(PAMZ)

Parkland**Airshed** Management**Zone**

ozone management plan

Parkland Airshed Management Zone (PAMZ)
Ozone Management Plan

Prepared by Stantec Consulting Ltd.

for
Parkland Airshed Management Zone

December 2008

The Parkland Airshed Management Zone (PAMZ) is a multi-stakeholder group established in 1997 to identify air quality concerns within the zone and implement management strategies to address those concerns. PAMZ uses the CASA Comprehensive Air Quality Management System (CAMS) model to guide their decision making process. CAMS is based on shared responsibility and uses a consensus-building collaborative approach. PAMZ agreed to be the coordinating body tasked to develop, maintain and be responsible for an adaptive O_3 management plan which contains performance indicators and will be inclusive of all stakeholder interests in the area. The O_3 Management Plan is a collaborative effort involving input from key stakeholders. PAMZ will submit the O_3 Management Plan to Alberta Environment by the end of 2008.

The PAMZ region generally reports "Good" air quality as measured by Alberta's Air Quality Index (AQI). However, air quality rapidly deteriorates under certain weather conditions which can trap pollutants in the area at ground level. This can lead to periods of poor air quality causing reduced visibility, smog, increased incidences of air quality related health concerns, damage to vegetation, limited outdoor activity and an overall reduction to quality of life for area residents.

According to a recent emissions inventory (AMEC, 2008), the main emissions contributing to poor air quality in the PAMZ region are industrial emissions sources (i.e. the petroleum industry). It is suspected that human activities, such as residential heating and transportation, also contribute to local poor air quality events. Emissions from these sources undergo complex chemical reactions in the atmosphere to form ground level ozone. Projected industrial and residential growth in the region could lead to increased emissions from these sources. For instance, the population of Red Deer grew by over 30% between 2000 and 2007, and the surrounding region also experienced significant growth. The City of Red Deer Population Projections 2007 – 2031 projects a baseline growth scenario of population growth to over 151,182 by 2031.

PAMZ created a multi-stakeholder Ozone Management Committee to develop a terms of reference for a draft O_3 Management Plan. The draft plan was provided to stakeholders at two consultation events in November 2008 to provide opportunity for stakeholder input. The events began with a brief presentation that included background on the development of the O_3 Management Plan and a short introduction to the air quality science and local issues that are creating O_3 exceedances in the region. The attendees were then asked to review and prioritize the draft objectives, actions, steps, indicators and responsibilities. Feedback obtained at these events was incorporated into the final version of the plan where possible.

The PAMZ Board will sign and submit the plan to Alberta Environment on behalf of the PAMZ stakeholders to show commitment to using the plan as an element of the overall airshed management activities.

executive summary

In November 2006, Alberta Environment notified the Parkland Airshed Management Zone that the air quality monitoring stations in the area exceeded the *Management Plan* action trigger (58 ppb) for ozone. The *Management Plan* trigger is an action related to the Clean Air Strategic Alliance (CASA) Particulate Matter and Ozone Management Framework. This framework is based on the Canadian Council of Ministers of the Environment (CCME) Canada Wide Standards (CWS) for particulate matter (PM) and ozone (O_3).

The CASA framework set several triggers lower than the CWS in order to provide opportunity for action prior to exceeding the CWS. PM and O_3 were selected by the CCME as the first contaminants to be managed because both pollutants have significant adverse effects on human health and the environment. The Red Deer Census Agglomeration (CA) will be used by the CCME for reporting purposes. The CASA framework calls for this plan to be developed by the end of 2008.

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background and introduction

The Parkland Airshed Management Zone (PAMZ) reports “Good” air quality for the majority of any given year as measured by Alberta’s Air Quality Index (AQI). However, air quality rapidly deteriorates under certain weather conditions which can trap pollutants in the area at ground level. These conditions can lead to periods of poor air quality causing reduced visibility, smog, increased incidences of air quality related health concerns, damage to vegetation, limited outdoor activity and an overall reduction to quality of life for area residents. Ozone is a pollutant contributing to poor air quality events in the region and is a main cause of smog.

The PAMZ region is located in central Alberta mid-way between Edmonton and Calgary. The Queen Elizabeth (QE II) highway bisects the region. Red Deer is the major distribution and service center for the surrounding rural area including a number of smaller towns and rural developments.

PARKLAND AIRSHED MANAGEMENT ZONE

The Parkland Airshed Management Zone (PAMZ) was established in 1997 to identify air quality concerns within the zone and implement management strategies to address those concerns. PAMZ is endorsed by the Alberta Clean Air Strategic Alliance (CASA) and uses the CASA Comprehensive Air Quality Management System (CAMS) model to guide their decision making process. CAMS is based on shared responsibility and uses a consensus-building collaborative approach.

PAMZ Vision:
Our air is clean, clear, fresh and free from emissions that affect humans, animals or the environment.

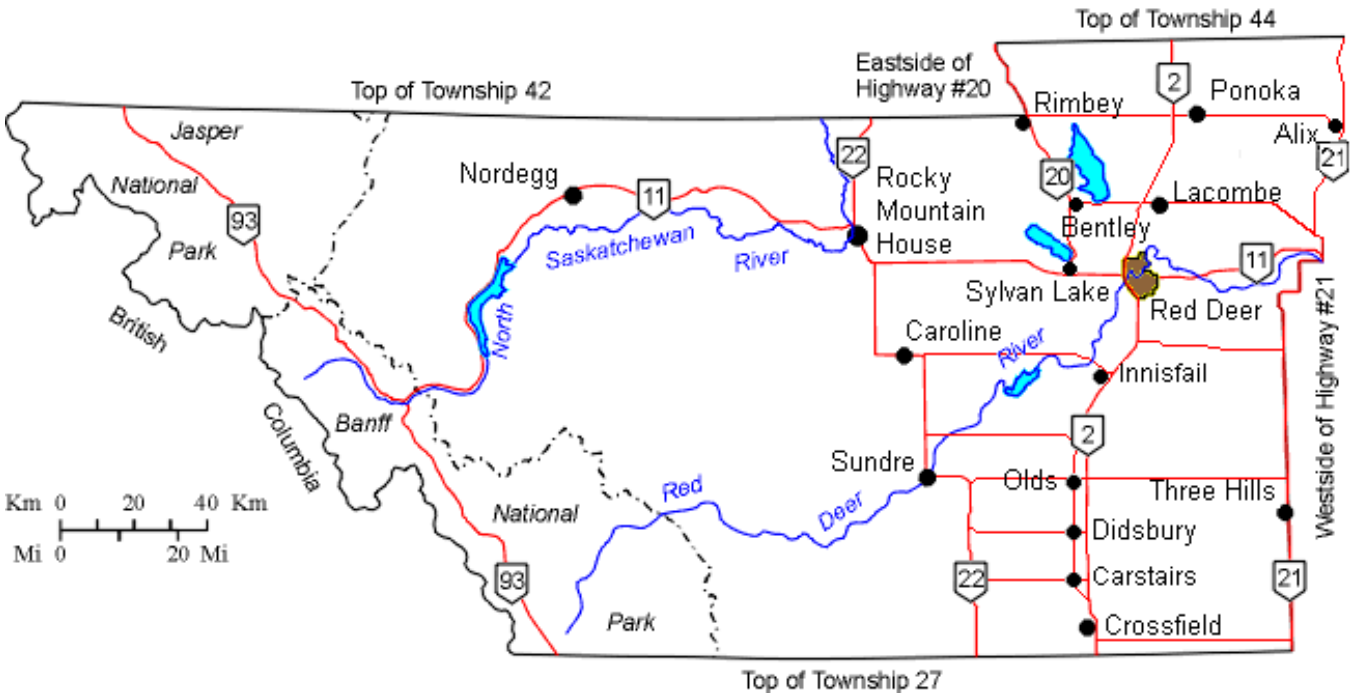
PAMZ agreed to be the coordinating body tasked to develop, maintain and be responsible for an adaptive O_3 management plan which contains performance indicators and will be inclusive of all stakeholder interests in the area.

PAMZ Mission:
We lead in monitoring air quality and applying innovative strategies to manage the air we breathe.

PAMZ boundaries encompasses a 45,000 square kilometer area west of central Alberta including the City of Red Deer. Approximately 220,000 people live and work in the area. The regional economy is based upon agriculture (primarily cattle and grain), oil and gas processing, petrochemicals, forestry and tourism. The boundaries were established by stakeholders using a consensus process and considering factors such as emission sources and volumes, landforms, dispersion characteristics, impacts, and administrative considerations such as municipal boundaries.

PAMZ Slogan:
We care for our air

Parkland Airshed Management Zone



KEY AIRSHED ISSUES

The PAMZ region is located in central Alberta mid-way between Edmonton and Calgary. The City of Red Deer is the third largest city located in the Edmonton/Calgary growth corridor with a population of over 85,000 and a service area of over 200,000. Between 2000 and 2007 the population of Red Deer grew by over 30% and the surrounding region also experienced significant growth. The City of Red Deer Population Projections 2007 – 2031 projects a baseline growth scenario of population growth to over 151,182 by 2031. The high growth scenario predicts a population of 184,945 by 2031. Growth is expected for infrastructure and industry as the population increases.

Over 63% of local Red Deer residents support an anti-idling bylaw.

- Red Dear VitalSigns 2008

Air quality in the area is dependent on several factors:

- emission rates of pollutants, such as those from agriculture, vehicles, home furnaces, and industrial and commercial activities
- atmospheric dispersion, which is the ability of the atmosphere to transport and dilute the emissions formed in the area through mixing via wind or movement of the pollutants to higher levels in the atmosphere
- local topography which can trap emissions at ground level

The local climate is cold and dry which causes variability in the vertical atmospheric mixing layer over the area and often traps emissions close to the

The largest industrial emissions source in the area is the petroleum industry. The main human activity contributing to emissions in the area are from residential home heating and transportation-related activities. Emissions from these sources undergo complex chemical reactions in the atmosphere to form ground level ozone.

CASA PM AND O_3 MANAGEMENT FRAMEWORK

The CASA Particulate Matter and Ozone Management Framework is based on the Canadian Council of Minister for the Environment (CCME) Canadian Wide Standards (CWS) for particulate matter (PM) and ozone (O_3) and established a series of thresholds at which increasingly stringent levels of management tools are required to ensure that the desired environmental and human health outcomes are achieved.
The CWS for O_3 is:

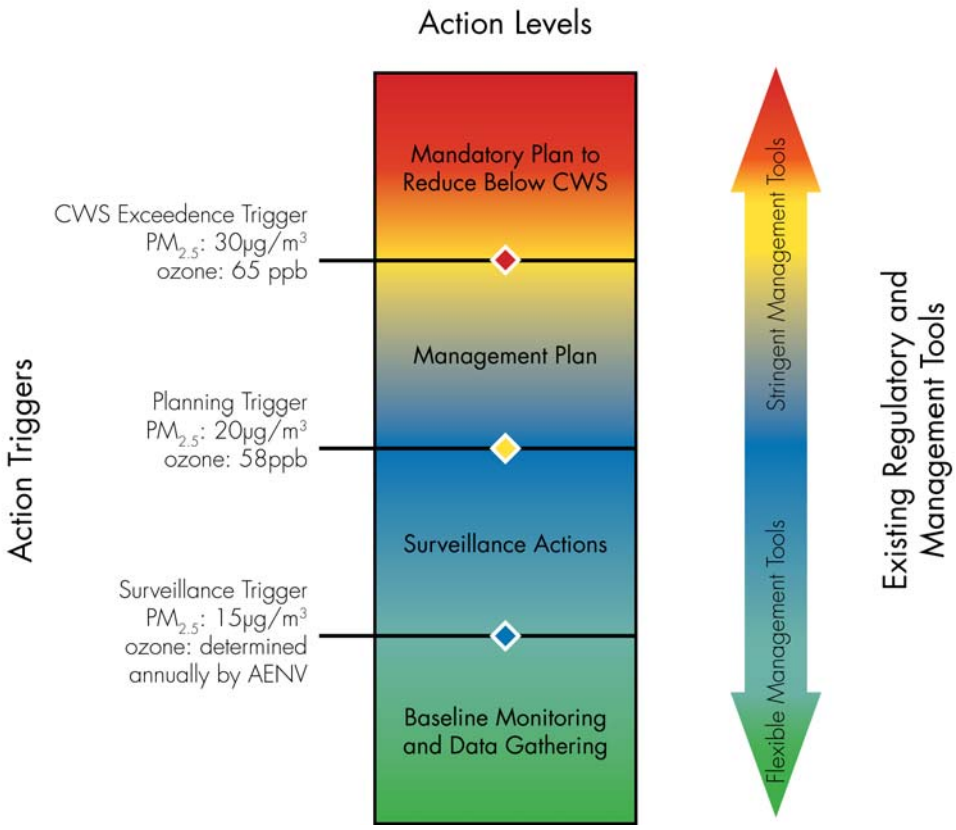
65 parts per billion (ppb) averaged over 8 hours, by year 2010. Achievement is based on the fourth highest measurement annually and averaged over three consecutive years.

Achievement of the CWS standards are based on an average of three consecutive years of ambient air quality data. Alberta Environment collected and reviewed data for five "planning years": 2001 – 2003, 2002 – 2004, 2003 – 2005, 2004 – 2006 and 2005 – 2007. In November 2006, following review of the 2001 – 2003 dataset, Alberta Environment notified PAMZ stakeholders that the "planning trigger" for ozone (58 ppb) was exceeded at the Caroline and Red Deer air quality monitoring stations. When this threshold was exceeded the framework called for development of a management plan to ensure that the CWS for O_3 is not exceeded in the future. The framework calls for this plan to be developed by the end of 2008. Note that the PAMZ air quality stations have not exceeded the planning trigger for PM2.5, but the Red Deer station is in the *Baseline Monitoring and Data Gathering* action level.

The CASA framework established a series of thresholds at which increasingly stringent levels of management tools are required to ensure that the desired environmental and human health outcomes are achieved.

The CASA Particulate Matter and Ozone Management Framework acknowledges two key components of the Canada Wide Standards:

- Continuous Improvement
- Keeping Clean Areas Clean



PM and O_3 were selected by the CCME as the first contaminants to be managed because their reduction will protect both human health and the environment. Significant adverse human health and environmental effects include:

Ozone:

irritates the respiratory tract and eyes
exposure to high levels results in chest tightness, coughing and wheezing
people with respiratory and heart problems are at a higher risk
linked to increased hospital admissions and premature death
agricultural crop loss and noticeable leaf damage

Particulate matter less than 2.5 micrometers ($PM_{2.5}$):

penetrates to the deepest parts of the lungs
linked to asthma, bronchitis, acute and chronic respiratory symptoms (shortness of breath and painful breathing), and premature deaths (especially the elderly, children and asthmatics)
impairs visibility (haze)
contributes to acid rain formation

There is no apparent lower threshold without impacts on human health for PM and O_3

- CCME, 2000.

The O_3 Management Plan is a collaborative effort involving input from key stakeholders.

PAMZ O_3 MANAGEMENT COMMITTEE TERMS OF REFERENCE

Purpose: to develop an ozone management plan for the Parkland Airshed Management Zone and to coordinate management activities with other airsheds.

Goal: to have a completed management plan in place by November 2008.

Objectives:

- Determine sources of ozone and characterize their contribution to ambient ozone levels.
- Develop a strategy to ensure ambient ozone levels don't exceed the Canada Wide Standard, air quality is maintained, and to improve air quality wherever possible.

Membership: a minimum of one representative from each of the following stakeholder groups: industry, government, non-government organizations and also the executive director. The membership of the committee can be expanded as needed. Sub-committees may be formed as needed.

Roles and Responsibilities: there will be one chair, with a two-year term. The chair will organize and run meetings, work with Executive Director to distribute agendas, minutes and meeting materials and communicate updates to the PAMZ Board of Directors. Committee members will attend meetings (or arrange for an alternate to attend), consult with their stakeholder group or organization, represent interests of their stakeholder group or organization, complete assigned action items and will rotate responsibility for recording minutes .

Accountability: the committee will report and be accountable to the PAMZ Board of Directors who will make the final decision on committee recommendations.

Meetings: a minimum of five meetings per year timed to coincide as much as possible with PAMZ Board Meetings. Additional meetings may be held as agreed upon by the committee. Draft minutes are to be distributed within one month after each meeting.

Decision-Making: the committee will utilize consensus-decision making. Representation from each sector (government, industry, non-government organizations) are required for a quorum to make decisions.

Principles:

Resources are used effectively
Issues are shared
Communication and relationships are fostered
Openness and transparency

Conduct:

The committee will follow and abide by the CASA Ground Rules:
Listen Generously
Speak Straight
Be "For Each Other"
Honor Commitments
Acknowledge & Appreciate Others
Be Concerned For Inclusion
Be Concerned For Alignment

emissions

Pollutants are emitted from numerous sources in the PAMZ region. Local industrial activities, such as upstream oil and gas and local manufacturing facilities produce air emissions from their process streams, storage tanks and heating. Municipalities contribute to air emission from fleet vehicles, buildings, local construction activities and transit. Individual residents produce air emissions from vehicles, from their home heating systems, from fireplaces and cleaning products. Natural sources of emissions include vegetation, forest fires and animals.

A recent emissions inventory was conducted to determine the relative contributions of these source specific emissions to the overall air quality in the region (AMEC, 2008). This emission inventory was prepared using estimation methods developed by the US Environmental Protection Agency, Environment Canada and Alberta Environment.

The emission inventory included the following major sectors:

Industrial Sources
- Fossil Fuel Industries
- Manufacturing Industries

Non-Industrial Sources
- Electrical and Heat Generation
- Commercial Heating
- Residential Heating

Mobile Sources
- Residential and Commercial Fleets
- Other Transport – Air and Rail

Miscellaneous Sources
- Solvent and Other Product Use

Agriculture / Open Sources
- Livestock Operations
- Farming Operations

POLLUTANTS CONTRIBUTING TO O_3 FORMATION

The main focus of the O_3 Management Plan is to reduce O_3 emissions that exceed the planning trigger and to avoid future exceedances of the CWS. However, the formation of O_3 is dependent on the existence of other pollutants that contribute to the formation of ozone via complex chemical transformations in the atmosphere such as:

- Oxides of Nitrogen (NO and NO_2)
- Ammonia (NH_3)
- Volatile Organic Compounds (VOC)
- Carbon Monoxide (CO)
- Total Hydrocarbons (THC)

Primary emissions are emitted directly to the atmosphere from a source

Secondary emissions form in the atmosphere via complex chemical transformations

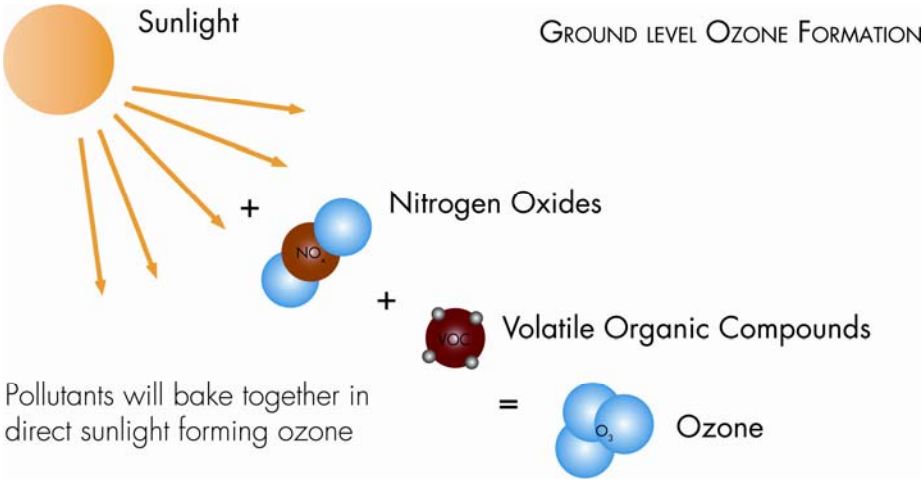
The "primary pollutants" listed above are easier to manage than secondary O_3 and a reduction in these emissions will ultimately result in a reduction of O_3 emissions. The emissions inventory also included pollutants related to particulate matter primary emissions and secondary formation:

- Particulate Matter ($PM_{2.5}$ and PM_{10})
- Oxides of Sulphur (SO_2 and SO_3)

The primary pollutants play an important role in determining air quality in the PAMZ region and their reduction will protect human health and the environment.

Ozone (O_3) is a colorless gas that at normal outdoor concentrations is odourless. However, ozone does have a distinctive sharp odour when found at higher concentrations, such as those associated with electrical discharges from lightning storms or photocopiers. At higher concentrations, ozone's health effects can include reduced lung function, aggravated existing respiratory illness, and irritated eyes, nose, and throat as it is a strong oxidizer. High

concentrations can reduce crop yields. Chronic exposure can cause permanent damage to the alveoli of the lungs. The ozone layer in the upper atmosphere (stratosphere) absorbs UV radiation and creates a warm layer of air in the stratosphere. The ozone layer is, therefore, responsible for the thermal structure of the stratosphere. Stratospheric ozone shields the Earth against harmful rays from the sun, particularly ultraviolet B radiation. Ozone that is present at ground level (troposphere) is a pollutant, as it is involved with oxides of nitrogen in the photochemical production of many of the constituents of air pollution. It is also a primary constituent of smog. Globally, ground-level ozone is mostly anthropogenic. However, ozone is different from other pollutants in that it is not emitted directly into the air. It is a "secondary" pollutant because it is produced when two "primary" precursor pollutants, nitrogen oxides and volatile organic compounds (VOCs), react in the presence of heat and sunlight under stagnant meteorological conditions. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, factories, consumer and commercial products, other industrial sources and forests. Ozone and the precursor pollutants that cause ozone can also be transported into an area from pollution sources, such as urban centers and industrial complexes, that are located hundreds of kilometers upwind. A major source of VOCs in rural areas is natural emissions from trees and vegetation. O_3 was not inventoried because the methodology did not consider secondary pollutants that are formed by interactions between primary pollutants, such as NOx and VOCs.



Ozone can be destroyed through reactions with nitric oxide. In Alberta, ozone concentrations are generally lower at urban locations than at rural locations, most likely because of the destruction of ozone by nitric oxide emitted by motor vehicles. In Alberta, maximum ozone values are generally recorded during the late spring and summer when ozone production in the lower atmosphere is at a maximum due to high solar radiation levels combined with stagnant weather conditions. At other times of the year, high daily average ozone values may be influenced by dynamic atmospheric processes such as tropopause folding and episodes of stratospheric ozone intrusion. Recent studies conducted for the CASA Particulate Matter and O3 Project Team and others have indicated that some of ground-level O3 observed in Alberta may originate from the United States and Pacific Rim countries.

Area car ownership statistics (2008): 1.26 registered vehicles for every person in Red Deer aged 15 to 79

- Red Dear VitalSigns 2008

Oxides of nitrogen (NOx), mostly in the form of nitric oxide (NO) and nitrogen dioxide (NO_2), are products of all types of combustion, but are primarily produced by combustion at higher temperatures. For the purposes of air quality monitoring, oxides of nitrogen are considered to be the sum of nitric oxide and nitrogen dioxide. Most oxides of nitrogen are emitted in the form of nitric oxide. Nitric oxide (NO) reacts rapidly in the atmosphere through various mechanisms to form nitrogen dioxide. Nitrogen dioxide is a reddish-brown gas with a pungent irritating odour. Oxides of nitrogen emissions are produced by transportation sources (automobiles, trucks, trains), industrial sources (oil and gas industries) and power generation plants. Other sources of oxides of nitrogen

include natural gas combustion (e.g. home heating), heating fuel combustion and forest fires. The largest urban source of oxides of nitrogen is emissions from motor vehicles. At higher concentrations, nitrogen dioxide is an irritating gas that may constrict the airways of asthmatics and increase the susceptibility to infection in the general population. It is a major component of atmospheric photochemical reactions that lead to smog formation, acid rain and ground level ozone formation and destruction. Exposure of vegetation to high concentrations of oxides of nitrogen results in observable effects such as leaf colouring and impairment of leaf function.

Ammonia (NH_3) is normally a gaseous compound with a characteristic pungent odor. Ammonia is commonly used as a fertilizer and explosive and is directly or indirectly to precursor to most compounds containing nitrogen, especially nitric acid. Ammonia is both caustic and hazardous and is highly toxic to aquatic animals. Exposure to very high concentrations of gaseous ammonia can result in lung damage and death

Volatile organic compounds (VOCs) are present in the atmosphere typically in a gaseous form. These compounds include several types of hydrocarbons such as alkanes, alkenes, alkynes, aromatics (i.e., benzene and toluene), aldehydes, ketones, alcohols, esters, and some chlorinated compounds. VOCS are linked to elevated cancer risks associated with exposure. Specific reactive VOCs are also of concern because of their capability for long-range transport in the atmosphere and their role in the formation of ground-level ozone and particulate matter. Vegetation and forests can emit large amounts of natural VOCs when temperatures are high.

Carbon monoxide (CO) is a colourless, odourless gas formed when carbon-based fuels such as gasoline, oil, and wood burn with an insufficient supply of oxygen. Except for carbon dioxide, it is one of the longest lived naturally occurring atmospheric carbon compounds. The major source of CO in urban locations is motor vehicle exhaust emissions. Forest fires are also an important natural source of CO. Minor sources include fireplaces, industry, aircraft and natural gas combustion. CO interferes with the blood's ability to carry oxygen to the body's tissues and results in numerous adverse health effects.

Hydrocarbons are divided into two broad categories, "reactive" and "non-reactive" hydrocarbons. The term "total hydrocarbons" (THC) refers to a broad family of chemicals that contain carbon and hydrogen atoms and includes both reactive and non-reactive hydrocarbons. Reactive hydrocarbons include many volatile organic compounds such as alkenes, alkynes, benzene, toluene, ethylbenzenes and xylenes and other aromatics. Reactive hydrocarbons are important because they can react with oxides of nitrogen in the presence of sunlight to form ozone and may be toxic to humans, animals or vegetation. Polycyclic aromatic hydrocarbons are of particular interest because they are less volatile than other reactive hydrocarbons and some are known carcinogens. Trees and plants are major natural emitters of reactive hydrocarbons with other significant sources being intensive livestock operations, vehicular emissions, gasoline marketing and storage tanks, petroleum and chemical industries, dry cleaning, fireplaces, natural gas combustion and aircraft traffic. Motor vehicles are the major source of hydrocarbons in urban areas. The major non-reactive hydrocarbon in the atmosphere is methane, which is a naturally occurring colorless, odorless gas that is regarded by many to be a major contributor to the

greenhouse effect. Large amounts of methane are produced naturally from bogs, shallow lakes and soils through the decay of vegetation under anaerobic conditions. The global background total hydrocarbon level is currently about 1.8 ppm consisting primarily of methane. Human activity is contributing to a worldwide increase in ambient methane concentrations of approximately 2-8 ppb/year in recent years.

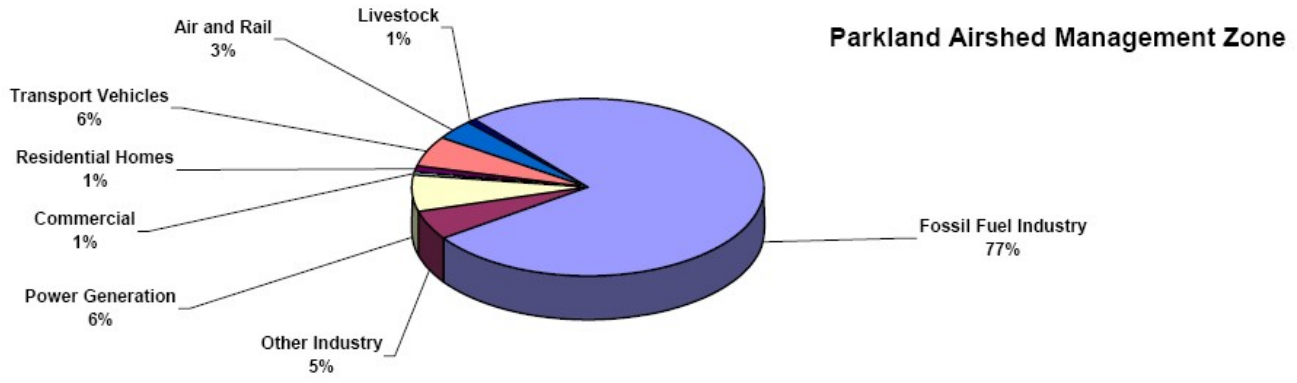
The term inhalable particulates, or PM_{10}, refers to particles that have a diameter of less than 10 microns and are suspended in the air for an indefinite period of time. PM_{10} is a mixture of various substances. These substances occur in the form of solid particles or as liquid drops. Some particles are emitted directly into the atmosphere. Other particles result from gases that are transformed into particles through physical and chemical processes in the atmosphere. PM_{10} can be divided into two groups of particles based on size: fine particles and coarse particles. Fine particles, also known as respirable particulate, are those particles that are less than about 2.5 microns in diameter and are known collectively as $PM_{2.5}$. In contrast, coarse particles are those that are greater than about 2.5 microns in diameter. Generally, the fine particles pose the greater health risk because these particles can be deposited deep in the lung and contain substances that may be harmful to health. In addition to their health impacts, the fine particles are the main contributors to reduced visibility. The particles give smog its colour. This fine fraction is also known as respirable particulate. Particulate pollution can cause eye, nose and throat irritation and other health problems. Numerous studies have linked respirable particulate matter to aggravated heart and lung diseases such as asthma, bronchitis and emphysema. The $PM_{2.5}$ levels observed at the Red Deer Riverside station remain below the CASA framework 15 µg/m3 surveillance trigger and do not warrant any further actions.

Sulphur dioxide (SO_2) is a colorless gas with a strong, suffocating odour. It can be detected by taste and odour by a majority of the population at concentrations of 300 parts per billion (ppb). Short-term (acute) exposures to high concentrations of sulphur dioxide can trigger constriction of the airways, causing particular difficulties for asthmatics. Children can experience increased respiratory tract infections and healthy people may experience sore throats, coughing, and breathing difficulties. Sensitive vegetation may be injured by exposure to high concentrations of sulphur dioxide. Long-term (chronic) exposure has been associated with increased risk of mortality from respiratory or cardiovascular disease. Sulphur dioxide is formed during the processing and combustion of fossil fuels that contain sulphur, such as gasoline, natural gas, oil, coal and oil sands. Volcanic eruptions are a natural source of sulphur dioxide. The largest sources of sulphur dioxide in PAMZ are the large incinerator stacks at local gas processing plants. Other zonal sources include smaller oil and gas plant, battery and well flares. Elsewhere in the province heavy oil and oil sands facilities, coal-fired power generation plants, pulp and paper mills and fertilizer plants are major sources. Sulphur dioxide is emitted directly into the atmosphere where it can persist for days, allowing for wide distribution of the gas. In the atmosphere, some sulfur dioxide can be

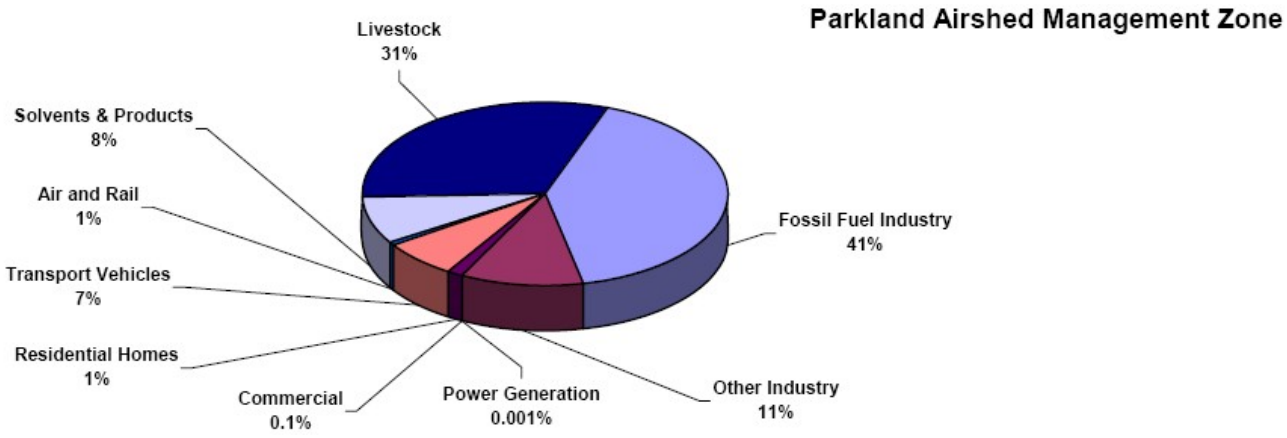
oxidized by ozone and hydrogen peroxide to form sulfur trioxide. Both sulfur trioxide and sulfur dioxide are soluble in water and if they are present in the atmosphere when condensation occurs, tiny droplets of sulfuric acid (acid rain) are formed. Sulphur dioxide can combine with other atmospheric gases to produce fine particles.

CURRENT EMISSIONS

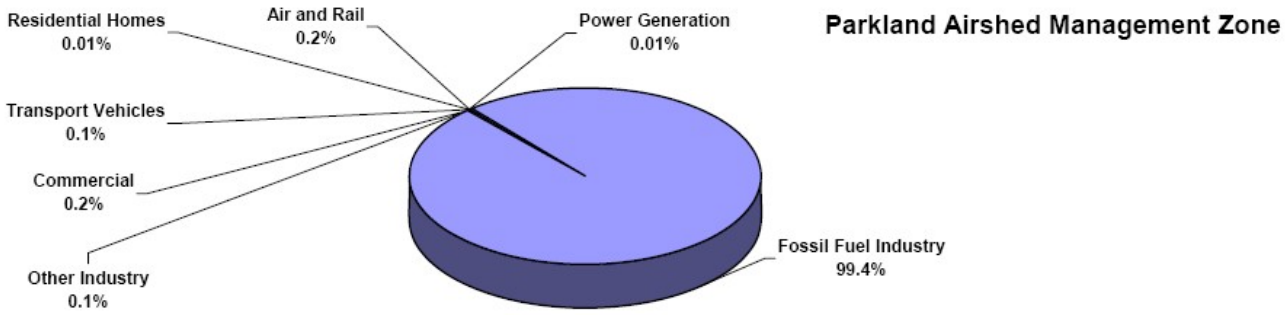
A 2006 Environment Canada emissions inventory was used to compile the emission trends in the PAMZ area. This inventory used the most current emission estimation methodologies and statistics available at the time, and represents the most comprehensive emissions inventory available for Canada. This data will be the baseline year and future emissions inventories will be measured against this data to determine increases or decreases in emissions. The emissions inventory considered point sources, such as stack emissions, area sources, such as residential fuel use, and volume sources, such as on-road transportation.



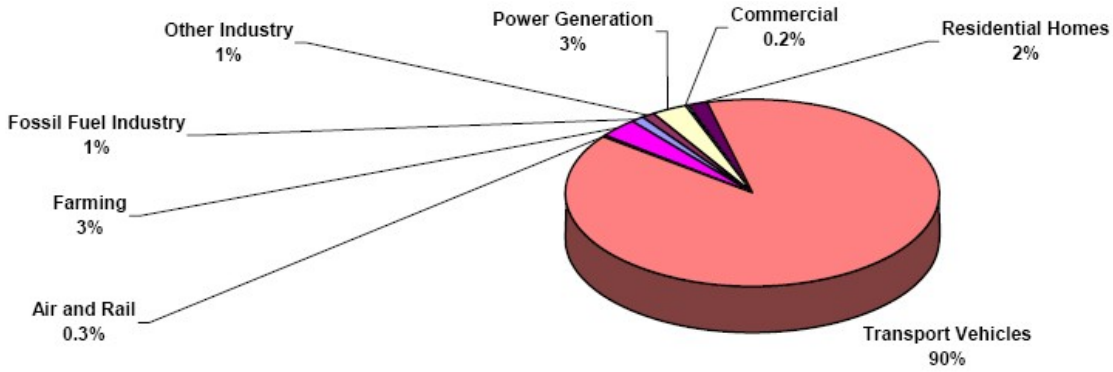
NOx Emission Profile for PAMZ



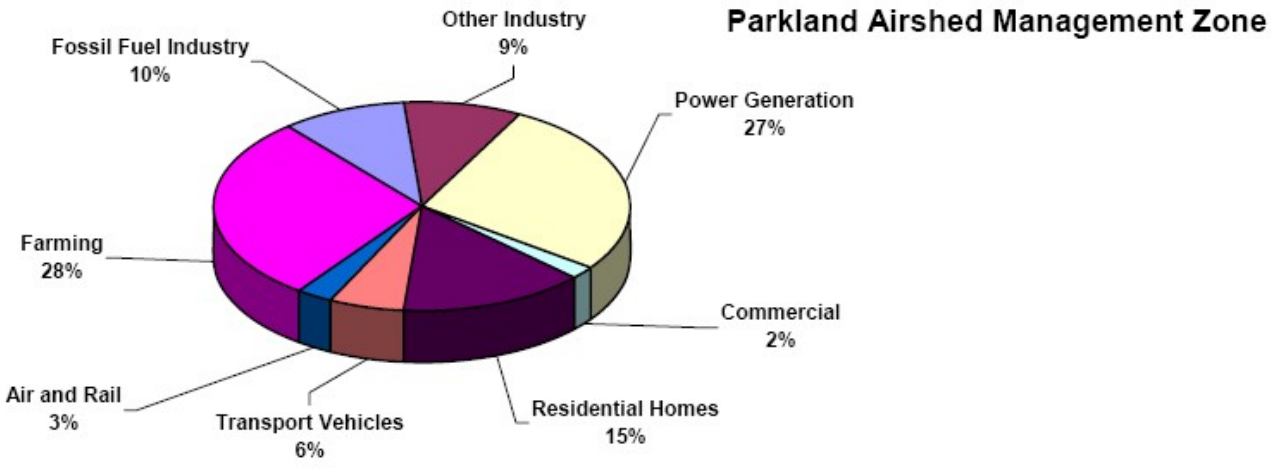
VOC Emission Profile for PAMZ



SO_2 Emission Profile for PAMZ



$PM_{2.5}$ Emission Profile for PAMZ



$PM_{2.5}$ Emission Profiles for PAMZ (not including road dust)

Primary PM_{10} and $PM_{2.5}$ emission sources include paved and unpaved roads. In general, over 90% of the primary road dust $PM_{2.5}$ results from unpaved roads. Over 95% of the primary road dust PM_{10} results from unpaved roads.

The emission profiles show that:

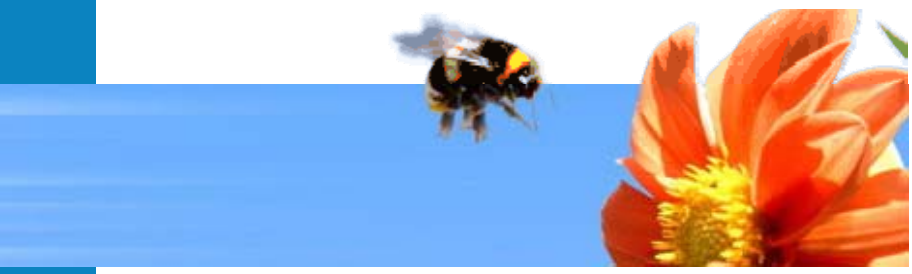
- Petroleum industries are the predominant emission source for SO_2, NOx and VOCs
- Transportation is the predominant $PM_{2.5}$ emission source
- Farming and power generation are the second largest contributors to $PM_{2.5}$

FUTURE EMISSIONS

The City of Red Deer is the third largest city located in the Edmonton/Calgary growth corridor with a population of over 85,000 and a service area of over 200,000. Between 2000 and 2007 the population of Red Deer grew by over 30% and the surrounding region also experienced significant growth. The City of Red Deer Population Projections 2007 – 2031 projects a baseline growth scenario of population growth to over 151,182 by 2031. The high growth scenario predicts a population of 184,945 by 2031. Changing trends have also been noted in industrial sources in the area. **Need info on oil and gas/Joffre area/etc.**

The City of Red Deer Municipal Development Plan (MDP) identifies key trends relating to sustainable development and smart growth including less emphasis on private automobiles with promotion of alternative means of transportation (i.e. transit, walking and cycling). Guiding principles of the MDP include effectively managing, in a sustainable manner, issues associated with growth and sustaining the natural environment and protection of natural systems. Environmental responsibility is identified as important for land use and future growth concepts. Policy 9.14 states "The City shall promote efforts to improve air quality and may work with other stakeholders to monitor air quality and establish stewardship programs that promote air quality."

ambient air quality



Air quality in the PAMZ region is generally classified as "Good" according to the Alberta Air Quality Index (AQI), which indicates that there are no known harmful effects to soil, water, vegetation, animals, materials, visibility or human health.

PAMZ operates an Air Quality Monitoring (AQM) Program and the primary intent of AQM is to provide high quality air quality data to develop, implement and evaluate strategies that address priority zonal air quality issues. There are two main types of air quality monitoring occurring in the PAMZ region: continuous ambient monitoring and passive monitoring.

The PAMZ AQM Program's four major goals are to:

- Provide data to address the current and future air quality concerns/issues of the zone's various stakeholders
- Contribute to the body of information required by the scientific community and other users to provide a better understanding of certain pollutants including their sources, behaviors and effects
- Be dynamic and evolutionary in nature, capable of responding to changing or emerging concerns, issues, technologies, and developments in other management zones/programs
- Be effectively funded by the zone's stakeholders while allowing PAMZ to research, develop and implement other programs and activities

The high priority air quality concerns identified in the PAMZ area are:

- **Human health effects**
- **Livestock effects**
- **Flaring**
- **Intensive livestock operations**
- **Pollution prevention**

- PAMZ website, 2008

Continuous monitors continually draw air through a commercial analyzer that is calibrated to output the "real-time" ambient concentration of the compound monitored. They provide high resolution results, but are costly.

- PAMZ operates four continuous monitoring stations:
- One fixed station owned and operated by PAMZ southeast of Caroline
- One fixed station owned by Alberta Environment, and operated by PAMZ, in the City of Red Deer
- Two portable stations owned and operated by PAMZ (one located northeast of Crossfield for one month of every quarter, and otherwise used for issues monitoring and to fill data gaps in the region)

The continuous stations monitor for the following contaminants:

- sulphur dioxide (SO_2)
- hydrogen sulphide (H_2S)
- total reduced sulphur compounds (TRS)
- nitrogen oxides (NOx)
- ozone (O_3)
- carbon monoxide (CO)
- Methane and non-methane and total hydrocarbons (CH_4, NMHC, THC)
- fine particulate matter ($PM_{2.5}$)

Note that prior to 2007 the only station to monitor PM continuously was the Red Deer station. Therefore, only data from Red Deer could be analyzed to determine whether $PM_{2.5}$ met the CWS.

Various meteorological parameters, such as wind speed and direction, are also monitored continuously to gain a better understanding of possible sources and behaviors of the different pollutants.

Passive monitors are a cost-effective method of collecting air quality data over a large region. They are useful in identifying long term air quality trends and assessing spatial variability to assist in making regional-scale air quality assessments. They are simple in design, low cost and easy to use. They are suitable for remote use since they do not require power.

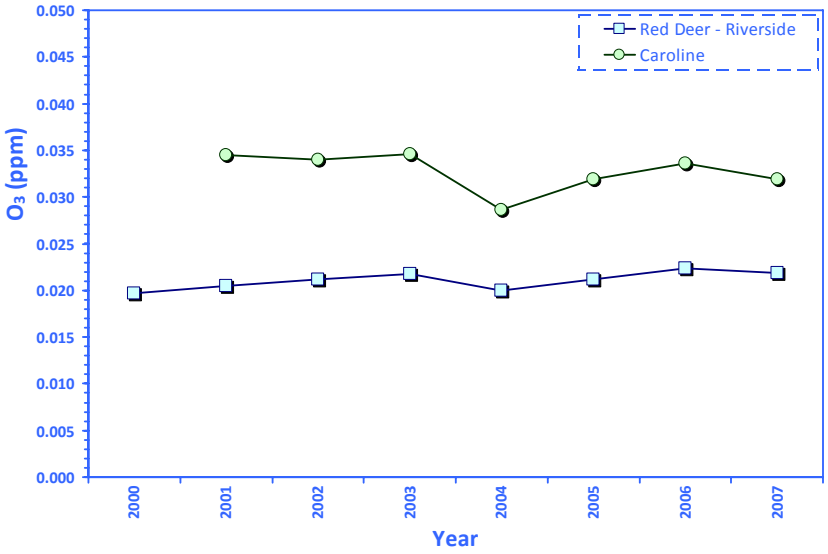
The PAMZ Passive Monitoring Network consisted of thirty-four permanent stations and included passive data collected at the Red Deer AQM Station. In general, the passive monitoring stations are located throughout the zone on a 3 X 3 township grid system. There is a bias to the more developed eastern part of the zone. Passive monitoring is conducted year-round on a monthly interval.

The parameters measured in the network are:

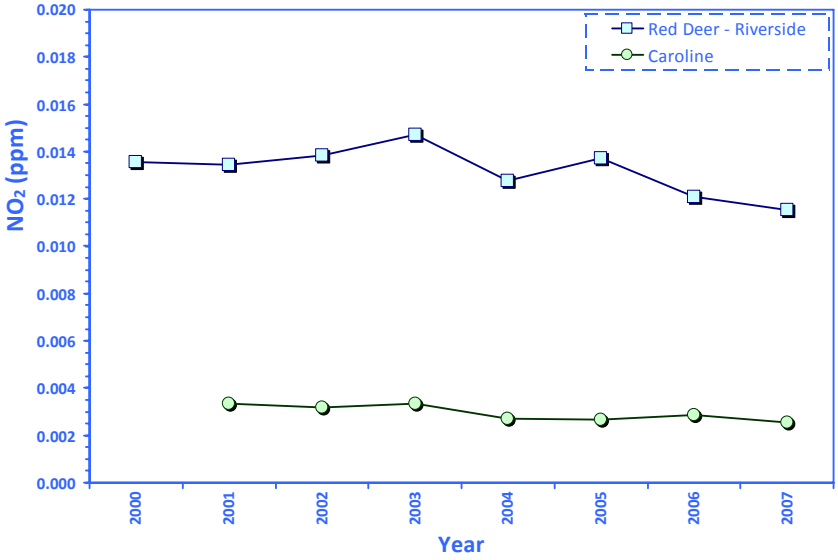
- SO_2
- NO_2
- O_3

AIR QUALITY TRENDS

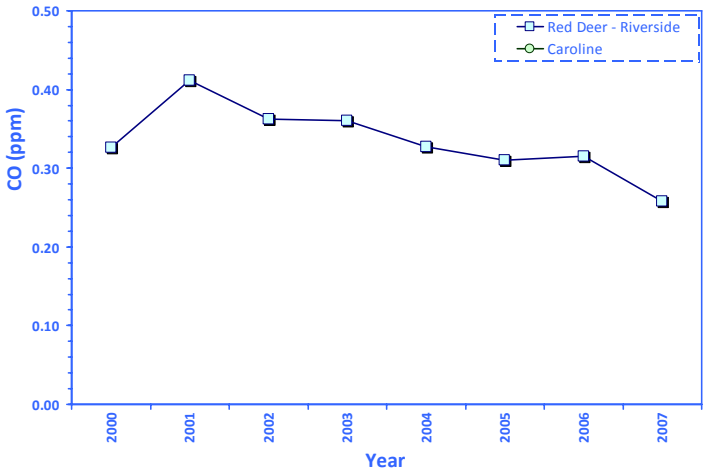
PAMZ publishes an annual report which summarizes operation of the Air Quality Monitoring Program including a review of air quality trends for the preceding year. Data collected from the Caroline and Red Deer air quality monitoring stations are submitted to the Alberta Ambient Air Data Management System (AAADMS), more commonly known as the CASA Data Warehouse. Data trends are shown below for all available years. Partial years were not used because they showed a strong dependence on season.



Provincial annual average O_3 concentrations are generally consistent and show an overall increase.

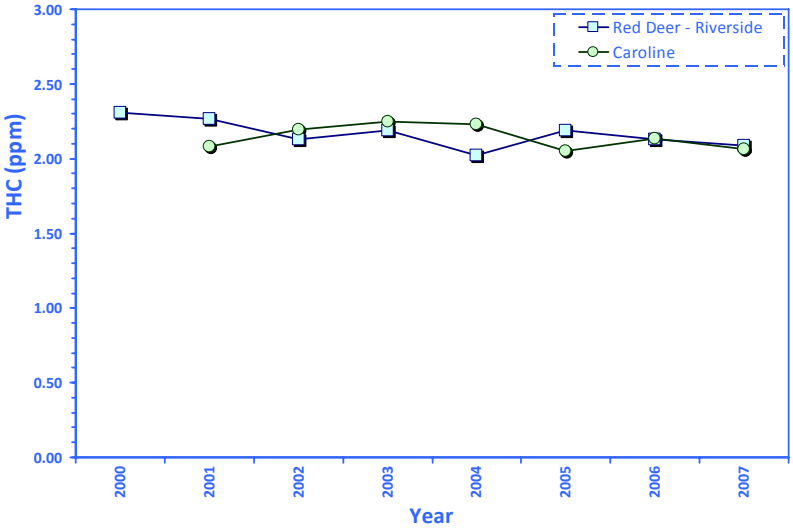


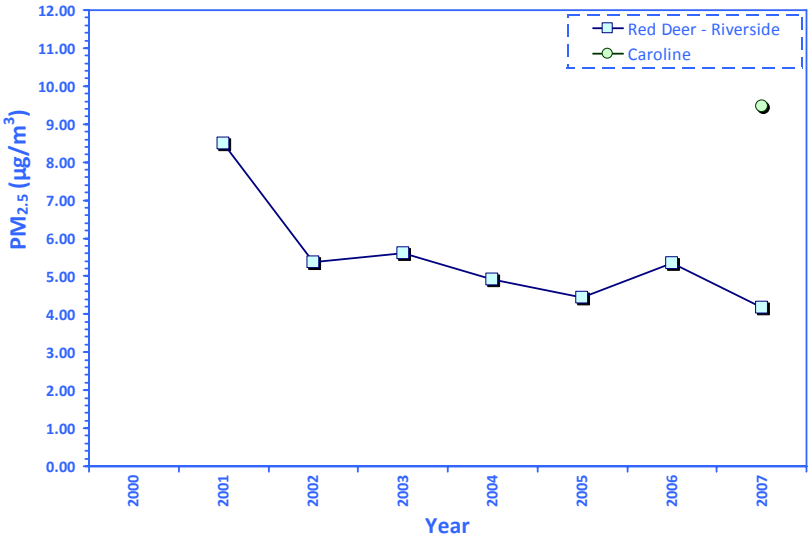
Annual average NO_2 concentrations have generally decreased slightly over the past fifteen years; however, this decrease seems to have reached a plateau. Advances in automobile emission technologies, such as improvements in fuel injection and combustion efficiency from catalytic converters, are generally credited with the slight decrease in emissions although overall the volume of cars on the road has increased.



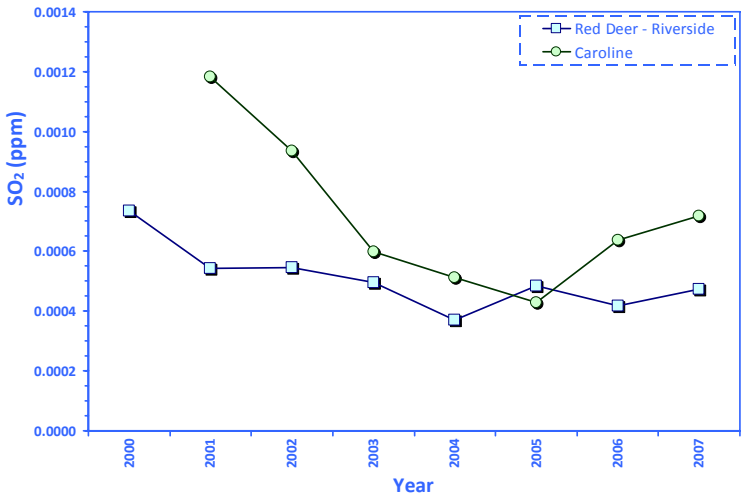
Average annual CO concentrations have been generally steadily declining since 1990 likely related to the reduction in vehicle emissions from technological improvements in automobiles. The 2007 annual average concentration at the Red Deer station declined from 2006 to 0.26 ppm. The maximum hourly average concentration of 3.1 ppm is much lower than the Alberta Ambient Air Quality Objective of 13 ppm.

Annual average total hydrocarbons (THC) have remained generally constant with no statistically significant decrease or increase noted.



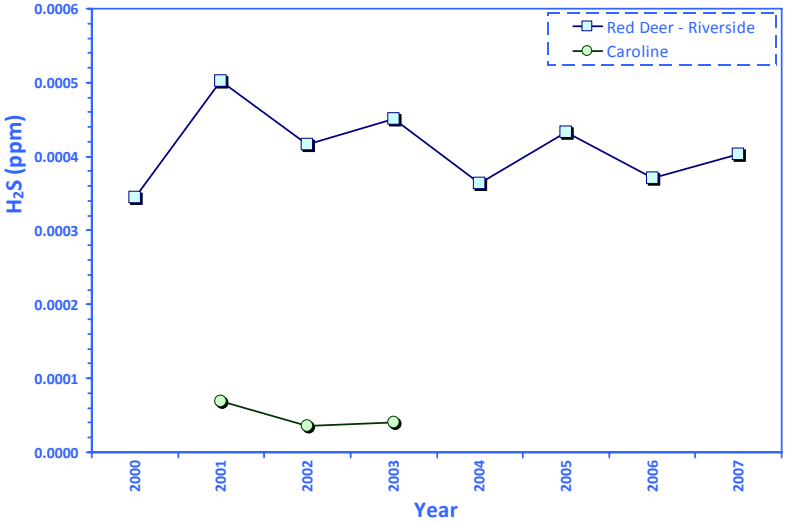


In 2007, in conjunction with the assessment of provincial zone levels, Alberta Environment released an assessment of provincial $PM_{2.5}$ levels. The levels observed at the Red Deer station remain below the surveillance trigger (15 µg/m^3) and so further action was not warranted.



Annual average SO_2 show an overall decrease.

Annual average H_2S concentrations has generally decreased at the Red Deer (urban) location.



O_3 PLANNING TRIGGER EXCEEDANCES

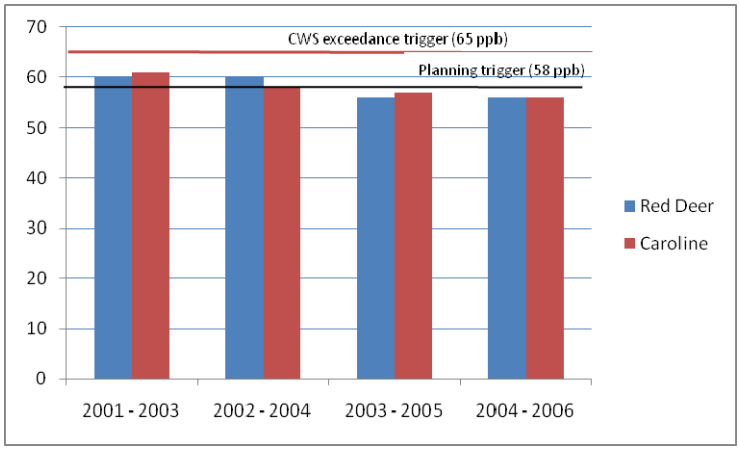
Only the Red Deer and Caroline air quality stations could be used to determine whether the O_3 CWS was exceeded because the calculation methodology requires three years of continuous monitoring. The exceedances events described in this section are restricted to the Caroline and Red Deer stations. However, PAMZ performs O_3 monitoring at several of their other locations, including passive sites, in order to determine overall ozone trends in the area.

Exceedances of 58 ppb *Management Plan Trigger*

Year	Red Deer	Caroline
2001	2	16
2002	13	18
2003	2	8
2004	2	1
2005	2	8
2006	7	14

**natural, background and transboundary sources excluded*

It is important to note that these absolute exceedances differ from the calculation used to determine whether the CASA Framework planning trigger are exceeded. To determine these exceedances the fourth highest annual readings are averaged over three consecutive years.



Three year average ozone levels
after analysis for background, natural and transboundary influences

PAMZ investigated twelve exceedances, or near exceedance, events spanning from 2001 to 2006 to review detailed information pertaining to the triggering event and the days preceding and following the event (AMEC, 2008a,b):

2001: Red Deer, May 13 (56 ppb)
2001: Caroline, Aug 17 (70 ppb)
2002: Caroline, June 13 (72 ppb)
2002: Red Deer, June 22 (67 ppb)
2003: Eagle Hill, July 19 (60 ppb)
2003: Eagle Hill, July 21 (63 ppb)
2003: Red Deer, July 22 (65 ppb)
2003: Eagle Hill, July 23 (63 ppb)
2003: Red Deer, Aug 8 (57 ppb)
2006: Rosas, Apr 26 (65 ppb)
2006: Caroline, May 14 (65 ppb)
2006: Red Deer, Sep 4 (67 ppb)

Note that days were analyzed that did not exceed 58ppb in order to give and understanding of high ozone levels in the area. Also, stations other that Red Deer and Caroline were considered although to give a broader picture of ozone behaviour in the area; however these stations cannot be used to determine CWS exceedances because they do not have three years of consecutive monitoring data. The analysis included data from the PAMZ continuous stations (Red Deer and Caroline) and the portable stations: Crossfield-Carstairs (Raven), Edwell (Peregrine), Fenn (Raven), Limestone Mountain (Raven), Rosas (Peregrine), Rosebud Creek, Stauffer, Sunchild and Sunchild School (Peregrine). Data from additional surrounding stations was used during selected events using: Esther, Calgary Northwest, Violet Grove, Breton and Steeper.

The August 17/2001, June 13/2002, July 19/2003 and July 21/2003 events appear to be localized and non-transport related with effects on the central PAMZ region and northern CRAZ region during these events. The triggering events on July 22/2003 and July 23/2003 appear to be centralized spanning from WCAS to CRAZ throughout the central PAMZ region. The event on September 4/2006 also appears to be centralized spanning north central PAMZ and the south eastern WCAS region. The two triggering events on April 26/2006 and May 14/2006 were influenced by transported emissions from the eastern edge of WCAS and the Edmonton CMA.

Based on the trajectory analysis there was indication of potential transport effects due to forest fires and other regional factors, with the strongest association noted on April 26/2006 in which the trajectory passed through the Edmonton CMA before ending at the station. Other trajectories identified potential contributions as the air mass passed through regions of potential emission sources.

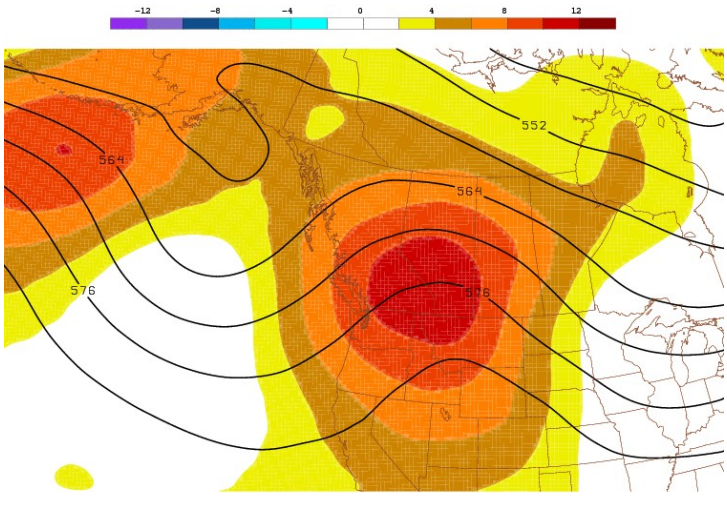
The results of a conditional analysis of ambient meteorological data indicated that the Red Deer and Rosebud Creek station have higher average O_3 during high temperatures (>30°C) and light breeze (6-11 km/hr). The Caroline, Eagle Hill, Crossfield-Carstairs, Violet Grove, Breton, and Esther stations have higher average O_3 during periods of high temperatures (>30°C) and breezy winds (>11 km/hr). The Edwell, Limestone Mountain, Rosas and Stauffer stations have higher average O_3 during periods of warm temperatures (>20°C and <30°C) and breezy winds (>11 km/hr). The Sunchild and Sunchild School stations have higher average O_3 during periods of moderate temperatures (>10 °C and <20°C) and breezy winds (>11 km/hr). Elevated readings occurring during stronger winds indicates the potential effects are more likely regional or related to transport effects. The Fenn station had higher average O_3 during periods of high temperatures (>30°C) and light winds (< 6 km/hr). Elevated readings occurring during light winds indicates the potential effects are more likely localized or near-field effects.

Based on the data trend investigation the Red Deer, Caroline, Eagle Hill, Rosas and Stauffer stations are more likely influenced by high ozone when winds are predominately from the Southeast. The Crossfield-Carstairs, Rosebud Creek and Limestone Mountain stations are more likely influenced by high ozone when winds are predominantly from the west-southwest. The remaining stations including Edwell, Fenn and Sunchild are more likely influenced by high ozone when winds are predominantly from the northwest.

The AMEC study indentified NOx as the primary manageable anthropogenic (human caused) pollutant connect to the ozone concentrations. There was a very strong correlation between ozone exceedances and month of year with spring and summer more likely to have higher ozone levels than fall and winter. There was a lesser correlation between ozone exceedances and local meteorology.

LOCAL METEOROLOGY

A meteorological analysis was performed on the triggering events to determine the conditions that are associated with high ozone days in Red Deer and Caroline (Evans, 2008).



500 HPA HEIGHTS AND ANOMALIES FOR RED DEER EXCEEDENCE

The Red Deer station showed the following trends during the exceedance events:

- Synoptic-scale ridge of high pressure
- Higher than normal temperatures in both central and southern Alberta (greater than 6°C above normal)
- Slower than average wind speeds with minimum winds near the Red Deer region
- Winds tended to be more southerly and the general northwest winds climatologically expected in the area were less pronounced
- No major precipitation events immediately preceding trigger events (for approximately four days)
- Vertically stable atmosphere inhibiting convective development

The Caroline station showed the following trends during the exceedance events:

- Synoptic-scale ridge of high pressure, but not as significant as noted in Red Deer
- Higher than normal temperatures, but much less than noted for the Red Deer exceedances
- Slower than average wind speeds but with no local minimums
- Winds during the events tended to resemble climatological winds with a slight increase in occurences from the southeast and a decrease in winds from the north and northwest
- No major precipitation events immediately preceding trigger events (for approximately four days)
- Vertically stable atmosphere inhibiting convective development

This analysis seems to show differences between urban (Red Deer) and rural (Caroline) ozone trends. It appears that strong high pressure conditions have the most influence on the urban area, while the rural area shows a stronger signal to the high pressure events. This could be a result of high natural background ozone levels or perhaps an influence of transboundary sources. At this time these conclusions are speculative and further work needs to be done in order to determine the cause of the differences.

PREDICTED AIR QUALITY

Environment Canada conducted a study in 2005-2006 (Environment Canada, 2007) that used a state-of-the-art atmospheric chemistry model called “Community Multiscale Air Quality” (CMAQ) to model atmospheric chemistry and pollutant concentrations in Alberta over a three month summer time period. A total of eight model simulations were conducted: a base case simulation, a future case scenario using a plausible estimate of future emissions, five emissions control scenarios where the effect of removing emissions from different economic sectors was investigated, and a trans-boundary scenario.

The economic sector simulations showed the relative contribution to ozone from each sector. In the Red Deer area the dominant sectors contributing to peak ozone concentrations were (ranked in order of contribution):

- Upstream oil and gas
- On-road transportation
- Electricity sector

The future case simulation projected emissions from power generation, chemical, refineries and cement sectors. Emissions from upstream oil and gas and mobile transportation were not adjusted, but the model is still considered to be conservative (overestimates emissions). Province-wide the emissions were projected to increase by 25% for NOx and 18% for VOCs. The future simulation showed modest increases in ozone over most of central and southeastern Alberta.

The study recommended that the ozone monitoring network be expanded into the area southeast of Edmonton to provide insight into the ozone east of the Calgary-Edmonton corridor.

management plan

PAMZ agreed to be the coordinating body tasked to develop, maintain and be responsible for an adaptive O_3 management plan which contains performance indicators and will be inclusive of all stakeholder interests in the area. The O_3 Management Plan is a collaborative effort involving input from key stakeholders. PAMZ will submit the O_3 Management Plan to Alberta Environment by the end of 2008.

PAMZ O_3 MANAGEMENT PLAN VISION STATEMENT

The PM and O_3 Management Plan for the PAMZ region will ensure that measured O3 emissions will always achieve or be better than CWS by 2010.

PLAN DEVELOPMENT

Stakeholder input was required to successfully develop a robust and achievable Plan. The PAMZ O_3 Management Committee consists of multi-stakeholder representatives that developed a terms of reference for the draft O_3 Management Plan. An initial meeting was held with the PAMZ O_3 Committee in order to develop the draft plan. The committee discussed the following topics to identify local issues creating O_3 exceedances in the region, and to develop draft objectives, actions, steps and indicators to include in the plan:

- What will be the best indicator of good air quality in the PAMZ region?
- Since the area will continue to grow in population for many years, what are some tools we can use to plan effectively for these new emissions?
- Who should bear the responsibility to make sure that the Plan is implemented correctly and the actions in it are enforced?
- Where should the funding to implement the Plan and its actions come from?
- What are some methods that can be used to raise awareness and educate the people in the Red Deer region about air quality issues?

The feedback received by the PAMZ O_3 Committee was used to develop draft objectives, actions, steps and indicators. The objectives were developed by combining the common themes.

Included in the objectives were recommendation from "Annotated Bibliography: A Review of Existing Ambient Air Quality Policy Potentially Affecting Emissions of Particulate Matter and Ozone Precursors within Alberta Airshed Zones" (Dance, 2008). This report provided air emission reduction efforts identified or in progress and assessed their influence on reducing ozone levels in the region. Current regulatory policies, legislation, existing plans and commitments, bylaws and other relevant documents that effect the airsheds were reviewed for PM, O_3 and precursor initiatives.

The draft plan was provided to stakeholders at two consultation events in November 2008: one in Red Deer and one in Olds. The events were intended to provide opportunity for stakeholder input regarding types of reduction efforts and reduction expectations. The events began with a brief presentation that included background on the development of the O_3 Management Plan and a short introduction to the air quality science and local issues creating O_3 exceedances in the region. The attendees were then asked to review and prioritize the draft objectives, actions, steps, indicators and responsibilities. Feedback obtained at the events was incorporated into the final version of the plan where possible.

The following considerations were discussed at the stakeholder events:

- Relative contribution of the sector to the emissions in the area

- Fairness of reduction efforts expected by all sectors
- Barriers to reducing emissions in each sector (ex. “low hanging” versus cost-prohibitive solutions)
- Relative confidence of whether the proposed reduction is achievable
- Mitigation of ‘peak’ events vs. overall reductions
- Implementation strategies: realistic expectations and tangible ways to implement actions outlined in the plan

MANAGEMENT PLAN STRUCTURE

The management plan consists of six **Objectives** which are general statements of desired ends to be achieved over an unspecified period of time. They are a more specific articulation of the vision and chart the direction for the Plan and they are not expected to be measurable. Each objective has several associated **Actions** which answer the “When?” and “Who?” questions associated with the Plan. Actions include various Steps to achieve the objectives. **Indicators** are used to assess the rate of success in meeting the objectives and they will be measurable Key Performance Indicators (KPIs) using the SMART formula (Specific, Measurable, Achievable, Reasonable, Timely).

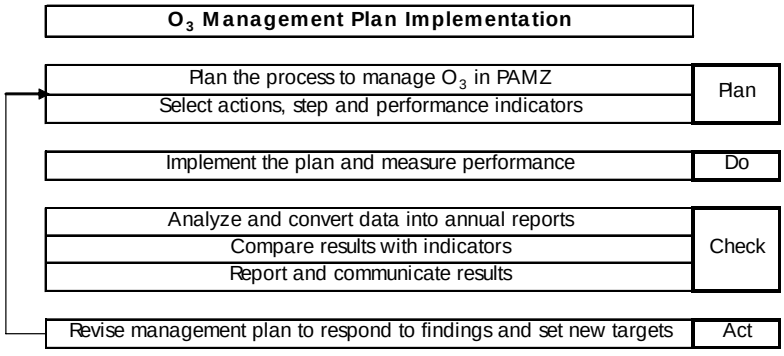
A **Time Frame** is assigned to each step and indicator:
Continuous: carried on indefinitely (C)
Immediate: O—12 months
Short Term: 12 – 24 months
Medium Term: 3 – 5 years
Long Term: 6—10 years

Responsibility for each action or step is assigned to one or more of the following stakeholders:

- AENV: Alberta Environment
- CRD: City of Red Deer
- PAMZ: Red Deer Region Airshed Zone
- SRD: Sustainable Resource Development

O_3 MANAGEMENT PLAN IMPLEMENTION

PAMZ will submit the O_3 Management Plan to Alberta Environment by the end of 2008. Responsibility for actions, steps and indicators are assigned to stakeholders who have indicated an interest in pursuing feasibility because of synergies with existing corporate or municipal interests. Stakeholders will also be encouraged to identify ongoing initiatives within their organizations and list them in the formal plan.



objective1

management plan

Determine human health impacts of poor air quality on PAMZ stakeholders

Action 1A — Determine impact of poor air quality on PAMZ residents

Step 1A-1

Alberta Environment will adopt an air quality index that includes a health linkage.

- Status update will be published in annual PAMZ report

Responsibility: Lead=AENV
Timeframe: Medium Term (3—5 yrs)

Step 1A-2

The PAMZ Human Health Committee will coordinate an air quality related health study on target groups.

- Status update will be published in annual PAMZ report as applicable

Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)

Action 1B — Predict local poor air quality events

Step 1B-1

Support development of air quality forecasting to predict poor air quality events.

- Liaise with Environment Canada and status update will be published in annual PAMZ report as applicable

Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)

Step 1B-2

Creation of smog advisory/warning system in conjunction with local media outlets.

- PAMZ will work with Alberta Environment to set up advisory system at Red Deer station

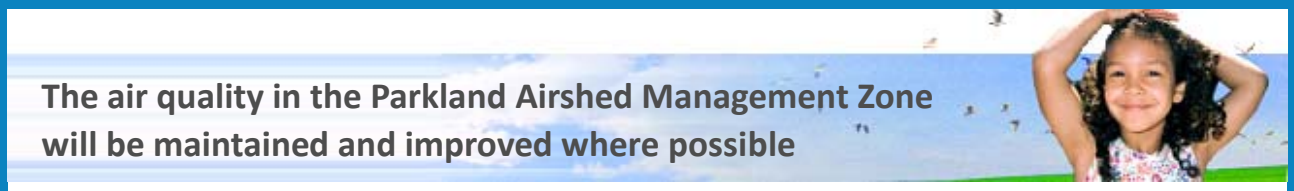
Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)

Step 1B-3

Conduct an ozone cumulative impact assessment.

- Assessment will be published in annual PAMZ report as applicable

Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)



The air quality in the Parkland Airshed Management Zone will be maintained and improved where possible

objective2

Action 2A

The O_3 management plan will be tracked and reported regularly and will be implemented using a continuous improvement / adaptive management approach

Step 2A-1

Air quality measurements will be ranked to describe local air quality.

- Air quality measurements will be compared to the Alberta Ambient Air Quality Objectives and Canada Wide Standards
- Air Quality parameters will be compared to a baseline level to determine if pollution levels are decreasing
- Local air quality measurements will be compared to other locations

Responsibility: Lead=PAMZ Assist=AENV
Timeframe: Continuous. Report published yearly.

Step 2A-2

The PAMZ O_3 Management Committee will undertake management plan review in a transparent manner. The Committee will consist of multi-stakeholder representatives from the PAMZ region.

- Details of the O_3 Management Plan review will be published annually in the PAMZ annual report

Responsibility: Lead=PAMZ Assist=AENV
Timeframe: Continuous. Report published yearly.

Step 2A-3

The three year ozone triggering assessment (for the previous three years) will be used to describe the triggering limits.

- The ozone triggering assessment will be updated annually and the results will be published on the Alberta Environment website

Responsibility: Lead=AENV
Timeframe: Continuous. Report published yearly.

Action 2B

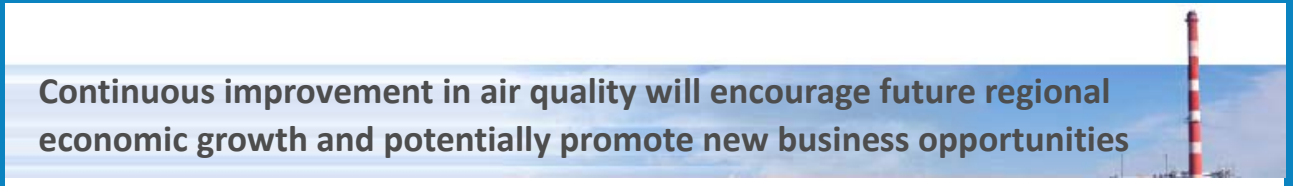
Continue and improve air quality monitoring, especially for ozone and precursors

Step 2B-1

PAMZ will assess opportunities to expand O_3 monitoring capability to better characterize ozone behaviour in the zone.

- A monitoring "gap analysis" will be conducted to determine required ozone monitoring data such as addition of a high elevation station and a downwind station
- PAMZ will gain understanding of O_3 in rural areas of PAMZ
- Ozone monitoring results will be included in the PAMZ annual report

Responsibility: Lead=PAMZ Assist=AENV
Timeframe: Continuous. Report published yearly.



Continuous improvement in air quality will encourage future regional economic growth and potentially promote new business opportunities

Action 3A

Encourage area stakeholders, including oil and gas, to reduce O_3 and precursor emissions through use of incentives and deterrents

Step 3A-1

Local area oil and gas stakeholders will participate in EUB Directive 60 (fugitive emissions and flaring reductions) and the Specified Gas Emitters Regulation (SGER) according to regulatory requirements

- Industry will investigate method for adopting best available technology for up-grades and will assess effectiveness
- Reduction in visual emissions, such as flaring and venting
- Progress will be communicated in PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Continuous. Report published yearly.

Step 3A-2

Provincial implementation of the CASA Emissions Management Framework for the Alberta Electricity Sector, which will management O3 precursors from the electricity sector. These emissions potentially impact the northern area of PAMZ.

- Provincial implementation status will be documented in the PAMZ annual report.

Responsibility: Lead=AENV
Timeframe: Long Term (6—10 yrs)

Step 3A-3

Non oil and gas local area industry will investigate methods for appropriate and industry specific best available technology with respect to air emissions.

- Progress will be communicated in PAMZ annual report.

Responsibility: Lead=PAMZ
Timeframe: Continuous. Report published yearly.

Regional land use planning will encourage and promote good air quality

Action 4A

Regional land use planning will encourage and promote good air quality

Step 4A-1

PAMZ will participate in area Land Use Management Framework to ensure that air emissions and airsheds are considered.

- Updated on Land Use Management Framework will be included in the PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)

Step 4A-2

Review existing municipal plans from Red Deer and Red Deer County, and will collaborate with other municipalities located within PAMZ , to determine if there are existing initiatives that benefit ozone reduction (i.e. modal transportation options).

- Municipal plan ozone initiatives and opportunities will be listed in the PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Short Term (12—24 months). Report published yearly.

Step 4A-3

Review integrated watershed plan and determine if there are connectivities to the ozone management plan.

- Updated on watershed plan will be listed in the PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)

Step 4A-4

Track progress of QE2 Corridor Bullet Train initiative.

- Provide update in annual report as available

Responsibility: Lead=PAMZ
Timeframe: Long Term (6—10 yrs)

Step 4A-5

City of Red Deer will offer incentives for public to take transit to recreational locations, such as discount on entry fees with transit pass.

- Increased ridership to recreational areas tracked on City of Red Deer website

Responsibility: Lead=City of Red Deer
Timeframe: Medium Term (3—5 yrs)

Regional land use planning will encourage and promote good air quality

objective4

Action 4B

Investigate impact of through traffic on local air quality

Step 4B-1	Commission a study on through traffic to determine emissions contribution and effect of reduction of speed limit by 10 km/h.
	• Study findings released to stakeholders • Through traffic emissions included in updated emissions contribution **Responsibility:** Lead=AENV **Timeframe:** Medium Term (3—5 yrs)

Action 4C

Reduction of biomass burning

Step 4C-1	Commission review to list existing bylaws that limit biomass burning (including agricultural and slash/disposal burning).
	• List existing municipal bylaws and feasibility of bylaws on other municipalities in the PAMZ annual report **Responsibility:** Lead=PAMZ **Timeframe:** Short Term (12— 24 months)

Step 4C-2	Coordinate with Sustainable Resource Development (SRD), Alberta Agriculture and Research Department (AARD) and Parks Canada to develop policy for slash/disposal burning.
	• Identify SRD, AARD and Parks Canada contacts • Publish coordination updates in the PAMZ annual report **Responsibility:** Lead=SRD Assist=AENV/PAMZ **Timeframe:** Medium Term (3—5 yrs)

management plan

Build and promote awareness of local air quality issues

Action 5A

Identify opportunities to advocate behavioural changes to stakeholders

Step 5A-1	Educate stakeholders and business owners about air quality benefits of initiatives such as alternative work schedules, transit usage, decrease number of vehicles per family, personal transportation contribution to local air quality issues and telecommuting.
	• Include information in PAMZ Education and Communication Plan • Include information on personal responsibility for air quality management in the zone in the PAMZ annual report **Responsibility:** Lead=PAMZ **Timeframe:** Short Term (12— 24 months)
Step 5A-2	Educate stakeholders about green energy choices.
	• Provide information regarding industrial initiatives that increase energy efficiencies and the benefits of cogeneration adoption **Responsibility:** Lead=PAMZ Assist=AENV **Timeframe:** Short Term (12— 24 months)
Step 5A-3	Coordinate with local school boards to implement an air quality curriculum module in elementary schools.
	• Coordinate with the Fort Air Partnership (FAP), and other provincial airsheds, to determine feasibility of adapting current module for use in PAMZ zone • Update progress in PAMZ annual report **Responsibility:** Lead=PAMZ Assist=AENV **Timeframe:** Short Term (12— 24 months)
Step 5A-4	Promote small businesses whose activities promote a decrease in ozone emissions.
	• Post inventory of appropriate small businesses, such as emissions testing and biodiesel, on the PAMZ website • Encourage local promotion of vehicle scrappage programs, such as Climate Change Central Car Heaven **Responsibility:** Lead=PAMZ **Timeframe:** Short Term (12— 24 months)

objective 5

Build and promote awareness of local air quality issues

Step 5A-5	PAMZ will raise awareness of area air quality issues, especially ozone, by holding contests and competitions, developing and distributing an air quality flyer, promoting alternative vehicle use initiatives (odd license plates drive on odd days).
	• One flyer will be developed • Will cross-promote at three area events and distribute flyers • A series of "Ozone Fact Sheets" will be available on PAMZ website **Responsibility:** Lead=PAMZ **Timeframe:** Short Term (12— 24 months)
Step 5A-6	Cross promote with other appropriate area events and link to appropriate initiatives on the PAMZ website.
	• Compile list of appropriate area events and list those identified for cross promotion on the PAMZ website and in the PAMZ annual report **Responsibility:** Lead=PAMZ **Timeframe:** Short Term (12— 24 months)

Action 5B — PAMZ will educate and outreach to stakeholders about O_3 emissions and reduction plans

Step 5B-1	Maintain relationships with local media outlets (TV, radio and newspapers) to promote air quality related issues.
	• Maintain list of local media outlets and routinely send information regarding PAMZ activities **Responsibility:** Lead=PAMZ **Timeframe:** Continuous
Step 5B-2	Investigate methods to outreach to all stakeholders
	• Maintain links to PAMZ website from other appropriate websites • Publish "Zone" newsletter **Responsibility:** Lead=PAMZ Assist=AENV **Timeframe:** Short Term (12— 24 months)
Step 5B-3	O_3 emissions and reduction plans will be integrated into PAMZ communication and education plan
	• PAMZ communication and education plan will be posted on PAMZ website **Responsibility:** Lead=PAMZ Assist=AENV **Timeframe:** Short Term (12— 24 months)

Build and promote awareness of local air quality issues

Step 5B-4	Update the City of Red Deer Vital Signs report and include more detailed air quality information.
	• Vital Signs report will be posted on the City of Red Deer website **Responsibility:** Lead=City of Red Deer **Timeframe:** Short Term (12— 24 months)

Agencies will work collaboratively to improve air quality and to share environmental responsibility

Action 6A

The O_3 Management Plan will be consistently, fairly and equitably funded

Step 6A-1

Investigate methods for including non-traditional air emissions sources (agriculture, forestry, gas stations, dry cleaners, etc).

- Establish relationship with all stakeholders contributing to local air quality issues
- List organizations and groups identified for outreach in the PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Long Term (6—10 yrs)

Step 6A-2

Will recommend that the Alberta Government develop a sufficient and consistent funding mechanism for managing provincial and zone emissions, such as the "Clean Air Fund", funded by existing tax dollars, that issues grants specific to airsheds.

- Monies transferred to PAMZ from ANEV will be identified in the PAMZ annual report

Responsibility: Lead=AENV
Timeframe: Long Term (6—10 yrs)

Step 6A-3

Identify opportunities for improving local air quality that do not require funding such as implementing anti-idling bylaws and municipal policies on energy efficiencies.

- Maintain list of zone initiatives and include in the PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Long Term (6—10 yrs)

Step 6A-4

The existing PAMZ funding formula will include resources to fund the O_3 Management Plan.

- The emissions inventory used to determine sector contributions will be updated in 2009 and posted on the PAMZ website

Responsibility: Lead=PAMZ Assist=AENV
Timeframe: Short Term (12— 24 months)

Agencies will work collaboratively to improve air quality and to share environmental responsibility

objective6

Action 6B

PAMZ will coordinate with other agencies to identify opportunities for sharing of resources and knowledge

Step 6B-1

Collaborate with Alberta Transportation to evaluate:

- Implementation of annual vehicle inspections (emissions testing) as part of vehicle renewal process
- Inclusion of a mileage-based multiplier on the provincial registration fee (or base multiplier on vehicle emissions load)
- Incorporation of fuel efficiency messages into the driver's training program

- Alberta Transportation contact update will be published in annual PAMZ report

Responsibility: Lead=PAMZ
Timeframe: Long Term (6—10 yrs)

Step 6B-2

Alberta Environment will ensure that:

- New/renewed/amended *EPEA* Industrial Approvals will include clause to be member of PAMZ
- Industry Codes of Practice will be updated to include air quality protection
- Air quality protection regulations and guidelines will be developed/updated
- Companies/facilities with exemplary air quality emissions will have access to a streamlined approvals process

- Changes to Codes of Practice, regulations, guidelines that benefit zone air quality will be mentioned in the PAMZ annual report (i.e CCME Code of Practice for VOC emissions)
- Facilities with *EPEA* Industrial Approvals will be PAMZ members

Responsibility: Lead=AENV
Timeframe: Medium Term (3—5 yrs)

Step 6B-3

Identify feasibility of creating Agricultural Best Management Practices listing practical, economical and feasible techniques to reduce ozone precursors (NOx and VOCs)

- Identify key contacts with zone Agricultural producers
- List updates in annual PAMZ report

Responsibility: Lead=PAMZ
Timeframe: Medium Term (3—5 yrs)

Step 6B-4

Participate in ozone management working group to coordinate efforts and initiatives with other airshed zones requiring an ozone management plan

- CASA PM and O_3 Implementation Team updates published in annual PAMZ report

Responsibility: Lead=PAMZ
Timeframe: Short Term (12— 24 months)

Agencies will work collaboratively to improve air quality and to share environmental responsibility

Action 6C

Adopt voluntary compliance strategies, stewardship programs, corporate responsibility and individual responsibility to reduce air emissions

Step 6C-1	Industry located in the PAMZ zone will voluntarily commit to reduction targets suitable to their industry/municipality.
	• Industry will provide status updated for the annual PAMZ report **Responsibility:** Lead=PAMZ **Timeframe:** Short Term (12— 24 months)
Step 6C-2	Individual voluntary initiatives will be promoted such as financial incentives for home owners such as rebates and free pick-up and disposal of old refrigerators and furnaces.
	• City of Red Deer to provide status update in annual PAMZ report **Responsibility:** Lead=City of Red Deer **Timeframe:** Short Term (12— 24 months)

Action 6D

Responsibility for implementation of the Ozone Management Plan is shared among all stakeholders

Step 6D-1	Implementation of the Plan will be supervised by PAMZ with the support and regulatory backstop of Alberta Environment.
	• Implementation of Plan will be monitored by PAMZ and AENV **Responsibility:** Lead=PAMZ Assist=AENV **Timeframe:** Long Term (6—10 yrs)

Action 6E

Releases of ozone and precursor substances will be reported to regulatory authorities, as appropriate

Step 6E-1	Stakeholders will collect and submit ozone and ozone precursor information as required by the Federal, National Provincial organizations.
	• NPRI substance release trends will be published in the PAMZ annual report • Adoption status of The Alberta Regulatory Framework for Air Emissions (sets fixed emission caps for ozone precursors by 2015) will be published in the PAMZ annual report • Initiatives relating to the Canadian Clean Air Act will be identified in the PAMZ annual report **Responsibility:** Lead=PAMZ Assist=AENV **Timeframe:** Short Term (12— 24 months)

Agencies will work collaboratively to improve air quality and to share environmental responsibility

Action 6F

Will compile and maintain a list of initiatives from government and national agencies that reduce ozone and precursors

Step 6F-1

Federal regulations include:

- Federal On-Road Vehicle Emissions Regulations (enforce emissions standards for ozone precursors in new vehicles phased in over 2004—2010
- Sulphur in Diesel and Gasoline Regulations (in place since 2006)
- EcoAction (voluntary program offering rebates to retrofit homes and purchase more efficient vehicles and tax incentives for transit passes)
- Specified Gas Emitters Regulation (SGER)
- Canadian Council of Ministers of the Environment Canadian Wide Standards for Ozone

CASA initiatives include:

- Clean Air Strategy
- Flaring and Venting Framework (reduced flare volumes by 60—70% by 2006/2007)
- Confined Feeding Operations Project Team
- Pollution Prevention and Continuous Improvement
- Particulate Matter and Ozone Framework

ERCB Directives include:

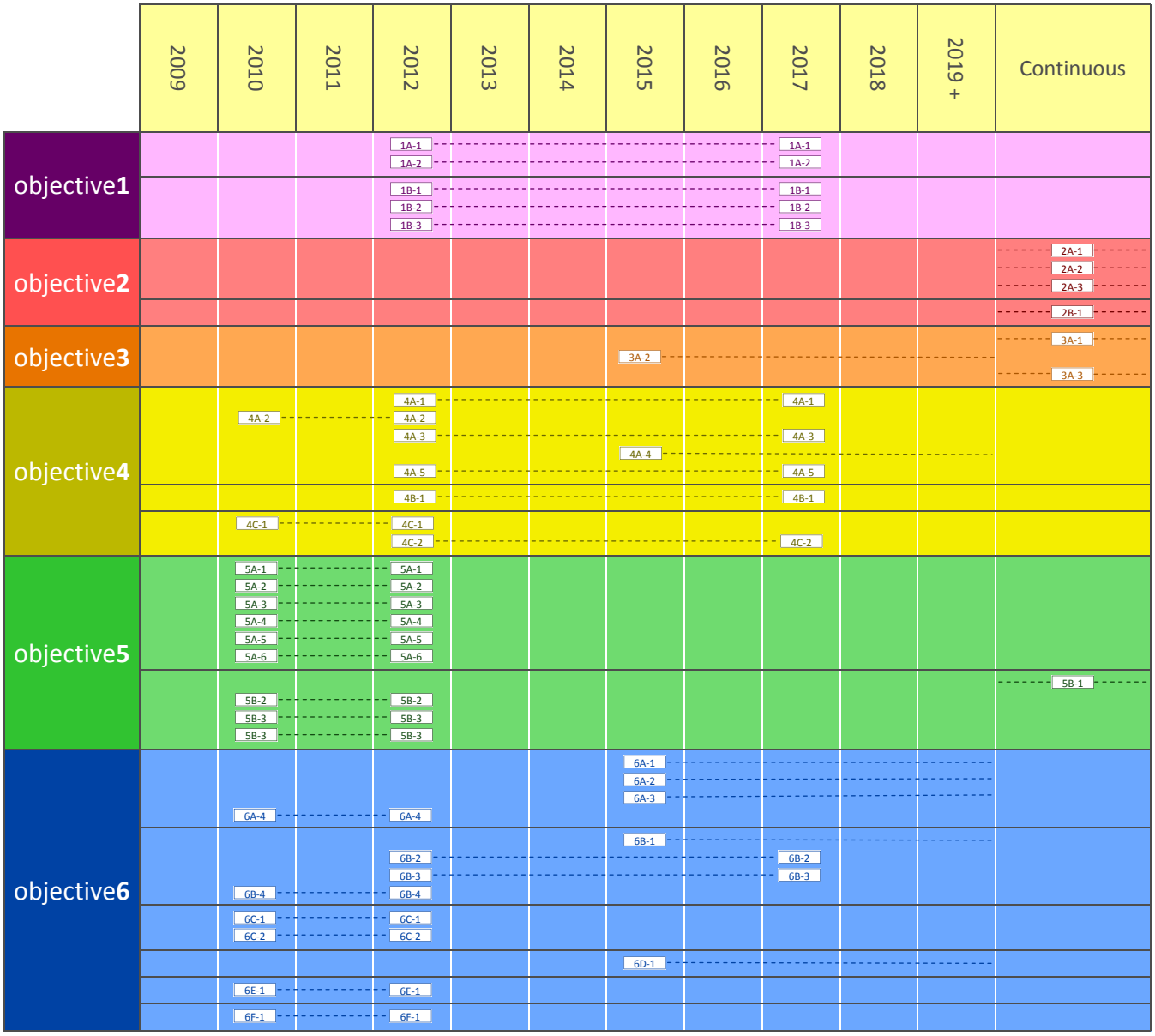
- Directive 60 regulations and guidelines for flaring, incinerating and venting for upstream oil and gas (reduce ozone precursor emissions with targets set for 2009)
- CAPP initiatives include:
- Best Management Practices for Control of Benzene Emissions from Glycol Dehydration
- CAPP/CETAC-West Best Management Practices for Fuel Gas Management

- List will be included in PAMZ annual report

Responsibility: Lead=PAMZ
Timeframe: Short Term (12— 24 months)

O_3 MANAGEMENT PLAN GHANTT CHART

The Ghantt chart attached below displays the timelines for completion of each step.



STAKEHOLDER SIGN OFF

On behalf of the Parkland Airshed Management Zone, the PAMZ Executive Committee submit the attached O_3 Management Plan to Alberta Environment on behalf of the PAMZ stakeholders to show commitment to using the plan as an element of the overall airshed management activities.

Representative	Title	Signature
Andy Lamb	PAMZ Chair	_____
Lenore Harris		_____
Blake Reid		_____
Kevin Warren		_____
Reg Watson		_____
Larry Williams		_____
Brian Goliss		_____
		_____

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