


5- YEAR LONG-TERM MONITORING OR OPERATIONAL ACTIVITY WORK PLAN

Changes to this Work Plan are only accepted via an Approved Addendum.

General Information	
Monitoring Category: <i>(From OSM long-term plan; choose from drop-down menu)</i>	Watershed Monitoring
Strategic Monitoring Objective: <i>(From OSM long-term plan; choose from drop-down menu)</i>	Objective: Detect and report concentration levels and trends of chemical substances of concern in the aquatic environment that are likely to cause adverse human and/or environmental health effects.
Work Plan Unique Identifier:	GW-LTM-S-3-1718
Monitoring Activity Title:	Groundwater Monitoring
Geographic Location <i>(choose from drop-down menu, if Project Location is in more than one area choose from second drop-down)</i>	Athabasca Oil Sands Region
Monitoring Site(s) Coordinates <i>(latitude and longitude)</i>	<p>For 2017-2018, up to 67 groundwater wells in the Cold Lake Beaver River (CLBR), South Athabasca Oil Sands (SAOS), North Athabasca Oil Sands (SAOS) (potential wells listed in the attached Excel file) will be sampled. The exact number of wells sampled will depend upon adequate internal human resources within Alberta Environment and Parks (AEP) and, for some wells, securing access to private land (Statoil, Canadian Natural Resources, Devon, private citizens). Methods for selecting these sites are described in the following sections and in the “metadata” tab in the attached Excel file.</p> <p> SamplingLocations_2 0172018_GWMonitori</p>
Monitoring Organization and Responsible Manager:	Alberta Environment and Parks Cynthia McClain
Date Monitoring initiated:	2017
Specific Monitoring Objective: <i>(State the monitoring objective addressed through this monitoring)</i>	<p>Overall objective: to assess spatial and temporal trends in groundwater quantity and quality, as well as potential causes and consequences of these observations.</p> <p>To achieve this objective the following factors were included in the study design:</p> <p>-study area includes North Athabasca Oil Sands (NAOS), South Athabasca Oil Sands (SAOS) and Cold Lake Beaver River (CLBR); see monitoring locations above</p>

	<p>-groundwater wells will be selected based on the stratified monitoring network developed by Guy Bayegnak and contractors prior to 2017 [1-5]. The stratified monitoring network consists of three categories of wells, based on their proximity to development or sensitive receptors. Specifically: (i) investigative wells (in areas hydraulically down-gradient of development activity or planned development), (ii) surveillance wells (in areas up-gradient of sensitive receptors, based on groundwater flow patterns), and (iii) strategic monitoring (wells at a far distance from operations). Investigative wells were considered to be the highest priority, whereas surveillance or strategic wells may not be selected for sampling every year.</p> <p>-groundwater levels, field water quality parameters and samples for laboratory chemical analysis are taken from multiple aquifers/formations, at varying depths.</p> <p>-data collected in each well with data loggers is downloaded at each site visit</p> <p>-data evaluation and reporting may include investigation of anomalies, comparison to historical conditions, and gap identification</p> <p>-shape files (e.g., maps of well locations) and digital data files (e.g., databases) produced will be in a format usable for future analysis</p>
<p>Deliverables (Annual): <i>What Data Reports will be produced and when?</i></p>	<p>The final deliverable at the end of the fiscal year will be:</p> <p>Field sampling events completed (April-November)</p> <p>Lab analysis performed (April-December)</p> <p>Lab results archived in AEP’s database system (January-March)</p>

Appendix 1 – Annual Monitoring Schedule

(Please provide detailed information on the specifics of your monitoring schedule including – **locations, schedule, methods, SOPs, QA/QC data release, references**)

<p>Sampling Locations/Sites</p>	<p>Sampling Schedule (timing/frequency)</p>	<p>Compounds to be Analyzed</p>	<p>SOPs to be Consulted <i>(hyperlinks accepted)</i></p>	<p>QA/QC Complete & Data Release Date</p>
<p>Up to 67 wells in CLBR, SAOS, NAOS (specific locations to be selected from wells listed an excel attachment in general information section above)</p>	<p>Up to 2 times per year between April and November</p>	<p>Parameters to be analyzed may include: pH, ORP, conductivity, TDS, major ions, routine potability, dissolved organic carbon, ammonia, naphthenic acids (FTIR and orbital trap), dissolved metals, BTEX, PHC F1 &F2, PAHs, phenols, turbidity, 14C, 3H, 18O, 2H, dissolved As</p>	<p>EMSD groundwater sampling SOP’s are currently under review.</p>	<p>March</p>

References:

- [1] Jean Birks, John Manchuck, Yi Yi, Michael Moncur, Emily Taylor, Don Jones, Clayton Deutsch, John Gibson, James Brydie, and Ernie Perkins. Oil sands groundwater monitoring program review: Phase ii, 2016.
- [2] Matrix Solution Inc. 2014 program report south athabasca oil sands area regional groundwater monitoring network, 2015.
- [3] Matrix Solution Inc. 2014 regional groundwater monitoring and wells rehabilitation program north athabasca oil sands area regional groundwater monitoring network, 2015.
- [4] Guy Bayegnak. 2016-2017 Groundwater monitoring program for the lower Athabasca region: Data quality objectives, groundwater management framework, 2016.
- [5] Guy Bayegnak. An evaluation of Cold Lake Beaver River Area Historical Data: Well selection for an integrated groundwater monitoring program in the Oil Sands, Groundwater monitoring, 2017.

Appendix 2 – Detailed Multi-Year Financial Breakdown: if changes are to be made then an Addendum must be Complete and Approved.

(Complete the following detailed financial breakdown; add or delete categories as required)

Budget requirements	Year 1 (201X- 201Y)		Year 2 (201X- 201Y)		Year 3 (201X- 201Y)		Year 4 (201X- 201Y)		Year 5 (201X- 201Y)	
	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
1) Salaries and benefits										
a) Appendix 3 - Totals	183,500		183,500		183,500		183,500		183,500	
2) Operations and Maintenance										
a) Vehicles and Transportation	15,000		15,000		15,000		15,000		15,000	
b) Helicopter	100,000		100,000		100,000		100,000		100,000	
c) Lab analysis	122,000		122,000		122,000		122,000		122,000	
d) Data management										
e) Field work (equipment and maintenance)	130,000		130,000		130,000		130,000		130,000	
3) Consumable Materials and supplies										
a) Field and lab supplies, fuel, shipping	9,000		9,000		9,000		9,000		9,000	
4) Travel										
a) Conferences and meetings	5,500		5,500		5,500		5,500		5,500	
b) Field work - travel	35,000		35,000		35,000		35,000		35,000	

Oil Sands Monitoring (OSM)

August 4, 2017

c) Project-related travel										
5) External Contracts										
a)										
Grand Total	600,000		600,000		600,000		600,000		600,000	

Appendix 3 – Staffing Plan

(Complete the following detailed staffing plan; add or delete categories as required)

Responsible Role	Year 1 – Budget Allocation		Year 2 – Budget Allocation		Year 3 – Budget Allocation		Year 4 – Budget Allocation		Year 5 – Budget Allocation	
	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding	OSM Funding	External Funding
Science Expertise	30,000		30,000		30,000		30,000		30,000	
Technical/Field Staff	153,500		153,500		153,500		153,500		153,500	
Administrative and Program Coordination										
Grand Total <i>(inserted into Appendix 2)</i>	\$183,500	\$	\$183,500	\$	\$183,500	\$	\$183,500	\$	\$183,500	\$

Appendix 4 - Approvals

Project Submitted by:		
Name: Dr. Cynthia McClain		
Organization: Alberta Environment and Parks	Signature:	Date:
Project Approved by:		
Dr. Monique Dubé (AEP)		Dr. Kevin Cash (ECCC)
Signature		Signature
		
Date		Date