FOCUSED STUDY ACTIVITY WORK PLAN

General Information

Work Plan Unique Identifier:	*B-IC-9-1718*	
Focused Study Activity Title:	**Wildlife Contaminants and Toxicology: Investigation of Pathophysiological Effects**	
Focused Study Category:	Investigation of Cause or Potential Ecological Impact	
Geographic Location (*choose from drop-down menu. If Project Location is in more than one area choose from second drop-down***)**	Lower Athabasca River	More than 2 Locations (Described in Detailed Monitoring Plan)
Monitoring Site(s) Coordinates *(latitude and longitude)*	See appended list below	
Project Leader:	Bruce Pauli	
Organization and contact information:	**Environment and Climate Change Canada (ECCC)** Ecotoxicology and Wildlife Health Division Science and Technology Branch Environment and Climate Change Canada National Wildlife Research Centre 1125 Colonel By Drive, Ottawa, ON N1H 0H3 Tel: 613 998-6690; email: bruce.pauli@canada.ca	
Date Study initiated:	2011	
Monitoring Category:	Biotic Response Monitoring	
Strategic Objective of Focused Study: *(From OSM long-term plan; choose from drop-down menu)*	Objective B2: Investigate the causal mechanisms of a known important biotic relationship in relation to Oil Sands Developments Monitoring physiological, endocrinological and population structuring as a function of contaminant burdens and anthropogenic disturbances in wildlife inhabiting the Lower Athabasca Region, the Peace River District and north to the Peace-Athabasca Delta has revealed detectable levels of contaminants including heavy metals, PAHs and pesticides (rodenticides) in higher trophic biota. In addition, assessment of individual and population-level health endpoints in these animals has revealed certain changes that could be linked to contaminant exposure. These responses could either be due to the unique features of the landscape they inhabit (i.e. the McMurray Geological Formation), the prevalence of contaminant-releasing natural events (e.g. forest fires) or a result of increased contaminant input to the environment from both local and long distance sources. This focused study/investigation of cause will integrate with other components of the oil sands monitoring program to	

	gain a more holistic picture of these cause-effect relationships in order to provide data useful to regulators, policy makers and industry groups wishing to increase their environmental performance. An assessment of contaminant burdens and effects in mammalian and avian wildlife in the region, using novel tools (such as compound-specific isotope analyses of contaminant extracts) to identify contaminant sources, and biological data from both individual- and population-level endpoints will allow for a stronger, more relevant determination of the impacts of oil sands operations on free-ranging resident wildlife species. A major component of this focused study/investigation of cause project is to conduct integrated evaluations of food web structure and food web contamination as influenced by exposures to complex mixtures of different environmental pollutants. Exposure to persistent organic pollutants, or bioaccumulative heavy metals, could have negative consequences on food web structure, leading to population level impacts in top trophic predators. The overall strategic objective of this focused study/investigation of cause is to establish the monitoring of contaminant burdens and effects in bioindicator wildlife species (including, muskrat, mink, river otter and various waterfowl species). Relevant biomarker endpoints will be developed, and validated as part of a long-term monitoring strategy for the evaluation of potential environmental impacts of oil sands industrial activities.
Hypotheses: *(Briefly outline the specific hypotheses that your focused study is aiming to address)*	The work will test the hypotheses that 1) contaminant burdens in the tissues of bioindicator wildlife species collected near oil sands industrial operations are no different than burdens measured in animals that are collected from remote areas and sites of traditional importance to indigenous communities and local stakeholders, 2) oil sands industrial operations are not contributing to the increase in contaminant burdens in the tissues of these bioindicator species, and 3) contaminant burdens in the bioindicator wildlife species collected in the region are below currently accepted guidelines (when available) for the protection of wildlife consumers.
Deliverables: *What tangible goal (s) and/or product(s) will the monitoring produce and when?*	Tangible goals and products from this focused study/investigation of cause and the associated monitoring include the following: 1. Monitoring information on the burdens of contaminants in top trophic predators and prey species as part of a wider trophic level assessment of environmental contamination in the oil sands region, and whether these contaminants may be having ecological impacts (at either the individual or population-level), 2. Information on the source of the contaminants measured in the wildlife of the region and whether the source of those contaminants may be traced to oil sands industrial operations, 3. Through integration with other oil sands monitoring projects and focused studies/investigations of cause, the establishment of toxicological endpoints and other biomarkers of impaired

	ecosystem health from oil sands industrial operations by using established or developing new analyses and toxicity assessment endpoints based on physiological, endocrinological, immunological, morphological, and genomic parameters. 4. The establishment and validation of the monitoring protocols developed above as a long-term monitoring strategy for the assessment of potential environmental impacts of oil sands industrial operations. These tangible goals and products will be produced throughout the 3-year duration of the study, with product 4) being delivered by the end of the three year period.

Detailed Study Plan

(Please provide detailed information on the specifics of your focused study including – (**keywords, hypothesis and the assumptions and constraints behind your hypothesis**)

Provide a maximum of 10 key words that describe this project. Use commas to separate them:

Athabasca River, wildlife, bioindicator species, mammals, waterfowl, mercury, PAHs, oil sands, cumulative effects, ecosystem health

Describe how you will test your hypotheses:

Overview: A key aspect of how we will test our hypotheses is through enhanced cooperation with other researchers in the oil sands community, i.e. with other groups in ECCC (scientists from WSTD and ASTD), and with Alberta Environment and Parks, the Alberta Biodiversity Monitoring Institute, the Canadian Wildlife Service, Health Canada, Alberta Health and Wellness, and academia as well as other stakeholders such as local indigenous communities and traditional land users such as hunters and trappers (through the Alberta Trappers' Association). Our research and monitoring efforts will be stronger through the incorporation of indigenous and local ecological knowledge. We also note that during 2017/18, a crucial aspect of this workplan is ongoing communication with proposed study partners and collaborators as mentioned above to further develop and refine the longer term work plan and strategy. Our plan is to accomplish this through regular teleconferences (e.g. quarterly) with principal investigators and ECCC partners, and if possible, via workshops with project scientists. This is crucial for the development of recommendations for the most appropriate techniques and ecosystem components to include in a long-term monitoring program for the oil sands. With sufficient collaboration and integration with other areas of the oil sands monitoring program, and sufficient resources allocated to this project, we plan to test the hypotheses of this particular project through the following activities:

- Continue outreach to stakeholders and land-users as collaborators in this program and for program adaptation and the acquisition of biological samples,
- Continue targeted collection and analysis of tissues from hunter- and trapper-supplied waterfowl and mammals from areas of highest interest identified under JOSM,
- Continued collection of tissues and other samples from semi-aquatic furbearers (North American river

otters, mink and muskrat) for monitoring of contaminant burdens and toxicology in sentinel species,
- Continued collection of mammals (including rodents) to assess rodenticide burdens,
- Continued collaboration with Alberta Health for the provision of health assessments based on relevant data provided to them,
- Continued collaboration with the province of Alberta and industry to examine birds retrieved from tailing ponds to fingerprint a bitumen exposure signal (see next bullet) from contaminant burdens in target tissues,
- Investigate chemical fingerprinting and applications in longer-term monitoring programs of wildlife that come into contact with oil sands processed water and other industrial waste products using samples previously stored at the National Wildlife Specimen Bank (Ottawa, ON)
- To conduct a toxicity assessment associated with this, use chemical extracts from oiled birds in *in ovo* and *in vitro* toxicological assays to identify potentially sensitive molecular biomarkers of exposure to oil sands processed water, and to determine sub-lethal biological effects on migratory wildlife.

Background: Polycyclic aromatic hydrocarbons (PAHs) are a group of chemicals that are formed during the incomplete burning of coal, oil, and gas, during wildfires and residential wood burning, and from vehicle exhausts, asphalt roads, municipal and industrial waste incineration, or the burning of other organic substances. They represent a group of approximately 100 different chemical species; 32 of which have been designated as priority pollutants by the United States Environmental Protection Agency. PAHs are also listed under Schedule 1 of the Canadian Environmental Protection Act because of their high toxicity and the need to regulate their release to different environmental compartments. Recent studies have highlighted a substantial increase in PAHs (especially the more polar, alkylaromatic hydrocarbons and hetero-compounds) at lower trophic levels during the past 25 years. In fact, since 2000, PAHs now dominate the summed contaminant burdens in lower trophic biota in the Arctic. Because protecting the health of ecosystems is a major concern for Canadians and globally, the impacts of PAHs need to be carefully monitored and understood in a world that is reliant on energy produced from the burning of fossil fuels.

The oil sands' bitumen is heavily and severely biodegraded crude oil dominated by alkylaromatic hydrocarbons and hetero-compounds, some of which are likely oxidized, which increases their water solubility and potential for bioaccumulation and biomagnification. The process by which bitumen is upgraded to synthetic crude has involved the combustion of coke, which in turn produces fly ash and releases PAHs and heavy metals to the environment. Environment Canada's National Pollutant Release Inventory as well as a number of recent studies supports a general increase in heavy metal and PAH input to the air, water and sediment in the region. The toxicity of PAHs in the environment can also be increased by co-exposure to certain heavy metals such as arsenic. Concerns still exist over Sb, As, Cd, Cr, Cu, Pb, Ni, and Se concentrations in water, sediment and wildlife (and consumers of wildlife) living in oil sands-impacted areas.

Muskrats (*Ondatra zibethicus*) and waterfowl (e.g. green winged teal *Anas carolinensis*) are important subsistence species, and mink (*Neovison vison*) and river otter (*Lontra canadensis*) are top trophic level carnivores that prey on fish and readily bioaccumulate environmental pollutants. Collectively, they are considered sentinel species of aquatic ecosystem health. Using representative biota from different trophic levels, the proposed research will aim at assessing the PAH and metal profiles within different trophic levels with mink and otter as the apex predators. The goal is to monitor and quantify the extent to which polar PAHs and priority heavy metal pollutants (such as Hg and MeHg, Cd, As, Pb, etc) bioaccumulate and biomagnify in food chains of the boreal ecosystem, impacted by oil and gas industrial activities associated with oil sands mining.

There have been few studies on exposure of free-ranging terrestrial mammals to PAHs and heavy metals in areas impacted by oil and gas industrial activities and the ecological significance and the effects of this exposure are poorly understood, especially in long-lived species, where long-term survival and lifetime productivity may be adversely affected. Given the paucity of information on the levels and effects of PAHs on reproductive

success, immune functions and population level responses, further investigative studies in terrestrial apex predators are warranted.

The Athabasca River and the Peace–Athabasca Delta may be impacted by industrial development in the upstream region of the oil sands. Recent reports of aquatic contamination have raised concerns on the impacts of PAHs and heavy metals on wildlife. The proposed focused study/investigation of cause will rely on a mix of well-established and novel analytical techniques to answer the objectives set above. Isotopic ratios (of carbon) and signatures (of nitrogen) will be used in monitoring and identifying point source inputs and impacts on trophic structure. The relative contribution of PAHs and heavy metals to biota from oil sands mining and refining, from forest fires and from natural bitumen deposits will be evaluated with the use of compound specific isotopic analyses undertaken primarily through the coupling of capillary gas-chromatography or liquid chromatography systems to an isotope-ratio mass spectrometer (IRMS), or through the use of accelerated mass spectrometry (AMS). The use of AMS also allows for the determination of heavy metal isotopes, useful in source-apportionment studies.

The collection of carcasses through indigenous community-based monitoring programs, and commercial hunters and trappers will provide the project with tissue samples from muskrat, mink, otter and waterfowl species to undertake contaminant analyses. A non-invasive otter fecal sampling strategy at latrine sites in different watersheds will allow for a broader population-level impact assessment. Assessment of 2012-2015 FY JOSM data revealed that river otter populations responded to anthropogenic disturbances at oil- and gas-impacted sites. Semi-aquatic furbearers consistently had higher levels of PAHs and heavy metals near industrial disturbances. River otter fecal samples revealed higher cortisol and thyroid hormone levels, while animals at low impact sites demonstrated greater reproductive success and corresponding progesterone levels. Using a novel (now published) fecal swabbing protocol and a specific DNA lysis buffer solution, we were able to increase PCR amplification rates to 76% (i.e. the number of “usable” samples for laboratory analysis). This increased success rate renders our approach a more cost-efficient and reliable method for generating population level response data for various monitoring programs, such as the one proposed for this Focus Study/Investigation of Cause.

Population genetics provide important endpoints when evaluating the impacts of anthropogenic disturbances on resident wildlife. Fecal samples not only provide valuable DNA for assessment of population level impacts, but can also provide information on physiological responses to environmental stressors such as fecal hormone levels, intestinal parasite loads, and contaminant burdens as we have demonstrated in 2012-2015.

Monitoring residual contaminant levels in biota is important, but also important is the understanding of how these contaminants are impacting ecosystem health. An examination of how high trophic terrestrial vertebrates respond to these contaminants, and how their health is affected as a result, will not only provide the scientific community with better context when monitoring contaminant burdens in wildlife, but will also help tailor cost-effective policies and risk mitigation measures. Contaminant levels need to be interpreted in light of their impacts on ecosystem health, and this represents a major knowledge gap when considering risks of exposure to heavy metals and PAHs, particularly the alkylated PAH species with a high potential of bioaccumulation and biomagnification in apex predators.

Little is known of furbearer population ecology in northern boreal regions. Previous findings suggest that the consequent effects of chronic contaminant exposure at the population level may be mitigated through behavioral decisions of individuals. Some studies concluded that populations of apex predators such as otters can persist in and around locally contaminated sites if relatively less disturbed and contaminated habitats remain in the vicinity of the affected areas. The testing of these conclusions in the Athabasca oil sands region will greatly improve the value of these sensitive monitoring species and interpretation of wildlife contaminants data.

Highlights of Field Experiments and Activities proposed for 2017-2020:

- Collect waterfowl and aquatic furbearers (muskrat, mink, river otter) and numerous other species including fish and aquatic invertebrates occupying different trophic positions in the boreal food web for analysis and monitoring of oil sands-related contaminants of concern. Collections will be completed in collaboration with key stakeholders (i.e. indigenous community-based monitoring programs and traditional land users such as hunters and trappers through the Alberta Trappers' Association).

- Hunter/Trapper-harvested wildlife samples will be obtained in the oil sands and at "reference" sites from registered fur management areas outlined in the map provided below. Emphasis will be placed on collections within the surface mineable region, the Peace-Athabasca Delta, and reference locations.

- Additional wildlife collection sites will be aligned geographically with other wildlife toxicology focused studies/investigations of cause (e.g. gull and tern, amphibian and wetland health monitoring sites) to inform the extent to which oil sands contaminants of concern are impacting boreal ecosystems and wetland health; these sites include comparable sites that are near oil sands operations – both surface mining and *in situ* – and sites farther afield but still on deposit, sites off deposit, and sites in downstream "reference" areas such as the Peace-Athabasca Delta.

- Monitoring of river otter latrine sites in different watersheds for population-level impact assessment.

- Complete assays suing *in ovo* and *in vitro* biochemical techniques to assess potential ecological and toxicological implications of waterfowl coming into non-lethal contact with oil sands tailings ponds. Tailings bird samples were obtained via provincial (Alberta) and industry contacts and are currently in storage at the National Wildlife Specimen Bank (Ottawa, ON).

Sites:

Note that candidate sites will be selected from the table below, but are not all candidate sites are on this list. Further, sites may be added or dropped from the program based on data analyses and stakeholder feedback.

RFMA (Site)	POINT_X	POINT_Y	Species Sampled	Samples Collected	Years Collected
137	-114.25466314600	57.16978925740	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
174	-113.94032989500	56.97430006430	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
282	-110.34477031000	56.60730541990	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
308	-110.07993895300	53.86770747570	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
314	-114.58647808800	55.38020692260	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
325	-113.41764726500	57.64857816120	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
357	-115.69925320500	54.35243306870	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
581	-110.15953729700	56.42199966930	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
883	-116.02580565600	52.92174540540	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019

1234	-112.10662550100	55.64019453190	Muskrat, fisher, otter, mink	Whole Carcass, feces + DNA	2017-2019
1303	-111.89483509400	55.88059115970	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1326	-110.90779663100	55.71272392050	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1364	-112.01830281100	56.62916540930	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1407	-116.22257612900	54.03245184850	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1474	-111.30899411500	55.84301444120	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1521	-114.53986235400	54.54744508300	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1535	-115.33339314400	51.82948601670	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1576	-112.19024647500	56.42856497620	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1595	-110.68821064300	55.60455434720	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1623	-114.72779151700	54.74314010170	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1738	-114.51933402900	54.71985368820	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1790	-111.58930025600	56.83730527050	Muskrat, fisher, otter, mink	Whole Carcass, feces + DNA	2017-2019
1804	-116.52262964900	53.98301465630	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1865	-112.72973589400	56.35609643860	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1963	-113.80384126600	54.63223338190	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2007	-111.75932193600	55.08874964570	Muskrat, fisher, otter, mink, waterfowl	Whole Carcass	2017-2019
2090	-110.66359731600	56.45879741980	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2108	-119.62365181000	53.89001464740	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2116	-112.53861801500	55.51369813960	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2248	-112.66335705900	55.61795793190	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2307	-115.30009089000	54.42779422240	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2317	-111.63794559500	56.58962718070	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2322	-110.82969739000	55.51619011020	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2386	-112.40044802200	55.52844415810	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2410	-114.39743428500	54.79548505650	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019

2718	-111.29174615400	57.09707035120	Muskrat, fisher, otter, mink, waterfowl	Whole Carcass	2017-2019
2820	-111.09625892100	56.12724053360	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2828	-115.03676309400	55.60632918990	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2843	-118.95218347500	54.33451195980	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2867	-112.13991766100	56.01685898480	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2911	-112.87692570700	56.76937733410	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2929	-113.30477340500	57.90446887380	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2945	-111.73609537100	56.05191566770	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2508	-117.0380206	56.7482581	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1530	-116.5647161	56.02517701	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2478	-117.813409	56.98823851	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2490	-119.3200201	57.90433848	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1731	-117.8971827	56.90394839	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1397	-118.0953455	57.0403538	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
1350	-116.65131	56.4626244	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2387	-116.6529677	54.83319564	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
2615	-118.0990577	56.68301722	Muskrat, fisher, otter, mink	Whole Carcass	2017-2019
PAD	-111.741932	58.550194	Muskrat, fisher, otter, mink, waterfowl	Whole Carcass	2017-2019

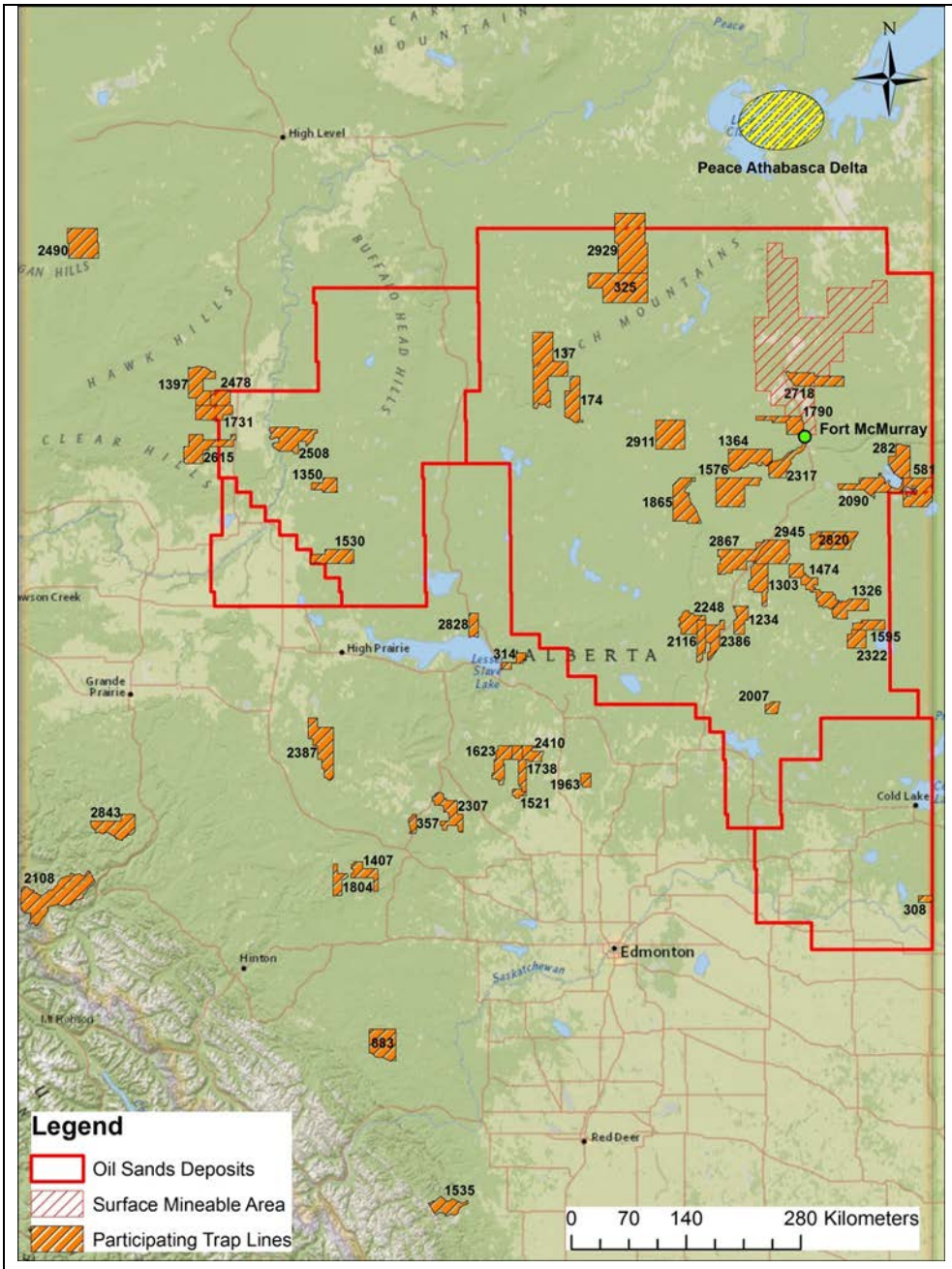

Fig 1 – Map of possible sampling locations

Assumptions and Constraints behind the hypotheses and the testing methods:

(1) Compiled data support a conclusion that contaminant burdens in the tissues of bioindicator wildlife species are highly variable and no oil sands "signal" can be detected in the contaminants data,

(2) Contaminant inputs to the region come from various sources leading to the potential to confound the data,

(3) The compiled data do not provide a clear link to the oil sands industrial operations as being the source of the increased contaminant burdens seen.

(4) Contamination and contaminant effects on both the food webs and the apex predators being studied in this program should be detectable and effects measurable using a suite of diagnostic, bioassessment indicators or biomarkers

References:

N/A

Data Management

If this work generates data please summarize your project-level data management plan.

Deliverables	**Timeframe**
Data Collection Period: *Field work*	Start : 2017-04-03 End: 2018-03-30
Data Analysis Period: *Laboratory analysis and QA/QC of data*	Start : 2017-09-11 End: 2018-03-30
Data Release Date: *Metadata and data consistent, complete and meet basic standard format for publication in Open Data; on or linked to JOSM portal*	2018-11-01
Project-level Data Management Plan	This project is linked to the Wildlife Contaminants and Toxicology Biotic Response Synthesis Project. This means that data collected during this focused study/investigation of cause will be submitted to and incorporated into the on-going Oil Sands Wildlife Contaminants and Toxicology Program database being established by that project. From there the data can be assessed by the Synthesis Project activities, and can also be made available to the ECCC Open data Catalogue, the ECCC Oil Sands Portal and the GoC Open Data Catalogue.

Reporting and Publications

Provide information on the anticipated reports / publications. (Insert additional rows if needed)

Expected Subject/Titles of Publications or Reports	Short Description of Publication or Report	Expected Year of Publication
Numerous publications in the international peer-reviewed literature		

Technical / Professional Roles and Responsibilities

Identify members of the monitoring team/organization, their roles and responsibilities. Identify monitoring organization leads if different from overall monitoring activity lead. (Insert additional rows if needed)

Role	Responsibilities	Resource Name/Organization
Philippe Thomas Co-Project Lead/PI	Design of focus study, field work, analysis of data, writing and interpretation of focus study	ECCC
Lukas Mundy Co-Project Lead/PI	Design of focus study, analysis of data, writing and interpretation of focus study	ECCC
Organics Chemist	Laboratory analyses and organic contaminants analytical support	ECCC
Laboratory Technologist Science Team Support	Processing of samples and laboratory analyses	ECCC
Laboratory Technologist Science Team Support	Processing of samples and laboratory analyses	ECCC

Deliverables (Year 1) If your Focus Study is longer than 1 year then complete **Appendix C** for multi-year deliverables breakdown

Provide a summary of tangible quarterly deliverables. Identify major project areas (deliverables) and results that can be identified as a tangible goal. This could include: field work, lab work/ analysis, evaluation, data, reports, publications, SOPs etc. Do not define process as your Deliverable e.g. 'fly to Ft. McMurray to conduct fieldwork' or 'seek Director approval for report'.

Deliverable(s) (please provide enough information to support status reporting)
Q1 – April to June 2017
Equipment maintenance, contract preparation, materials acquisition, planning, sample preparation
Q2 – July to September 2017
Equipment maintenance, contract preparation, materials acquisition, planning, field sampling, sample preparation
Q3 – October to December 2017
Sample preparation and analysis, data acquisition **Data Product: Progress reporting**
Q4 – January to March 2018
Sample preparation and analysis, data acquisition and data reporting
Data Product: Progress reporting

Detailed Financial Breakdown – Year 1 of 3 (2017-2020)

Also complete **Appendix B** for the multi-year financial breakdown

Budget requirements – List areas that require budget expenditures: (ADD OR DELETE BUDGET CATEGORIES AS REQUIRED)	**OS Funding**	**External Funding (*outside JOSM*)**
O&M - Operations and Maintenance:		
Helicopter Costs	**$0**	**$**
Field Costs (includes agreements with Indigenous Peoples groups to collect samples)	**$60,000**	**$**
Fleet Use	**$0**	
Data Management	**$0**	**$**
Internal Lab Analysis	**$0**	**$**
Material and supplies – shipping	**$11,225**	
Consumable Materials & Supplies	**$13,450**	**$**
Sub-Total	**$84,675**	**$**
O&M - Travel		
Field Work	**$7,800**	**$**
Conferences (*identify conference*)	**$**	**$**
Meeting (*identify meeting*) *For two scientists to attend the Oil Sands Science Symposium and the Oil Sands Integrated Workplanning meetings*	**$**	**$**
Sub-Total	**$7,800**	**$**
O&M - External Contracts :		
External Lab Analyses (*river otter population genetics*)	**$23,000**	
External Lab Analyses (*organic contaminants analyses*)	**$63,119**	**$36,600**
External Contract (*river otter latrine site monitoring*)	**$21,250**	
External Contract (*analyses of river otter fecal samples*)	**$23,200**	
External Contract (*investigation of chemical fingerprinting in collected birds*)	**$11,800**	
Sub-Total	**$142,369**	**$**
Salaries:		

Budget requirements – List areas that require budget expenditures: (ADD OR DELETE BUDGET CATEGORIES AS REQUIRED)	OS Funding	External Funding (*outside JOSM*)
Principal Investigators	**$0**	**$**
Technical / Professional Assistants (Senior Organics Chemist, Organics analyst, Metals analyst)	**$259,156**[1]	**$**
Sub-Total	**$259,156**[1]	**$**
Total Salaries[1]	**$259,156**	**$**
Total O&M	**$234,844**	**$**
2017-2018 GRAND TOTAL	**$494,000***	**$**

[1]Includes associated EBP, Accommodations, PWGSC Accommodations, and SCC costs
*Grand Total including EBP, Accommodations, PWGSC Accommodations, and SCC costs

Appendix A - Approvals

Project Submitted by:		
Name:		
Organization:	Signature:	Date:

Project Approved by:		
Dr. Monique Dubé (AEP)		**Dr. Kevin Cash (ECCC)**
Signature 		Signature 
Date		Date

APPENDIX B – Detailed Multi-year Financial Breakdown (Complete the following detailed financial breakdown; add or delete categories as required)

Budget requirements	Year 1 (2017- 2018)		Year 2 (2018- 2019)		Year 3 (2019- 2020)	
	Cash	In-kind	Cash	In-kind	Cash	In-kind
1) Salaries and benefits						
a) Investigators						
b) Technical/professional assistants						
c) Field Staff						
d) WLSD Laboratory Services Unit	$259,156		$259,156		$259,156	
2) Operations and maintenance						
a) Facilities						
b) Equipment						
c) Lab analysis						
d) Data management						
e) Field work (includes CBMP collaborations)	$60,000		$60,000		$60,000	
f) Helicopter Cost						
g) Shipping	$11,225		$11,225		$11,225	
h) Fleet Use						
3) Consumable Materials and supplies						
a) Jars, dissection tools, blades, etc.	$13,450		$13,450		$13,450	
4) Travel						
a) Conferences and meetings						

b) Field work	$7,800		$7,800		$7,800	
c) Project-related travel						
5) Dissemination & Engagement						
a) Publications/Reports						
b) Translation (if required)						
c) Communications						
d) Stakeholder Engagement						
e) Indigenous Peoples Engagement						
6) External Contracts						
a) Lab analyses – river otter population genetics	$23,000		$23,000		$23,000	
b) Lab analyses – organics contaminants	$63,119		$63,119		$63,119	
c) River otter latrine site monitoring	$21,250		$21,250		$21,250	
d) Analyses of river otter fecal samples	$23,200		$23,200		$23,200	
e) Investigations of chemical fingerprinting using oiled birds	$11,800		$11,800		$11,800	
Grand Total[1]	$494,000		$494,000		$494,000	

[1]Grand Total including EBP, Accommodations, PWGSC Accommodations, and SCC costs determined from Budget Calculations spreadsheet

APPENDIX C –Years 2 and 3 Deliverables (Complete the following detailed breakdown. Provide a summary of tangible quarterly deliverables and your anticipated expenditures. Identify major project areas (deliverables) and results that can be identified as a tangible goal.)

Year 2 (2018- 2019)
Deliverable(s) (please provide enough information to support status reporting)
Q1 – April to June 2018
Equipment maintenance, contract preparation, materials acquisition, planning, sample preparation
Q2 – July to September 2018
Equipment maintenance, contract preparation, materials acquisition, planning, field sampling, sample preparation
Q3 – October to December 2018
Sample preparation and analysis, data acquisition Data Product: Progress reporting
Q4 – January to March 2019
Sample preparation and analysis, data acquisition and data reporting
Data Product: Progress Reporting for year 1 and 2

Year 3 (2019- 2020)
Deliverable(s) (please provide enough information to support status reporting)
Q1 – April to June 2019
Equipment maintenance, contract preparation, materials acquisition, planning, sample preparation
Q2 – July to September 2019
Equipment maintenance, contract preparation, materials acquisition, planning, field sampling, sample preparation
Q3 – October to December 2019
Sample preparation and analysis, data acquisition **Data Product: Progress reporting**
Q4 – January to March 2020
Sample preparation and analysis, data acquisition and data reporting