Government of
Northwest Territories

# Slave River at Fort Smith Enhanced Monitoring Interim Results

## Response to Incidents at Kearl Lake Oil Sands Mine Site – June 2023

### What happened?

Two significant spill events occurred at the Kearl Lake Oil Sands Mine Site over the past year: first, a long-term leak and second, a sudden overflow and spill. The impacted area includes muskeg and forested public lands in proximity to tributaries that feed into the Firebag and Muskeg rivers, which both flow into the Athabasca River, upstream of the NWT.

On May 19, 2022, Imperial Oil Resources Limited (Imperial) reported to Alberta Energy Regulator (AER) that discoloured surface water was found at locations, both on and to the north and northeast, of the boundary of Kearl Oil Sands Processing Plant and Mine. The company later confirmed that the seepage exceeded several water quality guidelines and that surface waters were contaminated with industrial wastewater.

On February 4, 2023, Imperial reported to AER a spill of approximately 5.3 million litres of industrial wastewater which overflowed from a storage pond that collects water from the storage pond seepage interception system and other surface water drainage systems. The overflow occurred on January 31, 2023.

### GNWT response

The Government of the Northwest Territories learned of the incidents on March 1, 2023.

In response, GNWT collaborated with the Fort Smith Métis Council, Town of Fort Smith, and Smith's Landing First Nation to initiate a precautionary water quality sampling program for the Slave River at Fort Smith on March 2, 2023. The monitoring program included:

- Water quality sampling at the Town of Fort Smith water treatment plant intake building and directly from the river near the town boat launch. Samples were analyzed for general water quality, total and dissolved metals, polycyclic aromatic hydrocarbons (PAHs), and naphthenic acids.
- Deployment of polyethylene membrane devices (PMDs) for select PAHs in the Town of Fort Smith water intake building. PMDs have excellent detection sensitivity, integrate chemicals over time and are easier to analyze than the biological organisms (e.g. fish) that they are trying to mimic.

## Preliminary results summary

Thus far, the monitoring program has found **the waters in the Slave River are safe for people and animals,** with no evidence of chemicals from the seepage and spill having contaminated the Slave River within the NWT.

To date, assessments conducted by Imperial and AER have not found impacts to waterbodies that drain into the Athabasca River and monitoring is ongoing.

Find more details on this monitoring here: https://www.imperialoil.ca/en-ca/company/operations/kearl/kearl-epo

## How is it possible that the spill did not impact the Slave River?

Any contaminants from the Kearl incidents first need to travel into the Firebag River or Muskeg River, then the Athabasca River and the Peace-Athabasca Delta (PAD).

From the PAD, the water connects with the Peace River and flows into the NWT. On average, approximately 70% of Slave River water is made up of water from the Peace River. The remaining 30% is from Lake Athabasca, Lake Claire, PAD streams/ponds, and the Athabasca River.

In simple terms, the water in the Slave River is more influenced by the Peace River than the Athabasca River. Water movement through the PAD is a complex process, involving sedimentation and mixing in many lakes, ponds, and streams. This can change water quality and have a filtering and/or dilution effect on water from the Athabasca River.

Given the incidents and the critical importance of water to our communities, the GNWT and water partners will continue to monitor the Slave River for any signs of contamination due to the Kearl Lake incidents.

## Next steps

Enhanced monitoring as described above continued through June. Routine sampling by the GNWT and water partners is now being undertaken moving forward.

We will continue to analyze water quality to monitor whether it changes over time and how it compares to guidelines, and communicate results with communities promptly.

All GNWT water quality data related to the Kearl Lake incidents are available here:
https://doi.org/10.25976/y4s6-oc52

## Result details

Preliminary findings show that levels of known bitumen enriched metals (such as molybdenum, nickel, and vanadium), major ions (such as magnesium, sodium, and sulphate), as well as oil sands substances of concern (including polycyclic aromatic hydrocarbons (PAHs) and naphthenic acids (NAs)) appear normal.

What follows is an assessment of what we found related to key metals and major ions which are analyzed to assess for potential contamination.

In general, we compare results to the Canadian Council of Ministers of Environment (CCME) freshwater

Protection of Aquatic Life (PAL) guidelines. These guidelines were developed across Canada as a measure to find out whether what is in the water could be harmful to organisms in the water.

In one case, we used Federal Environmental Quality Guidelines as CCME guidelines were not available for vanadium – a metal which is related to oil sands extraction.

We also compared current results to previous sample results to see if they are different from historical ranges. This can indicate that something has changed.

## Metals

Molybdenum, nickel, and vanadium are metals that are enriched from bitumen extraction and can indicate oil sands wastewater.

Results for total molybdenum, nickel, and vanadium **were below water quality guidelines.**

Results for molybdenum, nickel and vanadium (total and dissolved) were within historical ranges in 2022 and 2023. Figure 1 is a graph of total nickel in river water compared against the 90th percentiles of historical data (pre-2022) for each respective season. Seasons were defined as high water (May, June, July), regular open water (August, September, October), and Under ice (November, December, January, February, March, April). However, break-up was early in 2023 and samples collected after April 21$^{st}$ were considered "high water".

While it's normal to have some results above the 90th percentile, clusters above the 90th percentile for consecutive measurements could signal a change. **No such clusters were noted.**

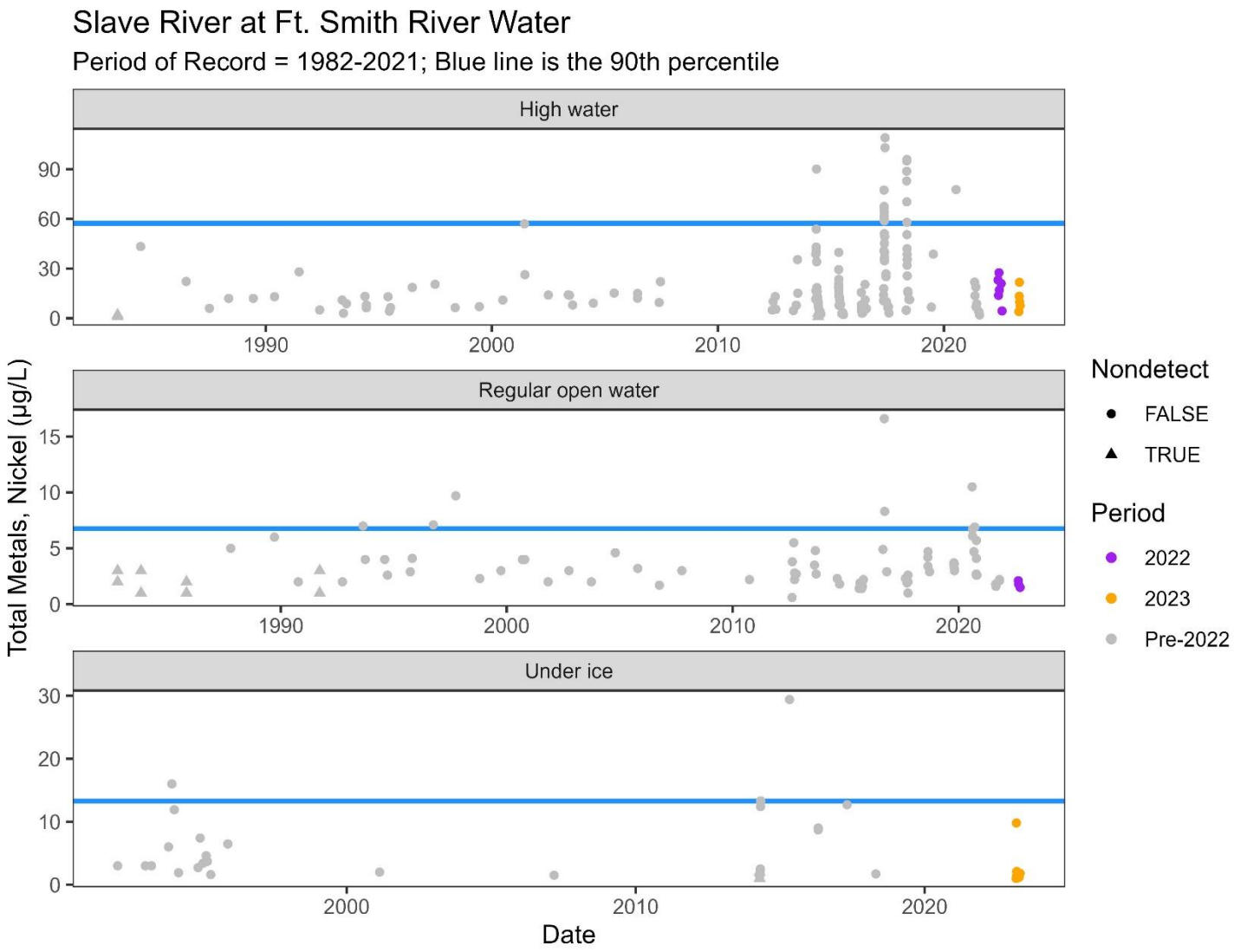


**Figure 1:** Total Nickel Levels in the Slave River at Fort Smith River Water (1988-2023) during high water (spring), regular water (summer and fall) and under ice (winter). Blue Line represents the 90th percentile. Regular open water sampling is currently underway.

## Major Ions

Like metals, major ions such as magnesium, sodium, and sulphate are expected to be higher in oil sands wastewater than in river water.

If these parameters are higher in the river than expected, this could indicate a signal from upstream. Major ions levels during 2022 and 2023 were within expected ranges.

Figure 2 is a graph of sodium in river water compared against the 90th percentiles of historical data (pre-2022) for each respective season[3].

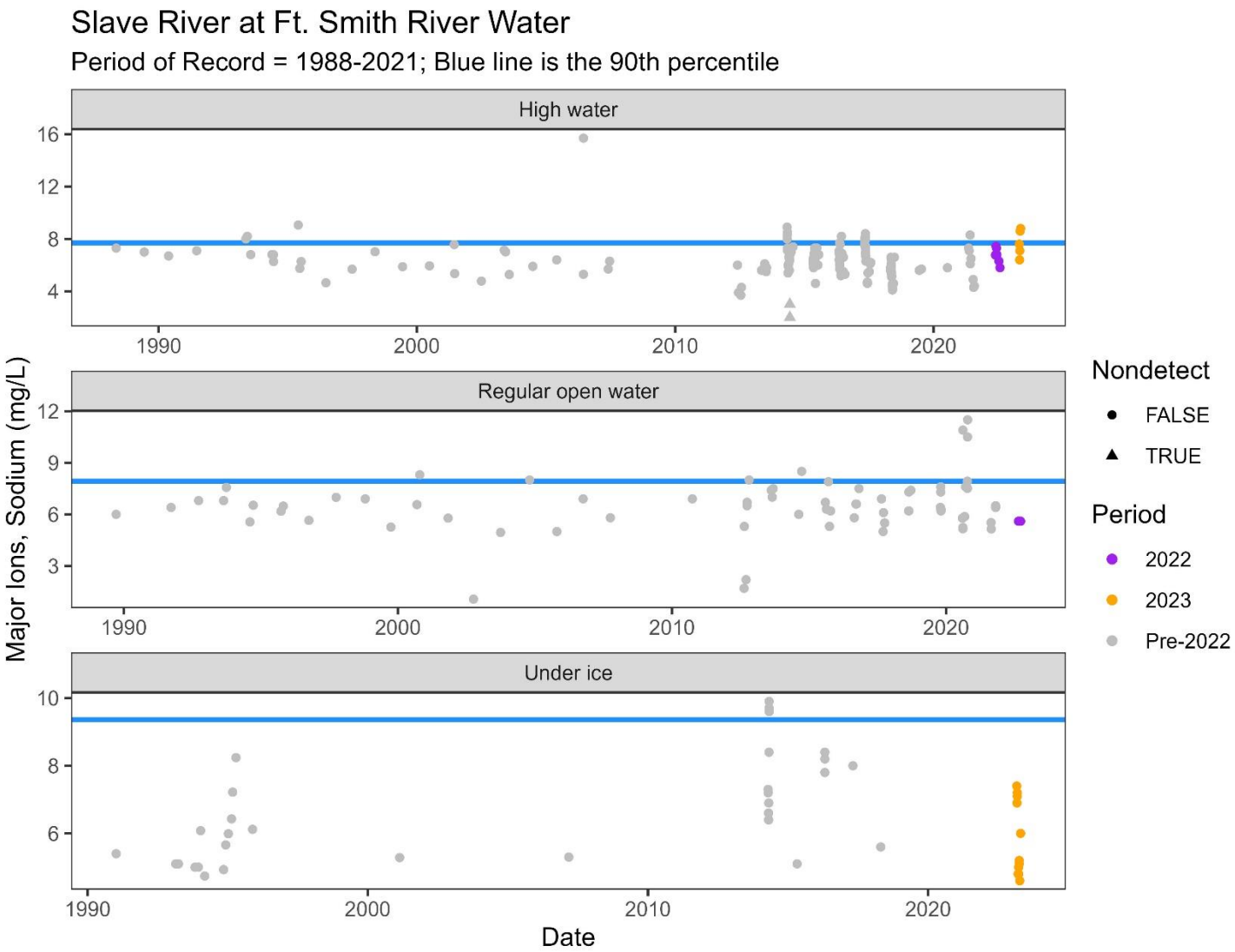


**Figure 2:** Dissolved Sodium Levels in the Slave River at Fort Smith River Water (1988-2023) during high water (spring), regular water (summer and fall) and under ice (winter). Blue Line represents the 90$^{th}$ percentile. Regular open water sampling is currently underway.

## Polycyclic Aromatic Hydrocarbons (PAHs)

Monitoring results for total PAHs were within values measured in the past. Here, total PAHs are represented as the sum of 16 individual parent PAHs and 33 individual alkyl-substituted PAHs that are known to be associated with bitumen from the Athabasca oil sands region.

Figure 3 is a plot of total PAHs measured in the Slave River between 2013 and 2023. Levels in late 2022 and early 2023 are within historical ranges. Figure 3 shows that PAH levels are generally lower during the winter than they are typically during the open water season. PAH levels were below CCME FAL guidelines, where guidelines exist.

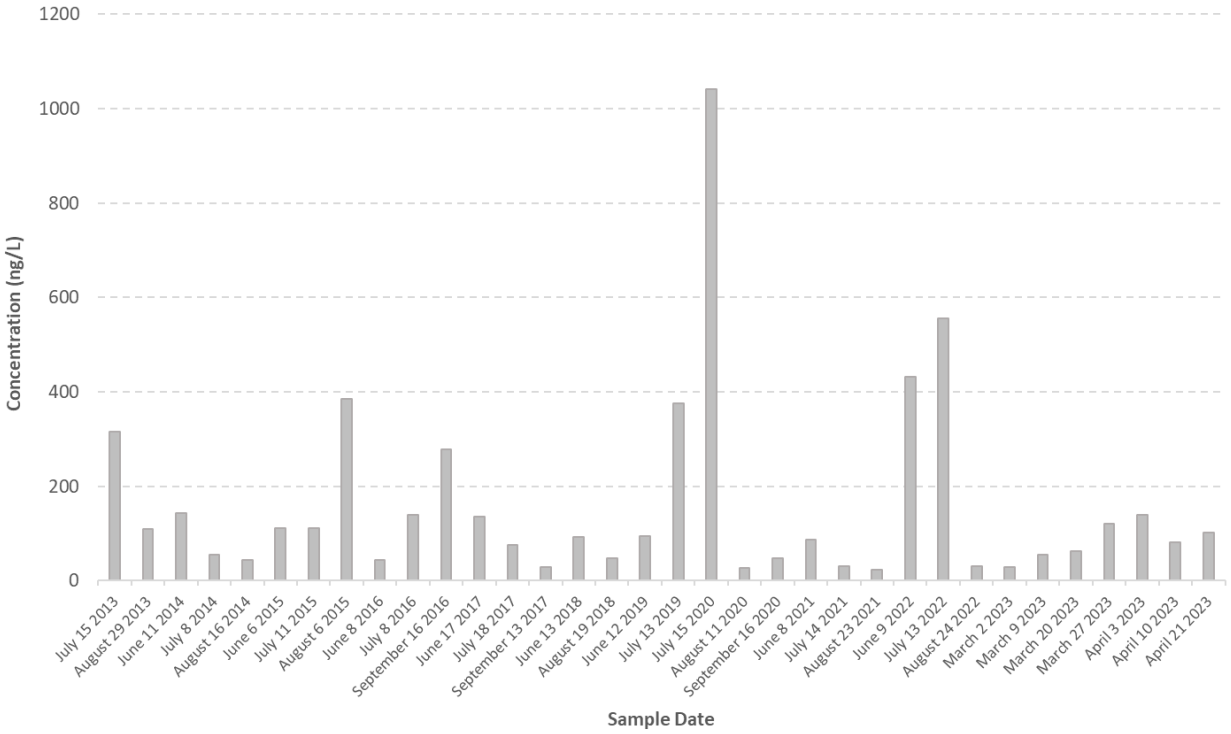


**Figure 3:** Sum of 16 Individual parent PAHs and 33 individual alkyl-PAHs measured in the Slave River between 2013 and 2023.

PAHs measured in the PMDs during 2022 were also within previously measured ranges. Most PAH results for the PMD deployed from March 13 to April 19, 2023, were below detection limits. Like the river water results, PMD PAH levels were lower in the winter than summer.

Detections of naphthenic acids and F2 petroleum hydrocarbons were reported near Kearl, upstream of the Firebag River. Although guidelines currently do not exist for naphthenic acids, summer 2022 and early 2023 results are within ranges previously measured in the Slave River at Fort Smith (Figure 4).

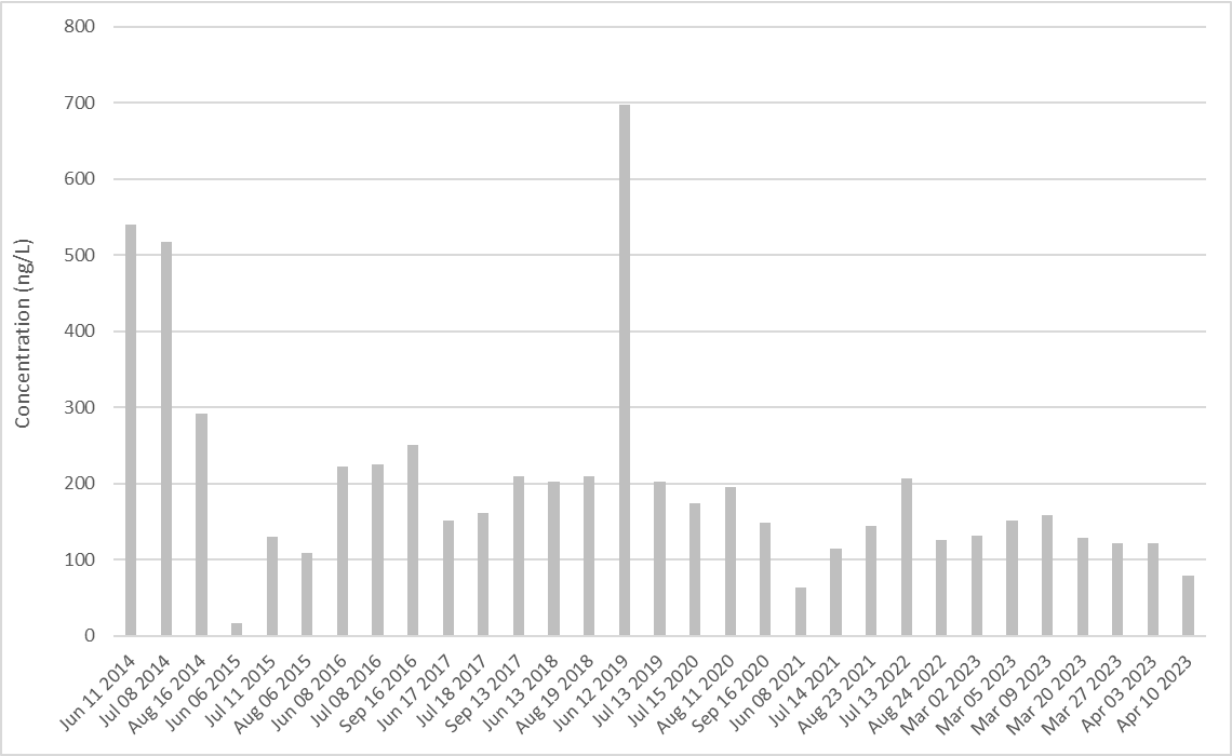


**Figure 4:** Sum of 60 individual naphthenic acids measured in the Slave River between 2013 and 2023.

## Get more information

Contact us with questions about these results or to learn more:
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