Wood Buffalo Environmental Association

Progress Report

2023-2024

Q4: January - March

SUBMITTED APRIL 2024

Table of Contents

List of Tables

1. Contract Scope and Delivery

This Progress Report is submitted quarterly by the Wood Buffalo Environmental Association (WBEA) on behalf of its members to Alberta Environment and Protected Areas (EPA) in accordance with the services and deliverables listed in Schedule A of the Government of Alberta contract 24RSD823 and 24RSD828, as amended.

As per the Alberta EPA contracts (Table 1), the WBEA provides environmental monitoring services based on the annual Oil Sands Monitoring (OSM) work plans and associated costs.

Table 1: 2023-2024 Alberta EPA Contracts and Work Plans

Alberta EPA Contract	Work Plan Name	Work Plan Reference
24RSD823	Atmospheric Pollutant Active Monitoring Network	A-LTM-S-1-2324
24RSD828	Integrated Atmospheric Deposition Monitoring	A-PD-6-2324

2. Introduction

The WBEA is a multi-stakeholder, community-based, not-for-profit association that operates in the largest municipality in Canada. The WBEA monitors the air in the Regional Municipality of Wood Buffalo (RMWB) 24 hours a day, 365 days a year and conducts a variety of air, land, and odour monitoring programs. The information collected from all the WBEA's air monitoring stations between Conklin and Fort Chipewyan, most of which are located at or near oil extraction plants, is openly and continuously shared with stakeholders and the public on the WBEA's website (https://wbea.org/) and through annual reports, community engagement, and outreach activities.

An Air Quality Task Force was established in 1985 to address environmental concerns raised by the Fort McKay First Nation related to oil sands development. In 1990, this Task Force became the Regional Air Quality Coordinating Committee. Then in 1996 the area was endorsed as a regional airshed by the Clean Air Strategic Alliance (CASA). The WBEA was incorporated as an Alberta Non-Profit Society in 1997 and assumed responsibility for air quality monitoring within the boundaries of the RMWB. The WBEA became a working partner of the Alberta Environmental Monitoring, Evaluation and Reporting Agency (AEMERA) in 2014. With the dissolution of AEMERA on June 30th, 2016, the WBEA began working with the OSM Program and Alberta EPA to fulfill its mandate to provide independent ambient air monitoring in the region.

The WBEA submits annual work plans to the OSM Program. Once the work plans, and any required changes, are approved, the WBEA receives a contract with deliverables for the work from Alberta EPA. This Progress Report is a quarterly update on the work agreed to in the OSM Work Plans and the associated Alberta EPA Contract and includes program updates, exceedances and non-compliances, research and development overviews and adaptive monitoring progress.

Note: Ambient air and laboratory data must be quality assured and controlled prior to submittal to Alberta Environment's Air Data Warehouse and upload to the WBEA website. The data validation process follows one month behind the current month (i.e., data from May is reviewed throughout June and submitted by the end of June). **To ensure reporting of the most accurate data, this progress report will include data and statistics from the previous quarter (2023-2024 Q3) that have already been validated, where applicable.**

3. Atmospheric Pollutant Active Monitoring Network, 2023-2024 Work Plan Reference A-LTM-S-1-2324

The components of the Atmospheric Pollutant Active Monitoring Network Work Plan that are fulfilled, or supported, by the WBEA are described below:

(1) ***Long-term core ambient air monitoring network*** *– includes continuous and time-integrated air monitoring. The Wood Buffalo Environmental Association (WBEA) operates 29 ambient air monitoring stations (AMSs) in the Athabasca Oil Sands Region (including the acute air monitoring station in Fort McKay - Waskōw ohci Pimâtisiwin). The Lakeland Industry and Community Association (LICA) operates 4 AMSs in the Cold Lake Oil Sands Region, and the Peace River Area Monitoring Program (PRAMP) operates 5 AMSs in the Peace River Oil Sands Region. All three airsheds collect time-integrated samples for the National Air Pollution Surveillance (NAPS) program and other parameters that cannot be collected through continuous monitoring. The long-term core air monitoring network was developed to fulfill EPEA Approval compliance monitoring requirements and satisfy community and scientific interests. Both the WBEA and PRAMP core ambient air monitoring networks are undergoing assessments to develop a series of recommendations to rationalize/optimize the network. The results of these assessments are not expected until late 2022 or early 2023 but recommendations can start informing network changes in 2023/24.*

(2) ***Recommendations 14/15 in the report "Recurrent Human Health Complaints Technical Information Synthesis – Fort McKay Area"*** *(Alberta Energy Regulatory and Alberta Health, 2016) – continue to be implemented. Implementation of these recommendations will improve air monitoring consistency within 30 km of Fort McKay and allow improved characterization of the air pollutants and their sources that cause air quality and odour concerns in the community. Some aspects of this monitoring are intended to be short-term or focused, as described in Section 10.0 Work Plan Approach/Methods.*

(3) ***Odour Monitoring*** *– The WBEA created an odour monitoring app (COMP) that allows the public to provide anonymous information on the odours they experience. The app collects information such as odour type, intensity, duration, timing and location. The collected information is compared to data at WBEA ambient air monitoring stations to determine if or how ambient air quality trends are related to odours. All submitted odour observations and annual reports can be found at* https://comp.wbea.org/*.*

(4) ***Transition to an Adaptive Monitoring Approach*** *– will continue in 2023-24. This will involve a structured approach to: (a) reviewing the existing monitoring network and document the purpose or objective for each station and for each parameter monitored at each station; (b) developing a shared understanding of regulatory and community expectations that will guide any OSM adaptive monitoring framework based adjustments required to the current long-term surveillance program; (c) determining which air quality parameters are applicable for the Adaptive Monitoring approach; (d) quantifying baselines for selected parameters; and (e) establishing limits of change for selected parameters.*

In addition, the Atmospheric Pollutant Active Monitoring Network work plan includes collaboration with two community-based (FMFN and Fort McKay Metis Nation (FMMN)) monitoring projects, one for dust and one for odour that were by that were approved for funding and commenced in 2022-23.

Lastly, the Oski-ôtin air monitoring station in Fort McKay has been decommissioned. This was formerly a standalone component of this work plan. No funds will be requested in 2023/24 for Oski-ôtin, although several reporting products involving Oski-ôtin measurements will be released in 2023/24.

The objectives of the 2023-24 work plan are:

(1) To measure impacts from Oil Sands development on ambient air quality.
(2) To provide ambient air data that citizens, industrial members, and regulatory bodies can use to make informed decisions on health, facility compliance, and environmental management policy.
(3) To provide ambient air data for community needs, including the Air Quality Health Index (AQHI), the Fort McKay Air Quality Index (FMAQI), and measuring representative ambient concentrations in populated areas.
(4) Implement ambient air monitoring approved by the Fort McKay Air Quality and Odour (FMAQO) Advisory Committee (specific to Recommendations 1, 14 and 15).
(5) To measure air parameters in Fort McKay that will assist in odour identification and source characterization/attribution during air quality and odour events.
(6) To understand the impacts of Oil Sands development on the odours experienced in communities in the AOSR.
(7) To understand the relationship between the odours experienced by community members and the ambient air data collected at active air monitoring stations.
(8) To measure air parameters in Fort McKay that will assist in dustfall identification and source characterization during dustfall and low visibility events.
(9) To understand the impacts of Oil Sands development on the dustfall experienced in Fort McKay.
(10) To understand the relationship between the dustfall experienced by community members in Fort McKay and the ambient air data collected at active air monitoring stations.
(11) To ensure that monitoring carried out in the region is relevant to the concerns of community members.
(12) To implement the adaptive monitoring approach, as directed by the OSM Program Oversight Committee, where appropriate in the Atmospheric Pollutant Active Monitoring Network.
(13) Create an Indigenous-led air monitoring program in the Peace Athabasca Delta and at reserve locations in partnership with WBEA.
(14) Expand the Fort Chipewyan air monitoring capabilities to fill the air quality data gap with time integrated sampling.
(15) Build community capacity through training of ACFN and MCFN Personnel for sampling program operations and maintenance.

The following section provides details on the Q4 2023-2024 milestones and objectives under Workplan A-LTM-S-1-2324 (Atmospheric Pollutant Active Monitoring Network). Deliverables are from the current Government of Alberta contract 24RSD823.

3.1 Continuous Monitoring - Operate 29 ambient air monitoring stations including the acute air monitoring station in Fort McKay (Waskōw ohci Pimâtisiwin - FMAQOAC Recommendation 1).

i. Complete monthly calibrations at all ambient air monitoring stations in the WBEA network in compliance with Alberta's Air Monitoring Directive (AMD). Perform preventative maintenance and repairs, as required.

A total of 161 analyzers were operated in each of October, November, and December 2023. This was the highest number of analyzers in operation in 2023 and was due to the addition of BlackGold AMS to the network. Operational average times for October to December 2023 are included in Table 2. Average operational times remained relatively constant throughout this quarter.

Monthly calibrations were completed at all air monitoring stations, in compliance with the Air Monitoring Directive (AMD). Preventative maintenance and repairs were carried out as needed (see Table 5 for internal audits).

Table 2: WBEA Continuous Analyzer Operation Statistics, by Month, October to December 2023

Month	Average Operational Time (%)	# of Analyzers with Operational Uptime %						Total # of Analyzers
		< 90*	90 to 92	93 to 94	95 to 96	96 to 98	98 to 100	
October 2023	99.1	3	1	0	4	8	145	161
November 2023	99.1	2	1	7	4	8	139	161
December 2023	99.1	3	1	0	4	8	145	161

*For details on analyzers operating at less than 90% uptime, please refer to Section 3.10.ii: Table 9.

ii. Perform annual calibrations on meteorological sensors at air monitoring stations.

Annual meteorological calibrations were completed at all stations for 2023-2024.

iii. Provide locations of Portable Stations in the WBEA Network.

The locations of portable stations in the WBEA Network for 2023-2024 Q4 are listed in Table 3. AMS 101 and 106 are located at the WBEA Center for upgrades in preparation for deployment. AMS 102 was deployed at the Leismer (Athabasca Oil) site in mid-September as required by their EPEA Approval 241311-01-00 and continued monitoring there throughout this quarter. AMS 103 was deployed at Harvest Energy BlackGold in mid-September and continued monitoring at that site throughout this quarter. AMS 104 was at MEG Energy's Sawbones Bay location to meet the requirements of EPEA Approval 216466-01-00. AMS 105 is currently housing the Reduced Sulphur Compounds (RSC) & Volatile Organic Compounds (VOC) gas chromatographs (GCs) at Bertha Ganter-Fort McKay (please refer to Section 3.9 for more information).

Table 3: Location of Portable Stations in WBEA Network, January to March 2024

WBEA Portable Number	January	February	March
AMS 101	WBEA Center	WBEA Center	WBEA Center
AMS 102	Leismer	Leismer	Leismer
AMS 103	BlackGold	BlackGold	BlackGold
AMS 104	Sawbones Bay	Sawbones Bay	Sawbones Bay
AMS 105	Bertha Ganter – Fort McKay	Bertha Ganter – Fort McKay	Bertha Ganter – Fort McKay
AMS 106	WBEA Center	WBEA Center	WBEA Center

iv. Provide continuous analyzer operation statistics, by month.

Continuous analyzer operation statistics are provided in Table 4. A total of 8 analyzers operated below 90% uptime between October and December 2023; these eight analyzers included THC (3), wind (2), TRS (1), CO_2 (1) and NH_3 (1).

Table 4: Continuous Analyzer Operation Statistics by Parameter, October to December 2023

Month	Overall Average Operational Time	No. of analyzer(s) below 90%	SO_2	H_2S	TRS	THC	O_3	NO_2	CO	CO_2	NH_3	$PM_{2.5}$	Wind
October 2023	99.1	3	0	0	0	1	0	0	0	0	1	0	1
November 2023	99.1	2	0	0	0	1	0	0	0	0	0	0	1
December 2023	99.1	3	0	0	1	1	0	0	0	1	0	0	0
Numbers of analyzers in the network		161	25	14	12	20	11	21	4	3	2	15	25
Total Number of non- compliances In 12 months		36	3	3	2	6	1	2	0	1	4	2	12
Percentage of non-compliance by parameter			10.7%	10.7%	7.1%	21.4%	3.6%	7.1%	0.0%	3.6%	14.3%	7.1%	42.9%

3.2 Time-Integrated Monitoring – Operate and maintain the WBEA's time-integrated sampling network, maintenance, and sample results.

i. Complete routine deployment and collection of time-integrated sampling. Perform preventative maintenance and repairs, as required.

The WBEA collected and deployed a total of 944 samples from October to December 2023 (See Appendix B for equipment present at each AMS location). Of these the WBEA had a 99.5% recovery rate; details on sample collection incidents and recovery percentages are provided below in Table 5.

Preventative maintenance and repairs were conducted by Deposition Technicians, as needed. Examples of maintenance conducted this quarter include pump and sample line replacements, tightening of loose fittings and inlet seal replacements.

Table 5: Time Integrated Sample Collection - Incidents and Recovery, October to December 2023

Month	No. of Incidents	Total No. of samples	% Recovery	# NAPS days	Incidents per Sample Type								
					$PM_{2.5}$	PM_{10}	EC/OC	VOC	PAH	Precip	TSP	Dustfall	TSSS
October 2023	2	316	99.4	5	0	1	0	0	1	0	0	0	0
November 2023	2	314	99.4	5	0	1	0	0	1	0	0	0	NA*
December 2023	1	314	99.7	5	0	0	0	1	0	0	0	0	NA*
Q3 Total	**5**	**944**	**99.5**	**15**	**0**	**2**	**0**	**1**	**2**	**0**	**0**	**0**	**0**

* TSSS samples only deployed until October as they can only sample in above freezing temperatures.

ii. Perform quarterly calibrations and audits of sampling equipment.

Quarterly calibrations and audits of time-integrated sampling equipment were completed at all air monitoring stations. Twenty-eight calibrations were completed in February and twenty-seven calibrations in March.

iii. Make time-integrated data available online.

Time-Integrated data can be accessed online at https://wbea.org/data/time-integrated-data-search/

iv. Submit time-integrated data with annual data report.

Time-Integrated data is submitted in the annual data report. The WBEA 2023 Ambient Data Annual Report can be found at https://wbea.org/resources-section/annual-data-report/

3.3 Continue the WBEA's Quality Assurance Program

i. Maintain the WBEA's Reference Centre, including monthly calibrations on reference analyzers, perform CGAs, and maintain primary reference materials.

Over the last quarter, regular maintenance and calibrations were carried out on instruments in WBEA's Reference Centre and a total of twenty-one CGAs were conducted. Seven of the twenty-one CGAs failed their audits, indicating the concentration was +/- 5% from the stated concentration. When failures occur, the WBEA does not deploy the cylinders and returns them to the manufacturer for replacement.

ii. Complete annual internal audits at all WBEA ambient air monitoring stations.

The WBEA has an internal audit program that follows the same procedures as the Alberta EPA; however, the WBEA applies stricter audit criteria allowing the WBEA to initiate investigations and potential maintenance repairs before an AMS analyzer would fail Alberta EPAs audit. Four internal audits were conducted in this quarter (Table 6).

Table 6: List of Internal WBEA Audits, January to March 2024

Air Monitoring Station	Audit Date	Parameters Audited	Audit Response	Follow-up
Patricia McInnes	Jan 22-23, 2024	SO2, TRS, NMHC, O3, NOX, NH3, PM2.5	Both NOX and NH_3 were outside WBEA audit limits for gas-phase titration, investigation suggests the site calibration gas affected the resulting analyzer adjustments. No further issues were observed by the audit.	Site NO calibration gas to be replaced.
Wapasu	Feb 15, 2024	SO2, H2S, THC, O3, NOX, PM2.5	NOX outside WBEA audit limits for gas-phase titration low point, site calibration gas adjustment caused the imbalance of channels. $PM_{2.5}$ flow was outside limits. No further issues observed.	Site NO calibration gas to be replaced. $PM_{2.5}$ flow was adjusted and documented during the audit.
Fort Chipewyan	March 7-8, 2024	SO2, TRS, O3, NOx, PM2.5, CO, CO2	The temp/RH sensor was outside of WBEA audit limits. Replaced the sensor during the station visit.	None required.
Firebag	March 18, 2024	SO2, H2S, THC, NOX	No issues observed with audit.	None required.

3.4 Operate the Community Odour Monitoring Program (COMP) App.

The Community Odour Monitoring Program (COMP) was launched September 2017 to help understand the link between odour in the communities and ambient air quality. Users submit odour observations through the WBEA COMP App. The number of odour observations and unique users that were submitted through the COMP App in 2024 are listed in the Table 7.

Near real-time odour observation information, data from the WBEA's community air monitoring stations for odour-causing compounds and all past COMP annual reports can all be found at https://comp.wbea.org/.

This last quarter the 2023 COMP Annual Report was finalized. The 2023 report can be found at the following website: https://comp.wbea.org/2023-annual-report/

Table 7: Number of Odour Observations Submitted in 2024

Month	Observations	Unique Users
January	2	2
February	3	3
March	2	2
April		
May		
June		
July		
August		
September		
October		
November		
December		

i. Create awareness of the COMP and COMP App for community members.

The WBEA is working on an upcoming awareness campaign to increase community knowledge about the COMP program. Advertisements were played on Rogers SportsNet and at the Landmark Cinemas Fort McMurray during the last quarter. A plan for upcoming advertisements and awareness campaigns is being created for 2024/2025.

ii. Release publicly available annual report on the WBEA website.

The 2023 COMP Annual Report was finalized and available online on April 2nd, 2024. The 2023 report can be found at the following website: https://comp.wbea.org/2023-annual-report/

3.5 Modify operations and reporting to meet new requirements in the Air Monitoring Directive (AMD).

No modifications in operations or reporting were required to meet changing AMD requirements in the fourth quarter of 2023-2024. The Alberta EPA is anticipated to release a new 30-minute average TRS guideline; at the time of writing this report, this guideline had yet to be released. Once implemented, the WBEA will be required to update its data management system to produce 30-minute averages.

3.6 Continue partnership with Athabasca Chipewyan First Nation (ACFN) and Mikisew Cree First Nation (MCFN) to create an Indigenous-led air monitoring program in the Peace Athabasca Delta.

At the end of 2022-2023, the WBEA, ACFN, and MCFN successfully completed the three-year plan to expand the air monitoring capabilities within the community of Fort Chipewyan and support the Air Quality Monitoring in the Peace Athabasca Delta Indigenous Community Based Monitoring (ICBM) work plan. ACFN and MCFN staff now operate and maintain the Fort Chipewyan AMS and changeout time-integrated and deposition samples. This work is ongoing and is now considered routine network operations.

On December 7th, 2023, a proposal was provided to the TEEM Committee for the expansion of the Deposition Program to Fort Chipewyan which will be an expansion of the current air monitoring program. The proposal was accepted via e-vote. This work will include two denuders, two sets of IERs and one set of passives that would be changed out by ACFN and MCFN staff (see Section 4 for more details on each program proposal). In February, the equipment was transported to Fort Chipewyan by WBEA technicians, and the equipment was deployed at the AMS station and at the remote location near the Jackfish reserve. The first denuder and passives samples were deployed at the beginning of March.

Reporting of data collected at the Fort Chipewyan AMS is included in the WBEA's routine monthly and annual reports, which are submitted to the Alberta EPA and are available on the WBEA's website.

3.7 Provide updates on Special Studies conducted by the WBEA to improve understanding of air quality in the RMWB region, monitoring methods, assessment of technology changes and method validation.

The WBEA conducts several special studies to ensure methods, technology, and data are of the highest quality. The following projects are currently being conducted by the WBEA:

Continuous Hydrocarbon Instrument Evaluation Study: The goal of this study is to ensure the WBEA hydrocarbon analyzers are accurately reporting ambient hydrocarbon concentrations. This study is separated into two phases:

> **Phase 1 (Complete)** The intent of phase one was to compare Thermo 51i to Thermo 55i analyzers. This was done in a co-location study and any differences in the data response between the different analytical technologies was examined. The reason for this analysis was that the WBEA recently replaced Thermo 51i analyzers with Thermo 55i analyzers at several stations. Phase one results indicated that the Response factor (RF) for the 51iTHC analyzer was much lower than expected for propane only.
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> **Phase 2 (Awaiting Deployment)** Based on the findings of the phase one study, the WBEA determined it was important to better understand the differences in analyzer response factors for propane across multiple manufactured flame ionization detector systems. The WBEA decided to include five instruments in this study: Thermo 51i, Thermo 55i, API N901, Mocon 9000NMHC and Envea NMHC. This equipment was installed in the new Mannix air monitoring station shelter and instrument testing began in August at the WBEA Centre. Station deployment is expected in the first quarter of 2024-2025, depending on weather. Planning with Suncor for station deployment is ongoing.

Continuous Particulate Instrument Evaluation Study: The goal of this study is to understand the differences in PM monitoring technologies and how they may influence PM data in the WBEA Network. This study is separated into two phases:

> **Phase 1 (Complete)** This portion of the study was completed in 2021-2022 and included a co-located study of the old and new $PM_{2.5}$ continuous monitoring technology. The purpose was to (1) understand any differences in response between the technologies, (2) to collect PM_{10} and $PM_{2.5}$ federal reference method (FRM) data to compare to both technologies for reference, and (3) to compare T640 PM_{10} data to the FRM for PM_{10} to validate the T640 as it is not a federal equivalent method (FEM) analyzer for PM_{10}.

Phase 2 (Ongoing) The purpose of phase two is to attempt to find differences in the PM monitoring methods to more accurately collect $PM_{2.5}$ data. The following instruments will be evaluated:

- API T640
- API T640x (FEM for PM 10 & PM 2.5)
- API T640 + BGI mini PM10 head
- SHARP 5030
- Partisol (PM 10)

The Fort McKay South AMS site compound was the chosen location for this study as it has the space and power available to accommodate the study. The shelter, with instruments installed, was deployed to the Fort McKay South AMS compound in March 2023. Data collection and evaluation is now ongoing. The data collection period will run until Spring 2025; after which, an analysis of the data will be conducted.

3.8 Continue operating a Regional Dustfall Monitoring program.

The WBEA's Ambient Air Technical Committee (AATC) approved the proposed Regional Dustfall Monitoring Proposal at the September 14th, 2022 committee meeting. The study is focused on publicly accessible residential and recreational areas and will measure the monthly collection of dustfall according to the American Society for Testing and Materials 1739-98 method. This study will cover a two-year period. Following the two-year study period, a report will be created comparing the dustfall measurements to the continuous $PM_{2.5}$, PM_{10}, and TSP measurements also taken at community AMS.

The dustfall collectors were deployed in October 2022 and sampling began in November 2022. Dustfall collectors are deployed at six air monitoring stations: Bertha Ganter – Fort McKay, Patricia McInnes, Athabasca Valley, Anzac, Janvier, and Conklin. Scheduled sampling and data analysis/review is ongoing.

Exceedances of the Alberta Ambient Air Quality Guideline (AAAQG) for Dustfall in residential and recreation areas (53mg/100cm) are available at https://wbea.org/data/air-quality-events/. In the last quarter, there were no recorded exceedances of dustfall.

A seventh dustfall collector was established June 12th, 2023 at Wapasu AMS as part of a co-location study with a turf surrogate surface sampler (TSSS) (See section 4.4 for more information). TSSS collectors are only deployed during summer months (approximately May-September, depending on freezing temperatures) and therefore, the dustfall collector at Wapasu was demobilized in mid-October along with the TSSS.

3.9 Fulfill monitoring requests from the Fort McKay Air Quality and Odours Advisory Committee (FMAQOAC) Recommendations 14/15 committee in accordance with the schedule outlined in the approved OSM Program work plan. Document all activities completed.

i. Analysis and Reporting of VOC and RSC compounds for the Triggered Samplers.

This project was initiated through the Rec 14/15 committee monitoring workplan. The intent was to design and build prototype VOC canister and RSC tube sampling systems to capture triggered samples during events of semicontinuous NMHC and continuous TRS readings in the Fort McKay region. The

WBEA designed and ordered two custom-made triggered samplers – one for RSC compounds, based on a methodology the WBEA developed in 2017, and one for VOCs. Both samplers were installed at Bertha Ganter – Fort McKay AMS in February 2022.

Since deployment, sampling has been ongoing, and operations have been routine. The current RSC trigger is 1.9 ppb TRS/ 5-min average, based on the methodology reference previously. The current VOC trigger is 0.3 ppm NMHC/5-min average which was modified in October 2022 (previous trigger set at 0.6 ppm). These triggers may be updated as necessary based on operational performance.

ii. Operation and maintenance of the VOC and RSC Gas Chromatograph analyzers.

The VOC and RSC Gas Chromatographs (GCs) are operational and collecting data at the Bertha Ganter – Fort McKay AMS. The GCs are complex equipment that currently require continual maintenance. Once full implementation and testing is complete, the semi-continuous gas chromatograph monitoring will be included as part of the long-term active air monitoring network. Last quarter, the WBEA purchased backup instruments for both the VOC and RSC GC. These were setup at the WBEA Centre.

The VOC GC was experiencing issues, was troubleshooted and issues were found to be due to the calibration gas. A new calibration gas cylinder was installed this quarter and the instrument is now running smoothly.

3.10 Provide data from the WBEA's ambient air monitoring network.

i. Maintain processing, validation, and reporting of all WBEA ambient air quality data. Make all data available on the WBEA's website.

During the fourth quarter of 2023-2024, monthly ambient air data was reviewed, as per the WBEA's monthly data validation process. Quality controlled Level II data was made available on the WBEA's website 30 days after the end of the calendar month in which the data were collected (https://wbea.org/data/continuous-monitoring-data/)

WBEA time-integrated data was collected and centralized within a database. A catalogue containing sample types, number of data points, and date ranges is available to view on the WBEA website. Time-integrated data can be refined and downloaded in a spreadsheet format from the website. The catalogue and download page are available at: https://wbea.org/data/time-integrated-data-search/

Additionally, during this quarter the WBEA completed the adjustment to the $PM_{2.5}$ T640 data, as requested by Alberta EPA. The WBEA adjusted both 5-minute and 1-hour data for all T640 analyzers in the WBEA's network, going back to 2017, when the analyzers were first deployed in the network. The WBEA will be making both the adjusted and the non-adjusted data available for download from the WBEA website and has submitted all the adjusted data to the Air Data Warehouse.

ii. Report exceedances of the Alberta Ambient Air Quality Objectives and Guidelines, and non-compliances of the Air Monitoring Directive to the Alberta Government as established by WBEA's Immediate Reporting Protocol and the Fort McKay Acute Response Triggers (FMART) Process.

The WBEA notifies members of exceedances in the ambient air network using the Air Quality Events app. Exceedances are also reported at quarterly committee meetings and through the WBEA's ambient air monitoring monthly data reports. These reports can be found at https://wbea.org/monthly-continuous-data-and-calibration-reports/

In the third quarter of 2023-2024, there were a total of 49 recorded exceedances detected within the WBEA network (Table 8). Users can search all exceedances through the WBEA's Air Quality Events website (https://wbea.org/data/air-quality-events/)

Non-compliances of the AMD that occurred in the WBEA network in the third quarter of 2023-2024 are listed in Table 9.

Table 8. Total number of Exceedances by Parameter, from October to December 2023

Event Type	Parameter						Total
	H_2S	$PM_{2.5}$	O_3	SO_2	Dustfall	TSP	
AAAQG		21					21
AAAQO	22	4		2			28
Total	**22**	**26**		**2**			**49**

Table 9: WBEA Non-Compliances, October to December 2023

Reporting Period	Date Reported	Alberta EPA Reference Number	Location	Brief Description	Issue	Remedial Action
October	11-Oct-23	420981	Stony Mountain	The wind speed and wind direction (WS/WD) sensors at Stony Mountain AMS operated less than 90% of October 2023, due to an electrical shortage.	During the daily system checks in early October, the WBEA identified that the WS/WD readings did not compare well with nearby stations. On-site maintenance was conducted and determined that an electrical shortage had interrupted the signal from the sensor to the data logger.	The shortage was repaired on October 11.
October	25-Oct-23	421542 Reported twice by mistake 2nd ref # 422365	Conklin	The NMHC analyzer at Conklin AMS operated less than 90% of October 2023 due to pump failure and contaminated cylinder.	On October 20, the THC/NMHC/CH4 baseline shifted from the expected concentration after the installation of a new hydrogen cylinder. The WBEA investigated the issue by replacing the cylinder multiple times and completing further maintenance to the instrument which did not resolve the analyzer response.	On Oct 23, the THC/NMHC/CH4 instrument was replaced and left to stabilize overnight. The following day the instrument was calibrated, and the baseline returned to the expected concentration.
October	27-Nov-23	422415	Bertha Ganter - Fort McKay	The NH3 analyzer at Bertha Ganter - Fort McKay operated less than 90% of operational time for the month of October 2023 due to analyzer intermittent flatlining throughout the month.	1. The NH3 analyzer readings flatlined intermittently throughout the month of October. Subsequent maintenance to reset the instrument resolved the issue on the days it flatlined. 2. The NH3 analyzer underwent routine calibration on October 18 and 19. Due to time constraints on October 18, the WBEA needed to extend the calibration over two days. 3. The NH3 analyzer requires additional time to stabilize to ambient conditions following daily spans and routine monthly multipoint calibrations at the range required by the AMD. This additional stabilization time is necessary and expected for this type of analyzer after exposure to high concentrations of NH3 gas.	The WBEA will continue its procedure of daily system checks, monthly site visits, and data validation to identify and address technical issues to ensure the highest operational time possible.
November	17-Nov-23	422062	Sawbones Bay	The Relative Humidity sensor at Sawbones bay operated less than 90% of operational	During routine daily system checks, the WBEA identified that the relative humidity sensor was over-ranging periodically, with values greater than	The WBEA will continue its procedure of daily system checks, monthly site visits,

				time for the month of November due to sensor operated out of range.	100% during high humidity events. The data was invalidated during the periods when measurements were over-ranging, and the sensor will be replaced.	and data validation to identify and address technical issues to ensure the highest operational time possible.
November	11-Dec-23	422934	Ells River	The THC/NMHC/CH4 analyzer Ells River operated less than 90% of due to a depleted support gas cylinder.	During routine daily system checks, the WBEA identified that the daily zero/span for the THC/NMHC/CH4 analyzer on November 5 did not meet AMD criteria. The WBEA investigated and found that the analyzer was operating with a depleted support gas cylinder.	On November 8, the support gas cylinder was replaced, and the instrument was calibrated to verify its performance. The WBEA will continue its procedure of daily system checks, monthly site visits, and data validation to identify and address technical issues to ensure the highest operational time possible.
November	24-Nov-23	422365	Stony Mountain	The wind speed and wind direction (WS/WD) sensors at Stony Mountain AMS operated less than 90% of October 2023, due to sensors being frozen.	Throughout November, the WS/WD sensor frozen due to weather conditions, resulting in inaccurate data. The sensor returned to normal operation when weather conditions changed, and the sensor thawed.	The WBEA will continue its procedure of daily system checks, monthly site visits, and data validation to identify and address technical issues to ensure the highest operational time possible.
December	5-Jan-24	423561	Mildred Lake	The THC, NMHC, and CH4 analyzer at the Mildred Lake AMS operated for less than 90% of December 2023, due to three different issues.	• On December 21, the CH4 span was outside of the AMD acceptable criteria, prompting an investigation. A technician replaced the instrument on December 21. • Between December 22 through 23, the baseline for the instrument was within the required limits but the data appeared noisy. A technician performed a maintenance calibration and span adjustment on the afternoon of December 23. • On December 30 and 31, the NMHC span was outside of the AMD acceptable criteria. On January 1, 2024, a technician conducted a calibration and retention time adjustment to fix the problem.	The analyzer was replaced, and the retention timing of the gas chromatography windows were adjusted.
December	24-Jan-24	424206	Fort Chipewyan	The CO2 analyzer at the Fort Chipewyan AMS operated for	On December 26, an onsite CO2 calibration failed the AMD criteria, resulting in no valid calibration	The WBEA has communicated with right personnel

				less than 90% of December 2023, due to operator error.	for the month of December. Prior to this incident, all daily quality assurance checks for the month of December were within AMD criteria. Following this incident, the CO2 daily span was above the AMD limits. The WBEA conducted a remote investigation and maintenance to correct the linearity of the instrument on January 3. On January 18, the CO2 analyzer's regular functionality was ultimately restored and resolved the issue following an on-site multipoint calibration.	regarding this operator error and provided them with tools and training to avoid the error in future.
December	25-Jan-24	424274	Athabasca Valley	The TRS analyzer at Athabasca Valley air monitoring station operated less than 90% for the month of December 2023, due to not providing the analyzer enough stabilization following the SO2 scrubber replacement and making a large span adjustment.	A multi-point calibration of the TRS was carried out on December 19. The technician had to replace the scrubber beads and make significant adjustments to the span when the scrubber check section of the calibration failed. TRS spans were constantly high, outside of AMD criteria, throughout the next few days. The WBEA investigated this and found that the problem was due to not providing the analyzer enough stabilization following the SO2 scrubber replacement and making a large span adjustment, on December 19. The WBEA conducted a recalibration, verified its performance, and resolved the issue on December 31.	The WBEA conducted a recalibration, verified its performance, and resolved the issue on December 31.

iii. Provide real-time air quality data from continuous air monitoring stations to EPA real-time website in the required format.

Real-time air quality data is provided on a continual basis to Alberta EPA via a secure file upload from the WBEA Data Management System.

iv. Submit Monthly Ambient Air Monitoring Report to the Alberta Government and submit data to the EPA Air Data Warehouse.

Table 10 lists the Monthly Air Monitoring Reports and Quality Assured Data that were submitted electronically via the Electronic Transfer System (ETS) to Alberta EPA.

Table 10: Schedule of Monthly Air Monitoring Reports and Quality Assured Data Submissions from October to December 2023

Monthly Air Monitoring Report and Quality Assured Data	Date Submitted
October 2023	November 29, 2023
November 2023	December 22, 2023
December 2023	January 31, 2023

v. Provide WBEA data to citizens, industry members, regulatory bodies, and governments so that it can be used to make informed decisions on health, facility compliance, and environmental management and policy. All data management and accessibility outcomes will be in alignment with the OSM Program direction.

The WBEA makes data accessible on the WBEA website. Data is further disseminated through the Alberta Data Warehouse, community outreach activities, and through WBEA committee meetings. The WBEA engages with members including Indigenous communities, industry, three levels of government, and non-government organizations. The WBEA works with Alberta EPA and OSM Program staff to ensure data management and accessibility outcomes are aligned.

vi. Any data not submitted to the Alberta Data Warehouse or not on the WBEA website will be provided directly to Alberta EPA in an agreed upon format within three months of data collection.

If data is not submitted to the Alberta Air Data Warehouse or not posted on the WBEA website, the WBEA will provide the data to Alberta EPA in an agreed-upon format within three months of data collection.

vii. Submit the WBEA Continuous Ambient Air Quality Monitoring Program Annual Report 2023 – Volume 1 Continuous Data; Volume 2 Integrated Data; and Volume 3 Site Documentation.

The 2023 Annual Report was submitted on March 28th, 2024 and is available online at https://wbea.org/resources-section/annual-data-report/.

3.11 Participate in Oil Sands Monitoring (OSM) Program related to optimizing and improving the active air monitoring network in the Athabasca Oil Sands Region (AOSR).

i. Participate in OSM Program Committees, activities, workshops, and webinars.

From January to March 2024, the WBEA participated in the OSM Air and Deposition TAC meetings, as required.

ii. Implement any additions, deletions, or any other changes to the WBEA active air monitoring network consistent with approved OSM Program workplan(s).

Based on the 2023-2024 workplan, there were no additions, deletions, or other changes to the WBEA active air monitoring network that were not previously identified.

iii. Document any additions, deletions, or any other changes to the WBEA continuous or time-integrated air monitoring network not indicated previously. Identify and describe any deviations from the approved OSM Program.

Based on the 2023-2024 workplan, there were no additions, deletions, or other changes to the WBEA continuous or time-integrated air monitoring network that were not previously identified.

iv. Participate in development of Adaptive Monitoring Approach for Active Air Monitoring Network.

From January to March 2024, the WBEA participated in the OSM Air and Deposition TAC meetings, as required.

4. Integrated Atmospheric Deposition Monitoring, 2023-2024 Work Plan Reference A-PD-6-2324

Atmospheric deposition is a critical pathway that links stressors to responses. Deposition monitoring data are used by the Oil Sands Monitoring Program to assess responses, and to help determine the source(s) of stressors. The primary objectives for atmospheric deposition long-term monitoring are to:

(1) Determine levels and changes of atmospheric deposition for specific pollutants that pose a likely risk for forest, river, lake, and wetland ecosystem function (OSM Objective #1 and #2)

(2) Quantify the contribution of OS emissions to deposition of pollutants of concern, particularly at ecological monitoring sites, and provide these data to ecological effects monitoring projects (OSM Objectives #1 and #2)

(3) Improve integration within and across themes, including continued model comparison and delivering deposition maps required by other themes (OSM Objective #3)

This work plan monitors the spatial and temporal changes in deposition of pollutants of concern at relevant ecological monitoring sites, including: acidifying (e.g., nitrogen, sulphur, and base cations) and eutrophying (e.g., nitrogen) pollutants at forest and wetland sites; and contaminants (i.e., polycyclic aromatic compounds (PACs) and trace metals) at forest, wetland, and aquatic sites. This work plan also contains environmental effects monitoring related to deposition, including: soil and forest health indicators, and fen/bog indicators. These effects monitoring activities are co-located with deposition monitoring to allow for an assessment of if/how deposition is affecting the environment.

Source apportionment analyses and chemical transport models can both determine the contribution of specific OS and non-OS sources to deposition. Deposition modelling and GIS techniques will support the estimation of deposition at ecological monitoring sites where deposition is not actually measured, and allow for determination of contribution of OS sources. The key modelling tool that will enable the above is GEM-MACH, which is an observation-evaluated tool that simulates emissions, transport, transformation, and deposition, and is used for scenario testing. GEM-MACH will be used in a 'service delivery role by 2024 (e.g., providing annual deposition maps, scenario-testing), with transition to that role finishing 2022-23, including comparison against surface observations. Beyond 2024, GEM-MACH will undergo periodic evaluations and updates as emissions evolve and inputs/science improves.

Integration is an on-going and iterative process. The focus for 2023/24 will be: (i) completion of model comparison to surface monitoring network data, (ii) improvement using data from past studies and long-term monitoring, (iii) configuration of the model and its inputs to provide deposition maps and output to estimate change and for adaptive monitoring purposes, (iv) further alignment of deposition monitoring methods and approaches across the OS Regions, and (iv) continued transitioning, as appropriate, to the adaptive monitoring framework including formalizing baseline and limits of change for ambient deposition surveillance monitoring and modelling.

The following objectives relate to ambient deposition and effects surveillance monitoring (and should not be conflated with the OSM Program Objectives noted previously):

1) *Monitor air concentrations and deposition of nitrogen, sulphur, base cations, and ozone at forest and wetland sites in the Oil Sands Regions, as well as nitrogen and sulphur deposition at two downwind transboundary sites. These data are directly used with data from Objective #2 for assessing stressor-response links, as well as for model comparison (see Objective #9).*

2) *Monitor soil and vegetation parameters in the Athabasca and Cold Lake regions for indicators of vegetative changes and acidification. Soil measurements are integrated with measured and/or modelled deposition data to assess stressor-response linkages.*

3) *Monitor temporal and spatial changes in deposition through regional collection of lichen samples for trace metals, PAHs, total nitrogen, and total sulfur. Data derived from this biomonitoring provides critical information about the extent of stressors entering ecosystems via the deposition pathway. These data are also necessary for the Groundwater, Surface Water, and Terrestrial TACs to investigate effects and attribute these effects to specific sources.*

4) *Continue operating a monitoring site where all deposition measurement methods are co-located with an existing continuous monitoring station for the purpose of ensuring measurement comparability.*

5) *Test surrogate surface samplers, a method to quantify fugitive dust deposition, at a subset of air monitoring stations for the spring, summer and fall. If validated, these data will complement the wintertime snowpack measurements allowing for direct year-round quantification of fugitive dust deposition.*

The following section provides details on the Q4 2023-2024 milestones and objectives under Workplan A-PD-6-2324 (Integrated Atmospheric Deposition Monitoring) and is based off the deliverable under the existing Government of Alberta contract 24RSD828.

4.1 Operate and maintain the Denuder sampling program, including routine sample changeouts and equipment maintenance.

Routine denuder sample changeouts are completed monthly. Dates for the 2023-2024 Q4 denuder changeouts are:

January 2nd – 5th, 2024
February 5th – 8th, 2024
March 4th – 6th, 2024

A denuder design update to improve temperature control and flow rate precision was started in August 2023. Retrofits of the units continued through last quarter. A review of the data and observations made by the Deposition Technicians indicated a potential issue with the flow rate. The actual flow rate differed from the rate logged by the machine by about half. Deposition technicians worked with the manufacturer to fix the issue and alterations to the denuders have begun this quarter to fix the flow rate. Denuder data is in the process of being reviewed as the flow rate is used in the calculation of concentrations.

An expansion of the deposition program, including the addition of two new denuders, was proposed at the December 7th, 2023 TEEM committee meeting. This was approved via e-vote. Denuders will be deployed (1) at the Fort Chipewyan Air Monitoring Station and (2) at a remote area near the Jackfish Reserve in the Peace Athabasca Delta (Figure 2). These denuders will be changed out monthly by ACFN and MCFN staff that currently maintain the AMS and time-integrated equipment. Equipment was transported to Fort Chipewyan in mid-February via the winter road. Denuders were deployed and began collecting data in March.

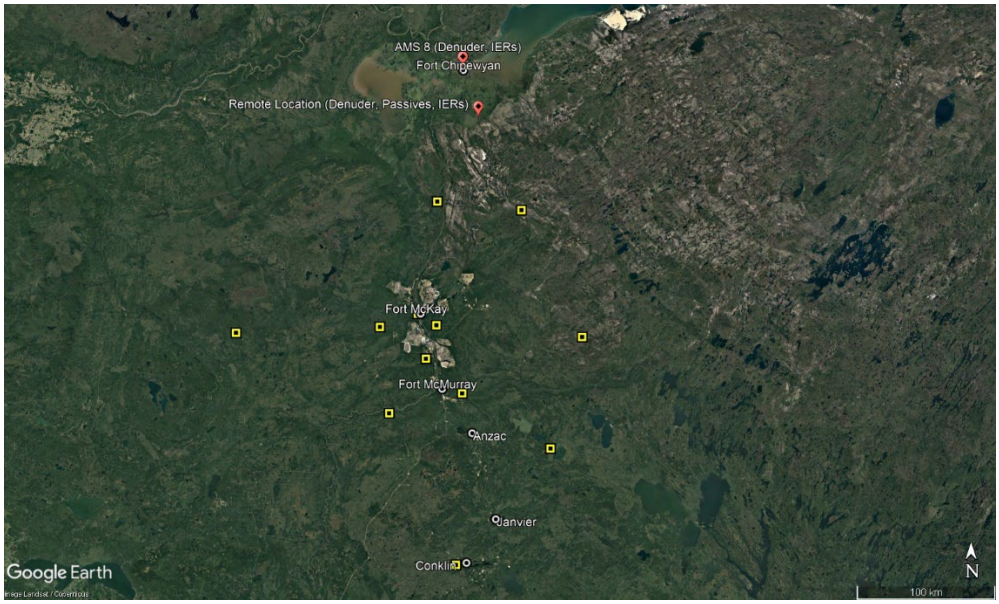

Figure 1: Map of the existing denuder/passive locations (yellow symbols) and the proposed locations of denuders/passives to be deployed in/near Fort Chipewyan.

4.2 Operate and maintain the Passive sampling program, including routine sample changeouts and equipment and site maintenance.

The passive program restarted in March 2023. All passives are co-located with a denuder (see Figure 2 for locations) and were initially configured to sample for Nitrogen Dioxide (NO_2) and Ozone (O_3). In August, SO_2 passives were added to the network.

Routine passive changeouts are completed monthly. Dates for the 2023-2024 Q4 passive changeouts are:

January 2nd – 5th, 2024
February 5th – 8th, 2024
March 4th - 6th 2024

An expansion of the deposition program to the Fort Chipewyan region, including the addition of one new set of passives, was proposed at the December 7th, 2023, TEEM committee meeting, and approved via e-vote. Passives will be co-located with the denuder at the remote area near the Jackfish Reserve in the Peace Athabasca Delta (Figure 2). These passives will be changed out monthly by ACFN and MCFN staff that currently maintain the AMS and time-integrated equipment. Passives were deployed in the beginning of March.

4.3 Operate and maintain the Ion Exchange Resins network sampling program, including routine sample changeouts and equipment and site maintenance.

Ion-exchange resins were changed out last quarter for deployment during the winter. During this quarter, regular maintenance and site checks were conducted. One site has been inaccessible since spring 2023 due to a beaver dam flooding the area and no successful place to land the helicopter; the Deposition Technicians took advantage of the freezing temperatures in February and the helicopter was able to land. The samples were retrieved but the IER posts and fencing material could not be retrieved due to the frozen ground; the technicians created a landing pad so retrieval of the remaining equipment will be done in the spring once the ground thaws.

At the end of last quarter, during the December 7th, 2023 TEEM committee meeting, a Deposition program expansion was proposed, which included deployment of IERs at Fort Chipewyan. This was approved via e-vote. Two locations for freefall IERs were chosen: (1) at the Fort Chipewyan Air Monitoring station, and (2) at a remote area near the Jackfish Reserve in the Peace Athabasca Delta (Figure 3). These IERs will be changed out seasonally by ACFN and MCFN staff that currently maintain the AMS and time-integrated equipment. Equipment was transported to Fort Chipewyan in February and IERs will be deployed in May along with the seasonal spring changeout.

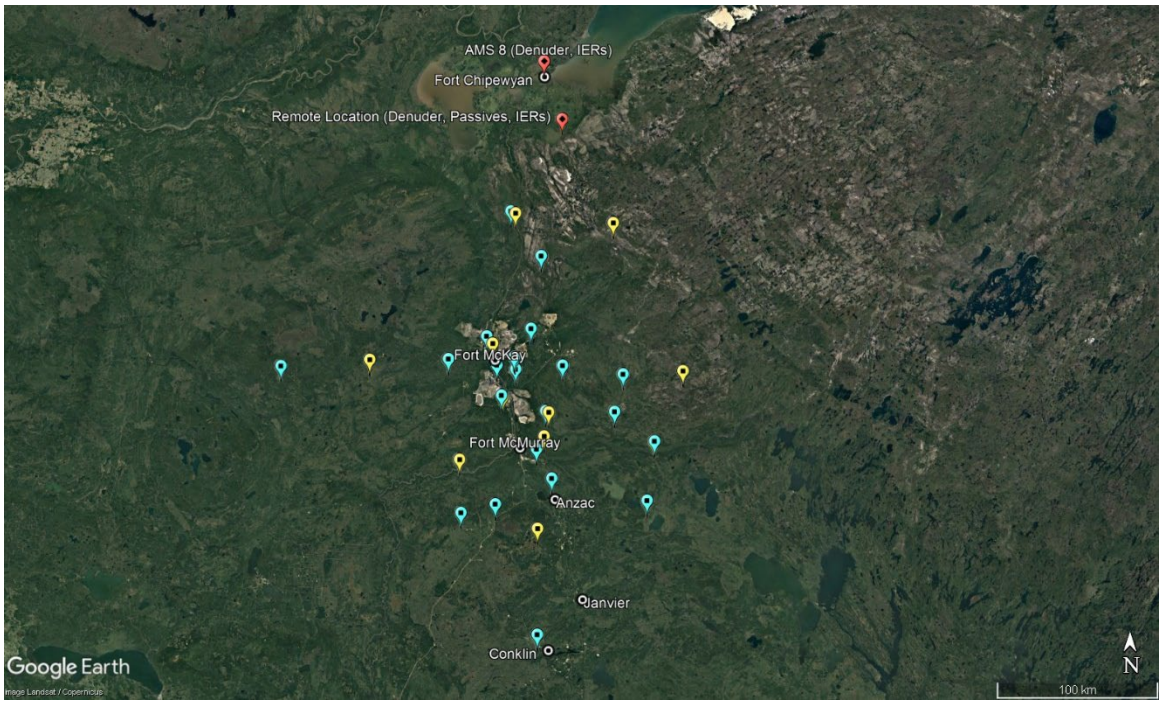

Figure 3: Map of the existing IER locations (yellow symbols = freefall, blue symbols = throughfall) and the proposed locations of freefall IERs to be deployed in/near Fort Chipewyan.

4.4 Operate and maintain the Turf Surrogate Surface Sampler pilot program, including routine sample changeouts, equipment and site maintenance, and data review.

The Turf Surrogate Surface Sampling (TSSS) project was initiated to collect dry-depositing gases using a method based on trials conducted in the USA. The TSSS consists of a disk-shaped airfoil supporting an artificial turf disk, which aims to collect the gases without altering the existing turbulent flow.

Two TSSS collectors were deployed June 12th, 2023 at Bertha Ganter – Fort McKay AMS and Wapasu AMS. TSSS are co-located with both a precipitation and a dustfall collector. The final TSSS sample for the season was retrieved on October 10th and the housing was brought back to the WBEA Centre. Data for the season was received in November and is currently undergoing review.

There were several sample incidents due to the turf being blown off the sampler. The deposition team along with the science advisors are in discussions and are working towards a fix.

4.5 Operate and maintain the Remote Ozone Network monitoring program, including routine and preventative maintenance, and data review.

Ozone is a “secondary pollutant” as it is not emitted directly into the air but is created by chemical reactions between oxides of nitrogen (NOx) and volatile organic compounds (VOCs) in the presence of ultraviolet radiation. As ozone is not emitted directly from a source, ozone creation and transportation can occur distances away from primary emission sources.

The Remote Ozone Monitoring (OZN) program was proposed to and approved by the TEEM Committee at the September 14th, 2022 meeting. The OZN program was created to provide continuous 15-minute measurements of ozone and meteorological conditions in remote areas around the RMWB during the annual growing season (i.e., April through October). The two main objectives of the OZN Program are to (1) measure the transformation of ozone created as a secondary pollutant from oil sands emissions, and (2) measure ground-level ozone increases due to stratosphere-troposphere exchange (STE).

A field trial of the equipment concluded that the analyzers are very sensitive to cold temperatures. To ensure data continuity through the deployment period, the WBEA began a field cold weather trial in mid-November 2023. The remote ozone tripod with cold weather kit was deployed as a co-location at the Athabasca Valley AMS. The data was closely monitored to understand how the analyzer responds to drops in temperature. The unit was deployed until mid-February. Results showed that although the unit turns off in extreme temperature drops, it will turn back on when temperatures rise.

A remote ozone unit was deployed at site 2001 on February 28th, 2024 as part of the STE portion of the project.

4.6 Operate and maintain the Meteorological Towers data collection program, including tower inspections and maintenance, equipment maintenance, and annual calibrations.

The Regional Meteorological Network (MET) provides continuous, hourly measurements of meteorological conditions in remote areas around the Wood Buffalo region. The WBEA operates six meteorological towers. Data collected by these towers are used for deposition calculations and modelling. The data is reviewed weekly and validated monthly.

Tower conditions were checked visually during routine sampling, which generally occurs monthly. Maintenance was scheduled as needed.

4.7 Provide an update on the Forest Health Monitoring program, including site maintenance, data review, and planning for the 2024 campaign.

The Forest Health Monitoring (FHM) program was established in the 1990s to examine the effects of deposition on soil chemistry, soil biology and vegetation. Field work to collect data is completed every six years, with the last campaign in 2018. Site maintenance was conducted between field campaigns to ensure plots are visible, labels/stakes are present, and any downed vegetation is appropriately removed.

Planning has begun for the upcoming 2024 field campaign. A series of planning workshops was initiated, with the goal to (1) align all members (community, industry, government, science advisors, WBEA staff) on the FHM objectives and history, and (2) review and decide on any outstanding recommendations from the 2018 report and determine the path forward. The first workshop was held November 7th and 8th 2023 where the history and results of the project to date were reviewed. The second workshop was held January 30th and 31st 2024 and topics included review of the previous workshop, a review of the TPP recommendations and the beginning of determining priority indicators for upcoming monitoring programs.

A review of the TEEM procedures manual continued this quarter. Communications with science advisors for the soil and vegetation portions of the Forest Health program continued and contracts were

developed. The new science advisors have been tasked with reviewing the procedures to ensure they meet current standards and to answer TPP recommendation questions.

A third Forest Health workshop will be held April 10th and 11th, 2024.

4.8 Provide an update on the 2021 Lichen sampling program.

All lichen samples collected as part of the 2021 regional lichen monitoring program were cleaned and ground based on the analyses required. The ground inorganic samples were sent to respective labs for analyses. Preliminary results have been received for sulphur, nitrogen, and trace metals.

To ensure comparability of PAC/PAH results with previous lichen analyses, a trial analysis was completed last quarter using lichen samples from 2014. The methods of the new lab proved to be comparable with past analyses results and analysis of the 2021 samples was completed. Results have been received and the data review process has continued this quarter.

4.9 Data & Reporting

i. Maintain public access to WBA deposition data via the WBEA website.

Public access to the searchable deposition database, and additional historical excel datasets, can be found at https://wbea.org/data/time-integrated-data-search/

ii. Provide support for ongoing analysis and interpretation of deposition monitoring and modeling data.

The WBEA Science Advisors continue to support the OSM Model-Measurement Intercomparison. In addition, support for analysis and interpretation of WBEA data is provided upon request.

iii. Provide WBEA data to citizens, industry members, regulatory bodies and governments, so that it can be used to make informed decisions on health, facility compliance, and environmental management policy. All data management and accessibility outcomes will be in alignment with the OSM Program direction.

Data collected under the Integrated Atmospheric Deposition Monitoring workplan is available to view on and/or download from https://wbea.org/data/time-integrated-data-search/. Users can search the WBEA's catalogue of data and can filter for specific sample types, date ranges, etc.

4.10 Changes to the Monitoring Network.

i. Participate in Oil Sands Monitoring (OSM) Program committees, activities, workshops and webinars related to optimizing and improving the atmospheric deposition monitoring network in the AOSR.

From January to March 2024, the WBEA participated in the OSM Air and Deposition TAC meetings, as required.

ii. Implement any additions, deletions or any other changes to the WBEA atmospheric deposition monitoring network consistent with approved OSM Program work plan(s).

There were no changes to the WBEA atmospheric deposition monitoring network during this quarter that were not indicated previously.

iii. Document any additions, deletions or any other changes to the WBEA atmospheric deposition monitoring network not indicated previously. Identify and describe any deviations from approved OSM Program work plan(s).

There were no changes to the WBEA atmospheric deposition monitoring network during this quarter that were not indicated previously.

5. Appendix A – Adhering to Contract Clauses

Clause 9

As per Clause 9, Personnel Replacement, of the WBEA Contracts with Alberta EPA, the WBEA is required to report any changes to the list of key personnel. The WBEA made no changes to its key personnel list during this reporting period. Any changes would be communicated to the Alberta EPA within five business days of the change.

Clause 12

As per Clause 21, Conflicts of Interest and Ethical Conduct, of WBEA's Contracts with Alberta EPA, the WBEA is required to report all potential or perceived conflicts of interest. The WBEA noted the following potential or perceived conflicts of interest during this reporting period (Table 11). These conflicts are communicated to the Alberta EPA via email within five business days of each meeting.

Table 11: Declared Conflicts of Interest in Q4, January to March 2024

Date	Meeting	Member	Member Organization	Declared Conflict of Interest
Friday, January 19, 2024	GC Meeting	Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and OSM Oversight Committee as alternate and OSM Indigenous Caucus
		Curtis Brock	EPA	Works for EPA
Friday, February 16, 2024	GC Meeting	Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and OSM Oversight Committee as alternate and OSM Indigenous Caucus
		Curtis Brock	EPA	Works for EPA
Wednesday, February 28, 2024	TK Meeting	NA	NA	No conflicts were declared
Wednesday, March 6, 2024	AATC/OMP	David Spink	Fort McKay First Nation	Participates on OSM Air and Deposition TAC, participated in two Indigenous Community Based Monitoring (ICBM) project submissions that involve the WBEA (Fort McKay Métis Nation – odour project & Fort McKay First Nation – dust project)
		Danlin Su	Fort McKay First Nation	Participated in two ICBM project submissions that involve the WBEA (Fort McKay Métis Nation – odour project & Fort McKay First Nation – dust project)
		Courtney Brown	Canadian Natural	Participates on Air and Deposition TAC
		Charles Grimm	Suncor	Participates on OSM Air and Deposition TAC
Wednesday, March 13, 2024	TEEM	David Spink	Fort McKay First Nation	Participates on OSM Air and Deposition TAC, participated in two Indigenous Community Based Monitoring (ICBM) project submissions that involve the WBEA (Fort McKay Métis Nation – odour project & Fort McKay First Nation – dust project)
		Sunhee Cho	Alberta EPA	Participates on OSM Air ATC
		Courtney Brown	Canadian Natural	Participates on Air and Deposition TAC
Friday, March 15, 2024	GC Meeting	Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and OSM Oversight Committee as alternate and OSM Indigenous Caucus
		Curtis Brock	EPA	Works for EPA

Wednesday, March 20 2024	GM Meeting	Chris Heavy Shield	Chipewyan Prairie Dene First Nation	Participates on Oversight Committee
		Peter Fortna	CRDAC	Participates on OSM ICBMAC and Indigenous Caucus
		Luc White	ECCC	Works for ECCC
		Ryan Abel	Fort McKay First Nation	Participates on OSM Air and Deposition TAC and Oversight Committee as alternate, and Indigenous Caucus
		Queenie Gray	Parks Canada	Participates on OSM Wetlands TAC
		Curtis Brock	EPA	Works for EPA
		Greg Wentworth	EPA	Works for EPA and participates on OSM Air and Deposition TAC

6. Appendix B – Summary of Air Monitoring Stations & Parameters in the WBEA Network

Continuous Monitoring Measurements

Table 12 provides a list of stations names and parameters measured by continuous methods, which include sulphur dioxide (SO_2), nitric oxide/nitrogen dioxide (NO/NO_2), ozone (O_3), $PM_{2.5}$, total reduced sulphur (TRS), hydrogen sulphide (H_2S), total hydrocarbons (THC), methane (CH_4), non-methane hydrocarbons (NMHC), carbon monoxide (CO), carbon dioxide (CO_2) and ammonia (NH_3).

Table 12: Summary of stations and continuously measured parameters at WBEA Air Monitoring stations

Station name	SO_2	$NO/NO_2/NO_x$	O_3	$PM_{2.5}$	TRS	H_2S	THC	CH_4	NMHC	CO	CO_2	NH_3
BERTHA GANTER-FORT MCKAY	X	X	X	X	X	X	X	X	X	X	X	X
MILDRED LAKE	X					X	X	X	X			
BUFFALO VIEWPOINT												
MANNIX	X	X	X	X		X	X	X	X			
PATRICIA MCINNES	X					X	X	X	X			
ATHABASCA VALLEY	X	X	X	X	X		X	X	X			X
FORT CHIPEWYAN	X	X	X	X	X		X	X	X	X		
BARGE LANDING	X	X	X	X	X					X	X	
LOWER CAMP	X	X		X	X		X	X	X			
FORT MCKAY SOUTH	X					X	X	X	X			
ANZAC	X	X	X	X	X		X	X	X			
WAPASU	X	X	X	X	X		X	X	X			
STONY MOUNTAIN	X	X	X	X		X	X					
FIREBAG	X	X	X	X	X		X	X	X	X	X	
MACKAY RIVER	X	X				X	X					
CONKLIN	X	X				X	X					
JANVIER	X	X	X	X	X		X	X	X			
FORT HILLS	X	X	X	X	X		X	X	X			
WASKOW OHCI PIMATISIWIN	X	X		X	X		X	X	X			
CHRISTINA LAKE	X					X						
JACKFISH 2/3	X	X				X						
SURMONT 2	X	x				X						
ELLS RIVER	X	X		X		X	X					
LEISMER	X	X		X		X	X	X	X			
SAWBONES BAY	X	X				X						
JACKFISH 1	X	X				X						
KIRBY SOUTH	X	X				X						
KIRBY NORTH	X	X				X	X					
BLACKGOLD	X	X				X	X					

Continuous Meteorological Measurements

Table 13 provides a listing of stations and meteorological parameters measured by continuous methods. Parameters measured include ambient temperature (Temp), relative humidity (RH), barometric pressure (BP), wind speed (WS), wind direction (WD), vertical wind speed (VWS), global radiation, precipitation, and leaf wetness.

Table 13: Summary of stations and meteorological parameters measured continuously at WBEA Air Monitoring Stations.

Station name	Temp	RH	BP	WS	WD	VWS	Global Radiation	Precipitation	Leaf Wetness
BERTHA GANTER-FORT MCKAY	X[1,2]	X[1]		X[2]	X[2]		X	X	X
MILDRED LAKE	X[1]	X[1]		X[2]	X[2]				
LOWER CAMP MET TOWER	X[4]	X[4]		X[4]	X[4]	X[4]			
BUFFALO VIEWPOINT	X[1]	X[1]		X[2]	X[2]				
MANNIX	X[5]	X[5]		X[5]	X[5]	X[5]			
PATRICIA MCINNES	X[1]	X[1]		X[2]	X[2]				
ATHABASCA VALLEY	X[1]	X[1]	X	X[2]	X[2]				
FORT CHIPEWYAN	X[1]	X[1]		X[2]	X[2]		X		X
BARGE LANDING	X[1]	X[1]	X	X[2,3]	X[2,3]				
LOWER CAMP	X[1]	X[1]	X	X[2]	X[2]				
FORT MCKAY SOUTH	X[1]	X[1]		X[2]	X[2]				
ANZAC	X[1]	X[1]		X[3]	X[3]				X
WAPASU	X[1]	X[1]		X[2]	X[2]			X	
STONY MOUNTAIN	X[1]	X[1]		X[3]	X[3]		X	X	X
FIREBAG	X[1]	X[1]		X[2]	X[2]				
MACKAY RIVER	X[1]	X[1]		X[2]	X[2]			X	
CONKLIN	X[1]	X[1]		X[2]	X[2]				
JANVIER	X[1]	X[1]		X[2,3]	X[2,3]				
FORT HILLS	X[1]	X[1]		X[2]	X[2]				
WASKOW OHCI PIMATISIWIN	X[1]	X[1]		X[2]	X[2]				
CHRISTINA LAKE	X[1]	X[1]		X[2]	X[2]				
JACKFISH 2/3	X[1]	X[1]		X[2]	X[2]				
SURMONT 2	X[1]	X[1]		X[2]	X[2]				
ELLS RIVER	X[1]	X[1]		X[2]	X[2]		X		
LEISMER	X[1]	X[1]		X[2]	X[2]				
SAWBONES BAY	X[1]	X[1]		X[2]	X[2]				
JACKFISH 1	X[1]	X[1]		X[2]	X[2]				
KIRBY SOUTH	X[1]	X[1]		X[2]	X[2]				
KIRBY NORTH	X[1]	X[1]		X[2]	X[2]				
BLACKGOLD	X[1]	X[1]		X[2]	X[2]				

[1] Parameter measured at 2m.
[2] Parameter measured at 10m.
[3] Parameter measured at 20m.
[4] Parameter measured at multiple elevations (i.e., 20m, 45m, 100m, 163m).
[5] Parameter measured at multiple elevations (i.e., 20m, 45m, 75m, 90m).

Time-Integrated Analysis Measurements

Table 14 provides a listing of stations and air quality parameters measured by time-integrated methods. Parameters measured include volatile organic compounds (VOC), particulate matter less than 2.5 µm aerodynamic diameter ($PM_{2.5}$) and associated metals and ions, elemental carbon-organic carbon (EC/OC), particulate matter less than 10 µm aerodynamic diameter (PM_{10}) and associated metals and ions, polycyclic aromatic hydrocarbons (PAH), precipitation samples, dustfall, and total suspended particulates (TSP).

Table 14: Summary of parameters measured using Time-integrated methods at WBEA Air Monitoring Stations

Station name	VOC	$PM_{2.5}$	EC/OC	PM_{10}	PAH	Precip	TSP	Dustfall
BERTHA GANTER-FORT MCKAY	X	X	X	X	X	X		X
PATRICIA MCINNES	X	X		X	X			X
ATHABASCA VALLEY	X	X		X	X			X
FORT CHIPEWYAN	X	X	X	X	X			
BARGE LANDING	X							
FORT MCKAY SOUTH	X			X				
ANZAC	X	X		X	X			X
WAPASU			X			X		X
STONY MOUNTAIN			X			X		
CONKLIN	X	X		X	X			X
JANVIER	X	X		X	X			X
FORT HILLS	X			X				
ELLS RIVER	X			X			X	

Additional Continuous/Semi-continuous Measurements

Table 15 provides a list of stations and continuous/semi-continuous methods that are additional to standard monitoring techniques. Parameters measured include AE33 aethalometer (measures black carbon), visibility sensor, reduced sulphur compounds (RSC) gas chromatography (GC), volatile organic compounds (VOC) GC, triggered VOC, and triggered RSC.

Table 15: Summary of stations and continuous/semi-continuous methods at WBEA Air Monitoring Stations

Station name	AE33 Aethalometer	Visibility Sensor	RSC GC	VOC GC	Triggered VOC	Triggered RSC
BERTHA GANTER-FORT MCKAY	X		X	X	X	X
BUFFALO VIEWPOINT		X				
LOWER CAMP		X				
STONY MOUNTAIN	X					

Research and Development Measurements

Table 16 provides a list of stations and studies conducted by the WBEA for research and development purposes. Current studies conducted at WBEA Air Monitoring Stations include the Continuous Hydrocarbon Instrument Evaluation Study, the Continuous Particulate Instrument Evaluation Study, and the Turf Surrogate Surface Sampler study. Note: The Turf Surrogate Surface Sampler study was paused in October for the winter months as the equipment cannot collect data in freezing temperatures.

Table 16: Summary of stations and studies for research and development purposes at WBEA Air Monitoring Stations

Station name	Continuous Hydrocarbon Instrument Evaluation Study	Continuous Particulate Instrument Evaluation Study	Turf Surrogate Surface Sampler
BERTHA GANTER – FORT MCKAY			X
MANNIX	Awaiting deployment		
FORT MCKAY SOUTH		X	
WAPASU			X

7. Appendix C – Map of the WBEA Monitoring Network