2016-2018 Red Deer Fine Particulate Matter Response Implementation

Progress Report

DECEMBER 2019

Alberta

Alberta Environment and Parks, Government of Alberta

December 2019

Red Deer Fine Particulate Matter Response Implementation Progress Report 2016-2018

ISBN 978-1-4601-4600-2

For more information contact:

Alberta Environement and Parks
Information Centre
Main Floor, 9820-106 Street
Edmonton, AB T5K 2J6
Toll-free: Dial 310-0000 and the phone number
Telephone: 780-427-2700
www.environment.alberta.ca

Executive Summary

The Red Deer Fine Particulate Matter Implementation Progress Report (the report) provides an update on the state of the management actions for fine particulate matter management in the Red Deer area. Alberta Environment and Parks, and members of the Red Deer Air Quality Advisory Committee (the Advisory Committee) developed three priority objectives to implement management actions to reduce fine particulate matter ($PM_{2.5}$) levels in the Red Deer Air Management Area. This report, therefore, presents highlights of the progress of the Advisory Committee and its represented stakeholders have made in implementing the Red Deer Fine Particulate Matter Response (the response).

The Red Deer area exceeded both the Canada-wide Standards (CWS) and the Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter ($PM_{2.5}$). In 2015 the Advisory Committee was established and charged with working to reduce the ambient levels of $PM_{2.5}$ in the Red Deer Air Quality Management Area by implementing a management response. The response was released in April 2016 for implementation over 15 years. The response contains three objectives: Action, Investigation, and Engagement. Each objective contains management actions that the Advisory Committee can implement in three phases: Phase 1, ending December 2020; Phase 2, ending December 2025; and Phase 3, ending December 2030.

A consultative and collaborative process between Alberta Environment and Parks and the Advisory Committee resulted both in the implementation of the response and the development of this report. As a result, this report contains actions jointly implemented by members of the Advisory Committee.

The implementation of the response involves executing over 80 management actions. Organizations within the Advisory Committee self-identified management actions to implement that could reduce $PM_{2.5}$ concentrations. The response identifies these organizations as ‘lead organizations’. Many actions involve executing fiscal projects that require budgetary approval by the respective lead organizations. The lead organizations have characterized a significant percent of the management actions as a high priority in the 2018/2019 fiscal year. Action-oriented management actions include those related to the transportation sector, industrial sector, and related to energy consumption. Alberta Environment and Parks, the Parkland Airshed Management Zone, and several other Advisory Committee members are leading the investigative actions. Lastly, all organizations represented in the Advisory Committee have committed to participating in $PM_{2.5}$ education and literacy campaigns targeted at members of the public to meet the engagement objective.

Alberta Environment and Parks is taking additional actions to reduce emissions in the Red Deer Air Quality Management Area to meet the CAAQS. Through regional planning actions and other Alberta Environment and Parks led initiatives, including the use of regulatory and non-regulatory policy tools, Alberta Environment and Parks is supporting sustainable resource development. Alberta Environment and Parks is also assessing potential policy actions to manage air quality in air zones assigned to Orange and Red CAAQS management levels. Such province-wide policy actions will have the potential to reduce the pollution transported to the Red Deer Air Quality Management Area from other air zones in the province. Alberta Environment and Parks is working with other departments within the Government of Alberta to reduce emissions from non-point sources while managing point sources through the existing industrial approvals process. Alberta Environment and Parks has also started new initiatives, including the Industrial Air Emissions Management Program (IAEMP), to support the existing regulatory processes in managing air quality in the Red Deer Air Quality Management Area.

Additionally, Alberta Environment and Parks is advancing knowledge in priority areas and informing management approaches by working with local airshed organizations and partners. Alberta Environment and Parks is continuing to engage with the public by working with municipalities, industries, and airshed organizations to understand regional priorities and identify management actions to manage $PM_{2.5}$ in the

area. Alberta Environment and Parks through outreach and education, will inform the general public and key stakeholders regarding the state and impact of $PM_{2.5}$ emissions on the Red Deer Air Quality Management Area.

The ambient air quality has improved since the Red Deer area exceeded the CWS and CAAQS. This improvement is reflected in assessments released by Alberta Environment and Parks that show the Red Deer area transitioning from the CAAQS Red management level (mandatory actions for achieving air zone CAAQS) to most recently the CAAQS Orange management level (actions for preventing CAAQS exceedances). Multiple factors contribute to the observed change in ambient concentrations of $PM_{2.5}$. Therefore, establishing a direct causational relationship between ambient air quality and the implementation of management actions is difficult and is an important focus of future investigative work. Currently, the improvement in ambient air quality can at best be described as occurring in correlation with the ongoing implementation of the response. Future assessments of ambient air quality will help to continue to motivate the development and implementation of management actions by informing the stringency and urgency of the overall management response.

Contents

Introduction

This report highlights the progress made to date in implementing the Red Deer Region Fine Particulate Matter Response[1] (herein referred to as the response). The Red Deer Air Quality Advisory Committee (herein referred to as the Advisory Committee) continues to meet regularly to share updates and progress on the implementation of actions committed to in the response.

Red Deer Riverside ambient air quality monitoring station exceeded the Canada-Wide Standards (CWS) (for the 2009-2011 and 2010-2012 assessment periods) and Canadian Ambient Air Quality Standards (CAAQS) for fine particulate matter (for the 2011-2013 assessment period). In response, Alberta Environment and Parks released the response in 2016, in conjunction with the Red Deer Fine Particulate Matter Response Science Report[2] (herein referred to as the science report). The Advisory Committee is a multi-stakeholder group consisting of representatives from municipalities, industry, non-governmental organizations, the local airshed, the public, and provincial government. The Advisory Committee was established during the development of the response to advise Alberta Environment and Parks and provide regular updates on implementation of the response. The response is a place-based management action plan aimed at reducing concentrations of $PM_{2.5}$ in the Red Deer Air Quality Management Area (Figure 1). The response outlines three main objectives: Action, Investigation and Engagement. Management actions under these objectives are identified for implementation by key stakeholders. The response is to be implemented over a fifteen-year timeframe.

In 2012, Alberta adopted the national Air Quality Management System (AQMS) for fine particulate matter ($PM_{2.5}$). The national AQMS outlines how to manage ambient air quality using the CAAQS. Alberta Environment and Parks reports the ambient air quality in Red Deer using the CAAQS (Table 1). Information on how Alberta is managing air quality to meet CAAQS in the broader Red Deer Air Zone is available in the Red Deer Air Zone Fine Particulate Matter Response: Government of Alberta Action Plan[3].

[1] https://open.alberta.ca/publications/9781460125410
[2] https://open.alberta.ca/publications/9781460125434
[3] https://open.alberta.ca/publications/9781460129098

Table 1: Comparing the Management Actions and Triggers/Threshold Values of the Canada-wide Standards and Canadian Ambient Air Quality Standards.

	Averaging Time	CWS 24-hour	CAAQS (2015) 24-hour	CAAQS (2015) Annual
Management Action Levels	Red	Mandatory Plan to Reduce Below Canada-wide Standards	Actions for Achieving Air Zone CAAQS	
	Trigger/Threshold	30 µg/m^3	28 µg/m^3	10.0 µg/m^3
	Orange	Management Plan	Actions for Preventing CAAQS Exceedances	
	Trigger/Threshold	20 µg/m^3	19 µg/m^3	6.4 µg/m^3
	Yellow	Surveillance Actions	Actions for Preventing Air Quality Deterioration	
	Trigger/Threshold	15 µg/m^3	10 µg/m^3	4.0 µg/m^3
	Green	Baseline Monitoring and Data Gathering	Actions for Keeping Clean Areas Clean	

Purpose

The purpose of this report is to provide an update on the efforts to implement the response within the three priority objectives that have informed the activities of Alberta Environment and Parks and the multi-stakeholder group to date. The three objectives are: Objective 1 (Action), Objective 2 (Investigation), and Objective 3 (Engagement).

The response is currently in Phase 1 of implementation (2015 – 2020). This report highlights the progress made since the implementation of the response in 2016, any additional priorities identified, actions to achieve by the conclusion of Phase 1 (in 2020), and the context that informs the path forward. For more information on these objectives, please refer to the response. The goal of the response is to reduce ambient fine particulate matter concentrations and remain below the CAAQS, as measured at ambient air quality monitoring stations within the Red Deer Air Quality Management Area.

State of the Ambient Air Quality

Figure 1: Aerial photo looking towards the City of Red Deer during a wintertime high concentration $PM_{2.5}$ event

Table 2: Active Continuous Ambient Air Quality Monitoring Stations within the Red Deer Air Quality Management Area

Monitoring Station	Period of Operation	Station Classification*
Red Deer Riverside	May 1, 2005 – Present	Large Population Center
Red Deer Lancaster	October 2012 – March 2013 June 2013 – May 2014 December 2014 – present	Large Population Center

*Classification obtained from the draft report "A Five-year Provincial Air Quality and Deposition Monitoring, Evaluation and Reporting plan (2019-2023)".

Alberta Environment and Parks uses the ambient air quality monitoring stations shown in Table 2 to report against the CAAQS: Red Deer Riverside and Red Deer Lancaster. Red Deer Lancaster air quality monitoring station started operating continuously in December 2014. Until then, the air quality monitoring station was portable and was used in the wintertime at the Red Deer Lancaster site to understand wintertime concentrations of $PM_{2.5}$ in Red Deer. Since at least 2 years of valid data are required to report against CAAQS for $PM_{2.5}$ and O_3, Red Deer Lancaster air quality monitoring station was not included in CAAQS assessments until the 2014-2016 data period.

Alberta Environment and Parks is implementing the CAAQS in spatial alignment with the Alberta Land Use Framework Planning Regions. The Red Deer Air Zone has the same boundaries as the Red Deer regional planning boundary. Although the Red Deer Air Zone is much larger than the Red Deer Air Quality Management Area, ambient air quality monitoring stations in the City of Red Deer remain the only stations which meet the criteria to report against the CAAQS. The CAAQS metrics, the 98th percentile of daily average $PM_{2.5}$, annual average $PM_{2.5}$ and 4th highest daily one-hour maximum O_3, are based on three-year averages. The following table outlines the ambient air assessment results for the Red Deer Air Zone during the following assessment periods: 2011-2013, 2012-2014, 2013-2015, 2014-2016, and 2015-2017.

Table 3: CAAQS Management Level Assignments by Station

Assessment Period	Air Zone Management Level*	Station	Metric Specific Management Level Assignment**	
			24-hour	Annual
2011-2013	Red	Red Deer Riverside	Red	Red
2012-2014	Orange	Red Deer Riverside	Orange	Orange
2013-2015	Orange	Red Deer Riverside	Orange	Orange
		Red Deer Lancaster	N/A***	N/A***
2014-2016	Yellow****	Red Deer Riverside	Yellow	Yellow
		Red Deer Lancaster	Yellow*****	Orange*****
2015-2017	Orange	Red Deer Riverside	Yellow	Yellow or lower******
		Red Deer Lancaster	Yellow	Orange

*****The management level assigned to the Air Zone is that of the station with the highest management level for either $PM_{2.5}$ metric values.
******Metric specific management level assignments are determined considering Transboundary Flows and Exceptional Events
*** Did not calculate the 3-year average because only one year is available
****Where monitoring stations meet the completeness criteria for the 3-year average, stations with metric values based on only two years of data will be excluded for consideration of the air zone management level assignment.
*****One of the three years of the assessment period did not meet completeness criteria. The 3-year average is based on two years.
******Transboundary Flow/Exceptional Event analysis may have brought the station to the Green Management Level but was not performed

For several assessments, the Red Deer Air Quality Management Area has been assigned to management levels below the Red management level. Taken in isolation, the lower $PM_{2.5}$ concentrations that resulted in being assigned these management levels could suggest that air quality has improved in the Red Deer Air Quality Management Area since the 2011-2013 assessment. However, a number of factors may be contributing to the perceived improvement in ambient air quality. In 2013, Red Deer Riverside air quality monitoring station changed $PM_{2.5}$ monitoring instruments. This type of instrument, in use since 2013, has been shown to measure concentrations fractionally lower than the type of instrument used for the period of 2009-2013. Additionally, wintertime atmospheric inversions, which reduce atmospheric dispersion of pollutants in the Red Deer Air Quality Management Area were less frequent during the years of 2014, 2015, 2016 and 2017 than in the years of 2009, 2010, 2011, and 2013. Ambient concentrations of $PM_{2.5}$ are also influenced by multiple factors including varied emission sources such as, transboundary flows, on-road transportation, agricultural, industrial, and natural emission sources. Weather conditions, geography, and exceptional events (e.g. forest fire smoke) also affect ambient air quality. Regardless, the intent of the CAAQS requires action at all management levels: Green (actions for keeping clean areas clean), Yellow (actions for preventing air quality deterioration), Orange (action for preventing CAAQS exceedance) and Red (actions for achieving air zone CAAQS).

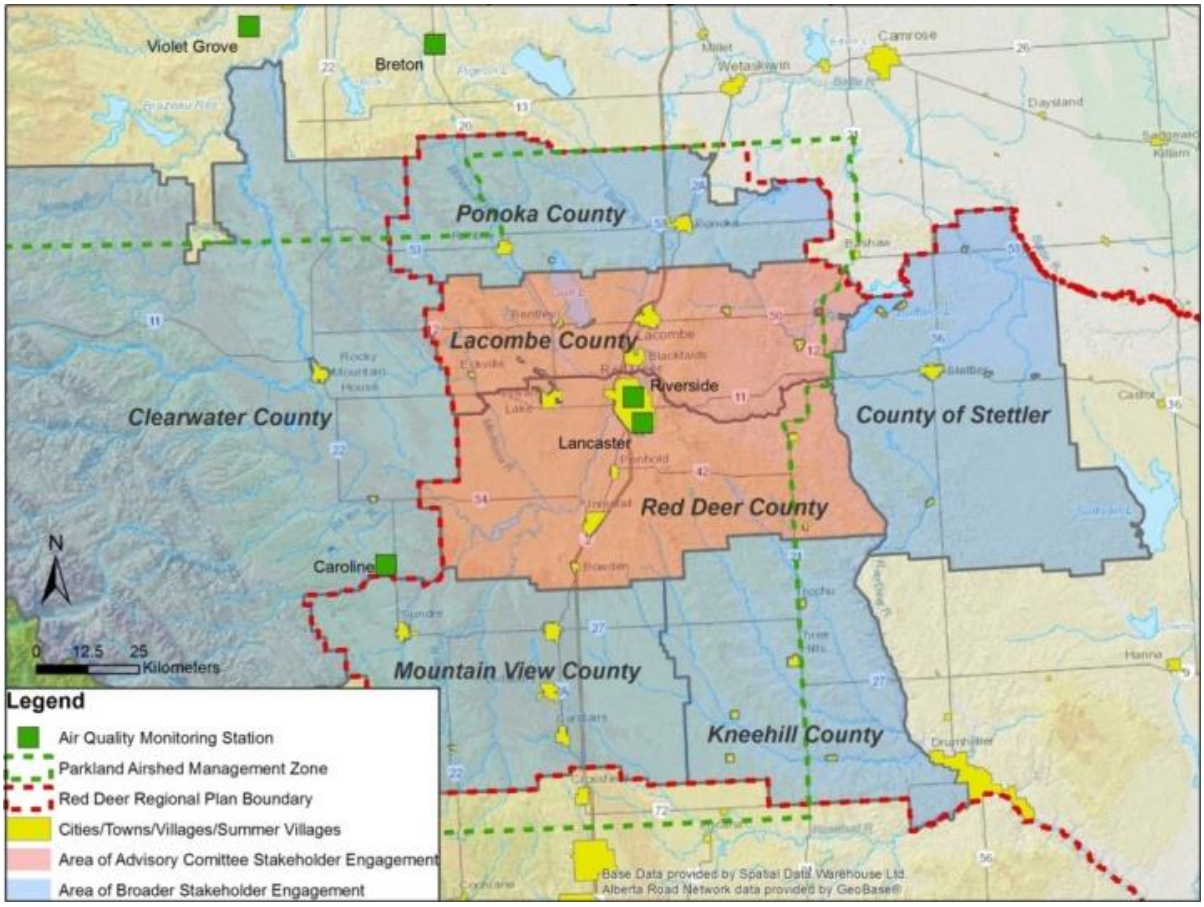

Figure 2: Map of the Continuous Ambient Air Quality Monitoring Stations nearby the City of Red Deer

Oversight and Delivery of Objectives

The overarching goal of the response is to achieve a reduction in ambient $PM_{2.5}$ concentrations to levels below the CAAQS standards, both for the annual and 24-hour metrics. Table 4 provides an overview of the goal and objectives of the response. Achieving this goal requires intentional management actions as a starting point. Implementation of the management actions committed to in the response is ongoing. Implementation of the response is to occur in phases, including a process to acknowledge and respond to new information through evaluation of management actions every five years. In order to set reasonable targets during the implementation of the response, the committed management actions reflect a set of guiding principles that align with the multi-sector operational needs of the respective Advisory Committee members implementing the actions. The management actions committed in the response are also phased into three distinct time-periods to reflect the operational requirements of implementing the actions. Phase 1 is currently underway and will conclude in 2020. Implementation of the response is an ongoing deliverable and remains a focus for Alberta Environment and Parks and the Advisory Committee.

Priorities for Phase One

Responding to the complex challenges of managing air quality requires several years of implementing and revising management actions before key stakeholders can identify the potential outcomes of the management actions.

Indicators of success in implementing the objectives in phase 1 include meeting the outcomes set in the response (Table 4). Management actions classified under the action objective are sector-based initiatives focussed on the reduction of $PM_{2.5}$ from emission sources in the Red Deer Air Quality Management Area. The compiled inventory of management actions classified as action in the response are predominantly budget-dependent and implementation may depend on the financial status of the respective stakeholder organization implementing the action. Management actions classified as investigation have led to increased knowledge of the contributing factors and emission sources influencing $PM_{2.5}$ concentrations. Many of the management actions classified as investigation have resulted in deliverables for the Government of Alberta, key stakeholders, and the public. Management actions characterized as engagement required shared implementation from all sectors while Alberta Environment and Parks works with the Parkland Air Management Zone to ensure relevant public outreach and education . The expectation is for the public to use and leverage the information to take positive action year-round, and particularly on event days. The engagement strategy seeks partnership with airshed and Environmental Non-Government Organizations (ENGOs) to provide public outreach and education on management initiatives to reduce $PM_{2.5}$ in the Red Deer Air Quality Management Area.

Evaluation of the response is intended to incorporate specific performance indicators and targets. When the phase 1 implementation of the response is evaluated at the 5-year window, these performance indicators will be used to evaluate the effectiveness of the actions identified in phase 1 of the response, in relation to the overall goal of the response. Performance with respect to these targets will help inform priorities for phase 2 of implementation.

Table 4: Descriptions of the Goal and Objectives of the Response in relation to the intended Implementation priorities and Outcomes of Phase 1 of implementation.

Goal	Reduce ambient fine particulate matter concentration and remain below the numerical CAAQS as measured at ambient air quality monitorng stations within the Red Deer Air Quality Management Area	
Objective	**Implementation Phase 1**	**Outcomes Phase 1**
1 - Action: Identify and develop management actions that can be implemented throughout the year to achieve measureable reductions in ambient fine particulate matter concentrations and precursors	Implement actions identified in Phase 1	Phase 1 committed and proposed actions are implemented. Implemented actions will be refined based on new information
2 - Investigation: Continue to improve knowledge of fine particulate matter in the Red Deer air quality management area. Improvement in knowledge can inform the cause of the exceedances and provide insight into better managing the issue	Implement investigation actions identified in Phase 1	Government of Alberta and stakeholders including the public increase their knowledge of the conditions, factors, and sources that contribute to the event days observed during the winter months and issues related to year-round management of $PM_{2.5}$
3 - Engagement: Empower the public and stakeholders to reduce ambient fine particulate matter through promotion of outreach and education on the state of air quality in the Red Deer air quality management area and on how they can take action.	Implement engagement action identified in Phase 1	Stakeholders including the public are aware about the fine particulate matter issue and begin applying their knowledge to take action to address the event days observed during the winter months and issues related to year-round management of $PM_{2.5}$
Evaluation		
Performance Indicator	**Targets**	
Canadian Ambient Air Quality Standards (CAAQS)	If the implemented management actions are effective we can expect to see a reduction in ambient fine particulate matter concentration	
Event Days	If the implemented management actions are effective we can expect to see a reduction in the number of event days reported	
Emission Reduction	Efforts will be made to quantify the estimated reduction in precursor emissions, where feasible from implementing management actions	
Outcomes	Evaluate whether identified actions are being implemented within the phase indicated	

Progress of the Objectives in Phase 1

The response highlights the management of major sources of nitrogen dioxide (NO_2) and volatile organic compounds (VOCs) as a means of reducing secondary $PM_{2.5}$. Major sources of secondary $PM_{2.5}$ identified in the response and associated science report include on-road transportation, upstream oil and gas activities, non-industrial non-point sources, and to a lesser extent, chemical manufacturing. Alberta Environment and Parks and the Advisory Committee have made progress in the past three years to reduce emissions using scientific investigation to inform the management actions to reduce observed $PM_{2.5}$ concentrations.

Organizations within the Advisory Committee identified management actions to implement that could reduce $PM_{2.5}$ concentrations. Each year of the implementation, the lead organizations prioritize each management action as high, medium or low, depending on budgetary and staffing resource considerations. The focus of each management action could be different in a given fiscal year. Figure 3 highlights the

proportion of the management actions the respective lead organizations have prioritized as high, medium and low priority (as of the drafting date this report). Appendix A provides the detailed implementation progress of the respective management actions. The department is yet to receive an implementation report from some lead organizations and these management actions are categorized in the “no update” category. Implementation is reported as “ongoing” in the management actions listed in the Low, Medium, and High categories for the 2018 fiscal year.

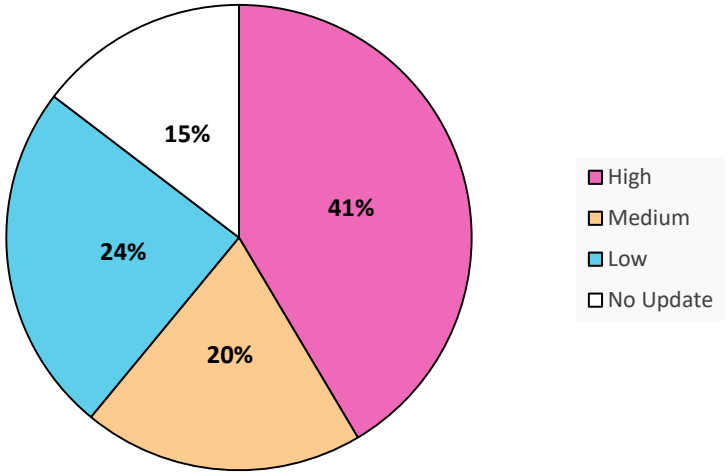

Figure 3: Percentage distribution of the management actions in the response prioritized in 2018 as High Medium, Low and No Update.

This report is arranged in the following manner: by objective and subsequently by sector. These sections summarize the progress of management actions and initiatives Alberta Environment and Parks and respective organizations represented in the Advisory Committee during implementation. The following examples are highlights only. Refer to Appendix A in this report for a list of comprehensive initiatives identified in the response to determine their progress and next steps. Two years remain to complete the initiatives underway in phase 1 before a comprehensive evaluation of the response and identification of key priorities for phases 2 and 3.

Objective 1: Action

Transportation

The science report identified transportation as a major source of oxides of nitrogen (NO_x) and VOCs. Transportation related sources release these gasses and in turn lead to the formation of secondary $PM_{2.5}$ in Red Deer. Additional investigation, specifically Provincial Air Quality Photochemical Modelling[4], continues to highlight transportation-related sources as a significant contributor to emissions that result in the formation of $PM_{2.5}$. Transportation related sources include on-road and off-road sources. A wide range of vehicles, engines and equipment types including personal and commercial vehicles, and combustion

[4] https://open.alberta.ca/publications/9781460142387

driven lawn and garden equipment contribute to transportation related emissions. Transportation related sources are concentrated near population centers.

Municipal Efforts

The municipalities overseeing implementation of the response are the City of Red Deer, Lacombe County, and Red Deer County. These municipalities have completed or are currently implementing several initiatives to address emissions associated with transportation (where aspects are within their municipal jurisdiction or responsibility). The City of Red Deer, in particular, has been leading implementation of management actions proposed for the transportation sector.

Within the role of providing transit service as an alternative transportation option, the City of Red Deer is implementing system-wide improvements including intelligent transit and bus stop upgrades to improve rider services. In July 2018, the City of Red Deer initiated the testing of intelligent transit features that included stop announcements, passenger counting, and enhanced security.

From the perspective of managing transportation emissions from their own operations, the City of Red Deer and Lacombe County have also implemented greening the fleet strategies for their fleet vehicles. This includes the use of Compressed Natural Gas (CNG) buses, adding a zero-emissions electric vehicles, as well as idling education programs for their staff and fleet drivers. Red Deer County has added a zero-emissions electric vehicle to their fleet and Lacombe County has restructured their graders to be more efficient and reduce idling time.

Each municipality has expanded their regional transit system and the City of Red Deer is making transit more accessible by allowing small pets and bicycles onboard, providing a free trip-planning tool, and offering a book-borrowing service on the buses.

Red Deer County is implementing a dust control incentive program and is developing a program that will reduce travel time to landfills. Finally, each municipality is participating in the development of multi-use trail systems that will increase access between and within municipalities. When complete, the multi-use trail systems will enable alternate transportation systems including biking and other active transportation with a potential of minimizing emissions.

The City of Red Deer tracks and reports annually to city council and the public on $PM_{2.5}$ and other pollutant concentrations as part of the city's Environmental Master Plan annual reports. Furthermore, in addition to distributing promotional signage and brochures throughout the city, the City of Red Deer collaborated with the Parkland Air Management Zone to create an idle-free program toolkit to share with other municipalities. The toolkit includes web pages, bumper stickers, and decals. The City of Red Deer has also implemented idle-free education and signage in thirty-eight schools in the city and previously launched a Clean Air Responsible Schools (CARS) program in several classes. Lacombe County focused their idle-free education on councillors and staff.

Government of Alberta

Alberta Environment and Parks has worked closely with partner agencies to move proposed and committed actions forward with respect to transportation. This includes participating in the Clean Air Strategic Alliance Non-Point Source working group, which resulted in recommendations around the management of transportation emissions in Alberta. Alberta Environment and Parks has also worked to bring new actions, which include Policy and Planning division's participation in national level transportation discussions. Alberta Health Services has also moved forward with anti-idling initiatives at healthcare facilities.

Figure 4: The 67 Street bridge over the Red Deer River in the City of Red Deer. Actions around transportation in the City of Red Deer are focussing less individual vehicle use.

Energy

Energy is required for most daily activities including heating and cooling homes, lighting for domestic and industrial use, and the manufacturing of products. Most energy-related air pollution concerns are due to the combustion of some form of hydrocarbon fuel (e.g. coal, natural gas, biomass, etc.). Sectors using energy, and thus having an impact on air quality, vary and include residential, commercial, transportation, and industrial emission sources. It is therefore important to find ways to increase energy efficiency and reduce emission associated with energy use. This section highlights the efforts made by Alberta Environment and Parks and the Advisory Committee to reduce energy consumption through alternative forms of energy, upgrading facilities, and increasing energy efficiency.

Municipal Efforts

The municipalities represented on the Advisory Committee have each taken individual actions to increase energy efficiency. The City of Red Deer completed a citywide replacement of streetlights with LED bulbs in 2018, and now requires all proposed new neighborhoods to use LED lighting going forward. The City of Red Deer is educating residents about energy efficiency by creating a webpage with links to home energy audits and placing energy efficiency toolkits in Red Deer Public and Red Deer College libraries. The City of Red Deer also has a Community Energy and Emissions Plan which includes actions around building efficiency, which has been integrated into Red Deer's 2019 Environmental Master Plan. The City of Red Deer has completed a Corporate Green House Gas Emissions Inventory and Plan to identify opportunities for increased energy efficiency in its internal operations. It has further added second thermal imaging camera at Red Deer Public Library to detect energy loss in homes as well as working with communities to

increase community awareness of green power alternatives. Lacombe County has completed an audit of both county offices and retail shop buildings as well as made capital changes to lighting and heating, including the design of two remote retail shops using solar panels. Red Deer County is pursuing similar actions and a building energy audit is currently underway. In addition, the Government of Alberta supported Red Deer College in the installation of solar panels that led to a significant reduction in energy consumption.

Figure 5: Solar panels installed on the roof of Sorensen Station in downtown Red Deer. Solar panels help reduce emissions from energy generation in the Red Deer Air Quality Management Area.

Industrial

This section highlights the efforts made by industrial representatives that are part of the Advisory Committee, in conjunction with efforts from Alberta Environment and Parks and the Alberta Energy Regulator, to implement the actions committed to in phase 1 of the response. The response ensures that industries and commercial operations in the Red Deer Air Quality Management Area requiring an *Environmental Protection and Enhancement Act* approval meet the regulatory limit for $PM_{2.5}$ emissions and associated limits of other precursor gases that may lead to the formation of $PM_{2.5}$.

Facility Specific Efforts

The industrial stakeholders Husky Energy, ATCO, Shell Canada, NOVA Chemicals Corporation, Dow Chemical Canada ULC, and MEGlobal Canada Inc. have each committed to an annual Leak Detection and Repair program for fugitive emissions. Leak Detection and Repair programs aim to identify and repair leaks, which may result in substantial emissions of precursor gasses that can lead to the formation of $PM_{2.5}$, at industrial facilities. Shell Canada has refreshed its Leak Detection and Repair program and completed the leak detection and repair to follow best management practices. Shell Canada also has a maintenance schedule for the Caroline Gas plant, which reduced emissions at the plant. MEGlobal Canada Inc. conducted fugitive emissions monitoring at the Prentiss plant and voluntarily initiated repairs for leaks of ethylene oxide and other substances. Husky Energy is performing compressor testing and performing emission estimation modeling.

NOVA Chemicals Corporation has a longstanding and robust fugitive emissions program. NOVA Chemicals Corporation is working towards reducing oxides of nitrogen (NOx) emissions from existing equipment and has completed the refurbishment of five furnaces. NOVA Chemicals Corporation is proceeding with phase 2 of their furnace refurbishment project, which will include refurbishment of another four furnaces.

ATCO completed a partial (50%) coal-to-gas conversion at Unit 4 at Battle River Facility. The increased use of natural gas, as a substitute for coal, results in significantly fewer emissions of $PM_{2.5}$ and other precursor gasses that may form $PM_{2.5}$.

Figure 6: Ethylene cracking furnaces and flare stacks at NOVA Chemicals Corporation's Joffre Facility. NOVA Chemicals Corporation are refurbishing some ethylene cracking furnaces to reduce NO_x emissions.

Government of Alberta

Alberta Environment and Parks is in the process of implementing the Industrial Air Emissions Management Program (IAEMP) that will manage emissions of $PM_{2.5}$ and its precursors among major industrial emitters in the Red Deer Air Quality Management Area. Alberta Environment and Parks continues to work with key stakeholders to implement the program. As of the writing of this report, Alberta Environment and Parks has developed an IAEMP information-sharing website for facilities participating in the program. Participants have access to information pertaining to the program as well as tools to assist in information gathering activities that are part of the program.

Objective 2: Investigation

Objective 2 of the response is to continue to use scientific investigation to inform and refine the development of actions to reduce observed $PM_{2.5}$ concentrations. During the development of the response, Alberta Environment and Parks, with the assistance of the Parkland Air Management Zone Technical Working Group, conducted scientific investigations by analyzing historical data in Red Deer to explore the factors influencing the elevated $PM_{2.5}$ concentrations in the region. The science report is a compendium of the shared understanding of the natural and anthropogenic influences affecting $PM_{2.5}$ in Red Deer as of 2016. This investigation provided a better understanding of $PM_{2.5}$ trends in the Red Deer Air Quality Management Area. Please refer to the Red Deer Fine Particulate Matter Response Science Report for more details on the conclusions and recommendations from the investigation.

Since the publication of the science report in 2016, a number of actions associated with investigation have continued involving Alberta Environment and Parks and the Parkland Air Management Zone. The Parkland Airshed Management Zone is the local air quality monitoring provider in the Red Deer Air Quality Management Area, and has played a pivotal role in supporting ongoing investigation actions. In 2016, the Parkland Air Management Zone received two grants from Alberta Environment and Parks, one for additional monitoring to understand $PM_{2.5}$ composition in Red Deer and another to perform photochemical modeling in Central Alberta to understand the sectors contributing to $PM_{2.5}$ formation in Red Deer. The Parkland Air Management Zone published the final photochemical modeling report in 2017 and it continues to support ongoing $PM_{2.5}$ composition monitoring lead by Alberta Environment and Parks. The monitoring of $PM_{2.5}$ composition occurred at three sites in Red Deer and the surrounding area. This includes the now permanent Red Deer Lancaster monitoring station as well as a temporary station at a site upwind of Red Deer, named Horn Hill, which will be decommissioned following the winter of 2019/2020. This project is collecting 24-hour samples every 3 days that are subsequently analyzed to determine the species composition of $PM_{2.5}$.

In fall 2017, Alberta Environment and Parks identified that additional photochemical modeling would be valuable to understand sector contributions to $PM_{2.5}$ throughout the province. In 2018, the department completed the Provincial Air Quality Photochemical Modelling project, with the final report published in January 2019. This project provides additional information on sector-based source apportionment of $PM_{2.5}$ and its precursors. It will help to inform management actions in the province, including the Red Deer Air Quality Management Area.

Alberta Environment and Parks continues to collaborate with partner organizations to advance investigation related management actions. Through work at the Clean Air Strategic Alliance table, investigations into the contributions of non-point sources are moving forward, including projects focussed on agricultural and transportation emissions of $PM_{2.5}$ and its precursors. Current findings specific to agriculture are available in the Primer Alberta Agriculture and Rural Development Non-Point Source Air Quality Management in

Alberta[5]. Alberta Environment and Parks has also facilitated a Clean Air Strategic Alliance-lead project to measure $PM_{2.5}$ and precursor emissions from light and heavy-duty transportation sources at locations across the province, including Red Deer. Alberta Environment and Parks continues to collaborate with other Alberta government departments (e.g. Alberta Health, Alberta Agriculture and Forestry, Alberta Municipal Affairs, Alberta Energy, Alberta Transportation, etc.) on the management of $PM_{2.5}$ in the Red Deer area. Partner organizations, including Alberta Health Services, have formed an air quality committee in the region.

Municipalities represented at the Advisory Committee are leading many individual investigations. Lacombe County has identified potential areas for change around vehicle fuel consumption by completing their initial Standard Operating Procedure Report. The City of Red Deer is tracking and reporting air quality levels annually as part of the Environmental Master Plan. The City of Red Deer is also focused on providing multi-modal opportunities.

As we continue to implement the response, additional actions associated with investigation, including the Red Deer $PM_{2.5}$ species composition-monitoring project, are required to be able to manage emissions from multiple potential sources. Collaboration and support from all stakeholders including those identified by Shell Canada and MEGlobal Canada Inc. to support ongoing science investigations are important to improving the state of knowledge and identifying further actions to reduce $PM_{2.5}$.

Figure 7: Red Deer Lancaster air quality monitoring station, operate by the Parkland Airshed Management Zone.

[5]https://www.casahome.org/uploads/source/PDF/B._Primer_Alberta_Agriculture_and_Rural_Development_Non-Point_Source_Air_Quality_Management_in_Alberta.pdf

Objective 3: Engagement

To manage air quality for the long-term, it is key to have engagement initiatives to ensure the public has the appropriate air literacy to inform choices that reduce $PM_{2.5}$ emissions. Figure 8 shows the pathway to achieve the literacy outcome of the engagement objective. This objective empowers the public and key stakeholders to reduce ambient $PM_{2.5}$ through the promotion of outreach and education on the state of air quality and on how they can take steps as individuals to reduce $PM_{2.5}$ in the Red Deer Air Quality Management Area.

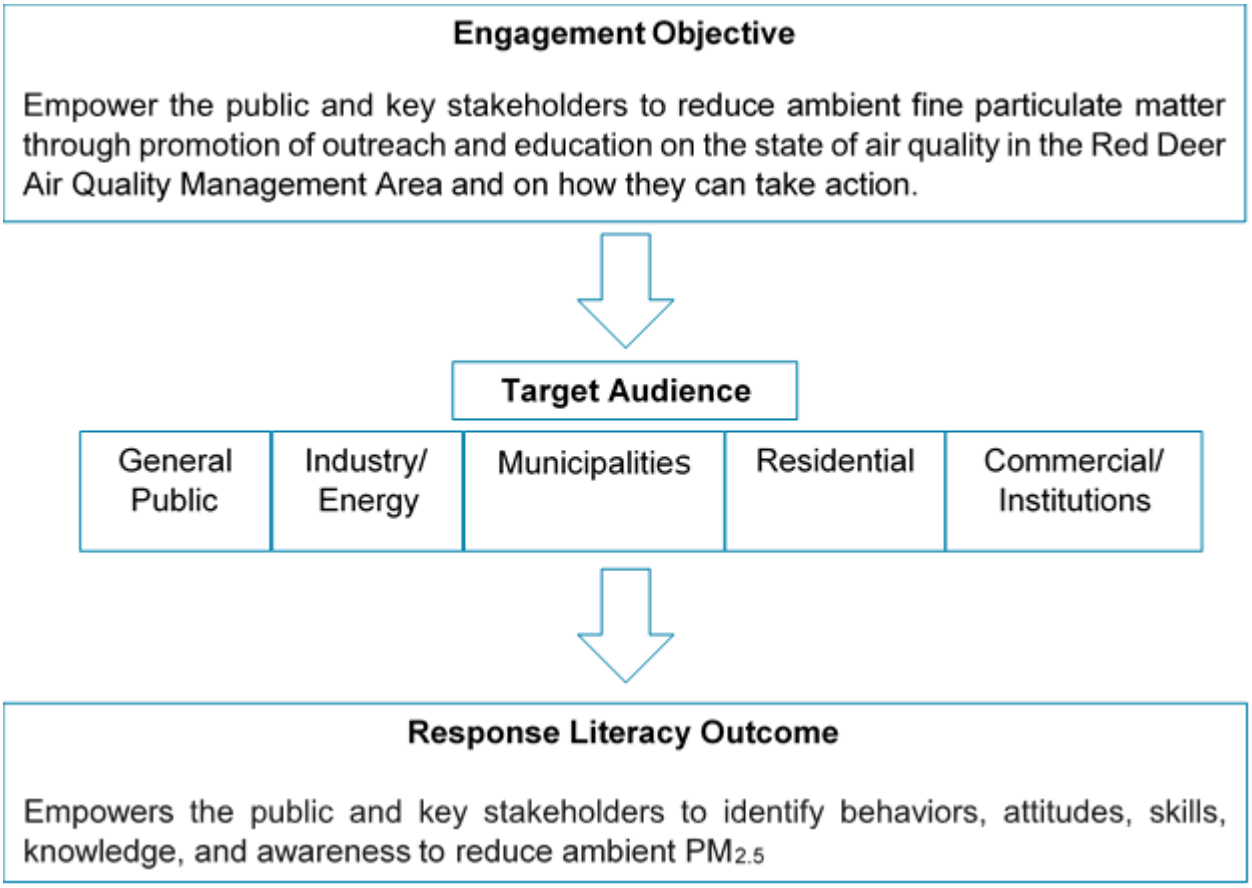

Figure 8: Red Deer $PM_{2.5}$ Engagement Strategy to Provide Air Literacy.

Alberta Environment and Parks is coordinating with stakeholder implemented efforts within the Red Deer Air Quality Management Area. This includes efforts to engage, educate, and perform outreach activities for the public through drafting a shared engagement strategy, which includes long-term visions, obstacles, and strategies to managing air quality in the area. Alberta Environment and Parks has increased engagement and education on air quality issues through a number of strategies, including collaborating with the Parkland Air Management Zone and the Alberta Airsheds Council. The Alberta Airsheds Council received a grant to develop materials about $PM_{2.5}$ for its webpage. Alberta Environment and Parks published blog posts to increase air literacy, and assisted in the launch of a new version of the Air Quality Health Index (AQHI) app. Alberta Health Services made AQHI available on the environmental health website. These efforts highlight the actions that individuals can take to help improve air quality in the air zone. The Parkland Airshed Management Zone and the City of Red Deer are promoting awareness of air quality levels and associated health impact using AQHI alongside municipal idle free toolkit and other educational materials to support

additional learning. A new focus for Alberta Health is to work with municipalities through the Planning and Development Division to develop Health Communities by Design Edge in terms of considering urban sprawl, healthy food, and safe affordable housing. Alberta Health has also created a cancer prevention dashboard as a public education tool for communities, organizations, and strategic care groups. Furthermore, based on recommendations submitted by Alberta Environment and Parks, the Canadian Council of Ministers of the Environment released a guidance document to assist government, municipalities and Aboriginal communities with their response to air-quality problems associated with open-air burning.

The municipalities of Lacombe County and Red Deer County have each implemented different education programs about different air quality topics. Lacombe County has completed the first phase of idle-reduction programming for councillors, staff, and the community and is currently developing a new education program targeting energy consumption. In February 2018, Lacombe County completed a Climate Resilience Action Plan Workshop. Red Deer County published articles in the county news and social media outreach highlighting the pathways of $PM_{2.5}$. The City of Red Deer piloted Clean Air Responsible Schools program in five classes to help students understand and take action on local air quality issues and is now offering air quality education presentations to local classrooms. The City of Red Deer also engaged with the community by meeting at schools to reward drivers for not idling and by celebrating the Commuter Challenge, which introduces alternative modes of transportation. Thirty-eight schools in Red Deer have committed to being idle-free, and have received signs, presentations and teacher's manuals to help them. Shell Canada and MEGlobal Canada Inc. are participating in industrial sector engagement by continually updating and sharing a list of improvements implemented by the industry that affect $PM_{2.5}$ concentrations. To help promote awareness, NOVA Chemicals Corporation has engaged their leadership, and incorporated $PM_{2.5}$ concentrations in the region into future planning. Additionally they have targeted idling through signs posted throughout the site and regular mentions in their newsletter. NOVA Chemicals Corporation also added a carpooling initiative in addition to emissions reductions for vehicles.

Figure 9: Alberta Environment and Parks employees Rita Stagman (left) and Crystal Parrell (right) at the 2019 Clean Air Day in Red Deer

Anticipating Phase 2 (2020 – 2025)

Implementation of phase 2 of the response will commence in 2020. The goal of phase 2 reflects that the CAAQS for $PM_{2.5}$ become more stringent in 2020: reduce ambient $PM_{2.5}$ concentration and remain below the 2020 CAAQS value within the Red Deer Air Quality Management Area, as measured at the monitoring stations. As the implementation of the response transitions into the next phase, the focus is on continuing current management actions and identifying new management actions. As an example, the Red Deer Advisory Committee has recently updated their terms of reference to reflect the management of key contaminants of concern, including $PM_{2.5}$, ground-level ozone (O_3), nitrogen dioxide (NO_2), and sulphur dioxide (SO_2). Additionally, reflection on and evaluation of phase 1 actions will inform areas of improvement for phase 2 implementation. Where management actions pledged in phase 1 remain, they will be refined, and where possible, expanded based upon new information in phase 2.

Monitoring of ambient data will be a key focus going forward. Assessment of the ambient monitoring data will continue to be a priority during implementation. In addition, results from ongoing monitoring and modelling investigations, (e.g. $PM_{2.5}$ species composition monitoring) will continue to be shared and evaluated to ensure up to date information is used to evaluate management actions and identify additional management actions as necessary.

Alberta Environment and Parks will continue to develop and implement an engagement strategy in the Red Deer Air Quality Management Area to educate the public and provide opportunities for the public to work towards reducing $PM_{2.5}$.

For the remainder of phase 1, the municipalities will continue to expand transportation related initiatives including greening of fleets, idle-free programs, construction of multi-use pathways, and regional transit. Energy use reduction strategies will include the efficient use of energy, adoption of green power, LED conversion of streetlights, and waste to energy projects. Industrial partners will continue Leak Detection and Repair programs and projects related to specific NO_x reductions. Alberta Environment and Parks will continue to use the existing *Environmental Protection and Enhancement Act* approval process to manage large-scale industrial facilities. Alberta Environment and Parks will also continue to seek new and extended policy tools and collaborative approaches to manage the cumulative emissions of Code of Practice and non-registrant industrial facilities. Alberta Environment and Parks will also begin the management phase of IAEMP, which includes identifying and implementing emission reductions. The management of NO_x emissions through IAEMP will include wide-ranging consultation within the Government of Alberta and with the participating facilities.

Alberta Environment and Parks and the Advisory Committee aim to identify new opportunities to share information with external audiences and support management initiatives to improve air quality. Programs involving public participation related to anti-idling initiatives, idle free school zones, energy efficiency and reduction, and the health impacts of poor air quality, will continue to be developed and implemented during the phase 2 implementation of the response.

National and Provincial Initiatives

Air management is a complex and adaptive process that involves collaborative approaches with all stakeholders. This report acknowledges that there are many other initiatives for knowledge sharing, alignment and collaboration purposes. This report highlights some of such initiatives in the following sub-sections.

National Air Quality Management System

In October 2012, the Canadian Council of Ministers of Environment (CCME) established the Canadian Ambient Air Quality Standards (CAAQS) as objectives under the *Canadian Environmental Protection Act* 1999. Canadian provinces and territories, with the exception of Quebec, agreed to implement a comprehensive approach for reducing air pollution in Canada. The national Air Quality Management System (AQMS) includes adopting human health-based CAAQS for $PM_{2.5}$, O_3, SO_2 and NO_2 to drive regional and provincial air quality management, improved intergovernmental collaboration to reduce emissions from the transportation sector, and industrial emission requirements that set a base level of performance for major industries in Canada.

The CAAQS are a key driver for air quality management in the Red Deer Air Quality Management Area. The CCME has developed standards for NO_2, SO_2, $PM_{2.5}$, and ozone. The CAAQS for ozone and $PM_{2.5}$ are already in effect and will become more stringent in 2020. It is likely that the 2020 CAAQS will result in the Red Deer Air Quality Management Area remaining assigned to the Orange management level for $PM_{2.5}$. It is essential to continue implementing existing management actions and develop proactive management actions to ensure that the Red Deer Air Quality Management Area does not fail to achieve the CAAQS in the future. Should the Red Deer Air Quality Management Area fail to meet the CAAQS in the future, without the development of management actions by stakeholders, it is possible that the federal government could impose *Canadian Environmental Protection Act* enabled actions in the region.

Red Deer Region Air Zone Canadian Ambient Air Quality Standards Response - Government of Alberta Action Plan

The Government of Alberta released in September 2017 the Red Deer Air Zone CAAQS Response - Government of Alberta Action Plan[6] highlighting the steps the Government of Alberta plans to take to meet the CAAQS in Red Deer Air Zone. In the plan, the Government of Alberta committed to improving air quality in Red Deer Air Zone by committing to implementing regulatory and non-regulatory actions including updates to Alberta Ambient Air Quality Objectives (AAAQOs) for $PM_{2.5}$, O_3, NO_2, and SO_2 to correlate with the CAAQS. Alberta Environment and Parks has started the process of updating the AAAQOs and it is in consultation with key stakeholders to determine the appropriate values for the Objectives. Alberta Environment and Parks is taking additional action on emissions through industrial approvals in Alberta by continuing to apply science informed emissions standards to all the industrial sources in renewal applications that are in air zones at Orange and Red CAAQS management levels.

[6] https://open.alberta.ca/publications/9781460135952

Red Deer Regional Plan

The *Alberta Land Stewardship Act* authorizes the Government of Alberta to establish planning regions and adopt a statutory plan for each region. Regional planning in Alberta plays an important role in coordinating provincial policies at the regional level. The Red Deer Regional Plan is one of the seven land-use framework planning initiatives that will take place under the *Alberta Land Stewardship Act*. The regional planning process for the Red Deer Region is yet to start, and when it does, will take a phased approach that begins with a consultative process with key stakeholders, indigenous peoples and the public. The Red Deer Regional Plan will work to collaboratively manage cumulative effects and reflect the views of residents of Red Deer Region. When the Red Deer Regional Plan is complete, it will provide both public policy direction in areas such as economic diversification or community development, and binding regulation with respect to environmental thresholds around the air, water, and biodiversity. The approach to developing the Red Deer Regional Plan will encourage multi-stakeholder participation to work collaboratively to achieve desired economic, social and environmental goals.

Interim Approach to the Implementation of the Canadian Ambient Air Quality Standards in the Red Deer and North Saskatchewan Air Zones

The Interim Approach to the Implementation of the Canadian Ambient Air Quality Standards in the Red Deer and North Saskatchewan Air Zones[7] (the interim approach) is a collaborative management response process developed by Alberta Environment and Parks to manage the cumulative effects of emission sources on air quality in the Red Deer and North Saskatchewan air zones. The interim approach was developed to ensure a collaborative management response process was in place in the Red Deer and North Saskatchewan air zones prior to the implementation of the 2020 CAAQS.

The interim approach provides context regarding the management of existing activities under specific ambient environmental conditions. It also confirms regional objectives and establishes thresholds for proactive management beneath the CAAQS. The interim approach complements existing policies, legislation, regulations, and management tools. The interim approach incorporates components of the response to ensure it supports the initiatives undertaken in managing $PM_{2.5}$ in the Red Deer Air Quality Management Area, including that it is:

- **Outcomes-focused**: Driven by clearly defined outcomes for the desired quality or state of the air quality now and in the future.
- **Place-based**: It is important to acknowledge sub-regions or areas with denser industrial activity may have varying needs and outcomes and thus there is a need to tailor management to be sensitive to these differences.
- **Knowledge-based**: A sound knowledge base and performance management systems including ongoing investigation and performance evaluation to measure set outcomes and determine what, or if, management actions are required.
- **Adaptive**: The interim approach is intended to adapt to changing social, economic and environmental scenarios and utilizes new information and learnings.
- **Shared Stewardship**: A collaborative process to inform the development of outcomes and build commitment for the shared responsibility of air management to achieve outcomes.

[7] https://open.alberta.ca/dataset/9781460145524

Industrial Air Emissions Management Program (IAEMP)

The Industrial Air Emissions Management Program intends to identify industrial NO_x emission management opportunities at selected facilities in the North Saskatchewan and Red Deer air zones. The focus of the IAEMP is gathering information on existing industrial equipment and pollution abatement controls at facilities in the North Saskatchewan and Red Deer air zones. This information will be compared between facilities, regions and ultimately to those of leading jurisdictions. Management approaches and potential government policy decisions (when applicable) will be determined based on the outcome of these comparisons. The IAEMP focusses on the management of NO_x emitting sources primarily due to NO_x being an important precursor to the formation of $PM_{2.5}$. Management of NO_x emissions is expected to result in decreased formation of $PM_{2.5}$.

Base-level Industrial Emissions Requirement (BLIERs)

As one element of the national Air Quality Management System, Base-Level Industrial Emissions Requirements (BLIERs) represent minimum national standards of environmental performance to be applied consistently cross-country. The Multi-Sector Air Pollutant Regulation issued under the *Canadian Environmental Protection Act* contains the finalized BLIERs to limit air pollutant emissions from non-utility boilers and heaters, reciprocating engines and cement kilns. However, all individual jurisdictions maintain the ability to apply more stringent requirements and are encouraged to do so where practical. This approach is reflected in Alberta's policy entitled "Application and use of the BLIERs within the Alberta Regulatory and Policy System."[8]

The BLIERs are minimum requirements that apply regardless of where industrial sites are located and does not consider any type of local air quality issues. As a result, the application of BLIERs on their own may not achieve the necessary emission reductions to address achievement of the Canadian Ambient Air Quality Standards. Additional provincial and regional initiatives, such as the response, are required for ongoing management of air quality in stressed airsheds.

Clean Air Strategic Alliance (CASA) Project on Non-Point Sources

The Clean Air Strategic Alliance (CASA) is a multi-stakeholder partnership composed of representatives from industry, government, and non-government organizations committed to a comprehensive air quality management system for Alberta. For over 20 years, CASA has used consensus-based negotiation to develop tools and resources to help improve air quality for all Albertans. In 2018, CASA published a suite of recommendations for management actions on several non-point sources contributing to ambient $PM_{2.5}$ and ozone concentrations in air zones at the orange or red management level in Alberta (including Red Deer). Based on one of the CASA recommendations, a roadside vehicle emissions testing study is planned for 2019; the vehicle emissions data collected and analysed through this study (CASA "ROVER III Project") are to help inform actions to reduce emissions from the transportation sector, which is one of the largest emission sources both in urban areas and Alberta as a whole.

[8] https://open.alberta.ca/publications/9781460112519

CASA Electricity Framework

Under the CASA Electricity Framework, when a coal-fired Electrical Generating Units (EGU) reaches its end-of-design life, the proponents will adopt a more stringent requirement in developing a new unit. This initiative has resulted in the conversion of coal to natural gas in several of the EGUs in the province. Similarly, the EGUs represented in the Advisory Committee have initiated the process of converting from coal to natural gas. The transition from coal to natural gas has a co-benefit in managing air quality. There will be a reduction in the emission of pollutants as electricity generation transitions to natural gas and renewable energy sources.

Red Deer Air Quality Advisory Committee Membership

Figure 10: Representative members of the Red Deer Air Quality Advisory Committee

Public Member
Jim Saltvold

Provincial Government
Ehimai Ohiozebau – Alberta Environment and Parks
Kelly Holbein – Alberta Health Services
Kelly Williams – Alberta Environment and Parks (not pictured)
Maxwell Mazur – Alberta Environment and Parks

Municipal Government
Andrew Treu- Red Deer County (not pictured)
Lauren Maris- City of Red Deer
Nancy Hackett- City of Red Deer (not pictured)
Keith Boras- Lacombe County (not pictured)

Industry
Aaron Rognvaldson- Husky Energy (not pictured)
Amit Bhargava- ATCO (not pictured)
Andrea Brack- NOVA Chemicals Corporation (not pictured)
Crissy Handziuk- NOVA Chemicals Corporation
Lyndsey Hunter - Shell Canada
Julie Kos- MEGlobal and Dow Chemical (not pictured)
Jim Hackett- ATCO

Parkland Airshed Management Zone
Kevin Warren

Environmental Non-governmental Organization
Wayne Ungstad

GLOSSARY

Action Level
An action level is one of four levels of the Interim Approach to Implementing the Canadian Ambient Air Quality System (CAAQS) in the Red Deer North Saskatchewan Region (RDNSR), 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 to reducing air pollution in Canada. It is the product of unprecedented collaboration by the federal, provincial, and territorial governments and stakeholders.

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 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 (NH_3)
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 approval.

Base-Level Industrial Emissions Requirements (BLIERs)
BLIERs are emissions requirements proposed for new and existing major industrial sectors and some equipment types in Canada. The program is intended to ensure that all significant industrial sources in Canada, regardless of where facilities are located, meet a good base-level of performance. 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 developed the Canadian Ambient Air Quality Standards that are established as objectives under the *Canadian Environmental Protection Act* (1999) and has replaced the existing Canada-wide Standards. These new standards have been developed for particulate matter and ozone first, and will subsequently developed for nitrogen oxides, sulphur dioxide, and volatile organic compounds. All standards, when developed, will set triggers to promote proactive measures to keep clean areas clean and for continuous improvement.

Canada-wide Standards (CWS)
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. The CAAQS have replaced the CWS.

Clean Air Strategic Alliance (CASA)
The Clean Air Strategic Alliance is a 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 extend from the effects of individual activities alone.

Emissions Management Framework for the Alberta Electricity Sector
The Clean Air Strategic Alliance (2003) Emissions Management Framework 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 ($\mu g/m^3$); 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 PM 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 the 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 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
A non-point source is a pollution source that is not recognized to 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. While individual emissions from non-point sources may be relatively small, these sources can have notable cumulative effect.

Ozone (O_3)
Refers to an oxygen compound (O_3) 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 a transfer of the pollutant by diffusion from the air to the monitor's 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 Air Monitoring
Regional air stations are strategically located to represent areas with multiple emission sources.

Secondary Pollutant
A secondary pollutant is one that is formed by atmospheric reactions of a 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 vapors given off at a gasoline station. The organic vapors 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 modeling, which helps in identifying the sources and the extent of 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. 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 (SO_2)
A strong smelling, colorless 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.

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: Comprehensive List of Management Actions Key Stakeholders Committed to in 2016

Pink highlights high priority actions (H) after 3 years of implementation and the progress made to date on all management actions. Orange highlights medium action items (M) and potential next steps on the respective action item. Blue highlights management actions identified as low priority (L). Actions items for which no update was available are not highlighted using any colour. Actions listed in the “new action” column are ne actions not originally included in the response.

Legend	
High Priority	
Medium Priority	
Low Priority	
No update available.	

Lead	Action	New Action	Priority	Progress	Next Steps
Who’s leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
Objective 1 (Action): Identify and develop management actions that can be implemented throughout the year to achieve measurable reductions in ambient fine particulate matter concentrations and precursors.					
Sector: Transportation and Energy					
Strategy: Reduce Fuel Consumption					
Lacombe County	Implement areas of identified change including engagement of Councillor’s and staff, vehicle fuel consumption, facilities, and new initiatives to create improvement.		H	• Idle reduction education program underway and pre and post evaluation completed seeing progress and changes. • Capital changes completed on graders include reducing the ‘automatic’ idle time by changing the computer data. Also changed out grader blades that allow graders to be turned off during changes	Continue to grow the program and see if behavioral changes have been achieved through the program.

				now rather than having to idle for hydraulic reasons. • Written the Standard Operating Procedure for Fleet Vehicles manual that examines what fleet to purchase and why, including using environmental factors in decision making such as emissions testing.	
Sector: Transportation					
Strategy: Reduce Fuel Consumption					
Lacombe County	Evaluate fuel consumption of vehicle and machinery fleet, including identifying energy conservation measures that will help lower the operating costs and decrease the environmental impacts of the fleet.		H	• Idle reduction education program underway and pre and post evaluation completed seeing progress and changes.	Continue to grow the program and see if behavioral changes have been achieved through the program.
Lacombe County	Develop and implement an internal idle reduction program for the County; includes the County vehicles, machinery, Councillors, and staff.		H	• Council and staff Idle reduction education program underway and pre and post evaluation completed to see progress and changes	Continue to grow the program and see if behavioral changes have been achieved through the program.
City of Red Deer	Idle Free program launched in the community, which includes a large range of education		M	• The City has web pages, bumper stickers, decals. • Posted signs at 23 City, commercial and institutional locations throughout the city.	Work with PAMZ on distribution plan for the municipal idle free toolkit.

	materials, marketing, and advertising tools, prompts, and signage posted in key locations in the community. Sign locations include city facilities, recreation and art centers, City Hall, Red Deer College, businesses, churches, and others.			• Completed a brochure for businesses about idling at the drive-through. • City Council chose not to take action in the form of an idle-free bylaw. • Created municipal idle free toolkit in partnership with PAMZ.	
City of Red Deer	Idle Free School program: Education program around the benefits of being an idle-free school. The program includes teachers' manual, school assembly presentation, communications support, and signage (signage is co-sponsored with partner Lafarge Canada).		M	• 38 schools in Red Deer have committed to being idle-free, and have received signs, presentations and teacher's manuals to help them. • Piloted Clean Air Responsible Schools (CARS) program in 5 classes to help students understand and take action on local air quality issues. • Now offering classroom presentation on air quality (elementary level).	Continue to reach out to schools.
City of Red Deer	Greening the Fleet Strategy for the City of Red Deer.		L	• Council approved the conversion of the bus fleet to Compressed Natural Gas (CNG). • The *Idling Gets You Nowhere* campaign was relaunched to reduce vehicle idling among City staff. • Smart Driver Training is being given to all new and recertifying drivers of fleet	• Implement metrics to track progress on idling and define goals. • Install anti-idling devices and GPS. • Develop vehicle right-typing policy, as well as policy to

				vehicles that includes driving to be fuel efficient • The City purchased a zero-emissions Electric Vehicle to add to the fleet. • 17 CNG buses started operating in July 2017. • 27 out of 62 (44%) conventional buses and 6 out of 24 (25%) paratransit buses are now CNG fueled instead of diesel.	the right size (pool) the fleet.
Alberta Health Services (AHS)	Anti-idling signs are posted at drop-off locations at Red Deer Regional Hospital (completed). This example could be extended to other AHS buildings in the Red Deer area/region (proposed).			No update available.	No update available.
Lacombe County	Design and construction of multi-use trails within rural areas, allowing connection to adjoining municipalities.		H	• Completed design and seeking funding opportunities.	Building of trail
AEP		Maintain cross-ministry alignment on managing transportation emissions.	L	AEP staff participate in various provincial and national level working groups (e.g. CCME Mobile Source Working Group, CASA, etc.) which are exploring management options for transportation-related emissions.	TBD
AEP		Explore the opportunity to reduce emissions through procurement	L	AEP has taken initial steps to understand potential fuel cost savings and emissions reductions as a result of using more fuel-efficient vehicles.	Draft a greening fleet proposal and guideline for use in Red Deer North Saskatchewan Region and for potential

		and use of vehicles as part of the Greening Government Strategy.			adoption in other areas of AEP.
Strategy: Reduce Emissions with Proper Vehicle Management, Maintenance, and Technology					
Lacombe County	Lacombe County and Sylvan Lake have started pilot projects to reduce idling times to reduce health and environmental effects. Throughout the project, PAMZ will document and evaluate the process and use the learnings to develop an idle reduction tool kit that other municipalities can use in central Alberta.		H	• Idle reduction education program underway and pre and post evaluation completed to see progress and changes.	Continue to grow the program and see if behavioral changes have been achieved through the program.
City of Red Deer	The City of Red Deer adopted and is implementing a greening the fleet strategy for corporate vehicles. Red Deer also has a corporate idle-free policy for the fleet.		M	• Finalizing the Corporate fleet policy to formalize how the City addresses these issues. • The City relaunched the Idling Gets You Nowhere campaign among City staff. • All new and recertifying drivers of fleet vehicles go through Smart Driver Training that includes driving to be fuel-efficient. • Zero emissions Electric Vehicle added to the fleet and circulating through departments with a positive response. • Started a pilot program where specific equipment will be pool resourced and	• Review idling data from GPS devices. • Incorporate vehicle right-typing policy and as well as policy to the right size (pool) the fleet into corporate fleet policy.

				made available for City operations with a positive response.	
Red Deer County	Dust Control Incentive Program offers a cost-share incentive program to County residents for the purchase and application of dust abatement in front of their residence.		H	• Established a dust control program	Ongoing program monitoring.
Red Deer County	Improve fleet maintenance through an Integrated Asset Management Plan.		L	• Not yet started	Fleet maintenance will be a part of Asset Management which is in early development.
Various Municipalities	Regional transit services: "BOLT" regional transit service launched as a partnership with Lacombe, Blackfalds, and The City of Red Deer. Regional Transit service between Red Deer County and the City of Red Deer successfully operating.		H	• BOLT transit to Blackfalds and Lacombe is operating. • Regional service to Springbrook/Gasoline Alley is operating.	• Continued operation in coordination with Lacombe's Burman University making annual transit pass available and restructuring service to better suit the needs of students and commuters. • In talks to expand service in Red Deer County to Penhold and Innisfail thanks to the GoA announcement to pilot transit expansion in rural regions • Continue to operate regional transit services and hold

					discussions with regional partners regarding expansion.
Lacombe County	Fleet has practical idling procedures in place, while not negatively affecting operational efficiencies; vehicle replacement ensures current advanced emissions systems and technology and ensures maintenance programs are current.			• No update available.	No update available.
Lacombe County	The use of plug-in interior vehicle warmers in Lacombe County vehicles could be explored and introduced			• Trialed with Lacombe County staff but did not prove to be useful	Complete
Lacombe County	Could consider writing key elements/requirements into Request For Proposals and Request For Tender for projects provided they are consistent with internal trade agreements and Alberta Purchasing Connection.		M	Written the Standard Operating Procedure (SOP) for Fleet Vehicles manual that examines what fleet to purchase and why, including using environmental factors in decision making such as emissions testing.	To be completed – Senior Management reviewing SOP report.
Strategy: Create Environment that Encourages Alternative Modes of Transportation					

Lacombe County	Design and construction of multi-use trails within rural areas, allowing connection to adjoining municipalities.		H	Design is being completed and funding is being sought.	To build a trail when funding is available.
Lacombe County	Almost all development is low density and does not provide an opportunity to consider public transportation. Currently cooperating with urban centers to provide transportation related to special needs.			No update available.	No update available.
City of Red Deer	Installation, maintenance, and planning for extensive trail system including walking and biking paths.		M	• As the city grows, new trails and pathways are added. • Adding sidewalks and trails to improve walkability.	Ongoing implementation in accordance with the Multimodal Transportation Plan (MTP).
Red Deer County	Construction and maintenance of rural trail system as well as planning for future expansion of trails through open space and concept planning.		M	• Construction complete fall 2017 and the second component is underway.	Red Deer County Council has endorsed 11 kilometers of rural trail system connecting Springbrook to the City of Red Deer. Project is reliant on the approval of funding.
Red Deer County	Work with the City of Red Deer to provide RDT service extensions		M	• Underway.	County to continue work with the City to expand service levels to

	to Gasoline Alley and the Hamlet of Springbrook.				Springbrook and Gasoline Alley
Red Deer County	Continued investigation in the area of waste-to-energy technologies to reduce our need to transport solid waste to a landfill outside of the County.		L	• The ongoing effort to reduce kilometers traveled hauling waste to landfills.	Red Deer County is continuously looking at technologies and opportunities to reduce its reliance on landfill, and reducing the total amount of kilometers traveled to dispose of its solid waste.
City of Red Deer	City of Red Deer providing and considering new transit programs to improve rider services, such as Google Maps and allowing pets on buses. Also, to reduce the impact by purchasing right-sized buses.		H	• In July 2018 kicked off testing of new intelligent transit features: stop announcements, passenger counting, enhanced security. • Allowed small dogs and cats on board in handheld crates that can fit in the passenger's lap. • Free trip planning tool using Google Maps. • Bike and Ride program allows passengers to bring their bicycles on their Transit trips. • Books on the Bus provides mini-libraries on buses so riders can help themselves to free books. • Wifi on all buses.	• Implement system-wide intelligent transit features on all transit buses in November 2018, including access to real-time transit information. Data gathered will be used to strengthen transit system based on user needs. • All buses will be tracked live using GPS, with an interactive website and forward facing app for customer use. • Finalize LED wayside signage installed at 9 key bus stops to announce real-time transit information. • Complete upgrade of 30 bus stops: new

					larger shelters with LED lighting and push-button electric heating below certain temperatures at key locations.
AEP	Provide support and guidance to assist municipalities when making decisions on land-use planning for improved environmental outcomes.		H	• CASA Recommendations to Reduce Non-point Source Air Emissions in Alberta 15A: Develop Land-use planning protocols to support air quality outcomes.	• Follow-up on implementation.
Red Deer County		Purchase replacement Compressed Natural Gas bus in 2016	H	Complete in 2017.	
Sector: Energy					
Strategy: Reduce Energy Consumption					
Lacombe County	Evaluate the energy consumption of facilities, including identifying energy conservation measures that will help lower the operating costs and decrease the environmental impacts of the buildings.		H	• Completed Audit of both County office and shop building as well as made capital changes to lighting and heating where appropriate.	• Continue to monitor the situation and look for new opportunities for improvement.

Lacombe County	Consider alternative energy sources (solar power) during the design and construction of two remote shops. Based on the experience gained, solar power may be expanded to other facilities.		H	• Designs have been approved for solar panels on two remote shops. The shops are being currently built.	• Provide some education to staff and Councillors regarding the merits of solar consumption.
City of Red Deer	LED traffic light and street light replacement program.		H	• Citywide replacement program complete by 2018. • New neighbourhoods' street lighting is LED.	• Ongoing use of LED in new neighborhoods.
City of Red Deer	Increase Green Power for corporate building as well as working with the community to increase community awareness of green power alternatives.		H	• Solar installation on Sorensen Station as part of Alberta Municipal Solar Program. • Refreshed home conservation toolkits in Red Deer Public Library to help residents identify opportunities to improve energy efficiency. • Added second FLIR thermal imaging camera to detect energy loss in the home. • Ongoing implementation of the Corporate GHG Emissions Inventory and Plan for increased energy efficiency.	• Recommendations for action in Community Energy and Emissions Plan and Environmental Master Plan for renewable energy strategy
Lacombe County	For internal purchases, will continue to look at energy efficiency when purchasing equipment and vehicles.		M	• Not yet started	• Examine green procurement strategies
Lacombe County	Can amend standards and specifications to require any new		L	• Not yet started	

	generator being proposed as part of a communal water/wastewater facility to be natural gas generated.				
Lacombe County	LED Street Light Replacement Program.		L	Not yet started	
Red Deer County	Amendment made to Red Deer County Land-use Bylaw to allow for green energy development.		M	• Conducted building energy audit in 2016.	Funding for upgrades and retrofits will be pursued through the Municipal Climate Change Action Center (MCCAC). Current seeking vendors to perform a building energy audit.
Sector: Industrial					
Strategy: Ensure facilities meet regulatory requirements for fine particulate matter emissions					
AEP	Develop and deliver an Industrial Air Emissions Management Program focusing on EPEA approval holders in the Red Deer and Capital Region area to manage and reduce emissions for fine particulate matter and its precursors.		H	• In September 2019, notification letters were sent from AEP facilities identified as participating in the program • AEP held a webinar on January 29, 2019, to provide context and background information about the program to participants. Participants had the opportunity to ask questions and get clarification on aspects of the program. • AEP released the TalkAEP information portal, as well as the IAEMP survey to participants on January 31, 2019. • AEP is working with a volunteer facility to determine timelines for completion. Once determined, AEP will communicate a due date for completing the survey to participants.	• Determine a timeline for participants to complete the survey. • Draft the Air Emissions Management Program. • Evaluate data obtained from the survey in order to understand potential management needs. • Design a management strategy to manage NO_x emissions where needed.

Alberta Energy Regulator	The Alberta Energy Regulator regulates upstream oil and gas facilities within the Red Deer Air Quality Management Area; where these facilities are known to emit NOx, SO2, and VOCs. There are currently no new AER initiatives to manage these substances in the RD Air Quality Management Area but the AER remains committed in existing and applicable regulations. Existing requirements, such as Directive 060 are already in place.		H	• Ongoing quarterly meetings with AEP to discuss the implementation of the Response and other programs in the region.	• Continue quarterly meetings with AEP.
NOVA	Reducing NOx emissions from existing equipment. Major capital expenditures provide the most efficient opportunity to upgrade emission controls and will reduce emission intensity. These opportunities are tied to capital		H	• The Ethylene Two Furnace Refurbishment Project Phase One has effectively reduced NOx emissions for five furnaces. • Phase One is now complete.	• NOVA Chemicals is proceeding with Phase Two of the Furnace Refurbishment Project, which will include refurbishment of another four furnaces in Ethylene Two. • NOVA Chemicals is pursuing

	stock turnover timing and major expansions. Will continue to look at ways to minimize emissions from owned facilities.				investigations into projects for further NOx reductions.
Lacombe County	Will continue to look at ways to minimize emissions from owned facilities.			No update available.	No update available.
AEP		Review NPRI data to determine non-EPEA registrants that could potentially	L	• AEP has notified some non-EPEA registrants' facilities to participate in relevant programs in the region. • Education input can be incorporated into the engagement strategy	• Determine the cumulative emissions of non-EPEA approval holders.
Lead Industry	Annual Leak Detection and Repair Program for Fugitive Emissions. Lead industries have a longstanding fugitive emissions control program. The lead industry is defined as the industry responsible for reporting back on the committed management action. At the Advisory Committee table, this currently	H		• Shell has a robust LDAR program in place for the Caroline Gas Plant. The plan follows the Canadian Association of Petroleum Producers (CAPP) Best Management Practice (BMP) for Fugitive Emissions Management. • Shell also participated in the CAPP Methane Task Team, which provided technical reviews and input to support new Directive 60 LDAR regulation development. • During the 2018 plant turnaround Shell repaired several steam leaks resulting in a reduction of NOX and SOX emissions, as well as fuel gas usage.	• Continue program execution. • Modify the program upon release of regulation.

	although subject to change, includes Husky Energy, Shell Canada, NOVA Chemical ULC, MEGlobal Canada Inc.				
				• NOVA Chemicals has a longstanding robust fugitive emissions program.	• Continue program execution.
				• MEGlobal is conducting Fugitive Emissions Monitoring at the Prentiss Plant as prescribed by the Canadian Council of Ministers of the Environment (CCME) Code of Practice for the Measurement and Control of Volatile Organic Compound (VOC) Emissions from Equipment Leaks. • All accessible sources were subject to monitoring. In 2015, the Leak Rate for the overall site was 0.57%, which is within the CCME guideline of 2%. Overall VOC fugitive emissions as defined by the CCME Code of Practice for 2015 were within the historical range. • In 2015, repairs were voluntarily initiated for all leaks in excess of 1,000 ppmv, except for those in ethylene oxide service where the repairs were initiated at 500 ppmv.	• Monitoring for the MEGlobal P1 Production Unit and MEGlobal P2 Production unit will continue to be conducted annually. • The LP7 Production Unit will continue to be monitored semi-annually. Applicable compressor seals will be monitored quarterly. • The site continues to commit a fulltime resource to the fugitive emission program through a contract vendor. This fulltime contractor manages all work within the fugitive emissions program and allows for continued improvements due to shorter cycle times and consistency in monitoring.

					• The site continues to use a lower leak definition for initiating repair of components, and equipment integrity improvements set at 1,000 ppm for all VOCs except for ethylene oxide which is set at 500 ppm compared to the CCME leak definition of 10,000 ppm.
				• ATCO has a longstanding fugitive emissions control program.	• Continue program execution.
				• Husky Energy is performing compressor testing. The previous modeling overestimated emissions, therefore re-estimating emission modeling based on new information. Also looking at fugitive emissions.	• Continue program execution.
ATCO		Reducing NOX emissions from existing equipment.	H	• 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. • Completed a partial (50%) coal-to-gas conversion at Unit 4 at Battle River Facility. The increased use of natural gas as a substitute for coal results in significantly fewer emissions including $PM_{2.5}$, SO_2, NO_x. • ATCO Power has received the AUC Approval to convert Battle River Unit 5 from coal-fueled to natural gas-fueled and allow for additional natural gas as a supplemental fuel in Unit 3 and Unit 4.	Continue program execution.

				However, the timing for conversions is dependent upon receiving firm gas supply and is to be determined.	
Sector: Residential					
Strategy: Reduce fine particulate matter emissions and precursors					
Alberta Health Services AEP	Alberta Health Services (AHS) and AEP to collaborate and develop specific messaging for when air quality advisories are issued to encourage public action. Part of developing specific messaging can be informed by the current work to analyze and draw draft findings around fine particulate matter events and health impacts to Albertans.		M	• AEP to work with Alberta Health and AGS to develop staged messages for the Health Advisory Board for when air quality advisories are issued during the wintertime. Staged messages include information about temperature inversions and suggestions for how the public can help reduce pollution. • AHS has a memo to use in Alberta schools upon issuance of an advisory. • AHS has a dashboard on the environmental health website that is able to link the air quality (both overall air quality health index and 5 major components – SO_2, NO_2, $PM_{2.5}$, O_3, and outdoor temperature) with respiratory symptom events in the emergency department and health-link calls across Alberta. Maximum, minimum, and average aggregations are reported.	AHS to provide an update on the dashboard.
AEP	During high AQHI days driven by fine particulate matter. AEP will work with municipalities to address burning. Part of this initiative will heavily focus on education to inform the public about the effect and impact of wood fire/garbage/yard		L	Shared the following document with Red Deer AC members: CCME released a guidance document to assist government, municipalities, and Aboriginal communities with their response to air quality problems associated with open-air burning. The tools and information in the Guidance Document have been designed to enhance local air management programs by providing: best practices to help ensure open-air burning activities are regulated or conducted in a responsible manner and to	TBD

	waste burning on air quality. Additional initiatives can include: • Wood burning complaint forms. • Free yard waste pick up during spring, summer, and fall. • Brushing and chipping program to decrease burning.			minimize potential adverse human health and environmental impacts; and, regulatory elements for the creation of municipal by-laws, or where needed, provincial/territorial regulations. http://www.ccme.ca/en/resources/air/wood_burning.html?	
Lacombe County	Can consider a guideline for southern exposure as part of the MDP review. Lacombe County does not have the expertise to develop guidelines and best practices for construction and renovation of homes, however, can facilitate the dissemination of information available through the industry.			No update available.	No update available.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
Objective 2 (Investigation): Continue to improve knowledge of fine particulate matter in the Red Deer Air Quality Management Area. Improvement in knowledge can inform the cause of the exceedances and provide insight into better managing the issue.					
All Sectors					
Strategy: Monitoring and Data					
City of Red Deer Parkland Airshed Management Zone	City of Red Deer partners with PAMZ to host monitoring stations at two permanent locations within city limits and regularly reviews and shares data.		L	• Second permanent, Red Deer Lancaster, station fully approved, operational and in compliance with all applicable Air Monitoring directive requirements.	The City of Red Deer and PAMZ continue to collaborate to enhance monitoring.
City of Red Deer	Track and report annually to City Council and public on PM2.5 and other pollutant levels as part of the City of Red Deer's Environmental Master Plan annual reports.		H	• Report pollutant levels as part of the Environmental Master Plan annual reporting.	• Ongoing annual reporting. • Awaiting 2015-2017 official results from AEP on $PM_{2.5}$ and ozone.
Red Deer County	Review programs and initiative being done by other neighboring municipalities		L	Not yet started	TBD

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks

Parkland Airshed Management Zone
 	
Alberta Environment and Parks through Environmental Monitoring, Evaluation and Division (EMSD)
	Advancing the knowledge of fine particulate matter and its precursors to inform management actions in the Red Deer air quality management area:
	• Increase understanding of the species composition of particulate matter.
	• Broadening the understanding of the spatial and temporal variation of fine particulate matter and its precursors.
	• Continued modeling studies to understand
			H	• Increase understanding of the species composition of particulate matter.
				  ○ AEP in collaboration with PAMZ initiated a monitoring project to understand the species composition of PM2.5 in Red Deer.
				  ○ 24-hour long samples are being taken every three days at three sites in the Red Deer area.
				• Broadening the understanding of the spatial and temporal variation of fine particulate matter and its precursors.
				  ○ As a complement to the specialized monitoring for species composition, monitoring equipment was standardized at all monitoring stations within Red Deer in addition to a third, temporary station, being sited upwind of Red Deer
				• Continued modeling studies to understand the formation, dispersion, and deposition of particulate matter in the region.
				  ○ With the support of a grant from AEP, PAMZ undertook an air quality modeling study in Central Alberta which resulted in sector-based source apportionment. This
					• A PAMZ monitoring network assessment could be part of the revised AQM plan scheduled for completion in 2020
					• Continue to conduct speciation monitoring in Red Deer. It is anticipated that the monitoring study will conclude in Spring 2020.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	the formation, dispersion, and deposition of particulate matter in the region. • Conduct a monitoring network assessment, as required to better design a monitoring program to better understand the sources of fine particulate matter and its precursors. • Investigate other sources of fine particulate matter and its precursors from non-EPEA-approved small businesses			study was subsequently made publically available through PAMZ. ○ AEP undertook a province-wide modeling assessment which resulted in sector-based source apportionment of PM2.5 across the province. This study was novel as it examined a whole calendar year, to align with the need to consider annual average concentrations with CAAQS. The final report is available through OpenAlberta.	

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	and operations. For more information on Alberta's transition to managing to the CAAQS for fine particulate matter, refer here.				
Sector: Transportation and Energy					
Strategy: Understand Impacts					
City of Red Deer	Support carpool promotion programs (for employees, for residents, for customers).		H	• Use the Commuter Challenge in June to promote carpooling. • Carpooling promotions and 6 reserved parking stalls for City of Red Deer staff and visitors at Civic Yards building and 2 at Recreation Centre.	• Commuter Challenge and promotions complete for 2018. • Continue internal promotion of new preferential parking for carpoolers.
City of Red Deer	Integrated Transportation/ Movement Study encouraging public transit and increased multi-use trails.		M	• Engineering focused on providing more multi-modal opportunities: light timing favors pedestrians; studying pedestrian hotspots. • Working with transit to make sure their routes are efficient.	• Ongoing implementation of the Multimodal Transportation Plan. • Integrate into revised Environmental Master Plan.
Lacombe County	Understand Lacombe County's impact		H	• Completed Audit of both County office and shop building.	Completed and implemented some changes. More ideas to

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	on the environment regarding energy consumption; includes energy audits of vehicle fuel consumption, an energy audit of facilities, identification of current best management practices, and Councillor and staff engagement.				be generated from the report.
City of Red Deer	Traffic Light optimization based modeled traffic flow, update the model with real-time data.		M	• Optimized every minute with the existing software system. • New software installed to help side road management. • Continue to implement a corridor at a time. • Installed 2 roundabouts.	Ongoing implementation of the Multimodal Transportation Plan.
Strategy: Identify Areas of Change					
Lacombe County	Identify potential areas for change around vehicle fuel consumption, facilities, best management practices, alternative		M	• Completed initial standard operating procedure report.	Waiting for review by Senior Management.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	energy sources, and engagement of Councillor and staff.				
Red Deer County	Improvements to fleet operations and maintenance by reviewing policy		L	Not yet started	
Red Deer County	Include air quality awareness as part of our tendering packages to promote air quality stewardship with our contractors.		L	Not yet started	
Sector: Small Businesses and Operations					
Strategy: Understand Impacts					
Alberta Environment and Parks	Better understand contributions from small businesses and manufacturing that do not require an Environmental Protection and		L	• AEP started to collect information about businesses in the interested area (Capital Region) that aren't provincially regulated but numerous and a potential source (i.e. construction, manufacturing, mining, quarrying, oil & gas extraction, transportation, and warehousing categories).	TBD

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	Enhancement Act (EPEA) approval to the fine particulate matter issue. This knowledge will inform us of the impact on air quality and help us identify partners and promote collaboration.				
Lacombe County	Assist in the dissemination of information relative to emissions from small businesses			No update available.	No update available.
Lacombe County	Collaborate in the identification of industry and businesses that are large emitters o0f air pollution through the planning and environmental department.			No update available.	No update available.
Alberta Environment and Parks		Investigate the contributions of agricultural emissions to	L	• Currently investigated through the CASA NPS and other GoA initiatives. • Some analysis performs through Provincial Photochemical Modelling.	• Continue to engage in ongoing discussions with

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
		particulate matter and its precursors.			other departments within the GoA. • Review available document including Primer Alberta Agriculture and Rural Development Non-Point Source Air Quality Management.
Sector: Residential					
Strategy: Understand Impacts for Residential					
AHS	Gather statistics on the number of patients that present with respiratory-related illnesses to Red Deer Emergency Department of Health Link calls. Overlap with air quality data.		H	• Established Provincial Air Quality Committee consisting of 2 medical officers of health, manager, supervisors, 3 field inspectors, and AHS communications. • Will cover any issues that deal with air quality and public health.	Ongoing report of AHS Provincial Air Quality Committee.
City of Red Deer	Investigate the development of guidelines or recommended best practices for new construction		H	• Continuing work to reduce energy use and emissions throughout the community, in new and older buildings throughout sectors. • Draft Green Building Policy for The City of Red Deer in progress.	• Complete Community Energy and Emissions Plan to include actions around building efficiency and

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	to address building energy intensity for both new constructions and potentially for the renovation of older buildings as well.				integrate into the Environmental Master Plan. • The GoA Climate Action Plan may address this management action. • Complete corporate Green Building Policy.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
Objective 3 (Engagement): Empower the public and stakeholders to reduce ambient fine particulate matter through the promotion of outreach and education on the state of air quality in the Red Deer air quality management area and on how they can take action.					
All Sectors					
Strategy: Communicate and Promote Responsible Actions to Reduce Fine Particulate Matter Event Days					
Alberta Environment and Parks	AEP will engage with municipalities (i.e. information session to Councils) to inform and provide support for the implementation of the response.		L	• Provides departmental and implementation through the Red Deer Advisory Committee	• AEP to follow-up with municipalities to determine additional ways to provide support.
Alberta Environment and Parks	Use of Air Quality Health Index (AQHI) as a public and health care education communications tool.		M	• The launched a new version of the AQHI Canada App on Clean Air Day 2017.	• Continue the use of the Air Quality Health Index (AQHI) as a public and health care education communications tool.
All	Develop and implement a PM2.5 Education and Engagement Strategy that identifies target audiences, strategies, and outline best practices for each sector.		H	• Draft of the Engagement Strategy, which includes long-term vision, barriers, and strategies completed in 2017. • Alberta Airshed Council received a grant to support the development of particulate matter literacy materials that will be hosted on the AAC webpage to serve as a source and repository for information, education, and engagement materials pertaining to fine particulate matter (PM2.5) and its management in the province.	• Work with the Advisory Committees to implement the Engagement Strategy. • Alberta Airshed Council (AAC) to develop key messages on fine particulate matter management and deliver on an active

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
					engagement campaign. • The PAMZ Communications Committee is currently developing its work plan for 2019 and this will reference a PM2.5 Education and Engagement strategy working with its partners.
AHS	Increase public knowledge about air quality. Have a link to AEP website or specific information on AHS website and information available through Health Link.			No update available.	No update available.
Red Deer County	Educate and raise awareness on PM2.5 through County News, website, and Social Media		H	• Articles in County news. Outreach with social media.	Continued outreach with newspaper and social media. Establish material to add to the county website.
Red Deer County	Become a PAMZ member		H	Complete	Continue to support PAMZ

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
Sector: Transportation					
Strategy: Communicate and Promote Responsible Actions to Reduce Air Emissions					
Lacombe County	Provide Councillors, staffs and the community with education and awareness about idling.		H	Completed Phase 1 of idle reduction programming	New programming to be developed.
City of Red Deer	Engage additional schools into the Idle Free program. There are 16 schools within the City and two in the region that have successfully used the program and been designated as Idle Free. Summer interns are hired to conduct idle free education and observations/audits and research reports.		M	• Summer interns were hired for two years to research, report and intervene on idling behavior in Red Deer. • Friendly interventions held at schools where drivers are rewarded for not idling. • Started a new Clean Air Responsible Schools (CARS) program in 5 classes to help students understand and take action on local air quality issues.	• Continue idling interventions as requested • Expand CARS program • Continue to engage new schools on idle free commitments
City of Red Deer	Recognition and celebration of World Car Free Day aim to reduce car dependency,		M	• Celebrated Commuter Challenge in June 2017 & 2018 instead of WCFD in hopes that it introduces people to alternative modes of transportation earlier in the	• Integrate actions to discourage single occupancy vehicle use into the

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	ultimately reducing air pollution by encouraging residents to leave their car at home and find alternative ways to get around. This has included the City of Red Deer offering free transit services for the entire day as a method to encourage ridership.			year, reducing weather barriers to active/public transportation • Included one day of free transit, a free one-day bike valet storage downtown and a month-long promotion of alternative modes of transportation to the community.	Environmental Master Plan refresh. • Consider at part of Environmental Master Plan revision.
NOVA Chemicals	Facility Idle Free Education Program		L	• NOVA Chemicals encourages employees and contractors to employ idle-free practices at both work and home by installing Idle-Free Site signage in parking areas on the plant site and providing educational information about idling and emissions reduction in the site newsletter.	Ongoing targeted communication through the newsletter.
NOVA Chemicals	NOVA Chemicals uses carpool.ca to allow carpoolers to find carpool partners. Initiatives are held annually to promote carpooling.		L	• NOVA Chemicals encourages employees and contractors to carpool to the worksite. Communications promoting carpooling are also provided in the site newsletter and posters across the site.	Hold initiative to promote carpooling during carpool week in October.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
NOVA Chemicals	Voluntary Vehicle Emission Testing Program – NOVA Chemicals own equipment to test vehicle emissions and supports vehicle emission testing programs for its employees, community, and in partnership with PAMZ in Red Deer. Emission clinics educate people on vehicle maintenance and the impact of their vehicle on the environment		L	• NOVA Chemicals has provided emissions testing days for employees to test both their personal and fleet vehicles.	Continue with participating in opportunities as they arise.
PAMZ	During voluntary vehicle emissions testing events, educate about the impact on air quality from altering a vehicle's air emissions control system. Potential to expand service and education to partners (i.e.		L	• PAMZ has discontinued its vehicle emissions testing program that was previously operated as a partnership with the City of Red Deer and AEP on Clean air day. • PAMZ is currently working with CASA's Rover II Project Team, which will see remote monitoring of vehicles emissions sometime in spring-summer of 2019.	Communications around this program will include linkages to $PM_{2.5}$.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	vehicle dealerships)				
AHS	Education brochures on anti-idling for schools to include at the beginning of year information packages.			No update available.	No update available.
Sector: Energy					
Strategy: Communicate and Promote Responsible Actions to Reduce Air Emissions.					
Lacombe County	Provide Councillors, staff, and the community with education and awareness about energy consumption.			No update available.	No update available.
Sector: Industrial					
Strategy: Report on continuous improvements related to fine particulate matter					
Lead Industry	Share a list of improvements implemented by the industry that impact and manages for fine particulate matter. Update the list periodically. The intent is to give industry the		H	Lead facilities continue to be an active member of the Red Deer Advisory committee and provide quarterly updates.	The lead industry will continue to participate in the upcoming committee and stakeholder meetings as they arise, and provide support to the science investigation work being undertaken by AEP.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
	opportunity to demonstrate continuous improvement and proactive management by publically share what management initiatives have already been implemented				
Sector: Residential/Others					
Strategy: Communicate and Promote Responsible Actions to Reduce Fine Particulate Matter Event Days.					
AHS	Give air quality presentations for health care professionals.			No update available.	No update available.

Lead	Action	New Action	Priority	Progress	Next Steps
Who's leading the action	The action committed to or proposed by the lead(s) in the response	New action or actions adapted following the release of the response	2018 priority level of the actions for the lead organization	Description of work done to date concerning the respective actions	Description of the upcoming & remaining tasks
Additional Action					
Alberta Environment and Parks		Convene a multi-stakeholder communications committee.	H	• The multi-stakeholder communications committee is the Red Deer Advisory Committees.	Ongoing quarterly meeting
Alberta Environment and Parks		Identify opportunities to share information with an external audience (broader stakeholders and the public).	M	• Engaged industrial participants through IAEMP webinars. ○ IAEMP webinar held Jan 29, 2019.	• Broader engagement to be leverage with the potential future engagement sessions related to regional planning • IAEMP webinars planned to continue • Work with AEP community engagement branch to leverage resources and expertise.
City of Red Deer		Review Fire Ban Procedure during poor air quality events.	H	• Formalized the procedure to implement recreational fire bans when air quality is poor. • Fire ban procedure used in August 2018 due to fire risk combined with poor air quality. • Met in October 2018 to review the implementation of the new Fire Ban Procedure. • Participate in PAMZ Communications Committee and $PM_{2.5}$ Advisory Committee	• Participate in PAMZ Communications Committee and PM2.5 Advisory Committee. • Support the GoA Education and Engagement Strategy on this issue as requested.

Appendix B: Growth and Expansion

There has not been a major change in the population of the City of Red Deer since publishing the response. The response identified transportation-related emissions as an important contributor to the formation of $PM_{2.5}$. There has been a slight decrease in vehicle registrations. The impact of the decrease in on-road vehicle registrations may however not be significant enough to influence the level of $PM_{2.5}$ measured at the Red Deer monitoring stations. For example, in 2017, the City of Red Deer had 87,870-vehicle registration. The 2017 vehicle registration was an annual change of -2.10% from the 2016 total vehicle registrations of 89,752. The utility vehicles segment had the largest increase in 2017, increasing 4.44% to 24,351. Red Deer County had 21,107 vehicle registrations in 2017, greatly increasing 20.9% from 17,452 in 2016.[9]

Construction

The science report identified construction activities as a non-point source of $PM_{2.5}$. The following figure shows the volume of construction activity has declined since publishing the response. The value of construction projects indicates an approximate annual value of announced or under construction capital projects above $5 million.

Figures B1 shows the value of major construction projects in the City of Red Deer starting in 2007. The City saw $135.8 million worth of building permits issued in 2017, declining -32.2% from $200.3 million in 2016. The industrial segment had the largest increase in 2016, increasing by 77.8% to $11.5 million[10].

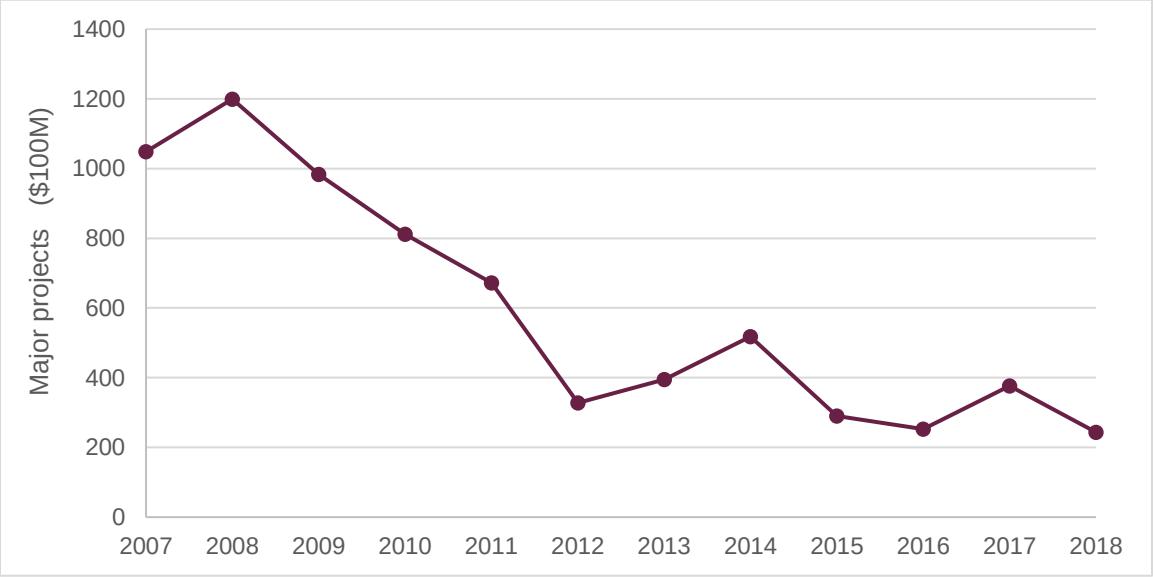

Figure B1: Financial value of major construction projects in the City of Red Deer

The response identified Red Deer Country as the largest source of non-point source of primary $PM_{2.5}$ due to multiple activities, including construction and unpaved roads. Figure B2 highlights how the value of

[9] Alberta Transportation, Office of Traffic Safety, Collision, Vehicle and License Statistics
[10] Adapted from Statistics Canada, Building Permits Survey (custom data request).

major projects in Red Deer County has decreased -3.79% in the last five years. Red Deer County issued 149 building permits in 2017, precipitously declining -29.7% from 212 in 2016. However, Red Deer County saw $56.0 million of building permits issued in 2017, greatly increasing 94.7% from $28.8 million in 2016. The industrial segment had the largest increase over 2016, increasing 240.0% to 17[11].

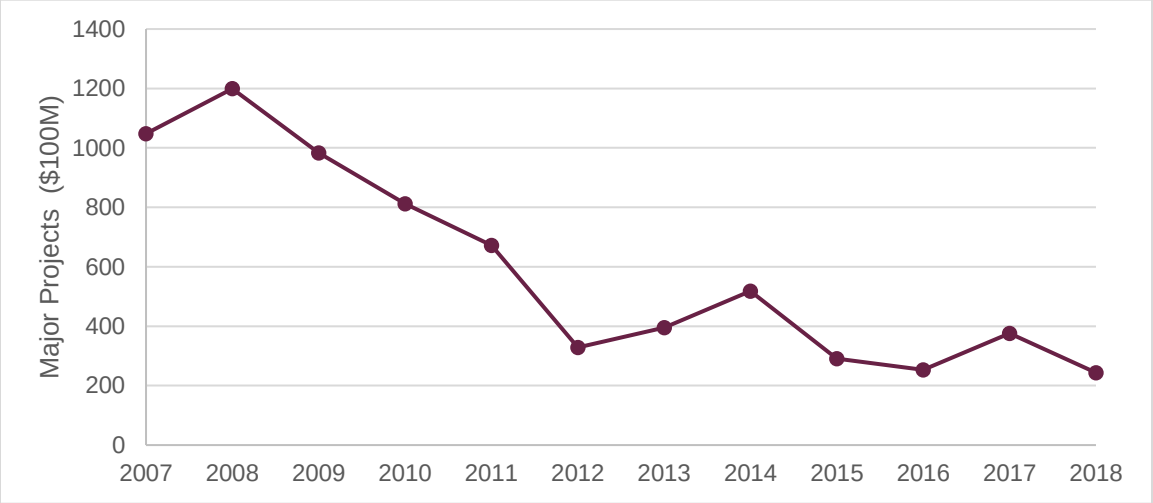

Figure B2: Financial value of major projects in Red Deer County

Lacombe County issued 76 building permits in 2017, increasing 20.6% from 63 in 2016. Figure B3 shows how the industrial segment had the largest increase over last year, increasing to 7. The county saw $28.9 million of building permits issued in 2017, greatly increasing 53.3% from $18.8 million in 2016[12].

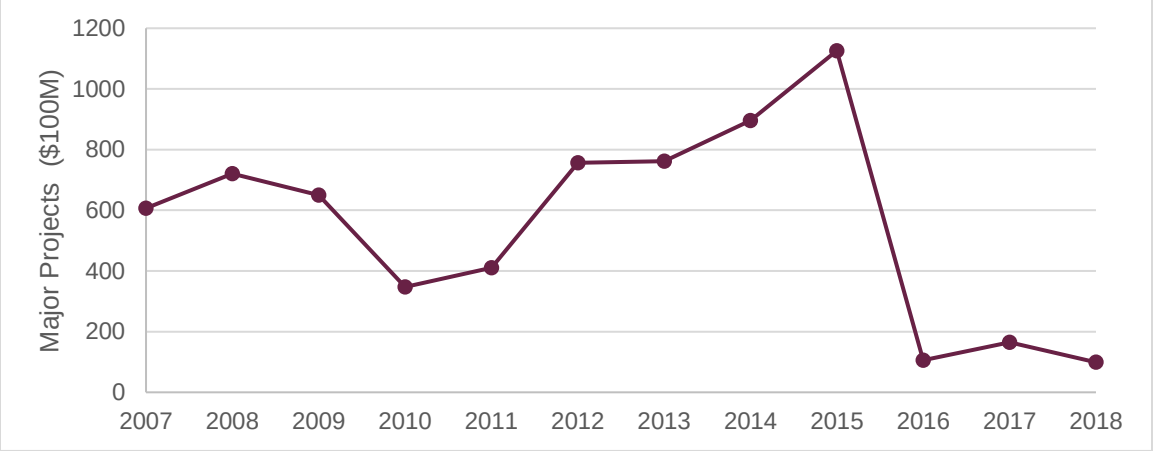

Figure B3: Financial value of major projects in Lacombe County

[11] Adapted from Statistics Canada, Building Permits Survey

[12] Adapted from Statistics Canada, Building Permits Survey (custom data downloaded from regionaldashboard.ca).

Industrial Emissions

There has not been rapid growth in the number of industries reporting emissions since the development of the response in 2016. The charts below show $PM_{2.5}$, NO_2, VOCs, and SO_2 emissions from 2007 onwards. While NO_2 and SO_2 emissions have generally reduced in the past years, $PM_{2.5}$ emissions have plateaued and VOC relatively increased. It is, however, important to state that the overall emissions of $PM_{2.5}$ reported are relatively low. All data are from the National Pollutant Registry Inventory (NPRI) for Census Division 8 (The areas enclosed by Red Deer County, Lacombe County, and Wetaskiwin County).

There has been decreaseing industrial emissions of $PM_{2.5}$ since 2013 (Figure B4).

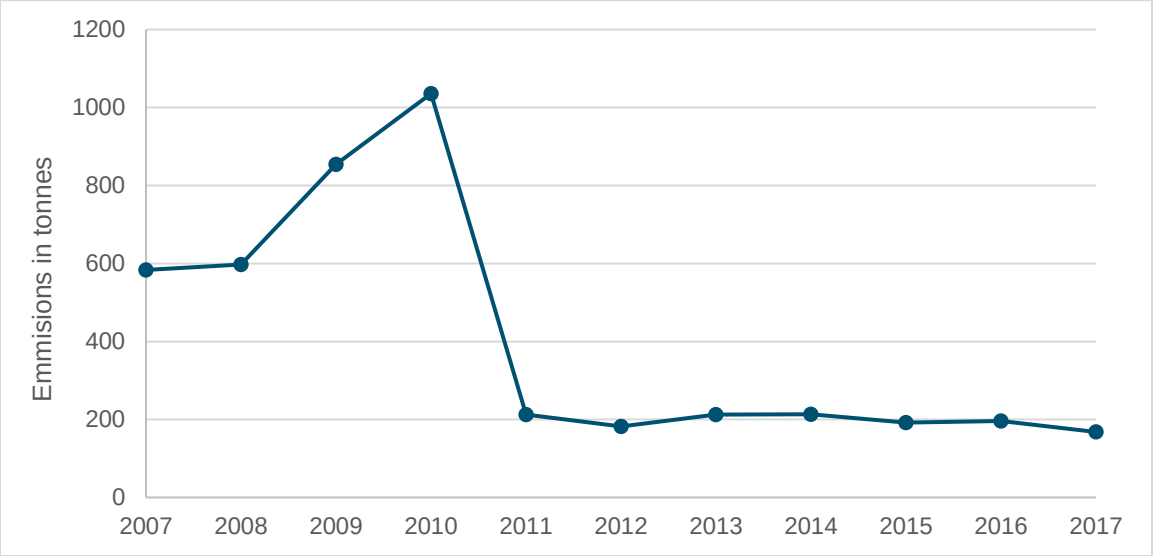

Figure B4: Industrial $PM_{2.5}$ emissions from 2007 to 2017.

Figure B5 shows how there has also been some continuous improvement made by existing facilities over the years to NO_2 emissions.

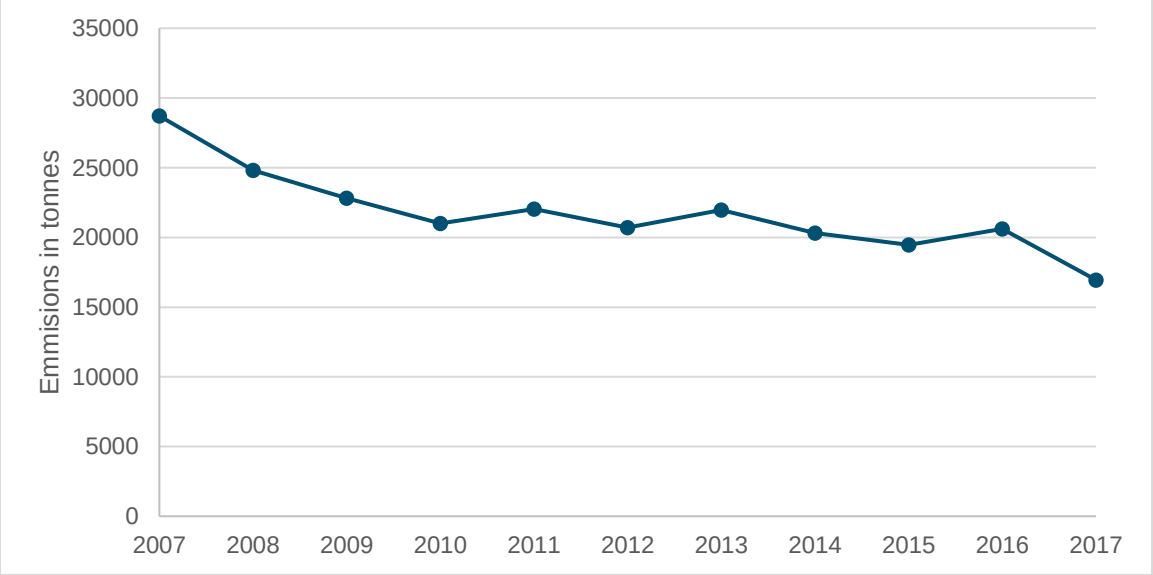

Figure B5: Industrial NOx emissions from 2007 to 2017.

Figure B6 shows how VOC Emissions in Census Division 8 are variable. The year of 2014 was a sharp decrease and thereafter the trend has been shown to increase.

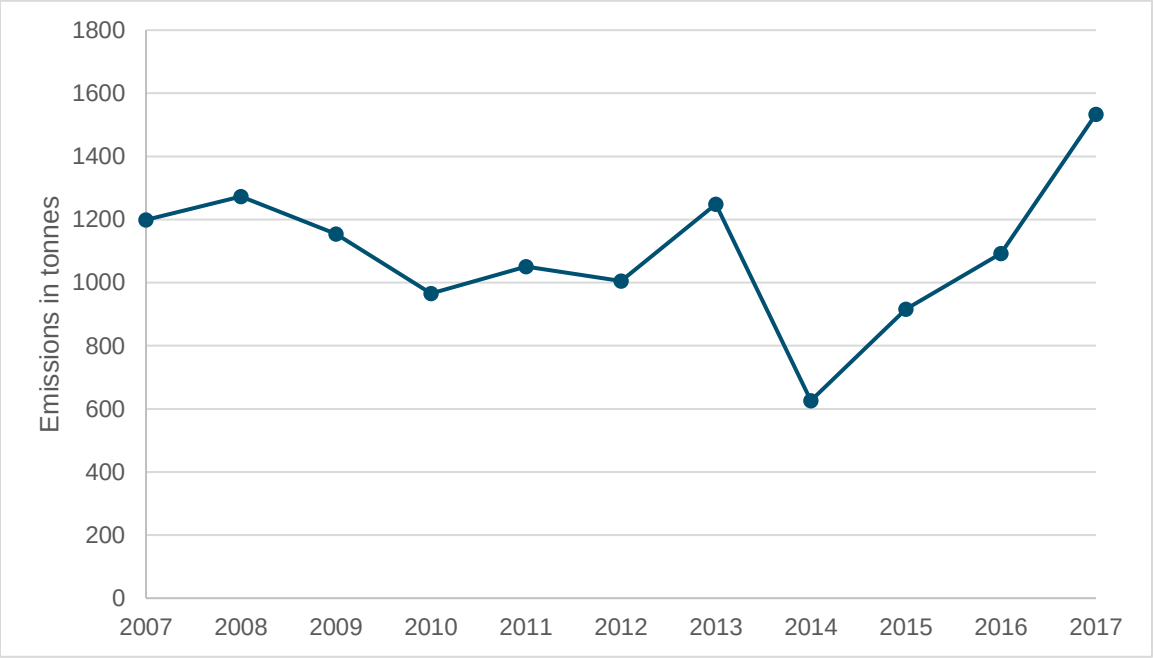

Figure B6: Industrial VOC emissions from 2007 to 2017.

SO_2 emissions have been trending down as of 2014 (Figure B7).

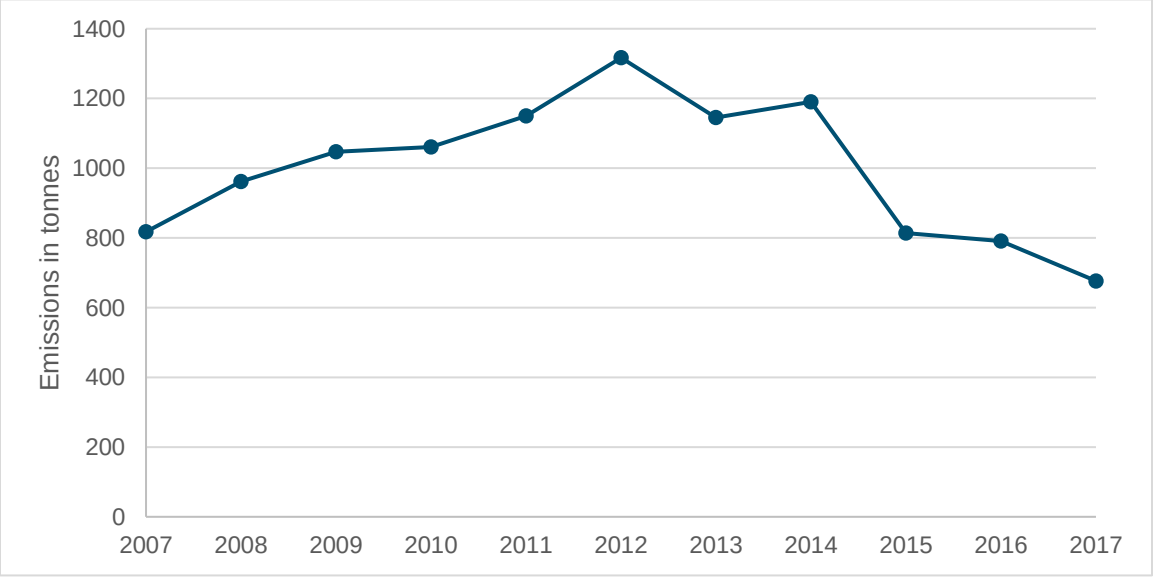

Figure B7: Industrial SO_2 emissions from 2007 to 2017.


Alberta