revealed some remaining soils with hydrocarbon contamination exceeding guideline concentrations. In 2018, Dominion removed approximately 250 m<sup>3</sup> of additional contaminated soil from the Old Camp area and hauled it to the active on-site land farm for remediation. Dominion conducted confirmatory monitoring after the 2018 excavation work, and all soil samples had hydrocarbon concentrations less than the guidelines.

2018 water quality monitoring in the constructed channel at the reclaimed Phase 1 pond measured arsenic concentrations at some locations above the Effluent Quality Criteria specified in the Ekati Water Licence. Dominion plans to continue monitoring in the area, but asserts that natural attenuation and dilution along the flow path will reduce concentrations before the water enters Larry Lake.

## Panda-Koala Underground

In July 2018, the Government of the Northwest Territories (GNWT) granted approval for Dominion to permanently leave equipment in the underground, including the entire conveyor system. The approval requires the removal of all hydraulic oil, and that all grease left on/in equipment be biodegradable. Dominion completed underground mining activities in the Panda-Koala underground in November 2018. A GNWT inspection report dated March 12, 2019 states that the Panda-Koala underground has been decommissioned and the portal blocked with mesh to keep wildlife out. All power, air and communications were shut down on February 26, 2019.



Panda Waste Rock Storage Area, photo Courtesy of Dominion Diamond Mines ULC

## FINANCIAL SECURITY AND CLOSURE PLANNING

### Financial Security

To manage public liability and risk, the GNWT needs to hold financial security that is equal to the total anticipated cost of closure and reclamation of the Ekati mine at that time. The total reclamation security held by the GNWT as of December 31, 2018 was \$293 million. This represents an increase of \$8 million from December 2017.

In January 2018, Dominion requested adjustments of its reclamation security to address changes in the closure liability, including:

- An increase of \$735,000 for Pigeon pit because the enlargement of the pit requires an increased water volume for flooding as part of closure, and
- A decrease of \$7.9 million for Misery WRSA because Dominion has covered most of the exposed metasediment.

Security Item	Amount Held
Water Licence Security W2012L2-0001	\$271,095,482
Ekati Environmental Agreement	\$19,991,424
Jay Early Works Land Use Permit W2016F0007	\$1,480,000
Pigeon Land Use Permit W2016D0005	\$427,000
<b>Total</b>	<b>\$292,993,906</b>

Table 7. Ekati Mine Reclamation Security Held (December 31, 2018)

In October 2018, the WLWB concluded that any adjustment related to the Pigeon pit should be addressed as part of the overall ICRP v3.0 review and additional information is required before making a decision about reduction of security for Misery WRSA. On March 20, 2019 Dominion submitted a request for security adjustment to address the information request. Review of the new information is ongoing.

### Split Between Land and Water Reclamation Security

As indicated in the Table 7, GNWT holds reclamation security predominantly under the Water Licence. As part of the Water Licence amendment processes for the Jay project and Misery Underground (MUG) project GNWT stated its preference to hold separate securities under:

1. Land use permits and leases for land-related liabilities, and
2. Water Licence for water-related liabilities.

For both projects the WLWB determined that security should be combined and held under the Water Licence. In an October 2018 Request for Ruling, Dominion asked WLWB to authorize splitting of security for the Misery Underground (MUG) Project land and water related liabilities because GNWT had refused to accept a combined security under the Water Licence. Pending resolution of this issue, GNWT does not hold security for liabilities associated with the MUG project.

## AGENCY ASSESSMENT

### Interim Closure and Reclamation Plan (ICRP) v3.0

The submission of an updated, site-wide ICRP was a positive step in planning for closure of the Ekati mine. The Agency reviewed ICRP v3.0, held five community information sessions to discuss the Plan with Aboriginal Society members, and participated in the WLWB's Technical Workshop January 22-23 2019.

Closure and reclamation planning is an iterative process and ICRPs are expected to evolve and develop as mining progresses. ICRPs should increase in level of detail as the mine moves towards closure, with each version providing increased certainty and understanding about the closure and reclamation. As expected, Dominion updated ICRP v3.0 to include new mine components, but the ICRP failed to provide the expected increased level of detail (e.g., in closure designs, and details about future water quality predictions). In some areas (e.g., closure criteria, closure monitoring) ICRP v3.0 provides less detail than ICRP v2.4. In ICRP v3.0, the reduced detail about closure criteria increases uncertainty about the expected post-closure outcomes, and the lack of detail about closure designs leaves greater uncertainty about what the closure and reclamation will entail.

ICRP v3.0 lacks numerical closure criteria that are needed to define the expected closure and post-closure conditions, for water, soil, sediment and air for example. The Agency considers this to be a major weakness of the ICRP. In an objectives-based closure planning approach as required by WLWB guidance, closure objectives and closure criteria define expected closure and post-closure conditions and outcomes. These will influence the design and implementation of closure and

reclamation measures, facilities and activities, including for progressive reclamation activities that are already underway or may soon start. In a proactive closure planning approach, closure criteria also influence decisions about operational designs and activities. Otherwise, decisions and actions taken during operations can constrain future closure options and make it difficult, expensive or impossible to achieve closure criteria and objectives. The Agency believes that well-defined closure criteria, including appropriate numerical criteria (e.g., for water, sediment, air and soil) provide a critical foundation for evaluating the adequacy of the closure and reclamation activities proposed in ICRP v3.0.

In some cases, the analyses in ICRP v3.0 rely on comparison with operational aquatic benchmarks as criteria. However, Dominion does not provide any rationale to describe why the same criteria will be applicable at closure. Adverse conditions and risks that may be acceptable during the relatively short operational life of a mine may not be acceptable for the ensuing 100s or 1000s of years, during which the enduring structures and contamination exist. Thus, operational criteria may not be applicable for closure.

The Agency is concerned that ICRP v3.0 fails to provide details about monitoring closure and post-closure conditions, and responding to changing and unexpected conditions. Monitoring and adaptive management are key components of the closure and reclamation plan for Ekati mine. ICRP v3.0 identifies the need for these activities, but provides very little detail. There is a generic summary of what adaptive management entails, but no details about how it will be applied at Ekati. Details about monitoring that were included in ICRP v2.4 have been removed from ICRP v3.0, leaving little information about closure and post-closure monitoring.

The Agency is concerned about proposed changes to the closure and reclamation plan that could have long-term effects on wildlife, including proposed changes for closure of roads, pits and WRSAs that may affect wildlife movement and access/egress. ICRP v3.0 proposes substantially less closure effort specifically aimed at mitigating wildlife-related concerns. During the WLWB's Technical Workshop and the Agency's community information sessions about the ICRP, community members frequently raised concerns about the potential effects of the project on wildlife, especially caribou. Additional research, evidence, analysis and engagement are needed before the proposed reduced efforts for wildlife mitigation are accepted.

Overall, the Agency concluded that ICRP v3.0 has several critical flaws that make it inadequate as a closure and reclamation plan for the present stage of mining at the Ekati mine, and therefore the Agency does not support the approval of ICRP v3.0 in its current form.

With respect to financial security and closure liabilities, the Agency continues to believe that closure liabilities should never be allowed to exceed the posted security. The Agency also remains convinced that there are benefits, efficiencies and reduced risks that arise from holding both land and water securities under one regulatory instrument. The proposed splitting of security into two instruments could create significant challenges for making timely security adjustments and using security for closure activities if that becomes necessary. GNWT has indicated that there is a legal impediment to holding security under a single instrument. If this is the case, then this is an important flaw in the current regulatory system and it should be addressed.

# ASSESSMENT OF THE REGULATORS

## HIGHLIGHTS

- 🐾 Department of Fisheries and Oceans Canada (DFO) level of involvement in the environmental regulation of the Ekati mine was disappointing and seems to be decreasing from previous assessments;
- 🐾 Environment and Climate Change Canada's (ECCC) participation in document reviews has improved in the level of detail and the number of documents reviewed; and
- 🐾 GNWT-ENR approved the updates to the Environmental Agreement (EA), this process began in 2015. The EA is expected to be signed shortly.



## THE REGULATORS AND OUR MANDATE

As the public watchdog for environmental management at the Ekati mine, the Agency monitors the performance of the operator as well as agencies that regulate the mine. The following are our comments regarding the regulators' performance in 2018-19.

## AGENCY'S OVERALL ASSESSMENT

As in previous years, the regulators as a whole remain effective in ensuring that Dominion operates the Ekati mine in an environmentally sound manner. The majority of regulators' time and expertise during 2018-19 was focused on the updated Interim Closure and Reclamation Plan v3.0, finalization of Misery under-ground and potassium amendments, deposition of Processed Kimberlite into Panda-Koala pits, updates to the Waste Rock and Ore Management Plans, and various responses plans. Over the course of the year, the Agency identified some instances where we felt that government agencies and regulators performed well and some instances where their involvement could have been improved.

### Government of the Northwest Territories

**Department of Lands:** The Agency is pleased that a regular inspections routine was maintained in 2018-19 (12 water licence and 4 operational land use permit operational inspections, 6 exploration land use permit inspections). The inspections for the Ekati mine continue to be thorough and effective.

### Department of Environment and Natural Resources (ENR):

**Water Resources Division (WRD):** Apart from the Agency, the WRD have been the only regulator that consistently provides detailed comments and analysis, including consultant input when necessary. Their analysis and input was particularly helpful for major reviews, including the ICRP v3.0, Panda-Koala Deposition Study, and the Waste Rock and Ore Management Plans. In the Agency's opinion, this input improved participants' understanding of review topics and provided relevant information to help inform the Wèk'eezhì Land and Water Board's decision.

**Conservation, Assessment and Monitoring Division:** This Division is responsible for administering Ekati's Environmental Agreement. The process of updating the Environmental Agreement was initiated in 2015. The addendum and release document was signed on November 21, 2018. The updated version of the Environmental Agreement has yet to be finalized, signed and distributed. This process continues to take much longer than expected.

**Wildlife Division:** The Agency was disappointed with wildlife division's lack of participation in the regulatory process. The ICRP v3.0 review process is ongoing with important issues being raised regarding how to best close the mine site in relation to wildlife and caribou movement and usage in particular. Unfortunately the wildlife division did not provide any comments to the ENR submission nor did they attend the technical workshop in January 2019.

The Bathurst Caribou Range Plan appears to have stalled with little progress since the release of the draft engagement document in January 2018. Given the critical declines in caribou herds, the Agency believes that completion and implementation of this plan should be a top priority.

**Environment Division:** The Agency has not been made aware of any developments at the Environment Division that relates to the Ekati mine.

### Crown-Indigenous Relations and Northern Affairs Canada

Following devolution of its land and water management responsibilities to the Government of the Northwest Territories (GNWT), Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has a much-diminished role in environmental regulatory processes including involvement with the Environmental Agreement. Each year the Agency has an Annual General Meeting (AGM) and an Implementation Meeting in order to meet its obligations under its bylaws and the Environmental Agreement. Although CIRNAC did not attend the AGM, the Agency was glad that a representative from CIRNAC was able to participate at a follow up Special Meeting of the Society (necessary due to not meeting quorum during the AGM). We hope to see increased participation from CIRNAC at future meetings.

## Fisheries and Oceans Canada

Fisheries and Oceans Canada (DFO) involvement with the regulatory process this past year has been negligible. They provided a single comment and recommendation requesting the use of silt curtains for the Sable Diffuser Construction Plan. They did not comment on several other key documents that could have potential impacts to fish and fish health including the Aquatics Effect Monitoring Plan (AEMP), AEMP Response Plans, Waste Water and Process Kimberlite Plan v8.0 with associated Panda-Koala Deposition Plan, Jay AEMP Design Plan, and the Interim Closure and Reclamation Plan. Considering DFO's technical expertise and their mandate it is very disappointing that a Federal Agency is not able to provide greater input to the regulatory system.

## Environment and Climate Change Canada

Environment and Climate Change Canada's (ECCC) involvement in the regulatory processes for the Ekati mine has steadily improved over the last few years. In 2018-2019 both the level of detail and the number of documents reviewed have increased. Of particular note were comments on the ICRP 3.0, WROMP 10, and the Panda-Koala Deposition Study. We were also glad to see that ECCC had one of their regional experts call in from Winnipeg for the ICRP Technical Workshop. Their involvement is important and welcome.

ECCC has finalized changes to the federal Metal and Diamond *Mining Effluent Regulations*. The regulations now include diamond mining. Dominion is now required to comply with these regulations in addition to requirements under its Water Licence.

## Wèk'eezhì Land and Water Board

The Agency is pleased with the WLWB's management of the Water Licence, Land Use Permits and management plans associated with the operation of the Ekati mine. Of note, the level of detail provided in the Board's recent Reasons for Decision is excellent, as this helps the Agency and others to understand the rationale for the decision and clarify requirements for future revisions. The Agency notes however, the need for the WLWB to better ensure the inter-relationship between review decisions is maintained (e.g., while several aspects of water quality modelling related to the Panda/Koala Deposition Study were deferred to the process to update the ICRP, the proposed ICRP v3.0 did not address this issue). The Agency would like to highlight the importance of alternative methods of communications (e.g., technical workshops) on major subjects of review (e.g., ICRP v3.0) as it allows for clarification, discussion and information exchange with Dominion and other participants.

Haul truck carrying kimberlite ore leaving open pit





# ASSESSMENT OF DOMINION DIAMOND MINES

## HIGHLIGHTS

-  Dominion was generally responsive to written comments on management plan submissions, but reluctant to discuss concerns during the ICRP technical workshop in a meaningful way.
-  The Agency's annual on-site visit to the Ekati mine was constrained by Dominion to one day.



Caribou on Ekati minesite, photo Courtesy of Dominion Diamond Mines ULC.

With only minor exceptions, Dominion continues to operate the Ekati mine in compliance with its water and land licences and permits.

Following a trend set in the last few years, the Agency again felt that Dominion's overall engagement and responses to comments over the course of the 2018-19 review period were disappointing. The depth and transparency of technical discussions at workshops and written comments were poor. The Agency believes the quality of engagement and discussion at meetings are not at the same high level as they have been historically.

Meetings with Dominion and regulators are a critical component of any review system as they allow for all parties present to be aware of the topics and discuss options and solutions. They also enable the Agency to meet our mandate in

providing independent comments and advice to address community concerns. When meetings are not held, the quality of analysis we are able to provide is impaired and the ability of our Aboriginal Society members to participate in the review process is compromised. Due to high workloads, Aboriginal Society members are more likely to attend a meeting on a topic of interest than submit lengthy written comments. The Agency is disappointed to see that Dominion does not take full advantage of the face to face meetings with regulators and community representatives.

In the past Dominion has been very accommodating in providing the Agency with a two-day overnight site visit each year to view mine operations. While scheduling the 2018 site visit, the Agency was informed we would only be able to do a day trip. This greatly limited our ability to see the whole site, forcing us to focus on a few key areas of interest.

With the development of several new pits (Misery Underground, Lynx, Sable, etc.), construction of the Sable road, and ongoing concerns with Waste Rock Storage Areas in recent years it is not possible to effectively visit and discuss with Dominion staff all the areas of interest in a single day. In addition to the obvious advantage of being onsite, there are many less tangible benefits such as having more time for general discussion, understanding perspectives and relationship building with Dominion staff that can't be accomplished with a shortened visit. While the Agency acknowledges the increasing operational and financial challenges Dominion are currently facing, we feel that a minimum of two days at site each year is important in enabling us to fulfill our mandate.



# FINANCIALS



The Independent Environmental Monitoring Agency had a financial audit completed for fiscal year 2018-2019 in accordance with Canadian accounting standards for not-for-profit organizations.

# RESPONSIBILITY STATEMENT

The accompanying financial statements have been prepared by management, which is responsible for the reliability, integrity and objectivity of the information provided. They have been prepared in accordance with Canadian accounting standard for Not-for-Profit Organizations. Where necessary the statements include amounts that are based on informed judgments and estimates by management, giving appropriate consideration to reasonable limits of materiality.

In discharging its responsibility for the integrity and fairness of the financial statements and for the accounting systems from which they are derived, management maintains the necessary system of internal controls designed to provide assurance that transactions are authorized, assets are safeguarded and proper records are maintained. These controls include quality standards in hiring and training employees, written policies and procedures manuals, and accountability for performance within appropriate and well-defined areas of responsibility. The Agency's management recognizes its responsibility for conducting the Agency's affairs in accordance with the requirements of applicable laws and sound business principles, and for maintaining standards of conduct that are appropriate to IEMA.

The Auditor annually provides an independent, objective audit for the purpose of expressing an opinion on the financial statements in accordance with generally accepted auditing standards. The Auditor also considers whether the transactions that come to his notice in the course of this audit are, in all significant respects, in accordance with specified legislation and directives from the Agency.



**Kim Poole, Secretary Treasurer**  
July 31, 2019



# INDEPENDENT AUDITORS' REPORT

## Opinion

We have audited the accompanying financial statements of Independent Environmental Monitoring Agency (IEMA), which comprise the statement of financial position as at March 31, 2019, and the statement of operations, statement of changes in net assets and statement of cash flows for the year then ended, and notes to the financial statements, including a summary of significant accounting policies.

In our opinion, the accompanying financial statements present fairly, in all material respects, the financial position of IEMA as at March 31, 2019, and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

## Basis for Opinion

We conducted our audit in accordance with Canadian generally accepted auditing standards. Our responsibilities under those standards are further described in the *Auditor's Responsibilities for the Audit of the Financial Statements* section of our report. We are independent of IEMA in accordance with the ethical requirements that are relevant to our audit of the financial statements in Canada, and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our opinion.

## Responsibilities of Management and Those Charged with Governance for the Financial Statements

Management is responsible for the preparation and fair presentation of the financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing IEMA's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate IEMA or to cease operations, or has no realistic alternative but to do so.

Those charged with governance are responsible for overseeing IEMA's financial reporting process.

## Auditor's Responsibilities for the Audit of the Financial Statements

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with Canadian generally accepted auditing standards will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Canadian generally accepted auditing standards, we exercise professional judgment and maintain professional skepticism throughout the audit. We also:

- Identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error,

as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.

- Obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of IEMA's internal control.
- Evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- Conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on IEMA's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause IEMA to cease to continue as a going concern.

- Evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with those charged with governance regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

### Other Matters

The financial statement of IEMA for the year ended March 31, 2018 were audited by another auditor who expressed an unmodified opinion on those statements on August 2, 2018.

*EPR Yellowknife Accounting Prof. Corp.*

**EPR Yellowknife Accounting  
Professional Corporation  
Yellowknife, Canada  
July 31, 2019**

## STATEMENT OF CHANGES IN NET ASSETS

For the year ended March 31  
See accompanying notes.

### BALANCE, BEGINNING OF YEAR

Excess of revenues over Expenditures  
Amortization  
Additions

### BALANCE, END OF YEAR

2019			2018		
Total	Unrestricted Funds	Tangible Capital Asset Fund	Total	Unrestricted Funds	Tangible Capital Asset Fund
\$12,086	\$8,655	\$3,431	\$12,086	\$6,939	\$5,147
\$-	\$-	\$-	\$-	\$-	\$-
\$-	\$1,033	(\$1,033)	\$-	\$1,716	(\$1,716)
\$-	\$-	\$-	\$-	\$-	\$-
\$12,086	\$9,688	\$2,398	\$12,086	\$8,655	\$3,431

## STATEMENT OF FINANCIAL POSITION

For the year ended March 31  
See accompanying notes.

Approved on behalf of the board:



Jaida Ohokannoak, Chairperson



Kim Poole, Secretary-Treasurer

### ASSETS

#### CURRENT

Cash  
Restricted cash (Note 5)  
Prepaid expenses

Tangible capital asset (Note 6)

### TOTAL ASSETS

### LIABILITIES

#### CURRENT

Accounts payable and accrued liabilities (Note 7)  
Deferred revenue (Note 8)  
Contributions repayable (Note 9)

### FUND BALANCES

Unrestricted Fund  
Tangible Capital Asset Fund

### TOTAL NET ASSETS

### TOTAL LIABILITIES AND NET ASSETS

	2019	2018
Cash	\$69,692	\$124,546
Restricted cash (Note 5)	\$506,528	\$376,561
Prepaid expenses	\$526	\$2,473
<b>TOTAL CURRENT ASSETS</b>	<b>\$576,746</b>	<b>\$503,580</b>
Tangible capital asset (Note 6)	\$2,398	\$3,431
<b>TOTAL ASSETS</b>	<b>\$579,144</b>	<b>\$507,011</b>
Accounts payable and accrued liabilities (Note 7)	\$60,531	\$118,364
Deferred revenue (Note 8)	\$356,875	\$348,851
Contributions repayable (Note 9)	\$149,652	\$27,710
<b>TOTAL LIABILITIES</b>	<b>\$567,058</b>	<b>\$494,925</b>
Unrestricted Fund	\$9,688	\$8,655
Tangible Capital Asset Fund	\$2,398	\$3,431
<b>TOTAL NET ASSETS</b>	<b>\$12,086</b>	<b>\$12,086</b>
<b>TOTAL LIABILITIES AND NET ASSETS</b>	<b>\$579,144</b>	<b>\$507,011</b>

# STATEMENT OF OPERATIONS

For the year ended March 31  
See accompanying notes.

## REVENUES

Core fund - Dominion Diamond Mines ULC  
Seperate fund - Dominion Diamond Diamond Mines ULC  
Interest income

## TOTAL REVENUES

## EXPENSES

Advertising and promotion  
Amortization  
Auditing and bookkeeping fees

## Board support

- honoraria  
- travel, meals and accomodations

## Community consultation

- annual general meeting  
- annual report  
- community visits

Consultants  
Equipment  
Insurance  
Office supplies  
Postage and courier  
Professional development  
Rent - facility rental  
Rent- office and maintenance

## Separate fund

- honoraria  
- travel and administration  
Staff recruitment  
Staff travel  
Telephone and fax  
Wages and benefits

## TOTAL EXPENSES

## EXCESS OF REVENUES OVER EXPENSES FROM OPERATIONS

## OTHER ITEMS

Unspent funding - core  
Unspent funding - separate fund

## EXCESS OF REVENUES OVER EXPENSES FOR THE YEAR

	2019	2018
	\$657,702	\$646,715
	\$40,000	\$40,000
	\$2,751	\$1,615
<b>TOTAL REVENUES</b>	<b>\$700,453</b>	<b>\$688,330</b>
	\$6,826	\$13,116
	\$1,033	\$1,716
	\$15,652	\$19,778
	\$112,069	\$160,650
	\$36,333	\$42,431
	\$5,072	\$19,283
	\$51,189	\$32,533
	\$31,526	\$30,928
	\$-	\$26,570
	\$37	\$87
	\$4,539	\$2,928
	\$10,665	\$21,422
	\$4,539	\$2,928
	\$286	\$233
	(\$100)	\$499
	\$-	\$1,335
	\$212	\$19,883
	\$-	\$2,609
	\$-	\$4,550
	\$-	\$297
	\$2,711	\$6,734
	\$241,251	\$221,538
<b>TOTAL EXPENSES</b>	<b>\$550,801</b>	<b>\$660,620</b>
	\$149,652	\$27,710
	(\$109,874)	(\$10,203)
	(\$39,778)	(\$17,507)
	(\$149,652)	(\$27,710)
	\$-	\$-

## STATEMENT OF CASHFLOWS

For the year ended March 31  
See accompanying notes.

### CASH PROVIDED BY (USED IN)

#### Operating activities

Excess of revenue over expenses

#### Items not affecting cash

Amortization

### CHANGES IN NON-CASH WORKING CAPITAL BALANCES

Increase in prepaid expenses

Increase (Decrease) in accounts payable and accrued liabilities

Increase (Decrease) in deferred revenue

Increase (Decrease) in contributions repayable

Net change in non-cash working capital balances

Net cash provided by (used in) operating activities

#### Investing activity

Purchase of capital assets

### Increase (decrease) in cash and cash equivalents

### CASH, AT BEGINNING OF YEAR

### CASH, AT END OF YEAR

Cash consists of:

Operating cash

Restricted cash

	2019	2018
	\$-	\$-
	\$1,033	\$1,716
	<b>\$1,033</b>	<b>\$1,716</b>
	\$1,947	\$1,579
	(\$57,833)	\$54,683
	\$8,024	\$5,494
	\$121,942	(509)
	\$74,080	\$61,247
	\$75,113	\$62,963
	\$-	\$-
	\$75,113	\$62,963
	<b>\$501,107</b>	<b>\$438,144</b>
	<b>\$576,220</b>	<b>\$501,107</b>
	\$69,692	\$124,546
	<b>\$506,528</b>	<b>\$376,561</b>
	<b>\$576,220</b>	<b>\$501,107</b>

# STATEMENT ON FINANCIAL STATEMENTS

For the year ended March 31  
See accompanying notes.

## 1. ORGANIZATION AND JURISDICTION

Independent Environmental Monitoring Agency ("the Agency") is a not-for-profit organization incorporated under the Societies Act of the Northwest Territories. It is exempt from income tax under Section 149(1)(i) of the Income Tax Act.

The mission of the Agency is to oversee environmental management of the Ekati Diamond site in the Northwest Territories.

## 2. BASIS OF ACCOUNTING

These financial statements have been prepared in accordance with the significant accounting policies set out below. These financial statements are prepared in accordance with Canadian Accounting Standards for not-for-profit organizations.

## 3. SIGNIFICANT ACCOUNTING POLICIES

The following is the summary of the significant accounting policies used by management in the preparation of these financial statements.

### a) Fund accounting

The accounts of the Agency are maintained in accordance with the principle of fund accounting. A fund is a set of accounts established to classify resources according to specific activities. The following funds are maintained and are internally restricted by the Agency.

Unrestricted Fund - to record the general activities of the Agency.

Investment in Equipment - to record the historical cost of equipment acquired less accumulated amortization and disposal.

### b) Tangible capital assets

Capital Assets are recorded at cost. Amortization is applied as a reduction to both the asset and net assets invested in Equipment. Amortization is calculated by the declining balance method over their estimated useful lives at the following rates:

<b>Equipment</b>	<b>20%</b>
<b>Computer Equipment</b>	<b>30%</b>
<b>Computer Equipment-New</b>	<b>55%</b>
<b>Website</b>	<b>30%</b>

### 3. SIGNIFICANT ACCOUNTING POLICIES (CONTD ... )

#### **Tangible capital assets (Contd ... )**

When tangible capital assets are sold or retired, the related cost and accumulated amortization are removed from the accounts and any gain or loss is charged against earnings in the period.

Tangible capital assets acquired or constructed during the year are not amortized until they are put into use.

One half of the year's amortization is recorded in the year of acquisition. No amortization is recorded in the year of disposal.

#### **c) Financial instruments - recognition and measurement**

Independent Environmental Monitoring Agency measures its financial assets and financial liabilities at fair value. The Agency subsequently measures all of its financial assets and financial liabilities at amortized cost, except for investment in equity instruments that are quoted in an active market, which are measured at fair value. Changes in fair value are recognized in the statement of operations.

Financial assets measured at cost include cash and cash equivalents, term deposits and restricted cash. Financial liabilities that are measured at cost include accounts payable and accrued liabilities and contributions repayable.

#### **d) Impairment**

Financial assets measured at amortized cost are tested for impairment when there are indicators of possible impairment. At the end of each reporting period, management assesses whether there are any indications that financial assets measured at cost or amortized cost may be impaired. When a significant adverse change has occurred during the period in the expected timing or amount of future cash flows from the financial asset or group of assets, a write-down is recognized in net income. The write down reflects the difference between the carrying amount and the higher of:

- the present value of the cash flows expected to be generated by the asset or group of assets;
- the amount that could be realized by selling the assets or group of assets;
- the net realizable value of any collateral held to secure repayment of the assets or group of assets.

When the events occurring after the impairment confirm that a reversal is necessary, the reversal is recognized in net income to a maximum of the accumulated impairment loss recorded in respect of the particular financial asset.

**e) Deferred revenue**

Deferred revenue is the unexpended contribution amounts received during the fiscal year that are transferred by agreement into the subsequent year. It is reported as a current liability as it is expected that the program will be completed or funds be repaid within the next fiscal year.

**f) Revenue recognition**

The Agency follows the deferred method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which related expenses occur. Unrestricted contributions are recognized as revenue when they are received or receivable or if the amount can be reasonably estimated and its collection is reasonably assured.

Interest income is recognised when earned.

**g) Use of Estimates**

The preparation of financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the balance sheet date and the reported amounts of revenues and expenses during the year. Actual results could differ from those estimates.

**4. FUTURE ACCOUNTING CHANGES**

In March 2018, the Accounting standards Board ( AcSB) issued the following new standards in part III ( Accounting Standards for Not-for-Profit Organizations) of the CPA Canada Hand Book.

Section 4433 Tangible Capital Assets Held by Not-for-Profit Organizations and Section 4434 Intangibles Assets Held by Not-for-Profit Organizations states that the cost of contributed tangible capital assets is deemed to be fair value at the date of contribution plus all cost directly attributable to its acquisition, including installing at the location and the condition necessary for its intended use. Previously, there was no guidance on how to determine the cost of a contributed tangible asset.

Section 4441, Collections held by Not-for-Profit Organizations states that collections ( which includes work of arts, historical treasures or similar assets) are recorded on the statement of financial position at either cost or nominal value on the statement of financial position. All collections are accounted for using the same method.

Section 4433, 4434 and 4441 (the new standards) replace Section 4431, 4432 and 4440 respectively. The new standards are effective for annual periods beginning on or after January 1, 2019. Earlier Application is permitted.

## 5. RESTRICTED CASH

Restricted cash represents cash received from Dominion Diamond Mines ULC that is intended for a specific purpose or represents the amount to repay.

	2019	2018
Cash received in advance for the next fiscal year (Note 8)	\$356,876	\$348,851
Cash repayable from annual surplus (Note 9)	\$149,652	\$27,710
	<b>\$506,528</b>	<b>\$376,561</b>

## 6. TANGIBLE CAPITAL ASSETS

	Cost	Accumulated Amortization	2019 Net Book Value	2018 Net Book Value
Equipment	\$13,065	\$11,718	\$1,347	\$1,684
Computer equipment	8,521	8,211	\$310	\$689
Website	15,120	14,379	\$741	\$1,058
	<b>\$36,706</b>	<b>\$34,308</b>	<b>\$2,398</b>	<b>\$3,431</b>

## 7. ACCOUNTS PAYABLE AND ACCRUED LIABILITIES

	2019	2018
Accounts payable and accrued liabilities	\$21,875	\$99,861
Payroll remittances-Canada Revenue Agency	\$12,560	\$10,932
GNWT-Payroll taxes	\$4,968	\$6,019
Salaries and benefits payable	\$21,128	\$1,552
	<b>\$60,531</b>	<b>\$118,364</b>

## 8. DEFERRED REVENUE

Deferred revenue consists of payments received in advance and is intended for the upcoming fiscal year expenditures.

	2019	2018
Received from Dominion Diamond Mines ULC	\$356,875	\$348,851

## 9. CONTRIBUTIONS REPAYABLE

	2019	2018
Dominion Diamond Mines ULC Core Funding	\$109,874	\$10,203
Dominion Diamond Mines ULC Separate Funding	\$39,778	\$17,507
	<b>\$149,652</b>	<b>\$27,710</b>

Contributions repayable arising from one fiscal year are normally deducted from contributions provided by Dominion Diamond Mines ULC in the following fiscal year. In the year, the Agency had excess contributions of \$149,652 which is to be deducted from the 2019/2020 contributions.

## 10. COMMITMENTS

As at March 31, 2019 the Agency has an operating lease (month-to-month) for office space; there are no immediate plans for changes in rental agreements nor location. The payment for the next year is based on the existing month-to-month contract is \$31,500 (2018 -\$31,500).

## 11. ECONOMIC DEPENDENCE

The Agency receives all of its contribution funding from Dominion Diamond Mines ULC. Management is of the opinion that operations would be significantly affected if the funding was substantially curtailed or ceased. The funding arrangement is governed by legislation.

## 12. FINANCIAL INSTRUMENTS

Financial instruments consist of recorded amounts of cash and cash equivalents, term deposits and restricted cash as well as accounts payable and accrued liabilities, deferred revenue, and contributions repayable which will result in future cash outlays.

The Agency is exposed to the following risks in respect of certain of the financial instruments held:

### (a) Credit risk

Credit risk arises from the potential that a counter party will fail to perform its obligations. The Agency does have credit risk in cash, cash equivalents, term deposits, and restricted cash of \$ 576,220 (2018 -\$501, 107) as a result of having funds with one chartered bank in excess of the insurable limit. Furthermore, the Agency has a concentration of credit risk as full balance of cash is held at one financial institution. This risk has not changed from the prior year.

### (b) Liquidity risk

Liquidity risk arises from the potential that an entity will have difficulty in meeting its obligation associated with the financial liabilities. The Agency does have a liquidity risk in the accounts payable and accrued liabilities and contributions repayable of \$64,213 (2018 -\$118,364). Liquidity risk is the risk that the Agency cannot repay its obligations when they become due to its creditors. This risk has not changed from

the prior year. The Agency manages liquidity risk by continually monitoring actual and forecasted cash flows from operations to ensure, as far as possible, that it will have sufficient liquidity to meet its liabilities when due, without incurring unacceptable losses or risking damage to the Agency's reputation. The Agency has determined that the risk is not significant.

### 13. COMPARATIVE AMOUNTS

The financial statements have been reclassified, where applicable, to conform to the presentation used in the current year.

## SUMMARY OF WORK PLAN AND CORE BUDGET 2019-20 AND 2020-21

Activity	Forecasted 2018-19	Proposed 2019-20	Proposed 2020-21
Board Meetings	51,549	92,530	94,000
Review of Documents	78,747	66,295	67,300
Separate Fund	212	40,000	40,000
Communications	102,255	169,060	171,595
Outside Contracts	0	10,000	10,000
Management and Admin	318,037	329,880	334,800
<b>Total</b>	<b>550,800</b>	<b>707,765</b>	<b>717,695</b>
Approved	697,665	713,749	724,455

Table 8. Core Budgets 2019-20 and 2020-21

The work plan for 2019-20 is based on the direction and feedback received from our Society Members at our annual general meeting (AGM) and the Agency's own initiatives.

The second year of the work plan, 2020-21, will be refined and modified based on direction received during next year's AGM, and any changes or modifications to activities at the Ekati mine.

Dominion Diamond Mines ULC (Dominion), as the owner of the Ekati mine, is solely responsible for funding the Agency in accordance with the 2006 Resolution Agreement. The Agency's budget for 2019-20 is \$713,749 while the budget for 2020-21 is projected to be \$724,456 which reflects an assumed increase in Canada's Annual Consumer Price Index (CPI) of 1.5%.

## MAJOR ACTIVITIES

### Board Meetings and Conference Calls

Board meetings are held three to four times per year. They provide an opportunity for Directors to discuss, review, and make recommendations on recent, ongoing and anticipated initiatives. Guests are invited to meetings to provide updates and receive input on their specific activities. Dominion, Wek'èezhìi Land and Water Board (WLWB), and Government of the Northwest Territories (GNWT) inspectors are regular guests.

**Proposed Activities:** Annually, three to four board meetings, including follow up and administration.

Review of Reports, Plans and Programs, and Implementation of the Environmental Agreement

Directors review and make recommendations on the major reports, programs, studies and plans required under the Environmental Agreement, water licences, and other regulatory approvals.

**Proposed Activities:** The Agency expects to review the following reports in 2019-20:

- The regular environmental monitoring annual reports for 2019 under the Environmental Agreement and water licence;
- Environmental Impact Report;
- Interim Closure and Reclamation Plan;
- Aquatic Effects Monitoring Program Design Plan and Re-evaluation;
- Aquatic Response Framework - Response Plans;
- Air Quality Emission Monitoring and Management Plan (consolidated)
- Dust Suppression Pilot Project Interim Report;
- Various management plans and updates including the Caribou Road Management Plan; Wildlife Effects Monitoring Plan.

There is also the Implementation meeting with Dominion, GNWT, Indigenous and Northern Affairs Canada, and the Agency which focuses on the implementation of the Environmental Agreement.

A similar workload is expected in 2020-21.

### Separate Fund Activities

The Resolution Agreement establishes a Separate Fund of up to \$40,000 per year for Agency expenses where a public hearing is reasonably assured as indicated in approved work plans or budgets, or as confirmed by a regulatory body.

**Proposed Activities:** There currently is no Public Hearing process expected for 2019-2020.

The Agency is not expecting a public hearing process for 2020-21.

### Consultation and Communication

Consultation and communications with our Society Members and the general public is an important part of the Agency's mandate.

**Proposed Activities 2019-20:** The Agency will maintain its visits to communities. The Agency will continue to produce technical and plain language annual reports, a pamphlet summarizing the annual reports for distribution to all households, and attend workshops and meetings relevant to our mandate. The Agency will continue to maintain its website, the Ekati mine Timeline and public registry. The Agency will also be implementing other parts of our Communications Plan including printed material.

Similar activities are anticipated in 2020-21.

### Outside Contracts

On occasion, the Agency turns to other experts to help review reports, studies, and plans.

**Proposed Activities 2019-20:** It is difficult to predict what, if any, outside expertise the Agency may commission, but expects the review of Aquatic Effects Monitoring Program Design Plan and Re-evaluation may require some outside expertise.

### Management and Administration

The Agency provides the majority of its management and administrative services through its Yellowknife office and staff of an Executive Director and a Communications and Administration Specialist. The Agency manages its own office space and equipment.

**Proposed Activities 2019-20:** Maintain current staff and benefit levels.

The same activities are anticipated in 2020-21.

# ACRONYMS AND GLOSSARY

**AEMP** – Aquatic Effects Monitoring Program

**AQMP** – Air Quality Monitoring Program

**AQEMMP** – Air Quality and Emissions Monitoring and Management Plan

**AES** – Aquatic Ecology Synthesis

**ARD** – Acid Rock Drainage

**ARF** – Aquatic Response Framework

**CAM** – Continuous Air Monitoring

**CCME** – Canadian Council of Ministers of the Environment

**CIMP** – Cumulative Impact Monitoring Program

**CPI** – Consumer Price Index

**CRMP** – Caribou Road Mitigation Plan

**CPKSA** – Coarse Processed Kimberlite Storage Area

**DDEC** – Dominion Diamond Ekati ULC (“the company”)

**DFO** – Fisheries and Oceans Canada

**DO** – Dissolved Oxygen

**DNA** – deoxyribonucleic acid

**EQC** – Effluent Quality Criteria

**ECCC** – Environment and Climate Change Canada

**EIR** – Environmental Impact Report

**EMAB** – Environmental Monitoring Advisory Board

**ENR** – Department of Environment and Natural Resources (GNWT)

**EPA** – NWT Environmental Protection Act

**GNWT** – Government of the Northwest Territories

**GTC** – Ground Temperature Cable

**HVAS** – High Volume Air Samplers

**IACT** – Inter-Agency Coordinating Team

**ICRP** – Interim Closure and Reclamation Plan

**INAC** – Indigenous and Northern Affairs Canada

**KIA** – Kitikmeot Inuit Association

**KPSF** – King Pond Settling Facility

**LKDFN** – Lutselk’e Dene First Nation

**LLCF** – Long Lake Containment Facility

**LUP** – Land Use Permit

**MVEIRB** – Mackenzie Valley Environmental Impact Review Board

**NSMA** – North Slave Métis Alliance

**NWT** – Northwest Territories

**PAG** – Potential Acid Generating

**PDC** – Panda Diversion Channel

**PK** – Processed Kimberlite

**PSD** – Pigeon Stream Diversion

**QA/QC** – Quality Assurance/Quality Control

**REA** – Report of Environmental Assessment

**Review Board** – Mackenzie Valley Environmental Impact Review Board

**SLEMA** – Snap Lake Environmental Monitoring Agency

**SNP** – Surveillance Network Program

**SSMMP** – Suspended Sediment Monitoring and Management Plan

**TK** – Traditional Knowledge

**TKEG** – Traditional Knowledge Elders Group

**TOC** – Total Organic Carbon

**TDS** – Total Dissolved Solids

**TSP** – Total Suspended Particulate

**TSS** – Total Suspended Solids

**WEMP** – Wildlife Effects Monitoring Program

**WEMPlan** – Wildlife Effects Monitoring Plan

**WLWB** – Wek’èezhìi Land and Water Board

**WRSA** – Waste Rock Storage Area

**YKDFN** – Yellowknives Dene First Nation

**VEC** – Valued Ecosystem Component

**ZOI** – Zone of Influence

**Action Levels** – A predetermined change to a monitored variable or other qualitative or quantitative measure that requires the Licensee to take appropriate actions that may include, but that are not limited to: further investigations, changes to operations, or enhanced mitigation measures.

**Adaptive Management** – A management system with continual monitoring so that if initial mitigation measures are ineffective, additional or alternative mitigation is applied to keep the impact within acceptable levels.

**Benthos** – The sediments and mud at the bottom of rivers, lakes and ponds that can contain living organisms. Benthic invertebrates such as fly larvae and clams are an important food source for small fish.

**Chloride** – Salt resulting from the combination of the gas chlorine with a metal. Fish and aquatic communities cannot survive in water with high levels of chlorides.

**Cladocera** – An order of small crustaceans (i.e., zooplankton) that live in water (commonly called water fleas).

**Consultation** – (i) The provision, to the party to be consulted, of notice of a matter to be decided in sufficient form and detail to allow that party to prepare its views on the matter;

(ii) The provision of a reasonable period of time in which the party to be consulted may prepare its views on the matter, and provision of an opportunity to present such views to the party obliged to consult; and (iii) Full and fair consideration by the party obliged to consult of any views presented.

**Environmental Agreement** – Created as a legally binding instrument to provide monitoring and

input into management practices not covered by other authorizations. Parties include BHPB and the federal and territorial governments. Akaitcho Treaty 8 First Nations (LKDFN and YKDFN), Kitikmeot Inuit Association, North Slave Métis Alliance and Tłı̨chǫ Government were involved in the negotiations.

**Hydrocarbons** – Organic compounds which contain only hydrogen and carbon. This includes fossil fuels (i.e., coal, petroleum and natural gas) as well as their derivatives, such as plastics, solvents and oils.

**Kimberlite** – A rare, potentially diamond bearing iron and magnesium rich rock from deep in the earth's mantle. Kimberlites are generally found as vertical pipe-like structures.

**Molybdenum** – A metal that can affect trout just after they hatch.

**Nitrate** – A nutrient, like a fertilizer, derived from nitrogen. Nitrate can affect the growth of baby fish if it gets too high.

**Phytoplankton** – Microscopic plants (e.g., algae) found in freshwater and ocean environments. They are an important food source for zooplankton.

**Processed Kimberlite** – The waste material and water mixture that is left over after the mill removes the diamonds from the ore. Also referred to as “tailings”.

**Progressive Reclamation** – Reclamation that can be carried out during the construction and operation phases of a mine prior to final closure (e.g., rock waste dumps).

**Reclamation** – The recovery to viable ecosystems of areas of land and water bodies that have been disturbed during mining.

**Schist** – A large group of coarse-grained metamorphic rocks which readily split into thin plates or slabs as a result of alignment of lamellar or prismatic minerals.

**Slave Geological Province** – Area between the City of Yellowknife and the Arctic coast.

**Tailings** – See “Processed Kimberlite”.

**Total Suspended Particulates** – The fraction of airborne particulates that will remain airborne after their release in the atmosphere.

**Valued Ecosystem Component** – Environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.

**Waste Rock** – Rock containing diamonds but too low in grade to be mined or processed economically. Also other rock that must be removed to access kimberlite pipes.

**Waste Rock Seepage** – Water that drains through the waste rock piles. This water may pick up contaminants as it touches the waste rock and may enter the receiving environment.

**Wastewater** – Water that contains wastes from the mining process, including sewage and chemicals from explosives.

**Zone of Influence** – Area of reduced caribou occupancy.

**Zooplankton** – The small, mostly microscopic animals that live suspended in freshwater (and ocean) environments. Zooplankton feed on phytoplankton and small particles in the water. They are an important food source for small fish.

# DIRECTOR BIOGRAPHIES



## JAIDA OHOKANNOAK | CHAIRPERSON

APPOINTED BY KITIKMEOT INUIT ASSOCIATION IN 2003

For over 20 years, Jaida Ohokannoak has lived and worked in small northern communities. She currently resides in Nunavut. Jaida has significant experience, knowledge and expertise in environmental assessment, research, monitoring and renewable resource management. She believes mining can be conducted in an environmentally responsible manner to the benefit of both industry and local peoples without long-term adverse impacts to the environment.



## EMERY PAQUIN | VICE CHAIRPERSON

APPOINTED JOINTLY BY THE GOVERNMENTS OF CANADA AND THE NWT, AND DOMINION DIAMOND IN 2015

Emery Paquin is an independent environmental consultant living in Yellowknife. He has more than 35 years of environmental management experience with the northern mining industry and territorial government, and served six years as a Member on the Inuvialuit Water Board.



## KIM POOLE | SECRETARY/TREASURER

APPOINTED BY THE TĚJCHQ GOVERNMENT IN 2015

Kim Poole first served as an Agency Director from 2006 – 2015 (jointly appointed by the Governments of Canada and NWT and BHP Billiton), but was reappointed by the TĚjchq Government in 2015. Kim is an independent wildlife biologist with over 35 years of experience in the Northwest Territories, Nunavut and British Columbia in the areas of wildlife and wildlife habitat research, and assessment and mitigation of environmental impacts related to the mining, forestry, and tourism industries.



## BILL SLATER

APPOINTED BY THE NORTH SLAVE MÉTIS ALLIANCE IN 2018

Bill Slater is an independent environmental consultant with an engineering education. He is based in Whitehorse, where he has lived and worked for over 25 years. Most of his work is for First Nation governments, as a technical advisor on mining and mine closure projects. His technical focus areas include environmental effects assessment, mine closure, water quality and water management.



## JESSE JASPER

APPOINTED JOINTLY BY GOVERNMENTS OF CANADA AND THE NWT, AND DOMINION DIAMOND IN 2016

Jesse Jasper retired in 2011 after 39 years of service. Since 1971 he has worked exclusively in northern Canada, focusing on land and water resource development, water monitoring studies to evaluate impacts on development. He coordinated a number of reviews and technical presentations for environmental impact assessments, including NWT Diamond Project, which is now the Ekati Diamond Mine. Jesse represented INAC and EC on a number of boards, including the Mackenzie River Basin Board, the NWT Water Board, and the Mackenzie Gas Project.



## TIM BYERS

APPOINTED BY AKAITCHO TREATY 8 FIRST NATIONS (YKDFN AND LKDFN) IN MAY 2001

Tim Byers is an independent consultant living in Manitoba. He has been working on projects in the Canadian Arctic since 1980. He specializes in studies of fish, Arctic seabirds and marine invertebrates and has assisted Aboriginal communities in documenting their indigenous environmental knowledge. He would like to see more Aboriginal youth engaged in environmental sciences and Traditional Knowledge used more effectively in environmental monitoring, research and impact assessments.



## RONALD ALLEN

APPOINTED JOINTLY BY GOVERNMENTS OF CANADA AND THE NWT, AND DOMINION DIAMOND IN 2017

Ron Allen has been living and working in a variety of Arctic communities since the 1970s and has worked with community groups and organizations on local cultural values, concerns and aspirations related to renewable resources. Ron moved to the Northwest Territories as a Renewable Resources Officer and transferred to Fisheries and Oceans Canada in the 1980s where he worked as a Fishery Officer and Habitat Inspector. Later, he worked as Area Manager and Area Director, delivering and managing multiple-sector operational programs including Habitat Assessment, Fisheries Management, Conservation and Protection, Science, and Administrative Services.





# 2018-2019 ANNUAL REPORT

A PUBLIC WATCHDOG FOR ENVIRONMENTAL  
MANAGEMENT AT THE EKATI DIAMOND MINE

**TECHNICAL LANGUAGE**

INDEPENDENT ENVIRONMENTAL  
MONITORING AGENCY



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