WOOD BUFFALO
ENVIRONMENTAL ASSOCIATION

W B E A

2023 WBEA Annual Report

Contents

Byron Fediuk

Message from the President

Hello!

I'm pleased to be addressing our community as WBEA's President for the first time since joining the Governance Committee in June 2023.

Organizational transitions—particularly in leadership and governance—are not always easy. I'd like to express my sincere gratitude to my predecessor Cliff Dimm, the other Governance Committee members, and Sanjay for their support (and patience) during my transition into this new role.

I'd like to share with you some of the observations I've made in my brief time with the WBEA.

The level of dedication from the WBEA staff and leadership to deliver on annual projects and strategic priorities is at the 'commitment' level. There is continuous monitoring and attention given to ensure those deliverables are met. Open dialogue and reciprocation between staff and leadership about work plans are apparent.

There are frequent discussions of new ways of doing the work more efficiently and the continuous improvement mindset leads to opportunities for new work that often bring value to the region's monitoring programs. This is made evident by the investment of time and personnel in the work of the Network Assessment Working Group, as well as numerous other projects and committees the WBEA worked with this year.

There seem to be two things that help strengthen the relationship between the Governance Committee and the WBEA team: strong bylaws and processes, and the diversity of those at the WBEA's table. The strength of WBEA processes, combined with good representation of regional stakeholders and rightsholders brings quality to decisions and outcomes through the sharing of perspectives.

Everything I've witnessed and participated in at the WBEA so far has been indicative of a reputation earned through more than twenty-five years of world-class air quality monitoring in the region. I'm proud to have joined the WBEA in this continued service and look forward to more years of strong collaboration.

Byron Fediuk,
WBEA President

Cliff Dimm

Message from the
Past President

I appreciate this opportunity to say thank you one last time for what has been a brilliant seven years of service with the WBEA.

Working through this leadership transition over the past year, I truly feel the Governance Committee (GC) has had some of the best discussions I've been part of in my time with WBEA.

At my workplace, we have often used the line, "Why? Why Now? Why This Way?" as a method to seek understanding and learning on a topic and to challenge paradigms and precedents. This type of dialogue helps to grow understanding and pushes individuals to reassess the logic and rationale of "why" we do things the way we do, or how best to do them going forward. Asking these questions is always highly valuable, and I wanted to thank my fellow GC members and the WBEA staff for making us all take a step back to truly understand the "Why," and the resulting, "So what?" that comes from it.

With Byron, Sanjay, and all members of the WBEA's GC and Operations Leadership Team, I know I'm exiting an organization poised to do significant, impactful work for years to come.

Cliff Dimm

Sanjay Prasad

Message from the
Executive Director

The WBEA enjoyed continued success in 2023, a direct result of the commitment of our staff, and the dedicated and active participation of our membership, which included 42 members, made up of Indigenous communities, industry, government, and non-government organizations.

The capabilities of the WBEA expanded in 2023 as our team grew to more than 40 results-focused individuals, contributing their experience and best practices to the work we do in the region. Our staff continually demonstrate an ongoing commitment to safety and safe work practices. At the end of the year, the WBEA had a safety compliance rate of over ninety-five percent. I'd like to express my gratitude for all the hard work put in by each WBEA staff member this year.

The drive for results from WBEA members this year was particularly evident with an attendance rate above 90% at all our quarterly General Members meetings. I'd like to extend my sincerest thanks to Cliff Dimm, who stepped down as President of the WBEA's Board this past year. Cliff was the WBEA president for seven consecutive years; his experience, professional knowledge, and dedication to our organization continues to be reflected in the WBEA today. At our 2023 Annual General Meeting, Byron Fediuk was elected as President by the WBEA's membership. Byron's proven track record of success at Syncrude Canada supports his new role at the WBEA, and I look forward to building a strong collaboration over the coming years.

This year, our engagement and communications strategies focused on community outreach and engagement with regional stakeholder and rightsholder groups. Opportunities ranged from sharing Air Quality Health Index (AQHI) information and data at regional tradeshows, to being an active participant in the CAREERS Indigenous Youth Internship Program, to facilitating discussions about the future of air quality monitoring at the Network Assessment Working Group sessions. Essential support for these, and among other WBEA programs, was realized through funding from the Oil Sands Monitoring Program and Alberta Environment and Protected Areas.

The WBEA continued to deliver on the priorities set out in our 2022 – 2026 Strategic Plan. Our four strategic directions—Leading World-Class Environmental Monitoring Programs, Enhanced Collaboration and Focused Purpose, Credibility and Social Acceptance, and Independence and Program Security—were further defined through specific action items, which are reported to our membership at our quarterly General Members meetings.

One major success for the WBEA was undoubtedly the expansion of our Analytical Services Group in 2023. Transferring capacity from contracted labs in the United States to the WBEA Center allows for the maintenance of reference-level method detection limits while realizing significant and ongoing cost efficiencies.

For many, this past year will be remembered for having the highest number of annual smoke event days on record, surpassing even what our region saw in 2016. It is important to recognize the resilience displayed by those living and working in the Regional Municipality of Wood Buffalo during such a uniquely challenging season.

In closing, I wish to thank all members, partners, and WBEA staff for their resolve to deliver valuable independent air quality monitoring in our region in 2023.

Sanjay Prasad,
WBEA Executive Director

We are the Wood Buffalo Environmental Association, the WBEA.

For more than twenty-five years, we've been present in the Wood Buffalo region as an independent air quality reporter. We're founded on a vision of scientifically independent, consensus-based environmental monitoring. The WBEA serves all stakeholders, rightsholders, and individuals in the Regional Municipality of Wood Buffalo (RMWB) by providing the data they need 24/7 to make informed environmental decisions.

The WBEA Today

In 2023, the WBEA focused its efforts on meaningful engagement with its membership and committees to further the understanding of WBEA programs and initiatives.

This effort could be seen in action among members of the Network Assessment Working Group (NAWG). The group found serious traction in 2023, finalizing recommendations which were proposed to optimize and enhance our current monitoring network.

The re-engagement of the Traditional Knowledge Committee (TKC) was another notable highlight for the year. The WBEA respects Indigenous ways of knowing in all parts of the work we do. The TKC met three times in 2023, ending the year by re-establishing the committee's purpose, goals, and direction which will lay the groundwork for 2024 and beyond.

Knowledge sharing was further prioritized in the WBEA's Forest Health Monitoring (FHM) workshops. An extension of the longstanding Terrestrial Environmental Effects Monitoring (TEEM) Committee, these workshops aimed to grow understanding and support for FHM program efforts from stakeholders, partners, and Indigenous community members alike.

Through every success the WBEA achieved in 2023, we worked to demonstrate a commitment to our vision, mission, and values.

The information found in this report is the result of the collaborative work of all WBEA staff, members, stakeholders, and rightsholders coming together in understanding the important role that high-quality environmental monitoring continues to play in our region.

Who We Are

The WBEA has had a long-standing presence in the region having originally formed as an Air Quality Task Force in 1985. The WBEA was officially incorporated in 1997 and has been the leader in air quality monitoring in the region ever since. For a better understanding of the WBEA's history and governance structure, please visit the "About" section of our website, **wbea.org**.

Vision

To empower all stakeholders and rightsholders with environmental data to make informed decisions.

Mission

We are a multi-stakeholder, consensus-based organization providing world-class environmental monitoring and reporting.

Our Values

- ☑ Scientifically independent.
- ☑ Recognize and respect Indigenous Knowledge.
- ☑ Transparent and timely in communicating accurate and accessible data.
- ☑ Dedicated to using best practices and technology.
- ☑ Support diverse stakeholder participation and consensus-based decisions.

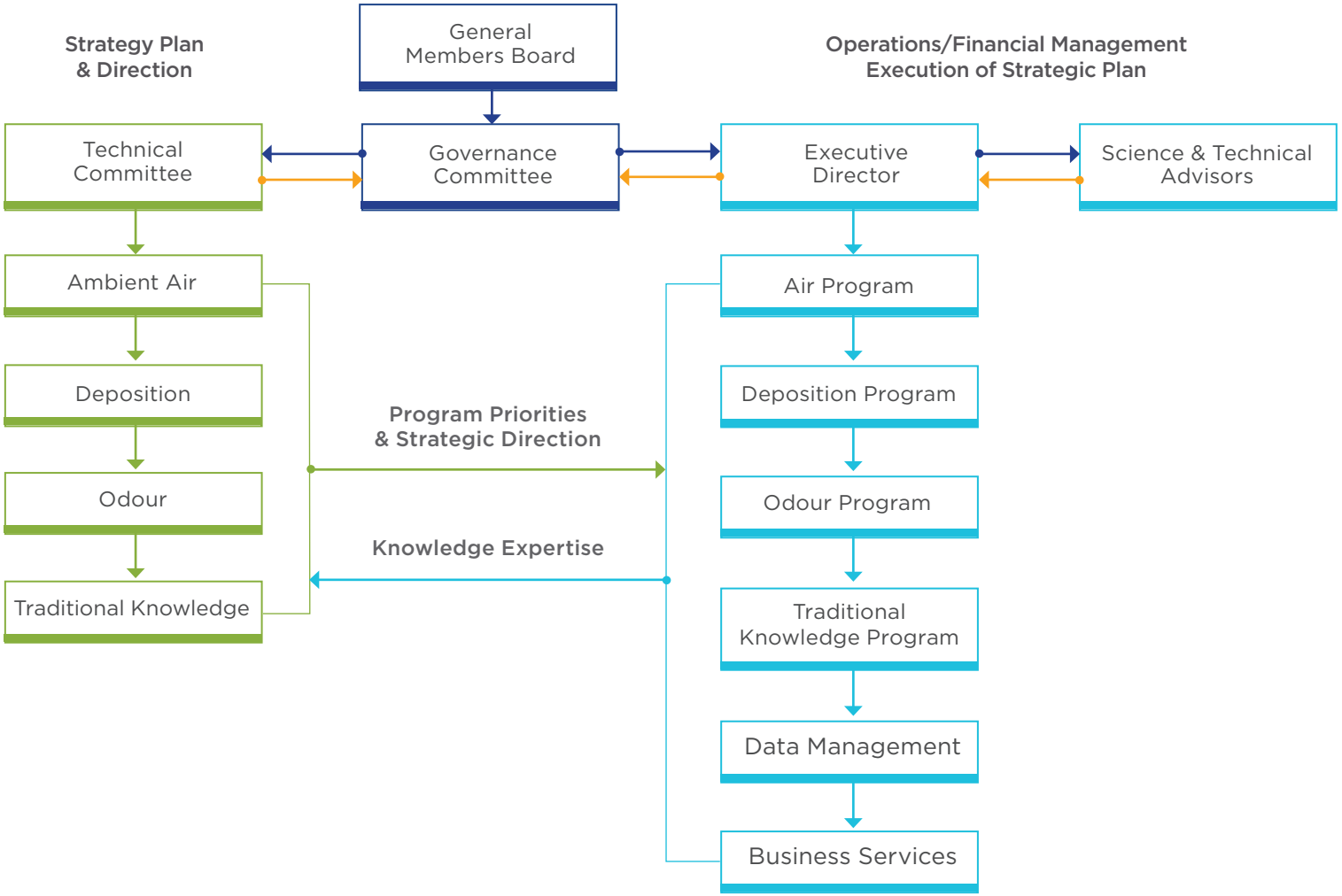
Organizational Structure

The General Members Board and Governance Committee provide strategic direction and oversight for the organization. The Technical Committees determine the strategic plans and direction for each of the WBEA's monitoring programs. The Executive Director provides operational direction for the WBEA staff, engaging science and technical advisors as required, to ensure stewardship to the overarching direction set by the General Members Board and Governance Committee.

LEGEND

Direction & Oversight

Stewardship



WBEA Partnerships

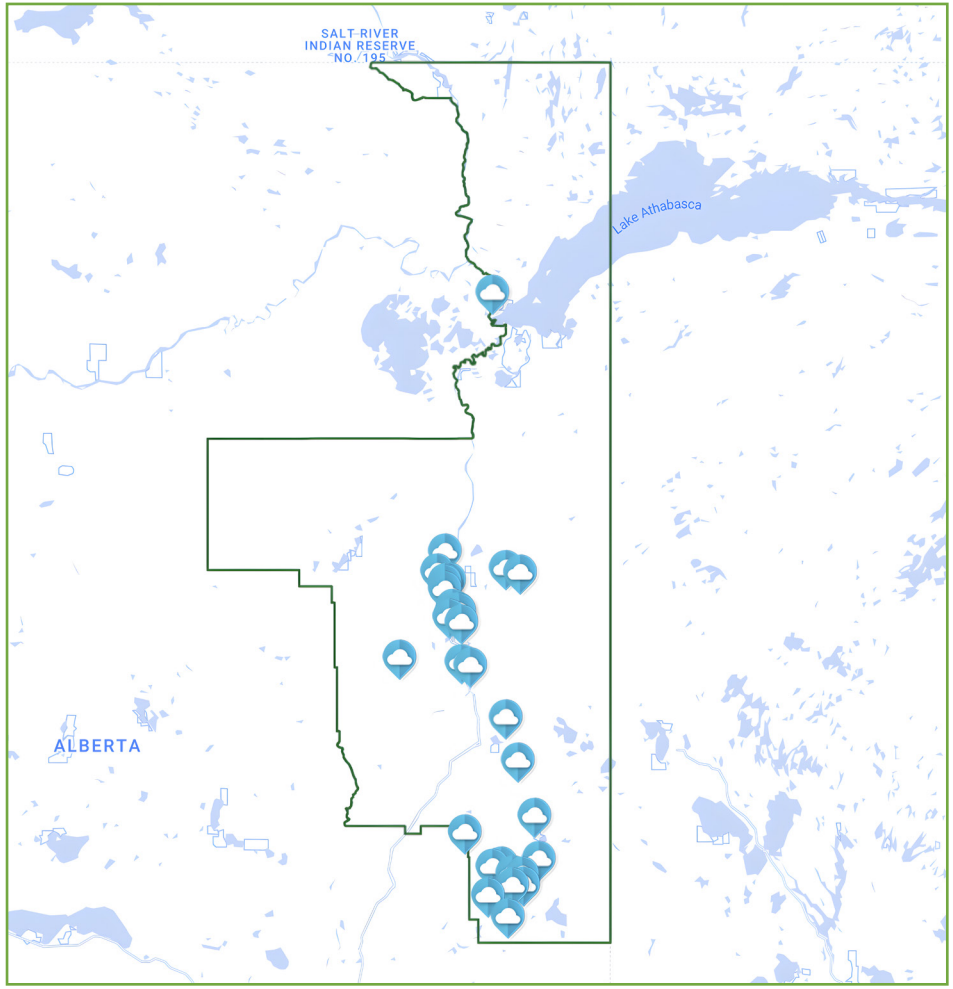
The WBEA is fortunate to work with partners across the province, including Alberta Environment and Protected Areas, the Oil Sands Monitoring Program, and Alberta Airsheds Council. The WBEA acknowledges the financial support of the AEPA and the Oil Sands Monitoring Program.

To learn more about the WBEA's involvement with these partnerships, visit: **https://wbea.org/monitoring-your-air-quality-24-7/#abpartnerships**.

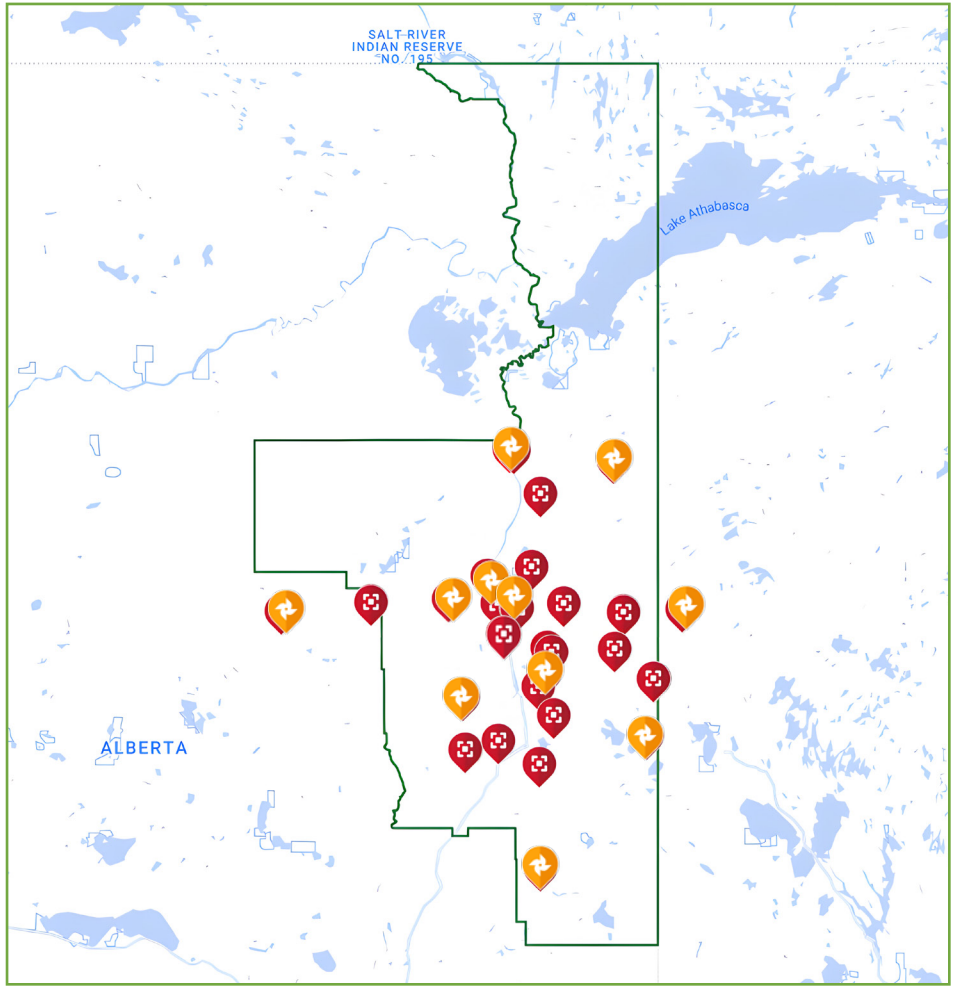
WBEA Monitoring Network

The WBEA and its monitoring network serves the RMWB, a region situated within the boreal forest of northwestern Alberta. The map below shows each location of the WBEA's monitoring sites in 2023.

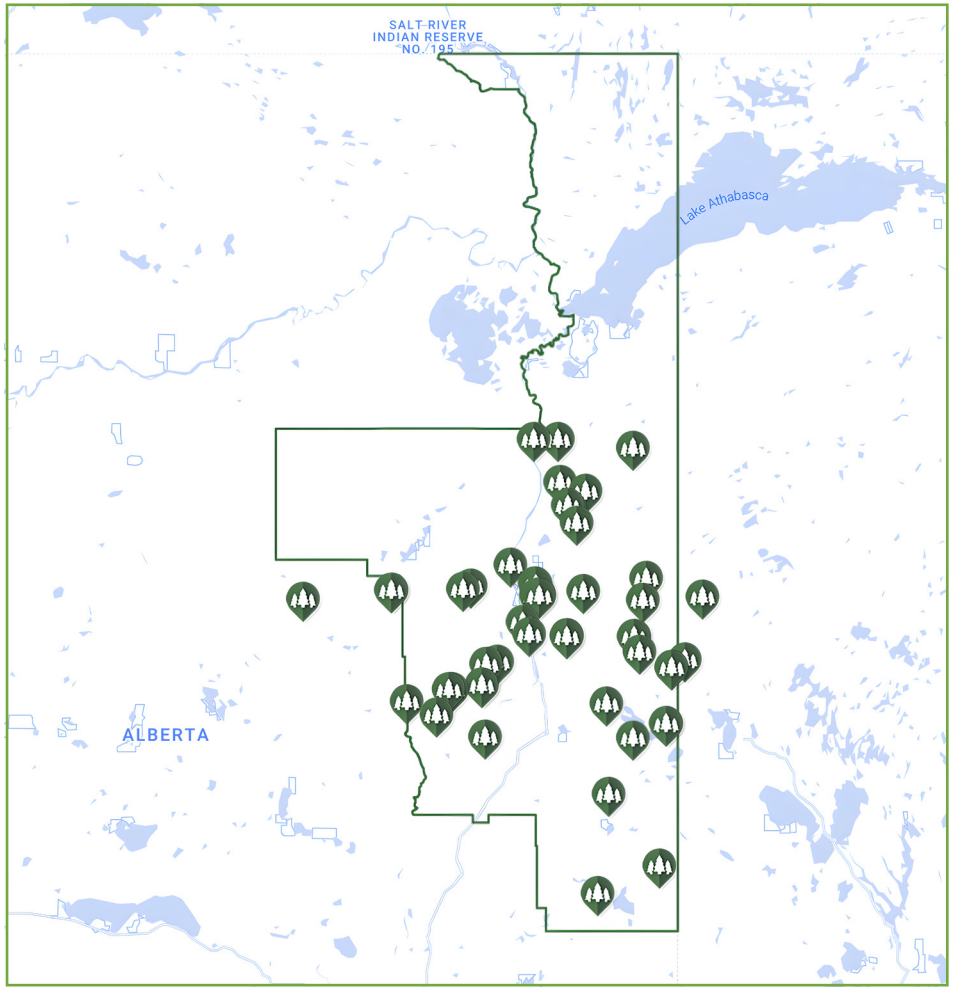
Ambient Air Monitoring sites



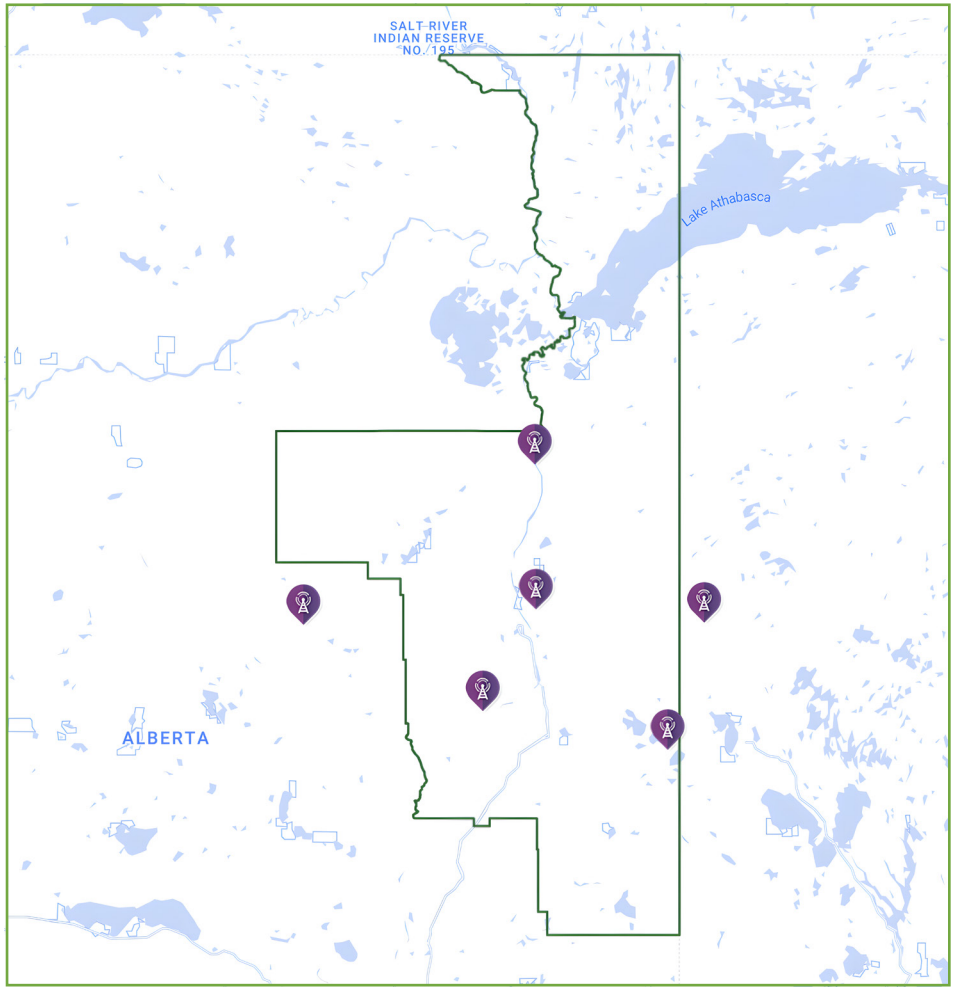
Deposition – Denuder/IER sites



Deposition – Forest Health Monitoring sites



Regional Meteorological sites



Ambient Air Monitoring

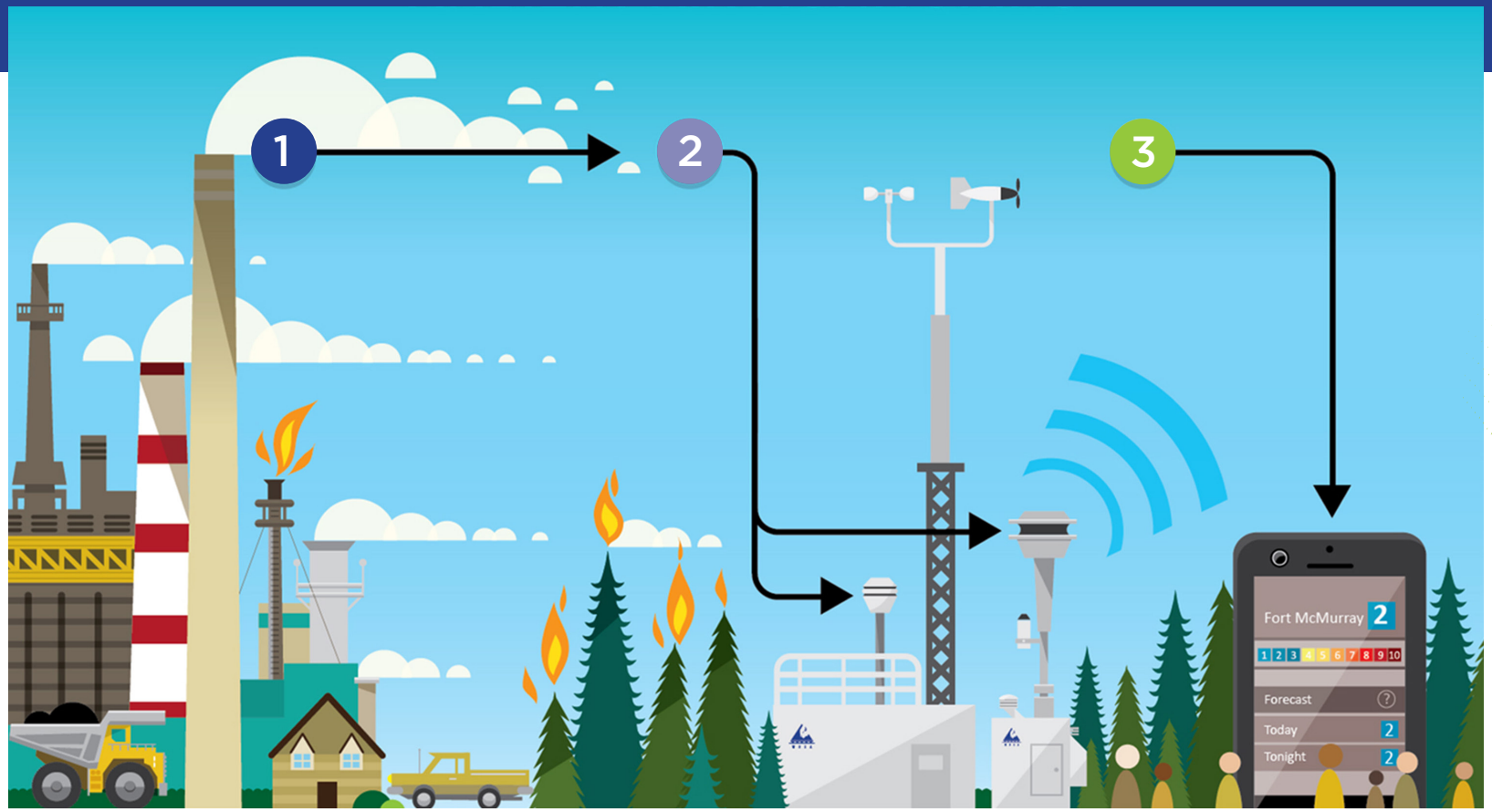
The WBEA operated approximately 30 ambient air monitoring stations (AMS) throughout the RMWB in 2023. These included industrial, attribution, community, background, and meteorological stations.

The Ambient Air Monitoring (AAM) Program functions to address multiple objectives, scientific questions, and requirements set by global, national, provincial, and regional jurisdictions. The WBEA's website highlights each of these requirements specifically and how they relate to the WBEA's monitoring network activities.

When ambient concentrations of any air pollutant the WBEA measures exceed the Alberta Ambient Air Quality Objectives and Guidelines (AAAQOs & AAAQGs), which are set provincially, the WBEA has an Immediate Reporting Protocol that is put into action.

Details about the WBEA's monitoring network, parameters monitored at each station, monitoring objectives and requirements, and the WBEA's Immediate Reporting Protocol can be found at **wbea.org**.

The below image demonstrates how the WBEA collects ambient air data through continuous analyzers and time-integrated samplers to ensure residents, stakeholders, and rightsholders have the information they need to make informed environmental decisions.



1 Source

Pollution is emitted into the air from a variety of sources.

2 Measure

The WBEA ambient air monitoring stations measure the concentrations of pollutants in the air.

3 Share

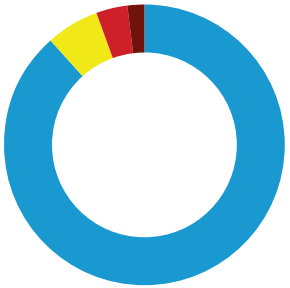
The information the WBEA collects is available to view on **wbea.org** and is used to calculate the Air Quality Health Index (AQHI).

Air Quality Health Index (AQHI)

Alberta's Air Quality Health Index—AQHI—is a scale created to help individuals better understand the impact of air quality on their health by providing important ambient air data at a glance. The following graphs show the percentage of time each community station reported each risk level during 2023. Visit **wbea.org** to access near real-time values for and to learn more about the AQHI and Fort McKay Air Quality Index (FMAQI).

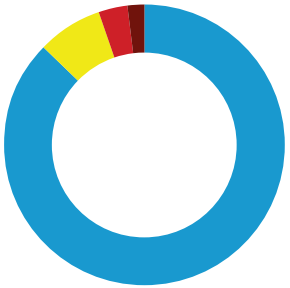
2023 Hourly AQHI by Station

LOW RISK			MODERATE RISK			HIGH RISK				VERY HIGH RISK
1	2	3	4	5	6	7	8	9	10	10 +



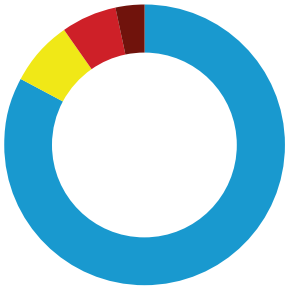
Anzac

88.40% Low Risk
6.21% Moderate Risk
3.67% High Risk
1.71% Very High Risk



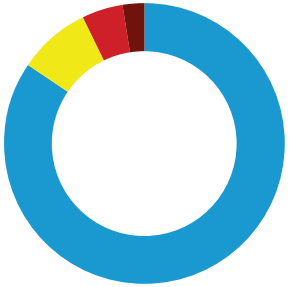
Conklin

87.46% Low Risk
7.50% Moderate Risk
3.33% High Risk
1.70% Very High Risk



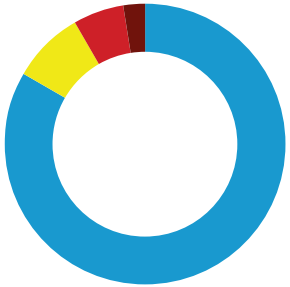
Fort Chipewyan

83.27% Low Risk
7.17% Moderate Risk
6.29% High Risk
3.27% Very High Risk



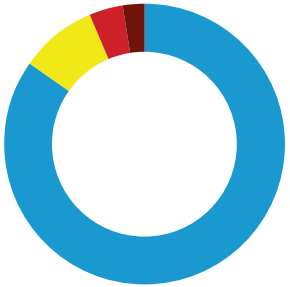
Fort Mckay Bertha Ganter

84.47% Low Risk
8.38% Moderate Risk
4.78% High Risk
2.38% Very High Risk



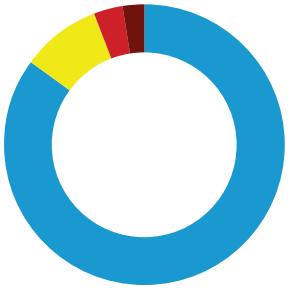
Fort McKay South

83.58% Low Risk
8.29% Moderate Risk
5.63% High Risk
2.49% Very High Risk



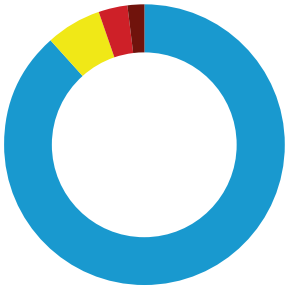
Athabasca Valley (Fort McMurray)

84.76% Low Risk
9.09% Moderate Risk
3.89% High Risk
2.26% Very High Risk



Patricia McInnes (Fort McMurray)

85.03% Low Risk
9.14% Moderate Risk
3.59% High Risk
2.24% Very High Risk



Janvier

88.48% Low Risk
6.32% Moderate Risk
3.37% High Risk
1.83% Very High Risk

Air Quality Events

The WBEA's ambient air quality data is compared to several established air quality thresholds, triggers, and limits. Air quality events occur when the concentration of ambient air detected by the WBEA exceeds the standards set as the Alberta Ambient Air Quality Objectives (AAAQO), and indicators identified as the Alberta Ambient Air Quality Guidelines (AAAQG). When an exceedance occurs, the WBEA follows the guidance of the Air Monitoring Directive and reports each occurrence to the appropriate governing bodies.

For more information on the WBEA's Immediate Reporting Protocol, See page 18 or visit wbea.org.

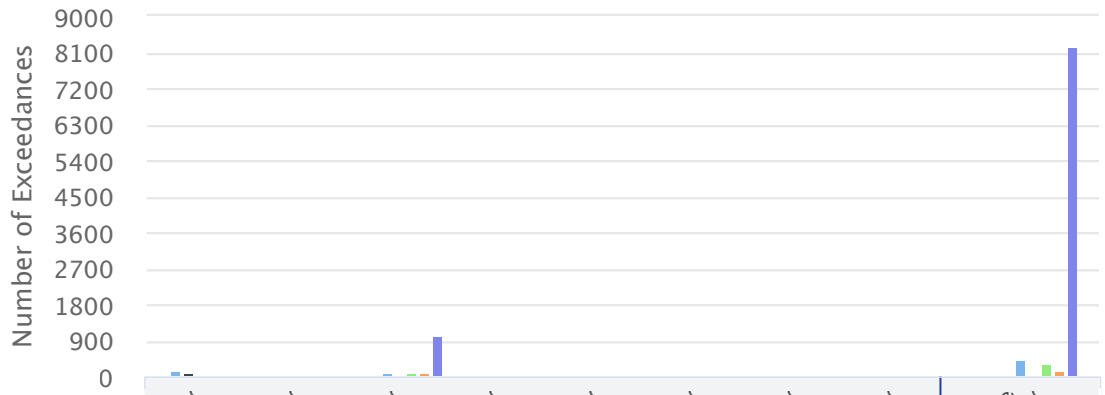
The WBEA developed an Air Quality Events (AQE) app as another way to notify interested stakeholders and partners of air quality events related to AAAQOs and AAAQGs. The AQE app provides near-real time notifications when an exceedance occurs in the network and allows users to subscribe to the air monitoring stations of interest. The app is available for download on iOS devices. In addition, all the historical and near real-time air quality events information are stored on the Air Quality Events page of the WBEA website: https://wbea.org/data/air-quality-events/.

Exceedances of Alberta Ambient Air Quality Objectives & Guidelines

The first graph, on page 16, presents a total count of air quality exceedances at all WBEA ambient air monitoring stations over a five-year period for AAAQOs from 2019-2023. The second graph, on page 17, shows the exceedances for 2023 based on station locations.

Note: Values may be too small to be visible on some graphs.

Air quality events in excess of AAAQOs and AAAQGs (2019-2023)



	H_2S TRS – 1-hour	H_2S TRS – 24-hour	$PM_{2.5}$ – 24-hour	SO_2 – 1-hour	SO_2 – 24-hour	O_3 – 1-hour	NO_2 – 1-hour	CO – 1-hour	$PM_{2.5}$ Guideline 1-hour
	AAAQO								AAAQG
2019	146	31	95	0	0	0	0	0	420
2020	103	27	0	1	0	1	0	0	30
2021	15	0	109	2	0	3	0	0	354
2022	10	1	83	1	1	0	0	0	174
2023	59	7	1039	8	0	5	0	0	8245

Note: Forest fire season was considered to be from March 1 – October 31, 2023.

***Note: TSP data reporting began in September 2022.*
Dustfall data reporting began in November 2022.

2023 Exceedances by Station

	1-hr H_2S /TRS	24-hr H_2S /TRS	24-hr $PM_{2.5}$	1-hr O_3	1-hr SO_2	1-hr $PM_{2.5}$
	AAAQO					AAAQG
Bertha Ganter - Fort McKay			72	1		565
Mildred Lake	5	1				
Lower Camp Met Tower						
Buffalo Viewpoint	1		75			616
Mannix	16	1			2	
Patricia McInnes			65			481
Athabasca Valley			66			513
Fort Chipewyan			78			819
Barge Landing			78			557
Lower Camp	36	4			6	
Fort McKay South			82			658
Anzac			57			475
Wapasu			70	2		595
Stony Mountain			54			383
Firebag						
Mackay River						
Conklin			59			410
Janvier			56			427
Fort Hills			93			731
Waskow Ohci Pimatisiwin						
Christina Lake						
Jackfish 2/3						
Surmont 2			56			454
Ells River			78			562
Leismer		1				
Sawbones Bay						
Jackfish 1	1					
Kirby South						
Kirby North						

Note: Forest fire season was considered to be from March 1 – October 31, 2023.

Reporting Air Quality Events

When ambient concentrations of any air pollutant the WBEA measures exceed the AAAQOs and AAAQGs, the WBEA has an Immediate Reporting Protocol that is put into action. WBEA analyzers continuously monitor ambient air, and in the event of an exceedance, the following steps are taken:

1. The data collection system automatically sends out alarm notifications to WBEA personnel and an independent third-party alarm monitoring company.
2. If an AAAQO is exceeded, the alarm company acknowledges the incoming alarm and reports the data and supporting information such as wind conditions, locations, time, etc. to Alberta Environment and Protected Areas (AEPA) in real-time. AEPA uses the data and information from the WBEA to follow up appropriately.
3. If an AAAQG is exceeded, the WBEA reports the data and supporting information such as wind conditions, locations, time, etc. to AEPA during business hours. AEPA uses the data and information from the WBEA to follow up appropriately.
4. If the exceedance occurs at an industry station, the owner is informed that they have exceeded an AAAQO or AAAQG, and they are provided with the same information that was given to AEPA. They follow up with AEPA and/or the Alberta Energy Regulator (AER), as required. Exceedances at community stations are followed up by the WBEA.

LARP Triggers & Limits

The Lower Athabasca Regional Plan (LARP) has existed as an extension of the Alberta Land-Use Framework since September 2012.

The LARP air quality objective is to manage releases from multiple sources, so they do not collectively result in unacceptable air quality. LARP sets out trigger levels and limits for NO_2 and SO_2 as described in the adjacent table. The WBEA provides AEPA with the air quality data that is used to calculate the annual LARP triggers and limits. When a trigger is exceeded, AEPA is required to create a regional management response.

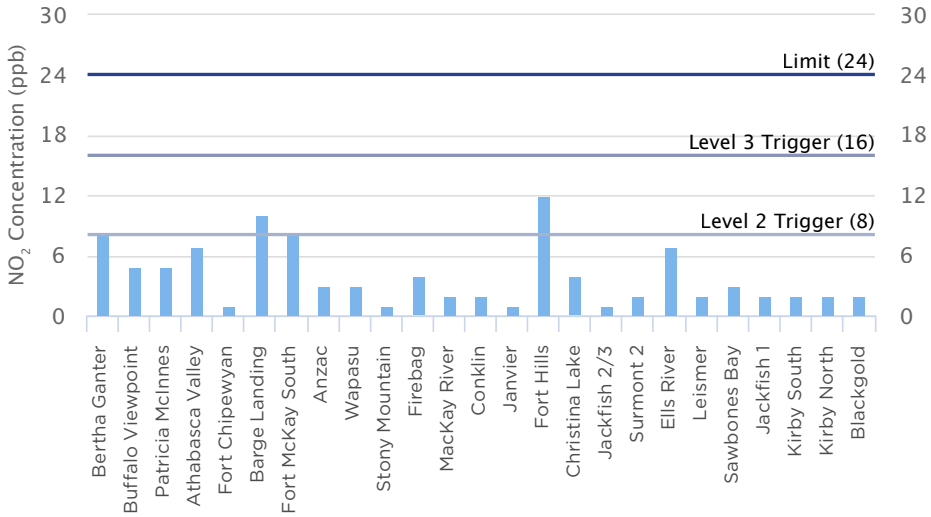
The graphs on page 20 show the annual average and hourly 99th percentile concentrations of NO_2 and SO_2 at each station location compared to the respective triggers and limit for each parameter. The use of the hourly 99th percentile data is a statistical measure to indicate upper limits of the data. Increases in the 99th percentile beyond the LARP triggers can be an early warning to help inform appropriate management actions to prevent future exceedances.

LARP Triggers Levels & Limits for Air Quality

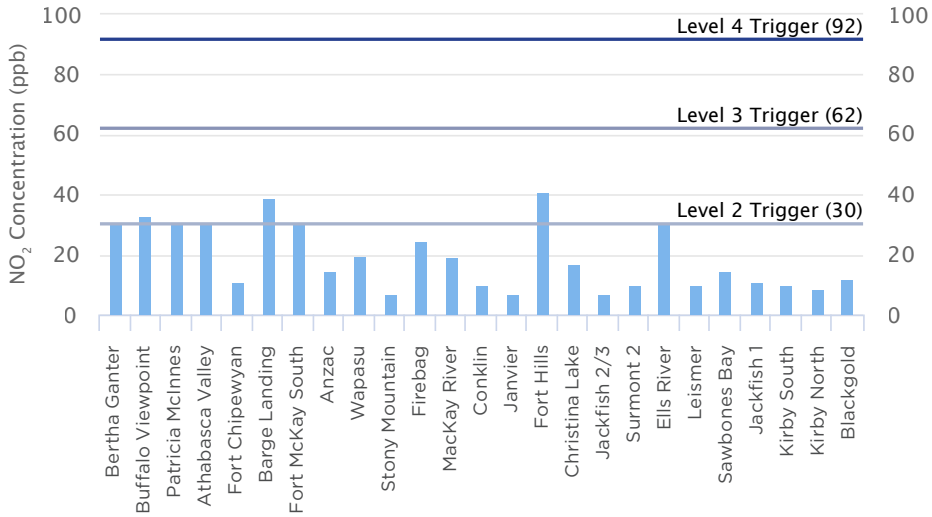
Description	Management Intent
Level 4	
Ambient air quality exceeding air quality limits	Improve ambient air quality to below limits
Limit	
Level 3	
Ambient air quality below but approaching air quality limits	Proactively maintain air quality below limits
Trigger	
Level 2	
Ambient air quality below air quality limits	Improve knowledge and understanding, and plan
Trigger	
Level 1	
Ambient air quality well below air quality limits	Apply standard regulatory and non-regulatory approaches

Note: The ambient air quality values based on the 99th percentile of hourly data are all established as triggers in the management framework.

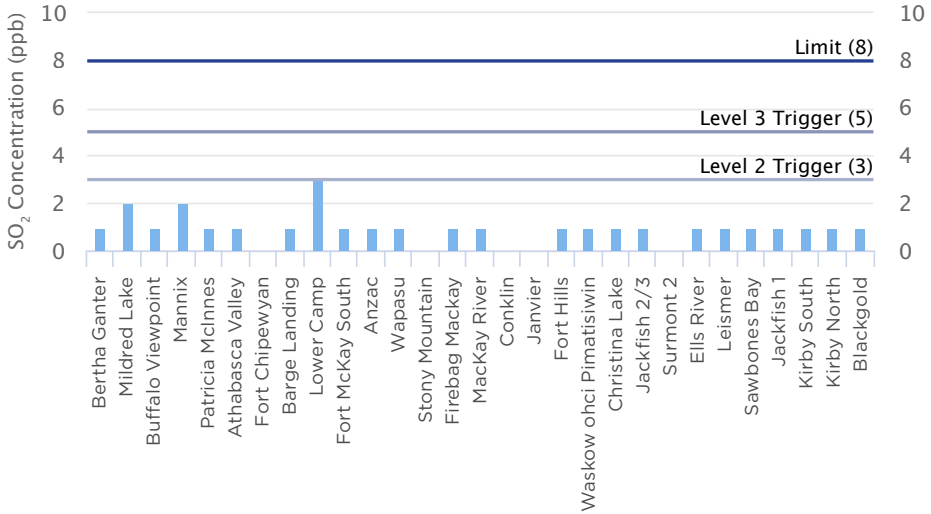
LARP NO_2 Annual Average



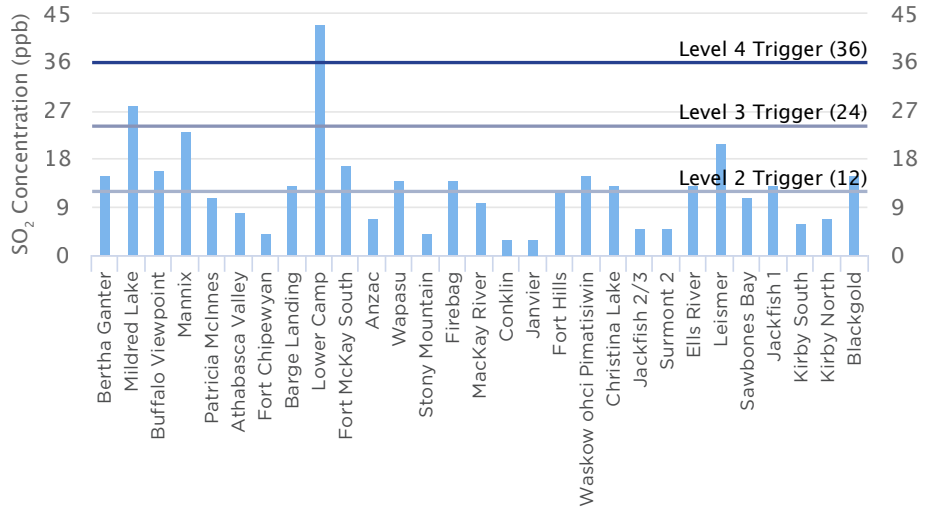
LARP NO_2 Hourly 99th Percentile



LARP SO_2 Annual Average



LARP SO_2 Hourly 99th Percentile



Regional Wind Profiles

Meteorological parameters, including wind speed and direction, humidity, precipitation, atmospheric pressure, solar radiation, and the vertical temperature structure of the atmosphere, all impact the dispersion, deposition, and transformation of common air pollutants.

Wind rose plots are a visual representation of the wind profile for a specific location, showing wind speed and wind direction for communities within the WBEA network. The position relative to the centre of the wind rose represents the direction which wind is blowing from. The magnitude of the slice represents the frequency which the wind blows from that direction.

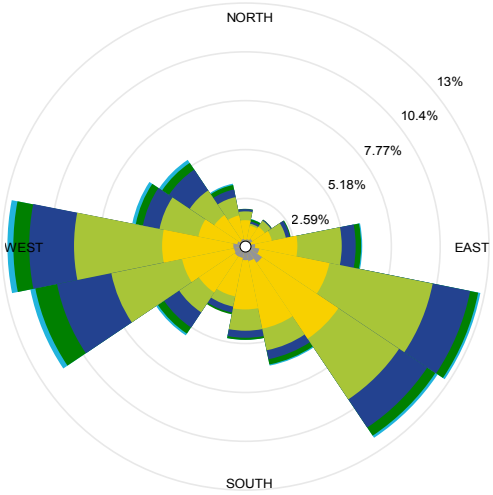
The colours within each wind rose triangle represent the wind speeds when blowing from that direction (shown in the legend above the wind roses). Calms are shown for each station as a percentage of time that wind speeds are below 0.5 kilometers per hour (km/h).

For example, the largest triangle in Fort Chipewyan wind rose shows the wind comes from the East, about 20% of the time in 2023. The olive-green colour in this triangle shows the wind was between 10 and 15 km/h about 4% of the time. Wind speeds were less than 0.5 km/h in Fort Chipewyan 0.06% of the time (calms).

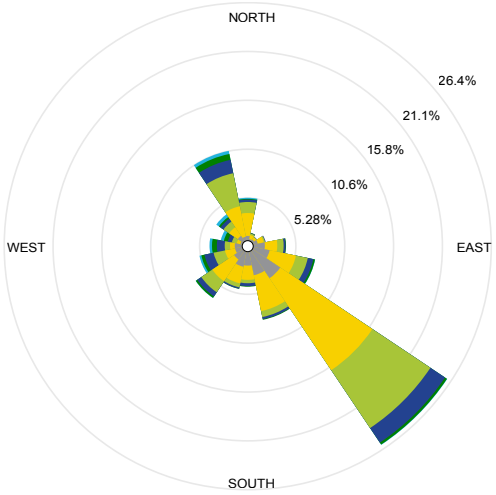
WIND SPEED (km/h)

0.5 - 5 | 5 - 10 | 10 - 15 | 15 - 20 | 20 - 25 | > = 25

Anzac
Calms: 0.08% | Tower Height: 20m



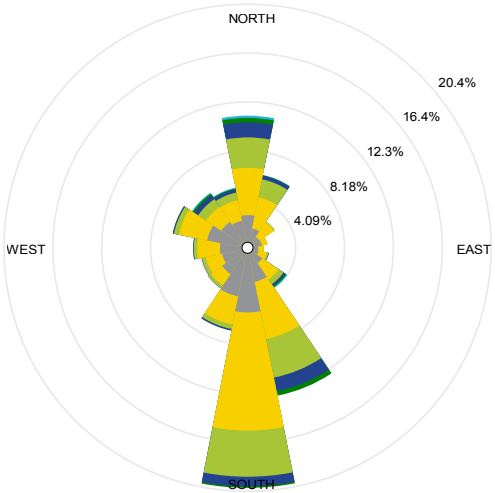
Athabasca Valley (Fort McMurray)
Calms: 0.29% | Tower Height: 10m



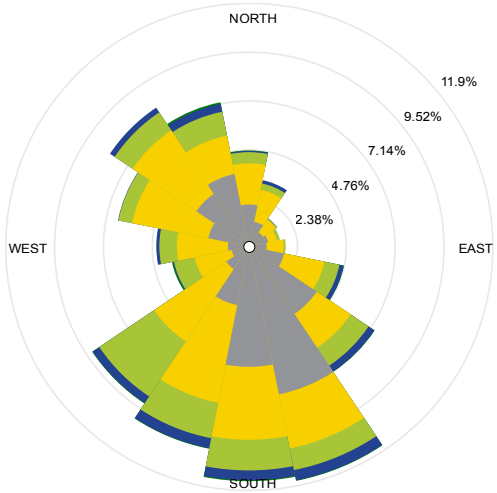
WIND SPEED (km/h)

0.5 - 5 | 5 - 10 | 10 - 15 | 15 - 20 | 20 - 25 | > = 25

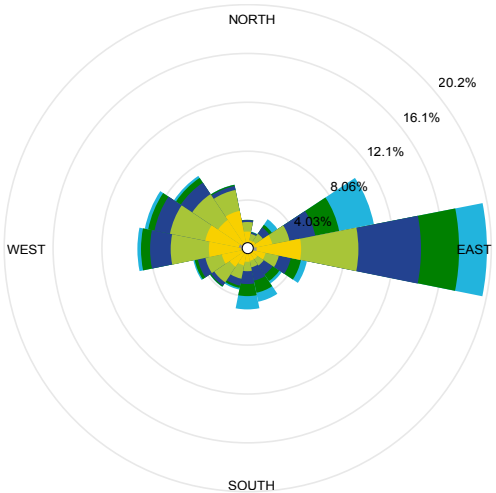
Bertha Ganter - Fort McKay
Calms: 0.50% | Tower Height: 10m



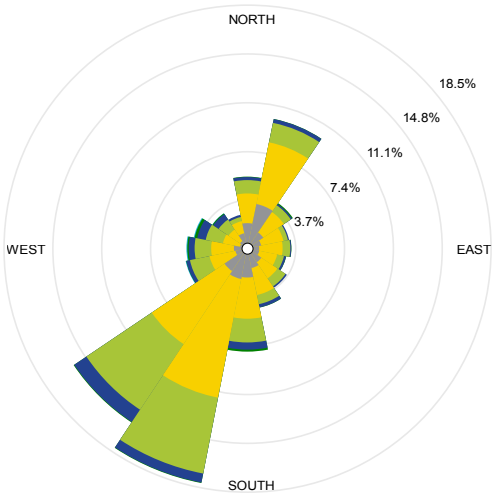
Conklin
Calms: 1.54% | Tower Height: 10m



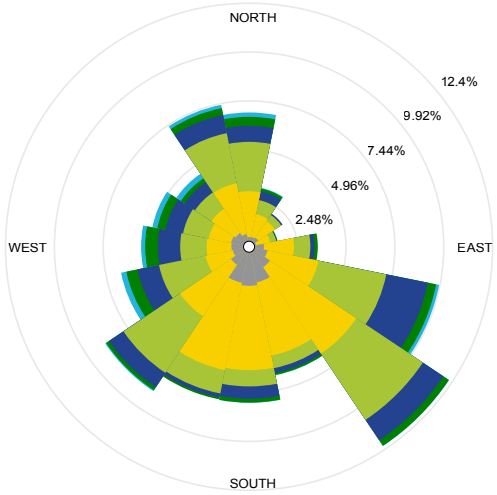
Fort Chipewyan
Calms: 0.06% | Tower Height: 10m



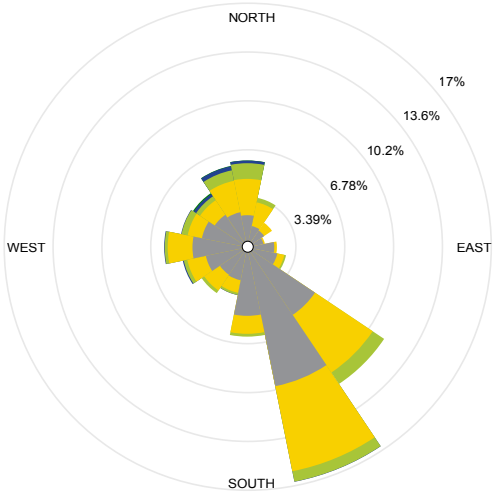
Janvier
Calms: 0.33% | Tower Height: 10m



Patricia McInnes (Fort McMurray)
Calms: 0.10% | Tower Height: 10m



Waskōw ohci Pimâtisiwin
Calms: 1.28% | Tower Height: 10m



Air Quality Parameters Monitored within the WBEA Network

Two key sampling methods are used by the WBEA for conducting high-quality ambient air monitoring within its network: continuous, which generates raw air quality data in near real-time; and time-integrated or “non-continuous”. The following pages provide a summary of stations and parameters measured at WBEA sites.

Summary of stations and parameters measured continuously at WBEA sites

WBEA ID	Type	Station Name	SO_2	NO_2	O_3	$PM_{2.5}$	TRS	H_2S	THC	CH_4	NMHC	CO	CO_2	NH_3
1	Community	Bertha Ganter-Fort McKay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	Compliance	Mildred Lake	✓					✓	✓	✓	✓			
3	Meterological	Lower Camp Met Tower												
4	Compliance	Buffalo Viewpoint	✓	✓	✓	✓		✓	✓	✓	✓			
5	Compliance/Meterological	Mannix	✓					✓	✓	✓	✓			
6	Community	Patricia McInnes	✓	✓	✓	✓	✓		✓	✓	✓			✓
7	Community	Athabasca Valley	✓	✓	✓	✓	✓		✓	✓	✓	✓		
8	Community/Compliance	Fort Chipewyan	✓	✓	✓	✓	✓					✓	✓	
9	Attribution	Barge Landing	✓	✓		✓	✓		✓	✓	✓			
11	Compliance	Lower Camp	✓					✓	✓	✓	✓			
13	Compliance/Attribution	Fort McKay South	✓	✓	✓	✓	✓		✓	✓	✓			
14	Compliance/Community	Anzac	✓	✓	✓	✓	✓		✓	✓	✓			
17	Compliance	Wapasu	✓	✓	✓	✓		✓	✓					
18	Background	Stony Mountain	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
19	Compliance	Firebag	✓	✓				✓	✓					
20	Compliance	Mackay River	✓	✓				✓	✓					
21	Community	Conklin	✓	✓	✓	✓	✓		✓	✓	✓			
22	Community	Janvier	✓	✓	✓	✓	✓		✓	✓	✓			
23	Compliance	Fort Hills	✓	✓		✓	✓		✓	✓	✓			
25	Emergency Response	Waskow ohci Pimatisiwin	✓					✓						
26	Compliance	Christina Lake	✓	✓				✓						
27	Compliance	Jackfish 2/3	✓	✓				✓						
29	Compliance	Surmont 2	✓	✓		✓		✓	✓					
30	Compliance	Ells River	✓	✓		✓	✓		✓	✓	✓			
501	Compliance	Leismer	✓	✓				✓						
505	Compliance	Sawbones Bay	✓	✓				✓						
506	Compliance	Jackfish 1	✓	✓				✓						
507	Compliance	Kirby South	✓	✓				✓	✓					
508	Compliance	Kirby North	✓	✓				✓	✓					
511	Compliance	Blackgold	✓	✓				✓	✓					

Summary of parameters measured using integrated methods at WBEA sites

WBEA ID	Type	Station Name	VOC	$PM_{2.5}$	$PM_{2.5}$ ECOC	PM_{10}	PAH	Precip	TSP	Dustfall
1	Community	Bertha Ganter-Fort McKay	✓	✓	✓	✓	✓	✓		✓
6	Community	Patricia McInnes	✓	✓		✓	✓			✓
7	Community	Athabasca Valley	✓	✓		✓	✓			✓
8	Community/Compliance	Fort Chipewyan	✓	✓	✓	✓	✓			
9	Attribution	Barge Landing	✓							
13	Compliance/Attribution	Fort McKay South	✓			✓				
14	Compliance/Community	Anzac	✓	✓		✓	✓			✓
17	Compliance	Wapasu			✓			✓		✓
18	Enhanced Deposition/ Background	Stony Mountain			✓			✓		
21	Community	Conklin	✓	✓		✓	✓			✓
22	Community	Janvier	✓	✓		✓	✓			✓
23	Compliance	Fort Hills	✓			✓				
30	Compliance	Ells River	✓			✓			✓	
CN 1	Compliance	Canadian Natural DF1								✓
CN 2	Compliance	Canadian Natural DF2								✓
CN 3	Compliance	Canadian Natural DF3								✓
CN 4	Compliance	Canadian Natural DF4								✓
CN 5	Compliance	Canadian Natural DF5								✓

Summary of stations and meteorological parameters measured continuously at WBEA sites

WBEA ID	Type	Station Name	Temperature	RH	BP	Wind Speed	Wind Direction	Vertical Wind Speed	Solar Radiation	Precip	Leaf Wetness
1	Community	Bertha Ganter-Fort McKay	✓	✓		✓	✓		✓	✓	✓
2	Compliance	Mildred Lake	✓	✓		✓	✓				
3	Meterological	Lower Camp Met Tower	✓	✓		✓	✓	✓			
4	Compliance	Buffalo Viewpoint	✓	✓		✓	✓				
5	Compliance/Meterological	Mannix	✓	✓		✓	✓	✓			
6	Community	Patricia McInnes	✓	✓		✓	✓				
7	Community	Athabasca Valley	✓	✓	✓	✓	✓				
8	Community/Compliance	Fort Chipewyan	✓	✓		✓	✓		✓		✓
9	Attribution	Barge Landing	✓	✓	✓	✓	✓				
11	Compliance	Lower Camp	✓	✓	✓	✓	✓				
13	Compliance/Attribution	Fort McKay South	✓	✓		✓	✓				
14	Compliance/Community	Anzac	✓	✓		✓	✓				✓
17	Compliance	Wapasu	✓	✓		✓	✓			✓	
18	Background	Stony Mountain	✓	✓		✓	✓		✓	✓	✓
19	Compliance	Firebag	✓	✓		✓	✓				
20	Compliance	Mackay River	✓	✓		✓	✓			✓	
21	Community	Conklin	✓	✓		✓	✓				
22	Community	Janvier	✓	✓		✓	✓				
23	Compliance	Fort Hills	✓	✓		✓	✓				
25	Emergency Response	Waskow ohci Pimatisiwin	✓	✓		✓	✓				
26	Compliance	Christina Lake	✓	✓		✓	✓				
27	Compliance	Jackfish 2/3	✓	✓		✓	✓				
29	Compliance	Surmont 2	✓	✓		✓	✓				
30	Compliance	Ells River	✓	✓		✓	✓		✓		
501	Compliance	Leismer	✓	✓		✓	✓				
505	Compliance	Sawbones Bay	✓	✓		✓	✓				
506	Compliance	Jackfish 1	✓	✓		✓	✓				
507	Compliance	Kirby South	✓	✓		✓	✓				
508	Compliance	Kirby North	✓	✓		✓	✓				
511	Compliance	Blackgold	✓	✓		✓	✓				

2023 Ambient Air Monitoring Data

The graphs on the following pages provide an overview of each parameter measured, including its sampling method, in 2023.

Continuous Monitoring

As its title suggests, the WBEA's continuous ambient air monitoring program uses analyzers that continually measure concentrations of pollutants in the air. This data is readily available to anyone in near real-time on our website, **wbea.org**.

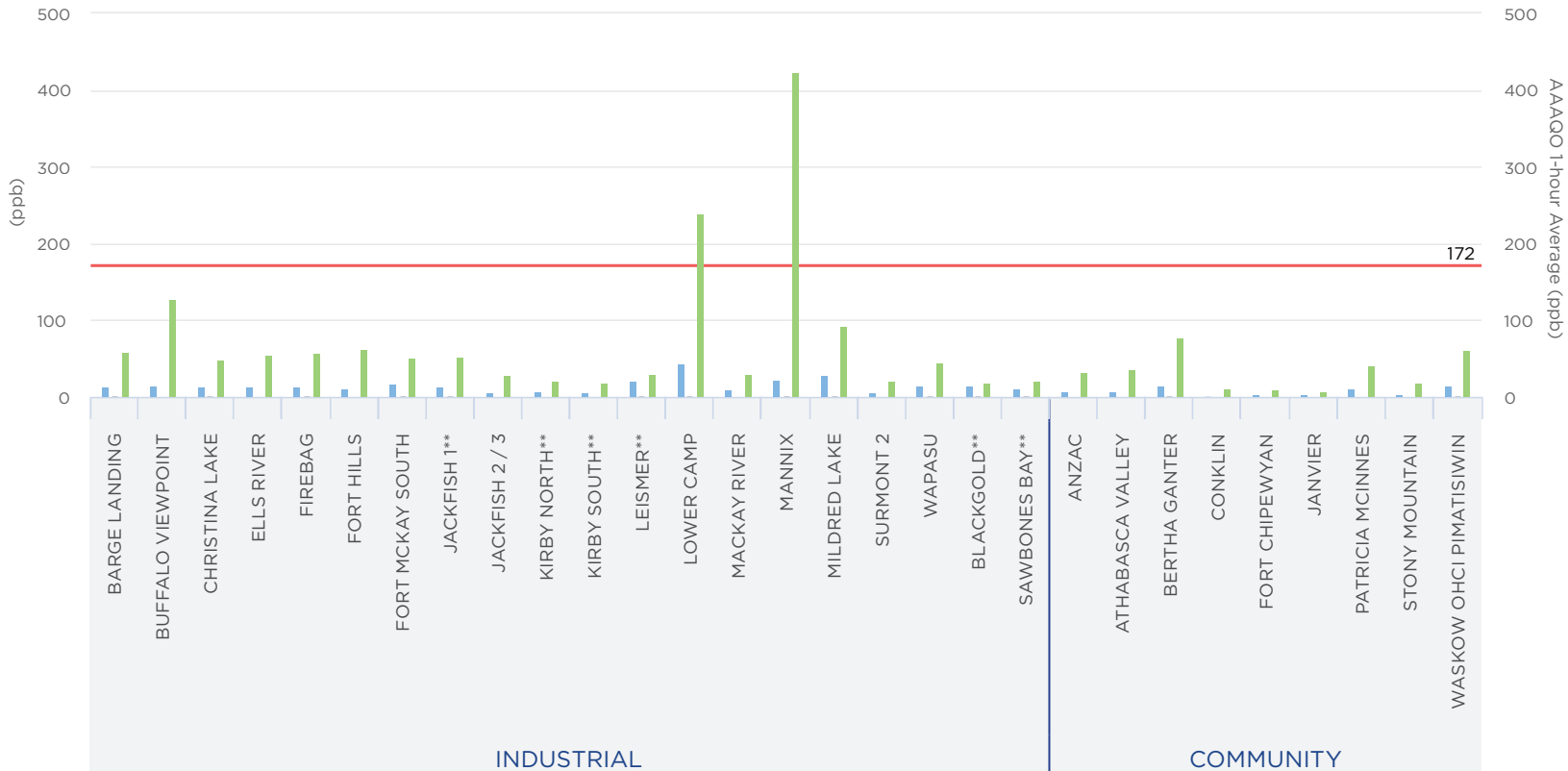
In addition to specific compounds, all stations continuously measure temperature, relative humidity, and wind speed and direction.

The data for continuous monitoring is presented in the following graphs as the annual hourly average (mean) concentrations of each parameter, along with the annual hourly 99th percentile and maximum concentrations. The annual hourly 99th percentile is used to show the high end of concentrations measured at the WBEA air monitoring stations after removing the highest 1% of events, which may be outliers.

Note: Averages may be too small to be visible on some graphs.

Sulphur Dioxide (SO_2)

SO_2 is produced from the combustion of sulphur-containing fossil fuels. Sulphur dioxide in the air at high concentrations can make breathing difficult, particularly for children, the elderly, and people with asthma. SO_2 reacts in the atmosphere to form sulphuric acid and acidic aerosols, which contribute to acid deposition and acid rain.

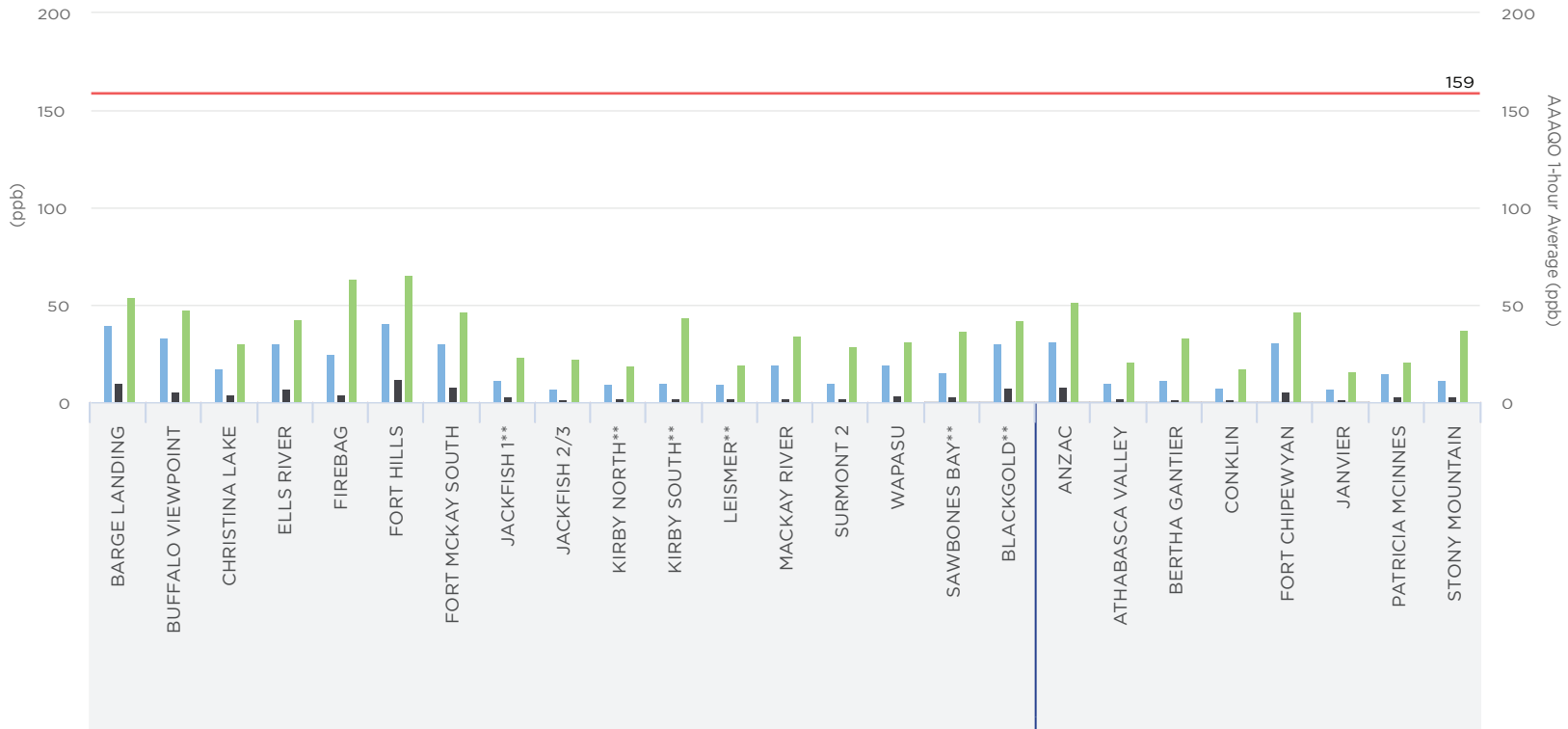


	BARGE LANDING	BUFFALO VIEWPOINT	CHRISTINA LAKE	ELLS RIVER	FIREBAG	FORT HILLS	FORT MCKAY SOUTH	JACKFISH 1**	JACKFISH 2 / 3	KIRBY NORTH**	KIRBY SOUTH**	LEISMER**	LOWER CAMP	MACKAY RIVER	MANNIX	MILDRED LAKE	SURMONT 2	WAPASU	BLACKGOLD**	SAWBONES BAY**	ANZAC	ATHABASCA VALLEY	BERTHA GANTER	CONKLIN	FORT CHIPEWYAN	JANVIER	PATRICIA MCINNES	STONY MOUNTAIN	WASKOW OHCI PIMATISIWIN
99th Percentile	13.4	15.7	13.3	12.8	13.6	11.5	16.9	12.9	5.1	7.1	5.6	20.7	42.9	9.7	23.0	27.7	5.0	14.3	14.4	11.0	7.4	8.1	15.2	2.8	4.0	3.0	11.0	3.6	14.7
Average	1.0	0.8	1.2	0.9	1.1	0.9	1.4	1.0	0.7	0.6	0.5	1.3	2.8	0.6	1.7	2.1	0.5	1.0	1.3	1.1	0.7	0.6	1.1	0.3	0.4	0.3	0.8	0.4	1.0
Max	59.8	127.3	50.2	54.5	56.1	63.5	51.3	52.9	28.3	20.0	18.3	30.0	238.7	30.2	424.1	92.9	21.5	46.4	19.0	20.8	31.4	35.9	77.5	11.2	9.1	7.9	41.6	18.5	61.3
AAAQO 1-hour avg.	172																												

*** **Note:** The WBEA uses Portable Air Monitoring Stations to measure air quality in locations where a permanent air monitoring station does not exist. Based on regulatory requirements, ambient air quality monitoring may be required for 3, 6, or 12 months per year.*

Nitrogen Dioxide (NO_2)

NO_2 is a reddish-brown gas with a pungent, irritating odour that is produced by combustion of fossil fuels. It plays a major role in atmospheric photo-chemical reactions, ground-level ozone formation and destruction, and can also interact with water to form acid rain.

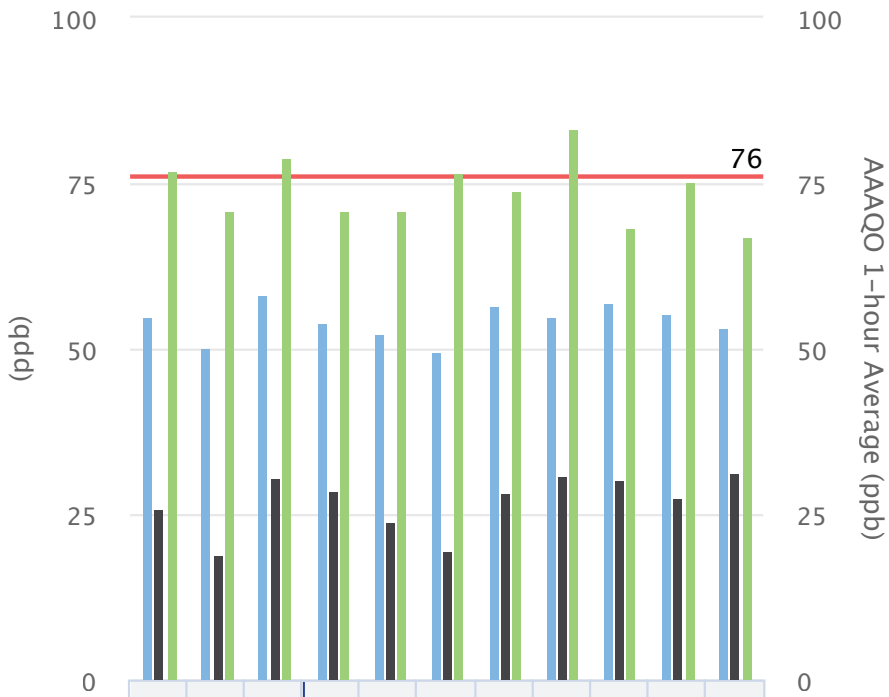


	BARGE LANDING	BUFFALO VIEWPOINT	CHRISTINA LAKE	ELLS RIVER	FIREBAG	FORT HILLS	FORT MCKAY SOUTH	JACKFISH 1**	JACKFISH 2/3	KIRBY NORTH**	KIRBY SOUTH**	LEISMER**	MACKAY RIVER	SURMONT 2	WAPASU	SAWBONES BAY**	BLACKGOLD**	ANZAC	ATHABASCA VALLEY	BERTHA GANTIER	CONKLIN	FORT CHIPEWYAN	JANVIER	PATRICIA MCINNES	STONY MOUNTAIN
99th Percentile	39.1	33.2	17.4	30.1	24.5	40.9	30.2	11.1	7.0	9.1	9.8	9.2	19.1	10.3	19.6	14.5	11.6	15.3	29.9	31.4	9.7	11.1	7.1	30.7	6.8
Average	10.3	5.3	3.8	6.8	3.7	12.3	7.8	2.4	1.3	1.9	1.8	1.9	2.1	1.7	3.1	2.8	2.5	2.5	7.2	8.3	2.1	1.4	1.5	5.2	1.4
Max	53.8	47.2	30.1	43.0	63.3	65.4	46.8	23.1	22.1	18.4	43.4	19.2	34.3	28.4	31.4	20.8	37.3	36.5	42.2	51.3	21.0	33.6	17.5	46.4	16.1
AAAQO 1-hour avg.	159																								

*** **Note:** The WBEA uses Portable Air Monitoring Stations to measure air quality in locations where a permanent air monitoring station does not exist. Based on regulatory requirements, ambient air quality monitoring may be required for 3, 6, or 12 months per year.*

Ozone (O_3)

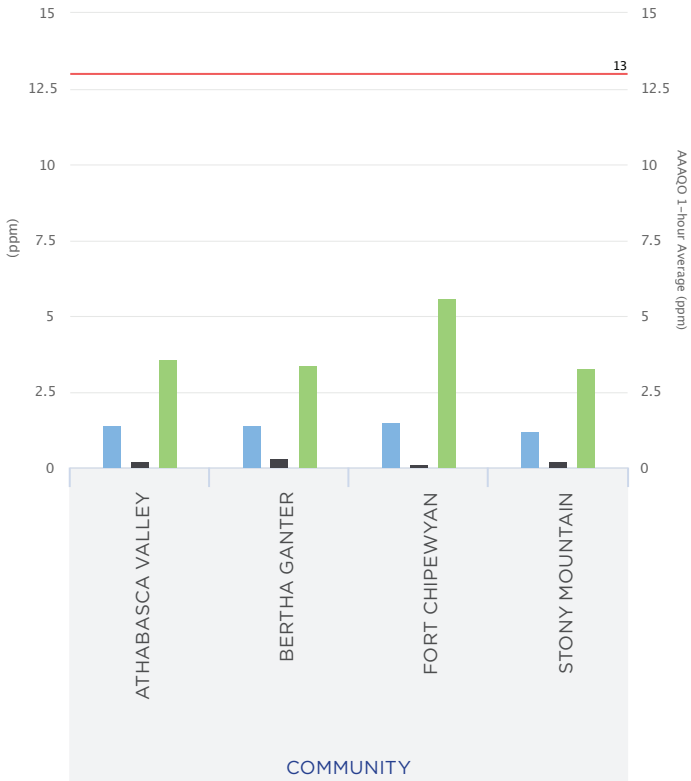
O_3 at ground level is not emitted directly into the air but formed by chemical reactions of NOx and volatile organic compounds (VOCs), from vehicular and industrial emissions. At high concentrations, breathing ozone can affect respiratory function, and cause coughing, throat irritation, and airway inflammation. Children, the elderly, and people with asthma are the most susceptible. Ozone can affect sensitive vegetation, by slowing plant growth and making them more susceptible to disease.



	BUFFALO VIEWPOINT	FORT MCKAY SOUTH	WAPASU	ANZAC	ATHABASCA VALLEY	BERTHA GANTER	CONKLIN	FORT CHIPEWYAN	JANVIER	PATRICIA MCINNES	STONY MOUNTAIN
99th Percentile	55.0	50.2	58.5	53.9	52.5	49.7	56.7	55.0	57.0	55.4	53.4
Average	25.9	18.9	30.8	28.6	24.1	19.7	28.2	31.1	30.4	27.8	31.3
Max	77.0	70.9	79.1	70.9	71.0	76.6	73.9	83.4	68.2	75.5	67.1
AAAQO 1-hour avg.	76										

Carbon Monoxide (CO)

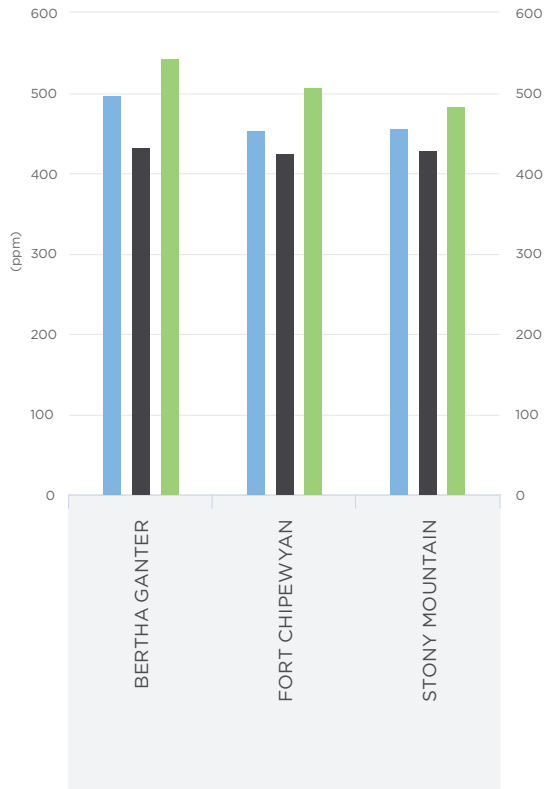
CO is formed from the incomplete combustion of carbon in fossil fuels. Transportation and vehicle emissions are the major source of carbon monoxide with elevated concentrations during the morning and evening rush hours. Breathing carbon monoxide decreases the amount of oxygen carried by the bloodstream.



	ATHABASCA VALLEY	BERTHA GANTER	FORT CHIPEWYAN	STONY MOUNTAIN
99th Percentile	1.4	1.4	1.5	1.2
Average	0.2	0.3	0.1	0.2
Max	3.6	3.4	5.6	3.3
AAAQO 1-hour avg.	13			

Carbon Dioxide (CO_2)

CO_2 is a natural component of the air we breathe. It is a colorless, odourless gas produced by respiration of plants and animals, and through combustion of fossil fuels. Ambient carbon dioxide is generally not a human health concern and is monitored in the network to help differentiate between origins of emissions such as forest fires and anthropogenic sources.

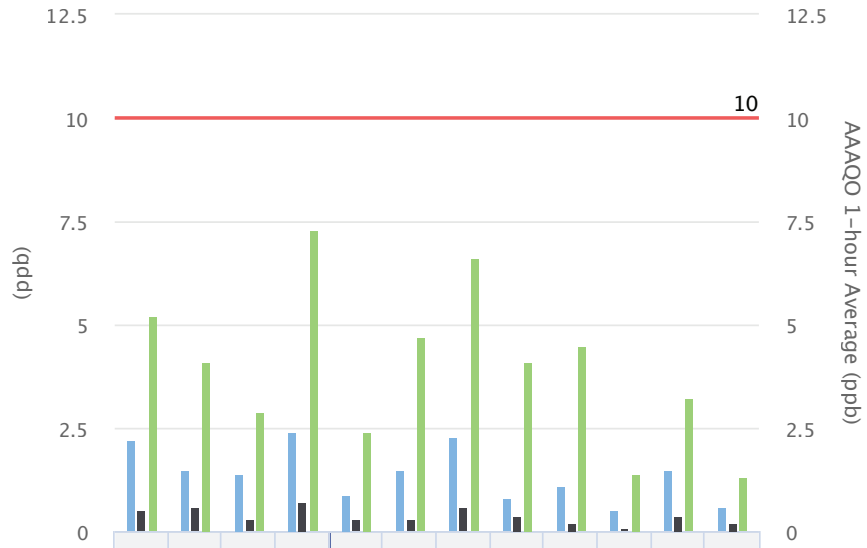


	BERTHA GANTER	FORT CHIPEWYAN	STONY MOUNTAIN
99th Percentile	498	454	456
Average	432	425	429
Max	544	508	483

Note: *CO_2 does not currently have an AAAQO.*

Total Reduced Sulphur (TRS)

The term "Total Reduced Sulphur" covers a larger group of sulphur-containing compounds, including H_2S, carbonyl sulphide, mercaptans, etc. These substances have the potential to cause odours in the region. Hydrogen sulphide is a colourless gas with a rotten egg odour. It is produced through industrial processes. In the WBEA airshed, most industrial TRS and H_2S emissions are from upgraders and tailings ponds, though there is a natural background ambient air concentration of the reduced sulphur compound, carbonyl sulphide, of approximately 0.5 ppb.

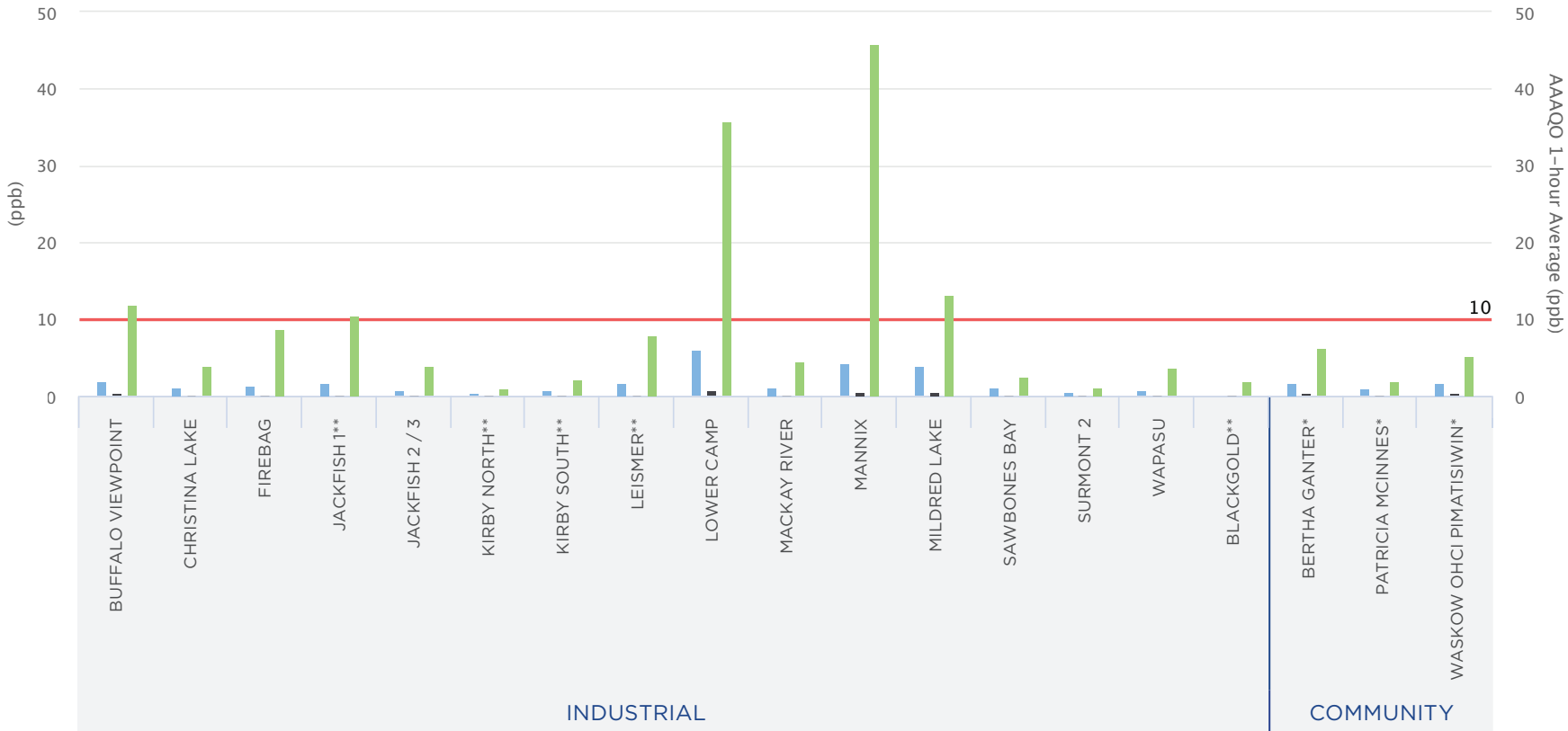


	BARGE LANDING*	ELLS RIVER	FORT HILLS*	FORT MCKAY SOUTH*	ANZAC*	ATHABASCA VALLEY*	BERTHA GANTER*	CONKLIN	FORT CHIPEWYAN*	JANVIER*	PATRICIA MCINNES*	STONY MOUNTAIN*
99th Percentile	2.2	1.5	1.4	2.4	0.9	1.5	2.3	0.8	1.1	0.5	1.5	0.6
Average	0.5	0.6	0.3	0.7	0.3	0.3	0.6	0.4	0.2	0.1	0.4	0.2
Max	5.2	4.1	2.9	7.3	2.4	4.7	6.6	4.1	4.5	1.4	3.2	1.3
AAAQO 1-hour avg.	10											

** Denoting TRS Analyzer*

Hydrogen Sulphide (H_2S)

H_2S is a colourless gas with a rotten egg odour. It is produced through industrial processes. The term "Total Reduced Sulphurs" covers a larger group of sulphur-containing compounds, including H_2S, carbonyl sulphide, mercaptans, etc. These substances have the potential to cause odours in the region. In the WBEA airshed most industrial TRS and H_2S emissions are from upgraders and tailings ponds, though there is a natural background ambient air concentration of the reduced sulphur compound, carbonyl sulphide, of approximately 0.5 ppb.



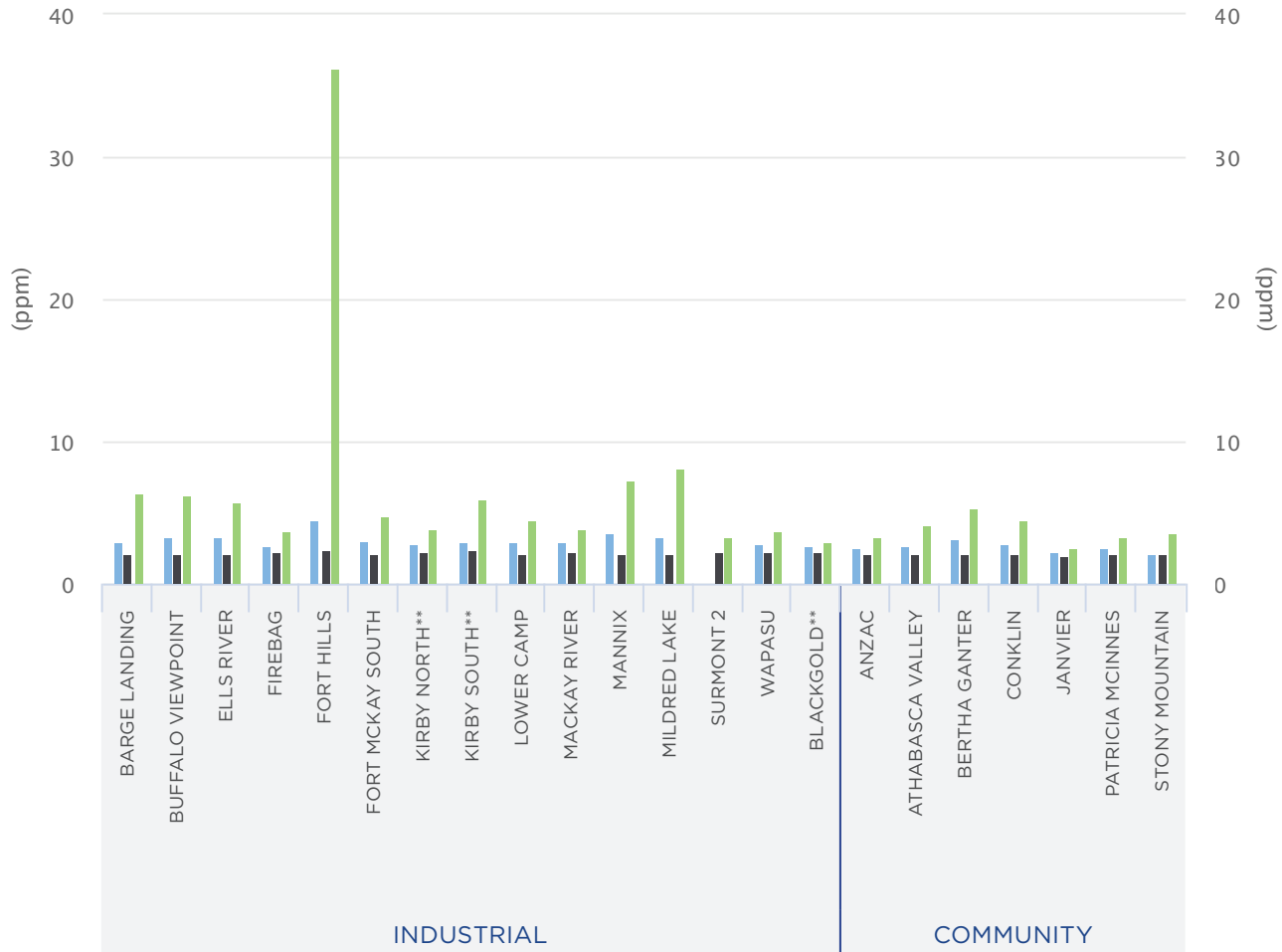
	BUFFALO VIEWPOINT	CHRISTINA LAKE	FIREBAG	JACKFISH 1**	JACKFISH 2 / 3	KIRBY NORTH**	KIRBY SOUTH**	LEISMER**	LOWER CAMP	MACKAY RIVER	MANNIX	MILDRED LAKE	SAWBONES BAY	SURMONT 2	WAPASU	BLACKGOLD**	BERTHA GANTER*	PATRICIA MCINNES*	WASKOW OHCI PIMATISIWIN*
99th Percentile	1.9	1.1	1.3	1.7	0.7	0.4	0.8	1.8	6.1	1.2	4.2	3.9	1.2	0.5	0.8	-	1.0	1.8	1.7
Average	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.2	0.7	0.2	0.5	0.5	0.2	0.1	0.1	0.2	0.2	0.3	0.3
Max	11.8	3.8	8.8	10.5	3.8	1.0	2.1	8.0	35.8	4.5	45.9	13.2	2.6	1.1	3.7	1.9	1.9	6.3	5.3
AAAQO 1-hour avg.	10																		

** Denoting TRS Analyzer*

***** Note:** The WBEA uses Portable Air Monitoring Stations to measure air quality in locations where a permanent air monitoring station does not exist. Based on regulatory requirements, ambient air quality monitoring may be required for 3, 6, or 12 months per year.*

Total Hydrocarbons (THC)

Total hydrocarbons (THC) are the combined concentrations of both methane and non-methane hydrocarbons. Some stations in the WBEA network only measure THCs, while certain stations measure CH_4, NMHC, and THC. Many hydrocarbons are emitted from natural sources, while others can come from industrial and vehicular emissions. The natural background level of THC, composed mainly of CH_4, is generally around 1.8 ppm.



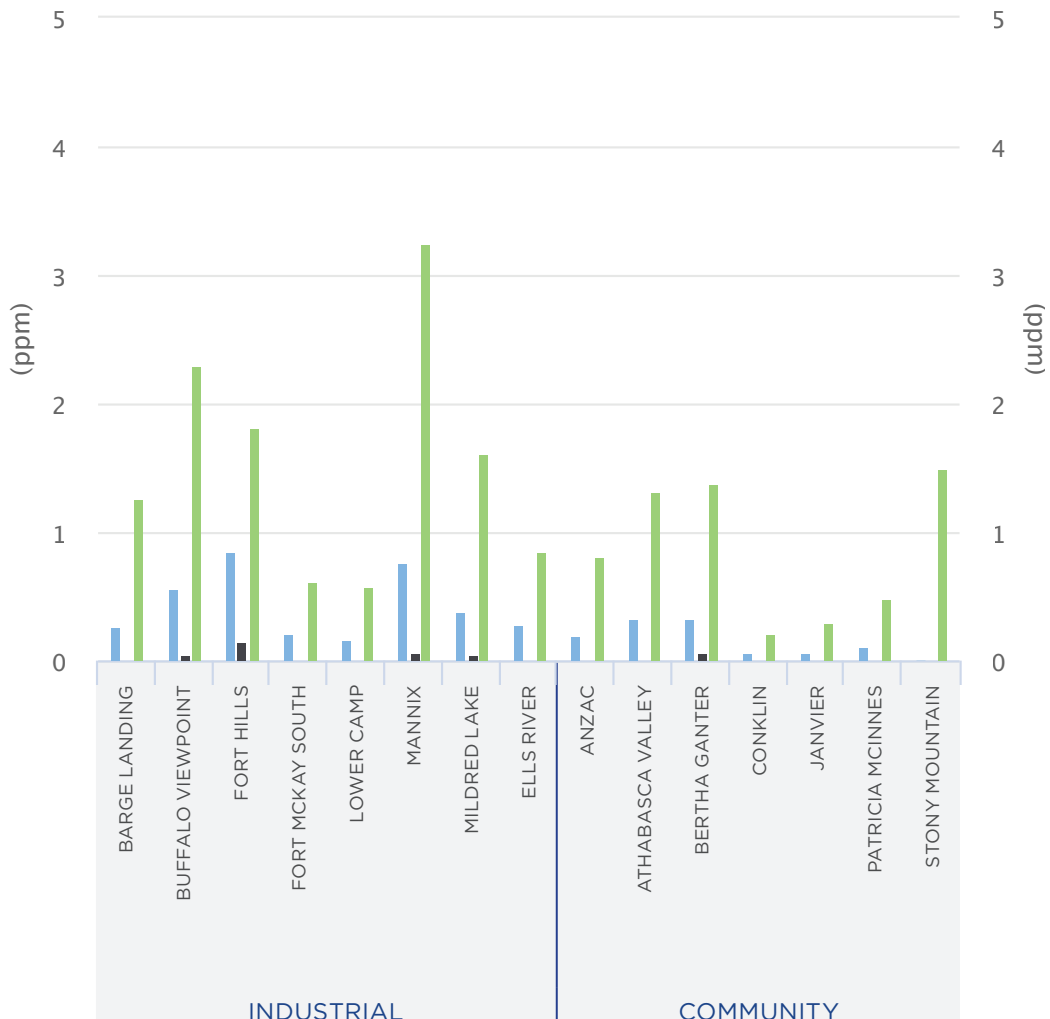
	BARGE LANDING	BUFFALO VIEWPOINT	ELLS RIVER	FIREBAG	FORT HILLS	FORT MCKAY SOUTH	KIRBY NORTH**	KIRBY SOUTH**	LOWER CAMP	MACKAY RIVER	MANNIX	MILDRED LAKE	SURMONT 2	WAPASU	BLACKGOLD**	ANZAC	ATHABASCA VALLEY	BERTHA GANTER	CONKLIN	JANVIER	PATRICIA MCINNES	STONY MOUNTAIN
99th Percentile	3.0	3.3	3.4	2.7	4.6	3.1	2.8	3.0	3.0	2.9	3.6	3.3	-	2.8	2.7	2.5	2.7	3.2	2.8	2.3	2.6	2.2
Average	2.1	2.1	2.2	2.3	2.4	2.2	2.3	2.4	2.2	2.3	2.2	2.2	2.3	2.3	2.3	2.1	2.1	2.2	2.1	2.0	2.1	2.1
Max	6.4	6.3	5.7	3.8	36.3	4.8	3.9	6.0	4.5	3.9	7.4	8.1	3.4	3.7	3.0	3.3	4.2	5.4	4.5	2.6	3.4	3.6

Note: *THC does not currently have an AAAQO.*

*** **Note:*** *The WBEA uses Portable Air Monitoring Stations to measure air quality in locations where a permanent air monitoring station does not exist. Based on regulatory requirements, ambient air quality monitoring may be required for 3, 6, or 12 months per year.*

Non-Methane Hydrocarbons (NMHC)

Methane (CH_4) is the most abundant hydrocarbon on earth, while reactive non-methane hydrocarbons (NMHCs) can react with other compounds in the atmosphere to form ozone. Total hydrocarbons (THC) are the combined concentrations of both methane and non-methane hydrocarbons. Some stations in the WBEA network only measure THCs, while certain stations measure CH_4, NMHC, and THC. Many hydrocarbons are emitted from natural sources, while others can come from industrial and vehicular emissions. The natural background level of THC, composed mainly of CH_4, is generally around 1.8 ppm.

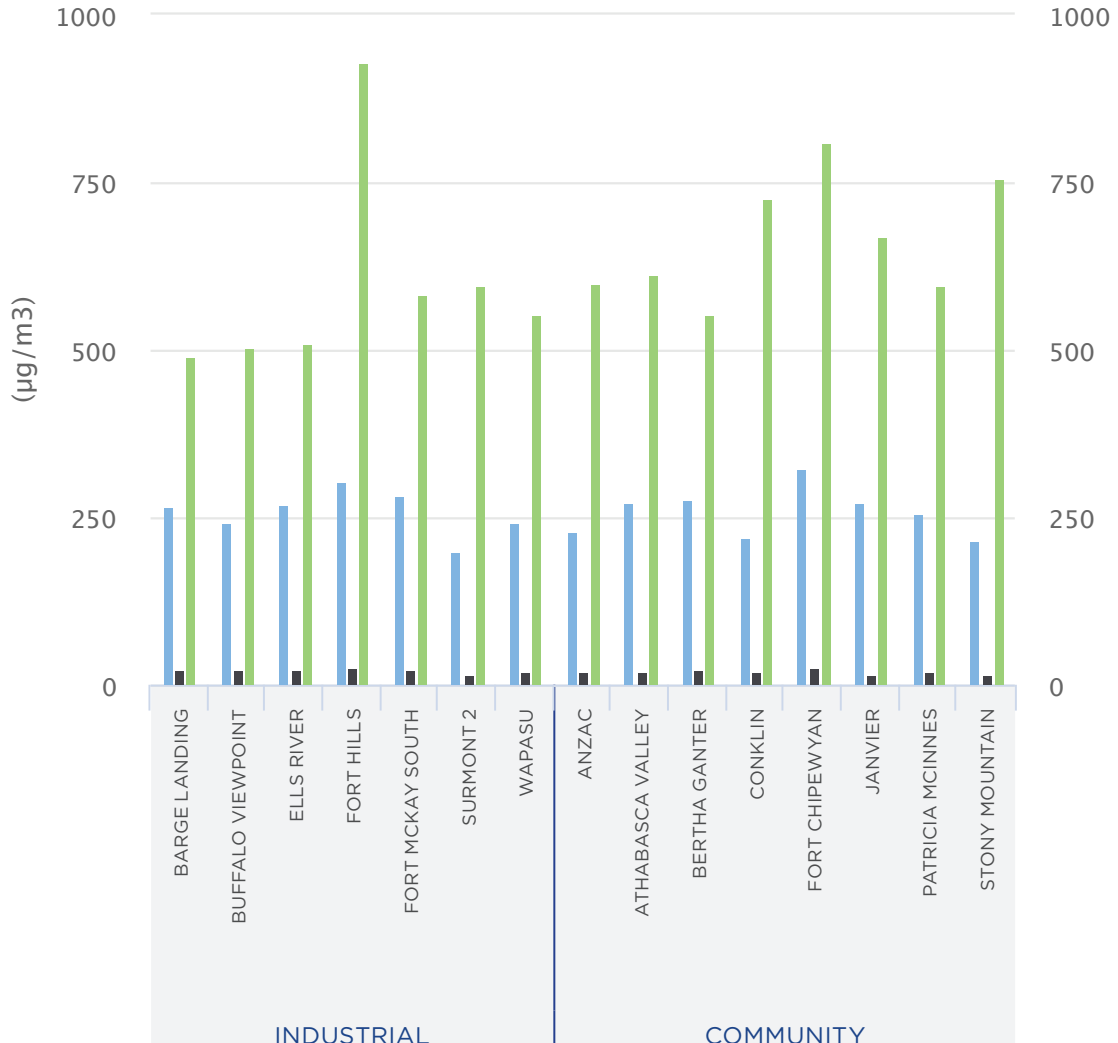


	BARGE LANDING	BUFFALO VIEWPOINT	FORT HILLS	FORT MCKAY SOUTH	LOWER CAMP	MANNIX	MILDRED LAKE	ELLS RIVER	ANZAC	ATHABASCA VALLEY	BERTHA GANTER	CONKLIN	JANVIER	PATRICIA MCINNES	STONY MOUNTAIN
99th Percentile	0.3	0.6	0.9	0.2	0.2	0.8	0.4	0.3	0.2	0.3	0.3	0.1	0.1	0.1	0.0
Average	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Max	1.3	2.3	1.8	0.6	0.6	3.2	1.6	0.8	0.8	1.3	1.4	0.2	0.3	0.5	1.5

Note: *NMHC does not currently have an AAAQO.*

Particulate matter less than 2.5 µm

Particulate matter consists of a mixture of solid particles and aerosols found in the air. $PM_{2.5}$ is the fraction of total particulate that are 2.5 µm (microns) in diameter or less, and is produced mainly by combustion processes, including forest fires.



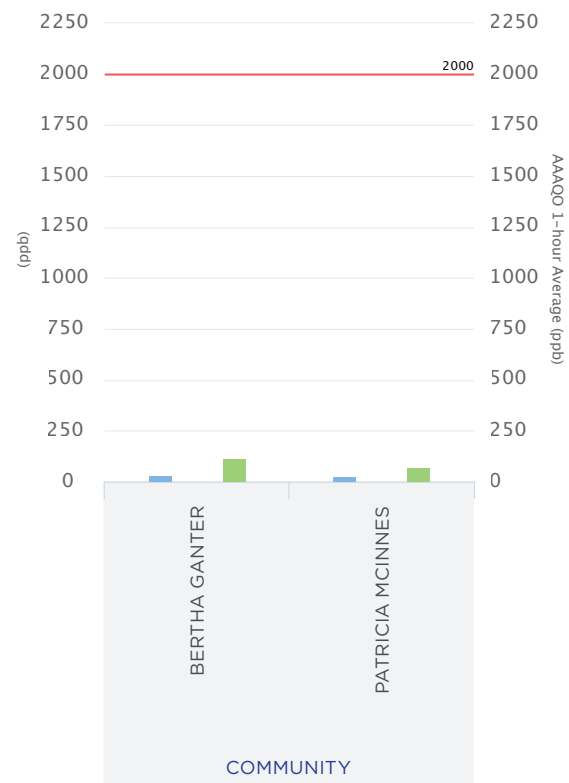
	BARGE LANDING	BUFFALO VIEWPOINT	ELLS RIVER	FORT HILLS	FORT MCKAY SOUTH	SURMONT 2	WAPASU	ANZAC	ATHABASCA VALLEY	BERTHA GANTER	CONKLIN	FORT CHIPEWYAN	JANVIER	PATRICIA MCINNES	STONY MOUNTAIN
99th Percentile	267.3	244.8	271.4	303.0	284.5	201.3	243.1	228.5	271.7	277.6	221.1	323.3	274.6	256.5	216.4
Average	23.7	23.1	22.0	27.2	24.8	17.2	20.8	18.6	21.4	23.5	19.7	26.8	18.2	20.4	17.4
Max	489.2	504.0	510.1	930.4	582.9	595.6	552.7	599.7	614.3	554.7	725.7	810.3	670.2	596.9	756.6

Note: *The data in the graph is presented using 1-hour concentration averages. $PM_{2.5}$ does not currently have a 1-hour average AAAQO.*

Note: *Forest fire season was considered to be from March 1 - October 31, 2023.*

Ammonia (NH_3)

NH_3 is a natural compound found in the environment as part of the nitrogen cycle and can also come from human activity. NH_3 is monitored by the WBEA because it is used by one industry member to help reduce SO_2 emissions. Exposure to elevated concentrations of ammonia can cause irritation of the nose, throat, and respiratory tract. NH_3 is currently monitored at the Bertha Ganter-Fort McKay and Patricia McInnes air monitoring stations.



	BERTHA GANTER	PATRICIA MCINNES
99th Percentile	29.3	22.7
Average	1.1	0.8
Max	114.1	72.9
AAAQO 1-hour avg.	2000	

Time-Integrated Monitoring

Time-integrated sampling provides a more detailed analysis of species present in ambient air, and supplements continuous monitoring which reports a total concentration in real time. Time-integrated monitoring methods consist of exposing sample media to the atmosphere for a period, then collecting and sending that media to a laboratory for analysis.

The WBEA's time-integrated sampling data is available at **https://wbea.org/data/time-integrated-data-search/**. The 2023 data for time-integrated monitoring methods is presented in the graphs below as the annual average (mean) of 24-hour sample concentrations, along with the 95th percentile to show readings on the high-end of the data collected, after removing the highest 5% which may be outliers. There are numerous species collected, however, the graphs show the nine (9) or ten (10) parameters with the highest concentrations in 2023.

Note: Averages may be too small to be visible on some graphs. View the annual report online to see the specific values at: **wbea.org/2023-annual-report**.

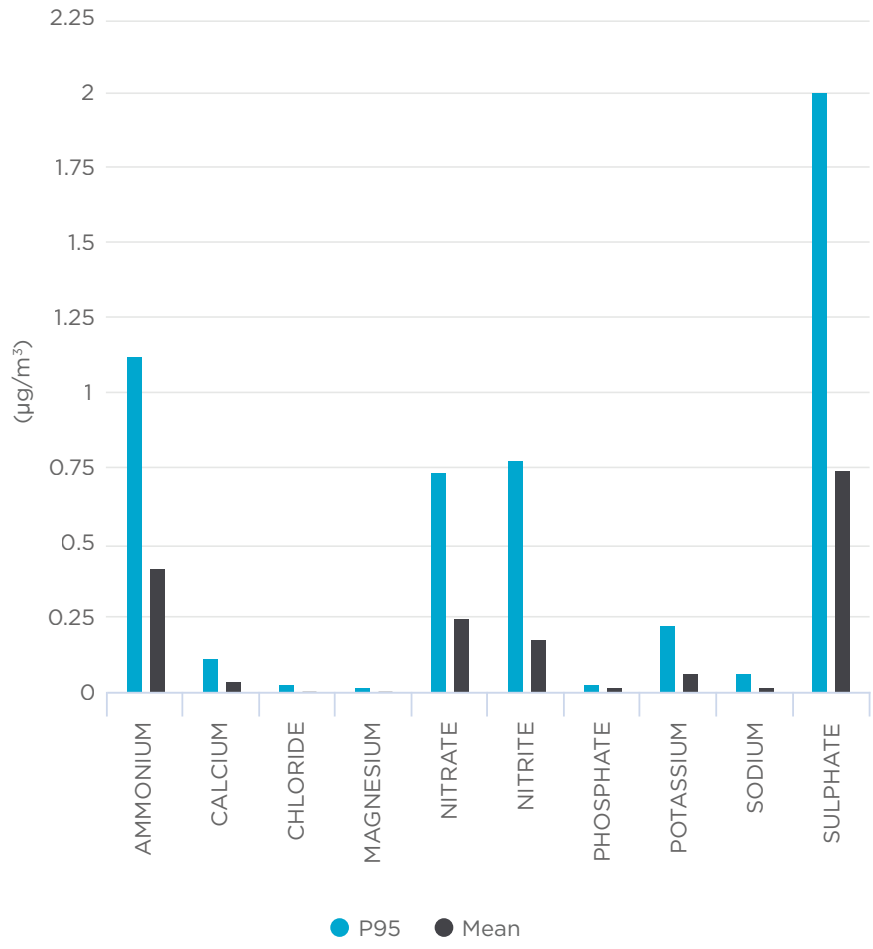
Particulate matter less than 2.5 µm - Ions

Particulate matter consists of a mixture of solid particles and aerosols found in the air. $PM_{2.5}$ is the fraction of total particulate that are 2.5 µm (microns) in diameter or less, and is produced mainly by combustion processes, including forest fires.

Typically, exceedances of the $PM_{2.5}$ AAAQO in the WBEA network are a result of forest fires. Fine particles are composed primarily of sulphate, nitrate, ammonium, inorganic and organic carbon compounds, and heavy metals. $PM_{2.5}$ poses a health risk as the particles can be inhaled deep into the lungs.

The continuous analyzer measures the concentration of particulate matter in the air at any given time. A time-integrated $PM_{2.5}$ sample is a measure of dry deposition and is analyzed for major ions similar to the wet deposition samples, and metals that make up the particulate matter in the air.

Anzac



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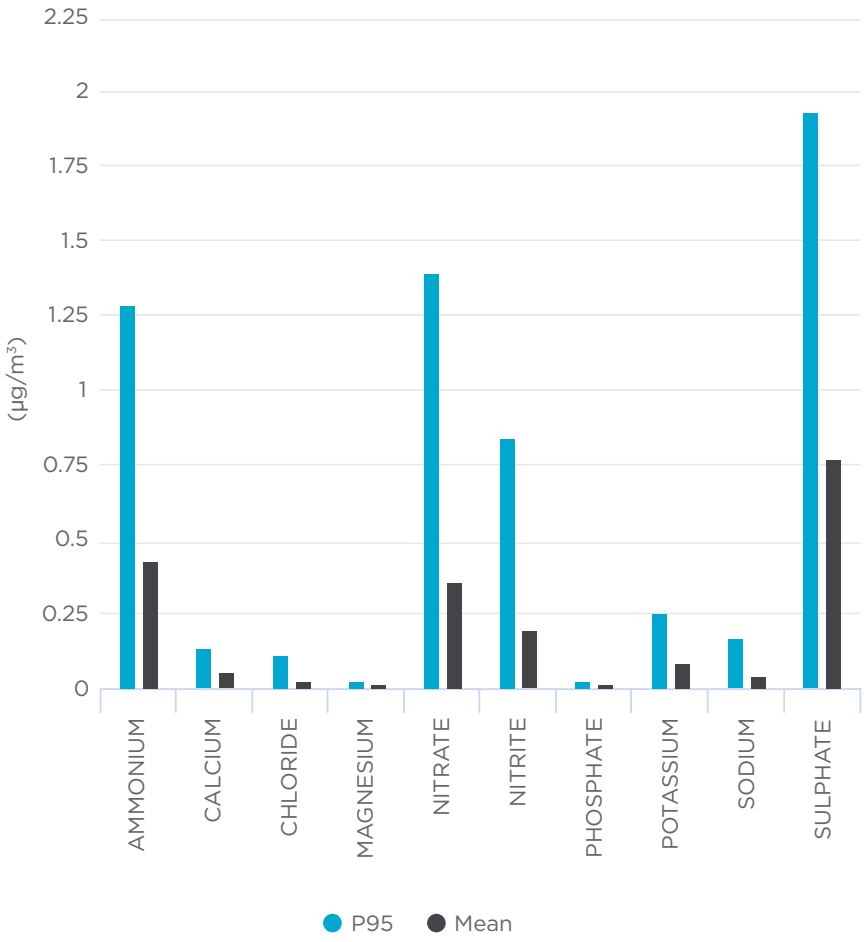
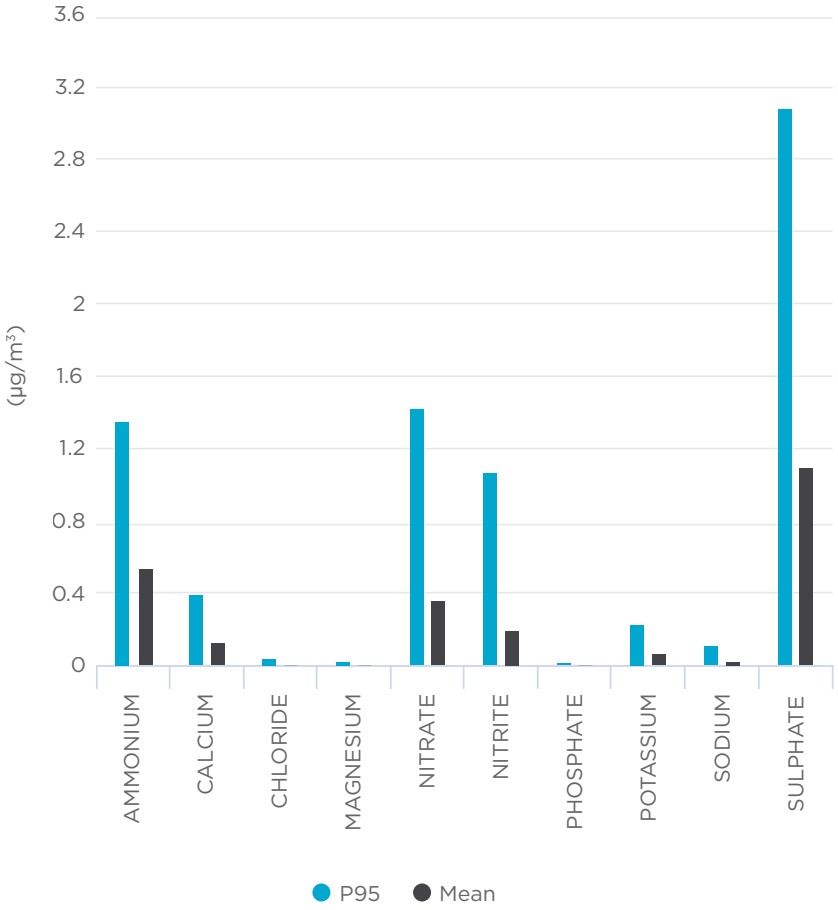
Athabasca Valley



Bertha Ganter - Fort McKay



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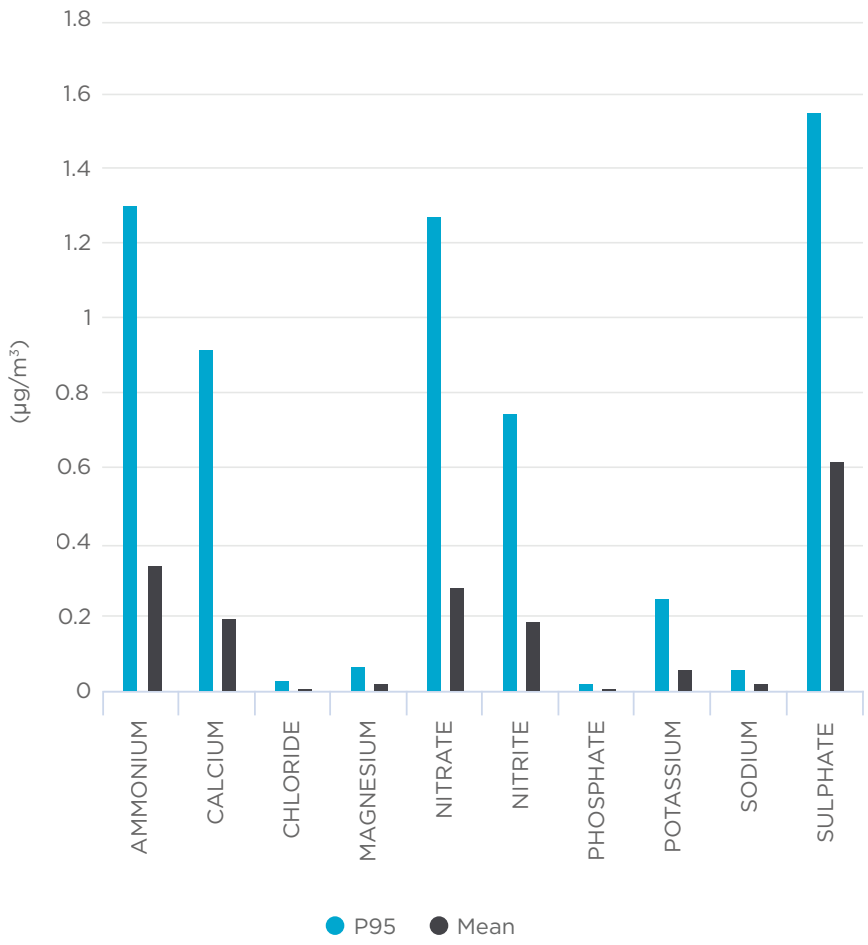
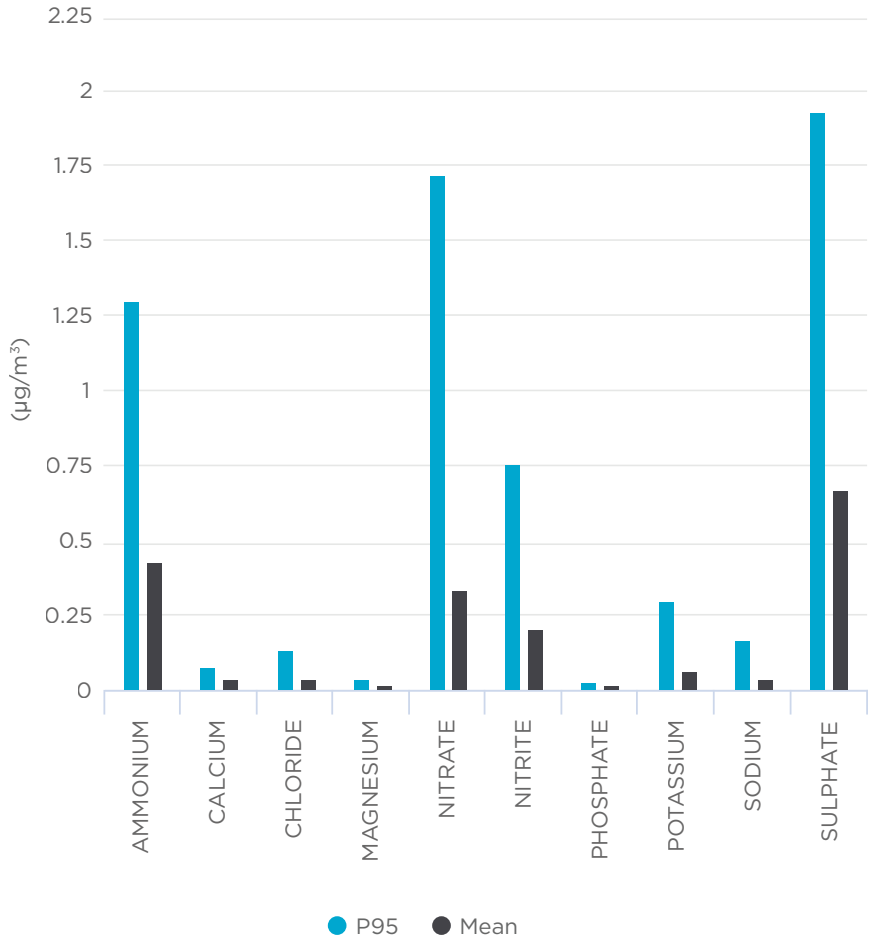
Conklin



Fort Chipewyan



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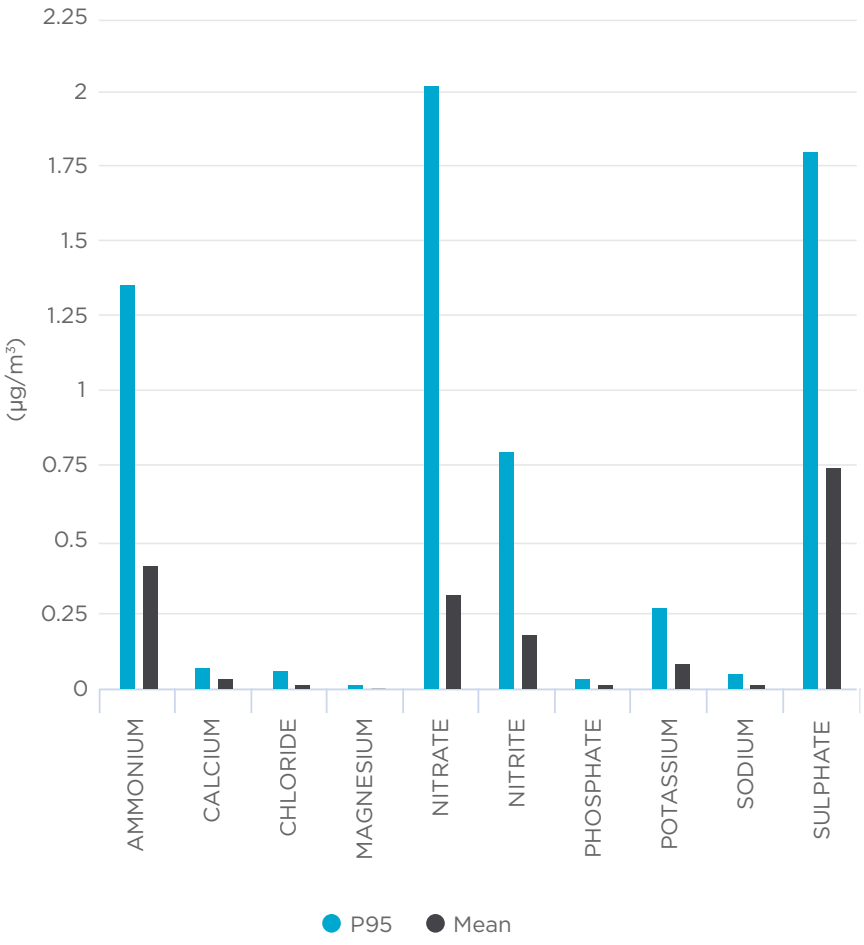
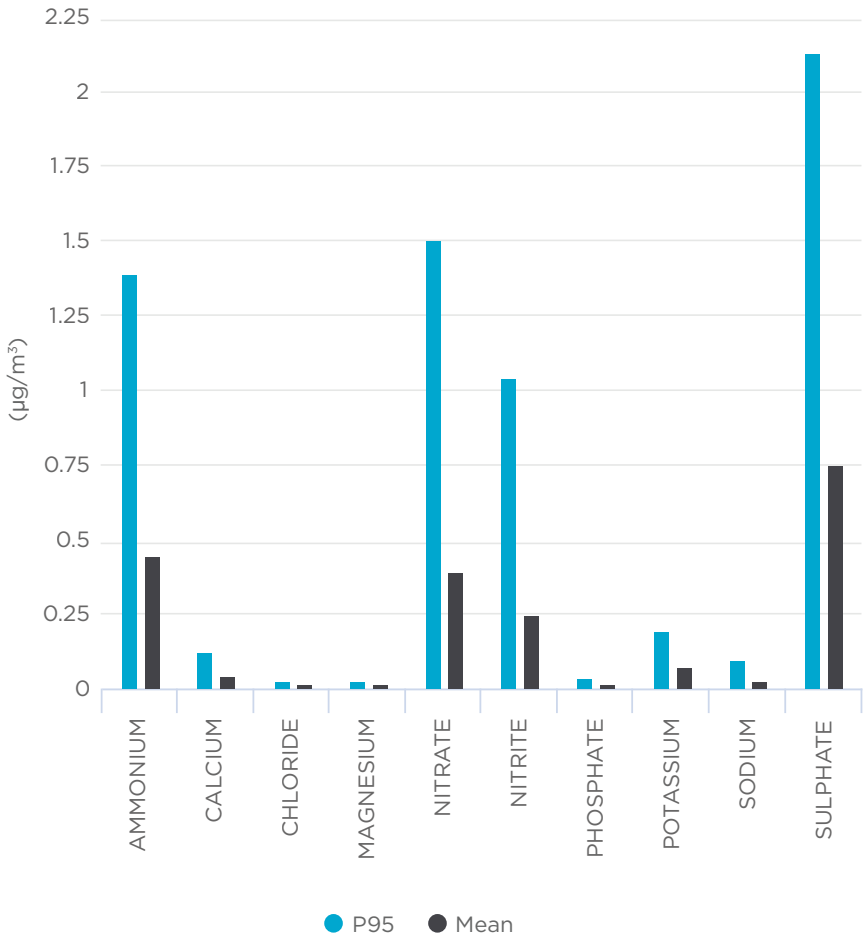
Janvier



Patricia McInnes



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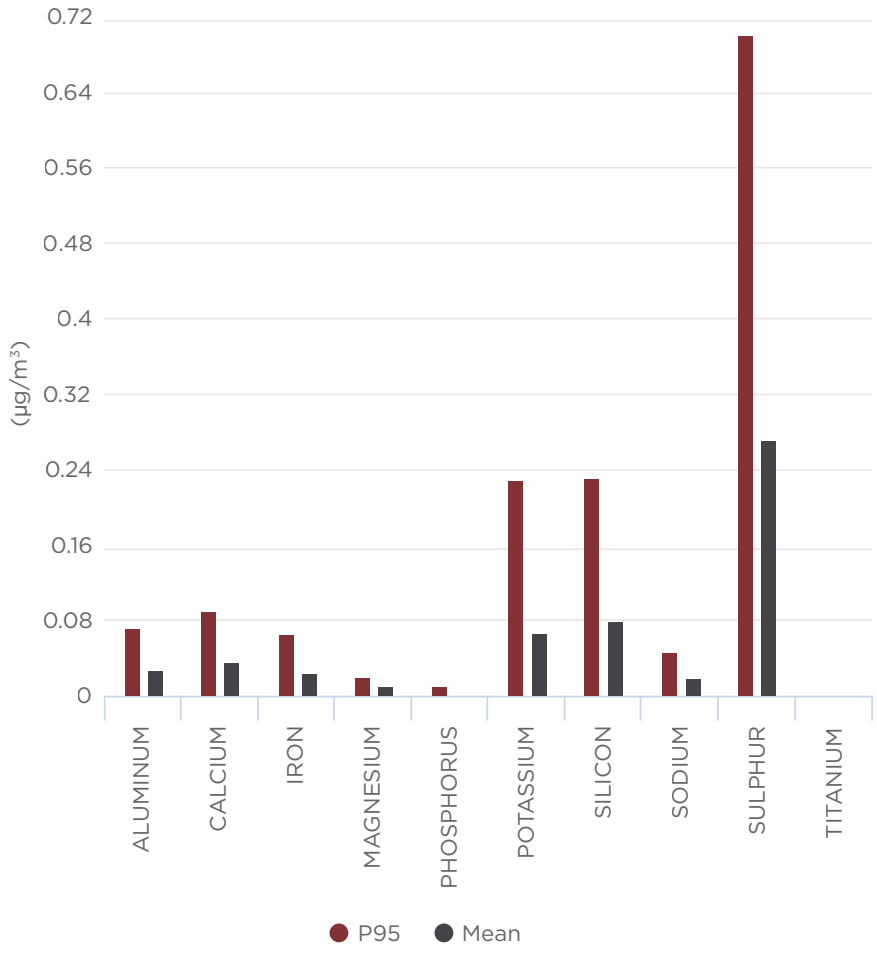
Anzac



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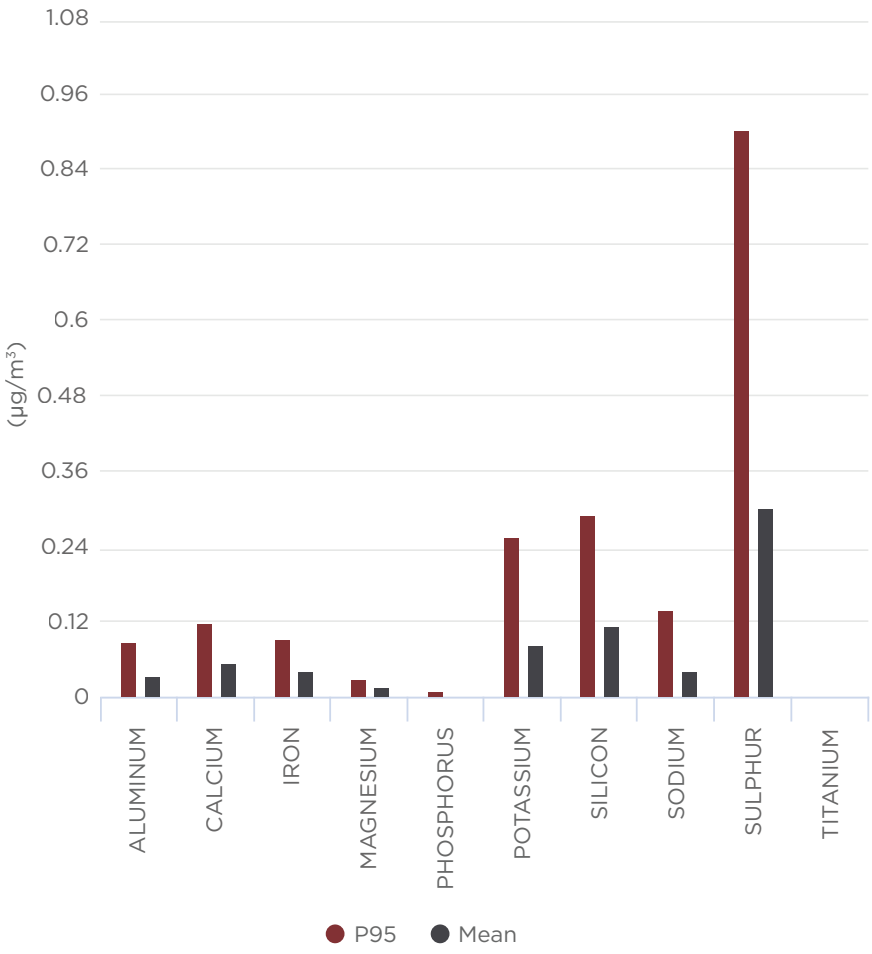
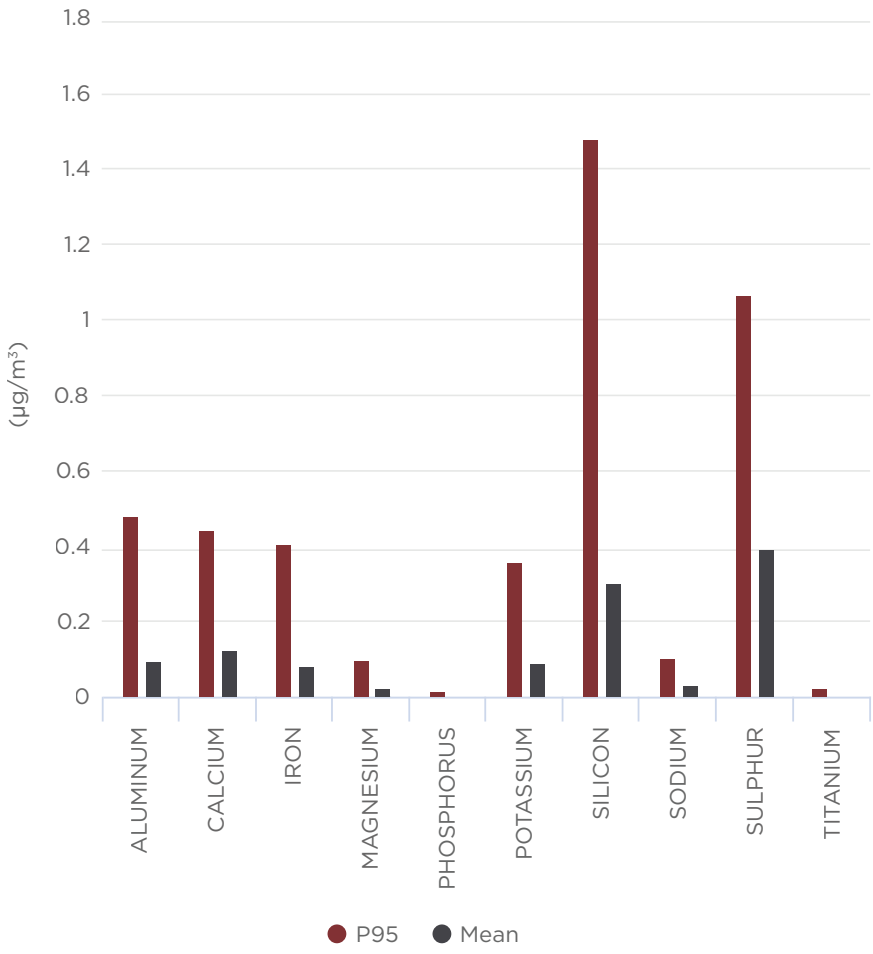
Athabasca Valley



Bertha Ganter - Fort McKay



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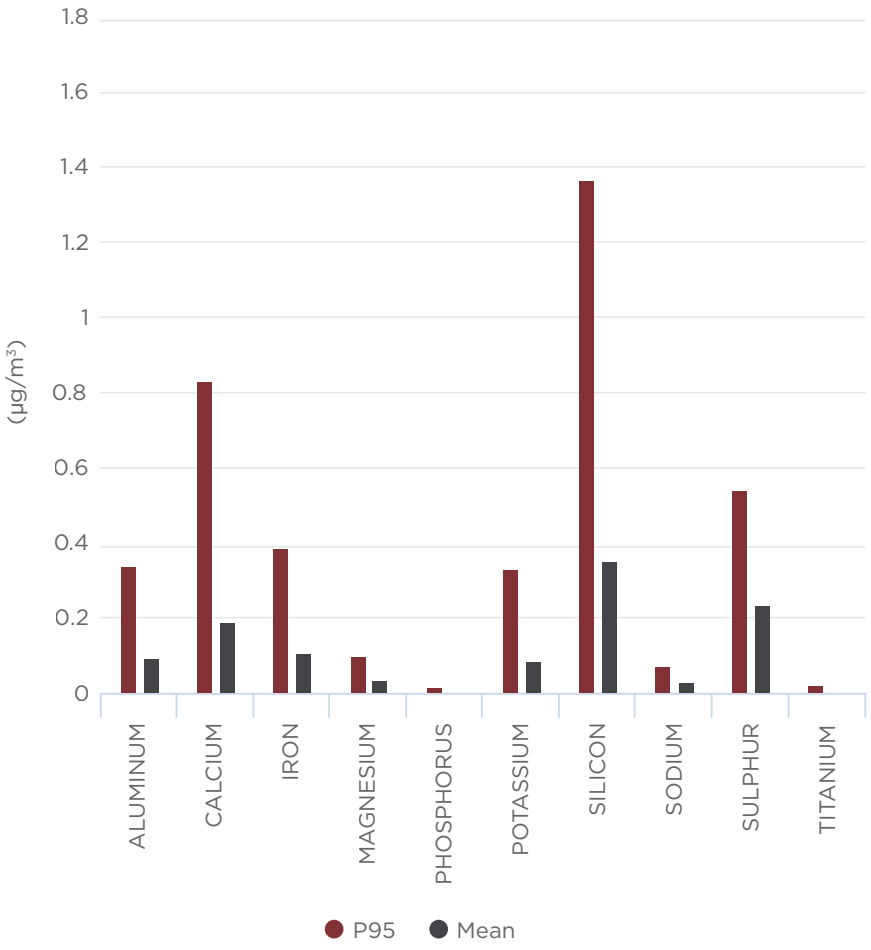
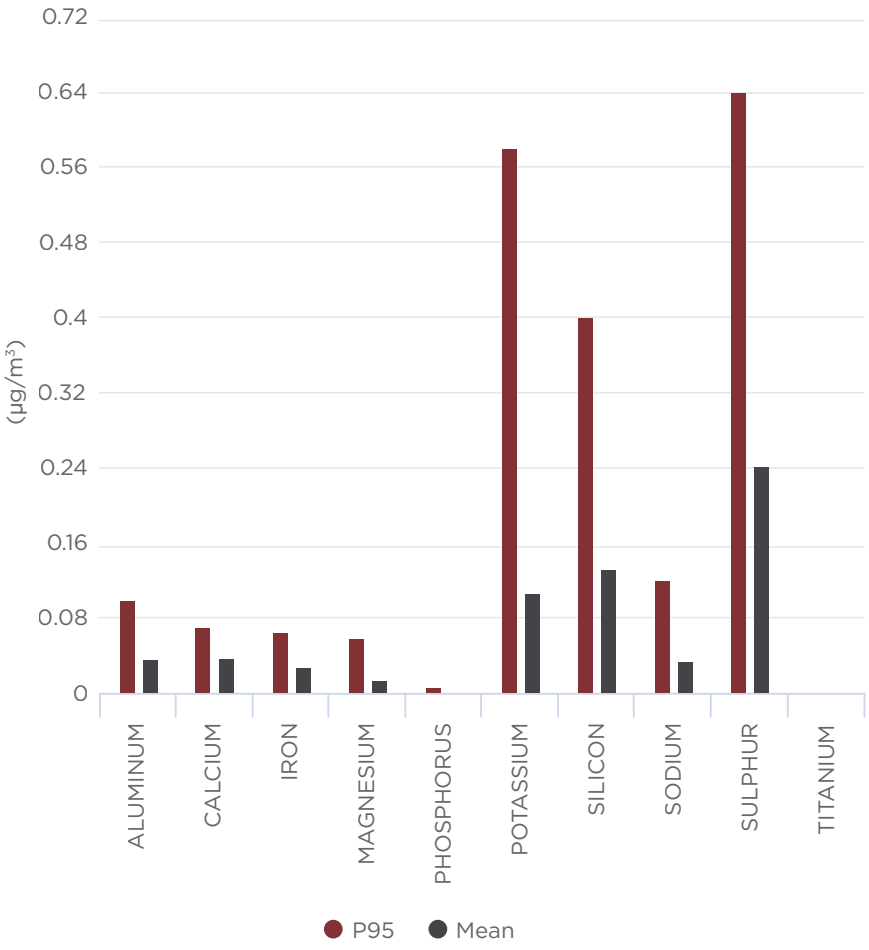


Fort Chipewyan



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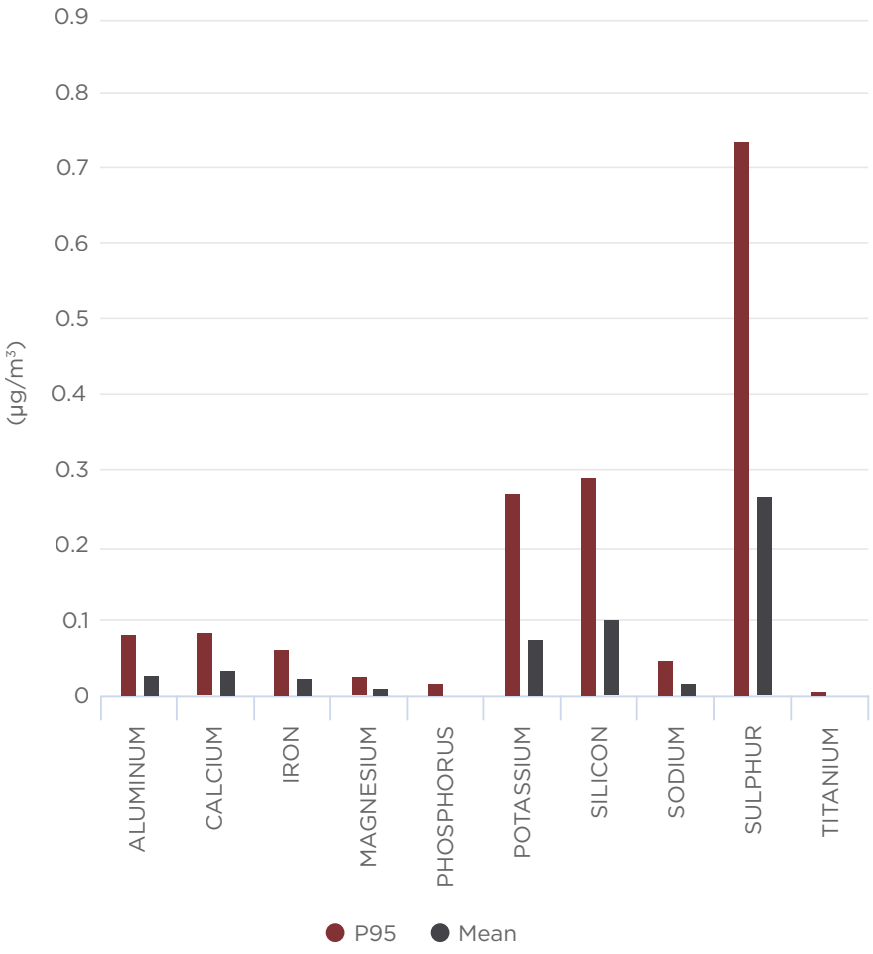
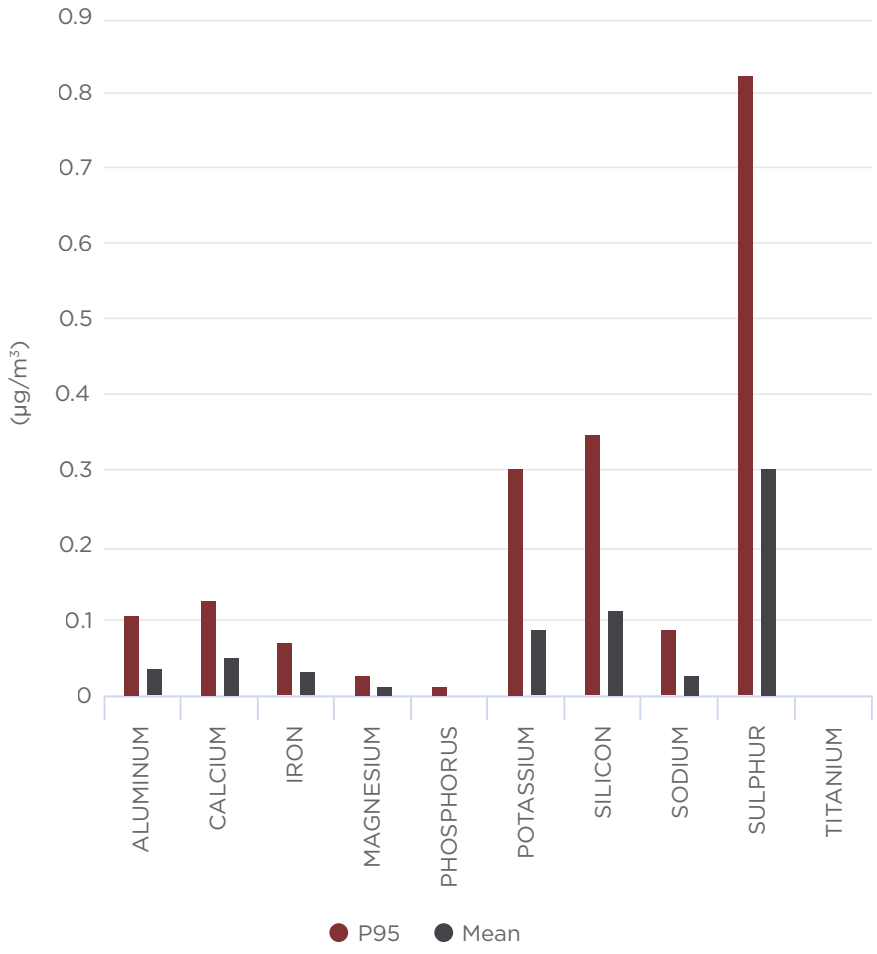
Janvier



Patricia McInnes



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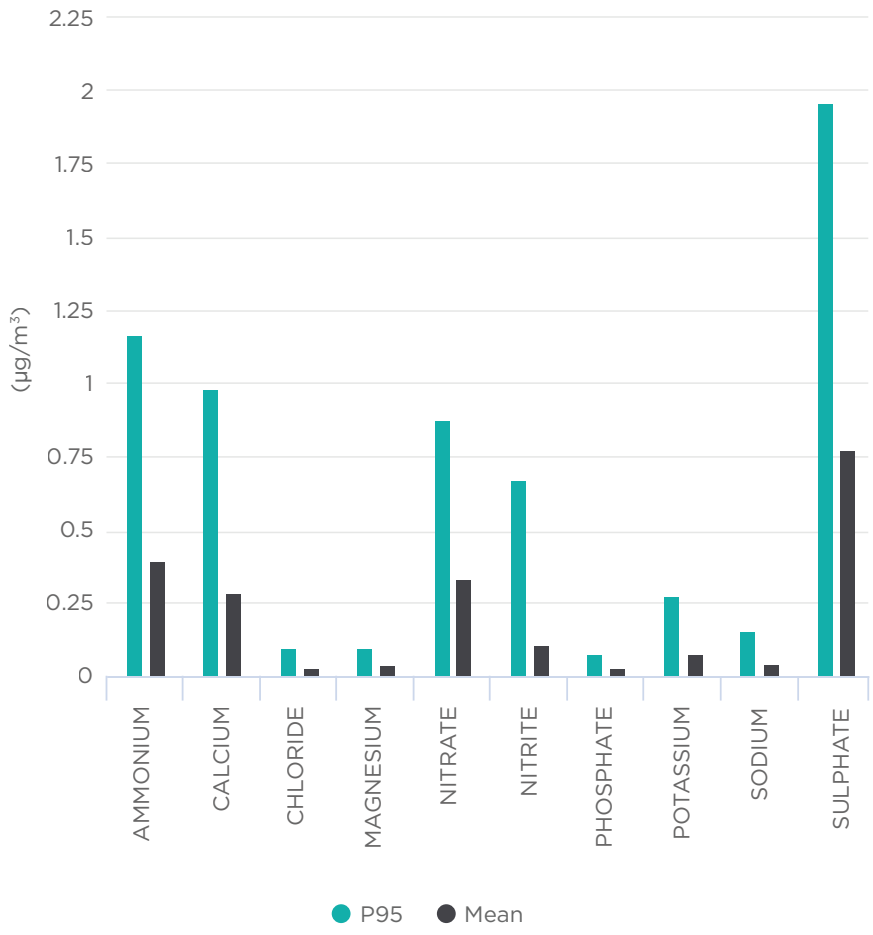

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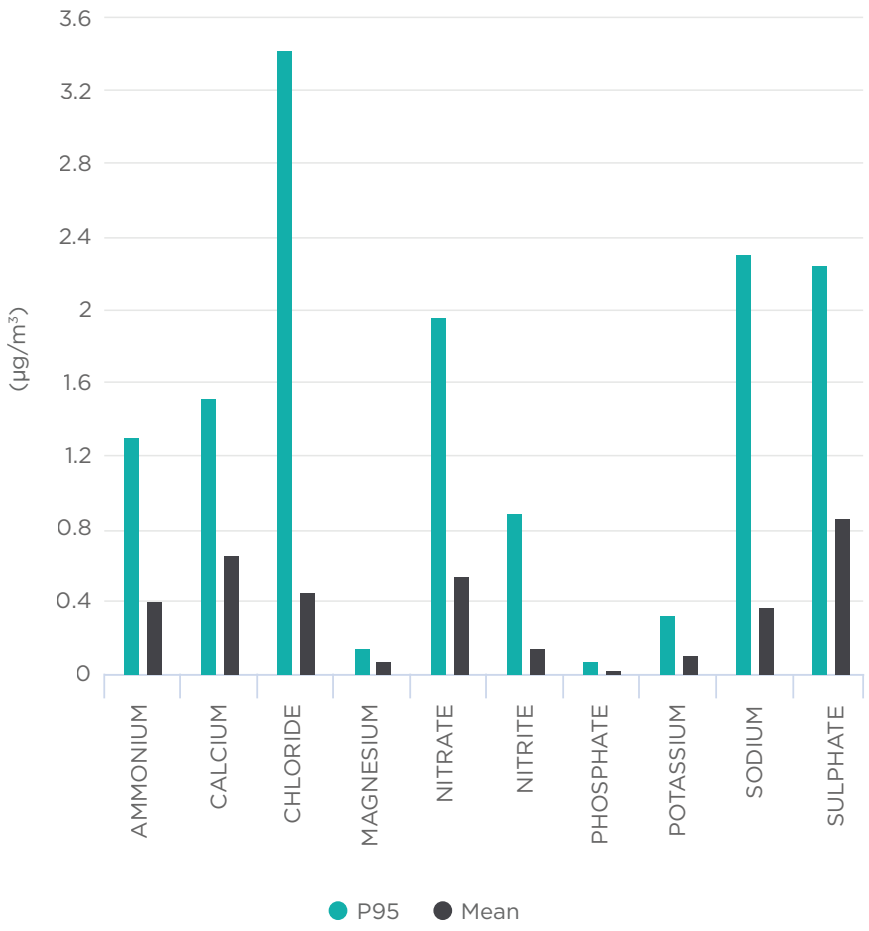
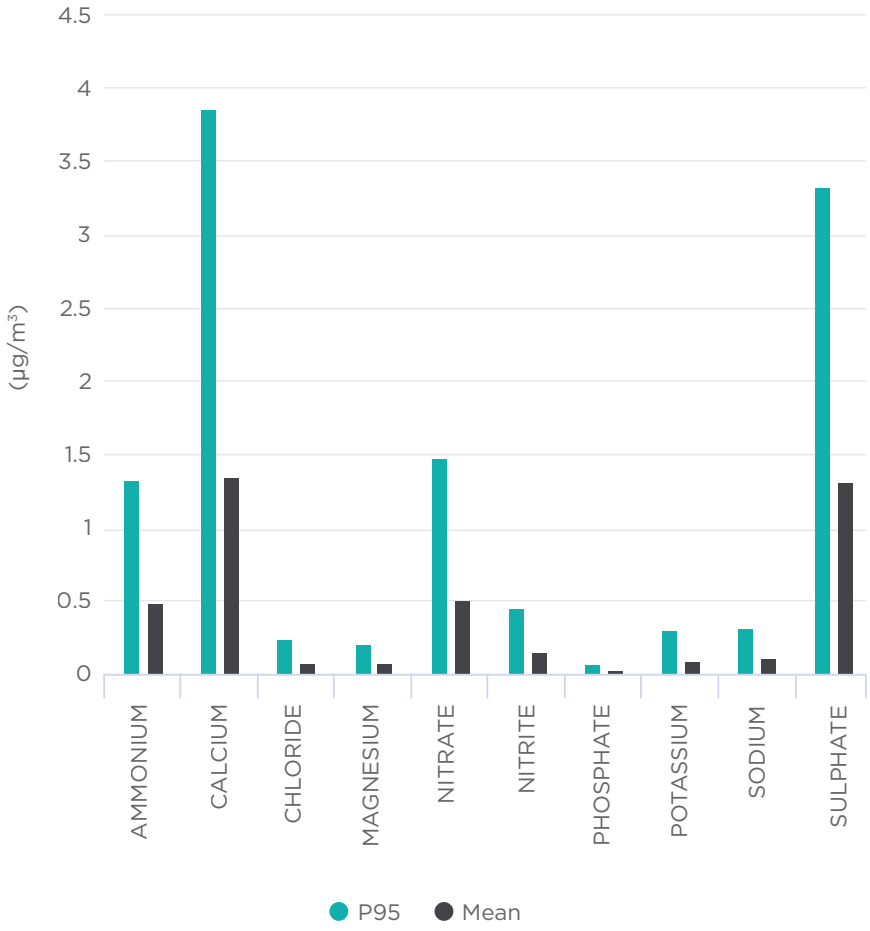


Bertha Ganter - Fort McKay



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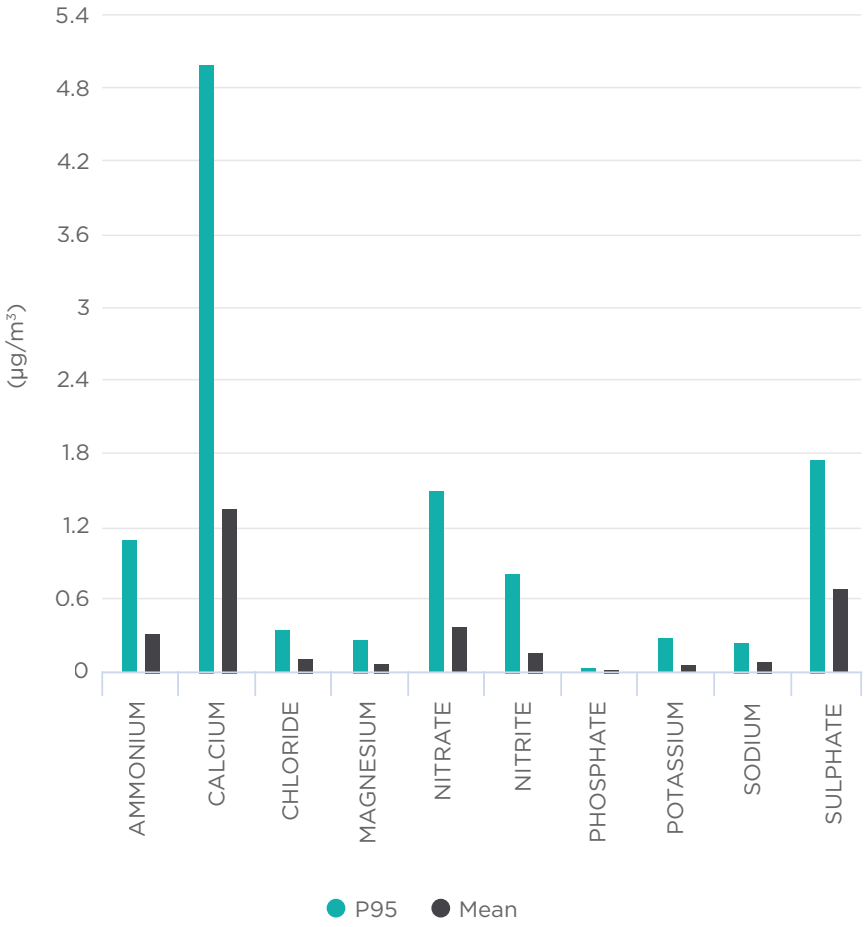
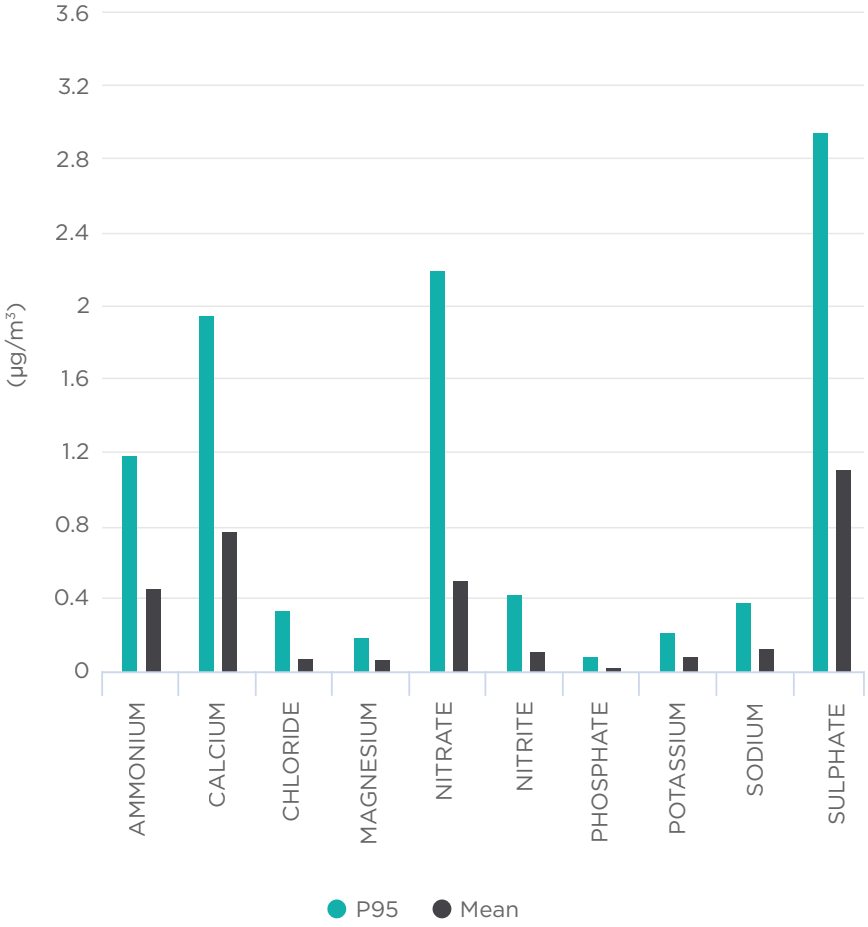


Ells River



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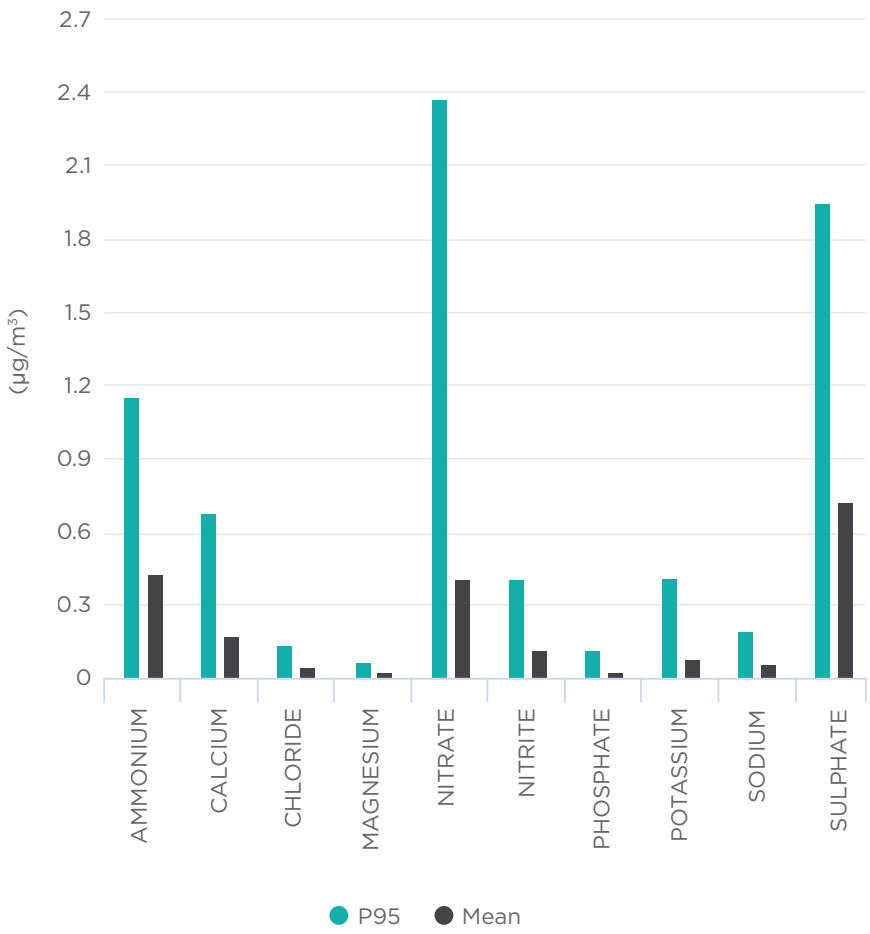
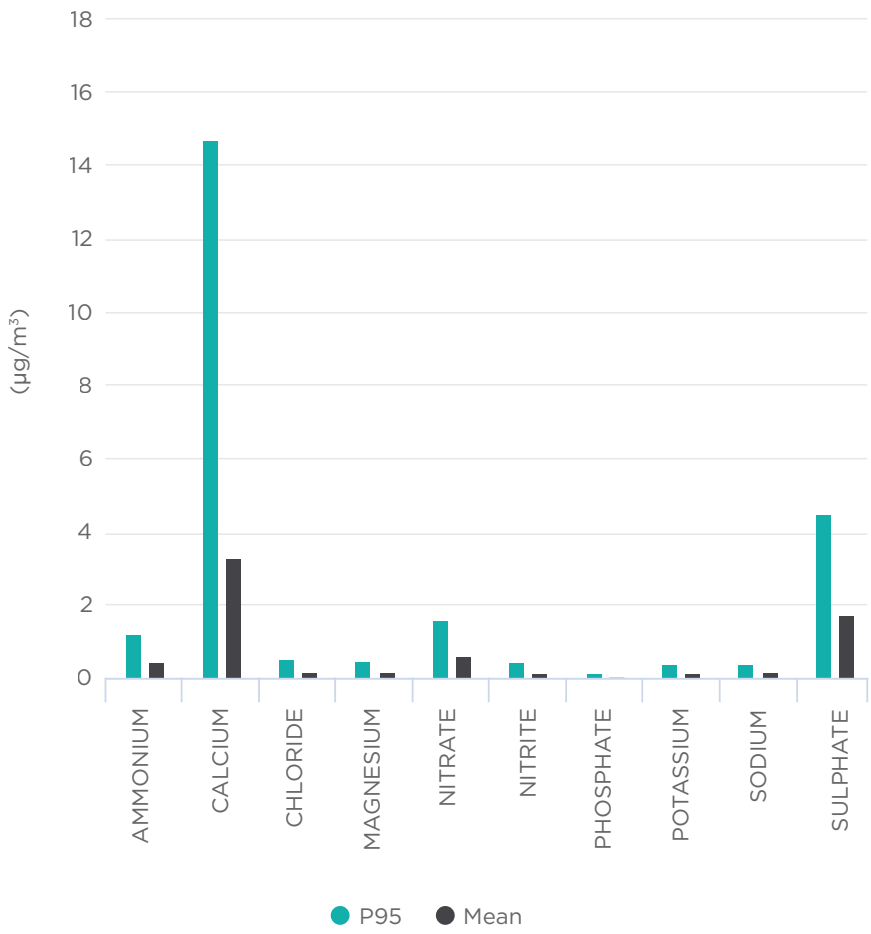
Fort Chipewyan



Fort Hills



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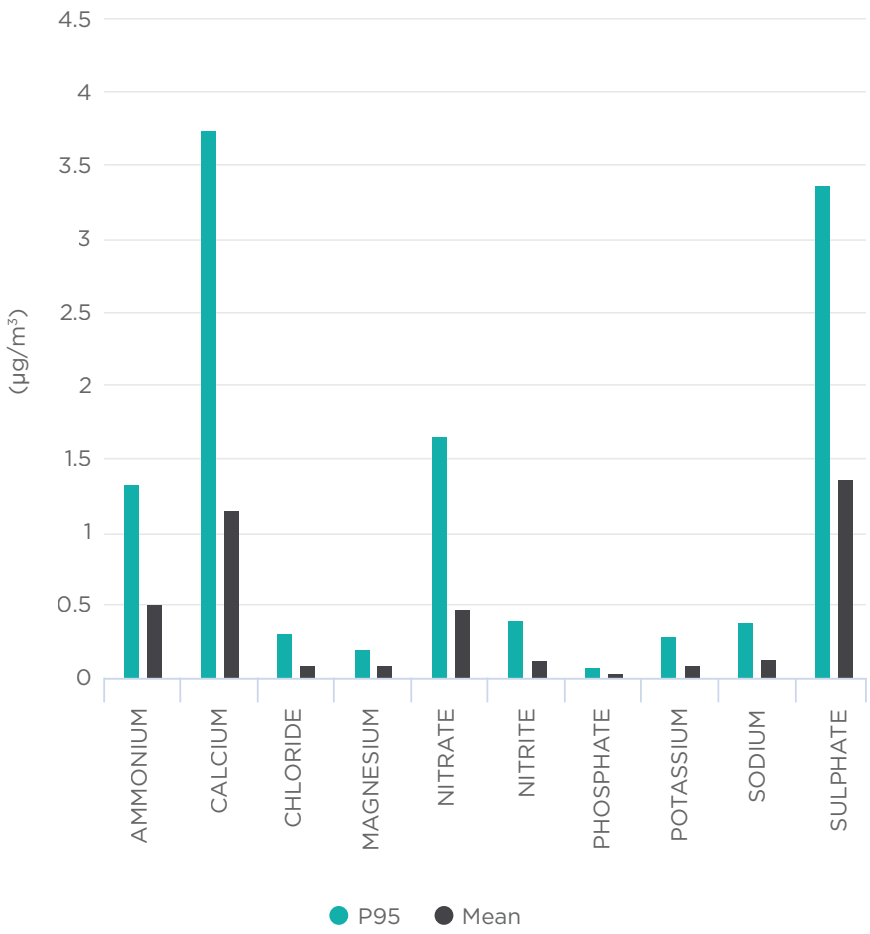
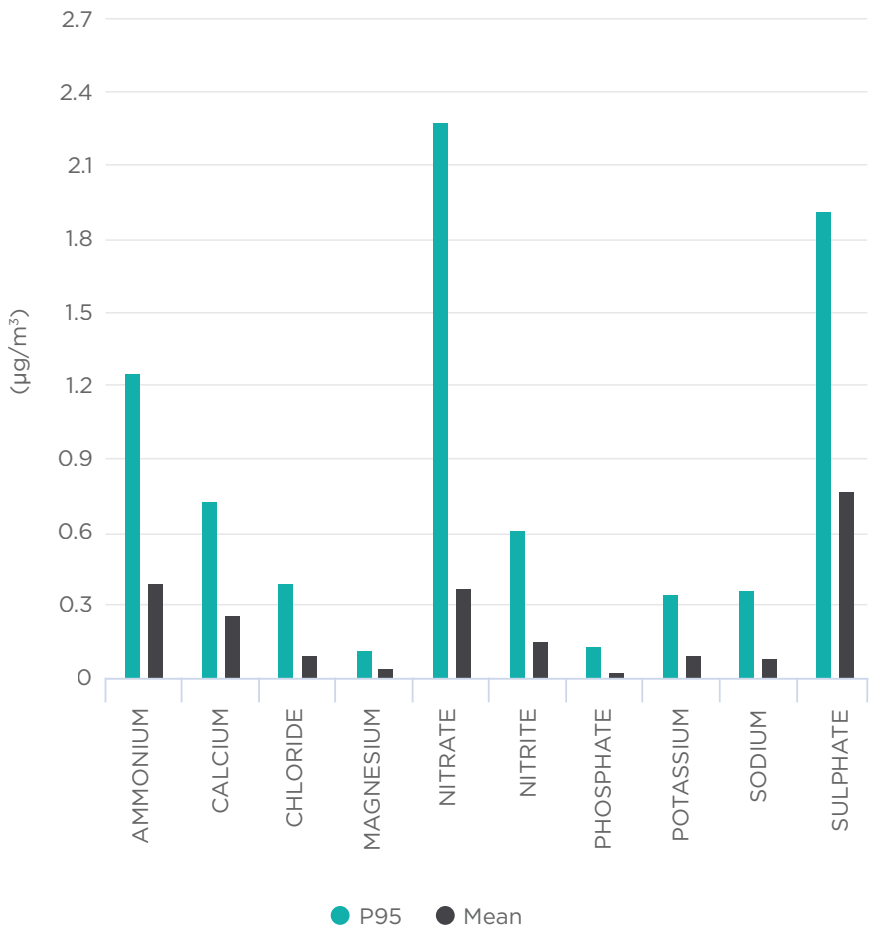
Fort McKay South



Janvier



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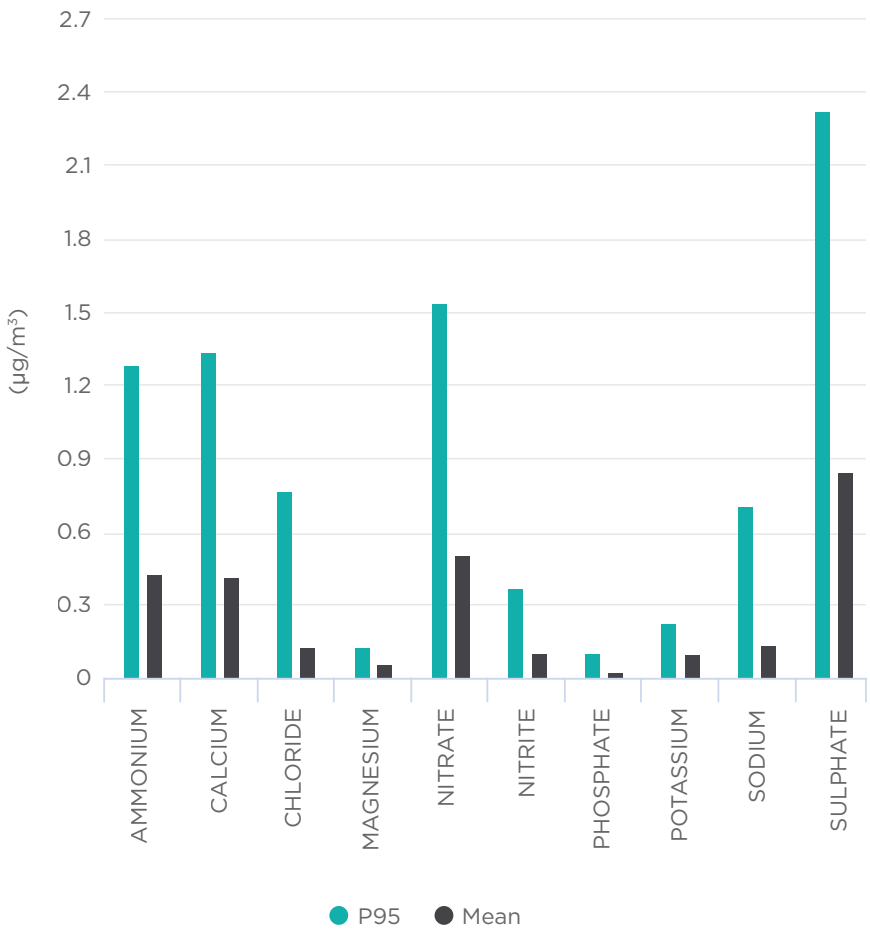
Patricia McInnes



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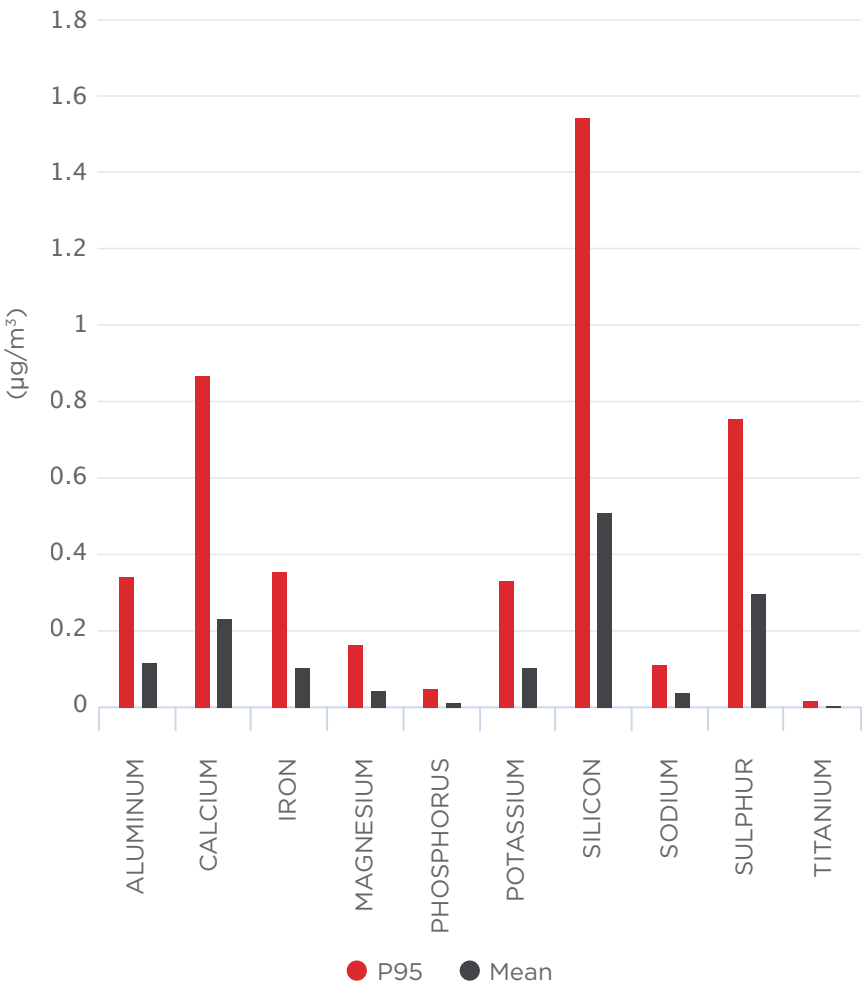
Anzac



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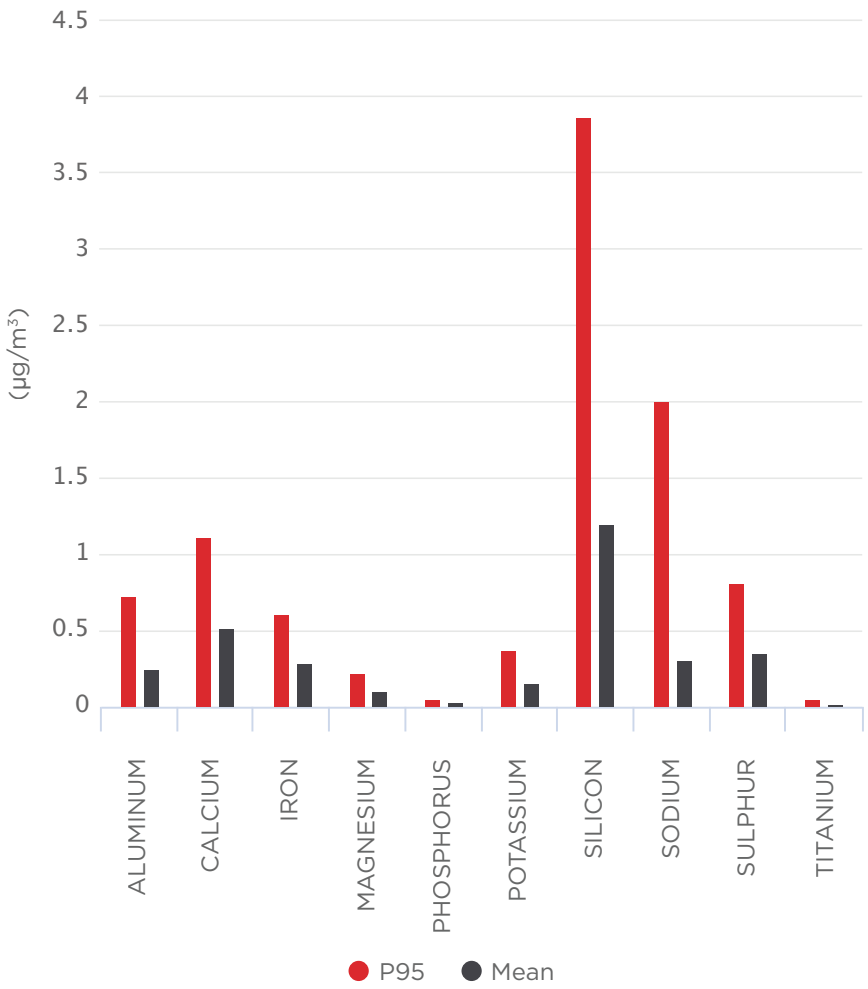
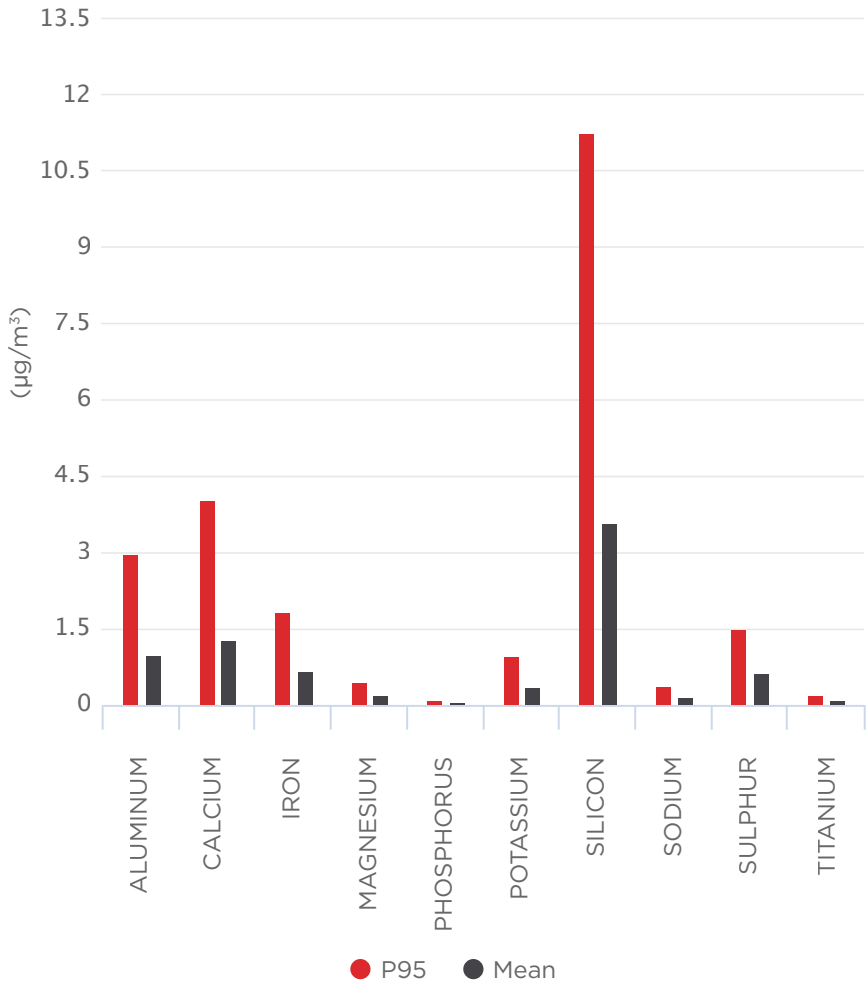
Athabasca Valley



Bertha Ganter - Fort McKay



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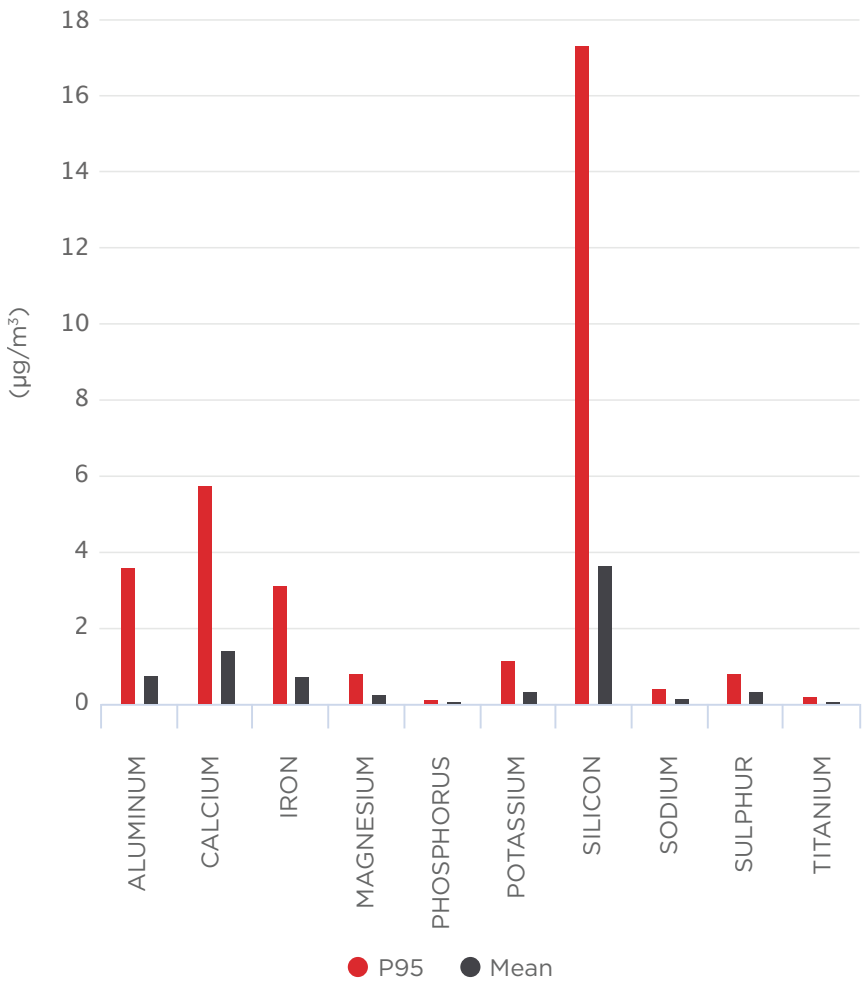
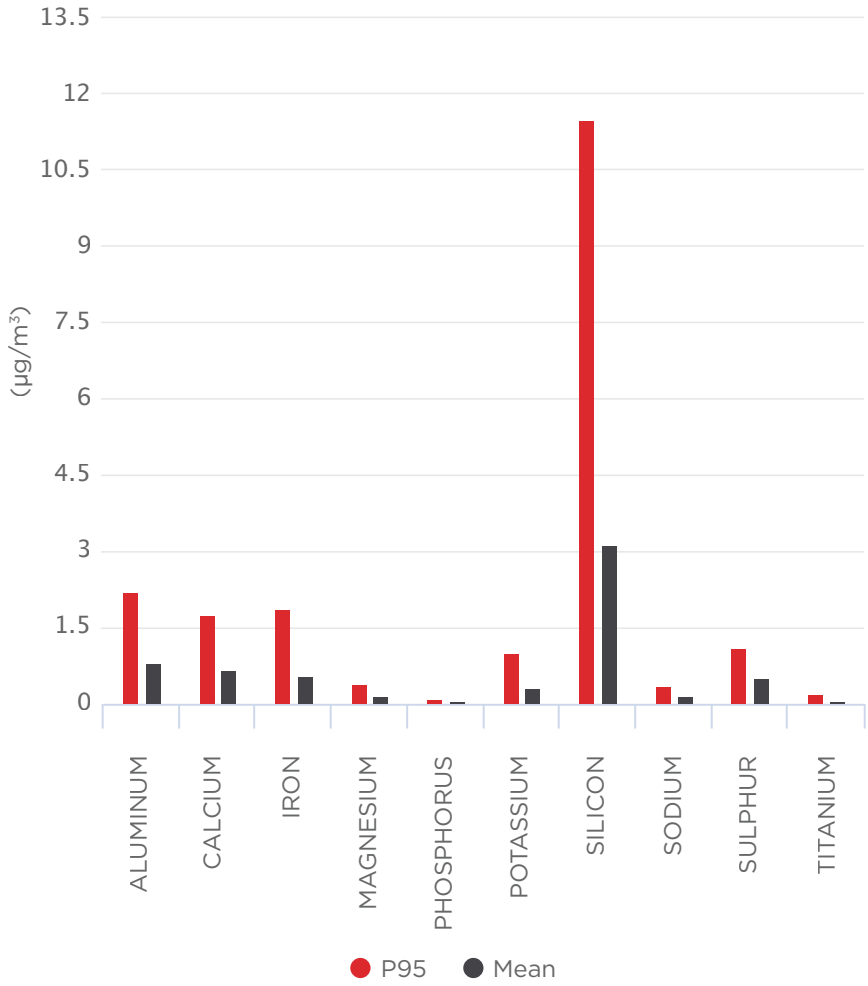
Conklin



Ells River



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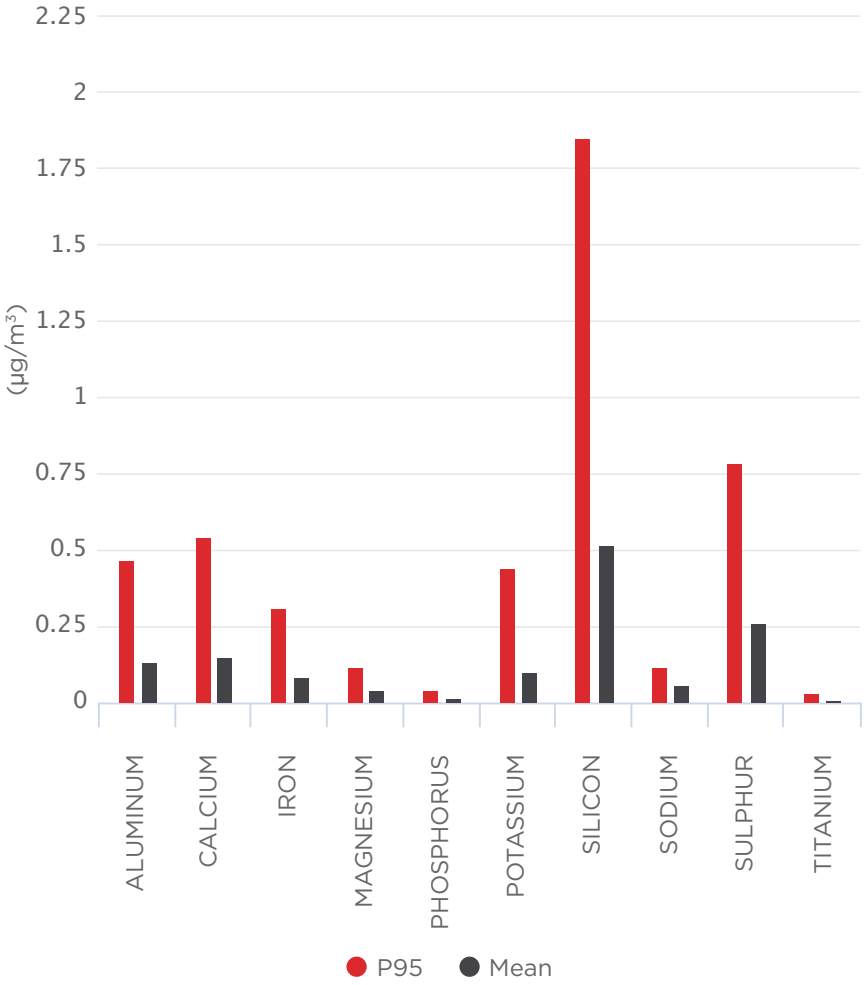
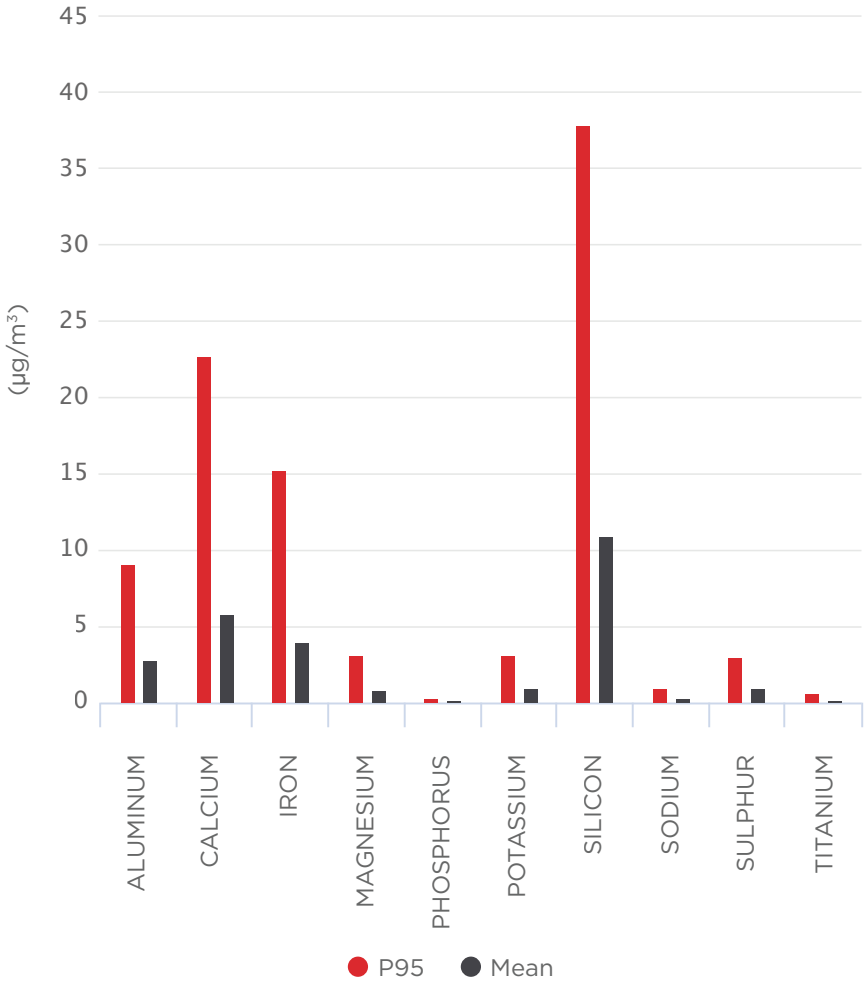
Fort Chipewyan



Fort Hills



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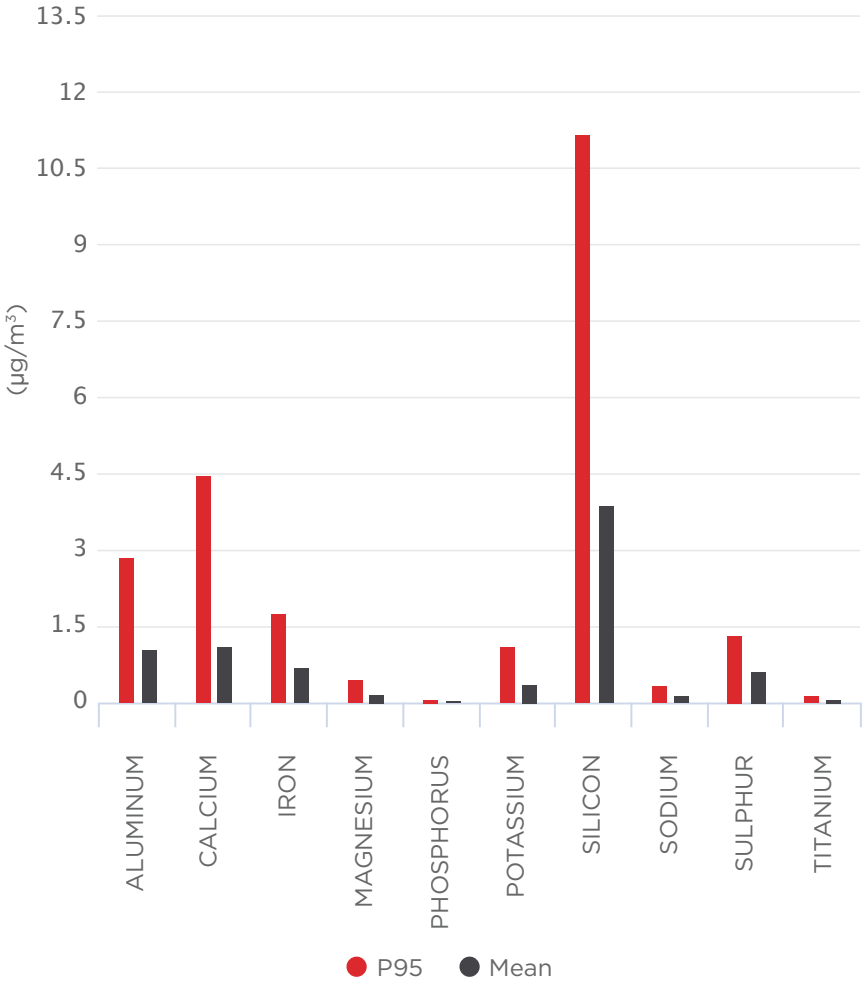
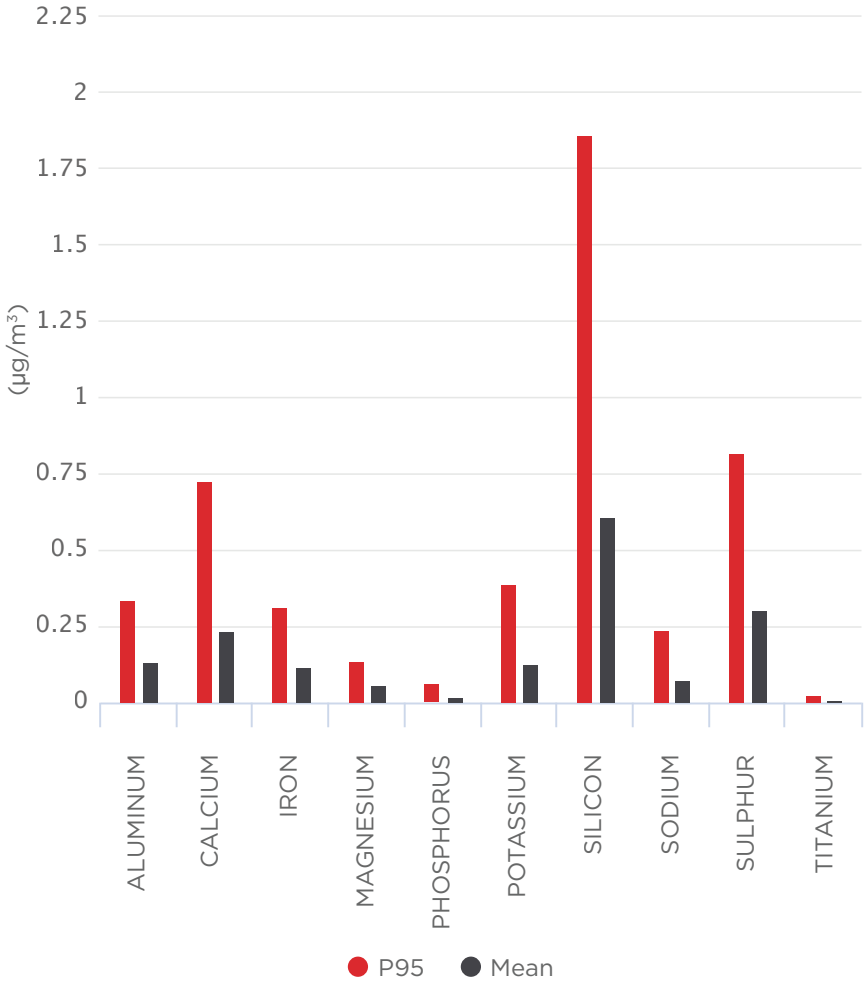


Janvier



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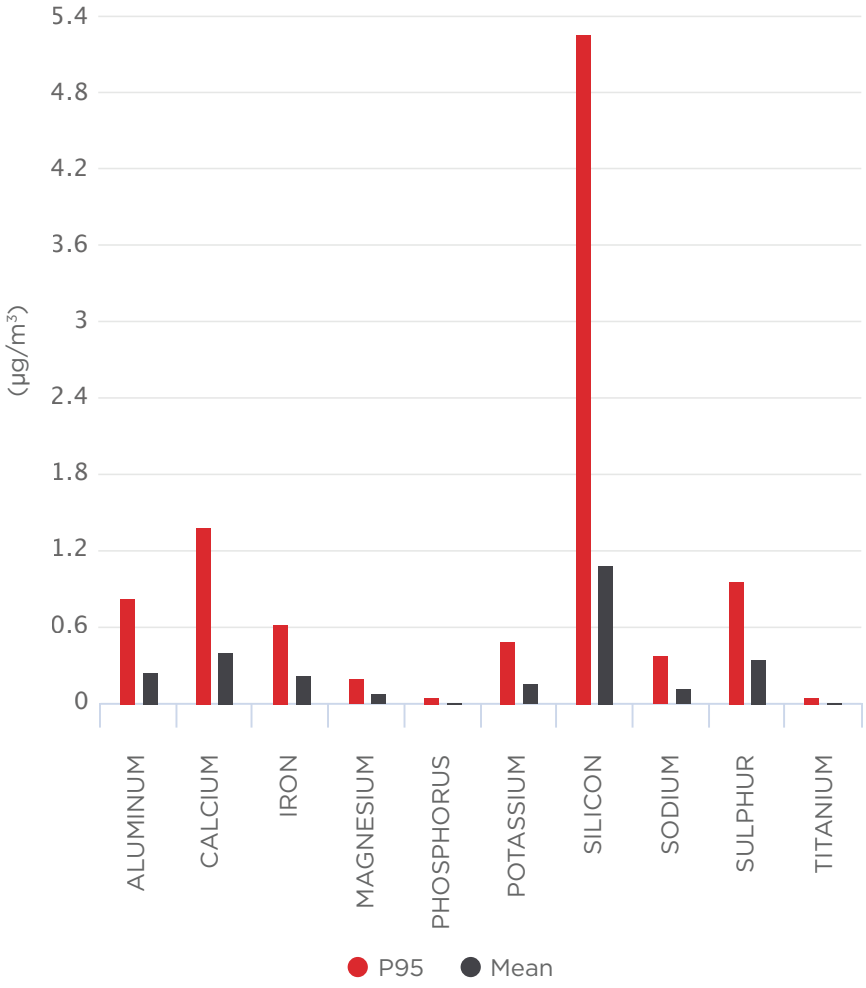

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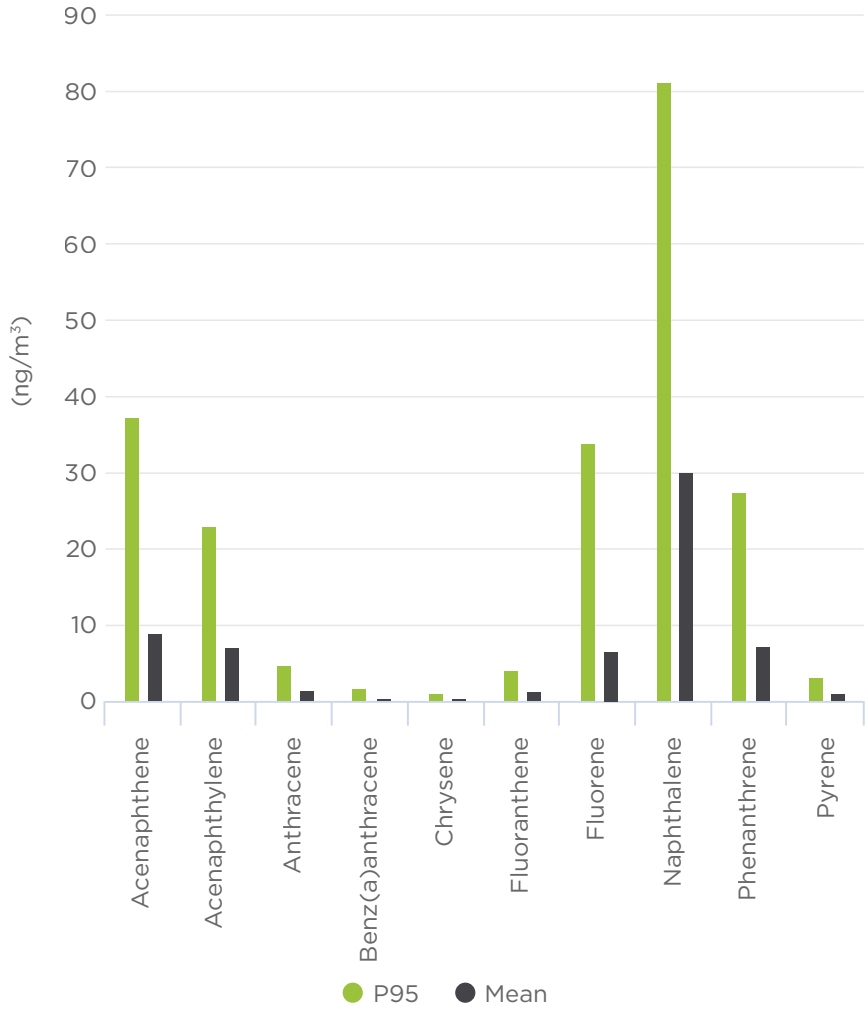
Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are a type of hydrocarbon – an organic compound containing carbon and hydrogen – that are produced from natural sources, such as the incomplete combustion of organic matter, and can be found in oil sand deposits. There are more than 100 different PAHs – some of which can be detrimental to human health and the environment.

In the WBEA's time-integrated sampling program, PAHs are collected on a sample media for a 24-hour period, every six days. These samples are collected and sent to the lab where they are analyzed to determine what PAHs were present in the air.

Anzac



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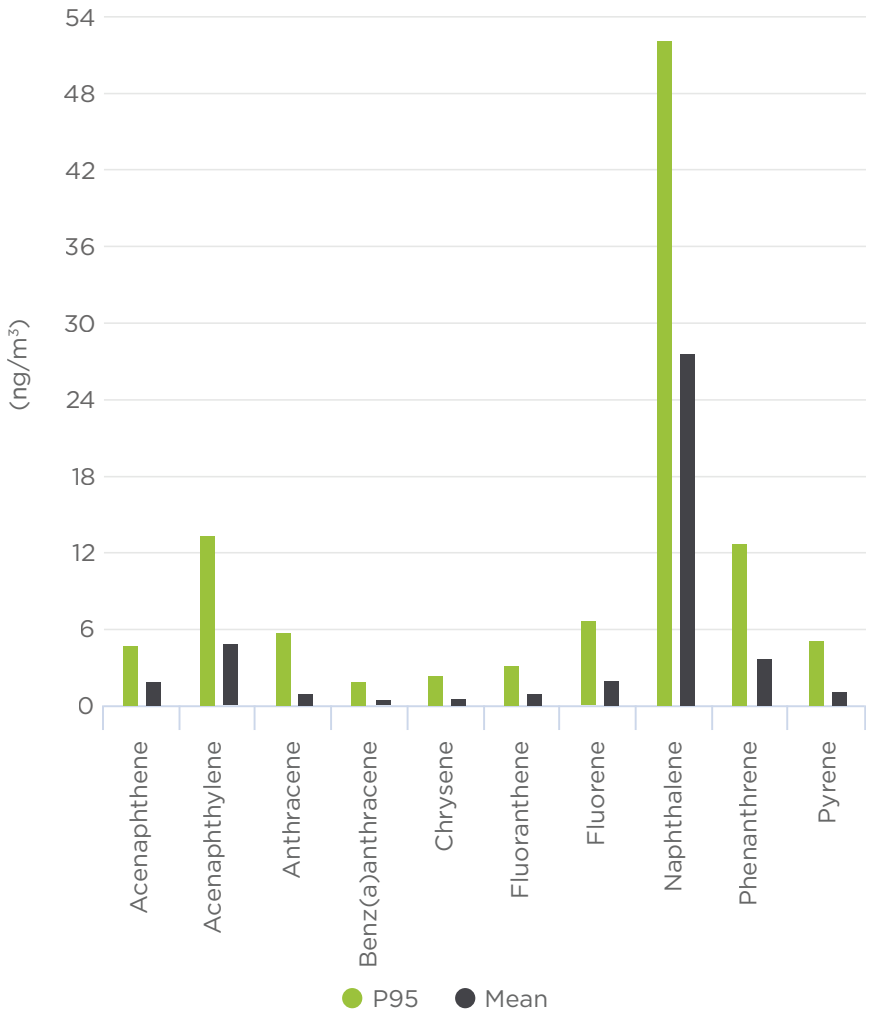
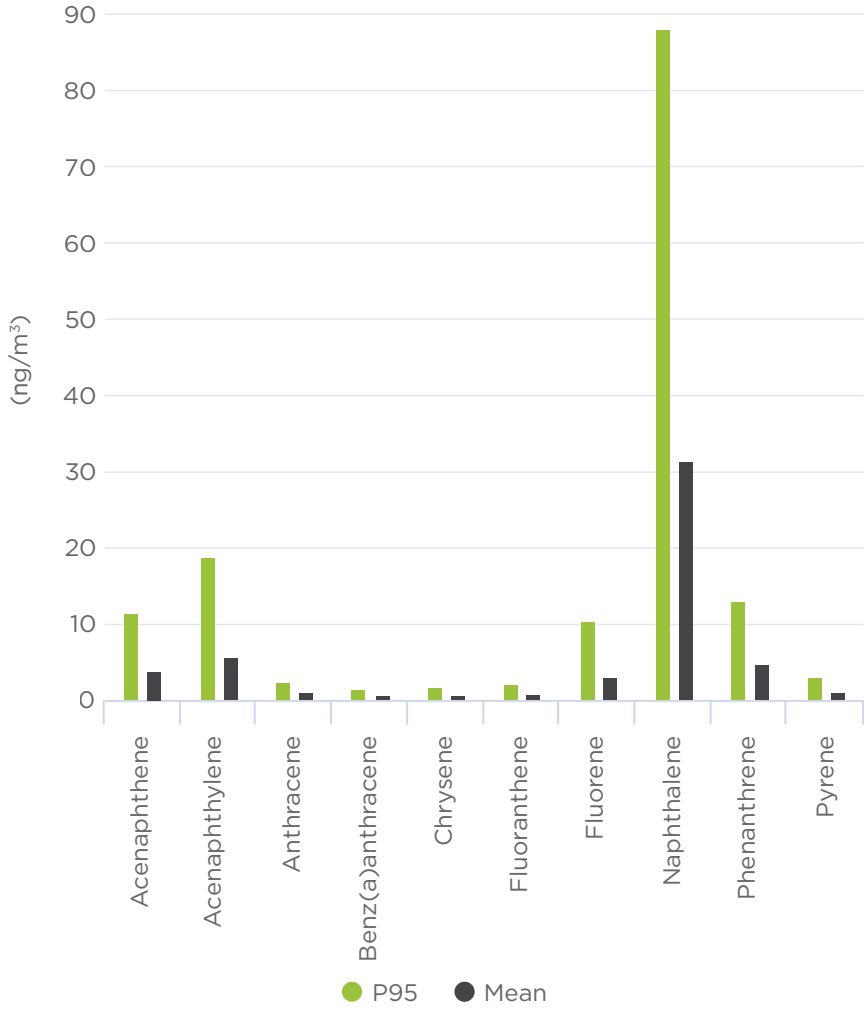
Athabasca Valley

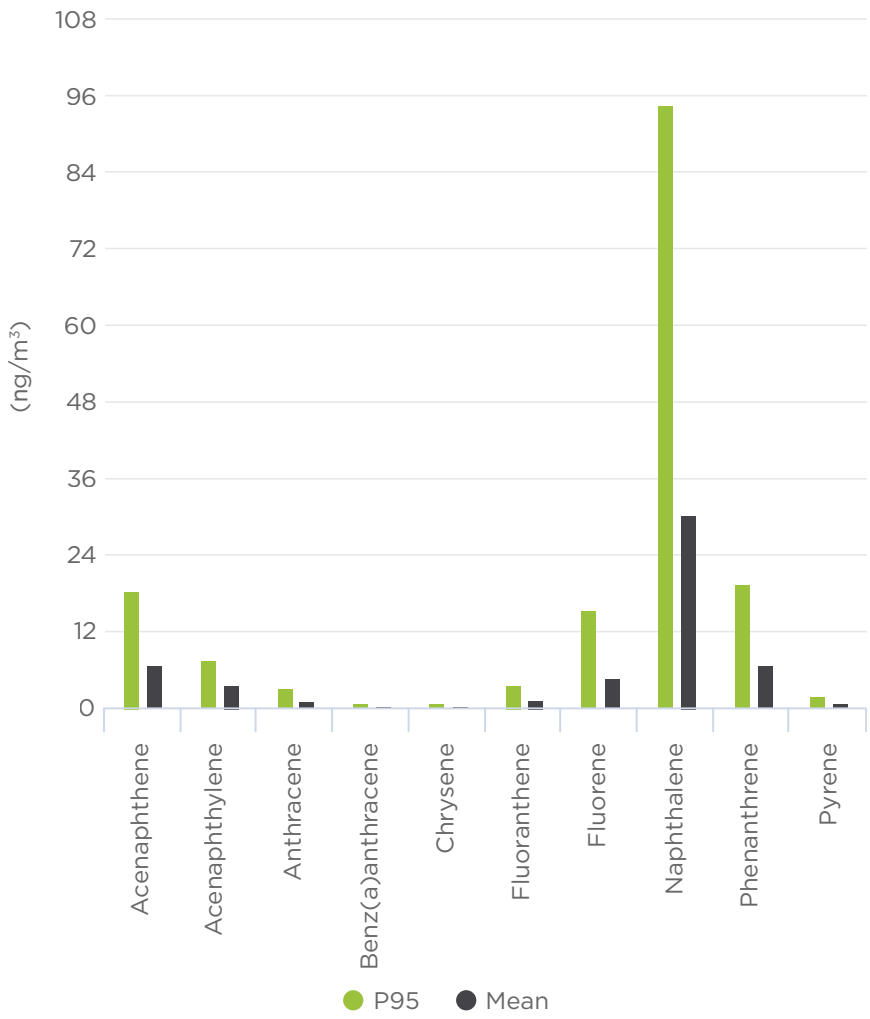


Bertha Ganter - Fort McKay

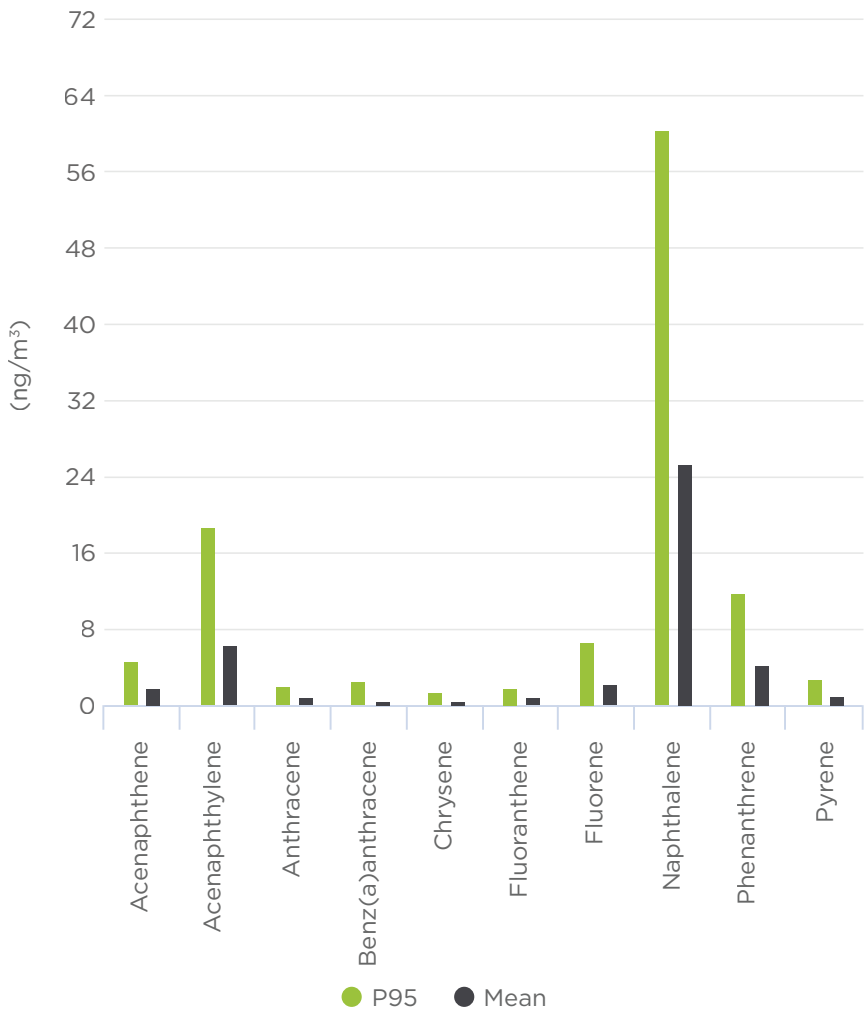


Note: Averages may be too small to be visible on some graphs.

Conklin

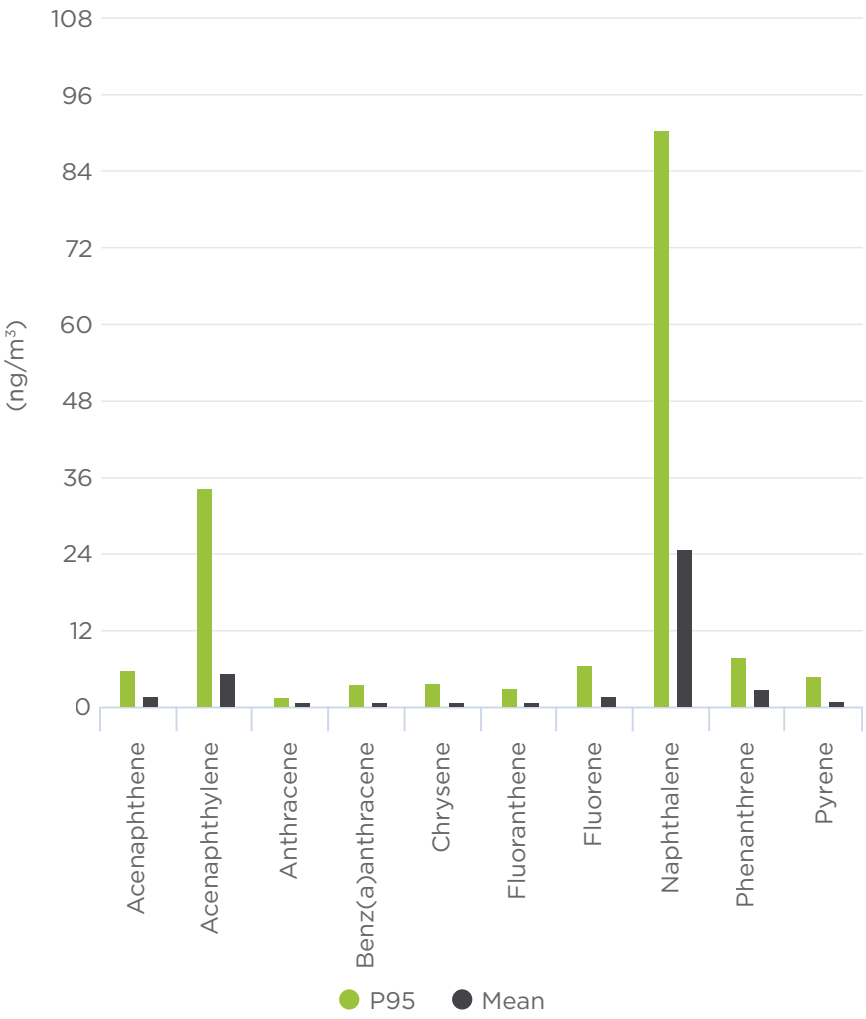


Fort Chipewyan

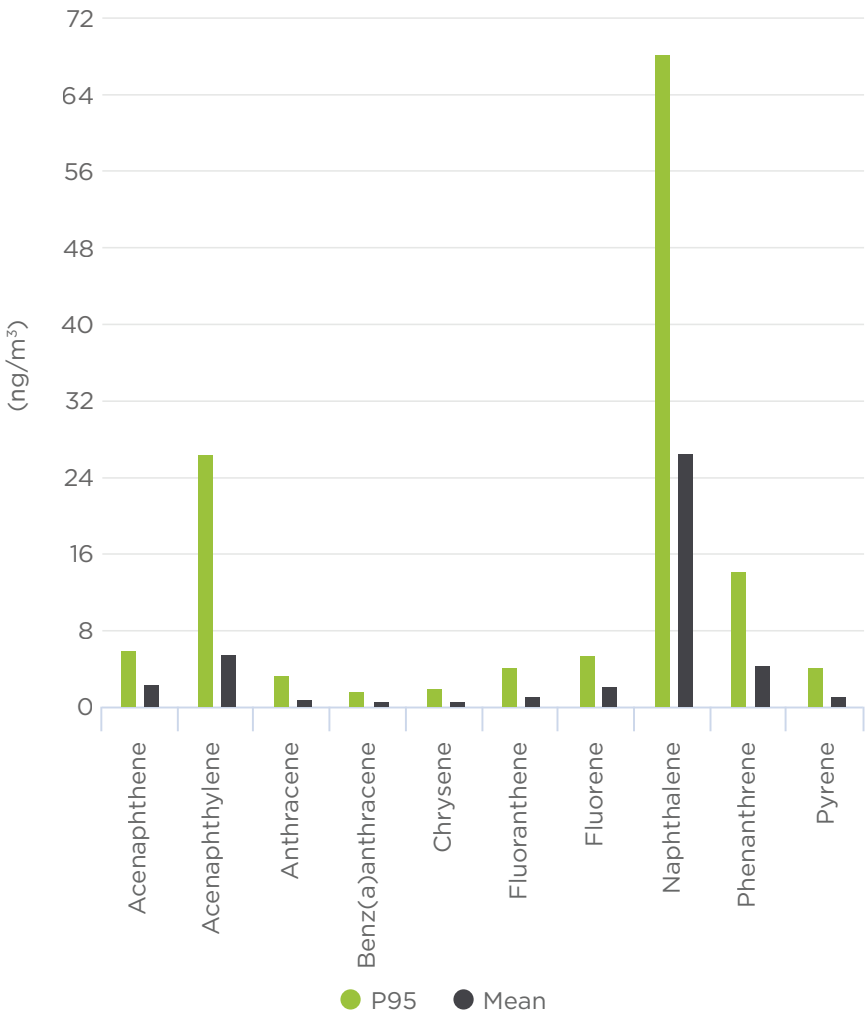


Note: Averages may be too small to be visible on some graphs.

Janvier



Patricia McInnes



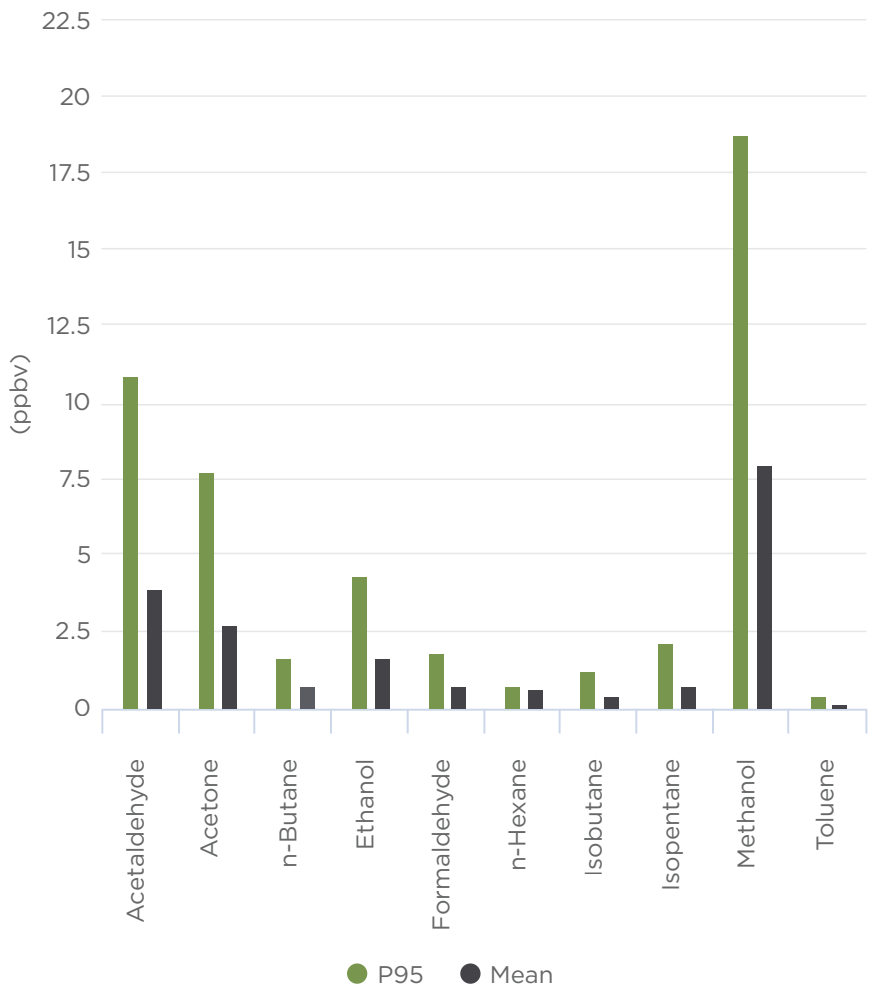
Note: Averages may be too small to be visible on some graphs.

Volatile Organic Compounds (VOCs)

VOCs are a group of chemical species that contain carbon, and react easily to become a gas. They may contain additional elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulphur, or nitrogen. VOCs are numerous, and come from both natural and human sources, and certain VOCs may contribute to ozone formation, odours, and long-term health effects.

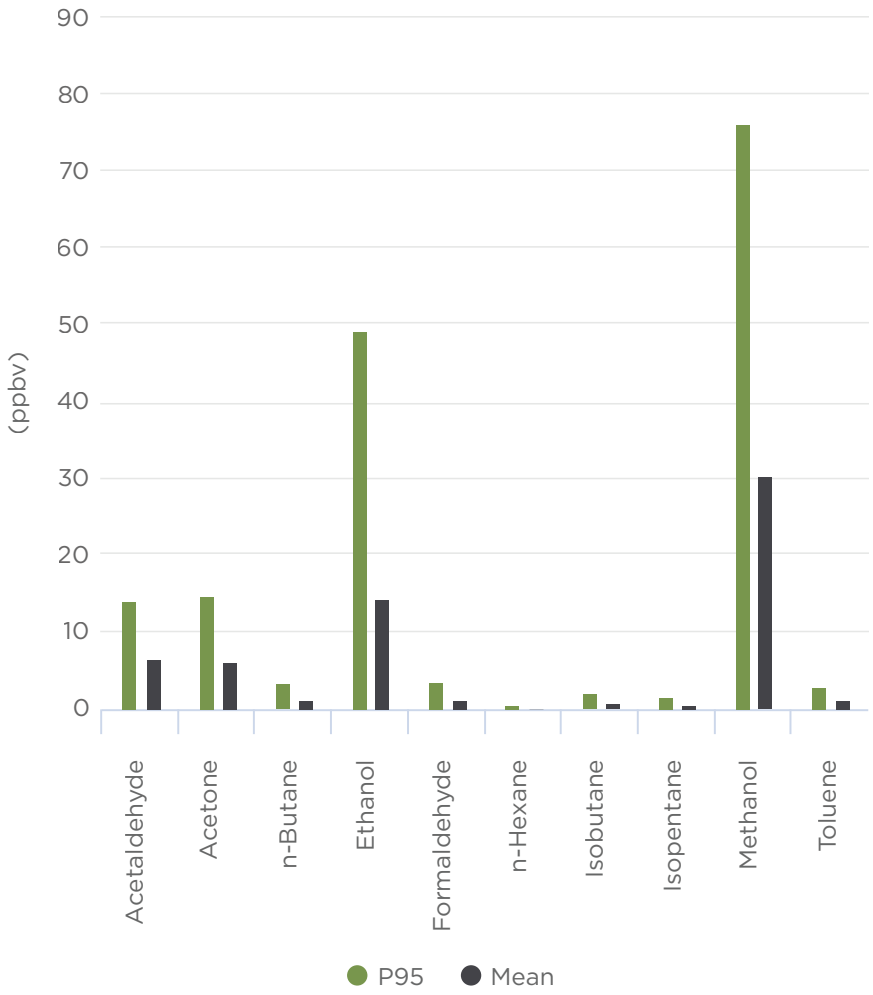
In the WBEA's time-integrated sampling program, an air sample is collected in a stainless-steel canister for a 24-hour period, every six days. These samples are then sent to the lab where they are analyzed to determine what VOCs were present in the air.

Anzac

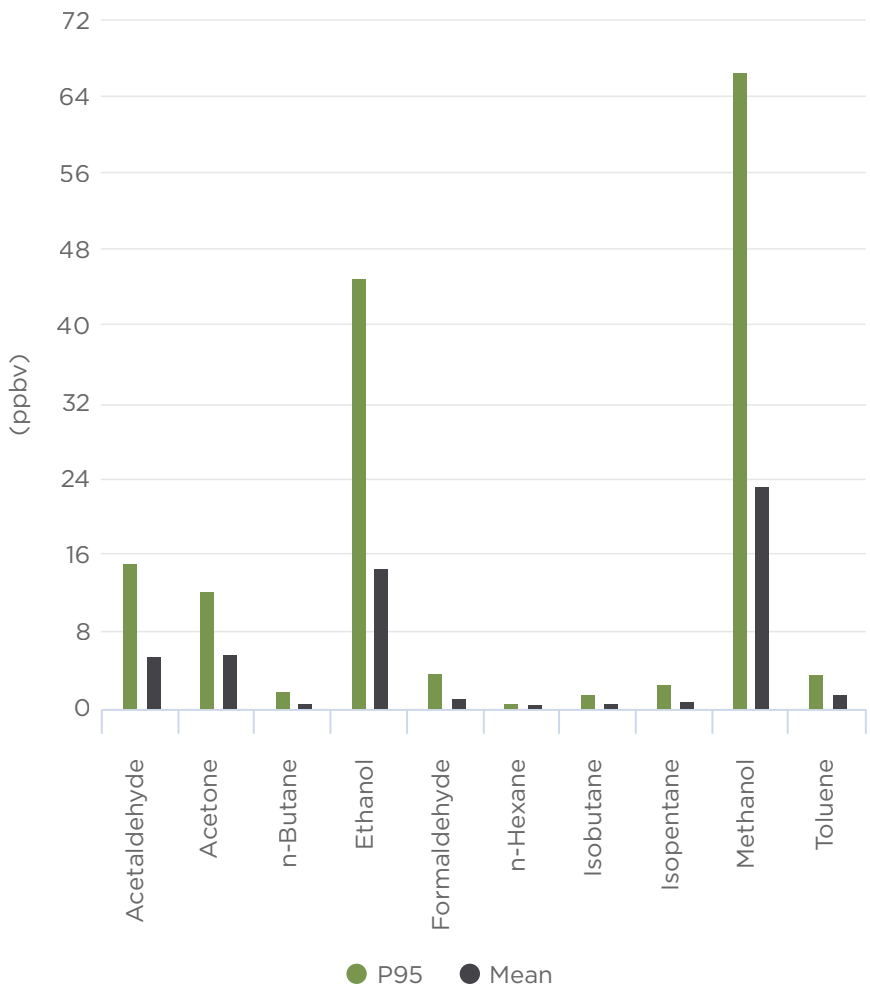


Note: Averages may be too small to be visible on some graphs.

Athabasca Valley

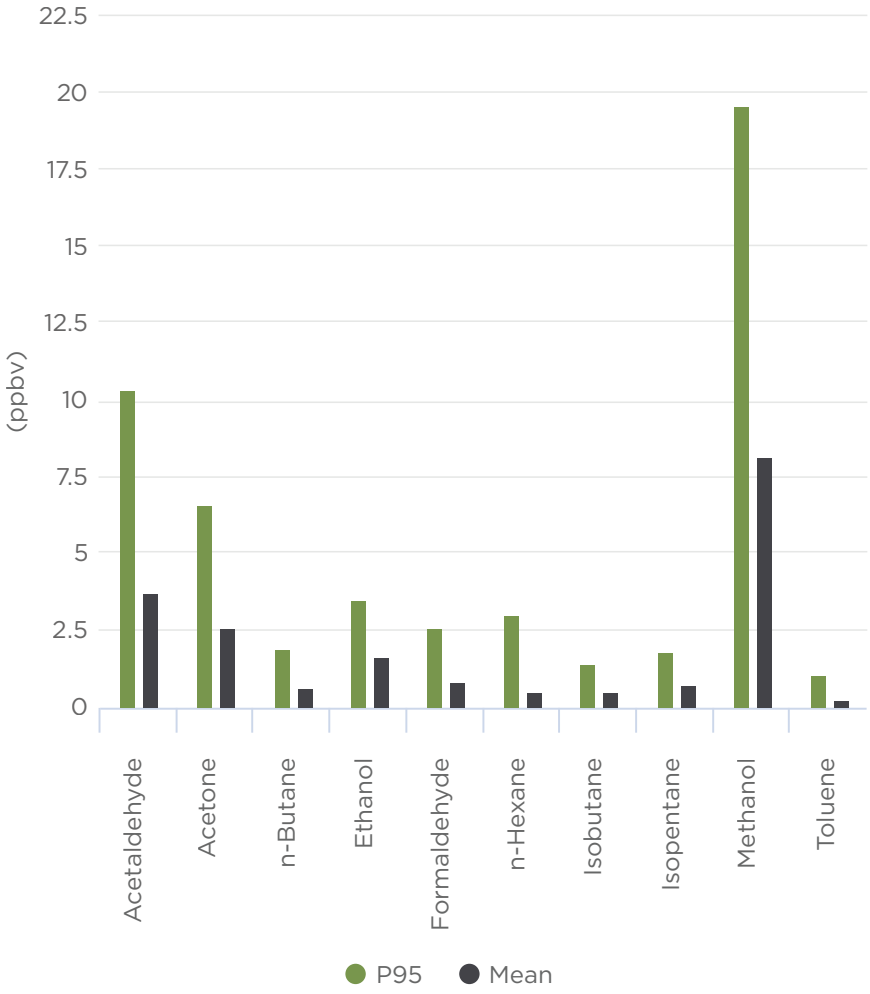


Barge Landing



Note: Averages may be too small to be visible on some graphs.

Bertha Ganter - Fort McKay



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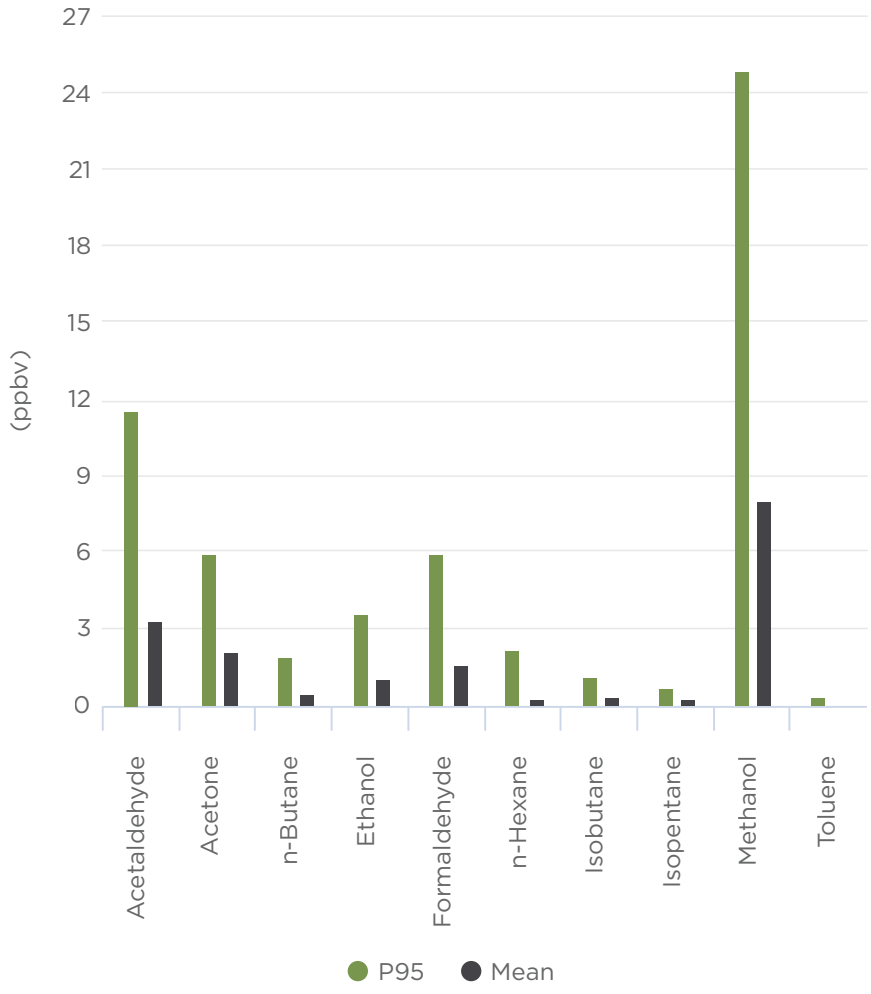
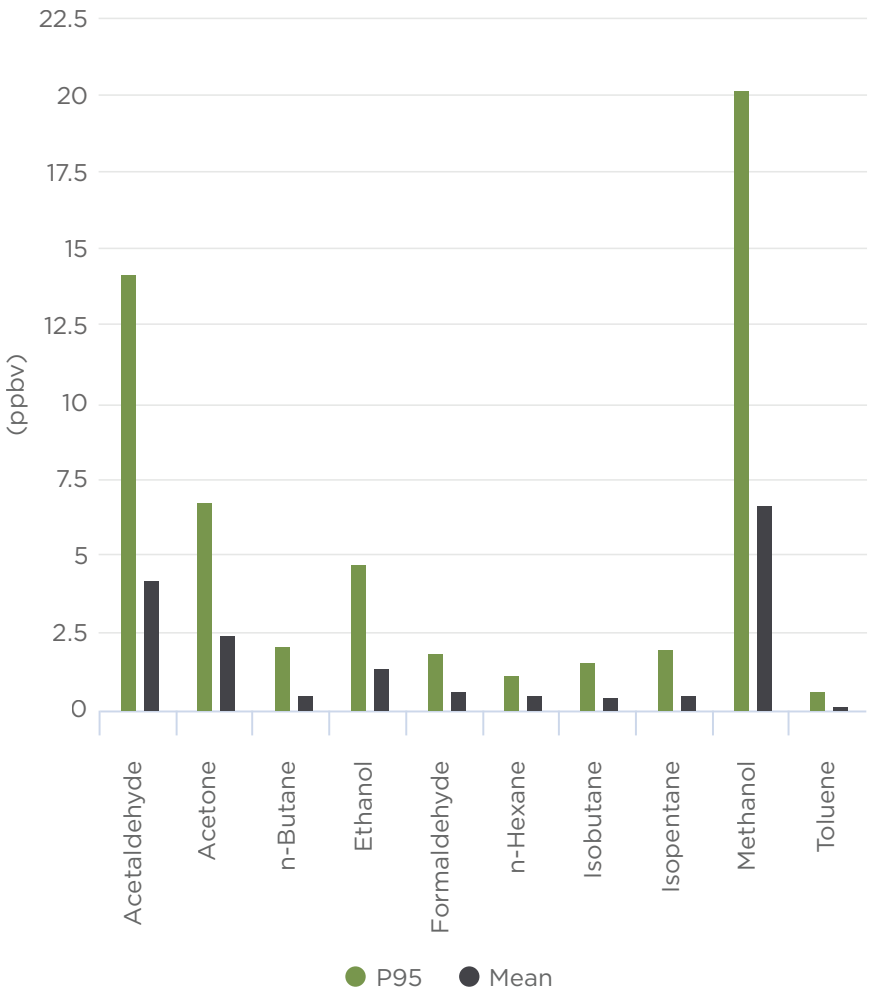
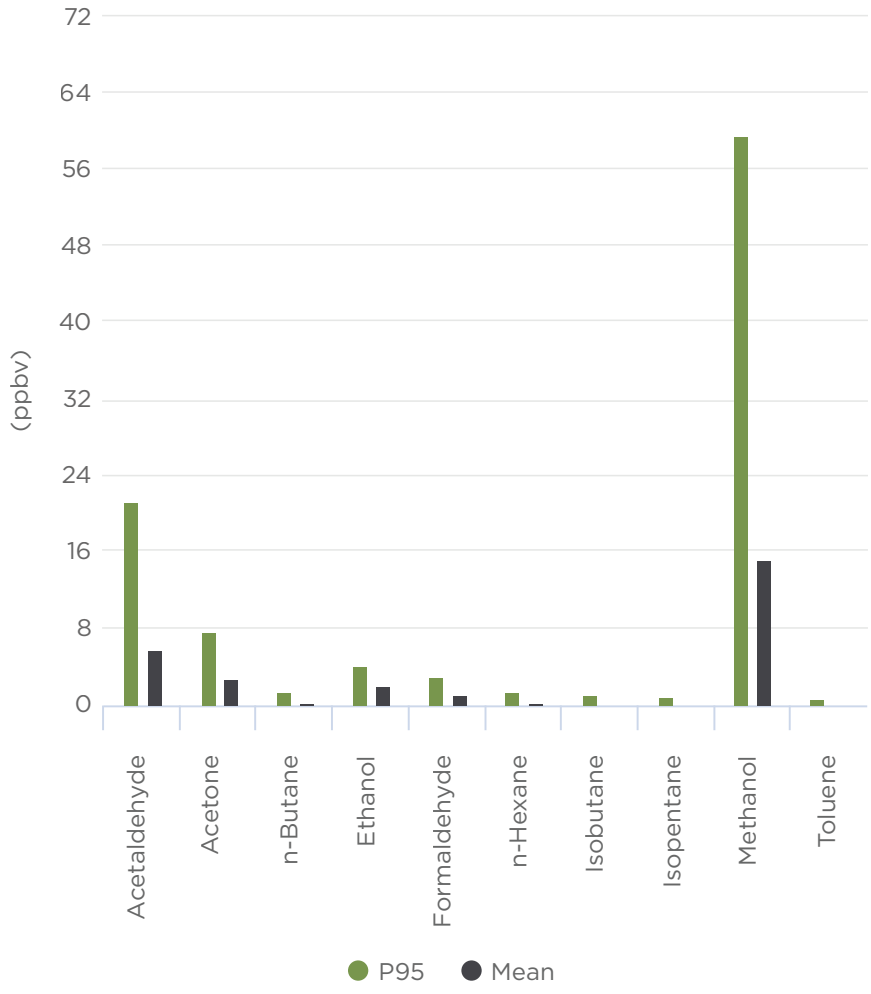


Note: Averages may be too small to be visible on some graphs.

Ells River

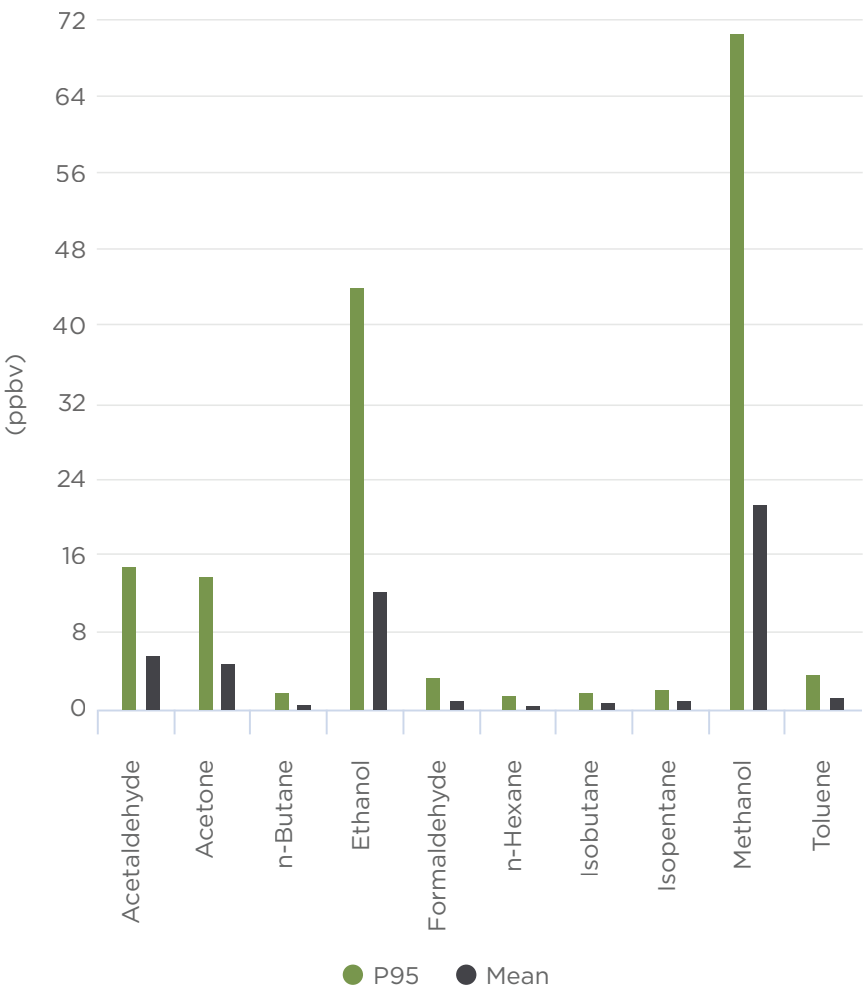


Fort Chipewyan

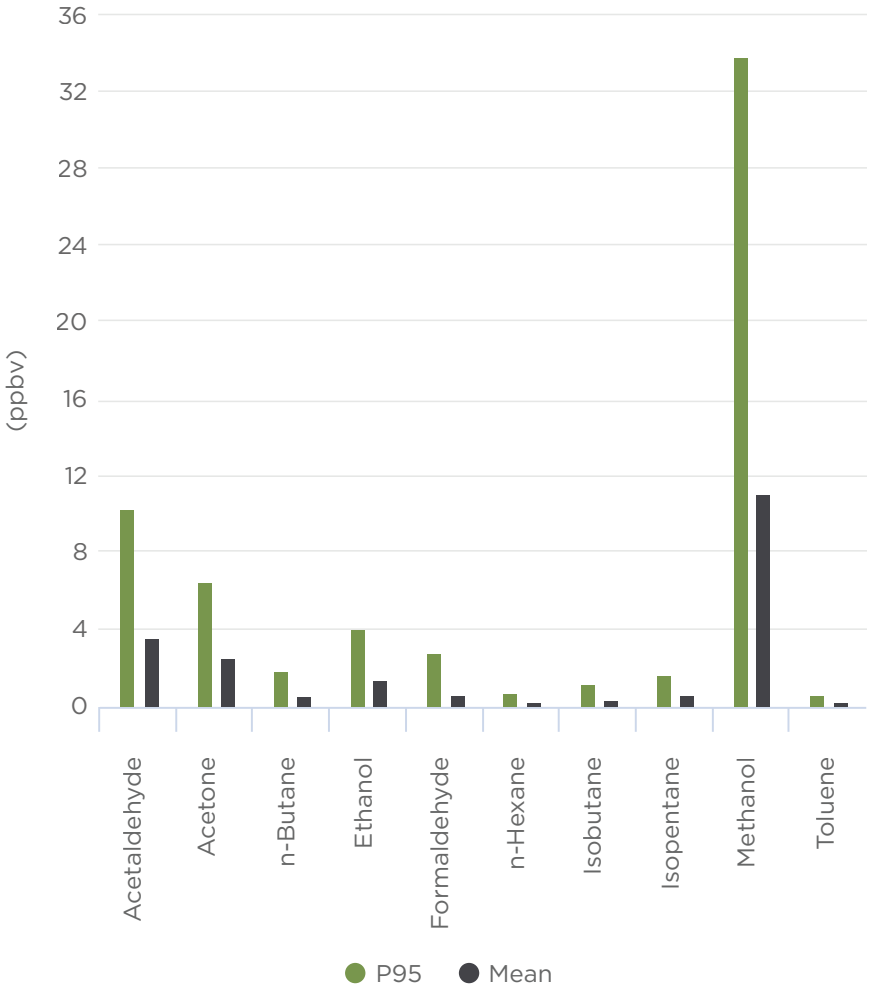


Note: Averages may be too small to be visible on some graphs.

Fort Hills

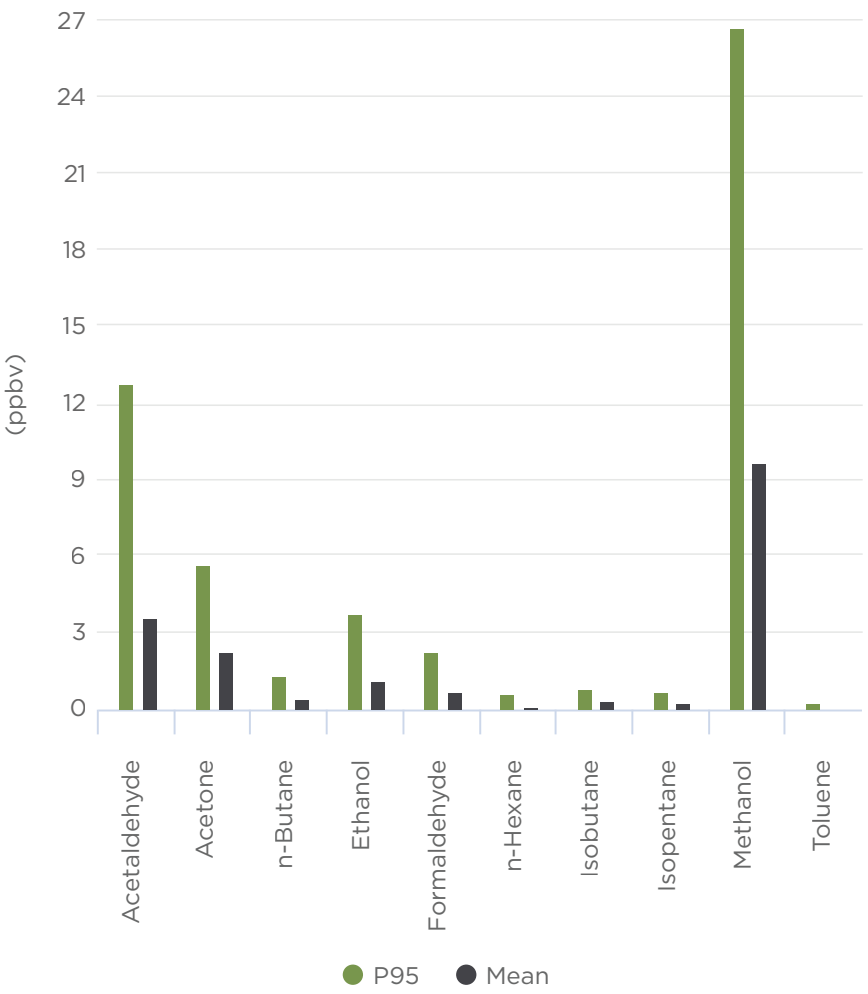


Fort McKay South

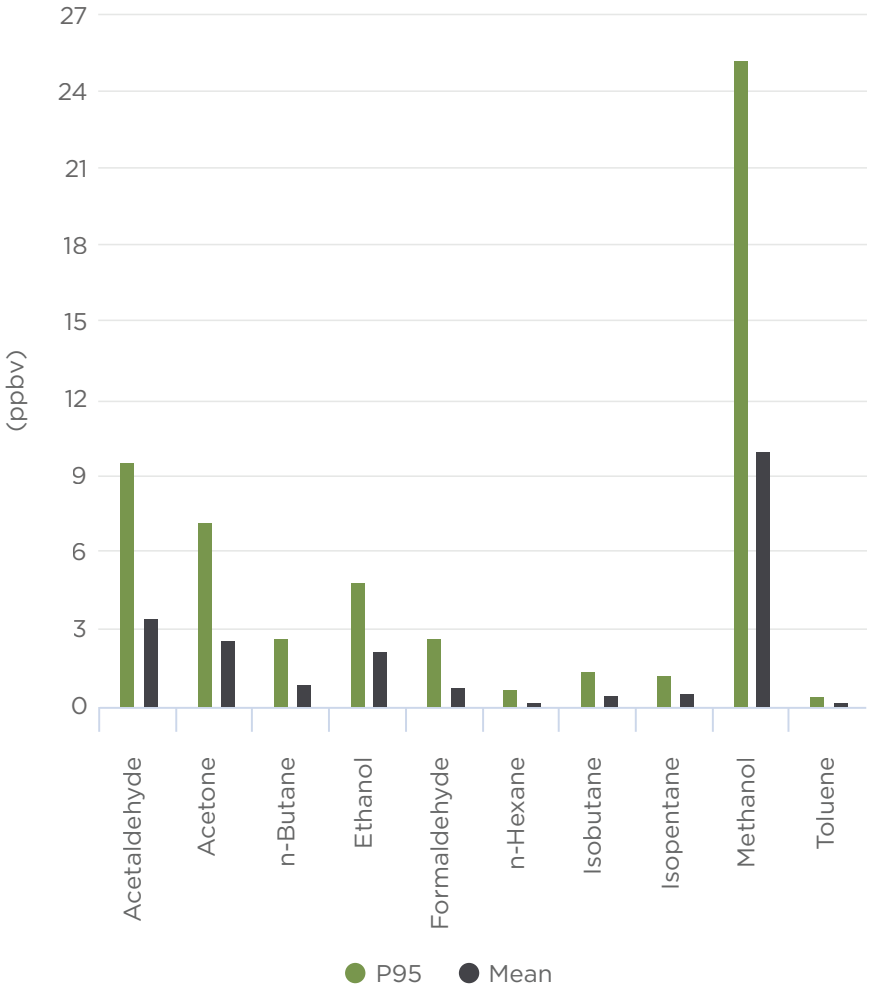


Note: Averages may be too small to be visible on some graphs.

Janvier



Patricia McInnes



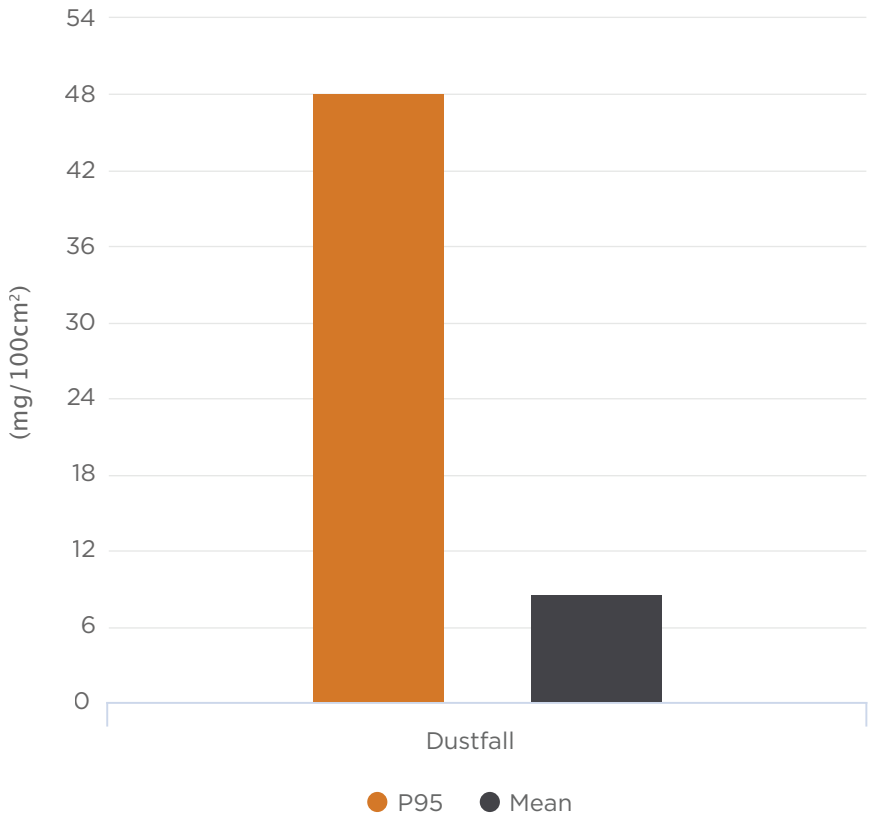
Note: Averages may be too small to be visible on some graphs.

Dustfall

Dustfall is a measurement of all particulate matter, which may include solid particles or aerosols, that are deposited from the atmosphere to the ground. Typically, dustfall monitoring is utilized near mining operations in order to track the amounts of fugitive dust emitted.

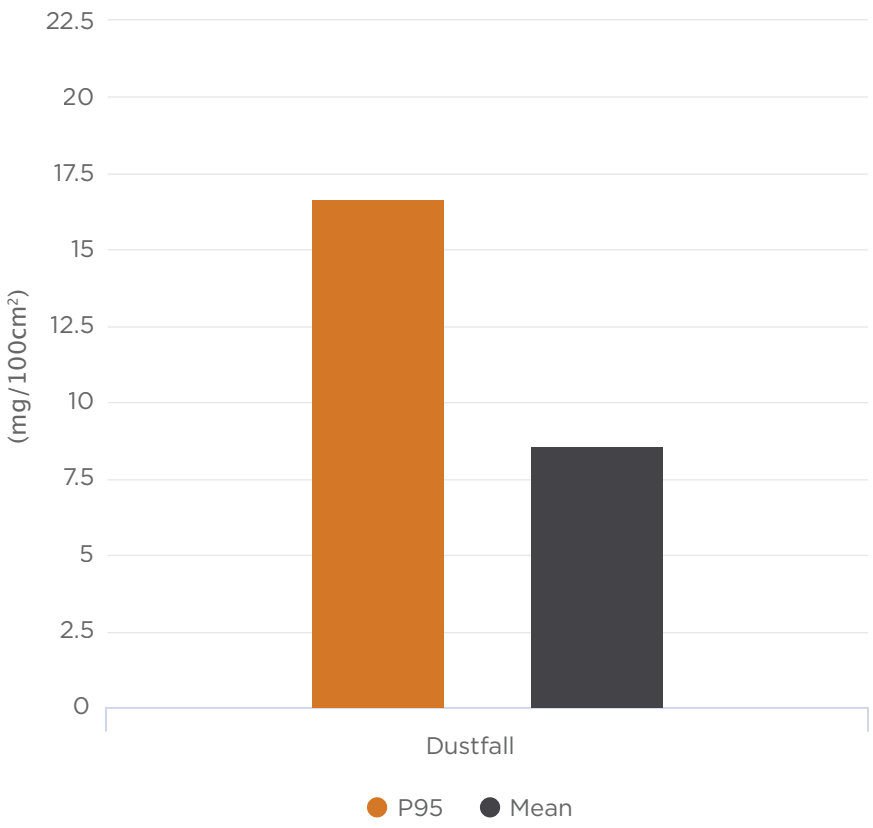
Dustfall is associated with an Alberta Ambient Air Quality Guideline (AAAQG) and is reported to the provincial government on a regular basis. Samples are collected over a 30-day period and averaged over the entire period.

Anzac

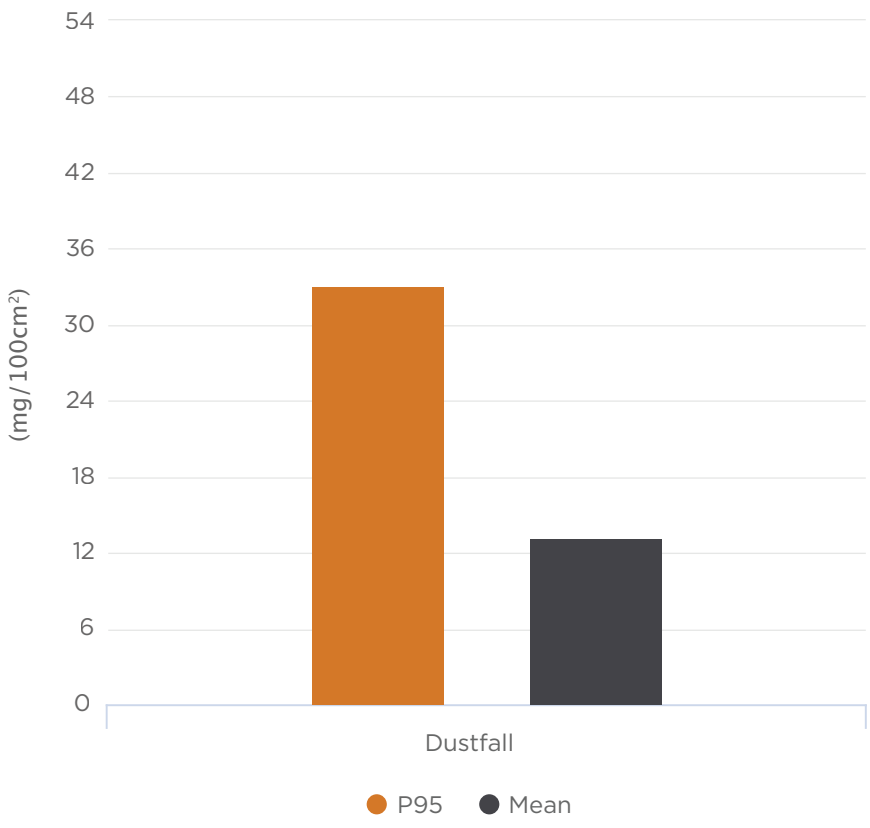


Note: Averages may be too small to be visible on some graphs.

Athabasca Valley

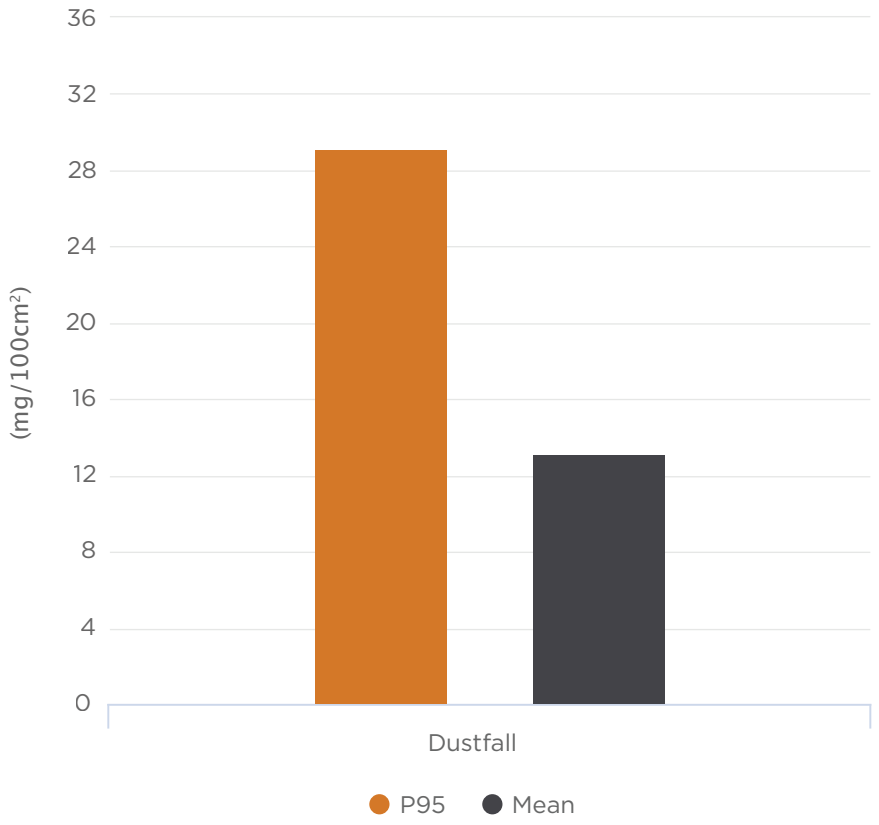


Bertha Ganter - Fort McKay

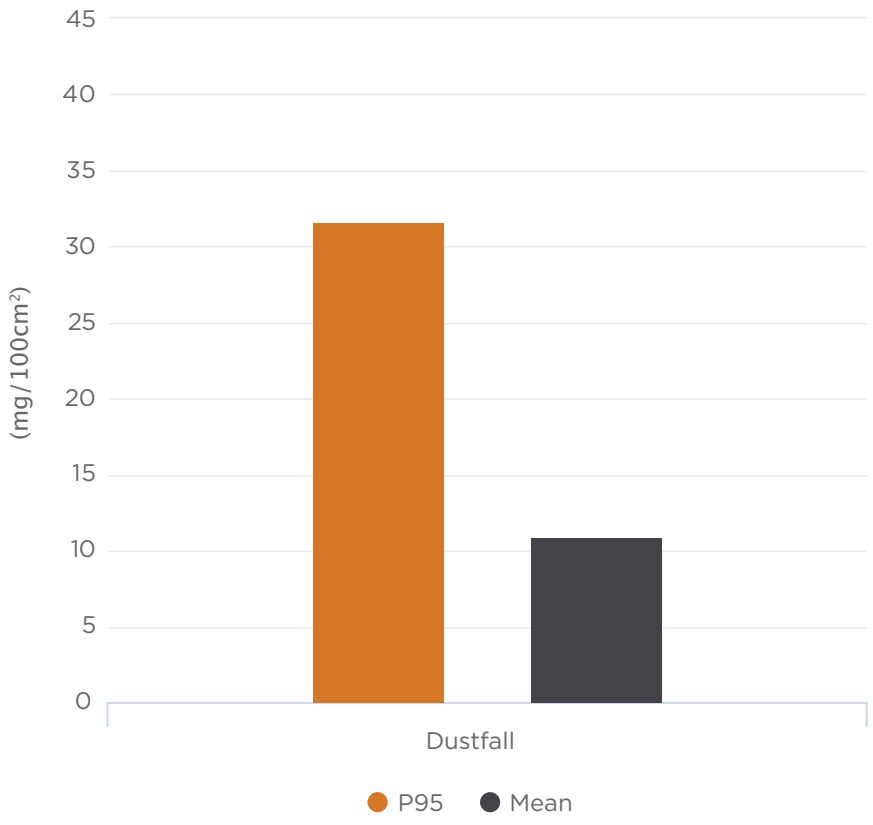


Note: Averages may be too small to be visible on some graphs.

Canadian Natural DF1

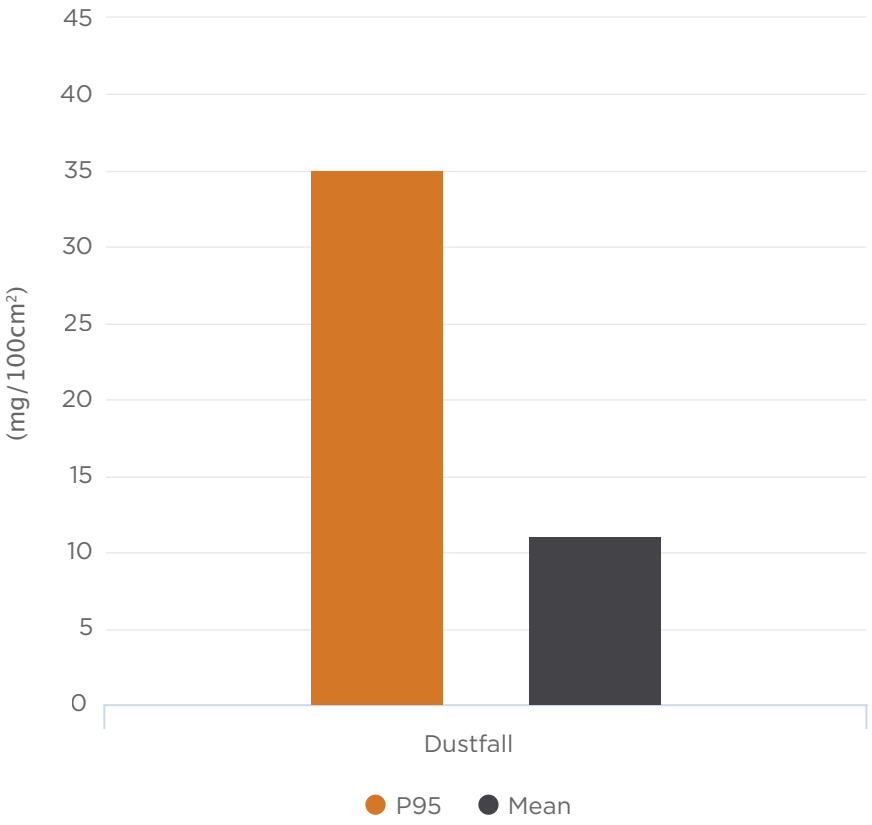


Canadian Natural DF2

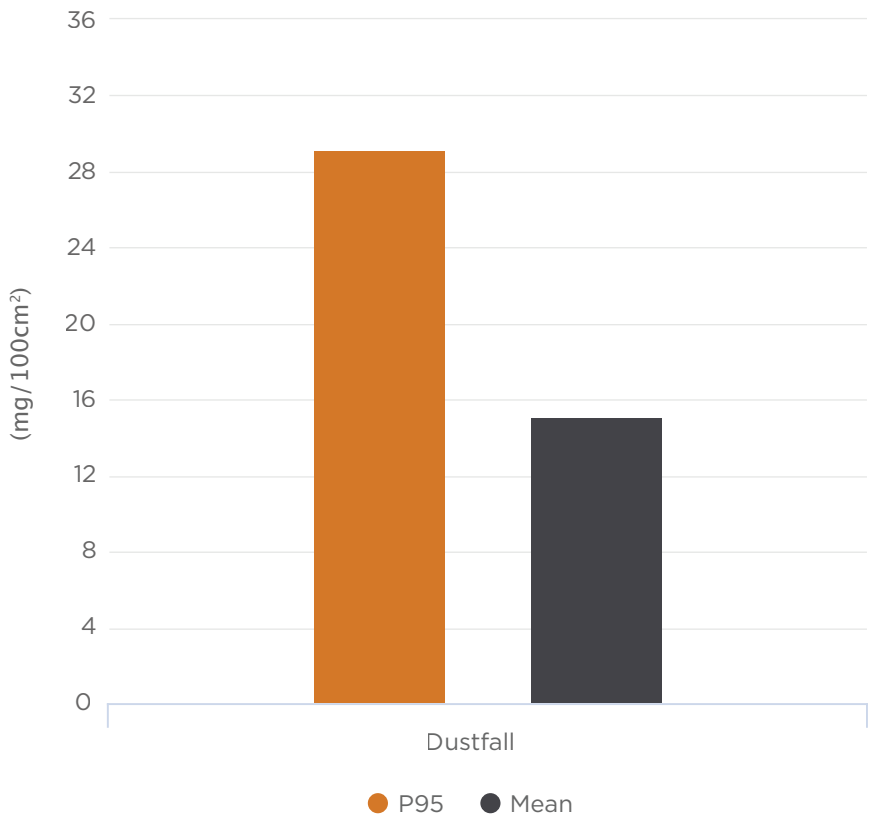


Note: Averages may be too small to be visible on some graphs.

Canadian Natural DF3

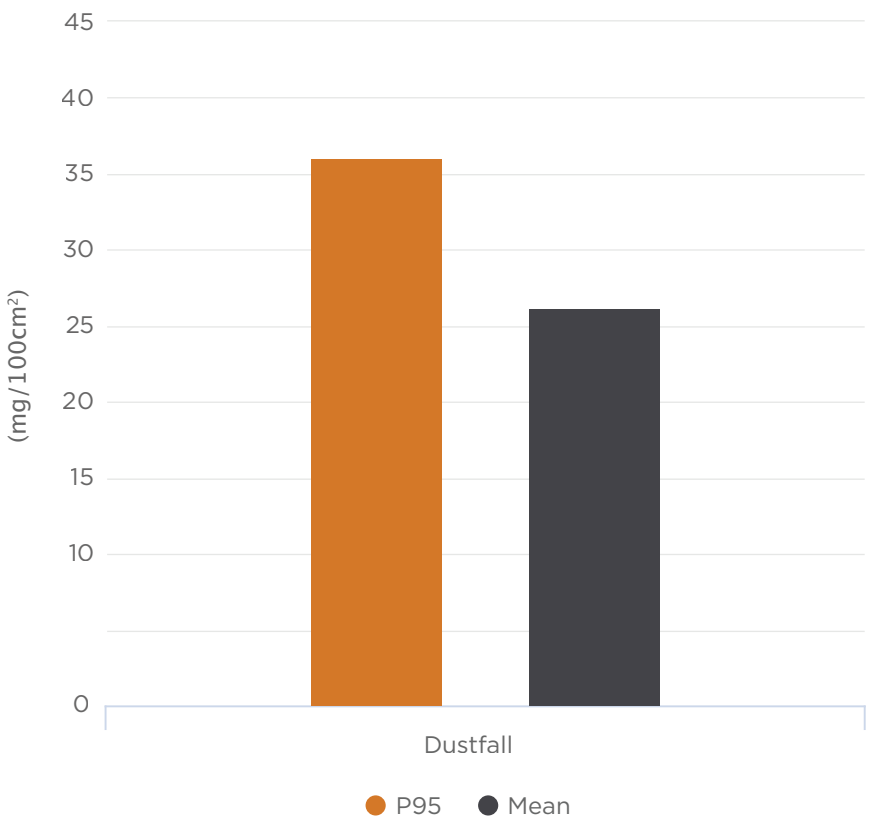


Canadian Natural DF4

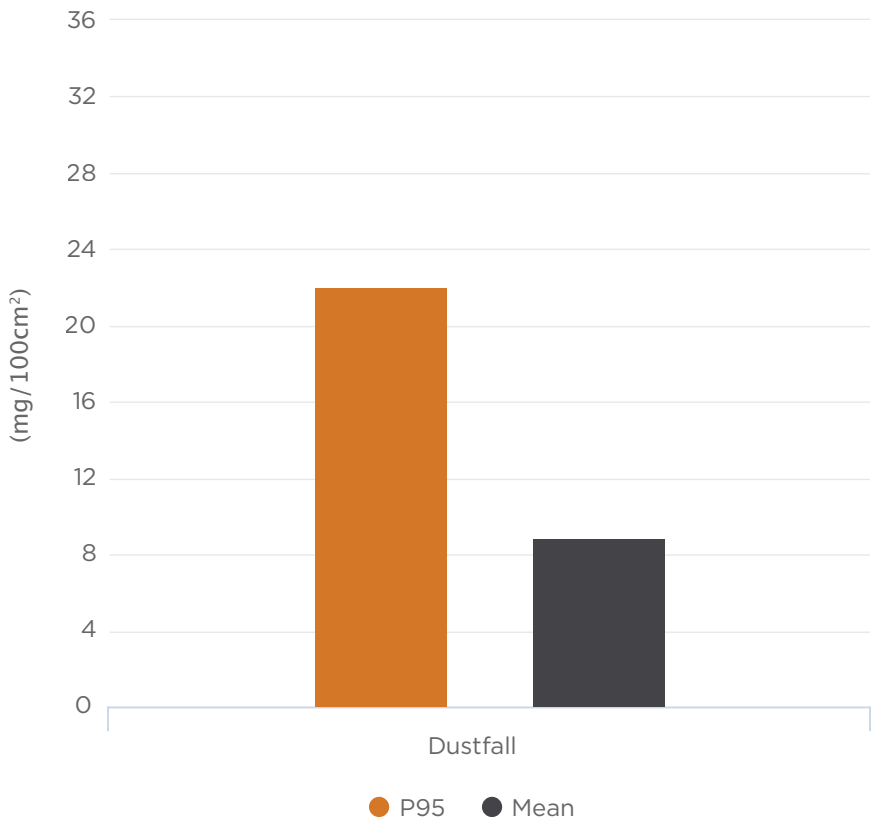


Note: Averages may be too small to be visible on some graphs.

Canadian Natural DF5

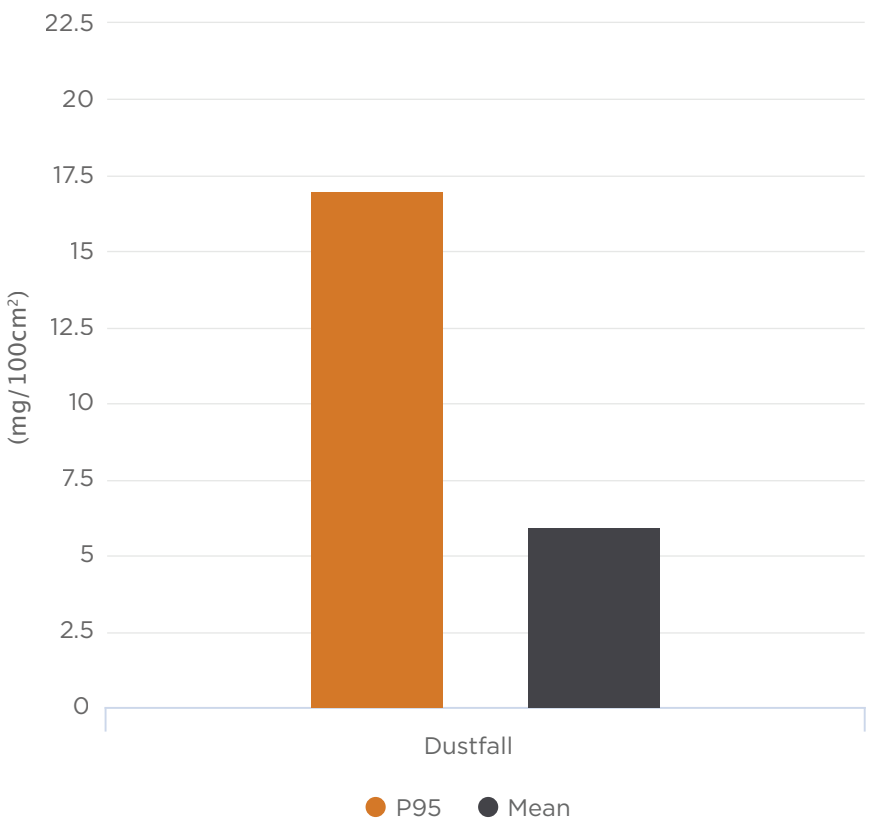


Conklin

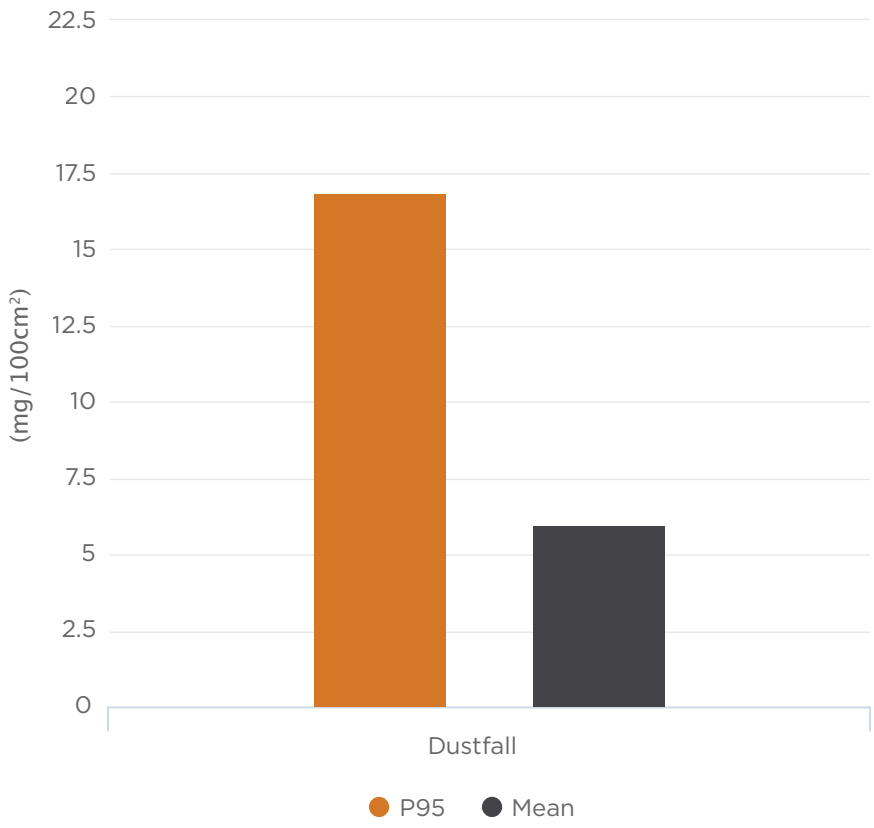


Note: Averages may be too small to be visible on some graphs.

Janvier

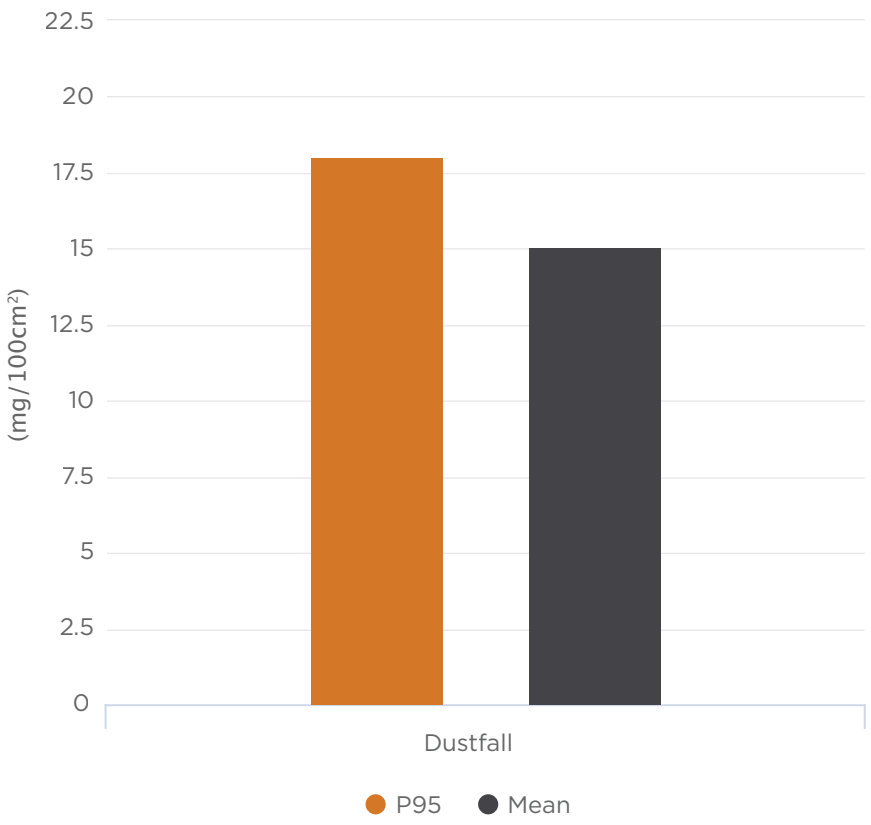


Patricia McInnes



Note: Averages may be too small to be visible on some graphs.

Wapasu



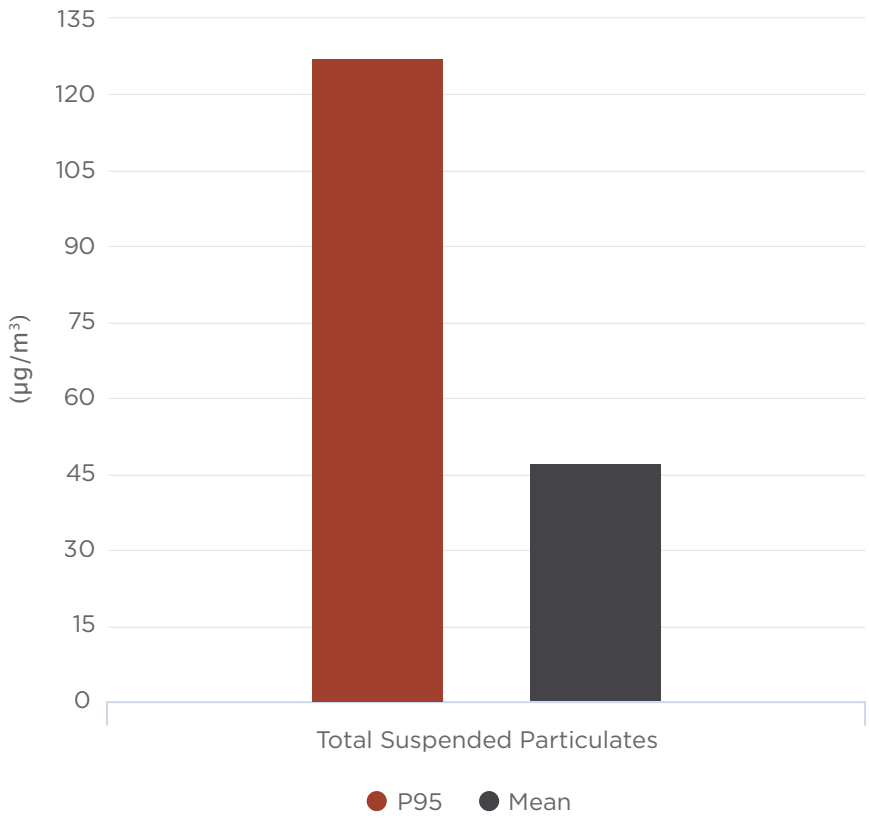
Note: Averages may be too small to be visible on some graphs.

Total Suspended Particles (TSPs)

TSP consists of all airborne solid and low vapor pressure liquid particles of any diameter. Locally, TSP consists mainly of dust agitated by industrial operations, sediment made airborne by wind, or particulate produced from wildfires or other combustion sources.

TSP is associated with an Alberta Ambient Air Quality Objective (AAAQO) and is reported to the provincial government on a regular basis. This time-integrated sample is analyzed for the total mass averaged over a 24-hour period every 6 days.

Ells River



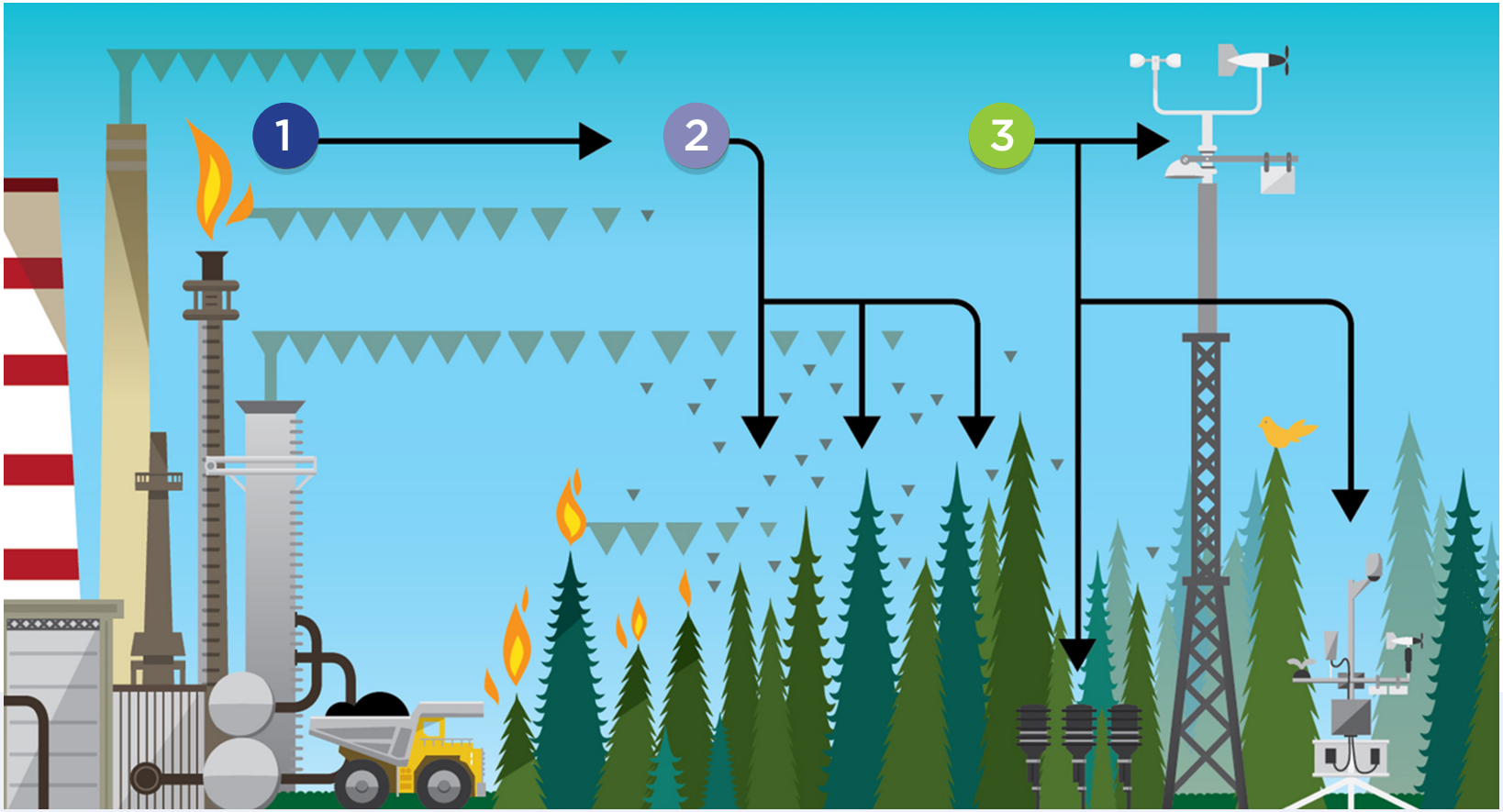
Note: Averages may be too small to be visible on some graphs.

Deposition Monitoring

The Deposition Monitoring Program, also referred to as the Terrestrial Environmental Effects Monitoring (TEEM) Program, was established to address community, industry, and government concerns about impacts of industrial development to regional forests.

The objective of the program is to determine cause-effect relationships between air pollutants and forest ecosystem health in the region. To meet this objective, the WBEA operates both a long-term Forest Health Monitoring Program and an Atmospheric Pollutant Deposition Monitoring Program. These programs monitor stressors (air pollution and deposition) and the potential impacts on the receiving environment (jack pine forests).

Data derived from the program must be thoroughly integrated and analyzed. The most recent comprehensive analysis of historical data was completed in 2019. At that time, the WBEA developed 75 recommendations for program improvements and published nine open-access manuscripts in a Virtual Special Issue of the journal Science of the Total Environment. The WBEA is in the process of reviewing and updating the program to be adaptive to current developments and the needs of its members.



1

Source

Pollution is emitted into the air from a variety of sources.

2

Deposit

The pollution may be deposited onto the surrounding forest.

3

Measure

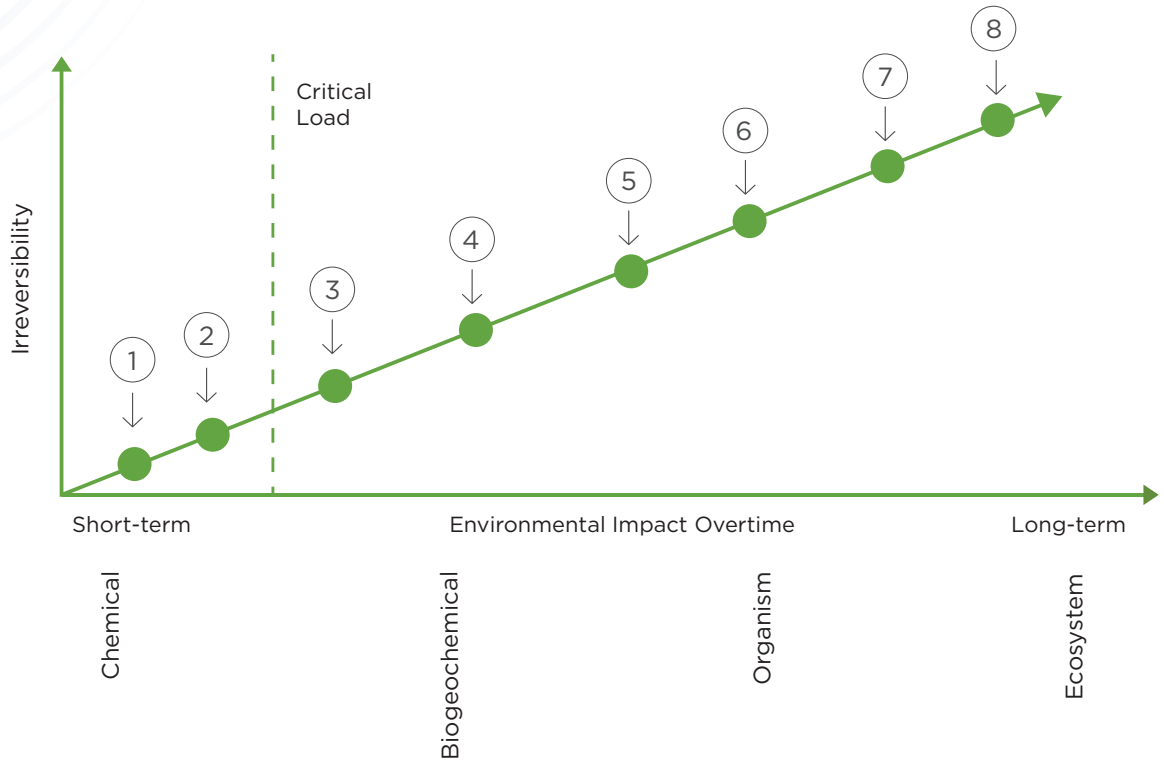
The WBEA collects samples and information to measure the effect of pollution on the enviroment.

Forest Health Monitoring

The Forest Health Monitoring (FHM) Program monitors jack pine forest sites through sampling of soils and vegetation every six years, as well as lichen sampling at varying intervals.

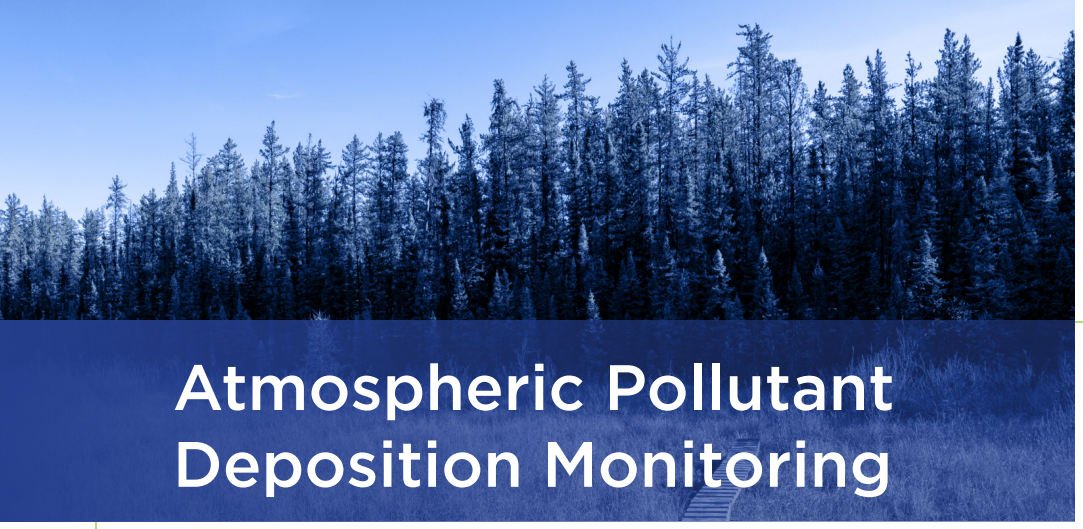
During initial program development, the upland jack pine (Pinus banksiana) ecosystem was identified as the most sensitive receptor to acidification due to their characteristically dry, nutrient-poor soils with limited buffering capacity. In these ecosystems, the effects of acid deposition are expected to be observed in a cascading manner from soils to vegetation, first impacting individual organisms, then the tree stand, and onward to landscape-level impacts. The bigger impacts will take a longer time to occur but will be harder to correct. This concept can be seen in the Critical Load Graph on the following page.

In 2023, the WBEA began a workshop series with the goal of information sharing and improved understanding of the FHM Program by all WBEA members. A multi-day workshop took place in November 2023, which informed members of the program's history and key findings. The workshop also served to initiate discussions for future monitoring priorities ensuring adaptive program evolution.



1. Emissions (stack, fleet)
2. Deposition (wet, dry) below CL & no effect
3. Altered jack pine soil chemestry (BC:Al, BS% C:N, nutrients)
4. Altered jack pine growth
5. Altered jack pine understory community composition
6. Altered aspen soil chemistry (BC:Al, BS% C:N, nutrients)
7. Altered aspen growth
8. Altered aspen understory community composition

Critical Load = the highest load that will not cause chemical changes leading to long-term harmful effects on the most sensitive ecological systems.



Atmospheric Pollutant Deposition Monitoring

Passive Air Sampling - Passive Samplers

Passive air sampling, specifically using passive samplers, is a cost-effective method for coverage of a broad spatial range, including remote locations, because they have no moving parts and require no power. Passive sampler data, along with meteorological data, is used to model deposition trends. In 2023, the passive sampling program was re-established with samplers deployed at denuder sites. Parameters measured included Nitrogen Dioxide (NO_2), Ozone (O_3), and Sulphur Dioxide (SO_2).

Active Air Sampling – Denuders

Active air sampling uses a pump to provide a known volume of air to a continuous analyzer or sample media. For this reason, in addition to a low detection limit, active air sampling provides higher quality data than passive air sampling. In 2023, the denuder program expanded to improve coverage across the region, growing from eight to twelve site locations.

Passive Deposition Sampling - Ion Exchange Resin

Ion exchange resin (IER) is a passive sampling method. Each IER is comprised of a column of resin beads that capture anions (total nitrogen and sulphur) and base cations. IER data provides insight about spatial gradients of atmospheric deposition and validates critical loads mapping and modelling exercises. In 2023 the WBEA optimized the program to include an increase in base cation collection. The change came about due to data suggesting base cations play a greater role in deposition than was first anticipated, and thus required a more comprehensive sampling network.

Access tower data online by visiting:
https://wbea.org/historical-monitoring-data/

Instrumented Regional Meteorological Network

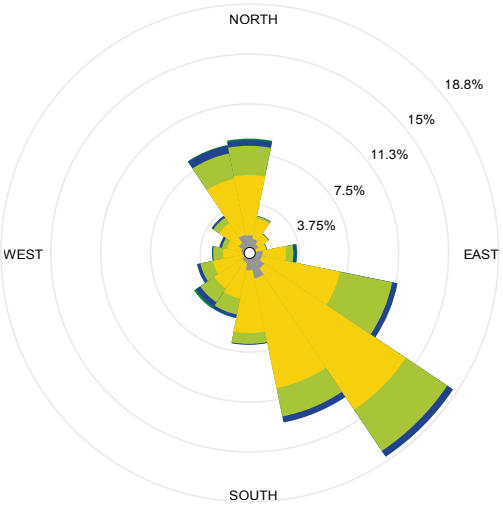
The WBEA's regional meteorological network provides key data for calculating deposition rates, modelling dry deposition, and evaluating the performance of deterministic models. The network is comprised of six 30-meter instrumented towers ("met towers") that provide continuous, hourly data on climatic conditions throughout the Wood Buffalo region. Each met tower is co-located with a Forest Health Monitoring (FHM) site and monitors air temperature, relative humidity, wind speed, wind direction, and solar radiation at four levels within and above the jack pine canopy, as well as temperature and volumetric water content within forest soil.

The adjacent map shows where each of the six 30-meter meteorological towers are located within the WBEA's network. The wind data collected from these towers, measured above the tree canopy, are used to characterize wind flow in a wider geographical area, calculate emission deposition, and evaluate ecological data. The corresponding wind roses for each tower are located on the following pages.

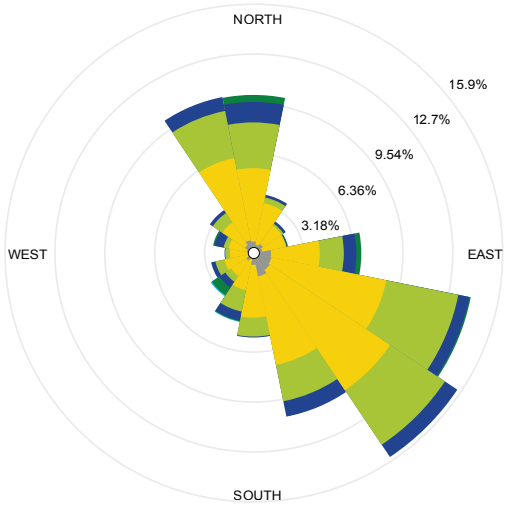
2023 Meteorological Tower Wind Roses

Meteorological Tower 1004

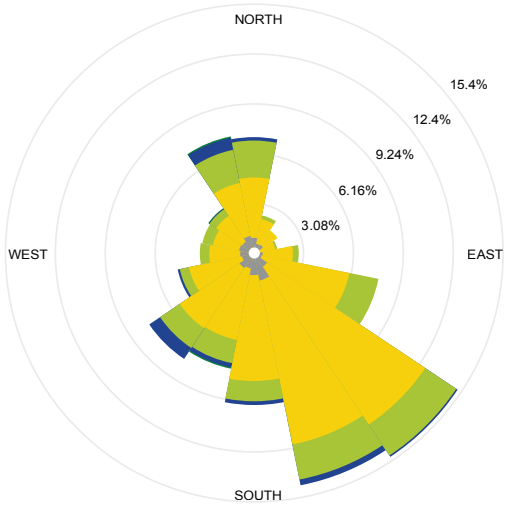
Annual Average



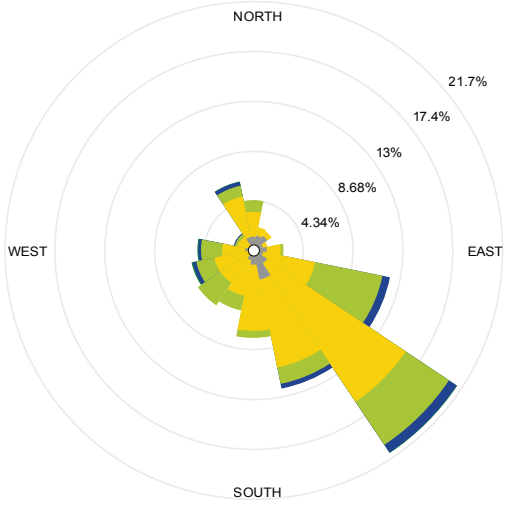
Spring



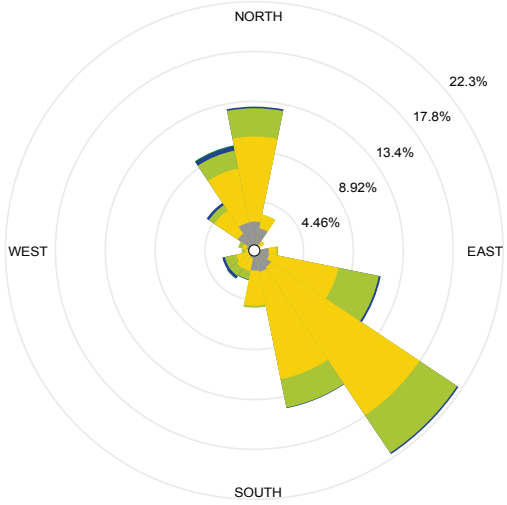
Summer



Fall



Winter



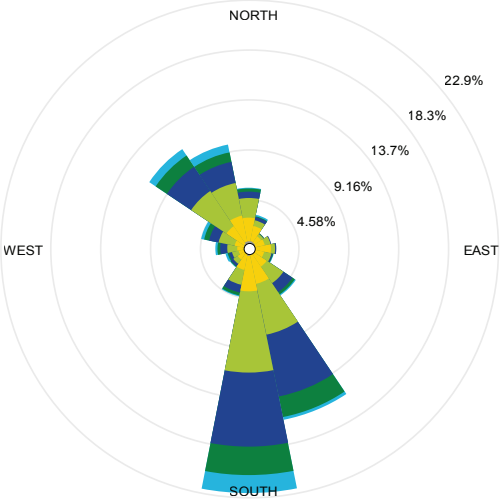
WIND SPEED (km/h)
Tower Height: 30m

- 0.5 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > = 25

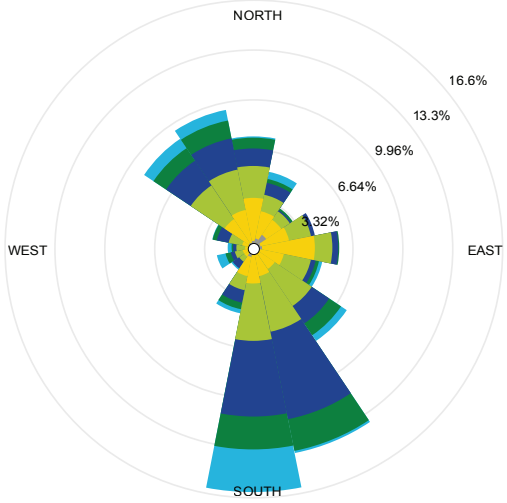
2023 Meteorological Tower Wind Roses

Meteorological Tower 1007

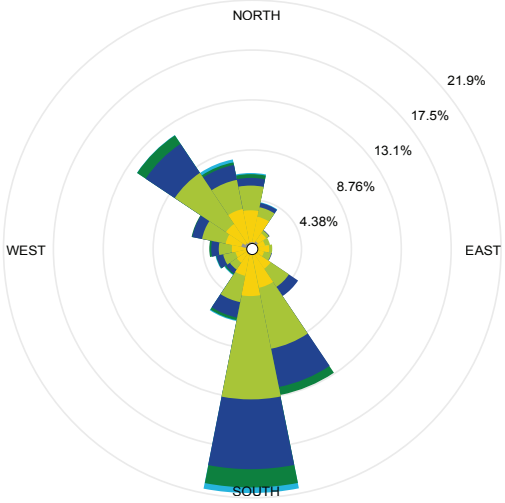
Annual Average



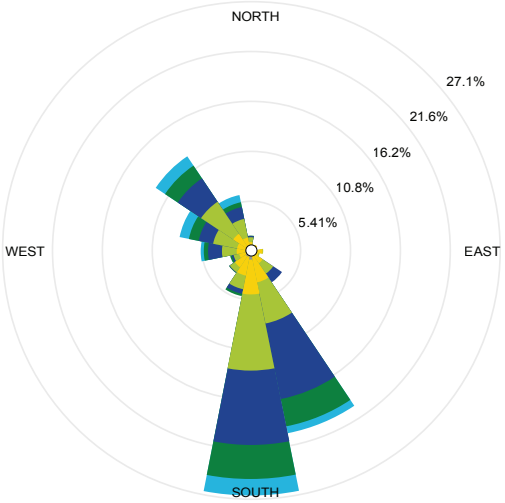
Spring



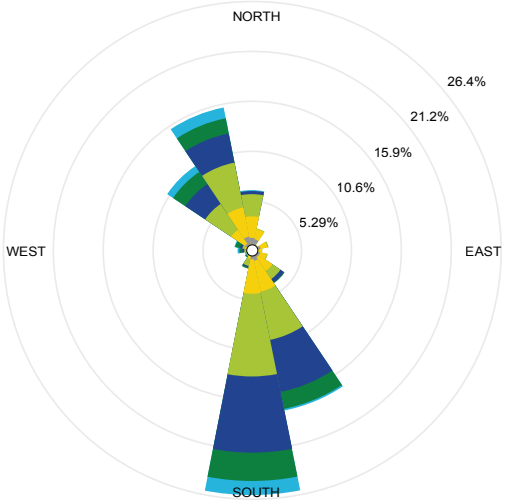
Summer



Fall



Winter



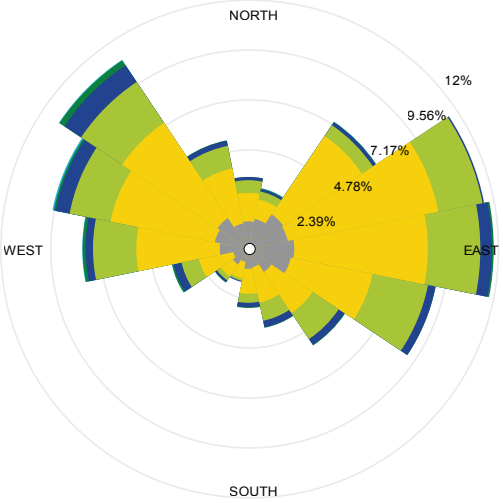
WIND SPEED (km/h)
Tower Height: 30m

- 0.5 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > = 25

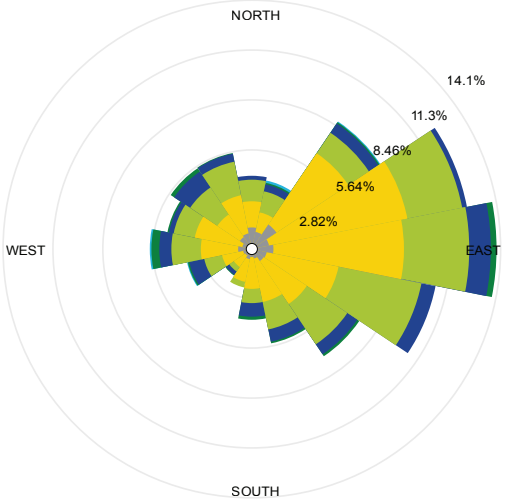
2023 Meteorological Tower Wind Roses

Meteorological Tower 2001

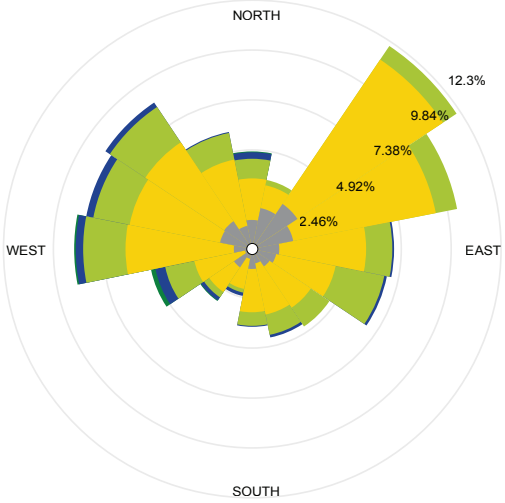
Annual Average



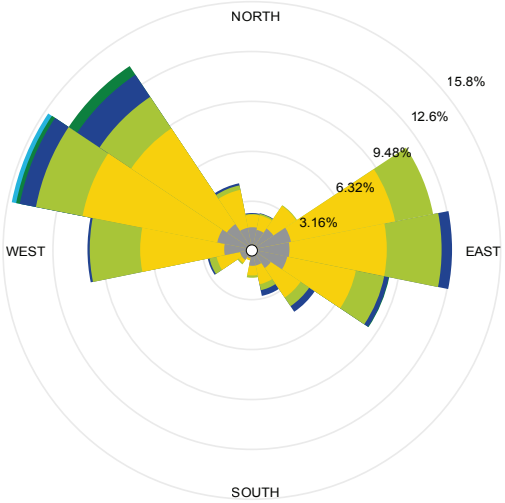
Spring



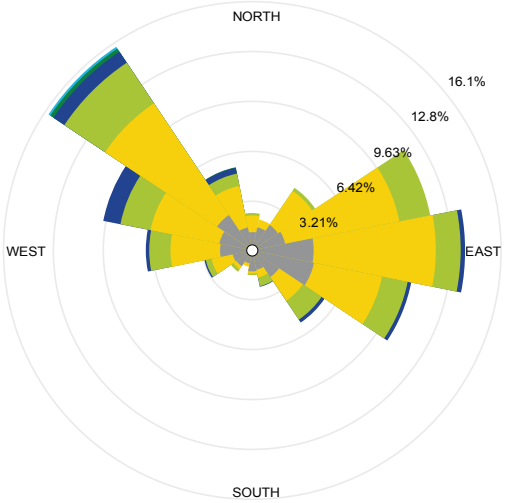
Summer



Fall



Winter



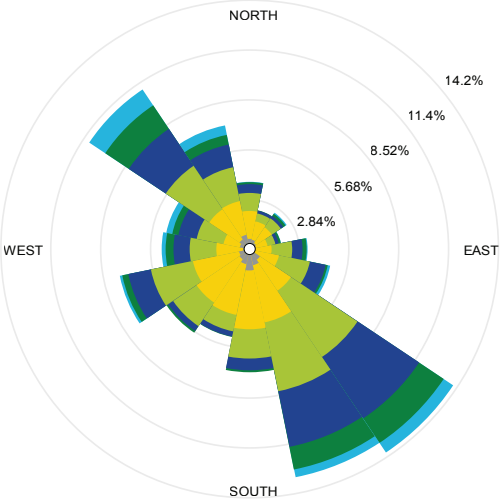
WIND SPEED (km/h)
Tower Height: 30m

- 0.5 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > = 25

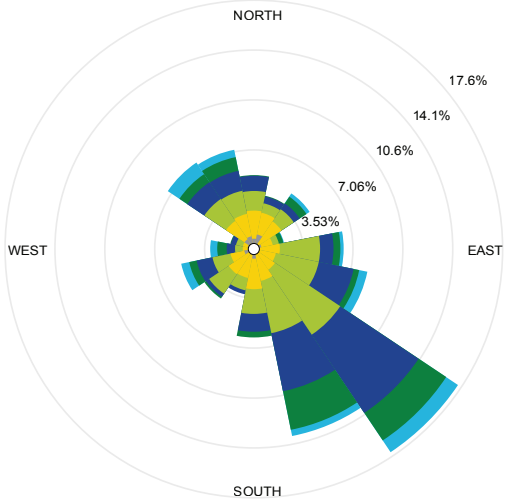
2023 Meteorological Tower Wind Roses

Meteorological Tower 2013

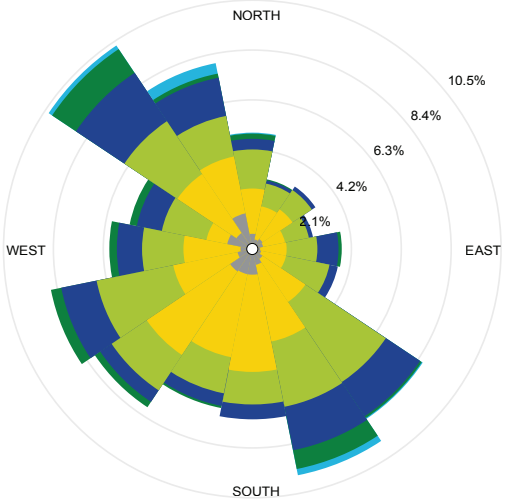
Annual Average



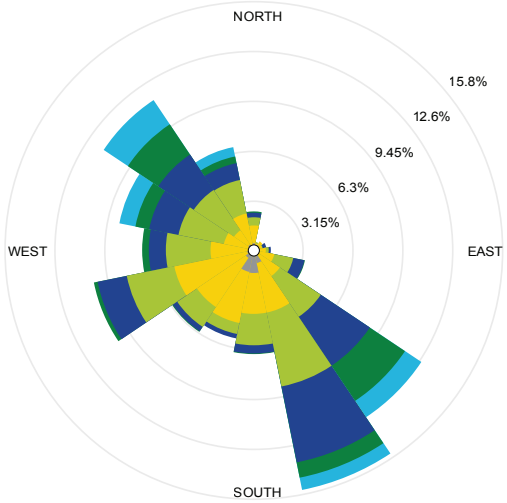
Spring



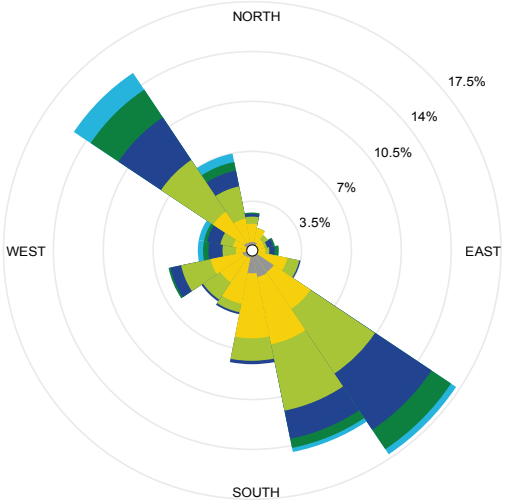
Summer



Fall



Winter



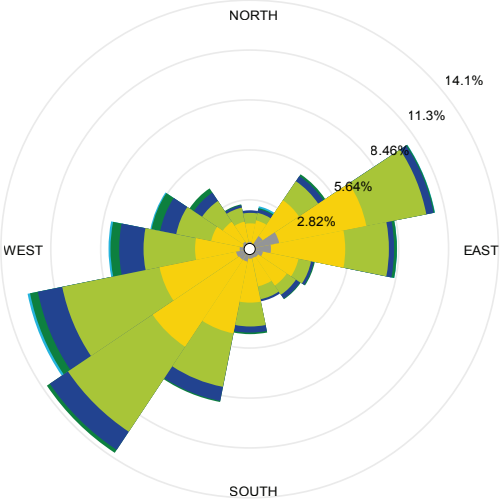
WIND SPEED (km/h)
Tower Height: 30m

- 0.5 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > = 25

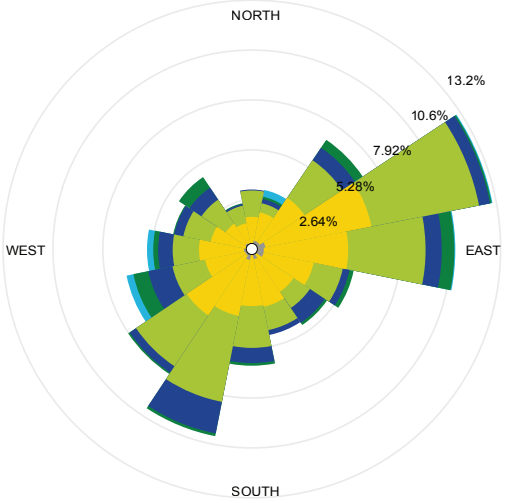
2023 Meteorological Tower Wind Roses

Meteorological Tower 3011

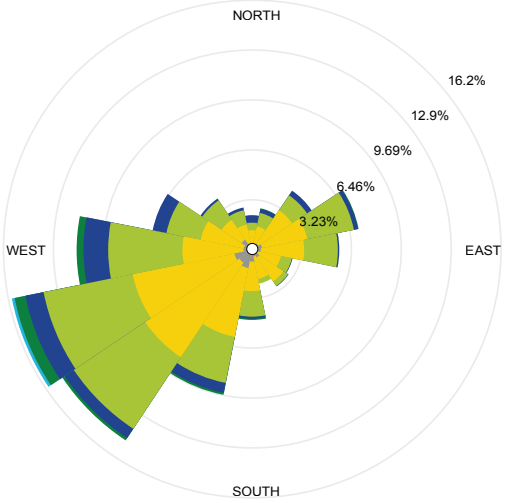
Annual Average



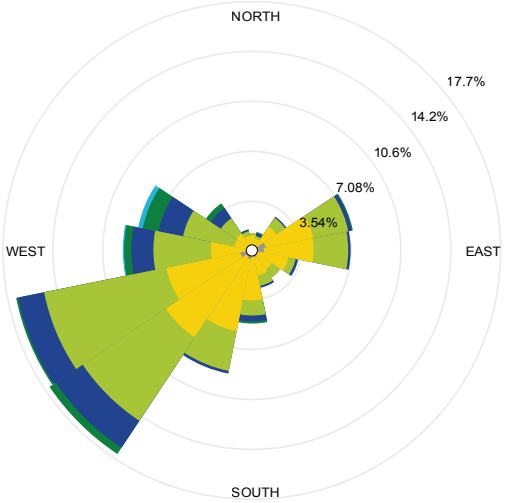
Spring



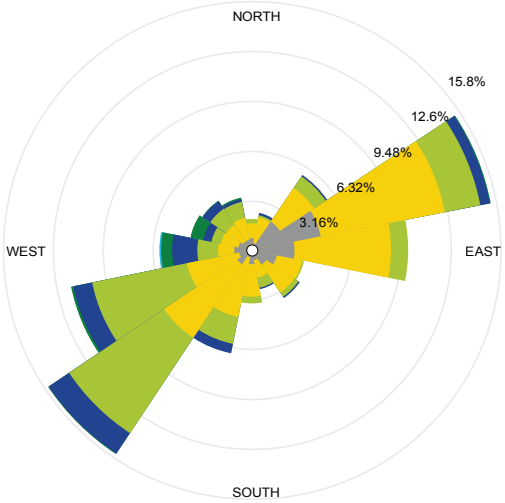
Summer



Fall



Winter



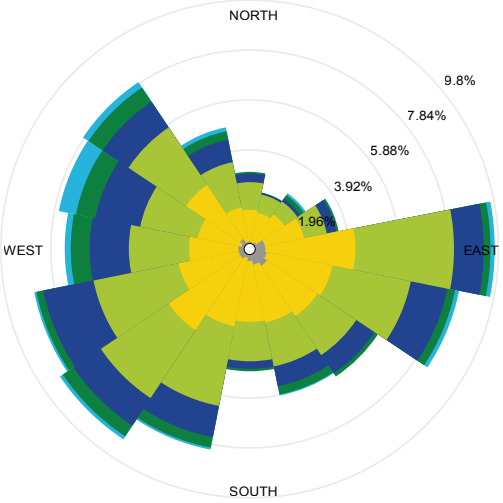
WIND SPEED (km/h)
Tower Height: 30m

- 0.5 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > = 25

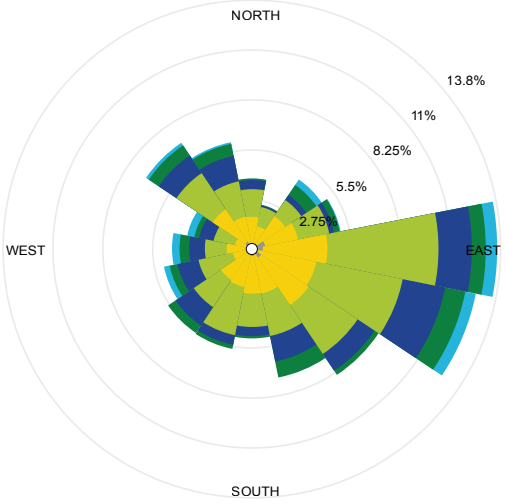
2023 Meteorological Tower Wind Roses

Meteorological Tower 3016

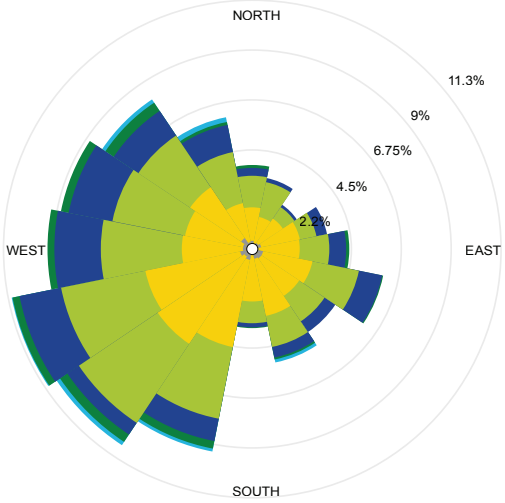
Annual Average



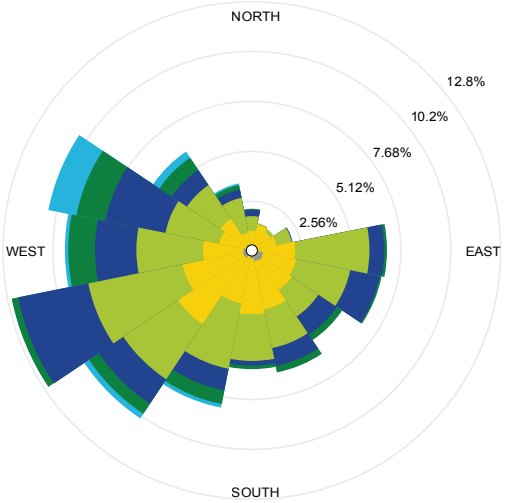
Spring



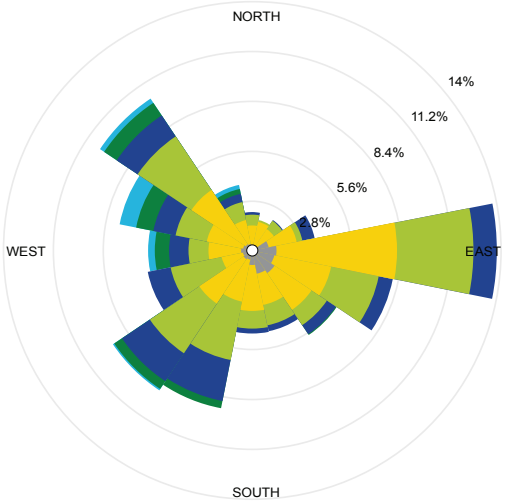
Summer



Fall



Winter



WIND SPEED (km/h)
Tower Height: 30m

- 0.5 - 5
- 5 - 10
- 10 - 15
- 15 - 20
- 20 - 25
- > = 25

Traditional Indigenous Knowledge

Fostering collaborative relationships with Indigenous communities in the Wood Buffalo region is foundational to the work carried out by the WBEA.

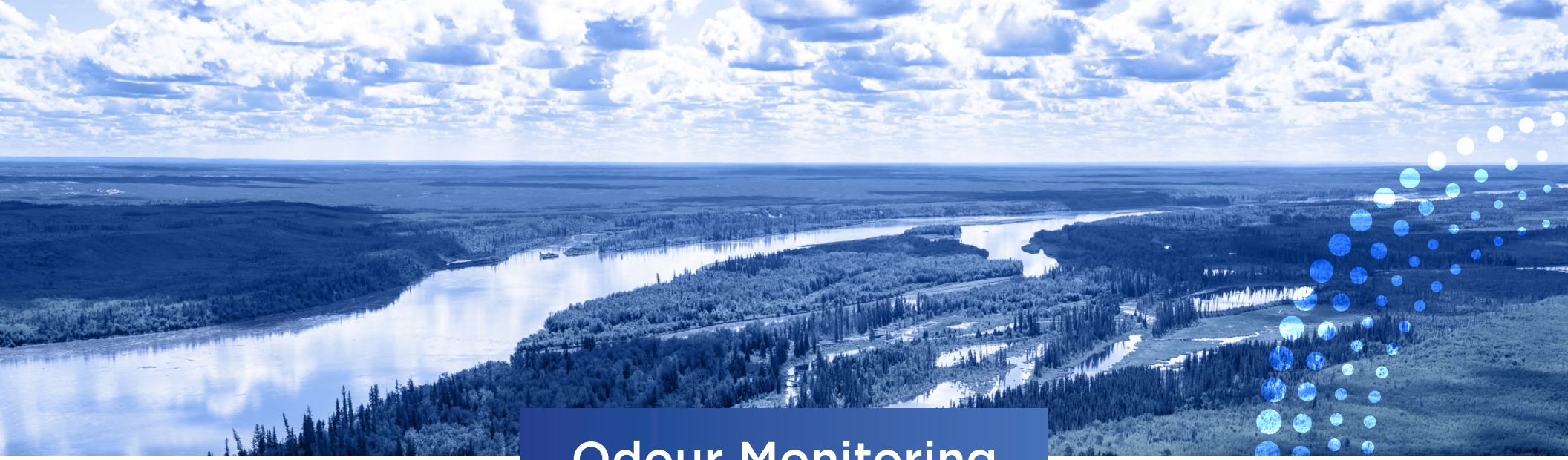
The re-engagement of the Traditional Knowledge Committee (TKC) demonstrates the WBEA's commitment to respecting Indigenous ways of knowing. The TKC was dedicated to developing a Terms of Reference (TOR) that described the intent, roles, and responsibilities of the committee. The committee's purpose will be to reflect Indigenous perspectives in the WBEA's monitoring programs.

In 2023, as with previous years, the Community-Led Berry Contamination Study strived to use best practice methodologies that appropriately bring together Indigenous and Western knowledge systems to build trusted relationships between participating Indigenous communities, academic researchers, and provincial and federal government scientists. Participating communities continued monitoring with a visit to each berry patch to spend time on the land, share lived experience and knowledge, observe the environmental condition, and harvest berries for laboratory analysis of health compounds and contaminants.

The Community-Led Berry Contamination Study is a multi-year community-based monitoring project that builds upon work initiated by Fort McKay First Nation, with support from the Wood Buffalo Environmental Association, since 2010. The project has grown to include Conklin Métis, Fort McKay Métis Nation, McMurray Métis, and Fort McMurray 468 First Nation.

The study objective is to monitor berries from culturally significant patches to inform the community questions, including "are the berries safe to eat?" and is driven by the concerns of the participating community members about changes to berry quality and health due to oil sands-related development. The cultural identity of Indigenous peoples is intertwined with their food sovereignty and food security, therefore, the continued access to cultural keystone species of berries is paramount for community health and well-being.

The study has produced qualitative and quantitative data for each community that has provided meaningful insight into their berry condition. While the WBEA provides support to the communities, the WBEA does not share the data on the communities' behalf; however, there is some indication from this study that levels of contaminants of concern are elevated in berries from patches considered unclean by Indigenous members, which are located closer to oil sands development, versus berries from patches considered clean or sacred by Indigenous members, which are located farther away from development.



Odour Monitoring

Community Odour Monitoring Program

The Community Odour Monitoring Program (COMP) app was created as an opportunity for people to provide information about the odours they experience throughout the RMWB, as outlined in the image on the following page. Currently, analyzers can measure the concentration of specific pollutants or groups of pollutants, but they cannot measure if an odour is present or how strong the odour would be. The app allows the WBEA to compare information people provide about odours to the ambient air data collected at WBEA air monitoring stations. The intent is to find whether there are trends in the ambient data when odours are present—such as elevated concentrations of odour-causing compounds.

View near-real time observations, access the COMP 2023 Annual Report, and find links to download the app to your iOS or Android Device on the COMP website: **comp.wbea.org**.

1

Source

Pollution is emitted into the air from a variety of sources.

2

Smell

The pollution may cause odours - anyone who experiences an odour in the RMWB can submit their observations via the WBEA's COMP app.

3

Share

Users can learn about odours and view all observations submitted at **comp.wbea.org**.

WBEA 2023 Membership

Indigenous members

Athabasca Chipewyan First Nation
Chard Métis Nation
Chipewyan Prairie Dene First Nation
Christina River Dene Nation Council
Conklin Resource Development Advisory Committee
Fort McKay First Nation
Fort McKay Métis Nation
Fort McMurray 468 First Nation
Lakeland Métis
McMurray Métis
Mikisew Cree First Nation
Non-government organization members

Non-government organization members

Keyano College

Government members

Alberta Energy Regulator
Alberta Environment and Protected Areas
Alberta Health
Alberta Health Services
Environment and Climate Change Canada
Health Canada
Parks Canada
Regional Municipality of Wood Buffalo

Industry members

Athabasca Oil Corporation
Canadian Natural
Cenovus Energy Inc.
ChemTrade Logistics
CNOOC International
Connacher Oil and Gas Ltd
ConocoPhillips Canada
H.J. Baker Sulphur Canada ULC
Hammerstone Corporation
Harvest Operations Corp.
Imperial Oil Limited
Inter Pipeline Limited
Keyera Energy Ltd.
MEG Energy Corp.
Parsons Creek Aggregates
PetroChina Canada Ltd.
Suncor Energy Inc.
Sunshine Oilsands Ltd.
Surmont Energy
Syncrude Canada Ltd.
Teck Resources Ltd.
Titan Tire Reclamation Corporation

WOOD BUFFALO
ENVIRONMENTAL ASSOCIATION

W B E A

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