

# 2018-19 Work Plan Template

All fields with an \* are mandatory

Project Description Summary			Co-Chair Decision
Date *	Project/Work Plan Identifier (if applicable)	Program Type and Strategic Alignment *	<p><b>* Decision Pool B: Workplan approved with contingency</b>  <b>* Approved at \$89,518 with contingency</b>                      * The project lead and key project members are to meet with the Oil Sands Monitoring Program leadership as coordinated by the OSM Secretariat to discuss this project specifically how this project links to oil sands stressors.                      * If funding is granted, it will be a requirement of funding that key members of the project team participate in a Water Monitoring Integration Workshop to be informed by the Oil Sands Monitoring Secretariat.                      * Funding expectations: as a minimum an annual progress report is required by February 28, 2019. All publications or products resulting from this work requires acknowledgement of funding from the Oil Sands Monitoring Program and are to be provided to the Oil Sands Monitoring Secretariat for tracking and any programmatic communications purposes. Work funded through the Oil Sands Program will be available for public dissemination.</p>
6/15/2018	B-IC-1-1819	OSM - Focus Study	
Program Category *	Status *	Dept. ID	
Biodiversity, Land, Ecosystem Health Sciences	Existing Project		
Project Leadership / Contact information			
Project Title *	Key Words (max 10) *		
Monitoring Benthic-Macro Invertebrates: Investigation of Cause of Nutrients Signatures in the Athabasca River	Athabasca River, benthic macroinvertebrates, bitumen, dragonfly, in situ studies, metabolomics, municipal wastewater, NMR, Odonata, oil sands		
Surname *	Given Name *	Title *	
Culp	Joseph	Section Head	
Organization *	Department	Division	
ECCC			
Branch *	Section/Unit (if applicable)	Phone *	
WSTD		5064717727	
Email *	Mailing Address	City	
<a href="mailto:joseph.culp@canada.ca">joseph.culp@canada.ca</a>	Wilfrid Laurier University, 75 University Ave. West	Waterloo, ON	
Postal Code	EMSD Executive Owner (If Applicable)		
N2L3C5			
Project Information			
Project Objective(s) (Bullet Form) *	This focus study will evaluate the cumulative effects of oil sands activities and municipal sewage discharge on benthic macroinvertebrates in the Athabasca River using in situ monitoring methods and the cutting edge biochemical analyses of NMR-(Nuclear Magnetic Resonance)-based metabolomics.		
Plain Language Overview (100 words) *	Assessment of 2012-2015 FY JOSM data revealed that benthic macroinvertebrate assemblages showed a similar longitudinal pattern among all years. Reaches least disturbed by human activity (i.e., M0, M1 and M2) were separated from sites (M3, M3B, M4, M6, M7 and M7C) exposed to municipal sewage effluent (MSE) and oil sands development (M3B, M4, M6, M7 and M7C). These results suggest that benthic macroinvertebrate communities between M2 and M8 exhibited early-warning signals of environmental stress (e.g., mild nutrient enrichment and/or contaminant exposure). The cause of the potential contaminant-nutrient signal shown by the benthic macroinvertebrate assemblage will be investigated through a focused study in the central Oil Sands area. Specifically, the work will examine the association of the benthic community with the nutrient-contaminant signal using a combination of kick-net samples of macroinvertebrates collected from field studies, the reciprocal transplant of dragonflies in rock basket cages from reference to exposed sites and a cutting-edge Nuclear magnetic resonance based (NMR) metabolomics analysis. The aim is to develop an understanding of the cumulative effects resulting from multiple stressors.		
Project Duration *	Project Original Start Date *	Estimated Completion Date *	
Multi-Year	4/1/2017	3/31/2020	
Specify Objectives This Project Will Address in 2018/2019. *	Field studies over three years will compare benthic structural composition and functional health in six distinct areas of the mainstem Lower Athabasca River: 1) reference reach outside OS geology; 2) reference reach outside OS geology, but exposed to municipal sewage; 3) reference reach inside OS geology; 4) near field reach within OS geology exposed to municipal sewage, but out of OS development; 5) near field reach within central OS development; and 6) far-field recovery reach downstream of OS development.		
Specify Objectives This Project Will Address Beyond 2018/19 (if multi-year). *	Continuation of above		
List Key Questions/Hypotheses Related to Each Objective Stated Above. *	The field studies will test the hypotheses that no differences in: 1) benthic macroinvertebrate assemblages or 2) metabolite levels exist between dragonfly nymphs among the study reaches along the mainstem Lower Athabasca River.		

Main Assumptions, Constraints, Dependencies. *	<p>(1) Nutrient inputs from Ft. McMurray and Oil Sands Developments will likely affect biological processes in the river and have the potential to confound the effects of OS stressors including contaminants;</p> <p>(2) Contaminant inputs to the mainstem arise from several possible pathways (including atmospheric transport, tributary inflows, groundwater flux, etc.). These contaminant inputs likely act as stressors that modify biological composition of benthic food webs; and</p> <p>(3) Nutrient and contaminant effects on benthic food webs should be detectable through a suite of diagnostic, bioassessment indicators.</p>	
Partner Categories (select all that apply) * A partner is an individual, group, agency, community etc. that is an active participant in the project and in achieving the project deliverables.	knowledge System *	Location (select all that apply) *
<input checked="" type="checkbox"/> Federal Government <input type="checkbox"/> Another AEP Division <input type="checkbox"/> Another GoA Department <input type="checkbox"/> University/Academic Institution <input type="checkbox"/> Solely delivered by GoA <input type="checkbox"/> Citizen Science <input type="checkbox"/> Indigenous Community or Organization <input type="checkbox"/> ENGO <input type="checkbox"/> Other	Classical Science	<input checked="" type="checkbox"/> Office or Laboratory <input type="checkbox"/> Sub-regional <input type="checkbox"/> Transboundary (provincial/territorial) <input type="checkbox"/> Lower Peace Region <input type="checkbox"/> Upper Peace Region <input type="checkbox"/> North Saskatchewan Region <input type="checkbox"/> Red Deer Region <input checked="" type="checkbox"/> Lower Athabasca Region <input checked="" type="checkbox"/> Upper Athabasca Region
<b>AEP ONLY: Strategic Alignment to EMSD Outcomes</b>		
<b>AEP ONLY: Strategic Alignment to EMSD Science Plan, select 1-2 areas that apply (if Applicable)</b> Choose one Choose one		
<b>AEP ONLY: Strategic Alignment to AEP Departmental Outcomes</b>		
<b>AEP ONLY: Environmental and Ecosystem Health and Integrity</b>	<b>AEP ONLY: Sustainable Economic Diversity</b>	<b>AEP ONLY: Social Well-Being</b>
Choose one	Choose one	Choose one
<b>AEP ONLY: Protected Public Health and Safety from Environmental</b>		
Choose one		
<b>AEP ONLY: IMAG/IMSC Information Needs, Please Specify Which Need(s) is Being Addressed. File location M:\EMSD\Common\Portfolio Mgmt System Shared Docs</b>		
<b>AEP ONLY: How This Project Will Address Each Strategic Theme Selected Above.</b>		
<b>Project Methodology</b>		
List the Key Project Phases and Provide Bullets for Each Major Task Under Each Project Phase. *	<b>Phase 1:</b> Transfer experiments using dragonfly nymphs to monitor for early warning signals of environmental stress. <b>Phase 2:</b> NMR-based metabolomics used to determine if novel metabolites are present after contaminant exposure.	
Describe How Changes in Environmental Condition Will Be Assessed. *	This focus study will evaluate the confounding effects of oil sands activities and municipal sewage discharge on benthic macroinvertebrates in the Athabasca River	
Are There Benchmarks (e.g., objectives, tiers, triggers, limits, reference conditions, thresholds, etc.) Being Used to Assess Changes in Environmental Condition? If So, Please Describe, If Not, State "NONE". *	Reference conditions outside the area of oil sands geology and experimental controls are established	
Provide a Brief Description of the Methods By Project Phase. *	<b>Phase 1:</b> Transfer experiments using dragonfly nymphs, a predacious benthic macroinvertebrate, will be undertaken to determine if nymphs moved to reaches of nutrient-contaminant exposure have different metabolic signatures than those in reference reaches. Differences in metabolic signatures can be indicative of exposure to environmental stressors. To establish the experiment, dragonfly nymphs will be collected at the reference site outside OS geology. Nymphs will be placed into 8 replicate rock basket cages (2 nymphs/cage) per reach. Sixteen nymphs will remain at the reference site outside OS geology, while the remaining individuals will be moved to the other five reaches along the Lower Athabasca River. <b>Phase 2:</b> NMR-based metabolomics has the advantages of being a fast, non-selective technique with minimal sample preparation. Metabolite levels can be quantified to identify whether metabolites in exposed organisms have increased or decreased compared with unexposed organisms. The NMR spectra can be evaluated to determine if novel metabolites are present after contaminant exposure. Metabolites that increase or decrease in concentration after contaminant exposure (or new metabolites) can reveal responses induced by exposure and may have the potential to serve as diagnostic indicators of environmental contamination.	
List the Key Indicators Measured. *	Benthic macroinvertebrate assemblage	

Describe Sample Handling Procedures, If Not Applicable, State N/A. *	Sample handling procedures are provided in standard operating procedure documents available internally and by request.	
List SOPs that Will Be Used, If Not Applicable, State N/A. *	Standard operating procedure documents available internally and by request. Further Standards and Protocols are available on the EMSD website: <a href="http://environmentalmonitoring.alberta.ca/resources/standards-and-protocols/">http://environmentalmonitoring.alberta.ca/resources/standards-and-protocols/</a>	
Describe the QA/QC Plan, If Not Applicable, State N/A. *	Quality assurance and quality control needs to be conducted in accordance with the SOPs for data QA/QC developed by ECCC, available internally and by request.	
Describe How Indigenous Communities are Involved in the Project Design, Data Collection, and Analysis (Knowledge Co-creation) and How is their Consent Sought. If Not Applicable, State N/A. *	N/A	
<b>Components Delivered by Others</b>		
List by Project or Project Phase Each Component That Will Be Delivered by An External Party (including analytical laboratories) and Name the Party. State None if Not Required. *	None	
Will These Components be Delivered Under Grant or Contract or Both? Please Describe and Name the Associate Work Plan/Grant/Contract for These Services if Not Included Within This Work Plan. *	Not Required	
<b>Monitoring Site Locations and Coordinates (for all sites, please add them to the Monitoring Site Location tab - a separate excel sheet)</b>		
Attach Map of Locations. Distinguish Indicators by Station if Necessary. Distinguish Sampling Frequency by Station if Necessary.	An interactive map of all sampling locations is available on the ECCC OSM portal at: <a href="http://environmental-maps.canada.ca/osm/App/Index?GOCTemplateCulture=en-CA">http://environmental-maps.canada.ca/osm/App/Index?GOCTemplateCulture=en-CA</a>	
<b>Project Schedule</b>		
<b>FOR OIL SANDS MONITORING PROJECTS ONLY:</b> A coordinated field monitoring schedule for the OSM Program is required. Please complete the attached document named "OSM Program Field Monitoring Schedule" in addition to this work plan. Fill as much as you can recognizing that scheduling changes will occur and the scheduling document will be updated regularly. Please note the scheduling document will be shared with stakeholders.	See Attached	
<b>FOR OIL SANDS MONITORING PROJECTS ONLY:</b> Have You Coordinated With Other Project Leads On Field Logistics? If So, Please Specify. *	N/A	
<b>Other</b>		
Additional Details.		
Will Capacity Building and Training be a Component of the Project and If So, Explain How. If Not, State N/A. *	Training of students is included as an aspect of this study	
Environmental Impact and Considerations.	N/A	
<b>Data Management and Digital Assets</b>		
Will Data be Produced as a Result Of This Project? *	Type of Quantitative Data Variables	Frequency Of Collection
Yes	Discrete	Other
Data Collection Period: Start Date - End Date	Timeline For Upload Period: Start Date - End Date	
2018-07-01 to 2018-09-01	01-11-2018 - 31-03-2020	

Is There a Data Sharing Agreement? (Yes or No).	No	
Will the Data Include Traditional Knowledge as Defined by and Provided by an Indigenous Representative, Community or Organization (Yes / No).	No	
Platform/Location of Data Storage.	Final data will be submitted to the appropriate data portal (primarily the Oil Sands Monitoring Data Portal). Analysis of the data will be made available through publications in peer-reviewed literature.	
<b>Project Deliverables</b>		
<b>Proposed 2018-19 Deliverable Type (for each deliverable outline document, presentation, meeting, etc.)</b>		
<input checked="" type="checkbox"/> Peer-reviewed Journal Publication	<input type="checkbox"/> Peer-reviewed Conference Proceeding	<input type="checkbox"/> Non-peer reviewed Conference Proceeding
Q1 - Deliverable, Comments	Q1 - Deliverable, Comments	Q1 - Deliverable, Comments
Q2 - Deliverable, Comments	Q2 - Deliverable, Comments	Q2 - Deliverable, Comments
Q3 - Deliverable, Comments	Q3 - Deliverable, Comments	Q3 - Deliverable, Comments
Q4 - Deliverable, Comments	Q4 - Deliverable, Comments	Q4 - Deliverable, Comments
1 publication "Benthic Macroinvertebrate Assemblage Response to Municipal Sewage, Naturally- Occurring Bitumen and Oil Sands Development: A Field Experiment" expected in 2019		
<input type="checkbox"/> Conference Presentation(s)	<input type="checkbox"/> Stakeholder Presentation	<input type="checkbox"/> Key Engagement/Participation Meeting *
Q1 - Deliverable, Comments	Q1 - Deliverable, Comments	Q1 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
Q2 - Deliverable, Comments	Q2 - Deliverable, Comments	Q2 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
Q3 - Deliverable, Comments	Q3 - Deliverable, Comments	Q3 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
Q4 - Deliverable, Comments	Q4 - Deliverable, Comments	Q4 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
<b>Proposed Deliverables After 2018/2019 for the project funds received in 2018/2019</b>		

<input checked="" type="checkbox"/> Peer-reviewed Journal Publication	<input type="checkbox"/> Peer-reviewed Conference Proceeding	<input type="checkbox"/> Non-peer reviewed Conference Proceeding
Q1 - Deliverable, Comments	Q1 - Deliverable, Comments	Q1 - Deliverable, Comments
1 publication: "NMR-Based Metabolomics of a Predatory Benthic Macroinvertebrate Exposed to Naturally-Occurring Bitumen, Municipal Sewage and Oil Sands Activities" expected in 2021		
Q2 - Deliverable, Comments	Q2 - Deliverable, Comments	Q2 - Deliverable, Comments
Q3 - Deliverable, Comments	Q3 - Deliverable, Comments	Q3 - Deliverable, Comments
Q4 - Deliverable, Comments	Q4 - Deliverable, Comments	Q4 - Deliverable, Comments
<input type="checkbox"/> Conference Presentation(s)	<input type="checkbox"/> Stakeholder Presentation	<input type="checkbox"/> Key Engagement/Participation Meeting *
Q1 - Deliverable, Comments	Q1 - Deliverable, Comments	Q1 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
Q2 - Deliverable, Comments	Q2 - Deliverable, Comments	Q2 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
Q3 - Deliverable, Comments	Q3 - Deliverable, Comments	Q3 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
Q4 - Deliverable, Comments	Q4 - Deliverable, Comments	Q4 - Deliverable, Comments
Choose one	Choose one	Name of Meeting, Year, Location, Dates, Participant Groups and Number of Participants.
<b>All Completed Products</b>		
if a multi-year project, specify all completed products to date (consistent format for the fields below). Add rows as required.		
<b>Journal Paper</b>		
Required Format: Author (follow APA citation format), Year, Title, Journal, Volume, Page Numbers, Open or Closed and Document Location		
Example: Jacoby, W. G. (1994). Public Attitudes Toward Government Spending. American Journal of Political Science, 38(2), 336-361.		
Fearon, J. D., & Laitin, D. D. (2003). Ethnicity, insurgency, and Civil War. American Political Science Review, 97(01), 75. doi: 10.1017/S0003055403000534		
1)		
2)		
3)		
4)		
5)		
<b>Technical Report</b>		
Required Format: Author, Year, Title, Publisher Location, Name of Publisher, Publisher, Document Location		
Example: Author, F.M. (Publication Year). Title of Report (Report No. XXX). Publisher City, State: Publisher		
1)		
2)		
3)		

4)
5)
<b>Book Chapter</b>
<b>Required Format: Author, Year, Title of Paper, Editors, Title of Book, Page Numbers, Location of Publisher, Name of Publisher, Document Location</b>
Example: Hemingway, E. (1999). The Killers. In J. Updike & K. Kenison (Eds.), The Best American Short Stories of the Century (pp.78-80). Boston, MA: Houghton Mifflin)
1)
2)
3)
4)
5)
<b>Conference Proceeding</b>
<b>Required Format: Author, Year, Title of Paper, Editors, Title of Proceedings, Name of Conference Location of Conference, Publisher Location, Name of</b>
Example: Author of Paper, A., & Author of Paper, B. (Year, Month date). Title of Paper. In A. Editor, B. Editor, & C. Editor. Title of Published Proceedings. Paper Presented at Title of Conference: Subtitle of Conference, Location (inclusive page numbers). Place of Publication: Publisher.)
1)
2)
3)
4)
5)
<b>Public Dissemination Document</b>
<b>Required Format: Author, Year, Title, Journal / Report, Volume, Publisher, Page Number, Number of Pages, Document Location</b>
1)
2)
3)
4)
5)
<b>AEP ONLY: EMSD Strategic and Operational Publication</b>
<b>Required Format: Author, Year, Title, Publisher Location, Name of Publisher, Publisher, Document Location</b>
1)
2)
3)
4)
5)
<b>Other Documents</b>
<b>Detailed Information of Other Documents</b>
1)
2)
3)
4)
5)
<b>Conference Presentation</b>
<b>Required Format: Presenter, Date, Location, Title, Platform or Poster, Conference Name</b>
1)
2)
3)
4)
5)
<b>Stakeholder Presentation</b>
<b>Required Format: Presenter, Date, Location, Title, Platform or Poster, Name of Meeting</b>
1)
2)
3)
4)
5)
<b>Key Engagement/Participation Meeting</b>
<b>Required Format: Meeting Host, Date, Location</b>
1)
2)
3)
4)

5)

Human Resources / Staffing Plan (roles and responsibilities)		
Name & Role	Organization	Responsibilities
Dr. Robert Brua Co-Project Lead	ECCC	Design of focus study, field work, analysis of data, writing and interpretation of focus study
Dr. Joseph Culp Co-Project Lead	ECCC	Design of focus study, analysis of data, writing and interpretation of focus study
Science Team Support	ECCC	Design of focus study, writing and interpretation of focus study
Field and Lab Technical Lead and Support	ECCC	Design of focus study, field work, lab analyses of focus study

AEP ONLY: Additional Human Resources Required from EMSD			
Name & Role	Branch - Section	Estimated time (% of annual FTE)	Salary Estimate Range

Financial Details and Budget Request		
Source of Funding Requested Year 1 - 2018/19		
	AEP ONLY: EMSD	OSM
Salaries and Benefits		40156
Operations and Maintenance		49363
Consumable materials and supplies		
Conferences and meetings travel		
Field work travel		
Project-related travel		
Engagement		
Reporting		
External Contracts		
Organization/Vendor/Suppliers		
Overhead		
Grants		
Capital		
Total budget request for the year	0	89518
Total budget approved		

Approved at:  
89,518

Source of Funding Requested Year 2 - 2019/20		
	AEP ONLY: EMSD	OSM
Salaries and Benefits		
Operations and Maintenance		
Consumable materials and supplies		
Conferences and meetings travel		
Field work travel		
Project-related travel		
Engagement		
Reporting		
External Contracts		
Organization/Vendor/Suppliers		
Overhead		
Grants		
Capital		
Total budget request for the year	0	0
Total budget approved		

Source of Funding Requested Year 3 - 2020/21		
	AEP ONLY: EMSD	OSM
Salaries and Benefits		
Operations and Maintenance		
Consumable materials and supplies		
Conferences and meetings travel		
Field work travel		
Project-related travel		
Engagement		
Reporting		
External Contracts		
Organization/Vendor/Suppliers		
Overhead		
Grants		
Capital		
Total budget request for the year	0	0
Total budget approved		

Source of Funding Requested Year 4 - 2021/22		
	AEP ONLY: EMSD	OSM
Salaries and Benefits		
Operations and Maintenance		
Consumable materials and supplies		
Conferences and meetings travel		
Field work travel		
Project-related travel		
Engagement		
Reporting		
External Contracts		
Organization/Vendor/Suppliers		
Overhead		

Grants		
Capital		
Total budget request for the year	0	0
Total budget approved		
<b>Budget Request for the Entire Project</b>	0	89,518
<b>Project Approval(s)</b>		
<b>Proposal Submitted by</b>		
Surname	Given Name	Organization
Culp	Joseph	ECCC
Signature	Date	
<b>Proposal for OSM Reviewed by</b>		
EMSD Executive Director	Signature	Date
AEP Administrator/Coordinator - Review	Signature	Date
ECCC Administrator/Coordinator - Review	Signature	Date
<b>OSM Project Approved by</b>		
AEP Co-Lead for OSM	Signature	Date
ECCC Co-Lead for OSM	Signature	Date
<b>AEP ONLY: Proposal for EMSD Reviewed by</b>		
EMSD Director	Signature	Date
<b>AEP ONLY: EMSD Project Approved by</b>		
EMSD Executive Director	Signature	Date
EMSD Chief Scientist	Signature	Date
<b>OSM / EMSD Project Has Not Been Approved</b>		
Project Status	Date Notified	Date Required
The project is conditionally approved. The following conditions are required before approval is granted.		
List the Condition(s)		
Condition(s) Addressed / Approval Granted		
Choose one		
<b>OSM / EMSD Approval Post Removal of Condition(s)</b>		
Name & Title	Signature	Date



**Add All Monitoring Site Locations and Coordinates (insert more rows if required)**

Site Identifier *	Location Name *	Long/Lat *
Site 1		
M0		-113.3006/54.7265
Site 2		
M1A		-111.65542/56.6219
Site 3		
M2A		-111.4623/56.6927
Site 4		
M3		-111.4042/56.7938
Site 5		
M4		-111.5649/57.098
Site 6		
M9		-111.3681/58.0666