



The Implementation Plan

Third Annual Report: 2014–2015

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Preface

This annual report presents information on the progress made in the final year (April 1, 2014 to March 31, 2015) of the Joint Canada/Alberta Implementation Plan for Oil Sands Monitoring (Implementation Plan). Implementation for the third year of the three-year plan was jointly led by the Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA) on behalf of the Government of Alberta and Environment Canada on behalf of the Government of Canada.



Executive Summary

The Joint Canada/Alberta Implementation Plan for Oil Sands Monitoring (Implementation Plan) initiated in February 2012 outlined how the governments of Alberta and Canada would work together as partners to implement a world-class monitoring program for the oil sands that integrates the components of air, water, wildlife contaminants and biodiversity.

Over the past three years, Canada and Alberta have made progress in strengthening the planning and delivery structures, and provided leadership in ensuring that the necessary monitoring and supportive scientific activities were conducted to meet the commitments and objectives outlined in the Implementation Plan. Adoption of a phased approach ensured that the program was responsive to emerging priorities, information, knowledge, and input from key stakeholders. The Implementation Plan was funded by industry to a maximum of \$50 million annually.

This annual report presents highlights of progress made against commitments and objectives, and includes a technical annex summarising monitoring activities in the third year (2014–2015) of the Implementation Plan.

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1. Introduction

The Joint Canada/Alberta Implementation Plan for Oil Sands Monitoring (“Implementation Plan”), which outlines a three-year commitment to implement a single, government-led monitoring program for the oil sands, was announced by the governments of Canada and Alberta in February 2012. In the Implementation Plan, both governments recognized that the industrial development in the oil sands region necessitated a better understanding of cumulative environmental impacts through a scientifically rigorous, comprehensive, integrated and transparent ambient environmental monitoring program in the oil sands region.

Designed to build on existing environmental monitoring in the region, the Implementation Plan addresses the need for a scientifically credible, integrated approach to environmental monitoring to be phased in over three years (April 1, 2012 to March 31, 2015). This was to ensure an orderly installation of necessary infrastructure, incremental enhancement of activities, and the appropriate integration with existing monitoring activities in the region.

Key commitments of the plan:

- Funding;
- Accountable administration and review;
- Adaptive management;
- Transparent and accessible results.

The key commitments made by both governments covered funding, accountable administration and review, adaptive management, scientific oversight, as well as transparent and accessible results. The purpose of these commitments was to implement a monitoring program that fulfills the following objectives:

- Support sound decision making by governments, as well as stakeholders;
- Ensure transparency through accessible, comparable and quality-assured data;
- Enhance science-based monitoring for improved characterization of the state of the environment and collect the information necessary to understand cumulative effects;
- Improve analysis of existing monitoring data to develop a better understanding of historical baselines and changes; and,
- Reflect the transboundary nature of the issue and promote collaboration with the governments of Saskatchewan and the Northwest Territories.

The results generated from monitoring and supportive scientific activities of the Implementation Plan will enhance the understanding of the sources, effects and fate of oil sands-related emissions as well as cumulative environmental effects in the region resulting from oil sands development activities.

The governments of Canada and Alberta committed to reporting annually on the progress made in achieving the objectives outlined in the Implementation Plan. Joint reports on monitoring activities for the first two years of the Implementation Plan were released.

As in 2013–2014, the 2014–2015 report will be presented in two parts. This first part presents the status of progress in year three (2014–2015) of the Implementation Plan. The second part, to be released later this year (Fall 2015), will present a technical and scientific overview of results from the 2014–2015 monitoring work.

2. Reporting Against Key Commitments

This section reports on the progress made against key commitments and overall objectives of the Implementation Plan for the third year (2014–2015) of joint oil sands monitoring in the following areas: funding, accountable administration and review, adaptive management, and transparent and accessible results.

2.1 FUNDING

In year three, Canada and Alberta worked with the oil sands industry to ensure continued funding support for the monitoring program. As articulated in the Implementation Plan, the costs of implementing enhanced environmental monitoring of oil sands activities for the three-years (2012–2015) are paid by industry, up to a maximum of \$50 million annually through the [Oil Sands Environmental Monitoring Program Regulation](#), a regulation under the Alberta's *Environmental Protection and Enhancement Act*.

Highlights of 2014–2015 commitment on funding:

- *Oil Sands Environmental Monitoring Program Regulation* enabling the collection of monitoring fees from oil sands operators; and,
- Funding of monitoring activities within a \$50 million cap.

In 2014–2015, industry no longer provided funds for monitoring directly to regional organizations. Under the *Oil Sands Environmental Monitoring Program Regulation*, funding for these organizations is now collected from industry by the Government of Alberta. With the creation of the Alberta Environmental Monitoring Evaluation and Reporting

Agency (AEMERA) as the provincial arms-length organization responsible for environmental monitoring in Alberta, the Government of Alberta charged the agency with disbursing the funds collected from industry for monitoring work. In 2014–2015, AEMERA worked jointly with the Government of Canada to disburse the funds for monitoring work to all participants.

Consistent with the governments' commitment to ensure funding transparency by reporting on expenditures, a total of **\$49,997,249** of funding was approved for monitoring in year three (see tables 1 and 2).

A summary of 2014–2015 allocations and expenditure is provided in Tables 1 and 2; for further details please see [Appendix A](#).

2014–2015 Budget Summary (Government)			
	Planned	Expenditure	Variance
EC ¹	\$ 20,469,223	\$ 16,874,482	\$ 3,594,741
ESRD ²	\$ 3,867,000	\$ 2,580,693	\$ 1,286,307
Total	\$ 24,336,223	\$ 19,455,175	\$ 4,881,048

Table 1: Summary of 2014–2015 planned budget and expenditure – Environment Canada and Environment Sustainable Resources Development

2014–2015 Budget Summary (Monitoring Organizations)			
	Planned	Expenditure	Variance
ABMI ³	\$ 5,899,440	\$ 5,899,440	
LICA ⁴	\$ 1,017,000	\$ 1,003,671	\$ 13,329
WBEA ⁵	\$ 13,321,705	\$ 12,569,080	\$ 752,625
Hatfield ⁶	\$ 5,422,881	\$ 4,402,404	\$ 1,020,477
Total	\$ 25,661,026	\$ 23,874,595	\$ 1,786,431

Table 2: Summary of 2014–2015 planned budget and expenditure – Monitoring Organisations

Variances in the budget summary tables represent the difference between amount approved and actual expenditure for 2014–2015. These variances reflect:

- **Cost Savings and Efficiencies**
A number of projects were delivered under budget due to cost efficiencies by pooling and coordination of contracts and resources.
- **External Factors on Implementation**
Some projects were delayed or deferred due to external factors, such as obtaining permits, or availability of equipment.

In reconciling the funding at the end of each fiscal year, industry is only invoiced for the actual amount spent to deliver work done under the approved work plan.

¹ Environment Canada

² Environment and Sustainable Resources Development

³ Alberta Biodiversity Monitoring Institute

⁴ Lakeland Industry and Community Association

⁵ Wood Buffalo Environmental Association

⁶ Monitoring Service Contracts with Hatfield Consultants managed through Environment and Sustainable Resource Development/AEMERA



2.2 ACCOUNTABLE ADMINISTRATION AND REVIEW

2.2.1 Joint Management of Monitoring Program

Core activities for the 2014–2015 implementation year are as follows:

a. Reporting on 2013–2014 Year

In line with commitments made by both governments, joint reports on monitoring activities for the 2013–2014 implementation year of the Implementation Plan were released in October 2014 (Progress Against Commitments) and December 2014 (Monitoring Results).

b. 2014–2015 Program Implementation

Environment Canada (EC) and AEMERA jointly administered the Implementation Plan. As with previous years, delivery of monitoring work for 2014–2015 was achieved through governments⁷, regional monitoring organizations⁸ and contractors⁹ approved for specific projects.

c. Planning for 2015–2016

Technical Component Advisory Committees (CACs) for air, water, wildlife contaminants and biodiversity incorporated broad-based multi-stakeholder perspectives gathered at the annual oil sands monitoring forums in June and November 2014 into the 2015–2016 technical monitoring work plan development process. Stakeholder feedback on improving the CACs planning process informed efforts to establish a consistent approach across all CACs such as ensuring focus on scientific and technical aspects of monitoring, consistency in the frequency of meetings, and the provision of opportunities for stakeholder participation in the process.

2014–2015 is the third year of the three-year Implementation Plan. As AEMERA became operational with its Board in place, AEMERA assumed responsibility for managing the \$50 million fund for environmental monitoring in the oil sands region and with that, the approval of the 2015–2016 work plan recommended by the CACs. The draft 2015–2016 monitoring work plan was reviewed jointly by AEMERA and EC, and presented to the AEMERA Board for approval. The Board approved the budget for technical components of the 2015–2016 work plan in December 2014 and the budget for cross-cutting components in February 2015 (see [Appendix B](#)).

Following the approval of the work plan, AEMERA began to establish Monitoring Service Contracts and Agreements outlining operational and financial accountabilities with specific deliverables, timelines, and payment schedule as well as a process in preparation for implementation of the 2015–2016 work plan.

⁷Environment and Sustainable Resource Development (ESRD), Environment Canada (EC).

⁸Alberta Biodiversity Monitoring Institute (ABMI), Lakeland Industry and Community Association (LICA) and Wood Buffalo Environmental Association (WBEA).

⁹Hatfield Consultants.

2.2.2 Engagement

In the Implementation Plan, the governments of Alberta and Canada committed to engaging with Aboriginal peoples, industry, scientists and stakeholders to seek and incorporate stakeholder advice into the Joint Oil Sands Monitoring (JOSM) annual planning process.

For the 2014–2015 year, representatives of First Nations and Métis Organizations, industry, monitoring organizations in Alberta, non-governmental organizations, and academia as well as other governments were invited to participate in various JOSM engagement activities. Highlights of these are provided in the following sections.

2.2.2.1 Multi-stakeholder Forums

The multi-stakeholder forums are one of the mechanisms through which the governments of Canada and Alberta share information and seek feedback from stakeholders on oil sands monitoring. In 2014–2015, the forums brought together representatives from the three levels of government, oil sands industry, First Nations, Métis organizations, non-governmental organizations, and academia to share information and discuss progress made on oil sands monitoring implementation. In year three, multi-stakeholder forums were held as follows:

- June 4-5, 2014 – The June forum marked the beginning of the 2015–2016 monitoring planning cycle. A broad cross-section of stakeholders provided input on needs, issues and questions important to their organizations and communities. Figure 1 below depicts participants' input during the June forum breakout sessions. This input was considered in the process of developing the 2015–2016 monitoring work plan.



Figure 1: Key areas of interest based on participants' input during breakout sessions at the oil sands monitoring forum in June 2014

- November 26–27, 2014 – The purpose of the November forum was to review and validate the draft work plan with stakeholders and representatives of Aboriginal groups that provided input at the forum held in June 2014. Figure 2 outlines the timeline including where the multi-stakeholder forums fit into the 2015–2016 monitoring planning process.

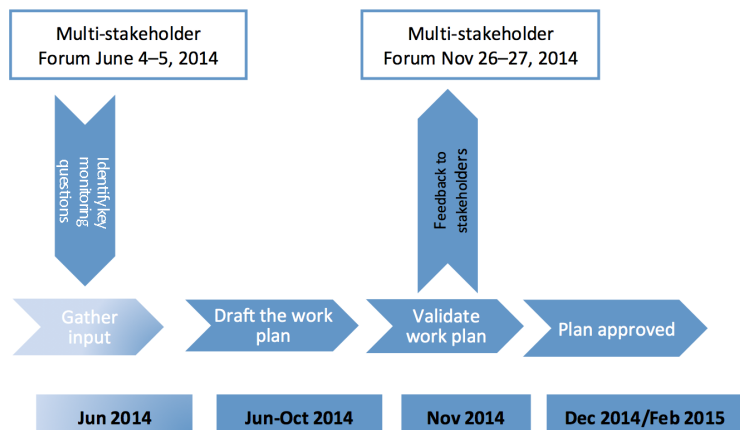


Figure 2: Timeline of the 2015–2016 monitoring planning process

2.2.2.2 Oil Sands Monitoring Symposium

The first Oil Sands Monitoring Symposium was held in February 2015. The purpose was to share data and results collected during the three-year JOSM with scientists, government, industry, non-governmental organizations, and others interested in oil sands environmental monitoring. The two-day symposium was well attended with a total of 320 participants representing First Nations and Métis organizations; provincial and federal government departments; non-profit organizations; oil sands companies; consultants; and, academic institutions (see [Appendix C](#)).

Information presented at the symposium covered the following key areas:

- Pressures and stressors: understanding the sources contributing to impacts on the environment (i.e. resource use, emissions, land disturbance);
- Long-term monitoring: backbone of the monitoring systems; air, water, biodiversity and wildlife health; and
- Focused monitoring: heavy metal and organic contaminants; pollutant transformation processes and wildlife health studies.

Feedback from participants surveyed indicated that over 90% of respondents found the information presented of relevance to their interests and work.

Key achievements:

- Two multi-stakeholder forums in June and December 2014;
- First Oil Sands Monitoring Symposium held in February 2015; and
- Initiation of a coordinated planning process; start of shift from a collection of independent activities to a strategic engagement and communications program.

2.2.2.3 Aboriginal Engagement

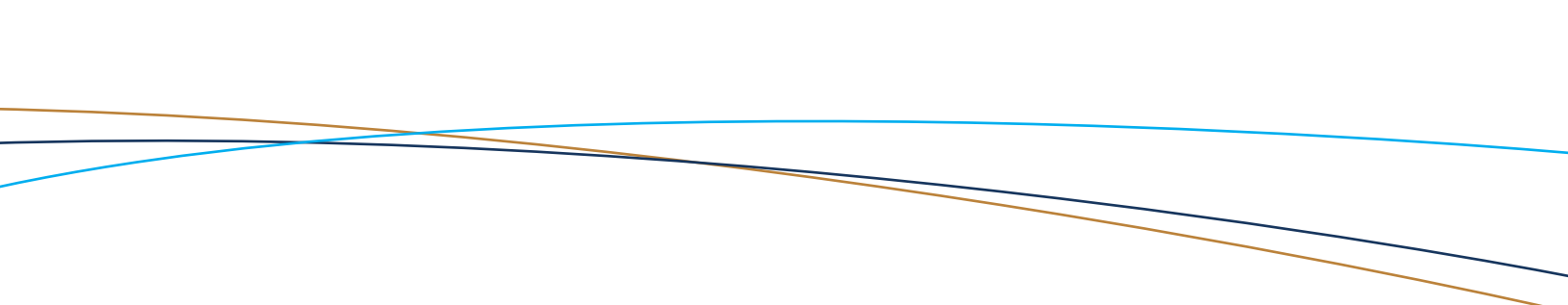
In the Implementation Plan, the governments of Canada and Alberta committed to the delivery of a monitoring program based on the principles of inclusion of Traditional Ecological Knowledge (TEK) and the training and involvement of members of local communities in the actual monitoring activities. Progress was made on this commitment in year three (2014–2015) as the implementation of a three-pronged engagement approach earlier proposed by the governments of Canada and Alberta to address the interests expressed by representatives of First Nations and Métis organizations continued in 2014–2015. This approach includes:

- Setting up mechanisms for ongoing relationship development and communication with First Nations and Métis organizations; i.e., a broader, more inclusive Aboriginal advisory body as a forum to directly provide advice and recommendations to the JOSM co-Chairs;
- Integrating the use of TEK in monitoring, evaluation and reporting; and
- Building capacity within the communities through the development of training opportunities.

Key achievements:

- Elder and Community regional information sessions;
- One-on-one community visits to six Aboriginal Communities; and
- Identifying key areas of interest to Aboriginal communities.

Implementing this approach required the involvement of Aboriginal groups in the development of appropriate mechanisms, protocols and processes that support the use of TEK as well as enable Aboriginal participation. Activities in 2014–2015



focused on developing relationships, trust and a shared understanding of long-term collaboration through dialogue with Aboriginal groups, elders and community members to share and document information on interests, concerns and opportunities.

A series of forums, working sessions, and elder and community regional information sessions were held in 2014–2015 to facilitate conversations between Aboriginal communities and the governments. Identifying monitoring needs and priorities, ensuring Aboriginal engagement and participation in oil sands monitoring, involvement in governance and process, as well as supporting science and cultural training were highlighted during these sessions as key areas of interest to Aboriginal people in the oil sands region. These outcomes were presented to the JOSM co-Chairs, and informed the work planning process for 2015–2016.

2.2.2.4 Aboriginal Involvement in Monitoring

In the Implementation Plan, the governments of Canada and Alberta committed to seeking opportunities to enhance the training and participation of members of local communities in monitoring activities. In 2014–2015, an inventory and analysis of the state of Community-Based Monitoring (CBM) projects and organizations in Alberta's oil sands region was conducted with the participation of 18 Aboriginal communities. Information on existing and historical CBM work was gathered and respective communities indicated their capacity and interest in participating in the delivery of future monitoring activities: a report on the CBM study is currently in draft.

Both AEMERA and EC remain committed to seeking opportunities for training and capacity building within Aboriginal communities, and to working with Aboriginal peoples to foster openness, transparency, and credibility in the monitoring system in the oil sands region.

2.2.2.5 Industry Engagement

In addition, AEMERA continued discussions with industry representatives and the Alberta Energy Regulator that focused on identifying approval clauses related to regional, ambient/cumulative effects monitoring, and ensuring that ambient monitoring as well as facility performance monitoring are complementary rather than duplicative.

AEMERA and EC shared information on the progress of implementation with industry at several JOSM meetings and forums held through 2014–2015; industry representatives also participated in oil sands monitoring planning processes through the CACs.

Highlights of commitment on accountable administration and review:

- First Oil Sands Science Symposium held on February 24-25, 2015;
- Two multi-stakeholders forums held in June and November 2014;
- Several meetings held with representatives of First Nations and Métis organisations for discussions on JOSM;
- Implementing technical CACs to incorporate multi-stakeholder perspectives into developing 2015–2016 monitoring work plans;
- Development of 2015–2016 monitoring work plans through a single, integrated, government-led monitoring planning process; and
- Progress made in identifying clauses related to regional, ambient/cumulative effects monitoring, to ensure ambient and facility performance monitoring are complementary rather than duplicative.

2.3 ADAPTIVE MANAGEMENT

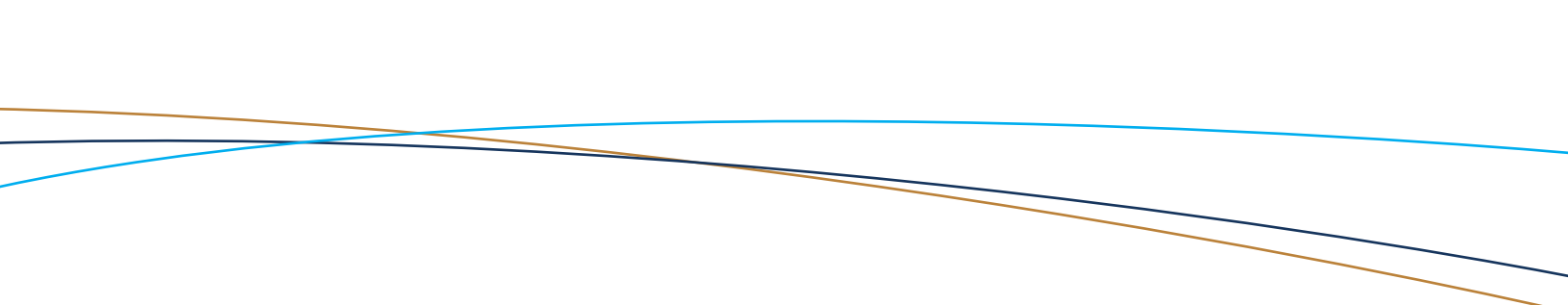
Consistent with adaptive management, plans and activities have evolved to reflect lessons learned and experience gained from initial work, as well as discussions with participants. A key outcome from the June and December multi-stakeholder forums in year three (2014–2015) was that the events were better suited for discussing broad goals and general results due to the diverse backgrounds of participants. To share detailed scientific results, the first Oil Sands Monitoring Symposium was held in February 2015. Feedback from participants surveyed indicated that the information presented at the symposium was relevant to their interests and enhanced their understanding of the oil sands monitoring program.

In 2014, the Office of the Auditor General of Alberta and the Office of the Auditor General of Canada carried out audits of JOSM.

The objective of the provincial audit was to assess the nature and quality of the first public report on the program and whether the results presented were complete and verifiable, based on evidence that is sufficient and appropriate.

Highlights of commitment on adaptive management:

- Having separate forums focused on technical and non-technical audiences; and
- Exploring opportunities for integration of monitoring across media.



The provincial audit reviewed the report on the first year (February 2012 to March 2013) of the three-year JOSM program during which time the program was co-led by EC and Environment and Sustainable Resource Development (ESRD), on behalf of the Government of Alberta. AEMERA assumed responsibility for JOSM upon proclamation of the Act establishing the agency on April 28, 2014.

In the audit report ([Report of the Auditor General of Alberta](#)) released on October 7, 2014, the Auditor General of Alberta made recommendations to AEMERA, and the agency has presented an action plan addressing the recommendations to the Auditor General. Highlights of AEMERA's action plan are as follows:

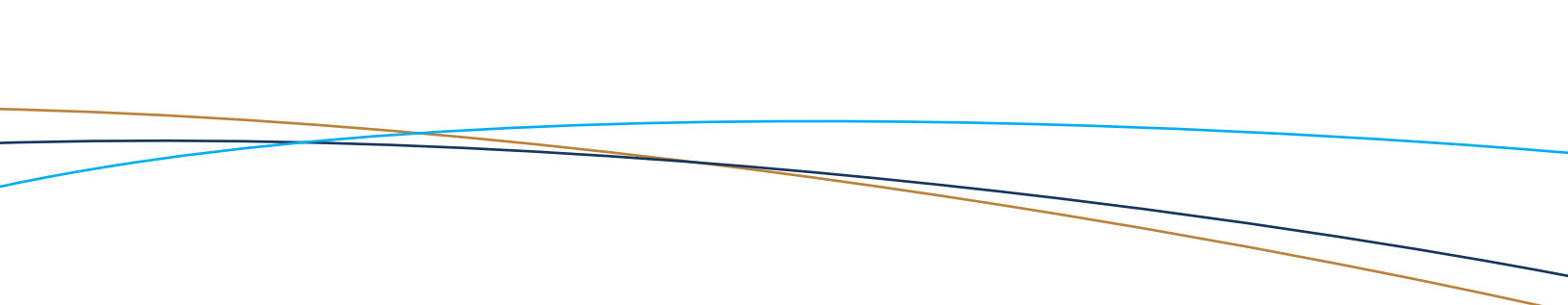
1. Ensure timely, accurate and transparent public reporting

AEMERA committed to working with EC to ensure that public reporting on the joint plan is timely, accurate and transparent. To this end, AEMERA and EC agreed that the JOSM annual report for year two (2013–2014) be separated into two reports to minimize any delays related to validation of the science and ensure timely release of information. The Business Report and the Monitoring Results Report were released in October and December 2014, respectively. It was agreed that annual reports on implementation would include reporting on both key commitments for the program and will be prepared for release in June 2015.

To ensure accuracy in reporting, AEMERA and EC reinforced expectations regarding accuracy and transparency in reporting on JOSM work with JOSM leads at a joint meeting in Edmonton in November 2014. A system of rigorous review has been implemented to ensure that the report clearly identifies monitoring commitments that were met and provide a summary of what was done (see [Technical Annex](#)). In addition, where commitments for a specific year were not met, reasons as well as further actions are provided.

2. Improve planning and monitoring

AEMERA committed to implementing effective processes for monitoring the status of projects. This involved ensuring that approved annual work plan items have detailed project plans, with clearly defined deliverables, timelines and payment schedules. AEMERA is also implementing a more rigorous program management system to assist with internal project tracking and status updates, financial tracking, and external tracking of monitoring delivery agents. Contracts for monitoring activities with deliverables and accountabilities, including timely reporting, were established with respective delivery organizations. AEMERA's expectations regarding monitoring status of all projects and reporting to senior management were circulated to Alberta program leads in February 2015.



To ensure timely sharing of information between the governments, AEMERA and EC continued to hold regular joint meetings through all levels (executive, management and operational) of the JOSM program with decisions and actions documented for reference. Reporting protocols have been established to ensure that information-sharing between JOSM participants occurs in a timely manner to meet the needs of the program and also to address the challenge of different reporting practices at provincial and federal levels.

The objective of the federal audit was to determine whether EC implemented its responsibilities under the Joint Canada–Alberta Implementation Plan for Oil Sands Monitoring according to established timelines and budgets, and the objectives and approaches set out in the joint plan. The audit period was from February 2012 to April 2014 and focused on the Department’s implementation of work plans for the 2013–2014 fiscal year and on the development of work plans for the 2014–2015 fiscal year.

The 2014 Fall Report of the Federal Commissioner of Environment and Sustainable Development concluded that EC played an important role in implementing the joint plan, and that according to concrete work plans, EC had implemented most of the projects examined according to established timelines and within budget. EC also had established quality assurance and quality control procedures and standard operating protocols for each examined project, and was in the early stages of integration. The federal audit report recommended that EC work in partnership with AEMERA to define options that build on the JOSM Implementation Plan and ensure world-class monitoring continues beyond 2015. It also recommended that EC, in consultation with AEMERA, work with First Nations and Métis to develop an engagement approach, and to integrate TEK into monitoring of the oil sands, as well as to develop a strategy for integrating monitoring results across air, water and biodiversity components.

EC and AEMERA are working to continue the federal-provincial relationship, building upon the foundation of JOSM and including efforts to advance work to monitor cumulative effects in the oil sands region. This includes the commitment to engage First Nations and Métis representatives and to incorporate TEK into oil sands monitoring activities.

2.4 TRANSPARENT AND ACCESSIBLE RESULTS

In the Implementation Plan, both Canada and Alberta committed to providing open, transparent access to monitoring data and results in a timely, standardized and coordinated manner. To this end, monitoring organizations provided key support for JOSM data management, including quality assurance and storage. Also, in 2014–2015, the Data Sharing and Information Release Protocol released in December 2013 (see [Appendix D](#)) continued as the tool for managing the release of monitoring data and information on the JOSM program.

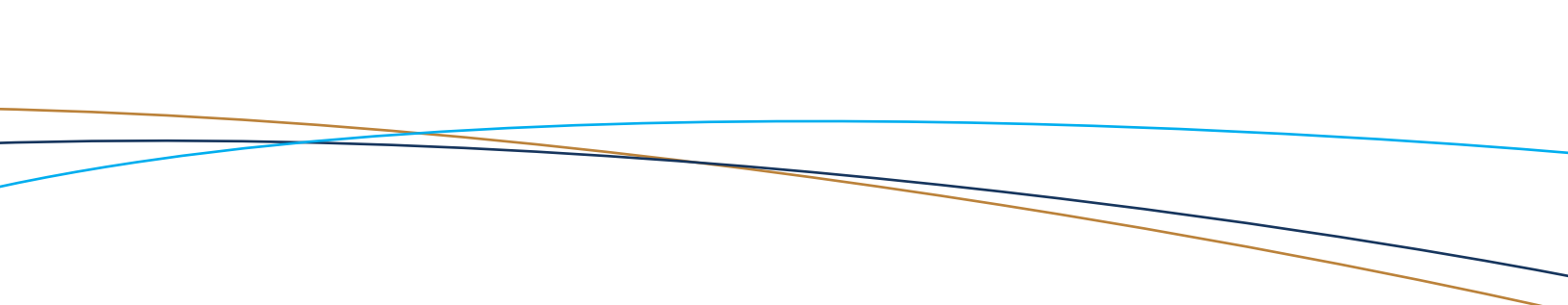
In November 2014, AEMERA introduced an information-sharing platform AEMERIS (Alberta Environmental Monitoring, Evaluation and Reporting Information Service) to provide access to data on key ambient air, water, land and biodiversity indicators and related environmental information. Built on an existing platform created for environmental reporting in the oil sands region, AEMERIS is designed to bring together current province-wide environmental data and allow users to access information in a variety of ways, i.e., by medium (air, water, land, biodiversity), and geographically within a provincial regional land use planning context. AEMERIS also allows users to access real-time data from provincial monitoring stations presented in relation to specific indicators.

Data and information collected as part of the JOSM program by all participants including government are also available on the JOSM web portal or via original data sources such as the websites of respective organizations. Links to JOSM data are provided below:

- Canada-Alberta Oil Sands Environmental Monitoring Information Portal: <http://www.jointoilsandsmonitoring.ca>
- AEMERA Portal: <http://aemeris.aemera.org>
- CASA Data Warehouse: www.casadata.org
- Wood Buffalo Environmental Association: www.wbea.org
- Lakeland and Industry Community Association: www.lica.ca
- Former RAMP: <http://www.ramp-alberta.org/ramp/data.aspx??>
- ABMI: <http://www.abmi.ca/abmi/home/home.jsp>

Highlights of commitment on transparent and accessible results:

- AEMERA information Management System portal launched; and
- Air QA/QC Guidance Document produced.



As part of ensuring that JOSM air data are collected according to prescribed standards, a comprehensive inventory of Monitoring Standards and Protocols was established (see <http://aemera.org/current-activities/albertas-oil-sands/standards-and-protocols.aspx>) using information collected from EC, ESRD/AEMERA and regional monitoring organizations.

Collective monitoring activities in year three (2014–2015) contributed further to ensuring openness and transparency through the timely provision of accessible, comparable and quality-assured data.

3. Summary and Next Steps

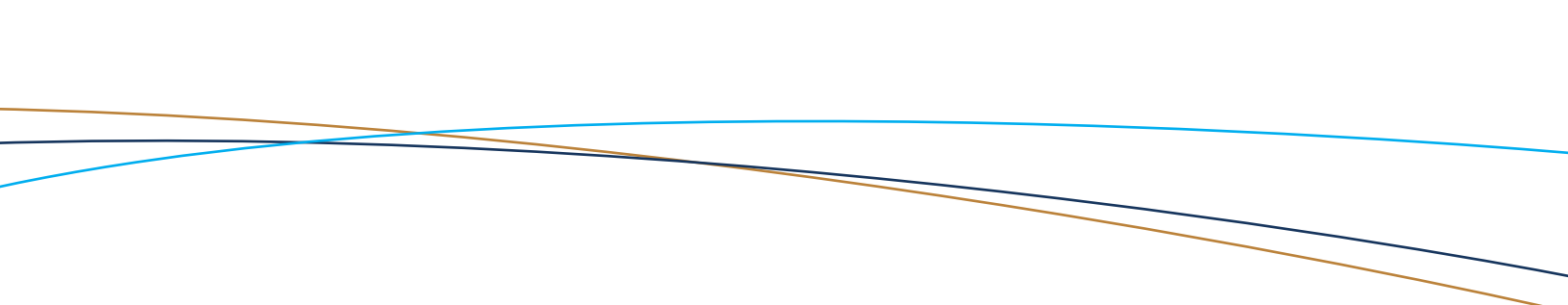
The governments of Alberta and Canada have worked together over the past three years (2012–2015) to implement a phased and adaptive monitoring program for the oil sands region. Both governments made commitments intended to improve characterization of the state of the environment and to generate information to enhance understanding of the cumulative effects of development activities in the oil sands area.

The Joint Canada/Alberta Implementation Plan for Joint Oil Sands Monitoring (Implementation Plan) was designed to strengthen scientific understanding of potential environmental and cumulative effect impacts of oil sands development, and to help guide effective and responsible management of this resource. In addition to the resources committed by both governments to environmental monitoring in the oil sands area, Canada and Alberta also worked with the oil sands industry through the Canadian Association of Petroleum Producers to ensure continued funding support for the monitoring program of up to \$50-million annually. The governments have reported publicly on administering this funding for each year of the Implementation Plan.

Year three (2014–2015) is the final year of the Joint Canada/Alberta Implementation Plan for Oil Sands Monitoring. Enhancements to the environmental monitoring system were made as outlined in the Implementation Plan; processes and governance structures as well as funding mechanisms to support oil sands monitoring were established.

Monitoring activities for year three (2014–2015) have been completed and evaluation of the data collected is in progress. It is expected that the annual results report for 2014–2015 will be released in the fall of 2015.

Both Canada and Alberta committed to an independent expert peer review of the monitoring system for scientific integrity after year three of the Implementation Plan. A panel of world-renowned science experts tasked with this commitment has been constituted and the review process is currently underway. The panel's report is expected in the fall of 2015.



Both governments also committed to an internal review of the scope, the operations and the cost of the monitoring program. Over the past three years (2012–2015), the scope, operations and cost of the monitoring program have been jointly reviewed by the two governments as part of the annual planning process to ensure the monitoring program remains as cost effective and efficient as possible.

In December 2013, the Government of Alberta passed the Protecting Alberta's Environment Act creating the Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA). Since its creation, AEMERA has taken over the responsibility for oil sands monitoring on behalf of the Government of Alberta. As the three-year Implementation Plan reached its conclusion on March 31, 2015, AEMERA and Environment Canada have been actively engaged in discussions focused on defining a new federal-provincial relationship going forward. AEMERA through its Board has acknowledged the contributions of all of its oil sands monitoring partners, in particular the scientific contributions made by the Government of Canada through Environment Canada to oil sands monitoring work.

The Office of the Auditor General of Alberta conducted an audit of joint oil sands monitoring in year three to assess whether Alberta met the commitments made in the Implementation Plan. The findings of the audit and recommendations to AEMERA are documented in the audit report released (Report of the Auditor General of Alberta) in October 2014. AEMERA is committed to addressing the Auditor General's recommendations. The Office of the Auditor General of Canada also conducted an audit released in the 2014 Fall Report of the Commissioner of Environment and Sustainable Development (CESD). Environment Canada is committed to addressing the CESD recommendations.

The 2014–2015 work planning process was informed by a review of existing monitoring work, including current long-term monitoring to establish trends, focused studies, new and emerging priorities, and input received through the multi-stakeholder meetings held in June and November 2014. The outcome of this planning process was the 2015–2016 monitoring work plan, which was approved for implementation by the AEMERA Board in December 2014 and February 2015.

Aboriginal and stakeholder participation continue to be a vital part of oil sands monitoring. AEMERA's Aboriginal program will focus on enhancing relationships with First Nations and Métis organizations to ensure that oil sands monitoring activities effectively respond to their interests and concerns, and identifying ways and means of encouraging sustained Aboriginal participation and facilitating the inclusion of TEK in environmental monitoring programs. Aboriginal peoples and oil sands-related stakeholders will continue to receive information and be provided with opportunities for input into oil sands monitoring activities.

AEMERA and Environment Canada remain committed to working together to achieve a scientifically rigorous, comprehensive and integrated system of environmental monitoring in the oil sands region.



4. Appendices

- A. [2014–2015 JOSM Allocations and Expenditure](#)
- B. [JOSM Annual Work Plan for 2014–2015](#)
- C. [Oil Sands Monitoring Symposium – Participants by Sector](#)
- D. [Joint Canada/Alberta Implementation Plan for Oil Sands Monitoring Data and Results Sharing and Release Principles and Protocols](#)



5. References

Environment Canada and Alberta Environment and Sustainable Resource Development. 2012. *Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring*. Government of Canada, Gatineau, QC, Canada, 27 p.

Environment Canada and Alberta Environment and Sustainable Resource Development. 2013. *Multi-stakeholder Component Advisory Committees Terms of Reference (Approved and adopted by co-Chairs as of May 31st, 2013)*.

Environment Canada and Alberta Environment and Sustainable Resource Development. 2013. *Joint Canada/Alberta Implementation Plan for Oil Sands Monitoring Data and Results Sharing and Release Principles and Protocols*.

Environment Canada and Alberta Environment and Sustainable Resource Development. 2013. *Joint Canada-Alberta Implementation Plan for Oil Sands Monitoring — Charter*.

6. Acronyms

ABMI	Alberta Biodiversity Monitoring Institute
AEMERA	Alberta Environmental Monitoring, Evaluation and Reporting Agency
AEMERIS	Alberta Environmental Monitoring, Evaluation and Reporting Information Service
AG	Auditor General
CAC	Component Advisory Committees
CAPP	Canadian Association of Petroleum Producers
CASA	Clean Air Strategic Alliance
CBM	Community Based Monitoring
EC	Environment Canada
EPEA	Environmental Protection and Enhancement Act
ESRD	Environment and Sustainable Resources Development
JOSM	Joint Oil Sands Monitoring
LICA	Lakeland Industry and Community Association
NWT	North West Territories
OAG	Office of the Auditor General
OSM	Oil Sands Monitoring
RAMP	Regional Aquatics Monitoring Program
SOP	Standard operating protocols
TEK	Traditional Ecological Knowledge
TWG	Transition Working Group
WBEA	Wood Buffalo Environmental Association

7. Technical Annex

Monitoring activities implemented for year three (2014–2015) are categorised into the following components: air, water, biodiversity and wildlife health. A summary of the results of work done in the third implementation year to monitor the impacts of oil sands activities in the region is presented in this section.

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Table 1 – Air Quality Implementation Plan Activities (p. 17 in the original plan)		
Element – Ambient Air Quality		
Ambient Air Monitoring	Continuation and expansion of ambient monitoring network, consistent with the Integrated Monitoring Plan	2014–2015 commitment met. <ul style="list-style-type: none"> • Wood Buffalo airshed: <ul style="list-style-type: none"> - Time integrated polycyclic aromatic hydrocarbon (PAH), volatile organic compound (VOC) and particulate matter (PM) data collected in accordance with sampling schedule - All quality assured continuous air monitoring data was uploaded to the CASA Data Warehouse by March 31, 2015 - Time integrated data to the end of December 2013 available on WBEA web site - Upper air wind profiler installed at Wapasu station - Suncor Firebag station commissioned • Cold Lake airshed: <ul style="list-style-type: none"> - Operated Cold Lake South, Maskwa, St. Lina, and PAMS continuous monitoring stations - Installed and operated AEMERA reference PM monitor at Cold Lake station - Operated 26 passive monitoring stations (SO₂, NO₂, O₃ and H₂S) - Operated integrated VOC and PAH sampling equipment at Cold Lake South and PAMS - Integrated VOC and PAH data available on LICA web site

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Fixed Platforms	Installation of three additional ecosystem, transformation and deposition sites in and around the oil sands area. Continuation of measurements at four existing sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Installed three new downwind ecosystem sites in the Northwest Territories (Wood Buffalo National Park) and Saskatchewan (Pinehouse Lake and Flat Valley), to add to the Island Falls, Saskatchewan site that has been operational since 2012 • Commenced measurements at a downwind site in the Northwest Territories (Wood Buffalo National Park) and Saskatchewan (Pinehouse Lake). Measurements will commence at Flat Valley, Sask., in 2015–2016 • Continued enhanced monitoring of BTEX (benzene, toluene, ethylbenzene and xylenes) at AMS 1 (Bertha Ganter), total gaseous mercury (TGM) at AMS 6 (Patricia McInnes), TGM and speciated mercury at AMS 13 (Fort McKay South). TGM monitoring at AMS 11 (Lower Camp) was stopped in April 2014
	Development of oil sands upwind site	2014–2015 commitment met. <ul style="list-style-type: none"> • Constructed and installed monitoring infrastructure at one upwind site at Jossard Alberta. Measurements will commence in 2015–2016
Monitoring Pollutant Transformation	Continue seasonal studies on pollutant transformation	2014–2015 commitment met. <ul style="list-style-type: none"> • 2013 data acquired from ground-based and airborne summer intensive monitoring campaign underwent quality assurance/quality control. Ongoing monitoring is occurring at a ground-based site (Fort McKay, Oski-ôtin) • Integrating results to understand the emissions, transformation and transport of air pollutants in the oil sands region • Monitoring methods for sulphur compounds are being compared to inform and improve monitoring methods
Remote Sensing and Modelling	Use remote sensing to produce maps of additional pollutants; use models to produce high-resolution air pollutant maps	2014–2015 commitment met. <ul style="list-style-type: none"> • Generated maps of satellite-derived nitrogen dioxide (NO₂) and sulphur dioxide (SO₂) surface concentration over the oil sands region during the period of 2005 to 2014. Updated trend maps in satellite-measured NO₂ and SO₂ to the end of 2014. Created preliminary satellite-based maps of surface deposition fluxes of NO₂ and SO₂ • Conducted a survey of satellite-based measurements of ammonia (NH₃) over the oil sands • Produced images from two Environment Canada autonomous aerosol LiDAR systems; subsequent analysis is ongoing • Analysis of lichen PAC concentrations completed and receptor modeling attributing concentrations to source types completed. Draft report submitted March 31st • The Alberta Advanced Air LiDAR was deployed at Suncor and Syncrude sites

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Focused Studies	Studies on odours, degraded visibility, tree rings and fingerprinting data from oil sands-specific sources	2014–2015 commitment met. <ul style="list-style-type: none"> • Odour monitoring conducted for volatile organic compounds, total reduced sulphur and hydrocarbons completed with WBEA analyzers and PFGC <ul style="list-style-type: none"> - E-nose operated successfully - Human Exposure Monitoring Program (HEMP) portable station continued to collect data at Mildred Lake - Fort McMurray Community Odour Monitoring Program (COMP) met deliverables and report produced - Data integration report produced for 2014 data • Regional network assessment underway with final report due on June 30, 2015, for 2014 data • Deployment of open path FTIR at Fort McKay to support the odours monitoring program
Element – Source Emissions Monitoring		
Emissions Inventories	Identify gaps in emissions inventories and begin to address information needs	2014–2015 commitment met. <ul style="list-style-type: none"> • Assessed priority data gaps and developed best estimates for these emissions sources using available information to improve the emissions inventory for air quality modeling over the oil sands region • Compiled emissions data into an accessible database • Developed Access database and database documentation for emission inventory
Point Sources (Stacks and Fugitive)	Obtain additional point source data to develop/validate emission factors	Commitment met in 2013–2014.
	Additional monitoring to address gaps in emissions inventories	Commitment met in 2013–2014.
Tailings Ponds	Continuation of studies on tailings ponds emissions	2014–2015 commitment partially met. <ul style="list-style-type: none"> • Used information obtained from the summer 2013 intensive airborne campaign to advance work towards this commitment • Eddy covariance technique was used to quantify fugitive emission fluxes of methane (CH₄) and carbon dioxide (CO₂) from one oil sands tailings pond from June 5 to 18, 2014. Technical report prepared. Originally, three tailings ponds were proposed for monitoring. Industry would not allow site access, citing safety concerns • Tested and refined remote data connectivity of the Autonomous Mobile Platform for its deployment in tailings pond monitoring

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Mobile and Area Sources	On-board measurement on buses	<ul style="list-style-type: none"> • Work was postponed for 2014–2015 – Pending further discussion • Activity not approved for 2014–2015
	Development of emissions factors for heavy haulers	<ul style="list-style-type: none"> • Work was postponed for 2014–2015 – Pending further discussion • Activity not approved for 2014–2015
Element – Deposition		
Ecosystem Exposure	Measurement of pollutants in ecosystem settings to determine deposition and exposure. Link to wildlife monitoring in Table 3 below	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued measuring air concentrations of polycyclic aromatic compounds (PACs) using passive samplers at 16 sites across the oil sands region to determine deposition and exposure
	Measurement of dry deposition flux	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued developing an approach to estimate dry and wet deposition of polycyclic aromatic compounds using air concentration measurements
Forest Critical Loads	Improve forest critical load exceedance maps	2014–2015 commitment met. <ul style="list-style-type: none"> • Improved forest critical load exceedance maps by collecting and analyzing soil samples, and analysing existing vegetation and soils data sets • Additional Environment Canada work not funded by JOSM • Upgraded critical load models and updated Canada-wide critical loads • Continued operation of a critical load science facility at Trent University
Enhanced Deposition	Continue measurement of polycyclic aromatic compounds and particulate metals at three sites. Add two additional sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued measurement of polycyclic aromatic compounds and particulate metals at three pilot sites (Mannix, AMS 5; Lower Camp, AMS 11; Fort McKay South, AMS 13), using active sampling techniques. Measurements at Fort McKay South were discontinued part-way through 2014. First 1.5 years of high-volume polycyclic aromatic compounds and particulate metals data from the three pilot sites went through quality assurance/quality control processes • Four new sites (Wapasu Creek, AMS 17; Bertha Ganter – Fort McKay, AMS 1; Conklin, AMS 8; and Buffalo Viewpoint, AMS 4) are being prepared and samplers have been deployed at one of the four new sites • Full implementation of Conklin and Buffalo Viewpoint sites delayed due to permitting issues

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Deposition Modeling	Deposition modelling using most recent data	2014–2015 commitment met. <ul style="list-style-type: none"> • Improved and updated the emissions information used to run the air quality model in several ways • Updated the high resolution air quality model (GEM-MACH) to improve capabilities for modelling a range of pollutants. Model output compared with observations from the summer 2013 campaign • Used the model to generate animations of nitrogen and sulphur deposition and Air Quality Health Index (AQHI) values for the oil sands domain
Deposition Monitoring	Existing airshed monitoring	<ul style="list-style-type: none"> • Wood Buffalo airshed: <ul style="list-style-type: none"> - Operated dry deposition denuders at four sites and data collected - Forest Health Report completed - Routine passive sampling collections completed at 30 ecosystem-based passive towers - Chemical analysis and data interpretation ongoing for IER (Ion Exchange Resins) deposition measurements - Analysis of berry health-promoting constituents completed - Analysis of remotely collected, continuous ozone data completed for three sites • Cold Lake airshed: <ul style="list-style-type: none"> - All laboratory and field work completed for soil acidification monitoring program at the Moose Lake PP site - All laboratory and field work completed for acid sensitive lake monitoring program at selected lakes. Report completed and on LICA web site
Element – Crosscutting		
QA/QC – Air Short Term Study	Standards and QA/QC work were carried out to support the commitments in the implementation plan	2014–2015 commitment met. <ul style="list-style-type: none"> • An inventory of Monitoring Standards and Protocols for air, water and biodiversity was established. The relevant information was collected from EC, ESRD/AEMERA and monitoring organizations

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Table 2 – Water Implementation Plan Activities (p. 19 in the original plan)		
Element – Surface Water Quality/Surface Water Quantity/Sediment		
Mainstem Water Quality	Increase sampling frequency to monthly at specific sites; initiate sampling in the Peace Athabasca Delta (PAD)	2014–2015 commitment met. <ul style="list-style-type: none"> • Increased sampling frequency from quarterly to monthly • Continued monthly sampling at two sites • Continued quarterly sampling at one site • Took a total of 229 water quality samples at five sites. Semi-permeable membrane devices and suspended sediment sampling devices were deployed at four sites • Available data can be accessed through Canada-Alberta Oil Sands Environmental Monitoring Information Portal
	Continue and increase comparability studies and laboratory round-robin	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued to collect data at key co-located monitoring sites to support data comparability studies between Alberta and EC for long-term monitoring
	Continue to implement items identified in year 1; phase in monitoring of additional sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Implemented additional water quality monitoring on the west bank to support assessment of comparability with panel sampling conducted by EC • Added an additional centre channel station, as per implementation plan • Continued monitoring at two stations downstream of oil sands development, on a seasonal basis
Tributary Water Quality	Continue Benthos/CABIN and fish work supporting water quality	2014–2015 commitment met. <ul style="list-style-type: none"> • Water quality sampling in support of benthos program taken at 66 tributary sites in fall • Completed water quality sampling at all tributary benthic/fish reaches (34 stations), and 9 benthic lake stations
	Implementation of remaining upstream and headwater tributary sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Initiated monthly sampling in Wapasu Creek, Steepbank River, Clearwater River and Christina River • Completed water quality sampling at 15 stations
Expanded Geographic Extent (Peace Athabasca Delta; Slave River; Lake Athabasca)	Implementation of up to 10 additional sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Collected 178 water quality samples at the 12 sites in the expanded geographic area • Deployed semi-permeable membrane devices at six locations within the EGA throughout the year • Deployed automated water quality samplers were deployed at two sites

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Event-based Sampling	Continue monitoring program as established	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> Implemented event-based water quality monitoring to better characterize water quality conditions associated with significant hydrological events (e.g., snowmelt, large magnitude rainfall/runoff events) Transitioned from daily to bi-daily to bi-weekly to weekly sampling during the spring freshet periods at 14 sites on the Steepbank, Ells, Firebag, Muskeg, High Hills and MacKay rivers. The High Hills was added as a reference site Ongoing post-freshet monthly water quality sampling at all 14 tributary sites Maintained continuous, real-time measurements of pH, dissolved oxygen, temperature, specific conductivity, and turbidity at 14 sites in the Steepbank, Firebag, MacKay, Muskeg, High Hills and Ells rivers (listed above) Installed a network of water quality auto-samplers at six sites in the Mackay, Steepbank and Ells rivers to capture water quality changes during high rainfall and runoff events
Passive Sampler Program	Increase number of sites to full implementation and increase sampling frequency	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> Increased number of sites and sampling frequency Continued monthly deployments at five sites, and Slave and Peace rivers Implemented monthly sampling and method development continued
Groundwater Quality	Continue monitoring program as per Baseline year. Baseline year–Groundwater assessment proximate to Suncor Pond 1 (~80 sample stations) and Muskeg and Athabasca River proximate to Shell’s Tailings Area (~20 sample stations)	<p>Commitment met in 2013–2014.</p> <ul style="list-style-type: none"> Data and publication to be release in 2015–2016 fiscal year
	Surface groundwater interactions (Steepbank, Ells, Firebag, Muskeg, Mackay)	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> Tested various methods on the MacKay developed in 2013/14/15 and to quantify/constrain groundwater input to the river and identify critical locations for potential monitoring in future
Water Quantity	Mainstem: Consider new hydromet station at a key location to be determined	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> Installed New WSC Hydromet station (proximate to the original station that had been discontinued at Embarras). This permanent installation replaced the temporary station at Embarras Airport established in 2011
	Tributary sites and Expanded Geographical Extent: add additional tributary hydromet measurement coincident with water quality monitoring sites, as per the Integrated Monitoring Plan	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> Added one additional discharge monitoring station on the Steepbank River downstream of the North Steepbank River

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
River Ice Monitoring	Implement up to eight more sites on the Athabasca mainstem; increase monitoring frequency	2014–2015 commitment met. <ul style="list-style-type: none"> • In support of modelling ice dynamics, 10 new pressure transducers were installed at strategic locations along the Athabasca mainstem. Measurements to inform numerical modelling • Installed water level loggers and time lapse cameras prior to ice breakup at multiple locations along the Athabasca River were retrieved and elevations determined • Surveyed additional cross sections and bed material composition
Sediments	Benthos/CABIN and fish work to generate supporting sediment quality data	2014–2015 commitment met. <ul style="list-style-type: none"> • Sampled for bed sediment quality data at key benthic sites referenced below • Suspended sediment quality collected for four sites on Steepbank and three sites on Ells Rivers • Continued sediment quality sampling at all depositional historical benthic reaches (24 stations), 9 lakes (Gardiner, Kearn, Namur, Gregoire, McClelland, Christina, Johnson, Shipyard, Isadore's lakes), and four channels of the Athabasca River Delta (Fletcher, Big Point, Goose Island channels, Embarras River)
	New mainstem hydromet station indicated to collect sediment samples	2014–2015 commitment met. <ul style="list-style-type: none"> • Sediment sampling under implementation phase at the new WSC Hydromet station installed Fall 2014
	Continue mainstem historic method sediment sampling. Expand sediment sampling at mainstem sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Historical method of sediment sampling was determined to be no longer an option. • Continued bulk sediment sampling at mainstem sites
	Full scope of sampling of sediment cores from small lakes implemented	2014–2015 commitment met. <ul style="list-style-type: none"> • Sampled full scope of sediment cores from small lakes within 100 km of the AR6 site for paleo-analyses

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
	Process-based sediment monitoring in mainstem/tribs; implement remaining sites	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> • Continued process-based sediment monitoring in mainstem and tributaries of the Athabasca River • Completed Bulk Suspended Sediment Collection <ul style="list-style-type: none"> - Centrifuged for sediment quality and sediment physical characteristics - Collected large volume bed sediment (100 kg) and water (1000 L) from the Steepbank River within an area of benthic effects monitoring • Completed suspended sediment sampling <ul style="list-style-type: none"> - Winter only (under ice) on Mainstem - Tributaries [Ells (3) and Steepbank (4)] (time integration monthly) - Mainstem (time integrated monthly open water only) • Continued time-integrated suspended sediment sampling comparison study towards informing future monitoring program • Bathymetry data collection completed (data currently being uploaded to OS Data Portal – Fort McMurray to Old Fort) • Constructed sediment rating curves for Athabasca and tributaries of suspended loads to use as boundary conditions in sediment transport model
	Regional hydrology and hydrological/hydraulic modelling; hydro-climatology; hydrological/hydraulic modelling; river ice dynamics	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> • Performed hydro-climate data extraction and analysis over the Athabasca watershed for first estimates of water availability • Coupled hydrological and hydraulic models to identify water availability indicators. Performed hydrologic simulations corresponding to climate variability over the Athabasca watershed • Quantified the occurrence and atmospheric causes of historical and projected future hydro-climatic variability and extremes; the controlling synoptic-scale atmospheric circulation patterns associated with these extremes have been identified • Produced prototype 1D model of contaminant/sediment transport for the Athabasca River • Produced prototype 2D model of main channel above and below the Steepbank River confluence (approx 20 km reach) • Assessed Muskeg River climate and land use change scenarios on water levels (informing IFN) • Advanced study of river-ice/sediment dynamics associated with spring river-ice breakup • Advanced common Alberta/EC water quality modelling platform (EFDC) for lower Athabasca River

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
	Monitoring sediment dynamics/transport/chemistry – tributaries; sediment monitoring at M3; river sediment quality sampling and analysis - captured in the aquatic ecosystem health	2014–2015 commitment met. <ul style="list-style-type: none"> • Completed sediment dynamic modelling of Ells River and Steepbank River initiated • Completed 5m annular flume runs (Steepbank River) to provide erosional and depositional algorithms for sediment transport models • Analyzed six sediment cores for lead-210 dating, polycyclic aromatic compounds, organic carbon, chlorophyll, mercury, 45 other metals and other elements • Sediment monitoring as part of overall sediment dynamics monitoring program
Element – Benthic Invertebrates		
Mainstem	Mainstem – continue all sites	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued collecting benthic macroinvertebrate and algal assemblages at 11 reaches (21 sites) along the Athabasca River (see sites with “biomonitoring station” in title) • Collected samples for comparison of Athabasca River zoobenthos sampling methods • Collected samples (water quality, sediment chemistry, chlorophyll a) supporting the biomonitoring activity at all sites • Collected dragonfly nymphs for mercury bioaccumulation at all sites • Continued assessment of spatial and temporal trends of the mainstem Athabasca River benthos
Tributaries	Implement up to 30 additional sites focusing on enhanced coverage of reference locations	2014–2015 commitment met. <ul style="list-style-type: none"> • Collected benthic macroinvertebrate, algal assemblages and measurements of habitat characteristics (eg, substrate, velocity) at 66 reaches in tributaries of the Athabasca River and in the EGA (Birch Hills). Samples collected with two mesh sizes (400 and 250 um) for comparison to historic sampling approaches • Continued sampling at all sites for water quality, sediment chemistry, chlorophyll a to support the biomonitoring activity • Continued collecting dragonfly or stonefly nymphs for mercury bioaccumulation at all sites • Continued assessment of spatial and temporal trends of the tributary benthos communities • Additional benthic invertebrate monitoring implemented on the Gregoire River • Continued benthic invertebrate sampling at RAMP historical tributary reaches (36) and 9 lake stations (Gardiner, Kearl, Namur, Gregoire, McClelland, Christina, Johnson, Shipyard, Isadore’s lakes) - by Health Canada

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Deltaic Ecosystem Health	Biota/water quality/sediments: complete implementation of all sites as per Implementation Plan at the increased sample frequency	2014–2015 commitment met. <ul style="list-style-type: none"> • Completed sampling of 25 sites on the Peace, Athabasca and Birch Deltas and five additional sites in the Slave River Drainage area • Collected samples for biomonitoring including benthos, water and soil for DNA analysis and benthos for standard CABIN analysis • Initiated sampling of dragonfly larvae for mercury analysis • Monitored wetland water level and temperature in the original 12 sites
Element – Snow/Wet Precipitation (Acid Deposition to Acid-Sensitive Lakes and Snowpack)		
Snow and Atmospheric Deposition	All snow sites continue monitoring	2014–2015 commitment met. <ul style="list-style-type: none"> • Analyzed approximately 160 snow samples for unfiltered and filtered mercury, methylmercury, water chemistry, and multi elements. Samples for polycyclic aromatic compounds analysis were extracted and will be analyzed this year • Additions/improvements in sampling design resulted in collection of snow at numerous sites ranging from 75–200 km from major developments to more accurately determine background and improve deposition mapping • Additionally, continued historical snow course survey (in four areas) in winter of 2014 and 2015
	Wet precipitation sites co-located with three WBEA sites: ongoing	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued ongoing monitoring of wet precipitation for PAHs and metals • Preliminary analysis and interpretation of polycyclic aromatic hydrocarbons and metals data in 2014–2015
Element – Fish Health/Toxicology/Contaminant		
Wild Fish Health	Mainstem: all sites fully implemented by Year 2	2014–2015 commitment met. <ul style="list-style-type: none"> • Sampled five Athabasca River mainstem sites in early fall for fish contaminant analysis (white sucker and walleye). Sites located upstream and downstream of Athabasca, Poacher’s landing, and Northlands • Sampled nine Athabasca River mainstem sites in the fall for fish health in the small-bodied (trout perch) sentinel fish species. Sites include Athabasca, Poacher’s landing, Water treatment plant Fort McMurray, Northlands, Muskeg River, Ells River • Continued fish tissue survey of white sucker and walleye on the Athabasca River, Poacher’s landing, Northlands. Fish tissues analysis is ongoing
	Tributaries: all sites fully implemented by Year 3	2014–2015 commitment met. <ul style="list-style-type: none"> • Sampled 15 tributary sites for small-bodied fish (slimy sculpin, longnose dace, lake chub) in the MacKay, Steepbank, Ells, Dover, Firebag, High Hills, Horse, Dunkirk and Alice rivers

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Wild Fish Communities/ Species Diversity	Mainstem: all sites fully implemented at existing frequency	2014–2015 commitment met. <ul style="list-style-type: none"> Continued seasonal fish inventory surveys at 14 reaches on the Athabasca River and three reaches on the Clearwater River. Modifications in fishing effort and timing of sampling due to restrictions outlined in the AESRD fish research licence (FRL) on fishing during spawning seasons
	Tributaries: all sites fully implemented at existing frequency	2014–2015 commitment met. <ul style="list-style-type: none"> Continued fish community surveys at 34 historical tributary reaches where water quality and benthos sampling were conducted
Fish Toxicology	Tributaries – sampling program to continue	2014–2015 commitment met. <ul style="list-style-type: none"> Sampled 16 tributary sites for sediments. Fish exposures in the lab will be done in 2015–2016. Data analyses continue
	Snow – current snow sites	2014–2015 commitment met. <ul style="list-style-type: none"> Collected eight samples from freshet: Steepbank Mid and Lower and Ells Mid and Lower. Samples assessed for effects in embryo-larval fathead minnows. Data analyses continue
	Ponds – ponds, seeps and groundwater to be determined	2014–2015 commitment met. <ul style="list-style-type: none"> Collected four groundwater samples close to and far from oil sands tailings ponds. Fish exposures in the lab will be done in 2015–2016. Data analyses continues
Riverine In-situ Bioassays	Continue sampling program	2014–2015 commitment met. <ul style="list-style-type: none"> Caged Mussels for four weeks at six sites on the Athabasca River or tributaries Caged Hyalella for two weeks at six sites on tributaries of the Athabasca River
Lake Health (Fish/Invertebrates)	Continue sampling program	2014–2015 commitment met. <ul style="list-style-type: none"> Benthic invertebrate monitoring implemented in Gregoire, Gardiner and Namur Lakes. However, ESRD was not able to provide fish tissue samples to Hatfield from lakes selected for their FWIN program, for mercury testing

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Element – Acid-Sensitive Lakes		
Acid-Sensitive Lakes	300 sites or more	2014–2015 commitment met. <ul style="list-style-type: none"> • Assessed nearly 350 regional lakes (Level 1 lakes) sampled in 2012–2013 augmented with information collected from nearly 600 other regional lakes prior to JOSM, informed selection of a representative sub-set of the regional lakes (51 lakes) to be monitored annually with greater intensity. These 51 lakes were sampled in 2014–2015 • The regional network of nearly 350 lakes was not sampled in 2014–2015. As per the acid sensitive lakes monitoring plan, the monitoring of the large regional network is only repeated every 5 to 10 years
	Align work under RAMP with results from assessment and lake surveys	2014–2015 commitment met. <ul style="list-style-type: none"> • Added 22 former RAMP lakes to the JOSM network of acid-sensitive lakes • Sampled 45 lakes (5 lakes were removed from the historical RAMP program)
	Conduct additional tiered samples of lake systems as informed by previous years' status and trends analysis	2014–2015 commitment met. <ul style="list-style-type: none"> • Sampled the 51 lakes identified in Alberta, Saskatchewan and the southern Northwest Territories for more intensive monitoring (Level 2 lakes) in spring (after the lakes had cleared of ice), and again in fall (prior to lake freeze-up) • Continued baseline characterization and paleo-ecological analyses of acid sensitive lakes • Selected three new lake sites for intensive/extensive investigations of lake ecosystems (Level 3 lakes) in Saskatchewan and evaluation continued of candidate lakes in Alberta. Instrumentation of selected lakes was initiated
Element – Focused/Site-specific Assessments		
Representative Sub-basin Studies (REPS)	Examine other potential REPS candidates; ongoing analyses/sampling	2014–2015 commitment met. <ul style="list-style-type: none"> • Established eight REPS sites: four on the Steepbank, three on the Ells, and one river reach of the Athabasca Mainstem below Fort McMurray • Measured (sediment transport/dynamics, fish and invertebrate health, water quality parameters, water quantity [flows], sediment quality parameters, in-situ toxicology, etc.) at identified locations • Archived benthic invertebrate samples from the REPS project were analysed
Mainstem – Paired Buoys	Continue buoy deployment during open-water season. Add future instrumentation as feasible	2014–2015 commitment met. <ul style="list-style-type: none"> • Near-real time monitoring established using a Pontoon for In-Situ Characterization of Environmental Systems (PISCES) • Continued collecting environmental data using YSI 6600 sondes deployed for monthly rotations in stand-alone application at two sites in the expanded geographic area

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Table 3 – Wildlife Contaminants and Toxicology Monitoring Program Implementation Plan Activities (p. 23 in the original plan)		
Element – Wild Bird Health and Contaminants		
Colonial Water Bird Health and Contaminants	Gulls and Terns: eggs collected at least at the following locations: Rocky Point (WBNP), Mamawi Lake (WBNP) and Egg Island (Lake Athabasca)	2014–2015 commitment met. <ul style="list-style-type: none"> Collected and analyzed eggs from Egg Island (Lake Athabasca) and from Mamawi Lake in Wood Buffalo National Park. Additional eggs were collected from 4 more JOSM sites and obtained from 10 other sites where other science activities were being conducted. Prey fish were collected near colonial waterbird nesting sites in the Peace Athabasca Delta
Insectivorous Bird Health and Contaminants	Swallows: eggs collected at least at the following locations: N and S of Fort MacKay, N and S of Fort McMurray (reference)	Not part of 2014–2015 work plan. <ul style="list-style-type: none"> Reconnaissance work had highlighted a number of scientific, logistical and safety challenges with respect to the successful collection of an adequate number of samples
Element – Amphibian Health/Toxicology/Contaminants		
Wild Amphibian Health Contaminants	Amphibian samples collected from ponds in the Fort McMurray area and from ponds over an expanded geographical area at increasing distances from Fort McMurray with continued monitoring at two sites in NWT and various sites in Alberta (up to 40 ponds)	2014–2015 commitment met. <ul style="list-style-type: none"> Analyzed water and amphibian tissue samples for contaminants from 18 wetland sites. Passive sampling devices were used to monitor PAHs at 9 wetland sites over the course of the spring/summer. Completed reconnaissance for new amphibian breeding sites suitable for long-term monitoring
Amphibian Laboratory Exposures and Effects	Assessing impacts of water quality on amphibians using pond water, snow melt, and <i>in situ</i> exposures	2014–2015 commitment met. <ul style="list-style-type: none"> Ongoing assessment and analysis of impacts on amphibians exposed in the laboratory to wetland sediments collected from the oil sands region in 2013
Element – Bird Health and Toxicology		
Laboratory Exposure and Effects – Air Emissions	Exposures of laboratory birds to VOCs and SO ₂	2014–2015 commitment met.
Field Exposure and Effects – Air Emissions/PAHs	Nest boxes installed radially around three processing plants and in reference location	2014–2015 commitment met. <ul style="list-style-type: none"> Completed laboratory analysis for field collected samples from 2012 and 2013 A limited amount of field work was planned and completed for this project in 2014–2015

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Element – Wild Bird and Hunter/Trapper Harvested Wildlife Toxicology and Contaminants		
Dead and Moribund Bird Contaminants and Toxicology	Birds collected from tailings ponds near Fort McMurray (event-based)	2014–2015 commitment met. <ul style="list-style-type: none"> Collected 28 waterfowl carcasses (mallards, common goldeneyes, green-winged teal)
Hunter/Trapper Harvested Wildlife Contaminants and Toxicology	Mallards, otters harvested/trapped at locations in NWT and northern Alberta. Target sample of 20 animals at each location and up to 100 mallards and 60 otters processed for contaminants and toxicology	2014–2015 commitment met. <ul style="list-style-type: none"> Obtained American marten, fisher, Canada lynx, river otter, muskrat, and mink carcasses from local hunters and trappers. 18 pre-fledged mallards were obtained from the Peace-Athabasca Delta, near Fort McKay and Lac La Biche
Element – Plant Health and Contaminants		
Laboratory Phytotoxicity and Contaminants	Greenhouse exposures to NA_2SO_4 , and naphthenic acids	2014–2015 commitment met. <ul style="list-style-type: none"> Analyzed soil and plant samples for contaminants following greenhouse exposures Initiated seedbank germination study
Field Vegetation Assessment/Contaminants	Vegetation assessments undertaken at up to 10 sites in NWT, northern Alberta and Saskatchewan, including along the Athabasca River and in reference sites	2014–2015 commitment met. <ul style="list-style-type: none"> Completed vegetation surveys at 10 sites in the oil sands region Collected soil and plant parts for contaminant analysis Collected soil for seedbank germination study

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Table 4 – Biodiversity and Land Disturbance Monitoring Implementation Plan Activities (p. 25 in the original plan)		
Element – Core Terrestrial Biodiversity Monitoring		
	Fully implemented biodiversity program across 20x20km regularized grid with site visits every 5 years. Fully monitored area includes 3 oil sands areas (Athabasca, Cold Lake, and Peace) and all areas within the Lower Athabasca regional planning area (up to 90-100 sites/yr.)	<p>2014–2015 commitment partially met.</p> <ul style="list-style-type: none"> • ABMI terrestrial and wetland protocols were completed at 77 sites in the 3 oil sands areas. Site numbers reduced from plan as related to access restrictions at the Cold Lake Air Weapons Range • Data collected on site characteristics, natural disturbance, human disturbance, soil, trees, snags, downed wood birds, wetland characteristics, vascular plants, mosses, lichens, mites and aquatic invertebrates • Field data entered into electronic format, verified, and stored on the ABMI website so that it is available for public download • Specimens and vocalizations (from birds, vascular plants, mosses, lichens, mites and aquatic invertebrates) catalogued, sorted and forwarded to experts for identification • Expert identification of specimens completed for birds, vascular plants, mites and aquatic invertebrates. Identification of lichen and moss specimens is ongoing and will be completed during 2015–2016 • Information on vegetation and human footprint summarized at a variety of scales for sites that were sampled • Habitat associations (including associations with broad human footprint types) updated for more than 500 species and 300 new associations added (mammals, birds, vascular plants, mosses, lichens and mites). All associations posted on ABMI website • Preliminary evaluation of methods to map/determine biodiversity hotspots in the boreal region of Alberta • Completed report on the status of biodiversity in the oil sands region of Alberta
	Periodic population or trend assessments of key provincial species (e.g., moose, deer, wolf)	<p>2014–2015 commitment partially met.</p> <ul style="list-style-type: none"> • Surveys conducted in Wildlife Management Units (WMUs), 503,519, and 527. Unsuitable weather conditions prevented survey of WMUs 258 and 540. These will be surveyed in 2015–2016 • Forward Looking Infrared (FLIR) technology to survey moose/deer was assessed. A report will be developed in 2015–2016 • Population and trend assessment of wolves was not undertaken based on cost and technical feasibility considerations

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Element – Cause-effects Monitoring		
Waterfowl Effects Assessment and Trend Monitoring	Cause-effects monitoring of key migratory songbirds and wetland-associated birds	2014–2015 commitment met. <ul style="list-style-type: none"> • Acquired satellite imagery for 100 waterfowl survey plots to support land cover mapping and development of waterfowl-habitat associations • Conducted statistical analysis using existing data to examine how waterfowl pair and brood abundance changes with density of, and distance to, closest linear feature (roads, seismic lines, and pipelines)
Landbirds Effect Assessment Monitoring	Cause-effects monitoring of key migratory songbirds and wetland-associated birds. Initial predictions of avian response to current and future land-use	2014–2015 commitment met. <ul style="list-style-type: none"> • Collected avian data across a gradient of oil sands disturbance within the Athabasca oil sands area. Avian point count data are available for 12,062 individual birds representing 141 species from 884 sample sites. Focal work on generalist and specialist birds was conducted across a gradient of SAGD disturbance in lowland (muskeg bog, peatland, black spruce) forest systems • Updated avian local-scale models (individual stressor models) for 59 species of forest songbirds with 2014 data (EC, University of Alberta) to predict how birds respond to the direct effects of habitat alteration from individual energy sector activities (e.g. wellsites, seismic lines, pipelines) and the indirect effects of edge habitat • Updated avian landscape-scale models of forest songbirds, originally reported in 2013–2014, with 2014–2015 data; using ABMI footprint data developed models for 81 species to predict changes in population size (density) and distribution in current and no disturbance landscapes, and to assess sensitivity to human disturbance
Element – Measurement Harmonization		
	On-going system to coordinate biodiversity monitoring efforts by industry and other stakeholders into the core biodiversity monitoring program	2014–2015 commitment met. <ul style="list-style-type: none"> • Automated recording units (ARUs) deployed using standardized methods by five energy companies in on-lease monitoring programs. Methods aligned with core biodiversity monitoring program • Tested methods for deployment in wetland/open environments at regional ABMI sites • Developed business plan for a Bioacoustics Unit to further coordinate the collection, processing, and storage of acoustic data
	Development of standard protocols and processes for monitoring efforts in the oil sands areas for boreal songbirds	2014–2015 commitment met. <ul style="list-style-type: none"> • Developed protocols for training and surveying of boreal songbirds, and standards for point count surveys of boreal songbirds

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Element – Species at Risk (SAR) and Rare/Difficult Species Monitoring		
	Surveys of boreal woodland caribou	<p>2014–2015 commitment partially met: in coordination with ESRD’s provincial caribou program, 1688 caribou fecal pellet samples were obtained from 164 sites for DNA analysis from the West Side of the Athabasca River caribou range. Samples sent to Trent University for processing and analysis.</p> <ul style="list-style-type: none"> • DNA sight/re-sight activities above were carried out in coordination with AESRD caribou monitoring for demographic rates and distribution • Analysis and report preparation has been delayed pending results from the DNA lab
Whooping Crane Monitoring	Monitoring of Whooping Crane	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> • Monitored the location of 34 whooping cranes marked with satellite transmitters in Wood Buffalo National Park and surrounding areas, in May and August 2014, to facilitate searches for whooping crane nests and fledged young • Monitored the location of 29 whooping cranes marked with satellite transmitters in Saskatchewan, in September and October 2014, to facilitate searches for whooping cranes having migrated through oil sands mining areas with or without offspring
Trend Monitoring for Rare/Difficult to Monitor Species	Full implementation of status and trends and cause-effects monitoring for other key provincially and federally listed species and improved monitoring for rare/difficult to detect species	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> • Study design and sampling plan for status and trend monitoring of old forest-associated landbird species (Canada Warbler, Black-throated Green Warbler, Cape May Warbler, Bay-breasted Warbler, Brown Creeper, Red-breasted Nuthatch) was implemented across the Peace River, Athabasca and Cold Lake Oil Sands Areas • A total of 29,938 individuals representing 137 bird species were detected during surveys at 2,490 sample points located among 123 survey areas
	Implementation of specialized protocols for collecting data on key provincially and federally listed species	<p>2014–2015 commitment met.</p> <ul style="list-style-type: none"> • Regional rare plant sampling occurred across the Lower Athabasca Planning Region (LAPR) as per the adaptive sampling model. Data was used to create a model predicting the probability of rare plant occurrence across the entire region • First year of effectiveness monitoring of translocations as a mitigation option for rare plants • Owl, amphibian, and rare wetland birds were surveyed using Automated Recording Units across the LARP—surveys were done both at new locations as well as 2013 sites to begin to monitor inter-annual variation; developed automatic recognizers for Canadian toad and common nighthawk sonograms using specialized protocols • GPS backpacks were deployed on 14 additional Barred Owls resulting in the collection of 161 data points from a total of 26 owls • GPS backpack data and occupancy survey data are currently being used to evaluate four resource selection function models to determine their applicability in the OSM area

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
	Coordinated data collection of priority provincially and federally listed species	2014–2015 commitment met. <ul style="list-style-type: none"> • Continued coordination of the Yellow Rail working group with both governments and industry to prioritize monitoring sites for Yellow Rail and coordinate surveys • Tested the use of ARUs for population-level census of acoustic species on lease
Element – Human Disturbance Footprint Monitoring		
	Development and implementation of wall-to-wall footprint mapping (extension from panels) with continued refinement	2014–2015 commitment met with ongoing activities for 2015–2016. <ul style="list-style-type: none"> • Wall-to-wall Human Footprint Inventory for 2012 was completed, with a public release of V1 in October 2014 • Updates to the 2012 wall-to-wall Human Footprint Inventory to 2014 conditions is ongoing, with a website release planned for late 2016 • Completed 3x7 km sample-based Human Footprint Layer in OSM region for 2013 conditions and began analysis of 2010–2013 footprint change based on these samples • Completed Base Feature Updates including cutlines in OSM region in 13 NTS Blocks • Established Human Footprint Monitoring Program Initiative in partnership with Environment and Parks to create an Enhanced version of Human Footprint Inventory
	Refinement of footprint types for key provincial species, forest songbirds and species at risk	2014–2015 commitment met. <ul style="list-style-type: none"> • Detailed classes of human footprint were determined/summarized for field sites visited during 2014–2015, and for all quarter sections in the OSM region • Updated Hydropoly boundaries in the 2012 Human Footprint Inventory to 2012 conditions • Submitted an NSERC collaborative research and development project to test methods for monitoring vegetation recovery in disturbed areas

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
Element – Habitat Monitoring		
	On-going augmented program to collect vegetation and other ground-based habitat data	2014–2015 commitment met. <ul style="list-style-type: none"> • Primary Land Vegetation Inventory conducted for 16 townships where land cover data was lacking • On the ground habitat data collected at 77 ABMI core systematic sites and 15 cause-effect sites
	On-going augmented wall-to-wall land cover mapping	2014–2015 commitment met. <ul style="list-style-type: none"> • Detailed classes of vegetation and wetlands were determined/summarized for field sites visited during 014–2015, and for all quarter sections in the OSM region • Combined existing wetland and other vegetation layers to create an OSM-wide vegetation map that incorporates vegetation and ecosite information, and additional detail from AVI, GVI, PLVI, and existing wetland inventories • Created a suite of Phenological and Greenness metrics: 2000–2014; including Start of the Growing Season, Length of the Growing Season, and Vegetation Productivity from Remotely Sensed Normalized Difference Vegetation Index (NDVI) data (MODIS data)
	Continue work to assess potential of remote-sensed and high-resolution photo data for biodiversity prediction. Assess ability to interpret and classify data sources to provide key habitat features relevant to key species that are the focus of cause-effects monitoring	2014–2015 commitment partially met: <ul style="list-style-type: none"> • Geospatial work and analysis of LiDAR data to develop methods to track the recovery, restoration and deactivation of linear footprints in OSM region • Completed Aging Cutlines in OSM region in 22 NTS Sheets to support the GIS data analysis to identify Caribou restoration priority areas • Initiated discussion with organizations in Alberta to develop a wetland inventory initiative that builds on new remote sensing imagery; Hosted an ABMI-led workshop on “Wetland Mapping and Inventory Needs” with 40 participants representing Federal Government, Provincial Government, Municipal Government, Energy Industry, Academia, and others

IMPLEMENTATION PLAN ACTIVITIES	COMMITMENTS MADE IN THE IMPLEMENTATION PLAN FOR FY 2013–2015	PROGRESS AGAINST COMMITMENTS
	Through species-habitat modelling, identify key sources and sets of land cover, productivity, climate and other biophysical variables required for biodiversity prediction	<p>2014–2015 commitment partially met:</p> <ul style="list-style-type: none"> • Analysis of LiDAR and optical data to pilot methods to derive remotely-sensed proxies of biophysical parameters of land surface responses to Human Footprint: assessing vegetation structure in post-disturbed areas (LiDAR data); delineate uplands from wetlands (LiDAR data); mapping catchments (LiDAR data); Land Surface Water Index (Landsat data) • Modeled species-habitat relationships to identify land cover and biophysical information that need to be included in the analyses. Modeling was conducted for more than 2000 species (detailed models for more than 800 species): mammals, birds, vascular plants, mosses, lichens, and mites • Modeling will continue in 2015–2016 and, if appropriate, additional biophysical variables will be added
	Continue building library of land cover, productivity, climate and other biophysical data layers required for biodiversity prediction.	<p>2014–2015 commitment partially met:</p> <ul style="list-style-type: none"> • Created Data Repository of Remotely Sensed Normalized Difference Vegetation Index (NDVI) time series data for Alberta: available from 2000–2014 to be used to derive a suite of Phenological and Greenness metrics from Alberta, including Start of Growing Season, Length of Growing Season, and Vegetation Productivity • Created 1950s Wall-2-Wall Historical Orthophotos (250 images for OS region) Data Repository; the dataset was published on ABMI website