ALBERTA TAILINGS POND II

Commission for Environmental Cooperation

Response to Submission SEM-17-001

Prepared by:

Environment and Climate Change Canada for the Government of Canada

November 2017

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1. INTRODUCTION

On June 26, 2017, the CEC Secretariat received the *Alberta Tailings Ponds II* Submission on Enforcement Matters (SEM), filed by Environmental Defence Canada, the Natural Resources Defense Council, and a private individual, resident in Canada.

The submission alleges that Canada is failing to effectively enforce ss. 36(3) of the *Fisheries Act*[1] (the 'Act') with respect to the leaking of deleterious substances from oil sands tailings ponds into the surface waters and groundwater of Northeast Alberta. The submitters allege that tailings ponds systematically seep into waters frequented by fish[2] and that the effluent which seeps from tailings ponds into waters frequented by fish is deleterious to fish.[3] The submitters maintain that Canada has neither prosecuted nor pursued regulation governing tailings pond leakage. Furthermore, the submitters assert that the federal government has relied on the Alberta government to monitor, report and investigate illegal releases from tailings ponds and that Alberta in turn relies on industry self-reporting of tailings leakage.[4]

On August 16, 2017, the Secretariat concluded that the submission met the criteria set out in Article 14(1) of the *North American Agreement on Environmental Cooperation* (NAAEC) and in accordance with Article 14(2) determined that the submission merits a response from Canada.

In its determination, the Secretariat indicated Canada may provide information concerning enforcement of ss. 36(3) of *the* Act in the Alberta oil sands region, in relation to both direct and indirect deposits of deleterious substances from tailings ponds into water frequented by fish.

This document represents Canada's response to the Secretariat, in accordance with NAAEC Article 14(3), and provides information concerning the Government of Canada's enforcement of the pollution prevention provisions of the Act in the Alberta oil sands region. Specifically, the response explains the results of Environment and Climate Change Canada's (ECCC) most recent proactive inspections at oil sands tailings ponds, which were a national enforcement priority between 2009 and 2014. In addition, the legal and scientific justifications for transitioning to a reactive enforcement approach in 2014 are discussed. The roles of the federal and provincial governments are outlined as well. It is Canada's position that the inspections conducted by enforcement officers, other enforcement activities described in the response, and ongoing scientific research to better understand if ss. 36(3) violations are occurring in the oil sands region, constitute effective enforcement of environmental laws, as per Article 45(1) of the *NAAEC.*

[1] (R.S.C., 1985, c. F-14); Available at: http://laws-lois.justice.gc.ca/eng/acts/F-14/
[2] Submission, page 4-5.
[3] Submission, page 5-6.
[4] Submission, page 2.

2. EXECUTIVE SUMMARY

Canada is a land of vast natural resources and the people of Canada want those resources to be developed responsibly - for the preservation and protection of the country's rich and varied environment and for the health and safety of future generations. It is Canada's position that Environment and Climate Change Canada (ECCC)'s actions in the oil sands region, including its record of inspections and its continuing scientific research to distinguish natural versus anthropogenic depositions, demonstrate Canada's effective enforcement of the pollution prevention provisions of the *Fisheries Act.*

The oil sands are the third-largest proven oil reserve in the world. The Alberta oil sands formation comprises 142,000 square kilometres (km^2) of land in Athabasca, Cold Lake, and Peace River areas in northern Alberta.[5] Oil sand itself is a naturally occurring mixture of sand, clay or other minerals, water, and bitumen.[6] Within the Alberta oil sands, reserves shallow enough to mine (up to 75 metres) are found only within the Athabasca oil sands area, which comprises 4,800 km^2 and accounts for about 3.4% of the total oil sands formation, of which only a fraction is actively mined.[7] When bitumen is extracted, residual waste known as tailings is produced. Tailings contain a mixture of water, clay, unrecovered bitumen, and solvent, including some organic and inorganic compounds that are toxic. These tailings are stored in large basins called tailings ponds to allow the mineral fraction to settle out, with a total fluid tailings volume of 1.2 billion cubic metres.[8]

The Athabasca River is a major feature of the region, and its waters flow through areas of surface mining activity and natural outcroppings of oil sands (Sun et. al, 2017). There is potential for tailings water, also known as oil sands process-affected water (OSPW), to interact with the Athabasca watershed. Tailings ponds are designed to prevent the seepage of OSPW outside of containment zones. Individualized tailings management plans and mitigation measures are required under Alberta legislation with the intention of managing any risk of seepage.

Differentiating between anthropogenic (oil sands industrial activity) and natural sources of bitumen is the primary scientific challenge in determining whether seepage is occurring beyond containment zones as the natural oil sands formation leaches bitumen into groundwater to form a complex mixture (known as natural bitumen-influenced water) which closely resembles the chemical mixture of tailings water. Differentiating between natural bitumen-influenced groundwater and OSPW is scientifically and technically challenging as methods for their analysis have not been available and only now are in their preliminary stages of development and verification.

Subsections 36(3) to 36(6) of the Act, also known as the "pollution prevention provisions", establish a general prohibition against the unauthorized deposit of deleterious substances in

[5] Alberta Energy Facts and Statistics: http://www.energy.alberta.ca/OilSands/791.asp
[6] Natural Resources Canada "What are the oil sands": http://www.nrcan.gc.ca/energy/oil-sands/18089
[7] Alberta Energy Facts and Statistics: http://www.energy.alberta.ca/OilSands/791.asp
[8] Total fluid tailings volume at end of 2016, based on the 2016 tailings reports received by the Alberta Energy Regulator (AER).

waters frequented by fish. ECCC enforcement officers seek to enforce these provisions through proactive and reactive enforcement activities.

From 2009 to 2014, ECCC's Enforcement Branch, in collaboration with its Science and Technology Branch, conducted proactive enforcement activities at various tailings ponds in Alberta. During this period, ECCC conducted onsite inspections at seven tailings ponds, including at the sites highlighted by the submitters in the submission. Following their inspections, enforcement officers, in consultation with ECCC's scientists, determined that they did not have reasonable grounds to believe that there were violations of the pollution prevention provisions of the Act for any of the inspections conducted. The main reason for this, was that when deleterious substances were found in groundwater samples, enforcement officers could not determine if they came from natural or anthropogenic (i.e. oil sands industrial activity) sources; officers were not able to establish that a person deposited or permitted the deposit of a deleterious substance.

At the time of inspections, the scientific tools were unavailable to attribute any deleterious substances found in groundwater to tailings ponds. In 2014, following five years of effort to inspect tailings ponds with no reasonable grounds to support violations of the Act, ECCC redirected its proactive enforcement efforts toward other regional and national issues where resources could have a greater positive impact on the environment. This decision to reallocate resources was made in the context of an annual national planning process and the development of a national enforcement plan, and was consistent with Article 45 of the NAAEC.

In parallel, in an effort to address the knowledge gaps related to identifying seepage from tailings ponds, ECCC scientists have been working diligently to develop the scientific tools necessary to determine whether tailings pond seepage is occurring, and its extent and impact. ECCC scientists have been at the forefront of this important work and have made promising advances on discovering the compositions of OSPW and natural bitumen-influenced groundwater, and the ability to distinguish the two. Scientific advances from the past three years are expected to lead to an improved ability for ECCC to enforce the pollution prevention provisions of the Act in the coming years.

The Government of Canada works in coordination with the Government of Alberta, as with other provinces, to promote compliance with federal laws.

Collectively, these actions, including ECCC's record of inspections, and its continuing scientific research, demonstrate that Canada is effectively enforcing its environmental laws in a manner consistent with the NAECC, including Articles 5 and 45.

3. ECCC ENFORCEMENT ACTIVITIES UNDER THE *FISHERIES ACT*

3.1 The Pollution Prevention Provisions of the *Fisheries Act*

The "fisheries protection and pollution prevention provisions" comprise ss. 34 through 42 of the *Fisheries Act* (the 'Act'). Fisheries and Oceans Canada (DFO) has primary responsibility for the administration of the Act, which includes responsibility for administration and enforcement of the provisions intended to prevent serious harm to fish and manage threats to the sustainability and on-going productivity of Canada's commercial, recreational, and Aboriginal fisheries. Since 1978, ECCC has been responsible for the administration and enforcement of ss. 36(3) to 36(6), also known as the "pollution prevention provisions" of the Act, with respect to the deposit of deleterious substances in water frequented by fish.[9]

Subsection 36(3) of the Act, which is the subject of the submission, establishes a general prohibition against the deposit of deleterious substances in waters frequented by fish. It provides that:

> "Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water."

Subsection 36(4) of the Act provides that a deposit of a deleterious substance is not an offence if permitted by regulation. Subsections 36(5) and (5.2) allow the Governor in Council and the Minister to enact regulations authorizing the deposit of deleterious substances, subject to conditions such as monitoring and reporting. However, no regulations currently exist that apply to the deposit of substances from oil sands tailings ponds.

For clarity, ss. 34(1) of the Act defines a "deleterious substance" as:

> **(a)** any substance that, if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water, or

[9] From 1978 to 2014, ECCC was responsible for the administration and enforcement of the pollution prevention provisions of the Act in accordance with the 1978 Prime Ministerial Instruction and Directive issued by the Right Honourable Pierre Trudeau. ECCC's responsibilities were later formalized by a Governor in Council Order (also referred to as the Designation order) published in Canada Gazette, Part II on March 12, 2014, which resulted in the Minister of Environment and Climate Change having legal responsibility for the administration and enforcement of ss. 36(3) to (6) of the Act for all purposes and subject matters with the exception of aquaculture, and aquatic invasive species or aquatic species that constitute a pest to fisheries, which remain the responsibility of the Minister of Fisheries, Oceans and the Canadian Coast Guard.

> **(b)** any water that contains a substance in such quantity or concentration, or that has been so treated, processed or changed, by heat or other means, from a natural state that it would, if added to any other water, degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water.

In addition, Canadian case law has clarified that it is not necessary that the receiving water be rendered deleterious to fish. In *R. v. Kington*, the Court stated: "...It is the substance that is added to water frequented by fish that is defined [in ss. 36(3)], not the water after the addition of the substance."[10]

3.2 ECCC's Enforcement Branch Organization and Authorities

ECCC's Enforcement Branch (EB) is responsible for the protection and conservation of the environment and wildlife within federal jurisdiction for current and future generations. In-the-field enforcement officers across Canada enforce environmental and wildlife laws, including the following:

- *Canadian Environmental Protection Act, 1999* (CEPA)[11]
- pollution prevention provisions of the Act, including ss. 36(3)[12]
- *Migratory Birds Convention Act, 1994* (MBCA)[13]
- *Canada Wildlife Act* (CWA)[14]
- *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade* Act (WAPPRIITA)[15]
- *Species at Risk Act* (SARA)[16]

EB has two operational directorates: the Environmental Enforcement Directorate (EED), and the Wildlife Enforcement Directorate (WED). Officers are spread across the following five administrative regions:

- Pacific and Yukon Region (British Columbia and Yukon);
- Prairie and Northern Region (Alberta, Manitoba, Saskatchewan, the Northwest Territories and Nunavut);
- Ontario Region (Ontario);
- Quebec Region (Quebec); and,
- Atlantic Region (Newfoundland and Labrador, New Brunswick, Nova Scotia, and Prince Edward Island).

[10] Submission, page 3; Submission Appendix I
[11] Available here: http://ec.gc.ca/alef-ewe/default.asp?lang=En&n=4CD78F9F-1
[12] Available here: http://ec.gc.ca/alef-ewe/default.asp?lang=En&n=9ABFA22F-1
[13] Available here: http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=3DF2F089-1
[14] Available here: http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=E8EA5606-1
[15] Available here: http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=65FDC5E7-1
[16] Available here: http://ec.gc.ca/alef-ewe/default.asp?lang=en&n=ED2FFC37-1

There are 150[17] enforcement officers in EED responsible for enforcing CEPA and the pollution prevention provisions of the Act, including 30 officers in the Prairie and Northern Region. There are 80[18] enforcement officers in WED responsible for enforcing the MBCA, the CWA, WAPPRIITA, and SARA.

Throughout this document, the term "enforcement officer" refers only to officers in EED. These officers are designated by ECCC as both inspectors and fishery officers under the Act. Officers are provided with training with respect to the application of the Act and have legal authorities, including powers of inspection and search, seizure and detention (section 3.4).

Responding to alleged violations

In addition to authorities and powers set out in the Act, the provisions of the Act are enforced in accordance with the *Compliance and Enforcement Policy for the Habitat Protection and Pollution Prevention Provisions of the Fisheries Act* (Compliance and Enforcement Policy, Annex 1).[19] The Compliance and Enforcement Policy outlines general principles for the application of the provisions of the Act. It explains the role of regulatory officials in promoting and enforcing the Act. It sets out principles of fair, predictable, and consistent enforcement governing the application of the law, and responses by enforcement officers to alleged violations.

Enforcement officers carry out two main enforcement activities: inspections and investigations. The purpose of an inspection is to assess compliance; inspection powers are set out in s. 38 of the Act, and further described in the Compliance and Enforcement Policy. The purpose of an investigation is to gather evidence of a suspected violation. An enforcement officer may conduct an investigation when he or she has reasonable grounds to believe that an offence has been committed under the Act.

The Act and the Compliance and Enforcement Policy establish several enforcement measures to address alleged violations. Officers may (i) issue warnings and directions in response to alleged violations, (ii) recommend that the Minister of Environment and Climate Change consider exercising the authority to issue an order requiring that a person provide plans or other information, (iii) recommend that the Attorney General seek an injunction from a court to stop an alleged violation, or (iv) recommend a file for prosecution to the Public Prosecution Service of Canada.

When taking enforcement action, an enforcement officer considers each element of an offence. For ss. 36(3), the elements of the offence include the following:

- that a substance was deposited;
- that one or more persons have deposited or have permitted the deposit of the substance;

[17] Head count as of Aug. 17, 2017; includes managers.
[18] Head count as of September 8, 2017; includes managers.
[19] Available here: http://www.ec.gc.ca/alef-ewe/default.asp?lang=en&n=D6B74D58-1As

- that the substance deposited is deleterious to fish; and,
- that the substance was deposited in water frequented by fish, or in a place where it may enter such water.

When deciding on the appropriate response to a violation, enforcement officers consider factors set out in the Compliance and Enforcement Policy including the nature of the violation, effectiveness in achieving the desired result, and consistency in enforcement. To take an enforcement action, an enforcement officer needs reasonable grounds to believe that an offence has occurred. With regards to prosecutions, the minimum standard to lay a charge is reasonable grounds to believe that an offence has occurred. However, for conviction of an accused, each element of an offence must be proven to the higher threshold of beyond a reasonable doubt.

The standards of "reasonable grounds to believe" and "beyond a reasonable doubt" have specific, legal meanings, and have been addressed in case law:

- Reasonable grounds requires the "person in authority" to believe both subjectively and objectively that a criminal offence has been committed (*R. v. Storrey* (1990), 1990 CarswellOnt 78 (S.C.C.))).
- Proof "beyond a reasonable doubt" is closer to an absolute certainty than to a reasonable probability (*R. v. Starr* (2000), 147 C.C.C. (3d) 449 (S.C.C.)))).

3.3 Enforcement Activities at Oil Sands Tailings Ponds in Alberta

This section describes the most recent inspections carried out by ECCC enforcement officers and their results.

Inspections at Oil Sands Facilities

Between 2009 and 2014, with support from Science and Technology Branch, EED enforcement officers conducted proactive inspections at oil sands tailings ponds in Alberta. Oil sands were specifically included as a priority in EED's National Enforcement Plans for fiscal years 2010-2011 through 2013-2014.

Inspections were conducted by enforcement officers at seven different tailings pond sites to determine if oil sands process-affected water (OSPW, i.e. tailings water) was being deposited contrary to the Act. The submission references five sites: Syncrude Beaver Creek and Mildred Lake; Canadian National Resources Limited (CNRL) Horizon Mine; Suncor Tar Island Pond 1; Suncor South Tailings Pond; and Shell Jackpine Project. Inspections were conducted by officers at all five sites, as well as two that are not mentioned in the submission: Shell Muskeg River (External Tailings Pond), and Syncrude Aurora. A list of inspections is attached as Annex 2. Over 600 samples were taken during the inspections. The range of tests conducted on samples taken during the inspections was determined in consultation with scientists in ECCC's Science and Technology Branch.

Below is a summary of inspections conducted at the seven sites. Inspection dates are listed as occurring between 2009 and 2014. While physical, on-site inspections occurred between calendar years 2009 and 2013, work on the inspection files continued into 2014.

1. Syncrude: Beaver Creek and Mildred Lake

In May 2009, ECCC officers conducted an inspection at Syncrude Canada Ltd. Mildred Lake. Officers returned on September 23, 2009, to collect groundwater samples from the Mildred Lake Settling Basin. Levels of major ions, dissolved metals, dissolved organic carbon, total alkalinity, and ammonia-nitrogen were found to be below Canadian Council of Ministers of the Environment (CCME) Guidelines[20], and not deleterious to fish. Levels of naphthenic acids were measured to be higher than in the Athabasca River. At the time of the inspection, further scientific research was required in order for ECCC scientists to develop a methodology to determine if naphthenic acids in the natural environment were from anthropogenic or naturally occurring sources.

ECCC officers returned to the site on June 23, 2010, with departmental scientists. Samples were taken from monitoring wells, Beaver Creek, the drainage collection system, and an interception well, which is a well installed to intercept groundwater before it reaches Beaver Creek in case it is being influenced by the pond. Based on sample results, there was not enough data to conclude that groundwater was being contaminated by the tailings pond, or being deposited into Beaver Creek. Again, further scientific research was needed to determine the origin of substances.

On August 15, 2012, the site was inspected again by enforcement officers, to determine whether substances associated with mining could be found in groundwater near or in Beaver Creek. Samples were taken from monitoring wells and from Beaver Creek and analyzed for anions, ammonia, total metals, naphthenic acids, and benzene, toluene, ethylbenzene and xylene (BTEX). The only compound with elevated levels was naphthenic acids. At the time, the technology was still not available to determine whether the naphthenic acids were anthropogenic or naturally occurring.

As a result, enforcement officers did not have reasonable grounds to believe an offence under ss. 36(3) had occurred. In particular, they were unable to determine that a deleterious substance was deposited by a person.

2. Canadian Natural Resources Limited (CNRL) Horizon Mine

In May 2009, ECCC officers conducted an aerial inspection of the CNRL Horizon Mine tailings pond. Officers did not observe any visible discharges from the tailings pond into fish bearing water.

[20] CCME Guidelines provides a voluntary set of science-based goals for the quality of aquatic and terrestrial ecosystems.

On September 27, 2010, ECCC officers collected groundwater samples from monitoring wells and had them analyzed for ammonia, total and dissolved metals, anions, mercury, polycyclic aromatic hydrocarbons (PAHs), and naphthenic acids. Results showed that ammonia levels in one sample were elevated, but only in a sample collected a half a kilometer away from any water body; the remaining samples, including the ones collected closer to the Athabasca River, did not contain results that would indicate a potential violation.

On August 16, 2012, enforcement officers once again took groundwater samples from monitoring wells at CNRL's Horizon mine, and had them analyzed for ammonia, dissolved metals, naphthenic acids, BTEX, and anions. None of the substances were found to be at elevated levels.

3. Suncor Tar Island Pond 1

On June 22, 2010 enforcement officers, accompanied by ECCC scientists, took samples from five monitoring wells near Suncor's Tar Island Pond 1, as well as from a floodplain pond and interception well. All samples except for the interception well sample were analyzed for naphthenic acids, PAHs, mercury, anions, and dissolved metals. The interception well sample was analyzed by Science and Technology Branch for chemistry and toxicity evaluation for research purposes. Regarding sample results, three wells had arsenic concentrations higher than the CCME guideline of 5 ug/L. Two wells had chloride concentrations higher than the CCME guidelines.

In September 2010, again accompanied by ECCC scientists, enforcement officers inspected Tar Island Pond 1 and took samples from groundwater monitoring wells adjacent to the pond. Samples were analyzed for ammonia, total and dissolved metals, anions, mercury, PAHs, and naphthenic acids. Levels of arsenic, ammonium, zinc, chloride, boron, and vanadium were found to be high in comparison to the CCME Guidelines.

Enforcement officers corresponded significantly with scientists on this file. During the time that the file was open, while progress was made on differentiating naturally occurring from anthropogenic sources, there was still no clear indication of whether or not the substances were coming from the pond rather than from natural sources. As a result, enforcement officers did not have reasonable grounds to believe that an offence under ss. 36(3) had occurred, in particular, that deleterious substances were deposited by a person.

In June 2011, ECCC enforcement officers and scientists collected groundwater samples from the Athabasca River at various locations upstream of Suncor Pond 1. Sample results were compared to sample results taken adjacent to Pond 1 in 2010. The purpose was to help determine if there was a difference between compounds found in groundwater upstream of Pond 1 to those found adjacent to Pond 1.

The following parameters were collected at each location: trace metals, anions, BTEX, naphthenic acids, ammonium, ammonium isotopes, cations, sulphur isotopes, water isotopes, as

well as field parameters which included pH, temperature, dissolved oxygen, conductivity, and oxidation reduction potential.

The results of this inspection were inconclusive. Enforcement officers did not have reasonable grounds to believe that there was an offence under ss. 36(3), in particular, that a deleterious substance was deposited by a person.

4. Suncor's South Tailings Pond

Enforcement officers conducted an inspection at Suncor's South Tailings Pond on May 14-16, 2013. The inspection included analysis of samples from groundwater monitoring wells and the tailings pond, and determining groundwater flow direction in the area of concern. The following parameters were analyzed: anions, ammonia, dissolved metals, naphthenic acids, synchronous fluorescence spectroscopy, BTEX, and sweetener. Sweetener was used as an attempt to link groundwater samples to the tailings pond, as it may be an indication of anthropogenic sources.

Following the analysis of samples, there was no indication of OSPW found except for one well. However, data of the direction of groundwater flow showed that Suncor pumps this groundwater back into their tailings ponds and not towards surface waters.

Based on the information obtained during the inspection, there were no reasonable grounds to believe that a violation of ss. 36(3) had occurred.

5. Shell Canada Limited's Jackpine Project

On May 24, 2012, enforcement officers collected groundwater samples from monitoring wells between the tailings pond and Jackpine Creek. Samples were analyzed for anions, dissolved metals, ammonia, BTEX, and naphthenic acids. The samples did not contain concentrations either above CCME Guidelines or significantly above natural background levels for substances where there were no recommended concentrations in those guidelines.

Based on the information obtained during the inspection, enforcement officers did not have reasonable grounds to believe that an offence under ss. 36(3) of the Act had occurred.

6. Shell's Albian Sands-Muskeg River Mine – External Tailings Pond

Officers inspected the Shell's Albian Sands Muskeg River External Tailings pond on May 26, 2009; September 28, 2010; June 26-28, 2011; September 22, 2011 and May 24, 2012. During this time, numerous samples were collected from groundwater monitoring wells as well as from the Muskeg River and from a manmade outfall (August 2011). Elevated concentrations of naphthenic acids were detected twice: first in 2010 and then in September 2011. It was unknown if the naphthenic acids were from anthropogenic or natural sources. When no elevated levels of substances were found in 2012, the file was recommended for closure.

7. Syncrude Aurora

Officers inspected the Syncrude Canada Ltd. Aurora Operations on May 26, 2009; June 24, 2010; and August 14, 2012. During this time numerous samples were collected from groundwater monitoring wells as well as from an interception well. All samples except for the interception well were tested for naphthenic acids, PAH, mercury, anions, and dissolved metals. The interception well sample was analyzed by ECCC's Science and Technology Branch for chemistry and toxicity. There were no elevated concentrations in the samples taken, except for naphthenic acids. However, it was unknown if the naphthenic acids were from natural or anthropogenic sources. As such, enforcement officers did not have reasonable grounds to believe that a violation of ss. 36(3) had occurred.

Inspection Results

For all of the inspections conducted, enforcement officers, after consulting in depth with ECCC scientists, determined that they did not have reasonable grounds to believe that there was a violation of the pollution prevention provisions of the Act. The primary reason for these determinations was an inability to differentiate whether the source of deleterious substances in bitumen influenced groundwater samples was anthropogenic or naturally occurring.

Enforcement actions, such as issuing a direction under ss. 38(7.1) of the Act, only require officers to have *reasonable grounds to believe* that a violation of the Act has occurred. On the other hand, in a prosecution, significantly greater certainty is needed as the Crown must prove the accused guilty *beyond a reasonable doubt.* In a successful prosecution for an alleged offence of ss. 36(3) of the Act, the Crown must prove the accused guilty beyond a reasonable doubt. At the time of the inspections, existing science prevented the officers from having reasonable grounds to believe a violation of ss. 36(3) of the Act had occurred, and they were unable to take either of these enforcement measures.

ECCC has conducted inspections: inspections may lead to investigations and investigations may lead to prosecution. This can only occur where there is the means to establish sufficient grounds to believe an alleged violation has occurred. The submission maintains that Canada has failed to prosecute. However, as outlined in NAAEC Article 5, prosecution is just one aspect of enforcement.

The submitters' appendices contain information from environmental assessments and reports of the oil sands where authors project or report unintended seepages and then outline mitigation measures to manage any risks to surface waters. In the documentation provided it is clear that operators' intentions are to contain OSPW so that it does not reach surface water bodies. The estimates of seepage provided by the submitters are insufficient proof of violations of ss. 36(3) of the Act for enforcement purposes, As discussed, the most recent inspections undertaken by enforcement officials at the same sites referenced by the submitters did not provide enforcement officers with reasonable grounds to believe that there was a violation of the pollution prevention provisions of the Act.

Further, as documented and explained above, the decisions taken by enforcement officers were based on facts and available information. A high threshold must be met for a conviction, namely proof beyond a reasonable doubt that an accused has committed an offence.

In conclusion, the decisions taken by enforcement officers in relation to each file constitute legally sound decisions.

Prioritization of Enforcement Resources

Under Article 45(1) of the NAECC, a Party has not failed to effectively enforce its environmental law or to comply with Article 5(1), where the Action or inaction in question by agencies or officials of that Party:

> " (a) reflects a reasonable exercise of their discretion in respect of investigatory, prosecutorial, regulatory or compliance matters; or (b) results from *bona fide* decisions to allocate resources to enforcement in respect of other environmental matters determined to have higher priorities."

In accordance with Article 45(1), given the high number of regulations under the many federal environmental laws that ECCC enforces (see section 3.2) and given the numerous regulatees coupled with Canada's vast and, at times, remote geography, EED is required to prioritize its resources. Environmental enforcement priorities are defined annually in consultation with experts from ECCC's Environmental Protection Branch and Science and Technology Branch.

Approximately 40% of inspections conducted by the EED are related to the pollution prevention provisions of the Act and its regulations. The remaining 60% of inspections are related to CEPA and its regulations. Inspection activity under the Act spans numerous sectors including the petroleum and chemicals industry, logging, mining, agriculture, cement plants, aquaculture, manufacturing, and food processing.

During the prioritization process, instruments enforced by EED are placed within three categories divided roughly equally in terms of inspection effort: high priority, proactive, and reactive:

1. High Priority Regulations: Various factors are considered when choosing high priority instruments. These include instruments that are new and require enforcement strategy to implement, instruments that are part of governmental and/or departmental priorities, and instruments for which a high level of risk is identified.

2. Proactive inspections: Instruments are selected for proactive inspections when there is a moderate to high level of non-compliance, when maintenance is required to ensure that the level of compliance is maintained when the environmental risk is high, and when more information is being sought on the regulated community.

3. Reactive inspections: Enforcement officers respond to incidents that occur, and information received from the public. These often have significant adverse environmental

impact, and, while unplanned, constitute a critical part of EED's work. Therefore, considerable resources are set aside for these activities to be conducted throughout the year. A considerable amount of inspections under the Act are reactive in nature. Whenever officers receive actionable information on potential non-compliance of a regulation, they will take the necessary actions, regardless of where the regulation is in terms of priority, to ensure adherence to the relevant Act and its regulations.

Enforcement officers also conduct reactive inspections upon referral from other branches within ECCC. This accounts for a small proportion of inspection effort. It includes instruments for which there is a big compliance promotion push, instruments undergoing significant amendments, instruments for which the level of risk is known to be low, and instruments for which increased attention would not yield an increase in compliance

Following the annual planning process, a National Enforcement Plan is developed, which forms the cornerstone of environmental enforcement efforts for the relevant fiscal year.

Over five years (2009 to 2014) EED allocated significant resources to enforcement activities in Alberta, including tailings ponds inspections that involved the gathering and analysis of over 600 samples. These inspections did not result in enforcement officers having reasonable grounds to believe a violation had occurred or sufficient information regarding the elements of an offence and to take enforcement measures, including initiating investigations or recommending prosecutions. As a result, ECCC stopped conducting proactive inspections of groundwater at oil sands tailings ponds in Alberta. This decision was taken in the context of ECCC's risk-based approach for planning and prioritizing its enforcement activities, consistent with Article 45 of the NAAEC. It was also a reasonable exercise of discretion in respect of compliance matters.

Within the context of resource constraints and the need to prioritize enforcement efforts, ECCC redirected its proactive enforcement efforts toward other regional and national issues where resources could have a greater positive impact and better serve the interests of the Canadian population. While enforcement continues on a reactive basis in the Alberta oil sands, in relation to tailings ponds and the Act, ECCC scientific research has been advancing the knowledge and tools needed to enforce the pollution prevention provisions of the Act. Section 4 describes the science-based reasons for ECCC's decision-making.

Prioritization of Enforcement Activities *in Prairie and Northern Region*

As mentioned above, in part due to the challenges created by scientific uncertainties related to tailings ponds in Alberta, in 2014, the Prairie and Northern Region realigned its priorities in relation to this issue. Since 2014, the region has redirected proactive enforcement efforts to other national and regional issues where resources could have a greater positive impact on the environment. The Prairie and Northern Region has focused on addressing national priorities, known regulated communities, and investigating alleged offences (harm that is known).

Since 2014, the officer who led the oil sands tailings ponds inspections (with support from other officers in Alberta), has conducted many inspections and investigations, including the following:

- Acklands-Grainger Inc.: The lead enforcement officer led the investigation into alleged violations of the *Ozone-Depleting Substances Regulation, 1998.* On Dec. 12, 2016, Acklands-Grainger Inc. pleaded guilty in the Provincial Court of Alberta, for contravening the Regulations, made under CEPA. The company was fined $500,000. The investigation determined that between 2012 and 2014, the company sold HV Switchgear Lubricant and Sprayon EL2204, which contained the prohibited HCFC-225.
- PCB investigation: An investigation into the release of oil containing PCBs from a transformer, above the threshold set in the Regulations.
- Engines investigation: An on-going investigation into the import of engines for alleged contraventions of the *Off-Road Compression-Ignition Engines Emission Regulations*, *Off-Road Small Spark-Ignition Engine Emission Regulations* and CEPA.
- Act investigation: An investigation into the release of diesel into water frequented by fish. The file is currently before the courts.

In addition, since 2014, successful prosecutions in Alberta Provincial Court have included the following:

- On Oct. 3, 2017, Sherritt International Corporation (Sherritt) pleaded guilty to three counts of contravening the Act. Sheritt was sentenced to pay $1,050,000. The charges relate to releases of deleterious effluent that occurred at Coal Valley Mine, on Aug. 3, 2012, and July 27, 2011. Coal Valley Mine, which was owned by Sherritt from 2001 to 2014, is an open pit coal mine located 90 km south of Edson, Alberta;
- On June 15, 2017, Canadian National Railway Company (CN) pleaded guilty to one offence under the Act and three offences under CEPA. It was the result of an incident on April 9, 2015, in which ECCC enforcement officers responded to a report of an oil sheen on the North Saskatchewan River. A joint investigation with Alberta Environment and Parks was conducted. CN was ordered to pay $2,500,000. An additional fine of $125,000 was levied on May 25, 2017, in relation to provincial charges under the *Environmental Protection and Enhancement* Act*;*
- Prairie Mines & Royalty ULC (formerly known as Coal Valley Resources Inc.) pleaded guilty on June 9, 2017, to two counts of violating the Act, and was ordered to pay $3,500,000. On Oct. 31, 2013, a dike at the Obed Mountain Mine failed, resulting in more than 670 million litres of contaminated water and sediment spilling into two creeks, and impacting the Athabasca River. This file was a joint investigation between Fisheries and Oceans Canada, the Province of Alberta, and ECCC;
- On September 20, 2016, the manager of Page the Cleaner, a dry-cleaning facility in Edmonton, pleaded guilty to one count of contravening the *Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations*, made under CEPA. He was fined $20,000. The charges stem from inspections of the business' premises in 2014 and 2015, when ECCC enforcement officers identified tetrachloroethylene waste water and residue stored in uncovered containers, in contravention of the Regulations;
- On July 28, 2015, Panther Industries (Alberta) Inc. (Panther Industries) pleaded guilty and was ordered to pay $375,000 in penalties under the Act and CEPA, for an offence related to a spill of hydrochloric acid into the environment and into water frequented by

fish. ECCC's investigation determined that on Dec. 9, 2012, approximately 150,000 litres of hydrochloric acid spilled through a broken sight glass on a storage tank system at the Panther Industries site in Edmonton, Alberta; and,

- On Nov. 25, 2015, Shooter's Hill Livestock Inc. pleaded guilty to allowing the deposit of a deleterious substance (liquid hog manure) into water frequented by fish and was ordered to pay $50,000. ECCC was notified of the incident on May 10, 2014, and subsequently opened an investigation.

The allocation of resources to address priority matters constituted a reasonable exercise of discretion and *bona fide* decisions to allocate resources, in accordance with the definition of effective enforcement under article 45 of NAAEC.

3.4 Other Enforcement Activities

ECCC undertakes a variety of enforcement activities to promote compliance with the pollution prevention provisions of the Act. As recognized in Article 5, section 1, of the NAAEC, relevant governmental enforcement actions go beyond simple prosecution. In addition to monitoring compliance and investigating suspected violations, including through on-site inspections (NAAEC Article 5.1(b)), ECCC has supported the following enforcement activities with respect to the pollution prevention provisions of the Act:

a) Appointing and training inspectors (NAAEC Article 5.1(a))

Enforcement officers in EED are designated as both inspectors and fishery officers under the Act. Subsection 38(1) of the Act provides the authority for the appointment of inspectors, and s. 5(1) provides the authority for the appointment of fishery officers. Every enforcement officer is furnished with a certificate of designation which defines the specific powers and authorities that they are provided. For the purpose of designating enforcement officers, including designations as inspectors and fishery officers, ECCC has a program that outlines the requirements that enforcement officers must meet to be designated. Once standards have been met, a designation is issued.

ECCC enforcement officers are provided with training with respect to the application of the Act and the use of enforcement tools authorized by the Act. Enforcement officers must successfully complete the EB Officer Designation Training Program. This consists of 160 hours of Environmental Enforcement Standardized Training (EEST), and 170 hours of Applied Enforcement Training (AET) that is facilitated by a certified Law Enforcement Training institution. The Act component of EEST is 12 hours; the sampling component is 24 hours. These training courses are augmented by field training on enforcement activities and enforcement measures used by officers in response to non-compliance. In addition, the Department provides on-going training to its enforcement officers, such as regulatory training, professional development, and/or training on any enforcement matter that would require officer knowledge and skills to be enhanced.

b) Publicly releasing enforcement information (NAAEC Article 5.1(d)

ECCC maintains a public registry of corporations convicted under certain laws, including the pollution prevention provisions of the Act.[21] In addition, the ECCC website contains Enforcement Notifications, which provide information about penalties resulting from prosecutions under laws that ECCC enforces, including the pollution prevention provisions of the Act.[22]

c) Providing for search, seizure, and detention (NAAEC, Article 5.1(k))

Powers of inspectors and fishery officers are set out in the Act. The Act gives inspectors (ss. 38(3)) and fishery officers (ss. 49(1)) the authority to enter places for the purpose of verifying compliance with the Act. In relation to ss. 36(3) of the Act, inspectors must have reasonable grounds to believe that an activity is occurring that is likely to result in the deposit of a substance into water frequented by fish. While verifying compliance, inspectors may examine substances or products, take samples, and conduct tests of measurements (ss. 38(3.1)); fishery officers may open any container, conduct tests or and require any person to produce any relevant records (ss. 49 (1) - 49(1.1)). These powers were used in the inspections mentioned above.

The Act gives fishery officers the powers of search, seizure, and detention. Fishery officers may carry out a search after a warrant has been issued (ss. 49.1(1)) and without a warrant in exigent circumstances (ss. 49(3)). Fishery officers have the power to arrest (s. 50), and the authority to seize anything that will afford evidence of an offence under the Act (s. 51).

In addition to the authorities under the Act, ECCC provides enforcement officers with training on these powers during their designation training, described below. Enforcement officers receive a minimum of 14 hours of training specifically on search warrants, along with additional training related to search, seizure, and detention.

d) Issuing administrative orders, including orders of a preventative, curative or emergency nature (NAAEC Article 5.1(l))

NAAEC Article 5 section 1(l) provides for the issuance of administrative orders, including orders of a preventative, curative, or emergency nature. The Act provides for the issuance of administrative orders of a preventative, curative, or emergency nature:

- Directions: Under ss. 38(7.1), an inspector may direct a person to take measures to prevent or to counteract, mitigate or remedy adverse effects from a deposit of a deleterious substance in water frequented by fish. Directions can be preventive, curative and of an emergency nature;
- Orders: Under ss. 37(1) of the Act the Minister may request information such as plans, specifications, analyses, and samples concerning any work or undertaking to enable the Minister to determine if a deposit of a deleterious substance is occurring that would be an

[21] Available here: http://www.ec.gc.ca/alef-ewe/default.asp?lang=En&n=1F014378-1
[22] Enforcement Notifications available here: http://www.ec.gc.ca/alef-ewe/default.asp?lang=En&n=8F711F37-1

offence under the Act. If the Minister believes that an offence is being or is likely to be committed, the Minister may issue orders requiring changes to the work or undertaking, restricting the operation of the work or undertaking, or closing the work or undertaking for a stipulated period of time;
- In addition, the Attorney General of Canada has the authority to seek an injunction from a court in order to stop an alleged violation of the Act. Enforcement personnel recommend injunctive action where continuation of the activity constitutes a significant and immediate threat to fish.

e) Other appropriate government action (NAAEC Article 5.1)

Departmental scientific efforts (described in section 4) demonstrate that ECCC is taking the appropriate government actions needed to develop and improve the scientific tools needed to assess compliance with the Act with respect to oil sands tailings ponds.

3.5 Relationship with Alberta

The Government of Canada is committed to cooperating with the province of Alberta to manage the oil sands responsibly and promote compliance with environmental laws, including the pollution prevention provisions of the Act. As is evident from the proactive work conducted by federal enforcement officers in the oil sands, ECCC enforces its federal laws. Nonetheless, an effective working relationship with Alberta is central to the enforcement of federal and provincial environmental laws. This relationship is facilitated by the following Agreements and regulations:

- The *Deposit Out of the Normal Course of Events Regulations*, under *the* Act *(*referred to as *"Notification Regulations,"* Annex 3*);*
- The *Canada-Alberta Environmental Occurrences Notification Agreement* (referred to as the "*Notification Agreement,* "Annex 4);[23] and,
- The *Administrative Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act* (referred to as *the "Administrative Agreement,* "Annex 5).

Federal, provincial and territorial laws require, in most cases, notification of the same type of environmental emergency or environmental occurrence, such as oil or chemical spills or other unauthorized deposit of a deleterious substance in Canadian fisheries waters. In 2011, in order to reduce duplication of effort and streamline notification of these events, the *Deposit Out of the Normal Course of Events Regulations* was created under *the Fisheries Act.* These are referred to as the "Notification Regulations".

ECCC and Fisheries and Oceans Canada have entered into Notification Agreements[24] with the Governments of Alberta, British Columbia, Manitoba, Ontario and Saskatchewan, as well as with the Governments of the Northwest Territories and Yukon. The Notification Agreements

[23] Available here: http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=3BA6536B-1
[24] Available here: http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=5200AB4B-1

complement the Notification Regulations under the Act as well as the Release and Environmental Emergency Notification Regulations, made under the *Canadian Environmental Protection Act, 1999* (CEPA).

The purpose of the *Canada-Alberta Environmental Occurrences Notification Agreement* is to establish a streamlined system for persons required to notify Canada and Alberta of environmental emergencies or occurrences.[25] Under the Notification Agreement, the province operates a 24-hour telephone line and transfers relevant information to ECCC.

The *Administrative Agreement* [26] allows the coordination of regulatory activities between the federal and provincial levels in an effort to provide coherence where regulatory requirements are duplicated at the federal and provincial levels for the regulated sector. It does not result in the delegation of the enforcement of ss. 36(3) of the Act to the province of Alberta.

Inspections conducted by ECCC as a result of referrals from Alberta are published annually in the *Fisheries Act Annual Report.*[27]

Notification regulations and agreements allow provinces to inform federal enforcement officers when a breach of the pollution prevention provisions might have occurred, and is standard practice with every province and territory.

Alberta's policies, regulations and requirements for the management of the oils sands are summarized in section 5.

[25] An environmental occurrence includes the release, or the likelihood of a release, of a substance into the environment in contravention of regulations referred to in section 95, 169, 179 or 212 of CEPA 1999, an environmental emergency under section 201 of CEPA 1999, or an unauthorized deposit of a deleterious substance, in water frequented by fish, or a serious and imminent danger of such an occurrence under ss. 38(5) of the Act.
[26] Available here: http://ec.gc.ca/ee-ue/default.asp?lang=En&n=26F90F87-1
[27] Available here: http://publications.gc.ca/site/eng/9.505666/publication.html

4. RESEARCH FOR WATER QUALITY MONITORING IN THE ALBERTA OIL SANDS

ECCC's Science and Technology Branch is responsible for the department's scientific research activities related to water quality monitoring in the Alberta oil sands region. The Canada Centre for Inland Waters (CCIW) in Burlington, Ontario, a shared ECCC and DFO facility, has state-of-the-art laboratories designed for studying the health of fish, other aquatic life, and water chemistry.

Routine water quality monitoring in the Alberta oil sands region is conducted under the Joint Oil Sands Monitoring Program (JOSM). Alberta Environment and Parks, along with ECCC's Water Science and Technology Directorate within the Science and Technology Branch, jointly conduct these monitoring efforts as well as advance scientific understanding of the impacts of bitumen influenced waters.

Tailings ponds are engineered to seep, as seepage provides critical structural stability.[28] What is scientifically unclear is whether seepage is occurring beyond containment zones, and if it is occurring, to what extent. Scientists from ECCC have been working to assess the environmental impacts of the oil sands on the Athabasca watershed. Since 2014, ECCC scientists have made significant advancements in the development of an "analytical toolbox" (a set of five methods to distinguish between natural and anthropogenic sources of deleterious substances) as well as in the identification of substances unique to OSPW (source attribution to OSPW) alongside forensic tools that can now distinguish between individual tailings ponds and improved sampling methodologies. These advances will support ECCC enforcement officers' efforts to assess compliance of ss. 36(3) of the Act in the coming years and represent governmental action in support of effective enforcement, as per Article 5(1) of the NAAEC.

4.1 Identifying the Sources of Bitumen-Influenced Waters

Establishing scientific certainty with respect to identifying and sourcing OSPW is a central challenge to verifying compliance with section 36(3) of the Act. The Alberta oil sands region is characterized by large deposits of thick hydrocarbons called bitumen trapped in a mixture of sand, clay, minerals and water. Following mining of the oil sand formation, the bitumen is extracted with a hot water wash, with no unique chemical additives. The liquid portion of the remaining (waste) tailings, which comprise OSPW, is a highly complex mixture of inorganic and organic compounds, which has a similar composition to the groundwater that passes through the natural oil sands formation.

[28] The geological setting for tailings ponds varies significantly. Impermeable geological strata under some ponds results in minimal seepage, while more permeable underlying sediments may result in higher rates of seepage. For the latter, seepage will mix with natural groundwater beneath the pond. The natural groundwater flow is often greater than the seepage rate, resulting in dilution. Interception trenches are built down gradient from tailings ponds to collect seepage before it can reach any surface water bodies.

ECCC has conducted extensive research on differentiating bitumen-derived contaminants found naturally in the environment from anthropogenic sources, including analyzing all possible contaminant-flow vectors such as aerial deposition, biota contamination, sediment and water/snow contamination and the potential for OSPW seepage via groundwater systems. Recent work by ECCC scientists Kurek et al. (2013); Kirk et al. (2014); Zhang et al. (2014); Summers et al. (2016); Evans et al. (2016), has led to much improved understanding of natural and industrial airborne deposition within the oil sands region and may provide a stronger scientific basis for future enforcement actions. In addition, ECCC scientists have developed various methodologies to characterize, and close existing knowledge gaps with regards to groundwater-surface water interactions (see Roy et al., 2016). For the purposes of this Response the discussion will focus on the research conducted on OSPW seepage.

This research has focused on analyzing groundwater as it would be the first recipient of OSPW seepage and would presumably have the highest concentrations of OSPW, providing the best probability of detection. It is important to distinguish that the goal of this research is to ascertain if seepage is occurring *beyond* containment structures. Such structures include interceptor wells, ditches and relief well structures that are all designed to capture and return seepage to the containment zone. Samples from these containment structures have been included in research efforts to distinguish OSPW from natural bitumen-influenced waters.

Efforts to build an "Analytical Toolbox"

Given the complex chemical composition of OSPW (including new substances, with no prior chemical identities), it is necessary to develop new analytical methods to detect any OSPW that may be entering into groundwater or surface waters. Early efforts to build an "Analytical Toolbox" capable of differentiating natural from anthropogenic sources of bitumen influence in groundwater samples are presented in the 2014 study by Frank et al.[29] The study analyzed a suite of inorganic and organic chemical indicators, both routine and high-resolution , at two tailings ponds from two different mining operations and concluded that differentiation was possible. Results from this study also indicated that OSPW-affected groundwater was likely reaching the Athabasca River at one location (Tar Island Pond 1). However, this publication did not describe any chemicals or chemical classes that were exclusively unique to OSPW. Instead, the weight of evidence from a complement of analyses led to the study's conclusions. It provides potential indication that OSPW seepage is reaching the Athabasca River at one location but did not examine the broader scope of the river to confirm that this is the case, and did not constitute proof of a violation of the pollution prevention provisions of the Act for enforcement purposes.

Since this seminal 2014 study, research has continued at ECCC to improve the "analytical toolbox", to identify chemicals unique to OSPW, to better understand the chemical variabilities of anthropogenic and natural bitumen-influenced environments within the oil sands region and to determine if OSPW seepage itself is toxic, relative to the natural bitumen background. In efforts to improve the confidence in detecting seepage, additional chemicals were evaluated for their diagnostic capabilities (flame retardants, artificial sweeteners), as well as additional background groundwater sites (including those influenced by natural bitumen). The toolbox was then

[29] Submission Appendix XXI

reapplied to the original study sites used by Frank et al. 2014 and samples of the Mildred Lake tailings plume (Oiffer et al., 2009). This current research (Hewitt et al. 2018 forthcoming publication) has not yet been accepted in the peer reviewed scientific literature; therefore its results must be categorized as preliminary.

In the Hewitt et al. (2018) study, the entire chemical compositions in groundwater samples from both pond sites and the new reference sites were statistically analyzed to determine which chemicals showed the greatest diagnostic potential for identifying OSPW seepage. The chemicals which showed the greatest potential were two groups of naphthenic acids (termed Family A and B). Although these acids do occur naturally at low levels in bitumen-influenced groundwater, they are enriched significantly in OSPW and groundwater affected by OSPW seepage. It is likely that these compounds are enriched in tailings during the bitumen extraction process. The Family A and B naphthenic acids were discovered in 2014 as a result of extensive and ongoing collaborations between ECCC and the University of Plymouth (UK). Commercially available standards for these acids do not exist, so custom synthesis of them has been undertaken to determine their exact structures and to make authentic standards available to all stakeholders for seepage assessments, general naphthenic acid method development and toxicological evaluations. This custom synthesis is expected to be completed in 2018.

This improved toolbox will provide stronger indications of OSPW seepage. In an effort to close this knowledge gap, ECCC has conducted a parallel study of the same two pond sites and all new reference sites to examine all the chemicals detected, including unknowns, so that new chemicals unique to OSPW and seepage can be identified. Preliminary results have identified four new substances unique to OSPW and OSPW-affected groundwater and chemical structures have been proposed for each as no commercial standards are available (Milestone et al. 2018 forthcoming publication). The incorporation of unique chemicals present in OSPW into the analytical toolbox could help provide enforcement officers with reasonable grounds to believe a violation of s. 36(3) of the Act has occurred, or potentially prove beyond a reasonable doubt that OSPW is present in a given sample.

Methods that are part of this improved "analytical toolbox" will, once published in the scientific literature, be transferred to the Joint Oil Sands Monitoring Program and federal and provincial enforcement agencies.

Sampling Methodology

It is important to note that for future use of the toolbox for enforcement purposes, officers will need to collect composite samples. ECCC research into the variability of natural surface and ground waters, as well as OSPW (Frank et al. 2016 study) has revealed that single samples are not likely to be accurate representations of their original sources Therefore, composite samples should be taken in efforts to accommodate the high range of variability present within all (anthropogenic and natural) bitumen-influenced samples. Forensic tools developed in this study also now enable scientists to differentiate tailings ponds from each other, which may allow enforcement agencies to attribute seepage to specific sources.

It is also worth noting that while ECCC scientists have adopted this sampling methodology, many in the research community and industry have yet to agree and to adjust their collection methods..

4.2 Understanding the Impacts of Bitumen-Influenced Waters

In addition to the research undertaken by ECCC scientists to characterize OSPW and identify its source, ECCC scientists have been working to understand the impacts of any deleterious substances (whether natural or anthropogenic) occurring in the Athabasca watershed on aquatic life and ecosystems.

While chemicals associated with bitumen-influenced waters, including tailings ponds, are known to be toxic, the most sensitive organisms and biological endpoints have not yet been determined. Nor has it been determined which areas in the oil sands region would be most likely to be impacted by industrial activities, or how these impacts would differ from organism exposure to natural bitumen formations. This important research is briefly described below.

Toxicological Effects of Bitumen-Influenced Ground waters

Tailings ponds do contain substances that are deleterious to fish. These include soluble organic chemicals (such as naphthenic acids), residual bitumen, ammonia, sulphate, chloride, aromatic hydrocarbons, and trace metals. Research led by ECCC on the toxicity of bitumen- influenced groundwater (natural and anthropogenic) has been ongoing since 2010, with the objectives of understanding their chemistry and their health effects on aquatic life.

The soluble organic fraction of OSPW, including naphthenic acids, has been shown to be a primary contributor to toxicity (MacKinnon et al. 1986, Brown et al. 2015, Mahaffey et al. 2016). ECCC scientists' research surrounding soluble organic mixtures (Marentette et al. 2015a, 2015b, 2017, Bartlett et al. 2017) have indicated that the observed toxicity differs between species and biological endpoints within the same soluble organic mixture.

This result is important because it shows that different types of organisms should be assessed when trying to determine if a sample is toxic, and also that a non-descriptive measurement like a "total naphthenic acid concentration" is not a useful measure of potential harm to fish, as these organic compounds represent the summation of thousands of sub-compounds whose toxicity is dynamic. Another result from these aforementioned studies was the conclusion that commercially available naphthenic acids, derived from petroleum sources other than bitumen, are not comparable to naphthenic acids derived from bitumen, further supporting the need for the development of more relevant chemical standards.

Additional research addressing the toxicity and complexity of soluble organic mixtures within bitumen-influenced waters (Bauer et al. 2018b (collaboration between U. Waterloo and ECCC), Frank et al. 2018 forthcoming publications) support previous findings. Ongoing research is attempting to identify toxic bitumen-derived chemicals, with research into lethal (Bauer et al. 2018 forthcoming publication; a collaboration between U. Waterloo and ECCC)) and sub-lethal effects (research underway, Houde et al. 2018, forthcoming publication) at environmentally

relevant concentrations. As these toxic chemicals are identified, assessment of their origin (anthropogenic or natural) will be vital for environmental monitoring and enforcement initiatives.

In addition to assessing the toxicity of soluble organic mixtures within bitumen-influenced waters, ECCC researchers have assessed the toxicity of environmental samples (sediments, snow melt, surface water, and groundwater) in controlled laboratory experiments. This current research stream is ongoing and will provide support for wild organism health assessments led by ECCC in the same locations (Parrott et al. 2018 forthcoming publication).

Development of Standards and Certified Reference Materials

In an effort to develop analytical standards for complex bitumen-derived soluble organic mixtures, ECCC in collaboration with the University of Waterloo developed a new extraction method in 2017 that isolates soluble organic compounds from the source materials relevant to the oil sands (Bauer et al. 2018a forthcoming publication). With this method, large quantities of naturally-derived mixtures will be collected by ECCC and used for the preparation of Certified Reference Materials. ECCC is currently making the reference materials from composite samples of an unprecedented 2017 industry-wide sampling of all active tailings ponds and from an Alberta provincial groundwater monitoring well.

In addition, no standards currently exist for acid-extractable organics, including naphthenic acids, which contribute to observed toxicity in bitumen-influenced waters. ECCC scientists, through JOSM, are leading an initiative to synthesize a previously identified individual naphthenic acid (Family A isomer), in order to be able to quantify acid-extractable organics in all bitumen-influenced waters. This work will be necessary in the development of CCME guidelines for the protection of aquatic life from naphthenic acids and for diagnostic purposes in tracking OSPW seepage. The final products of the Certified Reference Materials and the Family A naphthenic acid standard will be made available to all stakeholders through the National Research Council.

Ecological Effects of Contaminants

In 2011, the Governments of Canada and Alberta, through JOSM, designed a monitoring plan for surface water quality and quantity, air quality and biodiversity of the lower Athabasca River between Fort McMurray and its confluence with Lake Athabasca.

The three year monitoring plan (2012 to 2015) had a number of objectives:

- To support sound decision-making by governments as well as stakeholders;
- to ensure transparency through accessible, comparable and quality-assured data;
- to enhance science-based monitoring for improved characterization of the state of the environment and collect the information necessary to understand cumulative effects;
- to improve analysis of existing monitoring data to develop a better understanding of historical baselines and changes; and,

- to reflect the transboundary nature of the issue and promote collaboration with the Governments of Saskatchewan and the Northwest Territories.

Based on the results of monitoring, ECCC scientists have been assessing the health of wild fish and benthos living within the oil sands region and developing baselines for use in assessing change into the future. Where methodologically feasible, the data are being compared to historical fish and benthos collections. ECCC is in the process of finishing seven reports[30] along with a synthesis report interpreting all of the data collected during the first three years of JOSM. Changes in fish health, benthic communities, and contaminant levels have been documented in some tributaries in these JOSM reports. A summary of the baseline fish health and toxicology work for the oil sands program can be found in McMaster et al. (2017 in press).

Baseline data is being used by the JOSM Fish Program to develop tiers and triggers within the program to be used by JOSM management – or future Canada-Alberta agreement - when significant change in ecosystem health is detected.[31] The completion of "trigger values" will allow rapid and timely adjustments to monitoring, ensuring that ECCC and collaborative research groups are capable of detecting significant environmental effects outside normal variability in the oil sands region.

To date there have been no reports of OSPW-derived chemicals in surface waters, or of observed ecological effects in areas near tailings ponds.

4.3 Summary of Findings and their Impact on Enforcement

ECCC has taken appropriate governmental action (as per Article 5.1 of the NAAEC) by supporting the advancement of scientific knowledge and tools necessary to improve ECCC enforcement officers' ability to enforce ss. 36(3) of the Act. The scientific advancements and on-going work include the development and validation of an "analytical toolbox":

- to distinguish between natural and anthropogenic sources of deleterious substances[32]; and
- to identify substances unique to OSPW, alongside forensic tools, to support the ability to attribute the source of the deleterious substance and distinguish between individual tailings ponds.

[30] The seven reports are expected to be completed by December 2017 and cover the following areas of research: atmospheric deposition; water quality (tributaries); water quality (mainstem and extended geographic area); groundwater quality/quantity; water quality/quantity modelling; benthic invertebrates, and; fish health.

[31] Some sites are still in baseline data collection but those with baseline data complete have entered a 3-year cycle of data collection (once every three years) which is evaluated against the baseline for change.

[32] ECCC and academic scientists have indicated that OSPW-affected groundwater was likely reaching the Athabasca River at one location (Franck et al. 2014) and are in the process of publishing forthcoming manuscripts (Hewitt et al., 2018; Milestone et al., 2018; Bauer et al., 2018a; Bauer et al., 2018b; Frank et al. 2018; Houde et al. 2018; Parrott et al. 2018) which will present an improved "analytical toolbox" (a set of five methods to distinguish between natural and anthropogenic sources of deleterious substances).

The most recent scientific advances of ECCC scientists are in process of being reviewed through the usual independent peer-review validation for publication in scientific journals. Previous ECCC scientific findings are publicly available, and the most recent findings will be shared with enforcement officers to help inform appropriate future enforcement activities.

In addition to the above activities related to the effective enforcement of the Act, the department is also taking action to understand the impacts of bitumen-influenced waters on the ecosystem through JOSM. Besides the current knowledge and practice of measuring ecotoxocological effects, there remain some knowledge gaps to determine if seepage of OSPW, and specific industrial sources into surrounding groundwater, would influence toxicity and pose a risk to the receiving environment; or alternatively, whether migration of that groundwater into surface water could be expected to cause deleterious effects.

Additional ongoing research initiatives include:

- Pursuing identifying chemicals within bitumen-influenced groundwater with the greatest toxicity, as well as the organisms and bioassay endpoints that are most sensitive, and;
- Assessing changes in fish health and benthic community composition now that baseline information and tiers and triggers of change have been identified.

5. PROVINCIAL POLICIES AND REGULATIONS

The Government of Alberta's oil sands strategy, *Responsible* Act*ions: A Plan for Alberta's Oil Sands* (Annex 6)[33] commits to developing resources in an environmentally responsible way. The Government of Alberta uses all available regulatory tools to achieve desirable environmental outcomes and sustainable resource development including:

- effective laws and policies;
- timely stakeholder engagement;
- cooperative inter-governmental arrangements;
- rigorous environmental assessment processes;
- comprehensive project approvals;
- thorough environmental monitoring;
- innovative research and industrial practices; and
- risk-informed compliance assurance programs including inspections and enforcement when appropriate.

To ensure environmental impacts are either avoided or mitigated, the Government of Alberta continuously reviews comprehensive laws, policies, programs and cooperative monitoring efforts.

5.1 Provincial Policies for Environmental Management of the Oil Sands

Alberta's oil sands strategy, *Responsible* Act*ions: A Plan for Alberta's Oil Sands* includes specific goals for the environmental management of tailings ponds, including the development of a Land-use Framework regional plan and the reduction of oil sands projects' environmental footprint.

Alberta's Land-Use Framework Regional plans consider cumulative effects in the management of development and growth in Alberta. Environmental management frameworks established under the *Lower Athabasca Regional Plan* (LARP)[34] are a key tool to implementing this approach in the oil sands region. Environmental management frameworks have regulatory backing under the *Alberta Land Stewardship Act*, and assist in managing long-term, regional scale cumulative effects by the setting of thresholds, triggers, limits and/or targets. The following frameworks have been developed and implemented in the Lower Athabasca Region and are summarized below:

i. Surface Water Quality Management Framework;
ii. Surface Water Quantity Framework;

[33] Available at: http://energy.alberta.ca/pdf/OSSgoaResponsibleActions_web.pdf
[34] Available at: https://landuse.alberta.ca/LandUse%20Documents/Lower%20Athabasca%20Regional%20Plan%202012-2022%20Approved%202012-08.pdf

iii. Groundwater Management Framework; and,
iv. Tailings Management Framework.

i. Surface Water Quality Management Framework:

The LARP *Surface Water Quality Management Framework* (2012)[35] protects existing and future water uses of the Lower Athabasca River. Water quality limits are based on provincial guidelines, and triggers are based on statistical deviation from historical ambient concentrations. If monitoring indicates a limit or trigger has been exceeded, there will be a regional management response. This framework describes the types of management actions that may be required, such as the preparation of management plans (individual or collective), further monitoring, and the use of best management practices.

ii. Surface Water Quantity Framework:

The LARP *Surface Water Quantity Management Framework* (2015)[36] articulates the Government's commitment to ensuring that river flow conditions, oil sands sector water withdrawals, and ecosystem conditions within the lower Athabasca River downstream of the Grand Rapids are monitored, evaluated, and reported to the public. The Government of Alberta continues to work with oil sands water license holders to promote compliance with requirements established through the framework.

The objective of this framework is to manage cumulative water withdrawals to support both human and ecosystem needs, while balancing social, environmental, and economic interests. To enable this, the framework identifies indicators for both the condition of the water resource (natural variations in water flow) and pressures on the water resource (use).

The framework sets weekly management triggers and water withdrawal limits that are used to enable proactive management of water use from the Athabasca River during the oil sands mining process. These are enacted through the establishment of water management agreements amongst oil sands mine operators. Weekly water withdrawal limits reflect seasonal variability and become more restrictive as flows in the river decrease. In addition, adaptive management triggers indicate when river flow and water use conditions are close to, or outside of, the range of predicted future conditions used in modelling and development of the weekly management triggers and withdrawal limits. Adaptive management triggers are used to direct a management response process, led by the Alberta Ministry of Environment and Parks.

iii. Groundwater Management Framework:

[35] Available at: http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-SurfaceWaterFramework-Aug2012.pdf

The LARP *Groundwater Management Framework* (2012)[37] protects groundwater from contamination by maintaining conditions within the range of natural variability, and ensuring the integrity of regional groundwater flows. This framework builds on existing site specific groundwater monitoring approval conditions and incorporates a cumulative effects approach to resource management. It includes a set of indicators based on the nature of the aquifers and potential impacts of both mining and in situ operations. The framework includes interim triggers and provides for the establishment of final triggers and limits. The information required to finalize triggers and limits is being collected through regional groundwater monitoring networks. Like the Surface Water Quality Management Framework, the groundwater framework describes the types of management actions that may be required, such as the preparation of mitigation plans (individual or collective), further monitoring, and the use of best management practices.

iv. Tailings Management Framework:

The LARP *Tailings Management Framework* (2015) [38] for the Mineable Athabasca Oil Sands (TMF) provides direction to manage fluid tailings volumes during and after mine operation in order to manage and decrease liability and environmental risk resulting from the accumulation of fluid tailings. Based on the 2016 tailings reports received by the Alberta Energy Regulator (AER) the total fluid tailings volume by the end of 2016 was 1.2 billion cubic metres.

The TMF seeks to balance increasing fluid tailings volumes with associated risks to environmental protection. Lowering fluid tailings volumes and/or minimizing accumulation can reduce the risk of seepage, reduce risks to wildlife that may come into contact with tailings ponds, contribute to dam safety, and lower the environmental footprint of tailings. Under the TMF, there is also an opportunity to improve the quality of tailings, which would have additional environmental benefits.

The objective of the TMF is to minimize fluid tailings accumulation by ensuring that fluid tailings are treated by oil sands operators and reclaimed by them progressively during the life of a project. The Government of Alberta expects that all fluid tailings associated with a project are ready-to-reclaim within 10 years of the end of mine life. The objective will be achieved while balancing environmental, social, and economic needs. The goals of the TMF are to:

- establish fluid tailings volume triggers and limits to manage accumulation;
- manage long-term liability and environmental risk of untreated fluid tailings, especially tailings ponds;
- clarify Government of Alberta expectations;
- encourage technological innovation to meet environmental challenges;
- support proactive management strategies;

[37] Available at: http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-GroundwaterFramework-Aug2012.pdf
[38] Available at: http://aep.alberta.ca/land/cumulative-effects/regional-planning/documents/LARP-TailingsMgtAthabascaOilsands-Mar2015.pdf

- enhance transparency and assurance through regular monitoring, evaluation, and reporting on fluid tailings volume accumulation and treatment; and
- establish direction for managing legacy tailings.

5.2 Provincial Regulations

The Government of Alberta has a suite of regulatory requirements in place to manage tailings ponds and issues associated with any potential seepage. The regulatory requirements are designed to ensure that provincial regulators can hold mineable oil sands operators accountable for tailings ponds management. The Government of Alberta policy is to contain and reuse oil sands process-affected water (including water that has contacted bitumen).

Most regulatory aspects of oil sands development are implemented by the Alberta Energy Regulator (AER). The AER ensures that oil sands are developed within government policy and in an environmentally responsible way.

The AER has comprehensive rules, regulations, and requirements in place for the safe design, construction, and operation of tailings ponds. Companies allowed to develop Alberta's oil and gas resources must follow all rules, regulations, and requirements, including under the *Environmental Protection and Enhancement* Act (EPEA),[39] the *Water* Act,[40] and the *Public Lands* Act.[41]

Proposed oil sands mines are subject to rigorous environmental assessment processes with extensive hydrological studies, in order to identify potential negative effects and ensure these are managed and mitigated by the operators of oil sands facilities. Furthermore, an approval is required under the *Oil Sands Conservation Regulation*[42] for companies' storage of oil sands tailings.

The EPEA *Conservation and Reclamation Regulation*[43] requires that mine operators reclaim disturbed lands including tailings ponds to an equivalent land capability in accordance to EPEA approval conditions and any other applicable standards, criteria and guidelines.

Directive 085: Fluid Tailings Management for Oil Sands Mining Projects[44] establishes application and reporting requirements that operators must meet in order to demonstrate that all fluid tailings will be ready to reclaim within 10 years of the end of mine life, as outlined in the *Tailings Management Framework*. Oil sands operators are required to submit a tailings management plan application to the AER to demonstrate how each project will comply with the *Tailings Management Framework* and *Directive 085*.

[39] Available at: http://www.qp.alberta.ca/documents/Acts/E12.pdf
[40] Available at: http://www.qp.alberta.ca/documents/Acts/w03.pdf
[41] Available at: http://www.qp.alberta.ca/documents/Acts/P40.pdf
[42] Available at: http://www.qp.alberta.ca/documents/Regs/1988_076.pdf
[43] Available at: http://www.qp.alberta.ca/documents/Regs/1993_115.pdf
[44] Available at: https://www.aer.ca/documents/directives/Directive085.pdf

The approvals process under the Water Act establishes requirements for monthly reporting of the volume of OSPW collected by the recapture systems. It also includes conditions to maximize reuse of OSPW. Oil sands operators must make efforts to manage seepage through containment systems (the extent of which is dependent on the local geology). [45]

Approvals issued under EPEA, set out requirements for groundwater recapture systems, monitoring of groundwater quality, evaluation and reporting. All oil sands tailings ponds are constructed with systems and facilities to recapture seepage from the ponds. Intercepted seepage is pumped back into the pond or to a water treatment plant. Furthermore, groundwater monitoring wells are installed down gradient of interception systems to monitor conditions. This monitoring is required under the EPEA approval. Technical staff of the AER review submitted reports to assess whether any samples contain substances that exceed provincial and national water quality standards,[46] or that could lead to potential adverse effects on the environment.

All newer tailings ponds (1994 to present) naturally seep from their dykes, but all the seepage is intercepted and pumped back to the recycle water system. These newer ponds are often equipped with interception walls or barrier walls – in-ground obstacles made of special clay that stops seepage from progressing further to other water bodies. If it is necessary to enhance the interception system, additional pumps are installed downhill of tailings ponds to deplete ground waters and prevent seepage progression. Everything is closely monitored using numerous groundwater wells. New monitoring and interception wells are installed whenever necessary as mandated by the AER.

[45] The geological setting for tailings ponds varies significantly. Impermeable geological strata under some ponds results in minimal seepage, while more permeable underlying sediments may result in higher rates of seepage. Interception trenches are built down gradient from tailings ponds to collect seepage before it can reach any surface water bodies.

[46] These standards are: CCME Canadian Environmental Quality Guidelines (national) and Alberta Surface Waters and Alberta Tier 1/2 Soil and Groundwater Remediation Guidelines (provincial).

6. CONCLUSIONS

It is the Government of Canada's position that ECCC's actions in the oil sands region, including its record of inspection and its continuing scientific research demonstrate Canada's effective enforcement of the pollution prevention provisions of the *Fisheries Act*.

6.1 Canada exercises its enforcement functions in a manner consistent with its domestic laws

Between 2009 and 2014, ECCC proactively inspected oil sands tailings ponds operating in the Northeast Alberta region with respect to the pollution prevention provisions of the Act. Following the inspections, enforcement officers, in consultation with ECCC scientists, determined that they did not have reasonable grounds to believe that there were violations of the pollution prevention provisions of the Act. The enforcement officers' activities and decisions were guided by the Compliance and Enforcement Policy, as well as the scientific knowledge and tools available to determine, to the relevant legal standard, the source of deleterious substances. Given the information available to enforcement officers, Canada exercised its enforcement functions in a manner consistent with its domestic laws.

6.2 Canada exercises its discretion and uses priority setting processes in a reasonable manner

In 2014, following the significant allocation of resources to inspections at oil sands tailings ponds in Alberta, the Prairie and Northern Region realigned its priorities to focus on other national and regional issues where resources would have a greater positive impact on the environment. This decision to reallocate resources was taken in the context of an annual national enforcement planning process, and the development of a national enforcement plan. This was a reasonable exercise of discretion in respect of compliance matters, and a bona fide decision to allocate resources to enforcement in respect of other environmental matters determined to have higher priorities.

6.3 Canada's enforcement actions are effective

ECCC assumes its role of enforcing the pollution prevention provisions of the Act seriously and responds in a timely fashion when spills, leakages or deposits are reported. Canada maintains that its decisions and actions, including ECCC's record of inspections and its continuing scientific research, demonstrate Canada is effectively enforcing its environmental laws in a manner consistent with the NAAEC.

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