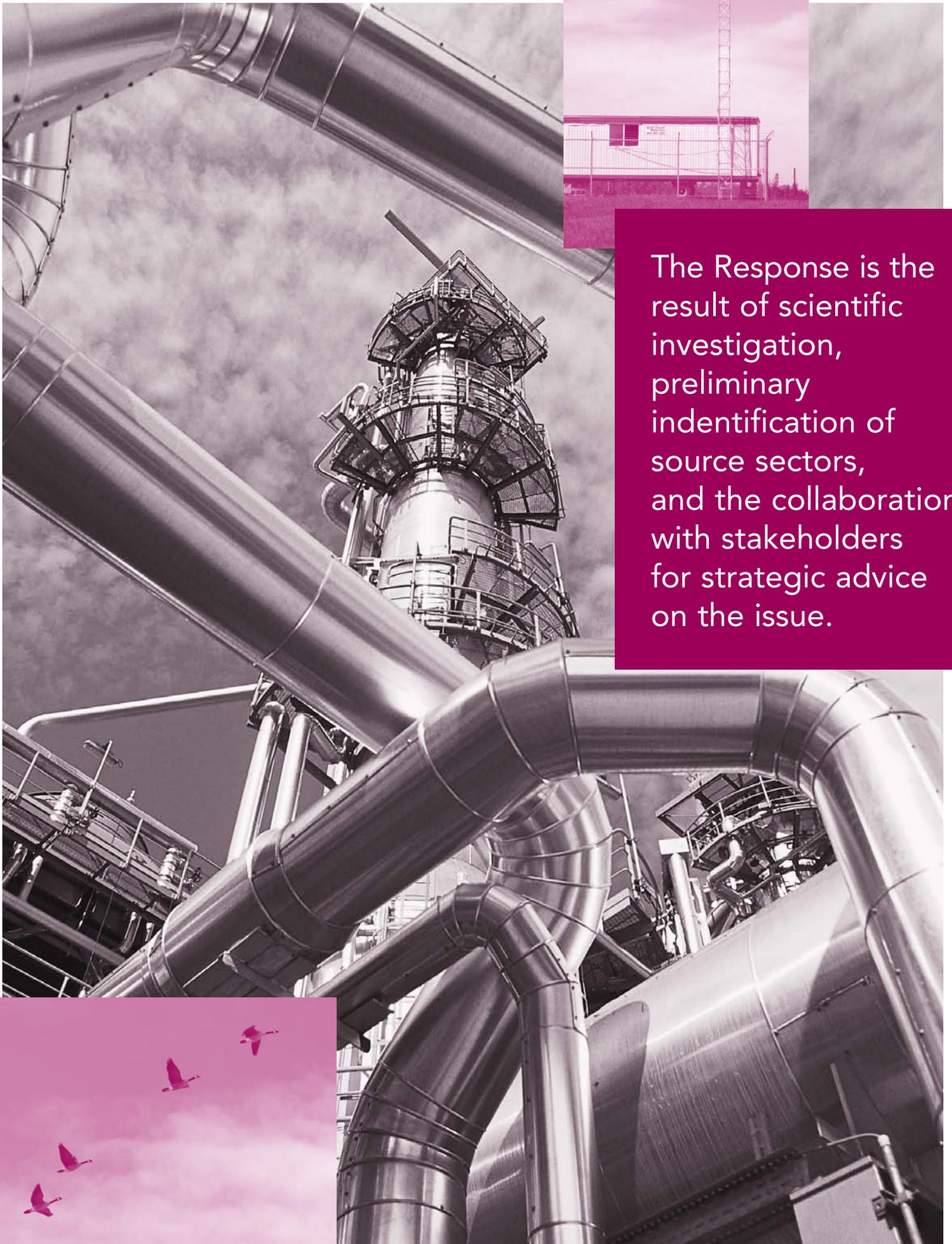




capital region
fine particulate
matter response

DECEMBER 2014





The Response is the result of scientific investigation, preliminary identification of source sectors, and the collaboration with stakeholders for strategic advice on the issue.





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mandate

Annual assessments of ambient air quality conducted by Alberta Environment and Sustainable Resource Development for 2008–2010 and 2009–2011 showed that Edmonton Central and Edmonton East ambient air quality monitoring stations within the Capital Region were in exceedance of the Canada-wide Standards for fine particulate matter.

Under the Clean Air Strategic Alliance (CASA) Particulate Matter and Ozone Management Framework, if the Canada-wide Standard is exceeded, Alberta Environment and Sustainable Resource Development will develop and implement, in collaboration with stakeholders, a mandatory plan containing measures to reduce ambient concentrations of fine particulate matter to below the numerical Canada-wide Standard.

An Oversight Advisory Committee was established in 2012 to implement the Capital Region Air Quality Management Framework (the '*Framework*'). The first priority was providing strategic advice to Alberta Environment and Sustainable Resource Development during the development of the Capital Region Fine Particulate Matter Response.



executive summary

The Capital Region Fine Particulate Matter Response (the 'Response') was prepared when Alberta Environment and Sustainable Resource Development annual ambient air quality assessments found that fine particulate matter concentrations in the Capital Region exceeded the Canada-wide Standard. The provincial annual assessments for fine particulate matter in 2008–2010 and 2009–2011 identified that Edmonton Central and Edmonton East air monitoring stations were in Level 4 (the Mandatory Plan to Reduce Action Level) of the *Framework*. In addition, Edmonton South and Lamont monitoring stations were in Level 3 (the Management Plan Action Level). According to both the *Framework* and the Clean Air Strategic Alliance (CASA) Particulate Matter and Ozone Management Framework, Alberta's commitment to achieving the Canada-wide Standard required that a mandatory response plan is developed by Fall 2014. The goal of the Response is to reduce ambient fine particulate matter concentration and remain below Level 4 at all monitoring stations within the Capital Region.

In 2014, the Canadian Ambient Air Quality Standards replaced the Canada-wide Standards. However, the management approach mandating the development and implementation of a mandatory plan when the limit is exceeded remains the same. Jurisdictions are expected to manage against these new and more stringent standards by 2015.

Managing particulate matter is important because health-related studies have linked particulate matter, especially fine particulate matter, to cardiac and respiratory diseases. Particulate matter can also affect plant health and contribute to soil and water toxicity. Particulate matter sources range from transportation, industrial, and energy generation to agriculture, residential, and commercial activities. The Capital Region and Industrial Heartland are fundamentally important to the overall economic activity of the province and with industrial and population growth pressures, management of the cumulative effects of economic and social development on air, water, and land capacity is critical to support future sustainable growth in this region.

In August 2012, stakeholders in the Capital Region were notified of the Capital Region fine particulate matter issue. In November 2012, Alberta Environment and Sustainable Resource Development shared information with the Capital Region stakeholders on the issue and timeline for development of a mandatory response plan. Subsequently, an Oversight Advisory Committee was formed to implement the Capital Region Air Quality Management Framework with the first priority being to complete the Capital Region Fine Particulate Matter Response.

The Oversight Advisory Committee enlisted the expertise of a multi-stakeholder Technical Sub-committee to enhance their understanding through scientific investigation of fine particulate matter. The findings and recommendations from the Technical Sub-committee are captured in the Fine Particulate Matter Science Report. In addition, the Oversight Advisory Committee conducted a jurisdictional scan (Appendix D) and compiled a list of stakeholder's current, committed, and proposed actions (Appendix E). These deliverables were used to inform the development of the Response.



Preliminary scientific investigation determined that the exceedance of fine particulate matter into Level 4 was largely the result of secondary fine particulate matter formation and greater frequency of days with fine particulate matter events between January and March 2010 driven by weather conditions associated with calm winds and temperature inversions. These “event days” are characterized by a 24-hour average fine particulate matter concentration that is equal to or greater than 20 micrograms per cubic metres.

Modelling was conducted to identify which of the potential sources had the greatest contribution to secondary fine particulate matter formation. Work is currently underway to continue to improve on the model’s ability to perform source apportionment.

Secondary fine particulate matter formation is highly complex and additional studies to build on the preliminary investigation are required. This Response adopts recommendations from the Capital Region Fine Particulate Matter Science Report. These recommendations include:

- refinement of the fine particulate matter modelling;
- continued implementation of recommendations from the Capital Region Monitoring Network Assessment report to better understand the distribution of fine particulate matter in the region; and
- continued supplemental speciation monitoring to better determine the impact and composition of secondary fine particulate matter contributing to the issue.

The focus of developing the Response was on gathering baseline information, improving scientific understanding, learning from other jurisdictions and identifying initiatives that are already committed or underway that can lead to near and future management of fine particulate matter.

Figure 1 on page 8 communicates the systems thinking that was applied to developing and evaluating the Response in order to meet the goal of the Response which is **to reduce ambient fine particulate matter concentration and remain below Level 4 at all monitoring stations within the Capital Region**. To achieve the goal, three main objectives have been chosen. These are management **actions** that can be used during fine particulate matter event days and throughout the year to achieve measurable reductions of fine particulate matter concentrations; scientific **investigation** to improve understanding of the substance; and **engagement** to promote public and stakeholder participation in solutions to the issue.

Implementation will begin in 2015 and since jurisdictions are expected to manage air quality against the new Canadian Ambient Air Quality Standards starting in 2015, implementation of the Response will be evaluated and reported against the Canadian Ambient Air Quality Standards rather than the Canada-wide Standards in order to be consistent, responsive, and future-focused to the increasingly stringent national standards for fine particulate matter.



Implementation and delivery on the outcomes will take a phased approach—Phase 1 (2015–2017), Phase 2 (2017–2020) and Phase 3 (2020 +)—to allow for an iterative approach that acknowledges new information (scientific and other), develops and implements key new actions starting in Phase 1, and recognizes that some actions may take time to have a significant impact. The development and implementation of new actions will continue as required in phases 2 and 3 to ensure levels of fine particulate matter improve and do not exceed the standard again despite anticipated population and industrial growth.

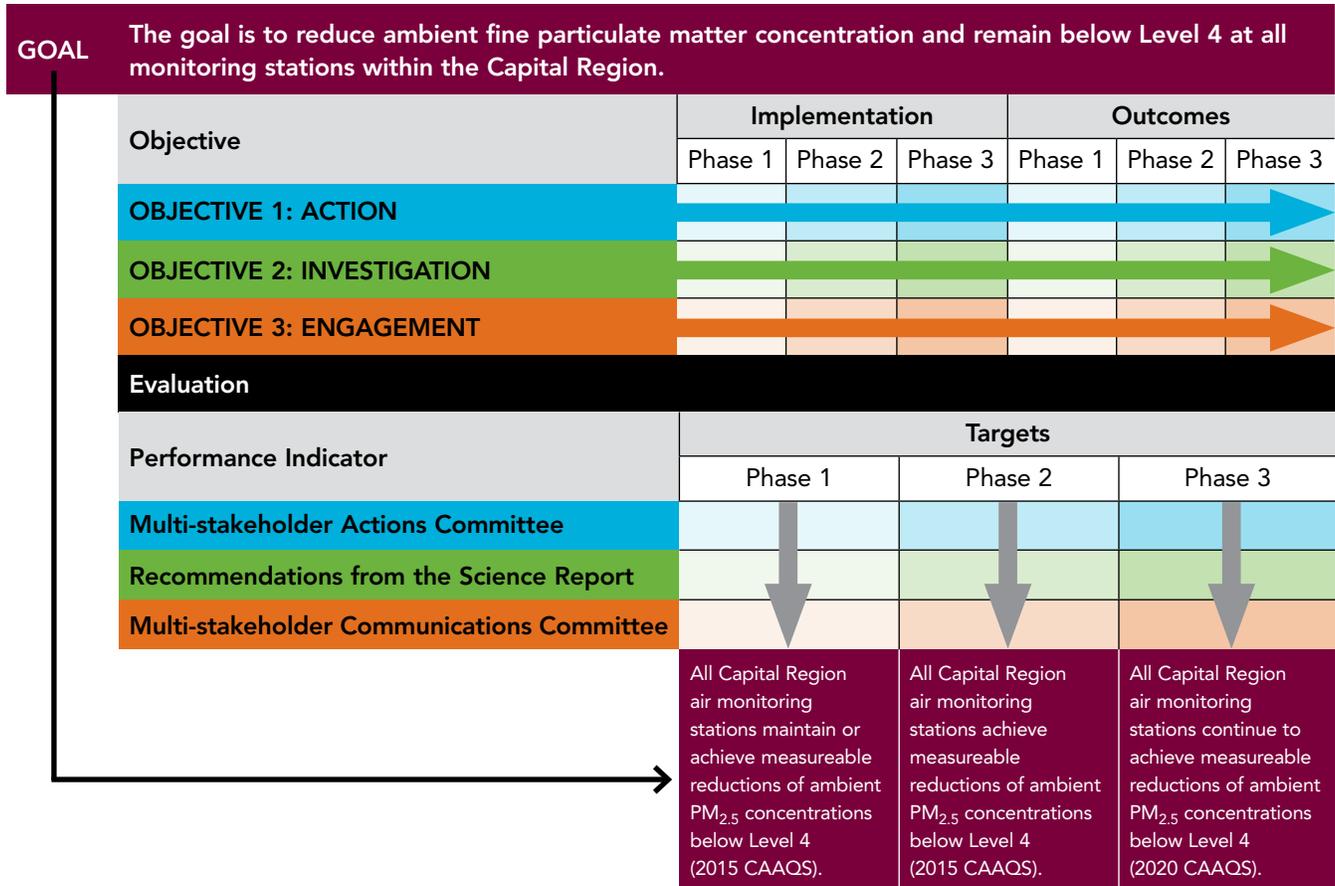
This iterative approach to implementation aligns with the principle of continuous improvement in the Canada-wide Standards Agreement and consequently the Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework. The principle implies that remedial and preventative actions are taken to reduce emissions from anthropogenic sources towards the long-term goal of reducing overall ambient concentration of fine particulate matter when ambient levels are below the national standards. However, when ambient levels are above the national standards, additional actions need to be considered based on the sources contributing to levels in that area. Consequently, the Response coordinates the process to track, monitor, identify, and implement additional actions as required in each phase to ensure ambient levels of fine particulate matter are below and remains below the national standards.

Evaluation of the Response will occur annually against the ambient air quality assessments, performance indicators, and targets. Annual status updates to the public on the implementation of the Response will:

- outline any trends in fine particulate matter levels in light of the most recent and past air quality annual assessments;
- indicate progress towards reducing below Level 4 (tasks and deliverables);
- highlight new findings from ongoing investigative work;
- update the actions and outline any other changes (status of action development and implementation);
- note any other action or factors, not part of the Response that also have an impact on the achievement of the goal of the Response (progress on other national and provincial initiatives); and
- provide feedback on the effectiveness of the Response (performance indicators and targets).

In addition to annual status updates, the Response and Science Report will undergo a comprehensive review every five years starting in 2020.

Figure 1
The Capital Region Fine Particulate Matter Response Logic Model:
Understanding and Evaluating a Complex System



The Response is the result of scientific investigation, preliminary identification of source sectors, and collaboration with stakeholders for strategic advice on the issue. The release of Alberta Environment and Sustainable Resource Development’s Annual Status Report for the Framework and the Five-year Review of the Science Report and Response will continue to engage stakeholders and provide not only accountability, but also collaborative and transparent administration of the Response.

Building confidence in the fine particulate matter science performed in the Capital Region remains a priority. Better characterization of fine particulate matter event days may help refine the management response to these issues and ultimately inform the management tools used. Therefore, the continued collaboration of stakeholders, and the work of the Technical Sub-committee remains a high priority.



ACKNOWLEDGEMENTS

This document was developed using a collaborative, multi-stakeholder approach with representation from the Government of Alberta, industries, municipalities, an environmental non-governmental organization, and airsheds. Members and participants engaged their organizations and dedicated their time in the completion of the Fine Particulate Matter Response and associated documents.

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Bill Calder – Prairie Acid Rain Coalition
Laurie Danielson – Northeast Capital Industrial Association
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Brent Korobanik – Lehigh Cement
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Frederic Picard – Strathcona Industrial Association
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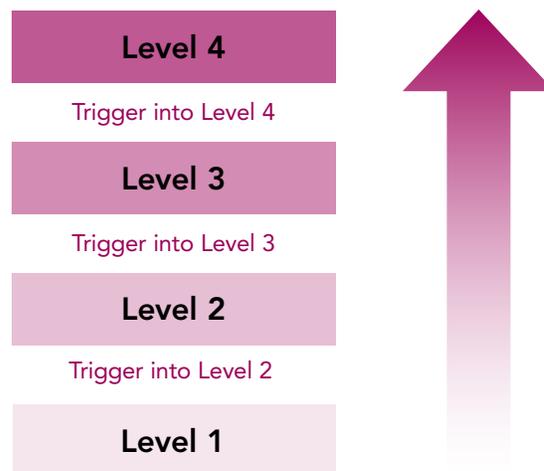
priority issue: fine particulate matter

Fine particulate matter can be emitted directly into the atmosphere as primary fine particulate matter or can be formed in the atmosphere from precursor gases reacting in favourable meteorological conditions as secondary fine particulate matter. Potential precursor gases in the Capital Region are nitrogen oxides (NO_x), sulphur dioxide (SO₂), ammonia (NH₃), and volatile organic compounds (VOCs).

Under the Clean Air Strategic Alliance (CASA) Particulate Matter and Ozone Management Framework, Alberta Environment and Sustainable Resource Development performs annual ambient assessments of fine particulate matter concentration using data collected at air monitoring stations¹ within Alberta. For fine particulate matter, all stations in the Capital Region except Edmonton McIntyre station and Redwater Industrial station are used in the ambient assessment. Edmonton McIntyre station is a special study site and Redwater Industrial station is located too close to an industrial operation to provide an accurate measurement of ambient conditions.

Action levels and associated management approaches are then assigned to individual monitoring stations. The Capital Region Air Quality Management Framework adopted the Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework approach to manage fine particulate matter in the Capital Region.

Figure 2
Triggers and Levels for Increasing the Stringency of Actions as the Levels Increase



The management actions that are associated with lower levels provide time to address ambient concentrations. Each higher level is prescribed by successively more stringent management actions, such as compliance tools and timelines. This concept is illustrated in Figure 2. The intent is that appropriate actions are taken to avoid an exceedance into Level 4. Management actions are defined in the *Framework* (pages 37-42).

¹Within the Capital Region, there are twenty continuous monitoring stations operated by Alberta Environment and Sustainable Resource Development, Fort Air Partnership, West Central Airshed Society, Strathcona Industrial Association, and Lehigh Cement.

The annual assessments for 2008–2010 and 2009–2011 identified that two monitoring stations, Edmonton Central and Edmonton East, exceeded the Canada-wide Standard Exceedance Trigger into the Mandatory Plan to Reduce Below the Canada-wide Standard Action Level and that two other monitoring stations, Edmonton South and Lamont stations, exceeded the Planning Trigger into the Management Plan Action Level, which correspond to Level 4 and Level 3, respectively, in the *Framework*. When ambient fine particulate matter concentrations are above the Canada-wide Standard Exceedance Trigger, Alberta Environment and Sustainable Resource Development leads the development of a mandatory plan to reduce below Level 4, in collaboration with local stakeholders.

The recent release of the provincial 2010–2012 annual assessment² confirmed that elevated fine particulate matter remains an issue. Edmonton Central monitoring station remained in Level 4 while the Edmonton East monitoring station reduced into Level 3. Edmonton South and Lamont monitoring stations remained in Level 3. Table 1 shows the concentrations for the past three annual assessments at the four stations in Level 4 or Level 3. The 2011–2013 annual assessment will be reported against the new, more stringent Canadian Ambient Air Quality Standards (CAAQS) and will be available in 2015.

Table 1
The Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework Annual Assessments for 2008–2010, 2009–2011, and 2010–2012

Year	Edmonton Central	Edmonton East	Edmonton South	Lamont
2008–10	31.1	32.5	25.6	22.4
2009–11	35.3	32.3	26.5	*
2010–12	35.3	28.7	30.2 ³	20.6

* Insufficient data ■ Level 3 ($\geq 20 \mu\text{g}/\text{m}^3$) ■ Level 4 ($>30 \mu\text{g}/\text{m}^3$)

Managing particulate matter is important because health-related studies have linked particulate matter, especially fine particulate matter to cardiac and respiratory diseases such as asthma, bronchitis, emphysema, and various forms of heart diseases. Smaller (fine particulate matter) particles can penetrate deeper into the lungs, irritating the respiratory system, reducing the effective surface area for oxygen exchange or transferring toxic compounds in fine particulate matter into the blood stream. Particulate matter can also affect plant health, the balance of nutrients in soil and water, and can contribute to soil and water toxicity.

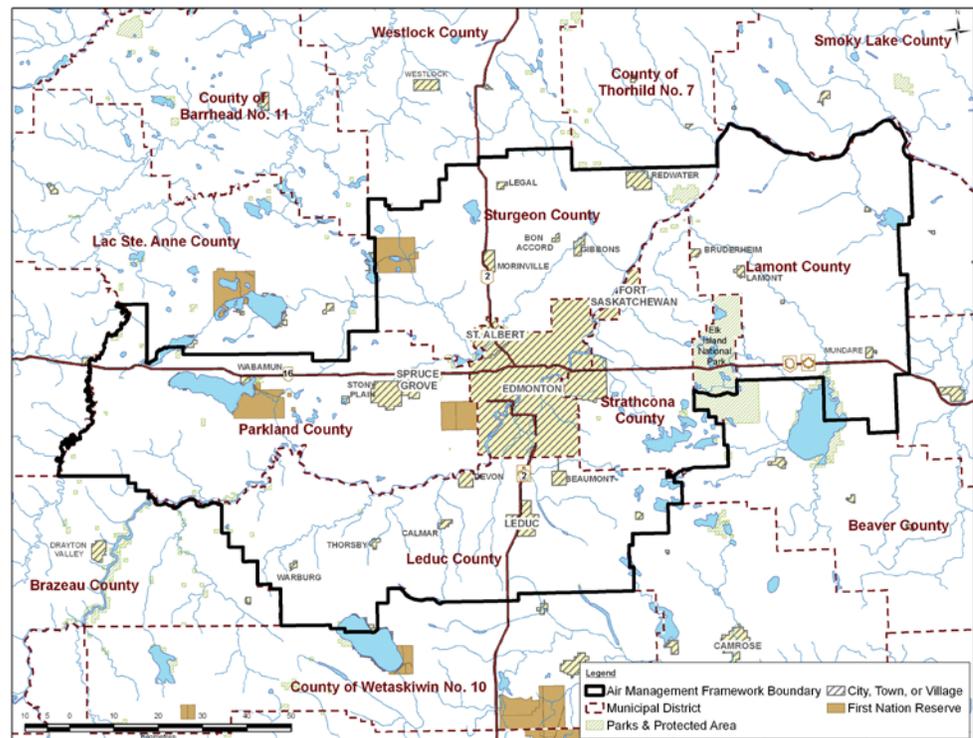
²www.esrd.alberta.ca/air/management-frameworks/canadian-ambient-air-quality-standards-for-particulate-matter-and-ozone/documents/ParticulateMatterOzoneFactSheet-2010-2012.pdf

³The Canada-wide Standards (CWS) specified standards, and rounding results to a whole microgram per cubic meter or parts per billion, but the triggers in the Clean Air Strategic Alliance (CASA) Framework below the CWS were specified to one decimal place. This has led to the situation in which a $20.2 \mu\text{g}/\text{m}^3$, for example, would exceed the Planning Trigger of $20.0 \mu\text{g}/\text{m}^3$ but a $30.2 \mu\text{g}/\text{m}^3$ (which rounds to $30 \mu\text{g}/\text{m}^3$) does not exceed the Exceedance Trigger of $30 \mu\text{g}/\text{m}^3$. Under the Canadian Ambient Air Quality Standards, the precision is consistent across the concentration ranges.

DESCRIPTION OF THE CAPITAL REGION AIR MANAGEMENT AREA

The Capital Region is defined by the Edmonton Capital Region Board boundary which includes Lamont County and Elk Island National Park as shown in Figure 3. This area covers approximately 11,993 kilometres, consisting of 24 municipalities, including the City of Edmonton, and is located within the North Saskatchewan Regional planning area. Detailed description of the Capital Region air management area can be found on page 12 of the Framework.

Figure 3
Capital Region Boundary





air quality management in alberta

Air quality management in Alberta has evolved over time to adapt to changing needs and improved knowledge. Air quality has traditionally been managed for industrial facilities, specific populations, and ecologically sensitive areas and has recently evolved to a cumulative effects management approach. More history on the evolution of air quality management in Alberta can be found in Appendix A.

FINE PARTICULATE MATTER MANAGEMENT

Just as air quality management has evolved over time, so too has management specific to fine particulate matter. When the National Ambient Air Quality Objectives (NAAQOs) for Total Suspended Particles (TSP) was established under the *Clean Air Act* in 1970s, the health and environmental effects related to the finer fractions of particulate matter were not well understood. Even in the 1980s, the role of particulate matter as a major component of smog was not recognized. Throughout the 1990s, evidence of the serious health implications of inhaling particulate matter grew with scientific studies. This led to the establishment of the Canada-wide Standard for Particulate Matter in 2000.

In 2001, the federal government declared particulate matter less than 10 microns in diameter (PM₁₀) to be toxic and be included in the Canadian *Environmental Protection Act* (1999) with an emphasis on the finer fraction (PM_{2.5} or fine particulate matter). In 2003, the primary precursors to secondary particulate matter—nitrogen oxides (NO_x), volatile organic compounds (VOCs), sulphur dioxide (SO₂), and ammonia (NH₃) were also declared to be toxic on the basis of their contribution to particulate matter formation.

Key initiatives that drive fine particulate matter management in the Capital Region are highlighted in the bullets below. It should be acknowledged that not all of these initiatives are focused on directly reducing emissions. Nevertheless, they each play distinct and important roles in the overall management of fine particulate matter. Additional details are provided in Appendix B.



Key Initiatives for Fine Particulate Matter Management in the Capital Region

- The Canada-wide Standards for Particulate Matter have been in effect since 2000. This established an inter-governmental commitment to reduce fine particulate matter and its associated risks to human health and the environment. These standards will be replaced by the more stringent Canadian Ambient Air Quality Standards in 2015. Jurisdictions will report their 2012–2014 annual assessments against the Canadian Ambient Air Quality Standards in 2015 and will be expected to manage air quality against these standards. Alberta began reporting against the new standards in 2014 for 2011–2013 data, and will be available in January 2015.
- The Alberta Ambient Air Quality Objectives set the national and provincial 24-hour and annual limits for fine particulate matter. In addition, industrial release limits help to ensure pollution prevention and control technologies are adopted to adequately protect the environment.
- Key provincial management frameworks, such as the Acid Deposition Management Framework and the Emissions Management Framework for the Alberta Electricity Sector, guide the management and reduction of fine particulate matter and precursor pollutants such as nitrogen oxides and sulphur dioxide.
- Policies such as the national base-level industrial emissions requirements (BLIERs) ensure that all industrial sources across the country are meeting at least the national standards. The first three of these BLIERs for the cement sector, gas-fired non-utility boilers and heaters, and stationary gas-fuel fired engines have been gazetted by the federal government. Once these requirements are in place, they are anticipated to have a significant reduction on nitrogen oxides emissions, an important component of secondary fine particulate matter.
- A charter for the Clean Air Strategic Alliance (CASA) Non-point Sources work to understand and address non-point source air emissions contributing to ambient fine particulate matter and ozone standard exceedances in Alberta has been approved in principle.

Although it is important to recognize existing initiatives in the development of the Response, exceedance into Level 4 highlights the need for a response that is future-focused and coordinated amongst stakeholders. During implementation, existing and emerging initiatives will continued to be acknowledged, aligned and coordinated, where appropriate.



investigating the cause of the exceedance

In June 2013, the Capital Region Oversight Advisory Committee advised convening a Particulate Matter Technical Sub-committee to inform development of the Response. The Technical Sub-committee conducted scientific investigations of fine particulate matter to explore the factors influencing the wintertime elevated fine particulate matter concentrations in the Capital Region.

The Technical Sub-committee used a three-pronged investigative approach in which they:

- analyzed historical data (2006–2011);
- designed and deployed supplemental speciation monitoring; and
- evaluated the United States Environmental Protection Agency’s Community Multi-Scale Air Quality Model (CMAQ) as a fine particulate matter source apportionment tool.

The analysis of historical data focused on key factors that preliminary analysis revealed as potential areas to explore, specifically:

- seasonal variations of fine particulate matter events;
- year-to-year variation of fine particulate matter events;
- meteorological conditions during fine particulate matter events; and
- mass composition of fine particulate matter events.

The findings from these analyses provided a better understanding of the trends and conditions that are conducive to fine particulate matter events in the Capital Region. Below are the summarized findings from the investigation. Details of the investigation, findings, and recommendations can be found in the Capital Region Fine Particulate Matter Science Report.

- **Seasonal variations**

Elevated fine particulate matter concentration can occur year-round, but the exceedances that triggered the Response are observed to occur during the colder months from October to March.

- **Year-to-year variations**

The incidence of fine particulate matter exceedances was notably higher during 2010; this was likely due to a number of factors possibly including the upgrade to federal equivalent method (FEM) fine particulate matter analysers that yielded higher but more accurate concentrations of the true mass and meteorological phenomenon associated with low wind speeds and temperature inversions. Despite the greater number of events in 2010, the median 24-hour concentrations were comparable to the median concentrations for the other years in the data range.

- **Meteorological conditions**

Fine particulate matter events can occur when there is either a temperature inversion or low wind speeds (less than six kilometres per hour). However, the highest concentrations are measured when both an inversion and low wind speeds are present.

• Mass composition

Data from the supplemental speciation monitoring confirmed that secondary fine particulate matter is the larger component of the fine particulate matter mass in the Capital Region. Given that the non-forest fire events frequently occur between October to March (colder season) and are the likely driver for the observed exceedance, an analysis of the secondary fine particulate matter component on colder season event days show that ammonium nitrate [NH_3NO_3 or ANO_3] and organic matter (OM) are the two prominent components, followed by ammonium sulphate [$(\text{NH}_3)_2\text{SO}_4$ or ASO_4].

Detailed analyses of secondary fine particulate matter composition at the Edmonton McIntyre monitoring station and thermodynamic equilibrium modelling of conditions in the Capital Region have demonstrated that the ambient atmospheric conditions in the Capital Region are non-ammonia-limiting. These results suggest that over a wide range of conditions, any substantial changes in ambient ammonia concentrations would not likely have a significant effect on secondary fine particulate matter formation. Consequently, it is likely that the limiting reactants in the formation of ammonium nitrate and ammonium sulphate in the Capital Region are nitrogen oxides and sulphur dioxide [ultimately nitrate (NO_3^-) and sulphate (SO_4^{2-})].

The Capital Region Fine Particulate Matter Science Report highlights that managing major sources of nitrogen dioxide and volatile organic compounds in the Capital Region may be an effective means of reducing secondary fine particulate matter. On cold season event days, secondary fine particulate matter is dominated by ammonium nitrate and organic matter. In reference to Figure 2⁴ in the Science Report, common major sources of nitrogen dioxide and volatile organic compounds are electrical generating stations (except volatile organic compounds), refineries, and petrochemical facilities. In addition, major sources for nitrogen oxides and volatile organic compounds include off-road and on-road automobile sources.

Determining the relative contribution of emissions of other secondary fine particulate matter forming precursors, during cold season events as well as throughout the rest of the year, remains a challenge. As a result, modelling for fine particulate matter (including secondary fine particulate matter) for winter 2010 was undertaken to investigate and evaluate the capability of the United States Environmental Protection Agency Community Multi-Scale Air Quality (CMAQ) model as a source apportionment tool. While the model was unsuccessful at reproducing the observed fine particulate matter concentration, predicted total fine particulate matter concentrations were of notable improvement from previous studies. In addition, several improvements were made to enable the development of a future successful model.

The findings from the science investigation demonstrate that the fine particulate matter issue in the Capital Region is complex. Many factors can contribute to elevated fine particulate matter concentrations and the challenges in modelling fine particulate matter for source apportionment purposes contribute to this complexity.

⁴Figure 2: Sector-based Breakdown of $\text{PM}_{2.5}$ Precursor and Primary $\text{PM}_{2.5}$ Emissions in the Capital Region (Averaged over January to March 2010)



In an ongoing effort to better understand and characterize the fine particulate matter events in the Capital Region, Alberta Environment and Sustainable Resource Development accepted the list of recommendations presented in the Capital Region Fine Particulate Matter Science Report. With advice from the Technical Sub-committee, the department identified key recommendations to address information gaps that are prioritized based on the need, feasibility, and cost. These recommendations, noted below, are by no means exhaustive and may be amended with evolving needs, but nevertheless represent current investigative priorities to be completed in the implementation of the Response. Refer to the Fine Particulate Matter Science Report for the complete list of recommendations and associated rationale.

The Science Report's Recommendations for Immediate Consideration

- Pursue the next phase of modelling to achieve more accurately modelled secondary fine particulate matter; this is essential for successfully completing the description of a sector-based source apportionment.
- Continue implementing the recommendations from the Capital Region Monitoring Network Assessment for continued improvements of the spatial characterization of fine particulate matter events.
- Continue the supplemental speciation monitoring program for an additional year as it would provide clarity on event-day concentrations, which were not captured in the 2014 monitoring program.

SOURCE SECTORS

Sources of fine particulate matter and precursor gases in the Capital Region are many and varied. One of the enhancements from the modelling study was an improved emissions inventory, which highlights the relative contribution of various sources to primary fine particulate matter and precursor gases averaged over January to March (the colder months) in 2010 within the Capital Region. The improved emissions inventory indicates that point and non-point sources related to all sectors of the economy can contribute to elevated fine particulate matter concentrations. Consequently, the economic sectors identified below (in alphabetical order) have been considered in the development of the implementation plan for the Response. Ongoing investigation efforts regarding the relative contribution of the source sectors will help provide additional information required to prioritize management efforts. Further details on the rationale for considering these sectors in the Response are included in Appendix C.

Economic Sectors that Contribute to Primary and Secondary Fine Particulate Matter in the Capital Region

- Agriculture
- Commercial/Institutional
- Energy
- Industrial
- Residential
- Small Businesses and Operations
- Transportation

taking action – developing a regional response

The Capital Region Air Quality Management Framework prescribes a process to address fine particulate matter exceedances when they occur. This process is based on shared ownership, accountability, and the need to take a regional perspective when investigating an issue.

Figure 4 shows the timeline from identifying the Capital Region fine particulate matter issue to implementing the Response. Details of the work conducted throughout the timeline are provided below.

Figure 4
Timeline for Development of the Capital Region Fine Particulate Matter Response



The Oversight Advisory Committee was formed in December 2012 to provide strategic advice to Alberta Environment and Sustainable Resource Development on the implementation of the Capital Region Air Quality Management Framework and development of the Capital Region Fine Particulate Matter Response. This committee includes representation from government, industry, airsheds, municipalities, and environmental non-government groups. Key recommendations from the Oversight Advisory Committee have guided the development of this Response, including the following deliverables: a jurisdictional scan; sector-based actions tables of current, committed, and proposed actions; stakeholder engagement; and the Capital Region Fine Particulate Matter Science Report; each described below.



JURISDICTIONAL SCAN

A jurisdictional scan was conducted to determine whether other North American jurisdictions experienced wintertime fine particulate matter issues, and to determine processes and programs that have been implemented to address these issues. Three key learnings were identified.

Three Key Learnings from the Jurisdictional Scan

1. The process of completing a State Implementation Plan (SIP) required by the US Environmental Protection Agency for states exceeding the US ambient air quality standards includes modelling to investigate the issue and determine meaningful actions.
2. Wintertime fine particulate matter events are unique to the Capital Region within the Canadian context. Other areas reported to experience some of the highest levels of fine particulate matter in the country have events that occur in the summer as a result of fuel wood combustion and transboundary emissions from the United States. Solutions to wintertime fine particulate matter are not standard between regions and require a place-based approach.
3. To effectively implement management programs, methods for reporting and evaluating on the progress and performance indicators are required.

From the key learnings, the development of the Response followed a similar process to the US State Implementation Plan, including the development of the emission inventory for the winter period, conducting supplemental speciation monitoring studies to analyze the mass composition, performing regional air quality modelling, and involving stakeholders. Furthermore, the findings from the jurisdictional scan identified key strategies that would help reduce fine particulate matter and may be used as a comprehensive resource for identifying new actions in the future. Detailed findings of the jurisdictional scan are documented in Appendix D.

CURRENT, COMMITTED, AND PROPOSED ACTIONS

Through multiple one-on-one consultations and group meetings, stakeholders were asked to describe initiatives that they were currently doing (current), actions that are budgeted and approved (committed) or actions that they plan to do (proposed) that support the Response's objectives. This information has been compiled into an actions table as seen in Appendix E. This list is a reflection of initiatives the Oversight Advisory Committee identified as relevant and is not intended to be an exhaustive list of all initiatives in the Capital Region.

The intent for Appendix E is to develop a baseline inventory of the relevant efforts that are underway in the Capital Region that will enhance fine particulate matter management. Annual review of Appendix E will provide stakeholders the ability to demonstrate their initiatives in implementing tools that could address the issue,



and leverage on the combined efforts. Through the annual evaluation and reporting on the implementation of the Response, the actions list will be reprioritized and refined to remove, edit, or identify and implement new management actions based on the information gathered from ongoing tracking of the current implemented actions and findings from investigative efforts.

STAKEHOLDER ENGAGEMENT

In August 2012, stakeholders in the Capital Region were notified of the region's fine particulate matter issue. In November 2012, these stakeholders were invited by Alberta Environment and Sustainable Resource Development to an information session about the priority issue and the timeline for the development of the Capital Region Fine Particulate Matter Response. Stakeholders agreed to form an Oversight Advisory Committee to guide the implementation of the Capital Region Air Quality Management Framework and development of the Response. In June 2014, the Oversight Advisory Committee re-engaged the broader stakeholders to follow-up on the November 2012 commitment to obtain input from the broader stakeholder group in development of the Response. Key objectives of the workshop included:

- continue engagement with the broader stakeholder group;
- continue to share understanding of the fine particulate matter issue and process to develop the Response;
- share learnings gathered since November 2012; and
- obtain input and feedback from the group on proposed content sections of the Response.

Information collected at the June 2014 workshop was incorporated into the finalization of the Response and implementation plan (Section 5.4). A complete list of attendees at the November 2012 and June 2014 workshops is located in Appendix F. Additional engagement sessions will be held as required to ensure ongoing collaborative support as implementation continues.

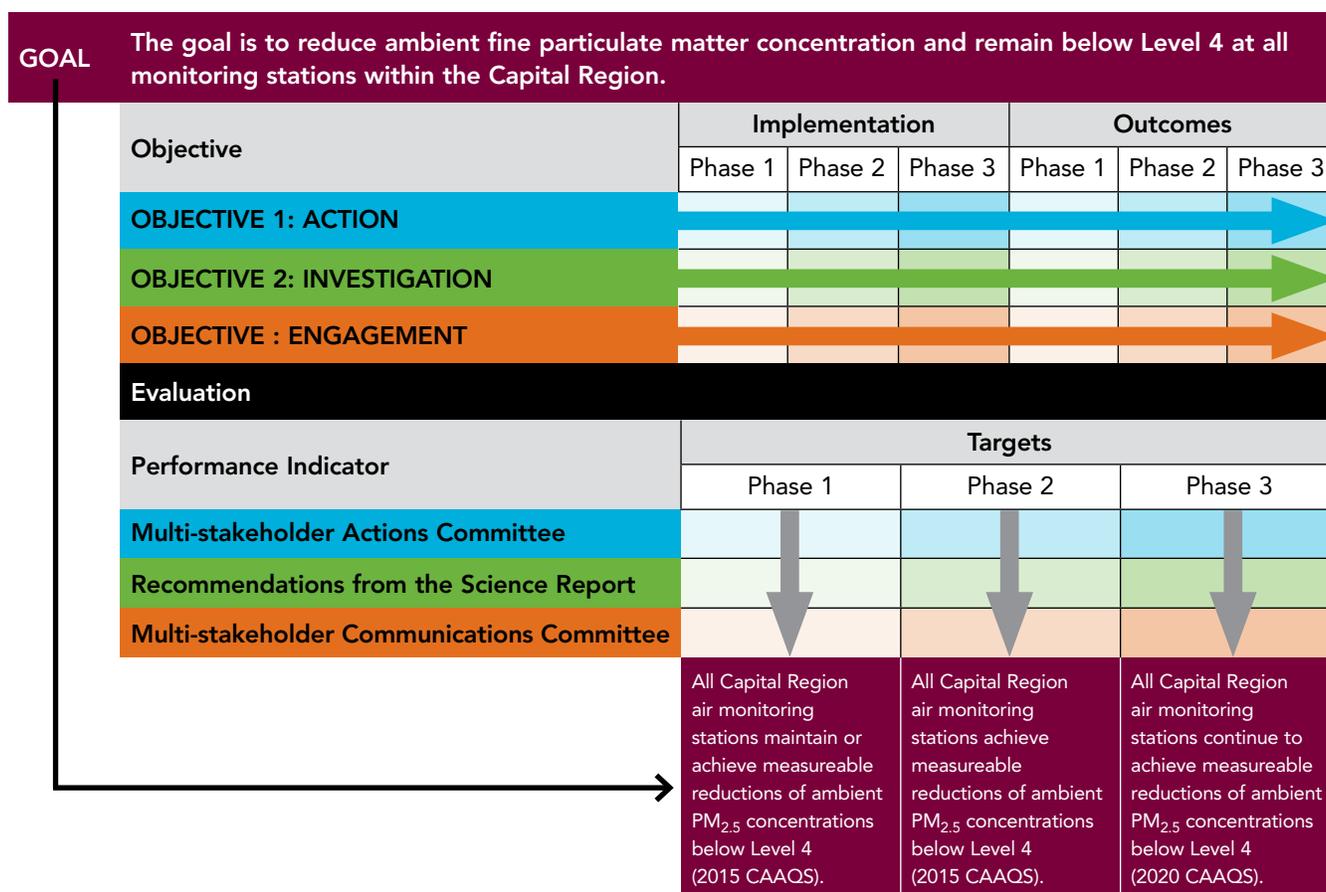
CAPITAL REGION FINE PARTICULATE MATTER SCIENCE REPORT

The Capital Region Fine Particulate Matter Response Technical Sub-committee was formed to increase stakeholder knowledge and understanding of fine particulate matter science in the Capital Region, provide feedback on technical initiatives, and communicate the science work to the Oversight Advisory Committee. Key deliverables for the Technical Sub-committee included the supplemental speciation monitoring programs, modelling study, and the Capital Region Fine Particulate Matter Science Report. The Response has incorporated recommendations on modelling, monitoring, and additional studies that the Technical Sub-committee made in its Science Report.

the response

This section brings together the scientific findings, source sectors, and consideration for action to describe the Response’s cumulative effects management approach. Figure 5 communicates the systems thinking that was applied to developing, and eventually will be used to evaluate, the Response.

Figure 5
The Capital Region Fine Particulate Matter Response Logic Model:
Understanding and Evaluating a Complex System



Achieving the goal of the Response which is to reduce and maintain ambient fine particulate matter below Level 4 at all monitoring stations within the Capital Region requires a proactive and future-focused approach. To achieve this, three main objectives were chosen to recognize the importance of educating (engagement), researching (investigating), and adapting to new information to make informed and timely decisions on management tools (action).

Phase 1 (2015–2017), Phase 2 (2017–2020), and Phase 3 (2020+) allow for an iterative implementation process for achieving outcomes. *Implementation* of the Response focuses on key activities under each objective to describe what needs to be accomplished to meet the outcomes. *Outcomes* describe the state or status of the Response in each phase.

Evaluation of the success of the Response relies on *performance indicators and targets* that set criteria for success and identify to what extent the criteria are fulfilled, respectively. If the targets for each of the objectives are met, the expectation is that the targets of the overall goal of the Response will also be met. Each component of the system is described in detail below.

GOAL

The goal is *to reduce ambient fine particulate matter concentration and remain below Level 4 at all monitoring stations within the Capital Region.*

OBJECTIVES

To achieve this goal, the three objectives identified by stakeholders recognize the importance of educating, researching, and adapting based on new information (Table 2). These three objectives are used to frame the tasks and deliverables in the implementation of the Response. To take immediate actions in the short-term, the initial focus will be on event days, while the longer term management actions will focus on year-round emissions.

Table 2
The Three Objectives of the Response

OBJECTIVE 1 – Action

Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient fine particulate matter concentrations.

OBJECTIVE 2 – Investigation

Continue to improve general and scientific knowledge of fine particulate matter in the Capital Region for strategic, effective, and efficient management of the issue.

OBJECTIVE 3 – Engagement

Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient fine particulate matter.

OUTCOMES

Cumulative effects management establishes outcomes for an area by balancing environmental, economic, and social considerations and implementing appropriate plans and tools to ensure those outcomes are met. For the Response, there is a phased approach to deliver the outcomes, which allows for an iterative response that acknowledges and responds to new information. In recognizing that impacts from implementing certain tasks and deliverables may take several years before being realized, the outcomes were developed to describe the state or status for each phase under each of the objectives. Table 3 shows the outcomes for each of the three objectives in the immediate (Phase 1), medium (Phase 2), and long-term (Phase 3). The objectives will be delivered when the outcomes are achieved. As each outcome is met, the Response moves closer to the goal.

Table 3

Outcomes for Each of the Three Objectives in Phase 1, Phase 2, and Phase 3

	Phase 1 Outcome (2015–2017)	Phase 2 Outcome (2017–2020)	Phase 3 Outcome (2020+)
GOAL →	The goal is to reduce ambient fine particulate matter concentration and remain below Level 4 at all monitoring stations within the Capital Region.		
	All Capital Region air monitoring stations maintain or achieve measureable reductions of ambient PM _{2.5} concentrations below Level 4 (2015 CAAQS)	All Capital Region air monitoring stations achieve measureable reductions of ambient PM _{2.5} concentrations below Level 4 (2015 CAAQS)	All Capital Region air monitoring stations continue to achieve measureable reductions of ambient PM _{2.5} and are below Level 4 (20120 CAAQS)
OBJECTIVE 1 ACTION →	Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.		
	GoA and stakeholders implement short-term committed actions. The action list is refined to remove, edit, identify, and implement new actions as needed, based on information from the tracking of implemented actions and ongoing investigative findings.	GoA and stakeholders implement medium-term committed actions. The action list is refined to remove, edit, identify, and implement new actions as needed, based on information from the tracking of implemented actions and ongoing investigative findings.	GoA and stakeholders implement long-term committed actions. The action list is refined to remove, edit, identify, and implement new actions as needed, based on information from the tracking of implemented actions and ongoing investigative findings.
OBJECTIVE 2 INVESTIGATION →	Continue to improve general and scientific knowledge of PM_{2.5} in the Capital Region for strategic, effective, and efficient management of the issue.		
	GoA and stakeholders increase knowledge of the factors and sources that contribute to the event days observed during the winter months in the Capital Region and issues related to year-round management of PM _{2.5} .	GoA and stakeholders continue to increase knowledge of the factors and sources that contribute to the event days observed during the winter months in the Capital Region and issues related to year-round management of PM _{2.5} .	GoA and stakeholders are knowledgeable of the factors and sources that contribute to the event days observed during the winter months in the Capital Region and issues related to year-round management of PM _{2.5} .
OBJECTIVE 3 ENGAGEMENT →	Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient PM_{2.5}.		
	The public and stakeholders are increasingly informed of their roles and implement actions to address event days during the winter months and throughout the year.	The public and stakeholders are increasingly informed of their roles and continue to implement actions to address event days during the winter months and throughout the year.	The public and stakeholders are well informed of their roles and have completed actions to address event days during the winter months and throughout the year.



IMPLEMENTATION PLAN

Implementation of the Response will occur in phases and includes a process to acknowledge and respond to new information as it becomes available. The three phases address the immediate (Phase 1), medium (Phase 2), and long-term (Phase 3) priorities and their associated tasks and deliverables (Figure 6 and Table 4). This iterative approach to implementation acknowledges the principle of continuous improvement required in each phase to ensure ambient levels of fine particulate matter are below and remain below the national standards.

Phase 1 (2015–2017)

The focus is on refining scientific knowledge of the issue, implementing short-term commitments; developing the process to track, monitor, identify, and implement additional management actions; developing and implementing a communications plan to inform the public and broader stakeholders about the issue.

Phase 2 (2017–2020)

One focus is on applying investigative findings. Another focus is on using the information gathered from the tracking and monitoring of the implemented actions to better inform management decisions and achievement of the medium-term commitments, including continued implementation of the communications plan.

Phase 3 (2020+)

The focus is on ongoing implementation and reporting of the Response. In addition, this phase will see to the completion of a five-year comprehensive review of the Response and Science Report.

Figure 6 illustrates the timeline for the phases, objectives (actions, investigation, and engagement) and associated priority tasks. Table 4 captures those same objectives and priority tasks in further detail. Phased implementation recognizes that some management actions can take years to implement or have results of those actions be realized.

Figure 6
Phase Implementation Timeline with Priority Tasks and Deliverables by Objective

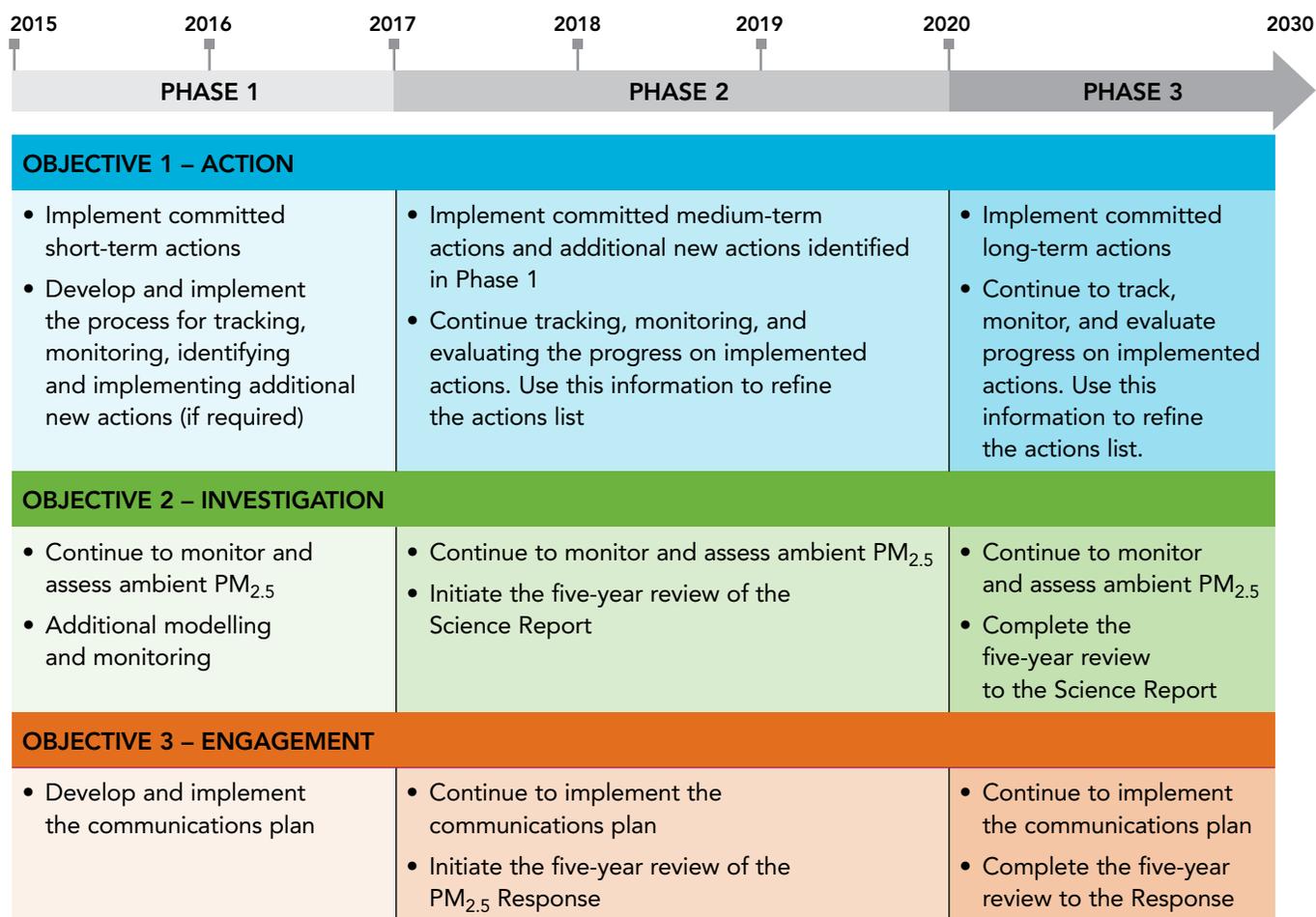


Table 4
Phased Implementation Table with Detailed Priority Tasks and Deliverables for Each Objective

	Phase 1 Outcome (2015–2017)	Phase 2 Outcome (2017–2020)	Phase 3 Outcome (2020+)
OBJECTIVE 1 ACTION	Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.		
Outcomes	GoA and stakeholders implement short-term committed actions. The action list is refined to remove, edit, identify and implement new actions based on information from the tracking of implemented actions and ongoing investigative findings.	GoA and stakeholders implement medium-term committed actions. The action list is refined to remove, edit, identify and implement new actions based on information from the tracking of implemented actions and ongoing investigative findings.	GoA and stakeholders implement long-term committed actions. The action list is refined to remove, edit, identify and implement new actions based on information from the tracking of implemented actions and ongoing investigative findings.
Tasks and Deliverables	ESRD convenes a multi-stakeholder actions committee to: <ul style="list-style-type: none"> • develop a process to track, monitor, evaluate, identify and implement new actions as needed; • re-prioritize and refine either by removing or editing existing actions, and by adding new actions. 	A multi-stakeholder actions committee: <ul style="list-style-type: none"> • tracks, monitors and evaluates progress on implemented actions; • re-prioritizes existing actions, and identifies and implements new actions as needed based on information gathered on the evaluation of implemented actions and investigative findings. 	A multi-stakeholder actions committee: <ul style="list-style-type: none"> • continues to track, monitor, and evaluate process on implemented actions; and • continues to re-prioritize existing actions, identifies and implements new actions as needed based on information gathered on the evaluation of implemented actions and investigative findings.

Table 4 (continued)

Phased Implementation Table with Detailed Priority Tasks and Deliverables for Each Objective

	Phase 1 Outcome (2015–2017)	Phase 2 Outcome (2017–2020)	Phase 3 Outcome (2020+)
OBJECTIVE 2 INVESTIGATION	Continue to improve general and scientific knowledge of PM_{2.5} in the Capital Region for strategic, effective, and efficient management of the issue.		
Outcomes	GoA and stakeholders increase knowledge of the factors and sources that contribute to the event days observed during the winter months in the Capital Region and issues related to year-round management of PM _{2.5} .	GoA and stakeholders continue to increase knowledge of the factors and sources that contribute to the event days observed during the winter months in the Capital Region and issues related to year-round management of PM _{2.5} .	GoA and stakeholders are knowledgeable of the factors and sources that contribute to the event days observed during the winter months in the Capital Region and issues related to year-round management of PM _{2.5} .
Tasks and Deliverables	Stakeholders implement short-term committed actions under Objective 2 and priority recommendations from the Science Report.	Stakeholders implement medium-term committed actions under Objective 2 and priority recommendations from the Science Report.	Stakeholders implement long-term committed actions under Objective 2 and priority recommendations from the Science Report.
	ESRD monitors and assesses fine particulate matter concentrations and assigns levels through annual assessments.	ESRD monitors and assesses fine particulate matter concentrations and assigns levels through annual assessments.	ESRD continues ongoing monitoring, evaluation, and reporting processes and adjustments as required.
	ESRD conducts a Phase 2 modelling study to refine the model, run scenarios, and analyze results.	The five-year review of the Science Report is initiated to gather new findings and identify additional investigative work as required.	The Science Report is updated through the five-year review to reflect new findings and identify and pursue additional investigative work as required.
	ESRD summarizes and reports findings from investigative studies.		

Table 4 (continued)

Phased Implementation Table with Detailed Priority Tasks and Deliverables for Each Objective

	Phase 1 Outcome (2015–2017)	Phase 2 Outcome (2017–2020)	Phase 3 Outcome (2020+)
OBJECTIVE 3 ENGAGEMENT	Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient PM_{2.5}.		
Outcomes	The public and stakeholders are increasingly informed of their roles, and implement actions to address event days during the winter months and throughout the year.	The public and stakeholders are increasingly informed of their roles, and continue to implement actions to address event days during the winter months and throughout the year.	The public and stakeholders are well informed of their roles, and have completed actions to address event days during the winter months and throughout the year.
Tasks and Deliverables	A multi-stakeholder communications committee develops a communications plan to identify target audiences, strategies, and examples of actions that can be implemented related to fine particulate matter management with a focus on event days in the short term.	A multi-stakeholder communications committee continues to deliver on key messages and engage the public and stakeholders on what they can do during winter event days and throughout the year to reduce fine particulate matter concentrations.	A multi-stakeholder communications committee continues to deliver on key messages and engage the public and stakeholders on what they can do during winter event days and throughout the year to reduce fine particulate matter concentrations.
	The multi-stakeholder committee identifies opportunities to share information with external audiences.	ESRD conducts public and broader stakeholder workshops to update on new potential actions as needed.	ESRD conducts public and broader stakeholder workshops to update on the progress and success of the Response in meeting its objectives and goals.
		ESRD updates the Capital Region Fine Particulate Matter Response through the five-year review.	ESRD updates the Capital Region Fine Particulate Matter Response through the five-year review.

EVALUATING THE RESPONSE

Effectiveness of the Response in reaching the goal to reduce fine particulate matter concentrations and remain below Level 4 at all monitoring stations within the Capital Region will be evaluated annually against the annual ambient assessments.

To evaluate success of the Response, performance indicators and targets have been identified for each phase and objective. The performance indicators set the criteria for success and the targets allow for evaluation of how well the criteria have been fulfilled in each phase. Table 5 (on the following page) shows the performance indicators with the associated targets. Evaluating the Response against these components will help Alberta Environment and Sustainable Resource Development and stakeholders adapt the Response as needed.



Table 5
Evaluation Table by Implementation Phase

	Phase 1 Performance Indicator Target (2015–2017)	Phase 2 Performance Indicator Target (2017–2020)	Phase 3 Performance Indicator Target (2020+)
GOAL →	The goal is to reduce ambient fine particulate matter concentration and remain below Level 4 at all monitoring stations within the Capital Region.		
OBJECTIVE 1 ACTION →	Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.		
Performance Indicator – Multi-stakeholder Actions Committee	A multi-stakeholder Actions Committee is convened to track the status of current and committed actions and identify, evaluate, and initiate new actions, if required.	A multi-stakeholder Actions Committee re-prioritizes the action list based on new findings and suggests additional actions, if required.	A multi-stakeholder Actions Committee is able to recommend the top three actions for each priority source sector.
OBJECTIVE 2 INVESTIGATION →	Continue to improve general and scientific knowledge of PM_{2.5} in the Capital Region for strategic, effective, and efficient management of the issue.		
Performance Indicator – Recommendations from the Technical Sub-committee as Documented in the Science Report	All recommendations are considered and either completed, have identifiable timeframes to be completed, or identified as not to be completed at this time.	Remaining and/or new recommendations are considered and either completed, have identifiable timeframes to be completed, or identified as not to be completed at this time.	All recommendations are completed or identified as not to be completed, with rationale.
OBJECTIVE 3 ENGAGEMENT →	Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient PM_{2.5}.		
Performance Indicator – Multi-stakeholder Communications Committee	The committee develops and implements a communications plan that identifies target audiences, strategies, and actions that the audiences can implement during event days and year round to help manage fine particulate matter.	Public and stakeholders implement recommendations as identified in the communications plan.	Public and stakeholders implement all recommendations in the communications plan and if they do not, then a rationale as to why not is provided.



REPORTING

Accountability and having collaborative and transparent administration are guiding principles of the Capital Region Air Quality Management Framework. Reporting on implementation of the Response will support these principles.

Annual Status Report

The implementation of the Response will be publicly reported through the Capital Region Air Quality Management Framework Annual Status Report. The Status Report will speak to the implementation of the Response and will:

- outline any trends in fine particulate matter levels in light of the most recent and past air quality annual assessments;
- indicate progress towards reducing below Level 4 (tasks and deliverables);
- highlight new findings from ongoing investigative work;
- update the actions and outline any other changes (status of action development and implementation);
- note any other action or factors, not part of the Response that also have an impact on the achievement of the goal of the Response (progress on other national and provincial initiatives); and
- provide feedback on the effectiveness of the Response (performance indicators and targets).

Five-Year Review

Starting in 2020, both the Science Report and Response will be comprehensively reviewed for the purposes of applying adaptive management, integrating new science, managing for new stresses on the environment, and continuing to align with provincial and national initiatives. The review will serve to update and incorporate new information as well as to assess the success of the Response in achieving the stated outcomes and goals.



references

- Alberta Environment. 1989. Alberta Air Monitoring Directive. Edmonton: Government of Alberta
 - _____. 2000. Industrial Release Limits Policy.
 - _____. 2007. Analyzing Exceedances of the Canada-wide Standard for Particulate Matter and Ozone and the CASA Framework Triggers.
 - _____. 2008. Alberta Acid Deposition Management Framework.
 - _____. 2008. Alberta's 2008 Climate Change Strategy.
 - _____. 2009. Air Management in Alberta.
 - _____. 2010. State of the Environment Reports.
 - _____. 2011. Alberta Ambient Air Quality Objectives.
- Alberta Environment and Alberta Energy. 1991. Clean Air Strategy for Alberta. Edmonton: Government of Alberta.
 - _____. 2012. Clearing the Air: Alberta's Renewed Clean Air Strategy Action Plan.
- Alberta Environment and Sustainable Resource Development. 2012. Particulate Matter and Ozone Management Fact Sheet (2008–2010). Edmonton: Government of Alberta.
 - _____. 2012. Technical Supporting Document for the Capital Regional Air Quality Management Framework.
 - _____. 2012. The Capital Region Air Quality Management Framework for Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂), Fine Particulate Matter (PM_{2.5}), and Ozone (O₃).
 - _____. 2013. 2011 Ambient Air Quality Assessment Summary Report.
 - _____. 2013. 2012 Ambient Air Quality Assessment Summary Report.
 - _____. 2013. Application and Use of the National Base-Level Industrial Emissions Requirements (BLIERS) Within the Alberta Regulatory and Policy System.
 - _____. 2013. Background—Ambient Air Quality Assessment Summary Reports.
 - _____. 2013. Fact Sheet about the Capital Region Air Quality Management Framework
 - _____. 2013. Particulate Matter and Ozone Management Fact Sheet (2009–2011).
 - _____. 2013. Technical Supporting Document for the Capital Region Air Quality Management.
 - _____. 2014. Capital Region Fine Particulate Matter Science Report
- Canadian Council of Ministers of the Environment. 2000. Canada-wide Standards for Particulate Matter and Ozone. Quebec City: Canadian Council of Ministers of the Environment.
 - _____. 2007. Guidance Document on Continuous Improvement (CI) and Keeping-Clean-Areas-Clean (KCAC).
 - _____. 2012. Guidance Document on Air Zone Management.
- Clean Air Strategic Alliance. 2003. An Emissions Management Framework for the Alberta Electricity Sector Report to Stakeholders. Edmonton: CASA.
 - _____. 2003. *CASA Particulate Matter and Ozone Management Framework*.
- Government of Alberta. 2014. *Environmental Protection and Enhancement Act*. Edmonton: Alberta Queen's Printer.
- Government of Canada. 1999. *Canadian Environmental Protection Act*. Ottawa: Department of Justice.
- United States Environmental Protection Agency (US EPA) website at www.epa.gov.

abbreviations and acronyms

ABBREVIATIONS AND ACRONYMS

- ACA – Alberta Capital Airshed
- ANO₃ – Ammonium Nitrate
- ASO₄ – Ammonium Sulphate
- BLIERS – Base-Level Industrial Emissions Requirements
- CAAQS – Canadian Ambient Air Quality Standards
- CASA – Clean Air Strategic Alliance
- CCME – Canadian Council of Ministers of the Environment
- CWS – *Canada-wide Standards*
- EPEA – *Environmental Protection and Enhancement Act*
- ESRD – Alberta Environment and Sustainable Resource Development
- FAP – Fort Air Partnership
- FEM – Federal Equivalent Method
- GoA – Government of Alberta
- HNO₃ – Nitric Acid
- NCIA – Northeast Capital Industrial Association
- NH₃ – Ammonia
- NO – Nitric Oxide
- NO₂ – Nitrogen Dioxide
- NO_x – Nitrogen Oxides
(NO_x is often used to indicate the family of nitrogen oxide compounds)
- O₃ – Ozone
- PM – Particulate Matter,
PM_{2.5} refers to Fine Particulate Matter (smaller than 2.5 microns)
- PPB – Parts per billion
- SO₂ – Sulphur Dioxide
- SO₄ – Sulphate
- µg/m³ – Micrograms per cubic metre
- US EPA – United States Environmental Protection Agency
- VOCs – Volatile Organic Compounds
- WCAS – West Central Airshed Society

Acid Deposition Management Framework

Sulphur dioxide (SO₂) and nitrogen oxides (NO_x) are the main acid forming pollutants. The Alberta Acid Deposition Management Framework (2008) is based on four levels of acid deposition. Each of the levels of deposition corresponds with specific management practices.

Action Level

An action level is one of four levels of the *Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework*, e.g. Baseline Monitoring and Data Gathering, Surveillance Actions, Management Plan or Mandatory Plan to Reduce Below the Canada-wide Standards (or Canadian Ambient Air Quality Standards starting in 2015).

Air Quality

The composition of air, with respect to quantities of pollutants therein, and/or a measure of the health-related and visual characteristics of the air; used most frequently in connection with standards against which the contribution of the particular pollutant source can be compared.

Air Quality Management System

The national *Air Quality Management System* (AQMS) is a comprehensive approach for reducing air pollution in Canada. It is the product of an unprecedented collaboration by the federal, provincial and territorial governments and stakeholders. The AQMS includes:

- Canadian Ambient Air Quality Standards (CAAQS) to set the bar for outdoor air quality management across the country;
- a framework for air zone management within provinces and territories that enables action tailored to specific sources of air emissions in a given area;
- regional airsheds that facilitate coordinated action where air pollution crosses a border;
- industrial emission requirements that set a base level of performance for major industries in Canada; and
- improved intergovernmental collaboration to reduce emissions from the transportation sector.

Air Quality Objective

A numerical concentration, value or narrative statement which is intended to provide protection of the environment and human health to the extent that is technically and economically feasible, and is socially and politically acceptable.

Airshed

An airshed is a geographic area that, because of emissions, topography, climate and meteorology, typically experiences similar air quality.



Ambient Air

Outside air; any portion of the atmosphere not confined by walls and a roof to which the general public has access.

Ambient Air Quality Limit

An ambient air quality limit of a substance in the ambient air is the maximum concentration that is deemed acceptable from a social, environmental and technical perspective. It is defined as the Canada-wide Standard which will be updated to the Canadian Ambient Air Quality Standards in 2015.

Ambient Air Quality Trigger

An ambient air quality trigger is a concentration set at a value lower than the ambient air quality limit. The ambient air quality triggers are intended to provide sufficient time to react to prevent reaching the ambient air quality limit.

Ammonia (NH₃)

A pungent colorless gaseous compound of nitrogen and hydrogen that is very soluble in water and can easily be condensed into a liquid by cooler temperature and pressure.

Approval

Under the *Environmental Protection and Enhancement Act (EPEA)*, “approval” means an approval issued in respect of an activity, and includes the renewal of an approval.

Base-Level Industrial Emissions Requirements (BLIERs)

BLIERs are one component for consideration when developing provincial source emission requirements and industrial approvals; but are not the sole consideration. Alberta, like all other jurisdictions, is entitled to set more stringent requirements especially where the BLIERs do not align with provincial policy. The BLIERs represent minimum national source-based standards.

Canadian Ambient Air Quality Standards

The Canadian Council of Ministers of the Environment is developing Canadian Ambient Air Quality Standards that will be established as objectives under the *Canadian Environmental Protection Act (1999)*, and will replace the existing Canada-wide Standards. These new standards will be developed for particulate matter and ozone first, and then for nitrogen oxides, sulphur dioxide, and volatile organic compounds. The standards will set triggers to promote proactive measures to keep clean areas clean and for continuous improvement.



Canada-wide Standards

Canada-wide Standards are inter-governmental agreements developed under the Canadian Council of Ministers of the Environment to address environmental protection and health risk issues. The standards represent a commitment to reducing the concentrations of substances such as fine particulate matter and ozone in ambient air.

Clean Air Strategic Alliance (CASA)

The Clean Air Strategic Alliance is multi-stakeholder partnership, composed of representatives selected by industry, government, and non-government organizations, which recommends strategies to assess and improve air quality in Alberta.

Continuous Monitoring

Continuous monitoring involves monitoring the quality of the ambient air on a continuous basis. This can provide the greatest resolution but may be costly due to capital and operating expenses. Data from continuous monitoring can be stored in different time blocks, such as one-hour averages or five-minute averages. Typically, fine particulate matter and gases such as ozone and sulphur dioxide are continuously monitored. Continuous monitoring can be carried out on a long-term or temporary basis.

Cumulative Effects

Cumulative effects are the combined effects of past, present and foreseeable human activities over time on the environment, economy and society in a particular place. The combination of activities can produce effects that are different in scale, nature or extent from the effects of individual activities alone.

Emissions Management Framework for the Alberta Electricity Sector

The Clean Air Strategic Alliance Emissions Management Framework (2003) for the Alberta Electricity Sector aims at continuous improvement of air emissions standards for electricity generation through seven key components: standards for new units, requirements for existing units, stakeholder review at five-year intervals, monitoring transparency and accountability, continuous improvement, renewable and alternative energy, and energy efficiency and conservation.

Fine Particulate Matter

Refers to airborne particles that are 2.5 microns or less in diameter.



Fine Particulate Matter Event

“Event days” are those days where the 24-hour average fine particulate matter concentration is equal to or greater than 20 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$); this is equivalent to exceeding the Planning Trigger into Level 3. The 24-hour concentration is calculated from midnight to midnight. The fine particulate matter concentration of 20 micrograms per cubic meter was adopted from the Management Plan Action Level in the Clean Air Strategic Alliance Particulate Matter and Ozone Framework.

Industrial Release Limits Policy

The intent of this policy is to provide a clear process for developing industrial release limits that ensures the appropriate level of pollution prevention and control technologies are adopted and that the environment is adequately protected. This involves determining the achievable release limits based on the capability of the most effective demonstrated pollution prevention and control technologies.

Inversions

Also called a thermal inversion, temperature inversions occur when the normal decrease in air temperature with increasing altitude is reversed and air above the ground is warmer than the air below it. With temperature inversions, cold air sinks to the ground level and stays there because it is denser than warm air. The conditions become stagnant and pollutants are trapped at ground level.

Iterative

The process of revising and improving with the aim of approaching a desired goal with each revision.

Nitrogen Dioxide (NO_2)

Toxic pungent reddish-brown gas formed by the reaction of atmospheric ozone with the nitric oxide produced from combustion.

Nitrogen Oxides (NO_x)

A general term pertaining to compounds of nitrogen monoxide (NO) and nitrogen dioxide (NO_2). Nitrogen oxides are typically created during combustion processes, and are major contributors to smog formation and acid deposition.

Non-point Source

Non-point source is a pollution source that is not recognized to be have a single point of origin. It is often characterized by the release of pollutants from many different and diffuse sources (aggregated sources of emissions). This aggregation is done because the emission sources are either too small and numerous, too geographically dispersed, or too geographically large to be estimated or represented by a single point.

Ozone (O₃)

Refers to an oxygen compound (O₃) occurring in the form of a gas in the atmosphere at ground-level.

Passive Monitoring

Passive monitoring involves exposing a reactive surface to the air, which results in transfer of the pollutant by diffusion from the air to the monitor surface. The exposed surfaces are analyzed to determine the pollutant concentration. The sampling rate for some passive monitors is adjusted based on wind speed, temperature and humidity.

Point Source

A point source is a stationary location or fixed facility from which substances are discharged.

Primary Pollutant

A primary pollutant is one that is emitted into the atmosphere directly from the source of the pollutant and retains the same chemical form.

Regional Monitoring

Regional stations are strategically located to represent areas with multiple emission sources.

Regional Plans/Planning

In the context of the *Land-use Framework*, the Government of Alberta has created seven land-use regions and is developing land-use plans for each region. The regional plans integrate provincial policies at the regional level, set out regional land-use objectives, provide the context for land-use decision making within the region, and reflect the uniqueness of the landscape and priorities of each region. Municipalities and provincial government departments will be required to comply with regional plans in their decision making.

Secondary Pollutant

A secondary pollutant is one that is formed by atmospheric reactions of precursor of primary emissions. Secondary pollutants undergo a chemical change once they reach the atmosphere. An example of a secondary pollutant is ozone created from organic vapours given off at a gasoline station. The organic vapours react with sunlight in the atmosphere to produce the ozone, the primary component of smog. Control of secondary pollutants is generally more problematic than that of primary pollutants, because mitigation of secondary pollutants requires the identification of the precursor compounds and their sources as well as an understanding of the specific chemical reactions that result in the formation of the secondary pollutants.



Source Apportionment

This is a process of taking measurements and tracking down the sources of a substance through receptor modelling, which helps in identifying the sources and the extent of their contribution to the substance.

Source (of Emissions)

There are many sources of emissions, but these have generally been grouped into two categories: emissions from point and non-point sources. A **point source** is a stationary location or fixed facility from which substances are discharged; e.g., a smokestack. A **non-point source** is a pollution source that is not recognized to have a single point of origin. Common non-point emission sources are agriculture, forestry, urban, mining, construction, and city streets.

Sulphur Dioxide (SO₂)

A strong smelling, colourless gas that is formed by the combustion of fossil fuels containing sulphur. Sour gas processing plants, oil sands processing plants and coal-fired power generating plants are major sources of sulphur dioxide.

Transboundary

Transboundary refers to the long range movement of emissions and pollutants across political or predetermined spatial borders. Transboundary pollution refers to substances that originate in one jurisdiction, but have adverse effects in another area/jurisdiction at such a distance that it is not generally possible to distinguish the contribution of individual emission sources or groups of sources.

Volatile Organic Compounds (VOCs)

VOCs are carbon-containing compounds that evaporate into the air at room temperature. VOCs contribute to the formation of smog and/or may be toxic. Common sources include gasoline, alcohol, and the solvents used in paints.



appendix a – air quality management in alberta

Air quality management in Alberta has evolved over time to adapt to changing needs and improved knowledge and can be traced back to 1945 when a section of Alberta's Public Health Act was amended to follow the evaluation of air quality complaints. Alberta's Department of Health was responsible for programs to assess and control air pollution in Alberta until 1971, when Canada's first environment department, the Alberta Department of Environment was created. Soon after, Alberta's *Clean Air Act* was passed, which allowed the environment minister to make a range of regulations related to ambient air quality standards, emission standards, and monitoring methods. In 1992, the *Clean Air Act* was replaced with the Environmental Protection and Enhancement Act.

Air quality has traditionally been managed for industrial facilities, specific populations, and ecologically sensitive areas through environmental assessments, regulatory approvals, code of practices, and enforcement. Other management approaches for point sources include ambient air quality objectives, source performance standards, plume dispersion modelling, ambient air and source emission monitoring, environmental reporting, emission inventories, compliance education and prevention programs, and research. Point sources are defined as a stationary location or fixed facility from which substances are discharged.

By 2007, with increased population and industrial growth, the Government of Alberta recognized that management of air quality must not only be approached on a project-by-project basis but must also consider a cumulative effects management approach at a regional scale. Comprehensive regional air management was phased in to meet the evolving needs to inform and address stakeholder's concerns on local issues, such as public health, impact of new facilities, and regional development. Today, cumulative effects management continues to establish outcomes for an area by balancing environmental, economic, and social considerations and implementing appropriate plans and tools to ensure those outcomes are met.

This approach also recognizes the need to develop strategies to manage non-point sources as well as the point sources noted above. For example, all applications for new and existing facilities are currently evaluated to determine if the Capital Region Air Quality Management Framework and associated management response objectives are met. Non-point sources are those sources too diverse or widespread to regulate through the traditional approval method. Jurisdictional issues and the number of sources also add to the complexity of regulating and management of non-point sources. The initiatives outline below highlight the national and provincial commitments to managing air quality in Alberta, which are relevant to the Capital Region.

CANADA'S AIR QUALITY MANAGEMENT SYSTEM

The national Air Quality Management System is a comprehensive approach for improving air quality in Canada and is the product of unprecedented collaboration by the federal, provincial, and territorial governments and stakeholders. The system will be incorporated as part of Alberta's existing air quality management system. Implementation began in 2013 and includes the following.

- 
- Canadian Ambient Air Quality Standards (CAAQS) will replace the current Canada-wide Standards in 2015 and set the bar for ambient air quality management across the country.
 - A framework for air zone management within the provinces and territories that enables action tailored to specific sources of air emissions in a given area.
 - Regional airsheds that facilitate coordinated action where air pollution crosses a border.
 - Industrial emission requirements that set a base level of performance for major industries in Canada.
 - Improved intergovernmental collaboration to reduce emissions from the transportation sector.

ALBERTA'S CLEAN AIR STRATEGY

In the 1980s and early 1990s, national and provincial discussion on the impact of fossil fuels on climate change, acid deposition, and smog were of particular significance for Alberta as an energy-producing province. In response, the 1991 Clean Air Strategy was developed to foster collaboration and stewardship and improves environmental performance through emission reductions, technological advancements, and enhanced knowledge. It also gave rise to the Clean Air Strategic Alliance and airshed zone organizations that currently monitor and report on air quality in Alberta. In 2012, the Renewed Clearing the Air, Alberta's Clean Air Strategy was released and reflected the changing needs and issues in air quality management in Alberta. The strategy is guided by an Action Plan which outlines short, medium, and long-term actions over the next 10 years that will enhance Alberta's existing air quality management system. The strategy also underlines the need to address both point and non-point sources.

NORTH SASKATCHEWAN REGIONAL PLAN AIR QUALITY MANAGEMENT FRAMEWORK

The North Saskatchewan Regional Plan is currently in development under the Land-use Framework. Under the regional plan, there will be an Air Quality Management Framework that sets thresholds for select indicators to support the environmental outcomes for the North Saskatchewan Region. The North Saskatchewan Region Air Quality Management Framework will incorporate the Capital Region Air Quality Management Framework and align with Canada's Air Quality Management System.

CAPITAL REGION AIR QUALITY MANAGEMENT FRAMEWORK

Released in June 2012, the Capital Region Air Quality Management Framework was developed by Alberta Environment and Sustainable Resource Development and stakeholders as a tool for adaptive management that allows decision-makers to learn from experience and new information, and adapt to changing social, environmental, and economic expectations and demands.



appendix b – particulate matter management

THE CANADA-WIDE STANDARD AND CANADIAN AMBIENT AIR QUALITY STANDARDS (CAAQS) FOR FINE PARTICULATE MATTER

In June 2000, the Canada-wide Standard for fine particulate matter was established by the Canadian Council of Ministers of Environment (CCME). This standard represented the long-term goal of minimizing the risk of fine particulate matter on human health and the environment while balancing the costs of reducing emissions that contribute to fine particulate matter in the ambient air.

- The Canada-wide Standard 24-hour average for fine particulate matter is $30\mu\text{g}/\text{m}^3$. Achievement is set to be based on the annual 98th percentile ambient measurement, which is averaged over three consecutive years.
- The Canadian Ambient Air Quality Standards (CAAQS) will come into effect in 2015 to set new standards for ambient air quality management across Canada, replacing the Canada-wide Standard for fine particulate matter. The new standards for a 24-hour average are $28\mu\text{g}/\text{m}^3$ in 2015 and $27\mu\text{g}/\text{m}^3$ in 2020.

CLEAN AIR STRATEGIC ALLIANCE (CASA) PARTICULATE MATTER AND OZONE MANAGEMENT FRAMEWORK

The Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework is Alberta's commitment to achieving the Canada-wide Standard levels, and it sets out four action levels representing a continuum of management activities based on measured ambient concentrations of these substances in the province. The intent of the CASA Framework was to facilitate a multi-stakeholder responsibility for air quality management. When the Canada-wide Standards for fine particulate matter or ozone are exceeded, Alberta Environment and Sustainable Resource Development in collaboration with stakeholders must develop a mandatory response within two years to identify measures that will reduce ambient concentrations to below the numeric Canada-wide Standard.

TRIGGERS, LIMITS, AND LEVELS FROM THE CAPITAL REGION AIR QUALITY MANAGEMENT FRAMEWORK

The Capital Region Air Quality Management Framework adopted the triggers, limits, and associated management approaches described in the Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework as shown in Table 6. The trigger into Level 4 is set by the Canada-wide Standard for fine particulate matter. The triggers will be updated in 2015 and 2020 to align with the new Canadian Ambient Air Quality Standards.

Table 6
Comparison of Levels and Triggers in the Capital Region and Clean Air Strategic Alliance Management Frameworks for Fine Particulate Matter

	Clean Air Strategic Alliance Particulate Matter and Ozone Management Framework	Capital Region Air Quality Management Framework
	Baseline Monitoring and Data Gathering	Level 1
Surveillance Trigger	15 µg/m ³	15 µg/m ³
	Surveillance Actions	Level 2
Planning Trigger	20 µg/m ³	20 µg/m ³
	Management Plan	Level 3
Exceedance Trigger	30 µg/m ³	30 µg/m ³
	Mandatory plan to reduce below Canada-wide Standards	Level 4

Level Assignment and Management Actions

Management actions associated with lower levels provide time to address ambient concentrations to avoid exceeding the annual air quality limits for fine particulate matter. Each level is prescribed by successively more stringent management actions, such as compliance tools and timelines. The intent is that appropriate actions are taken to avoid an exceedance into Level 4.

ALBERTA AMBIENT AIR QUALITY OBJECTIVES FOR FINE PARTICULATE MATTER

Alberta ambient air quality objectives are issued by Alberta Environment and Sustainable Resource Development. The objectives are used to report on the state of Alberta’s atmospheric environment, inform Albertans on air quality through an air quality index, establish approval conditions for regulated industrial facilities evaluate proposals for constructing facilities, guide special ambient air quality surveys, and assess compliance near major industrial air emission sources.

- The 24-hour average concentration standard is 30µg/m³ — adopted from the Canada-wide Standard.
- The 1-hour average concentration standard is 80µg/m³ — to be used for monitoring and reporting of the Ambient Air Quality Index.



EMISSIONS MANAGEMENT FRAMEWORK FOR THE ALBERTA ELECTRICITY SECTOR

The Emissions Management Framework was developed through a collaborative, multi-stakeholder process to improve air emissions standards for the electricity sector. Through an emission trading program, mercury controls, standards, and approval clauses, the framework has reduced nitrogen oxides, and sulphur dioxide emissions by 54,352 tonnes and 33,583 tonnes respectively between January 1, 2006 and December 31, 2011. Proposed reductions in the framework are:

- mercury: 70 – 80 per cent by 2013 based on the Mercury Emissions from Coal-fired Power Plants Regulations (Alberta Regulation 34/2006);
- sulphur dioxide: 46 per cent (by 2025);
- nitrogen dioxide: 32 per cent (by 2025); and
- fine particulate matter: 51 per cent (by 2025).

INDUSTRIAL RELEASE LIMITS POLICY

The intent of this policy is to provide a clear process for developing industrial release limits to ensure that ambient air quality is maintained within ambient air quality objectives. This involves determining the achievable release limits based on the capability of the most effective demonstrated pollution prevention and control technologies.

BASE-LEVEL INDUSTRIAL EMISSIONS REQUIREMENTS (BLIERS) WITHIN THE ALBERTA REGULATORY AND POLICY SYSTEM

The BLIERS represent minimum national source-based standards. Alberta, like all other jurisdictions, is entitled to set more stringent requirements, especially where BLIERS do not align with provincial policy. Examples of such cases are provided below. BLIERS are focused on nitrogen oxides, sulphur dioxide, volatile organic compounds, and the particulate matter.

- **Case I: BLIERS are more stringent than existing provincial standards**
If the industrial site(s) meet the BLIERS, no further action is required by industry; but, the Government of Alberta may review and update the existing provincial requirements, as needed. If an industrial site does not meet the BLIERS; then, actions must be taken to ensure compliance with the BLIERS.
- **Case II: BLIERS are equivalent to existing provincial standards**
All industrial sites are deemed to automatically meet the BLIERS if they are conforming to existing provincial standards equivalent to the BLIERS. No further action is required because the industrial site is already mandated to meet both the national and provincial requirements.
- **Case III: BLIERS are less stringent than existing provincial standards**
Where an industrial site is exceeding the BLIERS, but failing to meet provincial requirements, then industry must be brought into compliance with the provincial requirements.



CLEAN AIR STRATEGIC ALLIANCE NON-POINT SOURCE (ANTICIPATED)

A project charter has been approved in principle by the CASA Board, to address non-point source air emissions contributing to ambient fine particulate matter and ozone standard non-achievement (exceedances) in Alberta. The scope of the work will be limited to non-point sources of fine particulate matter, ozone, and precursors (sulphur oxides, nitrogen oxides, volatile organic compounds, and ammonia). The charter identifies four objectives.

- **Objective 1**
Compile and review information and agree on a common understanding of non-point sources in Alberta.
- **Objective 2**
Identify non-point sources of air emissions in Alberta, where opportunities to use the Clean Air Strategic Alliance's multi-stakeholder approach could add the most value.
- **Objective 3**
Identify and recommend management actions, which could include recommending policy change, to address the highest value non-point source air emissions opportunities in Alberta.
- **Objective 4**
Develop and implement a strategy and action plan for communicating the work of the Clean Air Strategic Alliance's Project Team, and engaging stakeholders and the public.

appendix c – source sectors and rationale

Sector	Rationale
Agriculture	The agriculture sector includes precursors and particulate emissions sources such as ammonia, wind-blown soil erosion, manure waste management systems, burning of agricultural residues, and fuel combustion for water pumping and space heating. Although agriculture has an overall impact on the total loading of fine particulate matter, it is currently unclear as to whether it is contributing to the secondary fine particulate matter formation observed in the Capital Region. Additional research and studies are required to confirm its contribution.
Commercial/ Institutional	The commercial and institutional sector includes non-manufacturing business establishments, government, schools, hospitals, and public organizations. This sector is important as it is a potential non-point source currently not managed through regulation, approvals, or codes of practice.
Energy	The energy sector includes electricity generation and primary energy production. All industrial activities related to the production and upstream distribution of crude oil, bitumen, coal, and natural gas are covered in this sector. These activities can produce nitrogen oxides and sulphur dioxide emissions which contribute to smog, acid rain, and the formation of fine particulate matter.
Industrial	The industrial sector includes all activities related to the processing and assembling of raw materials. Precursor emissions from industrial activities such as petroleum refining, chemical production, metal manufacturing, oil and gas extraction, and natural gas use and processing may react in the atmosphere to form secondary fine particulate matter.
Residential	The residential sector includes all activities and equipment related to residential buildings including: space heating, water heating, air conditioning, and lighting, refrigeration, cooking, and running a variety of other appliances. This sector is important as it is a potential non-point source currently not managed through regulation, approvals, or codes of practice.
Small Businesses and Operations	Some aspect of the upstream oil and gas industries do not require an approval or registration under a code of practice. These types of facilities are the smaller, more common types such as well sites, batteries, compressor stations, and activities such as drilling and completions. Any such activity must conform to ambient air quality objectives. This sector is important as it is a potential non-point source currently not managed through regulations, approvals, or codes of practice.
Transportation	The transportation sector includes all activities that relate to on-road and off-road vehicles. Certain transportation types including aircraft and marine vessels have not been considered as these modes are unlikely to be managed at an airshed level in Alberta. Precursor emissions in on-road and off-road vehicle exhaust may react in the atmosphere to form secondary fine particulate matter. Primary fine particulate matter is emitted through construction operations and unpaved roads. In addition to including policies that impact transportation, infrastructure and land-use play a key role in shaping travel patterns, which are linked to traffic congestion, greenhouse emissions, air pollution, and fuel consumption.

appendix d – jurisdictional scan (summer 2013)

PUBLIC EDUCATION AND EDUCATION TO ENHANCE SCIENTIFIC KNOWLEDGE

Education and Awareness

1

Action:

Reduce Emission with Proper Vehicle Maintenance

Lead:

Canadian Council of Ministers of the Environment—Mobile Sources Working Group

Description:

Explore partnership opportunities with key stakeholders to leverage education, training, and materials pertaining to proper vehicle maintenance to heavy duty vehicle owners/operators, dealers, and service providers

Implementation Status:

Within three years (2013–2014 to 2016–2017)

Measureable Outcomes:

Reduce air pollutants and greenhouse gas emissions from mobile sources through information sharing and collaboration on different initiatives.

2

Action:

Clean Air Strategy—Increase public knowledge related to air quality and its management

Lead:

Alberta Environment and Sustainable Resource Development

Description:

The department's Air Quality Health Index (AQHI) website has:

- been updated to include information on air quality and health effects;
- information that was added to the Alberta Health Services website;
- campaigns that target health professionals (nurses, doctors, pharmacists, and health inspectors);
- a Public Information Campaign with a focus on at-risk populations;
- teamed up with the City of Edmonton to promote AQHI signage on roads, highways, and in communities;
- outreach events and ESRD's One Simple Act Program that provide Albertans with information about what actions can be taken to positively affect air quality; and
- conducted a survey to assess the level of public awareness and will track this awareness over time.

Implementation Status:

In progress; two to five years (short to medium term)

Measureable Outcomes:

Increased public awareness about the connection between air quality and health

3 Action:
Heat Alert and Response System (HARS)

Lead:
Windsor, Ontario

Description:
Provide residents of Windsor with a:

- way to identify when a heat wave is likely to happen and if it presents a health risk;
- response plan of activities that will help reduce the negative health impacts of extreme heat; and
- public education program to help people make good decisions when there is an extreme heat event.

Implementation Status:
In development.

Measureable Outcomes:
Reduce the number of premature deaths, hospital admissions, and emergency visits.

4 Action:
Study—linking poor air quality to financial and health costs

Lead:
The Ontario Medical Association

Description:
The association developed detailed estimates of the costs incurred during a single year (2005). It estimated that in Essex County (including Windsor), there were 260 premature deaths, 900 hospital admissions, and 2,750 emergency visits associated with poor air quality in 2005. The results of their study also project increases in these numbers to the year 2026. A background report is available that explains the methodology used for the study.

Implementation Status:
Completed—June 2005.

Measureable Outcomes:
Improve scientific understanding of smog's (ozone and fine particulate matter) health effects.

5 Action:
Awareness Campaign for Anti-Idling

Lead:
Greater Toronto Area (GTA)—City of Mississauga, Ontario

Description:
The City of Mississauga participated in the GTA-wide Anti-Idling Campaign in 2003 with anti-idling interventions conducted at Mississauga schools.

Implementation Status:
2003 and ongoing

Measureable Outcomes:
The city won the 2003 Silver Canadian Environment Award for this pilot project and continues to promote the campaign throughout Mississauga.

6 Action:
Smog Alert Response Plan

Lead:
City of Mississauga, Ontario

Description:
Reactive response to smog advisory days.

Implementation Status:
Since 1998.

Measureable Outcomes:
Major activities suspended during smog advisory days are the use of gasoline or diesel-powered equipment (lawnmowers, leaf blowers (after 11:30 am); pesticide spraying (less than 1 per cent of publicly owned lands are sprayed); the use of oil-based paints, solvents, and cleaners; incinerators (animal services); street sweeping and road painting (postponed until night operation); vehicle engine idling, refuelling of essential vehicles; and live fire training.

7 Action:
20/20 The Way to Clean Air

Lead:
Greater Toronto Area, Ontario

Description:
The goal is to reduce GTA energy consumption by 20 per cent at home and on the road. The 20/20 campaign provides step-by-step tips to reduce home energy and vehicle use by taking actions that save energy without sacrificing comfort or convenience.

Implementation Status:
Ongoing

Measureable Outcomes:
Reductions in these pollutants will improve local air quality and lessen the impact of smog and climate change on the environment and health.

8 Action:
Smog Eating Concrete

Lead:
Eindhoven University of Technology—Netherlands

Description:
Reduce NO_x up to 45 per cent in ideal weather conditions. The concrete is sprayed with a chemical—titanium oxide—that neutralizes air pollutants. Titanium dioxide pavement is more expensive.

Implementation Status:
Research and piloted into a city block in Hengelo, Netherlands.

Measureable Outcomes:
Can reduce NO_x up to 45 per cent.

Memoranda of Understanding

1 Action:
Alberta-Saskatchewan Memorandum Agreement on Data Sharing and Monitoring Cooperation

Lead:
Alberta Environment and Sustainable Resource Development

Description:
Work plan

Implementation Status:
~ four years (medium term)

Measureable Outcomes:
N/A

2 Action:
Printing and Graphics—Pollution Prevention Project

Lead:
Quebecor Printing Canada, Shorewood Packagers, Printing and Graphics Association, Environment Canada, and the Ontario Ministry of Environment

Description:
Memorandum of Understanding to undertake a Pollution Prevention Project which:

- promotes pollution prevention practices and environmental management systems among all printing and graphic companies;
- continues to develop and promote education and training tools for pollution prevention;
- actively pursues volatile organic compound emission inventories and reduction initiatives; and
- looks for opportunities for including energy conservation as part of environmental management plans.

Implementation Status:
Ongoing

Measureable Outcomes:
Total reductions of volatile organic compounds achieved through this initiative are approximately 400 tonnes per year.

Additional Regional Monitoring Option

1 Action:
Clean Air Strategy—Develop comprehensive ambient air monitoring programs

Lead:
Alberta Environment and Sustainable Resource Development

Description:

- Air Monitoring Directive Revision—Section 2 Ambient Air Monitoring Planning
- Air Monitoring Directive Revision—Section 3 Ambient Air Monitoring Site Selection
- Air Monitoring Directive Revision—Section 4 Ambient Monitoring Requirements
- Air Monitoring Directive Revision—Section 5 Quality System Requirements
- Air Monitoring Directive Revision—Section 7 Calibration Requirements
- Air Monitoring Directive Revision—Section 8 Audit Requirements
- Air Monitoring Directive Revision—Section 10 Mobile Monitoring Requirements
- Air Monitoring Directive Revision—Section 11 Emergency Requirements

Implementation Status:
One to two years (short term)

Measureable Outcomes:

- Standardized reporting practices (i.e. reporting method, reporting frequency, etc.) as outlined in the updated Air Monitoring Directive will increase information sharing and transparency assisting Alberta Environment and Sustainable Resource Development to more effectively assess emitters for continuous emissions performance improvements.

2 Action: Monitor Air Quality

Lead:

Alberta Environment and Sustainable Resource Development

Description:

ESRD has three monitoring stations within the Edmonton Area in addition to those operated by local airshed groups—West Central Airshed Society (WCAS), Alberta Capital Airshed Association, Fort Air Partnership (FAP), Lakeland Industry and Partnership Association, and Parkland Airshed Management Zone

ESRD conducted a Monitoring Network Assessment for the Capital Region and these are the recommendations for improvement:

- a. add a north-south monitoring axis to the region: Leduc, St. Albert, and Morinville/Bon Accord/Gibbons;
- b. add a monitor in the Spruce Grove/Stony Plain area;
- c. reduce redundant monitoring in sparsely populated areas and around facilities that are in long-term compliance;
- d. replace old TEOM monitors with consistent and comparable fine particulate matter monitoring technologies that do not lose volatile components;
- e. share monitoring resources across airshed boundaries to better capture spatial gradients, pollution transport, and population exposure; and
- f. consider moving monitors. Monitors are often sited too closely (within six km) to neighbouring sites. This leaves some areas over-characterized at the expense of large areas/populations with no monitoring (e.g., southeast Edmonton).

Measureable Outcomes:

A comprehensive monitoring network that accurately represents the state of ambient air quality in the region.

Monitoring Networks (Continuous and Passive)

1 Action:
Clean Air Strategy—Encourage continuous improvement in emissions reduction technology

Lead:
Alberta Environment and Sustainable Resource Development

Description:

- Air Monitoring Directive Revision—Section 2 Ambient Monitoring Planning
- Air Monitoring Directive Revision—Section 4 Ambient Monitoring Requirement

Implementation Status:
One to two years (short term)

Measureable Outcomes:

- Continuous improvement. The focus will shift from meeting standards to reducing emissions from all sources. Under this principle, all emitting sources must strive to improve their emissions performance.
- Policy efficiency. The decision-making authority will ensure that regulations and policies are aligned with environmental legislation and are efficiently satisfying multiple policy objectives.

ACHIEVE MEANINGFUL/MEASUREABLE REDUCTIONS

Municipal Programs, Planning, and Policies

- 1 Action:**
Transit-Oriented Development
Lead:
Alberta Transportation, Alberta Environment and Sustainable Resource Development, and Municipalities
Description:
 - work with municipalities to commit to developing residential areas near transit hubs;
 - leverage Alberta Transportation funding and grants; and
 - provide incentives to companies to invest in transit-oriented and energy efficient technology or design.**Implementation Status:**
N/A
Measureable Outcomes:
Aim at encouraging people to use transit for commuting to work as well as for non-work related activities.

- 2 Action:**
Bethel Transit Terminal
Lead:
Strathcona County, Alberta
Description:
The Alberta Government awarded Strathcona County \$13.6 million to use towards a new off-street transit terminal and expanded parking. The new development will be located at the current site of Strathcona Station and Park and Ride on Bethel Drive. The new transit terminal will be an integrated terminal and park and ride lot that will eventually anchor inter-municipal transit service between Strathcona County and Edmonton. The development will include over 1,200 parking stalls, an improved kiss and ride area, 20 off-street bus bays to facilitate transfers between local and inter-municipal routes, and an enclosed passenger platform, along with improve pedestrian and bicycle access.
Implementation Status:
Open in late 2013.
Measureable Outcomes:
Reduction of cars on the road

3 Action:
Emerald Hills Urban Village

Lead:
Strathcona County, Alberta

Description:
Emerald Hills Urban Village (EHUV) is a 20-hectare diverse neighbourhood development within Sherwood Park. EHUV was chosen as the first project to apply the SuN LIVING approach, which provides the methodology for implementing sustainability and sustainable living concepts. The project will use technology to reduce energy and resources while the design focuses on the natural environment to enhance well-being. The development will incorporate a variety of development types, such as:

- independent living townhomes and side-by-side duplexes;
- multi-family condominium apartments;
- seniors' apartment housing,
- residential over commercial development;
- a long-term care facility; and
- commercial and retail spaces.

Implementation Status:
Open

Measureable Outcomes:
Application of sustainability and sustainable living concepts

4 Action:
Roots for Trees

Lead:
City of Edmonton, Alberta

Description:
Increase Edmonton's tree canopy by 20 per cent

Implementation Status:
Ongoing

Measureable Outcomes:
Between April to October, fine particulate matter was trapped using the trees planted throughout the city. Primary fine particulate matter was maintained but did the city did not see an increase or reduction in secondary fine particulate matter.

5 Action:
LED Street Lighting Pilot Project

Lead:
City of Edmonton, Alberta

Description:
The City of Edmonton initiated pilot projects to test and temporarily install energy efficient fixtures at locations across the city.

Implementation Status:
Replacement of the existing high pressure sodium street lights with LED street lights began in residential areas in 2011. Replacement will be done in conjunction with the neighbourhood rehabilitation program and the neighbourhood LED retrofit programs.

- Neighbourhood Rehabilitation Programs:
These are complete reconstructions of neighbourhoods. The entire street light system is replaced. This includes bases and underground cabling.
- Neighbourhood LED Retrofit Program:
This program selects neighbourhoods that are in the middle of their lifespan.

Measureable Outcomes:
Power consumption reductions between 40 and 60 per cent

6 Action:
Metro Line (NAIT to North Edmonton City Limits) LRT Expansion

Lead:
City of Edmonton, Alberta

Description:
The Northwest LRT will travel from NAIT northwest to a future park and ride site planned at the northwest city limits. The LRT service areas will include Grand Trunk, Castledowns, and Griesbach. It will also provide the opportunity for a future connection to the City of St. Albert. Building the Northwest LRT is part of the Transportation Master Plan's vision to expand LRT services to all sectors of Edmonton by 2040.

Implementation Status:
On May 8, 2013, Edmonton City Council approved the Northwest LRT Concept Plan. Currently no budget has been allocated to this project to continue the Northwest LRT to the next stages of preliminary engineering, design, and construction. The City of Edmonton's priorities are to complete the LRT lines to NAIT, the southwest, and east.

Measureable Outcomes:
Create compact neighbourhoods with a mixture of residential, employment, recreational, and business opportunities within convenient walking distance of transit.

7 Action:
Increase population density to mitigate the cost, energy, and resources required to build and maintain public infrastructure

Lead:
Windsor, Ontario

Description:
The City of Windsor has adopted a residential intensification target of 10 per cent for 2006–2026. This means that 10 per cent of all new residential development should be located within built-up areas of the city that have access to existing services such as roads and sewers.

Implementation Status:
2006–2026

Measureable Outcomes:
Based on the estimated housing demand during this 20-year period, 10 per cent represents 1,968 housing units. It is worth noting that there are limited numbers of large infill sites with the majority less than one hectare in size. Hence, careful planning and design will be necessary to ensure that new development is sensitive to existing neighbourhoods.

8 Action:
Community Transit Services

Lead:
Mississauga Transit Strategy

Description:
Recommendations of the Mississauga Transit Strategy that guide transit planning decisions include a pilot study, shuttle bus service, fare integration, marketing strategy, implementing a transit driver training program, old bus replacement program, and carpooling options.

Implementation Status:
2000–ongoing

Measureable Outcomes:
In 2004, Mississauga Transit achieved record ridership levels with 25,492,900 revenue customers.

9 Action:
Increase Green Space

Lead:
City of Kitchener, Ontario

Description:
With increase growth, it is imperative that the City of Kitchener increases green space as it helps to moderate climate and provide a place to grow good locally (community gardens). Focussing on planning and building 'green connections' can also serve to provide greater trail access to public green spaces within the network and more options for walking, biking, and alternative healthy modes of personal transportation.

Implementation Status:
2006 and ongoing

- Measureable Outcomes:**
- Requires that developers dedicate the maximum (2 per cent) parkland conveyance for industrial developments;
 - Requires that developers dedicate the maximum (5 per cent) parkland conveyance for institutional developments;
 - Establishes the proposed Natural Lands Acquisition Fund for purchasing imperilled lands;
 - Embrace LEED principles in the creation of new developments;
 - Encourage the use of native planting and low-maintenance plants in all future landscape designs; and
 - Make rain barrels available to all high-intensity development to offset the use of municipal water.

10 Action:
Improve Air Quality

Lead:
City of Montreal, Quebec

- Description:**
- minimize the use of wood heating in urban environments;
 - test alternatives to abrasive minerals;
 - expand knowledge of sources of fine particulate matter and the concentrations of each type;
 - influence the decisions of the Canadian Council of Ministers of the Environment's committee on air quality;
 - minimize the use of heating oil in buildings; and
 - test eco-friendly alternatives to de-icing salts and abrasive minerals.

Implementation Status:
2010–2015

Measureable Outcomes:
Achieve the CWS for ambient fine particulate matter by 2020

Vehicle Emission Programs for In-use Vehicles

1

Action:

Reduce Emissions with Advanced Transportation Technologies

Lead:

Canadian Council of Ministers of the Environment—Mobile Sources Working Group (MSWG)

Description:

The MSWG will evaluate alternative mechanisms and identify preferred approaches for collaboration and/or cross-Canada implementation of electric vehicles and other infrastructure.

Implementation Status:

Within three years (2013–2014 to 2016–2017)

Measureable Outcome:

Reduce air pollutants and greenhouse gas emissions from mobile sources through information sharing and collaboration on different initiatives.

2

Action:

Reducing Emissions from In-use Diesel Vehicles and Engines

Lead:

Canadian Council of Ministers of the Environment—Mobile Sources Working Group

Description:

Identify existing programs aimed at retrofitting and replacing older higher-emitting vehicles and engines and evaluate partnership and opportunities to encourage retirement and retrofit of diesel engines across the country.

Implementation Status:

Within three years (2013–2014 to 2016–2017)

Measureable Outcomes:

Reduce air pollutants and greenhouse gas emissions from mobile sources through information sharing and collaboration on different initiatives.

3 **Action:** Carpool.ca

Lead:

Engstrong, TransCanada, Chevron Texaco, Shell Canada Ltd., NOVA Chemical, IBM, TransAlta Corp, and ENMAX Corp.

Description:

The City of Calgary launched a large scale outreach campaign with the focus of the initiative on the availability of an online ride matching system. It was deemed to be highly successful with corporations taking on internal initiatives to support the program. These elements included:

- an ATM, cafeteria, and fitness facilities;
- teleconferencing/videoconferencing abilities;
- bike parking, showers, lockers, and change rooms;
- carpool parking;
- fleet vehicles for employee use; and
- commuter challenge participation.

Implementation Status:

2002–2004

Measureable Outcomes:

Increased corporate participation and involvement

4 **Action:** Emissions Testing Programs

Lead:

Metro Vancouver, British Columbia

Description:

Air Care requires 1992 or older vehicles to be tested annually while vehicles after 1992 are required to be tested every two years. In 2012, the BC government ended the testing of light cars and trucks and focused on testing heavy duty diesel vehicles at the end of 2014.

Implementation Status:

1992–2014

Measureable Outcomes:

Reduced emissions by 31 per cent

5 **Action:** Drive Clean

Lead:
Province of Ontario

Description:
An automobile emissions control program that identifies high-emitting vehicles with missing, broken, or malfunctioning emission controls. Once these vehicles are identified, the program strives to ensure that effective and durable repairs are performed on them with the goal of reducing on-road emissions.

Implementation Status:

- 1999: GTA/Hamilton–Wentworth
- 1999: Diesel–Entire province of Ontario
- 2001: Designated urban areas and commuter zones (south-central and southwest)
- 2002: Southern Ontario Smog Zone (Windsor to Ottawa)

Measureable Outcomes:

- Reduced VOC and NO_x emission from light duty vehicles in the southern Ontario smog zone by more than 81,200 tonnes since it began in 1999 through to 2003.
- Between 2000 and 2002, the program is estimated to have reduced fine particulate matter from diesel heavy-duty vehicles by nearly 1,100 tonnes.

Economic Instruments, Including Tools to Incent

1 **Action:** Reduce Emissions by Greening Fleet

Lead:
Canadian Council of Ministers of the Environment—Mobile Sources Working Group (MSWG)

Description:
The SmartWay Transport Partnership, a program delivered in Canada by Natural Resources Canada, is collaboration between freight shippers, carriers, and logistics companies to voluntarily achieve improved fuel efficiency and reduce emissions from freight transport. The MSWG will support the efforts of the Transportation Working Group on Energy Efficiency to advocate for jurisdictions to become affiliates of the SmartWay program and promote SmartWay to industry partners and municipal colleagues.

The MSWG will also look for opportunities to leverage other green fleet programs such as E3, which helps public and private organizations to improve fleet performance and recognize best practices.

Implementation Status:
Within three years (2013–2014 to 2016–2017)

Measureable Outcomes:
Reduced air pollutants and greenhouse gas emissions from mobile sources through information sharing and collaboration on different initiatives.

2 **Action:** GreenTRIP

Lead:
Alberta Transportation

Description:
A one-time funding program that will support new and expanded public transit throughout Alberta, GreenTRIP will provide capital funding only for sustainable public transit infrastructure and technology.

Project: C-Line

- > \$3.4 million in funding will help expand the C-Line inter-municipal bus service currently operating between Leduc, Nisku, and Edmonton
- > The C-Line provides service from the Century Park Transit Centre in Edmonton to bus stops in Nisku and Leduc before turning to Century Park.
- > Leduc will use the GreenTRIP funding to purchase four low-floor buses and five commuter shuttle buses, develop four park and ride facilities, construct a transit garage, and build bus shelters and bus stops. This will allow an additional “feeder” bus route to be created, using the shuttle buses to connect residents with the C-Line, and provide services from Leduc to Nisku, and to the Edmonton International Airport.

Others:

- > North LRT extends to Churchill Station
- > Edmonton LRT NAIT line announced as first project approved under GreenTRIP (April 5, 2011)

Implementation Status:
Five morning and afternoon trips offered during peak periods, Monday through Friday

Measureable Outcomes:
Increased public transit development and alternative modes of transportation.

3 Action:
Environmental Initiative Grant Program—Solar Power Electrical System

Lead:
City of St. Albert, Alberta

Description:
The program was initiated in 2007 and since then, the city and the Environmental Advisory Committee have received and allocated funding to numerous projects.

- a. Solar Power Electrical System—St. Albert United Church: In September 2011, a 4.75 kW capacity grid-connected solar panel system was installed.

Implementation Status:
Awarded \$12,500 from the City of St. Albert in 2010.

Measureable Outcomes:
In the first 12 months of operation, the system produced 6,055kWh of electricity, enough power to service 303 hours for one day and the carbon capture required to offset the planting of 109 trees. The daily reduction on an annual basis from the provincial grid system has ranged from four to 20 per cent

4 Action:
Fare Integration

Lead:
Mississauga Transit and Go Transit

Description:
Go Transit is the inter-regional transportation authority of the Greater Toronto and Hamilton Area. Fare integration services may exist between GO Transit and local transit providers, where customers may ride GO buses within local service areas using appropriate local proof-of-payment at no additional cost.

Implementation Status:
2001

Measureable Outcomes:
Increased transit ridership for those who would normally drive or be dropped off at GO stations. Integrated fares increased ridership by 37 per cent in 2002 from 2001.

5 Action:
Eco-Roof Incentive Program

Lead:
Greater Toronto Area, Ontario

Description:
This program aims to help Toronto’s commercial, industrial, and institutional sector take action on climate change by promoting the use of green and cool roofs on existing buildings. Eligible green roof projects will receive \$50/square metre up to a max of \$100,000. Eligible cool roof projects will receive \$2–\$5/square metre up to \$50,000. The program promotes the installation of green and cool roofs on existing buildings and new buildings not subject to the Green Roof by-law.

Implementation Status:
Started in 2009

Measureable Outcomes:

Green Roof Case Studies

- > ESRI Canada (2009–2012): 393,353 L of storm water diverted from municipal system per year resulting in 88 kg of CO2 equivalent emission reduction.
- > Metro Central YMCA (2009–2011): 271, 548L of storm water diverted from municipal system per year resulting in 61 kg of CO2 equivalent emission reduction.
- > Native Child and Family Services (2009–2011): 296,691 L of storm water diverted from municipal system per year resulting in 67 kg of CO2 equivalent emission reduction.
- > The Gladstone Hotel: 264,585 L of storm water diverted from municipal system per year resulting in 59 kg of CO2 equivalent emission reduction.

Cool Roof Case Studies

- > Black Creek Pioneer Village
- > Toronto Cricket, Skating and Curling Club
- > University of Toronto, Scarborough Campus

6 Action:
Order No Idling Zone Signs

Lead:
New Jersey

Description:
Install on building parking lots, or anywhere that idling is a problem

Implementation Status:
Ongoing

Measureable Outcomes:
Identification of hotspots

Municipal By-laws

1

Action:
Anti-Idling Bylaw

Lead:
City of Edmonton, Strathcona County, City of St. Albert – Alberta

Description:
“No persons shall cause or permit a vehicle to idle for more than three minutes in a continuous 30-minute period”

Implementation Status:
Applied to designated areas such as schools and hospitals

Measureable Outcomes:
Improved air quality and reduce emissions contributing to climate change

2

Action:
Health Protection Air Quality By-law 2010-035

Lead:
Town of Oakville, Ontario

Description:
The town’s Health Protection Air Quality By-law 2010-035 requires that an application for approval by a proposed or existing facility with a major health-risk air pollutant emission be posted for public comment for 30 days prior to the meeting when the application will be considered by Town Council. Emission reports must include:

- company and facility names;
- locations of facilities;
- daily and yearly emissions in both average and worst-case scenarios; and
- green features, best environmental practices and technologies, and/or sustainability plans demonstrating commitment to the environment by limiting and reducing emissions.

Implementation Status:
Town Council approved the health protection air quality by-law on February 1, 2010 with an implementation schedule that was amended on December 20, 2010.

Measureable Outcomes:
Reduce health-risk air pollutant emissions from the town’s facilities and operations.

Codes of Practice

1

Action:

Reduce Emissions with Advanced Transportation Technologies

Lead:

Canadian Council of Ministers of the Environment (CCME)—Mobile Sources Working Group

Description:

Efforts to deter the tampering of emission control equipment on heavy duty vehicles will be explored, including an assessment on the need to update the CCME Environmental Code of Practice for On-Road Heavy-Duty Vehicle Emission Inspection and Maintenance Programs.

Implementation Status:

Within three years (2013–2014 to 2016–2017)

Measureable Outcomes:

Reduced air pollutants and greenhouse gas emissions from mobile sources through information sharing and collaboration on different initiatives.

2

Action:

Reduce Emissions with Proper Vehicle Maintenance

Lead:

Canadian Council of Ministers of the Environment (CCME)—Mobile Sources Working Group

Description:

Efforts to deter the tampering of emission control equipment on heavy duty vehicles will be explored, including an assessment on the need to update the CCME Environmental Code of Practice for On-Road Heavy-Duty Vehicle Emission Inspection and Maintenance Programs.

Implementation Status:

Within three years (2013–2014 to 2016–2017)

Measureable Outcomes:

Reduce air pollutants and greenhouse gas emissions from mobile sources through information sharing and collaboration on different initiatives.

Revise Policies, Plans, and Performance Standards for New or Existing Sources

1 Action:
Clean Air Strategy—Encourage continuous improvement in emissions reduction technology

Lead:
Alberta Environment and Sustainable Resource Development

Description:

- Update the Substance Release Regulation (under the *Environmental Protection and Enhancement Act*—Alberta Regulation 124/1993)
- Work to begin on updating the Foundry Code of Practice

Implementation Status:
~ four years (medium term) and ~ two years (short term), respectively

Measureable Outcomes:

- Continuous improvement. The focus will shift from meeting standards to reducing emissions from all sources. Under this principle, all emitting sources must strive to improve their emissions performance.
- Policy efficiency. The decision-making authority will ensure that regulations and policies are aligned with environmental legislation and are efficiently satisfying multiple policy objectives.

2 Action:
Non-Road Diesel Engine Emission Regulation

Lead:
Metro Vancouver, British Columbia

Description:
The regulation provides fee refunds and reductions when an engine is upgraded or retrofitted with an approved Emission Reduction Measure (ERM). ERMs are verified by the US Environmental Protection Agency and California Air Resources Board and include re-power, remanufacture, retrofit, or a similar device, alteration, or technological change that reduces fine particulate matter emissions from a non-road diesel engine.

Implementation Status: 2011

- The regulation applies if an individual owns or operates a non-road diesel engine that is 25 horsepower or greater. The regulation focuses on older (Tier 0 and Tier 1) engines.
- It does not apply to engines less than 25hp—such as those used for agricultural operations, personal recreational machines, emergency generators, and other stationary machines operated only in the case of emergency.

Measureable Outcomes:
Exhaust stream retrofits fall into three broad categories:

- Diesel Oxidation Catalyst—reduce fine particulate matter emissions by 25 per cent or more
- Flow Through Filters—reduce fine particulate matter emissions by ~50 per cent
- Diesel Particulate Filters—reduce fine particulate matter emissions by ~85 per cent or more

Environmental Protection Order

1 Action:
Alberta *Environmental Protection and Enhancement Act*

Lead:
Government of Alberta

Description:
Purpose of this act is to support and promote the protection, enhancement, and wise use of the environment.

Implementation Status:
Ongoing

Measureable Outcomes:
Environmental compliance

Approval Conditions or Restrictions

1 Action:
Clean Air Strategy—Encourage continuous improvement in emissions reduction technology

Lead:
Alberta Environment and Sustainable Resource Development

Description:
Continue to apply the *Environmental Protection and Enhancement Act* through approvals within Alberta.

Implementation Status:
Ongoing

Measureable Outcomes:

- Continuous improvement. Focus from meeting standards to reducing emissions from all sources. Under this principle, all emitting source must strive to improve their emissions performance.

Regional Emissions or Concentration Limits for Specified Substances

1 Action:
Canadian Ambient Air Quality Standards (CAAQS)—Air Quality Management System

Lead:
Canadian Council of Ministers of the Environment

Description:

- Set the bar for outdoor air quality management across the country
- Ozone and fine particulate matter standards for 2015 and 2020 are more stringent and replace the Canada-wide Standards for these pollutants
- Working to develop standards for sulphur dioxide (SO₂) and nitrogen dioxide (NO₂). Expected completion in 2015.

Implementation Status:
O₃ and fine particulate matter (2015 and 2020) & SO₂ and NO₂ (2015)

Measureable Outcome:
In progress. First report on 2015 standards will occur in 2014 using 2012–2014 data.

2 Action:
Base-level Industrial Emissions Requirements (BLIERs)—Air Quality Management System

Lead:
Canadian Council of Ministers of the Environment

Description:
Ensure major industrial sources meet a base-level environmental performance standard. Potential opportunities for implementation include legislative changes, partnering with existing projects, and utilizing the existing industrial approvals system.

Implementation Status:
2012–2015

Measurable Outcome:
In progress. The outcome will see a consistent level of performance for all major industries across the country.

More Stringent Performance Standards or Regulations

1 Action:
ISO 14001 Environmental Management System Registration

Lead:
City of Kitchener, Ontario

Description:
ISO 14001 Environmental Management System Registration, starting with the city's fleet. ISO promotes the development and implementation of voluntary international standards and is a series of voluntary standards to help operations improve their environmental performance and make greater use of pollution prevention approaches.

Implementation Status:
2006 and ongoing

Measureable Outcomes:
Reduced emissions from major sources starting with the city fleet.

Ambient Air Quality Management Plans

1 Action:
Canada's Air Quality Management System

Lead:
Canadian Council of Ministers of the Environment

Description:
This is a comprehensive approach for improving air quality in Canada and is the product of unprecedented collaboration by the federal, provincial, and territorial governments and stakeholders.

Implementation Status:
There are five components to the system, each with its own implementation timeline that will be discussed in greater detail in its respective summary boxes.

Measureable Outcomes:

- improved outdoor air quality;
- industrial facilities across Canada meet the minimum emission standards;
- provinces and territories tailor actions to specific sources of air emissions in a given area;
- coordinated action where air pollution crosses a border; and
- improved intergovernmental collaboration to reduce emissions from the transportation sector.

2 Action:
Air Zone Management—Air Quality Management System

Lead:
Canadian Council of Ministers of the Environment

Description:

- Air zones are geographic areas within jurisdictions that exhibit similar air quality profiles and challenges.
- Air zone management is a provincial/territorial responsibility and is guided by an air zone management framework.
- Each province/territory will delineate their air zones according to their own air quality circumstances and lead local air quality management actions.
- To date, Alberta, Nunavut, Prince Edward Island, and Saskatchewan have delineated their air zones.

Implementation Status:

Annual reporting on air quality and management levels in the air zones will begin in 2014.

Measureable Outcome:

In progress. Air zone management will result in coordinated actions that are specific to geographical areas that exhibit similar air quality profiles and challenges. Supports actions to improve air quality and keep clean areas clean.

3 Action: Air Zone Management Plan

Lead:
Alberta Environment and Sustainable Resource Development

Description:

Development

- > develop the mandatory Capital Region fine particulate matter Response to address the ambient air quality data readings reporting a high concentration for fine particulate matter;
- > develop the North Saskatchewan Region Air Quality Management Framework; and
- > reconfigure the Capital Region Air Quality Management Framework for the Canadian Ambient Air Quality Standards.

Publish

- > Publish the mandatory Capital Region fine particulate matter Response; and
- > publish the North Saskatchewan Region Air Quality Management Framework.

Implement

- > Implement the Capital Region Air Quality Management Framework; and
- > define clear roles and responsibilities for participants with timelines and a review timeline.

Report on Progress

- > Prepare a State of the Environment report to communicate the status of ambient air quality and any management actions initiated under the Capital Region framework or other management frameworks;
- > prepare an Assessment Summary Report detailing results of ambient air quality monitoring and management actions; and
- > prepare a Status Report to summarize the implementation status of the Capital Region Air Quality Management Framework. This Status Report will be completed six months after the Assessment Summary Reports are released.

Implementation Status:

Ongoing

Measureable Outcomes:

Proper management and compliance of the Canadian Ambient Air Quality Standards

Facility Continuous Improvement Plans

1 Action:
Best Available Technology Economically Achievable (BATEA) and Developing Technology-Based Standards

Lead:
Alberta Environment and Sustainable Resource Development

Description:
In 2003, the CASA Electricity Project Team defined BATEA as “technology that can achieve superior emissions performance and that has been demonstrated to be economically feasible through successful commercial application across a range of regions and fuel types.”

Implementation Status:
Implementation may vary depending on whether the facility is:

- new (immediate implementation) as outlined in Figure 2 of the document; or
- existing (phased in over an established time period) or at end of life (where implementation may not be necessary within a set time period after which the facility commits to shut down) as outlined in Figure 3.

Measureable Outcomes:

- reductions in environmental footprints from industry;
- continuous improvements; and
- the development of a benchmark and base level for industrial performance requirements.

2 Action:
Volatile Organic Compounds Reduction in Auto Manufacturing

Lead:
Daimler Chrysler—Brampton, Ontario

Description:
The Brampton Assembly Plant located in Brampton, Ontario manufactures 1,377 cars per day. The production processes include stamping, body welding, painting, and assembly. In the past, vehicles in the plant were painted with a solvent-based colour coat prior to spraying with a solvent-borne clear coat.

Implementation Status:
During summer 1997, the plant converted the colour base coat paints from high-solids solvent borne enamels to waterborne paints.

Measureable Outcomes:
Reduced solvents in the base coat painting by 75 per cent and 25 tonne of volatile organic compounds. Total capital investment for this pollution prevention project was \$57 million.

3 Action:
Sandalwood Works Yard Improvement in Salt Storage

Lead:
City of Brampton, Ontario

Description:
The redeveloped Sandalwood Works Yard has a state-of-the-art winter materials storage facility. It is approximately 24,000 square feet and has the capacity to store 8,000 tonnes of salt and house an indoor salt brine loading station. Salt brine is used both as an anti-icer applied to the road surface and to pre-wet granular salt.

Implementation Status:
2011

Measureable Outcomes:
The facility's environmentally-friendly advantages include:

- salt and brine loading occurs indoors;
- concrete floors and walls prevent chlorides from seeping into the ground;
- membrane and weeping tiles under the facility offer added protection;
- holding tanks below the floor collect the salt washed from vehicles, which is then reused in the salt brine manufacturing process; and
- engineered wood finishes on the roof and walls provide resistance to salt corrosion.

4 Action:
Enbridge Commutes

Lead:
Enbridge Gas Distribution

Description:
Secured company-leased Natural Gas Vehicle (NGV) shuttle bus to assist employees in getting to and from a designated subway stop.

Implementation Status:
Initiated in 2000

Measureable Outcomes:
Increased carpooling and reduced numbers of commuter vehicles.

5 Action:
Mandatory Diesel Retrofit Projects—Port Authority of Allegheny County

Lead:
Pittsburgh, Pennsylvania

Description and Implementation Status:

- Replaced two 1996 model year transit buses with cleaner 2010 model-year diesel hybrid electric buses
- Repowered nine 2003 model year diesel buses with engines that met tighter 2007 emission standards

Measureable Outcomes:

Reduced PM by 0.1 tons per year, CO by 1.5 tonnes per year, and NO_x by 4.8 tonnes per year.

6 Action:
Mandatory Diesel Retrofit Projects—Constructors Association of Western Pennsylvania

Lead:
Pittsburgh, Pennsylvania

Description and Implementation Status:

- Retrofit or repower 39 pieces of heavy-duty diesel powered non-road construction equipment

Measureable Outcomes:

Reduced PM by 9.4 tons per year, CO by 72 tons per year, VOCs by 11.3 tons per year, and NO_x by 69 tons per year.

7 Action:
Mandatory Diesel Retrofit Projects—CSX Transportation

Lead:
Pittsburgh, Pennsylvania

Description and Implementation Status:

- Replaced one vintage diesel switcher locomotive without emission controls with a two engine configuration that has the latest in emission control technology

Measureable Outcomes:

Reduced PM by 0.5 tons per year, CO by 172 tons per year, NO_x by 16.6 tons per year; and saves 15,000 gallons of diesel fuel annually

8 Action:
Green-Belt

Lead:
Dofasco—Hamilton, Ontario

Description:
In 1999, nearly 200,000 square feet of roads were newly paved and almost 10,000 square meters of Dofasco Hamilton property was improved through green belt projects.

Implementation Status:
1999

Measureable Outcomes:
Reduced PM emissions from roads and open sources

9 Action:
Reduce Volatile Organic Compounds Release from the Rail Loading Area

Lead:
Chemical Nova—Sarnia, Ontario

Description:
A significant portion of all VOCs release to the atmosphere is the result of fugitive leaks from the transfer and storage of feedstock or products—an example is in rail loading yards when materials are loaded into railcars. Nova Chemicals rail loading area in Sarnia Ontario included 150 railcars used to transport styrene. Styrene is a VOC that contributes to the formation of smog and is a carcinogen.

Implementation Status:
In 1999, Nova Chemical redesigned their rail car loading area and retrofitted all their railcars with new loading equipment. The retrofit cost \$1.25 million and the new equipment allowed the loading of styrene into the railcars without the product being exposed to the air.

Measureable Outcomes:
This retrofit resulted in a reduction of fugitive styrene emissions by 98 per cent and equates to a 10 tonne reduction in styrene emissions from the Sarnia site and a 40 per cent reduction of total site styrene emissions.

Regional Planning Mechanisms for Managing Non-regulated Sources

1 Action:
Airshed Coordination and Reporting—Canada’s Air Quality Management System

Lead:
Canadian Council of Ministers of the Environment

Description:

- Airsheds are broad geographic regions with similar air quality profiles based on factors such as air flow trajectories, weather patterns, and topography that encompass a number of air zones and cross provincial/territorial or international boundaries.
- This initiative provides a framework to discuss and address cross-border air quality issues and to coordinate overall system monitoring and reporting.
- Airshed boundaries will be reviewed after the delineation of air zones is complete.

Implementation Status:

- In 2013–2014, CCME will conduct analyses and begin to coordinate actions to address the transboundary flow of pollutants in the airsheds.
- Airsheds will be used for the development of the fifth year State of the Air Reports—first report to be published in 2016.

Measureable Outcome:

In progress. A mechanism to coordinate action when air pollution crosses a border that is either interprovincial or international

2 Action:
New West Partnership Trade Agreement (NWPTA) for British Columbia, Alberta, and Saskatchewan

Lead:
Alberta Environment and Sustainable Resource Development

Description:

ESRD actively participated in the NWPTA discussions regarding the sectors: asphalt, metal processing, open burning, sawmills, pulp and paper mills, wood processing, and wood treatment plants. ESRD will provide all written regulatory requirements and technical air aspects to support the NWPTA work.

Implementation Status:

One to two years (short term)

Measureable Outcomes:

Management of interprovincial exchange and emissions from the mentioned sectors.

Emission Reduction Plans

1

Action:

Anti-Smog Action Plan (ASAP)

Lead:

Province of Ontario

Description:

Since 1996, the ASAP has provided a unique forum for addressing smog in Ontario. More than 50 organizations representing government and industry have signed the Anti-Smog Accord, an agreement which endorses a range of reduction measures to achieve Ontario's smog goals.

Implementation Status:

1996 with a progress report that was published in 2000 and 2002.

Measureable Outcomes:

- 45 per cent reduction of Ontario's emissions of NO_x and VOCs from 1990 levels by 2010 from the original 2015 target;
- interim reduction target of 25 per cent NO_x and VOC reduction from 1990 by 2005; and
- reduce pollutants contributing to fine particulate matter by 10 per cent by 2015.

appendix e – current, committed and proposed actions

The table below is organized according to the three objectives of the Response: action, investigation, and engagement. Under each objective are the source sectors and a list of strategies that have been identified from the jurisdictional scan as reoccurring strategies that are expected to achieve the goal of the Response. Under each strategy are the current, committed, and proposed actions submitted by stakeholders on behalf of their respective organizations. The lead of each action and an estimated timeframe for implementation are also provided. Actions that are underway will be tracked and monitored to inform evaluation of the Response. The list below is a reflection of initiatives the Oversight Advisory Committee identified and is not intended as an exhaustive list of all initiatives in the Capital Region.

OBJECTIVE 1 ACTION				
Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.				
Sector	Strategy	Timeframe	Action	Lead
Transportation	Expand Regional Transit	Underway	Transit currently has 14 double decker buses in service to accommodate more passengers on commuter routes.	Strathcona County
		Underway	Ongoing assessment to maximize ridership through route management.	City of Edmonton
		Underway	Expansion of LRT to all sectors of the city with a goal to increase transit ridership and transit mode shift, and spur the development of compact, urban communities.	City of Edmonton
		Underway	Local routes are changed in September 2014 to offer greater opportunities for local passengers.	Strathcona County
		Underway	Bethel Transit Terminal opened in September 2014.	Strathcona County
		Phase 3: Long-term (2020+)	Expand regional transit services within the Capital Region.	Capital Region Board
	Reduce Fuel Consumption	Underway	Continue to evaluate and test alternative fuel for public transit vehicles that may contribute to reductions in regional emissions.	City of Edmonton
		Underway	Continue to provide idling guidelines for city operated vehicles and a training program that teaches fuel efficiency driving techniques.	City of Edmonton Strathcona County

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 Identify and develop management actions that can be implemented during event days
ACTION and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Transportation	Reduce Fuel Consumption	Underway	Continue to evaluate fleet replacement vehicles to ensure they are the right sized vehicles, with current engine technology.	City of Edmonton Strathcona County
		Underway	Edmonton has two operating electric buses and numerous hybrids in the municipal fleet.	City of Edmonton
		Underway	Fleet services have four hybrid transit buses and electric powered ice re-surfacers.	Strathcona County
	Reduce Emissions with Proper Vehicle Management, Maintenance, and Technology	Underway	Fleet and transit have idling procedures in place; vehicle replacement ensures current advance emission systems and technology and ensures maintenance programs are current.	City of Edmonton Strathcona County
		Underway	Explore opportunities to reduce emissions through procurement and use of vehicles as part of the Greening Government Strategy.	ESRD
		Underway	Continue to evaluate the use of a telematics system and anti-idling system to track idling, speed, location, and driving habits of city operation vehicles.	City of Edmonton Strathcona County
		Underway	Continue to review traffic signal systems and complete advanced traffic analysis of key traffic corridors in order to optimize traffic flow and minimize congestion.	City of Edmonton
		Phase 1: Immediate-term (2015–2017)	Convene a group of relevant stakeholders within the department to explore options to manage emissions from traffic.	ESRD

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 ACTION Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Transportation	Establish Incentive Programs	Underway	A consultant is working on a Transit Fare Strategy Review.	Strathcona County
		Underway	Implement an updated fare strategy and work with region on consolidating efforts on developing a more comprehensive fare solution that also addresses the need of other regional partners.	City of Edmonton
		Phase 1: Immediate-term (2015–2017)	Implement an updated fare strategy.	Strathcona County
	Consider Ambient Air Quality in Land-use Planning Decisions	Phase 2: Medium-term (2017–2020)	Provide support and guidance to assist municipalities when making decisions on land-use planning for improved environmental outcomes.	ESRD
	Create Environments that Encourage Alternative Modes of Transportation	Underway	Design and construction of multi-use trails within urban and rural areas.	Strathcona County
		Underway	Design and construction of multi-use trails within urban areas.	City of Edmonton
		Underway	Transit routes and stops are integrated into all urban neighbourhoods.	Strathcona County
		Underway	Complete the Evolving Infill Project and implement the infill guidelines.	City of Edmonton

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 ACTION Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Transportation	Create Environments that Encourage Alternative Modes of Transportation	Phase 1: Immediate-term (2015–2017) & Phase 2: Medium-term (2017–2020)	Trails Strategy implemented with annual capital budgets dedicated to multi-use trail development.	Strathcona County
		Phase 1: Immediate-term (2015–2017)	TransCanada Trail and River Valley Alliance Trail to connect the County to City of Edmonton and Fort Saskatchewan.	Strathcona County
		Phase 2: Medium-term (2017–2020)	Transit Master Plan implemented, parallel and in coordination with the Integrated Transportation Master Plan.	Strathcona County
		Phase 3: Long-term (2020+)	Create a walkable environment, cycle friendly city and an integrated network of multi-use trail facilities.	Capital Region Municipalities
	Prioritize Transit-Oriented Development	Underway	Guidelines to encourage transit-oriented development that apply to development proposals and infrastructure upgrades within 400 metres of a transit station.	City of Edmonton Strathcona County
		Underway	Encourage a minimum of 25 per cent of city-wide housing unit growth to be located in the downtown and mature neighbourhoods, and around LRT stations and transit centres where infrastructure capacity supports redevelopment.	City of Edmonton

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 ACTION Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Industry	Require Approval Renewal and Amendments to Reduce Emissions with Increased Stringency	Phase 1: Immediate-term (2015–2017)	New facilities: Approvals will be reviewed against requirements for emission control related to fine particulate matter emissions and precursors (i.e., Guidance for Assessing Best Available Technology Economically Achievable (BATEA) and Developing Technology-based Standards.	Industry ESRD
	Establish Pollution Projects and Agreements Between Government, Private Industry to Reduce Particulate Matter Emissions or Precursors	Underway	Ensure all approvals include approval clauses; a regulatory tool exists that ESRD could enact in the short-term.	ESRD
	Reducing Industrial Point Source Air Emissions— Existing Facilities (Equipment and Processes)	Underway	Continue to implement continuous improvement for emissions monitoring and reductions through the EPEA Approvals process.	Industry ESRD
		Underway to Phase 3: Long-term (2020+)	Major capital expenditures provide the most efficient opportunity to upgrade emission controls and will reduce emission intensity. These opportunities are tied to capital stock turnover timing and major expansions.	Industry

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 Identify and develop management actions that can be implemented during event days
ACTION and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Industry	Report on Continuous Improvements Related to Fine Particulate Matter Implemented by Industry	Underway to Phase 3: Long-term (2020+)	A list of improvements implemented by industry since 2010 that impacted and managed fine particulate matter. This list of improvements should be updated periodically (three to five years).	Industry
	Reduction and Control Fugitive Emissions	Underway to Phase 1: Immediate-term (2015–2017)	The CASA NPS Project deliverables would include an evaluated list of recommended management actions which may include applicability to industry.	Clean Air Strategic Alliance
		Phase 1: Immediate-term (2015–2017) to Phase 3: Long-term (2020+)	Evaluate control options for fugitive emissions, especially those that would contribute to fine particulate matter in the winter months, when these events have occurred.	Industry
Review Control Technology Improvements	Underway to Phase 3: Long-term (2020+)	Control technology improvements will be proactively implemented by industry, provided the effectiveness has been proven and the cost to implement is reasonable. A periodic review of fine particulate matter emission control technology may assist in implementing BATEA and general control targets.	Industry	

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 ACTION Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Energy	Encourage Lower Emission Electricity Generation	Underway	Continue to implement the Greenhouse Gas Management Plan through initiatives including the purchase of green power and LED Street Light Replacement Program.	City of Edmonton
		Underway to Phase 3: Long-term (2020+)	The federal Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations (GHG Regulations) and the Electricity Emissions Management Framework in combination or separately will reduce emissions from coal fired-units in Alberta. 576 MW of coal generation in the Capital Region must meet NO _x and SO _x BATEA by 2018, and greenhouse gas emission intensity of 0.42t/MWh by 2020.	Environment Canada ESRD Industry
		Underway to Phase 3: Long-term (2020+)	The electricity generation facilities are required by the Emissions Trading Regulation, Alberta Air Emissions Standards for Electricity Generation and approval requirements to reduce emissions and develop a continuous improvement report five years according to the Electricity Emissions Management Framework.	ESRD Industry
Small Businesses and Operations	Ensure Compliance with EPEA	Underway	Code of practice sweeps are conducted (in partnership with municipalities) to operations indentified to be contributing significantly to the PM _{2.5} issue.	ESRD

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 1 ACTION Identify and develop management actions that can be implemented during event days and throughout the year to achieve measureable reductions in ambient PM_{2.5} concentrations.

Sector	Strategy	Timeframe	Action	Lead
Residential	Promotion and Awareness of Integrated Home Retrofit Services	Underway	Green Home Guide and Green Living Guide.	City of Edmonton
Commercial and Institutional	Performance Standards to Increase Energy Use Efficiency in Commercial Building	Underway	The Municipal Sustainable Building Policy requires sustainable facility operation and management practices including (a) efficient management of energy and water resource, (b) continued promotion of alternative modes of transportation, (c) monitoring of indoor air quality, and (d) effective waste management for new civic buildings.	City of Edmonton Strathcona County
		Underway	Continue to implement Green Building Policy C567, which includes education and outreach, and the evaluation of incentives, process improvements, and possible new regulations.	City of Edmonton
	Promotion and Awareness	Phase 2: Medium-term (2017–2020) & Phase 3: Long-term (2020+)	Recognizes the social, environmental, and economic benefits that can be realized through the design, construction, and operation of buildings.	Strathcona County
Agriculture	Understand Agricultural Sector Emissions	Phase 2: Medium-term (2017–2020)	Investigate the contributions of agricultural emissions to particulate matter and its precursors.	ESRD

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 2 Continue to improve general and scientific knowledge of PM_{2.5} in the Capital Region
INVESTIGATION for strategic, effective, and efficient management of the issue.

Sector	Strategy	Timeframe	Action	Lead
All Sectors	Continue to Monitor and Model Air Quality, Conduct Further Fine Particulate Matter Programs and Conduct Studies Related to the Effects of Fine Particulate Matter Levels on Human Health and the Environment	Underway	Continue to utilize the regional travel model to forecast and work with the Province on using this model to improve emissions modelling in the region.	City of Edmonton
		Underway	Continue to monitor city operations for compliance with federal and provincial legislation when there are expected air quality impacts (e.g., asphalt plant, aggregate recycling, fleet turnover, etc.).	City of Edmonton
		Underway	Increase regional air quality monitoring by partnering with Alberta Capital Airshed and Strathcona Industrial Association to install a new air quality monitoring station in Ardrossan.	Strathcona County
		Underway	Continue membership with Alberta Capital Airshed.	City of Edmonton Strathcona County
		Underway	Continue to facilitate discussion and understanding around fine particulate matter and receptors.	Alberta Capital Airshed Fort Air Partnership West Central Airshed Society
		Underway	Continued comparative sampling of Federal Equivalency Methods of particulate matter monitoring to the standard reference method.	Fort Air Partnership
		Underway to Phase 1: Immediate-term (2015–2017)	The CASA NPS Project deliverables would include an evaluated list of recommended management actions which may include applicability to industry.	Clean Air Strategic Alliance
		Underway to Phase 1: Immediate-term (2015–2017)	Study contributions of sector emissions on fine particulate matter and precursors depending on determined priorities in support of air quality management.	ESRD

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
- Proposed:** intent to implement, pending budget and approval

OBJECTIVE 2 INVESTIGATION Continue to improve general and scientific knowledge of PM_{2.5} in the Capital Region for strategic, effective, and efficient management of the issue.

Sector	Strategy	Timeframe	Action	Lead
All Sectors	Continue to Monitor and Model Air Quality, Conduct Further Fine Particulate Matter Programs and Conduct Studies Related to the Effects of Fine Particulate Matter Levels on Human Health and the Environment	Underway to Phase 2: Medium-term (2017–2020)	Continue to advance understanding of secondary fine particulate matter formation specific to the Capital Region context in support of air quality management.	ESRD
		Underway to Phase 1: Immediate-term (2015–2017)	Increase regional air quality monitoring which provides better data for Air Quality Health Index reporting to the public.	Strathcona County

OBJECTIVE 3 ENGAGEMENT Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient PM_{2.5}.

Sector	Strategy	Timeframe	Action	Lead
All Sectors	Communicate and Promote Responsible Actions to Reduce Fine Particulate Matter Event Days	Underway	Continue to provide Air Quality Health Index information.	All Applicable Stakeholders
		Underway	Continue to advance Sustainable Transportation Social Marketing Program to support the strategic goal of shifting the transportation mode.	City of Edmonton
		Phase 1: Immediate-term (2015–2017) to Phase 3: Long-term (2020+)	Convene a multi-stakeholder communications committee consisting of representatives from each sector to develop a strategy and a communications plan that identifies target audiences, strategies, and examples of actions that audiences can implement themselves related to fine particulate matter management. Focus is on event days.	All Applicable Stakeholders

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OBJECTIVE 3 ENGAGEMENT Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient PM_{2.5}.

Sector	Strategy	Timeframe	Action	Lead
All Sectors	Communicate and Promote Responsible Actions to Reduce Fine Particulate Matter Event Days	Phase 1: Immediate-term (2015–2017) to Phase 3: Long-term (2020+)	Communicate to stakeholders and public, issues related to fine particulate matter event days and what actions can be taken by individuals and organizations to contribute to the avoidance or mitigation of event days. The level of activity will be dependent on the availability of funding from ESRD.	Alberta Capital Airshed Fort Air Partnership West Central Airshed Society
		Underway to Phase 3: Long-term (2020+)	Participate in multi-stakeholder forums on precursor emissions on the federal and provincial level (i.e., Environment Canada’s Multi-sector Air Pollutant Regulations).	ESRD Industry
	Promote Individual and Public Responsibility to Reduce Fine Particulate Matter	Underway	Burn barrel guidelines for permits.	Strathcona County
		Underway	Chipping events to decrease burning.	Strathcona County
		Phase 1: Immediate-term (2015–2017)	Burn barrel inspection for over 2,000 permits annually.	Strathcona County
		Phase 1: Immediate-term (2015–2017)	Introduce an “Open Burning and Your Health” program to target fire safety and air quality.	Strathcona County

- Current:** actions that are underway
- Committed:** actions that have been budgeted and approved
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OBJECTIVE 3 ENGAGEMENT Promote outreach, education, and participation of the public and stakeholders in the state of Capital Region air quality and about their roles and responsibilities to reduce ambient PM_{2.5}.

Sector	Strategy	Timeframe	Action	Lead
All Sectors	Conduct Anti-Idling Campaigns	Underway	Continue to provide education and awareness about idling.	City of Edmonton
		Underway	Fleet services have idling guidelines in place for transit, fleet, and seasonal equipment.	City of Edmonton Strathcona County
		Underway	Continue to provide support and resources to Alberta Capital Airshed members including municipalities, industry, and others.	Alberta Capital Airshed
		Underway	Fleet has purchased Telematic Systems for equipment and transit buses to track idling time and location. Reinforcing the idling policy to operating departments.	City of Edmonton Strathcona County
	Increase Public Knowledge Related to Air Quality and Management	Underway to Phase 3: Long-term (2020+)	Identify opportunities to share information to external audiences on the Response (i.e., Clean Air Day Initiatives).	All Applicable Stakeholders
		Phase 1: Immediate-term (2015–2017)	Increase air quality literacy in the region via a public education campaign.	Alberta Capital Airshed Fort Air Partnership West Central Airshed Society

FUTURE STRATEGIES FOR CONSIDERATION

On a sector-by-sector basis, a number of strategies may be considered that also would promote action, investigation, and engagement about fine particulate matter issues. Examples include strategies to:

- establish legislation and management programs to reduce emissions (transportation);
- provide training on methods to reduce emissions (industry);
- invest in alternative energy with low emissions (energy);
- promote public information disclosure about emissions (energy);
- retrofit infrastructure with more advanced technology to reduce power consumption (small businesses and operations);
- apply performance standards for consumer products (residential);
- apply performance standards to increase energy use efficiency in residential buildings (residential); and
- promote voluntary agreements to implement best management practices to reduce agricultural sector emissions (agriculture).

appendix f – list of attendees at the workshops

As part of developing the Response, two broader stakeholder workshops were held to obtain feedback which were incorporated into the Response. The following lists identify attendees of the workshops but do not reflect the full list of stakeholders invited.

NOVEMBER 2012

- Alberta Capital Airshed
- Alberta Environment and Sustainable Resource Development
- Alberta Plywood
- ARC Resources
- ATCO Energy Solutions
- Building Products of Canada
- Bunge Canada Holdings
- Bunge North America
- Capital Power
- Celanese EVA Performance Polymers
- Chemistry Industrial Association of Canada
- City of Edmonton
- City of Fort Saskatchewan
- City of St. Albert
- Custom Environmental Services Ltd.
- Enbridge
- Environment Canada
- Development
- Fort Air Partnership
- General Recycling
- Gibson Energy ULC
- Imperial Oil
- Lamont County
- Lehigh Cement
- Maxim Power Corp.
- Momentive Specialty Chemicals
- North West Redwater Partnership
- Parkland County
- Plains Midstream Canada
- Rio Tinto Alcan
- Strathcona County

- 
- Sturgeon County
 - Suncor Energy, Edmonton Refinery
 - Town of Bruderheim
 - Town of Calmar
 - Town of Gibbons
 - Town of Morinville
 - TransAlta
 - University of Alberta
 - Value Creation Inc.

JUNE 2014

- Air Products
- Alberta Capital Airshed
- Alberta Environment and Sustainable Resource Development
- Alberta Environmental Monitoring, Evaluation, and Reporting Agency
- Capital Power
- Chemistry Industry Association of Canada
- City of Edmonton
- City of St. Albert
- Environment Canada
- Fort Air Partnership
- Gibson Energy
- Imperial Oil
- Innovation and Advanced Education
- Lamont County
- Mewassin Community Council
- Milner Power
- Northeast Capital Industrial Association
- Prairie Acid Rain Coalition
- Sherritt International, Metals Division
- Strathcona County
- Strathcona Industrial Association
- Suncor Energy, Edmonton Refinery
- Town of Devon
- TransCanada
- University of Alberta



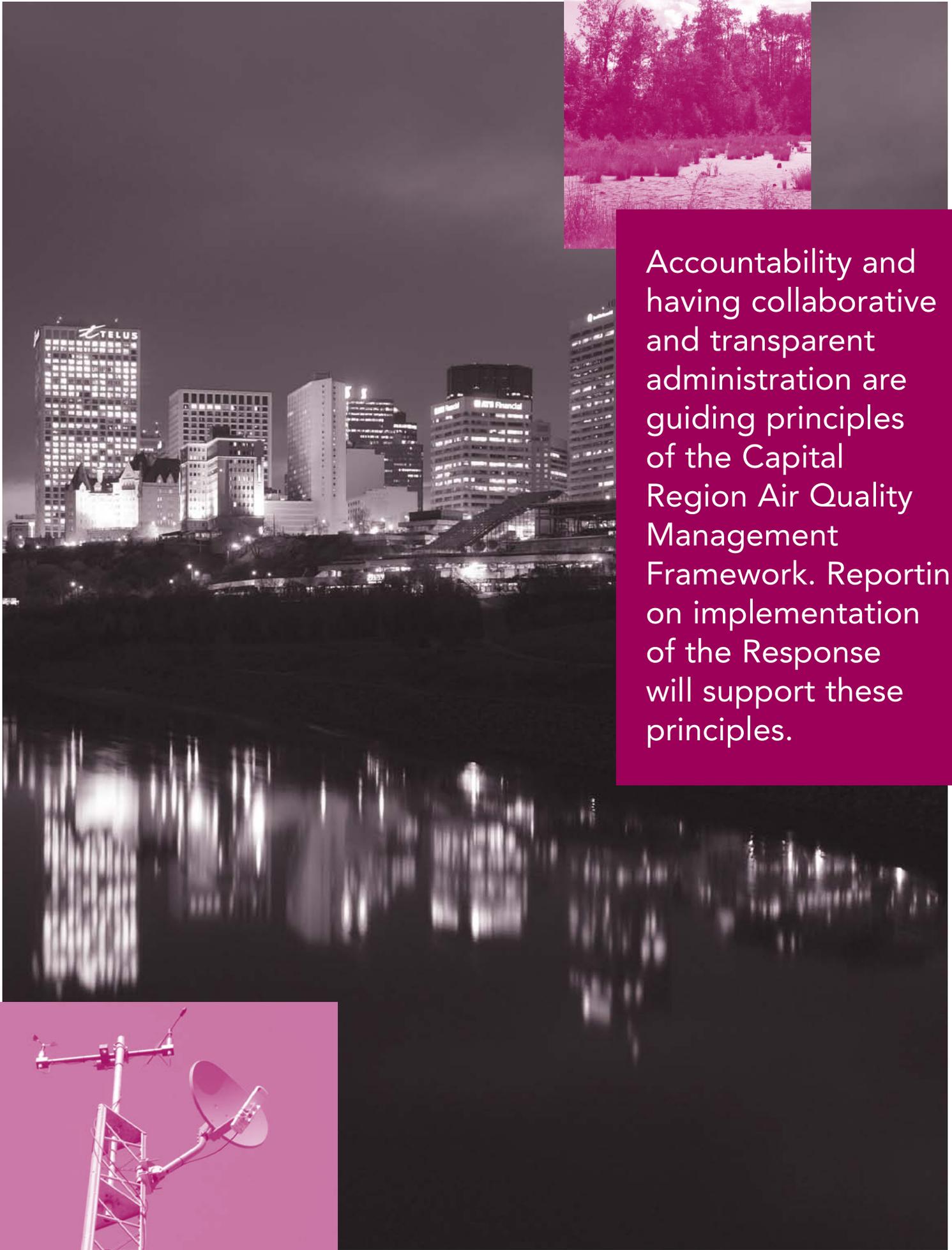
list of publications under the capital region air quality management framework

ALBERTA ENVIRONMENT AND SUSTAINABLE RESOURCE DEVELOPMENT PUBLICATIONS

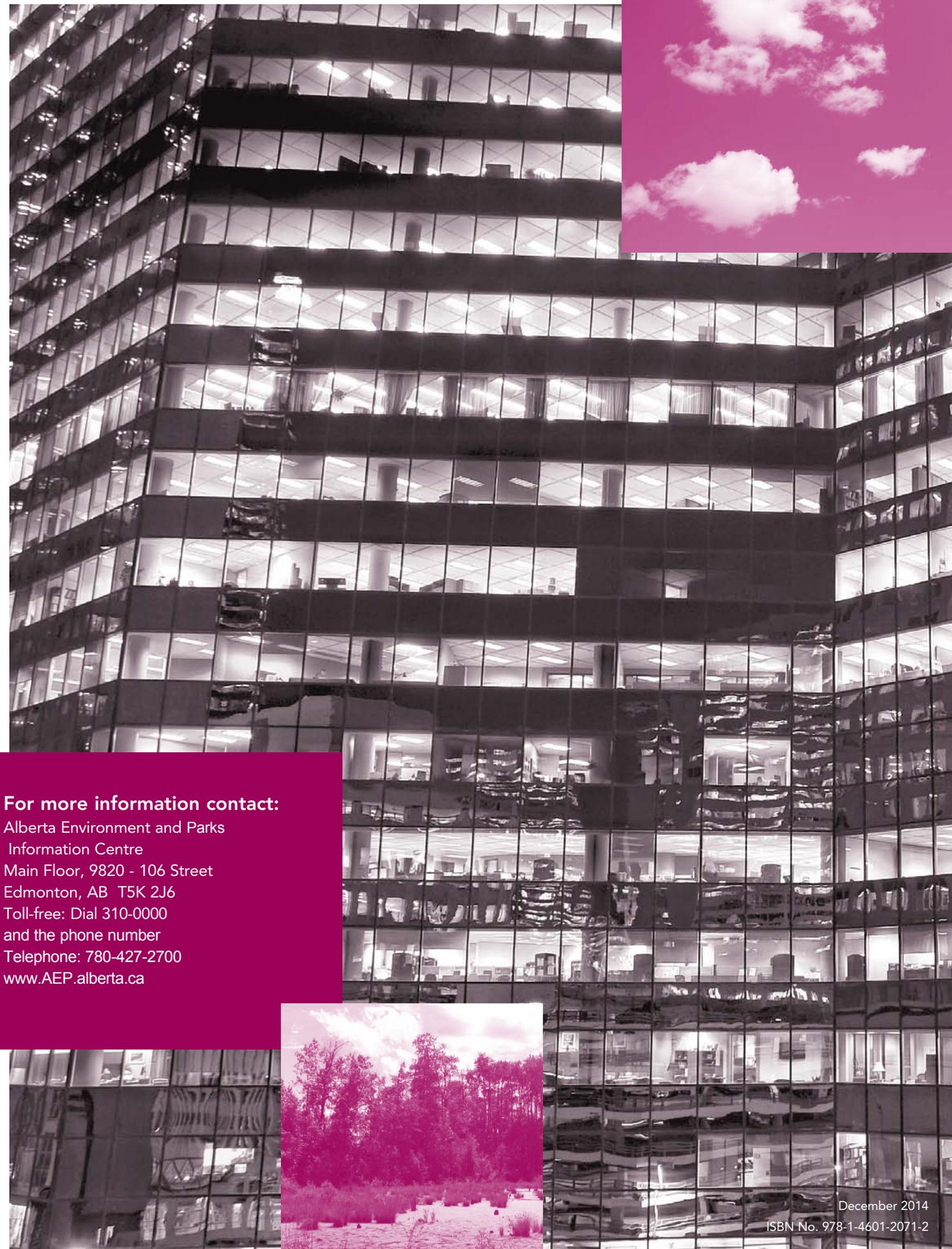
- The Capital Region Air Quality Management Framework for Nitrogen Dioxide (NO₂), Sulphur Dioxide (SO₂), Fine Particulate Matter (PM_{2.5}), and Ozone (O₃) (2012)
- An accompanying fact sheet about the Framework (2013)
- Technical Supporting Document for the Capital Region Air Quality Management (2013)
- Backgrounder—Ambient Air Quality Assessment Summary Reports (2013)
- 2012 Ambient Air Quality Assessment Summary Report (November 2013)
- 2011 Ambient Air Quality Assessment Summary Report (November 2013)
- Capital Region Network Assessment Report (Publication date: Fall 2014)

Publications under the Capital Region Fine Particulate Matter Response

- Factsheet – Process Overview (Publication date: November 2013)
- Factsheet – What is Fine Particulate Matter in the Capital Region? (Publication date: November 2013)
- Capital Region Fine Particulate Matter Science Report (Publication date: December 2014)
- Factsheet – Overview of Response (Publication date: December 2014)



Accountability and having collaborative and transparent administration are guiding principles of the Capital Region Air Quality Management Framework. Reporting on implementation of the Response will support these principles.



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