

2018-19 Work Plan Template

All fields with an * are mandatory

| Project Description Summary | | | Co-Chair Decision (March 8, 2018) |
|--|--|---|--|
| Date * | Project/Work Plan Identifier (if applicable) | Program Type and Strategic Alignment * | <p>* Decision Pool A: Workplan approved but at a reduced funding level.</p> <p>* Approved at \$1,412,000</p> <p>* Deliverables for this level of funding are to be clarified and an amended workplan submitted before March 23, 2018 to the Oil Sands Monitoring Secretariat. Funding levels were reduced as this review was funded last year (17/18).</p> <p>* It is a requirement of funding that a status report from the review conducted in 2017/18 be submitted to the Oil Sands Monitoring Program Secretariat by April 30, 2018.</p> <p>* It is a requirement of funding that key members of the project team participate in a Deposition Monitoring Integration Workshop to be informed by the Oil Sands Monitoring Secretariat.</p> <p>* The design review report will be published, as a minimum, under the Oil Sands Monitoring Technical Report Series as informed by the Oil Sands Monitoring Program Secretariat</p> <p>*Funding beyond 2018/19 is dependent upon the findings of the Deposition Monitoring Integration Review and Workshop.</p> <p>*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> |
| 21/12/2017 | B-PD-12-1819 | OSM - Long Term Monitoring | |
| Program Category * | Status * | Dept. ID | |
| Air/Atmosphere/Climate | Existing Project | 1104 - 03421 | |
| Project Leadership / Contact information | | | |
| Project Title * | Key Words (max 10) * | | |
| Forest Health Monitoring Program | Atmospheric Deposition, Forest Health, Effects Monitoring, Air Quality, Jack Pine | | |
| Surname * | Given Name * | Title * | |
| Farr | Dan | Director, Biodiversity and Ecosystem Health Sciences | |
| Organization * | Department | Division | |
| Alberta Provincial | Alberta Environment and Parks | Environmental Monitoring and Science | |
| Branch * | Section/Unit (if applicable) | Phone * | |
| Science | Airshed Sciences | 7802297251 | |
| Email * | Mailing Address | City | |
| Dan.Farr@gov.ab.ca | 9888 Jasper Avenue | Edmonton | |
| Postal Code | EMSD Executive Owner (if Applicable) | | |
| T5J 5C6 | Bill Donahue | | |
| Project Information | | | |
| Project Objective(s) (Bullet Form) * | The primary objective of the forest health monitoring program is to implement an approach for establishing/determining cause-effect relationships between air pollutants and forest ecosystem health in the oil sands region. | | |
| Plain Language Overview (100 words) * | The Wood Buffalo Environmental Association operates a long-term forest health monitoring (FHM) network to detect any impacts of air contaminants on forest health. WBEA monitors jack pine forest sites that are sensitive to acid deposition, and assesses whether there are changes to soils, vegetation, or the trees. This information informs stakeholders on broader effects, as well as environmental management and other monitoring programs, especially water, wildlife and wetland monitoring. In addition to the intensive sampling component, the FHM approach includes an annual tree condition assessment at each monitoring site. These assessments are currently conducted by Alberta Agriculture and Forestry personnel. | | |
| Project Duration * | Project Original Start Date * | Estimated Completion Date * | |
| Multi-Year | 1998 | Intensive monitoring every six years. Tree condition assessment conducted annually. This is a long-term | |
| Specify Objectives This Project Will Address in 2018/2019. * | The specific objectives of this program in 2018-19 are to: (1) Complete the program design review for the Forest Health Monitoring Program; (2) Conduct the 6-year intensive forest health sampling campaign; and (3) Continue the ongoing assessment of tree health at FHM sites. | | |
| Specify Objectives This Project Will Address Beyond 2018/19 (if multi-year). * | The focus of 2019-20 will be the reporting of results and outcomes from the intensive sample campaign carried out in 2018-19. | | |
| List Key Questions/Hypotheses Related to Each Objective Stated Above. * | Objective 1: The following questions are being addressed in the design review: 1. Has the program objective as stated in 1996 (and as broadened in 2013) been achieved? 2. If yes in part, which part(s)? What are the successes, what is the status of forest health? 3. If not in whole or part, why not? What limitations are inherent in the program that make achievement of the objective difficult? 4. What recommendations for program improvement are supported by the data and analyses? Should some program components be dropped or modified? Are there any substantive gaps? Objective 2: The following hypotheses are being addressed in the six-year intensive sampling campaign: 1. Changes in the chemical properties of the soil occur first. These changes may be in the availability of nutrients, the mobilization of aluminum, or both; 2. Changes in vegetation in response to altered soil chemistry. This is expected to first be observed in altered distribution of nutrients and other elements in plant tissues, and later in changes in tree growth; and 3. Altered species composition, as changes in soil chemistry and effects on vegetative growth create new competitive advantages and disadvantages among species at the site. Objective 3: The tree condition assessment determines if tree health is changing over time due to aging of the stand and/or changes due to exposure to air emissions. These assessments are also used in the interpretation of 6-year intensive sampling campaign data and to fill in the gaps between each sampling cycle. | | |

| | | | |
|--|--|---|--|
| Main Assumptions, Constraints, Dependencies. * | | <p>- Contracts with airshed organizations can be executed by April 1, 2018</p> <p>- WBEA will have the expertise, resources and ability to deliver the monitoring program given the challenges of site access at remote locations and the potential impacts of wildfire activity</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 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 checked="" type="checkbox"/> Other | | Classical Science | <input 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 type="checkbox"/> Upper Athabasca Region |
| AEP ONLY: Strategic Alignment to EMSD Outcomes | | | |
| AEP ONLY: Strategic Alignment to EMSD Science Plan, select 1-2 areas that apply (If Applicable) | | | |
| Ecosystems and Predicting Change Choose one | | | |
| AEP ONLY: Strategic Alignment to AEP Departmental Outcomes | | | |
| AEP ONLY: Environmental and Ecosystem Health and Integrity | | AEP ONLY: Sustainable Economic Diversity | AEP ONLY: Social Well-Being |
| Air/Climate Change Choose one | | Choose one | Choose one |
| AEP ONLY: Protected Public Health and Safety from Environmental Choose one | | | |
| AEP ONLY: IMAG/IMSC Information Needs, Please Specify Which Need(s) is Being Addressed. File location M:\EMSD\Common\Portfolio Mgmt System Shared Docs | | <p>•Info Need #12 (Ecosystem Services), Info Need #30 (Environmental Health Risk in Alberta) and Info Need #37 (Long-term Soil Acidification Monitoring Program): The program determines the impact of atmospheric deposition on forest ecosystems using selected ecological indicators in the Athabasca oil sands region of the province.</p> | |
| AEP ONLY: How This Project Will Address Each Strategic Theme Selected Above. | | <p>•Environmental and Ecosystem Health and Integrity - Using atmospheric deposition data collected in the Athabasca oil sands region (see A-LTM-S-3-1819 and A-LTM-S-4-1819) forest ecosystem health/function is monitored on a six-year cycle. This is part of the TEEM (Terrestrial Environmental Effects Monitoring) program which has the purpose of determining if oil sands activities are having an impact on terrestrial ecosystems.</p> | |
| Project Methodology | | | |
| List the Key Project Phases and Provide Bullets for Each Major Task Under Each Project Phase. * | | <p>The Forest Health Monitoring Program includes:</p> <p>(1) A program design review;</p> <p>(2) A six-year intensive sampling campaign; and</p> <p>(3) An annual tree condition assessment.</p> | |
| Describe How Changes in Environmental Condition Will Be Assessed. * | | <p>The WBEA Forest Health Monitoring (FHM) network is comprised of ecologically analogous jack pine sites located close-to and distant-from regional emission sources. Changes of environmental condition are assessed through chemical analysis of soils, foliage, and lichen tissue; morphological measurements of jack pine trees; and plant community composition assessments. Measurement and sampling of jack pine monitoring sites occurs on 6-year cycle. Forest condition assessments are conducted annually to identify and record the overall disease, insect and mechanical damage within a plot, recent tree mortality and the cause of death, the general forest health in proximity to the monitoring plots, and changes in forest health since the last assessment.</p> | |
| 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". * | | <p>The Acid Deposition Management Framework (Cumulative Environmental Management Association, 2004), a regional environmental management instrument implemented by Alberta Environment, includes the BC:Al ratio and Base Saturation percentage (BS%) as indicators of soil acidification. Reductions in values below thresholds in the ADMF will initiate management responses, thus monitoring for BC:Al ratio and BS% in the region is required. The analysis of BC:Al and BS% in sensitive soils in the Forest Health Monitoring Program fulfills this requirement.</p> | |

| | |
|---|---|
| Provide a Brief Description of the Methods By Project Phase. * | <p>Program design review: Consolidation, interpretation and publication in peer reviewed journal(s) of the extensive forest health dataset acquired by the Forest Health Monitoring Program, through the Terrestrial Environmental Effects Monitoring Program and Committee, since 1996, has not been achieved. The program design will include assembling and interpreting all of the data collected for the TEEM program and producing manuscripts (see line 123). Through this process, recommendations for improvements to the FHM program will be produced.</p> <p>Six-year Intensive Sampling Campaign: The Forest Health Monitoring Program integrates soil, vegetation, air quality and deposition monitoring at locations selected for their sensitivity and/or exposure to anthropogenic air emissions. Monitoring of these selected locations occurs on a 6-year sampling schedule. The monitoring program will include monitoring of chemical properties of soil and vegetation (nutrients in plant tissue, tree growth). Data collected during the intensive sampling campaign is required to determine if a change in soil and/or vegetation indicators of ecosystem health have occurred, or are occurring, in the Forest Health Monitoring network due to deposition and, if so, to quantitatively assess the significance of those changes.</p> <p>Tree Condition Assessment: A visual assessment and scoring of tree condition and tree health is conducted on an annual basis and have been conducted since the inception of the Forest Health Monitoring Program. These data provide a record of the changes in tree health over time, reflecting health changes due to aging of the stand and/or health changes due to exposure to air emissions. These assessments are also used in the interpretation of 6-year intensive sampling campaign data and to fill in the gaps between each sampling cycle.</p> |
| List the Key Indicators Measured. * | <p>Soil indicators: pH, soluble ions, cation exchange capacity (CEC), exchangeable cations, base cation to aluminum ratio (BC:Al ratio), base saturation (BS%), total C, total N and soluble N, total S and inorganic S, soluble P, carbon to nitrogen ratio (C:N ratio).</p> <p>Vegetation indicators: plant community composition, branch internode length, defoliation estimates, foliar chemical analysis (S, N, elemental concentrations), and foliar epicuticular wax structure and composition.</p> <p>Lichen indicators: epiphytic lichen community composition, lichen chemical analysis (S, N, elemental concentrations)</p> |
| Describe Sample Handling Procedures, if Not Applicable, State N/A. * | Sample handling procedures are provided in standard operating procedure documents located at http://www.wbea.org/resources/quality-assurance/standard-operating-procedures and http://wbea.org/download/foster_k_2015_wbea_forest_health_procedure_manual_2015.pdf |
| List SOPs that Will Be Used, if Not Applicable, State N/A.* | Sample handling procedures are provided in standard operating procedure documents located at http://www.wbea.org/resources/quality-assurance/standard-operating-procedures . SOPs for specific forest health monitoring methods are available from WBEA. |
| Describe the QA/QC Plan, if Not Applicable, State N/A. * | The QA/QC Plan is available from WBEA. |
| 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.* | Indigenous communities are involved through inclusion in WBEA. |
| Components Delivered by Others | |
| 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. * | All monitoring in this project plan is delivered by the Wood Buffalo Environmental Association (WBEA). |
| 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. * | All monitoring in this project plan is delivered by WBEA through a contract with AEP. |
| Monitoring Site Locations and Coordinates (for all sites, please add them to the Monitoring Site Location tab - a separate excel sheet) | |
| Attach Map of Locations. Distinguish Indicators by Station if Necessary. Distinguish Sampling Frequency by Station if Necessary. | See "FHM Site Map" tab. This map shows the locations of forest health monitoring sites, passive monitoring sites, portable ozone monitoring sites and long-term meteorological towers. |
| Project Schedule | |

| | | | |
|---|--|---|--|
| FOR OIL SANDS MONITORING PROJECTS ONLY: 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. | | Monitoring is ongoing. Forest Health Monitoring sites are indicated in the tab called "FHM Site Locations". | |
| FOR OIL SANDS MONITORING PROJECTS ONLY: Have You Coordinated With Other Project Leads On Field Logistics? If So, Please Specify. * | | Monitoring field logistics are coordinated by WBEA. | |
| Other | | | |
| Additional Details. | | This project is fully integrated with A-LTM-S-3-1819 (Atmospheric Deposition to Forest Ecosystems) and A-LTM-S-4-1819 (Meterological Network) to provide a source-to-sink approach for evaluating the effects of atmospheric pollutant deposition to forest ecosystems. Data and sampling protocols for the Wetland LTM (under development) will also be aligned with this project. | |
| Will Capacity Building and Training be a Component of the Project and If So, Explain How. If Not, State N/A.* | | N/A | |
| Environmental Impact and Considerations. | | N/A | |
| Data Management and Digital Assets | | | |
| Will Data be Produced as a Result Of This Project? * | Type of Quantitative Data Variables | Frequency Of Collection | |
| Yes | Discrete | Monthly | |
| Data Collection Period: Start Date - End Date | Timeline For Upload Period: Start Date - End Date | | |
| April 1, 2018 to October 31, 2018 | July 1, 2018 to March 31, 2019 | | |
| 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. | http://www.wbea.org/resources/reports-and-publications/ambient-air-monitoring-reports/integrated-samples-lab-results http://www.wbea.org/resources/reports-and-publications/terrestrial-monitoring-reports | | |
| Project Deliverables | | | |
| Proposed 2018-19 Deliverable Type (for each deliverable outline document, presentation, meeting, etc.) | | | |
| <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 | |
| Nine manuscripts are planned for submission to a Special Issue in the journal called <i>Science of the Total Environment</i> under the theme title "Relationships Between Air Pollutants and Forest Ecosystem Health in the Oil Sands Region, Alberta, Canada". Submissions are planned February 1, 2018 to September 1, 2018. The manuscript titles are indicated in the tab called "Special Issue Papers". | | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | |
| Preparation and submission of special issue papers indicated in "Special Issue Papers" tab. | | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | |

| | | |
|--|--|--|
| Preparation and submission of special issue papers indicated in "Special Issue Papers" tab. | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
| Preparation and submission of special issue papers indicated in "Special Issue Papers" tab. | | |
| <input checked="" type="checkbox"/> Technical Report | <input type="checkbox"/> Book Chapter | <input type="checkbox"/> Public Dissemination Document |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | Q1 - Deliverable, Comments |
| Technical Review of WBEA's FHM network - Report to include: supplement to 2015 report (integration of data not yet reported); results from targeted soil and needle sampling to provide validation of early-warning, forest edge sites; recommendations for design and implementation of fourth intensive sampling cycle for 2018-19 | | |
| 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. |
| | | |
| <input type="checkbox"/> EMSD Strategic & Operational Publication | <input type="checkbox"/> Other Documents | |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | |

| | | |
|---|---|---|
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | |
| | | |
| Proposed Deliverables After 2018/2019 for the project funds received in 2018/2019 | | |
| <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 |
| Preparation and submission of special issue papers indicated in "Special Issue Papers" tab. | | |
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | Q2 - Deliverable, Comments |
| Preparation and submission of special issue papers indicated in "Special Issue Papers" tab. | | |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | Q3 - Deliverable, Comments |
| Preparation and submission of special issue papers indicated in "Special Issue Papers" tab. | | |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | Q4 - Deliverable, Comments |
| | | |
| | | |
| <input type="checkbox"/> Technical Report | <input type="checkbox"/> Book Chapter | <input type="checkbox"/> Public Dissemination Document |
| 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 |

| | | |
|--|---|--|
| | | |
| <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. |
| | | |
| <input type="checkbox"/> EMSD Strategic & Operational Publication | <input type="checkbox"/> Other Documents | |
| Q1 - Deliverable, Comments | Q1 - Deliverable, Comments | |
| | | |
| Q2 - Deliverable, Comments | Q2 - Deliverable, Comments | |
| | | |
| Q3 - Deliverable, Comments | Q3 - Deliverable, Comments | |
| | | |
| Q4 - Deliverable, Comments | Q4 - Deliverable, Comments | |
| | | |
| All Completed Products | | if a |
| multi-year project, specify all completed products to date (consistent format for the fields below). Add rows as required. | | |
| Journal Paper | | |
| 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) |
| Technical Report |
| 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) AMEC. 2000. Monitoring long-term effects of acid emissions in northeast Alberta – 1990 annual report. Wood Buffalo Environmental Association, Fort McMurray, AB. |
| 2) CEMA. 2004. Recommendations for the Acid Deposition Management Framework for the Oil Sands Region of North-Eastern Alberta. Prepared by the Cumulative Environmental Management Association, NOx/SOx Management Working Group. 39 pp. |
| 3) Clair, T.A. and K.E. Percy (Editors) 2015. Assessing Forest Health in the Athabasca Oil Sands Region. WBEA Technical Report. 2015-05-25, 180 pp +Appendices |
| 4) Foster K.R. 2015. Forest Health Monitoring Program, 2015 Procedures Manual. Prepared for the Wood Buffalo Environmental Association Terrestrial Environmental Effects Monitoring Program, Fort McMurray, AB. 120 pp. |
| 5) Jones, C.E., Associates 2006. Terrestrial Environmental Effects Monitoring Acidification Monitoring Program: 2004 Sampling Event Report for Soils, Lichen, Understorey Vegetation and Forest Health and Productivity. Prepared for Wood Buffalo Environmental Association, Fort McMurray, AB, Canada. |
| 6) Jones, C.E., Associates 2006. Terrestrial Environmental Effects Monitoring Acidification Monitoring Program: 2004 Sampling Event Report for Soils, Lichen, Understorey Vegetation and Forest Health and Productivity. Prepared for Wood Buffalo Environmental Association, Fort McMurray, AB, Canada. |
| Book Chapter |
| Required Format: Author, Year, Title of Paper, Editors, Title of Book, Page Numbers, Location of Publisher, Name of Publisher, Document Location |
| 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) Jaques, D.R., and Legge, A. H. 2012. Ecological analogues for biomonitoring industrial sulfur emissions in the Athabasca Oil Sands Region, Alberta, Canada. Chapter 10. pp 219-241. IN K.E. Percy (Ed.) Alberta Oil Sands: Energy, Industry and the Environment. Elsevier, Oxford, UK. |
| 2) A full list of WBEA technical reports is available in an Excel spreadsheet or at http://www.wbea.org/resources/reports-and-publications . |
| 3) |
| 4) |
| 5) |
| Conference Proceeding |
| Required Format: Author, Year, Title of Paper, Editors, Title of Proceedings, Name of Conference Location of Conference, Publisher Location, Name of |
| 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) |
| Public Dissemination Document |
| Required Format: Author, Year, Title, Journal / Report, Volume, Publisher, Page Number, Number of Pages, Document Location |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| AEP ONLY: EMSD Strategic and Operational Publication |
| Required Format: Author, Year, Title, Publisher Location, Name of Publisher, Publisher, Document Location |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| Other Documents |
| Detailed Information of Other Documents |
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |
| Conference Presentation |
| Required Format: Presenter, Date, Location, Title, Platform or Poster, Conference Name |

| |
|----|
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

Stakeholder Presentation

Required Format: Presenter, Date, Location, Title, Platform or Poster, Name of Meeting

| |
|----|
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

Key Engagement/Participation Meeting

Required Format: Meeting Host, Date, Location

| |
|----|
| 1) |
| 2) |
| 3) |
| 4) |
| 5) |

Human Resources / Staffing Plan (roles and responsibilities)

| Name & Role | Organization | Responsibilities |
|---|--|-----------------------------|
| Sanjay Prasad | Wood Buffalo Environmental Association | Project Leadership |
| Dan Farr (project plan completed by Bob Myrick) | AEP | AEP Project Administrator |
| Terrestrial Effects Scientist | AEP | Terrestrial science support |
| Greg Wentworth | AEP | Atmospheric science support |
| | | |
| | | |
| | | |
| | | |

AEP ONLY: Additional Human Resources Required from EMSD

| Name & Role | Branch - Section | Estimated time (% of annual FTE) |
|----------------|------------------|----------------------------------|
| Greg Wentworth | Science | 10 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Financial Details and Budget Request

Source of Funding Requested Year 1 - 2018/19

| | AEP ONLY: EMSD | OSM |
|--|----------------|--------------------|
| Salaries and Benefits - AEP Chargeback | | \$12,000 |
| Salaries and Benefits - New OSM Staff | | \$0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WB EA) | | \$1,400,000 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | 0 | \$1,412,000 |
| Total budget approved | | |

Source of Funding Requested Year 2 - 2019/20

| | AEP ONLY: EMSD | OSM |
|--|----------------|----------|
| Salaries and Benefits - AEP Chargeback | | \$12,000 |
| Salaries and Benefits - New OSM Staff | | \$0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |

| | | |
|---|-----------------------|--------------------|
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | \$799,489 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | | \$811,489 |
| Total budget approved | | |
| Source of Funding Requested Year 3 - 2020/21 | | |
| | AEP ONLY: EMSD | OSM |
| Salaries and Benefits - AEP Chargeback | | \$12,000 |
| Salaries and Benefits - New OSM Staff | | \$0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | \$300,000 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | | \$312,000 |
| Total budget approved | | |
| Source of Funding Requested Year 4 - 2021/22 | | |
| | AEP ONLY: EMSD | OSM |
| Salaries and Benefits - AEP Chargeback | | \$12,000 |
| Salaries and Benefits - New OSM Staff | | \$0 |
| Operations and Maintenance | | |
| Consumable materials and supplies | | |
| Conferences and meetings travel | | |
| Field work travel | | |
| Project-related travel | | |
| Engagement | | |
| Reporting | | |
| External Contracts - Organization/Vendor/Suppliers (WBEA) | | \$300,000 |
| Overhead | | |
| Grants | | |
| Capital | | |
| Total budget request for the year | | \$312,000 |
| Total budget approved | | |
| Budget Request for the Entire Project | 0 | \$2,847,489 |

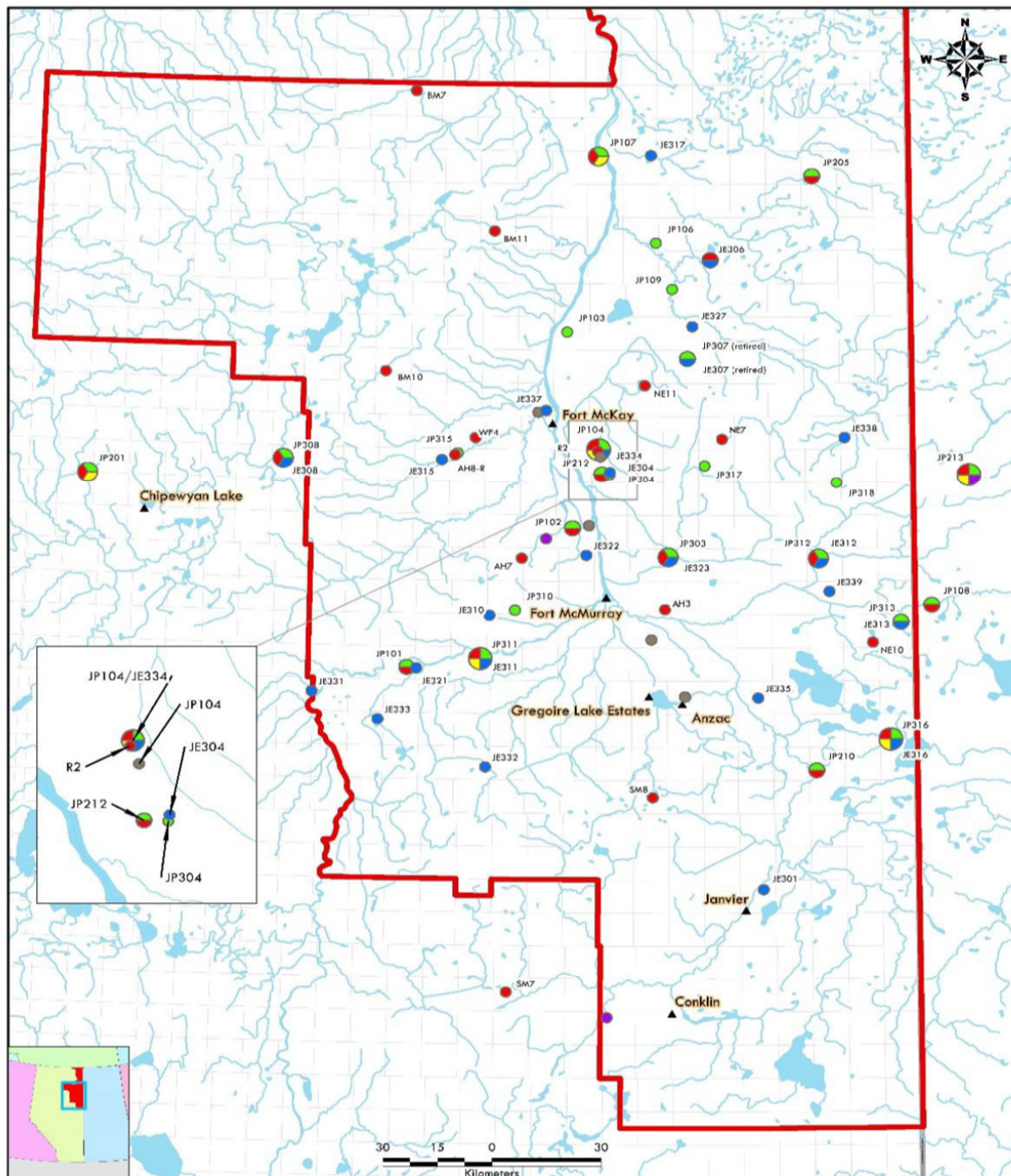
| Project Approval(s) | | |
|--|---|--------------|
| Proposal Submitted by | | |
| Surname | Given Name | Organization |
| Myrick | Bob | AEP |
| Signature | Date | |
| | 12-Feb-18 | |
| Proposal for OSM Reviewed by | | |
| Bob Myrick Director, Airshed Sciences | Signature | Date |
| | | |
| AEP Administrator/Coordinator - Review | Signature | Date |
| | for Bill Donahue Executive Director, Science | |
| | | |
| ECCC Administrator/Coordinator - Review | Signature | Date |
| | | |
| OSM Project Approved by | | |
| AEP Co-Lead for OSM | Signature | Date |
| | | |
| ECCC Co-Lead for OSM | Signature | Date |
| | | |
| AEP ONLY: Proposal for EMSD Reviewed by | | |
| EMSD Director | Signature | Date |
| | | |
| AEP ONLY: EMSD Project Approved by | | |
| EMSD Executive Director | Signature | Date |
| | | |

| | | |
|--|----------------------|----------------------|
| EMSD Chief Scientist | Signature | Date |
| | | |
| OSM / EMSD Project Has Not Been Approved | | |
| 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 | | |
| OSM / EMSD Approval Post Removal of Condition(s) | | |
| Name & Title | Signature | Date |
| | | |

| Budget Item | Description | Total Cost | |
|--|---|--|-----------|
| CORE Subtotal | | \$430,866 | |
| 1. Tree Condition Assessment (Insect and Disease Survey) | | \$0 | |
| Field Crew | Forest Health Assessment crew from Alberta Agriculture and Forestry. No charge for hours. WBEA covers hotel and per diem and provides field assistance. | \$0 | |
| Helicopter | Based on 20 flight hours per year. (10 field days, 2 flight hours/day). | \$0 | |
| 2. Program Design Review | | \$243,400 | |
| TPP Project Management | Based on one individual to provide project oversight. Includes time and travel. | \$26,000 | |
| Data Management | Based on one individual to catalogue TEEM data and compile a database. | \$4,400 | |
| Manuscript #1 | Includes time, travel and expenses associated with preparation of manuscript and publication fee. | \$21,000 | |
| Manuscript #2 | Includes time, travel and expenses associated with preparation of manuscript and publication fee. | \$41,900 | |
| Manuscript #3 | Includes time, travel and expenses associated with preparation of manuscript and publication fee. | \$34,750 | |
| Manuscript #4 | Includes time, travel and expenses associated with preparation of manuscript and publication fee. | \$41,000 | |
| Manuscript #5 | Includes time, travel and expenses associated with preparation of manuscript and publication fee. | \$66,350 | |
| Manuscript#10 | Includes time, travel and expenses associated with preparation of manuscript and publication fee. | \$8,000 | |
| LONG-TERM MONITORING Subtotal | | \$969,133 | |
| 3. 6-yr Forest Health Program (Intensive Sampling Campaign) | | \$969,133 | |
| Vegetation Crew | Based on 300 field hours per year. Includes hours, per diem, vehicle, equipment, and hotel for 4 field staff. | \$150,620 | |
| Soil Crew | Chemical Crew | Based on 300 field hours per year. Includes hours, per diem, vehicle, equipment, and hotel for 2 field staff. | \$88,160 |
| | Microbiology Crew | Based on 84 field hours per year. Includes hours, per diem, vehicle, equipment, and hotel for 2 field staff. | \$0 |
| | Soil Crew Total | | \$88,160 |
| Lichen Crew | Community Composition Crew | Based on 192 field hours per year. Includes hours, per diem, vehicle, equipment, and hotel for two field staff. <i>*Suspended for 2018/19 field season.</i> | \$0 |
| | Sampling Crew | Based on 70 field hours per year. Includes hotel and per diem for 1 field crew. WBEA to aid. Potential for WBEA to complete the sampling in its entirety. <i>*Suspended for 2018/19 field season.</i> | \$0 |
| | Lichen Crew Total | | \$0 |
| Laboratory Analysis | Lichen | Based on 150 samples analyzed for S&N, Elemental and PAH. | \$52,500 |
| | Soil | Based on 1632 samples analyzed for routine soil analysis. | \$168,096 |
| | Foliage | Based on 708 Jack Pine Needle routine analyses and 500 needle waxes. | \$44,757 |
| | Laboratory Costs Total | | \$265,353 |
| Helicopter | Based on 131 flight hours over 35 days per year. | \$210,000 | |
| | Scientist #1 Fees | Science specialist for deposition | \$50,000 |

| | | | |
|-------------------------|---------------------|--|-----------|
| Professional Fees | Scientist #1 Travel | Assumption of 4, 2-day trips to Fort McMurray. Includes airfare, accommodation and per diem. | \$5,000 |
| | Scientist #2 Fees | Science specialist for deposition and tree condition | \$105,000 |
| | Scientist #2 Travel | Assumption of 4, 2-day trips to Fort McMurray. Includes airfare, accommodation and per diem. | \$5,000 |
| | Scientist #3 Fees | Science specialist for soils. | \$50,000 |
| | Scientist #3 Travel | Assumption of 4, 2-day trips to Fort McMurray. Includes airfare, accommodation and per diem. | \$5,000 |
| | Scientist #4 Fees | Science specialist for lichen. | \$30,000 |
| | Scientist #4 Travel | Assumption of 4, 2-day trips to Fort McMurray. Includes airfare, accommodation and per diem. | \$5,000 |
| Professional Fees Total | | | \$255,000 |

| CORE Operating Costs | | \$187,466 |
|---------------------------|--|-----------|
| Forest Health Field costs | Field Staff/Benefits | \$50,911 |
| | Deposition Vehicle | \$2,000 |
| | Safety (Mandatory) | \$2,000 |
| | Deposition Training | \$2,000 |
| | Materials and Consumables | \$1,500 |
| | Information Technology (cell phone) | \$1,500 |
| | Site Maintenance | \$500 |
| | Stakeholder Engagement | \$1,000 |
| | Professional fees for Science Adv | \$2,500 |
| WBEA Administration | Data Management Systems | \$16,800 |
| | Administration Salary and Benefits | \$39,246 |
| | External Professional Fees | \$25,074 |
| | Insurance Expense | \$1,962 |
| | Office Equipment Lease & Expenses | \$1,472 |
| | Thickwood Occupancy Cost | \$13,246 |
| | Office expenses Telephone/Fax/Internet | \$7,849 |
| | Safety/Mandatory Training | \$736 |
| | Travel - Program Work | \$2,943 |
| | Conferences, Training and meetings | \$1,472 |
| | Stakeholder Honourariums | \$1,472 |
| | Financial Audit and Legal Fees | \$2,943 |
| Emergent Items | \$8,340 | |



Wood Buffalo Environmental Association
Terrestrial Monitoring Network 2017



- Legend
-  Forest Health Interior Plot
 -  Passive Monitor
 -  Meteorological Tower
 -  Forest Health Edge Plot
 -  Bog Site
 -  Portable Ozone Monitor
 -  Community
 -  Regional Municipality of Wood Buffalo

| Authors | Institute, Country | Indicative title of paper |
|---|---|--|
| Ken Foster David Spink Carla Davidson | Owl Moon Environmental Inc., CANADA Pravid Environmental Inc., CANADA Endeavour Scientific, CANADA | Introduction, history and monitoring design basis for the WBEA terrestrial environmental effects monitoring program (1996-2017) |
| Eric Edgerton Matt Landis Emily White Yu-Mei Hsu Joe Graney Bill Studebaker David Spink Carla Davidson Tom Dann | Atmospheric Research & Analysis, Inc., USA Integrated Atmospheric Solutions, USA Maed Consulting, USA WBEA, CANADA Binghamton University, USA Tobacco Road Collaborative, USA Pravid Environmental Inc., CANADA Endeavour Scientific, CANADA WBEA, CANADA | Air Quality and Deposition in the Athabasca Oil Sands 1996 to Present |
| Derek MacKenzie Sebastien Dietrich Mike Solohub | University of Alberta, CANADA University of Alberta, CANADA BioSynch Consulting Inc. CANADA | Changes in Soil Chemistry and Microbiology in Soils, and Changes in Foliar Chemistry, in Jack Pine Forests related to Deposition in the Athabasca Oil Sands Region |
| Ellen Macdonald | University of Alberta, CANADA | Jack Pine Growth & Health Monitoring and Vegetation Community Composition related to |
| Matt Landis Keith Puckett Bill Studebaker Joe Graney Eric Edgerton | Integrated Atmospheric Solutions, USA ECOFIN, CANADA Tobacco Road Collaborative, USA Binghamton University, USA Atmospheric Research & Analysis, Inc., USA IEG Consulting, USA | Atmospheric Deposition Effects on Lichen Communities and Chemical Composition |

| | | |
|---|---|--|
| Shanti Berryman | | |
| Matt Landis Patrick Pancras Keith Puckett Bill Studebaker Joe Graney Eric Edgerton | Integrated Atmospheric Solutions, USA Pancras Consulting, USA ECOFIN, CANADA Tobacco Road Collaborative, USA Binghamton University, USA Atmospheric Research & Analysis, Inc., USA | Source Apportionment of an Epiphytic Lichen Biomonitor to Elucidate the Sources and Spatial Distribution of Polycyclic Aromatic Compounds in the Athabasca Oil Sands Region, Alberta, Canada |
| Matt Landis Patrick Pancras Keith Puckett Bill Studebaker Joe Graney Eric Edgerton | Integrated Atmospheric Solutions, USA Pancras Consulting, USA ECOFIN, CANADA Tobacco Road Collaborative, USA Binghamton University, USA Atmospheric Research & Analysis, Inc., USA | Source Apportionment of Ambient Polycyclic Aromatic Compounds in Fine and Coarse Particulate Matter at the Fort McKay Community Site, in the Athabasca Oil Sands Region, Alberta, Canada |
| Joe Graney Matt Landis Eric Edgerton | Binghamton University, USA Integrated Atmospheric Solutions, USA Atmospheric Research & Analysis, Inc., USA | Coupling lead isotope ratios and multi-element analysis of particulate matter and lichens from the Athabasca Oil Sands Region to identify local, regional, and global source contributions |
| Carla Davidson | Endeavour Scientific, CANADA | Management Implications and Future Directions in Air, Deposition and Environmental Effects |